ENGINEERING INSPECTION AND EVALUATION OF QUALITY CLASS II/SEISMIC CATEGORY I PIPE SUPPORTS

WNP #2

Prepared for

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

SEPTEMBER 22, 1983

Project Engineer

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ATTACHMENTS

1.0 INTRODUCTION

In May and June 1983, an NRC Construction Assessment Team (CAT) reviewed Quality Class II/Seismic Category I (QCII/SCI) pipe supports at Washington Public Power Supply System's (Supply System) WNP-2. A QCII/SCI pipe support at WNP-2 is defined as a QCII pipe support on piping classified as QCII/SCI in the same room or building where QCI components are located. The CAT team compared as-installed pipe supports to the latest issued drawings. During this review, discrepancies were found and the CAT team noted that these discrepancies occurred at a higher rate and appeared to be more significant than those found during the CAT team's review of Quality Class I pipe supports. As part of the Supply System's program to resolve QCII/SCI concerns, Stone & Webster Engineering Corporation (SWEC) was contracted to perform a third party engineering inspection and evaluation of a sample of QCII/SCI large bore pipe supports at WNP-2.

2.0 CONCLUSION

The QCII/SCI pipe supports reviewed by SWEC at WNP-2 meet the requirements of Regulatory Guide 1.29. All deviations found during the SWEC review were determined not to have a significant effect on the structural integrity of the supports. Therefore, it is reasonable to assume that sufficient design margin exists to account for deviations between the as-designed and as-installed condition and that these supports adequately meet the requirements of Regulatory Guide 1.29.

3.0 SWEC PROGRAM

SWEC performed an independent third-party review of a sample of QCII/SCI large bore pipe supports consisting of two parts:

1. Sample selection and physical inspection of 60 large bore pipe supports. Sections 3.1 and 3.2 of this report provide details for the sample selection and inspection.

2. Engineering evaluation of deviations found during the physical inspection. Section 3.3 of this report provides details for the evaluation of deviations.

SWEC's inspection compared as-installed conditions to the latest pipe support drawing. Only supports which had not been "final as-built" were selected.

SWEC primarily employed the same procedure (WRO-01, Attachment C) and personnel, with respect to inspections and evaluations, used for a similar recently completed task involving QC I supports at WNP-2. It was not in SWEC's scope of work to re-perform work done by others or to review the basis of the original design.

3.1 Sample

The sample was taken from the Burns & Roe, Inc. (BRI) Data Base RPE Hanger Status Report dated August 25, 1983 titled "QC 2 and SC 1 Sorted by Mark No." This list was first marked up by Bechtel indicating which QCII/SCI supports would be final as-built. From the remaining supports, SWEC randomly picked 60 large bore pipe supports by system. A listing by system of the supports selected is shown in Attachment A. A list of all pipe supports inspected, along with the inspection results, is shown in Attachment B. The sample differed from that for QC I pipe supports as delineated in Attachment C.

3.2 Inspection

Inspections were performed using the same criteria and procedure used during SWEC's effort on QC I pipe supports. This procedure, WRO-01, is shown in Attachment C. Each pipe support was inspected for 17 attributes; the attributes selected for pipe support inspection were primarily those associated with the structural integrity of the support. The results of the inspections by attribute are shown in Attachment B.

3.3 Evaluations

If during the inspection an attribute was determined to be outside the tolerances established in Attachment C, 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 a disposition of the evaluation, it was referred to an Evaluation Group. The evaluation group then reviewed the deviation against the criteria in Section 5.5 of Attachment C with the clarifications listed in this section. When the effect of a deviation on the structural integrity of support could be accepted with calculations, it 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 be systematically remedied. The details of these types of bases for acceptance are shown in Attachment C, Section 5.5, with the clarifications listed below.

1. The judgement as to the correctness of support loads used in the evaluations was based on the "status as-built" documents, since no "final as-built" documentation was prepared for the supports inspected.

2. When a calculation was performed, results from the maximum load condition were compared to the project faulted allowable stresses and loads for QCII/SCI.

3. Only AWS/AISC minimal fillet weld generic acceptance, as shown in Section 5.5 of Attachment C, was used for deviations found in QCII/SCI. All other generic acceptance criteria shown do not apply.

The results of the evaluations are given in Section 4.0.

4.0 RESULTS

All deviations found during the SWEC review were determined not to have a significant effect on the structural integrity of the supports. The criteria used for the acceptance of the effect of deviations found was more conservative than that in Regulatory Guide 1.29.

During SWEC's review, three discrepancies were observed which were not directly related to the inspection. In two cases, supports COND-759 and CEP-19, the calculation and drawing had been revised, indicating a hardware change should be made but that change had not been made. In the third case, support SA-243, a revision was made to a support calculation which called for a hardware change but the corresponding drawing and support had not been changed. It should be restated that in these cases the effect of the deviations found were still determined to be acceptable.

For pipe support TSW 355, SWEC's interaction equation for concrete anchor bolts was used. This method raises the actual to allowable load ratio to the five thirds power when computing tension and shear interactions.

QCII/SCI LARGE BORE SUPPORT SAMPLE
DISTRIBUTION OF SAMPLE BY SYSTEM

SYSTEM DESIGNATION		TOTAL SUPPORTS[1]	SUPPORTS INSPECTED
AS	(AUXILIARY STEAM)	47	2
CAS	(CONTROL AIR SYSTEM)	314	7
CEP	(CONTAINMENT PURGE EXHAUST)	12	1
CN	(CONTAINMENT INERTING)	23	1
CO	(AUXILIARY STEAM CONDENSATE)	11	1
COND	(CONDENSATE)	177	5
CPR	(CONDENSATE FILTER DEMINERALIZER SYSTEM)	9	1
DW	(DEMINERALIZER WATER)	62	2
EDR	(EQUIPMENT DRAIN RADIOACTIVE)	264	7
FD	(FLOOR DRAINS)	71	2
FDR	(FLOOR DRAIN RADIOACTIVE)	326	7
FP	(FIRE PROTECTION)	75	3
FPC	(FUEL POOL COOLANT)	22	1
MD	(MISCELLANEOUS DRAINS)	7	1
MWR	(MISCELLANEOUS WASTE RADIOACTIVE)	118	3
OG	(OFF GAS)	7	1
RCC	(REACTOR CLOSED COOLING WATER)	231	5
RFW	(REACTOR FEED WATER)	1	0

QCII/SCI LARGE BORE SUPPORT SAMPLE
DISTRIBUTION OF SAMPLE BY SYSTEM (CONTINUED)

SYSTEM DESIGNATION		TOTAL SUPPORTS[1]	SUPPORTS INSPECTED
RHR	(RESIDUAL HEAT REMOVAL)	1	1
RWCU	(REACTOR WATER CLEAN-UP)	95	3
SA	(SERVICE AIR)	83	2
TMU	(TOWER MAKE-UP)	10	1
TSW	(TURBINE BUILDING SERVICE WATER	76	2
WCA	(RADWASTE CHILLED WATER)	3	1
	TOTALS	2045	60

NOTES:

1. From BRI data base not including supports marked by Bechtel which will be final as-built.

INSPECTION RESULTS

Number of Large Bore Supports this Report - 60
Number of Large Bore Supports with Deviations - 53

SUPPORT	Rev.	1A	1B	1C	1D	2A	2B	3A	3B	4A	4B	4C	4D	4E	5	6A	6B	7
AS-136	1															X		
AS-174	1					X						X	X	X		X		X
CAS-551	2	X																
CAS-603	2			X												X		
CAS-629	1											X				X	X	X
CAS-713	2	X			X											X		
CAS-764	2																	
CAS-794	1																	
CAS-809	1	X			X											X		
CEP-19	2										X	X	X			X		
CN-905N	0					X					X	X						X
CO-920N	0																X	
COND-628	3															X		
COND-686	5					X				X		X	X			X		
COND-743	1				X	X										X		

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INSPECTION RESULTS (CONTINUED)

SUPPORT	Rev.	1A	1B	1C	1D	2A	2B	3A	3B	4A	4B	4C	4D	4E	5	6A	6B	7
COND-759	1				X	X	X				X					X		
COND-801	1				X											X		
CPR-100	2															X		
DW-117	1	X																
DW-149	1	X				X										X		
EDR-82	3			X		X												
EDR-332	1	X																
EDR-379	3				X													
EDR-459	1															X		
EDR-476	1															X		
EDR-505	2				X													
EDR-522	1															X		
FD-99	2															X	X	
FD-226	1											X						
FDR-59	4	X								X		X				X		X

INSPECTION RESULTS (CONTINUED)

SUPPORT	Rev.	1A	1B	1C	1D	2A	2B	3A	3B	4A	4B	4C	4D	4E	5	6A	6B	7
FDR-196	2																X	
FDR-407	2	X														X	X	
FDR-637	2	X			X													
FDR-685	1	X			X											X	X	
FDR-724	1																	
FDR-826	3	X									X	X	X			X		
FP-147	4															X		
FP-176	2					X							X			X		
FP-909N	0	X										X				X		X
FPC-28	2									X						X		
MD-93	1	X			X								X					
MWR-439	2					X										X		
MWR-474	1																	
MWR-493	1					X												
OG-129	1															X		

INSPECTION RESULTS (CONTINUED)

SUPPORT	Rev.	1A	1B	1C	1D	2A	2B	3A	3B	4A	4B	4C	4D	4E	5	6A	6B	7
RCC-80	1																	
RCC-141	2					X	X					X	X			X		X
RCC-190	4	X								X		X						
RCC-212	1															X	X	
RCC-949N	0																	
RHR-3	2	X				X										X		
RWCU-115	5					X					X	X						
RWCU-197	2																	
RWCU-267	1															X		X
SA-243	3															X		
SA-270	1	X												X		X		
TMU-901N	0					X					X	X	X			X		X
TSW-323	2						X						X			X		
TSW-355	1	X										X	X			X	X	
WCH-900N	0					X					X					X		X
TOTAL		17	0	2	10	15	3	0	0	4	7	14	10	2	0	38	8	9

INSPECTION RESULTS (CONTINUED)

NOTES:

Note 1. Definition of headings are listed below:

CHECKLIST ITEMS
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

14420.04
Attachment C
Total pages - 20

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:

PROJECT ENGINEER	8/31/83
DOC EMD MANAGER	8/31/83

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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 colum 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.

- 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".

- 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

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

- 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

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 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

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)				

ATTACHMENT A - SUPPORT 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

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.

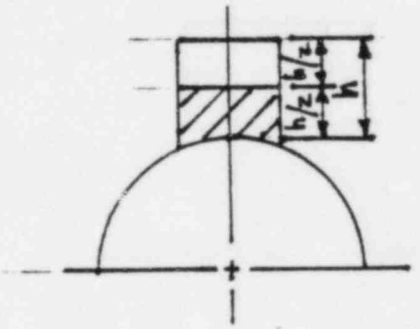

Figure A

*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: _____