Washington Public Power Supply System

P.O. Box 968 3000 George Washington Way Richland, Washington 99352 (509) 372-5000

Docket No. 50-397

October 26, 1983
G02-83-973

Mr. J. B. Martin
Regional Administrator
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Subject : NUCLEAR PROJECT 2
NRC INSPECTION REPORT 50-397/83-38 NOTICE OF VIOLATION

Reference : (a) Meeting with NRC on October 14, 1983, in Bethesda, Maryland

Attachments 1 and 2 are transmitted herewith in response to a request made by Mr. R. T. Dodds at reference (a).

Attachment 1 is a response to NRC Inspection Item 83-38/02, Quality Class I - As-Built Program, provided to the Resident Inspector at WNP-2.

Attachment 2 contains representative calculations, including some worst case conditions, performed by Stone and Webster during their performance of a third-party assessment of QCI and QCII/Seismic I as-builts for WNP-2.

If you have any questions or desire further information, please contact Hugh Crisp at (509) 377-2522, extension 4661.

C. S. Carlisle - 982A
Program Director, WNP-2

HAC/fl

Attachments: 1 and 2

cc: Mr. R. Auluck, NRC, Bethesda
Mr. R. T. Dodds, NRC RV
Mr. R. F. Heishman, NRC I&E
Mr. A. D. Toth, NRC Resident, WNP-2

IE 01

NRC FINDINGS/CONCLUSIONS COVER SHEET

NRC REPORT NO. 83-38/02 SUBJECT CATEGORY Quality Class I - As-Built Program DATE 9/21/83

TYPE Unresolved

General Problem

The Quality Class I As-Built Program does not successfully provide identification of all deficiencies.

Statement of Root Cause

The as-built program deficiencies identified by the NRC CAT Inspection cannot be attributed to one specific root cause. Evaluations of the as-built program has resulted in the identifications of five separate areas (causes) which collectively contributed to the as-built program anomalies. The subject areas are discussed below.

Specific Problem(s)

1) Measurement and recording errors were made in identifying potential hardware deficiencies during the constructors walk down inspection and preparation of as-built drawings.

2) Interpretation errors were made in identifying potential hardware deficiencies during the constructors comparison of the QCI hanger as-built deviations from the design using the allowable construction tolerances in BRI Drawing H-501.

Corrective Action to Prevent Recurrence

The contract specification was revised to clarify As-built program requirements and provide more concise as-built measurement tolerances. Two PED's were issued to revise the H-501 Drawing in order to clarify measurement and tolerance

Corrective Action for Specific Problem(s)

1) A synopsis of corrective action taken is documented in the Supply System "As-Builting - Quality Class I Pipe Support" Summary.

2) Resolution of this concern is summarized in the Supply System "As-Builting - Quality Class I Pipe Support" Summary

Supporting Documents

PED 215-H-W851
215-H-W941
215-H-W949

As-Builting - QC I Pipe Support Summary Part A

As-Builting - QC I Pipe Support Summary Part B

NRC REPORT NO. 83-38/02

3) Pipe supports categorized as Quality Class II, Seismic Category I were excluded from the project as-built program.	3) This concern was essentially resolved by NRC Inspection Item 83-05/05.	NRC Inspection Item 83-05/05 As-Building - QCI Pipe Support Summary Part C.
4) Clarification of ASME-NF/AISC Code Jurisdictional Boundaries.	4) This concern is covered by NRC Inspection Item 82-18/02.	NRC Inspection Item 82-18/02 As-Building - QCI Pipe Support Summary Part D.
5) Pipe whip Restraints were excluded from the as-built program.	5) BRI will perform this function as part of their final pipe break and missile hazards in-situ walkdowns.	As-Building - QCI Pipe Support Summary Part E.
6) This inspection item and the NRC CAT Report 83-29 identified specific deficiencies associated with a sample of thirty Bechtel large bore and Gilbert Commonwealth small bore Pipe supports.	6) Each of the NRC CAT identified supports were evaluated on a case by case basis. In addition the supply system performed a sample reverification of an additional 72 hangers. A summary of this program is attached.	As-Building - QCI large bore As-Built Program Evaluation (with attachments)

NRC REPORT NO. 83-38/02

7) As noted in this inspection item the Supply System assigned an independent third party to assess the project as-built program.	7) The third party review determined that the project QCI as-built program is acceptable and meets the needs of the project. A copy of the Stone & Webster Evaluation Report is attached.	Stone & Webster — Engineering Inspection & Evaluation of QCI Pipe Supports & Small Bore Piping.

Report No.	83-38/02
Paragraph	5.b
Report Date	8-30-83

Type
Unresolved

For Further Information:
H. Boarder x 6840
D. Cosgrove x 6826

Responsibility
Bechtel Engineering/
BRI Engineering

ITEM DESCRIPTION

5.b Mechanical Construction - (2.) Quality Class I - As-Built Program Does Not Successfully Provide Identification of Discrepancies

The adequacy and accuracy of the piping/support as-built program had been challenged by NRC regional inspectors, and licensee corrective actions taken as discussed in NRC inspection report number 50-397/83-05 paragraphs 5, 6.a, 6.d and 6.e. The licensee's actions had included identification, training, testing, and certification of personnel authorized to perform field as-built drawing updating; checking of results of individual as-built engineers; audits of program performance; and feedback to management and individuals. Work done prior to the updated program was sampled for each individual who did such work, and re-performance of the as-builts was scheduled for cases where the sample showed unacceptable discrepancies. Reasonable management attention appeared to have been applied to assure adequate performance accuracy by the as-built engineers. Audit results for program implementation did not reveal significant errors.

In Table III-2 and III-5 of inspection report 50-397/83-29 the NRC CAT inspectors identified several discrepancies between the as-installed piping supports versus the latest as-built drawings. For thirty Bechtel large bore and Gilbert-Commonwealth small bore pipe supports checked: five incorrect dimensions (large bore as-builts RHR-415, RHR-563, LPCS-28; and small bore as-builts SLC-4474-11 and DO-2533-2); two cases of undersize large bore support material (RCIC-21 and RCIC-952N); four undersize large bore support welds (RHR-465 and LPCS-28); two large bore support concrete anchor problems (HPCS-16 and RHR-563); and an incorrect material piece heat number on a large bore support (RCIC-952N). For piping isometrics, five of 89 dimensions appeared to have been incorrectly shown on the as-built drawings.

ITEM STATUS

As of 9-21-83:

Corrective action for this inspection item encompasses three programs.

- o Evaluation of the as-built program to determine the causes of the deficiencies and provide a generic fix to prevent recurrence.
- o Implementation of an as-built reverification program to evaluate both the NRC CAT inspection sample and an extended sample reinspection performed by the Supply System.
- o Assignment of a third party group of engineers to perform an independent assessment of the as-built program.

1. The evaluation of the as-built program identified five general causes (areas) for the deficiencies identified by the CAT Inspection. A synopsis of this evaluation and corrective action taken is documented in the Supply System "As-Building - Quality Class I Pipe Support" Summary.

2. The as-built reverification program has been completed. A summary of this program and the corrective actions taken is documented in the Supply System "As-Building - Quality Class I Large Bore As-Built Program Evaluation" Report.

Report No.	83-38/02
Paragraph	5.b
Report Date	8-30-83

ITEM DESCRIPTION

The CAT findings show some weakness in performance by Bechtel and Gilbert-Commonwealth field engineering personnel, in spite of Bechtel management efforts to obtain accurate work. Additional management action appears necessary to ascertain sufficient accuracy of prior and future as-built drawings. Such action appears to have been promptly initiated by the Supply System to resolve this matter, including assignment of a third party group of engineers to assess the as-built situation independently of Bechtel. (Unresolved items 397/83-38-02)

See Attachment 1 "Tables III-2 and III-5 of NRC Report 83-29.

ITEM STATUS

3. The third-party review determined that the project QCI as-built program is acceptable and meets the needs of the Project. This review is documented in the Stone & Webster "Engineering Inspection and Evaluation of QC-I Pipe Supports and Small Bore Piping" Report.

Attachment 1
83-38/02

TABLE III-2

ISOMETRIC DISCREPANCIES

Isometric Dwg. No.	Discrepancy
1. BC/G 213, Rev. 7	Distance between support MS-4C-2 and connection for the safety-relief valve - Actual: 7" Design Dwg.: 2' - 8 3/16" As-Built Inspection: Did not check this dimension. [PRFI-1961 was initiated on this issue]
2. 4PCS-603-112, Rev. 9	Distance between supports 4PCS-13 and 4PCS-44 - Actual: 30" Design Dwg.: 40 3/8" As-Built Inspection: 33 3/4"
3. SLC-045-16.25, Rev. 7	Valve SLC-V-18 (Item No. 12) has no valve operator orientation marked on the isometric drawing. The operator is installed in the vertical direction. This deficiency was not identified in the "as-built" program. [PEC 218-M-G075 was initiated on this issue]
4. BC/G-218, Rev. 7	Distance between support SB-9 and restraint RCT-9 - Actual: 5' - 8" Design Dwg.: 5' - 3" As-Built Inspection: 7' - 5½"
5. MS-4448-4, Rev. 8	Distance between pipe elbow and support MS-4448-42 (u-bolt) - Actual: 3½" (exceeds allowable tolerances) Design Dwg.: 6" As-Built Inspection: 4"

TABLE III-3

QUALITY CLASS I SUPPORT/RESTRAINT AS-BUILT DEVIATIONS

SUPPORT-RESTRAINT NO.	NRC CAT INSPECTOR OBSERVATION
HPCS-16	Richmond insert stud threads not staked
RCIC-21	Clip angle 4x4x3/8", drawing specifies 4x4x1/2"
RCIC-952N	1. Tube steel 4x4x1/4", drawing specifies 4x4x.375" 2. Wrong heat number etched on tube steel.
RHR-415	1. Vendor welds ground undersize during attachment weld grinding. 2. Critical dimension shown on red line as 5' 1 1/4", actual and original design is 5' 1 3/4".
RHR-563	1. Cold set dimensions on snubbers were 1' 1 5/8" and 1' 1 3/4". Drawing specifies 1' 1" ± 1/8". 2. Two of twelve expansion anchor mounting studs had less than required thread engagement into anchor shell.
SLC-4475-11	Clearance from pipe to support are 1/8" and 1/32", red line indicates 1/16" and 0".
RHR-465	Lug to pipe weld 3/16", drawing specifies 1/4".
LPCS-903N	Weld details were not specified on the drawing.
LPCS-28	1. Undersize welds on washer plates. 2. Cold set dimension on snubber as 2' 7 7/8" per design drawing, shown on red line as 2' 10 1/2".
RWCU-162	Weld details were not specified on the drawing.
DC-2833-2	Hanger location with respect to the pipe riser varied from design location by 2 7/8". The tolerance allowed by drawing 4801 for this critical dimension is ±2".
MS-998N	Lug to pipe welds 1/4", drawing specifies 5/16".

09/08/83

AS-BUILTING - QUALITY CLASS I PIPE SUPPORTS

DESCRIPTION OF CONCERN

The NRC CAT inspected 30 pipe supports at WNP-2. This inspection identified errors or deficiencies in the previously compiled as-built information made by the constructor in 12 of the 30 pipe supports. Also, an additional or extended sample of 72 pipe supports was inspected by the Project Quality Assurance organization. This review also identified errors or deficiencies in the construction as-builting process. The NRC CAT concluded that the constructors "as-built" program, while identifying a number of hardware deficiencies, does not appear to be completely effective in that the NRC CAT findings and site sample findings indicate that additional deficiencies exist, some of which are considered significant to the NRC CAT.

The NRC CAT concerns with the project as-built program covers five general areas:

A. Measurement and recording errors made in identifying potential hardware deficiencies during the constructors walkdown inspection and preparation of as-built drawings.

B. Interpretation errors made in identifying potential hardware deficiencies during the constructors comparison of the QC I hanger

as-built deviations from the design using the allowable construction tolerances in Burns and Roe (BRI) drawing H-501.

C. Exclusion of pipe supports categorized as Supply System Quality Class II, Seismic Category I from the project as-built program.

D. The location of ASME-NF/AISC code jurisdictional boundaries.

E. Exclusion of pipe whip restraints from the as-built program.

PROGRAM TO RESOLVE CONCERNS

A. Measurement and Recording Errors

The purpose of as-builting pipe supports and restraints is to assure that the "as-built" installations are within the design envelope as required by NRC I & E Bulletin 79-14. This is accomplished by the constructor performing actual in-situ measurements of specific attributes of the installation and reporting the results to the A/E when the as-installed attribute exceeds a specific value (or tolerance). Specific attributes that require inspection and measurement to assure that the installations are within the design envelope include:

- o Pipe run geometry
- o Valve type, size and location
- o Valve operator type and orientation
- o Size, type and location of other concentrated weights

- o Pipe support (hanger) type, location, orientation, size, and general assembly details.

To meet these requirements, it is not required that measurements be taken and/or recorded for all attributes associated with a piping system and its supports, nor is it necessary that all attributes need be measured to the same degree of accuracy. Accordingly, the A/E must specify:

1) Those attributes that require in-situ measurement

2) Those measurements that require recording

3) The measurement accuracy required for each type of attribute

4) Deviations from design that are required to be identified to the A/E for reconciliation with the design.

At the time of the NRC CAT inspection, the A/E had specified measurement and submittal requirements. Upon post NRC CAT inspection review of these specification requirements, it was determined that these requirements were causing implementation anomolies. As a result, the specification requirements in these areas were changed to:

1) Consolidate all as-built program requirements into one section in the specification (previously the as-built

requirements were scattered throughout many sections of the specification)

2) Delineate the deficiency submittal to the A/E requirements in more detail

3) Better specify measurement tolerances that are consistent with the ability of the constructor to measure the attribute with a high degree of repeatability while assuring the precision required by the A/E for various categories of attributes.

In addition, a detailed engineering evaluation was made of QC I hanger measurement, recording and interpretation errors (See Section B, Interpretation Errors). This evaluation was made by Bechtel Engineering personnel from San Francisco who were independent from the project and experienced in evaluation of as-built deviations. This evaluation consisted of developing criteria consistent with code, specification, and I & E Bulletin 79-14 requirements, determination of the effect of each deviation identified in the NRC CAT and site QA samples on the design on a case-by-case basis, and consideration of the generic impact of the deviations.

This evaluation is attached. The evaluation was reviewed and compiled by Bechtel Engineering at the WNP-2 site and was reviewed and approved by Burns and Roe. The evaluation results can be briefly summarized as follows:

- o None of the deviations (measurement, recording and interpretation) impact the design, function, or operability of the specific hanger

- o Some of the items noted in the evaluation are of a concern generically because of their potential impact on the function of the hanger. These items are:

  - Coldset of snubbers - snubber/strut pin-to-pin dimensions
  - Offsets in rods, struts and snubbers
  - Clearances/gaps in box-type hangers.

All of these items of concerns are hanger attributes that are subject to change over time due to hanger set and balancing, ambient temperature changes, thermal shakedown, system operation, etc. Because of this, these items are rechecked by the startup organization, after the constructors as-built program is complete, as part of the WNP-2 Section XI preservice inspection program. The evaluation also identified cases of loose nuts, missing bolting locking devices, and missing washers. These items are not items that need be as-built, but their installation may be critical. This general item is being addressed as part of a project corrective action program dealing with bolting and fasteners.

B. Interpretation Errors

The NRC CAT identified that errors were being made in not identifying hardware discrepancies when the constructor evaluated as-built deficiencies against the allowable construction tolerances in Burns and Roe drawing H-501. To resolve this concern and to minimize the interpretation errors:

1) The A/E defined in greater detail the requirements as to which as-built measurements need to be reviewed by constructor against drawing H-501 prior to submittal to the A/E.

2) Drawing H-501 was revised by the A/E to clarify specific details that were being misinterpreted.

3) The constructor re-reviewed all hanger as-built measurements required by the A/E to be reviewed against H-501 prior to submittal and corrected the errors made during previous reviews. The constructor's field engineers chosen for this task were experienced at making these evaluations and were specifically retrained for this task.

4) The process was independently audited by a Bechtel San Francisco Engineering Staff senior engineer experienced in design requirements.

5) An engineering evaluation was made of all interpretation errors identified in the NRC CAT sample. None of the errors were found to impact the design, function or operability of the specific hanger.

C. Exclusion of Pipe Supports Categorized as Supply System Quality Class II, Seismic Category I From the Project As-Built Program

The NRC CAT concern is essentially the same as NRC resolved item 83-05/05. The root issue was whether or not pipe supports on non-safety related piping which would otherwise be classifed Non-Seismic Category I, but whose failure could reduce the functioning of items important to safety (Seismic Category I) are to be as-built under the requirements of USNRC I & E Bulletin 79-14. Letter GO2-83-622 to NRC Region VI, dated July 15, 1983, transmitted the Supply Systems' position with respect to this issue. The issue was subsequently closed and the position that I & E Bulletin 79-14 does not apply to this category of piping and supports therefore accepted.

D. The Location of ASME-NF/AISC Code Jurisdictional Boundaries

The projects response to this issue is being addressed in responses to NRC Notice of Deviation 83-22 (Item 82-18/02) as contained in the Supply System letter GO2-83-701 to the NRC Region V, dated August 5, 1983, and in response to NRC NRR question 110.44.

E. Exclusion of Pipe Whip Restraints From the As-Built Program

Burns and Roe Engineering will (as part of their final pipe break and missile hazards in-situ walkdown) measure, record, and reconcile with the design all as-built locations of pipe whip restraints with respect to the piping. This is being done even though a sampling demonstrated that the locations of pipe whip restraints are located within a reasonable tolerance of their design location, that the restraints are demonstrated to be conservatively designed, and that no code, specification or regulatory requirement exists to require that these items be as-built reconciled with the design.

BURNS AND ROE, INC.
WPPSS
NUCLEAR PROJECT
NO. 2

PROJECT ENGINEERING DIRECTIVE

PA'D NON-PA'D T.O'D NON-T.O'D

CODE	PROJECT ENGINEERING DIRECTIVE													
2	1		2	1	5		-	H		-	W	1	8	5	1
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
DATE	0	7	/	1	2	/	8	3							
	X		16	17	X		18	19	X		20	21			

INFORMATION COPIES J. Mahoney
B. M. Boyum, G. Englert, J. Hopkins, J. Tutt
M. Ramchandani, C. Foley (WPPSS), J. Kayano

SHEET 1 OF 22

REASON FOR P. E. D.:

1. To clarify Specification 2808-215 As-Built requirements.
2. To provide 215 contractor with concise As-Built Measurement Tolerances.

TRANSMITTED FOR DOC CLOSEOUT AND DRAWING UPDATE ONLY

REFERENCES	
SUBJECT	As-Built Spec Revision
LOCATION	Various
ENG. SYSTEM	811 §7.1-P3/8.0-P1
S/U SYSTEM	970 n-P00/9.0-P5.6
QUALITY CLASS	I & II §240-P1
ORIGINATING DOCUMENTS	Request from D. Johnson (BPC) to resolve NRC QA Concerns

DESCRIPTION OF WORK:

1. Void the following PEDS: 215-H-G633, 215-H-M757, 215-H-N959, 215-H-M466
2. Revise Specification 2808-215, Section 15A as indicated on sheet 4 through sheet 13 of this PED.
3. Revise Specification 2808-215, Section 15B as indicated on sheet 14 through sheet 15 of this PED.
4. Revise Specification 2808-215, Section 15R as indicated on sheet 16 through sheet 21 of this PED.
5. Revise Specification 2808-215, Section 1C as indicated on sheet 22 of this PED.

RECEIVED
Bechtel Power Corporation
AUG 30 1983
JOB NO. 1463

REVIEWED BY S/U

NOTES

1. THIS PED REVISES DIRECTION PREVIOUSLY PROVIDED BY THE FOLLOWING PED(s): N/A
2. THIS PED VOIDS DIRECTION PREVIOUSLY PROVIDED BY THE FOLLOWING PED(s): (see item 1 of Desc. of Work
3. THIS PED WORK SHOULD BE COORDINATED WITH KNOWN OTHER WORK UNDER THE FOLLOWING PED'S: N/A
4. THIS PED DEPENDS ON THE PRIOR INSTALLATION OF THE FOLLOWING PED'S: N/A

REVISE:
NONE
DRAWINGS
SPECIFICATION ✓

APPROVALS:

DISCIPLINE ENGINEER	7/26/83 DATE
GROUP SUPERVISOR	8/3/83 DATE
PROJECT ENGINEER	8/5/83 DATE

PROJECT ENGINEERING DIRECTIVE	CODE	PROJECT ENGINEERING DIRECTIVE
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REFERENCE DRAWINGS

REVISE	DRAWING NO.	SHEET NO.	SUFFIX	REV.

REFERENCE DRAWINGS

REVISE	DRAWING NO.	SHEET NO.	SUFFIX	REV.

REFERENCE SPEC. PARAGRAPHS

REVISE	SECTION	PARAGRAPH	PAGE	REV.
Y	15A		iii	3
Y	15A	3.11	15a	2
Y	15A	3.11	15b	1
Y	15A	3.11	15c	1
	~~15A~~	~~3.11~~	~~15d~~	~~[illegible]~~
Y	15A	ATTACH 9	219	0
Y	15A	ATTACH 9	220	0
Y	15A	ATTACH 9	221	0
Y	15A	ATTACH 10	222	0
Y	15A	ATTACH 10	223	0
	15A	ATTACH 10	224	0
Y	15B	3.05.1	6a	2
Y	15B	3.05.3	8a	1
	15R		ii	2

PROJECT ENGINEERING DIRECTIVE

CODE | PROJECT ENGINEERING DIRECTIVE

2 1 5 - H - W 8 S 1

WNP 2 | BURNS & ROE, INC. | PAGE 3 OF 21

REVISE

REFERENCE DRAWINGS

DRAWING NO	SHEET NO	SUFFIX	REV.

REVISE

REFERENCE DRAWINGS

DRAWING NO	SHEET NO	SUFFIX	REV.

REVISE

REFERENCE SPEC. PARAGRAPHS

SECTION	PARAGRAPH	PAGE	REV.
1SR	3.13	31	1
1SR	3.13	32	2
1SR	EXHIBIT 2	45	0
1SR	EXHIBIT 2	46	0
1SR	EXHIBIT 2	47	0
1C	1.0	1	41

TABLE OF CONTENTS (Continued)

ADD

215

Rev. 3 11-19-79

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15A	PAGE 15A-iii	PARA N/A	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A		PED 215-H-W851 SHT 4 OF 22
SCALE N/A	DRAWN BY GEE DATE 7/22/83	CHKD BY WT M DATE 7/29/83	APPVD GEE DATE 7/29/83
			TITLE AS-BUILT SPECIFICATION REVISION

3.11 As-Built Drawings Confirmation

3.11.1 General Requirements

Contractor shall provide confirmation to Owner that the component/system installed configuration is in compliance with the Issued for Construction drawings.

Confirmation scope, for purposes of as-builting, shall include the following drawings as provided by the Owner:

1. Piping Erection Diagrams (Piping Isometric Drawings).

2. Support Detail Sheets (Hanger Detail Drawings).

Contractor shall confirm the installed configuration for the aforementioned drawings for pipe and pipe supports that fall under the following categories:

1. Quality Class I.

2. Quality Class II within Quality Class I/II Anchor Groups.

3. Quality Class II interfacing with Quality Class I/II Anchor Groups.

4. "Inaccessible" (Piping only).

"Inaccessible" is defined as

a) Buried, Embedded or Submerged.

b) Located in any of the Inaccessible Areas defined under Article 2.0 of WNP-2 Project Instruction PMI 6-6 entitled, "As-Builting Program Requirements".

3.11.2.1 Quality Class I Items

Contractor shall provide to the Owner redline mark-ups of the Piping Erection Diagrams listed on the BRI As-Built Scoping List indicating the installed configuration of all items on the drawing regardless of whether or not the installed configuration is within the construction tolerances provided by this Specification.

Contractor shall provide to the Owner confirmation of the installed configuration for the Support Detail Sheets listed on the BRI Hanger and Isometric Final As-Built Tracking List. Confirmation shall indicate that the installed configuration is within the construction tolerances provided by this Specification.

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15A	PAGE 15A-15a	PARA 3.11	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A		PED 215-H-W851 SHT 5 OF 22
SCALE N/A	DRAWN BY GEE DATE 7/26/83	CHKD [illegible] DATE 7/29/83	TITLE AS-BUILT SPECIFICATION REVISION
		APPVD GEE DATE 7/29/83	

Contractor shall provide to the Owner confirmation of the installed configuration for the Small Diameter Piping and Pipe Supports listed on the As-Built Isometric Status Tracking List (ISTL). Confirmation shall indicate that the installed configuration is within the construction tolerances provided by this Specification.

The measurement tolerances to be applied to the Contractor's as-built confirmation of the above items is provided in ATTACHMENT 9 entitled, "AS-BUILT MEASUREMENT TOLERANCES" of this Specification Section.

The as-built representation of welds on the Support Detail Sheets shall meet the requirements of ATTACHMENT 10 entitled, "APPROVED METHOD FOR THE AS-BUILT REPRESENTATION OF COMPLEX WELDS" of this Specification Section.

3.11.2.2 Quality Class II Items Within Quality Class I/II Anchor Groups

Contractor shall provide to the Owner redline mark-ups of the Piping Erection Diagrams listed on the BRI Hanger and Isometric Final As-Built Tracking List indicating the installed configuration of all items on the drawings regardless of whether or not the installed configuration is within the construction tolerances provided by this Specification.

Contractor shall provide to the Owner confirmation of the installed configuration for the Support Detail Sheets listed on the BRI Hanger and Isometric Final As-Built Tracking List. Confirmation shall indicate that the installed configuration is within the construction tolerances provided by this Specification.

Contractor shall provide to the Owner confirmation of the installed configuration for the Small Diameter Piping and Pipe Supports listed on the As-Built Isometric Status Tracking List (ISTL). Confirmation shall indicate that the installed configuration is within the construction tolerances provided by this Specification.

The measurement tolerances to be applied to the Contractor's as-built confirmation of the above items is provided in ATTACHMENT 9 entitled, "AS-BUILT MEASUREMENT TOLERANCES" of this Specification Section.

The as-built representation of welds on the Support Detail Sheets shall meet the requirements of ATTACHMENT 10 entitled, "APPROVED METHOD FOR THE AS-BUILT REPRESENTATION OF COMPLEX WELDS" of this Specification Section.

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15A	PAGE 15A-15b PARA 3.11		BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A		PED 215-H-W851 SHT 6 OF 21
SCALE N/A	DRAWN BY [illegible] DATE 7/26/83	CHKD BY WTM DATE 7/29/83	APVD [illegible] DATE 7/29/83	TITLE AS-BUILT SPECIFICATION REVISION

3.11.2.3 Quality Class II Items Interfacing With Quality Class I/II Anchor Groups

Contractor shall provide to the Owner redline mark-ups of the Piping Erection Diagrams listed on the BRI Hanger and Isometric Final As-Built Tracking List indicating the installed configuration of all items on the drawing regardless of whether or not the installed configuration is within the construction tolerances provided by this Specification.

Contractor shall provide to the Owner confirmation of the pipe support orientation with regard to the piping (i.e.: angle with regard to North-South, East-West or vertical directions) and the pipe support function (i.e.: Spring, Sunbber, X-Y Restraint) for those supports listed on the BRI As-Built Scoping List.

Contractor shall provide to the Owner confirmation of the installed configuration for the Small Diameter Piping and Pipe Supports listed on the As-Built Isometric Status Tracking List (ISTL). Confirmation shall indicate that the installed configuration is within the construction tolerances provided by this Specification.

The measurement tolerances to be applied to the Contractor's as-built confirmation of the above items is provided in ATTACHMENT 9 entitled, "AS-BUILT MEASUREMENT TOLERANCES" of this Specification Section.

3.11.2.4 "Inaccessible" Items

Contractor shall provide to the Owner redline mark-ups of the Large Diameter (2½") Piping Erection Diagrams only. This information will not be included in the Owner's As-Built Verification Program unless otherwise required by sub-paragraph 3.11.2.1 and 3.11.2.2 above.

The measurement tolerances to be applied to the Contractor's as-built confirmation of the above items is provided in ATTACHMENT 9 entitled, "AS-BUILT MEASUREMENT TOLERANCES" of this Specification Section.

REF DOC PCN N/A	RFI N/A	WPPSS NUCLEAR PROJECT NO. 2	
REF SPEC SECTION 15A	PAGE 15A-15c PARA 3.11	BURNS AND ROE, INC.	
REF DWG N/A	DWG ZONE N/A	PED 215-H-W851	SHT 7 OF 22
SCALE N/A	DRAWN BY GEE DATE 7/26/83	TITLE AS-BUILT	

ATTACHMENT 9

AS-BUILT MEASUREMENT TOLERANCES

THE FOLLOWING MEASUREMENT TOLERANCES ARE TO BE APPLIED DURING THE CONTRACTOR'S AS-BUILT CONFIRMATION OF THE ITEMS LISTED WHEN REQUIRED BY ARTICLE 3.11 OF THIS SPECIFICATION SECTION.

THE BELOW STATED MEASUREMENT TOLERANCES ARE THOSE REQUIRED BY THE OWNER AND ARE TO BE USED BY THE CONTRACTOR IN DETERMINING ACCEPTABLE MEASUREMENT TECHNIQUES AND THE ACCEPTABILITY OF ANY REMEASUREMENTS. THE TOLERANCES ARE GIVEN IN RECOGNITION THAT AS-BUILTING IS ACCOMPLISHED WITH STANDARD MANUAL MEASUREMENT TOOLS SUCH AS RULES, TAPES, PLUMBBOBS AND THAT MEASUREMENT ACCURACY IS FURTHER LIMITED BY LACK OF ACCESSIBILITY.

1. PIPING ERECTION DIAGRAMS

	Characteristic Measured	Tolerance
a)	Axial Piping Dimensions	± 2 inches or ± ½ the nominal pipe diameter, whichever is less restrictive
b)	Pipe Support Locations	Same as above
c)	Penetration Clearances	
	1. Dimensions less than or equal to 2 inches	± 1/8 inch
	2. Dimensions greater than 2 inches	± 1/4 inch
d)	Valve Stem Orientation	
	1. Power operated valves in other than vertical pipe runs	± 6 degrees
	2. All other valves	± 15 degrees
e)	Elevations and dimensions from pipe to building column lines	May be estimated

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15A	PAGE 15A-219	PARA ATTACH 9	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A		PED 215-H-W851 SHT 8 OF 22
SCALE N/A	DRAWN BY GEE DATE 7/29/83	CHKD BY LTT DATE 7/29/83	APPVD GEE DATE 7/29/83
			TITLE AS-BUILT SPECIFICATION REVISION

Characteristic Measured	Tolerance
2. SUPPORT DETAIL SHEETS	
a) Structural Member Dimensions	
1. Dimensions less than or equal to 5 inches	± 10% of dimension but not less than ± 1/32 inch
2. Dimensions greater than 5 inches	± 1/2 inch or ± 4% of dimension, whichever is less restrictive
b) Component Hardware Dimensions	
1. Pin-to-pin dimensions for Rod and Spring Supports	+ 12 inches - 3 inches
2. Pin-to-pin dimensions for Snubber cold setting	± 1/8 inch
3. Pin-to-pin dimensions for Rigid Sway Strut Assemblies	± 1/2 inch or ± 4% of dimension, whichever is less restrictive
c) Clearances/Gaps	
1. Dimensions less than or equal to 5 inches	± 10% of dimensions but not less than ± 1/32 inch
2. Dimensions greater than 5 inches	± ½ inch or ± 4% of dimension, whichever is less restrictive
d) Structural/Base Plates	
1. Length and Width	± 1/4 inch
2. Thickness	+ 1/4 inch - 0 inch
3. Eccentricity of attaching member(s)	± 1/4 inch
e) Base Plate Anchor Bolts	
1. Bolt hole center-to-center dimensions	± 1/4 inch
2. Bolt hole edge-to-edge of plate	± 1/8 inch

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15A	PAGE 15A-220 PARA ATTACH 9		BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A	PED 215-H-WBS1	SHT 9
SCALE N/A	DRAWN BY GEE DATE 7/29/88	TITLE AS-BUILT SPECIFICATION REVISION	
	CHKD BY WTM DATE 7/29/88 APPVD GEE DATE 7/29/88		

Characteristic Measured	Tolerance
3. Bolt hole diameter	+ 1/8 inch - 0 inch
4. Bolt washer thickness	+ 1/8 inch - 0 inch
f) Angular Dimensions	± 3 degrees
g) Weld Sizes	+ infinity - 1/32 inch

REF DOC PCN N/A RFI N/A | WPPSS NUCLEAR PROJECT NO. 2

REF SPEC SECTION N/I PAGE 15A-221 PARA ATTACH 9 | BURNS AND ROE, INC.

REF DWG N/A | DWG ZONE N/A | PED 215-H-W851 | SHT 10 OF 22

SCALE N/A | DRAWN BY GEE DATE 7/29/83 | CHKD I.I.T DATE 7/29/83 | APPVD GEE DATE 7/29/83 | TITLE AS-BUILT SPECIFICATION REVISION

ATTACHMENT 10

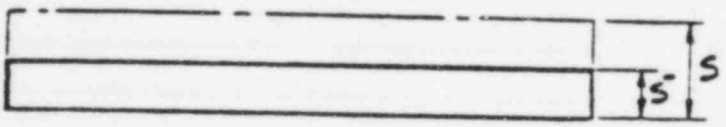
APPROVED METHOD FOR THE AS-BUILT

REPRESENTATION OF COMPLEX WELDS

CONSTRUCTED COMPLEX WELDS FOR PIPE SUPPORTS ARE TO BE REPRESENTED ON THE AS-BUILT DRAWINGS IN ACCORDANCE WITH THE FOLLOWING CASES, EXAMPLES AND NOTES:

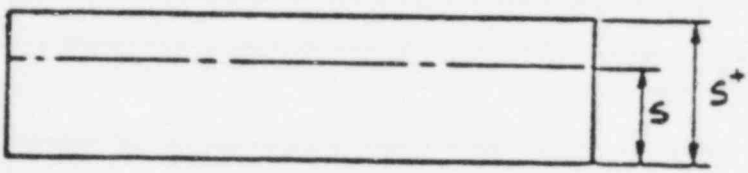
CASE 1 - REGULAR UNIFORM WELD PROFILE

A. WELD LEG LESS THAN DESIGN



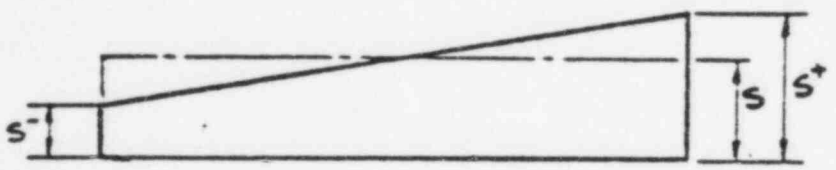
AS-BUILT TO INDICATE WELD LEG AS S^-

B. WELD LEG GREATER THAN DESIGN



AS-BUILT TO INDICATE WELD LEG AS S

CASE 2 - REGULAR TAPERED WELD PROFILE



AS BUILT TO INDICATE WELD LEG AS $\frac{(S^- + S^+)}{2}$

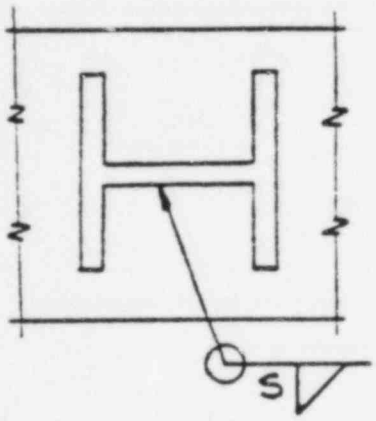
(SEE NOTE 4)

CASE 3 - IRREGULAR WELD PROFILE

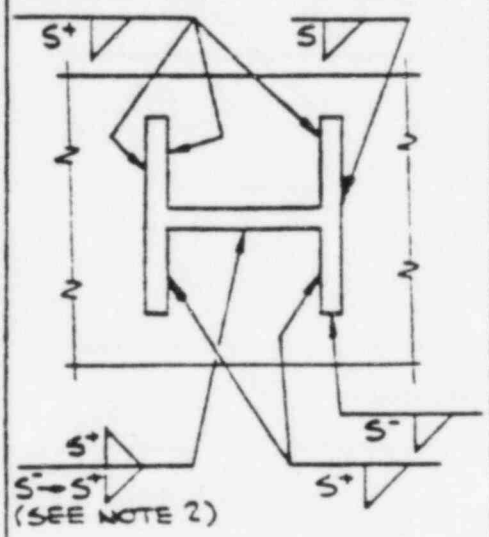
AS-BUILT TO INDICATE WELD LEG AS S^-

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15A	PAGE 15A-222	PARA ATTACH. 10	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A		PED 215-H-W851 SHT 11 OF 22
SCALE N/A	DRAWN BY [illegible] DATE 7/22/83	CHKD [illegible] DATE 7/[illegible]	TITLE AS-BUILT SPECIFICATION REVISION

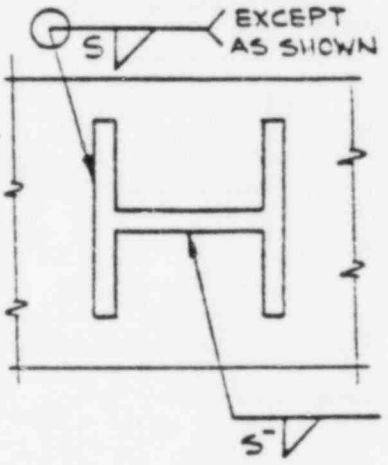
EXAMPLE 1



AS DESIGNED

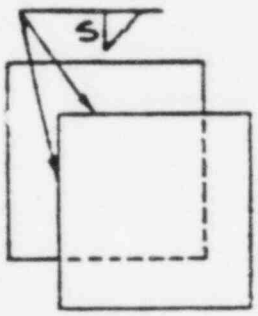


AS CONSTRUCTED

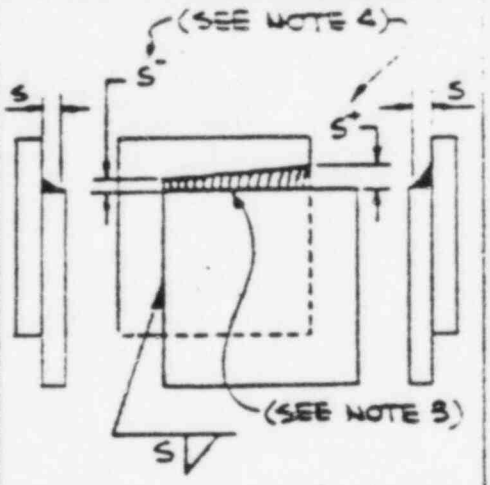


AS-BUILT REPRESENTATION

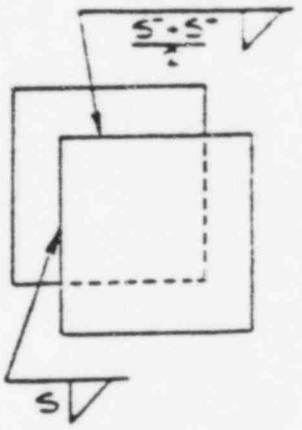
EXAMPLE 2



AS DESIGNED



AS CONSTRUCTED



AS-BUILT REPRESENTATION

15A-223

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15A	PAGE 15A-223	ARA ATTACH. 10	BURNS AND ROE. INC.
REF DWG N/A	DWG ZONE N/A		PED 215-H-W851 SHT 12 OF 22
SCALE N/A	DRAWN BY [illegible] DATE 7/22/82	CHKD [illegible] DATE 7/22/82	APPVD [illegible] DATE 7/21/82
			TITLE AS-BUILT SPECIFICATION REVISION

NOTES:

1. DESIGNATION LEGEND

   S - WELD LEG SIZE AS SPECIFIED ON THE SUPPORT DETAIL SHEET.

   S^+ - WELD LEG SIZE GAUGED AS LARGER THAN SPECIFIED ON THE SUPPORT DETAIL SHEET.

   S^- - WELD LEG SIZE GAUGED AS SMALLER THAN SPECIFIED ON THE SUPPORT DETAIL SHEET.

2. IN EXAMPLE 1, THE $S^- \rightarrow S^+$ DESIGNATION INDICATES AN IRREGULAR WELD PROFILE AS PER CASE 3.

3. IN EXAMPLE 2, THE WELD REFERENCING THIS NOTE HAS A REGULAR TAPERED WELD PROFILE AS PER CASE 2.

4. IN CASE 2 AND EXAMPLE 2, THE MINIMUM PERMISSIBLE VALUES FOR S^- AND S^+ ARE AS FOLLOWS:

   $S^- \geq$ S-1/16"

   $S^+ \geq$ S+1/16"

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15A	PAGE 15A-224	PARA ATTACH. 10	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A		PED 215-H-W851 SH 13 OF 22
SCALE N/A	DRAWN BY GEE DATE 7/22/83	CHKD BY WTM DATE 7/20/83	APPVD GEE DATE 7/29/83	TITLE AS-BUILT SPECIFICATION REVISION

f) Applicable reference drawings and revision numbers (e.g.: B&R or Vendor flow diagrams, piping and equipment drawings.)

g) Identification of all field welds by number.

h) DELETED

i) DELETED

j) Contract limits (as applicable)

k) Piping Code Group

l) Quality Class

m) Seismic Category

n) Design Pressure

o) Design Temperature

p) Operating Temperature

q) Identification of floor and wall penetrations including size.

r) Identification of all pipe supports by B&R tag number to include location relative to piping.

ADD

215SRP 78

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15B	PAGE 15B-62	PARA 3.5.1	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A		PED 215-H-W851 SH 14 OF 22
SCALE N/A	DRAWN BY GEE DATE 7/22/82		TITLE AS-BUILT SPECIFICATION REVISION
	CHKD BY WTM DATE 7/28/82	APPVD GEE DATE 7/29/82	

3.5.3 "As-Built" Drawing Confirmation

Contractor shall furnish Owner with "As-Built" Piping Erection Diagrams in accordance with the requirements of Section 15A, Article 3.0, Paragraph 3.11. ← ADD

DELETE

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15B	PAGE 15B-82	PARA 3.5.3	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A		PED 215-H-W851 SH 15 OF 22
SCALE N/A	DRAWN BY [illegible] DATE 7/22/82	CHKD LITM. DATE 7/28/82 APPVD [illegible] DATE 7/28/82	TITLE AS-BUILT SPECIFICATION REVISION

TABLE OF CONTENTS (Cont'd)

DELETE

215SRP223

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15R	PAGE 15R-ii	PARA N/A	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A		PED 215-H-W851 SH 16 OF 22
SCALE N/A	DRAWN BY GEE	DATE 7/	TITLE AS-BUILT

...ich are Seismic

...uality Class II and G drilled-in concrete anchors which are Seismic Category I shall have their installation verified and documented by Q.C. or at Contractor's option, evaluated and documented by Contractors Engineering, in accordance with Paragraph 3.12.4 (a) above.

c) Quality Class II and G, Non Seismic Category I

A minimum of 20% of the Quality Class II and G, Non Seismic Category I, drilled-in concrete anchors shall have their installation verified and documented by QC or, at Contractors option, evaluated and documented by Contractors Engineering, in accordance with paragraph 3.12.4 (a) above.

3.13 "As-Built" Drawings

215SRP223

DELETE

REVISE

Contractor shall furnish Owner with "As-Built" Support Detail Sheets in accordance with the requirements of Section 15A, Article 3.0, Paragraph 3.11.

DELETE

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15R	PAGE 15R-31	PARA 3.13	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE		PED 215-H-W881 SH 17 OF 22
SCALE N/A	DRAWN BY GEE DATE 7/22/83	N/A	TITLE AS-BUILT SPECIFICATION REVISION
	CHKD BY WTM DATE 7/29/83	APPVD GEE DATE 7/29/83	

DELETE

~~Contractor may "As-Built" the Large Diameter Support Erection Diagrams in combination with the Large Diameter Piping Erection Diagrams identified in Section 15B, Article 3.0, Paragraph 3.5.3 of this Specification. Under this option, the Contractor is required to meet the "As-Built" requirements of both Specification Sections (i.e.: Section 15B and this Section).~~

~~Dimensions shown on the "As-Built" Drawings shall be accurate to within the tolerances shown below.~~

~~± 10% For the dimensions up to 5".~~

~~± 1/2" For the dimensions 5" and/or larger.~~

~~± 1° For the angle measurements.~~

~~The As-Built representation of welds on the Support Detail Sheets shall meet the requirements of Exhibit 2.~~

3.14 Documentation

(a) The Contractor shall submit to the Owner the following documents, as applicable, in addition to others required by [illegible] Contractor shall [illegible] tal and cer[illegible] requir[illegible]

[illegible] seismic I support materia[illegible]

[illegible]cate of Test of filler metal and con-[illegible]able inserts.

.4 Weld records.

.5 Weld repair records.

.6 Nondestructive test reports.

.7 Shop test reports.

.8 Weld maps.

.9 As-builts.

215SRP236

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15R	PAGE 15R-32	PARA 3.13	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE		PED 215-H-W851 SHT 18 OF 22
SCALE N/A	DRAWN BY GEE	DATE 7/12/83	N/A TITLE AS-BUILT SPECIFICATION REVISION

DELETED

215SRP 1

#215 15R-45 Added, 9/10/82

REF DOC PCN N/A	RFI N/A	WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15R	PAGE 15R-45 PARA EXHIBIT 2	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A	PED 215-H-W851 SHT 19 OF 22
SCALE N/A	DRAWN BY GEE DATE 7/24/85	TITLE AS-BUILT SPECIFICATION REVISION
	CHKD BY LOT M DATE 7/29/85 APPVD GEE DATE 7/29/85	

DELETED

215SRP19!

#215 15R-46 Added 9/10/82

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15R	PAGE 15R-46	PARA EXHIBIT 2	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A		PED 215-H-W851 SHT 20 OF 22
SCALE N/A	DRAWN BY [illegible] DATE 7/22/83		TITLE AS-BUILT SPECIFICATION REVISION
	CHKD BY WTM DATE 7/29/83	APPVD [illegible] DATE 7/29/83	

DELETED

215SRP195

#215 15R-47 Added, 9/10/82

REF DOC PCN N/A	RFI N/A		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION 15R	PAGE 15R-47	PARA EXHIBIT 2	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A		PED 215-H-W851 SHT 21 OF 22
SCALE N/A	DRAWN BY GEE DATE 7/22/83		TITLE AS-BUILT SPECIFICATION REVISION
	CHKD BY WTM DATE 7/29/83	APPVD GEE DATE 7/21/83	

DIVISION 1

SECTION 1C

DRAWINGS AND DATA

1.0 CONTRACT DRAWINGS

The drawings listed below form an integral part of the technical specification and Contract Documents;

In addition to drawings listed herein, piping isometric drawings as listed in the Isometric Drawing Control Log (IDCL) and hanger detail drawings as listed in the Hanger Drawing Control Log (HDCL) are included as Contract Drawings under this Specification.

The Contractor shall refer to the DCL issued bi-weekly, the IDCL issued bi-weekly, and the HDCL issued weekly under separate covers and make a part hereof, as the reference for the latest revision of the applicable contract drawings as listed in this section of the contract documents.

The Contractor shall perform work using the latest revision of the contract and information drawings and refer to the DCL, IDCL, or HDCL for identification of changes to the drawings which have been directed by the Owner, but have not been incorporated in the latest revisions of the drawings.

ADD

The Contractor shall refer to both the BRI Hanger and Isometric Final As-Built Tracking List and the Small Diameter As-Built Isometric Status Tracking List (ISTL), issued periodically under separate covers and make a part hereof, as the reference for the contract drawings to be included in the Contractor's As-Built Verification Program per the requirements Division 15, Section 15A, Article 3.0, Paragraph 3.11 of this Specification.

Contractor shall revise arrangement drawings dimensionally to suit all equipment purchased by him at no additional cost to Owner. Revised dimensions shall be incorporated on shop drawings and submitted to Owner for approval prior to purchasing any equipment effected by these revisions.

Drawing No.	Rev.
1507	
	Interior Details, Sh.
	Misc. Interior Details, Sh. 2

REF DOC PCN N/A	RFI N/A	WPPSS NUCLEAR PROJECT NO. 2	
REF SPEC SECTION 1C	PAGE 1C-1	PARA 1.0	BURNS AND ROE, INC.
REF DWG N/A	DWG ZONE N/A	PED 215-H-W851	SHT 22 OF 22
SCALE N/A	DRAWN BY GEE DATE 8/5/83	TITLE AS-BUILT SPECIFICATION REVISION	
	CHKD BY [illegible] DATE 8/5/83 APPVD GEE DATE 8/8/83		

Washington Public Power Supply System
P.O. Box 968 3000 George Washington Way Richland, Washington 99352 (509) 372-5000

August 30, 1983
WPBEC-C0500-F-83-3119

Responds to: N/A
Response required by: N/A

Mr. J. Newgen
Construction Manager
Bechtel Power Corporation
P.O. Box 600, Caller Service
Richland, WA 99352

Subject: NUCLEAR PROJECT 2, CONTRACT-C0500
PED TRANSMITTAL
PED-215-H-W851

The attached Project Engineering Directive (PED) is forwarded to you for "DOCUMENT CLOSEOUT AND DRAWING UPDATE ONLY". Do not implement this PED unless specifically directed by the Supply System Test and Startup Department.

G K Afflerbach

G.K. Afflerbach, (988U)
Test and Startup Manager

GKA/lh

BURNS AND ROE, INC.
WPPSS
NUCLEAR PROJECT
NO. 2

PROJECT ENGINEERING DIRECTIVE

NON-PAID

CODE	PROJECT ENGINEERING DIRECTIVE
3 1	2 1 5 - H - W 9 4
1 2	3 4 5 6 7 8 9 10 11 12 13 14 15
DATE	0 7 / 2 6 / 8 3
X	16 17 X 18 19 X 20 21

REVISION FOR P. E. D.:

PROVIDE ± △△ TOLERANCES FOR LARGE BORE SUPPORT LOCATION DIMENSIONS ON PIPING.

INFORMATION COPIES H. J. HOPKINS
K. FRINDRICH, M, PIPE STRESS

SHEET 1 OF 3

REFERENCES	
SUBJECT	H-501
LOCATION	VARIOUS
ENG. SYSTEM	VARIOUS
S/U SYSTEM	970.0-P00
QUALITY CLASS	I, I & G

ORIGINATING DOCUMENTS: BRI REVIEW OF H-501

DESCRIPTION OF WORK:

VOID PED 215-H-P518
INFORMATION CONTAINED IN PED 215-H-P518 IS INCORPORATED INTO THIS PED.

REVISE CONTRACT DRAWING H-501 AS SHOWN ON SH 3 OF THIS PED.

RECEIVED
BONNEVILLE POWER ADMINISTRATION
AUG 30 1983
JOB NO. 14931

REVIEWED BY S/U

NOTES

1. THIS PED REVISES DIRECTION PREVIOUSLY PROVIDED BY THE FOLLOWING PED(s): N/A
2. THIS PED VOIDS DIRECTION PREVIOUSLY PROVIDED BY THE FOLLOWING PED(s): PED 215-H-P518
3. THIS PED WORK SHOULD BE COORDINATED WITH KNOWN OTHER WORK UNDER THE FOLLOWING PED'S: N/A
4. THIS PED DEPENDS ON THE PRIOR INSTALLATION OF THE FOLLOWING PED'S: N/A

REVISE:
NONE —
DRAWINGS ✓
SPECIFICATION —

APPROVALS:

W T Murphy — DISCIPLINE ENGINEER — 7/26/83 DATE
GROUP SUPERVISOR — 7/29/83 DATE
PROJECT ENGINEER — 8/3/83 DATE

PROJECT ENGINEERING DIRECTIVE | CODE 21 | PROJECT ENGINEERING DIRECTIVE -215-H-W941

WNP 2 | BURNS & ROE, INC. | PAGE 2 OF 3

REVISE

REFERENCE DRAWINGS

DRAWING NO.	SHEET NO.	SUFFIX	REV
M-501	01		02

REVISE

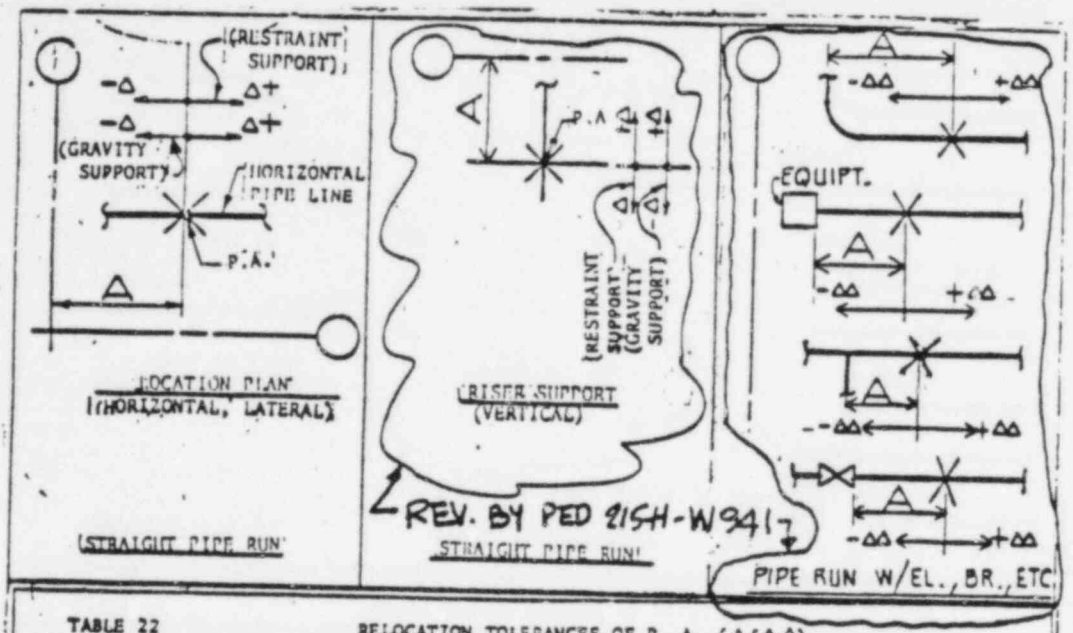
REFERENCE DRAWINGS

DRAWING NO	SHEET NO	SUFFIX	REV.

REVISE

REFERENCE SPEC. PARAGRAPHS

SECTION	PARAGRAPH	PAGE	REV.



REV. BY PED 215H-W941

TABLE 22 RELOCATION TOLERANCES OF P. A. (Δ&ΔΔ)

LARGE BORE - HANGER					SMALL BORE - HANGER					
TYPE OF LINE & HGR.	PIPE SIZE	+Δ	-Δ	±ΔΔ	PIPING CLASS	OPERAT. TEMP.	±Δ	-ΔΔ		REMARKS
					INSIDE OF CONTAINMENT					
HORIZONTAL (GRAVITY)	< 4"	4"	4"	2"	NB	ALL	1	1		
	4"~12"	8	8	4	NC ND B31.1	ALL	2	2		
	> 12"	18	18	6						
HORIZONTAL (RESTRAINT)	< 4	4	4	2						
	4~12	6	6	3						
	> 12	12	12	6						
VERTICAL (GRAVITY)	< 4	6	6	N/A						
	4~12	12	12							
	> 12	18	18							
VERTICAL (RESTRAINT)	< 4	6	6							
	4~12	10	10							
	> 12	12	12							
REMARKS					OUTSIDE OF CONTAINMENT					
					NB NC ND B31.1	ALL	6	2		

NOTE:
1. TOLERANCES SHOWN ABOVE APPLY UNLESS OTHERWISE NOTED ON THE HANGER ISOMETRIC DRAWING.
2. (Δ) AND (ΔΔ) TOLERANCES ARE NON-ADDITIVE

REVISED BY PED 215-H-W941

IF DOC PCN — RFI —		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION — PAGE — PARA —		BURNS AND ROE, INC.
REF DWG H-501	DWG ZONE C-4	PED 215-H-W941 SHT 3 OF 3
SCALE —	DRAWN BY WTM DATE 7/27/83	TITLE DWG. H-501, SH 1, DETAIL 22
	CHKD BY [illegible] DATE 7-27-83 APPVD GEE DATE 7/29/83	

Washington Public Power Supply System
P.O. Box 968 3000 George Washington Way Richland, Washington 99352 (509) 372-5000

August 22, 1983
WPBEC-C0500-F-83-3021

Responds to: N/A
Response required by: N/A

Mr. J. Newgen
Construction Manager
Bechtel Power Corporation
P.O. Box 600, Caller Service
Richland, WA 99352

Subject: NUCLEAR PROJECT 2, CONTRACT C0500
PED TRANSMITTAL
PED- 215-H-W941

The attached Project Engineering Directive (PED) 215-H-W941 is forwarded for implementation and you are hereby authorized to assign work as required by this PED. Master Work List (MWL) input is required for all physical work to be performed on this PED. A Startup Work Request (SWR) processed in accordance with PMI 9-1.1 is required prior to commencing physical work on provisionally accepted or turned-over system(s).

The following system package(s) affected by this PED have been provisionally accepted or turned-over as of this transmittal; NONE .

GK Afflerbach

G. K. Afflerbach, 927M
Test and Startup Manager

JOC/lh

BURNS AND ROE, INC.
WPPSS
NUCLEAR PROJECT
NO. 2

PROJECT ENGINEERING DIRECTIVE

NON-PAD

CODE	PROJECT ENGINEERING DIRECTIVE
2 1 1	21 D. - H - W 9 4 9
1 2	3 4 5 6 7 8 9 10 11 12 13 14 15
DATE	0 8 / 0 1 / 8 3
X	16 17 X 18 19 X 20 21

REASON FOR P. E. D.:

TO INCORPORATE COMMENTS AND SUGGESTIONS FROM REVIEWERS AND USERS OF H-501 DWG.

INFORMATION COPIES H. J. HOPKINS
K. FRINDRICH, 208

SHEET 1 OF 17

REFERENCES	
SUBJECT	H-501
LOCATION	VARIOUS
ENG. SYSTEM	VARIOUS
S/U SYSTEM	970.0 - NSI
QUALITY CLASS	I
ORIGINATING DOCUMENTS	

DESCRIPTION OF WORK:

REVISE DWG. H-501 AS SHOWN ON SHEETS 3 THRU 16 OF THIS PED.

REVIEWED BY S/U

NOTES

1. THIS PED REVISES DIRECTION — PREVIOUSLY PROVIDED BY THE FOLLOWING PED(s):
2. THIS PED VOIDS DIRECTION — PREVIOUSLY PROVIDED BY THE FOLLOWING PED(s):
3. THIS PED WORK SHOULD BE — COORDINATED WITH KNOWN OTHER WORK UNDER THE FOLLOWING PED'S:
4. THIS PED DEPENDS ON THE — PRIOR INSTALLATION OF THE FOLLOWING PED'S:

REVISE:

NONE
DRAWINGS H-501 SHT. 1 AND 2
SPECIFICATION

APPROVALS:

DISCIPLINE ENGINEER	WTM 7-29-83 DATE
GROUP SUPERVISOR	8/1/83 DATE
PROJECT ENGINEER	8/1/83 DATE

REV. 3 88 303.2

PROJECT ENGINEERING DIRECTIVE

CODE

PROJECT ENGINEERING DIRECTIVE 215 - H - W949

WNP 2 | BURNS & ROE, INC. | PAGE 2 OF 17

REVISE X X

REFERENCE DRAWINGS

DRAWING NO.	SHEET NO.	SUFFIX	REV
H501 -	01 -		- 02
H501 -	02 -		- 02

REVISE

REFERENCE DRAWINGS

DRAWING NO.	SHEET NO.	SUFFIX	REV.

REVISE

REFERENCE SPEC. PARAGRAPHS

SECTION	PARAGRAPH	PAGE	REV.

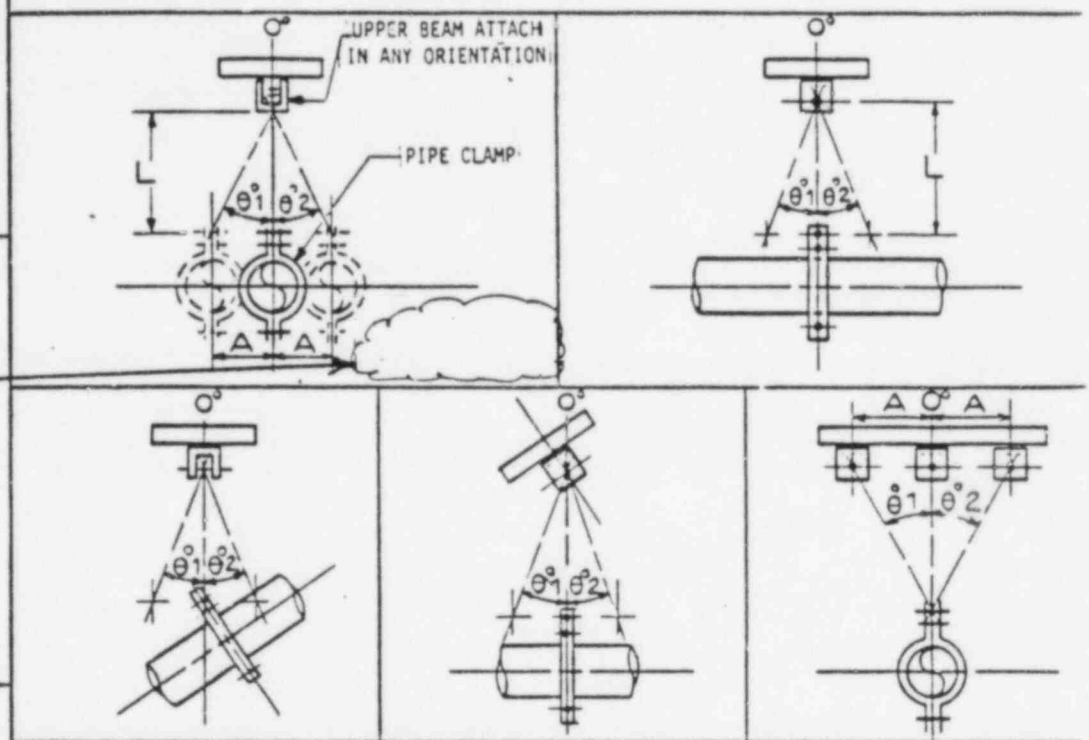
PED-H-949

DETAIL #1 TOLERANCE FOR MISALIGNMENT OF P. A. & S.A. FOR ROD HANGERS OR SPRING HGRS.

NOTES:

(1) THESE TOLERANCES SHALL NOT BE UTILIZED FOR RIGID STRUT OR SNUBBER INSTALLATIONS. THESE TOLERANCES ARE TO BE USED BY ERECTION, INSTALLATION OR ENGINEERING FOR THE PROPER FUNCTIONING OF ROD HANGERS. TOLERANCES ARE MEANT TO LIMIT THE MISALIGNMENT TO A MINIMUM.

(2) TOLERANCES FOR θ_1, θ_2, AND A CANNOT BE COMBINED.



PED-H-W949

θ_1 & θ_2 : ANGLE DUE TO THE MISALIGNMENT OR OFF-SETTING OF THE PINS TO THEIR ORIGINAL DESIGN AXI

$A = L \cdot \tan\theta$ ($\theta = \theta_1$ OR θ_2).

TABLE 1 TOLERANCE FOR ANGULARITY OF ROD HANGERS OR SPRING HGRS.

	DESIGN OFFSET	DESIGN TOLERANCE	SHOP FAB. TOLERANCES	ERECTION TOL. W/ OFFSET	ERECTION TOL. W/O DSN OFFSET
$\theta_1°$	$^{+4°}_{-0°}$	N/A	N/A	±0.2θ°	4°
$\theta_2°$	$^{+4°}_{-0°}$	N/A	N/A	±0.2θ°	4°
A	L TAN θ	N/A	N/A	±0.2(A)	A

PED-H-W949

EXAMPLE: IF OFFSET = 2° ERECTION TOLERANCES ARE ±.2 × (2°) = ± 0.4°
OR [(1 ± 0.2) × "A"] ON "A" DIMENSION.

IF θ = 4° IT ALLOWS 13/16" LATERAL MOVEMENT FOR EVERY FT. OF ROD LENGTH. FOR EXAMPLE ROD LENGTH ON THE HANGER WAS 4'-0" THEN THE S.A. POINT OR THE P.A. POINT COULD BE MOVED 4 × 13/16 = 3¼".

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REF DOC PCN —	RFI —	WPPSS NUCLEAR PROJECT NO. 2	
REF SPEC SECTION —	PAGE —	PARA —	BURNS AND ROE, INC.
REF DWG H-501 SHT 1	DWG ZONE K15	PED 215-H-W949	SHT 3 OF 17
SCALE —	DRAWN BY [illegible] DATE 7-8-83	TITLE H-501	
	CHKD BY WTM DATE 7-29-83	APPVD [illegible] DATE 8/1/83	

PED-H-W949

DETAIL 2 TOLERANCE FOR MISALIGNMENT OF P.A. & S.A. FOR STRUTS & SNUBBERS

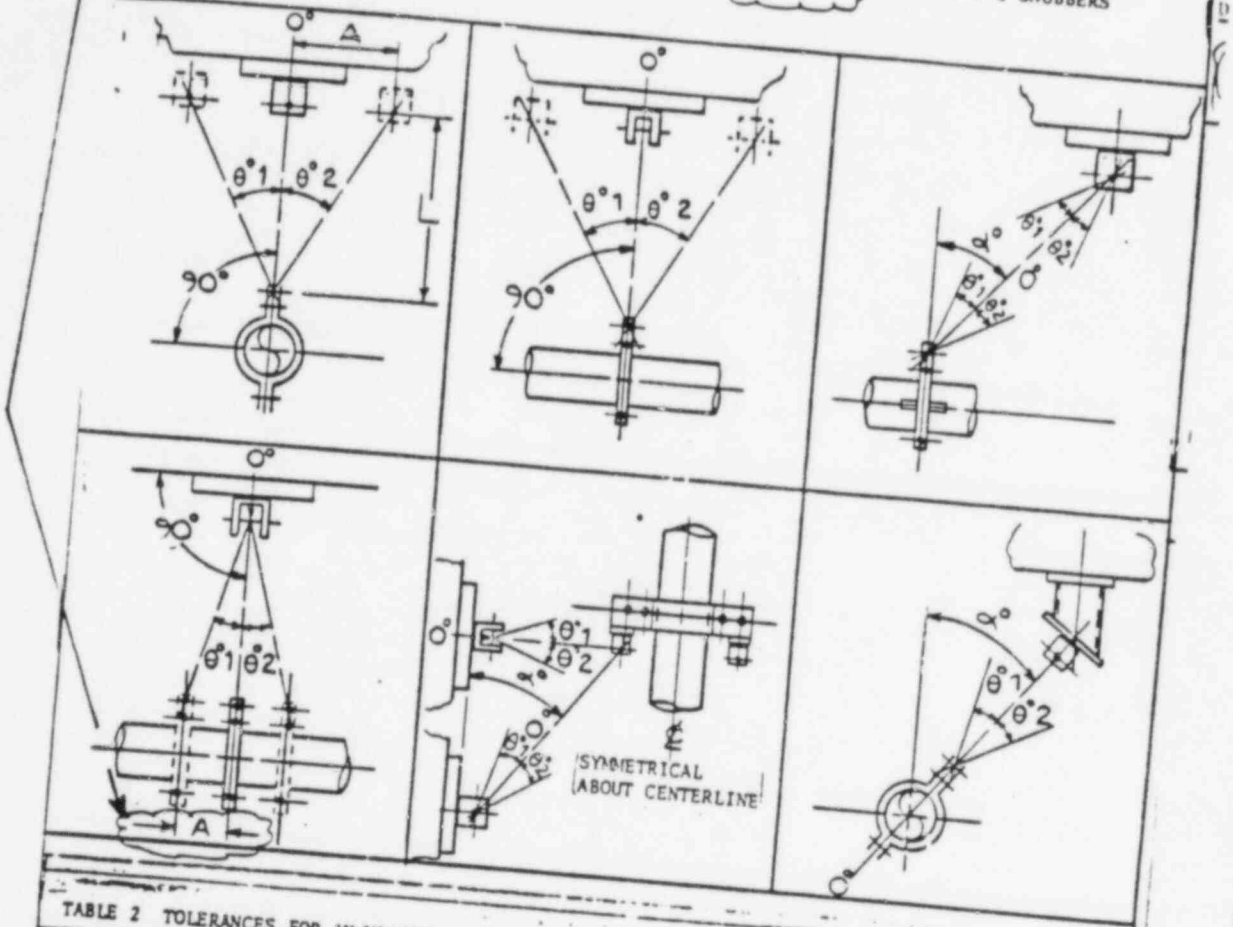


TABLE 2 TOLERANCES FOR ANGULARITY OF SNUBBER & STRUT ASSY's

	DESIGN OFFSET	DESIGN TOLERANCE	SHOP FAB. TOLERANCE	ERECTION OFFSET	ERECTION NO OFFSET	ERECTION NO OFFSET GE SNUBBER ONLY
$\theta_1°$	+30 -0	N/A	N/A	$\pm 0.2\theta_1°$	+4° -0	+2° -0°
$\theta_2°$	+30 -0	N/A	N/A	$\pm 0.2\theta_2°$	+4° -0	+2° -0°
"A"	L(TAN θ)	N/A	N/A	±0.2A		+A -0

NOTE: 1. α=DESIGN ANGLE
2. CONSTRUCTION TOLERANCE: IF OFFSET BY DESIGN IS "A", THEN TOLERANCES ON "A" = ±20% OF A
3. A = L (TAN θ)
4. TOLERANCES FOR $\theta_1°$ & $\theta_2°$ CAN NOT BE COMBINED

PED-H-W949

QC PCN —	RFI —		
SEC SECTION —	PAGE —	PARA —	WPPSS NUCLEAR PROJECT NO. 2
DWG H-501 SHT 1	DWG ZONE K12		BURNS AND ROE, INC.
DRAWN BY K.H. Budzenska DATE 7.8.83			PED 215-H-W949 SHT 4 OF 17
CHKD BY WTM DATE 7-29-83	Approved DATE 8/1/83		TITLE H-501

DETAIL # 3 CLEARANCE FOR BOX FROM HANGER

CASE: 1. HORIZONTAL & LATERAL RESTRAINT-RISER

2. VERTICAL (SEISMIC LOAD ONLY) & LATERAL RESTRAINT-HORIZONTAL RUN

(SEE GENERAL NOTES 7&13)

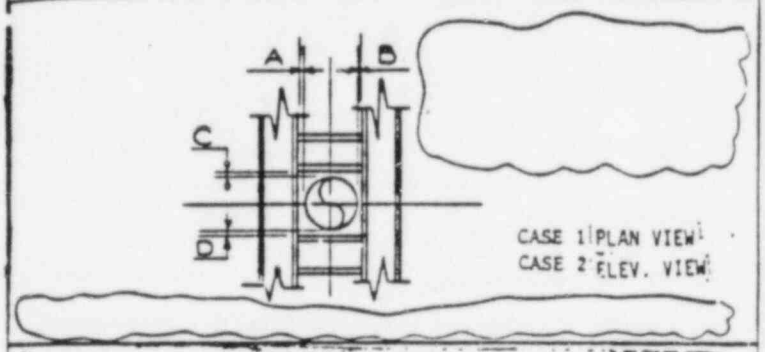


TABLE 3 TOLERANCES IN (INCHES)

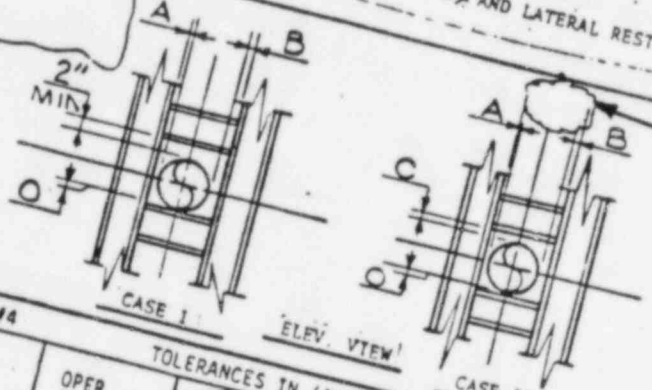
ITEM	OPER. TEMP.	PIPE DIA (INCH)	ERECT. DIM.	ERECT. TOL.
A OR B	—	ALL	1/16	—
C OR D	—	ALL	1/16	—
A + B OR C + D	≥ 200°F	1/2 ~ 12	1/8	+0 -1/16
"	"	14 & OVER	1/8	+1/16 -0
"	< 200°F	1/2 ~ 12	1/8	+0 -3/32
"	"	14 & OVER	1/8	+0 -3/32

PED-H-W949

REF DOC PCN —	RFI —	WPPSS NUCLEAR PROJECT NO. 2	
REF SPEC SECTION —	PAGE —	PARA —	BURNS AND ROE, INC.
REF DWG H-501 SHT 1	DWG ZONE K10	PED 215-H-W949	SHT 5 OF 17
SCALE —	DRAWN BY KEB DATE 7-8-83	TITLE H-501	
	CHKD BY WTK DATE 7-29-83	APPVD DATE 8/1/83	

DETAIL # 4 'CLEARANCE FOR BOX FRAME HANGER'

CASE: 1. DEAD LOAD' AND LATERAL RESTRAINT'
(SEE GENERAL NOTES 7 & 13) 2. (DEAD LOAD+SEISMIC LOAD)' AND LATERAL RESTRAINT



CASE 1 ELEV. VIEW CASE 2

-PED-H-W 949

TABLE #4

ITEM	OPER. TEMP.	TOLERANCES IN (INCHES) PIPE DIA (INCH)	ERECT. DIM.	ERECT. TOL.
A OR B	—	ALL	1/16	—
C	—	ALL	1/16	+1/32 -1/32
A + B	≤ 200°F	1/2 ≤ 12	1/8	+0 -1/16
		14 & OVER	1/8	+1/16 -0
	≤ 200°F	1/2 ≤ 12	1/8	+0 -3/32
		14 & OVER	1/8	+0 -3/32

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RFI —

PAGE — PARA —

SHT 1 DWG ZONE J 8

DATE 7-5-83 DRAWN DATE 8/1/83

WPPSS NUCLEAR PROJECT NO. 2
BURNS AND ROE, INC.
PED 215-H-W949 SH 6 OF 17
TITLE H-501

DETAIL 6

CLEARANCE FOR RADIAL STOPS IN PIPE SLEEVES (FLOORS & WALLSLEEVE)

(SEE GENERAL NOTES 7 & 13)

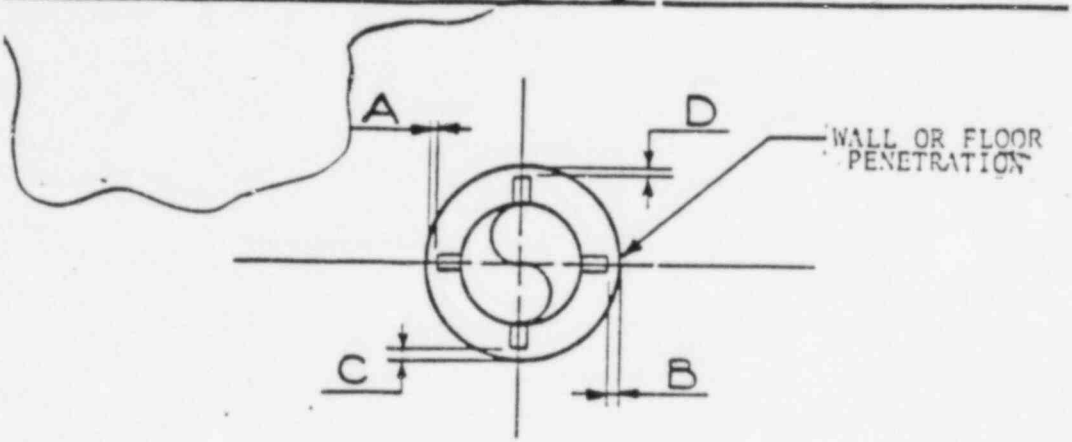

TABLE 6

ITEM	OP TEMP	PIPE SIZE	ERECT. DIM.	ERECTION TOL.		REMARKS
A	-	ALL	1/16"	-		
B	-	ALL	1/16"	-		
C	-	ALL	1/16"	-		
D	-	ALL	1/16"	-		
A+B OR C+D	≥200°F	1/2" ~ 12"	1/8"	+0 -1/16"		
"		14" & OVER	1/8"	+1/16" - 0		
"	<200°F	1/2" ~ 12"	1/8"	+ 0 - 3/32		
"		14" & OVER	1/8"	+0 -3/32		

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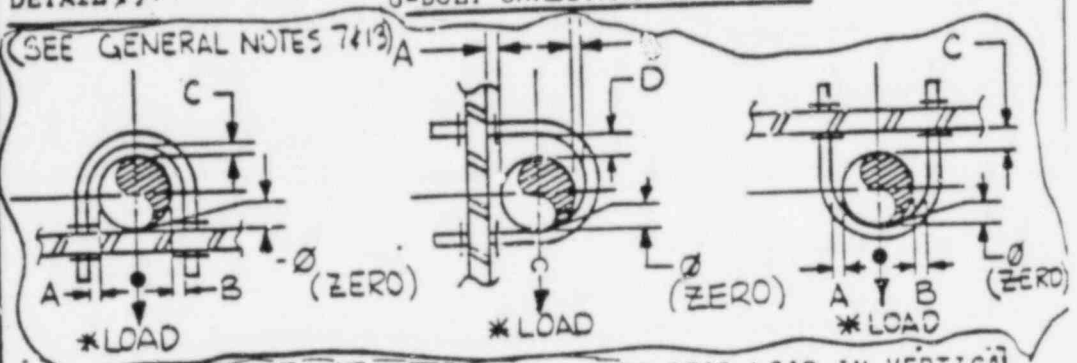
REF DOC PCN —	RFI —	WPPSS NUCLEAR PROJECT NO. 2	
REF SPEC SECTION —	PAGE — PARA —	BURNS AND ROE, INC.	
REF DWG H-501 SHT 1	DWG ZONE J4	PED 215-H-W949	SHT 7 OF 17
SCALE ~	DRAWN BY [illegible] DATE 7-8-83	TITLE H-501	
	CHKD BY WTM DATE 7-29-83	APPD [illegible] DATE 8/1/83	

REV 1

DETAIL #7 U-BOLT UNRESTRAINED AXIALLY

(SEE GENERAL NOTES 7 & 13)



CASE 1) DEAD LOAD IN VERTICAL DIRECTION. (USE ONLY FOR SEISMIC LOAD OR AS A GUIDE):

2) LATERAL, RESTRAINT AND DEAD LOAD AND/OR SEISMIC LOAD IN VERTICAL DIRECTION.

3) *: IF NO LOAD EXISTS, A CLEARANCE MUST BE MAINTAINED. SEE GENERAL NOTE 7.

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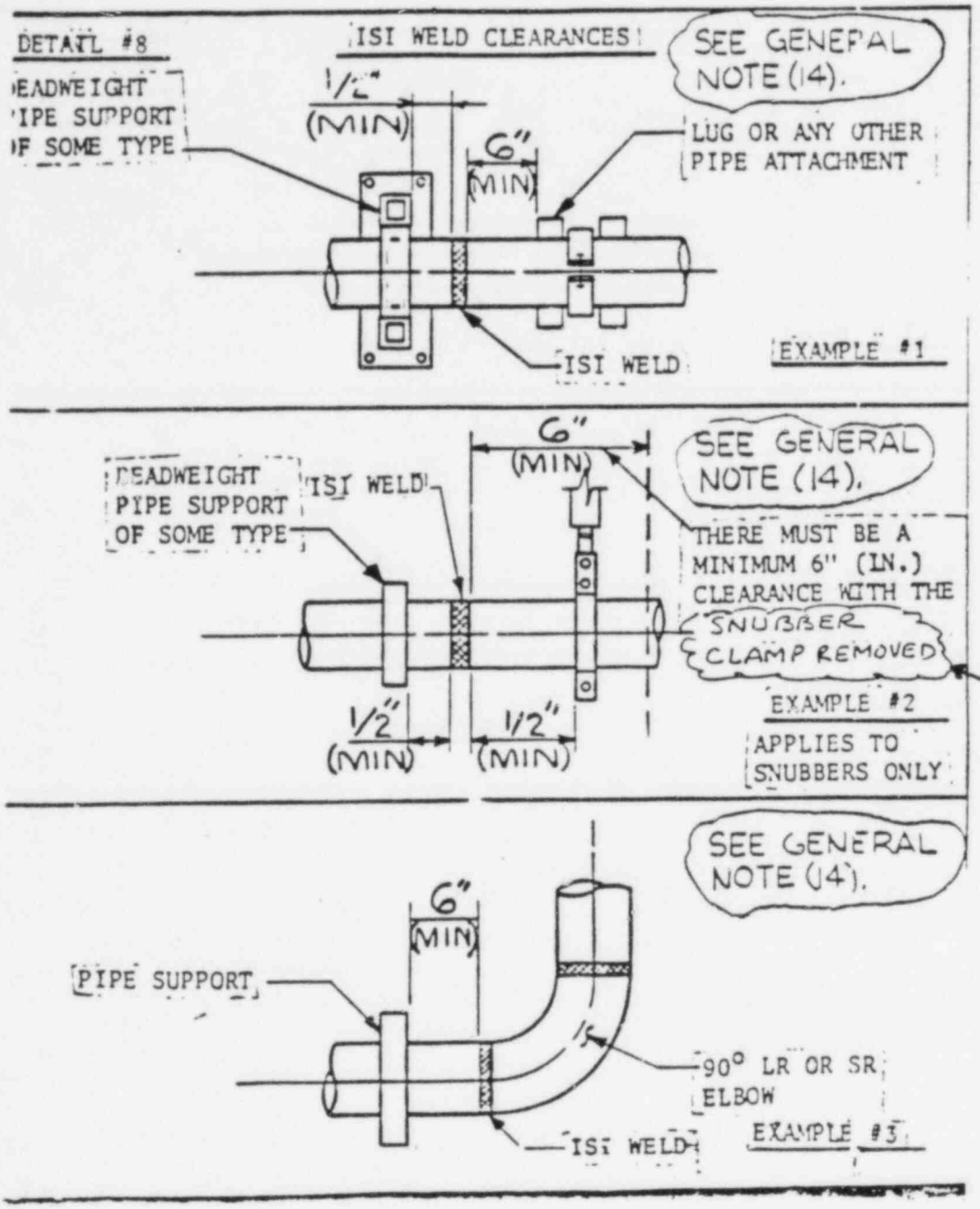
TABLE 7 TOLERANCES FOR U-BOLT ERECTION

ITEM	CASE	ERECT. DIM.	ERECT. TOL.				
A	1 or 2	1/16"					
B	1 or 2	1/16"					
C	1 or 2	1/16"	+1/16 -0				
D	1 or 2	1/16"	+1/16 -1/32				
A&B	1 or 2	1/8"	+1/32 -1/8				

REF DOC PCN —	RFI —	WPPSS NUCLEAR PROJECT NO. 2	
REF SPEC SECTION —	PAGE —	PARA —	BURNS AND ROE, INC.
REF DWG H-501 SHT 1	DWG ZONE F15	PED 215-H-W949	SH 8 OF 15
SCALE —	DRAWN BY [illegible] DATE 7-8-83	TITLE H-501	
	CHKD BY WTM DATE 7-29-83	APPD [illegible] DATE 8/1/83	

DETAIL #8

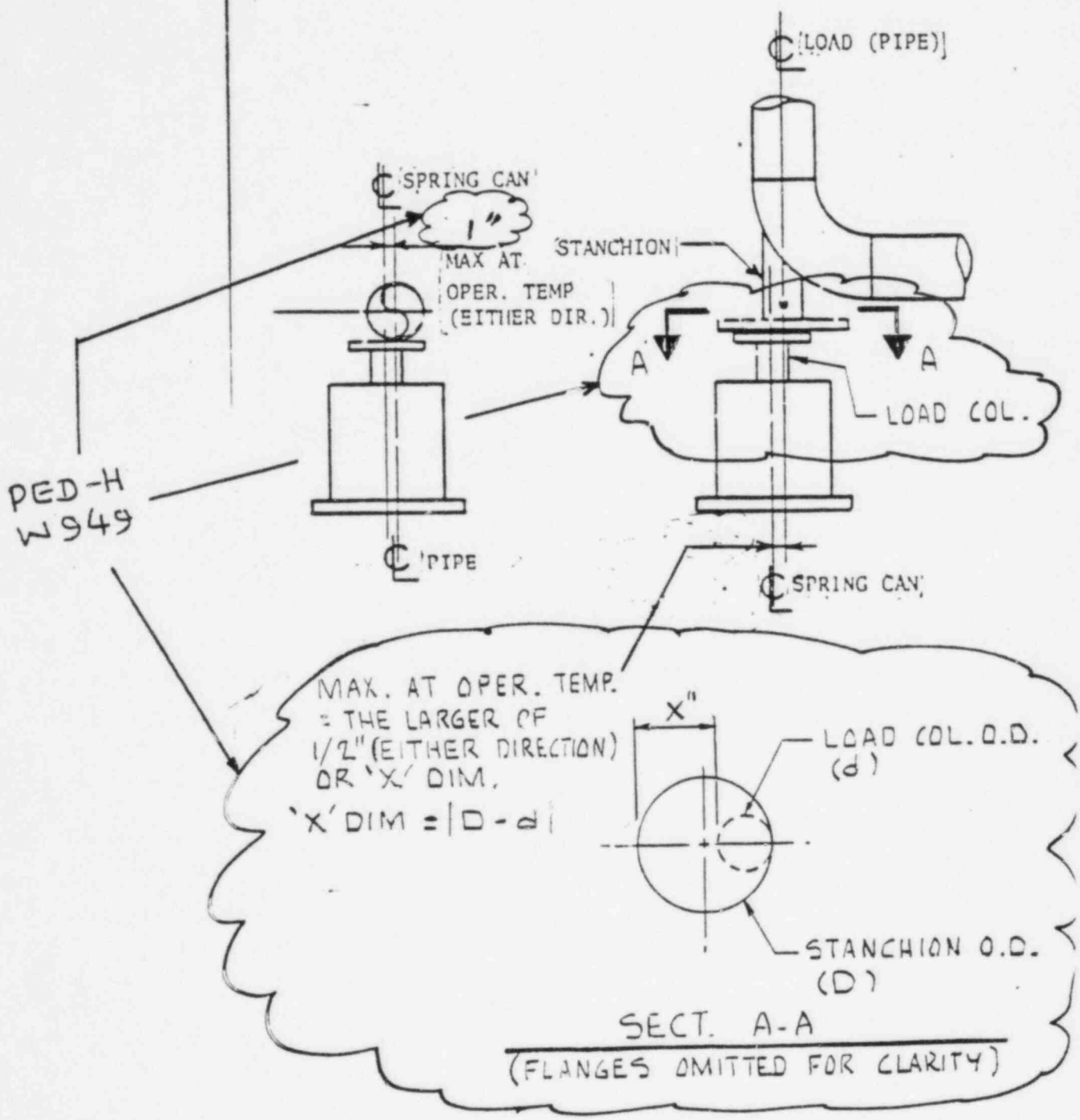
ISI WELD CLEARANCES



REF DOC PCN —	RFI —		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION —	PAGE —	PARA —	BURNS AND ROE, INC.
REF DWG H-501 SHT 1	DWG ZONE G13		PED 215-H-W949 SHT 9 OF 17
SCALE —	DRAWN BY K.K. Budhekar DATE 7-8-83		TITLE H-501
	CHKD BY WTM DATE 7-29-83	APPV DATE 8/1/83	

DETAIL #10

CENTERLINE TOLERANCES FOR INSTALLATION OF BOTTOM MOUNTED SPRING CANS



REF. DOC.: PCN —	RFI ~		WPPSS NUCLEAR PROJECT NO. 2
REF. SPEC. SECTION: —	PAGE: —	PARA: —	BURNS AND ROE, INC.
REF. DWG. H-501 SHT. 1	DWG. ZONE G11		PED 215-H-W949 SHT. 10 OF 17
SCALE: —	DRAWN BY: KKB DATE: 7-27-83		TITLE: H-501
	CHKD I.I.T.M. DATE: 7-29-83	APPD: DATE: 8/1/83	

DETAIL 9

WASHER PLATE REQUIREMENTS FOR ENLARGED BOLT HOLES

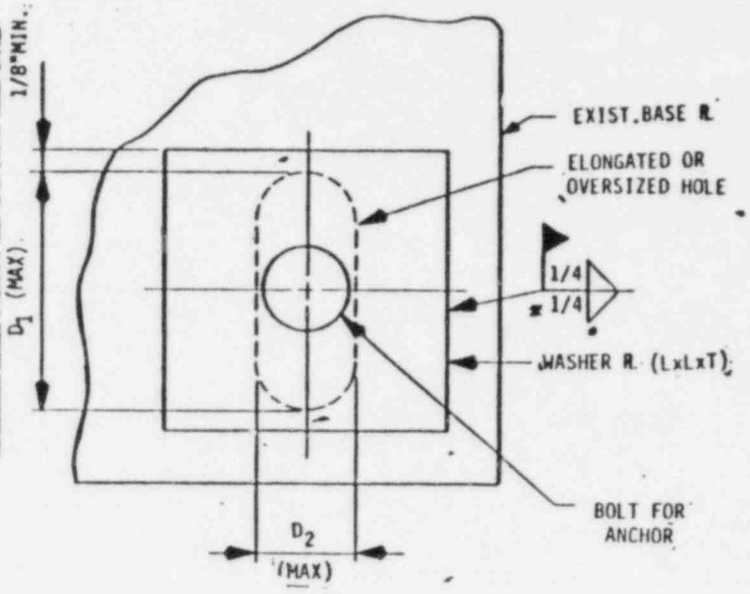
ANCHOR SIZE	WASHER PL L(IN)	WASHER PL T(IN)	D1 (MAX) (IN)	D2 (MAX) (IN)
1/4"Ø	1	1/4	3/4	7/2
3/8"Ø	1 1/4	1/4	1	5/8
1/2"Ø	1 3/4	1/4	1 1/2	3/4
5/8"Ø	2 1/4	1/4	2	15/16
3/4"Ø	2 1/2	1/4	2 1/4	1 1/8
7/8"Ø	3	1/4	2 3/4	1 5/16
1" Ø	3 3/4	1/2	3"	1 1/2
1 1/4" Ø	4 1/2	1/2	3 3/4	1 7/8

NOTES

1) HOLE IN WASHER PL. TO BE IN ACCORDANCE WITH DETAIL 17.

2) WELDING SHOULD BE DONE ON ANY TWO OPPOSITE SIDES, HOWEVER, FOR 5/8"Ø AND LARGER ANCHORS; IF THE ELONGATION OCCURS TOWARDS THE CORNER OF THE BASE PL A MAXIMUM OVERHANG OF 1/4" IS ACCEPTABLE ON TWO SIDES AND THE WELDING CAN BE DONE ON THE TWO REMAINING ADJACENT SIDES.

3) * ON INSTALLATION MADE PRIOR TO 6-22-79 A WELD SIZE OF 3/16" IS ACCEPTABLE.



PED-H-W949

REF DOC PCN ~ RFI ~

REF SPEC SECTION ~ PAGE ~ PARA ~

REF DWG H-501 SHT 2 DWG ZONE

SCALE ~ DRAWN BY Mike Wilson DATE 7-8-83 CHKD BY WTM DATE 7-29-83 APPD BY [signature] DATE 8/1/83

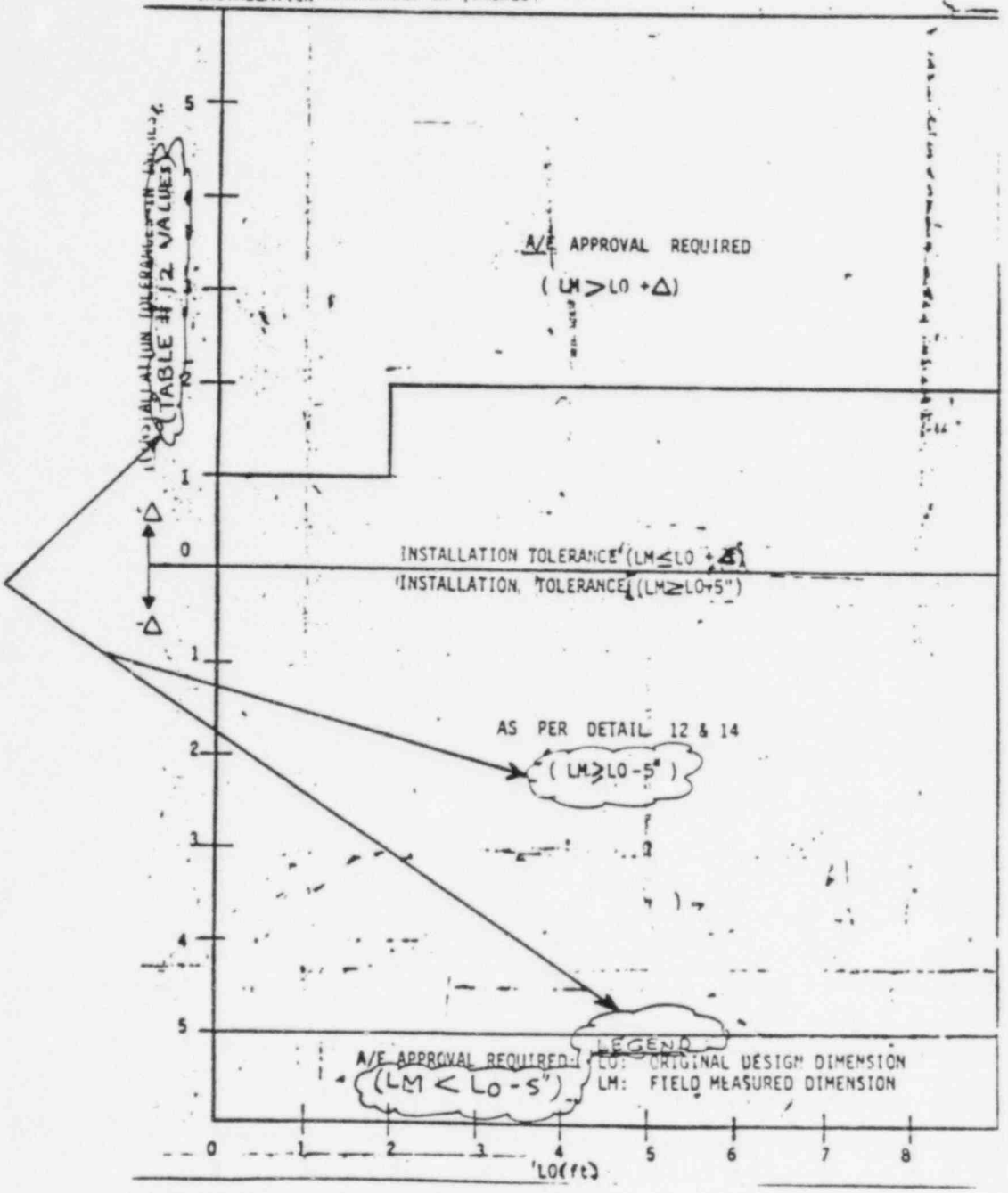
WPPSS NUCLEAR PROJECT NO. 2

BURNS AND ROE, INC.

PED 215-H-W949 SHT 11 OF 17

TITLE H-501

GRAPH 1 INSTALLATION TOLERANCES AND APPLICATIONS PER DETAIL 12

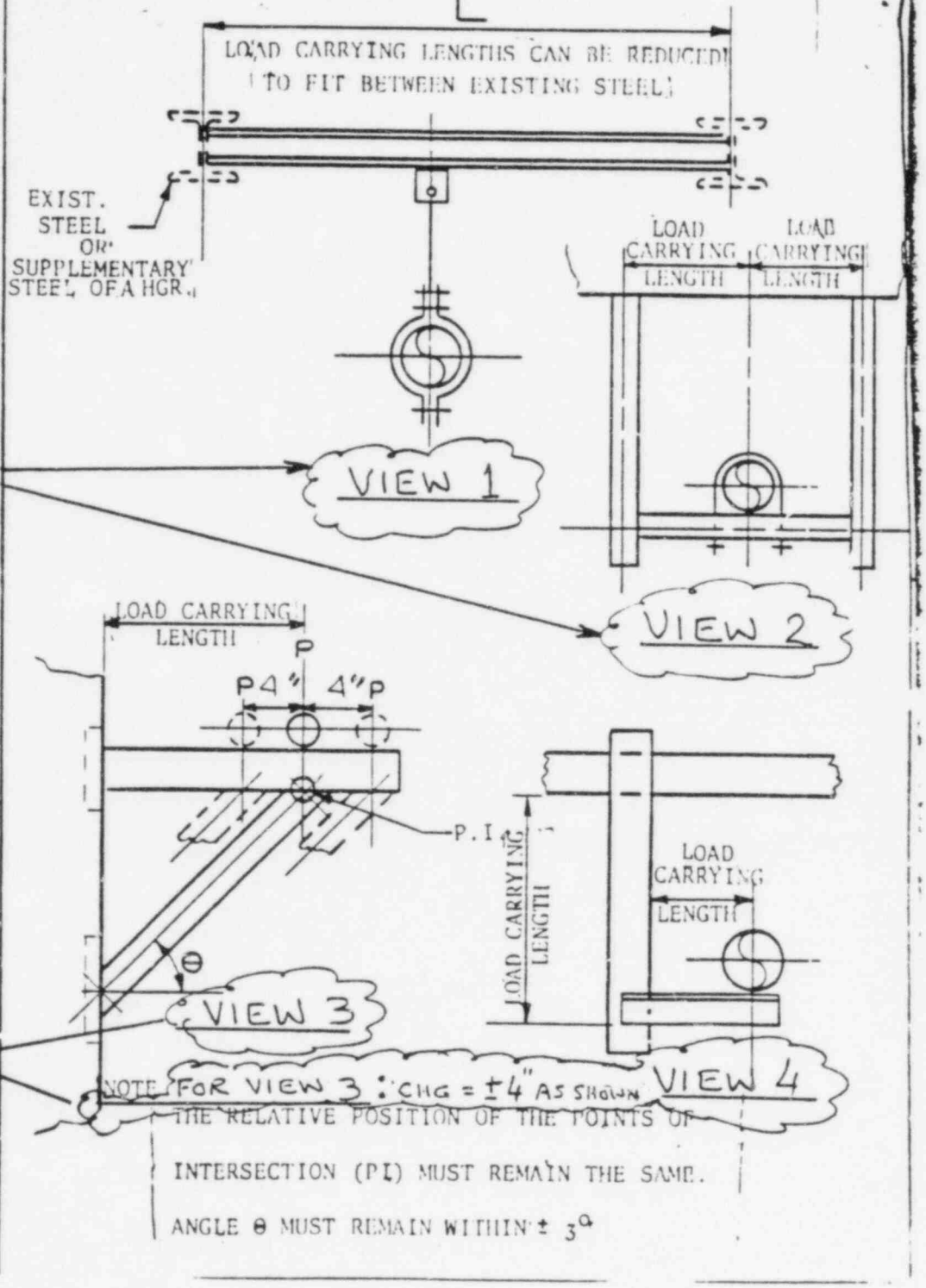


REF DOC PCN ~	RFI ~		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION —	PAGE —	PARA —	BURNS AND ROE, INC.
REF DWG H-501 SHT 1	DWG ZONE G4		PED 215-H-W949 SHT 12 OF 17
SCALE —	DRAWN BY K Kindvall DATE 7.8.83		TITLE H-501
	CHKD BY WTM DATE 7-29-83	APPD DATE 8/1/83	

PED-H-W949

DETAIL # 14. CHANGE IN LOAD CARRYING LENGTHS

NOTE 1) ALLOWABLE MAX. REDUCTION = 5", IF OVER 5" APPROVAL BY A/E REQUIRED



PED-H-W949

PED-H-W949

PED-H-W949

NOTE FOR VIEW 3: CHG = ±4" AS SHOWN

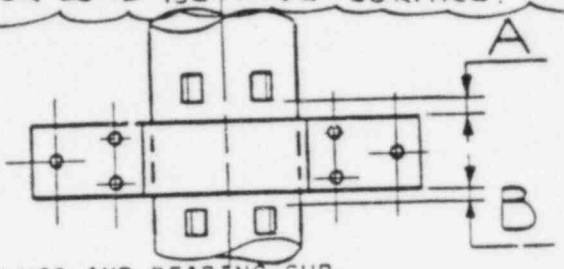
THE RELATIVE POSITION OF THE POINTS OF INTERSECTION (PI) MUST REMAIN THE SAME.

ANGLE θ MUST REMAIN WITHIN ± 3°

REF DOC PCN —	RFI —		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION —	PAGE —	PARA —	BURNS AND ROE, INC.
REF DWG H-501 SHT 1	DWG ZONE D13		PED 215-H-W949 SHT 13 OF 13
SCALE —	DRAWN BY K.H. Bud... DATE 7-8-83		TITLE H-501
	CHKD BY WTM DATE 7-29-83	APPD ... DATE 8/1/83	

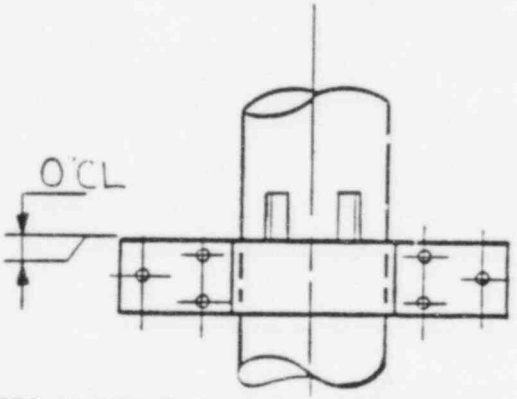
DETAIL #15

NOTE A) FULL CONTACT IS REQUIRED BETWEEN LUGS AND DEAD WEIGHT BEARING SURFACES OF CLAMPS OR STRUCTURES. HOWEVER WHEN MULTIPLE LUGS ARE USED ON ONE SIDE OF THE CLAMP OR STRUCTURE ONE LUG IN FULL CONTACT IS ACCEPTABLE PROVIDED THAT THE REMAINING LUGS ON THE SAME SIDE ARE INSTALLED WITHIN 0.016" OF THE CLAMP OR LOAD BEARING SURFACE.



B) THE GAP BETWEEN LUGS AND BEARING SURFACES SHALL BE SHIMMED AS NEEDED TO MEET CLEARANCES OR FULL CONTACT REQUIREMENTS. CASES WHERE THE REQUIRED A OR B DIMENSION CANNOT BE MET BY SHIMMING SHALL BE REFERRED TO A/E ENGINEERING FOR RESOLUTION. REFER TO GENERAL NOTE 13 FOR SHIMMING.

PED-H-W949



C) ON RISERS WHERE THE LUGS AND CLAMP SUPPORT THERMAL LOAD, DIMENSION "A" = 0 FOR MOVEMENT TOWARD B; DIMENSION "B" = 0 FOR MOVEMENT TOWARD A.

D) THE TOLERANCES SHOWN IN THIS DETAIL APPLY TO ALL AXIALLY LOADED PIPE (INCLUDING HORIZONTALLY LOADED RISER CLAMPS.)

E) SEE GENERAL NOTE 7.

REF DOC PCN —	RFI ~		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION —	PAGE —	PARA —	BURNS AND ROE, INC.
REF DWG H-501 SHT 1	DWG ZONE B14		PED 215-H-W949 SHT 14 OF 17
SCALE ~	DRAWN BY KKBudlong DATE 7-8-83		TITLE H-501
	CHKD BY WTM DATE 7-27-83	APPD DATE 8/11/83	

REV 1

PED-H-W949

TABLE 15 TOLERANCES FOR RISER CLAMP & LUGS

TYPE OF SUPPORT		ITEM	DESIGN CLEAR.	SHOP. TOLERANCE	ERECTION TOLERANCE	APPLICABLE NOTES
CASE WHERE DEAD WEIGHT LOAD IS SUPPORTED		A	0	N/A	N/A	A, B
		B	1/16	N/A	+ 1/16 - 1/32	D
CASE WHERE DEAD WEIGHT LOAD IS NOT SUPPORTED		A	1/16	N/A		B
		B	1/16	N/A		
		A+B	1/8	N/A	+0 -1/8	C, D

PED-H-W949

REF DOC PCN —	RFI —		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION ~	PAGE —	PARA —	BURNS AND ROE, INC.
REF DWG H-501 SHT 1	DWG ZONE B12		PED 215-H-W949 SHT 15 OF 17
SCALE —	DRAWN BY [illegible] DATE 7-8-83		TITLE H-501
	CHKD BY WTM DATE 7-29-83	APPVD [signature] DATE 8/10/83	

DETAIL 19 SKEWED WELDING

SKEWED WELDS WITH INCLUDED ANGLES BETWEEN 60° and 135° MAY BE CALLED OUT AS FILLET WELDS, WITH SPECIFIED EFFECTIVE THROAT.

A/E USES AWS D1.1 TO DETERMINE EQUIVILENT LEG LENGTHS. (CONDENSED TABLE SHOWN BELOW)

FOR ALL OTHER ANGLES <60° or >135° A GROOVE WELD SHOULD BE MADE AS SHOWN IN EXAMPLES BELOW. THESE GROOVE WELDS MUST HAVE, AS A MINIMUM, THE EFFECTIVE THROAT REQUIRED FOR FILLET WELDS CALLED OUT ON HGR DETAIL DRAWING.

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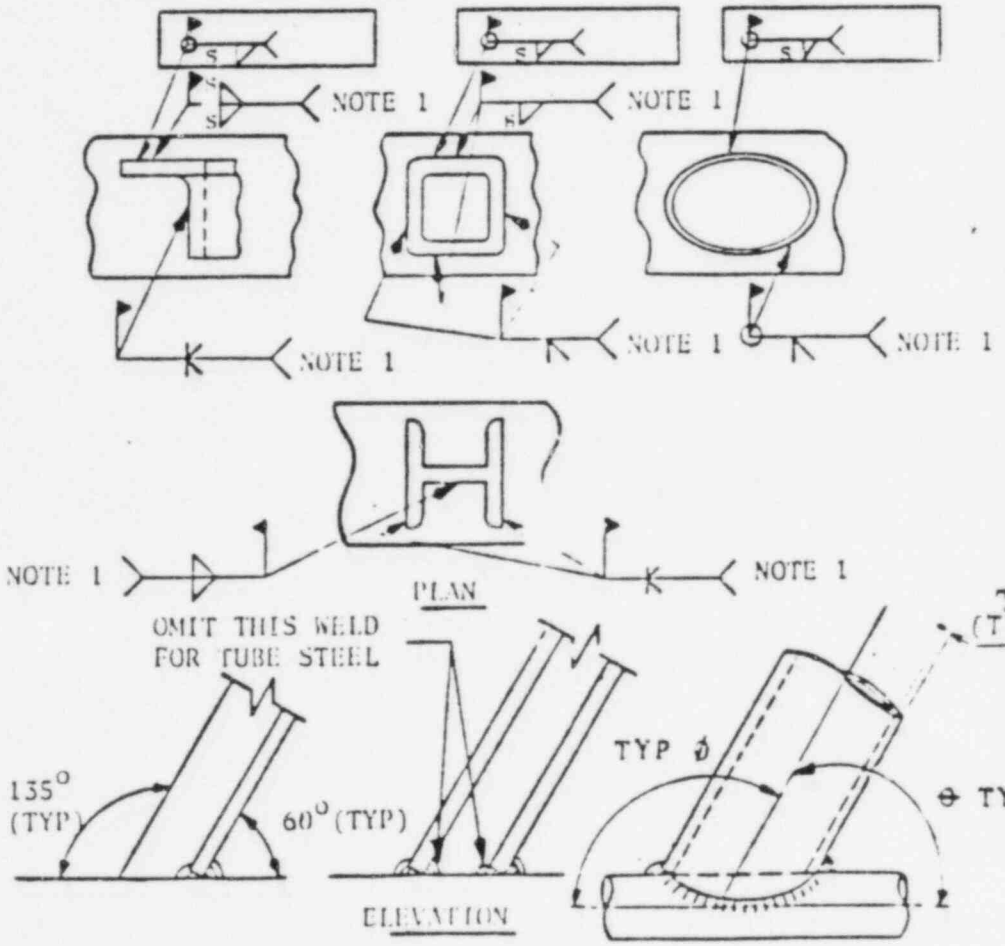
MIN SLOPE SHOULD BE 30° (IF THIS ANGLE IS LESS THAN 30° ON AN EXISTING DESIGN SUBMIT TO A/E FOR REVIEW)

NOTE:

(1) FILLET AND GROOVE WELDS TO BE BLENDED AT A CONVENIENT POINT ON THE RADIUS.



EFFECTIVE THROATS OF FILLET WELDS IN SKEWED T-JOINTS

REF DOC PCN —	RFI —		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION —	PAGE —	PARA —	BURNS AND ROE, INC.
REF DWG H-501 SHT 2	DWG ZONE J-1, 2		PED 215-H-W949 SHT 16 OF 17
SCALE —	DRAWN BY [illegible] DATE 7-8-83	H-1 2	TITLE H-501
	CHKD BY WTM DATE 7-29-83	APPD [illegible] DATE 8/1/83	

2 1

GENERAL NOTES;

(1) JURISDICITIONAL BOUNDARIES

Jurisdicitional Boundary Piping Supports

(1) Supporting Structure
The supporting structure consists of steel members attached to building concrete, or to building steel members. The supporting structure is to be considered an extension of the building structure for the purpose of supporting a pipe. All Specifications, Codes, and special requirements for safety related building structures shall apply.

K

(12) OVER-WELDING
Extra welds welded beyond the requirement of design/drawing are acceptable, except the angle clips or angle knees used for simply supported beam designs which shall be reviewed by A/E.

D

(13) SHIMMING
Contractor is authorized to use shims to attain proper clearances as indicated in detail #25.

PED-H-W949

Where deadweight is to be supported the required metal-to-metal contact should be complete. However the contact within the zone requirements specified in Detail # 25 is permitted provided that 0.000" replaces 0.016" for a "NO-GO" case.

(14) Detail #8 depicts minimum clearance dimensions between pipe support components and ISI welds and is applicable to all supports unless otherwise specified on the individual pipe support detail. Where the pipe support detail specifies or implies a locating dimension for pipe support components with respect to ISI welds that is less than the minimum specified by Detail #8, then that dimension shall be considered a minimum.

C

REF. DOC. PCN —	RFI —		WPPSS NUCLEAR PROJECT NO. 2
REF. SPEC. SECTION: —	PAGE: —	PARA: —	BURNS AND ROE, INC.
REF. DWG. H-501 SHT. 1	DWG. ZONE D-1		PED 2:5-H-W949 SHT. 17 OF 17
SCALE	DRAWN BY: K.K.Budhwani DATE: 7-27-83		TITLE H-501
	CHKD BY: WTM DATE: 7-29-83	APP'D: DATE: 8/1/83	

Washington Public Power Supply System
P.O. Box 968 3000 George Washington Way Richland, Washington 99352 (509) 372-5000

August 23 1983
WPBEC-C0500-F-83-3023

Responds to: N/A
Response required by: N/A

Mr. J. Newgen
Construction Manager
Bechtel Power Corporation
P.O. Box 600, Caller Service
Richland, WA 99352

Subject: NUCLEAR PROJECT 2, CONTRACT C0500
PED TRANSMITTAL
PED- 215-H-W949

The attached Project Engineering Directive (PED) 215-H-W949 is forwarded for implementation and you are hereby authorized to assign work as required by this PED. Master Work List (MWL) input is required for all physical work to be performed on this PED. A Startup Work Request (SWR) processed in accordance with PMI 9-1.1 is required prior to commencing physical work on provisionally accepted or turned-over system(s).

The following system package(s) affected by this PED have been provisionally accepted or turned-over as of this transmittal; NONE .

G. K. Afflerbach

G. K. Afflerbach, 927M
Test and Startup Manager

JOC/lh

NRC INSPECTION OPEN ITEM

Report No.	83-05/05
Paragraph	5
Report Date	3-29-83

Type: Unresolved

For Further Information:
D. Cosgrove #4580
H. Boarder #4589

Responsibility: WPPSS Engineering

ITEM DESCRIPTION

5. Bechtel As-Built Drawing Program

The inspector examined the Bechtel efforts to improve the program for as-built drawing revisions. Weaknesses in this area had been identified in Inspection Report 50-397/83-03 (paragraph 8) and as prior follow-up items 397/80-01-01 and 397/82-24-01.

The Bechtel lead as-built engineer stated that the updating effort would include 2,854 Quality Class I pipe support drawings. This would include detailed field verification of configuration and locations. The governing Bechtel procedure (SWP-P-P-6, Revision 4) excludes Quality Class II, Seismic Category I drawings from this population. This appears to conflict with the WPPSS governing procedure, PMI-6.6, which requires verification of Seismic Category I pipe supports. The WPPSS Project Quality Assurance Manager stated that a proposed revision to the PMI-6.6, to omit Seismic Category I drawings, had already been challenged by the project quality assurance organization. The issue involves the NRC Bulletin 79-14 requirement for as-built verification of Seismic Category I pipe supports. This matter is unresolved. (50-397/83-05-05)

ITEM STATUS

The engineer currently assigned this task displayed a computer printout of the NCR's for each site contractor, and showed evidence of the random selection process which he had used, and his measures to assure proper qualification of personnel performing the technical reviews. He discussed the results which showed that none of the selected 10% sample revealed engineering dispositions which would unacceptably compromise the design. He also described additional reviews of design change documents of various types for the various contractors and reviews of contractors' internal deficiency documents. His files included copies of the various documents selected, and review procedures originally in effect at the time the documents were generated. The sampling process appeared to be reasonable and inclusive of contractors' internal documents. The reverification group is in process of completing a report of this activity. This item is closed.

b. [redacted] - Exclusion of Quality Class II/Seismic Category I pipe supports from the detailed as-built verification program conducted for Quality Class I supports.

Procedures PMI-6-6 Revision 4 now reflects that final as-built drawings will only be prepared for Quality Class I piping and supports, except where additional scope is defined in each contract specification. Bechtel procedure SWP/P-P-6 Revision 5 describes the Quality Class I as-built program.

The as-built requirements of NRC Bulletin 79-14 are based upon assuring pipe stress analysis accuracy for piping systems having a safety function. In the WNP-2 FSAR such systems were designated Quality Class I/Seismic Category I. The WNP-2 program includes supports for such systems.

There are other piping supports which do not support safety related piping, but whose failures may affect a safety system (i.e. by acting as missles). In the FSAR these were originally also designated Quality Class I Seismic Category I. It appears that in 1981 the project redefined the criteria for such supports, designating them as Quality Class II/Seismic Category I. For these supports, the degree of deformation prior to collapse, and other functional criteria, are less restrictive than for supports of piping on safety related systems; this is described in the attachment to the July 15, 1983 WPPSS letter to NRC. Accordingly, the rigorous as built verification requirements of Bulletin 79-14 do not apply to the Quality Class II/Seismic Category I supports for purposes of stress analysis of the piping supported by those supports. (However, construction verification of critical portions of such supports may be warranted for purposes other than the specific safety related piping stress considerations of Bulletin 79-14).

This matter is closed with exception of the item opened in paragraph 5.a. (83-38/01)

9. Unresolved Items

Report No.	83-22 (82-18/02)
Paragraph	Appendix A 6d
Report Date	7-5-83

Type: Deviation

For Further Information:
D. Cosgrove Ext 6826
H. Boarder 6840

Responsibility: Supply System Engineering

ITEM DESCRIPTION

See Attachment 1 "Notice of Deviation," Appendix A

(Reclassified) Deviation (50-397/82-18/02) - Jurisdictional Boundaries for ASME Section III NF

This item was previously considered closed, as described in NRC Inspection Report 50-397/83-03. The inspector has reconsidered that conclusion after consultation with NRC Construction Appraisal Team members on site this report period.

The Supply System submitted an inspection criteria procedure (QVI-09) to NRC for approval as part of an FSAR amendment regarding compliance with workmanship details of the AWS-D1.1 Welding Code. This document described reverification program criteria to be used for structural steel. In other on-site documentation (e.g., Drawing H-501), the engineer had defined typical boundaries between structural steel (AWS-D1.1) and pipe supports (ASME III NF). The Drawing H-501 Sheet 3 shows various configurations of welded steel shapes upon which piping is supported. These are described as extensions of the building structure and subject to AISC/AWS Codes (and thus QVI-09).

As an example, Drawing H-501 Case VI shows a welded square frame, around a pipe; the pipe rests on the lower member of the frame, which is supported by a vertical tubular steel member (welded to the frame and to an embed plate on the concrete floor). The frame bears on the pressure boundary component, and thus meets the definition of "non-integral support" of ASME Section III NF-1510. Section NF-1515

ITEM STATUS

Report No.	83-22 (82-18/02)
Paragraph	Appendix A; 6d
Report Date	7-5-83

ITEM DESCRIPTION	ITEM STATUS

provides the jurisdictional boundary between a building structure and a non-integral support shall be the surface of the building structure; this appears to require design and fabrication of the steel frame and the vertical member in accordance with rules of ASME Section III NF.

The Burns and Roe Resident Group Supervisor for pipe supports stated that all supports had been designed in accordance with rules for ASME Section III NF; he stated that details which H-501 classify as non-NF do not involve any plate and shell structures and thus do not require any nondestructive examination beyond that of the AISC/AWS Code. Traceability requirements appear to be more extensive for ASME NF than AISC/AWS. The departure from the ASME Code appears to be a deviation from FSAR commitments. (Deviation 50-397/82-18-02)

Note: The original NRC Inspection Open Item Status Sheet and the excerpt (para 8e) from NRC Inspection Report 83-03 that previously closed this item are attached for information (Attachment II).

Follow-up (8-30-83) NRC Report 83-38 Paragraph 5.k(2)

Development of QVI-09 and the associated deviations from AWS-D1.1 welding workmanship criteria have been previously addressed by the regional inspectors in NRC inspection reports 50-397/82-18 and 83-03 (NRC open item 397/82-18-02). The matter was closed with the licensee issuance of FSAR amendment number 27 (page 3.8-190), and supporting letters to NRC dated January 17, 1983 (G02-83-007) and March 23, 1983 (G02-83-249), which documented the basis for exceptions to AWS D1.1 criteria.

Report No.	83-22
Paragraph	Appendix A 6d
Report Date	7-5-83

ITEM DESCRIPTION

The NRC CAT inspectors identified concerns with the implementation of the reduced acceptance criteria for weld quality, as allowed by reverification program procedure QVI-09. The inspectors considered that structural steel at reactor building elevation 444' contained welds with multiple defects, each of which may be acceptable under QVI-09, but as a composite may be "questionable quality". The inspectors noted that such multiple defects may potentially not be acceptable at connections more critical than those observed by the inspectors (if such connections exist). These CAT perceptions have been factored into the current NRC deliberations regarding the FSAR ammendment.

ITEM STATUS

Attachment I

APPENDIX A

NOTICE OF DEVIATION

Washington Public Power Supply System
P. O. Box 968
Richland, Washington 99352

Docket No. 50-397
Construction Permit No. CPPR-93

As a result of the inspection conducted on May 1-31, 1983, and in accordance with the NRC Enforcement Policy, 10 CFR Part 2 Appendix C, 47 FR 9887 (March 9, 1982), the following deviation was identified:

Paragraph 3.2.3 of the FSAR states that piping system supports shall be appropriate for the components supported as defined by the ASME Code Section III. The ASME Code Section III NF-1510(d) defines a non-integral pipe support as one which "bears on the pressure boundary component" and NF-1511 states that "the jurisdictional boundary between a building structure and a non-integral support shall be the surface of the building structure."

Contrary to the above, on April 9, 1982, the architect engineer issued drawing H-501, sheet three, which allowed non-integral supports to be excluded from the construction and inspection requirements of ASME Section III, subsection NF even though the non-integral supports extend beyond the building surface structure into the jurisdictional boundry of the ASME Code.

You are hereby requested to submit to this office within thirty days of the date of this Notice, a written statement or explanation regarding the item of deviation, describing corrective action taken, the results achieved (or corrective steps that are planned), and the date when corrective action will be completed.

JUL 5 1983
Dated

R. T. Dodds, Chief
Reactor Projects Section 1

Report No.	82-18/02
Paragraph	4
Report Date	9-28-82

Type: Concern

For Further Information: D. Cosgrove Ext 4580

Responsibility: SUPPLY SYSTEM QUALITY VERIFICATION PROGRAM MANAGER

ITEM DESCRIPTION

Reverification Program

In response to the June 17 NRC inquiry under 10CFR50.54(f), the Supply System, Bechtel, and site contractors have engaged in a reverification program which includes review of records and reinspections of hardware installed prior to July 1980. The Supply System described the policies for conduct of reviews and reinspections in the WPPSS July 17, 1980, reply to the NRC inquiry. One of the policies read "This program will have priority over ongoing work. The project construction work pace will be adjusted accordingly." Another Supply System policy included integration of the reverification effort into the general project completion activities. However, associated with this integration has been a drain of personnel from the reverification effort, and a postponement of reverification activities to support the recent reactor vessel hydrotest. The reverification staff has been reporting this status to the Supply System Management in weekly progress reports. Following the Management meeting, the WPPSS Director of Licensing and Quality stated that this was his first notification of staffing problems with the reverification group, and he indicated that additional support in this area may be forthcoming.

At this time the Supply System appears to be prioritizing the reverification work to support construction completion schedules. A special reverification report was issued for the reactor pressure vessel hydro boundary. This documents the reviews and reinspection performed, the sampling basis, the results, and the evaluation of results. For the 12 systems planned for inclusion in the hydrotest, there were 80 small bore and 90 large bore piping isometric drawings involved. The reverification review and inspection included

ITEM STATUS

As of 10-18-82

The PQA organization has reestablished the priority for completing prepurchase and inactive (PP&IA) reviews. The remaining work has been rescheduled for completion in the fourth quarter of 1982. The assigned staff has been increased to meet this schedule. All other QVP work activity is either complete or on schedule. (Re: WPBEC-C0500-F-82-2237)

Programmatic action is in place in the form of FSAR Change Notice #SCN-82-165 for the concern regarding visual weld examination criteria as defined in QVI-09. Resolution of this concern is dependent upon NRC review of the FSAR amendment to be generated from this change notice. No additional site action is required at this time.

Report No.	82-18/02
Paragraph	4
Report Date	9-28-82

14 of the large bore and 6 of the small bore piping drawings. The reverification effort identified only minor discrepancies, none of which appeared to warrant further inspection or increased sample size.

The Supply System has implemented a procedure QVI-09 (Special Structural Steel Reinspection Criteria). This document allows deviations from AWS-D.1 welding visual examination criteria for items within its definition of structural steel. The Supply System stated that an amendment to the final safety analysis report (FSAR) is in-process to define the AWS deviation. (WPPSS in-house change notice SCN-82-165, dated August 9-27, 1982). The notice defines structural steel as including radial and structural framing systems, steam tunnel beams and pipe hangers. The procedure QVI-09 also mentions ductwork, stiffeners, cable trays, brackets, and similar components. The Supply System verbally advised the inspector that the pipe support and hanger portions were limited to those parts excluded from ASME Section NF jurisdiction. It is not clear that WPPSS defined exclusions are consistent with the ASME definitions. This matter will be re-examined following NRC review of the amendment. (397/82-18-02)

This item was encompassed by the WBG/Bechtel procurement and installation documentation review activities and procedures which were conducted November 1981 through September 1982. The procedures WP-787 and WP-782 were apparently revised to reflect consistent requirements for documentation review prior to material release.

This matter is closed.

d. (Closed) Follow-up Item (397/82-12-03) Incorrrect Heat Number on Steel Plate

The Bechtel fabrication shop personnel identified a 5/8-inch steel plate which was marked with a heat number associated with a shipment of 1/2-inch thick material.

Bechtel documented this matter on a nonconformance report number 781, which was resolved in September 14, 1982 by return of the material to the vendor.

The identification of this issue at the fabrication shop indicated a multiple breakdown of quality controls with respect to: (1) material issuance from the site storage yard, (2) material receipt inspection at the site storage yard, and (3) the supplier's shipping inspections.

Bechtel has not identified the cause of the wrong identification number, although it appears to have originated at the supplier. The Bechtel purchasing personnel stated that this matter has not been incorporated into the Bechtel audit activities for the vendor involved and that there is no provision for routine feedback of such discrepancies for inclusion into the vendor audit program. (However, the site quality assurance department performs routine trending of nonconformance reports, and a significant item or trend data may be forwarded to the vendor auditing group from this source.)

The Bechtel quality assurance department addressed this matter as an isolated event and indicated that no further action was planned.

No items of noncompliance were identified.

8. e. [redacted] - Reverification Program Deviations from AWS-D1.1

The quality verification program "Special Structural Steel Reinspection Criteria" procedure QVI-09 allowed deviations from the AWS-D1.1 welding Code, for structural steel and pipe support sections not covered by ASME Section NF. The licensee planned an amendment to the safety analysis report (FSAR) to define the deviations. It was not apparent that the ASME Section NF boundaries had been properly defined for use with the QVI-09 procedure.

The Engineer (Burns and Roe) had issued drawing H-501, Sheet 3, to provide field guidance for determining ASME Section NF Code jurisdiction boundaries. The defined boundaries appear consistent with ASME Section NF (Part NF-1510).

The inspector reviewed a draft Amendment 27 of the FSAR Table 3.8-9 which described the deviations to be used for accepting completed work. Not all of the deviations were identified. The licensee subsequently clarified the amendment and submitted it to NRC via letter dated January 7, 1983.

Procedure QVI-09 includes an Attachment I which defines the justification for the deviations listed in Attachment II. Attachment II had been approved by the Engineer. However, the Bechtel originated Attachment I had not been endorsed by the Engineer and did not accurately represent the basis for the Engineer's approval. The licensee representative stated that the Engineer has been requested to clearly document the basis for approval. The inspector examined the approval routing sheets for the other QVI series of procedures, and determined that engineering, quality assurance, and test and startup organizations had concurred.

The licensee's proposed departures from the AWS-D1.1 Code appear reasonable, and have been documented in the FSAR. Further licensee action on this matter may be prescribed by the NRC licensing organization, if required.

This matter is closed.

f. (Closed) Unresolved Item (397/82-27-05) - Inspection criteria for snubber and sway-strut bracket pin connections

Appropriate acceptance criteria had not been provided to the field inspectors to assure end connection configurations which would prevent unacceptable disengagement of self-aligning bearings.

The licensee has now filed a 50.55(e) report with NRC dated December 20, 1982. Burns and Roe engineering direction has been amended by PED-215-H-G758. The licensee had issued direction to Bechtel (December 10, 1982) and to the startup organization (December 9, 1982) to perform reinspections and Bechtel revised the hanger balancing procedure SWP-P-P-12 (revision 2) to require end connection inspections.

The inspector examined these documents and noted that the Bechtel revision allows disengagement of up to 1/2 thickness of the end paddle, whereas the Engineer's direction limits it to 1/3-thickness, as described in the report to NRC. On January 7, 1983, the licensee and Bechtel representatives affirmed that the procedure has not yet been used to accept any hardware, and that a different procedure may be applied.

09/08/83

AS-BUILTING - QUALITY CLASS I LARGE BORE AS-BUILT PROGRAM EVALUATION

BACKGROUND

The NRC Construction Appraisal Team (CAT) review of the WNP-2 as-built program resulted in several findings against the program. One of the areas of concern was that there were too many as-buiting errors (mismeasurements, incorrect weld symbols, and missing data). Because of the NRC CAT findings, the Supply System agreed to extend the sample of hangers reviewed by 72 hangers and report the results to the NRC.

EVALUATION

The results of the as-built reverification for both the NRC sample and the extended sample were evaluated using the criteria shown in Attachment 1. Where it was necessary to confirm the evaluation using the actual design calculation, the A/E made the confirmatory review. Each deviation was evaluated first on a case-by-case basis (see Attachment 2). The deviations were then categorized. The summary of the categorization is shown in Attachment 3. Then, based on the frequency and significance, the deviations were evaluated on a generic basis (Attachment 4). Items of high frequency but low potential design impact are considered acceptable based on a high degree of confidence that the design would not be impacted.

CONCLUSIONS

None of the errors or omissions identified by the NRC CAT and the Project QA Organization in the extended sample effect the design, safety, or function of the supports reviewed with the exception of a potential thermal interference which is not an error of the as-built program and would have been subsequently identified in the hot pipe interference walkdown. The total number of findings against a sample in excess of 100 hangers is not significant considering that approximately 2500 welds and thousands of measurements were reviewed. Some of the items noted by the NRC CAT and the project extended sample are not part of the as-built program, but are important to the operability of the hangers. All of these items are covered in other existing inspection programs that have not yet been completed for the hangers at issue. There were no areas identified in either the NRC CAT or the extended samples that would require retrofitting the in-situ portion of the as-built program. The as-built review portion of the program is being 100% rereviewed.

ATTACHMENT 1

EVALUATION

CRITERIA

FOR

PIPE SUPPORTS

AS-BUILT DEVIATIONS

By: Bechtel Power Corporation
San Francisco Power Division
Plant Design Engineering Staff

RECOMMENDED ACCEPTANCE CRITERIA FOR AS-BUILDING

The criteria provided in the following sections shall be used for as-building of pipe support location on the isometric and pipe support drawing. This document shall be used in conjunction with As-Built Program Procedure SWP/P-P-6.

1. Pipe Support Location:

   Measured dimension shall be within ± 2" or 1/2 nominal pipe diameter, whichever is less restrictive. For details, refer to Table 1.

TABLE 1

TOLERANCES ON DIMENSIONS FOR PIPING	
CHARACTERISTICS MEASURED	AS-BUILT MEASUREMENT TOLERANCE
Pipe Routing Dimensions	$\pm$ 2" or $\frac{\text{Pipe Dia}}{2}$ whichever is less restrictive.
Support Locations	$\pm$ 2" or $\frac{\text{pipe dia}}{2}$ whichever is less restrictive.
Penetration Clearances	$\pm$ 1/8" (DIM $\leq$ 2") $\pm$ 1/4" (DIM > 2")
Valve Stem Orientation	+ 6° (Power Operated valves in other than vertical pipe runs) + 15° (Others)
Elevations And Dimensions From Pipe To Building Column Lines	Estimate

2.0 PIPE SUPPORT DETAIL:

2.1 Hanger Assembly and Structural Dimensions:

Hanger assembly and structural dimensions shown in the pipe support detail drawing are categorized in Table 3 and associated tolerances for as-building are shown. Figures 1 to 10 illustrate these dimensions for some typical pipe support details. Any combination of Figure 1 to 10 shall apply to one pipe support detail. Table 2 shall apply when the dimension in the question does not fall in one of the categories shown in Figures 1 to 10.

TABLE 2

ITEM	TOLERANCE
Dimension $\leq$ 5"	$\pm$ 10% of Dimensions
Dimension > 5"	Greater of $\pm$ 1/2" or 4% of Dimension
Angular Dimension	$\pm 3^{\circ}$

TABLE 3

HANGER ASSEMBLY AND STRUCTURAL MEMBER
DIMENSIONAL TOLERANCES

DIMENSION	TOLERANCE	INSPECTION CATEGORY (See Note 1)	REMARKS
C, C3, C4 ($\leq$ 5")	$\pm$ 10% of c dimension	2	
C, C3, C4 (> 5")	Greater of $\pm$ 1/2" and $\pm$ 4% of c dimension	2	
C_{min} (Rod and Spring hangers)	+ 12" - 3"	2	
C_{min} (Snubber and Strut Assemblies)	Not to exceed PP_{max} and not be less than PP_{min}. Where PP_{max} is maximum and PP_{min} is minimum dimension permitted by vendor.	2	Snubber cold setting shall be within $\pm$ 1/8" of specified on the drawing.
Length of Spring can, L, L_1, L_2, Q_1 Q_2	No measurement required.	1	
D & E	Visual Inspection D $\geq$ E	1	If condition not met it should be so noted.

NOTES: 1. For inspection Category #1, the dimensions are not required to be measured and recorded. For inspection Category #2, the dimensions are required to be measured and recorded.

2.2 Bill of Materials

2.2.1 Verify that items listed in the Bill of Materials are installed.

2.2.2 Structural shape shall be at least the size specified in the Bill of Materials.

2.2.3 In case of conflict of length dimensions of members between Bill of Materials and drawing, dimensions shown on drawing governs and dimensional requirement of paragraph 2.1 governs.

2.3 Clearances:

1) One Side Clearance: Applies when design drawing shows 1/16" gap on only one side of pipe such as gravity support and vertical restraint and other-side (lower) does not have any clearance. If measured clearance is within the range 1/32" to 1/8" (inclusive), it shall be noted as acceptable. The clearance outside this range shall be recorded within $\pm$ 1/32" tolerance.

2) Two Side Clearance: Applies when the design drawing shows 1/16" gap on both sides of the pipe. If the total clearance is within the range of 1/16" to 5/32" (inclusive), it shall be noted as acceptable. The total clearance outside this range shall be recorded within $\pm$ 1/16" tolerance.

2.4 Weld Size:

The as-building tolerance for weld size is + unlimited and - 0". Excessive and additional welds than specified need not be recorded. The undersize weld shall be recorded by the associated length within $\pm$ 10% tolerance.

2.5 Threaded components shall be inspected for properly locked, adequately engaged and torqued where required. Threaded engagement shall be considered adequate when the male end breaks the outside plane of the nut.

2.6 Spring Hangers, Snubbers and Strut Assemblies

2.6.1 Sizes and types shall be checked.

2.6.2 Cold setting of the snubber shall be within ± 1/8". The cold load setting shall be within one load division spacing (load setting ± 1/2" load division). Marking of the setting should be verified.

2.6.3 End connection clearances for snubbers and struts shall be verified.

2.7 Anchor Bolt verification shall be within the tolerances specified in Table 4.

TABLE 4

ITEM	TOLERANCE
Ecentricity	± 1/4"
Center to center dimension	± 1/4"
Edge distance (to edge of steel and to edge of concrete)	± 1/8"
Size (diameter)	+ 1/8" - 0"
Thickness of washer	+ 1/8" - 0"

Also anchor bolt type, size and orientation of reinforcing washers at anchor bolt shall be verified.

2.8 PLATE:

The width and length of the plate shall be measured within ± 1/4". the thickness of the plate shall be measured within + 1/4" - 0".

2.9 REFERENCE DIMENSION:

1. The following dimensions are included in pipe support details for reference only. They do not require "as-built" verification and may not be identified as reference.

   a) T.O.S. elevation

   b) B.O.S. elevation

   c) Pipe elevation

   d) B.O.C., T.O.C. or floor elevation

   e) Dimensions from column lines

   f) Azimuths and radial dimensions

   g) Lug elevation

   h) Orientation with respect to north

   i) Location plan

2. The size of existing members need not be verified and are for reference only.

2.10 Shim plates sizes and numbers of shims required to meet specified clearances need not be checked against Bill of Materials.

2.11 The structural orientation recorded within the guide line of Detail #13 of H501, sheet 3 shall be considered acceptable.

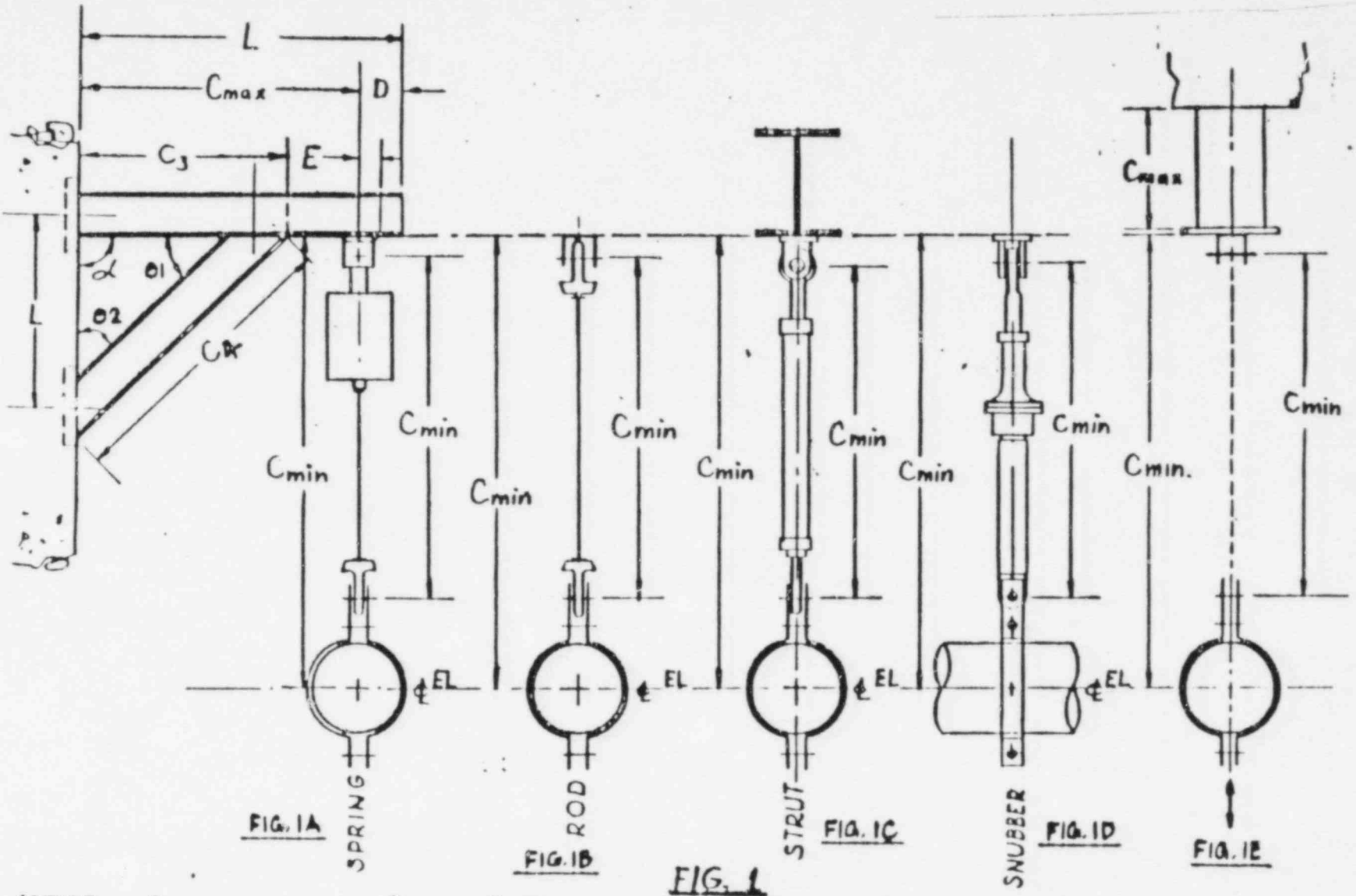
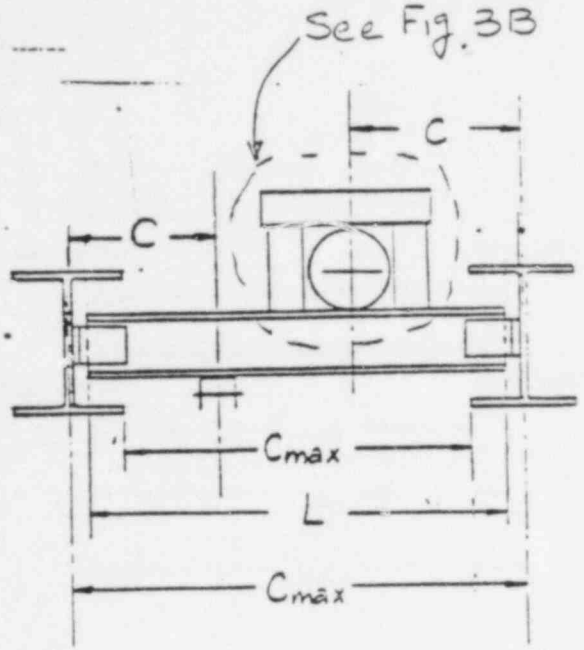


FIG. 1

NOTE: Cmin can be either of the dimensions shown. Only one needs to be verified



NOTE:
C_{max} can be any of the two dimensions shown. Only one needs to be verified.

FIG. 2A.

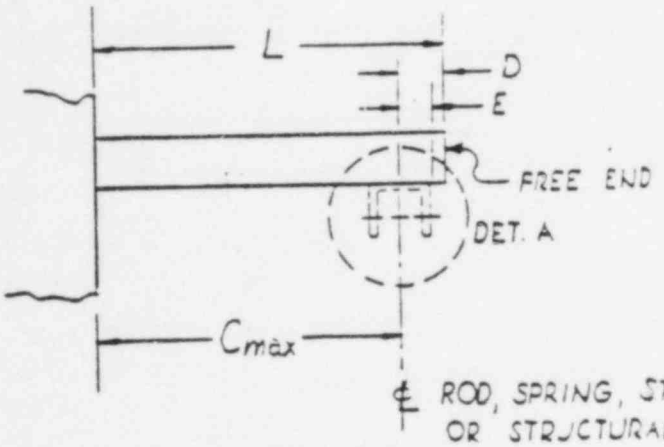
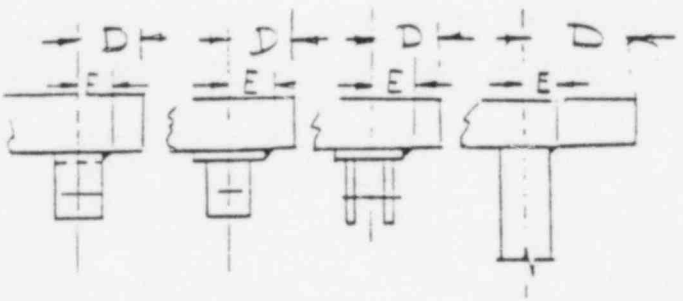


FIG 2B



DET. A

OTHER APPLICABLE CONNECTION TO FIG. 2B & 2C

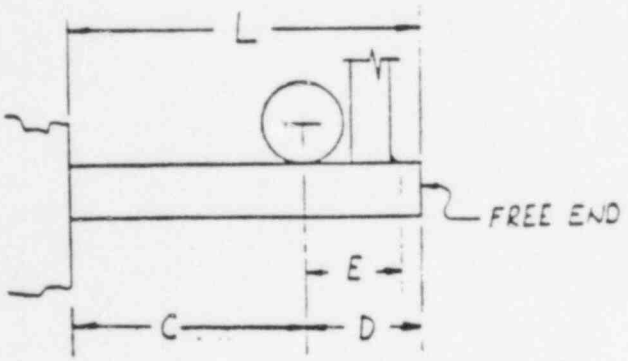


FIG 2C

FIG 2

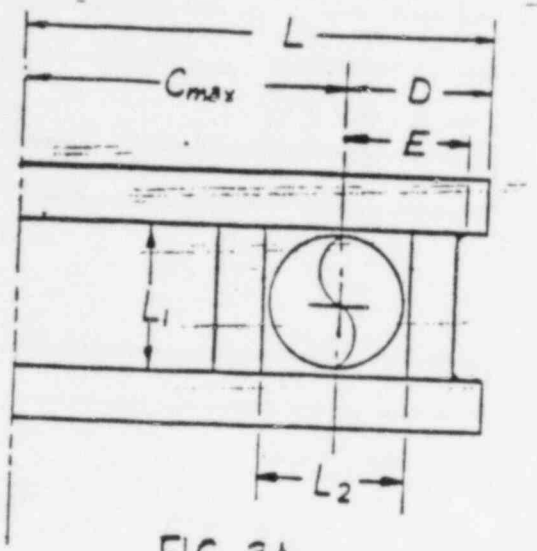


FIG. 3A

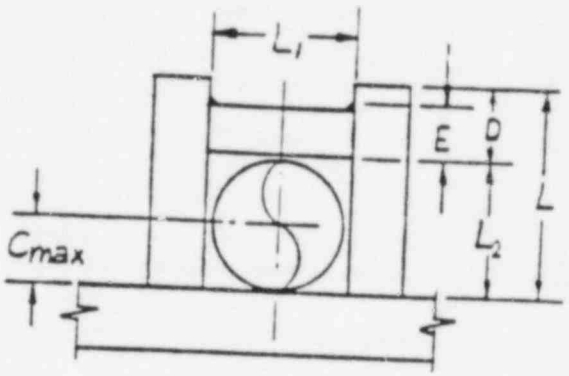


FIG. 3B

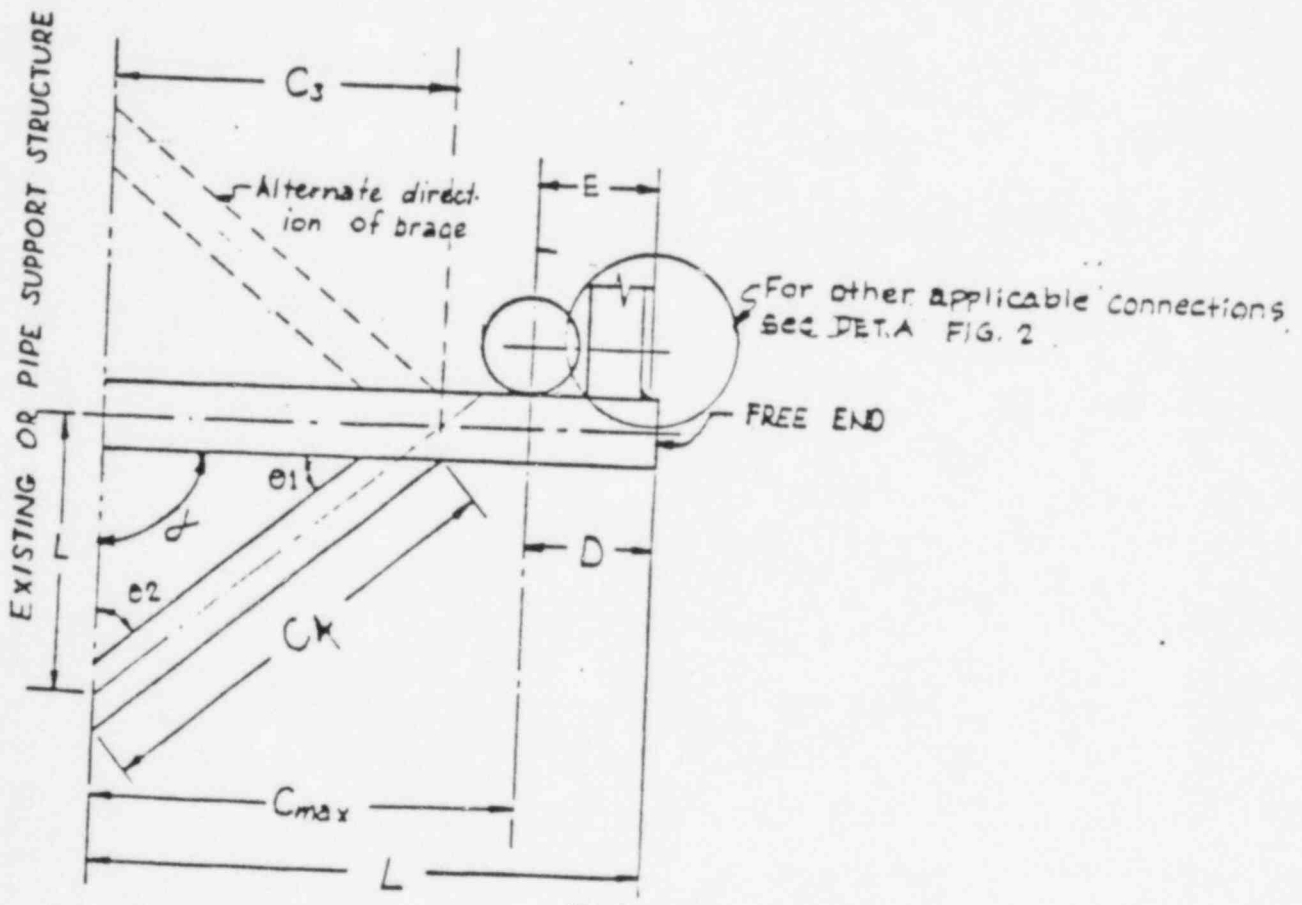


FIG 3C

FIG. 3

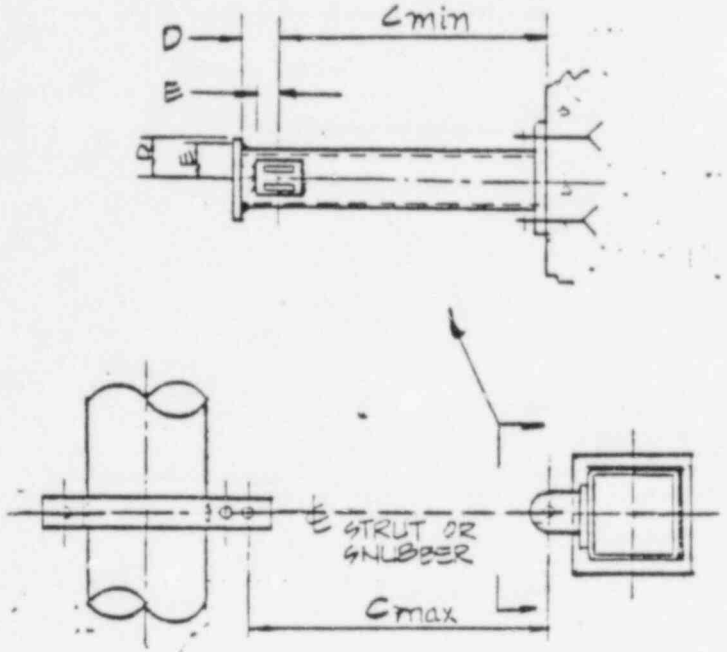


FIG. 4A

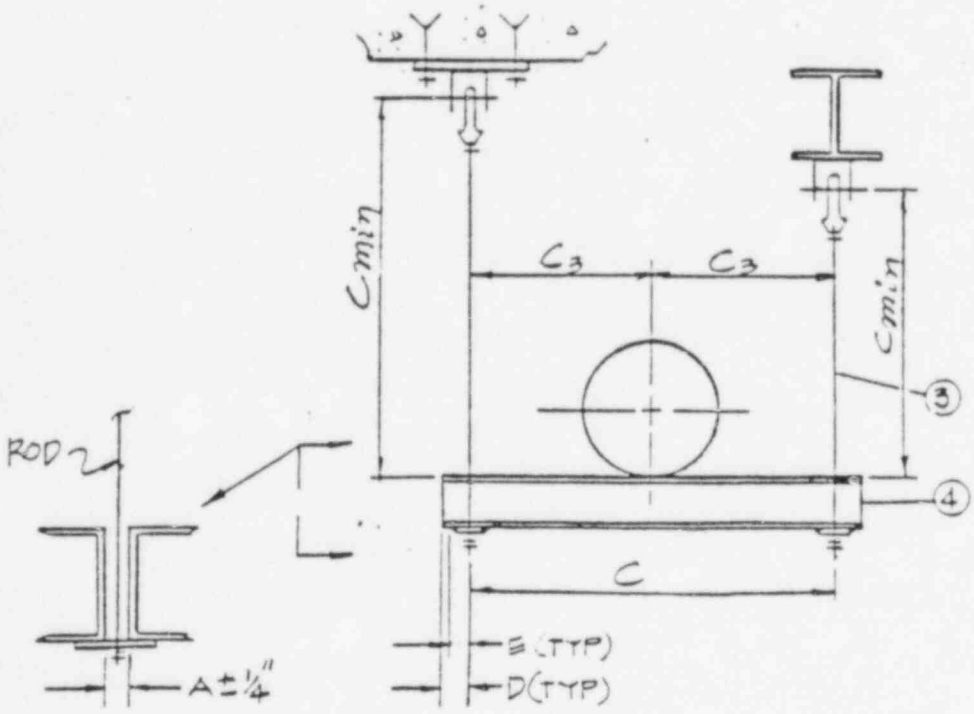


FIG 4B

Fig. 4

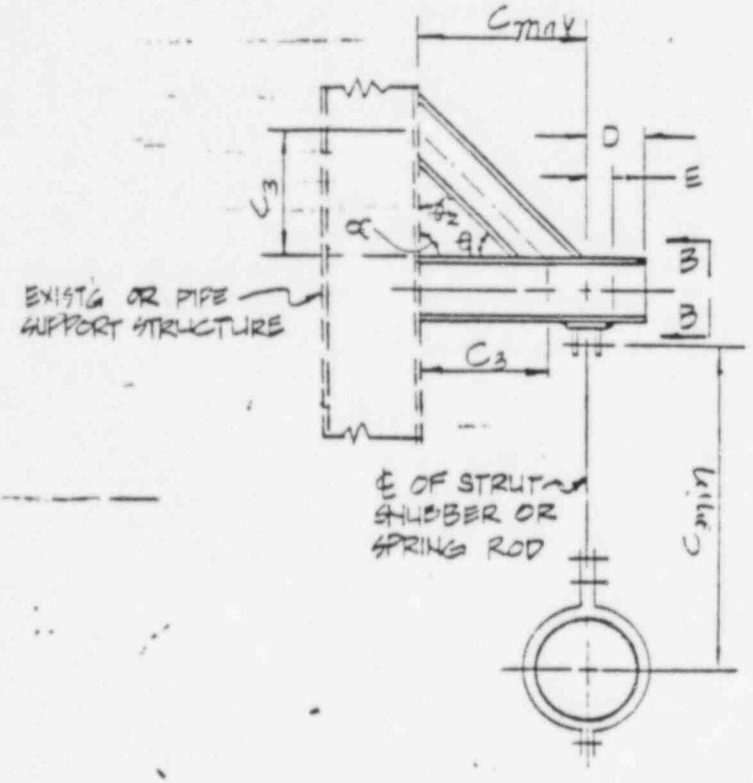
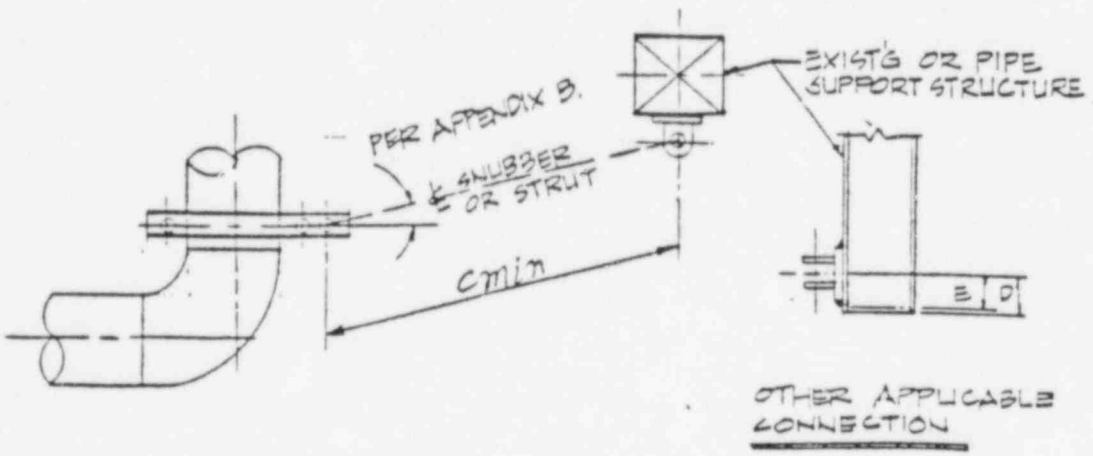


FIG-5A



OTHER APPLICABLE CONNECTION

FIG. 5B

Fig. 5

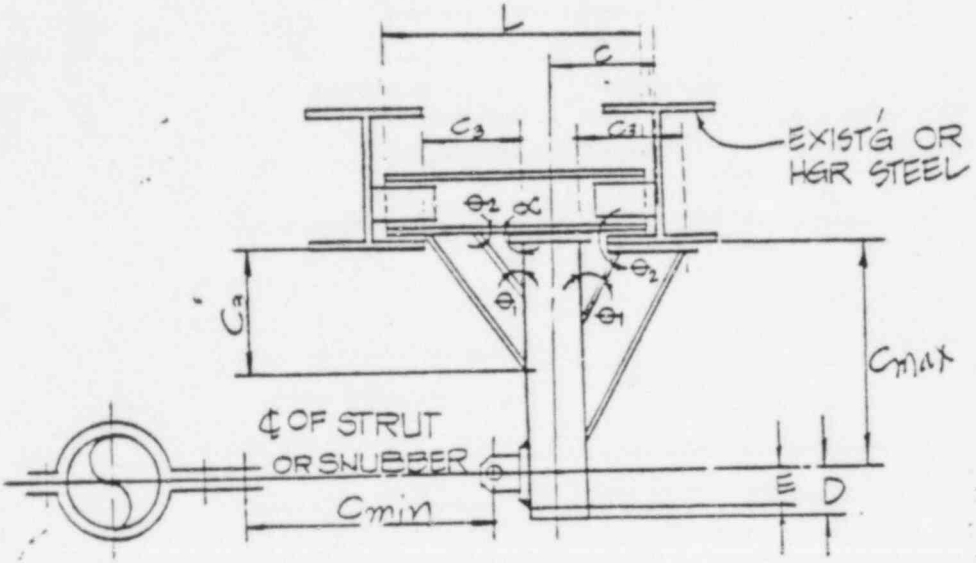


FIG. 6A

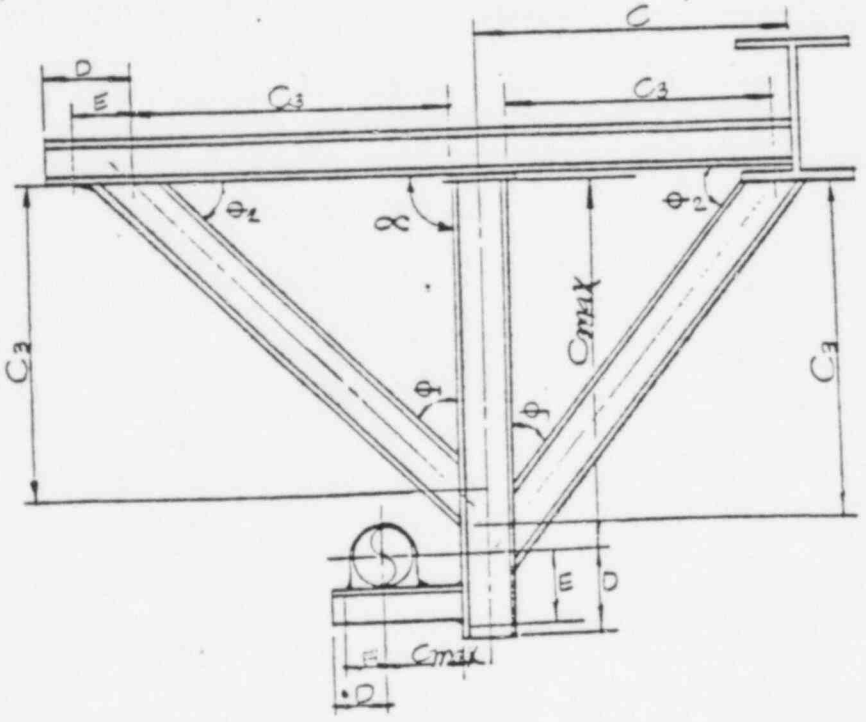


FIG. 6B

Fig. 6

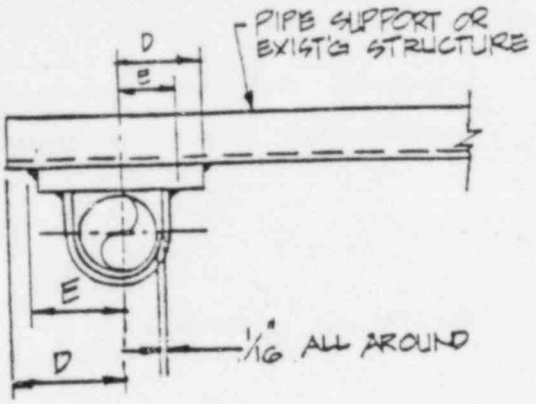


FIG. 7A

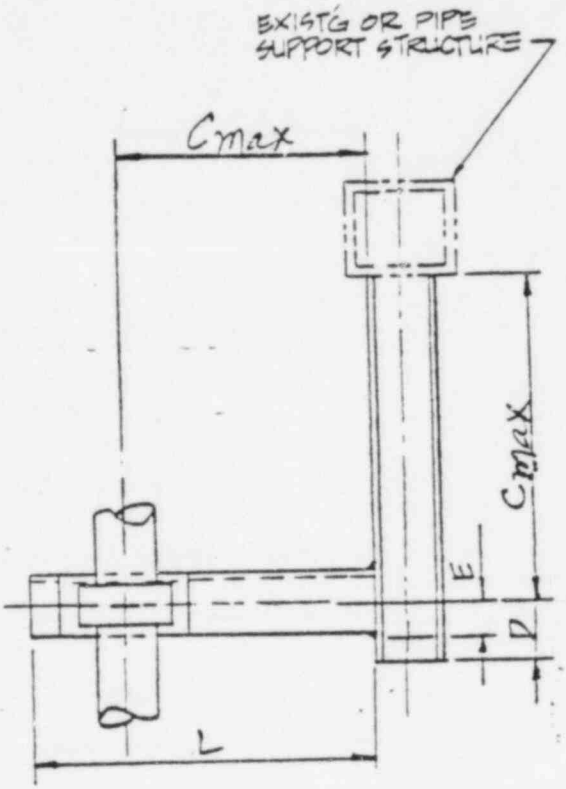


FIG. 7B

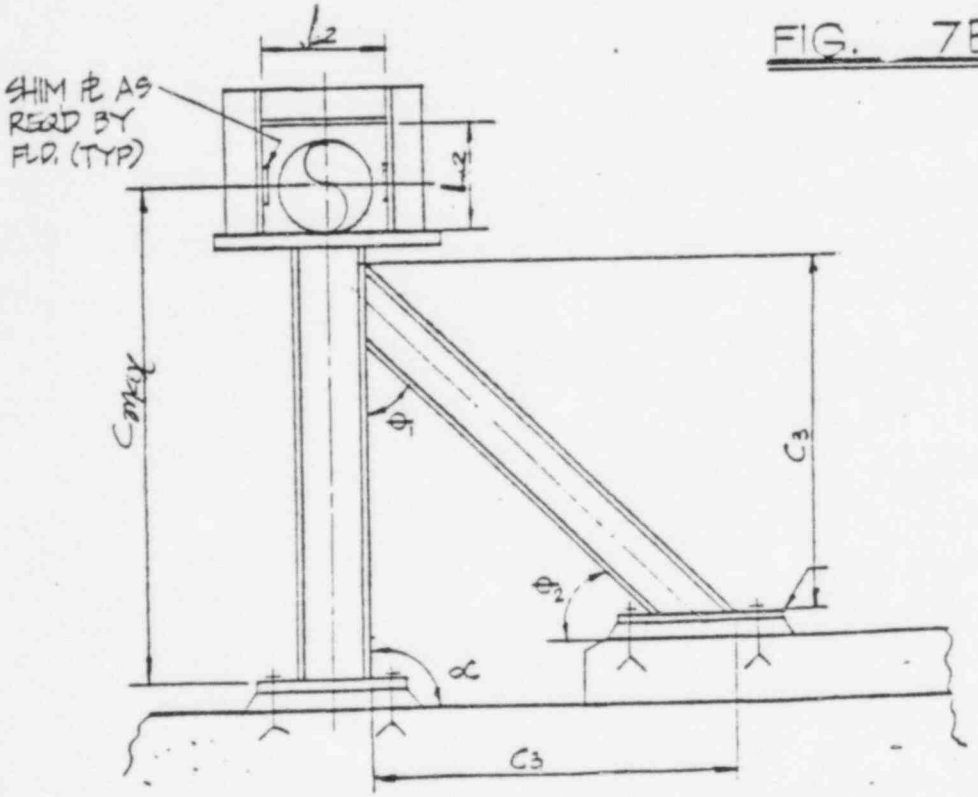


FIG. 7C

Fig. 7

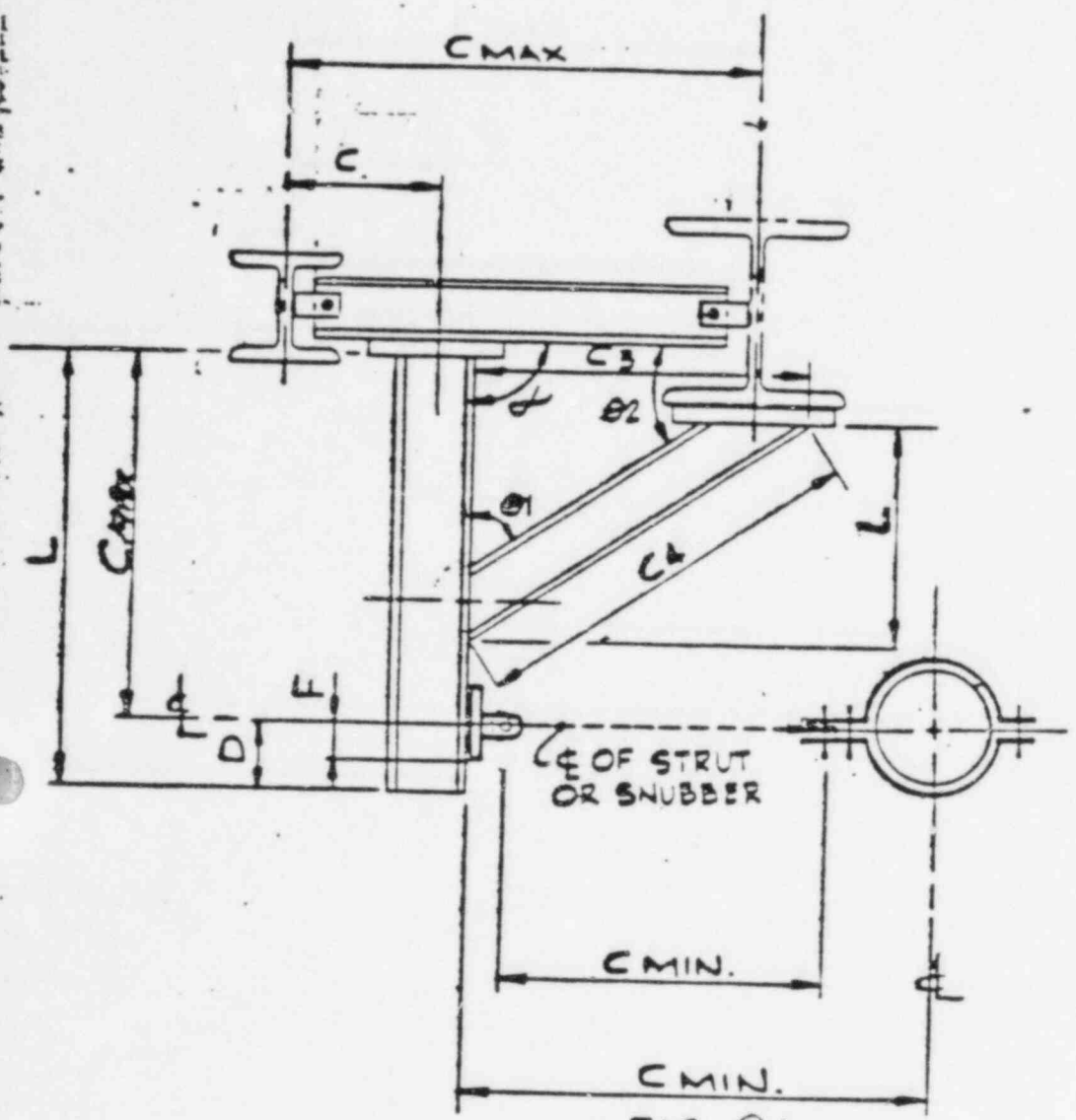


FIG. 8A

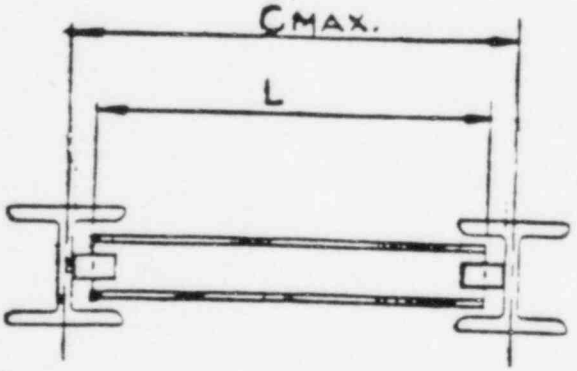


FIG 8B (Fig-8)

Note: For other dimensions, see Figure# 1 to 8.

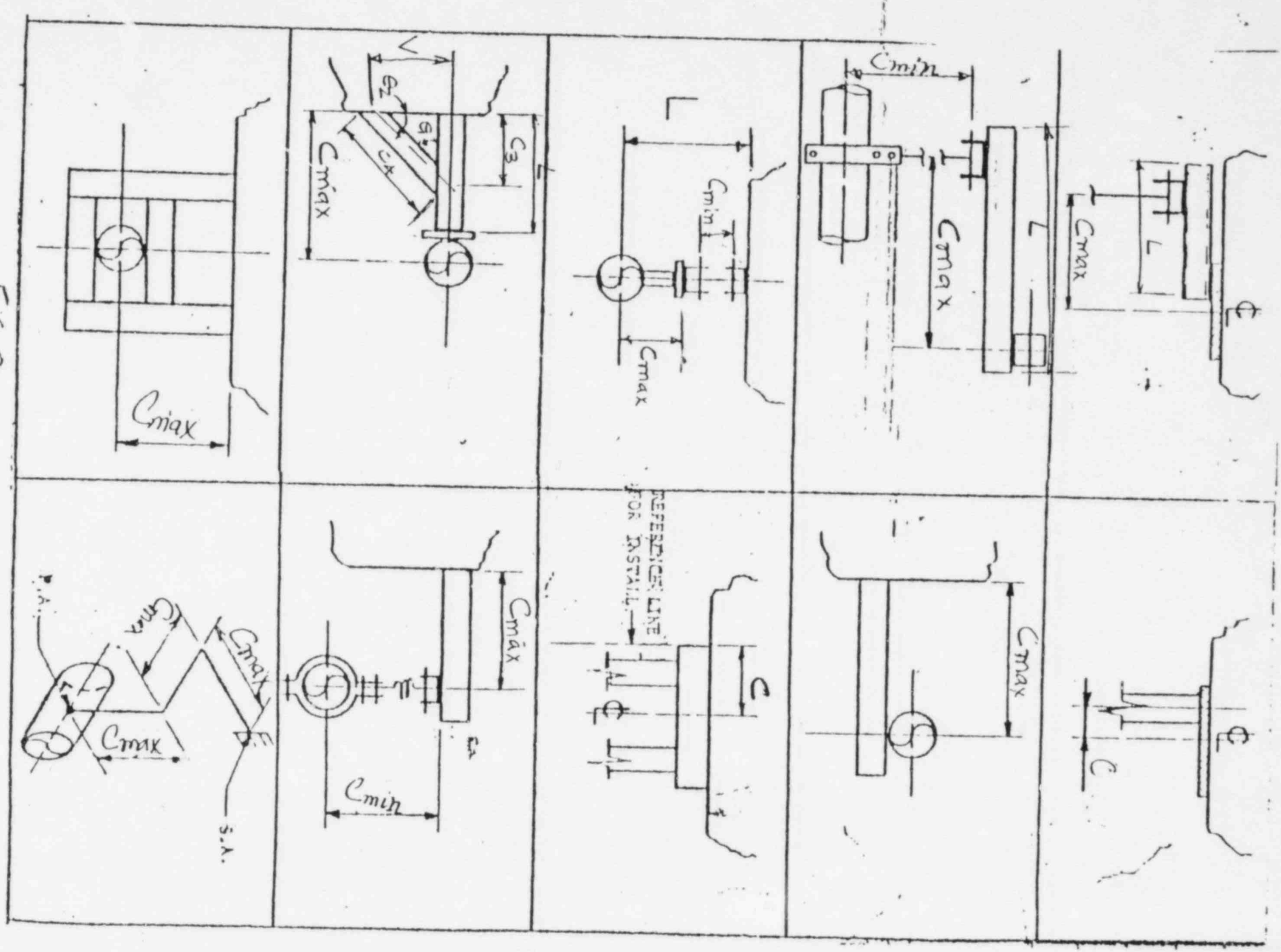


Fig. 9

Note: For other dimensions, see Figure # 1 to 8

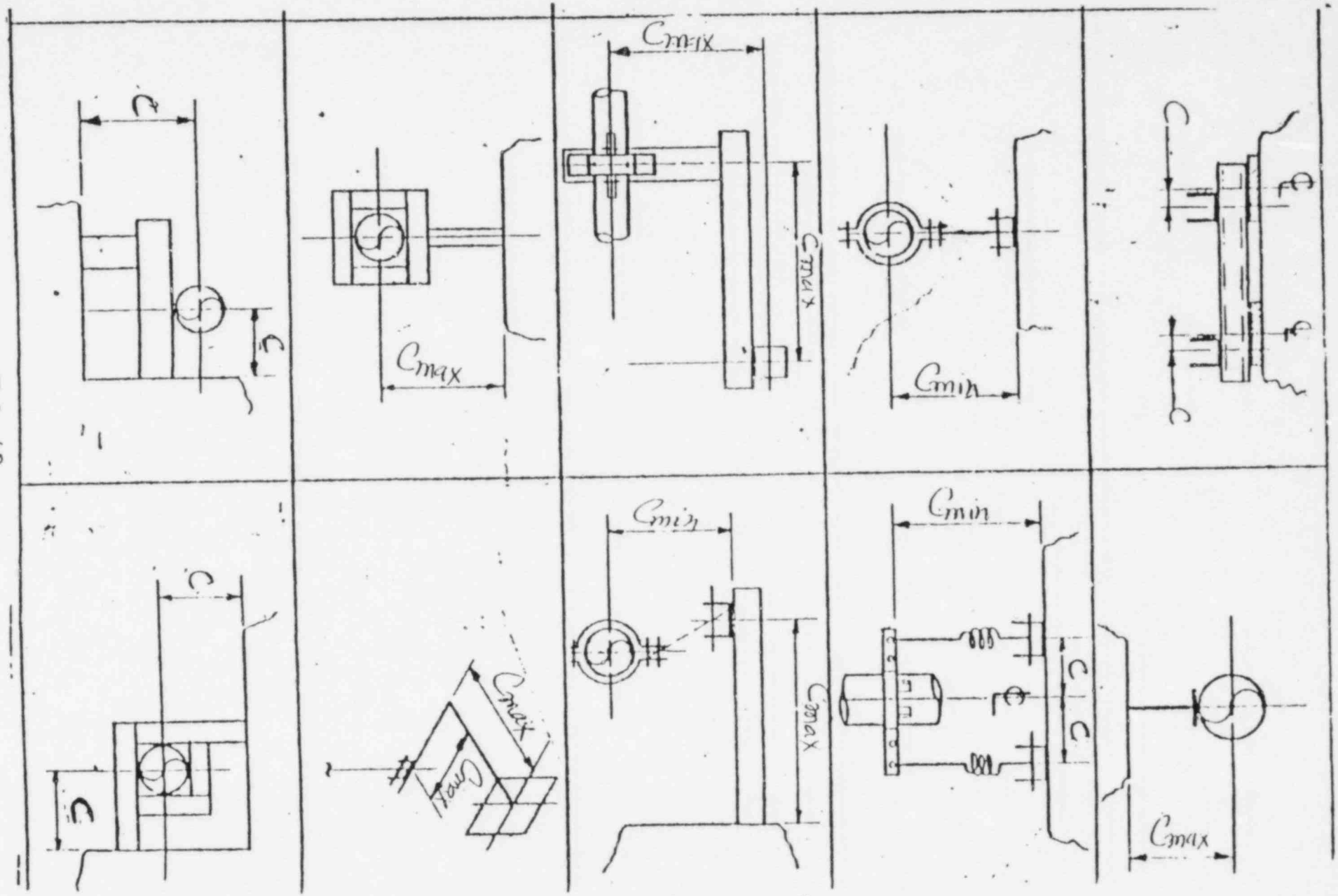


Fig-10

HANGER NO.	DEVIATIONS	REASON FOR DEVIATION	ENGINEERING EVALUATION	CATEGORY
DO-2533-2	Hanger location with respect to the pipe riser varied from design location to 2-7/8". The tolerance allowed by drawing H501 for this critical dimension is ± 2".	Reviewer problem - Delta delta misunderstanding.	No Design Impact per Engineering Evaluation.	M1
HPCS-16	Richmond insert stud threads not staked.	Not as-builter problem.	No Design Impact per Engineering Evaluation.	D2
LPCS-28	1. Undersize welds on washer plates. 2. Cold set dimension on snubber as 2' 7-7/8" per design drawing, shown on redline as 2' 10-1/2".		No Design Impact per Engineering Evaluation. No Design Impact per Engineering Evaluation.	W1 M2
LPCS-903N	Weld details were not specified on the drawing.	As-builter did not check to see if every joint had weld symbol. As-builter checked everything on drawing - weld symbol not shown on drawing - appears only on FRPED. Weld is OK.	No Design Impact per Engineering Evaluation.	W3
MS-998N	Lug to pipe welds 1/4", drawing specified 5/16".	Not as-builter error - Hanger was not as-built at time of NRC walkdown.	No Design Impact per Engineering Evaluation.	W1
RCIC-21	Clip angle 4x4x3/8", drawing specifies 4x4x1/2"		No Design Impact per Engineering Evaluation.	M7
RCIC-952N	1. Tube steel 4x4x1/4", drawing specifies 4x4x.375" 2. Wrong heat number etched on tube steel.	Heat number belongs to previously attached piece that was removed.	No Design Impact per Engineering Evaluation.	M7

CASE -CASE EVALUATION OF NRC CAT SAMPLE DEVIATIONS

HANGER NO.	DEVIATIONS	REASON FOR DEVIATION	ENGINEERING EVALUATION	CATEGORY
RHR-415	1. Vendor welds ground undersize during attachment weld grinding.		No Design Impact per Engineering Evaluation.	W1
	2. Critical dimension shown on redline as 5' 1/4", actual and original design is 5' 7-3/4".	Mismeasurement - to wrong point (top of pipe instead of plate.)	No Design Impact per Engineering Evaluation.	M1
RHR-465	Lug to pipe weld 3/16", drawing specifies 1/4".	1/32 concavity in weld.	No Design Impact per Engineering Evaluation.	W1
RHR-563	1. Cold set dimensions on snubbers were 1" 1-5/8" and 1' 1-3/4'. Drawing specifies ± 1" = 1/8".		No Design Impact per Engineering Evaluation.	M2
	2. Two of twelve expansion anchor mounting studs had less than required thread engagement into anchor shell.		No Design Impact per Engineering Evaluation.	D5
RWCU-162	Weld details were not specified on the drawing.	This is a QC-II hanger.	No Design Impact per Engineering Evaluation.	W3
SLC-4475-11	Clearance from pipe to support are 1/8" and 1/32", redline indicates 1/16" and 0".		No Design Impact per Engineering Evaluation.	M5

CASE-BY-CASE EVALUATION OF EXTENDED SAMPLE DEVIATIONS

HANGER NO.	DEVIATIONS	REASON FOR DEVIATION	ENGINEERING EVALUATION	CATEGORY
MSLC-11	1. As-builter - fillet weld instead of flare bevel. 2. Cir. was 1/16" and 1/32" instead of recorded 1/8" and 1/16".	Misunderstanding of weld symbol.	No Design Impact per Engineering Evaluation.	W3 M5
RHR-298	Gusset plate's welding less than design 5" 7" 9" and 9" actual versus 11-1/16" shown.		No Design Impact per Engineering Evaluation.	W2
RHR-319	A flare V weld was recorded as a flare bevel.		No Design Impact per Engineering Evaluation.	W3
RHR-408	1/4" fillet weld is actually 3/16" x 1/4".		No Design Impact per Engineering Evaluation.	W1
RHR-520	2' 7-7/8" recorded as 2' 8-1/2".	Not as-builter error (W851).	N/A	M1
RHR-609	Distance between welds is 4-1/4" instead of 4".	Not as-builter error (W851).	N/A	M1
RHR-920N	Thermal exp. interference with RHR 924N.	Not as-builter error (WNP-2-075)	Hanger Redesign Required for either RHR-920N or RHR-924N	D1
RHR-924N	1. See RHR 920N. 2. Under welding of flare bevel weld. 3. Unrecorded gap between lug and top of clamp.	Not as-builter error This is an extra weld not specified on design.	See RHR-920N No Design Impact per Engineering Evaluation. " "	D1 W1 M5
RHR-925N	Missing lock washer on Richmond insert.		No Design Impact per Engineering Evaluation.	D2
RHR-946N	P-P is 1' 7-3/8" instead of 1' 7-11/16" (critical dimension is OK).		No Design Impact per Engineering Evaluation.	M2

HANGER NO.	DEVIATIONS	REASON FOR DEVIATION	ENGINEERING EVALUATION	CATEGORY
MSLC-32	Three way test. clr. E-1/32" versus 1/16", W-3/32" versus 1/32", N-[illegible]/16" versus 1/32", S-OK - 1-lug 1/64" clr.		No Design Impact per Engineering Evaluation.	M5
FPC-908N	1. Shim t = 1/32" versus 1/16".		No Design Impact per Engineering Evaluation.	M1
	2. Lug —> clamp clr.		" "	M5
LPCS-45	1. Undersized fillet weld 1/4" x 3/16" and 1/8" x 3/16" versus 1/4".		No Design Impact per Ergineering Evaluation.	W1
	2. Measurement 2' 1-3/4" versus 2' 0-7/8".	Not as-builter error (W851).	↓	M1
HPCS-909N	1. Weld called inaccessible was 1/8" undersized.		No Design Impact per Engineering Evaluation.	W1
	2. One side of all around 5/16" fillet is 1/4" x 5/16".		↓	W1
	3. Rear bracket missing spacer washers.	Not as-builter error-spacer not required.	N/A	D3
HPCS-925N	7/8" clamp bolt instead of 1".	Not as-builter error - Reinspector error.	N/A	M6
MS-42	Flare bevel weld undersized by 1/8".		No Design Impact per Engineering Evaluation.	W1
MS-68	1. Strut interference with insulation.		No Design Impact per Engineering Evaluation.	D1
	2. Power Piping strut used instead of NPS.			D4
	3. P-P dimension not on drawing or verified.			M3
	4. Dimension 3' 7-1/4" versus 3'11".			M1
	5. Offset 1 3/4" versus 1".			M4
	6. Undersized welds on wrong side of stiffner plate.		↓	W1

CASE-BY -SE EVALUATION OF EXTENDED SAMPLE DEVIATIONS

HANGER NO.	DEVIATIONS	REASON FOR DEVIATION	ENGINEERING EVALUATION	CATEGORY
MS-170	Fillet weld is 1/4" x 5/16" versus 5/16".		No Design Impact per Engineering Evaluation.	W1
MS-171	Under filled flare bevel.		No Design Impact per Engineering Evaluation.	W1
MS-1000N	1. There are 4 item #15 versus 2 recorded. 2. Critical dimension not measured.	Original Bill of Material was wrong. Redundant dimension.	No Design Impact per Engineering Evaluation.	D4 M1
MS-1011S	1. Snubber 11-9/16" versus 11-3/4". 2. Dimension 5-3/16" versus 5".	Not as-builter error (W851).	No Design Impact per Engineering Evaluation.	M2 M1
MS-1013S	1. Snubber dimension 11-3/16" versus 11-9/16" and 1' 0-5/16" versus 1' 0-5/8". 2. Base plate dimension 5-1/4" versus 5", 6-3/4" versus 7", 7-1/4 versus 7", 4-3/4" versus 5".	Not as-builter error (W851).	No Design Impact per Engineering Evaluation.	M2 M1
MS-295	Spring Rod with 2-3/4" thread instead of 6" thread.		No Design Impact per Engineering Evaluation.	M1
RHR-17	Welded beam attachment is 3/4" - 5/8" was specified on drawing.		No Design Impact per Engineering Evaluation.	D4
RHR-96	Weld is 3/16" x 1/4" instead of 5/16" fillet.		No Design Impact per Engineering Evaluation.	W1
RHR-212	1. 8' 10-5/16" versus 8' 9-1/4". 2. Missed weld length 3. Clr. 1" specified - 1/2" exists 4. 1'-0" versus 8-15/16" 5. 3/16" fillet all around specified versus seal welded on 2 of sides. 6. 3/16" weld missing on bottom of attachment 7. 5-1/2" versus 7".	Not as-builter error (W851).	N/A No Design Impact per Engineering Evaluation.	M1 W2 M5 M1 W4 W4 M1

CASE-BASE EVALUATION OF EXTENDED SAMPLE DEVIATIONS

HANGER NO.	DEVIATIONS	REASON FOR DEVIATION	ENGINEERING EVALUATION	CATEGORY
RHR-245	Eight bolt base plate has one stud bolt instead of match bolt.	Not as-builter error - allowable substitution.	N/A	
RHR-548	Extra weld on plate washer.	Not as-builter error (W851)	N/A	
RHR-554	Strut p-p 1' 9-3/4" and 1' 10-7/8" versus 1' 11-1/2" each.		No Design Impact per Engineering Evaluation.	M3
RHR-928N	As-builter misidentified spring size.	Spring was poorly marked.	No Design Impact per Engineering Evaluation.	D4
RHR-SB-31	1. 1' 8-1/2" versus 1' 10"		No Design Impact per Engineering Evaluation.	M1
	2. Snubber p-p 2' 3-1/8" (actual) versus 2' 4" (as-built) 2' 7" (specified).			M2
MSRV-2A-5	Snubber p-p 1' 8-1/8" versus 1' 7-7/8".		No Design Impact per Engineering Evaluation.	M2
MSRV-2C-9	1. Flare bevel 1/16" under fill.		No Design Impact per Engineering Evaluation.	W1
	2. Oversize reinforcement plate 12-1/4" x 13-3/8" versus 11-1/4" x 13-1/4".			M1
LPCS-46	Missing weld not noted.		No Design Impact per Engineering Evaluation.	W4
LPCS-901N	Stiffener weld and plate shorter.		No Design Impact per Engineering Evaluation.	W2
RCIC-15	Stud used instead of bolt.	Not as-builter error per PED-215-H-E854.	N/A	
RCIC-26	Snubber p-p 2' 9-13/16" versus 2' 6".		No Design Impact per Engineering Evaluation.	M2

HANGER NO.	DEVIATIONS	REASON FOR DEVIATION	ENGINEERING EVALUATION	CATEGORY
RCIC-41	Clearance dev.		No Design Impact per Engineering Evaluation.	M5
RCIC-107	Weld marked TYP which was not. Other weld was specified OK.		No Design Impact per Engineering Evaluation.	W3
RCIC-121	1. Weld L 7-1/2" versus 7-3/4". 2. Flare bevel with 1/4" fillet cap is 3/16" x 1/4".	Not as-builter error (W851).	No Design Impact per Engineering Evaluation.	W2 W1
RCIC-904N	1. 3' 0-5/8" versus 3' 0". 2. Missing weld not reported. 3. 1/4" fillet actually 3/16" x 1/4". 4. 2' 11-5/16" versus 3' 0".	Not as-builter error (W851). Not as-builter error (W851).	No Design Impact per Engineering Evaluation.	M2 W4 W1 M1
RCIC-911N	1" clamp bolt used instead of 1-1/8".	Not as-builter error - Reinspector error.	N/A	M6
HPCS-12	1. Bill of Material for sway struct called out rear bracket but M-146 was installed but not specified on as-built. 2. 5° offset not reported.		No Design Impact per Engineering Evaluation.	D4 M4
HPCS-17	1. Portion of all around 1/4" fillet is 3/16" x 5/16" and 3/16" x 1/4" (skewed weld). 2. Washer plate is welded on two sides instead of four.		No Design Impact per Engineering Evaluation.	W1 W2
VR-2	1/4" all around fillet weld is 3/16" x 1/4" on one side.		No Design Impact per Engineering Evaluation.	W1

CASE-BY-CASE EVALUATION OF EXTENDED SAMPLE DEVIATIONS

HANGER NO.	DEVIATIONS	REASON FOR DEVIATION	ENGINEERING EVALUATION	CATEGORY
RCIC-127	Undersized weld.		No Design Impact per Engineering Evaluation.	W1
RHR-462	Hanger offset missed 4°-15' and 4°-45'.		No Design Impact per Engineering Evaluation.	M4

FREQUENCY SUMMARY OF CATEGORIZED DEFICIENCIES IN ATTACHMENT 2

	NRC	Extended	
Welding			
W1 Undersize	4	16	
W2 Underlength		5	
W3 Symbol	2	3	
W4 Missing		4	
TOTAL	6	28	
Measurements			
M1 Dimensions	2	15	
M2 Snubber P-P	2	7	
M3 Strut P-P		2	
M4 Offset		3	
M5 Clearance	1	6	
M6 Clamp Bolt Size		2	
M7 Steel Size	2	0	
TOTAL	7	35	
Details			
D1 Thermal Interference		3	
D2 Locking Device	1	1	
D3 Spacer Washer		1	
D4 Component Identification		5	
D5 Thread Engagement	1	0	
TOTAL	2	10	

GENERIC EVALUATION OF DEVIATIONS

FINDINGS

The errors reported by the re-as-built team fell into three general categories: welding, measurements, and miscellaneous details (See Attachment 1). There were 34 welding discrepancies noted of which six were from the NRC sample and 28 from the extended sample. Undersized welding not being measured and/or recorded was the most prevalent discrepancy with 20 findings. There was a total of 42 measurement errors reported, seven from the NRC sample and 35 from the extended sample. The remaining miscellaneous details, such as thermal interferences, locking devices, and component manufacturer that were missed during the original as-built numbered 12. Two of these items were from the NRC sample, 10 from the extended sample.

Many of the items, in both the NRC sample and the extended sample, that were originally thought to be errors turned out not to be as-builting errors per se. With the development of a more definitive set of measurement tolerances and acknowledgement that other existing inspection programs existed to reconcile certain deficiencies, most of the findings either fall within acceptable measurement tolerances or the deviations would be picked up by one or more other inspection programs. The following is a detailed summary of each category of deficiencies and a brief discussion on the findings in that category.

W1 - Undersized Weld: The NRC CAT identified MS-998N as deficient. However, the hanger was not as-built when the NRC CAT inspection was made. The hanger has subsequently been as-built and the undersized weld identified by the CAT was also recorded by the as-builter. The remainder of the undersized welds represent a small percentage of the total number of welds (19 of approximately 2,500, < 1%). None of the 19 undersized welds affected the design in accordance with an engineering evaluation.

W2 - Underlength Weld: The potential design impact of a weld that is shorter than designed is similar to that for a weld that is undersized. For two of the welds, the deviation was less than the measurement tolerance of PED-215-H-W851 and therefore is not really an as-builter error. In another case, the weld was called deficient because the weld of a web stiffner did not run from flange to flange. It is standard practice to clip the corners of stiffners resulting in a shorter weld even though the hanger detail did not call for it to be clipped. None of these deficiencies impacted the design.

W3 - Welding Symbol: Welding symbol errors cover two types of errors. Welds that are improperly specified, i.e., calling a flare bevel weld a fillet weld, are usually very obvious to the designer, and as such, result in a request by the AE for a re-as-built of that item. The other error is welds that are missing any weld symbol, and as such, appear not to be welded on the as-built when reviewed by the AE. In nearly all cases, this would be conservative.

W4 - Missing Welds: There was a total of four welds specified that were not made and not identified as missing by the as-builter. In all cases, an engineering evaluation of the detail indicated that the existing hanger meets code requirements. Further, four welds out of the total population in over 100 hangers with approximately 2,500 welds is a small error rate.

M1 - Dimensioning Errors: Nine of the 17 reported dimensioning errors are acceptable as-is because they fall within the WNP-2 measurement tolerance (PED-215-H-W851). The remaining eight dimensioning errors were minor and acceptable as they do not impact the design of the hangers.

M2 - Snubber Pin-to-Pin Measurement: The snubber pin-to-pin measurement errors are not significant for two reasons. First, the measurement tolerance of ± 1/8" is quite tight considering that pipes move due to ambient temperature changes and as a result of the hanger setting and balancing. Either of these can result in a hanger that is acceptable one day and unacceptable the next. Further, startup has a preservice inspection procedure (SLT-S-303) which reinspects all snubber supports prior to operation of the system and the pin-to-pin dimension is one of the items checked.

M3 - Strut Pin-to-Pin Measurements: Only two strut measurement errors were noted, and in one of the cases, the error was that the dimension was not verified. Strut pin-to-pin dimensions are change due to hanger

setting and balancing and are not critical as long as they are within the manufacturers limits on the load capacity data sheets(s). Further, many of the struts, approximately 80%, will be reinspected during startup's preservice inspection of supports (SLT-S-303).

M4 - Offset Measurement: In all cases, the offsets were acceptable as-is by an engineering review. Hanger offset measurements are another item that is reviewed by the startup preservice inspection procedure (SLT-S-303), and as such, most offsets will receive a second review. In two of the three offset measurement errors, offsets existed that were not reported by the as-builter.

M5 - Clearance Measurements: All seven of the clearance measurement problems were acceptable from an engineering review. Box restraint clearances like snubber settings can change from day-to-day due to ambient temperature changes and can be affected by the hanger setting and balancing. Hanger clearances are reinspected after the line has been balanced and most will be inspected again when startup does their preservice inspection under SLT-S-303.

M6 - Clamp Bolt Size: Both of the bolt size errors reported were later found not to be as-builter errors, but rather errors made during the as-built reinspection. The original as-built is correct. No deficiencies were found.

M7 - Steel Sizing Errors: The two cases where the steel thicknesses were not identified by the as-builters appear to be isolated cases as the extended sample did not identify a single additional case. These two cases represent a very small error rate among the hundreds of pieces of steel covered by the sample of over 100 supports. In both cases, the existing condition was acceptable based on an engineering evaluation.

D1 - Thermal Interference: The three thermal expansion interferences identified in the extended sample do not belong as as-builting errors. The requirement to look for thermal interferences has been removed from the as-built program. These items will be covered by both the Hot Pipe Interference Walkdown (BRI Project Instruction WNP-2-075) and startup preservice inspection (SLT-S-303).

D2,3,5 - Locking Devices, Spacer Washers , and Threaded Engagement: These items are not the responsibility of the as-built program with the exception of noting double nuts as a locking device. These deviations would be covered by several other programs. The hanger set and balance team insures that there is full threaded engagement and a locking device for all adjusted hangers. Startup's preservice inspection program (SLT-S-303) covers these items. Also, other sampling programs resulting from the generic problem identified by the NRC CAT concerning nuts and bolts will address these items.

D4 - Component Identification: There were five components that were not properly identified: a strut manufacturer, a spring can size, a

rear bracket for a strut the size of a welded beam attachment (a size larger than specified was installed), and the quantity of PSA-35 weld adapters (the original bill of materials was wrong). This represents a small error rate. Further, the spring size error would be readily identified by the hanger set and balance program. Both the spring can and the strut could also be identified during the preservice inspection (SLT-S-303). These errors are random and limited and were found not to impact the design or function of the hangers.

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ENGINEERING INSPECTION AND EVALUATION OF QC I PIPE SUPPORTS AND SMALL BORE PIPING

WNP-#2

Prepared For

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

September 15, 1983 (Revision 1)
~~September 1, 1983~~

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REASON FOR CHANGES

Revision 1
Changes from the initial report (dated September 1, 1983) have been made and are identified with a vertical line in the right hand margin.

The affected page/section/paragraph and the reason for each change is listed below:

1. Page 6, deleted the first item (bullet) under paragraph 3.5-C.
   Reason for deletion:
   During the final stages of the SWEC pipe support inspections, clearance was obtained for access to the Diesel Generator Rooms. Access to these rooms had been severely restricted due to ongoing major construction. During the inspection in these rooms, the inspection team noted a deviation on pipe support SW-1048-22 and turned it over to the evaluation group. The evaluation group determined that the sketch made by the inspection team did not contain sufficient detail to adequately assess the condition so a reinspection was recommended. The SWEC team made two attempts to obtain clearance for access to the Diesel Generator Rooms to reinspect this support but were unsuccessful because of newly instituted security clearance requirements. By this time schedule requirements dictated that the final report be prepared and issued, so this item was evaluated to the best of SWEC's ability as sketched on the inspection form and included in the final report.

   Subsequent to the preparation and submittal of the final report to the Supply System, SWEC engineers were able to obtain access to the Diesel Generator Rooms and conducted two inspections of support SW-1048-22. These inspections indicated that the information on the inspection form was incomplete and that the condition assumed in the report did not exist.

2. Page 7, second paragraph of section 3.7. Added clarifying sentences.
   Reason for change:
   Expanded the text of the report to more accurately explain the results of Attachment E.

3. Attachment E "Engineering Assurance Evaluation", page 2, under "Observation & *Disposition":

   - Changed the disposition of paragraph 3
     Reason for change:
     The only instants SWEC observed the starting of as-builts before construction completion was when temporary items were involved (paragraph 4.2 of Bechtel procedure 14631/RL-1.00). Providing this procedure is rigorously implemented, proper control of this work approach can be achieved.

   - Replaced the fifth paragraph.
     Reason for change:
     Developing an overall audit program at this point in the construction schedule would probably not yield any benefits. However, the current monitoring program must continue to be scheduled and performed.

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ATTACHMENTS

1.0 INTRODUCTION

In May and June 1983, a NRC Construction Assessment Team (CAT) reviewed the Quality Class I as-built program for WNP-2 as planned and implemented by the contractor for the Washington Public Power Supply System (Supply System). During this review, discrepancies between the as-built documentation and as-installed pipe support configurations were noted by the CAT Team. The CAT Team also noted that previous reviews of the as-built supports by both Project QA (PQA) and Bechtel QA (BQA) had indicated different rates of deviation. These three reviews were based on a relatively small sample of the pipe support population. As a result, the Supply System contracted with Stone & Webster Engineering Corporation (SWEC) to perform an independent third-party review of the QC I as-built program. This review included a physical inspection of a relatively large cross-section of the QC I pipe support and small bore piping population, the analysis of deviations, and an engineering evaluation of the significance of the deviations. In addition, a review of the as-built program was conducted to ascertain compliance with the requirements of I&E Bulletin 79-14.

2.0 CONCLUSIONS

- The present QC I as-built program in use at WNP-2 is acceptable and meets the needs of the project.

- The implementing procedures for the as-built program are satisfactory and meet ASME III and NRC I&E Bulletin No. 79-14 requirements.

- Deviations found during the SWEC review, were determined not to have a significant effect on the structural integrity of the support.

- Several isolated items found during the SWEC review may require further action by the Supply System. These are described in section 3.5 C of this report.

3.0 SWEC PROGRAM

SWEC performed a third-party review consisting of three parts:

1. Sample selection, physical inspection, and analysis of deviations for a significant sample of the hanger population.

   Sections 3.1, 3.2 and 3.3 of this report provide details of the inspections performed including sample selection and data analysis.

2. Engineering evaluation of deviations found during the physical inspection.

   Section 3.4 of this report provide details of the evaluations performed.

3. A review of the as-built program.

   Section 3.7 of this report describes the review performed and assesses the adequacy of the as-built program relative to regulatory requirements.

SWEC's work was limited to 1) comparing as-installed conditions to as-built drawings, and evaluating any deviations, and 2) reviewing the contractor implementation of the QC I as-built program. It was not within SWEC's scope of work to re-perform work done by others or to review the basis of the original design. Large bore QC I piping was not included in SWEC's Scope of Work. Also, since SWEC used as-built drawings for their inspections, it was assumed that any deviations previously found by Bechtel in the as-built program will be reconciled by others.

3.1 Sample Selection

Supports and piping to be inspected were initially selected at random from the Bechtel computer listing of as-built drawings by startup system. This list contains 2,270 QC I large bore pipe supports, 733 small bore QC I piping isometrics (with the associated supports), and 269 unique QC I small bore supports.

A sample of 15 percent of the population of large and small bore QC I pipe supports, small bore piping, and small bore unique supports was selected. This sample size greatly exceeds the sample sizes established in MIL-STD-105D for a 95 percent confidence level. For example, from a population of 2270 large bore supports, a sample of 340 supports was inspected to achieve 15 percent while MIL-STD-105D at a confidence level of 95 percent requires a sample of 125. On this basis, there is greater than 95 percent confidence level that the results of the inspection and evaluation of the sample can also be applied to the uninspected population.

A 15 percent sample consists of 340 large bore supports, 110 small bore piping isometrics, 184 small bore standard supports, and 55 unique small bore supports. The initial random sample was adjusted to assure a representative cross section of various support types and sizes which exist in the plant. The final sample and a breakdown by type, system, etc., is shown in Attachment A.

3.2 Inspection

Prior to commencement of the inspection phase, SWEC personnel were trained in weld measurement and the inspection procedures to be used, and were familiarized with the plant and the history of the WNP-2 as-built program.

Inspections were performed and data were collected according to Project Procedure WRO-01 - Procedure for Engineering and Evaluation of Pipe Supports (Attachment B).

Each pipe support was inspected for 17 attributes. The attributes selected for pipe support evaluation were primarily those associated with the structural integrity of the support. The 13 attributes selected for the small bore isometric evaluation were those considered to be associated with the structural integrity of the piping system and the configuration of the piping system. The results of the inspections by attribute are shown in Attachment C.

3.3 Data Analysis

The disposition of the attributes on each inspection form were inputed to SWEC's Pipe Hanger Information System Program (PHIS) and sorted by attribute, system and support type. From this information, the number and types of various deviations were compiled and results analyzed. Data results are shown in Attachment D.

3.4 Evaluations

If during the inspection an attribute was determined to be outside the tolerances established in Attachment B, it was marked as a deviation and evaluated. If the engineer on the inspection team could determine that the deviation did not affect the structural integrity of the support, it was documented on the inspection form as acceptable. If the inspection team could not determine disposition of the evaluation, it was referred to an Evaluation Group. The Evaluation Group then reviewed the deviation against the criteria in Section 3.1.5.1 of Attachment B. The effect of a deviation on the structural integrity of supports which could be accepted with calculations was so documented.

The basis for acceptance of the effect of a deviation on the structural integrity of a support was either by referencing existing design calculations or by performing calculations based on existing load data provided by Burns & Roe Inc., or Gilbert Commonwealth. Generic acceptance of the effects of deviations was also used where the Supply System has shown that those deviations will systematically be remedied. The details of these types of bases for acceptance are shown in Attachment B, Section 3.1.5.1.

3.5 Results

The results of the inspection phase are shown in Attachment C. They are presented in a tabular form indicating the number and type of deviations found.

A. During the inspection process, 141 supports were found to have fillet weld deviations. These supports contained a total of 1150 fillet welds. There were 233 of these fillet welds that were not in conformance with the as-built documentation; 204 of which, were considered critical to the structural integrity of the support.

From the information shown in Attachment C, a trend can be seen in the area of weld measurement on the as-built drawings. A further sort of weld deviations is presented in Attachment D. In the most common weld deviations, one or both legs of the fillet weld were 1/16" less than specified on the drawing. Review of stress levels in these welds indicated that they were within allowable limits.

It would be highly reasonable (because of the large sample size) to expect a similar proportion of weld deviations to be found in the uninspected population. Since the sample size was greater than that which would yield a 95 percent level of confidence (discussed in section 3.1) it would be reasonable to expect a similar proportion of the weld deviations in the uninspected population and for them be evaluated and dispositioned (structurally adequate) with the same rate of success as in the inspected population . On this basis, SWEC is more than 95 percent confident that no deviations in fillet welds, which could adversely affect the structural adequacy of the supports, will be found in the uninspected portion of the population. Therefore, SWEC does not recommend that any further weld inspections be conducted.

B. Many deviations were found in is U-bolt side clearances for small bore supports. The supply system has an ongoing program to cover these clearance problems; therefore, they were not further evaluated by SWEC.

C. The following items were observed during the inspection process which may require further action by the Supply System:

- Another condition observed by SWEC, was that insulation around small bore supports and pipes restricts thermal expansion pipe movement in the axial direction. It is recommended that the Supply System develop a program to account for this condition.

- It was observed that the stiffener plates located on building steel for supports RCIC-16 and RCIC-19 were distorted. This condition is not in the scope of the As-built Program but is being investigated by Bechtel.

- During the review of the inspection of a small bore piping isometric, SWEC discovered that a deviation was noted by a Bechtel as-builder but was not followed up with a Request For Information (RFI) or Project Engineering Directive (PED). Bechtel is currently reviewing the as-built drawings for this condition.

- Where deviations were found such as missing parts, excessive gaps, snubber settings, etc., the Supply System procedure SLT S303.0 was referenced for acceptance. SLT S303.0 references ASME XI which would exclude small bore supports for pipes one inch and below. It is recommended that this procedure be revised to include QC I pipe supports for pipes of 1 inch and 3/4 inch normal size.

Of the 689 large or small bore pipe support or small bore piping isometrics inspected, 311 had deviations requiring evaluations. 78 were evaluated by the inspection teams. Their effect on the structural integrity of pipe supports and piping were all determined acceptable. 233 required more detailed analysis by the evaluatin group. The effect of these deviations were also found acceptable to the criteria shown in Attachment B, Section 3.1.5.1, and the section 3.5 C of this report. Where deviations were observed that could affect the structural adequacy of the support, they were analyzed and found to have sufficient design margin so that the structural integrity of the support was not compromised.

3.6 Review of SWEC Activities

The Engineering Assurance Division* performed an audit of the SWEC project activities to determine if the procedure in use adequately describes and controls the work, and if the work was being accomplished according to the procedure. Work performed by the field inspection teams was observed and the subsequent documentation by these teams as well as the Evaluation Group was reviewed. The project procedure, Attachment B, and the project's compliance to it were found to be satisfactory.

3.7 Review of As-Built Program

An evaluation of the WNP-2 as-built program (as it applies to the QC I piping and associated pipe supports) was performed by SWEC's Engineering Assurance Division*. The intent of this evaluation was to assess the as-built program's compliance to ASME III and NRC I&E Bulletin No. 79-14 and its' ability to ensure that the engineering analysis applies to the actual as-installed configuration (members, location, welds) of the piping system. The evaluation was conducted by reviewing the applicable procedures, holding discussions with appropriate personnel from the Supply System (the Owner), Burns & Roe, Inc. (the A/E), the Bechtel Power Corp. (the Constructor) and others involved in the program, and by reviewing as-built documentation. The review concentrated on pipe supports and the construction program for identifying the as-built configuration to the A/E.

The results of this evaluation indicate that the written program and procedures are satisfactory and comply with ASME III and NRC I&E Bulletin No. 79-14 requirements. However, some procedural changes could be made to better describe interfaces between affected groups, reflect actual practices, and improve effectiveness. A detailed list of the items evaluated, associated observations, and dispositions are described in Attachment E. The dispositions regarding changes to procedures are suggestions that in SWEC's judgement could improve program effectiveness. A detailed list of the items evaluated and associated observations are presented in Attachment E.

*The SWEC Engineering Assurance (EA) Division is a Division in the Engineering Department and is responsible for administering the SWEC Standard Nuclear Quality Assurance Program as it applies to engineering and design activities.

TABLE IA - LARGE BORE SUPPORT SAMPLE

SUPPORT	REV.	SUPPORT	REV.	SUPPORT	REV.
CAC 86	2	CAC 10	2	EDR 493	4F0
CAC 87	1	CAC 108	1	EDR 503	2
CAC 9	1	CAC 109	1	EDR 903N	1
CAC 902N	2F0	CAC 111	3F0	EDR 904N	3F0
COND 591	4F0	CAC 116	3	EDR 906N	3F0
COND 886	2	CAC 117	4F0	FDR 475	1
CRD 904S	0	CAC 16	3	FDR 900N	2F0
CRD 905S	0	CAC 18	4F0	FDR 901N	2
DE 1	4F0	CAC 19	2	FDR 902N	2F0
DE 2	5F0	CAC 20	2	FPC 209	1
DE 3	3F0	CAC 21	3F0	FPC 210	3F1
DE 35	2F1	CAC 23	2	FPC 223	3
DE 36	3F0	CAC 49	2	FPC 224	5F0
DE 4	6F0	CAC 5	2	FPC 225	3F0
DE 40	2F0	CAC 50	4F0	FPC 228	2
DE 41	2F0	CAC 6	2F0	FPC 229	6F0
DE 42	3F0	CAC 78	1	FPC 41	5F0
DE 5	4F0	CAC 8	1	FPC 42	5F0
DE 68	4F1	CAC 80	1F0	FPC 43	4
DE 904N	1F0	CAC 81	1	FPC 59	4F0
DE 906N	1F0	CAC 82	2F0	FPC 60	2F0
DD 905N	1F0	CAC 83	2F0	FPC 64	2F0
DD 908N	1F0	CAC 84	1	FPC 906N	1F0

TABLE 1A - LARGE BORE SUPPORT SAMPLE (CONTINUED)

SUPPORT	REV.	SUPPORT	REV.	SUPPORT	REV.
FPC 909N	1	LPCS 905N	2F0	MS 285	2F0
FPC 919N	1F0	LPCS 907N	3	MS 289	3F0
HPCS 1	3	LPCS 908N	2F0	MS 290	3F0
HPCS 16	5	LPCS 909N	2F0	MS 305	3F0
HPCS 17	5F0	MS 1C-1PS	2F0	MS 306	2F0
HPCS 18	4	MS 1003N	2F0	MS 316	2F0
HPCS 31	7F0	MS 101	5F0	MS 321	2
HPCS 32	6F0	MS 115	4F0	MS 324	3F0
HPCS 38	4	MS 117	5F0	MS 325	1
HPCS 44	5F0	MS 119	5F0	MS 328	2F0
HPCS 7	4F0	MS 120	6F0	MS 342	2F0
HPCS 907N	3F0	MS 121	3	MS 45	5
HPCS 908N	4F0	MS 157	5F0	MS 47	6F0
HPCS 910N	3F0	MS 163	6F0	MS 993N	0
HPCS 911N	3F0	MS 168	5	MS 996N	1F0
HPCS 916N	2	MS 170	6F0	MS 997N	1F0
LPCS 11	3F0	MS 171	4F0	MS 998N	1F0
LPCS 13	4F0	MS 260	2F0	MSLC 10	1
LPCS 38	3	MS 261	1	MSLC 11	2F0
LPCS 39	4F0	MS 274	1	MSLC 12	1
LPCS 57	4F0	MS 275	2F0	MSLC 13	1
LPCS 61	4F0	MS 277	3F0	MSLC 25	2
LPCS 904N	4F0	MS 278	2F0	MSLC 26	2F0

TABLE 1A - LARGE BORE SUPPORT SAMPLE (CONTINUED)

SUPPORT	REV.	SUPPORT	REV.	SUPPORT	REV.
MSLC 27	2	RCIC 8	2	MSRV 4B-7	3F0
MSLC 28	1	RCIC 80	5F0	MSRV 4C-5	5F0
MSLC 29	2F0	RCIC 82	4F0	MSRV 5B-2	4F0
MSLC 31	1	RCIC 83	4F0	MSRV 5B-3	2F0
MSLC 32	2F0	RCIC 86	4	MSRV 5B-4	3F0
MSLC 34	2F0	RCIC 88	2	MSRV 5B-5	3F0
MSLC 35	1	RCIC 91	2	MSRV 5C-1	2F0
MSLC 39	2F0	RCIC 93	2	MSRV 5C-2	3F0
MSLC 9	1	RCIC 95	3F0	MSRV 5C-3	2F0
MSRV 2B-5	2F0	RCIC 952N	2F1	RCIC 10-10	4
MSRV 2B-6	3F0	RCIC 954N	3F0	RCIC 10	3F0
MSRV 2B-7	3F0	RCIC 969S	0	RCIC 11	4
MSRV 3A-6	4	RCIC 970S	1F0	RCIC 12	4F0
MSRV 3B-5	3F0	RFW 151	4	RCIC 14	4
MSRV 3B-6	3F0	RFW 152	2	RCIC 15	0
MSRV 3D-8PS	1F0	RFW 153	5	RCIC 16	3F0
MSRV 4A-10	2	RFW 162	5F0	RCIC 17	4F0
MSRV 4A-4	3F0	RFW 164	2	RCIC 19	4F0
MSRV 4A-5	2F0	RFW 177	4F0	RCIC 5	5F0
MSRV 4A-8	3F0	RFW 179	3	RCIC 6	3F0
MSRV 4A-9	2F0	RFW 182	7F0	RCIC 7	5F0
MSRV 4B-10	3F0	RFW 942N	0	RCIC 74	2F0
MSRV 4B-6	6F0	RHR SA-50	3F0	RCIC 79	4F0

TABLE 1A - LARGE BORE SUPPORT SAMPLE (CONTINUED)

SUPPORT	REV.	SUPPORT	REV.	SUPPORT	REV.
RHR SA-53	3F0	RHR 376	4F0	RHR 983N	3F0
RHR SA-54	2F0	RHR 408	3F0	RRC HA-1	1F0
RHR SA-56	RF0	RHR 412	3F0	RRC HB-1	0
RHR SA-58	3F0	RHR 414	3F0	RRC RA-1	2F0
RHR SA-59	3F0	RHR 415	5F0	RRC SB-11	2F0
RHR 10	4F0	RHR 416	3F0	RRC SB-13	1
RHR 11	4F0	RHR 425	3F0	RRC SB-14	1
RHR 135	5F1	RHR 428	RF0	RRC SB-15	2F0
RHR 136	5	RHR 431	4F0	RRC SB-16	2F0
RHR 138	3F0	RHR 582	4F0	RRC 1	2
RHR 17	3F0	RHR 583	3F0	RRC 1C-1	3F0
RHR 170	2	RHR 584	5F0	RRC 1C-13	3F0
RHR 171	6	RHR 585	4F0	RRC 1C-14	2
RHR 172	2F0	RHR 586	4F0	RRC 1C-15	2
RHR 173	3F0	RHR 66	3	RRC 1C-6PS	3F0
RHR 18	4	RHR 67	4	RRC 1C-900N	0
RHR 186	4F0	RHR 68	4	RRC 2	4F0
RHR 19	5F0	RHR 70	3	RRC 3	2
RHR 370	3F0	RHR 77	5F0	RRC 4	2F0
RHR 371	4F0	RHR 79	4F0	RWCU 1C-1	2
RHR 372	3F0	RHR 8	5F0	RWCU 1C-1PS	2
RHR 373	3F0	RHR 81	2	RWCU 1C-11	2F0
RHR 374	2	RHR 9	5	RWCU 1C-12	3F0

TABLE IA - LARGE BORE SUPPORT SAMPLE (CONTINUED)

SUPPORT	REV.	SUPPORT	REV.	SUPPORT	REV.
RWCU 1C-2	2	SW 106	1	SW 411	2
RWCU 1C-2PS	3F0	SW 107	1	SW 413	3
RWCU 1C-4	2	SW 108	1	SW 43	1
RWCU 1C-7	3F0	SW 109	3F0	SW 44	2F0
RWCU 1C-7PS	1	SW 110	2F0	SW 46	3F0
RWCU 139	3F0	SW 111	2	SW 47	2F0
RWCU 140	2F0	SW 112	4F0	SW 48	2F0
RWCU 141	3	SW 138	1	SW 49	2F0
RWCU 145	3F0	SW 25	4	SW 50	2F0
RWCU 146	1	SW 26	2	SW 51	1
SGT 20	1	SW 30	1	SW 905N	1
SGT 900N	1F0	SW 346	2	SW 906N	1
SGT 901N	1F0	SW 304	2	VR 1	3
SLC 901N	1	SW 305	1	VR 3	4F0
SLC 903N	2F1	SW 401	2	VR 4	3F0
SLC 904N	2F0	SW 402	2	VR 5	2F0
SLC 905N	2F0	SW 403	2	VR 900N	1
SW 100	1	SW 404	2	VR 902N	2F0
SW 101	3F0	SW 406	2		
SW 102	1	SW 407	2		
SW 103	1	SW 408	2		
SW 104	1	SW 409	3		
SW 105	1	SW 410	2		

TABLE IB - SMALL BORE ISOMETRIC SAMPLE

ISOMETRIC			REV.	ISOMETRIC			REV.	ISOMETRIC			REV.
DD	2532	3	4	CAC	2759	5	9	MS	2614	1	7
DD	2533	1	6F0	CAS	3085	2	9F0	MS	2615	1	7
DD	2708	1	7F0	CAS	3086	3	10F0	MS	2617	1	7
DD	2710	3	6F1	CAS	3088	3	9F0	MSLC	2826	1	2
DD	2711	1	5F0	CIA	4101	1	4	MSLC	2826	2	4F0
DD	2715	3	4	CIA	4115	1	5	RCC	2470	2	1
DSA	2536	1	6F0	COND	4631	3	6	RCC	2474	2	0
DSA	2729	2	7F0	COND	4631	4	5	RCIC	1477	4	2
DSA	2732	1	3F0	COND	4631	5	5	RCIC	1482	2	9
DW	1154	7	12	COND	4631	6	5	RCIC	1485	2	3
FDR	2222	2	7	DCW	2518	1	6F0	RCIC	1486	3	5F0
FPC	2934	1	4F0	DCW	2520	1	4	RCIC	2558	1	6
FPC	4444	2	5	DCW	2722	1	7F0	RCIC	2560	1	8
HPCS	1458	1	8	DCW	2724	1	5F0	RCIC	2560	8	8F0
HPCS	1458	3	7	DCW	4329	1	5F0	RCIC	2560	16	6
HPCS	1459	2	8F0	DCW	4603	1	3	RCIC	2560	16	5
HPCS	1645	1	3	DCW	4640	1	2F0	RCIC	4529	1	3
LPCS	1627	1	11	DE	2840	1	4F0	RHR	1968	1	12F0
LPCS	2565	1	13F0	DD	2525	3	6F0	RHR	1968	6	9F0
LPCS	3077	1	10F0	DD	2526	3	7F0	RHR	2018	1	5F0
MD	1288	2	8	DD	2527	1	5F0	RHR	2020	1	4
MS	1293	1	6	DD	2528	1	5F0	RHR	2104	1	10
MS	1425	1	8	DD	2531	3	5F0	RHR	2264	1	10

TABLE 1B - SMALL BORE ISOMETRIC SAMPLE (CONTINUED)

ISOMETRIC			REV.	ISOMETRIC			REV.
RHR	2287	2	4	SW	1038	4	9
RHR	2289	2	5F0	SW	1048	2	5F0
RHR	2578	1	4F0	SW	1526	178	4
RHR	4434	1	8F0	SW	1529	4	6
RHR	4515	1	5	SW	1532	3	4
RHR	4525	1	7	SW	2515	1	1
RRC	1336	1	8	SW	2521	1	4
RRC	1337	1	6F0	SW	2598	1	6
RRC	1337	3	4	SW	2706	2	7
RRC	1549	1	8	SW	2717	1	1F0
RRC	1551	4	8	SW	2723	1	5
RRC	1552	6	12	SW	4222	4	4
RRC	1940	1	7	SW	4441	1	7F0
RRC	4300	3	7	SW	4504	1	2
RWCU	3084	1	5	SW	4565	1	1
SGT	4449	2	3	SW	4618	1	1
SGT	4449	3	3	SW	4641	1	2
SLC	4456	2	5	SW	4642	1	1
SW	1006	2	7				
SW	1032	2	10F0				
SW	1034	3	4				
SW	1035	5	4				
SW	1038	1	5				

TABLE IC - SMALL BORE SUPPORT SAMPLE

SUPPORT		REV.	SUPPORT		REV.	SUPPORT		REV.
AB	E84-7	D6	DCW	4603-13	3	DD	2710-33	6F1
CAC	2759-51	9	DCW	4640-11	2F0	DD	2710-34	6F1
CAC	2759-52	9	DE	2840-12	3F0	DD	2710-35	6F1
CAS	3085-21	9F0	DE	2840-13	3F0	DD	2710-36	6F1
CAS	3085-22	9F0	DE	2840-14	3F0	DSA	2536-13	1F0
CAS	3085-25	9F0	DE	2840-15	3F0	DSA	2536-13A	1F0
CAS	3086-32	10F0	DE	2840-16	4F0	DSA	2536-13F	1F0
CAS	3088-32	8	DE	2840-17	3F0	DSA	2729-21	7F0
CIA	4101-11	4	DD	2526-31	7F0	DSA	2729-22	7F0
CIA	4101-12	4	DD	2526-32	7F0	DSA	2729-23	7F0
CIA	4101-13	4	DD	2526-33	7F0	DSA	2729-24	7F0
CIA	4101-14	4	DD	2526-34	7F0	DSA	2729-25	7F0
CIA	4115-11	0	DD	2526-35	7F0	DSA	2729-26	7F0
DCW	2513-11	1	DD	2533-11	6F0	DW	1154-71	
DCW	2518-11A	6F0	DD	2533-12	6F0	DW	1154-72	
DCW	2518-11B	6F0	DD	2533-13	6F0	FPC	2934-11	4F0
DCW	2518-12	6F0	DD	2533-14	6F0	FPC	2934-12	4F0
DCW	2520-11	4	DD	2533-15	6F0	FPC	4444-21	5
DCW	2724-11	5F0	DD	2708-11	7F0	FPC	4444-23	5
DCW	2727-11C	2F0	DD	2708-12	7F0	FPC	4444-24	5
DCW	4329-11	5F0	DD	2708-13	7F0	FPC	4444-25	5
DCW	4603-11	3	DD	2710-31	6F1	FPC	4444-26	5
DCW	4603-12	3	DD	2710-32	6F1	HPCS	1456-12	8

TABLE IC - SMALL BORE SUPPORT SAMPLE (CONTINUED)

SUPPORT	REV.
HPCS 1456-13	8
HPCS 1459-21	8F0
HPCS 1459-22	8F0
HPCS 1459-23	8F0
HPCS 1459-24	8F0
HPCS 1459-25	8F0
LPCS 1027-11A	11
LPCS 1027-11B	13F0
LPCS 2565-11A	13F0
LPCS 2565-11B	11
LPCS 2565-11C	13F0
LPCS 2565-12A	13F0
LPCS 2565-12B	11
LPCS 3077-11	10F0
MD 1288-21	8
MS 1293-13	6
MS 1425-15A	4
MS 1425-15B	4
MS 1425-15C	4
MS 1425-16	4
MSLC 2826-11	2
MSLC 2826-21	4F0
MSLC 2826-22	4F0
MSLC 2826-23	4F0
RCIC 1477-41	2
RCIC 1482-21	9
RCIC 1482-22	9
RCIC 1486-31	5F0
RCIC 2558-12	6
RCIC 2560-12	4
RCIC 2560-13	4
RCIC 2560-14	4
RCIC 2560-161	6
RCIC 2560-162	6
RCIC 2560-163	6
RCIC 2560-164	6
RCIC 2560-165	6
RCIC 2560-166	6
RCIC 2560-167	6
RCIC 2560-168	6
RCIC 2560-181	5
RCIC 2560-182	5
RCIC 2560-81	8F0
RCIC 2560-82	8F0
RCIC 2560-83	8F0
RCIC 2560-84	8F0
RHR 1968-11	12F0
RHR 1968-01	9F0
RHR 1968-02	9F0
RHR 1968-03	9F0
RHR 1968-04	9F0
RHR 1968-05	9F0
RHR 2018-11	5F0
RHR 2018-12	5F0
RHR 2020-13	3
RHR 2020-15	3
RHR 2020-15A	4
RHR 2104-11	10
RHR 2104-12	10
RHR 2107-11C	10
RHR 2107-11D	10
RHR 2204-11	10
RHR 2204-12A	10
RHR 2204-12B	10
RHR 2287-21	4
RHR 2289-21	4F0
RHR 2578-11A	4F0
RHR 2578-11B	4F0
RHR 2578-12A	4F0

TABLE IC - SMALL BORE SUPPORT SAMPLE (CONTINUED)

SUPPORT		REV.	SUPPORT		REV.
RMR	2578-12B	4F0	SW	1032-22	10F0
RMR	4434-11A	8F0	SW	1032-23	10F0
RMR	4434-12	8F0	SW	1035-51	4
RMR	4515-11	5	SW	1038-1	9
RMR	4515-12	5	SW	1038-2	0
RRC	1336-11B	8	SW	1038-3	9
RRC	1336-12	8	SW	1048-22	5F0
RRC	1337-14	5F0	SW	1048-23	5F0
RRC	1337-15A	5F0	SW	2515-11	1
RRC	1337-15B	5F0	SW	2515-12	1
RRC	1549-13	8	SW	2521-11	4
RRC	1551-41	8	SW	2521-12	4
RRC	1551-43	8	SW	2717-11	1F0
RRC	1552-03A	12	SW	2723-11	5
RRC	1552-03B	12	SW	4441-11	2F0
RRC	1552-04	12	SW	4441-12	7F0
RRC	1552-05	12	SW	4441-13	7F0
RRC	4300-33A	7	SW	4441-14	7F0
RRC	4300-33B	7	SW	4441-15	2F0
RRC	4300-34	7	SW	4441-16	2F0
RRC	4300-35	7	SW	4504-11	2
SGT	4449-31	3	SW	4505-11	1
SW	1032-21	10F0	SW	4505-12	1

TABLE ID - SMALL BORE UNIQUE SUPPORT SAMPLE

SUPPORT	REV.	SUPPORT	REV.	SUPPORT	REV.
CRD 1000-15	1F0	MS ~~4448~~-2	1F0	SLC ~~4452~~-34	0
CRD 1001-15	0	MSLC 2820-12	0	SLC 4452-71A	1F0
CRD 1001-16	0	MSLC 2820-14	1F0	SLC 4452-71B	1F0
CRD 9145	0	MSLC 2820-22	0	SLC 4452-73	1F0
HY 4230-15	0	MSLC 2820-23	1F0	SLC 4453-45	1
HY 4230-16	0	MSLC 2820-41	0	SLC 4453-65	1F1
HY 4234-16	2F0	MSLC 2820-43	1F0	SLC 4453-66	7
HY 4234-17	1	MSLC 2820-45	0	SLC 4453-67	0
HY 4236-15	2F0	MSLC 2821-22	0	SLC 4475-110	0
HY 4236-16	1	MSLC 2821-39	0		
HY 4236-17	2F0	MSLC 2821-41	0		
HY 4237-110	10F0	MSLC 2822-33	0		
HY 4237-17	1	MSLC 2823-23	0		
MS 1368-11	1F0	MSLC 2823-32	0		
MS 2019-311	1F0	MSLC 2823-39	0		
MS 2019-314	1F0	MSLC 2823-41	0		
MS 2019-320	1F0	MSLC 2823-42	0		
MS 2019-420	0	MSLC 2823-43	0		
MS 2019-43	1	RRC 1819-21	0		
MS ~~4448~~-12	0	RRC 1940-32	0		
MS ~~4448~~-13	0	SLC ~~4452~~-11	1F0		
MS ~~4448~~-31	1F0	SLC ~~4452~~-12	1F0		
MS ~~4448~~-11	0	SLC ~~4452~~-31	1F0		

TABLE IIA LARGE BORE SUPPORT SAMPLE - DISTRIBUTION

DISTRIBUTION OF SAMPLE BY SYSTEM

SYSTEM DESIGNATION (Description)		TOTAL HANGER (Per Bechtel Data Base, 8-1-83)	15% SAMPLE	HANGERS AUDITED
CAC	(Containment Atmos. Control)	102	15	27
CEP	(Containment Purge Exhaust)	6	1	0
COND	(Condensate)	27	4	2
CPR	(Cond. Filter Demineralizer System)	2	1	0
CRD	(Control Rod Drive)	0*	0	2
CSP	(Containment Purge Supply)	3	1	0
DCW	(Diesel Cooling Water)	4	1	0
DE	(Diesel Exhaust & Intake Air)	65	10	13
DO	(Diesel Fuel Oil)	6	1	2
EDR	(Equipment Drain Radioactive)	6	1	5
FDR	(Floor Drain Radioactive)	5	1	4
FPC	(Fuel Pool Coolant)	45	7	16
HPCS	(High Pressure Core Spray)	60	9	14
HY	(Hydraulic)	2	1	0
LPCS	(Low Pressure Core Spray)	44	7	11
MD	(Miscellaneous Drains)	2	1	0
MS	(Main Steam)	255	38	36
MSRV	(Main Steam Relief Valve)	147	22	23
MSLC	(Main Steam Valve Leakage Control)	41	6	15

*No supports listed on large bore data base. These supports are listed on small bore data base.

TABLE IIA CONTINUED

SYSTEM DESIGNATION (Description)		TOTAL HANGER (Per Bechtel Data Base, 8-1-83)	15% SAMPLE	HANGERS AUDITED
RCIC	(Reactor Core Isol. Coolant)	172	26	27
RFW	(Reactor Feed Water)	41	6	9
RHR	(Residual Heat Removal)	615	92	48
RRC	(Reactor Recirculation)	82	12	18
RWCU	(Reactor Water Clean-up)	31	5	14
SGT	(Stand-by Gas Treatment)	24	4	3
SLC	(Stand-by Liquid Control)	7	1	4
SW	(Service Water)	453	68	41
VR	(Radioactive Vent)	16	2	6
RCC	(Reactor Closed Cool. Water)	1	1	0
TOTAL		2264	344	340

TABLE IIB LARGE BORE SUPPORT SAMPLE - DISTRIBUTION

DISTRIBUTION OF SAMPLE BY SUPPORT TYPE

SUPPORT TYPE	TOTAL NUMBER OF TYPE	15% SAMPLE	HANGERS AUDITED
RIGID	1066	160	136
SNUBBER	526	79	87
SPRING	426	64	72
STRUT	246	37	45
TOTAL	2264	340	340

TABLE IIC LARGE BORE SUPPORT SAMPLE - DISTRIBUTION

DISTRIBUTION OF SAMPLE BY ASME CODE GROUPS

CODE GROUP	TOTAL NUMBER	15% SAMPLE	HANGERS AUDITED
A	391	59	73
B, C, D	1873	281	267
TOTAL	2264	340	340

TABLE IID SMALL BORE ISOMETRIC SAMPLE - DISTRIBUTION

DISTRIBUTION OF SAMPLE BY SYSTEM

SYSTEM DESIGNATION (Description)		TOTAL ISOMETRICS (Per Bechtel Data Base, 8-1-83)	15% SAMPLE	ISOs AUDITED
CAC	(Containment Atmos. Control)	10	2	1
CAS	(Control Air System)	14	2	3
CIA	(Containment Instr. Air)	71	10	2
COND	(Condensate)	10	2	4
CSP	(Containment Purge Supply)	2	1	0
DCW	(Diesel Cooling Water)	34	5	7
DE	(Diesel Exhaust & Intake Air)	8	1	1
DO	(Diesel Fuel Oil)	77	11	11
DSA	(Diesel Starting Air)	21	3	3
DW	(De-mineralizer Water)	1	1	1
FDR	(Floor Drain Radioactive)	6	1	1
FPC	(Fuel Pool Coolant)	4	1	2
HPCS	(High Pressure Core Spray)	11	2	4
HY	(Hydraulic)	8	1	0
LPCS	(Low Pressure Core Spray)	16	2	3
MD	(Miscellaneous Drains)	8	1	1
MS	(Main Steam)	31	5	5
MSLC	(Main Steam Valve Leakage Control)	13	2	2
RCC	(Reactor Closed Cooling Water)	4	1	2
RCIC	(Reactor Core Isol. Coolant)	65	10	10

TABLE IID CONTINUED

SYSTEM DESIGNATION (Description)		TOTAL ISOMETRICS (Per Bechtel Data Base, 8-1-83)	15% SAMPLE	ISOs AUDITED
RHR	(Residual Heat Removal)	88	12	12
RRC	(Reactor Recirculation)	47	7	8
RWCU	(Reactor Water Clean-up)	1	1	1
SA	(Service Air)	2	1	0
SGT	(Stand-by Gas Treatment)	6	1	2
SLC	(Stand-by Liquid Control)	2	1	1
SW	(Service Water)	161	23	23
TOTAL		721	110	110

TABLE IIE SMALL BORE ISOMETRIC SAMPLE - DISTRIBUTION

DISTRIBUTION OF SAMPLE BY SYSTEM

CODE GROUP	TOTAL NUMBER	15% SAMPLE	ISOs AUDITED
A	50	8	10
B, C, D	671	101	100
TOTAL	721	109	110

TABLE IIF SMALL BORE UNIQUE SUPPORT SAMPLE - DISTRIBUTION

DISTRIBUTION OF SAMPLE BY SYSTEM

SYSTEM DESIGNATION (Description)		TOTAL HANGER (Per Bechtel Data Base, 8-1-83)	15% SAMPLE	HANGERS AUDITED
CRD	(Control Rod Drive)	32	5	4
HY	(Hydraulic)	52	8	9
MS	(Main Steam)	64	10	11
MSLC	(Main Stm. Valve Leakage Control)	103	16	17
RRC	(Reactor Recirculation)	9	2	2
SLC	(Stand-by Liquid Control)	71	11	12
TOTAL		331	52	55

TABLE IIG SMALL BORE UNIQUE SUPPORT SAMPLE - DISTRIBUTION

DISTRIBUTION OF SAMPLE BY ASME CODE GROUPS

CODE GROUP	TOTAL NUMBER	15% SAMPLE	HANGERS AUDITED
A	139	21	18
B, C, D	192	29	37
TOTAL	331	51	55

TABLE IIH SMALL BORE UNIQUE SUPPORT SAMPLE - DISTRIBUTION

DISTRIBUTION OF SAMPLE BY SUPPORT TYPE

SUPPORT TYPE	NO. SAMPLE	15% SAMPLE	HANGERS AUDITED
RIGID	258	39	40
SNUBBER	62	10	10
SPRING	11	2	5
TOTAL	331	51	55

J.O. No. 14420.03

WRO-01
Revision B

PROCEDURE FOR

ENGINEERING INSPECTION AND EVALUATION

OF PIPE SUPPORTS

PROJECT INSTRUCTION NO. 1

J.O. No. 14420.03

WNP-2

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
WRO-01

APROVALS:

DATE:

G Varan
PROJECT ENGINEER

8/31/83

J.L. Cook
DOC EMD MANAGER

8/31/83

TABLE OF CONTENTS

1.0 PURPOSE

This document defines the scope, organization, and procedures to be employed by SWEC in performing WRO-01, Engineering Inspection and Evaluation Quality Class I (QCI) of Pipe Supports and Small Bore Piping.

2.0 INTRODUCTION

2.1 DEFINITIONS

SWEC - Stone & Webster Engineering Corporation
The Supply System - Washington Public Power Supply System
Data Package - All information associate with the inspection of an individual pipe support including as-built drawing and checklist.

Final Data Package - All information associated with the inspection and evaluation of an individual pipe support or small bore pipe including signed checklist together with as-built drawings, attachments, and calculations as required.

2.2 BACKGROUND

In May and June of 1983, the NRC Construction Assessment Team (CAT) reviewed the Supply System pipe support as-built program, as planned and implemented by the Supply System contractor. During this review, discrepancies between as-built documentation and as-installed support configurations were discovered. As a result, an independent third party review is being made. This procedure addresses that portion of the third party review concerning engineering inspection and evaluation of pipe supports.

2.3 LIMITATIONS

It is not in SWEC's scope of work to reperform design work done by others, or to review the basis of the original design. SWEC work will be limited to comparing as-installed conditions to the appropriate as-built drawings. The following describes the procedure for our review and the steps to be taken if discrepancies are identified.

3.0 GENERAL PROCEDURE

SWEC will perform and document an engineering inspection and qualification of a representative sample of the QC 1 pipe supports installed on the Supply System - Unit #2 project. The review will include on-site inspection of the pipe supports by experienced engineers and/or designers. The installation will be evaluated against the design documents of record (as-builts, specifications, etc.) using a checklist of pertinent engineering attributes as a guide. Deviations from the design documents will be noted in the checklist and will be evaluated based on engineering judgment and/or calculations.

Deviations that are found to be unacceptable (i.e., prevent the support from serving its intended function) will be documented in the checklist and made known to the Supply System in accordance with 5.5.3.

3.1 SAMPLE SIZE AND TRENDING OF RESULTS

The subject pipe supports will be divided into population groups based upon support type and pipe size. The results of the inspection for each of these populations will be evaluated periodically to determine trends.

The objective of the sampling and trending program is to identify as rapidly as possible any areas of genuine engineering concern. By using this type of approach, SWEC can facilitate the initiation of required rework by the Supply System on a timetable compatible with the fuel load schedule.

3.2 ENGINEERING REVIEW CHECKLIST

The engineering review checklist in Attachments A and B is designed to be a one-page (two-sided) document that addresses pertinent engineering concerns, provides traceability, and documents the review. It also documents deviations identified and the disposition of those deviations, together with identifying the engineer or designer that performed the review.

3.3 COMPUTERIZED DATA MANAGEMENT

SWEC will use PIPE HANGER INFORMATION SYSTEM (PHIS) (IS-202) program for data management to track the progress and status of these pipe support tasks.

3.4 DOCUMENTATION AND FINAL REPORT

The original data packages will be maintained on file by SWEC. The computerized progress reports and data will be maintained by SWEC and provided to the Supply System upon request. Copies of all final data packages and calculations produced will be turned over to the Supply System at the completion of the task.

SWEC will provide a final report which will state the findings, and delineate corrective actions taken during SWEC's execution of this task.

4.0 ORGANIZATION

SWEC will implement, control, and monitor the activities required to review the QC I pipe supports which have been as-built under the Bechtel as-built program. This task will be performed under the direction of the SWEC Project Manager located at the SWEC Richland, Washington office and the SWEC Project Team located at the site.

On-site inspection and evaluation of the pipe support installation will be performed by a Project Team reporting to the SWEC Project Engineer at the WNP-2 site. The Project Team will identify acceptable supports, document and evaluate deviations, track daily progress and update the computerized database.

Inspection will be performed by teams consisting of two engineers or one engineer and one designer. Where convenient one engineer or one designer may perform an inspection. The Inspection Team will evaluate deviations as discussed in Section 5.5.1. The balance of the deviations as discussed in 5.5.2 will be evaluated by an Evaluation Group. Computer tracking and trend analysis will be a function of the Evaluation group.

The Project Engineer will work closely with the Supply System to ensure that the goals of the review program are met satisfactorily.

5.0 DETAILED PROCEDURE

5.1 SCOPE

SWEC will perform a detailed inspection of 15% of the QC 1 large bore pipe supports, together with 15% of the QC 1 small bore piping and associated supports, including small bore unique supports. No large bore piping will be inspected.

There are 2270 large bore QC 1 pipe supports on this project. 15% equals 340 supports. There are 733 small bore QC 1 piping isometrics on this project. 15% equals 110 isometrics. There are 268 small bore unique supports. 15% equals 55 supports.

The supports and piping to be inspected shall be randomly selected from the Bechtel computer listing of as-built drawings by start-up system. The initial random selection will be adjusted to assure a sampling of support type and size.

5.2 DATA COLLECTION

A separate data package will be assembled for each pipe support or pipe that must be inspected. This package will consist of:

1. An engineering review checklist (Attachment A or B).

2. A copy of the as-built pipe support sketch or isometric drawing (the as-built document is a marked-up issue of the issued for construction document).

SWEC will use Bechtel-controlled files to determine the latest document of record. Copies of required documents will be requested from Site Document Control.

5.3 TRAINING

Shown below is the training required for all personnel assigned to this task. A training record will be maintained in a site located job book:

1. "History of the WNP-2 Pipe Support program", and a Summary of the Bechtel as-built program, given by Mr. L. Cantin of Bechtel Construction.

2. "Weld Measurement", given by Mr. P.J. Inserra of the Supply System.

3. "Implementation of the SWEC Checklist, Tolerances and Inspection Guidelines", given by Mr. Paul Hector of SWEC.

4. Plant familiarization tour, escorted by Mr. L. Goering of Bechtel Construction.

5.4 SUPPORT INSPECTION

Each inspection team will perform on-site inspections of assigned pipe supports and isometrics and will review each installation against the support design documents of record. Primarily those dimensions pertaining to the structural adequacy of the support will be checked. Each checklist attribute will be checked under the appropriate column at the time of the inspection, indicating whether the attribute is not applicable (NA), is acceptable (A), or is a deviation (D).

A deviation is an attribute which falls outside the tolerances established in Attachments D and E.

Any deviation will be noted in the Comments column of the checklist and/or in other appropriate documents attached to the checklist in the data package.

If the deviation is noted on other than the checklist, the document on which it is noted will be cited in the Comments column of the checklist, and that document will be affixed to the check lists.

A member of the inspection team will complete and sign the checklist in accordance with Section 5.5.1 of this procedure.

Attachment A	Support Checklist
Attachment B	Isometric Checklist
Attachment C	Inspection and Evaluation Guideline - Activity Sequence
Attachment D	Support Inspection Guideline
Attachment E	Isometric Inspection Guideline

5.5 DEVIATION EVALUATION

The cited deviations will fall into two groups: those which can be evaluated immediately by the inspection team and those which will require a more detailed evaluation by the Evaluation Group.

When the evaluation of a deviation is based on the support calculations or support loads, the evaluator must first judge the adequacy of the loads since they are based on pre-as-built construction documents. The adequacy of the support loads will be judged by a review of the as-built isometrics and applicable support drawings considering piping configuration, support location, and support type. If a judgment cannot be made on the support load without a computer pipe stress analysis, than notification will be made to the Supply System through the Project Engineer. A deviation can be accepted by referencing a Burns and Roe (B&R) calculation or performing a detailed calculation using B&R supplied loading data. Allowable stresses, loads, loading combinations, etc., are those currently used for the WNP-2 Project.

The effect of a deviation on the structural integrity of a support or pipe may be judged acceptable if that deviation will be remedied programmatically or referenced to a document which covers it on a generic level. Types of these deviations and their basis for acceptance are listed below.

- o AWS/AISC Minimum Fillet Weld Criteria - WPPSS Interoffice memorandum No. SS2-PE-83-138 dated 5/26/83 from P.J. Inserra to R.T. Johnson titled "Fillet Welds Not Meeting AWS D1.1 or AISC Minimum Size Requirements to Avoid Weld Cracking - NRC Open item 79-06-01".

- o Spring and Snubber Settings - WPPSS Procedures
  1) "Adjutment and Balancing of Components Supports" No. SLT-S305.0
  2) "Visual Examination of Component Supports" No. SLT-S303.0

- o Missing Parts, Snubber Paddle End Conenction Interferences and Close Clearance Excessive Gaps - WPPSS Procedure "Visual Examination of Component Supports", No. SLT-S303.0

- o Small Bore Support Generic Details - Where it is not specifically called out to refer to a small bore standard detail it is assumed that the small bore standards in GC-1000-1 apply based on RFI No. C0500-H-2939.

5.5.1 Deviations Evaluated Immediately

The inspection team may judge the effect of a deviation as acceptable from an engineering standpoint either on the basis of a cursory review of the pipe support calculation, or by comparison with another calculation or design standard.

These judgments and the basis thereof must be stated clearly in the "deviations evaluated as acceptable by inspection team" section of the checklist.

The inspection team may also judge that a deviation requires rework of the support to its existing design. If such is the case, refer to Section 5.5.3 of this procedure.

An Engineer or Designer may sign and date the checklist if no deviations are noted. If deviations are noted, an Engineer must sign the checklist.

5.5.2 Deviations Requiring Further Evaluation

The deviations listed in the "Deviations Require Further Evaluation" section of the checklist will be evaluated by a detailed review of the calculation and/or use of an alternative calculation. It may also be referenced to a document which covers that item on a general basis. This will be done by the Evaluation Group, which is separate from the inspection team.

Alternative calculations which SWEC performs will be prepared on a Standard Form, Attachment F, which will become part of the final data package. The calculation will indicate the objective and conclusions and include necessary detailed calculations performed together with applicable references. These calculations will be signed by the preparer and reviewer. The reviewer shall also perform in independent review.

If an evaluation requires an extensive manual or computerized analysis, the Supply System will be notified through the Project Engineer and guidance requested.

After the Evaluation Group has completed its evaluation, it will complete and sign that section of the checklist, noting next to each deviation whether it is acceptable or requires rework. In addition it will refer to the calculation that substantiates this position.
For deviations that require rework, the Evaluation Group will refer to Section 5.5.3 of this procedure.

5.5.3 Support Modification Request Preparation

Deviations that were evaluated in Sections 5.5.1 or 5.5.2 of this procedure as requiring rework shall be made known to the Supply System through the Project Engineer.

5.6 DOCUMENTATION OF REVIEW

The completed checklist will be filed with the document data package, which will be kept at the SWEC site offices.

A copy of each final data package and calculations (if prepared), will be submitted to the Supply System at the completion of SWEC's effort.

The results of the inspection and engineering review will be coded on the PHIS database by the Evaluation Group.

5.7 COMPUTERIZED DATA MANAGEMENT

A data entry coordinator will update the database daily to incorporate the results of the previous day's inspection and/or calculations.

5.8 SAMPLE SIZE AND TRENDING

5.8.1 Sample Size

It is SWEC's position that 15 percent is an adequate sample size if the results of this program indicate that the quality of the installations are good. Further sampling will only be done with the express agreement of the Supply System.

Various sizes and types of supports from each system shall be adequately sampled.

5.8.2 Trending

The subject pipe supports will be divided into various population groups based upon attributes such as support type and support size. The results of the inspection for each of these populations will be evaluated periodically to determine trends.

5.9 DOCUMENTATION

A copy of all final data packages and applicable calculations will be transmitted to the Supply System. The original document will be maintained in a file by SWEC. The computerized progress reports and data base will be maintained by SWEC and provided to the Supply System at its request. A copy of all separate calculations produced to substantiate actions taken will be turned over to the Supply System at the completion of the task.

All judgments rendered and calculations performed will be submitted to the Supply System after the completion of this scope of work. All of these items will be identified and referenced in the final report.

ATTACHMENT A - SUPPORT CHECKLIST

Revision 3

HANGER DRAWING NO.	REV.	INSPECTION TEAM	LEGEND: A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE
ISOMETRIC NO.	REV.	CHANGE DOCUMENT	

CHECKLIST ITEMS	STATUS			COMMENTS
	N/A	A	D	
1. General				
A. Support Location				
B. Support Orientation				
C. Catalog Items				
D. Close Clearance Gaps				
2. Support Structure				
A. Critical Dimensions				
B. Member Sizes, Structural Plates				
3. Struts and Snubbers				
A. Pin to Pin Dimensions, Snubber Setting				
B. Paddle-Pin Assembly Connections				
4. Baseplates				
A. Plate & Gusset Sizes				
B. Bolt Size & Type				
C. Bolt Hole Spacing				
D. Attachment Location				
E. Bolt Spacing to Adjacent Inserts				
5. Lugs - Bearing Surface				
6. Welding				
A. Size, Length, Quality				
B. Symbols				
7. Miscellaneous (Specify)				

Notes:

Results of Evaluation:

_____ No deviations noted.

_____ Deviations evaluated as acceptable by inspection team.

_____ Deviations require further evaluation.

_____ _____
Signature Date

Disposition of deviations subject to further evaluation:

_____ _____
Signature Date

Revision B

ATTACHMENT B - ISOMETRIC CHECKLIST

ISOMETRIC NO.	REV.	INSPECTION TEAM	LEGEND: A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE
	CHANGE DOCUMENT		

CHECKLIST ITEMS	STATUS			COMMENTS
	N/A	A	D	
1. General				
A. Pipe Size				
B. Piping Location				
C. Piping Dimensions				
D. Wall Penetrations/Clearances				
2. Fittings & Components				
A. Elbows				
B. Tees				
C. Valves				
D. Reducers				
E. Flanges				
F. Couplings				
G. Other Equipment				
3. Fillet Weld Size Socket Connections				
4. Miscellaneous (Specify)				

NOTE: Support data verified on support review checklists

ATTACHMENT B - ISOMETRIC CHECKLIST (continued)

Notes:

Results of Evaluation:

_____ No deviations noted.

_____ Deviations evaluated as acceptable by inspection team.

_____ Deviations require further evaluation.

_____ _____
Signature Date

Disposition of deviations subject to further evaluation:

_____ _____
Signature Date

ATTACHMENT C

INSPECTION AND EVALUATION GUIDELINE - ACTIVITY SEQUENCE

INSPECTION SEQUENCE

1. A support or isometric is assigned to an inspection team and recorded in the activity log.

2. The inspection team compares the 'as installed' (field) condition with the as-built revision of the sketch.

3. Deviations outside the SWEC tolerances are clearly detailed on the checklist, a mark-up of the sketch, or an added sketch as required.

4. Those deviations which can be judged acceptable by the inspector with a minimum of evaluation are listed with a brief explanation of the basis for judgement under 'deviations evaluated as acceptable by inspection team'.

5. Those deviations which require more extensive analysis to evaluate are listed under 'deviations subject to further evaluation'.

6. The checklist is signed and dated by the engineer/inspector and submitted to the inspection task engineer.

7. After review by the inspection task engineer, the checklist information is recorded in the PHIS database and refiled.

EVALUATION SEQUENCE

1. The log is reviewed for supports or isometrics requiring further evaluation. The data packages are pulled from the files and a cursory review is performed to determine if Burns and Roe calculations are required.

2. Data packages are signed out to an analyst and log and data base are updated.

3. Following an analysis the evaluations are routed to a reviewer.

4. Reviewed evaluations are separated into categories based on their final disposition. The log and data base are then updated and the data packages returned to files.

ATTACHMENT D

SUPPORT INSPECTION GUIDELINE

CHECKLIST ITEM	ATTRIBUTE DESCRIPTION/TOLERANCE
1A	SUPPORT LOCATION Hanger location to be checked with respect to work points on the piping using the as-built isometric as a reference. Tolerance: larger of $\frac{\text{pipe O.D.}}{2}$ or 2"
1B	SUPPORT ORIENTATION Compare the as-installed with that indicated on the as-built. Tolerance: $\pm 5^{\circ}$
1C	CATALOG ITEMS (Including snubber and strut sizes). Ensure that installed items match catalog, data and bill of materials.
1D	Close clearance gaps (in the restrained direction) Measure gaps between restraining members or clamps and pipe surface/lugs. Tolerance: 1. Where individual gaps = $\frac{1"}{16}$ on the drawings, then $\frac{1"}{32} \leq$ total gap $\leq \frac{5"}{32}$ Where total gap = sum of gaps in any restrained direction 2. Deadweight restraint - 0 gap specified. No tolerance 3. Other gaps: $\pm \frac{1"}{32}$
2A	CRITICAL DIMENSIONS Structural dimensions (not to include ref. dims, or dims) Tolerance: Dims $<$ 5" - $\pm$10% Dims $>$ 5" - larger of $\frac{1"}{2}$ or 4%
2B	MEMBER SIZES, STRUCTURAL PLATES Not to include Base Pl's, gusset Pl's or lugs. Plate tolerance: Thickness $+\frac{1"}{4}$, -0". Cut dimensions $\pm\frac{1"}{4}$ Member sizes outside dims, nominal -0 Wall thickness -0, +no limit

ATTACHMENT D (CONT'D)

SUPPORT INSPECTION GUIDELINE

CHECKLIST ITEM	ATTRIBUTE DESCRIPTION/TOLERANCE
3A	STRUT/SNUBBER PIN TO PIN, SNUBBER SETTINGS Tolerance: Pin to pin - +3", -no limit Snubber cold set $\pm \frac{1}{4}$"
3B	PADDLE-PIN CONNECTIONS Inspection for compliance with 215 spec. Section 15R, exhibit 5.*
4A	BASEPLATE AND GUSSETT SIZES Tolerance: Same as 2B
4B	BOLT SIZE AND TYPE Verify visible characteristics.
4C	BOLT HOLE SPACING Tolerance: Spacing $\pm \frac{1}{4}$" Edge distance $\pm \frac{1}{8}$"
4D	ATTACHMENT LOCATION Tolerance: $\pm \frac{1}{4}$"
4E	SPACING TO ADJACENT INSERTS Min. spacing = 10 $\frac{1}{2}$ x dia. of largest bolt Min. edge distance = 5 $\frac{1}{4}$ x bolt dia.
5	LUGS, BEARING SURFACE Tolerance: Lug dims: Thickness + $\frac{1}{4}$", - 0" Cut sizes $\pm \frac{1}{8}$" Bearing surface: Min. of point contact between lug and restraint required within shaded area of figure A.

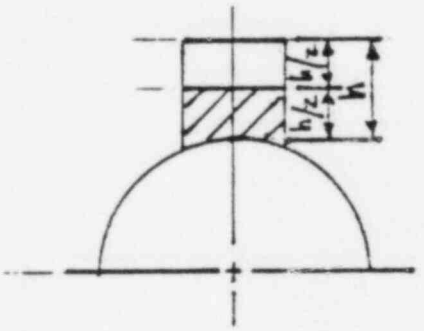


Figure A

*215 specification Sect. 15R - Procurement, Fabrication, and Erection of Pipe Supports W.O. 2808 Washington Public Power Supply System WPPS Nuclear Project No. 2 approval date Nov. 12, 1980.

ATTACHMENT D (CONT'D)

SUPPORT INSPECTION GUIDELINE

CHECKLIST ITEM	ATTRIBUTE DESCRIPTION/TOLERANCE
6A & 6B	WELDING SIZE AND LENGTH, SYMBOLS Tolerance weld size +no limit, -0 Weld length +no limit -10%

NOTE: Symbols and measurement criteria per 'as-built program' presentation by L. Cantin and printed handout from that presentation.

7 MISCELLANEOUS
Include any deviations from the as-built not directly addressed in other attribute categories.

ATTACHMENT E

ISOMETRIC INSPECTION GUIDELINE

CHECKLIST ITEM	ATTRIBUTE DESCRIPTION/TOLERANCE
1A	PIPE SIZE - OUTSIDE DIAMETER Tolerance: Use nominal dimension to confirm pipe size.
1B	PIPING LOCATION Report only gross location discrepancies.
1C	PIPING FABRICATION DIMENSIONS Tolerance: $\pm 2"$
1D	WALL PENETRATIONS/CLEARANCES Measure pipe O.D. to penetration I.D. Tolerance: $\pm \frac{1"}{8}$ (dim. $\leq$ 2") $\pm \frac{1"}{4}$ (dim. $>$ 2")
2A	ELBOWS Check type - butt weld, socket, bend, threaded Check radius - short, long, 5D, and arc length (NOTE: Radius of pipe bends are 5 times the normal pipe diameter unless otherwise noted.)
2B	TEES Check type - butt weld, socket, threaded, etc., as indicated on Bill of Material.
2C	VALVES: CHECK THE FOLLOWING ITEMS: 1. Type (gate, globe, check) and pressure rating. 2. Operator type (manual, air, motor) and orientation. 3. End to end dimension and type (socket, butt, threaded).
2D	REDUCERS Check type (concentric vs. eccentric) and dims. (length).
2E	FLANGES Check type and rating.
2F	COUPLINGS Check type and rating.
2G	OTHER EQUIPMENT (STRAINERS ETC.) Check to match equipment vs. Bill of Material.

ATTACHMENT E (CONT'D)

ISOMETRIC INSPECTION GUIDELINE

CHECKLIST ITEM	ATTRIBUTE DESCRIPTION/TOLERANCE
3	FILLET WELD SIZE - SOCKET CONNECTIONS Check fillet size vs. piping spec.
4	MISCELLANEOUS List deviations and concerns not identified by previous attribute categories.

ATTACHMENT F - CALCULATION FORM

EVALUATION OF SUPPORT NO._____ REV._____

ISOMETRIC NO._____ REV._____

REFERENCES

PREPARER: _____ DATE: _____

REVIEWER: _____ DATE: _____

LARGE BORE SUPPORTS

Number of Large Bore Supports this Report - 340
Number of Large Bore Supports with Deviations - 157

1 CHECKLIST ITEMS	NUMBER OF DEVIATIONS
1. General	
A. Support Location	7
B. Support Orientation	2
C. Catalog Items	17
D. Close Clearance Gaps	7
2. Support Structure	
A. Critical Dimensions	23
B. Member Sizes, Structural Plates	10
3. Struts and Snubbers	
A. Pin to Pin Dimensions, Snubber Setting	2
B. Paddle-Pin Assembly Connections	6
4. Baseplates	
A. Plate & Gusset Sizes	3
B. Bolt Size & Type	3
C. Bolt Hole Spacing	15
D. Attachment Location	17
E. Bolt Spacing to Adjacent Inserts	5
5. Lugs - Bearing Surface	4
6. Welding	
A. Size, Length, Quality	92
B. Symbols	20
7. Miscellaneous (Specify)	21

SMALL BORE PIPING ISOMETRICS

Number of Small Bore Isometrics this Report - 110
Number of Small Bore Isometrics with Deviations - 26

CHECKLIST ITEMS	NUMBER OF DEVIATIONS
1. General	
A. Pipe Size	0
B. Piping Location	0
C. Piping Dimensions	3
D. Wall Penetrations/Clearances	1
2. Fittings & Components	
A. Elbows	1
B. Tees	0
C. Valves	4
D. Reducers	1
E. Flanges	3
F. Couplings	0
G. Other Equipment	3
3. Fillet Weld Size Socket Connections	10
4. Miscellaneous (Specify)	7

SMA'L BORE SUPPORTS

Number of Small Bore Supports this Report - 184
Number of Small Bore Supports with Deviations - 88

CHECKLIST ITEMS	NUMBER OF DEVIATIONS
1. General	
A. Support Location	1
B. Support Orientation	1
C. Catalog Items	15
D. Close Clearance Gaps	8
2. Support Structure	
A. Critical Dimensions	15
B. Member Sizes, Structural Plates	9
3. Struts and Snubbers	
A. Pin to Pin Dimensions, Snubber Setting	0
B. Paddle-Pin Assembly Connections	0
4. Baseplates	
A. Plate & Gusset Sizes	5
B. Bolt Size & Type	0
C. Bolt Hole Spacing	29
D. Attachment Location	19
E. Bolt Spacing to Adjacent Iserts	5
5. Lugs - Bearing Surface	2
6. Welding	
A. Size, Length, Quality	41
B. Symbols	5
7. Miscellaneous (Specify)	8

SMALL BORE UNIQUE SUPPORTS

Number of Small Bore Unique Supports This Report - 55
Number of Small Bore Unique Supports with Deviations - 40

CHECKLIST ITEMS	NUMBER OF DEVIATIONS
1. General	
A. Support Location	1
B. Support Orientation	0
C. Catalog Items	4
D. Close Clearance Gaps	4
2. Support Structure	
A. Critical Dimensions	13
B. Member Sizes, Structural Plates	4
3. Struts and Snubbers	
A. Pin to Pin Dimensions, Snubber Setting	2
B. Paddle-Pin Assembly Connections	6
4. Baseplates	
A. Plate & Gusset Sizes	4
B. Bolt Size & Type	0
C. Bolt Hole Spacing	9
D. Attachment Location	4
E. Bolt Spacing to Adjacent Inserts	2
5. Lugs - Bearing Surface	0
6. Welding	
A. Size, Length, Quality	12
B. Symbols	2
7. Miscellaneous	9

TABULATION OF WELD DEVIATIONS

Total Supports [1]	-	141
Approximate No. of Welds	-	1150
No. of Weld Deviations	-	233
No. of Weld Deviations on Primary Load Path	-	204

Deviation Type

Fillet Weld Leg Size	-	192
Excessive Root Gap	-	8
Configuration (mising or short lengths)	-	33

NOTES: 1 Total supports include large bore, small bore and small bore unique supports that had one or more weld deviations.

ENGINEERING ASSURANCE EVALUATION OF THE AS-BUILT PROGRAM FOR WASHINGTON PUBLIC POWER SUPPLY SYSTEM WNP UNIT 2

CRITERIA EVALUATED	OBSERVATION & *DISPOSITION
1. Is there a written program or procedure that clearly describes the WPPSS As-Built program?	1. The procedures that describe the program are: • The Supply System (the Utility) Project Instruction, PMI-6-6, "As-Builting Program Requirements" • Burns & Roe, Inc. (BRI) (the A/E) Project Instruction, WNP-2-065, Rev. 0, "Final As-Built Verification for Quality Class I Piping and Pipe Supports" • Bechtel Power Corporation (BPC) (the Constructor) Quality Control Instruction, QC1-R1-1.00, Rev. 2 "Field Engineering As-Built Drawings" • BPC Specific Work Plan/Procedure, SWP/P-P-6, "As-Builting Program". *Continue Compliance.
2. Do the procedures specify what piping systems are applicable to this program?	2. The list of applicable piping systems was prepared by BRI and approved by the Supply System. However, this list has been superseded by addenda to the appropriate specifications. This serves as a cross-check for engineering as the Construction procedures apply to "all Quality Class I systems". *Continue Compliance.
3. Do the procedures identify what constitutes a design "package", i.e., specifications, diagrams, calculations, drawings, and how the latest issue (including all design change systems) is identified?	3. The procedures require evaluation against the latest design document. This is accomplished by BPC using the latest known drawing that was used to construct the support, and documents any changes to it during the walkdown. BRI uses the calculation, the latest drawings and changes, and any differences noted by Construction. *Continue Compliance.
4. Do the procedures identify which components of the piping system are to be included? Are all supports included or only seismic?	4. The procedures do identify which components are to be included in the program. However, to make the most efficient use of the time available, this review concentrated on pipe supports as they appeared to be of the most concern to the CAT. It should be noted that this program deals with Quality Class 1 systems only. *Continue Compliance.

CRITERIA EVALUATED	OBSERVATION & *DISPOSITION
5. Do the procedures specify the responsibilities of, and the interface between, the Utility, the A/E, and the Constructor?	5. The Supply System procedure delegates the responsibility for the performance of this task to the A/E and the Constructor. The BRI procedure describes the documentation flow and the tasks performed by the A/E. Interface with the Supply System and the Constructor however, are discussed only minimally. *Compliance with ASME III requirements could be more readily demonstrated if the procedures were revised to show more interface with the engineers. Although the BPC QC procedures adequately describe the documentation required to show that construction is complete, they allow the process to continue if construction is incomplete as long as it is documented. *Continue implementing the procedures for tracking support drawings with temporary items until final installation. The BPC field walk procedures concentrate on obtaining all possible measurements of any given support, and document how discrepancies are reported to the A/E. They do not however, refer to any engineering requirements and do not provide for ample interface with the A/E. *Compliance with ASME III requirements could be more readily demonstrated if the procedures were revised to show more interface with the engineers. Although a QA Master Audit Plan identifies continuous monitoring of the as-built program, the monitoring primarily focuses on a second check of red line drawings. A more comprehensive audit program that evaluates the adequacy and determines the effectiveness of the overall as-built program might have identified problems and obtained corrective measures earlier in the program (i.e. consistent application of tolerances used during inspection). *Continue the monitoring program. Should the Supply System perform future as-built efforts, expand the monitoring activities to include comprehensive audits of all facets and interfaces that comprise the entire as-built program.

CRITERIA EVALUATED	OBSERVATION & *DISPOSITION
6. Do the procedures identify all of the parameters/ criteria which are necessary to ensure that the plant is in agreement with the design; are reasonable tolerances included; is there a checklist to convey the principle points to the people performing the inspection?	6. Although both the A/E and the Constructor's procedures contain checklists, the direction to the persons doing the field walk is to review all dimensions as opposed to identifying the critical dimensions. All differences are noted by red-lining the drawings. Construction tolerances are applied by the system engineer to determine whether the noted differences are acceptable or if they need to be evaluated by BRI. *Should the Supply System perform future as-built efforts, it would be beneficial to identify the critical parameters. There were inadequate tolerances established for the as-built inspection to determine whether the noted measurements were within reasonable limits for repeatability. Procedures have now been revised to include this tolerance. *Continue Compliance.
7. Does the procedure require documentation of the as-built inspection?	7. The procedure requires the as-built inspection to be documented on a checklist and the completed checklist is filed in the documentation center to identify the status of each support. *Continue Compliance.
8. Are there requirements for documentation of discrepancies?	8. The as-built program contains requirements for documenting discrepancies. The as-built inspectors record all differences between the dimensions they obtain and what the drawing calls for by red-lining the drawing. The Constructor's system engineers cross out all discrepancies which are within construction tolerances or which are accounted for in other design documents. All other discrepancies are reported on an RFI to the A/E for evaluation. *Continue Compliance.

CRITERIA EVALUATED	OBSERVATION & *DISPOSITION
9. Are there requirements for documentation of the engineering evaluation to determine whether the design documents or the hardware should be modified to resolve the discrepancies?	9. The Request for Information (RFI) form is the documentation of the discrepancy and of the engineering evaluation. In addition the Project Engineering Directive (PED) is issued to show any additional work that may be required. *Continue Compliance.
10. Is there a system to control re-entry into a piping system after the as-built process is started?	10. The BPC procedure governs rework during the as-built process and start-up procedures govern afterwards. *Continue Compliance.
11. Is there a means of identifying description of changes and approval signature for revisions to procedures?	11. Each of the procedures that has been revised used margin indicators to show current changes and had approval signatures for the revisions. *Continue Compliance.
12. What is the basis for the As-Built effort?	12. Review of the procedures noted in item 1 above, discussions with responsible personnel, and review of documentation packages for completed work, such as SLC-903N and FPC-211, indicated that the principle thrust of the as-built program apparently was to resolve a previous NRC observation by shoring up the construction QA effort to ensure that the construction was in compliance with applicable drawings. The comparison of the as-built condition with the design analysis was also a function of the program. *Continue Compliance.

STONE & WEBSTER ENGINEERING CORPORATION

1200 JADWIN AVENUE, SUITE 455
RICHLAND, WASHINGTON 99352

BOSTON
NEW YORK
CHERRY HILL, N.J.
DENVER
CHICAGO
HOUSTON
PORTLAND, OREGON
WASHINGTON, D.C.

Mr. Hugh A. Crisp
Manager of Construction, WNP-2
Washington Public Power Supply System
3000 George Washington Way
Richland, Washington 99352

October 18, 1983
SW-WPPSS-045L-RH
J.O. No. 14420.03
14420.04

Dear Mr. Crisp:

QCI AND QCII/SCI PIPE SUPPORTS - WASHINGTON PUBLIC POWER SUPPLY SYSTEM MEETING WITH THE NRC AND STONE & WEBSTER ENGINEERING CORPORATION

During a meeting held on October 14, 1983, between the Nuclear Regulatory Commission (NRC), Washington Public Power Supply System (Supply System), and Stone & Webster Engineering Corporation (SWEC), the NRC requested additional information from the Supply System on QCI and QCII/SCI Pipe Supports. This information was with respect to the third-party review performed by SWEC. The request was for examples of SWEC inspection checklists and evaluations representing types of deviations and "minimum margin" conditions between the effects of deviations and project allowables.

Attachment A is a list of QCI and QCII/SCI Pipe Supports which describes these examples.

Attachment B includes examples of checklists and evaluations of deviations.

If you have any questions or need additional information, please do not hesitate to contact me at (509) 943-8392.

Very truly yours,

R. K. Westfahl by A. Dennis (per phone approval)

R.K. Westfahl
Senior Project Manager

RKW:akd

cc: W.K. Stockdale WPPSS
T. Bostrom Bechtel

WPPSS WNP-2

SWEC's ENGINEERING INSPECTION AND EVALUATION OF PIPE SUPPORTS

Supplemental Information to the Final Report

QCI Support	Description
CAC-116	- Typical weld deviation
DE-906N	- Typical baseplate deviation - Least margin for anchor bolts
DO-908N	- Typical close clearance gap deviation
COND-591	- Typical catalog deviation
FPC-43	- Typical member size deviation
LPCS-908N	- Typical weld deviation - Least margin for welds
MSLC-31	- Typical critical dimension deviation
RCIC-15	- Typical anchor bolt deviation
RFW-177	- Typical critical dimension deviation
RWCU-1C-2PS	- Typical catalog, weld and critical dimension deviations
SGT-901N	- Typical baseplate deviation
VR-5	- Typical weld root gap deviation

QCII/SCI Support	Description
TSW-355	- Support location, bolt spacing, attachment location, weld size and length deviations - Least margin, anchor bolts

SWEC ENGINEERING REVIEW CHECKLIST

ATTACHMENT B
SW-WPPSS-043L-RH
TOTAL NO. OF PAGES - 87

A - ACCEPTABLE
D - DEVIATION EXISTS
N/A - NOT APPLICABLE

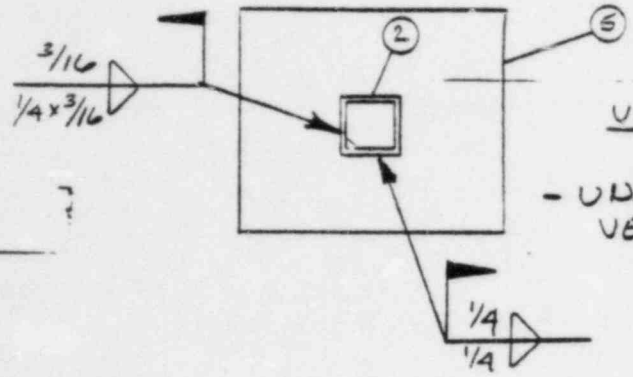
HANGER DRAWING NO.	REV.	INSPECTION TEAM
CAC-116	3	1 CARTER 4 DIETZ

ISOMETRIC NO. REV. 9FQ	CHANGE DOCUMENT	
CAC-628-5,8		

CHECKLIST ITEMS	STATUS N/A	A	D	COMMENTS
1. General				
A. Support Location		✓		
B. Support Orientation		✓		
C. Catalog Items	✓			
D. Close Clearance Gaps		✓		
2. Support Structure				
A. Critical Dimensions		✓		
B. Member sizes, structural plates		✓		
3. Struts and Snubbers				
A. Pin to Pin Dims., Snubber Setting	✓			
B. Paddle - Pin Assembly Connections	✓			
4. Baseplates				
A. Plate & Gusset sizes		✓		
B. Bolt size & type		✓		
C. Bolt hole spacing		✓		
D. Attachment location		✓		
E. Bolt spacing to adjacent inserts		✓		
5. Lugs - Bearing Surface	✓			
6. Welding				
A. Size, length, quality			✓	
B. Symbols		✓		
7. Miscellaneous (specify)	✓			

SWEC ENGINEERING REVIEW CHECKLIST

Notes:



VIEW LKG EAST

- UNDERSIZED WELDS ON VERTICAL FACES

Results of Evaluation:

N/A No deviations noted.

N/A Deviations evaluated as acceptable by inspection team.

-1- Deviations require further evaluation. 6A

Thomas Foster 30 Jul 83
Signature Date

Disposition of deviations subject to further evaluation:

ABOVE DEVIATION IS FOUND TO BE ACCEPTABLE.

SEE ATTACHED EVALUATION SHEET.

426 E. de Guzman 8/9/83
Signature Date

EVALUATION OF SUPPORT NO. CAC-116 REV. 3

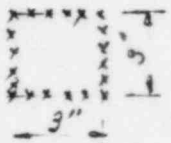
ISOMETRIC NO. CAC-628-5.8 REV. 9F0

NOTES: 1) BURNS & ROE DWGS. # M-200 SHT 169 HAS BEEN REVIEWED FOR DISCREPANCIES BETWEEN AS-ANALYZED & AS-BUILT PIPING CONFIGURATIONS. IT IS JUDGED THAT ANY SUCH DISCREPANCIES DO NOT SIGNIFICANTLY AFFECT CALCULATED SUPPORT LOADS.

MODIFIED LOAD

$F = (100 + 1947 + 1315)\,1.25 = 4203^{\#}$

ANALYSIS / CONCLUSION



$f = \frac{4203}{12} = 350$

$w = \frac{350}{18{,}000 \times .707} = 0.028$

↳ CONSERVATIVE

MIN. REQUIRED (PER DISC) = 3/16"

∴ DEVIATION 6A IS ACCEPTABLE.

REFERENCES:

① Iso. CAC-628-5.8 REV. 9F0

② Iso. M200, SHT. 169, REV 4

③ HANGER DWNG. CAC-116 REV 3

PREPARER: E. de Guzman 8/17/83

REVIEWER: G. Gallum 8/17/83

SWEC ENGINEERING REVIEW CHECKLIST

HANGER DRAWING NO.	REV.	INSPECTION TEAM	LEGEND:
DE-906N	1F0	DAVIS EWART	A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE
ISOMETRIC NO. REV. 3F0	CHANGE DOCUMENT		
DE-06I-1.1S			

CHECKLIST ITEMS	STATUS N/A	STATUS A	STATUS D	COMMENTS
1. General				
A. Support Location		✓		
B. Support Orientation		✓		
C. Catalog Items	✓			
D. Close Clearance Gaps	✓			
2. Support Structure				
A. Critical Dimensions		✓		
B. Member sizes, structural plates		✓		
3. Struts and Snubbers				
A. Pin to Pin Dims., Snubber Setting	✓			
B. Paddle - Pin Assembly Connections	✓			
4. Baseplates				
A. Plate & Gusset sizes		✓		
B. Bolt size & type		✓		
C. Bolt hole spacing			✓	1 SEE NOTE-4
D. Attachment location		✓		
E. Bolt spacing to adjacent inserts			✓	1 SEE NOTE-3
5. Lugs - Bearing Surface	✓			
6. Welding				
A. Size, length, quality			✓	SEE NOTE-5,6,7
B. Symbols		✓		
7. Miscellaneous (specify)				
~~GAPS (SLIPPAGE DUES)~~	✓			

SWEC ENGINEERING REVIEW CHECKLIST

Notes: 1. VOID

2. ITEM #5 BILL OF MATERIALS ATTACHMENT LOCATION ON BASE PLATE IS 1" WEST OF DESIGNATED POSITION ON AS-BUILT ISO. (RESTRAINT) VOID

3. 7" DIMENSION SPECIFIED (Edge To bolt) BETWEEN BASE PLATES DENOTED ON BILL OF MATERIALS AS ITEMS NO. - 7 OF AS-BUILT (Pg 3 of 6) IS INCORRECT, THE DIMENSION BETWEEN ADJACENT BOLT INSERTS WAS MEASURED AS 7". THE AS-BUILT ISO. SPECIFIES THE DIMENSION AS 9 3/4" (7" + 2 3/4"), INSERT ALLOWABLES SHOULD BE ASSESED

Results of Evaluation:

N/A No deviations noted.

_____ Deviations evaluated as acceptable by inspection team.

5 Deviations require further evaluation.

R. Ewart 8-8-83
Signature Date

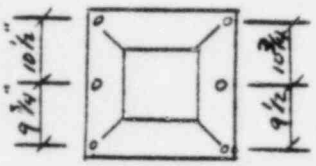
Disposition of deviations subject to further evaluation:

SEE ATTACHED SHTS FOR ANALYSIS OF DEVIATIONS

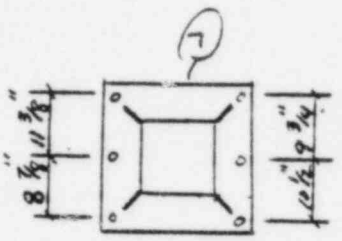
JOE STOLZ 8-31-83
Signature Date
S. Collins 8-21-83

ATTACHMENT TO THE
SWEC ENGINEERING CHECK LIST

4. Pg 3 of 6 As-built Dwg. BASE plate UPPER right. DEVIATION BOLT HOLE SPACING

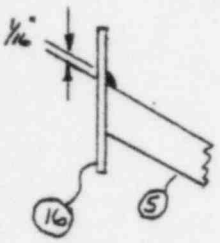


DIM. SHOWN ON AS-BUILT



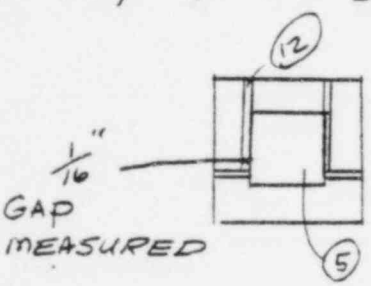
DIMENSIONS MEASURED IN FIELD

5. Pg-4 of 6 SECTION C-C, ITEM-5, skewed upper left. AS-BUILT ISO. SPECIFIES A 1/16" THICKNESS FOR A PENETRATION WELD. THE WELD IS NOT MEASURABLE IN THE FIELD (ITS FLUSH).



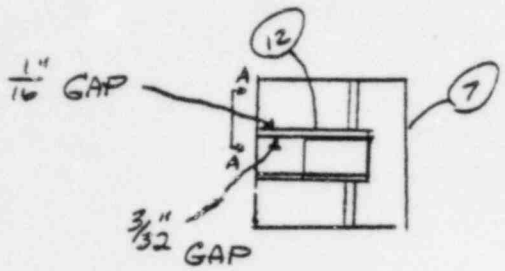
"AS-BUILT" (SHOWS 1/16" THICKNESS)

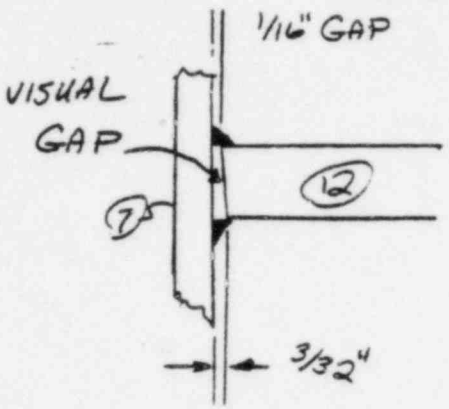
6. A 1/16" GAP WAS MEASURED BETWEEN BILL OF MATERIAL ITEMS 5 & 12 THIS GAP CAUSES THE EFFECTIVE THROAT OF THE TO BE REDUCED. (Pg 4 OF 6 SECTION D-D)



ATTACHMENT TO THE SWEC ENGINEERING CHECK LIST

7. A 3/32" GAP WAS MEASURED ON THE BOTTOM OF ITEM-12. A 1/32 inch GAP WAS MEASURED BETWEEN STIFFNER PLATE AND BASE PLATE. LOCATION TOP OF STIFFNER PLATE. THE EFFECTIVE THROAT OF THE 5/16" Fillets SHOULD BE REDUCED TO ACCOUNT FOR THE GAP





SECTION A-A

EVALUATION OF SUPPORT NO. DE-906N REV. 1FΦ

ISOMETRIC NO. DE-061-1.15 REV. 3FΦ

NOTES: 1) Burns & Roe Drawing #M-200 Sheet N/A has been reviewed for discrepancies between as-analyzed and as-built piping configurations. It is judged that any such discrepancies do not significantly affect calculated support loads.

2.) PIPE STRESS ISOMETRIC IS NOT AVAILABLE. PER AS-BUILT ISO, NO SIGNIFICANT CHANGE HAS BEEN NOTED BETWEEN AS-BUILT AND "ISSUED-FOR-CONSTRUCTION" STATUS. A FACTOR OF SAFETY OF 1.25 IS USED ON FINAL LOADS.

3) CRITICAL DEVIATIONS ARE CONSIDERED ONLY. THESE ARE THE WELD SIZE DEVIATIONS @ THE STIFFENERS. TO ANALYZE THESE, LOADS AT THE BASEPLATE ARE DETERMINED FROM A SIMPLE STRUDL ANALYSIS. PLATE STRESSES AND BOLT LOADS ARE THEN CHECKED PER STARDYNE ANALYSIS BY ELIMINATING THE STIFFENER IN QUESTION. (SEE NOTE 7, ON CHECKLIST, SHT 2)

ATTRIBUTE 4.C) (NOTE 4, CHECKLIST, SHT 2) BOLT SPACING.

UNDER ASSUMPTION THAT ORIGINAL DESIGN OF BOLTS DETERMINED THAT ALL BOLTS (1"Φ) WERE ACCEPTABLE BELOW ALLOWABLES AND THAT APPROVAL PER PED 215-H-M294 FROM AS-BUILT DWG. SHT 3 OF 6 ACCEPTS SPACING OF 9½", IT CAN BE ASSUMED THAT THE ACTUAL LOADS ARE SIGNIFICANTLY LOW ENOUGH TO ALLOW 9¾" SPACING. MIN. SPACING FOR 1" BOLTS IS RECOMMENDED @ 10" BECAUSE STIFFENERS ON BASEP WILL TAKE THE LOADS MORE DIRECTLY TO THE CORNER BOLTS. THE FOUR INSIDE BOLTS WILL CARRY MUCH LESS ACTUAL LOAD THAN THE CORNER BOLTS. ∴ DEVIATION ACCEPTABLE (BOLT SPACING PER REF 4). ALSO REFER TO STARDYNE RUN TO SEE ACTUAL INTERACTION ON THE BOLTS (MAX. INTERACTION = 0.66)

REFERENCES

1.) PIPE SUPPORT DWG. DE-906N, REV. 1FΦ

2) PIPING ISOMETRIC DE-061-1.15, REV. 3FΦ.

3.) B&R STATUS AS-BUILT SUPPORT LOAD CALC. 8.42.152

4) B&R DESIGN GUIDE M409.

PREPARER: Joe Stolus DATE: 8-31-83

REVIEWER: [signature] DATE: 8-31-83

EVALUATION OF SUPPORT NO. DE-906N REV. 1FØ
ISOMETRIC NO. DE-061-1.15 REV. 3FØ

ATTRIBUTE 4E) (NOTE 3, CHECKLIST, SHT. 1) BOLT SPACING

DEVIATION PRIMARILY DRAFTING ERROR. ORIGINAL "ISSUED FOR CONSTRUCTION" DWG SHOWS 7" BOLT SPACING (SEE DWG. SHT. 2 OF 6). SINCE THERE IS NO DEVIATION FROM ORIGINAL DESIGN, BY ENGINEERING JUDGEMENT. THIS DEVIATION IS ACCEPTABLE. (ALSO SEE STARDYNE RUN FOR BOLT INTERACTION; I.E. MAX INTERACTION = .66)

ATTRIBUTE 6A) (NOTES 5 AND 6, CHECKLIST. SHT. 2) WELD DEVIATIONS

NOTE 5) DEVIATION PRIMARILY DRAFTING ERROR. ORIGINAL "ISSUED FOR CONSTRUCTION" DWG. SHOWS BEVEL END PREPARATION REQ'D. (SEE DWG. SHT. 2 OF 6, SECT. B-B). SINCE END PREPARATION CANNOT BE VERIFIED, DEVIATION IS ASSUMED ACCEPTABLE.

NOTE 6) ORIGINAL "ISSUED FOR CONSTRUCTION" DWG. CALLS FOR 1/4" FILLETS (DWG. SHT 2 OF 6) 1/16" GAP WILL LOWER EFFECTIVE WELD LEG FROM 5/16" (PER AS-BUILT) TO 1/4" LEG. BY ENGINEERING JUDGEMENT THIS DEVIATION IS ACCEPTABLE.

REFERENCES

PREPARER: JRE Stevens DATE: 3-31-83
REVIEWER: [signature] DATE: 3-31-83

EVALUATION OF SUPPORT NO. DE-906N REV. 1FΦ

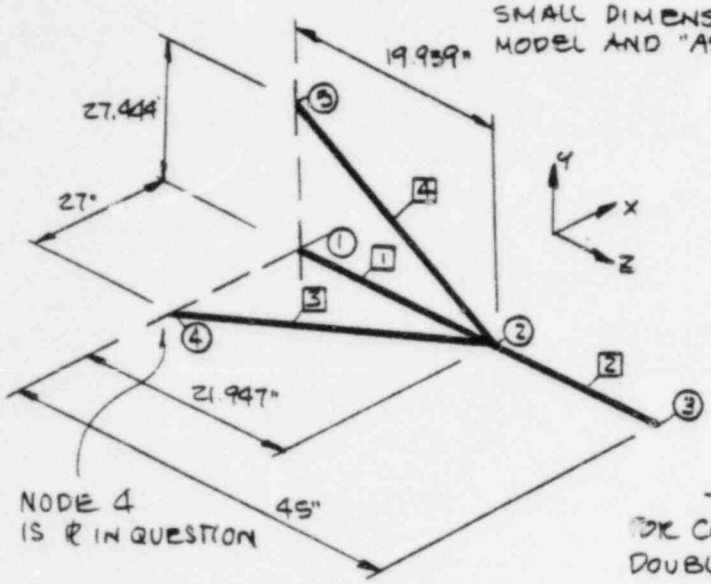
ISOMETRIC NO. DE-061-1.15 REV. 3FΦ

ATTRIBUTE 6A) (NOTE 7, CHECKLIST SHT 2) WELD DEVIATION

WELD ANALYSIS - INSTEAD OF CHECKING WELD SIZE DETERMINE R STRESSES AND BOLT LOADS W/OUT THE STIFFENER IN QUESTION.

DETERMINE LOADS ON BASEPLATE - GENERATE STRUDL MODEL (SEE ATTACH 1.0)

SMALL DIMENSIONAL DIFFERENCES MAY EXIST BETWEEN MODEL AND "AS-BUILT". THESE ARE ASSUMED INSIGNIFICANT.



MEMBER PROPERTIES

TS 10 x 10 x 1/2 (MEM 1 2) (REF 5)
TS 8 x 8 x 1/2 (MEM 3 4) (REF 5)

CONSTANTS

E = 29,000,000 PSI
G = 11,200,000 PSI } REF 6
POISSON'S = 0.3

MAX LOADS (DESIGN) (REF 5)

FOR CONSERVATIVE ANALYSIS MOMENTS ARE DOUBLED.

	Fx	Fy	Fz	(FT-LBS) Mx	(FT-LBS) My	(FT-LBS) Mz
DEADWT	116	-982	-118	-494	439	-253
NORMAL	±1815	±1206	±1148	±12514	±13066	±32530
	+1925 (1) -1705 (2)	-2188	+1030	-156096	+1620060 (2) -151524 (1)	-393396

(1) MOMENTS IN IN-LBS

REFERENCES

5.) S & W "STRUDL-SW USERS MANUAL" STRUDL, ST-306 VERSION 03 LEVEL 01.

6.) AISC "STEEL CONSTRUCTION MANUAL" 8TH EDITION

PREPARER: Joe Stocker DATE: 8-31-83

REVIEWER: [signature] DATE: 8-31-83

EVALUATION OF SUPPORT NO. DE-906N REV. 1FΦ
ISOMETRIC NO. DE-061-1.15 REV. 3FΦ

GENERATION OF STARDYNE MODEL (BASEPLATE IS LOCATED @ STRUDL NODE 4)

LOAD RESULTS FROM STRUDL (APPLY A MODIFIED LOAD FACT. OF 1.25 TO STRUDL LOADS; STARDYNE 'X' = STRUDL 'Y'; STAR 'Y' = STRUDL 'X' STAR 'Z' = STRUDL 'Z')

LOAD CASES 1 AND 2 (STARDYNE) (PER STRUDL RESULTS LOADING 1)

	CASE 1	CASE 2
Fx = 1.25 (4839) = 6049 LBS	+6074	-6074
Fy = 1.25 (8653) = 10817 LBS	+10817	+10567
Fz = 1.25 (8531) = 10664 LBS	+10664	+10664
Mx = 1.25 (2315) = 2894 IN LBS	+2894	-2894
My = 1.25 (55724) = 69654 IN LBS	+69654	+69654
Mz = 1.25 (13135) = 16419 IN LBS	-16419	-16419

LOADS OF 6074# IS CONSERVATIVE
LOAD 10567# IS NON-CONSERV (SHEAR LOAD DISCREPANCY NEGLIGIBLE)

LOAD CASES 3 & 4 (STARDYNE)

	CASE 3	CASE 4
Fx = 1.25 (5117) = 6397 LBS	+6397	-6397
Fy = 1.25 (1063) = 1330 LBS	+1330	-1330
Fz = 1.25 (1870) = 2338 LBS	+2338	+2338
Mx = 1.25 (19274) = 24093 IN LBS	-24093	+24093
My = 1.25 (57188) = 71485 IN LBS	+71485	+71458
Mz = 1.25 (13060) = 16327 IN LBS	-16327	-16327

CONCRETE ALLOW.

ASSUME COMPRESSIVE STRENGTH = 3500 PSI

MODULUS, $E = 57000\sqrt{3500}$
$= 3372176$ PSI
(REF 8)

BOLT PROPERTIES 1"Φ H.S.K.

TENSILE STIFF = 1057000 LB/IN } REF 7
SHEAR STIFF = 500000 LB/IN }

TENSION ALLOW. = 8740 LBS } REF 4
SHEAR ALLOW. = 6890 LBS }

REFERENCES

7.) B&R 'BOOK OF TYPICAL BASEPLATES' (REV. 1); APRIL, 1982

8) CONTROL DATA CORP. "BASEPLATE II USERS MANUAL" REV. 1.05, STARDYNE COMPUTER PROGRAM ST-330, VERSION 03 LEVEL 00.

PREPARER: Joe Stokes DATE: 8-31-83

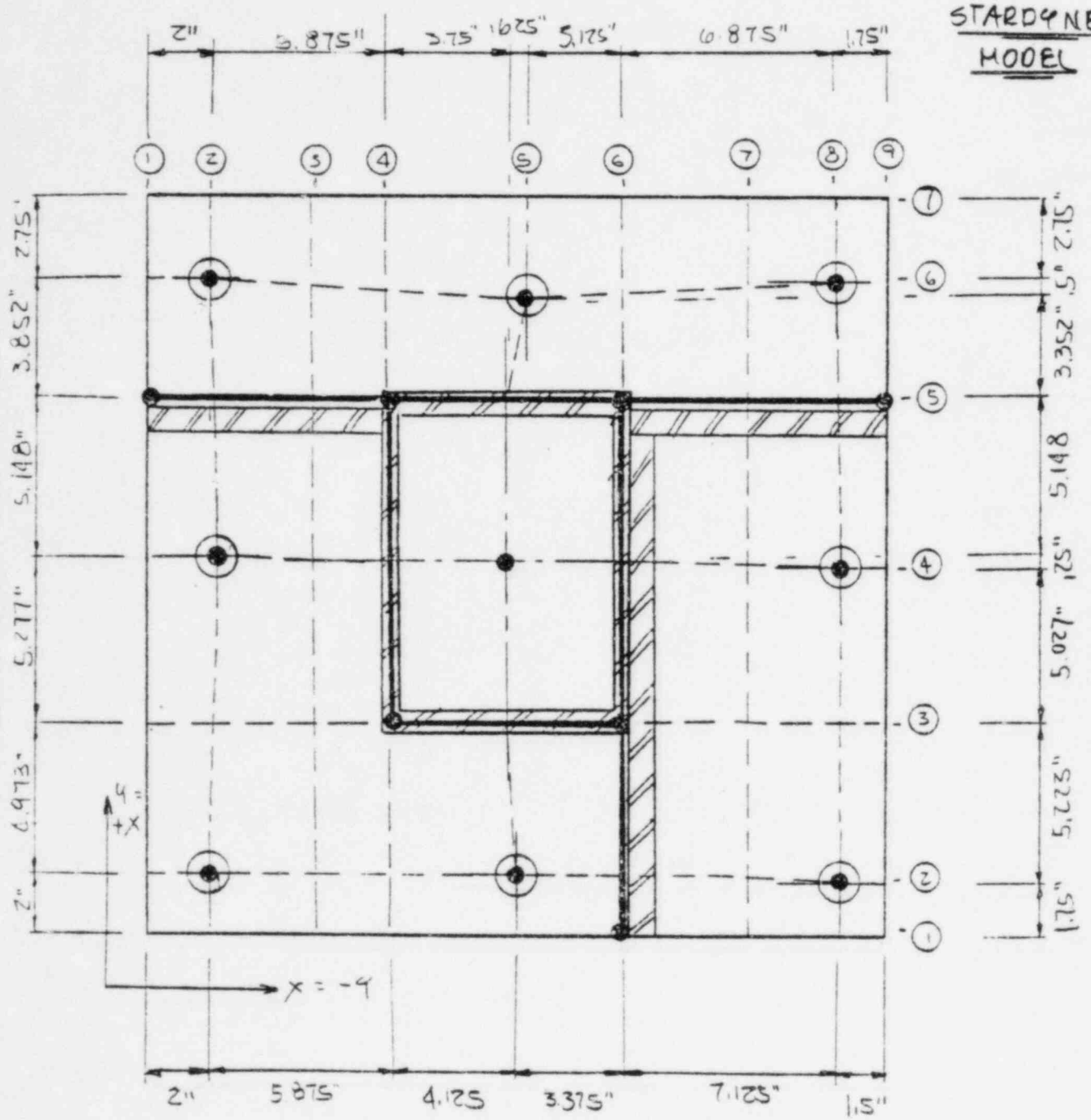
REVIEWER: S Gallite DATE: 8-31-83

300

EVALUATION OF SUPPORT NO. DE-906N REV. 1FD

ISOMETRIC NO. DE-061-1.16 REV. 3FD

STARDYNE MODEL



PREPARER: JE Stokes DATE: 8-31-83

REVIEWER: G Jaffolz DATE: 8-31-83

EVALUATION OF SUPPORT NO. DE-306N REV. 1FQ
ISOMETRIC NO. DE-061-1.15 REV. 3FQ

STARDYNE RESULTS

MAX BASEPLATE STRESS = 4399 PSI
(REF STARDYNE RUN, LOAD CASE 1)

MAX ALLOWABLE = 27000 PSI (REF 4) > 4399 PSI ∴ O.K.

MAX. BOLT LOAD INTERACTION = 0.66 < 1.0 ∴ O.K. (INTERACTION PER REF 4)

BY ENGINEERING, DUE TO AMOUNT OF CONSERVATISM IN USING DOUBLE MOMENTS (NORMAL CONDITION) AND 1.25 FACTOR OF SAFETY, THE FAULTED CONDITION WILL ALSO BE ACCEPTABLE.

BY OBSERVATION OF NEW STRESSES, OBTAINED BY ELIMINATING DEVIATE STIFFENER, ON THE BASE PLATE, THE OTHER STIFFENERS AND THEIR WELDS WILL STILL BE O.K. (MAX STRESS = 4399 PSI)

REFERENCES

PREPARER: Joe Stolen DATE: 8-31-83
REVIEWER: [signature] DATE: 8-31-83

STRUDL RESULTS

```
type 3d frame
units in lb deg
constants
e 29000000. all
g 11200000. all
poisson .3 all
joint coordinates
1   0.0   0.0   0.0 s
2   0.0   0.0  21.95
3   0.0   0.0  45.0
4 -27.0   0.0   0.0 s
5   0.0  27.45  0.0 s
member incidences
1   1   2
2   2   3
3   4   2
4   5   2
member end joint size end 6.5
member properties prismatic
1 2 table  sttube1  't10x60.9'
3 4 table  sttube1  't8x47.35'
loading 1  faulted
joint load
3 force x -1925.  y -2188.  z 1030.
3 moment x -156076.  y -151524.  z -393396.
loading 2  faulted 2
joint load
3 force x -1705.  y -2188.  z 1030.
3 moment x -156076.  y 162060.  z -393396.
stiffness analysis reduce
```

SUPPORT NO. FE-906N
ATTACH. PG. 1

502 A

****
results of latest analysis
****

problem - wrpss title - analysis of de-906n

active units inch lb deg degf sec

active structure type space frame

active coordinate axes x y z

loading - 1 faulted

member forces

member	joint	force: axial	force: shear y	force: shear z	moment: torsional	moment: bending y	moment: bending z
1	1	-10042.5	4927.1	643.8	134812.9	52366.9	-1715.6
1	2	10042.5	-4927.1	-643.8	-134812.9	-66499.1	109866.5
2	2	-1030.0	2188.0	-1925.0	393395.9	195895.2	-105662.6
2	3	1030.0	-2188.0	1925.0	-393395.9	-151523.9	156095.9
3	4	12095.2	-4838.2	1160.8	34952.6	-2314.9	-45342.2
3	2	-12095.2	4838.2	-1160.8	-34952.6	-38075.4	-123009.6
4	5	-1338.3	1687.4	6084.0	16789.5	-46613.6	13036.1
4	2	1338.3	-1687.4	-6084.0	-16789.5	-167221.6	46270.7

resultant joint loads - supports

joint		force: x force	force: y force	force: z force	moment: x moment	moment: y moment	moment: z moment
1	global	-343.8	4927.1	-10042.5	1715.6	52366.9	134812.9
4	global	8652.9	-4838.2	8530.4	55723.3	-2314.9	-13134.3
5	global	-6084.0	2099.0	482.1	-13036.1	-42223.9	-25920.1

loading - 2 faulted 2

member forces

SUPPORT DE-906N ATTACH PG. 2

502 B

member	joint	force			moment		
		axial	shear Y	shear Z	torsional	bending Y	bending Z
1	1	-109.7	5436.4	-5684.5	143761.9	3770.7	7585.5
1	2	109.7	-5436.4	5684.5	-143761.9	121003.7	111742.9
2	2	-1030.0	2188.0	-1705.0	393395.9	-122759.7	-105662.6
2	3	1030.0	-2188.0	1705.0	-393395.9	162059.9	156095.9
3	4	-354.6	-5117.0	-2121.4	36135.4	19273.3	-46208.1
3	2	354.6	5117.0	2121.4	-36135.4	54542.5	-131845.9
4	5	-866.5	1908.5	5042.5	36548.3	-47000.5	18027.2
4	2	866.5	-1908.5	-5042.5	-36548.3	-130229.2	49050.3

resultant joint loads - supports

joint		force			moment		
		X force	Y force	Z force	X moment	Y moment	Z moment
1	global	5684.5	5436.4	109.7	7585.5	3770.7	143761.9
4	global	1063.1	-5117.0	-1869.7	57187.3	19273.3	-13060.1
5	global	-5042.5	1868.6	949.4	-18027.2	-57897.3	-13882.5

SUPPORT NO DE-906N
ATTACH. RE. 3

502C

QUADRILATERAL PLATE
MAXIMUM PRINCIPAL STRESS SUMMARY

+Z FACE		-Z FACE	
ELEM	SIGMA PRINC	ELEM	SIGMA PRINC
15	3765.	5	4399.
5	3610.	11	3899.
14	3400.	15	3424.
11	3438.	14	3251.
17	3047.	17	3111.
23	2098.	23	2373.
10	1967.	10	1052.
10	1892.	25	1045.
4	1759.	13	1605.
25	1601.	29	1604.

MAX. COMPRESSION SUMMARY

NODE	Z-FORCE
61	-331.
54	-213.
62	-153.
60	-141.
1	-135.
58	-88.
55	-78.
59	-65.
2	-05.
63	-44.

BOLT LOADS

I LINE	J LINE	NODE	X-SHEAR	Y-SHEAR	SRSS	Z-TENSION
2	2	9	563.	1560.	1659.	862.
2	4	11	783.	1578.	1762.	3549.
2	6	13	958.	1581.	1848.	2772.
5	2	30	549.	1377.	1483.	2782.
5	6	34	960.	1577.	1678.	1709.
8	2	51	518.	1090.	1207.	200.
8	4	53	773.	1119.	1360.	154.
8	6	55	969.	1135.	1493.	0.

BOLT INTERACTION EQUATIONS

EQUATION=((TENSION/TALLOW)** 1.000+(SHEAR/VALLOW)** 1.000))** 1.000

NODE	TENSION ALLOW	SHEAR ALLOW	TENSION RATIO	SHEAR RATIO	INTERACTION FACTOR	SAFETY FACTOR
9	8740.	6890.	.099	.241	.339	2.95
11	8740.	6890.	.406	.256	.662	1.51
13	8740.	6890.	.317	.268	.585	1.71
30	8740.	6890.	.318	.215	.534	1.87
34	8740.	6890.	.196	.244	.439	2.28
51	8740.	6890.	.030	.175	.206	4.86
53	8740.	6890.	.018	.197	.215	4.65
55	8740.	6890.	0.000	.217	.217	4.62

****
* END LOAD CASE 1 *
****

QUADRILATERAL PLATE
MAXIMUM PRINCIPAL STRESS SUMMARY

+Z FACE		/ /	-Z FACE	
ELEM	SIGMA PRINC	/ /	ELEM	SIGMA PRINC
15	3403.		5	3868.
5	3373.		11	3650.
14	3259.		15	3588.
11	3039.		14	3436.
17	2698.		17	2917.
23	1843.		23	2174.
4	1829.		25	2015.
10	1808.		13	1754.
10	1790.		16	1707.
25	1407.		29	1508.

MAX. COMPRESSION SUMMARY

NODE	Z-FORCE
61	-286.
62	-147.
1	-137.
54	-125.
60	-120.
58	-94.
55	-92.
2	-67.
59	-60.
14	-53.

SUPPORT NO DE-90GN
ATTACHMENT PG. 7

BOLT LOADS

I LINE	J LINE	NODE	X-SHEAR	Y-SHEAR	SRSS	Z-TENSION
2	2	9	-883.	1452.	1700.	875.
2	4	11	-767.	1491.	1677.	3429.
2	6	13	-804.	1504.	1625.	2571.
5	2	30	-923.	1348.	1634.	2984.
5	6	34	-809.	1345.	1477.	1505.
8	2	51	-930.	1130.	1467.	341.
8	4	53	-761.	1140.	1375.	210.
8	6	55	-590.	1147.	1290.	0.

BOLT INTERACTION EQUATIONS

EQUATION=((TENSION/TALLOW)** 1.000+(SHEAR/VALLOW)** 1.000))** 1.000

NODE	TENSION ALLOW	SHEAR ALLOW	TENSION RATIO	SHEAR RATIO	INTERACTION FACTOR	SAFETY FACTOR
9	8740.	6690.	.100	.247	.347	2.88
11	8740.	6690.	.392	.243	.636	1.57
13	8740.	6690.	.294	.236	.530	1.89
30	8740.	6890.	.341	.237	.579	1.73
34	8740.	6690.	.179	.214	.393	2.54
51	8740.	6890.	.039	.213	.252	3.97
53	8740.	6690.	.024	.200	.224	4.47
55	8740.	6690.	0.000	.187	.187	5.34

****
* END LOAD CASE 2 *
****

502G

QUADRILATERAL PLATE SUPPORT DE-906N 5
ATTACHMENT PG. 8

MAXIMUM PRINCIPAL STRESS SUMMARY

+Z FACE ELEM	+Z FACE SIGMA PRINC	-Z FACE ELEM	-Z FACE SIGMA PRINC
15	2292.	5	2143.
14	2180.	15	2033.
5	1833.	14	1997.
11	1794.	11	1790.
17	1472.	17	1378.
16	1131.	47	1109.
25	1071.	16	909.
47	1024.	4	936.
10	1007.	13	907.
41	997.	25	899.

MAX. COMPRESSION SUMMARY

NODE	Z-FORCE
54	-1490.
61	-645.
47	-439.
55	-435.
53	-224.
62	-205.
46	-170.
60	-146.
1	-79.
58	-40.

502 H

BOLT LOADS

SUPPORT NO. DE-906N
ATTACHMENT PG. 5

I LINE	J LINE	NODE	X-SHEAR	Y-SHEAR	SRSS	Z-TENSION
2	2	9	626.	349.	716.	543.
2	4	11	824.	342.	892.	2012.
2	6	13	962.	339.	1020.	1436.
5	2	30	953.	171.	955.	1624.
5	6	34	959.	108.	974.	575.
8	2	51	820.	-21.	821.	136.
8	4	53	812.	-15.	812.	0.
8	6	55	901.	-3.	901.	0.

BOLT INTERACTION EQUATIONS

EQUATION=((TENSION/TALLOW)** 1.000+(SHEAR/VALLOW)** 1.000))** 1.000

NODE	TENSION ALLOW	SHEAR ALLOW	TENSION RATIO	SHEAR RATIO	INTERACTION FACTOR	SAFETY FACTOR
9	8740.	6890.	.082	.104	.186	6.02
11	8740.	6890.	.230	.130	.360	2.78
13	8740.	6890.	.164	.148	.312	3.20
30	8740.	6890.	.186	.095	.281	3.56
34	8740.	6890.	.066	.141	.207	4.83
51	8740.	6890.	.016	.090	.106	9.47
53	8740.	6890.	0.000	.118	.118	8.48
55	8740.	6890.	0.000	.139	.139	7.17

****
* END LOAD CASE 3 *
****

502 I

QUADRILATERAL PLATE
MAXIMUM PRINCIPAL STRESS SUMMARY

+Z FACE ELEM	+Z FACE SIGMA PRINC	-Z FACE ELEM	-Z FACE SIGMA PRINC
5	2951.	5	2817.
11	2609.	11	2672.
17	2107.	17	2226.
15	1650.	15	1923.
23	1566.	14	1564.
14	1526.	23	1554.
6	1018.	31	1411.
29	1008.	32	1185.
31	985.	29	1062.
32	939.	16	1040.

MAX. COMPRESSION SUMMARY

NODE	Z-FORCE
54	-862.
61	-455.
44	-422.
37	-310.
53	-299.
45	-236.
50	-150.
43	-134.
60	-129.
62	-122.

BOLT LOADS

SUPPORT NO. DE-906N

ATTACHMENT PG. 11

I LINE	J LINE	NODE	X-SHEAR	Y-SHEAR	SRSS	Z-TENSION
2	2	9	-891.	-72.	894.	318.
2	4	11	-809.	-62.	812.	1927.
2	6	13	-693.	-50.	694.	1918.
5	2	30	-907.	-165.	922.	389.
5	6	34	-704.	-170.	724.	1139.
8	2	51	-895.	-259.	932.	0.
8	4	53	-804.	-273.	850.	0.
8	6	55	-694.	-276.	748.	0.

BOLT INTERACTION EQUATIONS

EQUATION=((TENSION/TALLOW)** 1.000+(SHEAR/VALLOW)** 1.000))** 1.000

NODE	TENSION ALLOW	SHEAR ALLOW	TENSION RATIO	SHEAR RATIO	INTERACTION FACTOR	SAFETY FACTOR
9	8740.	6890.	.036	.130	.166	6.02
11	8740.	6890.	.220	.118	.338	2.96
13	8740.	6890.	.219	.101	.320	3.12
30	8740.	6890.	.044	.134	.178	5.61
34	8740.	6890.	.130	.105	.235	4.25
51	8740.	6890.	0.000	.135	.135	7.39
53	8740.	6890.	0.000	.123	.123	8.11
55	8740.	6890.	0.000	.109	.109	9.21

****
* END LOAD CASE 4 *
****

502K

SWEC ENGINEERING REVIEW CHECKLIST

HANGER DRAWING NO.	REV.	INSPECTION TEAM	LEGEND:
DO-908N	1FO	D. McDONELL C. HARRIS	A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE

ISOMETRIC NO. REV.	CHANGE DOCUMENT
DO-448-1.8 (6)	

CHECKLIST ITEMS	STATUS N/A	STATUS A	STATUS D	COMMENTS
1. General				
A. Support Location		✓		
B. Support Orientation		✓		
C. Catalog Items (U-BOLT)		✓		
D. Close Clearance Gaps			✓	SEE NOTE 1
2. Support Structure				
A. Critical Dimensions		✓		
B. Member sizes, structural plates		✓		
3. Struts and Snubbers				
A. Pin to Pin Dims., Snubber Setting	✓			
B. Paddle - Pin Assembly Connections	✓			
4. Baseplates				
A. Plate & Gusset sizes	✓			
B. Bolt size & type	✓			
C. Bolt hole spacing	✓			
D. Attachment location	✓			
E. Bolt spacing to adjacent inserts	✓			
5. Lugs - Bearing Surface		✓		
6. Welding				
A. Size, length, quality		✓		
B. Symbols		✓		
7. Miscellaneous (specify)	✓			

SWEC ENGINEERING REVIEW CHECKLIST

Notes:

NOTE 1: A 1/16" CLEARANCE GAP WAS MEASURED BETWEEN THE TOP LUG OF THE PIPE AND THE STOP CONNECTION. THIS GAP IS TO BE ZERO, THEREFORE, FURTHER [illegible] IS NECESSARY FOR THIS DEVIATION.

Results of Evaluation:

_____ No deviations noted.

-0- Deviations evaluated as acceptable by inspection team.

(1) Deviations require further evaluation.
10

518

Signature Date 8/26/83

Disposition of deviations subject to further evaluation:

SUPPORT DO-908N IS A DEAD WEIGHT SUPPORT AND NO GAP ALLOWED IN A VERTICAL DIRECTION, THEREFORE DEVIATION DESCRIBED IN NOTE 1 ABOVE REQUIRES INSTALLATION OF 1/16" SHIM PLATE BETWEEN THE LUG AND SUPPORTING PLATE ITEM # 8.

ACCEPTED, BASED ON "VISUAL EXAMINATION OF COMPONENT SUPPORTS" PROGRAM SLT-5303, SECTION 4.2.2.8.

Signature 08-22-83
Date

REVIEWED 8-26-85

HANGER DRAWING NO.	REV.	INSPECTION TEAM	LEGEND:
CCN D-591	2 PC	C. D[illegible] B. K[illegible]	A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE
ISOMETRIC NO. REV.	CHANGE DOCUMENT		
CCN D-551-IC-15 1 Mat Fig.	PED-215-H-W612.		

CHECKLIST ITEMS	STATUS N/A	A	D	COMMENTS
1. General				
A. Support Location		✓		[illegible]
B. Support Orientation		✓		
C. Catalog Items			✓	[illegible]
D. Close Clearance Gaps		✓		
2. Support Structure				
A. Critical Dimensions		✓		
B. Member sizes, structural plates		✓		
3. Struts and Snubbers				
A. Pin to Pin Dims., Snubber Setting		✓		
B. Paddle - Pin Assembly Connections		✓		
4. Baseplates				
A. Plate & Gusset sizes		✓		
B. Bolt size & type		✓		
C. Bolt hole spacing		✓		
D. Attachment location		✓		
E. Bolt spacing to adjacent inserts		✓		
5. Lugs - Bearing Surface		✓		
6. Welding				
A. Size, length, quality		✓		
B. Symbols		✓		
7. Miscellaneous (specify)				

SWEC ENGINEERING REVIEW CHECKLIST

Notes: See attached pages showing Deviations (1) & (2)

Results of Evaluation:

_____ No deviations noted.

__2__ Deviations evaluated as acceptable by inspection team.

__2__ Deviations require further evaluation.
See attached pages showing Deviations (1) & (2)

Signature / Date

Disposition of deviations subject to further evaluation:

ALL DEVIATIONS (1&2) ACCEPTABLE PER ATTACHED SHEETS.

B. F. Bowen (for RDC) 3/22/83

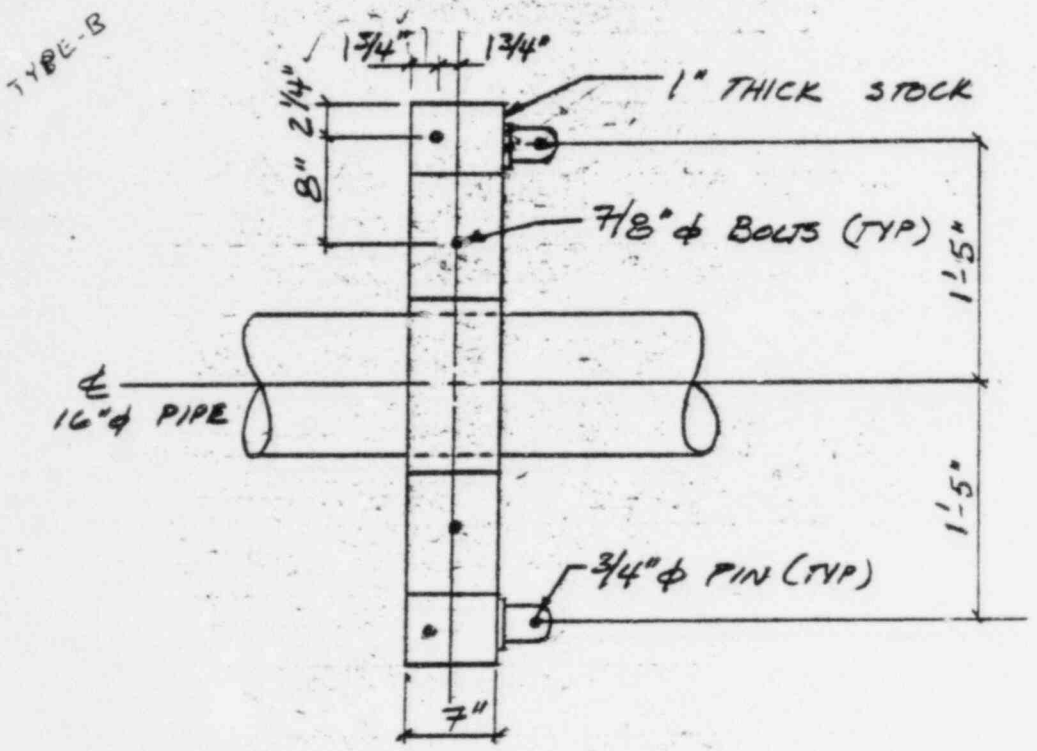
461 BOWER B. F. Bowen 3/22/83

Signature Date

ATTACHMENT '1' SWEC ENG.
REVIEW CHECHLIST
HANGER COND-591

DEVIATION (1)

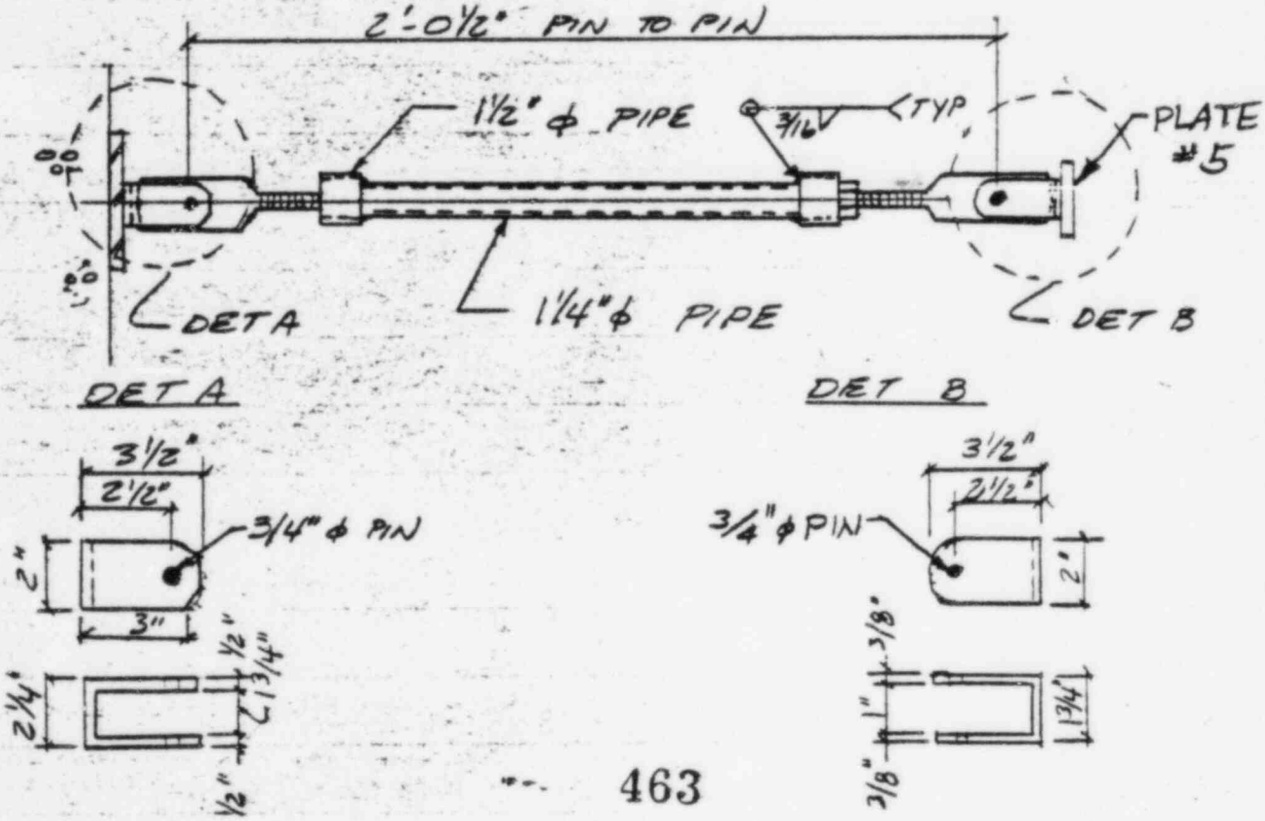
The 16"ϕ riser clamp stock size called out on the as-built drawing does not agree with the clamp stock size measured. The as-built calls for a 16"ϕ Special Riser Clamp Fig. 135A Stock Size = 1¼" x 7" w/ 1¼" ϕ Bolts. The clamp dimensions measured in the field are shown below:



We were unable to find this clamp in any available catalog so that we could could verify these dimensions. The observed stock size was 1" x 7" instead of 1¼" x 7".

DEVIATION (2)

The strut size is called out on the as-built drawing as, Rigid Strut Assembly NPS Fig. SRS Size 10 x 10¼" Lg., Pin ϕ = 3¼", Pipe ϕ = 1½" Nom., 1"ϕ Rod End w/ Power Piping Size 1½" HS-142 Beam Attachment. The strut measured in the field does not agree w/ this description & is shown below:



The strut assembly is a Size 8 instead of 10. The rear bracket (DET A) is correct. The front bracket (DET B) does not match the description given on the as-built (it has a ¾"ϕ pin instead of 1¼"ϕ as indicated). We could not find this bracket in any available catalogs.?

EVALUATION OF SUPPORT NO. COND-591 REV. 4FO

ISOMETRIC NO. COND-351-10.15H REV. _____
(NOT AVAIL.)

NOTES: 1) Burns & Roe Drawing #M-200 Sheet N/A has been reviewed for discrepancies between as-analyzed and as-built piping configurations. It is judged that any such discrepancies do not significantly affect calculated support loads. AS-BUILT ISO. NOT AVAILABLE (8-12-83) SO THEREFORE IT IS ASSUMED ACCEPTABLE AT THIS TIME.

DEV.-1 THE .16" ϕ RISER CLAMP STOCK SIZE CALLED OUT ON THE AS-BUILT DRAWING DOES NOT AGREE WITH THE CLAMP STOCK SIZE MEASURED. HOWEVER, THE SPECIAL CLAMP FIG-135A SPECIFIED ON THE AS-BUILT DWG. IS IN AGREEMENT WITH THE CLAMP STOCK SIZE MEASURED IN THE FIELD. (1"x7") THE BAR STOCK SIZE ON THE AS-BUILT RESTRAINT DWG. SHOULD BE DELETED SINCE IT IS NOT CORRECT. THE BOLT SIZE CORRESPONDING TO THE BAR STOCK SIZE (1"x7") IS 1 1/8 ϕ BOLTS. THE SIZE BOLTS MEASURED IN THE FIELD ARE 3/4" ϕ.

THE BAR STOCK SPECIFIED FOR THE 16 ϕ PIPE BY FIG-135A HAS A RATED CAPACITY OF 9500#. THE BOLT HAS A RATED CAPACITY OF 6100#. THEREFORE DEVIATION #1 IS ACCEPTABLE SINCE THE MAXIMUM DESIGN LOAD IS 4292#.

REFERENCES

PREPARER: R. D. Engel DATE: 8-13-83

REVIEWER: Ron E. Barker DATE: 8-13-83

EVALUATION OF SUPPORT NO. COND-591 REV. 4F0

ISOMETRIC NO. COND-351-10.151 REV. _____
(NOT AVAILABLE)

DEV.-2

THE STRUT SIZE SPECIFIED ON THE AS-BUILT ISO. IS SIZE 10. THE STRUT SIZE IN THE FIELD IS SIZE-8. THE MAXIMUM LOAD PER STRUT IS IS DESIGNATED AS 4960#. THE MAXIMUM DESIGN LOAD PER STRUT IS 2146# WHICH IS LESS THAN 50% OF THE RATED CAPACITY OF THE STRUT. THE 1/4" FILLET WELD CALLED OUT ON THE STRUT (NOT ASSEMBLY) IS 3/16". THE UNDERSIZED WELD IS ACCEPTABLE SINCE IT REDUCES THE CAPACITY BY 25% (OF THE WELD) COUPLED WITH THE FACT THAT THE DESIGN LOAD IS LESS THAN 50% OF THE ALLOWABLE

THE BRACKETS ARE SPECIFIED CORRECTLY BY THE AS-BUILT RESTRAINT DWG.

REFERENCES

PREPARER: R.D Ewart DATE: 8-13-83

REVIEWER: Ben S. Bu DATE: 8-15-83

BURNS AND ROE, INC.
Headquarters Office—Oradell, N.J.

W.O. No. 3900-76 Corp. Book No. 8.15-4 Page No.
Drawing No. COND-591 Calc No. 8.15.189 Sheet 3 Cont. on Sheet 4
By A Chmiel Checked C. Mahin Approved
Title 4"PSS NP2 PIPE SUPPORT REVIEW/REDESIGN PS MARK NO. COND.-591

LOADING CONDITIONS: Thermal Movements +0.005 -0.053 ✓
$\Delta x = 0.0''$, $\Delta Y = \cancel{0.002}''$, $\Delta Z = \cancel{-0.057}''$

LOAD TYPE		POUNDS			POUNDS-FT.		
		Fx	Fy	Fz	Mx	My	Mz
Thermal		-2277 ~~-269~~					
Dead Wt.		408 ~~300~~					
Misc.							
DYNAMIC LOADS	Normal	± 1942 ~~±1530~~					
	Emerg.	± 1942 ~~±1530~~					
	Faulted	± 3884 ~~±3360~~					
TOTAL LOADS	Normal	~~+1850~~ +2350 ~~-1499~~ -3811					
	Emerg.	~~+1830~~ +2350 ~~-1499~~ -3811					
	Faulted	~~+4292~~ ~~+3360~~ ~~-2760~~ -3476					
ORIGINAL SUPPORT DESIGN LOADS	Normal						
	Emerg.						
	Faulted						

Loads taken from Calc No. 8.14.64 Rev 6 Book No 8.14.64

3 K. Hayat 12/14/82 H. Calib.

6

INSTRUCTIONS FOR SELECTION OF SPECIAL RISER CLAMPS

From Chart A, locate the point determined by the intersection of the total load coordinate and the pipe size curve. Projece this point horizontally until the "D" dimension coordinate is reached. The correct stock size is shown on the curve above this point.

The bolt diameter is obtained by taking the size listed below the total load. Use the next largest bolt size if the load falls between two sizes.

To describe the riser clamp for a Bill of Material, list the following:

a. Type A or B (Use type B for 40,000# load or larger)

b. Pipe O.D.

c. Rod to rod dimension "C-C"

d. Stock size (ASME SA-36 material)

e. Bolt diameter

ASME SA-36 (ASTM A-36) carbon steel IS shall be used for 750°F max.

Typical example: Total load: 16,500#

Pipe O.D.: 20"

Rod to rod dimension (C-C): 36"

Dimension "D" = $\frac{36-20}{2}$ = 8

From Chart A: Design is type A

Stock size - 1 1/2" x9"

Bolt size - 1 1/2"

FIGURE 135

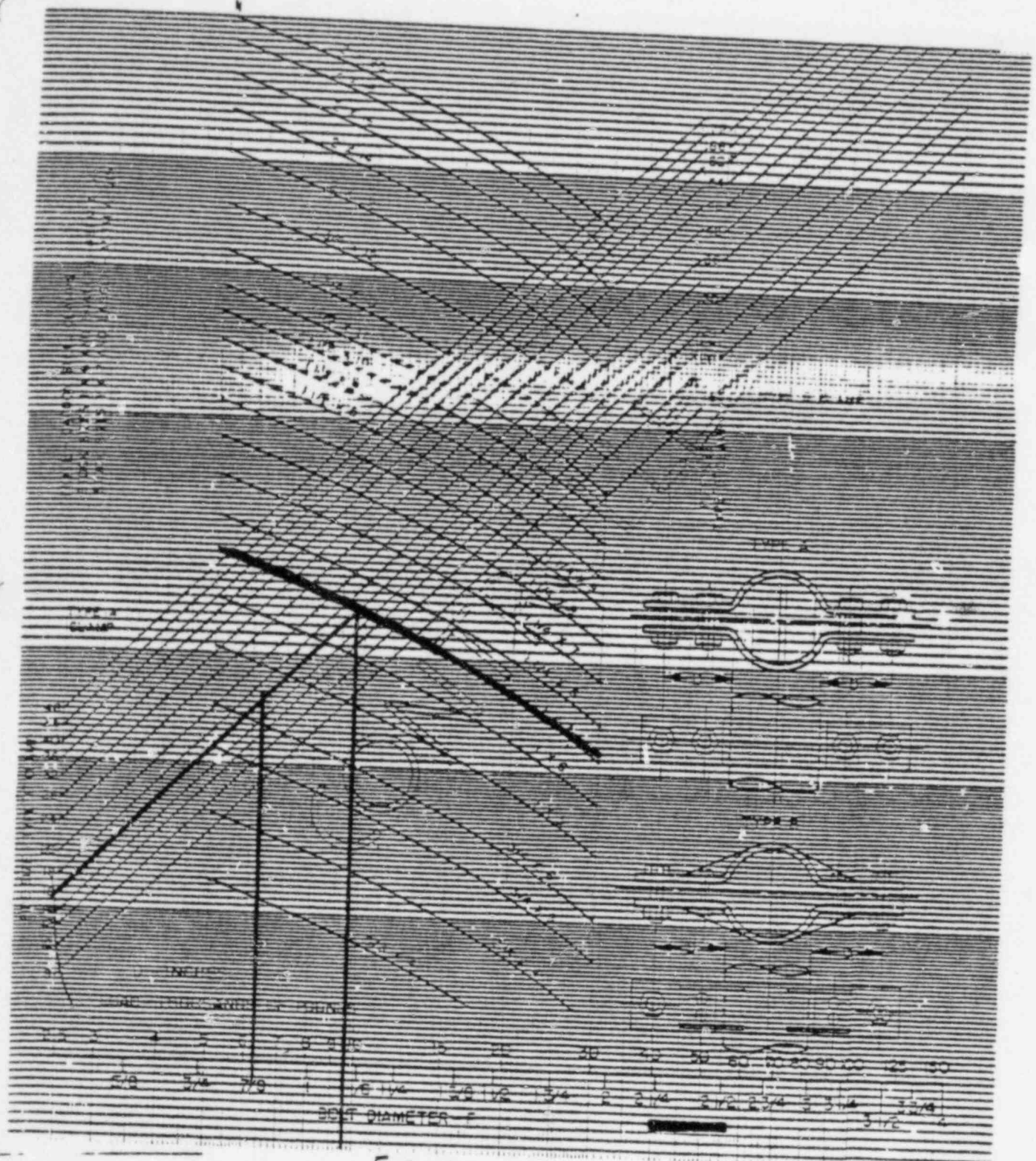
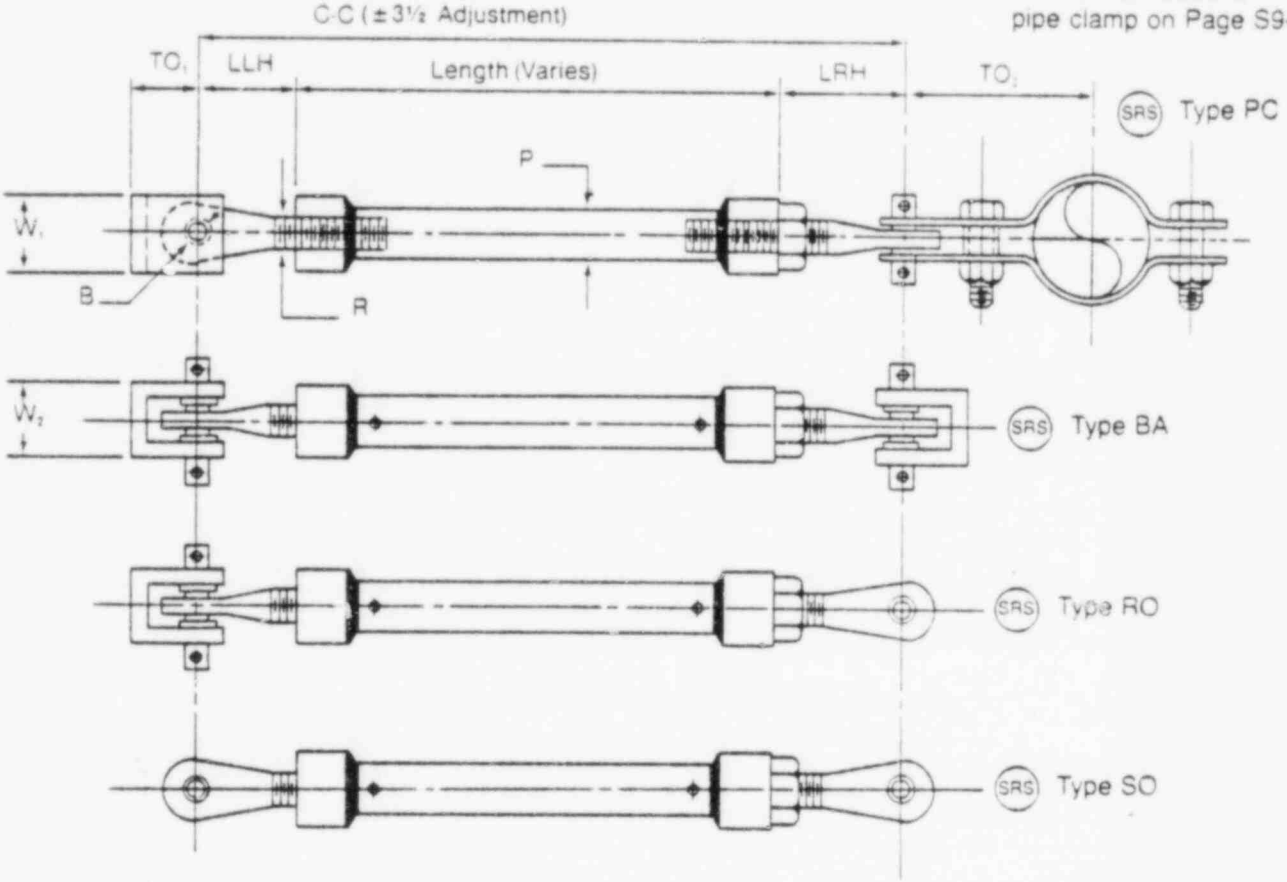


FIGURE 135
CHART A

FOR SPECIAL RISER CLAMPS

617

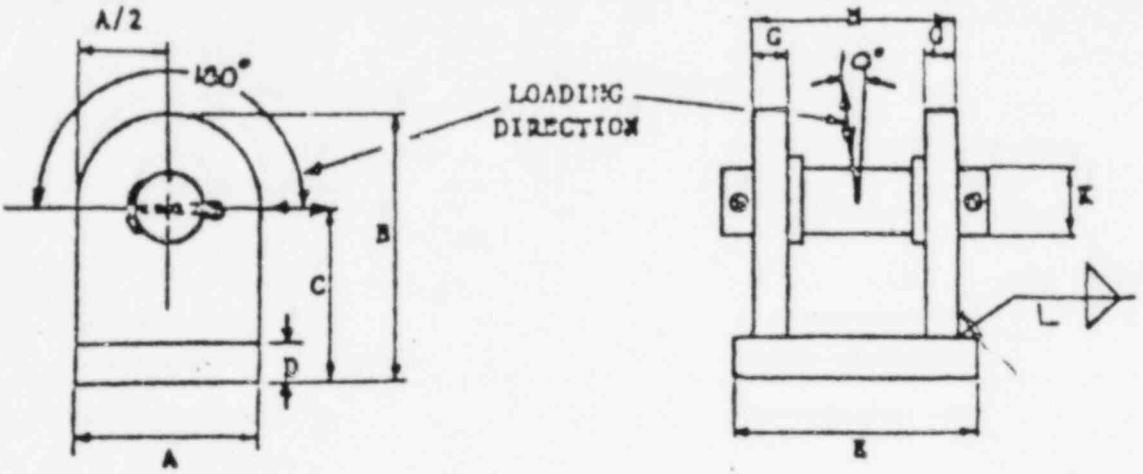
Dimension TO_2 found next to Part Code for pipe clamp on Page S9-S17



SWAY STRUT SIZE NO.	R	B	REAR BRACKET BASE SIZE		REAR BRACKET TAKE OUT	P	LLH	LRH	MINIMUM C TO C		MAX LOAD*	SWAY STRUT SIZE NO.
	ROD DIAM.	PIN DIAM.	W_1	W_2	TO_1	NOMINAL PIPE SIZE			WITH ADJUSTMENT	NO ADJUSTMENT		
06	¾	¾	1¼	2	1½	1"	4¾	5¾	19¾	15¾	2700	06
08	1	⅞	1½	3	2	1½"	5¼	6¼	21½	18	4960	08
10	1¼	⅞	2¼	3½	2½	1½"	6¼	7¾	24¼	21¼	8000	10
12	1¾	1	3	4½	3¾	2"	7½	9¾	28¾	24¾	11600	12
14	1¾	1	3	4½	3¾	2"	7½	9¾	28¾	24¾	15700	14
20	2½	1¼	6	7	4	3"	11¼	13¾	38	34½	33500	20
24	3	1½	10	10	5¼	4"	12½	15¼	41¼	37¼	50600	24
36	4½	3	12½	12½	8	6"	16¾	21	54½	51	120000	36

*Maximum Load at Minimum C to C

POWER PIPING COMPANY
600 GRANT AVENUE
PITTSBURGH, PA. 15223



SIZE	A	B	C	E	G	N	K	D	L
15 1 1/2	2.0	3.625	2.50	2.1875	.375	1.6875	.75	.375	1/
20 2	2.5	3.625	2.50	2.5625	.500	1.9375	1.00	.375	1/
25 2 1/2	3.0	4.250	2.75	3.2500	.750	2.6562	1.00	.500	1/
40 4 40	5.0	6.250	4.00	4.6250	1.000	3.8750	1.50	.750	3/
50 5	6.5	8.000	5.00	6.0000	1.250	5.0000	2.25	1.000	3/
60 6	7.5	9.750	6.00	6.7500	1.250	5.6250	3.00	1.250	3/
80 8	8.5	11.750	7.50	10.0000	1.500	6.6250	3.50	1.500	1/

US-142 BEAM ATTACHMENT

For use with Figure 350 Rigid Sway Strut or Hydraulic Snubber

Pin Material:
A-108 or A-193-B7 per M-300

CATALOG DATA:
Subject to change
without notice

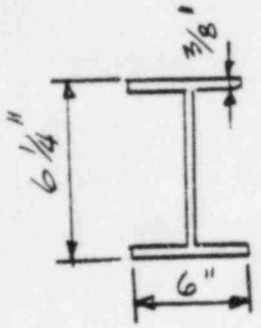
REF US-142, REV. 9
PPC LETTER TO B+R DATED 9/3/8

HANGER DRAWING NO.	REV.	INSPECTION TEAM	LEGEND:
FPC-43	4	JACOB MENDEZ	A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE
ISOMETRIC NO. REV. 6F0 FPC-605-10.12	CHANGE DOCUMENT PEO-215-W-K234 PEO-215-H-M281		

CHECKLIST ITEMS	STATUS N/A	A	D	COMMENTS
1. General				
A. Support Location		✓		
B. Support Orientation		✓		
C. Catalog Items		✓		
D. Close Clearance Gaps	✓			
2. Support Structure				
A. Critical Dimensions		✓		
B. Member sizes, structural plates			✓	W6x25 ITEM #2 SHOULD BE W6x20 SEE NOTE 1
3. Struts and Snubbers				
A. Pin to Pin Dims., Snubber Setting		✓		
B. Paddle - Pin Assembly Connections		✓		
4. Baseplates				
A. Plate & Gusset sizes	✓			
B. Bolt size & type	✓			
C. Bolt hole spacing	✓			
D. Attachment location	✓			
E. Bolt spacing to adjacent inserts	✓			
5. Lugs - Bearing Surface	✓			
6. Welding				
A. Size, length, quality		✓		
B. Symbols		✓		
7. Miscellaneous (specify)	✓			

SWEC ENGINEERING REVIEW CHECKLIST

Notes: NOTE 1 : ATTRIBUTE 2B



Results of Evaluation:

_____ No deviations noted.

__0__ Deviations evaluated as acceptable by inspection team.

__1__ Deviations require further evaluation. 2B

ATTRIBUTE 2B

Steve B. Jarod 8-2-83
Signature Date

Disposition of deviations subject to further evaluation:
see attached page. Deviation judged acceptable

S. Gallo 8/13/83
Signature Date

EVALUATION OF SUPPORT NO. FPC-43 REV. 4
ISOMETRIC NO. FPC-605-10.12 REV. 6 FO

Change in section properties for member 2 by using W6×20 ($A = 5.88\ in^2$ $S = 13.4\ in^3$ Ref. 1) instead of W6×25 ($A = 7.35\ in^2$ $S = 16.7\ in^3$ Ref 1) has insignificant effect due to max force & moment values acting @ this member:

Max shear force & bending moment for member 2.

$F = 3824 \times 1.25 = 4780\ \#$

$M = 4780 \times 15 = 71700\ \#\text{-in}$ Ref. 2

$\sigma = \frac{71700}{13.4} = 5351\ psi < F_{AL}$

Therefore deviation 2B can be judged as acceptable.

REFERENCES

1) AISC "STEEL CONSTRUCTION MANUAL"
2) Support Dwg FPC-43 Rev. 4
3) Piping ISO FPC-605-10.12 Rev. 6 FO

PREPARER: E. Gallegos DATE: 8/13/83
REVIEWER: E. de Guzman DATE: 8/15/83

HANGER DRAWING NO.	REV.	INSPECTION TEAM	LEGEND:
LPCS-908N	1	W. Pokrysheusky J. Mika	A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE
ISOMETRIC NO. REV.	CHANGE DOCUMENT		
LPCS-756-1921 10F0			

CHECKLIST ITEMS	STATUS N/A	A	D	COMMENTS
1. General				
A. Support Location		✓		
B. Support Orientation		✓		
C. Catalog Items		✓		
D. Close Clearance Gaps		✓		
2. Support Structure				
A. Critical Dimensions		✓		
B. Member sizes, structural plates		✓		
3. Struts and Snubbers				
A. Pin to Pin Dims., Snubber Setting		✓		
B. Paddle - Pin Assembly Connections		✓		
4. Baseplates				
A. Plate & Gusset sizes	✓			
B. Bolt size & type	✓			
C. Bolt hole spacing	✓			
D. Attachment location	✓			
E. Bolt spacing to adjacent inserts	✓			
5. Lugs - Bearing Surface	✓			
6. Welding				
A. Size, length, quality			✓	SEE NOTE 1
B. Symbols		✓		
7. Miscellaneous (specify)	✓			

SWEC ENGINEERING REVIEW CHECKLIST

Notes: 1. WELD SIZES DEVIATED SHOWN ON DWG
a) WELD SIZE BETWEEN ITEM 6 & EXIST. STEEL (LEFT) IS 5/16" VS. 3/8", ALSO 1 EXTRA WELD 5/16" ON RIGHT SIDE
b) BETWEEN GUSSET # ON RIGHT SIDE OF SUPPORT # ITEM # 6 - 1/4" VS. 5/16" (FAR SIDE)

Results of Evaluation:

N/A No deviations noted.

N/A Deviations evaluated as acceptable by inspection team.

-1- Deviations require further evaluation. (ITEM 6A)

Joseph O. Mitra 7-20-83
Signature Date

W. Ricky Sweeney 07-20-83
Signature Date

Disposition of deviations subject to further evaluation:

1. A) SEE ATTACHED EVALUATION;
B) WELDS MEET MIN. WELD SIZE REQUIREMENT. O.K.

661

JOE STOKES 8-23-83
Signature Date

(Reviewer) Craig Le Fevre 8/23/83

EVALUATION OF SUPPORT NO. LPCS-908N REV. 1 (2FD)
ISOMETRIC NO. LPCS-756-19.21 REV. 10FD

NOTES: 1) Burns & Roe Drawing #M-200 Sheet 1 has been reviewed for discrepancies between as-analyzed and as-built piping configurations. It is judged that any such discrepancies do not significantly affect calculated support loads.

MAX. DESIGN LOADS (SEE REF 3)

NORMAL

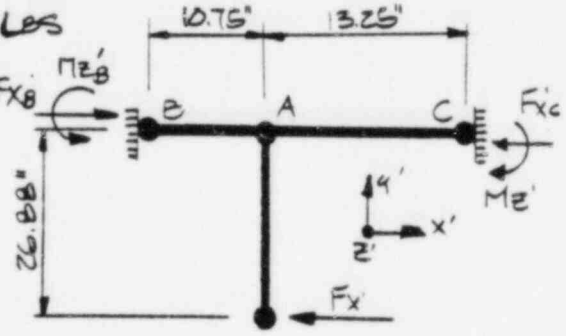
$F_x' = 1.25[(1583)^2+(4713)^2]^{1/2} = 6215$ LBS (1.25 IS A MODIFIED LOAD FACTOR)

EMERGENCY

$F_x' = 1.25[(2065)^2+(6149)^2]^{1/2} = 8108$ LBS

FAULTED

$F_x' = 1.25[(5257)^2+(15657)^2]^{1/2} = 20645$ LBS



RESOLVE FRAME FOR REACTIONS @ WELDS

RESOLVE LOADS TO PT. A:

NORMAL:
$F_x'A = 6215$ LBS
$M_z'A = (26.88)(6215) = 167060$ IN LBS

EMERGENCY:
$F_x'A = 8108$ LBS
$M_z'A = (26.88)(8108) = 217943$ IN LBS

FAULTED:
$F_x'A = 20645$ LBS
$M_z'A = 26.88(20645) = 554937$ IN LBS

RESOLVE LOADS TO PTS B & C (REF 5)

FAULTED CONDITION

$F_x'B = F_z'B = 20645$ LBS

REFERENCES

1.) PIPE SUPPORT DWG. LPCS-908N REV. 2FD
2.) PIPING ISO LPCS-756-19.21 REV. 10FD
3.) B&R SUPPORT REVIEW/REDESIGN CALC 8.15.1128 REV 2.
4.) AISC "STEEL CONSTRUCTION MANUAL" 8TH ED.
5.) BLODGETT "MANUAL OF STEEL CONSTRUCTION"

(CONT'D, SHT. 2)

PREPARER: JOE STOKES DATE: 8-23-83
REVIEWER: Craig Gray DATE: 8/23/83

EVALUATION OF SUPPORT NO. LPCS-908N REV. 1 (2FD)
ISOMETRIC NO. LPCS-756-19.21 REV. 10 FD

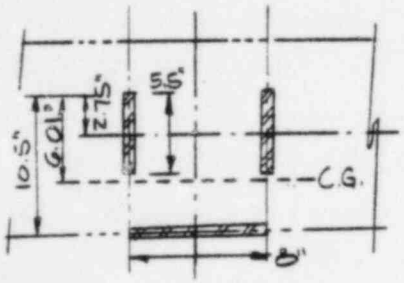
FAULTED REACTIONS (CONTINUED)

$F_{yB} = \frac{6(554937)(10.75)(13.25)}{(24)^3} = 34307$ LBS

$M_{zB} = \frac{(554937)(13.25)}{(24)^2}[24 - 3(10.75)] = 105316$ IN LBS

CONSERVATIVELY USE $M_{zB} = 196161$ IN LBS AS DETERMINED PER STRUDL MODEL, REF 3, SHT 6

WELD ANALYSIS @ PT. B



$S_{WZ} = 306.6/6.01$
$= 51.02$ IN^2

WELD GEOMETRY (ASSUME WELD THICKNESS AS UNITY)

$A_W = 2(5.5)(1) + 8 = 19$ IN

$\bar{y} = \frac{2(5.5)(1)(2.75) + 10.5(8.0)(1)}{19}$
$= 6.01$ IN.

$I_z = \left[\frac{(5.5)^3(1)}{12} + 5.5(3.27)^2(1)\right](2) + 8(1)(4.49)^2 = 306.6$ IN^3

$I_x = (5.5)(1.0)^2(2) + \frac{(8)^3}{12}(1/12) = 218.7$ IN^3

WELD FORCES - FAULTED

$F_x = \frac{F_x}{A_W} = \frac{20645}{19} = 1087$ LBS/IN

$F_y = \frac{F_y}{A_W} + \frac{M_z}{S_{WZ}} = \frac{34307}{19} + \frac{196161}{51.02} = 5651$ LBS/IN

RESULTANT $f_r = (f_x^2 + F_y^2)^{1/2} = 5754$ LBS/IN

LEG SIZE REQ'D $= 5754/0.707(28000) = 0.291$ IN < 0.3125 IN. O.K.
(REF. 6)

REFERENCES

(SEE SHT 1)

6) ASME III, SUBSECTION NF, APPENDIX F.

7.) AISC STEEL CONST. MANUAL 7TH EDIT.

PREPARER: Joe Stokes DATE: 8-23-83

REVIEWER: Craig A. Gray DATE: 8/23/83

EVALUATION OF SUPPORT NO. LPCS-908N REV. 1 (2FΦ)
ISOMETRIC NO. LPCS-756-19.21 REV. 1ΦFΦ

WELD FORCES (NORMAL-UPSET) APPLY RATIO (EMERG/FAULTED) LOAD

RESULTANT = (8108/20645)(5754) = 2260 LBS/IN

LEG SIZE REQ'D = 2260/.7071(18000) = 0.178 IN < 0.3125 IN ∴ O.K.
(REF. 7)

∴ WELD DEVIATION IS ACCEPTABLE

REFERENCES

(SEE SHTS. 1 & 2)

PREPARER: JOE STOKER DATE: 8-23-83

REVIEWER: Craig Lipsey DATE: 8/23/83

SWEC ENGINEERING REVIEW CHECKLIST

HANGER DRAWING NO.	REV.	INSPECTION TEAM	LEGEND:
MSLC-31	1	W. POKRYSHEVSKY R. EWART	A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE

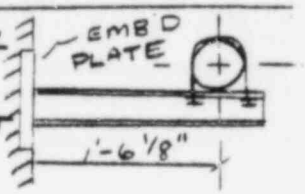
ISOMETRIC NO. REV.	CHANGE DOCUMENT		
MSLC-084-7.10 GF0	PED-215-MN167		

CHECKLIST ITEMS	STATUS N/A	A	D	COMMENTS
1. General				
A. Support Location		✓		
B. Support Orientation		✓		
C. Catalog Items		✓		
D. Close Clearance Gaps		✓		
2. Support Structure				
A. Critical Dimensions			✓	DIMENSION WALL TO ℄ PIPE 5¼" OFF
B. Member sizes, structural plates		✓		
3. Struts and Snubbers				
A. Pin to Pin Dims., Snubber Setting	✓			
B. Paddle-Pin Assembly Connections	✓			
4. Baseplates				
A. Plate & Gusset sizes	✓			
B. Bolt size & type	✓			
C. Bolt hole spacing	✓			
D. Attachment location	✓			
E. Bolt spacing to adjacent inserts	✓			
5. Lugs - Bearing Surface	✓			
6. Welding				
A. Size, length, quality			✓	SEE NOTE 2
B. Symbols		✓		
7. Miscellaneous (specify)	✓			

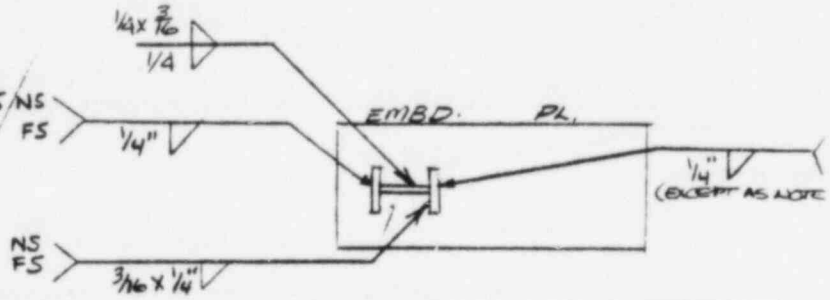
SWEC ENGINEERING REVIEW CHECKLIST

1. ITEM 2A. THE DIMENSION FROM THE WALL TO THE ℄ OF THE PIPE WAS SPECIFIED ON THE AS-BUILT ISO. AS 1'-0 13/16"

Notes:



2. ITEM 6A.
SUPPORT DWG. REQUIRES 1/4" FILLET ALL AROUND W4X13



Results of Evaluation:

N/A No deviations noted.

Ø Deviations evaluated as acceptable by inspection team.

2 DEVIATIONS REQUIRE FURTHER EVALUATION (ITEM 2A, 6A)

Ronnie D. Covart 07-22-83
Signature Date
W. Blythe Cooley 07-22-83

DISPOSITION OF DEVIATIONS SUBJECT TO FURTHER EVALUATION:

DEVIATIONS CONSIDERED ACCEPTABLE

833

Thomas F Carter 19 AUG 83
Signature Date
Ronald H McDowell 8/19/83

EVALUATION OF SUPPORT NO. MSLC-31 REV. 1

ISOMETRIC NO. MSLC-084-7.10 REV. 6P0

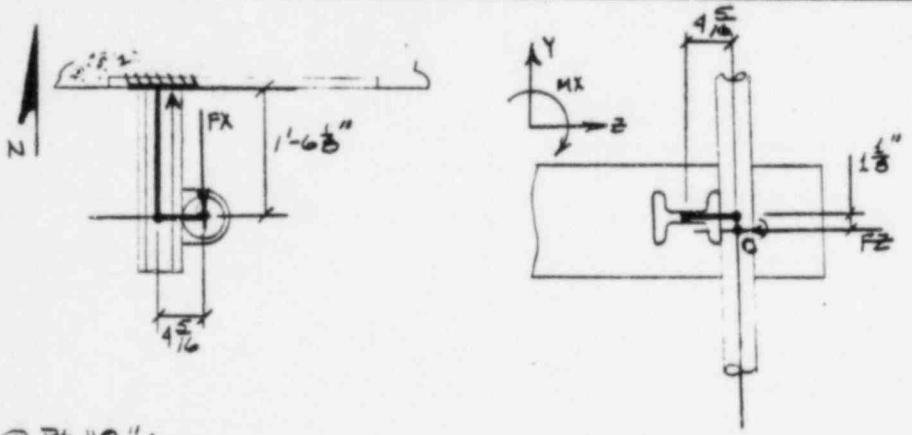
NOTES: 1) * Burns & Roe Drawing #M-200 Sheet ___ has been reviewed for discrepancies between as-analyzed and as-built piping configurations. It is judged that any such discrepancies do not significantly affect calculated support loads.

* NO M-200 ISO IS AVAILABLE - MSLC-084-7.10 REV 6 P0 HAS BEEN FIELD VERIFIED & NO DISCREPANCIES WERE NOTED WHICH WOULD AFFECT THE ANALYSIS OF THIS SUPPORT.

REF

ANALYSIS OF DEVIATIONS NOTED AS ITEMS 2A & 6A:

1



2

@ Pt "O":

FX = 210 lbs
FZ = 200 lbs

@ Pt "A":

FX = 210 lbs
FZ = 200 lbs

MX = 200(1.125) = 225 in-lbs

MY = 200(18.125) + 210(4.3125) = 4,531 in-lbs

* DUE TO RELATIVELY LOW LOADS SUMMARIZED TO RELATIVELY HIGH SECTION PROPERTIES OF EXISTING WELD, BY ENGINEERING JUDGEMENT THIS WELD & STRUCTURAL MEMBER HAVE ADAQUATE STRENGTH FOR THE APPLIED LOADING.

REFERENCES

1) AISC. 8th Ed
2) BURNS & ROE CALC 8.16.7553, DATED 12/3/82, SHT 3

PREPARER: Thomas F Carter DATE: 19 Aug 83

REVIEWER: Ronald K McDowell DATE: 19 Aug 83

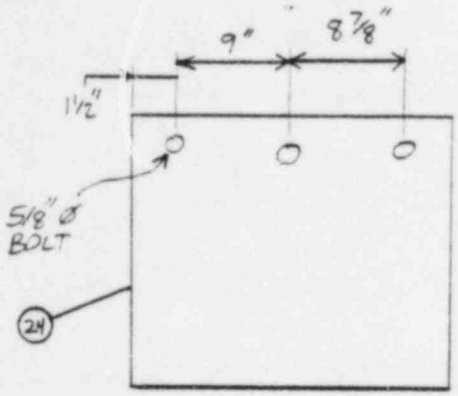
HANGER DRAWING NO.	REV.	INSPECTION TEAM	LEGEND:
RC1C-15	6	FISCHER + McDONELL	A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE

ISOMETRIC NO. REV.	CHANGE DOCUMENT
RC1C-659-7,10 6F0	

CHECKLIST ITEMS	STATUS N/A	A	D	COMMENTS
1. General				
A. Support Location		✓		
B. Support Orientation		✓		
C. Catalog Items	✓			
D. Close Clearance Gaps		✓		
2. Support Structure				
A. Critical Dimensions		✓		
B. Member sizes, structural plates		✓		
3. Struts and Snubbers				
A. Pin to Pin Dims., Snubber Setting	✓			
B. Paddle - Pin Assembly Connections - -	✓			
4. Baseplates				
A. Plate & Gusset sizes		✓		
B. Bolt size & type			✓	ONE BOLT IS A 5/8"Ø, NOT A 3/4"Ø (SEE BACK)
C. Bolt hole spacing			✓	SEE NOTES SECTION ON BACK
D. Attachment location		✓		
E. Bolt spacing to adjacent inserts		✓		
5. Lugs - Bearing Surface		✓		
6. Welding				
A. Size, length, quality		✓		
B. Symbols		✓		
7. Miscellaneous (specify)	✓			

SWEC ENGINEERING REVIEW CHECKLIST

Notes:



PARTIAL SECT. 'B-B'

ALL OTHER BOLT TO BOLT SPACINGS ARE WITHIN 1/4" OF DIMENSIONS SHOWN IN SECT. B-B OF HGR DWG AND ALL OTHER EDGE DISTANCES ARE WITHIN 1/8".

Results of Evaluation:

_____ No deviations noted.

_____ Deviations evaluated as acceptable by inspection team.

2 Deviations require further evaluation. 4B~~+~~C

Bruce Fischer 7/27/83
Signature Date

Disposition of deviations subject to further evaluation:

ALL DEVIATIONS SEE ATTACHED SHEETS FOR ANALYSIS

868

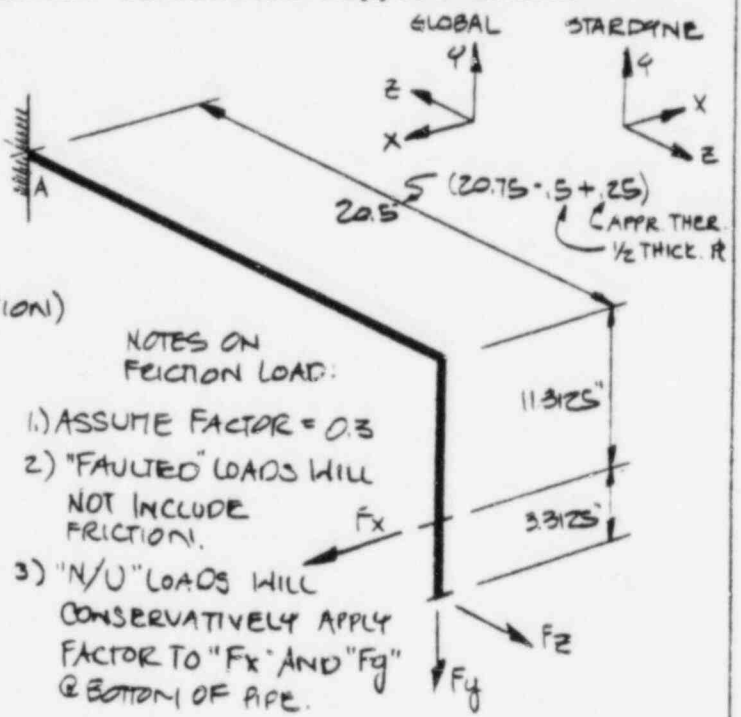
~~DE~~ STOICOS 8-26-83
Signature Date

7/26/83.

EVALUATION OF SUPPORT NO. RCIC-15 REV. 6

ISOMETRIC NO. RCIC-659-7.15 REV. 6FΦ

NOTES: 1) Burns & Roe Drawing #M-200 Sheet 115 has been reviewed for discrepancies between as-analyzed and as-built piping configurations. It is judged that any such discrepancies do not significantly affect calculated support loads.



DERIVATION OF DESIGN LOADS (REF 3)

	Fx	Fy	Fz (FRICTION)
DWT	-3	-776	
THERM	+1282	-39	
SEIS-"N/U"	±107	±607	
SEIS-"F"	±214	±1214	
TOTAL "N/U"	+1386	+0	+416
	-110	-1422	+460
TOTAL "F"	+211	+1214	0
	-217	-1990	0

NOTES ON FRICTION LOAD:

1.) ASSUME FACTOR = 0.3

2) "FAULTED" LOADS WILL NOT INCLUDE FRICTION.

3) "N/U" LOADS WILL CONSERVATIVELY APPLY FACTOR TO "Fx" AND "Fg" @ BOTTOM OF PIPE.

RESOLVED LOADS

STARDYNE CASE		Fx	Fy	Fz	Mx	My	Mz
(N/U)	1	+1386	-1422	+843	-16823	+28413	+15680
(N/U)	2	-110	-1422	+460	-22424	-2255	-1244
(F)	3	-217	-1990	Φ	-40795	-4449	-2455
(F)	4	+211	-1990	Φ	-40795	+4326	+2387

MAX REACTIONS @ PT. A

MOMENT EQUATIONS

Mx = 20.5(±Fy) + 14.625(±Fz)

My = 20.5(±Fx)

Mz = 11.3125(±Fx)

REFERENCES

1.) PIPE SUPPORT DWG RCIC-15 REV. 6

2.) PIPING ISOMETRIC RCIC-659-7.15 REV 6FΦ

3.) B&R SUPPORT REVIEW/REDESIGN CALC. 8.15.2139 REV 3

4.) B&R DESIGN GUIDE M409

5) B&R "BOOK OF TYPICAL BASE PLATES (REV. 1)" APPEN C

6.) AISC "STEEL CONSTRUCTION MANUAL" 8TH EDITION

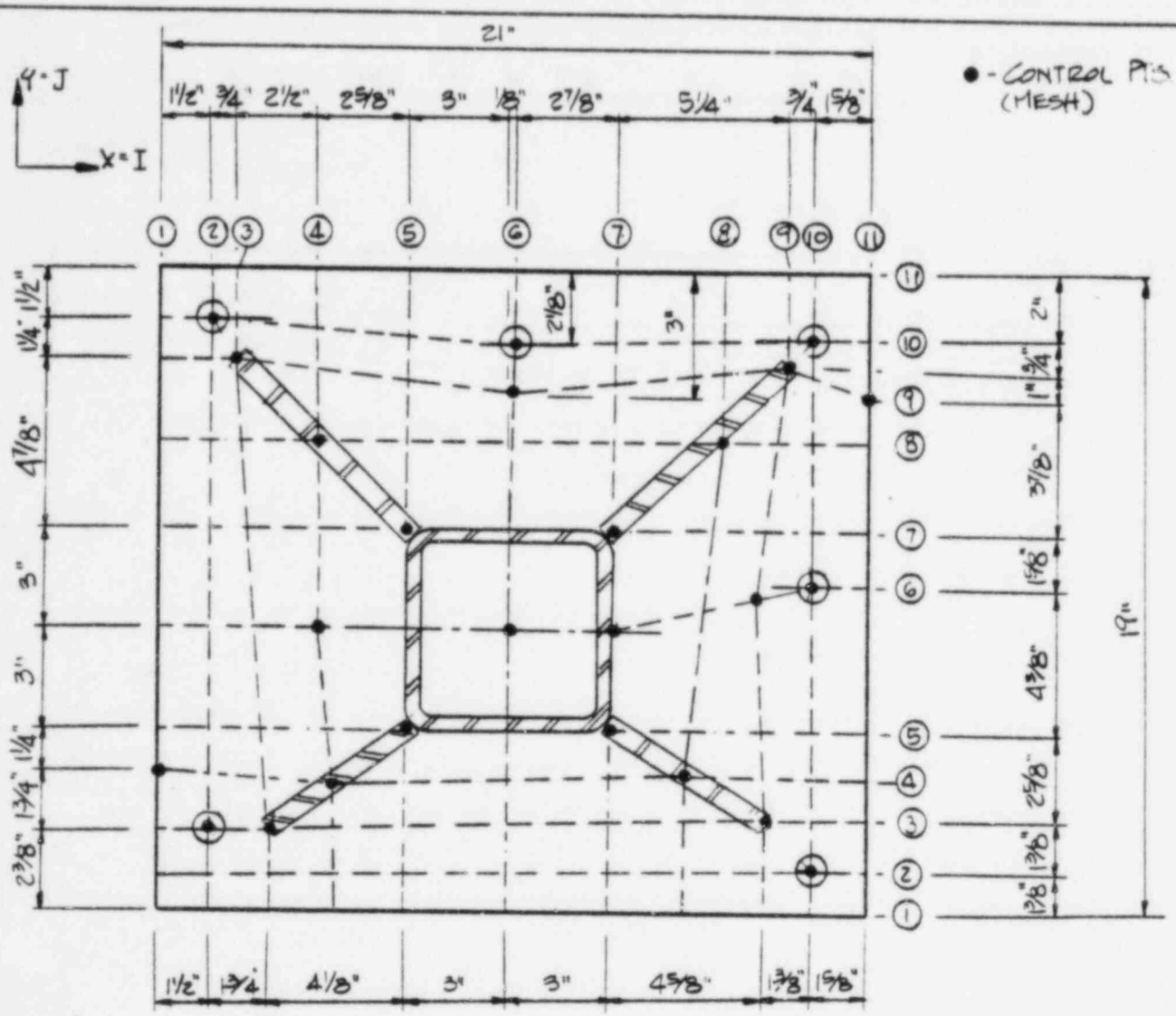
(CONT'D ON SHT 3)

PREPARER: JOE STOICA DATE: 8-24-83

REVIEWER: R.J. McDowell DATE: 8/26/83

EVALUATION OF SUPPORT NO. RCIC-15 REV. 6

ISOMETRIC NO. RCIC-659-7.10 REV. 6F0



STARDYNE MODEL AND INPUT (SEE ATTACHMENT 1.0)

BOLT PROPERTIES

¾" ϕ HILTI DROP-INS (REF 5)

TENSILE STIFF = 980000 LB/IN

SHEAR STIFF = 302000 LB/IN

TENSION ALLOW = 4060 LBS

SHEAR ALLOW = 4420 LBS (REF 4)

PREPARER: DF Stoltz DATE: 5-24-83

REVIEWER: [signature] DATE: 7-26-83

EVALUATION OF SUPPORT NO. RCIC-15 REV. 6
ISOMETRIC NO. RCIC-659-7.15 REV. 6FD

BOLT PROPERTIES (CONT'D)

5/8" ϕ HILTI DROP-IN BOLT

TENSILE STIFF = 840000 LBS/IN
SHEAR STIFF = 250000 LBS/IN. (REF 5)

TENSION ALLOWABLE = 2510 LBS
SHEAR ALLOWABLE = 3070 LBS (REF 4)

ASSUME CONCRETE COMPRESSIVE STRENGTH = 3500 PSI
CONCRETE MODULUS OF ELASTICITY $E_c = 57000\sqrt{3500} = 3372166$ PSI (REF 7)

RESULTS OF STARDYNE RUN

ATTRIBUTE 4.B.) UNDERSIZED BOLT

MAX. INTERACTION FOR 5/8" ϕ BOLT = 0.619 ≤ 1.0 ∴ O.K.
(REF STARDYNE OUTPUT NODE 21, CASE 1, AND REF 4)

∴ 5/8" ϕ BOLT IS O.K., DEVIATION ACCEPTABLE

ATTRIBUTE 4.C) BOLT HOLE SPACING

BY ENGINEERING JUDGEMENT, BECAUSE OF VERY LOW BOLT LOADS BOLT SPACING DEVIATION IS ACCEPTABLE. MINIMUM SPACING REQUIREMENT IS STILL MET ∴ DEVIATION IS ACCEPTABLE. (REF STARDYNE OUTPUT)

REFERENCES

7.) STARDYNE COMPUTER PROGRAM ST-330 VERSION ϕ3 LEVEL 00 W/ CONTROL DATA CORP. "BASEPLATE II USER MANUAL" REVISION 1.05, 1982.

PREPARER: JOE STOICA DATE: 8-26-83
REVIEWER: C.J. McDonnell DATE: 8/26/83

```
*************************************************************************
*
                    preprocessor input data cards
*
*************************************************************************

          1         2         3         4         5         6         7
1234567890 2345678890 2345678890 2345678890 2345678890 2345678890 2345678
```

3 title is baseplate anal. support rcic-15 rev. 6, iso rcic-659-7.10 rev.6#0

out	1*	0	0*	-1	0*	3	0*	0	0*	0	0*	0	0*
con	0*	0	0*	0.000*	3500.000*	0.000*	0.000*	0.000*	0.(
pla	11*	11	0*	21.000*	19.000*	1.000*	0.000*	0.000*	0.(
bpr	0*	0	1*	980.e3*	302.e3*	4060.*	4420.*	0.*	
bpr	0*	0	2*	840.e3*	250.e3*	2510.*	3070.*	0.*	
bol	10*	2	1*	19.375*	1.375*	0.000*	0.000*	0.000*	0.(
bol	10*	6	1*	19.375*	9.750*	0.000*	0.000*	0.000*	0.(
bol	6*	10	1*	10.500*	16.875*	0.000*	0.000*	0.000*	0.(
bol	10*	10	1*	19.375*	17.000*	0.000*	0.000*	0.000*	0.(
con	1*	4	0*	0.000*	4.500*				
con	3*	3	0*	3.250*	2.375*				
con	5*	5	0*	7.375*	5.375*				
con	7*	5	0*	13.375*	5.375*				
con	9*	3	0*	18.000*	2.750*				
con	4*	6	0*	4.750*	8.375*				
con	7*	6	0*	13.375*	8.375*				
con	5*	7	0*	7.375*	11.375*				
con	7*	7	0*	0.000*	0.000*				
con	3*	9	0*	2.250*	16.250*				
con	6*	9	0*	10.500*	16.000*				
con	9*	9	0*	18.625*	16.250*				
con	11*	9	0*	21.000*	16.250*				
con	4*	4	0*	5.313*	3.875*				
con	8*	4	0*	15.688*	4.063*				
con	4*	8	0*	4.813*	13.813*				
con	8*	8	0*	16.000*	13.813*				
con	9*	6	0*	17.750*	9.375*				
end									
tub	6*	6	1*	10.375*	8.375*	0.000*	0.000*		
sti	3*	3	2*	3.000*	0.000*	0.000*	.750*		
sti	9*	3	2*	4.000*	0.000*	0.000*	.750*		
sti	3*	9	2*	-4.000*	0.000*	0.000*	.750*		
sti	9*	9	2*	-3.000*	0.000*	0.000*	.750*		
end									
poi	6*	6	0*	0.000*	0.000*	0.000*			
loa	0*	0	1*	1386.*	-1422.*	843.*	-16823.*	28413.*	1568
loa	6*	0	2*	-110.*	-1422.*	460.*	-22404.*	-2299.*	-12(
loa	0*	0	3*	-217.*	-1990.*	0.*	-40795.*	-4449.*	-245
loa	0*	0	4*	211.*	-1990.*	0.*	-40795.*	4324.*	239
md									

"end" of j

```
**********************************************************************
*
*     baseplate anal. support rcic-15 rev. 6, iso rcic-659-7.10 rev.6f0
*
**********************************************************************
```

input parameters

plate thickness	1.000
plate x-dimension	21.000
y-dimension	19.000
modulus of elasticity ...	28.e6
concrete modulus	3.37e6
conc. comp. strength	3500.

bolt locations

bolt	i	j	stan node	x-coord.	y-coord.
1	2	3	14	1.500	2.375
2	10	2	101	19.375	1.375
3	10	6	105	19.375	9.750
4	2	10	21	1.500	17.500
5	6	10	45	10.500	16.875
6	10	10	109	19.375	17.000

bolt properties

bolt	stiffness (lb/in.)		allowable force (lb)	
	tension	shear	tension	shear
1	980.e3	302.e3	4060.	4420.
2	980.e3	302.e3	4060.	4420.
3	980.e3	302.e3	4060.	4420.
4	840.e3	250.e3	2510.	3070.
5	980.e3	302.e3	4060.	4420.
6	980.e3	302.e3	4060.	4420.

ATTACH 1.0
(CONT'D)

```
**********************************************************************
*
*     baseplate anal. support rcic-15 rev. 6, iso rcic-659-7.10 rev.6F0
*
**********************************************************************
```

attachment data

attachment number 1

type	tub	property number	1
d dimension	6.000	i line number	6
b dimension	6.000	j line number	6
height	0.000	x-coordinate	10.375
thickness (t1) ..	.375	y-coordinate	8.375
thickness (t2) ..	.375	orientation angle ..	0.0

load conditions

load case no. 1

star node	122
force fx	1386.
force fy	-1422.
force fz	843.
moment mx	-16823.
moment my	-23419.
moment mz	15680.

load case no. 2

star node	122
force fx	-110.
force fy	-1422.
force fz	460.
moment mx	-22424.
moment my	-2255.
moment mz	-1244.

```
*****************************************************************************
*
*     baseplate anal. support rcic-15 rev. 6, iso rcic-659-7.10 rev.6f0
*
*****************************************************************************

          load case no.    3

             star node  122
             force  fx      -217.
             force  fy     -1990.
             force  fz         0.
             moment mx    -40795.
             moment my     -4449.
             moment mz     -2455.

          load case no.    4

             star node  122
             force  fx       211.
             force  fy     -1990.
             force  fz         0.
             moment mx    -40795.
             moment my      4326.
             moment mz      2387.
```

baseplate connectivity

element number	ja node	jb node	jc node	jd node	element number	ja node	jb node	jc node	n
1	1	12	13	2	2	2	13	14	
3	3	14	15	4	4	4	15	16	
5	5	16	17	6	6	6	17	18	
7	7	18	19	8	8	8	19	20	
9	9	20	21	10	10	10	21	22	
11	12	23	24	13	12	13	24	25	
13	14	25	26	15	14	15	26	27	
15	16	27	28	17	16	17	28	29	
17	18	29	30	19	18	19	30	31	
19	20	31	32	21	20	21	32	33	
21	23	34	35	24	22	24	35	36	
23	25	36	37	26	24	26	37	38	
25	27	38	39	28	26	28	39	40	
27	29	40	41	30	28	30	41	42	
29	31	42	43	32	30	32	43	44	
31	34	45	46	35	33	35	46	47	
33	36	47	48	37	34	37	48	49	
35	38	49	50	39	36	39	50	51	

baseplate anal. support rcic-15 rev. 6, iso rcic-659-7.10 rev.6F0

baseplate connectivity

element number	Ja node	Jb node	Jc node	Jd node	element number	Ja node	Jb node	Jc node	Jd node
37	40	51	52	41	38	41	52	53	42
39	42	53	54	43	40	43	54	55	44
41	45	56	57	46	42	46	57	58	47
43	47	58	59	48	44	48	59	60	49
45	49	60	61	50	46	50	61	62	51
47	51	62	63	52	48	52	63	64	53
49	53	64	65	54	50	54	65	66	55
51	56	67	68	57	52	57	68	69	58
53	58	69	70	59	54	59	70	71	60
55	60	71	72	61	56	61	72	73	62
57	62	73	74	63	58	63	74	75	64
59	64	75	76	65	60	65	76	77	66
61	67	78	79	68	62	68	79	80	69
63	69	80	81	70	64	70	81	82	71
65	71	82	83	72	66	72	83	84	73
67	73	84	85	74	68	74	85	86	75
69	75	86	87	76	70	76	87	88	77
71	78	89	90	79	72	79	90	91	80
73	80	91	92	81	74	81	92	93	82
75	82	93	94	83	76	83	94	95	84
77	84	95	96	85	78	85	96	97	86
79	86	97	98	87	80	87	98	99	88
81	89	100	101	90	82	90	101	102	91
83	91	102	103	92	84	92	103	104	93
85	93	104	105	94	86	94	105	106	95
87	95	106	107	96	88	96	107	108	97
89	97	108	109	98	90	98	109	110	99
91	100	111	112	101	92	101	112	113	102
93	102	113	114	103	94	103	114	115	104
95	104	115	116	105	96	105	116	117	106
97	106	117	118	107	98	107	118	119	108
99	108	119	120	109	100	109	120	121	110

```
OUT  1,Φ,Φ,Φ,-1,3/
CON  ,,,,3500/
PLA 11,11,,21.,19.,1./
APR  ,,1,6.,6.,.375,.375/
BPR  ,,1,9800000,3020000,4060,4420/
BPR  ,,2,8400000,2500000,2510,3070/
BOL  2,3,1,1.5,2.375/
BOL 10,2,1,19.375,1.375/
BOL 10,6,1,19.375,9.75/
BOL  2,10,2,1.5,17.5/
BOL  6 10,1,10.5,16.875/
BOL 10,10,1,19.375,17.0/
CON  1,4,,0.,4.5/
CON  3,3,,3.25,2.375/
CON  5,5,,7.375,5.375/
CON  7,5,,13.375,5.375/
CON  9,3,,18.,2.75/
CON  4,6,,4.75,8.375/
CON  7,6,,13.375,8.75/
CON  5,7,,7.375,11.75/
CON  7,7,,13.375,11.75/
CON  2,9,,2.25,16.25/
CON  6,9,,10.5,16./
CON  9,9,,18.625,16.25/
```

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CON 11,9,,21.,15.25/
CON 4,4,,5.313,4.063/
CON 8,4,,15.688,4.063/
CON 4,8,,4.813,14./
CON 8,8,,16.,13.813/
CON 9,6,,17.75,9.375/
END /
TUB 6,6,1,10.375,8.75/
STI 3,3,2,3.0,,,.75/
STI 9,3,2,4.0,,,.75/
STI 3,9,2,-4.0,,,.75/
STI 9,9,2,-3.0,,,.75/
END /
POI 6,6/
LOA ,,1,1386,-1422,843,-16823,+28413 +15680/
LOA ,,2,-110,-1422,460,-22424,-2255,-1244/
LOA ,,3,-217,-1990,0,-40795,-4449,-2455/
LOA ,,4,+211,-1990,0,-40795,+4326,+2387/
END /
END OF JOB
```

SWEC ENGINEERING REVIEW CHECKLIST

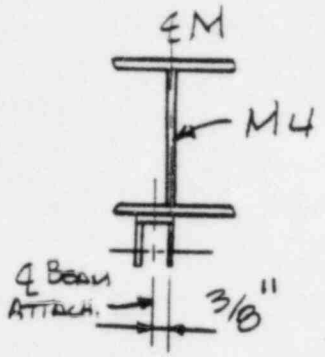
HANGER DRAWING NO.	REV.	INSPECTION TEAM	LEGEND:
RFW-177	4FO	S JACOB J MENDEZ	A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE
ISOMETRIC NO. REV.	CHANGE DOCUMENT		
RFW-438-1.2	PED 215-H-G668		

CHECKLIST ITEMS	STATUS N/A	A	D	COMMENTS
1. General				
A. Support Location	✓			AS BUILT ISO NOT AVAILABLE
B. Support Orientation		✓		
C. Catalog Items		✓		
D. Close Clearance Gaps	✓			
2. Support Structure				
A. Critical Dimensions			✓	SEE NOTE 1
B. Member sizes, structural plates		✓		
3. Struts and Snubbers				
A. Pin to Pin Dims., Snubber Setting	✓			
B. Paddle - Pin Assembly Connections	✓			
4. Baseplates				
A. Plate & Gusset sizes		✓		
B. Bolt size & type		✓		
C. Bolt hole spacing		✓		
D. Attachment location		✓		
E. Bolt spacing to adjacent inserts		✓		
5. Lugs - Bearing Surface	✓			
6. Welding				
A. Size, length, quality		✓		
B. Symbols		✓		
7. Miscellaneous (specify)	✓			

SWEC ENGINEERING REVIEW CHECKLIST

Notes:

NOTE 1 - ATTRIBUTE 2A BEAM ATTACHMENT IS ECCENTRIC TO M4.



Results of Evaluation:

_____ No deviations noted.

0 Deviations evaluated as acceptable by inspection team.

I Deviations require further evaluation.

ATTRIBUTE 2A

Steven P. Jacob 8-3-83
Signature Date

Disposition of deviations subject to further evaluation:

DEVIATION - ATTRIBUTE 2A FOUND ACCEPTABLE - SEE EVALUATION FORM ATTACHED.

953

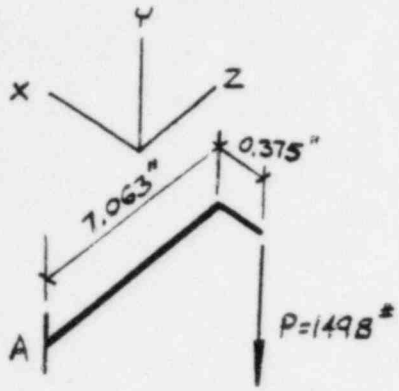
W. Robert Evans 08-24-83
Signature Date

Bruce Fischer 8/25/83

EVALUATION OF SUPPORT NO. RFW-177 REV. 4FO

ISOMETRIC NO. RFW-438-1.2 REV. ____

EVALUATION OF DEVIATION - ATTRIBUTE "2A".

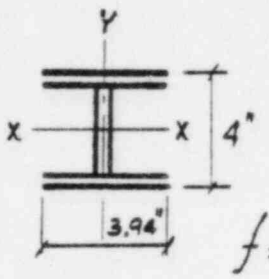


FORCES & MOMENTS @ PT. A
(LOAD FROM CALC 8.14.14BB)

$F_x = 0$
$F_y = 1198 \times 1.25$ (LOAD FACTOR) $= 1498\#$
$F_z = 0$
$M_x = 1498\# \times 7.063' = 10577$ in-#
$M_y = 0$
$M_z = 1498\# \times 0.375" = 562$ in-#

DUE TO INSIGNIFICANT MOMENT M_z AND RELATIVELY BIG SECTION PROPERTIES FOR MEMBER M14x3 SHEAR STRESS IN EXISTING MEMBER CONSIDERED AS NEGLIGIBLE BY ENGINEERING JUDGEMENT.
THEREFORE DEVIATION REQUIRES ONLY WELD SIZE CHECK AT POINT OF CONNECTION OF ITEM #4 & BASE PLATE, ITEM #1 AND CHECK ON BASE PLATE.

CHECK ON WELD @ PT. A (REF. 2)



AS-BUILT WELD IS 1/4 ALL AROUND.
FOR WELD TREADED AS LINE - SECTION PROPERTIES:
$A = 23.76$ $S_{w_x} = 36.85$ $J_w = 94.1$ $C_y = 2.0$

FORCE ON WELD

$$f = \sqrt{\left(\frac{M_x}{S_{w_x}}\right)^2 + \left(\frac{F_y}{A} + \frac{M_z \cdot C_y}{J_w}\right)^2} = \sqrt{\left(\frac{10577}{36.85}\right)^2 + \left(\frac{1498}{23.76} + \frac{562 \times 2.0}{94.1}\right)^2} =$$

$= 297$ #/in

$$t = \frac{f}{0.707 \times S_y} = \frac{297}{0.707 \times 18000} = 0.023 < 1/4 \text{ O.K.}$$

REFERENCES

1. CALC. NO. 8.16.658 & 8.14.14BB
2 BLODGETT "DESIGN OF WELDED STRUCTURES"
3 AISC MANUAL - 8TH EDITION.

PREPARER: W. Poky Sheesley DATE: 08-24-83

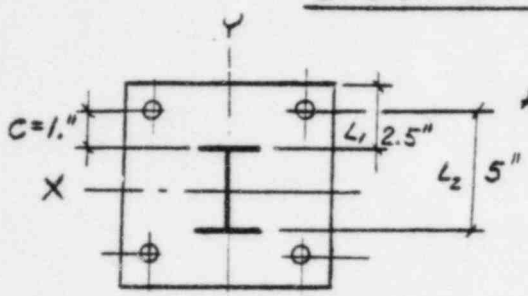
REVIEWER: Bruce Fischer DATE: 8/25/83

EVALUATION OF SUPPORT NO. RFW-177 REV. 4F0

ISOMETRIC NO. RFW-438-1.2 REV. ____

(CONT. FROM PG 1 OF 2)

CHECK ON BASE PLATE & ANCHOR BOLTS



BASE PLATE ½" × 9" × 9"

ANCHOR BOLTS ½" HVY. HEX. MACH BOLTS (HILTI DROP-IN)

$T_a = 2110$ $S_a = 1960$

$\frac{L_1}{t} = \frac{2.5"}{0.5} = 5.0 > 2$;

$S_x = \frac{M_z Y_i}{4(x^2 + y^2)} = \frac{562 \times 3}{4(3^2 + 3^2)} = 23\#$

$S_y = \frac{M_z \times X_i}{4(x^2 + y^2)} + \frac{F_y}{4} = \frac{562 \times 3}{4(3^2 + 3^2)} + \frac{1498}{4} = 398\#$

$S = \sqrt{S_x^2 + S_y^2} = \sqrt{23^2 + 398^2} = 399\#$

$\frac{S}{S_a} = \frac{399}{1960} = 0.203$; $P_{max} = LFM(P_{mx})$ $\frac{L_2}{t} = \frac{5.0}{0.5} = 10.0$ → LFM = 1

$P_{mx} = \frac{M_x \cdot L_2}{2L_2^2} = \frac{10577 \times 5}{(2) \times 5^2} = 1058\#$;

$P_{max} = 1058\#$ $P_{AL} = T_a\left[1 - (S/S_A)^{3/3}\right]^{3/5} = 2020\#$

$\frac{P_{max}}{P_{AL}} = \frac{1058}{2020} = 0.52 < 1.0$ → calculate $T_{eq.} = \left(\frac{6 M_y}{b_{EFF} \times G_{AL}}\right)^{1/2}$

$M_x = T \times C \times N$; $T = \frac{M_x L_2}{2 \times L_2^2} = \frac{10577 \times 5}{2 \times 5^2} = 1058$; $C = 1.0"$; $N = 2$

$M_x = 1058 \times 1.0 \times 2 = 2116$ in-# $b_{EF} = 0.66 \times 5 + 4.0 = 7.3$

$G_{AL} = 0.75 S_y = 27000$ [Ref 2] $T_{eq} = \left(\frac{6 \times 2116}{7.3 \times 27000}\right)^{1/2} = 0.25" < ½"$

BASE PLATE IS O.K

REFERENCES

1. STRUCTURAL EVALUATION PROGRAM (SD-STEP) - PROCEDURE FOR EVALUATION OF BASE PLATE. S&W NO. SDM-79-24
2. ASME III, SUBSECTION NF, APP. F

PREPARER: W. Foley/Stanley DATE: 08-24-83

REVIEWER: Bruce Fischer DATE: 8/25/83

SWEC ENGINEERING REVIEW CHECKLIST

HANGER DRAWING NO.	REV.	INSPECTION TEAM	LEGEND:
RWCU-1C-2PS-[redacted]	3F0	W. POKRYSHESKY R. EWART	A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE
ISOMETRIC NO. REV. 6	CHANGE DOCUMENT		
ECCI-212-37A.			

CHECKLIST ITEMS	STATUS N/A	A	D	COMMENTS
1. General				
A. Support Location		✓		
B. Support Orientation		✓		
C. Catalog Items			✓	6" PIPE CLAMP IN FIELD AS NOTED IN BILL OF MATERIAL
D. Close Clearance Gaps	✓			
2. Support Structure				
A. Critical Dimensions			✓	℄ DISTANCE W14X142 TO ℄ STRUT 1'-4 3/4"
B. Member sizes, structural plates		✓		
3. Struts and Snubbers				
A. Pin to Pin Dims., Snubber Setting		✓		
B. Paddle - Pin Assembly Connections		✓		
4. Baseplates N/A				
A. Plate & Gusset sizes	✓			
B. Bolt size & type	✓			
C. Bolt hole spacing	✓			
D. Attachment location	✓			
E. Bolt spacing to adjacent inserts	✓			
5. Lugs - Bearing Surface N/A	✓			
6. Welding				
A. Size, length, quality			✓	5/16" Fillet Specified 1/4" MEASURED
B. Symbols		✓		
7. Miscellaneous (specify)		✓		ITEM #3 SHOWN ON BILL OF MATERIAL BUT NOT CALLED OUT ON SKETCH

SWEC ENGINEERING REVIEW CHECKLIST

Notes: 1. CRITICAL DIMENSION DISCREPANCY SEE Pg 2 of 2

2. FILLET WELD SIZE DISCREPANCY SEE PAGE 2 OF 2

3. PIPE CLAMP BAR STOCK DISCREPANCY SEE PAGE 2 OF 2

Results of Evaluation:

N/A No deviations noted.

Ø Deviations evaluated as acceptable by inspection team.

3 Deviations require further evaluation.

R. D. Ewart 7-23-83
Signature Date
D. Foley Sheesley

Disposition of deviations subject to further evaluation:

ABOVE DEVIATIONS ARE FOUND TO BE ACCEPTABLE.
SEE ATTACHED EVALUATION SHEET.

1154

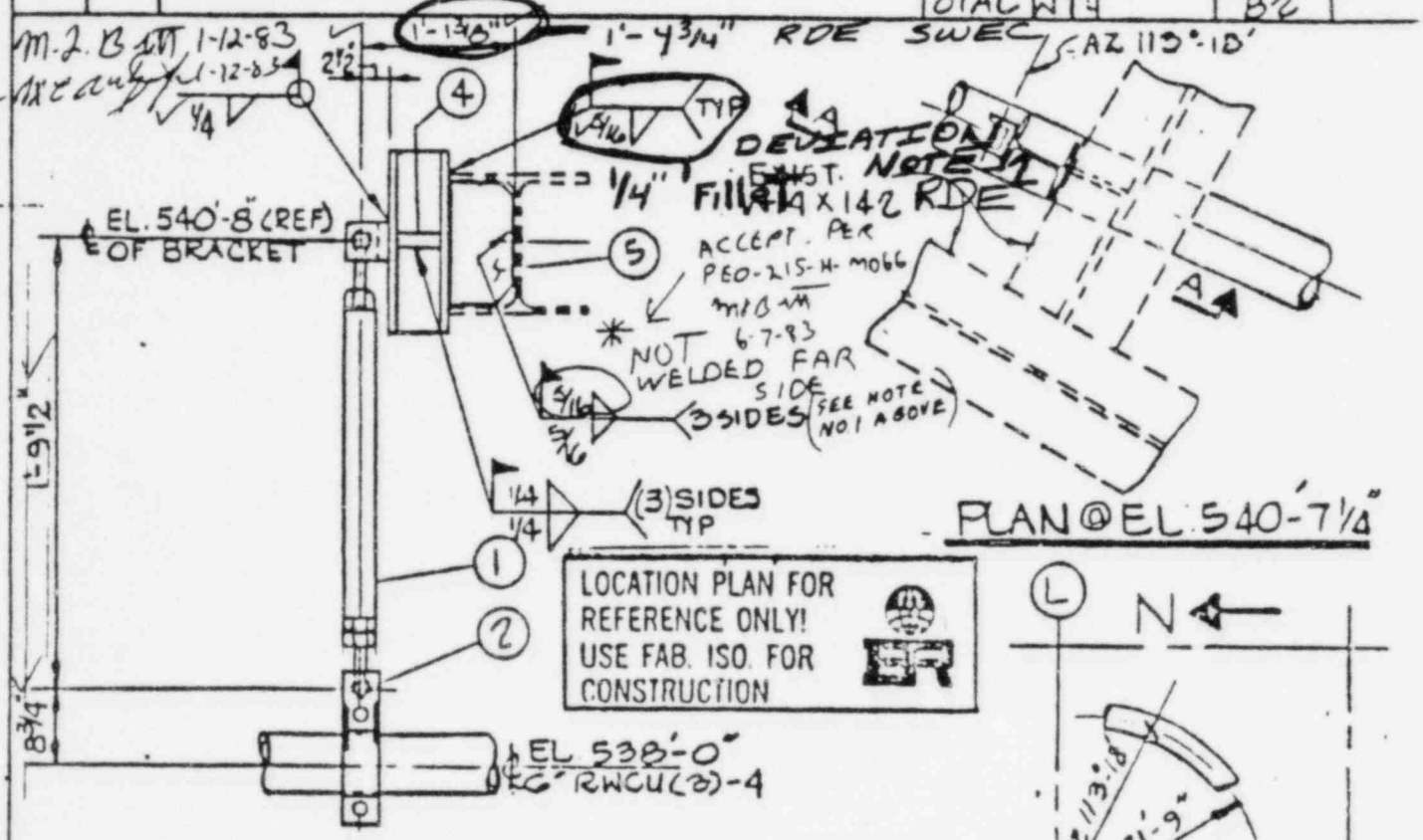
E. de Guzman 8/5/83
Signature Date

ATTACHMENT TO CHECKLIST

NOTE 1 FOR H&R Results of Review by Mike Dean of B+R Eng.
RWCU-1C-2PS ACCEPT AS IS" ANOPEO-215-H-M066 T. Taylor Feb 2/83.

* THIS STIFFENER IS WELDED ON THE WEST SIDE ONLY. THE EAST SIDE IS NOT WELDED AND IS NOW INACCESSIBLE FOR WELDING DUE TO ANOTHER STIFFENER LOCATED APPROX. 1" TO THE EAST.

ITEM NO	QUAD.	SIZE - DESCRIPTION	ASTM	WT.	
		RDE-SWEC NOTE 3 - ACTUAL BAR STOCK			
1	1	RIGID SWAY STRUT SIZE 15 FIG. 050 x 0'-8"		8	
2	1	6" Ø PIPE CLAMP M-502		21	
3	1	WC6 x 25 x 1'-6" LG (CUT TO SUIT)	A-36	38	
4	2	STIFF. PL 1/4" x 1 7/8" x 0'-5 7/16"	A-36	2	
5	1	STIFF PL 1/2" x 7 3/8" x 1'-0 5/8"	A-36	13	
		DEVIATION - NOTE 1			
			TOTAL WT:	82	



SECT. A-A

B&R 150 M200-36
DATA PT. 215, PG 2(LY)

1155

LOCATION PLAN

THERMAL MVTS.	PIPE	STRUCT.	NET
Dx	.976"N	.039"S	1.015"N
Dy	.453"UP	.453"UP	.000"UP
Dz	.558"E	.101"E	.457"E

ZONE: R-57	OP LD: -122#		HYDRO LD: -122#
THERMAL LD.: VERT: +730#	N-S: —	E-W: —	
SEISMIC LD.: VERT: ±1043#	N-S: —	E-W: —	
CODE/CLASS: III/1	GROUP: 1		O.A. LEVEL: I
PAINT: III	PIPE CALC.: 8.14.135		STL CALC.: 8-16-240
PIPING SYSTEM: REACTOR WATER CLEAN UP	REF. DWG. ISO.: RWCU-B12-3.7F		
	PIPING: M-713		

REV	REVISION	DATE	CHK	APVD
2	REVD BY B&R & IN ACCORDANCE W/WBG STATUS AS-BUILT	7/19/82	TC	HDE

DRWN [illegible] CHKD [illegible] SCALE NTS

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
HANFORD NO. 2 | 204.1 | 164

DRAWING NO. RIACU-1C-2PS

EDIN ACCORD SWP-PP-6.

ICE

EVALUATION OF SUPPORT NO. RWCU-1C-2PS REV. 3FD

ISOMETRIC NO. RWCU-812-3.7 REV. 6

NOTES: 1) BURNS & ROE DRWG. # M-200 SHT #36 & 36A HAS BEEN REVIEWED FOR DISCREPANCIES BETWEEN AS-ANALYZED & AS-BUILT PIPING CONFIGURATIONS. IT IS JUDGED THAT ANY SUCH DISCREPANCIES DO NOT SIGNIFICANTLY AFFECT CALCULATED SUPPORT LOADS.

MODIFIED LOAD

$F_+ = (730 + 2291 - 122) \times 1.25 = 3624^{\#}$ ↑

$F_- = (122 + 2291) \times 1.25 = 3016^{\#}$ ↓

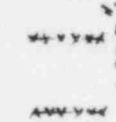
ANALYSIS / CONCLUSION

① PIPE CLAMP (DEVIATION 1C),
FROM REF. #4, FOR 6"Ø PIPE CLAMP, STOCK SIZE = 1/2" x 2 1/2"
$P_{ALLOW.} = 4960^{\#}$

RATIOING (FOR 1/2"x2") $P = 4960 \times \frac{2}{2.5} = 3968^{\#}$ APPROV. $> 3624^{\#}$, ok

② CRITICAL DIMENSIONS (DEVIATION 2A);
NEW DIMENSION (1'-4 3/4") WILL NOT AFFECT STRUCTURAL INTEGRITY OF PIPE SUPPORT, HENCE ok.

③ 1/4" FILLET (DEVIATION 6A);



$A = 12"$

$S_W = 6 \times 12.375 = 74.25$

$P = 3624^{\#}$

$M = 3624 \times (6.375 + 2.5) = 32.163^{"-\#}$

$f_1 = \frac{3624}{12} = 302$

$f_2 = \frac{32163}{74.25} = 433$

$f_R = 528^{\#/"}$

$q = \frac{528}{1/4 \times 0.707} = 2987$ psi, SMALL, HENCE ok.

REFERENCES:
① Iso. RWCU-812 3.7 REV. 6.
② Iso. M200, SHT 36 REV. 7 and SHT. 36A REV 0
③ HANGER DWNG. RWCU-1C-2PS REV. 3FD
④ NPS CATALOG 1981, P. P21.

PREPARER: E. de Guzman 8/15/83

REVIEWER: Joseph D. Mijka 8-8-83

BURNS AND ROE, INC.
Headquarters Office—Oradell, N.J.

W.O. No. 3900-75 Date 11/29/81 Book No. 8.16.30A Page No.
Drawing No. PWCV-1C.-2PS Calc. No. 8.16.3409 Sheet 3 Cont. on Sheet 4
By P Bradley Checked DJK Approved
Title APOSS NP2 PIPE SUPPORT REVISED/REDESIGN PS MARK NO. PWCV-1C-2PS

(1) CALC. 8.14.135, REV. 6; BK 8.14.135 ✓

LOADING CONDITIONS:

REV. 1 BY J. Baird 7/8/82
CHKD [illegible] 7/12/82

LOAD TYPE		POUNDS (1)			POUNDS-FT.		
		Fx	Fy	Fz	Mx	My	M±
Thermal			~~730~~ ~~±500~~				
Dead Wt.			122 ~~±~~				
Misc.			—				
DYNAMIC LOADS	Normal		~~±1500~~ 1048				
	Emerg.		~~±1500~~ 1263				
	Faulted		~~±3000~~ 2291				
TOTAL LOADS	Normal		~~+2000~~ -1000	1900 -926			
	Emerg.		~~+2000~~ ~~-1000~~	+2115 -1141			
	Faulted		~~±3000~~	+2413 -2169			
ORIGINAL SUPPORT DESIGN LOADS	Normal		+2000 -1000				
	Emerg.		+2000 -1000				
	Faulted		±3000				

(1) THERMAL MOVEMENTS:

Δ_X = 0.9[illegible] Δ_Z = .55[illegible]

1157

SWEC ENGINEERING REVIEW CHECKLIST

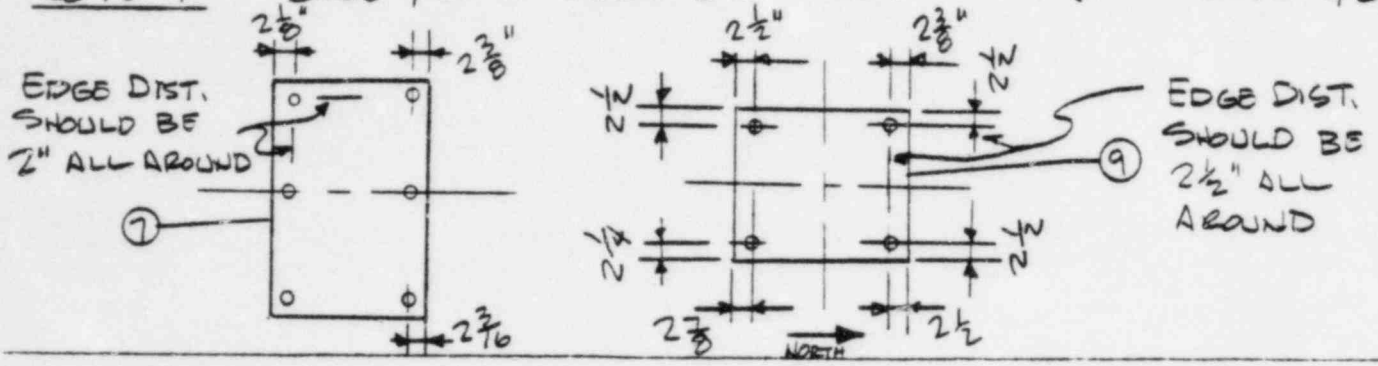
HANGER DRAWING NO.	REV.	INSPECTION TEAM	LEGEND:
SGT 901N	1 FO	S JACOB J MENDEZ	A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE
ISOMETRIC NO. REV. 9 FO SGT-62.3-4.7	CHANGE DOCUMENT PED-215-H-P876		

CHECKLIST ITEMS	STATUS N/A	STATUS A	STATUS D	COMMENTS
1. General				
A. Support Location		✓		
B. Support Orientation		✓		
C. Catalog Items		✓		
D. Close Clearance Gaps	✓			
2. Support Structure				
A. Critical Dimensions		✓		
B. Member sizes, structural plates		✓		
3. Struts and Snubbers				
A. Pin to Pin Dims., Snubber Setting		✓		
B. Paddle - Pin Assembly Connections		✓		
4. Baseplates				
A. Plate & Gusset sizes		✓		
B. Bolt size & type		✓		
C. Bolt hole spacing			✓	SEE NOTE 1
D. Attachment location			✓	SEE NOTE 2
E. Bo spacing to adjacent inserts		✓		
5. Lugs - Bearing Surface	✓			
6. Welding				
A. Size, length, quality		✓		
B. Symbols		✓		
7. Miscellaneous (specify)	✓			

SWEC ENGINEERING REVIEW CHECKLIST

Notes:

NOTE 1: BASE PLATE EDGE DISTANCES VARY (ATTRIBUTE 4C)



Results of Evaluation:

_____ No deviations noted.

0 Deviations evaluated as acceptable by inspection team.

2 Deviations require further evaluation.

ATTRIBUTES 4C & 4D

Steven P. Jurk 8-8-83
Signature Date

Disposition of deviations subject to further evaluation:

See attached pages. Evaluations 4C & 4D judged acceptable. Load factor is not applied.

1177

E. Gallman 8/22/83
Signature Date

E. de Guzman 8/22/83
Reviewer

STONE & WEBSTER ENGINEERING CORPORATION

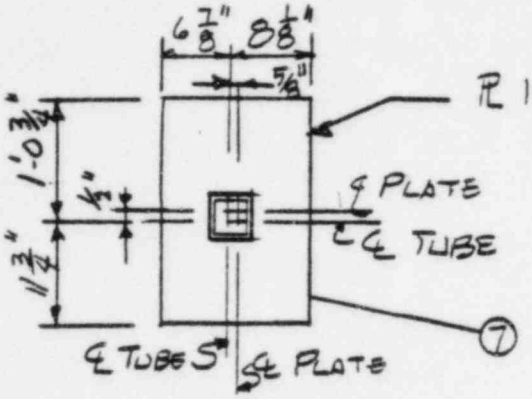
CALCULATION SHEET

▲5010.85 ATTACHMENT TO SWEC REVIEW CHECKLIST FOR HGR SGT 9.01N REV 1F0

CALCULATION IDENTIFICATION NUMBER				SHT. 1 OF 1 PAGE ___
J.O. OR W.O. NO.	DIVISION & GROUP	CALCULATION NO.	OPTIONAL TASK CODE	

NOTE 2: ATTRIBUTE 4D

ATTACHMENT OF TUBES TO BASE PLATES IS AS INDICATED



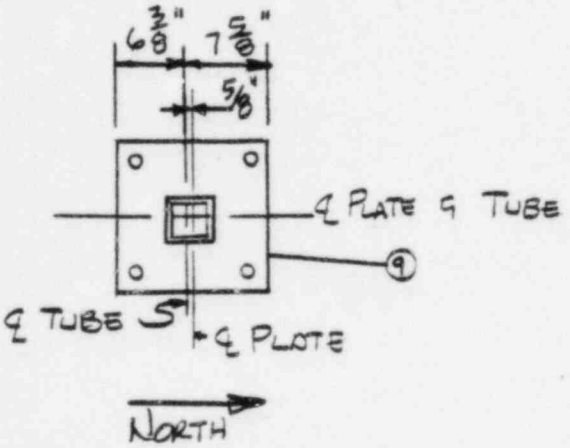


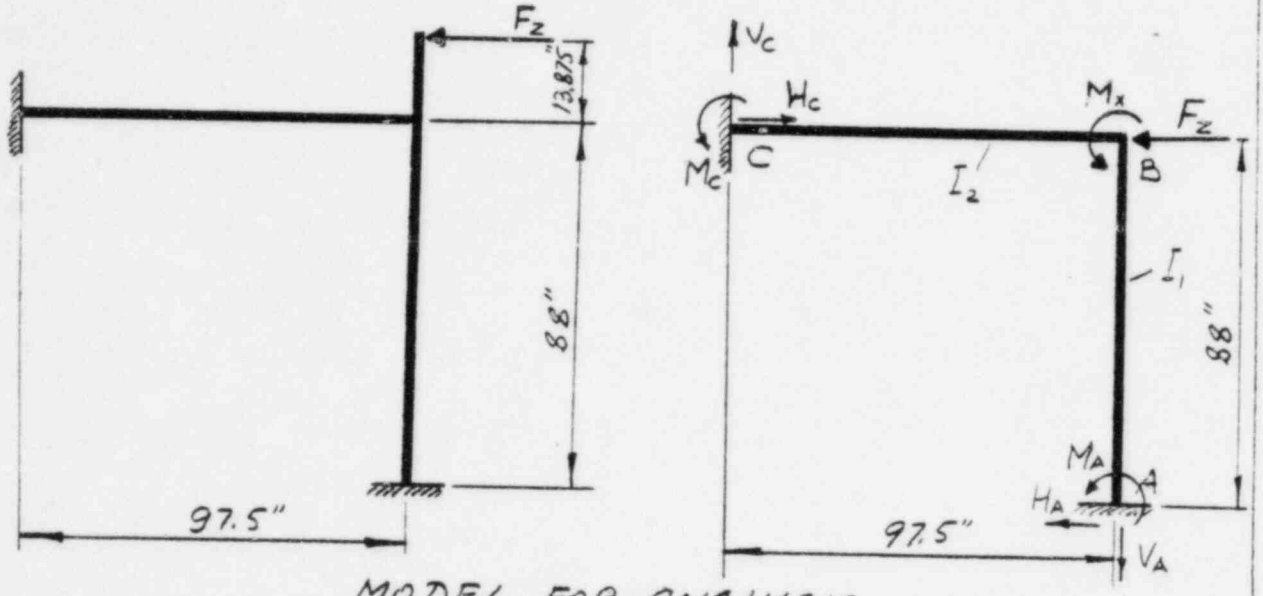
PLATE ⑨ ATTACHMENT DEVIATIONS WERE PREVIOUSLY ACCEPTED PER H-501 WHICH ALLOWS ECCENTRICITY UP TO 1"

SWEC ALLOWANCES ARE ± 1/4"

117S

EVALUATION OF SUPPORT NO. SGT-901N REV. 1FO
ISOMETRIC NO. SGT-62.3-4.7 REV. 9FO

CHECK LOADS @ BASE ℄ (REF 1)



MODEL FOR ANALYSIS

REACTIONS @ NODES 'A' & 'C'

1) FROM MOMENT M_x

$K = \frac{I_2}{I_1} \times \frac{h}{l} = \frac{h}{l} = \frac{88}{97.5} = .9$ ($I_1 = I_2$ Ref. 2) $N = K + 1 = .9 + 1 = 1.9$

$F_z = 8617\#$ (Ref 3) $M_x = F_z \times 13.875 = 119{,}561\#\text{-in}$

$M_{B_1} = \frac{M}{N} = \frac{119561}{1.9} = 62{,}927\#\text{-in}$ $M_{B_2} = \frac{M \times K}{N} = \frac{119561 \times (.9)}{1.9} = 56{,}634\#\text{-in}$

$M_A = \frac{M_{B_1}}{2} = \frac{62927}{2} = 31464\#\text{-in}$ $M_C = \frac{M_{B_2}}{2} = \frac{56634}{2} = 28317\#\text{-in}$

$V_A = V_C = \frac{3M_C}{l} = \frac{28317}{97.5} = 871\#$ $H_A = H_C = \frac{3M_A}{h} = \frac{3 \times 31464}{88} = 1073\#$

REFERENCES

1. A. Kleinlogel "Rigid frame formulas"
2. AISC "STEEL CONSTRUCTION MANUAL"
3. B & R PIPE SUPPORT LOADS.
4. SWEC, SD-STEP-4, Rev. 1, nov 1979
5. SUPPORT dwg SGT-901N Rev 1FO
6. PIPING ISO SGT-62.3-4.7 Rev 9FO
7. SPEC CHANGE FCD CO206-H-0145
8. ASME III, SECTION "F", app. 1

PREPARER: A. Golik DATE: 8/22/83

REVIEWER: E. de Guzman DATE: 8/22/83

EVALUATION OF SUPPORT NO. SGT-901N REV. 1FO
ISOMETRIC NO. SGT-62.3-4.7 REV. 9FO

2) FROM FORCE F_Z

$H_C = F_Z = 8617\#$ $H_A = 0$ $V_A = V_C = 0$ $M_A = M_C = 0$

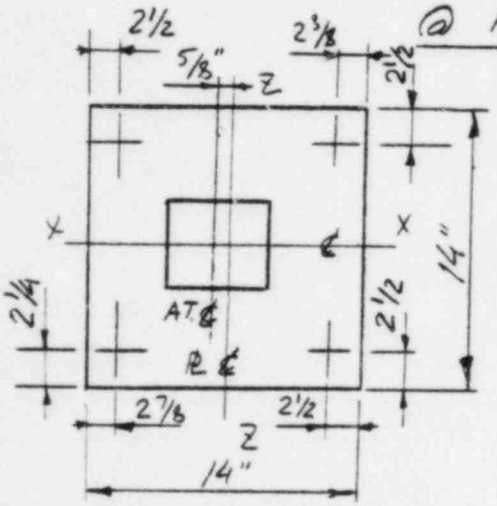
3) TOTAL REACTIONS @ NODES 'A' & 'C'.

$H_A = 1073\#$ $H_C = 1073 + 8617 = 9690\#$

$V_A = 871\#$ $V_C = 871\#$

$M_A = 31464\#\text{-in}$ $M_C = 28317\#\text{-in}$

CHECK BASE PL & ANCHOR BOLTS (Ref. 4) @ NODE 'A'



$F_x = 0$ $F_y = 871\#$ $F_z = 1073\#$

$M_x = 31464\#\text{-IN}$ $M_y = M_z = 0$

$P_T = \frac{F_y}{N} = \frac{871}{4} = 218\#$ LFT = 1.0

$P_{m_x} = \frac{M_x}{N_1 \times l_2} = \frac{31464}{2 \times 7} = 2247\#$ LFM = 1.0

$P_{max} = P_T + P_{m_x} = 218 + 2247 = 2465\# < 8740\#$ (Ref. 7)

*$S = \frac{F_z}{N} = \frac{1073}{4} = 268\# < 6090\#$ (Ref. 7)

$\left(\frac{2465}{8740}\right)^{5/3} + \left(\frac{268}{6090}\right)^{5/3} = .127 < 1.0$ ∴ O.K.

$b_{eff} = 0.66 \times 7 + 5 = 9.62\text{ IN}$ $M = P_{max} \times l_1 \times N = 2465 \times 4.5 \times 2 = 22185\#\text{-IN}$

$T_{req'd} = \left(\frac{6M}{b_{eff} \times \sigma_{AL}}\right)^{1/2} = \left(\frac{6 \times 22185}{9.62 \times 27000}\right)^{1/2} = 0.72\text{IN} < 1.0$ ∴ O.K.

Ref. 8

REFERENCES (see p. 1)

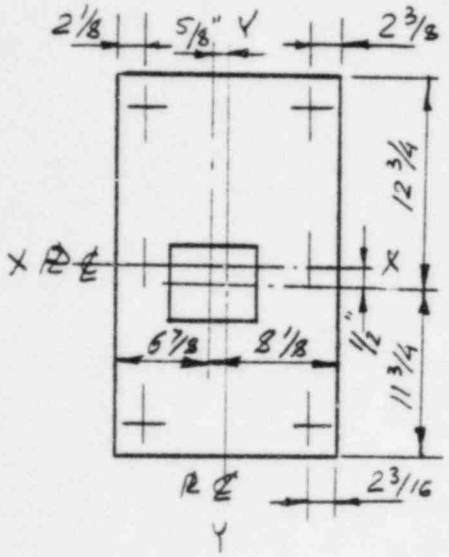
PREPARER: S. Jolton DATE: 8/22/83

REVIEWER: E. de Guzman DATE: 8/22/83

* Neglect 5/8" eccentricity due to small loads values

EVALUATION OF SUPPORT NO. SGT-90/N REV. 1FO
ISOMETRIC NO. SGT-62.3-4.7 REV. 9FO

CHECK BASE PL & ANCHOR BOLTS @ NODE 'C' (REF 4)



$F_x = 0 \quad F_y = 871\# \quad F_z = 9690\#$

$M_x = 28{,}317\#\text{-IN} \quad M_y = M_z = 0$

$P_T = \frac{F_z}{N} = \frac{9690}{6} = 1615\#$

$P_{mx} = \frac{M_x}{N_1 e_2} = \frac{28317}{2 \times 12.25} = 1156\#$ (conservative direction)

$\frac{L_2}{t} = \frac{13.25}{1} = 13.25 \quad \frac{L_1}{t} = \frac{8.25}{1} = 8.25$

$LFM = 1.4 \quad LFT = 1.3$

$P_{max} = 1.4 \times 1156 + 1.3 \times 1615 = 3718\# < 8740\#$ (Ref. 7)

*$S = \frac{F_y}{N} = \frac{871}{6} = 145\# < 6090\#$ (Ref 7)

$\left(\frac{3718}{8740}\right)^{5/3} + \left(\frac{145}{6090}\right)^{5/3} = .24 < 1.0 \therefore$ O.K

$b_{eff} = 0.66 \times 12.25 + 5 = 13.1$ IN $\quad P = P_T + P_{mx} = 1615 + 1158 = 2771\#$

$M = P \times C_1 \times N_1 = 2771 \times 7.25 \times 2 = 40180\#\text{-IN}$

$T_{req'd} = \left(\frac{6M}{b_{eff} \times \sigma_{AL}}\right)^{1/2} = \left(\frac{6 \times 40180}{13.10 \times 27000}\right)^{1/2} = .83\text{ IN} < 1.0 \quad \therefore$ O.K

Ref 8

REFERENCES

See p. 1

PREPARER: S. Gallerz DATE: 8/22/83

REVIEWER: E. de Guzman DATE: 8/22/83

* Neglect 5/8" eccentricity due to small loads values

SWEC ENGINEERING REVIEW CHECKLIST

HANGER DRAWING NO.	REV.	INSPECTION TEAM	LEGEND:
VR-5	2FO	JOE STOKES BRUCE BRUNSDON	A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE

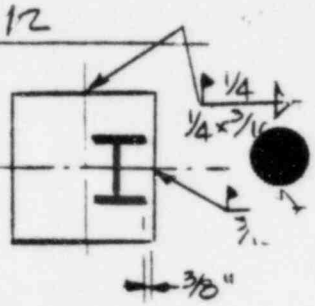
ISOMETRIC NO. REV.	CHANGE DOCUMENT
VR-6666-1.3 5FO	

CHECKLIST ITEMS	STATUS N/A	STATUS A	STATUS D	COMMENTS
1. General				
A. Support Location		✓		
B. Support Orientation		✓		
C. Catalog Items		✓		
D. Close Clearance Gaps		✓		
2. Support Structure				
A. Critical Dimensions		✓		
B. Member sizes, structural plates		✓		
3. Struts and Snubbers				
A. Pin to Pin Dims., Snubber Setting	✓			
B. Paddle - Pin Assembly Connections	✓			
4. Baseplates (PLATE WELDED TO EMBEDDED PLATE)				
A. Plate & Gusset sizes		✓		
B. Bolt size & type	✓			
C. Bolt hole spacing	✓			
D. Attachment location			✓	SEE NOTE 1 AND SKETCH ON SHT. 2 OF 2
E. Bolt spacing to adjacent inserts	✓			
5. Lugs - Bearing Surface		✓		
6. Welding				
A. Size, length, quality			✓	SEE NOTE 2 & 3 ON BACK.
B. Symbols		✓		
7. Miscellaneous (specify)	✓			

1282

Notes: 1.) ATTACHMENT IS OFFSET ON PLATE AS SHOWN:

2.) WELD OF ITEM (1) TO EMBED. PL IS AS SHOWN: THIS VIOLATES MIN. WELD REQUIREMENTS OF CODES.



3) WELD BETWEEN BEAM ATTACHMENT AND C14x13 IS INADEQUATE. 3/8" GAP EXISTS BETWEEN THE TWO. WELDS ARE UNDERSIZED AND UNDERCUT. REFER TO ATTACHED SKETCH FOR DETAIL.

Results of Evaluation:

_____ No deviations noted.

_____ Deviations evaluated as acceptable by inspection team.

_____ _____
Signature Date

✓ Deviations require further evaluation:

SEE NOTES ABOVE

1283 — 7-21-83

DISPOSITION OF DEVIATIONS:

ANALYZED AND ACCEPTABLE

JOE STOKES — 7-21-83
Signature Date

Joseph D. Mijka — 8-8-83

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION SHEET

▲5010.65 ATTACHMENT TO SWEC REVIEW CHECKLIST FOR HGR VR-5 REV 2FO

CALCULATION IDENTIFICATION NUMBER				SHT 1 OF 1 PAGE ___
J.O. OR W.O. NO.	DIVISION & GROUP	CALCULATION NO.	OPTIONAL TASK CODE	

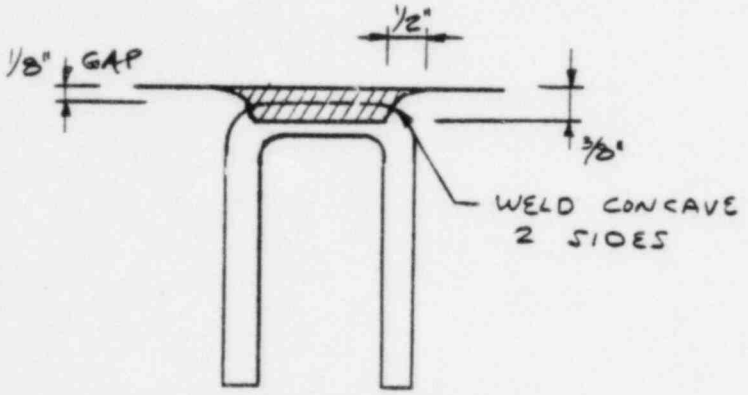
SWEC ENGRG REVIEW CHECKLIST

HANGER DWG. NO. VR-902N REV. 2FO

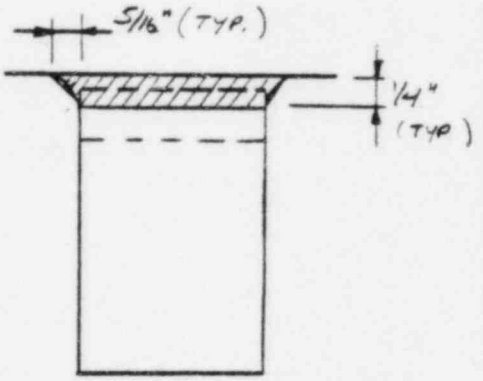
ISOMETRIC NO. VR-666-1.3 REV. 5FO

INSPECTION TEAM JOE STOKES
BRUCE BRUNSDON

WELD PROFILE - CONNECTION BETWEEN BEAM ATTACH. AND M4x13



ELEV. LKG. EAST



ELEV. LKG. NORTH

EVALUATION OF SUPPORT NO. VR-5 REV. 2 FO

ISOMETRIC NO. VR-666-1.3 REV. 5 FO

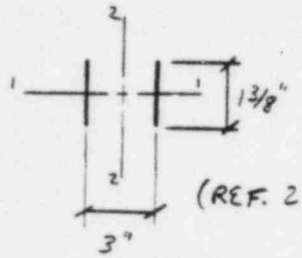
NOTES: 1) BURNS & ROE DRWG. # M-200 SHT. 122 HAS BEEN REVIEWED FOR DISCREPANCIES BETWEEN AS-ANALYZED & AS-BUILT* PIPING CONFIGURATIONS. IT IS JUDGED THAT ANY SUCH DISCREPANCIES DO NOT SIGNIFICANTLY AFFECT CALCULATED SUPPORT LOADS.

* AS-BUILT NOT AVAIL. COMPARED AS-ANALYZED TO MOST RECENT ISO. (i.e. REV. 4)

CHECK ON WELD BETWEEN M4x13 & BEAM ATT.

MAX. LOAD = (2320. #)(1.25) = 2900. # = F_3 (REF. 1)

↳ MODIFIED LOAD FACTOR



(REF. 2 FOR DIM.S)

(CONSERVATIVE)

f_w (WELD FORCE) = F_3 / A_W

A_W = 2 (13/8") = 2.75"

f_w = (2900#) / (2.75") = 1055. #/IN

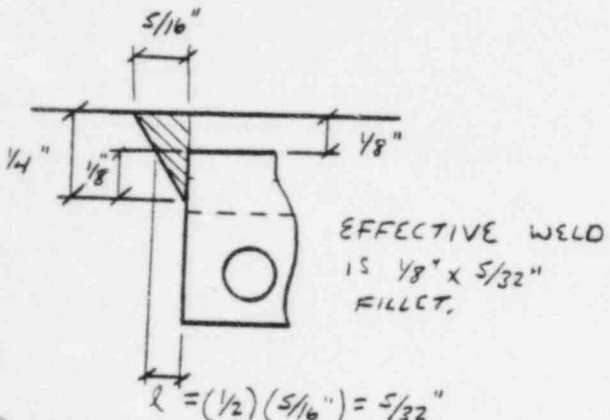
f_{WA} (WELD ALLOW.) = 18,000. PSI (REF. 3)

t_R (REQ'D THROAT) = f_w / f_{WA} = .059"

t (ACTUAL THROAT) = $(5/32")\cos\left[\arctan\left(\frac{5/32"}{1/8"}\right)\right]$

= .098"

$t > t_R$, SO WELD IS ACCEPTABLE



REFERENCES

(1) B&R CALC. NO. 8.16.1367
(2) POWER PIPING CATALOG
(3) ASME III SUB. NF
(4) DESIGN OF WELDED STRUCTURES - BY O.W. BLODGETT - 1976
(5) LETTER FROM H.A. CRISP TO J.F. NEWGEN, DATED JUNE 7, 1983 - NO. WPBEL-C0500-F-83-2153.
(6) HANGER DWG.

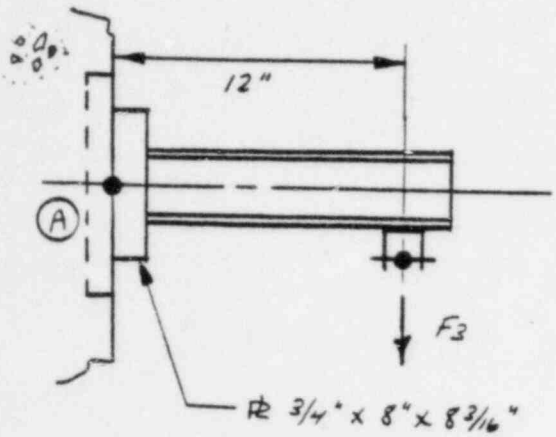
PREPARER: Joseph D. Miba 8-8-83

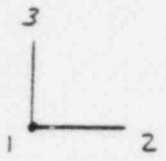
REVIEWER: Bruce Fischer 8-8-83

EVALUATION OF SUPPORT NO. VR-5 REV. 2 FO

ISOMETRIC NO. VR-666-1.3 REV. 5 FO

RESOLVE LOADS TO EMBED. PLATE



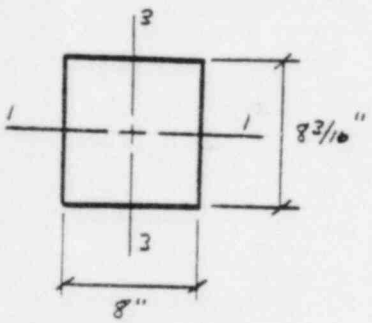


PT. A MAX. LOADS: (REF. P. 1)

$F_3 = 4493.\ \#$

$M_1 = (12")(F_3) = 53,916.\ IN\#$

CHECK ON WELD BETWEEN EMB. PL & PL 3/4" x 8" x 8 3/16"



3/16" FILLETS (CONSERV.)

WELD PROPERTIES: (REF. 4)

$A_W = 2(8" + 8\ 3/16") = 32.38"$

$S_{W1} = (8")(8\ 3/16") + (8\ 3/16")^2/3 = 87.85\ IN^2$

FORCE ON WELD: (REF. 4)

$$f_W = \left[(M_1/S_{W1})^2 + (F_3/A_W)^2\right]^{1/2}$$

$f_W = 629.\ \#/IN$

REQUIRED WELD SIZE (w): (REF 3)

$w = f_W/(.707)(18,000.\ PSI) = .049" < 3/16"$,
SO ACCEPTABLE

CHECK ON ATTACHMENT LOCATION:

DUE TO THE LOADS IMPOSED ON PL 3/4" x 8" x 8 3/16", THE OFFSET OF THE ATTACHMENT WILL HAVE A NEGLIGIBLE EFFECT AND SO IS JUDGED ACCEPTABLE.

NOTE:

MIN. WELD VIOLATIONS ACCEPTABLE PER REF. 5.

PREPARER: Joseph O. Miha 8-8-83

REVIEWER: Bruce Fischer 8-8-83

1280

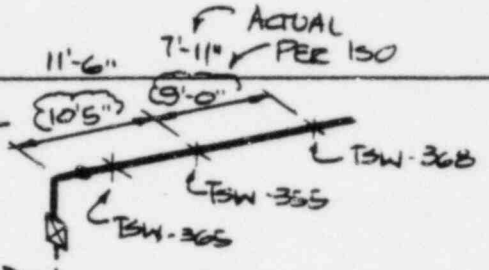
SUPPORT CHECKLIST

HANGER DRAWING NO.	REV.	INSPECTION TEAM	LEGEND:
TSW-355	1	J. STOKES S. JACOB	A - ACCEPTABLE D - DEVIATION EXISTS N/A - NOT APPLICABLE

ISOMETRIC NO.	REV.	CHANGE DOCUMENT
TSW-251-15.19	5	

CHECKLIST ITEMS	STATUS			COMMENTS
	N/A	A	D	
1. General				
A. Support Location			✓	NOTE 1 ON BACK
B. Support Orientation		✓		
C. Catalog Items	✓			
D. Close Clearance Gaps		✓		
2. Support Structure				
A. Critical Dimensions		✓		
B. Member Sizes, Structural Plates		✓		
3. Struts and Snubbers				
A. Pin to Pin Dimensions, Snubber Setting	✓			
B. Paddle-Pin Assembly Connections	✓			
4. Baseplates				
A. Plate & Gusset Sizes		✓		
B. Bolt Size & Type		✓		
C. Bolt Hole Spacing			✓	NOTE 3; ATTACHED
D. Attachment Location			✓	NOTES 4, 5; ATTACHED
E. Bolt Spacing to Adjacent Inserts		✓		
5. Lugs - Bearing Surface	✓			
6. Welding				
A. Size, Length, Quality			✓	NOTES 4, 5, 6, 7; ATTACHED
B. Symbols			✓	NOTES 6, 7; ATTACHED
7. Miscellaneous (Specify)				
INSULATION INTERFERENCES			✓	NOTE 2, ON BACK
				C 0305

Notes: 1.) PER ATTRIBUTE 1A) SEE ISOMETRIC DIMENSIONS SHOW ± 1'-1" IN OFFSETTING DEVIATIONS



2.) BECAUSE OF INSULATION, THE FOLLOWING ITEMS COULDN'T BE VERIFIED:
- PADS WELDED TO PIPE AND THEIR WELDS
- WELDS BETWEEN PADS AND TS6x6x3/8
- LENGTHS OF MEMBERS 6 & 7 (TS6x6x3/8)

Results of Evaluation:

_____ No deviations noted.

__1__ Deviations evaluated as acceptable by inspection team.

ATTRIBUTE 7) ITEMS NOT ABLE TO BE VERIFIED

_11__ Deviations require further evaluation.

ATTRIBUTES 1A (1); 4C (1); 4D (2); 6A (4); 6B (3) SEE NOTES ABOVE AND ON ATTACHED SHEETS

JE Stokes — Signature — 09-08-83 — Date

Disposition of deviations subject to further evaluation:

1A - DUE TO THE PIPING CONFIGURATION THE LOCATION DEVIATION IS JUDGED TO HAVE A NEGLIGIBLE EFFECT ON THE SUPPORT LOADS OR THE PIPE STRESS.

4C, 4D, 6A, 6B - JUDGED TO BE ACCEPTABLE AS PER ATTACHED EVALUATION

0 0309

Bruce Fuscha — Signature — 9/21/83 — Date

_____ REVIEWER — _____ DATE

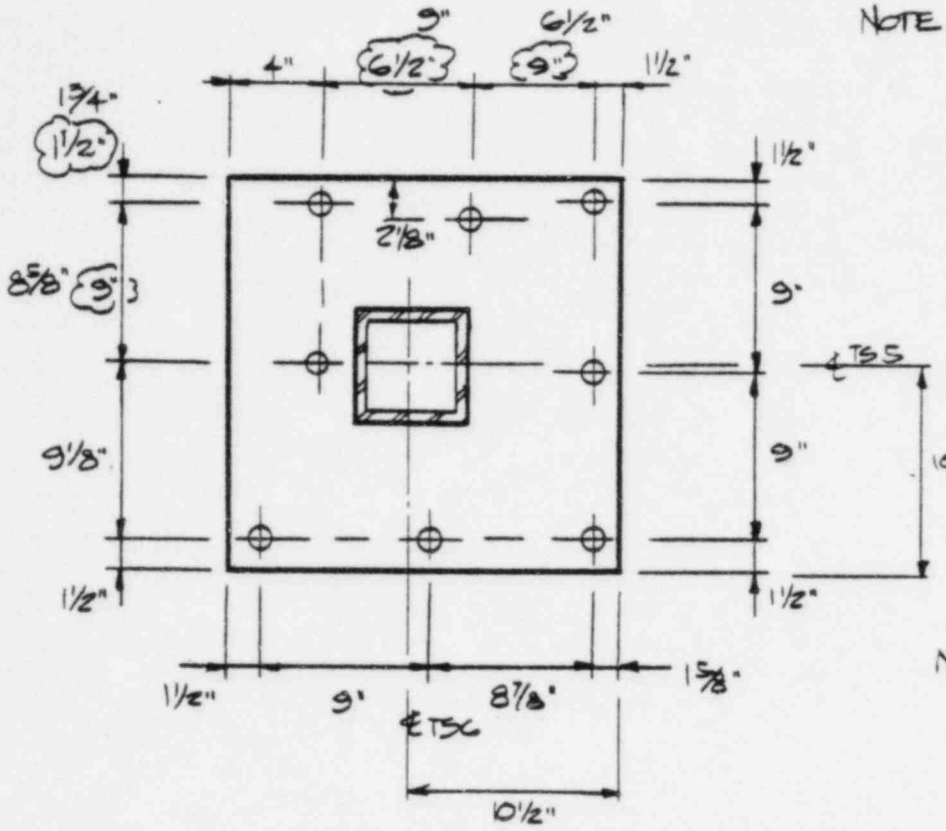
STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION SHEET

▲ 5010.65

CALCULATION IDENTIFICATION NUMBER				
J.O. OR W.O. NO.	DIVISION & GROUP	CALCULATION NO.	OPTIONAL TASK CODE	PAGE ____

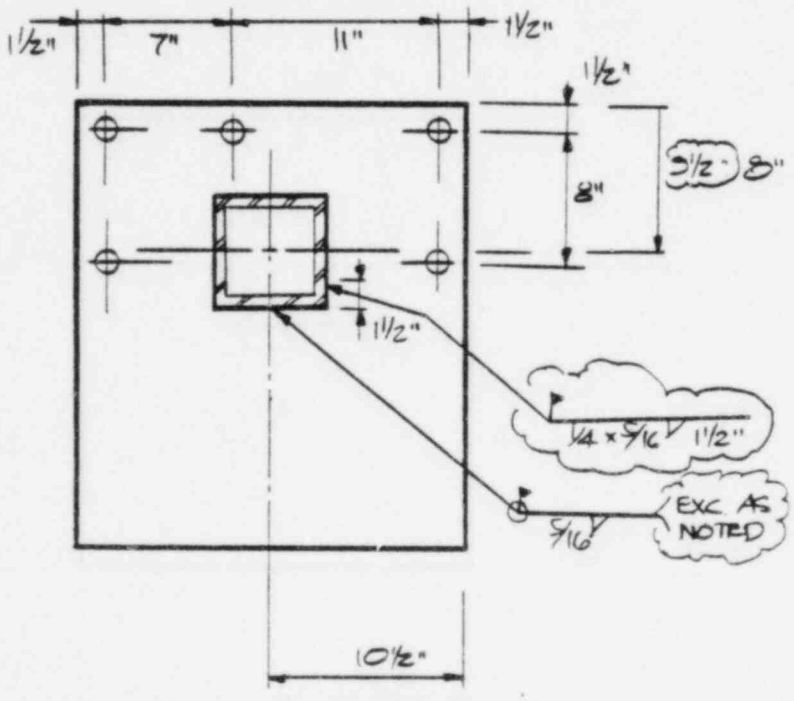
NOTE 3



"DETAIL 2"

BOLT SPACING DEVIATIONS

NOTE 4



DETAIL 1

ATTACHMENT LOCATION AND WELD DEVIATIONS

0 0310

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION SHEET

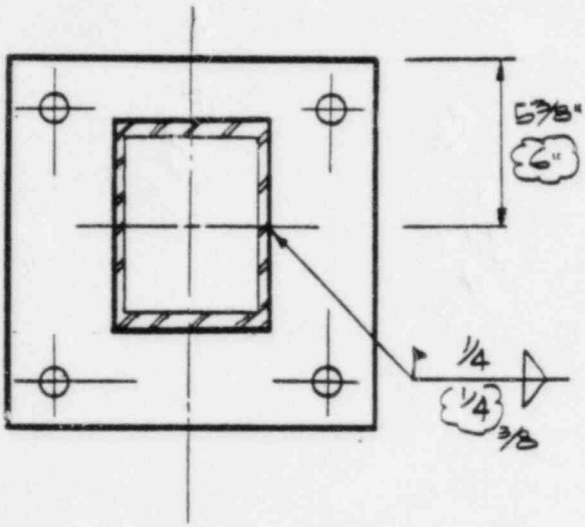
▲ 5010.65

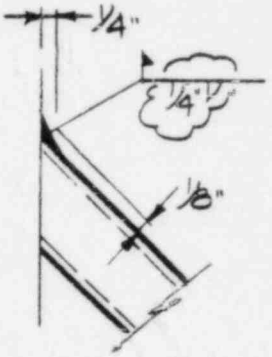
CALCULATION IDENTIFICATION NUMBER				
J.O. OR W.O. NO.	DIVISION & GROUP	CALCULATION NO.	OPTIONAL TASK CODE	PAGE ____

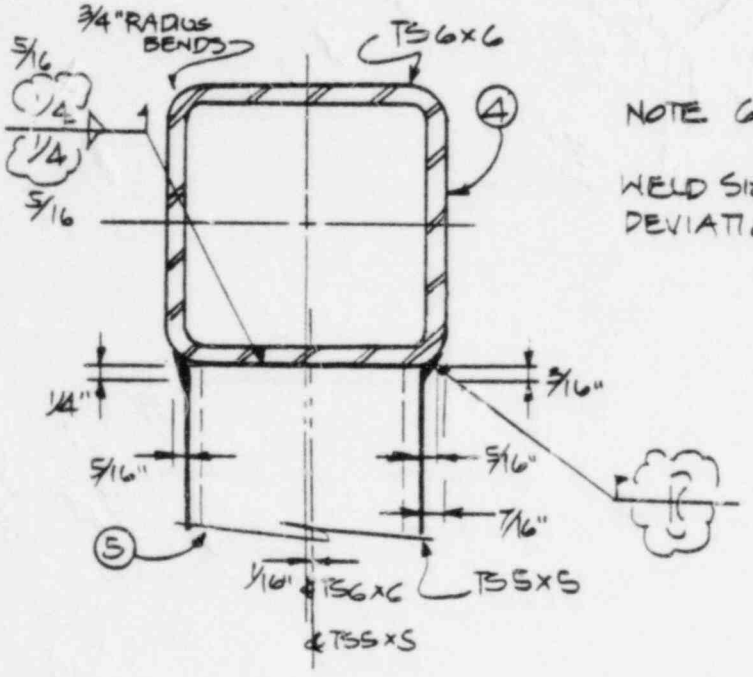
NOTE 5

"DETAIL 14"

ATTACHMENT LOCATION AND WELD DEVIATIONS







NOTE 6

WELD SIZE AND SYMBOL DEVIATION

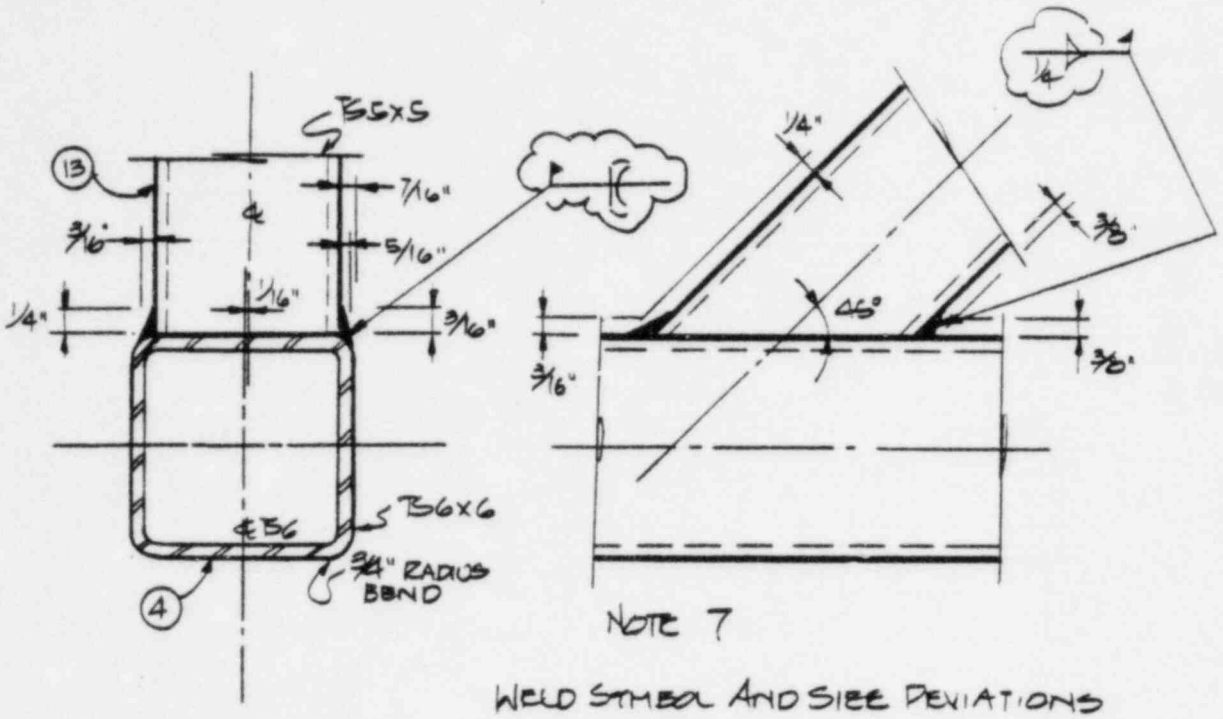
0 0311

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION SHEET

▲ 5010.65

CALCULATION IDENTIFICATION NUMBER				
J.O. OR W.O. NO.	DIVISION & GROUP	CALCULATION NO.	OPTIONAL TASK CODE	PAGE ____



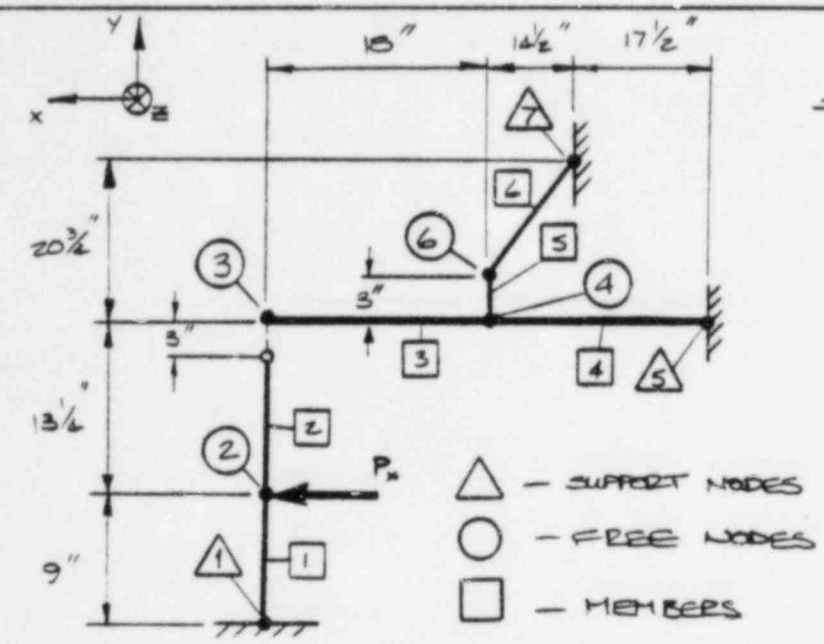
NOTE 7

WELD SYMBOL AND SIZE DEVIATIONS

0 0312

EVALUATION OF SUPPORT NO. TSW-355 REV. 1

ISOMETRIC NO. TSW-251-15.19 REV. 5



NOTE: FIELD VERIFIED DIMENSIONS USED IN STRUDL MODEL.

STRUDL MODEL OF TSW-355

NODAL COORDINATES

NODE	X	Y
1	50.	0.0
2	50.	9.0
3	50.	22.25
4	32.	22.25
5	0.	22.25
6	32.	25.25
7	17.5	43.0

MEMBER PROPERTIES

1 & 2	TS 5×5×3/8
3 & 4	TS 6×6×3/8
5	RIGID
6	TS 5×5×3/8

APPLIED LOAD

PER REF. 1, PG. 3

$P_x = \pm 30,322$ LB.

REFERENCES

1) BURNS AND ROE CALC NO. 8.16.3278 REV. 0
2) SWEC DOCUMENT SD-STEP 4, REV. 1
3) HGR DWG TSW-355 REV. 1
4) BURNS AND ROE DESIGN GUIDE, APPENDIX 2
5) BLODGETT, 'DESIGN OF WELDED STRUCTURES', 8th ED.
6) ASME III, SUBSECTION NF AND APPENDIX F
7) AISC MANUAL OF STEEL CONSTRUCTION, 8th ED.

PREPARER: Bruce Fischer DATE: 9/21/83

REVIEWER: B. J. Bahn DATE: 9/21/83

STRUDL INPUT

```
TYPE SPACE FRAME
UNITS IN FT DEG
CONSTANTS
E 29000000. ALL
G 11200000. ALL
POISSONS .3 ALL
JOINT COORDINATES
1  50.0   0.00 S
2  50.0   9.00
3  50.0  22.25
4  32.0  22.25
5   0.0  22.25 S
6  32.0  25.25
7  17.5  43.00 S
MEMBER INCIDENCES
1  1  2
2  2  3
3  3  4
4  4  5
5  4  6   $ DUMMY MEMBER
6  6  7
MEMBER 2 END JOINT SIZE END 3.0
MEMBER PROPERTIES PRISMATIC
1 2 6 TABLE 'STTUBE1' 'T5X21.94'
3 4   TABLE 'STTUBE1' 'T6X27.04'
5 AX 500. AY 500. AZ 500. IX 1000. IY 1000. IZ 1000.
LOADING 1 'FAULTED'
JOINT LOADS
2 FORCE X 30322.
```

0 0314

****
RESULTS OF LATEST ANALYSES
****

PROBLEM - WNP-2 TITLE - STRUDL ANALYSIS OF TSW-355

ACTIVE UNITS INCH LB DEG DEGF SEC

ACTIVE STRUCTURE TYPE SPACE FRAME

ACTIVE COORDINATE AXES X Y Z

LOADING - 1 FAULTED

MEMBER FORCES

MEMBER	JOINT	FORCE AXIAL	FORCE SHEAR Y	FORCE SHEAR Z	MOMENT TORSIONAL	MOMENT BENDING Y	MOMENT BENDING Z
1	1	-3348.73364	20475.2500	0.0	0.0	0.0	103809.375
1	2	3348.73364	-20475.2500	0.0	0.0	0.0	80467.8750
2	2	-3348.73364	-9846.74609	0.0	0.0	0.0	-80467.8750
2	3	3348.73364	9846.74609	0.0	0.0	0.0	-50001.5234
3	3	-9846.74609	-3348.73364	0.0	0.0	0.0	-50001.5234
3	4	9846.74609	3348.73364	0.0	0.0	0.0	-10275.0830
4	4	-6821.67187	-58.3300629	0.0	0.0	0.0	-1409.71973
4	5	6821.67187	58.3300629	0.0	0.0	0.0	-456.842529
5	4	-3290.40356	-3025.07373	0.0	0.0	0.0	-11085.4023
5	6	3290.40356	3025.07373	0.0	0.0	0.0	2010.10188
6	6	-4402.01953	261.094482	0.0	0.0	0.0	2010.10018
6	7	4402.01953	-261.094482	0.0	0.0	0.0	3374.02563

RESULTANT JOINT LOADS - SUPPORTS

JOINT		FORCE X FORCE	FORCE Y FORCE	FORCE Z FORCE	MOMENT X MOMENT	MOMENT Y MOMENT	MOMENT Z MOMENT
1	GLOBAL	-20475.2500	-3348.73364	0.0	0.0	0.0	103809.375
5	GLOBAL	-6821.67187	58.3300629	0.0	0.0	0.0	456.842529
7	GLOBAL	-3025.07373	3290.40356	0.0	0.0	0.0	-3374.02563

0 C315

EVALUATION OF SUPPORT NO. TSW-355 REV. 1

ISOMETRIC NO. TSW-251-15.19 REV. 5

REF.

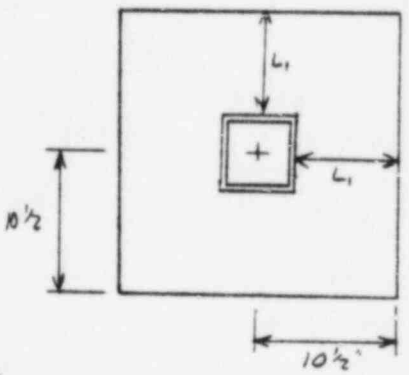
2 EVALUATION OF DEVIATION 4C :

3 $L_1 = 10\frac{1}{2} - \frac{5}{2} = 8$ in

$t = 1$ in

$\frac{L_1}{t} = 8 > 2$

∴ RIGID SOLUTION UNACCEPTABLE



LOADS (SEE PG. 3 – SUPPORT LOADS, JOINT 1)

THE SIGNS ON THE LOADS HAVE BEEN REVERSED SO THAT THEY NOW REFLECT THE LOADS ON THE BASE PLATE. (NOTE: UNI-DIRECTIONAL LOADING)

F_x =	20475 lb	M_x =	0 in-lb
F_Y =	3349 lb	M_Y =	0 in-lb
F_z =	0 lb	M_z =	-103,809 in-lb

REFERENCES

PREPARER: Bruce Fisicaro DATE: 9/21/83

REVIEWER: Ron E. Bowen DATE: 9/21/83

EVALUATION OF SUPPORT NO. TSW-355 REV. 1

ISOMETRIC NO. TSW-251-15, 19 REV. 5

REF.

COMPUTE SHEAR/BOLT

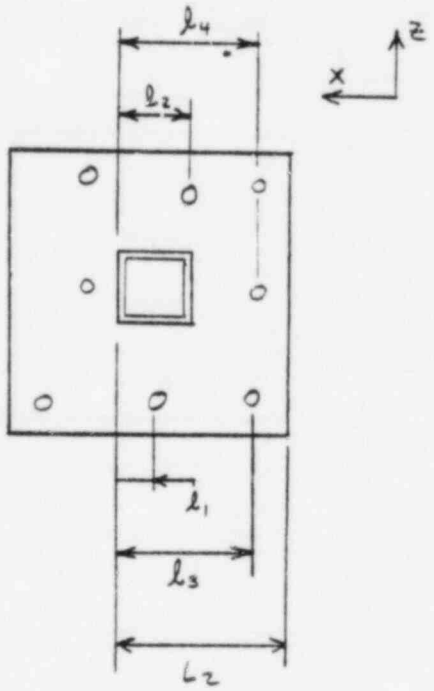
2 $S = \frac{F_x}{N} = \frac{20475}{8} = 2559$ lb

COMPUTE TENSION/BOLT

DUE TO THE DIRECTION OF THE BENDING MOMENT, ONLY THE BOLTS ON THE RIGHT SIDE OF THE PLATE GET ANY TENSION LOAD FROM THE MOMENT.

$L_2 = 13$ in
$l_1 = 2.5$ in
$l_2 = 5$ in
$l_3 = 11.375$ in
$l_4 = 11.5$ in

NOTE: ALL DIMENSIONS VERIFIED IN FIELD.



$$P_{Mz} = \frac{M_z \, l_4}{n_1 l_1^2 + n_2 l_2^2 + n_3 l_3^2 + n_4 l_4^2}$$

$$= \frac{103,809\,(11.5)}{(2.5)^2 + (5)^2 + (11.375)^2 + 2(11.5)^2}$$

$$= 2808 \text{ lb}$$

REFERENCES

M-R. DRWG. TSW-355, REV. 1

PREPARER: Bruce Fisher DATE: 9/21/83

REVIEWER: Ben P. Baker DATE: 9/21/83

EVALUATION OF SUPPORT NO. TSW-355 REV. 1

ISOMETRIC NO. TSW-251-15.19 REV. 5

REF.

2

$$P_T = \frac{F_r}{N} = \frac{3349}{8} = 419 \text{ lb}$$

COMPUTE LOAD FACTORS

$$\frac{L_2}{t} = \frac{13}{1} = 13 \Rightarrow LFM = 1.35$$

$$\frac{L_1}{t} = 8 \Rightarrow LFT = 1.65$$

COMPUTE MAXIMUM TENSION/BOLT

$$P_{MAX} = LFM(P_{MB}) + LFT(P_T)$$
$$= 1.35(2808) + 1.65(419)$$
$$= 4482 \text{ lb}$$

BOLT ALLOWABLES (3/4"Ø, HDI BOLTS)

3+4

$T_A = 6040$ lb
$S_A = 5870$ lb

BOLT INTERACTION

$$I = \frac{P_{MAX}}{T_A} + \frac{S}{S_A} = \frac{4482}{6040} + \frac{2559}{5870} = 1.18 > 1.0 \therefore$$ DO FINITE ELEMENT ANALYSIS OF B.E.

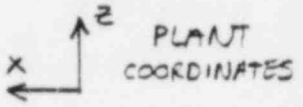
REFERENCES

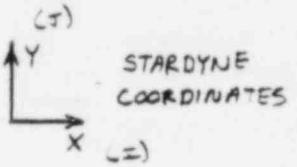
PREPARER: Bruce Fischer DATE: 9/21/83

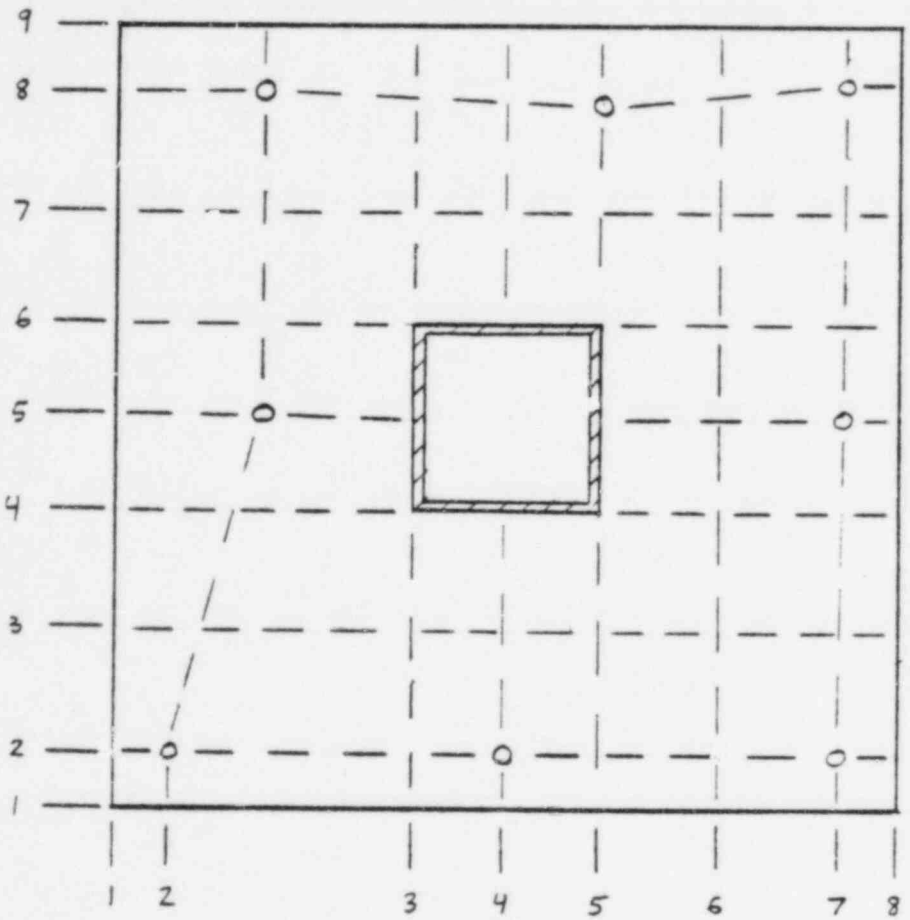
REVIEWER: Ben F. Boeh DATE: 9/21/83

0 0318

STARDYNE MODEL







Bruce Fischer 9/3/87

83/09/21. 11.43.33. VERSION 1.0 (FEB.82 RELEASE) PA

```
*****************************************************************
*                                                               *
*                    PREPROCESSOR INPUT DATA CARDS              *
*                                                               *
*****************************************************************

CARD          1         2         3         4         5         6         7
 NO  12345678901234567890123456789012345678901234567890123456789012345678901
  1  3 BASEPLT ANAL FOR HGR TSN-355, BAF
  2  OUT       0,0,0,-1,1,0/
  3  CON ,,,,3500/
  4  PLA 8,9,,21,21,1./
  5  APR ,,1,5,5,.375,.375/
  6  BPR ,,1,980000,302000,.0040,5870/
  7  BOL 2,2,1,1.5,1.5/
  8  BOL 4,2,1,10.5,1.5/
  9  BOL 7,2,1,19.375,1.5/
 10  BOL 2,5,1,4.,10.625/
 11  BOL 7,5,1,19.5,10.5/
 12  BOL 2,8,1,4.,19.25/
 13  BOL 5,8,1,13.,18.875/
 14  BOL 7,8,1,19.5,19.5/
 15  END /
 16  TUB 4,5,1,10.5,10.5/
 17  END /
 18  PUT 4,5/
 19  LOA ,,1,-20475,,3349,,-103809,/
 20  END /
 21  END OF JOB

                    END OF INPUT DATA
```

Bruce Fisher 9/21/83

ELEMENT + Z FACE

ELEM	SIGMA	ELEM	SIGMA	ELEM	SIGMA	ELEM	SIGMA
1	371.	2	658	3	404.	4	191.
5	392.	6	382.	7	617.	8	263.
9	2287.	10	2976.	11	5427.	12	8190.
13	8899.	14	6611.	15	3094.	16	1849.
17	2215.	18	3068.	19	2925.	20	248.
21	248.	22	3316.	23	3331.	24	1870.
25	1270.	26	3987.	27	6668.	28	458.
29	401.	30	7712.	31	4603.	32	1937.
33	4246.	34	5908.	35	12533.	36	14808.
37	14793.	38	12652.	39	4603.	40	2106.
41	2422.	42	2935.	43	4940.	44	4339.
45	4473.	46	5219.	47	2904.	48	2125.
49	760.	50	1229.	51	2954.	52	1960.
53	2361.	54	3289.	55	1579.	56	1082.

QUADRILATERAL PLATE
PRINCIPAL STRESSES

ELEMENT -Z FACE

ELEM	SIGMA	ELEM	SIGMA	ELEM	SIGMA	ELEM	SIGMA
1	891.	2	445.	3	748.	4	1136.
5	1237.	6	951.	7	555.	8	269.
9	1694.	10	2284.	11	4792.	12	6566.
13	7192.	14	5755.	15	2378.	16	1529.
17	2320.	18	2633.	19	1836.	20	140.
21	140.	22	1932.	23	2804.	24	1796.
25	1006.	26	3441.	27	5707.	28	243.
29	244.	30	6714.	31	3105.	32	2169.
33	3907.	34	5740.	35	11294.	36	13364.
37	13325.	38	11163.	39	4641.	40	1030.
41	1466.	42	2993.	43	5565.	44	3503.
45	3770.	46	5908.	47	3159.	48	1165.
49	570.	50	2004.	51	4252.	52	1137.
53	1453.	54	4523.	55	2388.	56	640.

MAX. COMPRESSION SUMMARY

NODE	Z-FORCE
14	-1796.
15	-1649.
13	-1409.
16	-857.
12	-640.
19	-327.
17	-237.
27	-193.
63	-189.
64	-158.

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BOLT LOADS

I LINE	J LINE	NODE	X-SHEAR	Y-SHEAR	SRSS	Z-TENSION
2	2	11	-2516.	-57.	2517.	0.
2	5	14	-2632.	-9.	2632.	0.
2	8	17	-2569.	11.	2569.	0.
4	2	29	-2531.	6.	2531.	1714.
5	8	44	-2560.	-1.	2560.	2088.
7	2	50	-2517.	59.	2518.	1260.
7	5	59	-2604.	17.	2604.	5011.
7	8	62	-2540.	-27.	2540.	821.

BOLT INTERACTION EQUATIONS

EQUATION=((TENSION/TALLOW)** 1.000+(SHEAR/VALLOW)** 1.000))** 1.000

NODE	TENSION ALLOW	SHEAR ALLOW	TENSION RATIO	SHEAR RATIO	INTERACTION FACTOR	SAFETY FACTOR
11	6040.	5870.	0.000	.429	.429	2.33
14	6040.	5870.	0.000	.448	.448	2.23
17	6040.	5870.	0.000	.438	.438	2.29
29	6040.	5870.	.284	.431	.715	1.40
44	6040.	5870.	.445	.437	.882	1.13
50	6040.	5870.	.209	.429	.638	1.57
59	6040.	5870.	.830	.444	1.273	.79
62	6040.	5870.	.136	.433	.569	1.76

****
* END LOAD CASE 1 *
****

Bruce Friedman 9/21/05

EVALUATION OF SUPPORT NO. TSW-355 REV. 1
ISOMETRIC NO. TSW-251-15,19 REV. 5

REF.

CHECK BOLTS *

THE CRITICAL BOLT IS AT STARDYNE NODE 59.

SHEAR RATIO $\frac{s}{S_A} = .444$
$P_{MAX} = 5011$ lb } (SEE PG. 10)

4 $T_A = 6040$ lb

2 $P_{AL} = T_A \left[1 - \left(\frac{s}{S_A}\right)^{5/3}\right]^{3/5} = 6040 \left[1 - (.444)^{5/3}\right]^{3/5}$
$= 5048$ lb > 5011 lb
$\therefore$ BOLTS ARE ADEQUATE

CHECK PLATE

7 $\sigma_{ALL} = .75 S_Y = 27{,}000$ lb/in^2
$\sigma_{MAX} = 14{,}808$ lb/in^2 $< \sigma_{ALL}$ (SEE PG. 9)
$\therefore$ PLATE IS ADEQUATE

* INTERACTION EXPONENT OF 5/3 USED PER REF. 2

REFERENCES

PREPARER: Bruce Fischer DATE: 9/21/83
REVIEWER: B. F. Rinker DATE: 9/21/83

0 0323

EVALUATION OF SUPPORT NO. TSW-355 REV. 1

ISOMETRIC NO. TSW-251-15.19 REV. 5

REF

EVALUATION OF DEVIATION 4D, NOTE 4:

BY REVIEW OF THE LOADS APPLIED TO THE PLATE (SEE PG. 3 – SUPPORT LOADS, JOINT 5), AND THE PLATE DETAIL, THE ATTACHMENT LOCATION DEVIATION IS JUDGED TO BE ACCEPTABLE.

EVALUATION OF DEVIATION 4D, NOTE 5:

BY REVIEW OF THE LOADS APPLIED TO THE PLATE (SEE PG. 3 – SUPPORT LOADS, JOINT 7), AND THE PLATE DETAIL, THE ATTACHMENT LOCATION DEVIATION IS JUDGED TO BE ACCEPTABLE.

REFERENCES

PREPARER: Bruce Fischer DATE: 9/21/83

REVIEWER: Bruce E. Bates DATE: 9/21/83

EVALUATION OF SUPPORT NO. TSW-355 REV. 1

ISOMETRIC NO. TSW-251-15.19 REV. 5

REF

EVALUATION OF DEVIATION 6A, NOTE 4:

BY REVIEW OF THE LOADS APPLIED TO THE WELD (SEE PG. 3 — SUPPORT LOAD, JOINT 5), THE WELD PROVIDED IS JUDGED TO BE ADEQUATE.

NOTE: THE AISC MINIMUM WELD REQUIREMENT CAN BE WAIVED AS PER WPPSS DOCUMENT WPBEC-C0500-F-83-2153.

EVALUATION OF DEVIATION 6A, NOTE 5:

BY REVIEW OF THE LOADS APPLIED TO THE WELD (SEE PG. 3 — SUPPORT LOAD, JOINT 7), THE WELD IS JUDGED TO BE ADEQUATE (ONLY VERTICAL WELDS CONSIDERED).

NOTE: THE AISC MINIMUM WELD REQUIREMENT CAN BE WAIVED AS PER WPPSS DOCUMENT NP[illegible] C0500-F-83-2153.

REFERENCES

PREPARER: Bruce Fisher DATE: 9/21/83

REVIEWER: B. E. Burke DATE: 9/21/83

EVALUATION OF SUPPORT NO. TSW-355 REV. 1

ISOMETRIC NO. TSW-251-15,19 REV. 5

REF.

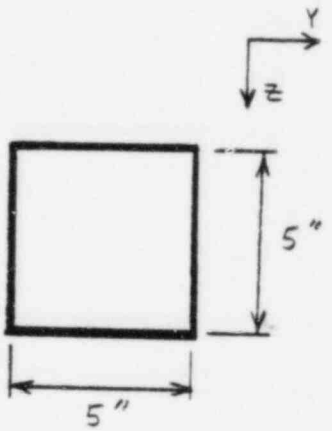
EVALUATION OF DEVIATIONS 6A + 6B, NOTE 6:

LOADS AND WELD PROPERTIES IN LOCAL STRUDL COORDINATES.

LOADS (SEE PG. 3 – MEMBER 2, JOINT 3)

F_x =	3349 lb	M_x =	0 in-lb
F_Y =	9847 lb	M_Y =	0 in-lb
F_z =	0 lb	M_z =	50,002 in-lb

WELD PROPERTIES



5
R. 7.4-7

$L_w = 4(5) = 20$ in

$S_w = 5(5) + \frac{5^2}{3} = 33.33$ in^2

REQUIRED WELD SIZE

$f_x = \frac{F_x}{L_w} + \frac{M_z}{S_w} = \frac{3349}{20} + \frac{50,002}{33.33} = 1668$ lb/in

$f_Y = \frac{F_x}{L_w} = \frac{9847}{20} = 492$ lb/in

$f = \sqrt{f_x^2 + f_Y^2} = \sqrt{1668^2 + 492^2} = 1739$ lb/in

•6 N/U ALLOWABLE WELD STRESS = 18,000 lb/in^2

$w_{REQ} = \frac{f}{.707(18,000)} = \frac{1739}{.707(18,000)} = .14$ in < t$_{eff}$ for 3/16 - 5/16 fillet

∴ WELD PROVIDED IS ADEQUATE

REFERENCES

PREPARER: Bruce Fischer DATE: 9/21/83

REVIEWER: Ben F. Funk DATE: 9/21/83

EVALUATION OF SUPPORT NO. TSW-355 REV. 1

ISOMETRIC NO. TSW-251-15,19 REV. 5

REF.

EVALUATION OF DEVIATIONS 6A + 6B, NOTE 7:

BY REVIEW OF THE LOADS APPLIED TO THE WELD (SEE PG. 3 - MEMBER 5, JOINT 6), THE WELD IS JUDGED TO BE ADEQUATE.

REFERENCES

PREPARER: Bruce Fisher DATE: 9/21/83

REVIEWER: Ben E. Burke DATE: 9/21/83