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Washington Public Power Supply System

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

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Docket No. 50-397

REGION VICE

November 22, 1983
G02-83-1084

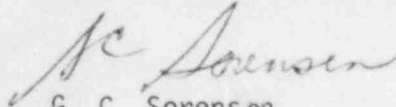
Mr. J. B. Martin
Regional Administrator
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

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

Reference : a) Letter G02-83-874, dated September 29, 1983,
C. S. Carlisle to J. D. Martin
b) Letter GI2-83-194, dated August 30, 1983,
D. M. Sternberg to C. S. Carlisle

Reference a) transmitted to Region V Washington Public Power Supply System's response to the Notice of Violation designated "F" in Appendix A of reference b).

In Attachment I to reference a), Washington Public Power Supply System committed to provide a copy of the Westinghouse report on electrical raceway walkdown and evaluation. Attachment I to this letter is a copy of the Westinghouse report.

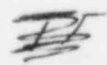

G. C. Sorensen
Manager, Regulatory Programs

HAC/f1

Attachment: Westinghouse Raceway Walkdown and Evaluation Summary

cc: Mr. R. T. Dodds, NRC RV
Mr. A. D. Toth, NRC Resident, WNP-2

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PDR ADOCK 05000397
Q PDR





WCQAP-006

SM-SA-212

Westinghouse
Electric Corporation

Water Reactor
Divisions

1983 NOV 29 11:01 AM
Nuclear Technology Division

Box 355
Pittsburgh Pennsylvania 15230

REGION V
November 15, 1983

Mr. C. S. Carlisle, Program Director
Washington Public Power Supply System
3000 George Washington Way
Richland, WA 99352

Dear Mr. Carlisle:

Re: Westinghouse Raceway Walkdown and Evaluation Summary

Attached herewith is the final report on the 42 electrical raceway supports inspected by Westinghouse. Although a number of minor discrepancies were noted during the inspection, subsequent evaluation showed all supports to be acceptable with no modifications required.

Sincerely yours,

WESTINGHOUSE ELECTRIC CORPORATION

Richard Orr

R. S. Orr
Technical Assistant
Structural Mechanics

RSO/kmc

Attachment

cc: H. Crisp
P. Shen
W. Stockdale
R. Sanan

WESTINGHOUSE_RACEWAY_WALKDOWN_AND_EVALUATION_SUMMARY

1.0) SUMMARY_and_CONCLUSIONS

A sample of the electrical raceway supports was selected and reviewed by Westinghouse to assess the quality of construction and prior quality control inspection and documentation. This report describes the methods by which Westinghouse selected the sample, obtained the required documentation, and evaluated raceway support construction.

As a result of the inspection several discrepancies were found between the installed support and the as-built documentation. However, by comparison of the installed support to the original design calculation, or by alternate calculations, the surveyed supports were shown to be adequate with no modifications required.

From the sample size selected (42) and the results obtained (no modifications required) the Supply System can be 90% confident that a 5% electrical raceway support deficiency level does not exist.

2.0) SCOPE

Westinghouse inspected a diversified sample of 42 Quality Class I, Seismic Category I conduit and cable tray supports. The inspection was limited to a comparison of the as-installed condition to the as-built documentation. Westinghouse assessed the impact of any differences that were noted in the inspection. Investigation of the design basis and its documentation were not within the scope of this evaluation.

The inspection was planned as investigative in nature rather than formal confirmation of a specific quality level. In light of this Westinghouse elected to use a team of engineers experienced in various disciplines rather than formally qualified Q.C. Inspectors.

3.0) METHOD

Preliminary walkdowns were conducted to obtain a diversified random sample of accessible supports located throughout the plant at various elevations.

As-built hanger drawings and previous inspection documentation for the supports listed in Attachment 2 were obtained from Supply System Records Management and Bechtel Q.A. files. In addition, the documents listed in the references below were obtained from Bechtel Quality Assurance. These documents defined the general requirements for support installation, construction tolerances, weld thickness and allowable variations in configuration. These

attributes encompass the major structural features of the supports. The following attributes were inspected and compared with the as-built drawings and applicable standards;

- 1) Member sizes and lengths.
- 2) Weld size and configuration (length, spacing, locations).
- 3) Location of bolts connecting tray supports to the trays.
- 4) Visual inspection of baseplate and anchor bolts for tightness, thread engagement where visible, spacing between anchors and required hole-to-edge distances. Spacing between anchor bolts in adjacent baseplates was not verified.

Spot checks were also made of other attributes such as support span.

For each support the drawing dimensions were check-marked or annotated and a field inspection and comment form was completed (attachment 1). All potential findings were reviewed with Bechtel Q.C.

Westinghouse personnel then investigated any deviations between the supports and as-built documentation by comparison to original design calculations and/or by alternate calculations. A typical evaluation is shown in Attachment 4.

4.0) REFERENCES

- 1.) As-Built Tray and Conduit Support Drawings
- 2.) Fischbach/Lord Electrical Company Raceway Installation and Inspection CP/QAP 402, Rev. 3 (Oct. 16, 1979)
- 3.) Fischbach/Lord Electrical Company Visual Weld Examination and Inspection Procedure CP/QAP 303, Rev. 6

5.0) FINDINGS REGARDING CONSTRUCTION QUALITY

Attachment 2 summarizes the findings by support. Attachment 3 lists the resolution of these findings by support. The following discussion is an overall summary of relevant findings and their impact on construction quality. Of 42 hangers inspected, none were found to have any unacceptable deficiencies in construction.

5.1) Welds

Upon inspection all welds appeared to be of good quality and in conformance with the designs in length, spacing and configuration. However, eight supports were found to have a weld undersized by $1/16"$ ($3/16"$ vs $1/4"$). Upon comparison to the original design calculations it was found that several of the welds were not required or were originally designed as $3/16"$. This indicated that many of the surveyed welds were adequate as installed. For those undersize welds not resolved in the above manner new stress calculations were performed. These calculations verified that these welds are adequate as installed.

5.2) As-Built-Dimensions

Dimension deviations from the drawings in excess of the tolerances allowed by CP/QAP403 (2" for dimensions exceeding 2 feet) were noted for five supports. On support TS-2196 the member was actually shorter than shown on the drawing and is adequate by inspection. On support TS-5346 the member was found to exceed the original as-analyzed length by approximately $1/2"$ inch. On a 5 foot long member this increase in length was insignificant. The deviations on the other supports were also found to be insignificant.

5.3) Configuration

For support TS-5358 the as-built drawing showed a cantilever member that did not exist in the field. This cantilever member was provided in the design for support of conduit. Since no conduits were supported the member was not required and the support is adequate as installed.

Support TS-4829 was found to have some variations in geometry from the original generic design. Calculations with the generic design provided for some variations but did not cover the observed installation. Additional calculations performed for the as-built support showed it to be adequate as installed.

5.4) Bolting

It was noted during the hanger inspection that several bolted connections had less than full thread engagement and/or inconsistent use of washers. Upon investigation of the installation criteria it was found that in all observed cases the use of washers was not required and/or an acceptable substitute was present (i.e. a serrated nut). In addition only a 4 thread nut engagement was required. All observed cases satisfied these criteria.

Another observation was that the minimum center to center and center to edge distances for cable tray hold down bolts were not satisfied. Review of the design assumptions and reanalysis of the generic loads resulted in reduced minimum bolt spacing and minimum edge distance requirements. With the new analysis all observed bolt spacings were adequate.

5.5) Conduit Attachment

It was noted that the number of conduits shown on the as-built drawing did not match the number installed in the field. It was determined that conduits installed on cable tray supports were not required to be as-built. The field engineer was responsible for determining if a support could resist the conduit load. If he was unable to make that decision he submitted the information to the responsible design engineer for analysis.

Westinghouse did not verify how the work was performed. Instead, several supports were selected for verification of the installed conduits by Westinghouse. Generic conduit loads were calculated by multiplying the conduit weight per unit length by the maximum allowable span of 6.75'. The sum of these generic loads was then compared to the load given on the drawing.

In several cases the sum of the generic conduit loads exceeded the value shown on the drawing. However, when the point of load application, and the relative magnitude of the load in comparison to the total support design load were considered, the effect of the increased conduit load was negligible. The attachment of conduits to the supports investigated was therefore found to be acceptable.

ATTACHMENT 1.

W CONSTRUCTION QUALITY ASSESSMENT PROGRAM
- ELECTRICAL RACEWAY SUPPORTS

PROCEDURE FOR POST-1980 Q.C. I EQUIPMENT INSPECTION

SUPPORT ID. NO. _____ SHEET _____ OF _____
APPLICABLE DWG. _____ DWG. REV. NO. _____ REV. DATE _____

W INSPECTION TEAM MEMBERS _____

INSPECTION DATE (PLANT WALKDOWN) _____

CHARACTERISTICS TO BE EXAMINED : INDICATE OK, N/A (NOT APPLICABLE), "NOT VERIFIED", "NOT OK". ATTACH COMMENTS FOR "NOT VERIFIED" OR "NOT OK" ON SUPPLEMENTARY SHEETS

CHARACTERISTIC	HARDWARE AS-DESIGNED?	Q.C. PROCESS EFFECTIVE IF N/A AS-DESIGNED
SUPPORT DIMENSIONS & FABRICATION WELD WORKMANSHIP WELD DIMENSIONS MEMBER DIMENSIONS		
• SUPPORT TO TRAY OR CONDUIT ATTACHMENT FASTENERS AS DESIGNED LOCKING DEVICES AS DESIGNED FASTENER TIGHTNESS		
• SUPPORT ANCHORING FASTENER TIGHTNESS FASTENERS AS DESIGNED THREAD ENGAGEMENT BOLT/STUD LOCATION LOCKING DEVICE		

OTHER OBSERVATIONS

* INCLUDING CORRECT "AS-BUILT" DRAWING OF SUPPORT

ATTACHMENT 2

RESULTS OF WESTINGHOUSE ELECTRICAL RACEWAY INSPECTION

I.D. NO.	TYPE	LOCATION (ELEV.)	FINDINGS
RADWASTE BUILDING			
1. RW 52-136	Conduit	RW (525)	OK
2. RW 52-137	Conduit	RW (525)	OK
3. RW 52-7762	Conduit	RW (525)	OK
4. RW 52-7532	Conduit	RW (525)	OK
5. RW 48-031	Conduit	RW (484)	OK
6. RW 48-7043	Conduit	RW (484)	OK
7. TS-1816	Tray	RW (484)	OK. Unistrut added with some washers under bolt heads, some under nuts.*
8. TS-1817	Tray	RW (484)	OK
9. TS-1818	Tray	RW (484)	Torque paint broken.
10. TS-2017	Tray	RW (484)	OK
11. TS-2134	Tray	RW (484)	Diagonal support had 3/16" weld, one side of attachment to base of tube.
12. TS-2195	Tray	RW (484)	Torque paint broken.
13. TS-2196	Tray	RW (484)	1) Torque paint broken on anchor bolts. 2) Horizontal member is 2' 6 3/4", vs 2' 9" dwg. Difference slightly exceeds 2' tolerance specified. CP/QAP 402, Rev. 3, P.17.

* Generic Drawing TS-528 mentions only bolt and nut; no lockwasher specified.

RESULTS OF WESTINGHOUSE ELECTRICAL RACEWAY INSPECTION

I.D. NO.	TYPE	LOCATION (ELEV.)	FINDINGS
RADWASTE/REACTOR BUILDING CORRIDOR			
14. RWRB6-3047	Conduit	RW/RB (467)	OK
15. RWRB6-3048	Conduit	RW/RB (467)	OK
16. RWRB6-7027	Conduit	RW/RB (467)	OK
17. RWRB6-7522	Conduit	RW/RB (467)	OK
18. TS-6207A	Tray	RW/RB (467)	Weld in Dwg. Section C-C appears undersized but is inaccessible to weld gage.
19. TS-6217	Tray	RW/RB (501)	OK
20. TS-6289	Tray	RW/RB (501)	Undersized weld, attachment of Items 2/3.
21. TS-6292	Tray	RW/RB (501)	Undersized weld, attachment of Items 2/3.
22. TS-6297	Tray	RW/RB (501)	1) Undersized weld, attachment of Items 2, 6. 2) Holes on tray $\leq 9/16$ " from edge.
23. RWRB 46-7015	Conduit	RW/RB (467)	OK
24. RWRB4-7565	Conduit	RW/RB (441)	Angle/plate attachment has only 3/16" weld.
25. RWRB4-7616	Conduit	RW/RB (441)	OK (3x3x3/8) substituted for 3x3x1/4 in accord with GENERIC DWG. TS-501).
26. RWRB4-7617	Conduit	RW/RB (441)	OK

RESULTS OF WESTINGHOUSE ELECTRICAL RACEWAY INSPECTION

I.D. NO.	TYPE	LOCATION (ELEV.)	FINDINGS
REACTOR BUILDING			
27. TS-4045	Tray	RB (422)	OK
28. TS-4829	Tray	RB (471)	1) Weld at top of tube 1/16" undersize. 2) Holes on tray are $\leq 9/16$ from edge.
29. TS-4830*	Tray	RB (471)	1) Undersized weld. 2) Damaged washer, one anchor bolt. 3) Holes on tray section 9/16" from edge. 4) Anchor bolt appears to be inclined $> 5^\circ$.
30. TS-4905	Tray	RB (501)	1) As-built dwg. does not reflect substitution of larger angle. (Accept- able per TS-S07, Note 14). 2) Added 15" 3x3 angle for conduit not shown in documentation package.
31. TS-5131*	Tray	RB (522)	OK; conduit location not clear on dwg.
32. TS-5132	Tray	RB (522)	3x3 tube actual wall thick- ness agrees with Dwg. Rev. 1 but not "as-built" Rev. 5.
33. TS-5308	Tray	RB (548)	OK
34. TS-5346	Tray	RB (548)	Rev. 4 "as-built" shows a 5' 1" member vs 5' 5" actual (Rev. 1 shows 5' 4")
35. TS-5347	Tray	RB (548)	Two anchor studs not fully engaged by nuts.

*Not fully inspected due to complexity of support.

RESULTS OF WESTINGHOUSE ELECTRICAL RACEWAY INSPECTION

I.D. NO.	TYPE	LOCATION (ELEV.)	FINDINGS
REACTOR BUILDING			
36. TS-5358	Tray	RB (548)	1) Actual dimensions of top horizontal member differ from dwg. 2) Support configuration differs from dwg.
37. TS-5359	Tray	RB (548)	Tray to tube clearance greater than shown on the drawing.
38. TS-5360	Tray	RB (548)	Dwg. lacks weld callout for top angle; Item 2 is 4' 4" actual, not 4'.
39. RB 47-734	Conduit	RB (471)	Retrieved dwg. shows Unistrut on wrong side of tube (dwg. not marked "As-Built").
40. RB 50-179	Conduit	RB (501)	OK
41. RB 52-3780	Conduit	RB (522)	OK
42. RB 52-351	Conduit	RB (522)	OK

SUMMARY OF RESOLUTIONS

TS-1816	Washers are not required by the Installation criteria.
TS-1818*	Not evaluated.
TS-2134	Originally designed as 3/16" weld.
TS-2196	Shortened cantilever reduces loads.
TS-6207A	Weld qualified by alternate calculation.
TS-6289	Weld adequate by comparison to original design calculations Other items adequate by alternate calculations.
TS-6292	Weld adequate by comparison to the original design calculations.
TS-6297	Weld qualified by alternate calculation. Edge distance adequate by alternate calculation.
RWRB4-7565	Weld qualified by alternate calculation.
TS-4829	Support qualified by alternate calculations.
TS-4830	Weld qualified by alternate calculation. Baseplate adequate by comparison to original design calculation. Edge distance adequate by alternate calculations.
TS-4905	Support adequate by comparison to original design calculation.
TS-5131*	Not evaluated
TS-5132	Tube section qualified by alternate calculation.
TS-5346	Support adequate by comparison to original design calculation.
TS-5347	Per the applicable installation criteria the nuts have adequate engagement.
TS-5358	Support is adequate by comparison to the original design calculation.
TS-5359	Support adequate by comparison to original design calculation.
TS-5360*	Weld qualified by alternate calculation. Increased member length not evaluated.

Attachment 3

RB47-734*

Not Evaluated.

* These items were judged to have no impact on support adequacy.

WESTINGHOUSE NUCLEAR TECHNOLOGY DIVISION

TITLE WNP-2 ELECTRICAL SUPPORT DISCREPANCY EVALUATION				PAGE 1 OF 2	
PROJECT WNP-2	AUTHOR M. Fisher	DATE 9/23/83	CHK'D. BY [Signature]	DATE 10/18/83	DATE
S.O. RWNPW04	CALC. NO. TS-4830	FILE NO.	GROUP SE-I		

PURPOSE

During the Westinghouse Task 2 electrical support walkdown and inspection, discrepancies were noted between the as-built document and the as-installed condition. Herein is the evaluation of these discrepancies and the conclusion as to the impact on design.

REFERENCES

W construction quality Assessment Program - Electrical Raceway Supports, Inspection Sheet, 8/27/83

- 1.
2. NPS Drawing TS-4830 Revision 4.
3. Design Calculation NPS calc NO G39-167 REV 1.

DISCREPANCY SUMMARY

- 1) ITEM # 8 to item 19 weld undersized by $\frac{1}{16}$ "
- 2) ONE ANCHOR IN ITEM 12 HAS A BROKEN LOCK WASHER (only $\frac{1}{2}$ in place)
- 3) 4 ANCHORS in item #12 ARE inclined, must be MEASURED AND COMPARED to PED 4500 Allowables.
- 4) Edge distance for "holddown" bolts is less than $\frac{9}{16}$ " ($\approx \frac{3}{8}$ ")
SEE GENERIC problem #2 AND A 6" TRAY HAD less than the REQUIRED 5min distance between holddown bolts.

IMPACT ON DESIGN

- 1) SEE PAGE 2 FOR CALC
- 2) BASE plate CALC CONSIDERS ONE bolt INACTIVE, the missing WASHER could MAKE this bolt INACTIVE \therefore PRESENT INTERACTION RATIO OF .67 w/ TRUE bolt INACTIVE is O.K.
- 3) TWO ANCHORS had a $\frac{3}{16}$ " GAP UNDER ONE side of the $1\frac{3}{8}$ " bolt head \therefore AN angle of 8° EXISTS. PED-CS-4500 REMOVES the requirement to INSPECT FOR ANCHOR INSERT ANGLE but THESE ANCHORS should HAVE BEEN INSTALLED with BEVELED WASHERS. BECAUSE the PRESENT INTERACTION RATIO is .67 the Additional 3° without A beveled washer by E.J. is O.K.

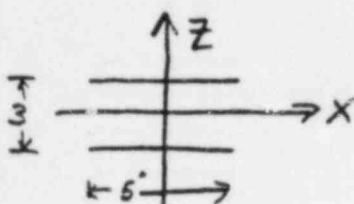
REV. NO. 1	REV. DATE 11/14/83	AUTHOR [Signature]	DATE 11/14/83	CHK'D. BY Richard Du	DATE 11/14/83	CHK'D. BY	DATE
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4) See GENERIC Problem #2

WESTINGHOUSE NUCLEAR TECHNOLOGY DIVISION

TITLE WNP-2 ELECTRICAL SUPPORT DISCREPANCY CALC				PAGE 2 OF 2	
PROJECT WNP-2	AUTHOR M. Fisher	DATE 9/23/83	CHK'D. BY Daniel R. [Signature]	DATE 9/29/83	CHK'D. BY [Signature]
S.O. RWNPWR04	CALC. NO. TS-4830	FILE NO.	GROUP SE-1		

DISC. 1) WELD AT THIS CONNECTION WILL BE EVALUATED
CONSIDERING THE TWO 5" FILLET WELDS
ONLY.



$$F_x = 275 \times 1.6 = 440 \text{ #}$$

$$F_y = 275 \times 1.6 = 440 \text{ #}$$

$$F_z = 275 \times 1.6 = 440 \text{ #}$$

$$M_x = 0$$

$$M_y = 440 \times 17.5 = 7700 \text{ in #}$$

$$M_z = 440 \times 17.5 = 7700 \text{ in #}$$

$$F_1 = \frac{7700 \times 1.5}{43.33} + \frac{440}{10} = 311 \text{ #/in}$$

$$S_x = bd = 5 \times 3 = 15$$

$$S_z = \frac{S^2}{3} = 8.333$$

$$F_2 = \frac{7700 \times 2.5}{43.33} + \frac{440}{10} = 488 \text{ #/in}$$

$$J = \frac{5^3 + 3 \times 5 \times 3^2}{6} = 43.333$$

$$F_3 = \frac{440}{10} + \frac{0}{15} + \frac{7700}{8.333} = 968 \text{ #/in}$$

$$F_T = 1128 \text{ #/in}$$

$$70 \text{ ksi} \times .3 \times .707 \times .25" = 3.71 \text{ K/in} \times \frac{32.8 \text{ ksi}}{36.0 \text{ ksi}} = 3.38 \text{ K/in @ } 200^\circ\text{F}$$

$$= 3380 \text{ #/in}$$

$$1120 \text{ #/in} < 3380 \text{ #/in} \therefore \text{Weld O.K.}$$

REV. NO. 1	REV. DATE 11/14/83	AUTHOR [Signature]	DATE 11/15/83	CHK'D. BY Richard [Signature]	DATE 11/14/83	CHK'D. BY	DATE
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