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TELECOPY TO:

Mr. Jack Martin
Regional Administrator

U. S. Nuclear Regulatory Commission
Region V
Creskside Oaks Office Park
1452 Maria Lane - Suite 210
Walnut Creek, CA. 94595-5368

Telecopy Number - 415-963-3773

FROM:

Mr. Thomas G. Woods, Jr.
Executive Vice President
Arizona Nuclear Power Project
Arizona Public Service Company
P. O. Box 21646, Sta. 1910
Phoenix, Arizona 85026

402-271-2121

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Arizona Public Service Company

P.O. BOX 91888 • PHOENIX, ARIZONA 85068

THOMAS G. WOODS JR.
10000 WILLOW BLVD
ANTONIA NUCLEAR POWER PROJECT

October 12, 1983

US Nuclear Regulatory Commission
Region V
Crescent Oaks Office Park
1450 Marie Lane - Suite 210
Walton Creek, CA 94596-5368

ATTN: Mr. J. Martin
Regional Administrator

Subject: Construction Assessment Inspection of Palo Verde Unit 1

File: C.1.10

Dear Sir:

Since the exit interview meeting of September 30, 1983, with the Construction Assessment Team, Arizona Public Service Company (APS) has made a preliminary review of the findings and would appreciate your consideration of some additional information.

In some cases we feel that the criteria used by the NRC during the inspection was more applicable to an operational plant. Testing at Palo Verde has not been completed nor have all the procedures necessary to operate the plant been fully developed and reviewed. Although the NRC's concerns in these areas are valid, and will be appropriately addressed, these deficiencies would have been corrected during the completion, testing and procedure development prior to operating Unit 1.

In several other areas, APS' investigations of NRC findings have disclosed additional information which the NRC did not have during the exit interview.

Electrical Separation

During the inspection three cases were identified where electrical separation criteria were not met. In one of the cases noted by the NRC, non-Class IE conduit 1E7J2ANRX43 was within 2 to 3 inches of a Class IE cable.

INMPS PS&R Section 8.2.1.4.1.2.C notes that "When non-Class IE cables enter an enclosure containing Class IE wiring, a 6 inch minimum physical separation is maintained between the non-Class IE cable and any Class IE wiring. Where a 6-inch separation cannot be maintained, the non-Class IE cables are installed in enclosed raceway (rigid steel conduit, flex. conduit, EMT, or enclosed metal gutter) and a minimum of 1 inch separation is maintained between the non-Class IE enclosed raceway and Class IE cables". Conduit 1E7J2ANRX43 met this separation requirement.

II. Embedded Plate Installation

During the inspection two embedded plates in the Containment Building, and one in the Auxiliary Building were identified as having thread engagement less than the minimum specified.

The embedded plate in the Containment Building, Unit 1 for Tag #SI-103-4-019; EL 89'-9-1/2" is a J-Plate. The thread engagement observed is acceptable for a J-Plate in accordance with Work Plan Procedure/Quality Control Instruction WEP/QC124.1, Exhibit 24.1-3. The embed plate in Unit 3 Containment Building south secondary shield wall EL 92'-0" had bolts number 3 and 8 relocated. Concrete placement Construction Inspection Plan (CIP) for placement 10023 has the required information noted on it. The embed plate in the Auxiliary Building EL 123'-3", 9'4" west of A1, north face of A1 wall, bolt number 5 on the embedded plate is approximately 3/4" deep. The plate has been UT examined in the vicinity of the recessed bolt to identify if the anchor was welded. Certified report of nondestructive examination shows that the bolt was welded.

III. Radiograph Acceptance

During the inspection radiographs which had been accepted were found to have surface irregularities which would preclude proper film interpretation.

Both APS and Bostel personnel have reviewed the radiographs in question and have identified them to meet code requirements. ASME Section V, Article 2, 1974 Edition, Winter 1975 Addenda states in paragraph T-221.2, "Welds - The weld ripples or weld surface irregularities on both the inside (where accessible) and outside, shall be removed by any suitable process to such a degree that the resulting radiographs involve due to any irregularities cannot be masked or be confused with the image of any discontinuity". Subsequent to the inspection, Bostel Internal and Quality Services Level III radiographic examiner reviewed the radiographs in question. His review confirmed the acceptability of the film interpretation. During the fabrication of the Bostel Field welds, information radiographs were also taken after the welds were in the following stages of completion: 1/4 T, 1/2 T, 3/4 T, and full T prior to internal cladding. These radiographs were interpreted and any questionable indications were removed prior to completing the welds. Additionally, the six welds in question have also undergone ASME Section XI, Preservice Ultrasonic Examination. The ultrasonic examination determined that the welds meet the acceptance criteria.

IV. High Pressure Safety Injection Pump Motor Installation:

During the inspection a record specifically documenting the torquing of High Pressure Safety Injection Pump A mounting bolts was not available.

Although there was not a specific inspection point for bolt torquing at the time of construction installation of the High Pressure Safety Injection Pump A motor mounting bolts, there is documentation of this torquing. APS Work Order #00013878, step 33, specifically notes QC verification of the final torque of the motor to the template.

V. Battery Intercell Resistance

During the inspection it was noted that the baseline value of battery intercell resistance had not been determined at the time of initial installation.

IEEE 450, Section 1, "Scope", states that "Sizing, installation, and other battery types and applications are also beyond the scope". Therefore, IEEE 450 does not deal with the installation of the battery itself. IEEE Section 8.3.2.1.1.2.3 states that testing of DC power systems is performed "prior to plant operation in accordance with IEEE 450-1972 as described in Section 14.2. Subsequent tests and inspections will be as described in Section 16.3/4." Neither of these sections of the PS&S require battery intercell resistance to be measured at the time of initial installation. Startup Generic Test Procedure for Battery System Checkout, GS-212.1, Rev. 2 addresses the requirement to measure intercell resistance checks in paragraph 8.3.

VI. Battery Tests

During the inspection it was noted that vendor testing of battery C did not conclusively fulfill the discharge rate requirements. This fact was recognized by the Project in 1981. Supplier Deviation Disposition Request (SDDR) 2767, submitted April 21, 1981, stated that the capacity discharge tests did not meet specification requirements. This SDDR was dispositioned on May 15, 1981, as acceptable, and noted that the capacity discharge tests will be run at the job site on the complete battery. Results of the test performed at the job site will be comparable to factory tests. Additionally, Quality Assurance Deficiency Report (QADR) 11 written August 6, 1981, noted similar problems. The Capacity Discharge Test will be performed in accordance with Station Manual Procedure 93E-1802, 125 VDC Class JE Station Battery Service Test. Therefore, the requirement to run a Capacity Discharge Test will be fulfilled.

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Additionally, it was noted that the load profile for Battery B did not fully envelope the requirements of FSAP paragraph 8.3.6. FSAR table 8.3.6 indicates that the load on Bus B after two hours is 349 amps. Battery specification 13E4090 indicates the discharge current at the end of two hours should be 387 amps. Station Manual Procedure 93PF-1D802, 125 V DC Class IE Station Battery Service Test, indicates that the discharge rate after two hours should be 387 amps. Both the battery specification and the test procedure to be used for testing the battery have acceptance criteria which exceed the requirements of the FSAR.

VII. Motor Control Cabinets

During the inspection it was noted that three mounting bolts in motor control cabinet M35 had inadequate thread engagement.

APS agrees with the NRC observation. However, the Project had already noted deficiencies in this area and initiated Design Change Package (DCP) 181-84-035, approved May 24, 1983, to correct these deficiencies.

VIII. Containment Atmosphere Sensing System

The NRC Inspector found the Containment Atmosphere Sensing Lines capped.

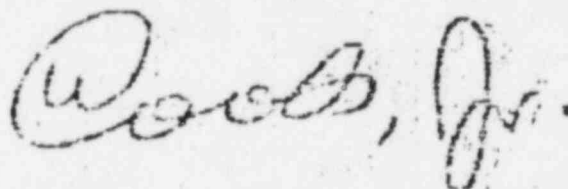
On April 25, 1983, the NRC issued IE Information Notice No. 83-27 titled "Inoperable Containment Atmosphere Sensing System". In June 1983, to address this IE Information System, an Operating Experience Review Action Distribution Sheet was prepared in accordance with Station Manual Procedure 7340-92203, Operating Experience Review. Action has been partially completed on this Operating Experience Review Action Distribution Sheet, but the item remains open.

Since Unit 1 is not in an operating phase, the capping of the Containment Pressure Sensing Lines does not violate a requirement. Additionally, since the Operating Experience Review Action Distribution Sheet remains open, there will be an additional review of this situation. The requirement to verify the Pressure Sensing Lines are uncapped will be added to procedure 415T-12214. APS feels confident that through the review process for IE Bulletins described above, we would have removed the caps prior to loading fuel.

Mr. J. Martin
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I hope this additional information will be considered in the writing of the final Construction Assessment Team report. I am personally very concerned with the discrepancies noted by the team and am implementing immediate action to review each finding in depth to correct and prevent repetition in the future.

Very truly yours,



TGW:CS:masd

cc: K. L. Turley

1. ELECTRIAN	
2. MILLWRIGHT	
3. IRONWORKER	
4. BOILER MAKER	
5. PIPE FITTER	
6. CARPENTER	
7. JANITOR	
8. QC WELDER	
9. Q C ELECT	
10 QC MECH/PIPING/NSSS	
11. LABORER	
12. INSULATOR	
13. WELDER	
14. NDE TECH	
15. SPRINKLER	
16. OPERATING ENGR	
17. QC CSC	

112
 10-29-83
 Jey

Inspector: L. E. VORDERBRUEGGEN

Question List

Name: SLUTER, O.F.

Work for: Organization BECHTEL

Craft: ELECTRICIAN

Date: 9/22/82

Years on site: 26 M.O.S.

Questions

1. Any problems with quality of work?

No, QUALITY APPEARS VERY GOOD

2. Any management pressure to "cut corners"?

No, FOREMEN EXPECT GOOD WORK

3. How's the QC here?

O.K. INSPECTORS ARE KNOWLEDGEABLE AND DILIGENT

4. What do you feel is managements attitude toward quality?

GOOD, QUALITY IS NEXT IN IMPORTANCE TO SAFETY.

5. Is there anything NRC should know about?

NOTHING THAT HE IS AWARE OF

Inspector: LEONOR BRUEGGEN

Question List

Name: GEORGE KILGORE
E-1224
Craft: ELEC. WELDER
Years on site: 4 YRS

Work for: Organization BECHTEL
Date: 9/27/83

Questions

1. Any problems with quality of work?

Quality is 1st class as far as he's been able to observe.

2. Any management pressure to "cut corners"?

On the contrary, foremen and Elec. Supt. demand that work be done according to reg's.

3. How's the QC here?

Always on your case! They appear to know what is correct and are helpful in "getting it right the first time"!

4. What do you feel is managements attitude toward quality?

Appears to be determined to get a good job done

5. Is there anything NRC should know about?

Nothing he is aware of!

Inspector: L. E. VORDERBRUEGGEN

Question List

Name: NIM RIFFLE

Work for: Organization BEGHTEL

Craft: ELEC.

Date: 9/28/83

Years on site: 1 1/2 YRS - ALL ON #1 - PREFERRED CHECKOUT

Questions

1. Any problems with quality of work?

Seen nothing to raise concerns

2. Any management pressure to "cut corners"?

None - Foremen expect work to be done right

3. How's the QC here?

satisfied with S. ^{Staff} Q.C. Knowledgeable and diligent!

4. What do you feel is managements attitude toward quality?

appears good from what he can deduce.

5. Is there anything NRC should know about?

Nothing he is aware of.

Inspector: C. J. Ames

95
9/16/83

7

Question List

Name: Bob Schmitz

Work for: Organization Dechtel

Craft: Electrical

Date: 9-15-83

Years on site: 7

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

Encourage quality, stress procedures

3. How's the QC here?

Good. Several Craftsmen are in QC now. This helps a lot.

4. What do you feel is managements attitude toward quality?

Very good response, concerned about quality.

5. Is there anything NRC should know about?

No problems

Inspector: J. Crane

Question List

Name: Joseph Crane

Work for: Organization Bechtel

Craft: Electrical Foreman

Date: 9-15-83

Years on site: 5-6

Questions

1. Any problems with quality of work?

Pretty good

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

*Good. A lot of former
Craftsman. Pretty good in whole*

4. What do you feel is managements attitude toward quality?

Really good. Stress QC

5. Is there anything NRC should know about?

No

Inspector: Albert

Question List

Name: W. Meedy

Work for: Organization Bechtel

Craft: Filter

Date: 9/15/83

Years on site: 4

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

"we have rush jobs but we're always given the time to do it right"

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

Good

5. Is there anything NRC should know about?

No

Inspector: Albert

Question List

Name: Ken Knoebel

Work for: Organization Buchtal

Craft: Fitter

Date: 9/15/83

Years on site: 2

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

Problems get taken care of.

5. Is there anything NRC should know about?

No

Inspector: Albert

Question List

Name: Leon Galvon

Work for: Organization Bechtel

Craft: Fitter

Date: 9/15/83

Years on site: 5

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here? *"I've been in construction for 30 years and this is the best I've ever seen"*

4. What do you feel is managements attitude toward quality?

Too much paper work but problems get addressed.

5. Is there anything NRC should know about?

No

Inspector: Young

Question List

Name: M. White

Work for: Organization Bechtel

Craft: Welding/NDE QC

Date: 9-13-83

Years on site: 5 1/2

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

Very good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No.

Inspector: Young

Question List

Name: C. Casey

Work for: Organization Bechtel

Craft: Welding/NDE QC

Date: 9-14-83

Years on site: 2

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No

Inspector: Young

Question List

Name: M. Spitzer

Work for: Organization Bechtel

Craft: Welding/NDE QC

Date: 9-14-83

Years on site: 2

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

Some but when QC finds it, its taken care of.

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No.

Inspector: Young

Question List

Name: G. New

Work for: Organization Bechtel

Crafts: Welding/NDE/QC

Date: 9-14-83

Years on site: 4 1/2

Questions

1. Any problems with quality of work?

Excellent

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

Good

5. Is there anything NRC should know about?

No.

Inspector: Young

Question List

Name: K Shaw

Work for: Organization Bechtel

Craft: Const/Startup Coord. QC

Date: 9-14-83

Years on site: 5 1/2

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

Good

5. Is there anything NRC should know about?

No.

Inspector: Young

Question List

Name: L. Stout

Work for: Organization Bechtel

Craft: Const/SH Coprd. QC

Date: 9-14-83

Years on site: 3 1/2

Questions

1. Any problems with quality of work?

Excellent

2. Any management pressure to "cut corners"?

None whatsoever

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

good.

5. Is there anything NRC should know about

No

Inspector: Young

Question List

Name: G. Briggs

Work for: Organization Bechtel

Craft: Mech Piping / NSSS QC

Date: 9-14-83

Years on site: 3 1/2

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

Very good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No.

Inspector: Young

Question List

Name: Jackson

Work for: Organization Bechtel

Craft: Mech Piping/NSSS QC

Date: 9-14-83

Years on site: 1

Questions

1. Any problems with quality of work?

None whatsoever

2. Any management pressure to 'cut corners'?

None

3. How's the QC here?

Excellent

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No.

Inspector: Young

Question List

Name: F. Loney

Work for: Organization Bechtel

Craft: Mech. Piping / NSSS QC

Date: 9-14-83

Years on site: 23

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

~~Excellent~~ None

3. How's the QC here?

Excellent

4. What do you feel is management's attitude toward quality?

good

5. Is there anything NRC should know about?

No.

Inspector: Young Jr.

Question List

Name: W. Smith

Work for: Organization Bechtel

Craft: Mech Piping/NSSS QC

Date: 9-14-83

Years on site: 6

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

Very good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No. All problems get resolved by QC.

Inspector: Young

Question List

Name: R Cole Work for: Organization Bechtel
Craft: Mech. piping / WSSS QC Date: 9-14-83
Years on site: 3 1/2

Questions

1. Any problems with quality of work?

No! None at all

2. Any management pressure to "cut corners"?

Some at times, especially with new supervisors. They soon learn that, ~~to~~ that's not the way it's done here.

3. How's the QC here?

Excellent

4. What do you feel is management's attitude toward quality?

Good.

5. Is there anything NRC should know about?

No. All of my problems are taken care of thru the chain of command.

Inspector: Randy M. Campbell

Question List

Name: MR. B. HILL

Work for: Organization Bechtel Eng.

Craft: ELECTRICIANS

Date: 9-9-82

Years on site: 5 YRS

(MIDNIGHT SHIFT)

Questions

1. Any problems with quality of work?

NO PROBLEMS

2. Any management pressure to "cut corners"?

NONE

3. How's the QC here?

GOOD / ADEQUATE

4. What do you feel is managements attitude toward quality?

NO PROBLEMS,

5. Is there anything NRC should know about?

NO

Inspector: Randy M. Campbell / REGION 1

Question List

Name: Rusty Welch

Work for: Organization E. Abel ENG

Craft: ELECTRICAL

Date: 9-9-83

Years on site: 3 YRS

MIDNIGHT SHIFT

Questions

1. Any problems with quality of work?

NONE

2. Any management pressure to "cut corners"?

NONE

3. How's the QC here?

PROVE ADEQUATE

4. What do you feel is managements attitude toward quality?

Gen. GOOD

5. Is there anything NRC should know about?

NO

Inspector: Young

Question List

Name: Carter

Work for: Organization Beechtel

Craft: IFC and Welder

Date: 9/14/83

Years on site: 5

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None! emphasis on getting it done right the first time.

3. How's the QC here?

excellent

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No.

Inspector: C J Crane

Question List

Name: Bill Preston

Work for: Organization Bechtel

Craft: Electrical

Date: 9-13-83

Years on site: 4 1/2

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

Very good. Turn down stuff that's not good.

4. What do you feel is managements attitude toward quality?

Very good
1st concern is safety, 2nd is quality.

5. Is there anything NRC should know about?

No

Inspector: C J Crane

Question List

Name: Judeo Southard

Work for: Organization Dachtel

Craft: Electrical

Date: 9-13-83

Years on site: 2 1/2

Questions

1. Any problems with quality of work?

Best quality I ever worked with.

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

Very adequate

4. What do you feel is managements attitude toward quality?

They stress safety & quality.

5. Is there anything NRC should know about?

No.

Inspector: J. BURDOW

Question List

Name: MCDONALD

Work for: Organization ISI/ICMS

Craft: PIPING INSULATOR

Date: 9/12/83

Years on site: 3

Questions

1. Any problems with quality of work?

NO

2. Any management pressure to "cut corners"?

NEVER EXPERIENCED ANY.

3. How's the QC here?

GOOD

4. What do you feel is managements attitude toward quality?

VERY GOOD

5. Is there anything NRC should know about?

USE OF POUNDING TO INSTALLING METAL METAL INSULATION'S PANELS RX VESSEL NEAR SUPPORT. THIS ISSUE WAS BROUGHT TO ATTENTION OF APS AIR/MAY 81, AND RESOLVED. APS LTR. DTD. 5/18/81.

Inspector: W. MARINI

Question List

Name: CARL LUCKE

Work for: Organization BEHNTEL

Craft: ELECTRICIAN

Date: 9-13-83

Years on site: 4 1/2 (ONE IN AIR BLOCK)

Questions

1. Any problems with quality of work? **NONE**
2. Any management pressure to "cut corners"? **NO - ALL THE RIGHT TOOLS AND MATERIAL ARE AVAILABLE TO DO IT RIGHT IF YOU HAVE THE AMBITION TO USE THEM.**
3. How's the QC here? **KNOWLEDGEABLE**
4. What do you feel is managements attitude toward quality? **GOOD**
5. Is there anything NRC should know about? **NO**

Inspector: W. MARINI

Question List

Name: RICHARD KEITH, JR.

Work for: Organization BECHTEL

Craft: ELECTRICIAN

Date: 9-13-83

Years on site: 5 1/4

Questions

1. Any problems with quality of work?

PLANT SEEMS TO BE WELL BUILT.

2. Any management pressure to "cut corners"? **No**

ALWAYS GIVEN ADEQUATE TIME TO GET WORK DONE PROPERLY.

3. How's the QC here? **VERY CONSCIENTIOUS**

VERY WELL TRAINED & QUALIFIED

4. What do you feel is management's attitude toward quality?

ATTITUDE IS "GOOD QUALITY WORKMANSHIP THROUGHOUT"

5. Is there anything NRC should know about? **No**

Marini

Inspector: W. MARINI

Question List

Name: RICK DEKINS

Work for: Organization BECHTEL

Craft: ELEC. INSPECTOR

Date: 9-13-83

Years on site: 6 1/2

Questions

1. Any problems with quality of work? **NONE**

2. Any management pressure to "cut corners"?
IN THE PAST THERE WERE A FEW INSTANCES, BUT THEY HAVE ALL BEEN RESOLVED AND DON'T LEAD TO ANY PROBLEMS WITH THE QUALITY OF THE WORK.

3. How's the QC here? **IN GENERAL ITS OK, BUT THERE ARE TOO MANY PROPOSED REVISIONS ALL THE TIME.**

4. What do you feel is managements attitude toward quality?
THEY'RE ALWAYS PUSHING TO GET THINGS DONE ON SCHEDULE BUT IT HASN'T COMPROMISED THE QUALITY OF THE WORK.

5. Is there anything NRC should know about? **No**

Inspector: W. MARINI

Question List

Name: PETE FLORES

Work for: Organization BREXTEL

Craft: ELECTRICIAN

Date: 9-13-83

Years on site: 2 YRS - 2 STRETCHES

Questions ONE YEAR IN 1978 AS WELDER'S HELPER
" " PRESENTLY PUTTING COVERS ON TRAYS

1. Any problems with quality of work? NONE

2. Any management pressure to "cut corners"? NEVER

3. How's the QC here? KNOWLEDGEABLE

4. What do you feel is managements attitude toward quality?
GOOD

5. Is there anything NRC should know about? No

Inspector: Albert

Question List

Name: K. Atwood

Work for: Organization Wildinger

Craft: Sheetmetal Worker

Date: Sept 12 83

Years on site: 4

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

*Good - Problems always
are addressed by mgt.*

4. What do you feel is managements attitude toward quality?

Good

5. Is there anything NRC should know about?

*Thinks San Laitre which damaged
containment liner was possibly
caused by lack of "isolators" on fan or
motor. A design deficiency. (Answer
in response to direct question re incident)*

Inspector: Young

Question List

Name: Bankley
Craft: Sheet Metal Worker
Years on site: 5 yrs off & on

Work for: Organization Waldinger
Date: 9/13/83

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No

Inspector: Young

Question List

Name: K Hall

Work for: Organization Bechtel

Craft: QC Mech/Piping/ISSS

Date: 9-23-83

Years on site: 4

Questions

1. Any problems with quality of work?

None at all

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

Excellent

4. What do you feel is managements attitude toward quality?

Very good

5. Is there anything NRC should know about?

No!

Inspector: Young

Question List

Name: J. White

Work for: Organization Bechtel

Craft: QC/Mech Piping

Date: 9-28-83

Years on site: 3

Questions

1. Any problems with quality of work?

None at all

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

Very good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

Had some problems during my 1st six months. I talked to Vorderbueggen, who confronted my supervisor and the problems got re-addressed. None since

Inspector:

Young

Question List

Name:

Barnett

Work for: Organization

Bechtel

Craft:

QC/Elect

Date:

9-28-83

Years on site:

5

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

Good

5. Is there anything NRC should know about?

No!

Inspector: Young

Question List

Name: Jack Stevenson

Work for: Organization Bechtel

Craft: QC/Mech Piping/SSSS

Date: 9-23-83

Years on site: 7

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

Very good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

I know of no problems at all.

Inspector: Young

Question List

Name: Pederson

Work for: Organization Bechtel

Craft: QC/Elect

Date: 9-28-83

Years on site: _____

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

good

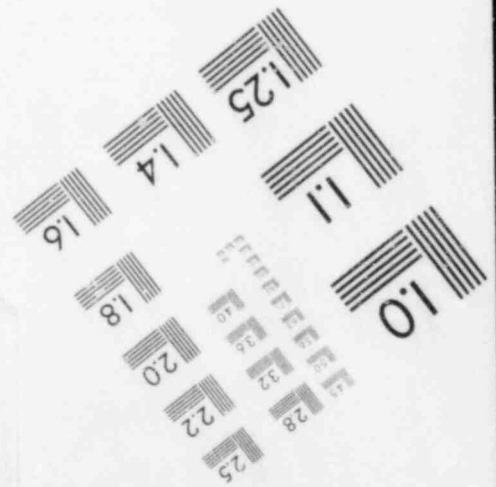
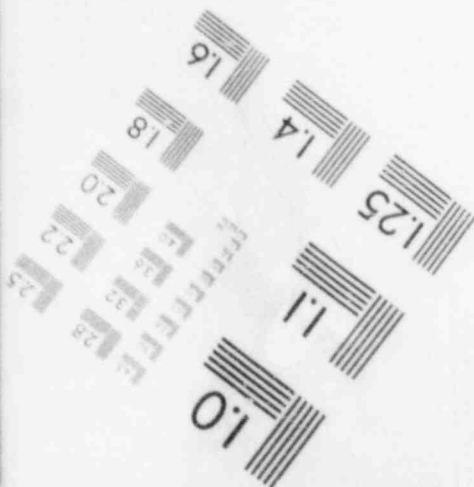
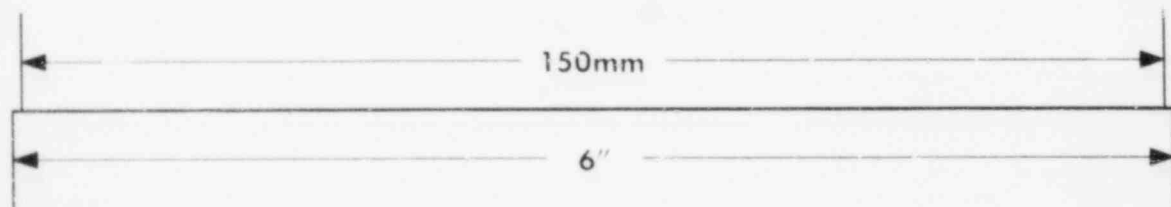
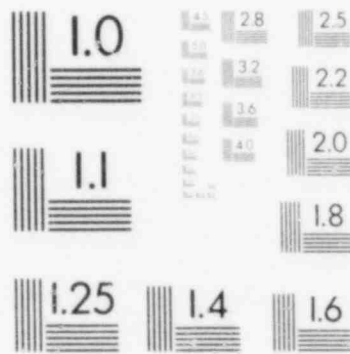
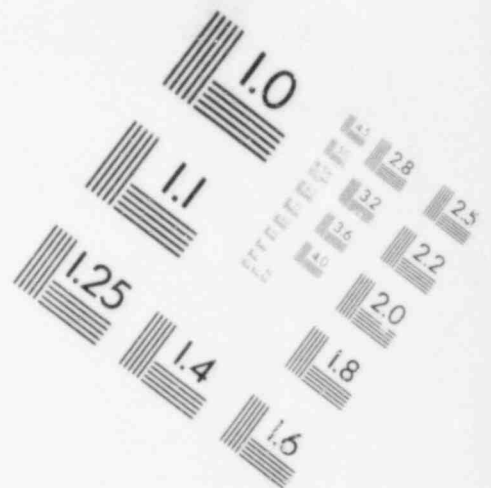
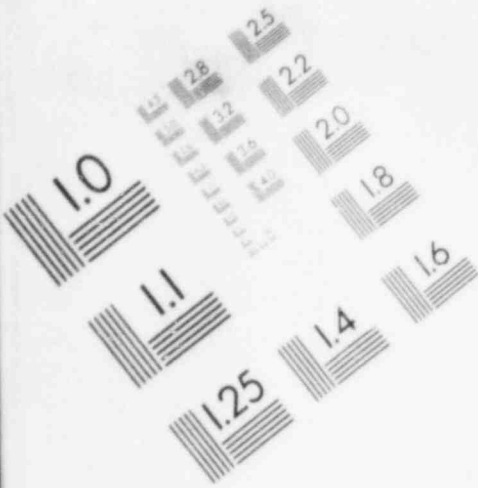
4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No

IMAGE EVALUATION
TEST TARGET (MT-3)



Inspector: ALBERT

Question List

Name: Gary Hazen

Work for: Organization Bechtel

Craft: Fitter (welder)

Date: 9/28/83

Years on site: 4

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

Not in quality

3. How's the QC here?

Good - When he was welding in aux bldg gen foreman came along and asked to see his papers to verify qualification for the 2" butt weld he was making. He thought he was qualified but it turned out he wasn't. Welds were subsequently

4. What do you feel is management's attitude toward quality?

Good - "This is the best I've seen of the places I've worked" explained that he had worked out Midlands and "Monroe" like they would do other places, just set them aside for awhile and put someone else's stamp on them"

5. Is there anything NRC should know about?

No.

Inspector: Young

Dane

Name: Tarapawa

Craft: DC/Elect

Years on site: _____

Question List

Work for: Organization Bechtel

Date: 9-28-83

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No

Inspector: Young

Question List

Name: Leben

Work for: Organization Bechtel

Craft: QC/EBCT

Date: 9-28-83

Years on site: 4

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No

Inspector: H. Walton

Question List

Name: Mc Dowell

Work for: Organization Bechtel

Craft: showermaker

Date: Sept. 13, 1983

Years on site: 2 yrs.

Questions

1. Any problems with quality of work?

NO

2. Any management pressure to "cut corners"?

NO

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

Good

5. Is there anything NRC should know about?

NO

Inspector: H. Walton

Question List

Name: Gaspar

Work for: Organization Bechtel

Craft: ironworker

Date: Sept. 13, 1983

Years on site: 7 yrs.

Questions

1. Any problems with quality of work?

NO

2. Any management pressure to "cut corners"?

NO

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

Good

5. Is there anything NRC should know about?

NO

Inspector: P Narbut

Question List

Name: Nichols

Work for: Organization Bechtel

Craft: Pipe fitter

Date: 9/27/93

Years on site: 3

Questions

1. Any problems with quality of work?

No, good work

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

Good, no doubts on knowledge

4. What do you feel is managements attitude toward quality?

Good

5. Is there anything NRC should know about?

No of no "fudging"

Inspector: Albert

Question List

Name: G. Henry

Work for: Organization W

Craft: QC Inspector

Date: 9/26

Years on site: "Few weeks"

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

Westinghouse acted promptly to correct seal leakage problem on the LPS1 pumps once they were made aware of the situation

5. Is there anything NRC should know about?

Believed APS operating people should have been aware of ^{3"}problem earlier since it ~~was~~ had to have been obvious that oil was being lost by sight gauge readings and oil addition.

Inspector: Albert

Question List

Name: C. Santa Cruz

Work for: Organization Bubtel

Craft: Electrician

Date: Sept 26

Years on site: 5 years
"off and on"

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

They do get in a hurry at times but when we object, time to do it right is made available.

3. How's the QC here?

OK

4. What do you feel is managements attitude toward quality?

Bubtel is OK - dont have any idea about APS

5. Is there anything NRC should know about?

No

Interview interrupted by Foreman who observed NRC inspector talking to craft and came in at end of it to issue instructions to craftsman. Foreman's interruption appeared designed to bring interview to a close.

Inspector: Young

Question List

Name: Chubbill

Work for: Organization Bechtel

Craft: DC/Elect

Date: 9-28-83

Years on site: 1 1/2

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No

Inspector: Young

Question List

Name: Milbo

Work for: Organization Bechtel

Craft: QC/Elect

Date: 9-28-83

Years on site: 7

Questions

1. Any problems with quality of work?

None at all

2. Any management pressure to "cut corners"?

None at all

3. How's the QC here?

excellent

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No.

Inspector: Young

Question List

Name: Griffen

Work for: Organization Bechtel

Craft: QC/Electrical

Date: 9-28-83

Years on site: 2

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

great

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No

Inspector: Young

Question List

Name: Denis

Work for: Organization Bechtel

Craft: QC/Elect

Date: 9-28-83

Years on site: 3

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No.

Inspector: Young

Question List

Name: Brown

Work for: Organization Bechtel

Craft: OC Mech piping / NSSS

Date: 9-28-83

Years on site: 3

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

Not know about but do. Initiate a program to educate the public as to what nuclear Power is all about.

Inspector: Young

Question List

Name: Nelson

Work for: Organization Bechtel

Craft: QC Mech/Piping/NSSS

Date: 9-28-83

Years on site: 6

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

good

4. What do you feel is management's attitude toward quality?

OK

5. Is there anything NRC should know about?

No

Inspector: C. J. Brown

Question List

Name: Mike D'Agostino

Work for: Organization Bectel

Craft: Electrical

Date: 9-12-83

Years on site: ~5

Questions

1. Any problems with quality of work?

No - Most people take time to resolve any problems.

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

QC doing a good job.

4. What do you feel is managements attitude toward quality?

Show Quality

5. Is there anything NRC should know about? *No. Would like to ask a question. Noticed that the ceiling and electrical lighting fixtures over the control bldg (elev. 140') office space and security area are not seismically supported (dipped). Why not? Could a seismic event cause a problem if ceiling and fixtures fell down. Would like an answer.*

Inspector: C. J. Casne

Question List

Name: Fred Sanchez
Craft: Electrician
Years on site: 3 years

Work for: Organization Electric
Date: 9/9/83

Questions

1. Any problems with quality of work?

No problems

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

Pretty tight

4. What do you feel is managements attitude toward quality?

Standards are high

5. Is there anything NRC should know about?

No.

Inspector: C. J. Crane

Question List

Name: Homer Bigley

Work for: Organization Bechtel

Craft: Electrical

Date: 9-12-83

Years on site: 7

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

Pretty good, pretty strict

5. Is there anything NRC should know about?

No

Inspector: C. J. Crane

Question List

Name: Richard Woods

Work for: Organization Ductel

Craft: Electrical

Date: 9-12-83

Years on site: 1

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

Never

3. How's the QC here?

Adequate

4. What do you feel is managements attitude toward quality?

Biggest lesson is quality

5. Is there anything NRC should know about?

No

*Re interviewed
by Albert 9/14
Same answers -
"They treat me
right around here"
"Best job I've ever
worked on"*

Inspector: H. Watson

Question List

Name: M. Davis

Work for: Organization Bechtel

Craft: Electrician

Date: Sept. 12, 1983

Years on site: 4 1/2 years

Questions

1. Any problems with quality of work?

NO

2. Any management pressure to "cut corners"?

NO

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

Real good

5. Is there anything NRC should know about?

NO

Inspector: H. Walton

Question List

Name: Carter

Work for: Organization Bechtel

Craft: Pipefitter

Date: Sept. 12, 1983

Years on site: 4 yrs, 4 months

Questions

1. Any problems with quality of work?

NONE

2. Any management pressure to "cut corners"?

NONE

3. How's the QC here?

Not enough inspectors. Long wait for G.C. inspectors to arrive. Very thorough when they do arrive

4. What do you feel is managements attitude toward quality?

Good

5. Is there anything NRC should know about?

NO

Inspector: Young

Question List

Name: Brandt

Work for: Organization Bechtel

Craft: Elect (Welder)

Date: 9/12/83

Years on site: 3

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No!

Inspector: Young

Question List

Name: Jaylor

Work for: Organization BECHTEL

Craft: Elec (Welder)

Date: 9/13/83

Years on site: 2

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

Very good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No

Inspector: ~~Hait~~ young

Question List

Name: Hait
Craft: elect app
Years on site: _____

Work for: Organization BECHTEL
Date: 9/12/83

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

Better than any where I've worked before.

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

Probably too much money is being spent for Quality.

Inspector: Young

Question List

Name: Limone
Craft: Pipefitter (Welder)
Years on site: 1

Work for: Organization BECHTEL
Date: 9/17/83

Questions

1. Any problems with quality of work?

No. They are quite fussy about quality.

2. Any management pressure to "cut corners"?

None at all, as a matter of fact they would rather you took extra time rather than having to redo the work.

3. How's the QC here?

Very fussy!

4. What do you feel is managements attitude toward quality?

Good

5. Is there anything NRC should know about?

I know of no problems.

Inspector: Young

Question List

Name: De Mille
Craft: Elect Foreman (Weld)
Years on site: 5

Work for: Organization BECHTEL
Date: 9/12/83

Questions

1. Any problems with quality of work?

NONE

2. Any management pressure to "cut corners"?

NONE

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

Some acts of sabotage have been seen lately. Mostly minor stuff but that requires rework.

Inspector: Albert

Question List

Name: Brette * Work for: Organization Bechtel
Craft: Ironworker (Welder) Date: 9/12
Years on site: 4

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

Good - "They are pretty strict here"

4. What do you feel is managements attitude toward quality?

Problems always get addressed

5. Is there anything NRC should know about?

People around here like their jobs -

** Helper present*

Inspector: C Young

Question List

Name: J. Innell

Work for: Organization BECHTEL

Craft: Electrical QC Inspector

Date: 9/12/83

Years on site: 5 1/2

Questions

1. Any problems with quality of work?

Doesn't understand why these allegations on quality. Quality on this project is excellent.

2. Any management pressure to "cut corners"?

There is pressure by ~~management~~ management for work to be done but not by cutting corners.

3. How's the QC here?

QC is very good!

4. What do you feel is managements attitude toward quality?

Very good!

5. Is there anything NRC should know about?

Only that Gunderson was Wined. He wore a sign on his hardhat that said "God didn't make man, Man made God".

Inspector: Young

Question List

Name: J. Jordan

Work for: Organization BECHTEL

Craft: Electrical QC inspector

Date: 9/12

Years on site: 2

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

Wants work to go faster but not cut corners to get there

3. How's the QC here?

QC is very good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

Knows of no problems on site

Inspector: Young

Question List

Name: R. Deakins

Work for: Organization BECHTEL

Craft: Electrical QC Inspector Date: 9/12/83

Years on site: 5

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

Very good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No!

Inspector: Young

Question List

Name: E. Piper

Work for: Organization BECHTEL

Craft: Electrical QC Inspector

Date: 9/12/83

Years on site: ~~2~~ 5

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

Very good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No!

Inspector: Young

Question List

Name: W. Brown

Work for: Organization BECHTEL

Craft: I&C Electrical QC

Date: 9/12/83

Years on site: 5

Inspector

Questions

1. Any problems with quality of work?

No problems.

2. Any management pressure to "cut corners"?

No pressure to cut corners.

3. How's the QC here?

QC is excellent. His duties required him to find problems and write up reports for corrective actions. Actions are always taken.

4. What do you feel is managements attitude toward quality?

Management has a good attitude toward quality.

5. Is there anything NRC should know about?

No

Inspector: Young

Question List

Name: G Martin

Work for: Organization BECHTEL

Craft: Electrical QC Inspector

Date: 9/12/83

Years on site: 3

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

QC is exceptional. Was in the Air Force for 10 years and QC here is as good as in the air force.

4. What do you feel is managements attitude toward quality?

Don't have much contact with much management but

5. Is there anything NRC should know about?

No!

Inspector: L. STANLEY

Question List

Name: RICK HODGES

Work for: Organization VIKING

Craft: SPRINKLER FITTERS

Date: 9-12-83

Years on site: 1 MONTH

Questions

1. Any problems with quality of work?

NO PROBLEMS SO FAR. HE IS NEW HERE, BUT HAS EXPERIENCE WITH BECHTEL ON FOSSIL PLANTS WHERE QUALITY WAS EMPHASIZED.

2. Any management pressure to "cut corners"?

NONE.

3. How's the QC here?

STRICT. DEFECTS HAVE TO BE REWORKED.

4. What do you feel is managements attitude toward quality?

TOO NEW FOR AN OPINION HERE.

5. Is there anything NRC should know about?

NOTHING YET.

Inspector: L. STANLEY

Question List

Name: MIKE WATT

Work for: Organization VIKING

Craft: SPRINKLER FITTERS

Date: 9-12-83

Years on site: 1 TO 2 YRS

Questions

1. Any problems with quality of work?

NO PROBLEMS OBSERVED FROM HIS VANTAGE-POINT.

2. Any management pressure to "cut corners"?

NO.

3. How's the QC here?

PRETTY TIGHT AND STRICT. DEFECTS MUST BE CORRECTED.

4. What do you feel is managements attitude toward quality?

GOOD ATTITUDE ^{BY} BECHTEL TOWARD QUALITY.

5. Is there anything NRC should know about?

NO.

Wagner

Inspector: Wagner

Question List

Name: _____

Work for: Organization Bachtel

Craft: Carpenter

Date: 9-7-83

Years on site: 7 yrs

Questions

1. Any problems with quality of work?

2. Any management pressure to "cut corners"?

3. How's the QC here?

4. What do you feel is managements attitude toward quality?

5. Is there anything NRC should know about?

NO

No problems
QA/QC or
management.

No work
related problems

Happy w. th
work,
Bachtel &
HPS

Inspector: Wagner

Question List

Name: _____ Work for: Organization BPC
Craft: Pipe fitter (welder) Date: 9-10-83
Years on site: 2-3

Questions

1. Any problems with quality of work?

NO

2. Any management pressure to "cut corners"?

NO

3. How's the QC here? - Very high praise for QA/QC
"Very strict QC here"

4. What do you feel is management's attitude toward quality?

Very high
No mgmt pressure to get work done ahead of schedule in lieu of safety or quality

5. Is there anything NRC should know about?

No problems or concerns

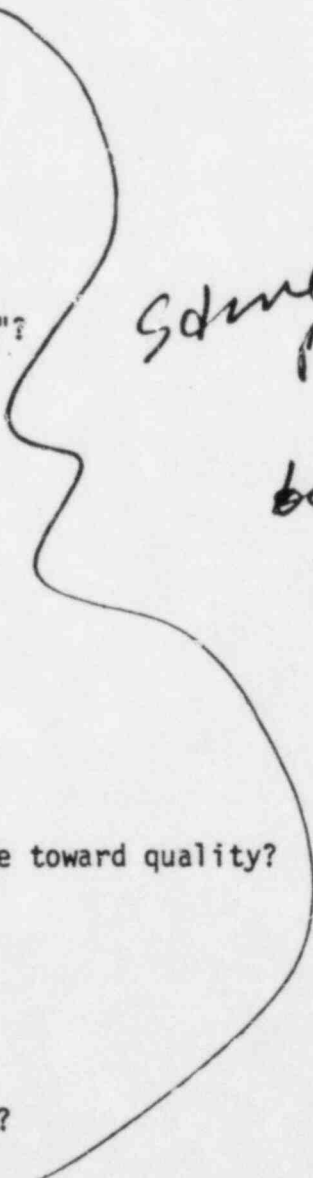
Inspector: Wagner

Question List

Name: _____ Work for: Organization BPC
Craft: Pipe fitter (Foreman) Date: 9-10-87
Years on site: 3+

Questions

1. Any problems with quality of work?
2. Any management pressure to "cut corners"?
3. How's the QC here?
4. What do you feel is managements attitude toward quality?
5. Is there anything NRC should know about?



Same as page 2

both interviewed together

Inspector:

Albert

Question List

Name:

Brewer

Work for: Organization

Bushnell

Craft:

Boilermaker

Date:

Sept 10 83

Years on site:

1 1/2

Questions

1. Any problems with quality of work?

Yes with the quality of vendor (CE) supplied components. Welding not up to site standards

2. Any management pressure to "cut corners"?

Not from the site.

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

Problems are addressed by management

5. Is there anything NRC should know about?

Yes Welding such as that in the upper guide structure is not to site standards and ~~the~~ the newspapers should realize that site work is much better inequality. "Anyone doing that kind of welding on site would have his papers pulled quick"

Inspector: J. BURDOIN

Question List

Name: D. DAVIDSON

Work for: Organization BREITEL

Craft: APPRENTICE ELEC.

Date: 9/10/83

Years on site: 1

Questions

1. Any problems with quality of work?

GOOD

2. Any management pressure to "cut corners"?

NO

3. How's the QC here?

GOOD

4. What do you feel is managements attitude toward quality?

EXCELLENT

5. Is there anything NRC should know about?

NO

Burdoin

Inspector: J. BURDOIN

Question List

Name: C. DICKENS

Work for: Organization BECHTEL

Craft: ELECTRICIAN

Date: 9-9-83

Years on site: 3

Questions

1. Any problems with quality of work?

GOOD

2. Any management pressure to "cut corners"?

NEVER EXPERIENCED THIS.

3. How's the QC here?

GOOD

4. What do you feel is managements attitude toward quality?

APP - GOES "EXTRA MILE"

5. Is there anything NRC should know about? ^{IS}

CONSTRUCTION QC ~~IS~~ GOOD, NO COMPLAINTS.
HOWEVER, HAS A CONCERN ABOUT OPERATOR
ABILITY TO OPERATE PLANT PROPERLY (SAFELY).

Inspector: J. BURDOIN

Question List

Name: LUNGO

Work for: Organization BECHTEL

Craft: JANITOR SUPERVISOR

Date: 9/9/83

Years on site: 3

Questions

1. Any problems with quality of work?

NO

2. Any management pressure to "cut corners"?

NO

3. How's the QC here?

CLEAN-UP OF ALL AREAS IS TO BE MAINTAINED TO REDUCE HAZARDS'

4. What do you feel is managements attitude toward quality?

VERY GOOD - NO COMPLAINTS

5. Is there anything NRC should know about?

RESPONSE WATER SPILLS IS SLOW. AREAS ARE TO BE ROPED OFF. WHEN OPERATIONS IS CALLED THEY DON'T ALWAYS RESPONSE AS QUICKLY AS THEY SHOULD.

Inspector: J. BURDOW

Question List

Name: JOHN HOWARD

Work for: Organization BECHTEL

Craft: IRON WORKER

Date: 9/9/83

Years on site: 3 ALSO WORKED ON CALVERT CLIFFS AND LIMRICK

Questions

1. Any problems with quality of work?
NO

2. Any management pressure to "cut corners"?
NO

3. How's the QC here?
VERY THOROUGH

4. What do you feel is managements attitude toward quality?
EXCELLENT
VERY POSITIVE

5. Is there anything NRC should know about?
NO

Inspector: J. BURDOIN

Question List

Name: JACK BRAMLETTE

Work for: Organization BECHTEL

Craft: IRON WORKER

Date: 9/9/83

Years on site: 4

3 YRS AT WNP-2

Questions

1. Any problems with quality of work?

NO

2. Any management pressure to "cut corners"?

NO

3. How's the QC here?

GOOD

4. What do you feel is managements attitude toward quality?

VERY GOOD -

5. Is there anything NRC should know about?

NO

Inspector: J. BURDOIN

Question List

Name: CROCKWELL

Work for: Organization BECHTEL

Craft: MILLWRIGHT

Date: 9/10/83

Years on site: 2

Questions

1. Any problems with quality of work?

NO

2. Any management pressure to "cut corners"?

NO

3. How's the QC here?

GOOD

4. What do you feel is managements attitude toward quality?

GOOD ATTITUDE. MANAGEMENT
IS VERY POSITIVE TOWARD QC.

5. Is there anything NRC should know about?

NO

Inspector: W. MARINI

Question List

Name: DAVE BENNETT

Work for: Organization BECHTEL

Craft: PIPEFITTER/WELDER

Date: 9-9-83

Years on site: 4

Questions

1. Any problems with quality of work? **NONE**

2. Any management pressure to "cut corners"? **NONE**

3. How's the QC here? **KNOWLEDGEABLE + CONSCIENTIOUS**

"EVEN IF I EVER DID TRY TO LET A BAD WELD SLIP BY, I'M SURE THAT QC WOULD CATCH IT."

4. What do you feel is managements attitude toward quality? **GOOD**

"THEY'RE ALWAYS TELLING US TO TAKE OUR TIME AND DO IT RIGHT."

5. Is there anything NRC should know about? **No**

Inspector: R.H. Harris

Question List

Name: Mike Sibley

Work for: Organization Bechtel

Craft: Bechtel GC (WEL)

Date: 9-9-83

Years on site: 3 yr

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

Excellent

5. Is there anything NRC should know about?

NO

Inspector: R. H. Harris

Question List

Name: Javi Carbajal

Work for: Organization Bechtel

Craft: pipe fitter

Date: 9-9-83

Years on site: 3 yrs

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

OK very good

4. What do you feel is managements attitude toward quality?

OK

5. Is there anything NRC should know about?

No

Inspector: R. H. Harris

Question List

Name: Lori Johnson

Work for: Organization Bechtel

Craft: pipe welder

Date: _____

Years on site: 5 yrs

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

~~OK~~ good ...

4. What do you feel is managements attitude toward quality?

~~OK~~ OK

5. Is there anything NRC should know about?

No

Inspector: R. H. Harris

Question List

Name: FRANK DRORINA

Work for: Organization Bechtel

Craft: DDW Welding

Date: 9-9-83

Years on site: 2 yrs

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

OK

4. What do you feel is managements attitude toward quality?

Good Excellent

5. Is there anything NRC should know about?

None

Inspector: Young

Question List

Name: Not given

Work for: Organization Not given

Craft: Laborer

Date: 9/9/83

Years on site: 3

Questions

1. Any problems with quality of work?

Rails in U-3 are stored on their sides (rails are for the train track in U-3 fuel storage building). Knows of no other problems.

2. Any management pressure to "cut corners"?

Some times but nothing specific

3. How's the QC here?

Good generally

4. What do you feel is managements attitude toward quality?

OK

5. Is there anything NRC should know about?

Just item one above

(over)

I talked to foreman. He stated rails should not be stored on their sides by specification. He then ordered the crew to stake the rail upright. He stated that the rails had been stored properly until this morning when the clean-up crew was brought in to clean-up so that the rails could be installed.

Robert Young Jr.

Inspector: Young

Question List

Name: LEFBRE

Work for: Organization BECHTEL

Craft: ELECTRICIAN

Date: 9/9/83

Years on site: 4

Questions

1. Any problems with quality of work?

No problems with quality. Quality very good.

2. Any management pressure to "cut corners"?

No! States he would not stand for it. He would leave first. Has 37 years of experience.

3. How's the QC here?

Very good! Better than at most job sites.

4. What do you feel is management's attitude toward quality?

Good! Management wants good work done.

5. Is there anything NRC should know about?

No! This man knew and worked with Gunderson. States that Gunderson not sound, had personal problems but is a good electrician.

Stanley

Inspector: LOREN STANLEY

Question List

Name: DAN RODRIGUEZ

Work for: Organization BECHTEL

Craft: I+C PIPING

Date: 9-10-83

Years on site: 4

Questions

1. Any problems with quality of work?

NO PROBLEMS WITH QUALITY OF THE WORK. EXPRESSED THE VIEWPOINT THAT THEY ARE CRAFTSMEN WHO DO QUALITY WORK.

2. Any management pressure to "cut corners"?

NO PRESSURE TO CUT CORNERS. A FULL DAY'S OUTPUT IS EXPECTED BY MANAGEMENT - THAT IS THE ONLY PRESSURE.

3. How's the QC here?

PRETTY STRICT. IF IT'S WRONG, QC REQUIRES THAT IT BE DONE OVER.

4. What do you feel is managements attitude toward quality?

(NOT MUCH REACTION HERE). (THEY HAD TROUBLE WITH THIS QUESTION PROBABLY BECAUSE THEY ARE TOO FAR REMOVED FROM MGMT.)

5. Is there anything NRC should know about?

NOTHING TO PASS ALONG ON THIS ONE.

(HE ASKED WHY NRC HADN'T DONE THESE INSPECTIONS BEFORE; WHY THIS PLANT AND TIME WERE CHOSEN, AND THANKED NRC FOR TAKING AN INTEREST IN ASSURING THAT PVNGC WAS A QUALITY PLANT.)

Inspector: LOREN STANLEY

Question List

Name: BAROLD NATIONS

Work for: Organization BECHTEL

Craft: I & C PIPING

Date: 9-10-83

Years on site: 2 TO 3 YR

Questions

1. Any problems with quality of work?

NO PROBLEMS WITH THE QUALITY OF THE WORK.

2. Any management pressure to "cut corners"?

HE HAS HAD NO PRESSURE PUT ON HIM TO CUT CORNERS.

3. How's the QC here?

TOUGH AND STRICT. QC INSISTS ON THE WORK BEING CORRECT.

4. What do you feel is managements attitude toward quality?

NO RESPONSE TO THIS QUESTION.

5. Is there anything NRC should know about?

NOTHING TO REPORT HERE.

Inspector: Albert

Question List

Name: Zepeda

Work for: Organization Buckete!

Craft: Huberir

Date: 9/8

Years on site: 5

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

4. What do you feel is managements attitude toward quality?

OK

5. Is there anything NRC should know about?

No

Inspector: Albert

Question List

Name: TAKAS

Work for: Organization

Craft#: INSULATOR

Date: 9/9/83

Years on site: 1 1/2

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

*Problems get corrected
when he finds something wrong*

5. Is there anything NRC should know about?

*No "I live next door and
have no problems or fears"*

Inspector: Albert

Question List

Name: Ramirez

Work for: Organization Buehler

Craft: Carpenter

Date: Sept 10 '83

Years on site: unknown

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

OK

4. What do you feel is managements attitude toward quality?

OK

5. Is there anything NRC should know about?

No

Interviewee was taciturn but pleasant personality

Inspector: Albert

Question List

Name: Mara Fioti

Work for: Organization Bechtel

Craft: Fitter

Date: Sept 10 83

Years on site: 4 yrs

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

Good
"For crying out loud, these people get all excited when a little fillet weld on a hanger isn't right"

4. What do you feel is managements attitude toward quality?

Good

5. Is there anything NRC should know about?

No

Inspector: Albert

Question List

Name: Rust

Work for: Organization Bechtel

Craft: Carpenter

Date: Sept 10 83

Years on site: 5 yrs

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here? "*Good every thing gets taken care of.*"

4. What do you feel is managements attitude toward quality? *Good.*

"Those characters that complain just dont want to do the work they are assigned"

5. Is there anything NRC should know about?

No

Inspector: Albert

Question List

Name: Bill Davis

Work for: Organization Bchtel

Craft: Millwright

Date: Sept 10 83

Years on site: "4 to 5 yrs"

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

"Every thing gets taken care of but there is too damn much paper work before one ~~can~~ can start work"

5. Is there anything NRC should know about?

No

Inspector:

KERCH

Question List

Name:

Jim Lee

Work for: Organization

BeThol

Craft:

WELPER

Date:

Years on site:

4+

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

no.

3. How's the QC here?

good.

4. What do you feel is managements attitude toward quality?

good.

5. Is there anything NRC should know about?

training of operational type people.

unit 1

Inspector: Kerch

Question List

Name: J. Cooper

Work for: Organization Bethel

Craft: welder

Date: _____

Years on site: 5 1/2 yr

Questions

1. Any problems with quality of work?

NO.

2. Any management pressure to "cut corners"?

NO

3. How's the QC here?

good.

4. What do you feel is managements attitude toward quality?

good.

5. Is there anything NRC should know about?

Source received material needs additional inspection before receiving on site.

Inspector: KERCH

Question List

Name: BRETT MATOUSEK Work for: Organization BETHEL

Craft: Welder

Date: _____

Years on site: 9 yrs

Questions

1. Any problems with quality of work?

No

2. Any management pressure to "cut corners"?

No

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No.

unit 1

Inspector: KERCH

Question List

Name: Fields

Work for: Organization Brother

Craft: pipe fitter

Date: _____

Years on site: 5 yrs

Questions

1. Any problems with quality of work?

None

2. Any management pressure to "cut corners"?

none

3. How's the QC here?

good.

4. What do you feel is managements attitude toward quality?

Good.

5. Is there anything NRC should know about?

No.

Inspector: Kerch

Question List

Name: Jan Waples

Work for: Organization GEO

Craft: NDE Tech

Date: _____

Years on site: 1 month

Questions

1. Any problems with quality of work?

Good,

2. Any management pressure to "cut corners"?

NO

3. How's the QC here?

Good

4. What do you feel is managements attitude toward quality?

Good

5. Is there anything NRC should know about?

No.

Inspector:

Kerch

Question List

Name: J. BROWN

Work for: Organization GEO

Craft: NDE Tech

Date: _____

Years on site: 19 months

Questions

1. Any problems with quality of work?

NONE

2. Any management pressure to "cut corners"?

NO!

3. How's the QC here?

Good.

4. What do you feel is managements attitude toward quality?

Good.

5. Is there anything NRC should know about?

NO.

1
Inspector: Kerck

Question List

Name: D. GRAHAM

Work for: Organization Bechtel

Craft: welder

Date: _____

Years on site: 4 1/2

Questions

1. Any problems with quality of work?

none

2. Any management pressure to "cut corners"?

no

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No,

1
Inspector:

H. Kerch

Question List

Name:

Jim Jazak

Work for: Organization

Bushell

Craft:

Welder

Date:

Years on site:

5 yrs

Questions

1. Any problems with quality of work?

none

2. Any management pressure to "cut corners"?

none

3. How's the QC here?

good.

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

NO.

Inspector: Keedh

Question List

Name: Chatterton

Work for: Organization BECHTEL

Craft: Welder

Date: _____

Years on site: 1 1/2 yrs

Questions

1. Any problems with quality of work?

No.

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good.

5. Is there anything NRC should know about?

No.

Inspector: KERCH

Question List

Name: _____

Work for: Organization Battal

Craft: Employer

Date: _____

Years on site: 10 months

Questions

1. Any problems with quality of work?

YES

2. Any management pressure to "cut corners"?

NO.

3. How's the QC here?

YES

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

No,

Kerch

Inspector: Kerch

Question List

Name: DAVE

Work for: Organization GE O

Craft: NDE TEST

Date: _____

Years on site: 9 mo

Questions

1. Any problems with quality of work?

NONE

2. Any management pressure to "cut corners"?

NONE

3. How's the QC here?

GOOD

4. What do you feel is managements attitude toward quality?

GOOD

5. Is there anything NRC should know about?

NONE

Inspector: KERCH

Question List

Name: T. Hacker

Work for: Organization Becthal

Craft: Fitter

Date: _____

Years on site: 4 yrs

Questions

1. Any problems with quality of work?

no

2. Any management pressure to "cut corners"?

no

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

none

1
Inspector:

KERCH

Question List

Name:

D. Jones

Work for: Organization

Bethel

Craft:

Fitter

Date:

Years on site:

4 yrs

Questions

1. Any problems with quality of work?

no

2. Any management pressure to "cut corners"?

no

3. How's the QC here?

good

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

NO

1

Inspector: Kerch

Question List

Name: Robert Coonan Work for: Organization Bechtel

Craft: Fitter Date: _____

Years on site: 5 yr

Questions

1. Any problems with quality of work?

none

2. Any management pressure to "cut corners"?

None

3. How's the QC here?

good.

4. What do you feel is managements attitude toward quality?

good

5. Is there anything NRC should know about?

no.

Inspector: Narbul

Question List

Name: Howard Joyce

Work for: Organization

Bechtel

Craft: QC Piping/Mech/P Supts

Date: 9/10/83

Years on site: 9 months

Commercial One 4 years

Questions

1. Any problems with quality of work? No

2. Any management pressure to "cut corners"? No

3. How's the QC here? Compared to other sites Not as tight
Less documentation. Possibly Not required
Do have a sense of quality work

4. What do you feel is managements attitude toward quality? Some bad actors
Don't cause they have... Don't get run over.

5. Is there anything NRC should know about? No

Inspector: P. Narbut

Question List

Name: Glen Hendry

Work for: Organization

B&W

Grade: FE Hgr's

Date: 9/10

Years on site: 3 yrs

Questions

1. Any problems with quality of work? No

2. Any management pressure to "cut corners"? No

3. How's the QC here? on whole ok.

4. What do you feel is managements attitude toward quality? Money not a factor
do emphasize quality
ADG would do right

5. Is there anything NRC should know about? No

Inspector: J. BURDOIN

Question List

Name: CHUCK JOHNSON

Work for: Organization BECHTEL

Craft: ELECTRICIAN

Date: 9/12/83

Years on site: TWO

Questions

1. Any problems with quality of work? -

NO

2. Any management pressure to "cut corners"?

NO

3. How's the QC here?

NO

4. What do you feel is managements attitude toward quality?

A VERY GOOD ATTITUDE

Is there anything NRC should know about?

NO

Inspector: J. BURDOIN

Question List

Name: GEO. P. FONSECA

Work for: Organization

BECHTEL

Craft: CARPENTER

Date:

9/12/83

Years on site: SIX

Questions

1. Any problems with quality of work? -

NO

2. Any management pressure to "cut corners"?

NO

3. How's the QC here?

GOOD

4. What do you feel is managements attitude toward quality?

GOOD

5. Is there anything NRC should know about?

NO

Inspector: J. BURDOIN

Question List

Name: CHEATUM

Work for: Organization BECHTEL

Craft: OPERATING ENGR'G.

Date: 9/12/83

Years on site: SEVEN

Questions

1. Any problems with quality of work?

NO

2. Any management pressure to "cut corners"?

NO

3. How's the QC here?

VERY GOOD

4. What do you feel is managements attitude toward quality?

VERY POSITIVE

5. Is there anything NRC should know about?

NO

Norbut

Inspector: Norbut

Question List

Name: E. (Manny) Polychronis

Work for: Organization Bechtel QC

Craft: Piping & Welding QC


Date: 9/8/83

Years on site: 3 1/4

Unit 1: 2 years (part as WEnjr)

Questions

1. Any problems with quality of work? Surprized at Quality of Stick Welds (low) compared to own welds. Rejects as QC, FE buys. Probably welds ok

2. Any management pressure to "cut corners"? Feel ok about supervisors. Allow him to write up anything. 1" pup piece in half inch line with dog leg in pup severe.  Engineering did not look at pipe NCR dispositioned use-as-is. NCR ? (6780) Will get #

To Wagner
9/8/83

3. How's the QC here? ok. in general

4. What do you feel is managements attitude toward quality?

Sometimes throw out "Quality is No. 1" when work is "hot" at Supt level mostly. Most of time QC wins. They will try to get away with what they can.

In Condens. St. Pump Rm Unit 2 6"-8" pipe drilled for 1" Socket
Saw "3" purge hose - pulled it. Supvr said good work - but no action after that

5. Is there anything NRC should know about?

No.

(Over)

Disposition of problem addressed on NCR PC-6990 was reviewed and approved by the construction piping engineering supervisor. The supervisor and his piping engineer said it was common standard industry practice to use a mitre joint as in this case in order to connect pipe lines around obstacles, etc.

Conclusion: They followed their system for review and approval of the NCR. This included field engineering (piping), QA, ANI and resident engineer.

WJW

Inspector:

Young

Question List

Name: _____

Work for: Organization

Bechtel

Craft: _____

Date:

9-28-83

Years on site: _____

Questions

1. Any problems with quality of work?

2. Any management pressure to "cut corners"?

3. How's the QC here?

4. What do you feel is managements attitude toward quality?

5. Is there anything NRC should know about?

Inspector: Young

Question List

Name: _____

Work for: Organization Bechtel

Craft: _____

Date: 9-28-83

Years on site: _____

Questions

1. Any problems with quality of work?

2. Any management pressure to "cut corners"?

3. How's the QC here?

4. What do you feel is management's attitude toward quality?

5. Is there anything NRC should know about?

J.M.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V

1450 MARIA LANE, SUITE 210
WALNUT CREEK, CALIFORNIA 94596



Docket No. 50-528

Arizona Public Service Company
P. O. Box 21666
Phoenix, Arizona 85036

Attention: Mr. T. G. Woods Jr.
Executive Vice President

Gentlemen:

Subject: Construction Appraisal Inspection 50-528/83-34

Draft
11/4/83

and last week too?

This refers to the construction appraisal inspection conducted by Region V on September 6-16 and 26-30, 1983 at Palo Verde Unit 1. The Construction Appraisal Team was composed of members of Region I, Region V and a number of consultants. This inspection covered construction activities authorized by NRC Construction Permit CFP-141.

The enclosed report identifies the areas examined during the inspection. Within these areas, the effort consisted of detailed inspection of selected hardware subsequent to Quality Control inspections, examination of procedures and records, observation of work activities and interviews with management and other personnel.

Appendix A to this letter is an Executive Summary of the results of the inspection and of conclusions reached by this office. The Appraisal team noted no pervasive breakdown in meeting construction requirements in the samples of installed hardware inspected. However, deficiencies in installed hardware were noted by the team which indicate a need for increased management attention to the APS Quality Control Inspections, Work Control and Quality Assurance Program. These deficiencies include the areas of hangers and supports, control of equipment after turn-over to startup, the as-built inspection program, electrical construction and other detailed deficiencies discussed in the attached report. Prompt APS management attention to the resolution of the detailed deficiencies identified during the inspection is needed.

Appendix B to this letter contains a list of apparent violations based on the Appraisal Team observations. Your response to this notice is to be submitted in accordance with the provisions of 10 CFR 2.201 as stated in Appendix B, Notice of Violation.

Appendix C to this letter contains an item on one of your activities which appeared to deviate from your commitment to the NRC, as set forth in the Notice of Deviation. Please respond to this notice as requested in the Notice of Deviation.

This cover letter does not convey any flavor of what this all means! I want a summary much like the one I gave. I can't interview with the

however large numbers of items slipping thru. In addition some items which are significant and reflect breakdowns or control by APS and startup. #114

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosures will be placed in the NRC Public Document Room unless you notify this office, by telephone, within ten days of the date of this letter and submit written application to withhold information contained therein within thirty days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

The response requested by this letter (and the accompanying Notices) are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, PL 96-511.

Should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely,

J. B. Martin
Regional Administrator

Enclosures:

1. Appendix A - Executive Summary
2. Appendix B - Notice of Violation
3. Appendix C - Notice of Deviation
4. Inspection Report 50-528/83-34

*we should bring out that
although the focus was construction
we kept getting drawn into test and
ops. etc.*

Docket No. 50-528

Arizona Public Service Company
P. O. Box 21666
Phoenix, Arizona 85036

Attention: Mr. T. G. Woods Jr.
Executive Vice President

Gentlemen:

Subject: Construction Appraisal Inspection 50-528/83-34

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Sincerely,

J. B. Martin
Regional Administrator

Enclosures:

1. Appendix A - Executive Summary
2. Appendix B - Notice of Violation
3. Appendix C - Notice of Deviation
4. Inspection Report 30-528/83-34

bcc: RSB/Document Control Desk (RIDS)

Distributed by RV:
Resident Inspector
Mr. Martin, RV
Arthur C. Gehr, Esq.
Ms. Jill Morrison
pink/green copies
docket file copy

RV

YOUNG/dot

MARTIN

11/ /83

11/ /83

This is an extremely poor piece of work. It doesn't convey what we were trying to do, it doesn't present the logic or the methodology of the inspection.

APPENDIX A

EXECUTIVE SUMMARY

The results in any useful way. There is no person who knows what's wrong.

An unannounced team inspection for the purpose of appraising site construction was performed at the Palo Verde Nuclear Generating Station Unit 1 during the periods of September 6 through 16 and September 26 through 30, 1983.

John W/O 10/1

OVERALL CONCLUSIONS

The team found basic construction to be satisfactory, although they did identify weaknesses in the conduct of final system inspections and in the control of work after turn over to test and operation. None of the findings were sufficiently pervasive to preclude the issuance of an operating ~~the~~ license providing prompt and adequate corrective action is initiated in these areas.

I don't want to say this. All cover letter.

AREAS INSPECTED AND RESULTS

Worker Interviews

The team contacted more than one hundred craftsmen or first line quality control inspectors with regard to any concerns they may have regarding the quality of work at Palo Verde.

These contacts were normally informal, and were made in private between one or two workers and one NRC inspector.

The tabulated results of these contacts, the crafts represented by the contacts, and any significant details in the responses are in the attached report. In summary, the responses were nearly all positive with regard to the quality of site construction work. The reservations of some with regard to off-site (vendor) work were being followed by either the Licensee, the NRC, or both.

Electrical and Instrumentation Construction

The inspections in this area revealed isolated deficiencies in the thoroughness of the final inspections and/or in maintenance following testing. For instance, plywood was found left in a covered vertical cable tray, and caps were left on containment pressure sensing lines.

Some problems with cable separation were found. However, it was noted that the Licensee does have a program underway which would provide for reinspection of separation in the areas examined by the NRC. None of the separation problems noted by the NRC appeared to be significant.

This is a major issue

Additionally, discrepancies associated with concrete expansion anchor bolts supporting electrical raceways were found. None of these, however, were such as to represent any particular safety significance.

doesn't cover any possibility

Mechanical Construction

An examination of 65 pipe hangers or supports of the HPSI system showed that fourteen such structures have deficiencies such as undersized fillet welds. However, deficiencies of a more significant nature were found in the HPSI piping inspections. For instance, a 10-inch suction line valve did not have the hand operating mechanism connected to the collar of the rising stem, and flange bolts on the same valve had not been adequately torqued. As a result, the valve bonnet was leaking.

Welding and Nondestructive Examination

The NRC examined 18 circumferential and 10 socket welds in the HPSI system by independent radiography. Also, 34 welds were visually examined in the field, and the radiographs on file for 192 welds were read by NRC. No deficiencies were found. In addition to the HPSI examinations, system radiographs and weld records for twelve welds in the primary loop were examined. Three primary loop welds in PVNGS Unit 3 was examined radiographically for comparison of radiographic techniques with similar Licensee radiographs. One unresolved item was identified dealing with weld ripple images which could possibly mask weld defects.

Structures

Examinations in this area include concrete in situ testing, penetrations, structural, bolting and welding. Some problems with bolting and welding of gallery steel were noted as described in the report.

X

APPENDIX B

NOTICE OF VIOLATION

Arizona Public Service Company
P. O. Box 21666
Phoenix, Arizona 85036

Docket No. 50-528
Construction Permit No. CPPR-141

As a result of the inspection conducted between September 6, 1983, and September 30, 1983, and in accordance with the NRC Enforcement Policy 10 CFR 2, Appendix C, 47 FR 9987 (March 9, 1982), the following violations were identified:

A. Appendix B, of 10 CFR 50, Criterion II, as implemented by Chapter 17 of the PSAR and FSAR, requires, in part that: "The quality assurance program shall provide control over activities affecting the quality of the identified structures, systems, and components, to an extent consistent with their importance to safety."

1. Contrary to the above requirement, on September 10, 1983, the containment pressure instrumentation was incapable of performing its intended safety function in that caps had been installed on the sensing lines. Construction of the containment and pressure sensing systems had been completed, turned over from the constructor to the licensee, and tested. No administrative requirement existed to assure that the caps would have been discovered until the next scheduled containment leak rate test pursuant to the operating license requirements.
2. Contrary to the above requirement, on September 10, 1983, scaffolding lumber was discovered in the channel "C" electrical raceway chase located at elevation 120 feet in the lower cable spreading room. These areas are required to be free of combustible materials.
3. Contrary to the above requirement, on September 14, 1983, 87 3/8-inch bolts were missing from the base frames for six motor control centers (MCC) of the vital AC on site power distribution system. These bolts are necessary to insure the structural integrity of these MCC's.
4. Contrary to the above requirement, on September 7, 1983, the manual operator for valve SI V470 on the suction of the HPSI "A" pump was disconnected and resting on the sprinkler system piping. Construction of the subsystem had been completed, turned over to the licensee, and was under going preoperational testing. There was no record of the defective and/or nonconforming condition.

Each should be a separate violation

what about missing nut & leakage ?

5. Contrary to the above requirement, on September 28, 1983, the position indicator for valve SI V402 on the suction of the HPSI "B" pump was positioned so that the valve could only be opened 30 to 35 percent. Construction of this subsystem had been completed, turned over to the licensee, and was undergoing preoperational testing. There was no record of the defective and/or nonconforming condition.

This is a Severity Level IV Violation, Supplement II *How can 1, 3, 4, 5 be level IV/5?*

- B. Appendix B of 10 CFR 50, Criterion V, as implemented by Chapter 17 of PSAR and FSAR requires, in part, that: "Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances, and shall be accomplished in accordance with these instructions, procedures, or drawings."

1. The separation and identification criteria as identified in the FSAR Section 8.3.1 are described in Bechtel's: a. "Cable and Raceway Physical Separation Guide," Drawing 13-E-ZAC-077, Revision 2, and b. "Installation Specification for Cable Splicing, Termination and Supports," Specification No. 13-EM-306.

- a. The separation requirement as described in the above specifications identifies one foot as the minimum separation distance between raceways of different separation groups located in the cable spreading rooms.

Contrary to the above requirement, the NRC inspector identified, in tray 1EZJ4AATBCE, cables projecting above the level of the tray siderails which were in physical contact with fire protection piping and two HVAC ducts.

- b. The separation requirement, as described in the above specifications, identifies the minimum separation distance between safety-related and nonsafety-related trays as one inch.

Contrary to the above requirements, the NRC inspector identified:

- (1) Nonsafety-related conduit 1EZADCNRQ506 for thermostat 1EQFNT1243C in HPSI A pump room was separated from safety related group 1 junction box 1EZACCAKKJ03 by less than one inch.
- (2) At diesel generator E-PEA-G01, nonsafety-related flexible conduit 1EZG1ANRX11 at junction box 4 was in contact with safety-related flexible conduit 1EZG1AARR20 at junction box 6.

each separate

a b c d are
separate
a. b. c. d. e. f. g. h. i. j. k. l. m. n. o. p. q. r. s. t. u. v. w. x. y. z.
Class IV
There are
together

- (3) In 4160-volt switchgear cubicle E-PBA-503L, nonsafety-related flexible conduit 1EZJ1ANRR52 was separated from safety-related wiring by less than one inch.
- (4) In 4160-volt switchgear cubicle E-PBA-503K, nonsafety-related flexible conduit 1EZJ1ANRR51 was separated from safety-related wiring by less than one inch.

c. The separation requirement as described in the above specifications requires each circuit and raceway be given a unique alphanumeric identification and colored dots (round emblems) along their lengths at intervals not greater than 15 feet.

Contrary to the above requirements, the NRC inspectors identified:

- (1) Separation group 1 cable tray located in HPSI pump room A was not marked with red color identification (round emblems) between points 1EZACEATCBA and 1EZACCARC03.
- (2) Round blue identification emblems were missing from channel D conduit (PT-351) for a distance of approximately 40/50 feet_x at the 120 foot elevation.
- (3) Temporary alphanumeric identification on cable tray 1EZAIDBTXF had not been replaced with permanent identification.

d. IEEE Standard 384-1974, "Criteria for Separation of Class IE Equipment and Circuit Breakers," endorsed by the licensee in Section 8.3.1 of the FSAR in Section 5.1.2, states, in part, "Exposed Class IE Raceways shall be marked in a permanent manner at points of Entry and Exit from an Enclosed Area."

Contrary to the above requirements, a NRC inspector identified that the following separation group I conduits were not identified by alphanumeric markings:

- (1) Conduits 1EZJ1AARC12, 14, and 16 on both sides of the wall between group I, 4.16 KV switchgear area and channel A remote shutdown panel area at the 100 foot elevation.
- (2) Conduit sleeves 1EZJ1BARC13, 14 and 15 on control building wall in channel B remote shutdown area at the 100 foot elevation.

2. Contrary to the above requirement and the Bechtel Specifications listed below, the following conditions existed at the time of the inspection.

a. Section 11.0 of Bechtel Specification 13-CM-320, "E^Rection of Structural and Miscellaneous Steel," states, in part, "Installation shall be in accordance with AISC Specification for Structural Joints using ASTM A325 or A490 bolts." Paragraph 5(a) of the AISC specification requires that A325 bolts, 7/8-inch diameter be tightened to at least a minimum tension of 39 Kips. An acceptable method of obtaining this tension is described in paragraph 5(e), "Turn-of-Nut Tightening," which requires that bolts be brought to a "snug tight" condition plus an additional 1/3 to 2/3 turn, depending on the bolt length.

Contrary to these requirements, on September 7 and 13, 1983, four A325 bolts were finger loose, and additional testing using a calibrated torque wrench found two A325 bolts with tightness less than 39 Kips.

b. Bechtel Specification 13-CM-307, "Design, Installation and Testing of Concrete Anchors," establishes requirements for bolt embedment depth, spacing, torquing, and case-by-case Licensee approval for use.

Contrary to these requirements, the NRC inspection of concrete expansion anchors found 15 bolts under-torqued, missing washers under two nuts, three bolts insufficiently spaced from other bolts or unused holes, three unused holes ungrouted, and two cases where prior Licensee approval was required and not obtained.

3. Procedure WPP/QCI 201.1, Revision 18, dated May 25, 1983, "Nuclear Pipe Hangers and Supports Installation," Appendix I, requires the QC Engineer to verify each completed task on the "CIP for Nuclear Pipe Supports."

The inspection requirement on the CIP for "Task 1" is to verify that the support assembly is correct per approved engineering drawings and specifications.

Contrary to the above, in September 1983, Unit 1 pipe supports were found not correctly installed per approved drawings and specifications but had been verified correct by the Piping QC Engineer. Specifically, supports SI-089-H008; SI-100-H003, H005, and H036; SI-101-H00A; and SI-106-H001 were found with items which did not meet drawing requirements. The supports had been accepted by Piping QC Engineers during the period November 29, 1979, to November 20, 1981.

If there were separate causes or class of problems here they should

be separate violation

X

4. Procedure WPP/QCI 201.1, Revision 18, dated May 25, 1983, "Nuclear Pipe Hangers and Supports Installation," Appendix I, requires the QC Engineer to verify each completed task on the "CIP for Nuclear Pipe Supports." The "CIP" inspection requirements for Task 8 require the Welding QC Engineer to verify that field welding is complete. For Task 9, he is to check the vendor welding for size and length. Additional instructions to the Welding QC Engineer in Appendix I instruct him to verify welding acceptability.

Contrary to the above, in September 1983, Unit 1 pipe supports were found with unacceptable weld conditions which had been verified acceptable by the Welding QC Engineers. Specifically, pipe supports SI-100-H005, H010, H015, and H034; SI-102-H00B; SI-106-H011; and SI-176-H001, and H003 were found with unacceptable weld conditions. The supports had been verified acceptable during the period July 14, 1980 to September 15, 1982.

5. Specification 13-PM-204, Revision 12, dated April 7, 1983, paragraph 12.1.2, states the design and location of all pipe supports shall be the responsibility of project engineering. Paragraph 12.1.4 states pipe supports designed by engineering will be shown on drawings and all design details will be shown including miscellaneous steel.

Contrary to the above, in September 1983, Unit 1 pipe support SI-100-H012 was found with a miscellaneous steel member installed. The member was not shown on the pipe support drawing, 13 SI-100-H012, Revision 1, and was used to provide support to an instrument air line.

This is a Severity Level ^{IV} ~~III~~ Violation, Supplement II.

- C. Appendix B of 10 CFR 50, Criterion IX, as implemented by Chapter 17 of the PSAR and FSAR, requires, in part, that: "measures be established to assure that special processes including welding are controlled and accomplished in accordance with applicable codes, standards, specifications, criteria, and other special requirements."

FSAR Section 3.8.1.6.6 states: "Welding is done in accordance with AWS D1.1-72, Revision 1, 1973, Structural Welding Code". Bechtel Drawing 13-S-ZAS-536, Revision 3, requires a 5/16-inch fillet weld when attaching structural steel vertical members to horizontal members. Drawing 13-C-ZAS-570, Revision 8, requires a 5/16-inch fillet weld when attaching structural steel to embedded plates. Additionally, AWS D.1.1, Paragraph 10.17, states that undercut shall be no more than .01-inch deep when its direction is transverse to primary tensile stress in the part that is undercut, and not more than 1/32 inch for all other situations.

Contrary to the above requirements, the NRC inspection found welds on structural steel with fillet sizes less than required by the drawings and welds with undercut which exceeded the requirements of AWS D1.1.

This is a Severity Level IV Violation, Supplement II.

- D. 10 CFR 50 Appendix B, Criterion XVI states, in part, that: "Measures shall be established to assure that conditions adverse to quality such as failures, ... deficiencies, ... defective material and equipment, and nonconformances are promptly identified and corrected."

Borg Warner valve assembly drawing number 77770-1 requires that the stud nuts connecting the bonnet to the valve body be torqued to a value of 160-200 foot-pounds.

Contrary to the above, on September 15, 1983, the inspector observed torque verification performed on valve number 470 which resulted in the identification of loose stud nuts connecting the bonnet to the valve body.

This is a Severity Level IV Violation, Supplement II.

Pursuant to the provisions of 10 CFR 2.201, Arizona Public Service Company is hereby required to submit to this office within thirty days of the date of this Notice, a written statement or explanation in reply, including: (1) the corrective steps which have been taken and the results achieved; (2) corrective steps which will be taken to avoid further items of noncompliance; and (3) the date when full compliance will be achieved. Consideration may be given to extending your response time for good cause shown.

Dated

T. Young, Chief
Reactor Project Section 1

what about the minimum wall issue

APPENDIX C

NOTICE OF DEVIATION

Arizona Public Service Company
P. O. Box 21666
Phoenix, Arizona 85036

Docket No. 50-528
Construction Permit No. CPPR-141

As a result of the inspection conducted between September 6, 1983 and September 30, 1983, and in accordance with the NRC Enforcement Policy 10 CFR 2, Appendix C, 47 FR 9987 (March 9, 1982), the following deviation was identified:

FSAR SECTION 3.8.1.6.6, Structural and Miscellaneous Steel, states:

"Welding is done in accordance with AWS D1.1-72, Revision 1, 1973, Structural Welding Code. The acceptance criteria for visual inspection of welding is done in accordance with AWS D1.72, Revision 1, 1973."

Contrary to this commitment, Appendix A, Visual Inspection Criteria. For Structural Steel and Miscellaneous Metal Welding to Meet Design Requirements, to Specification 13-CM-320, Erection of Structural and Miscellaneous Steel, permits acceptance of undercut, incomplete fusion (rollover or overlap), and underfilled weld craters in amounts or circumstances not allowed by the AWS Code. X

Additionally, Specification 13-EH-302 for electrical cable tray hangers references AWS D1.1-72 for inspection criteria. X

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 above deviation X describing corrective steps taken, the results achieved (or corrective steps that are planned), and the date when corrective action will be completed. X

Date

T. Young, Jr., Chief
Reactor Projects Section No. 2

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Division of Resident, Reactor Projects and Engineering Programs

Report No. 50-528/83-34

Docket No. 50-528

License No. CPPR-141

Licensee: Arizona Public Service Company
P. O. Box 21666
Phoenix, Arizona 85036

Facility Name: Palo Verde Nuclear Generating Station - Unit 1

Inspection at: Construction Site

Inspection conducted: September 6-16 and 26-30, 1983

Inspectors:

W. G. Albert, Senior Resident Inspector
WNP-3 (Team Leader) Date Signed

J. F. Burdoin, Reactor Inspector Date Signed

R. H. Campbell, Engineering Technician Date Signed

R. H. Harris, Engineering Technician Date Signed

H. W. Kerch, Lead Reactor Engineer Date Signed

P. P. Narbut, Project Inspector Date Signed

L. E. Vorderbrueggen, Senior Resident Inspector
PVNGS Date Signed

W. J. Wagner, Reactor Inspector Date Signed

G. E. Walton, Senior Resident Inspector
BVPS-2

Date Signed

T. Young, Jr., Chief
Reactor Projects Section 2

Date Signed

Consultants: W. Marini, C. Crane, and L. Stanley

Contract Technicians: K. Grevenow and J. Ludiwissi

Approved By:

T. W. Bishop, Director, Division of Residents,
Reactor Projects and Engineering Programs

Date Signed

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I. INSPECTION SCOPE AND OBJECTIVES

The scope of this inspection was the evaluation of on-site construction for Palo Verde Nuclear Generating Station Unit 1.

The objective was to provide an overall assessment of the actual as-built condition of the Palo Verde Nuclear Generating Station Unit 1 (PVNGS-1) by comparing the as-built condition to design requirements. Therefore, the inspection concentrated on hardware and assessed whether the construction of PVNGS-1 was performed in accordance with quality requirements applicable to the plant.

In the areas inspected, the following was determined:

- ° The construction observed was in conformance to the drawings and specifications.
- ° Necessary quality verifications were performed during the construction process with appropriate hold points and other controls.
- ° Nonconforming conditions were properly addressed in accordance with approved procedures.
- ° Equipment was turned over to the startup organization in operable condition and it was being maintained properly as evidenced by the as-found condition.

II. TEAM ORGANIZATION AND METHODS

The NRC inspection team consisted of ten NRC employees, three consultants, and two technicians from Wisconsin Testing, Inc., as follows:

William G. Albert - Team Leader

Registered Professional Engineer (Mechanical) with 33 years experience in reactor construction, engineering and operation. Currently the NRC's Senior Resident Inspector for the WNP-3 plant in Washington State.

Paul P. Narbut - Lead Inspector, Mechanical Area

Nuclear Engineer (Nuclear) with 20 years experience in the design, construction and testing of nuclear power plants. Currently a Project Inspector for the NRC's Region V office.

John F. Burdoin - Lead Inspector, Electrical Area

Registered Professional Engineer (Electrical, Mechanical and Nuclear), with 36 years experience in the field of electrical engineering. Currently a Reactor Inspector with the NRC's Region V office, specializing in electrical inspection.

Tolbert Young, Jr. - Interview and Report Coordination

Registered Professional Engineer (Nuclear) with 22 years experience in nuclear power plant operation. Currently a Section Chief with the NRC's Region V office.

Glen A. Walton - Welding and NDE Specialist

Twenty-seven years experience in regulation and management of NDE and QA/QC. Currently the NRC's Senior Resident Inspector for the Beaver Valley plant in Pennsylvania.

William J. Wagner - Welding Inspection

Registered Professional Engineer (Quality) and AWS-Certified Welding Inspector with 24 years of experience in the field of metallurgy, quality assurance and NDE. Currently a Reactor Inspector with NRC's Region V office, specializing in welding.

Harry W. Kerch - NDE Van Supervisor

Registered Professional Engineer (Quality) and Certified ASNT Level III Examiner with 35 years of NDE experience. Currently a Lead Reactor Engineer with the NRC's Region I office.

L. E. Vorderbrueggen - Team Support and Civil/Structural Coordinator

Electrical engineer with 36 years experience in the design and construction of industrial plants. Currently the NRC's Senior Resident Inspector at Palo Verde.

Richard H. Harris - NDE Inspection

Certified ASNT Level II Examiner and AWS Welding Inspector with 22 years experience in NDE and QC. Currently an Engineering Technician with the NRC's Region I office.

R. M. Campbell - NDE Inspection

Certified ASNT Level II Examiner and AWS Welding Inspector with nine years experience in NDE and QC. Currently an Engineering Technician with the NRC's Region I office.

Loren Stanley - Electrical Consultant

Registered Professional Engineer (Electrical) with 27 years electrical engineering experience. Currently in private consulting.

William Marini - Electrical Consultant

Electrical Inspection Specialist with 13 years experience in the field of electrical and welding inspection. Currently with Resource Technical Services.

Cyril J. Crane - Electrical Consultant

Registered Professional Engineer (Electrical) with 27 years experience in reactor operation and electrical engineering. Currently with Westec Services, Inc.

K. Grevenow - NDE Technician

Wisconsin Testing

J. Ludiwissi - NDE Technician

Wisconsin Testing

The methods used for this inspection were to select a sample of Palo Verde safety-related construction for rigorous examination. The sample was of high safety significance and was deemed to be representative of the work controls, procedures, methodology, and documentation of safety-related work performed at Palo Verde Nuclear Generating Station. Selection and in-depth examination of a representative sample of this nature allowed extrapolation of the Team's findings to the adequacy of other safety-related construction at Palo Verde.

Accordingly, the team's approach was to direct 70 percent of its effort to the verification of system installation for the High Pressure Safety Injection System (HPSI) A train. This included in-depth examination of a large number of elements related to this system, including piping, pipe supports, pumps, valves, welding, nondestructive examination, electrical power supplies, electrical cables (including redundancy and separation), instrumentation, control, electrical motors, supporting structural steel elements, and related concrete structures. Within this sample, special emphasis was directed to the areas of welding and electrical construction since both of these areas had been the subject of allegations. The other 30 percent of the team's effort was focused on inspection in other important areas such as the Reactor Coolant System.

The examinations discussed above were conducted by:

- (a) Physical inspection of systems, components, and structures.
- (b) Independent NDE of welds and structures.
- (c) Examination of documentation, where necessary, to support physical inspections.
- (d) Private interviews and discussions with over 100 craft and inspection personnel.
- (e) Examination of radiographs and other direct evidence of the quality of work such as postweld heat treatment charts.
- (f) Testing of components by ultrasonic thickness measurements, hardness, radio signal cable tracing, and concrete probes.

III. CONTACTS AND LICENSEE/NRC MEETINGS

The inspection was unannounced until the morning of September 6, 1983. On that day all team members and the NRC Nondestructive Examination (NDE) Van arrived on site. The teams primary point of contact during the course of this inspection was the Arizona Public Service (APS) Construction Quality Assurance organization at the site. This organization is managed by Mr. W. E. Ide.

An entrance meeting was held at the start of the inspection to acquaint the licensee with what the NRC inspection team intended to accomplish, arrange for needed drawings and documentation, arrange for off shift radiography, define organizational points of contact, and arrange necessary Saturday coverage since September 10, 1983, was a day of work for the inspection team. This meeting was attended by Mr. E. E. Van Brunt, APS Vice President for Nuclear Projects Management, Mr. J. A. Roedel, APS Corporate Quality Assurance Manager, Mr. W. J. Stubblefield, Bechtel Field Construction Manager and 20 other staff members of the APS and Bechtel Site Organizations.

On September 14, 1983, a brief meeting was held between the NRC team leader Mr. W. G. Albert, Mr. E. E. Van Brunt, APS Vice President of Nuclear Projects and Mr. D. B. Fasnacht, APS Nuclear Construction Manager. The purpose of this meeting was to provide highlights of tentative findings up to that time since Mr. Van Brunt could not attend the meeting on September 16th.

On September 16, 1983, a meeting was held between the team leader and the team lead inspectors with Mr. J. A. Roedel, APS Corporate Quality Assurance Manager, Mr. D. B. Fasnacht, APS Nuclear Construction Manager, Mr. W. G. Bingham, Bechtel Project Engineering Manager and approximately ten other APS and Bechtel Staff. The purpose of this meeting was to provide APS with a progress report on the type and nature of NRC findings at that point in the inspection.

This was a status meeting and, therefore, no attempt was made to categorize the findings as to their seriousness or to define which would be items of noncompliance. The NRC stated at that time that they perceived a weakness at the interface between construction and operations and while the basic construction appeared satisfactory, a significant number of findings indicated that either final inspections were not properly performed and/or there was a lack of control of work after completion of construction by the startup organization.

The principal exit interview for this inspection was held in the APS corporate offices on September 30, 1983. This meeting was attended by Mr. J. B. Martin, NRC Regional Administrator, Mr. T. W. Bishop, NRC Division Director and three NRC observers from headquarters organizations. The APS attendees included Mr. K. L. Turley, Chairman of the Board, Mr. O. M. DeMichele, President, Mr. T. G. Woods, Jr., Executive Vice President, Mr. E. E. Van Brunt, Vice President Nuclear

Projects, Mr. G. C. Andognini, Vice President Nuclear Operations, and eight other APS staff members. Bechtel attendance consisted of Mr. W. J. Stubblefield, Site Construction Manager and Mr. D. R. Hawkinson, Projects Quality Assurance Manager. In addition to the above, the meeting was also attended by representatives of the five other owner organizations for the Palo Verde Nuclear Generating Station which are: Southern California Edison Company, Salt River Project, Los Angeles Department of Water and Power, El Paso Electric and Public Service of New Mexico. At this meeting, the individual team members reported upon the areas examined and the significant findings in each area as detailed in this report.

The NRC management again reiterated their concern with regard to the quality controls exercised at the time of system turnover from construction to the APS startup organization and the apparent need for more definitive quality control by maintenance organizations. However, the NRC expressed general satisfaction with basic construction, particularly pipe welding, and the results of over 100 private but informal contacts with craftsmen and first-line inspectors.

The applicant expressed their intent to immediately and thoroughly followup on the NRC findings. Except for disagreement with the NRC finding regarding the readability of certain primary loop pipe radiographs, the applicant did not comment on the NRC findings at the time of this meeting and questions were generally continued to clarification of issues.

IV. Electrical and Instrumentation Construction

Objective

The primary objective of the appraisal of electrical and instrumentation construction was to determine whether safety-related components and systems were installed in accordance with regulatory requirements, SAR commitments, and approved construction specifications and drawings. Additional objectives were to determine whether procedures, instructions and drawings used to accomplish construction activities were adequate and whether quality-related records accurately reflect the completed work.

Particular attention was concentrated on the "A" train of the high pressure safety injection (HPSI) system to demonstrate specific areas within the broad categories of electrical and instrumentation construction. These areas include electrical raceway (cable tray and conduit) and raceway supports; electrical motors; electrical cable and cable terminations; electrical penetrations; instrumentation (sensors and logic); diesel generator; and onsite AC power distribution system and DC power system. Portions of the HPSI B train were also examined.

A. Electrical Raceways and Raceway Supports Raceways

1. Areas Examined Electrical Raceways

The NRC Team Inspectors examined approximately 1,690 feet of cable trays and 26 conduit runs. These raceways were inspected for: separation, proper identification and color coding, tray/conduit size and routing in accordance with design drawings, raceway bend radii conformance to criteria, bolted connection are tightness, weld conformance to applicable requirements, raceways free of debris and sharp edges, and installation and inspection documentation completeness and accuracy.

Findings

The following deficiencies were identified:

- a. Temporary alphanumeric identification on cable tray 1EZAIDBTXF had not been replaced with permanent identification.
- b. Nonsafety-related conduit 1EZADCNRQ506 for thermostat 1EQFNT1243C in HPSI A pump room was separated from safety-related group 1 junction box 1EZACCAKKJ03 by less than one inch.
- c. At diesel generator E-PEA-G01 nonsafety-related flexible conduit 1EZG1ANRX11 at junction box 4 is in contact with safety-related flexible conduit 1EZG1AARR20 at junction box 6.

- d. Separation group 1 cable tray located in HPSI pump room A was not marked with red color identification (round emblems) between points 1EZACEATCBA and 1EZACCARC03.
- e. The following separation group I conduits were not identified by alphanumeric markings:
 - 1) Conduits 1EZJ1AARC12, -14 and -16, on both sides of the wall between group 1, 4.16 KV switchgear area and channel A remote shutdown panel area, at the 100 foot elevation.
 - 2) Conduit sleeves 1EZJ1BARC13, 14 and 15 on control building wall in channel B remote shutdown area, at the 100 foot elevation.
- f. Round blue identification emblems were missing from channel D conduit (PT-351) for a distance of approximately 40/50 ft at elevation 120'.
- g. At diesel generator E-PEA-G01, vendor supplied nonsafety-related ALS flexible cable at junction box 14 could potentially move and come in contact with safety related flexible conduit 1EZG1AARY27 at junction box 7.
- h. The vinyl jacket on safety related flexible (anaconda metal hose type NWC), conduit ER1EZC1CARK13 inside containment was damaged and subsequently repaired in accordance with established procedures (Procedure for Raceway Installation, WPP/QCI 251.0, Revision 18, Section 5.10) by taping over the damaged vinyl with Scotch 33 tape.

2. Raceway Supports

The NRC Team examined 60 raceway supports. These supports were inspected for conformance to design drawings including: support spacing, configuration, location, mounting, material, support member size, and weld joints.

Findings

The following deficiencies were identified:

- a. The bolted connections attaching tray 1EZA1BBTXCV to hanger H7 (drawing 13-E-ZAC-016 Rev. 20) were disconnected.

- b. The as-installed configuration of the welds attaching the longitudinal bracing for hangers H212, H10, H11 and H12 on drawing 13-E-ZJC-044 Rev. 9 to embedded plates is not as specified by detail 21, alternate, on drawing 13-E-ZAC-043 rev. 18. In addition, slag remains on the referenced welds for hanger H12. The raceway installation cards for trays 1EZJ4AATXHA and 1EZJ4AATXHB indicate that these welds have been inspected and accepted by QC.
- c. The fifth support from instrument rack 1JSBAA01 for conduit 1EZC1AARX-10 was found to contain welds which exhibited overlap, which is prohibited by AWS D1.1-72.
- d. The priming and painting of welds on raceway supports in channel c (green) riser room adjacent to cable spreading room at the 120 foot elevation was incomplete.
- e. The fourth support from junction box J-RCA-PT-190A for conduit 1EZCAAARX08 contains a damaged P1001A3 unistrut member which prohibits the full engagement of a unistrut spring nut within the unistrut channel.

B. Electric Motor Installation
Areas Examined

The NRC Team Inspectors examined a sample of installed electric motors within the HPSI system. The motors selected were two HPSI pump motors, IMSIAP02 (Train A) and IMSIBP02 (Train B); and 17 motor-operated valve motors included in the HPSI System (Trains A and B);

UV-617	HV-530	UV-673	HV-531	UV-647
UV-667	HV-604	UV-674	UV-626	
HV-699	UV-627	UV-616	UV-636	
HV-609	HV-698	UV-637	UV-646	

For the motors, the inspectors reviewed associated vendor drawings and documents, and plant maintenance, test, and installation records which define the design and installation methods for the equipment. A physical inspection of the installed equipment was performed to determine compliance to design requirements and vendor installation criteria, mounting, bolting, identification, nameplate date, location, grounding, and protection. The following documents and areas were reviewed: equipment specifications; purchase order documentation; vendor drawings and instruction manuals, including maintenance and installation requirements; seismic analysis or test and equipment qualification documentation, including special mounting and maintenance requirements; equipment maintenance records for warehouse, construction, and startup phases; warehouse records including receipt, storage, and release documentation; material receiving reports, including equipment certifications from vendors; electrical testing records for pre-operational phase; and associated quality control and installation records.

The power cables for the motors were inspected in the field and the terminations were examined at the motors. The routing of the cables for the HPSI motors and approximately one-third of the MOVs were traced back to their respective 4160 volt or 480 volt power sources to verify physical separation of trains, cable tray/conduit arrangement, and cable tray fill. Specific cable numbers are identified below in Section C, electrical cable installation.

Findings

The following deficiencies were identified:

1. It was found that the installation of the dowel pins in the motor mounting (following alignment), as required by the manufacturer, had not been installed. Doweling of the motor mounts could not be identified on the master list of items to be completed prior to fuel load. However, it was established that the maintenance division, charged with the installation of these dowel pins, was aware of this remaining requirement in the mounting of the HPSI pump motors and tools were ordered in August 1983 to perform the job.
2. HPSI pump 1MSIAP02 motor, ground cable hold-down clamp was missing.
3. Motor heater (M-SIA-P02H) nameplate missing at MCC 1EPHAM37.
4. There are no permanent identification signs at entrances to HPSI pump rooms, Train A and Train B.
5. Revision 3 of Specification SYS.80-PE-410 for the HPSI pumps is not contained in Purchase Order 9500088, as required. Revision 2 of the specification is included in the purchase order.
5. MOV nameplate error at MCC 1EPHAM33. The nameplate reads JSIA-UH-604, but should read 1J-SIA-HV-604.
7. Material Receiving Report 42220 is missing from Purchase Order 960-1231 for MOV 1JSIA-HV 604.

C. Electrical Cable Installation and Cable Terminations

1. Electrical Cable Installation

The NRC Team inspectors selected a sample as listed below of installed electrical high and low voltage power, and control cables within the HPSI systems Trains A (and some in Train B) and the Class IE power systems. For each selected cable, the NRC inspectors reviewed associated drawings and documents which define the location, design route, and installation methods for cable installation within tray and conduit. A

physical inspection of the as-built cable installation was performed by inspecting the entire length of cable run between the associated equipment and its respective load center/control cabinet. The objective of the inspection was to ascertain compliance with design, installation, and quality assurance documents. During the course of the inspection, the following documents and areas were reviewed: elementary and cable block diagrams; cable code and cable scheme numbers; single line diagrams, cable type and identification, including separation color and cable markers; E580 computer program sorts for routing, identification of cables at tray points, actual and allowable tray fill at tray points, and size and type of cable; physical separation criteria, including raceway and tray designations; conduit and tray arrangement drawing; raceway installation cards; cable installation cards; and cable installation specifications. The physical inspection of the cable runs included a determination of size, type, routing, protection, separation, identification, loading, cable supports and cable spacing. The actual cable installation and routing was compared to the design as determined from the E580 computer program and the cable installation cards.

The installation was examined for the following power, control and instrument cables, totaling approximately 8680 feet for the HPSI system, Trains A and B and Instrument Channels A, B, C, and D.

<u>CABLES</u>	<u>EQUIPMENT</u>	<u>TO LOCATION</u>
1ESI01BC1CA	HPSI Pump/Motor B	1EPBBS04E
1ESI01AC1CA	HPSI Pump/Motor A	1EPBAS03E
1ERC65CC1XA	PT-102C	1ESACZ28I
1ERC65CC1XB	Penetration Z28	1JSBCC02A
1ERC65DC1XA	PT-102D	1ESFDZ77I
1ERC65DC1XB	Penetration Z77	1JSBDC02A
1EHC62CC1XA	PT-351C	1JSBCC02A
1EHC62DC1XA	PT-351D	1JSBDC02A
1ESI40BC1KA	V-609	1EPHBM3410
1ESI1BBC1KA	V-667	1EPHBM3608
1ESI39BC1KA	V-699	1EPHBM3807
1ERC64AC1XB	PT-102A	1ESAAZ47I
1ERC64BC1XA	PT-102B	1ESFBZ38I
1ERC64BC1XB	Penetration Z38	1JZJBE02
1EHC61AC1XA	PT-351A	1JSBAC02A
1EHC61BC1XA	PT-351B	1JSBBC02A
1EPE01AC1CA	Diesel Generator	1JDGAB03
1EPE01AC1CB	1EPEAG01	1JDGAB03
1EPE01AC1CC	1EPEAG01	1JDGAB03
1ESI40AC1KA	MOV HV-604	1EPHAM3305
1ESI39AC1KA	MOV HV-698	1EPHAM3708
1ESI40AC1RA	MOV HV-604	1EPHAM3305
1ESI39AC1RA	MOV HV-698	1EPHAM3708

<u>CABLES</u>	<u>EQUIPMENT</u>	<u>TO LOCATION</u>
1ESI21AC1RC	Penetration Z46	1EPHAM3512
1ESI21AC1RB	MOV UV-673	1EPHAZ46I
1ESI21AC1KA	Penetration Z46	1EPHAM3512
1ESI21AC1KB	MOV UV-673	1EPHAZ46I
1EBC64BC1XD	Remote Shutdown Pnl.	1JSBBC02A
1ESB01AC1RM	Distrib. Pnl. (1EPNA-D25)	1JSBAC02B
1ESB01AC1RS	Distrib. Pnl. (1EPNA-D25)	1JRMAB02B
1EPN02AC1RB	Isolat'n.Pnl. (1JSAA-C04)	1EPNAN11

Findings

The following deficiencies were identified:

- a. While inspecting the traceability of Anaconda 5 KV cable, it was found that the identification, required to be permanently marked on the outer jacket of the cable at three-foot intervals, could easily be rubbed off. This resulted in the cable jacket markings becoming illegible following handling during installation.
- b. Scaffolding lumber was found stored in channel C electrical raceway/cable chase located in the lower cable spreading room at the 120 foot elevation.
- c. In tray 1EZJ4AATSCE, cables are projecting above the level of the tray siderails, and are in physical contact with fire protection piping and two HVAC ducts.
- d. Traceability of 5KV cable was found to lack clarity. The cable is received on site from the vendor under a material receiving record (MRR) which identifies the cable, vendor and receiving cable reels. Following receipt, the vendors cable reels are assigned Bechtel cable reel numbers for storage and future processing. The Bulk Material Inventory (computer readout), the principle cable record, correlates Bechtel cable reel numbers to vendor reel numbers, but does not list the MRR numbers under which the vendor cable reels were delivered. Therefore, it is nigh impossible to trace cable directly from the Bechtel storage reels to the material receipt records.

Conclusions

Items b and c of the above findings have been identified as violations in a notice of violation issued to the licensee.

2. Cable Terminations

The NRC Team inspectors examined the terminations of 31 cables identified above under cable installation. The terminations at both ends of the cables were inspected for: cable terminations as shown on engineering documents, identification with enclosure, separation, size of conductor, tie-down, bend radius, grounding of cable shield, disposition of spare wires, proper size terminal lugs, neatness and workmanship, and installation and inspection documentation.

Findings

The following deficiency was identified:

Electrical installation, Specification EM-306, Section 7.2R, requires spare wires in a cable to be coiled and insulated with tape or a shrink sleeve. The end of green/black tracer, spare wire cable ESI21AC1RC at EPHAM3512 was bare and not insulated as required. The quality of insulating the ends of other spare wires was inconsistent and insecure.

D. Electrical Penetrations

The following installed containment electrical penetration assemblies were inspected:

<u>Number</u>	<u>Elevation</u>
Z28	100-foot
Z38	100-foot
Z46	120-foot
Z47	120-foot
Z77	120-foot

The location, type, mounting, and identification were compared with the installation drawings. The cable terminations at the penetrations were examined both inside and outside of containment. The QC records associated with receiving, storage and installation of these penetrations were also reviewed. Activities observed and documentation reviewed indicated work performed in this area was in accordance with requirements.

E. Electrical Instrumentation

The actuation of HPSI is initiated from either of two parameters (four channels); low-pressurized pressure and high containment pressure. The four pressurizer low-pressure transmitters, PT-102A, 102B, 102C and 102D; and the four containment high pressure transmitters, PT-351A, 351B, 351C, and 351D were inspected in the field.

These pressure transmitters were inspected for proper mounting, physical separation, identification of correct instruments and safety channel (color code), instrument calibration, etc. The stainless steel tubing runs were traced from the transmitters back to the containment isolation/root valves to verify; proper grade (slope) and tubing support.

The instrument cabinets and panels were inspected for technical requirements as contained in the Procurement Specifications 13-JM-200 (COMSIP, Inc) and 13-EM-022 (HARLO Corp.), and Installation Specification for Instrumentation and Control Equipment, 13-JM-702, Revision 8. The physical inspection also included inspection of internal wire routing and separation, cable marking (identification), termination connections, module mountings, overall workmanship, and cleanliness. Operator controls and displays for the HPSI system were examined at the B02 and B05 main control room benchboards. The interface between the HPSI system and remote shutdown panel was also examined.

The following engineered safety features (HPSI) systems cabinets and instrument panels were inspected:

1. NSSS Analog Instrument Cabinets A, B, C, and D:
1-J-SBA-C02A 1-J-SBB-C02A 1-J-SBC-C02A 1-J-SBD-C02A
1-J-SBA-C02E 1-J-SBB-C02B
2. Plant Protection System Cabinets A, B, C, and D:
1-J-SBA-C01 1-J-SBB-C01 1-J-SBC-C01 1-J-SBD-C01
3. Main Control Room Panels:
1-J-RMA-B02 1-J-RMB-B02 1-J-RMC-B02 1-J-RMD-B02
1-J-RMA-B05 1-J-RMB-B05 1-J-RMC-B05 1-J-RMD-B05
4. ESFAS Auxiliary Relay Cabinets A and B:
1-J-SAA-C01 1-J-SAB-C01
5. BOP ESFAS Cabinets A and B:
1-J-SAA-C02A 1-J-SAB-C02A 1-J-SAA-C02B 1-J-SAB-C02A
6. Isolation Cabinets A, B, C, and D:
1-J-SAA-C04 1-J-SAB-C04 1-J-SAC-C04 1-J-SAD-C04
7. Status Display Panel Inserts A and B:
1-J-ESA-C01 1-J-ESB-C01

8. Remote Shut Down Panel Sections (HPSI Valve Controls):

1-J-ZJA-E01 1-J-ZJB-E01 1-J-ZJC-E01 1-J-ZJD-E01

The following quality control records for the HPSI instrument systems were examined: purchasing/receiving records, storage/maintenance records, installation records, cable installation, and termination records.

Findings

The following deficiencies were identified:

1. The sensing lines for the four channels of containment pressure (PT-351A, 351B, 351C and 351D) were found to be capped immediately inside containment. The sensing lines were capped with threaded pipe caps and could only be removed with the aid of a pipe wrench. The presence of these pipe caps make this system inoperative. There were no records to indicate when the caps were installed or when they were to be removed.
2. The instrument sensing line support shown in Detail 1 on Drawing 13-J-01D-105, Revision 4 has a weld which contains undercut measuring approximately 1/32-inch in depth. The 1/32-inch value does not satisfy the requirements of the .01-inch criteria for undercut transverse to the primary tensile stress of the member in question as stated in AWS D1.1-72, Revision 1973 as defined in specification 13 CM 320.
3. An internal separation barrier cover was missing from remote shutdown panel 1JZJBE01, and no status tag noting its removal was observed.
4. It was found that temporary nonconformance report hold tags for level transmitters LT 1123A and LT 1124A at the 100 foot elevation inside containment were reversed.

F. Emergency Diesel Generator
Areas Examined

The electrical aspects of the Emergency Diesel Generator 1, 1EPEAG01, including control cabinet wiring, were inspected for location, mounting, separation, protection, and identification.

Findings

These reviewed aspects indicated work was performed in accordance with installation requirements. Some minor deficiencies that were found in raceways (flexible conduit) separation were address under raceway and support section of this report Paragraph IV.A-1. No other deficiencies were identified.

G. Onsite AC Power Distribution System
Areas Examined

The NRC inspector examined the following components of the Class I 4160-volt and 480-volt power distribution system:

1E-PBB-S04	4.16 KV switchgear, separation group 2
1E-PBA-S03	4.16 KV switchgear, separation group 1
1E-PGA-L35	480 V switchgear, separation group 1
1E-PGA-L33	480 V switchgear, separation group 1
1E-PHA-M33	480 V MCC, separation group 1
1E-PHA-M35	480 V MCC, separation group 1
1E-PHA-M37	480 V MCC, separation group 1
1E-PHB-M34	480 V MCC, separation group 2
1E-PHB-M36	480 V MCC, separation group 2
1E-PHB-M38	480 V MCC, separation group 2

The 4160-volt switchgear, 480-volt switchgear and 480-volt motor control centers (MCC) were inspected and compared to installation drawings relative to configuration, location, mounting, identification, installation documentation, and protection.

Findings

The following deficiencies were identified:

1. It was found that 87 3/8-inch bolts were missing from the base frames for the six separation groups 1 and 2 motor control centers identified.
2. It was ^Afound that three cubicle tie-down bolts in MCC 1E-PHA-M35 were not fully engaged. The licensee had in progress design change package (DCP) 1SE-PH-035 requiring certain modifications to the tie-down method for the above identified MCCs. These modifications were required to assure the MCCs comply with the seismic analysis requirements. X
3. In 4160-volt switchgear cubicle E-PBA-503L nonsafety-related flexible conduit 1EZJ1ANRR52 is separated from safety-related wiring by less than 1 inch which does not satisfy the separation requirements.
4. In 4160-volt switchgear cubicle E-PBA-503K nonsafety-related flexible conduit 1EZJ1ANRR51 is separated from safety-related wiring by less than one inch, contrary to separation criteria.
5. An error was found in the identification of compartment 05 of MCCEPMAM33 on drawing 13-E-PHA-003. Long term cooling valve JSIAHV604 was identified as JSIAUV604.

H. DC Power System

The four main DC batteries, battery chargers, and Vital AC bus inverters were inspected for electrical separation aspects, fluid levels, termination connections, bolting materials, spacers, mounting arrangements, and general workmanship and cleanliness. Equipment that was inspected is identified in the following list:

DC Batteries and Mounting Racks A, B, C, and D:
1-E-PKA-F11 1-E-PKB-F12 1-E-PKC-F13 1-E-PKD-F14

DC Battery Chargers A, B, C, and D:
1-E-PKA-H11 1-E-PKB-H12 1-E-PKC-H13 1-E-PKD-H14
1-E-PKA-H15 1-E-PKB-H16

Vital AC Bus Inverters A, B, C, and D:
1-E-PNA-N11 1-E-PNB-N12 1-E-PNC-N13 1-E-PND-N14

Technical requirements for the batteries, battery chargers, and inverters contained in Procurement Specifications 13-EM-050 for Exide, 13-EM-051 for Power Conversion Products, Inc., and 13-EM-054, respectively, were reviewed.

Each battery was physically inspected for adequate fluid levels, conductor termination connections, bolting materials used, and absence of battery case cracks. Each battery rack was inspected for battery-to-end plate spacing, battery-to-battery spacers, alignment of frame spring-nuts, and frame welding to the battery room floor imbeds. The location, floor mounting, panel displays, and electrical conduit configuration for each battery charger and Vital AC inverter were inspected.

Revisions 0 and 1 of the PM-410 Startup Generic Maintenance Procedure for Station Batteries were reviewed for technical requirements and test acceptance criteria. Records were inspected for each of the four safety-related batteries, such as on-site receiving records, mid-1981 test results during warehouse storage, and periodic maintenance test result records during construction for the period from February 1982 through September 1983.

Installation, in-site modification, and periodic maintenance records for each battery charger, and Vital AC inverter (prior to turnover to Startup) were also inspected.

Findings

The following deficiencies were identified:

1. The batteries were received on site during the summer of 1981. It was found that no procedure existed for performing the required periodic tests (IEEE Std. 308) to maintain the batteries. The required procedure came into effect in the spring of 1982.

2. The earliest maintenance records are for August 1981, and proceed monthly through November. However, no records can be found for December 1981 and January 1982.
3. The storage of periodic maintenance records did not satisfy the storage requirements of Section 1.8 of the FSAR. These records, required to be stored in a manner which minimizes the risk of destruction from fire, were found stored in a paper-board box.
4. No records exist to indicate that baseline annual cell-to-cell and terminal detail connection resistance data was ever recorded during factory acceptance tests for these batteries. However, the licensee startup generic test procedure addresses the requirement to record intercell resistance checks, during pre-licensing testing.
5. It was found that the vendor testing (at the factory) of battery C did not completely fulfill the discharge rate requirements. However, the licensee identified this, at the time, by issuing supplier deviation disposition request (SDDR) 2763 which requires the capacity discharge test to be run on the job site. This test is scheduled to be accomplished by the startup group during pre-licensing testing.

V. Hangers and Supports, Snubbers and Restraints

A. Areas examined

1. Hardware: The inspector examined all pipe hangers, supports, snubbers, and restraints on the HPSI A piping system from the start of suction line SIA-008-GCBC-10-inch through discharge lines SI-A-100-CCBA-4, ~~were~~ and SI-A-106 CCBA-3-inch, throughout the 40-foot elevation, up through the vertical pipe chase to the 89-foot elevation pipe chase. At this juncture, one of the five injection branch lines, SI-E-176-CCBA-3", was followed to the injection point and all pipe supports, hangers, snubbers, and restraints were examined. Additionally, miscellaneous branch lines from the HPSI discharge path were examined for supports (to the first isolation valve on the branch). Additionally, a few supports not involved in the line description above were examined if a condition was noted which warranted follow up. All supports examined are listed in Table V-1. X

In most cases, pipe insulation was removed for inspection. In those cases where a support was only partially examined, Table 1 so notes. These cases generally fall into the following conditions:

- Insulation not removed. This condition precluded examining pipe lug welds only. The hanger members and welds are not covered by insulation and can be thoroughly inspected.
- Lug welds only. In these cases, the inspector examined only the lug welds to increase the sample of lug welds by inspecting supports which were not on the selected branch line, but were part of HPSI-A.
- One aspect only (e.g., "base plate only"). In these cases, the support was not included in the lines selected but was partially examined because a condition warranting follow up was noted.
- Location and configuration only. These cases involved a series of replicate supports in a horizontal run. The location of the support and the configuration were checked against drawing requirements, and support member sizes and weld sizes were checked by visual examination rather than by measurement.

All other supports were examined fully.

The inspector examined the supports to determine that:

- . All supports shown on the piping isometric drawings were installed.
- . No additional supports were installed.
- . The support configuration was as shown on the support drawing.
- . The support member material was per the drawing.
- . The welds on the support were the correct size and met the applicable code and standard requirements.
- . The welded attachments to piping were per drawing.
- . The attachment welds to pipe were per drawing and met code and standard requirements.
- . Mechanical snubbers and restraints were installed where required by drawing.
- . The snubber and restraints were the proper size (load rating).
- . The snubbers and restraints had the proper cold setting shown on the drawing.
- . The supports were properly located per the drawing relative to the piping and the structure.

There are a total of 116 pipe supports involved in all of the HPSI-A system. The inspector examined 68 supports or about 60 percent. Of the 68 supports examined 14 supports had one or more problems. This is about a 20 percent reject rate. The problems identified are discussed in the "Findings" section below.

2. Drawings, Specifications, and Procedures

The inspector gathered and reviewed the applicable piping drawings, hanger drawings, specifications, work and inspection procedures, and pertinent vendor information.

Other safety-related documentation, including documents, authorizing deviations from the drawings, records of hanger inspection by QC, non-destructive examination records, welding inspection records, nonconformance reports, vendor certification records, code reports, and piping spool fabrication records were reviewed as they were identified in the pursuit of questions raised on a particular support's apparent anomalies.

The inspector also reviewed the FSAR and ASME codes for applicable requirements.

The documents discussed above will be listed and specifically addressed only as they apply to findings, discussed in the "Findings" section below.

3. Tools

The inspection was conducted utilizing unaided visual examination, tape measure, weld gages, angle finder, and adequate lighting. Safety equipment was utilized as required. No NRC independent non-destructive examination was performed on the pipe supports due to other priorities. In the one case where the visual inspection indicated a possible weld defect, the inspector requested the licensee reexamine the weld using liquid penetrant examination. The inspector observed the entire performance of the examination.

B. Findings

Table V-1 lists all supports inspected and shows which supports were found unsatisfactory and provides a brief description of the problem(s) found.

The problems found group into three areas which are considered apparent violations of NRC regulations. Each problem identified in Table V-1 is explained more fully below.

- (1) Failure of the pipe support QC personnel to identify support conditions which are not in accordance with drawing or specification requirements (six examples).

10 CFR 50, Appendix B, Criterion 5, requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, and drawings, and shall be accomplished in accordance with these instructions.

The licensee's procedure WPP/QCI 201.1, Revision 18, dated May 25, 1983, "Nuclear Pipe Hangers and Supports Installation," Appendix I, requires the Piping QC Engineer to verify each completed task on the "CIP for Nuclear Pipe Supports." The inspection requirement for Task 1 is to verify the support assembly correct per approved engineering drawings and specifications.

- . Support SI-089-H008 was found with rubber seal material injected in the space by the Flourogold slides plates, Items 54 and 55 on the drawing. The drawing does not show rubber sealant material. It is probable that the material was inadvertently injected after the support inspection on November 29, 1979, but the material had been neatly trimmed away and the edges painted in the area painting.
- . Support SI-100-H003 was found with a loose pipe clamp and installed at an angle of $4\ 1/2^\circ$ from vertical. Procedure WPP/QCI 201.1, paragraph 8.9, requires the clamp to be snug on the pipe. Procedure WPP/QCI, paragraph 9.2.7.1, requires the angle to be no greater than 2 degrees. The support was accepted by QC on November 20, 1983.
- . Support SI-100-H005 was found with the drawing specified dimension of $3\ 3/4$ inches between the centerline of the pipe stanchion and the centerline of the insert plate to be actually $7\ 1/2$ inches. This difference exceeds the tolerances of ± 2 inches paragraph 9.3.12 of the WPP/QCI. The support was accepted by QC on November 13, 1981.
- . Support SI-100-H036 was found in a condition which did not match the hanger drawing and modifying Field Change Request (FCR) 15, 123P. Item D of the FCR was not installed. The support was accepted by QC on October 22, 1983 to the drawing and FCR.
- . Support SI-101-H00A was found with a loose jam nut on Item 61, the sway strut assembly. The support was accepted by QC on October 2, 1981.
- . Support SI-106 H001 was found with the 2" long pipe lugs, Item 38, bearing on the supporting steel for only $3/16$ inch and $7/16$ inch, respectively. Paragraph 9.4.1 of the WPP/QCI indicates full bearing surface should be provided as indicated on the support drawing. The support was accepted by QC on May 23, 1980.

The failure of pipe support QC personnel to identify pipe support conditions which were not in accordance with drawing or specification requirements is an apparent violation of NRC regulations (~~Enforcement Item 50-528/83-34~~). X

- (2) Failure of the welding QC personnel to identify weld conditions which are not in accordance with the drawing or the welding code requirements (eight examples).

10 CFR 50, Appendix B, Criterion 5, requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, and drawings, and shall be accomplished in accordance with these instructions.

Licensee's procedure WPP/QCI 201.1, Revision 18, dated May 25, 1983, "Nuclear Pipe Hangers and Supports Installation," Appendix I, requires the Piping QC Engineer to verify each completed task on the "CIP for Nuclear Pipe Supports."

The inspection requirements for Task 8 require the welding QCE to verify that field welding is complete. For Task 9, he is to verify the vendor welding was checked for size and length. The instructions to the QCE in Appendix I instruct the QCE to verify welding acceptability.

Support SI-100-H005 was found with an underfill condition in the stanchion, Item 30, to pipe weld. The weld is required to be a 5/16-inch fillet weld. The actual fill was measured to be 1/4 inch. The weld was accepted on the field weld check list on November 9, 1981.

Support SI-100-H010 was observed to have an apparent lap in the weld of Item 38 to the pipe. This was a vendor weld. Minor slag was also present in the toe of the weld. These conditions would have precluded a satisfactory liquid penetrant examination by the vendor. The vendor records show the weld was liquid penetrant examined and accepted on December 4, 1977 (Job 2810, Piece 1-SI-100-S-009, "F" No. 261). The NRC inspector had the visual indication on the weld reexamined by licensee personnel by liquid penetrant examination in his presence. The liquid penetrant examination resulted in an unacceptable linear indication.

The vendor weld had been last inspected by site QC personnel per Task 8 on June 17, 1981, and was accepted.

- Support SI-100-H015 has the lug, item 38A, field welded to the pipe. The weld was 1/32-inch undersize. The welds were originally accepted on January 22, 1979, and were accepted again during the support inspection on October 28, 1981.
- Support SI-100-H034 was found with one undersized vendor lug weld (Item 38 to the pipe). The weld was required to be a 1/4-inch fillet and measured to be 3/16 inch. The vendor welds were checked by site QC for size and accepted on September 11, 1982.
- Support SI-102-H00B was found with several weld problems. The vendor weld of Item E to Item B was required to be a 3/16-inch fillet, but was 1/8 inch on three sides. Additionally, there was rollover (or laps) at the corners. The field weld of Item C to existing structure was required to have one-inch end returns on the welds, but did not. The vendor weld was accepted by site QC on August 18, 1981. The field weld was originally accepted on October 14, 1980, and was accepted again on August 18, 1981.
- Support SI-106-H011 was found with the pipe lug welds (Items 38 and 38A to pipe) closer than 1 inch to the adjacent pipe-to-pipe circumferential weld. The actual distance was 3/4 inch. Specification 13-PM-204, "Field Fabrication and Installation of Nuclear Piping Systems," paragraph 12.2.9, states that welded attachments shall not be installed within 1.0 inch of existing circumferential welds. The field lug welds were originally accepted on February 12, 1979, and again during final support acceptance on October 2, 1980.
- Support SI-176 H001 was found with an undimensioned weld on the drawing, therefore, the proper size of the weld could not be verified by the NRC inspector. The 3-inch long fillet field welds of Item 84 to Item B are not dimensioned on the support drawing 13-SI-176-H001, Revision 1. The welds were originally accepted on December 18, 1980, and were accepted again on September 15, 1982.
- Support SI-176-H003 was found to have an undersize weld. The skewed (120-degree) fillet weld of Item A to the containment insert plate measured 1/4 inch rather than the required 5/16 inch. The support weld was accepted on July 14, 1980.

Further discussions with the Lead QC Engineer for Pipe Supports and the Lead Welding Engineer disclosed that the Welding Engineer had given verbal instructions to the QC Engineer that were contrary to the AWS D.1.1 code requirements for measuring the size of skewed fillet welds. Hence, this undersize weld may be considered caused by improper engineering information. It follows that all skewed fillet welds may require reinspection to the proper criteria.

The AWS D.1.1 Code 1974 shows, in Figure 2.7.1, that skewed fillet welds are measured thus:



At Palo Verde the QC Engineer states welds are "measured" as shown below (it is not clear how this is "measured" since there is no access to one of the measurement points):



To "measure" by the Palo Verde method to a given size (e.g., $5/16$ inch on a 120-degree weld) will result in an undersize weld by the Code definition (in this case by $3/64$ inch). Nonetheless, QC inspectors are required by WPP/QCI 201.1 to inspect to AWS D.1.1 criteria for this weld. The AWS D.1.1 criteria are clear and are not superseded by verbal instructions from engineering.

The failure of welding QC to identify pipe support weld conditions which are not in accordance with the drawing or welding code requirements is an apparent violation of NRC regulations (~~Enforcement Item 50-528/83-34/XX~~). X

- (3) Failure of engineering to include a non-safety loads in a safe related pipe support calculation (one example).

10 CFR 50, Appendix B, Criterion 5, requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures and drawings and shall be accomplished in accordance with these instructions.

Specification 13-PM-204, Revision 12, Paragraph 12.1.2 dated April 7, 1983, states the design and location of all pipe supports shall be the responsibility of project engineering. Paragraph 12.1.4 states pipe supports designed by engineering will be shown on drawings and all design details will be shown including miscellaneous steel.

Support SI-100-H-012 was found with a miscellaneous steel member installed which was used as a support for an Instrument Air Line. The miscellaneous steel was not shown on the pipe support drawing, 13 SI-100-H-012, Revision 1. The drawing does show the engineering design loads used in the analysis of the pipe support and the applicable calculation number (Problem No. 513-E, point number 293).

Engineering was contacted by telephone, and the responsible engineer stated that the loads from the miscellaneous steel member used as an instrument air support (IA-116-H00A) were not included in the design load for the pipe support, SI-100-H-012.

The engineer stated that loads were inconsequential (29 pounds) and the instrument air calculation had been annotated to state that the attachment to the Safety Injection Support was satisfactory. Nonetheless, he stated the procedure requires the safety injection support calculation be amended to include such loads. The failure of engineering to include a nonsafety design load in a safety-related pipe support calculation is considered an apparent violation of NRC regulations. (~~Enforcement Item 50-528/83-34~~) X

TABLE ~~X~~V-1

	<u>SUPPORT</u>	<u>TYPE</u>	<u>FINDING</u>	<u>PROBLEM DESCRIPTION</u>	<u>DEGREE OF INSPECTION</u>
1.	SI 008 H001	S	Sat		Full
2.	SI 008 H002	SS	Sat		Full
3.	SI 008 H003	S	Sat		Full
4.	SI 008 H004	SNB	Sat		Full
5.	SI 008 H005	S	Sat		Full
6.	SI 089 H008	S	Unsat	Penetration Seal Material on Slide Plate	Slide Plate only
	(Partial Inspection)				
7.	SI 099 H001	SNB	Sat		Full
8.	SI 099 H002	S	Sat		Full
9.	SI 100 H001	S	Sat		Presence only - seal boot on
10.	SI 100 H002	S	Sat		Full
11.	SI 100 H003	S	Unsat	(1) Loose clamp (2) Excessive Angle	Full
12.	SI 100 H004	S	Sat		Full
13.	SI 100 H005	S	Unsat	(1) Location dimension varies more than allowed (2) Lack of fill on stanchion to pipe field weld	Full
14.	SI 100 H006	S	Sat		All but lug welds
15.	SI 100 H007	SNB	Sat		Full
16.	SI 100 H008	S	Sat		Full
17.	SI 100 H009	S	Sat		All but lug welds
18.	SI 100 H010	S	Unsat	PT accepted (by Vendor) w. lap and slag	Full
19.	SI 100 H011	S	Sat		Full
20.	SI 100 H012	S	Unsat	Nonsafety hanger loads not included	Full
21.	SI 100 H013	S	Sat		Full
22.	SI 100 H015	S	Unsat	Lug weld size	Full
23.	SI 100 H016	S	Sat		Full
24.	SI 100 H017	S	Sat		Full
25.	SI 100 H018	S	Sat		Full
26.	SI 100 H019	S	Sat		Full
27.	SI 100 H020	SNB	Sat		Full
28.	SI 100 H021	S	Sat		Full
29.	SI 100 H022	S	Sat		Location/ Configuration/ Clearances only
30.	SI 100 H023	S	Sat		"
31.	SI 100 H024	S	Sat		"
32.	SI 100 H025	S	Sat		"
33.	SI 100 H026	S	Sat		"
34.	SI 100 H027	S	Sat		"
35.	SI 100 H028	S	Sat		Full

36.	SI 100 H029	S	Sat		All but pipe lugs
37.	SI 100 H031	S	Sat		Lug welds only
38.	SI 100 H032	S	Sat		Lug welds only
39.	SI 100 H034	S	Unsat	Undersize lug weld	Full
40.	SI 100 H035	S	Sat		Lug welds only
41.	SI 100 H036	S	Unsat	Configuration differs from drawing	Full
42.	SI 101 H00A	SS	Unsat	Loose Locknut	Lock nut only
43.	SI 102 H00A	S	Sat		Full
44.	SI 102 H00B	S	Unsat	Welds deficient (Undersize weld, rollover, no end returns)	Full
45.	SI 105 H00B	S	Sat		Full
46.	SI 105 H00C	S	Sat		Full
47.	SI 105 H00D	S	Sat		Full
48.	SI 105 H00E	S	Sat		Full
49.	SI 106 H001	S	Unsat	Lack of Lug Contact area with support members	Full
50.	SI 106 H002	S	Sat		Full
51.	SI 106 H003	S	Sat		Full
52.	SI 106 H004	S	Sat		Full
53.	SI 106 H005	S	Sat		Full
54.	SI 106 H006	S	Sat		Full
55.	SI 106 H007	S	Sat		Full
56.	SI 106 H008	SNB	Sat		Full
56.	SI 106 H009	S	Sat		Full
57.	SI 106 H010	S	Sat		Full
58.	SI 106 H011	S	Unsat	Pipe lug weld w/in 1" of circumferential weld	Full
59.	SI 106 H012	S	Sat		All but pipe lugs
60.	SI 106 H013	S	Sat		All but pipe lugs
61.	SI 106 H014	S	Sat		Full
62.	SI 106 H015	S	Sat		Full
63.	SI 106 H016	S	Sat		Full
64.	SI 106 H023	S	Sat		Full
65.	SI 176 H001	S	Unsat	Undimensioned weld on drawing	Full
66.	SI 176 H002	S	Sat		Full
67.	SI 176 H003	S	Unsat	Undersize fillet weld	Full
68.	SI 176 H004	SS	Sat		Full

LEGEND

S = Support
 SS = Restraint (Sway Strut)
 SNB = Snubber

VI. PIPING SYSTEMS INSPECTION

Approximately 826 feet of HPSI-Train A piping was selected for inspection. Inspection was performed on 64 percent, which represents 530 feet of the HPSI piping, to verify compliance with the isometric drawings and ASME Section III requirements. This included 64 feet of piping on the suction line of HPSI pump A; the balance of piping inspected was on the discharge lines located in the auxiliary and containment buildings respectively. Piping system inspection includes visual inspection of pipe welds, welder qualifications, piping size and quality, and valve installation.

A. Piping System Welds

1. Areas Examined

Visual inspection of 200 pipe welds, out of a total of approximately 900 weld joints (pipe and socket) in the entire HPSI systems was made for quality and compliance with ASME Section III requirements. Characteristics examined included weld surface appearance, location, weld reinforcement, and absence of surface defects including cracks, lack of fusion, porosity, slag and undercut exceeding prescribed limits.

The records associated with one percent of the total welds were reviewed in detail and compared with the information obtained at the weld joint. Records examined included certified material test reports, piping class sheets, Bechtel's Form 84 which specifies the welding and nondestructive examination requirements for field erected piping, welder qualifications, field welding check list, and filler material certifications.

2. Findings

The type of pipe weld joints examined included pipe-to-pipe, pipe-to-fittings and pipe-to-valves. The visual inspection of these weld joints and the associated records reviewed indicated that the components were welded together by qualified welders using qualified filler materials and qualified welding procedures, the components being joined were certified, that the base material and the filler material were compatible for welding, and the required nondestructive examinations and weld inspections were performed.

B. Piping

1. Areas Examined

Field inspection activities included visual examination of the 530 feet of piping. This was to assure that the installed ~~piping was as specified on the design drawing, and that the~~ piping was as specified on the design drawing, and that the piping was reasonably straight, had a workmanlike finish and was free from injurious defects such as mechanical marks, abrasions and pits. X

2. Findings

Inspection of piping quality revealed one section of pipe to have an excessive amount of mechanical marks. This was identified on pipe spool 28 line number A106-CCBA, adjacent to pipe-to-valve weld number W025. The quality control instruction, WPP/QCI No. 204, Revision 3, "Piping Systems Release for Insulation," Appendix I, requires that piping systems, prior to insulation, be checked for surface damage by the quality control engineer. Any identified surface damage is then required to be documented on the construction inspection plan (CIP), and then evaluated in accordance with procedure ED-1, entitled "Elimination of Defects". The CIP for the pipe spool in question did not identify any surface damage on this system. The main concern was whether the pipe minimum wall thickness requirements were violated. The licensee initiated NCR No. SM 2976; the pipe was re-inspected and dispositioned "accept-as-is" in accordance with the acceptance standards specified in ED-1. X

Also during this examination of pipe quality the inspector observed an apparently unacceptable pit-like defect on the outer-surface of pipe spool SI-008-S002 adjacent to pipe support SI-008-H002. The pit was unusual in that it did not appear to be typical mechanical damage or a typical welding arc strike. It appeared to be a minor blow hole from the original pipe manufacturer. The pit appeared to violate minimum wall requirements. The inspector requested the licensee to have the pipe hanger removed for access to the pipe pit; measurements were taken by the piping QC engineer in the presence of the NRC inspector with a calibrated pit gage. The pit was measured to be 0.059 inches deep. The allowable minimum wall for pipe spool SI-009-S 002 is 0.219 inches and the remaining wall (calculated from nominal wall) is 0.191 inches. Therefore the pit represents an underwall condition requiring an engineering evaluation. X

Procedure WPP/QCI 204, Revision 2 "Piping Systems Release for Insulation", requires the final inspection of piping to be performed by a piping QC engineer prior to covering the pipe with insulation. Paragraph 3.1 of Appendix 1 requires an inspection for surface damage per specification (ED-1). The specification "Welding Standard ED-1 Elimination of Defects" states in paragraph 4.1 that defects may be removed provided wall thickness is not reduced below the minimum specified.

The pipe spool was inspected in accordance with the above and improperly accepted on November 14, 1982, as certified on the Piping Release No. 301-398. The failure of the piping QC engineer to identify an unacceptable defect during the piping inspection prior to insulation is considered an apparent item of noncompliance. ~~(Enforcement item 50-528/83-34)~~ x

C. Valves

1. Areas Examined

Valves were examined during the walkdown inspection for compliance with the isometric drawing; specifically to assure proper valve size, location, type, orientation and installation. In addition, torque verifications were performed on a few selected valves to assure that the torque values were within the valve manufacturer's acceptable range.

2. Findings

- (a) During the inspection of valve No. 470 on the suction side of the HPSI pump "A", it was observed that the manual operator assembly was totally disconnected from the valve and resting on the sprinkler system piping. There was no documentary evidence to indicate that maintenance was being performed on the operator assembly. Failure to indicate the operating status of the valve, such as by tagging, to prevent inadvertent operation is an apparent item of noncompliance. ~~Noncompliance (50-528/83)~~ x
- (b) Three additional adverse conditions were identified on valve No. 470. First, visual examination revealed that the bonnet was leaking; second, that one stud nut was missing from one of the studs connecting the bonnet to the valve body. These two conditions resulted in the inspector's request for torque verification on the stud nuts. The torque verification revealed a number of loose

stud nuts which connect the bonnet^m to the valve. This third item, failure of the stud nuts to meet the torque requirements specified on the design drawings, represents a condition adverse to quality, and is an apparent item of noncompliance. ~~Enforcement Item 50-528/83-34-~~

- (c) Valve No. 402 was found with the position indicator positioned so that the valve could only be opened about 30-35 percent. There was no documentary evidence to indicate that maintenance was being performed or that anyone was aware of the condition of the valve. Preoperational testing was being conducted on this subsystem. ~~(Enforcement Item 50-528/83-34-)~~

D. Welder Qualifications

1. Areas Examined

Bechtel specification WQ-1, Revision 17, of March 10, 1983, "Welding Standard Performance Specification," was examined. This specification describes the requirements for determining the ability of welders to make acceptable welds. The Welding Test Lab where welder performance qualifications are performed was examined for compliance with WQ-1 and ASME Section IX requirements. Also examined was the ability of the Welding Test Lab to detect "stand-in" for welder qualification tests. The qualification records of 22 percent of the welders who field-welded on the 530 feet of pipe selected for the inspection were examined for compliance with WQ-1 and the latest issue of ASME Section IX.

2. Findings

The welders records examined revealed that the welders were qualified, on the date the weld was made, to the requirements of Bechtel specification WQ-1. WQ-1 meets the requirements of the latest issue of ASME Section IX. The welder performance qualification records were being properly maintained and were up-to-date.

Although no new welders were being qualified during this inspection, the Welding Test Lab was examined found to be well organized and controlled. The weld rod is properly controlled, rod ovens are calibrated and kept at the correct temperature, and testing booths and welders' records are properly maintained.

Bechtel welder qualification procedures do not specifically address the subject of welder identity during qualification testing. However, Bechtel's current system requiring the welder's signature, social security number, and a photo badge appears to be satisfactory in preventing any practices of using stand-ins for welder qualifications.

VII. Inspection Results - Civil/Structural

A. Concrete Tests

1. Areas Examined

Eleven test areas were selected for examination using the "Windsor Probe Test" (WPT). These areas are identified in Table VII-1. They were selected as representative of concrete in the HPSI A pump room and in the vicinity of selected portions of the connected piping. The WPT measures the resistance of concrete to penetration by an explosively driven probe. Correlation to actual concrete strength is by reference to the Windsor Probe manufacturer's charts which relate probe penetration distance to strength for different aggregate hardness values.

2. Inspection Findings

Maximum aggregate size in the concrete tested was 1 1/2-inches. The Moh number for the aggregate selected from the probe manufacturer chart was number 6 (Far Southwestern United States). The indicated concrete strengths ranged from 5,800 to 7,600 psi. Detailed data are given in Table VII-1.

B. Structural Steel Framing

1. Areas Examined

Building and platform structural steel was examined to verify that the sizes, types and materials were in accordance with design requirements. The areas examined were in the HPSI A pump room, the auxiliary building northwest pipeway at the 40' elevation, and the 100 feet elevation on the south side of the containment building. The governing documents were as follows:

- . Specification 13-CM-320 - Erection of Structural and Miscellaneous Steel.
- . Drawing 13-C-00A-001 - Civil/Structural General Notes.

- . Drawing 13-C-ZADS-500 - Auxiliary Building - Framing Plan for Elevation 51'-6".
- . Drawing 13-C-ZCS-529 - Containment Internals - Structural Steel Platforms below Elevation 100.
- . Drawing 13-C-ZAS-570 - Auxiliary Building - Structural Steel Sections and Details - Sheet 1.
- . Drawing 13-C-ZAS-571 - Auxiliary Building - Structural Steel Sections and Details - Sheet 2.
- . Drawing 13-C-ZAS-572 - Auxiliary Building - Structural Steel Sections and Details - Sheet 3
- . WPP/QCI 58.0 - Erection of Structural and Miscellaneous Steel.

2. Inspection Findings

The steel that was examined was installed as specified and was of the required type and size. Certified Mill Test Reports were on file which verified that the proper material had been furnished. These were spot checked and were found to be in order. Bolting and welding of the steel is addressed in Sections VII.3 and VII.4 of this report.

3. Structural Steel-Bolted Connections

a. Areas Examined

Bolted connections in selected portions of the building and platform structural steel in areas associated with HPSI A train system were examined for compliance with design requirements. Particular attention was given to bolt size and type, presence of washers where required, adequacy of thread engagement. Tightness of a representative sample of bolts was tested using a calibrated torque wrench. The joints were located in the HPSI A pump room, the northwest pipeway at the 40-foot elevation and the 88-foot elevation pipeway in the auxiliary building, the 82 to 95-foot elevations of both "wrap-around" portions of the auxiliary building, and at

various elevations in the containment building. Additional structural steel joints not associated with the HPSI A train system were also examined. They were in the containment building and in the HPSI B pump room. Details are provided in Table VII-2. In addition to the documents listed in paragraph VII.B.1, the governing documents also include the following:

- . Drawing 13-C-ZAS-510 - Auxiliary Building Framing Plan for Elevation 88' - Area AAA.
- . Drawing 13-C-ZAS-511 - Auxiliary Building Framing Plan for Elevation 88' - Area AAB.
- . Drawing 13-S-ZAS-535 - Auxiliary Building Miscellaneous Steel Plan @ Elevation 88'.
- . Drawing 13-S-ZAS-536 - Auxiliary Building Miscellaneous Steel Sections and Details - Sheet 1.
- . Drawing 13-C-ZAS-581 - Auxiliary Building Miscellaneous Steel Platforms and Details - Sheet 2.
- . American Institute of Steel Construction (AISC) - Specification for Structural Joints Using ASTM A325 or A490 Bolts.

2. Inspection Findings

Detailed inspection findings are given in Table VII-2. Except as described below, all bolted joints examined satisfied the specified requirements.

Table 3 of the AISC specification requires that 7/8-inch diameter A325 bolts be tightened to a minimum tension of 39 kips. The following departures from that requirement were found:

- (a) Four bolts in one joint in the AC-6 platform at the 51'6" elevation of the HPSI A pump room were only "finger tight."
- (b) One bolt in a 4-bolt I-beam to I-beam connection at the 125 degree azimuth, 10 feet from the liner, elevation 88-feet in the containment building, required a nut rotation of 45 degrees before achieving the tightness equivalent to the required 39 kips.

- (c) One bolt in a 4-bolt floor beam connection in the auxiliary building northwest pipeway, 6 feet east of column line AD, 51'-6" elevation, required a nut rotation of 60 degrees to achieve the 39 kip requirement.

In all three cases, the connections had been inspected and accepted by Bechtel Quality Control personnel. The unsatisfactory bolting accepted by QC is an apparent violation. (~~Enforcement Item 50-528/83-34/-~~)

D. Structural Steel Welded Connections

1. Areas Examined

Welded connections in selected segments of the building and platform structural steel in areas associated with HPSI A train system were examined for compliance with design requirements. Attributes examined were fillet leg size and length, weld contour, and absence of overlap and undercut. The joints examined were located in the auxiliary building (pipeways at the southwest 40 foot elevation and at the 88 foot elevation), and in the containment building (80-87 foot elevation and the 125 foot elevation). Details are provided in Table VII-3. In addition to the documents listed in paragraphs VII.B.1. and VII.C.1., the governing documents also include the following:

- . Drawing 13-C-00A-050 - Welding and Nondestructive Examination Requirements for Civil Structural - "Form 84C".
- . Structural Welding Code AWS D1.1 1972, with Revision 1, 1973.

2. Inspection Findings

Detailed inspection findings are given in Table VII-3. The welded connections in the containment building that were examined were found acceptable. In the auxiliary building pipeway, elevation 88 foot, the inspector found six fillet welds with undersize leg length and four welds with unacceptable undercut. The welds are portions of a W8X31 pipe support rack, number B-79, fabricated by Marathon Steel Company.

In the auxiliary building northwest pipeway, elevation 51'6", the inspector found six fillet welds with undersize leg lengths. The welds are portions of a W16X36 floor beam clip connection. The inspector measured fillet weld sizes down to 5/32 inch, whereas 5/16 inch size was specified for these welds. The undercut criteria specified in AWS D1.1 requires that it be no more than .01 inch deep when its direction is transverse to primary tensile stress in the part that is undercut, and no more than 1/32 inch for all other situations. Contrary to this requirement, the inspector found undercut of approximately 1/16 inch deep.

The undersize and undercut welds had been inspected and accepted by Bechtel Quality Control personnel.

~~(Enforcement Items 50-528/83-24/)~~

X

FSAR Section 3.8.1.6.6 states: "The acceptance criteria for visual acceptance for welding is done in accordance with AWS D1.1-72, Revision 1, 1973." During the inspection, the following items were noted which appear to be deviations from this commitment:

- . AWS D1.1-72, Revision 1973, paragraph 3.6.6 states "welds shall be free from overlap." Specification 13-CM-320, Appendix A, paragraphs 3.1.4, 3.2, and 3.3.4 allow a maximum of 1/8" of overlap.
- . AWS D1.1-72, Revision 1973, paragraph 8.15.1.3 requires that "all craters are filled to the full cross section of the welds." Specification 13-CM-320, Appendix A, paragraphs 3.1.5, 3.2, and 3.3.8 allow underfilled weld craters.
- . AWS D1.1-72, Revision 73, paragraph 3.6.4 states that "...undercut shall not be more than 0.01" deep when its direction is transverse to primary tensile stress in the part that is undercut, nor more than 1/32" for all other situations." Specification 13-CM-320, Appendix A, paragraph 3.3.7 allows up to a maximum of 1/16" of undercut under certain circumstances and does not address undercutting transverse to primary tensile stress.
- . AWS D1.1-72 does not permit incomplete fusion. Specification 13-CM-320, Appendix A, paragraphs 3.1.8, 3.2 and 3.3.6 allow an exception to the requirement for complete fusion between weld metal and base metal.

Paragraph 9.2 of Specification 13-EM-302, Cable Tray Hangers, states that..." all quality Class Q cable tray hanger welds shall be inspected in accordance with AWS D1.1-79." (emphasis added)

These discrepancies are considered to constitute a deviation from the FSAR commitment.

E. Containment Structure Penetrations

1. Areas Examined

Five piping penetrations (nos. 13, 14, 15, 16, and 77) and one electrical penetration (no. 47), all associated with the HPSI train A system were visually examined and their records reviewed to ascertain compliance with the requirements of the ASME Boiler and Pressure Vessel Code, Section III-1974 Edition. In addition, piping penetration No. 62, monitoring containment internal pressure, and spare penetration No. 69 were examined. The visual examination was related to weld reinforcement height and surface finish. The records review addressed the presence and validity of the supplier's material test report, and the adequacy of the Field Welding check list (Form WR-5) and the Filler Metal Withdrawal Record (Form WR-6). Other factors examined were the qualification of the specified welding procedure, control of preheat and interpass temperatures, and nondestructive examination of the completed welds.

2. Findings

No discrepancies with the specified requirements were identified.

F. Steel Embed Plates In Concrete

1. Areas Examined

Except for 3 or 4 plates in the vertical pipe chase in the northwest corner of the auxiliary building, all embedded plates carrying pipe hangers/supports for the HPSI A system lines in the auxiliary building were examined. These were 3 plates on the suction line and 35 plates on the discharge lines. In addition, approximately 30 plates were randomly selected in various walls in the auxiliary and containment buildings, of which approximately 20 were not loaded. The examination included measurement of plate thickness and anchor bolt

length using an ultrasonic transducer and CRT videoscope (only 2 or 3 bolts in each embed plate were measured), and a graduated depth gauge measurement of bolt thread engagement. The governing documents were as follows:

- . Specification 13-CM-308 - Installation and Testing of Concrete Embeds and Insert Plates.
- . Drawing 13-C-00A-001 - Civil Structural - General Notes.
- . Drawing 13-C-00A-010 - Typical Insert Plate Schedules and Details.
- . Drawing 13-C-00A-011 - Anchor Bolt Schedule and Details.
- . Drawing 13-C-ZAS-110 - Auxiliary Building - Plan at Elevation 40'.
- . Drawing 13-C-ZAS-112 - Auxiliary Building - Insert Plan at Elevation 40'.
- . Drawing 13-C-ZAS-146 - Auxiliary Building - Plan at Elevation 120'.
- . Drawing 13-C-ZAS-200 - Auxiliary Building - Wall Elevations - Sheet 1.
- . Drawing 13-C-ZAS-224 - Auxiliary Building - Wall Elevations - Sheet 25.
- . Drawing 13-C-ZCS-413 - Containment Internals - Wall Inserts and Penetrations - Sheet 1.
- . Drawing 13-C-ZCS-406 - Containment Internals - Wall Inserts and Penetrations - South Secondary Shield Wall.

2. Inspection Findings

All embedded plates examined were found to be installed in the specified locations and were the specified thickness. All anchor bolt lengths were as specified. One plate was found with three of eight bolts apparently missing; search with the UT transducer, however, found that all three had been relocated (by welding) as permitted by the specification when interference with reinforcing steel was encountered. Two other plates were

found with documented relocation of anchor bolts. For one case of suspected insufficient bolt thread engagement, documentation was on file which showed that the bolt had been circumferentially welded to the back of the plate, also as permitted by the specification.

G. Concrete Expansion Anchors

1. Areas Examined

A representative sample of concrete expansion anchors was examined to ascertain conformance with the installation requirements. At Palo Verde, the design intent is to avoid the use of expansion anchors to the maximum possible extent. A generous quantity of embedded steel plates and unistrut channels were provided for fastening equipment generally and, except for specifically identified lightly loaded applications, expansion anchors were to be used only after all other methods had been evaluated and determined unfeasible or unacceptable by Engineering. For these situations, documented licensee approval is required on a case-by-case basis. The previously mentioned lightly loaded applications include electrical raceway (except cable tray) instruments, instrument sensing lines, and local panels.

A total of 88 anchor bolts were examined for depth of embed and proper torquing of the tensioning nut. These were comprised of the following:

- . 20 Hilti Kwik-Bolts associated with 1 electrical panel box and all Class IE raceway supports (9) in the HPSI A pump room.
- . 29 Hilti Kwik-Bolts fastening raceway supports in the east "wrap-around" section (100' elevation) of the auxiliary building.
- . 8 Hilti-Kwik-Bolts anchoring 2 instrument sensing line support plates in the east "wrap around" section (80' elev.) of the auxiliary building.
- . 8 Hilti Kwik-Bolts anchoring 2 switchbox panels in Battery Rooms C and D in the Control Building (100' elevation).
- . 17 Drillco Maxi-Bolts anchoring control center panels to the floor (100' elevation) in Battery Rooms A, C and D in the Control Building. (Only 8 of these bolts were torque tested).

- . 6 Drillco Maxi-Bolts anchoring 6" fire-line support plates (2) to the MSSS wall (108' elevation) in the corridor adjacent to the turbine building.

All torque testing was performed by a Quality Control Inspector or a journeyman electrician using a calibrated torque wrench in the presence of the NRC inspector. The governing documents were:

- . Specification 13-CM-307 - Design, Installation and Testing of Concrete Anchors.
- . WPP/QCI 24.1 - Installation and Testing of Concrete Expansion Anchors.

2. Inspection Findings

Of the 23 Drillco Maxi-Bolts examined, all were found to be embedded and torqued to the required values. For the bolts anchoring the equipment panels in the battery rooms, there was no documentary evidence that Bechtel had obtained the required licensee approval prior to their installation. Similarly, no approval documentation was available for 4 Hilti Kwik-Bolts used for a strut supporting a cable tray hanger in the auxiliary building east "wrap-around" at the 100' elevation (east wall).

In the HPSI A pump room, 6 miscellaneous Hilti Kwik-Bolts (1 raceway support) could not be properly torqued due to the absence of washers under the tensioning nut (support holes too large). Due to the proximity of adjacent supports, this one probably could have been eliminated and the raceway would have been adequately anchored. Also in the HPSI A pump room, one anchor bolt was insufficiently embedded (3") because it was located too close (1 1/2") to an ungrouted, unused hole. Embed depth should have been 6 1/4". Two unused holes were found ungrouted, contrary to the specified requirements. Additionally, there were two bolts that violated the specified minimum distance from other anchor bolts.

In the auxiliary building "wrap-around" section (100' elevation), 9 bolts, randomly located, were found undertorqued (all four in one 4-bolt plate), one bolt was too close (2 1/8") to the edge of a wall opening, one bolt was insufficiently embedded (2 1/4" instead of 5" required), and two bolts had nuts with insufficient thread engagement.

All bolts examined in this sample had been given the requisite inspection by Bechtel Quality Control inspection and had been judged acceptable. Although the identified discrepancies represent noncompliance with specified requirements, each one taken individually would not present any particular safety significance.

TABLE VII - 1

CONCRETE STRENGTH MEASUREMENT

Test No.	LOCATION/DESCRIPTION	PLACEMENT				Meas. (1)	STRENGTH (psi)		
		No.	Date	Age	Max. Agg. Size	Probe Exten-in.	Probe Meas	Break	Cylind. (2) Design
1	HPSI A Pump Room-Aux. Bldg. Floor (El. 40') Adjacent to Pump	1A05-1	11/24/76	6 Yrs.-11 Mo.	1 1/2	2.25	7400	5870	4000 @ 28 Da.
2	HPSI A Pump Room-Aux. Bldg. East Wall (Elev. 44') Adjacent to Pump	1A12-1	1/21/77	6 Yrs.-9 Mo.	3/4	2.20	7000	5185	"
3	HPSI A Pump Room-Aux. Bldg. South Wall (Elev 43') Adjacent to Pump Motor	1A12-1	1/21/77	6 Yrs.-9 Mo.	3/4	2.25	7400	5155	"
4	North Pipeway-Aux. Bldg- South Wall (elev.44') Between Col Lines AE & AF	1A08-1	12/23/76	6 Yrs.-11 Mo.	3/4	2.27	7600	5960	"
5	HPSI A Pump Room-Aux. Bldg. Floor (Elev.40') Adjacent to West Wall & Floor Embed under Suction Line to Contain. Sump	1A04-1	11/24/76	6 Yrs.-11 Mo.	1 1/2	2.125	6400	5870	"
6	Control Bldg. Floor (Elev.100') 125 V Battery A Charging Equipment Room	1J016	3/10/78	5 Yrs.-6 Mo.	1 1/2	2.050	5800	5875	4000 @ 91 Da.
7	Control Bldg. Floor (Elev.100') 125V Battery A Room	"	"	"	"	2.075	6000	5875	"
8.	Control Bldg. Floor (Elev.200') 125V Battery C Room	"	"	"	"	2.100	6200	5230	"

TABLE VII - 1

CONCRETE STRENGTH MEASUREMENT

Test No.	LOCATION/DESCRIPTION	PLACEMENT				Meas. (1)	STRENGTH (Psi)		
		No.	Date	Age	Max. Agg. Size	Probe Exten-in	Probe Meas	Cylind. (2) Break	Design
9	Control Bldg. Floor (Elev. 100') In front of HPSI A 4160V Motor Breaker Cubicle	"	"	"	"	2.150	6600	5875	"
10	Containment Bldg. Base Mat Floor (Elev. 80') Adjacent to South stairway	1C013-1	7/8/77	6 Yrs. -2 Mo.	1 1/2	2.200	7000	5350	5000 @ 91 Da.
11.	Containment Bldg. Base Mat Floor (Elev. 80') West Side Under Safety Injection Piping Runs	"	"	"	1 1/2	2.100	6200	6040	"

Notes

- (1) Windsor Probe Test-Average of 3 driven probes
- (2) Average of compression test of 2 cylinders

TABLE VII-2

STRUCTURAL STEEL BOLTED CONNECTIONS

<u>Inspection Location</u>	<u>Elevation</u>	<u>Amount of Inspection Versus Total Available</u>	<u>Type of Inspection</u>	<u>Inspection Findings</u>
Auxiliary Bldg. HPSI A Pump Room	51'6"	15 joints of approx. 30	Visual	Four Loose bolts in a 4-bolt Joint - Platform AC-6
Northwest Pipeway Auxiliary Bldg.	51'6"	13 joints of approx. 15	Visual	Acceptable
Wrap-Around Areas Auxiliary Bldg.	82'-95'	94 joints of approx. 200	Visual	Acceptable
Pipeway Area Auxiliary Bldg.	88'	40 joints of approx. 300	Visual	Acceptable
Containment Bldg.	80'-87'	110 joints of approx. 500	Visual	Acceptable
Auxiliary Bldg. HPSI A Pump Room	51'6"	10 bolts of approx. 120	Torque Test	Acceptable
Northwest Pipeway Auxiliary Bldg.	51'6"	28 bolts of approx. 52	Torque Test	One bolt rotated 60 degrees before minimum tightness was achieved.
Containment Bldg.	87'	24 bolts of approx. 2500	Torque Test	One bolt rotated 45 degrees before minimum tightness was achieved.
Containment Bldg.	98'	34 joints of approx. 100	Visual	Acceptable
*Containment Bldg.	125'	12 joints	Visual	Acceptable
*Containment Bldg.	140'	15 joints	Visual	Acceptable
*Containment Bldg. Pressurizer Compartment	-	20 joints	Visual	Acceptable
*Auxiliary Bldg. HPSI B Pump Room	51'6"	15 joints	Visual	Acceptable

*Items inspected which are not associated with the HPSI train A system.

TABLE VII-3

STRUCTURAL STEEL WELDED CONNECTIONS

<u>Inspection Location</u>	<u>Elevation</u>	<u>Amount of Inspection Versus Total Available</u>	<u>Type Of Inspection</u>	<u>Inspection Findings</u>
Northwest Pipeway Auxiliary Bldg.	51'6"	13 joints of approx. 15	Weld gauge Visual	Six undersize fillet welds
Pipeway Area Auxiliary Bldg.	88'	50 joints of approx. 200	Weld gauge Visual	Six undersize fillet welds, Four welds with undercut.
Containment Bldg.	80'-87'	110 joints of approx. 250	Weld gauge Visual	Acceptable
*Containment Bldg.	125'	4 joints	Weld gauge Visual	Acceptable

*Items inspected which are not associated with the HPSI Train A system.

VIII.

NRC Nondestructive Examination and Quality Review of Safety Related Systems

A. Purpose

The purpose of the independent, NRC nondestructive examination (NDE) was to verify the adequacy of the licensee's welding quality control program. This was accomplished by duplicating those examinations required of the licensee by regulations and evaluating the results. In addition to the required examinations, several additional confirmatory examinations designed to verify conformance with material specifications were performed and compared to quality assurance records. The NRC inspection team selected the HPSI A system to inspect at the Palo Verde Unit 1. There are approximately 900 piping welds in the HPSI A system. This system was undergoing pre-operational testing and was full of water under pressure. A selection of welds from this system that could be drained and inspected was made. Due to preoperational testing of Unit 1, a selection of welds from Unit 3 was also made. The selection of these welds was intended to provide a representative sample of piping components, sizes, materials, of shop and field welds. All the welds selected were previously accepted by the licensee based on vendor, shop, or field NDE records.

B. Document Reviews

The following quality assurance documents were reviewed to verify compliance with regulatory and code requirements:

1. Twelve weld document packages were reviewed for:
 - Material Certifications
 - NDE results
 - Fabrication records shop and field
 - Drawings (Isometric)
 - PWHT Charts

(Note: The twelve welds reviewed are listed at the end of Table VIII-2. 13-P-ZCG-103)

2. Two quality procedures were reviewed.
 - 13PM-201 Shop Fabrication of Nuclear Piping Systems
 - 13PM-204 Field Fabrication and Installation of Nuclear Piping Systems

3. A review of GEO's (site NDE subcontractor) internal audit, dated June 10, 1983, was performed. This audit reviewed all of GEO's NDE site personnel qualification at Palo Verde.

4. Verification of NDE Personnel Qualifications to SNT-TC-1A

The NRC inspector reviewed all of Bechtel's individual film interpreter qualification and certification records. He also reviewed 6 out of 39 of GEO's NDE records for personnel qualifications.

All the above documents were verified to satisfy NRC requirements and licensee commitments to industry codes and standards.

C. NRC Independent Examinations

(Note: Refer to Table VIII-1 for specific listings of independent inspection items)

1. Radiography

Twenty-one welds were re-examined by the NRC using an Iridium 192 source. Welds that were radiographed were ASME Code Class 1 and 2, carbon and stainless steel.

Results: All re-radiographed welds were found acceptable to ASME Section III acceptance criteria.

2. Pipe Wall Thickness Measurement - Eleven pipe welds and adjacent pipe material were examined per NRC procedure NDE-11, Revision 0, using a NORTEC NDT thickness gauge. Minimum wall thickness was determined by using an ASTM standard pipe sizes and nominal thickness chart.

Results: All areas examined were within tolerance requirements.

3. Ferrite Measurements - Thirteen pipe welds were checked for delta ferrite content using a Type II Ferrite Indicator (Severn Gauge).

Results: All measurements were within acceptable limits of material test results.

4. Hardness Measurements - Fourteen welds were checked for hardness (base material adjacent to welds) using the Equo-tip hardness tester per NRC Procedure NDE-12, Revision 0. Hardness numbers were converted to Brinnell values and the approximate tensile strengths were determined by use of conversion tables.

Results: All areas examined were within acceptable limits of material test reports.

5. Alloy Analyzer - Four pipe welds and adjacent base metals were examined using a Texas Nuclear Alloy Analyzer. A quantitative chemical analysis was made on two stainless steel, type 304, and two stainless steel, type 316 materials.

Results: Areas examined were within $\pm 2\%$ of chemical analysis indicated on corresponding certified mill test reports and were within acceptable limits.

6. Liquid Penetrant Examination - Eight safety related pipe weldments were liquid penetrant examined per NRC procedure NDE-9, Revision 0. All weldments examined were ASME Class 2 welds.

Results: All areas inspected were acceptable.

7. Visual Examination - Thirty-four weldments and adjacent base material were visually inspected for weld reinforcement, overall workmanship and surface condition per NRC procedure NDE 14, Revision 0.

Results: All areas inspected were acceptable.

8. Radiography of Socket Welds - Ten socket welds were radiographed to verify pipe engagement.

Results: All radiographs show at least a minimum of 1/16 inch gap per ASME Section III, paragraph NC4427 requirements.

9. Radiographic Review of Licensee Field Welds and Vendor Welds - A review of licensee's pipe weld radiographs was made during this inspection of ASME Class 1 and 2 weldments. Out of 746 sets of radiographs, 204 were reviewed as listed below, with results as listed in Table VIII-2.

The radiographic film review disclosed 6 welds which are in the "as-welded" condition and present weld ripple images in the film. The ASME V Code, paragraph T-221-2, requires that weld irregularities be removed to the extent that they cannot mask or be confused with actual discontinuities. The weld ripple images for ISO 01-P-SIF 105 Line 1RC-051-S-001-16, welds A and B; 1RC-051-S-002; weld A; and ISO-13-P-ZCG-103, 1RC-079, 030 and 073 are considered excessive and capable of masking or being confused with discontinuities in the opinion of the NRC Level III examiner.

On October 12, 1983 licensee representatives and the Bechtel Corporation Level III examiner telephoned the Regional office to express a difference of professional opinion. The Bechtel examiner did not consider that the weld ripple images could mask discontinuities. This item is considered unresolved. (Unresolved item 50-528/83-34-51)

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Table VIII-2
Review of Licensee RT Films and Records

<u>Line</u>	<u>ISO</u>	<u>WELD</u>	<u>RESULTS</u>
SI-008-CCBC-10"	13-P-SIF-201	FW 5	Acceptable
"	"	FW 1	Acceptable
"	"	FW 2	Acceptable
"	"	FW 3	Acceptable
"	"	FW 4	Acceptable
"	"	FW 6	Acceptable
"	"	*FW 7	Acceptable
SI-008-GCBC-10"	13-P-SIF-201	VW-D-F375	Acceptable
"	"	VW-B-F375	Acceptable
"	"	VW-A-F375	Acceptable
"	"	VW-A-422	Acceptable
"	"	VW-B-423	Acceptable
"	"	VW-A-423	Acceptable
SI-A-009-CCBC-4"	13-P-SIF-203	FW 1	Acceptable
"	"	FW 2	Acceptable
SI-099-CCBB-4"	13-P-SIF-203	VW-E-F149	Acceptable
"	"	VW-B-F149	Acceptable
"	"	VW-A-F149	Acceptable
SI-099-S-001-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
SI-A-100-CCBA-4"	"	FW 1	Acceptable
"	"	FW 2	Acceptable
"	"	FW 3	Acceptable
SI-100-CCBB-4"	13-P-SIF-203	VW-A-156	Acceptable
"	"	VW-B-156	Acceptable
"	"	VW-3-156	Acceptable
SI-A-101-CCBA-1"	13-P-SIF-204	FW 00L	Acceptable
2"	"	FW 00A	Acceptable
2"	"	FW 00B	Acceptable
2"	"	FW 00C	Acceptable
2"	"	FW 00H	Acceptable
2"	"	FW 00J	Acceptable
2"	"	FW 00K	Acceptable

*Visually verified RT root indication (concavity) between RT station numbers 12 and 15 by using a fiberscope. All areas of concern are acceptable.

<u>Line</u>	<u>ISO</u>	<u>WELD</u>	<u>RESULTS</u>
2"	"	FW 00L	Acceptable
2"	"	FW 00N	Acceptable
2"	"	FW 00P	Acceptable
2"	"	FW 00R(C)	Acceptable
2"	"	FW 00S(C)	Acceptable
2"	"	FW 00T	Acceptable
2"	"	FW 000	Acceptable
SI-A-102-CCBA-2"	13-P-SIP-204	FW 00A	Acceptable
"	"	FW 00B	Acceptable
"	"	FW 00C	Acceptable
"	"	FW 00D	Acceptable
"	"	FW 00E	Acceptable
"	"	FW 00F	Acceptable
"	"	FW 00G	Acceptable
"	"	FW 00H	Acceptable
"	"	FW 00J	Acceptable
"	"	FW 00K	Acceptable
"	"	FW 00L	Acceptable
"	"	FW 00M(C)	Acceptable
SI-103-CCBA-2"	13-P-SIF-203	FW 300	Acceptable
"	"	FW 00A	Acceptable
"	"	FW 00B	Acceptable
"	"	FW 00C	Acceptable
"	"	FW 00D	Acceptable
"	"	FW 00E	Acceptable
SI-103-CCBA-2"	13-P-SIF-203	FW 00G	Acceptable
"	"	FW 00I	Acceptable
"	"	FW 00J	Acceptable
"	"	FW 00K(C)	Acceptable
"	"	FW 00P	Acceptable
"	"	FW 00R	Acceptable
SI-105-S-003-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
SI-105-S-004-4"	13-P-SIF-203	A	Acceptable
SI-105-S-005-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
SI-105-S-002-4"	13-P-SIF-202	A	Acceptable
SI-105-S-001-4"	13-P-SIF-202	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
SI-157-CCBA-4"	13-P-SIF-204	FW 300	Acceptable
4"	"	FW 301	Acceptable
1"	"	FW 00C(C1)	Acceptable
2"	"	FW 00A	Acceptable
2"	"	FW 00B(C)	Acceptable
2"	"	FW 00C(C1)	Acceptable
2"	"	FW 00D(C)	Acceptable
1"	"	FW 00E	Acceptable
SI-157-CCBA-1"	13-P-SIF-204	FW 00E	Acceptable
2"	"	FW 00H	Acceptable

<u>Line</u>	<u>ISO</u>	<u>WELD</u>	<u>RESULTS</u>
1"	"	FW 001	Acceptable
4"	"	FW 001	Acceptable
4"	"	FW 002	Acceptable
4"	"	FW 003	Acceptable
3"	"	FW 004	Acceptable
3"	"	FW 006	Acceptable
3"	"	FW 007	Acceptable
3"	"	FW 008	Acceptable
SI-157-S-001-4"	13-P-SIF-136	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
SI-157-S-002-4"	13-P-SIF-136	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
SI-157-S-003-4"	13-P-SIF-136	A	Acceptable
SI-157-S-004-4"	13-P-SIF-136	A	Acceptable
SI-157-S-005-4"	13-P-SIF-136	A	Acceptable
"	"	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	13-P-ZG108	U-77(c-1)	Acceptable
SI-157-S-006-3"	13-P-SIF-136	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
SI-157-S-007-3"	13-P-SIF-136	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
RC-051-S-001-16"	01-P-SIF-105	A	Rejected Beads
"	"	B	Rejected Beads
RC-051-S-002-16"	01-P-SIF-105	A	Rejected Beads
RC-051-S-003-16"	01-P-SIF-105	G	Acceptable
"	"	H	Acceptable
"	"	A	Acceptable
"	"	B	Acceptable
"	"	D	Acceptable
SI-176-S-001-4"	13-P-SIF-204	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
SI-176-S-002-3"	13-P-SIF-204	A	Acceptable
SI-176-S-003-3"	13-P-SIF-204	A	Acceptable
SI-176-S-004-3"	13-P-SIF-204	A	Acceptable

<u>Line</u>	<u>ISO</u>	<u>WELD</u>	<u>RESULTS</u>
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
SI-176-S-006-3"	13-P-SIF-204	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
SI-218-S-001-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
SI-218-S-002-4"	13-P-SIF-203	A	Acceptable
SI-236-S-003-4"	13-P-SIF-203	A	Acceptable
SI-236-S-005-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
SI-236-S-006-3"	13-P-SIF-203	B	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
"	"	H	Acceptable
"	"	J	Acceptable
"	"	K	Acceptable
"	"	L	Acceptable
"	"	M	Acceptable
"	"	N	Acceptable
SI-248-S-003-3"	01-P-SIF-105	A	Acceptable
"	"	B	Acceptable
"	"	D	Acceptable
SI-248-S-007-3"	01-P-SIF-105	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	G	Acceptable
"	"	H	Acceptable
"	"	J	Acceptable
"	"	K	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
SI-248-S-008-3"	01-P-SIF-105	H	Acceptable
"	"	J	Acceptable
"	"	K	Acceptable
SI-248-S-009-3"	01-P-SIF-105	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable

"	"	D	Acceptable
SI-248-S-011-3"	01-P-SIF-105	G	Acceptable
"	"	H	Acceptable
"	"	J	Acceptable
SI-248-S-012-3"	01-P-SIF-105	F	Acceptable
"	"	C	Acceptable
"	"	H	Acceptable

<u>Ø.D. Size</u>	<u>Line</u>	<u>Document Review</u>	<u>ISO</u>	<u>Weld S/N</u>	<u>Results</u>
30"	1-RC079	"	13-P-ZCG-103	W001	Rejected Beads
30"	1-RC030	"	"	"	Rejected Beads
30"	1-RC073	"	"	"	Rejected Beads
30"	1-RC031	"	"	"	Acceptable
Unit 2					
30"	2-RC079	"	13-P-ZCG-103	W001	Acceptable
30"	2-RC030	"	"	"	Acceptable
30"	2-RC073	"	"	"	Acceptable
30"	2-RC031	"	"	"	Acceptable
Unit 3					
30"	3-RC079	"	13-P-ZCG-103	W001	Acceptable
30"	3-RC030	"	"	"	Acceptable
30"	3-RC073	"	"	"	Acceptable
30"	3-RC031	"	"	"	Acceptable

IX. CRAFT AND QC INSPECTOR INTERVIEWS

During the course of the inspection interviews were conducted by the team members with various craft persons and QC inspectors. These interviews were conducted on a one on one basis at random in the field, predominantly at Unit 1, but some were conducted at Units 2/3 and in the senior resident inspector's office. There were 115 of these interviews conducted with the idea of finding whether there was pressure by management to "cut corners," to obtain the interviewee's reception of quality on the project and to give the interviewee an opportunity to discuss any problems he/she may know of with a NRC inspector.

None of the workers indicated that there was any pressure to cut corners, all thought that the quality on this project was above average to excellent and none knew of major problems on this project that NRC did not know about.

Table IX-1
Workers Interviewed

<u>Craft</u>	<u>No. Interviewed</u>
1. Electrician	23
2. Millwright	2
3. Ironworker	7
4. Boilermaker	1
5. Pipefitter	21
6. Carpenter	4
7. Janitor	1
8. QC Welder	7
9. QC Elect	16
10. QC Mech/Piping/NSSS	12
11. Laborer	3
12. Insulator	2
13. Welder	7
14. NDE Tech	4
15. Sprinkler	2
16. Operating Engineer	1
17. QC CSC	2



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V

1450 MARIA LANE, SUITE 210
WALNUT CREEK, CALIFORNIA 94596

Docket No. 50-528

Draft
11/9/83

Arizona Public Service Company
P. O. Box 21666
Phoenix, Arizona 85036

Attention: Mr. T. G. Woods Jr.
Executive Vice President

Gentlemen: ~~XXXX~~ *OK OK*

Subject: Construction ~~XXXX~~ Inspection 50-528/83-34

This refers to the construction appraisal inspection conducted by Region V on September 6-16, 26-30, October 31 and November 1, 1983 at Palo Verde Unit 1. The Construction Appraisal Team was composed of members of Region I, Region V and a number of consultants. This inspection covered construction activities authorized by NRC Construction Permit CPPR-141.

The enclosed report identifies the areas examined during the inspection. Within these areas, the effort consisted of detailed inspection of selected hardware subsequent to Quality Control inspections, examination of procedures and records, observation of work activities and interviews with management and other personnel.

Appendix A to this letter is an Executive Summary of the results of the inspection and of conclusions reached by this office. The Appraisal team ~~noted no pervasive breakdown in meeting construction requirements in the samples of installed hardware inspected.~~ However, large numbers of deficiencies were not being identified during final QC inspections and/or there were uncontrolled changes made after the systems were turned-over to operations and startup. The majority of these deficiencies appeared to be minor but some were significant and reflected a breakdown in quality assurance and/or a lack of management control by operations and startup, and could not be determined from existing records.

determined that the basic const. work was satisfactory

The exact cause of some of the deficiencies

Enforcement action related to this inspection will be the subject of separate correspondence.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosures will be placed in the NRC Public Document Room unless you notify this office, by telephone, within ten days of the date of this letter and submit written application to withhold information contained therein within thirty days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

determined that many deficiencies were not being identified during final QC inspections and

#115

Should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely,

J. B. Martin
Regional Administrator

Enclosures:

1. Appendix A - Executive Summary
2. Inspection Report 50-528/83-34

Docket No. 50-528

Arizona Public Service Company
P. O. Box 21666
Phoenix, Arizona 85036

Attention: Mr. T. G. Woods Jr.
Executive Vice President

Gentlemen:

Subject: Construction Appraisal Inspection 50-528/83-34

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Should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely,

J. B. Martin
Regional Administrator

Enclosures:

1. Appendix A - Executive Summary
2. Inspection Report 50-528/83-34

cc w/enclosures:

J. Bynum, APS

G. C. Andognini, APS

F. E. Van Buren Jr., APS

bcc:

RSB/Document Control Desk (RIDS)

Ms. Jill Morrison

Arthur C. Gehr, Esq.

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Resident Inspector

Mr. Martin, RV

RV

YOUNG/dot *Bick* MARTIN

11/ /83 *11/* /83 11/ /83

APPENDIX A

EXECUTIVE SUMMARY

An unannounced team inspection for the purpose of appraising site construction was performed at the Palo Verde Nuclear Generating Station Unit 1 during the periods of September 6 through 16 and September 26 through 30, October 31 and November 1, 1983.

The inspection concentrated on hardware and was intended to assess whether the construction of Unit 1 was performed in accordance with quality requirements by comparing the as-built condition to the design requirements.

The method used in this inspection was to select a meaningful sample of completed safety-related construction for rigorous examination. The sample was of high safety significance and was representative of the work controls, procedures, methodology and documentation of all safety-related work performed at the Palo Verde Nuclear Generating Station. X

The team's approach was to direct 70 percent of its effort on system and installation verification of the High Pressure Safety Injection (HPSI) System, "A" train. This included an in-depth examination of a large number of elements related to that system, including: piping; supports; pumps; valves; welding; nondestructive examination; electrical supplies; (including redundancy/separation); electrical motors; cables; terminations; supporting structural steel elements; related concrete structures; and other systems. Within the sample special emphasis was directed to the area of welding and electrical activities because of the multiple allegations received in these areas in the past. The other 30 percent of the team's effort was focused on inspection of other important areas (including the Reactor Coolant System). The HPSI "A" train was selected because of its high safety significance, its representativeness in terms of construction practices, and the fact that the system had not previously been independently examined by a third party. The licensee had previously contracted Torrey Pines Technology to perform an independent quality assurance evaluation of the Palo Verde Nuclear Generating Station in the areas of organization, management, quality assurance, design and construction. Torrey Pines Technology (the independent auditor) selected the Auxiliary Feedwater, the Containment Spray and the Low Pressure Safety Injection systems of the "B" train for examination. X

On the order of 25%

OVERALL CONCLUSIONS

The team found that basic construction appeared to be satisfactory, however large numbers of deficiencies were not being identified during final QC inspections. The majority of these deficiencies appeared to be minor in nature but some were significant and reflected a ~~breakdown~~ ^{weakness} in quality assurance and/or a lack of management control by operations and startup. Although the team's focus was construction, a number of problems identified indicated that the deficiencies may have resulted from activities performed after the system or component had been turned over to operations and startup.

AREAS INSPECTED AND RESULTS

Worker Interviews

Because of concerns expressed to the NRC and ~~charges made in the press~~ regarding worker intimidation at Palo Verde, the team contacted more than 100 craftsmen or first line quality control inspectors with questions to determine if they felt intimidated or were subjected to undue pressures or to cut corners in their work.

In order to determine if there was intimidation or undue pressure if undue pressure it should

These contacts were ~~normally informal~~ ^{face to face}, and were made in private ¹ between one of two workers and one NRC inspector.

The tabulated results of these contacts, the crafts represented by the contacts, and any significant details in the responses are in the attached report. In summary, the responses were generally positive with regard to the quality of site construction work. ~~Some reservations were expressed about the quality of work done in vendor shops on components and shipped to the site as units.~~

of this problem were wide spread it would show up.

Electrical and Instrumentation Construction

The inspections in this area^d revealed deficiencies in the thoroughness of the final inspections and/or in maintenance following testing. Of major significance was the finding of pipe caps found in place on the containment pressure sensing lines with no administrative requirement in place to insure their removal prior to operation of the plant. Had these caps remained in place during operation the response capability of the HPSI system would have been seriously jeopardized. The inspector's were unable to reconstruct whether the caps were installed and left on by the construction personnel or ~~the preoperational testing personnel.~~ It did not, however, appear that the licensee's testing or start up program would have identified the existence of the caps.

X

(add para on bolting)
Some problems with cable separation were found. However, it was noted that the Licensee does have a program underway which would provide for reinspection of separation in the areas examined by the NRC. None of the separation problems noted by the NRC appeared to be major technical problems.

were later installed by

Additionally, discrepancies associated with concrete expansion anchor bolts and supporting electrical raceways were found. None of these, however, were such as to represent any particular safety significance.

The existence of these caps were therefore lost

do represent weaknesses in QC inspections for turnover

B Mechanical Construction

Use same as technical

An examination of 68 pipe hangers or supports of a total of 116 in (60 percent) the HPSI system showed that fourteen such structures have deficiencies such as undersize fillet welds. However, deficiencies of major significance were found in the inspection of the HPSI piping components. Specifically, a 10-inch suction line valve did not have the hand operating mechanism connected to the collar of the rising stem, and flange bolts on the same valve had not been adequately torqued. As a result, the valve bonnet was leaking. It appeared that the valve disassembly had been performed after construction personnel had completed their work on the valve. There was no indication that the preoperational testing or startup personnel had control measures in effect to recognize and repair the unsatisfactory valve condition. ** The same*
~~similar~~ valve was formed in a condition which would not allow it to open fully. *in train B*

If these conditions had not been found!

C Welding and Nondestructive Examination

The NRC examined 18 circumferential and 10 socket welds in the HPSI system by independent radiography. Also, 34 welds were visually examined in the field, and the radiographs on file for 192 welds were read by NRC. No deficiencies were found. In addition to the HPSI examination, system radiographs and weld records for twelve welds in the primary loop were examined. Three primary loop welds in PVNGS Unit 3 was examined radiographically for comparison of radiographic techniques with similar Licensee radiographs. One unresolved item was identified dealing with weld ripple images which could possibly mask weld defects.

(14) % of welds

D Structures

Examinations in this area include concrete in situ testing, penetrations, structural bolting and welding. Some problems with bolting and welding of gallery steel were noted as described in the report.

As noted above, many of the more significant problems identified by this construction inspection appeared to have occurred, in part, due to weaknesses in the preoperational/startup program reflecting the need for significant licensee action in this area.

Make statement on QC inspections

Add Paragraph.

Valves } ect.

Hangers } QC inspection of particle rate

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Division of Resident, Reactor Projects and Engineering Programs

Report No. 50-528/83-34

Docket No. 50-528

License No. CPPR-141

Licensee: Arizona Public Service Company
P. O. Box 21666
Phoenix, Arizona 85036

Facility Name: Palo Verde Nuclear Generating Station - Unit 1

Inspection at: Construction Site

Inspection conducted: September 6-16, 26-30 October 31 and
November 1, 1983

Inspectors:

W. G. Albert, Senior Resident Inspector
WNP-3 (Team Leader) Date Signed

J. F. Burdoin, Reactor Inspector Date Signed

R. H. Campbell, Engineering Technician Date Signed

R. H. Harris, Engineering Technician Date Signed

H. W. Kerch, Lead Reactor Engineer Date Signed

P. P. Narbut, Project Inspector Date Signed

L. E. Vorderbrueggen, Senior Resident Inspector
PVNGS Date Signed

W. J. Wagner, Reactor Inspector Date Signed

G. E. Walton, Senior Resident Inspector Date Signed
BVPS-2

J. L. Crews, Technical Assistant to the Date Signed
Regional Administrator

T. Young, Jr., Chief Date Signed
Reactor Projects Section 2

Consultants: W. Marini, C. Crane, and L. Stanley

Contract Technicians: K. Grevenow and J. Ludiwissi

Approved By: T. W. Bishop, Director, Division of Residents, Date Signed
Reactor Projects and Engineering Programs

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I. INSPECTION SCOPE AND OBJECTIVES

The scope of this inspection was the evaluation of on-site construction for Palo Verde Nuclear Generating Station Unit 1.

The objective was to provide an overall assessment of the actual as-built condition of the Palo Verde Nuclear Generating Station Unit 1 (PVNGS-1) by comparing the as-built condition to design requirements of a representative sample. Therefore, the inspection concentrated on hardware and assessed whether the construction of PVNGS-1 was performed in accordance with quality requirements applicable to the plant.

In the areas inspected, the following was determined:

- ° The construction observed was in conformance to the drawings and specifications.
- ° Necessary quality verifications were performed during the construction process with appropriate hold points and other controls.
- ° Nonconforming conditions were properly addressed in accordance with approved procedures.
- ° Equipment was turned over to the startup organization in operable condition and it was being maintained properly as evidenced by the as-found condition.

II. TEAM ORGANIZATION AND METHODS

The NRC inspection team consisted of ten NRC employees, three consultants, and two technicians from Wisconsin Testing, Inc., as follows:

William G. Albert - Team Leader

Registered Professional Engineer (Mechanical) with 33 years experience in reactor construction, engineering and operation. Currently the NRC's Senior Resident Inspector for the WNP-3 plant in Washington State.

Paul P. Narbut - Lead Inspector, Mechanical Area

Nuclear Engineer (Nuclear) with 20 years experience in the design, construction and testing of nuclear power plants. Currently a Project Inspector for the NRC's Region V office.

John F. Burdoin - Lead Inspector, Electrical Area

Registered Professional Engineer (Electrical, Mechanical and Nuclear), with 36 years experience in the field of electrical engineering. Currently a Reactor Inspector with the NRC's Region V office, specializing in electrical inspection.

Tolbert Young, Jr. - Interview and Report Coordination

Registered Professional Engineer (Nuclear) with 22 years experience in nuclear power plant operation. Currently a Section Chief with the NRC's Region V office.

Glen A. Walton - Welding and NDE Specialist

Twenty-seven years experience in regulation and management of NDE and QA/QC. Currently the NRC's Senior Resident Inspector for the Beaver Valley plant in Pennsylvania.

William J. Wagner - Welding Inspection

Registered Professional Engineer (Quality) and AWS-Certified Welding Inspector with 24 years of experience in the field of metallurgy, quality assurance and NDE. Currently a Reactor Inspector with NRC's Region V office, specializing in welding.

Harry W. Kerch - NDE Van Supervisor

Registered Professional Engineer (Quality) and Certified ASNT Level III Examiner with 35 years of NDE experience. Currently a Lead Reactor Engineer with the NRC's Region I office.

L. E. Vorderbrueggen - Team Support and Civil/Structural Coordinator

Electrical engineer with 36 years experience in the design and construction of industrial plants. Currently the NRC's Senior Resident Inspector at Palo Verde.

Richard H. Harris - NDE Inspection

Certified ASNT Level II Examiner and AWS Welding Inspector with 22 years experience in NDE and QC. Currently an Engineering Technician with the NRC's Region I office.

R. M. Campbell - NDE Inspection

Certified ASNT Level II Examiner and AWS Welding Inspector with nine years experience in NDE and QC. Currently an Engineering Technician with the NRC's Region I office.

Loren Stanley - Electrical Consultant

Registered Professional Engineer (Electrical) with 27 years electrical engineering experience. Currently in private consulting.

William Marini - Electrical Consultant

Electrical Inspection Specialist with 13 years experience in the field of electrical and welding inspection. Currently with Resource Technical Services.

Cyril J. Crane - Electrical Consultant

Registered Professional Engineer (Electrical) with 27 years experience in reactor operation and electrical engineering. Currently with Westec Services, Inc.

Jesse L. Crews - Registered Professional Engineer (Nuclear) with 22 years experience in reactor construction, engineering and operations. Currently Technical Assistant to the Regional Administrator.

K. Grevenow - NDE Technician

Wisconsin Testing

J. Ludiwissi - NDE Technician

Wisconsin Testing

The methods used for this inspection were to select a meaningful sample of Palo Verde safety-related construction for rigorous examination. The sample was of high safety significance and was deemed to be representative of the work controls, procedures, methodology, and documentation of safety-related work performed at Palo Verde Nuclear Generating Station. Selection and in-depth examination of a representative sample of this nature allowed extrapolation of the Team's findings to the adequacy of other safety-related construction at Palo Verde.

Accordingly, the team's approach was to direct 70 percent of its effort to the verification of system installation for the High Pressure Safety Injection System (HPSI) A train. This included in-depth examination of a large number of elements related to this system, including piping, pipe supports, pumps, valves, welding, nondestructive examination, electrical power supplies, electrical cables (including redundancy and separation), instrumentation, control, electrical motors, supporting structural steel elements, and related concrete structures. Within this sample, special emphasis was directed to the areas of welding and electrical construction since both of these areas had been the subject of allegations. The other 30 percent of the team's effort was focused on inspection in other important areas such as the Reactor Coolant System.

The examinations discussed above were conducted by:

- (a) Physical inspection of systems, components, and structures.
- (b) Independent NDE of welds and structures.
- (c) Examination of documentation, where necessary, to support physical inspections.
- (d) Private interviews and discussions with over 100 craft and inspection personnel.
- (e) Examination of radiographs and other direct evidence of the quality of work such as postweld heat treatment charts.
- (f) Testing of components by ultrasonic thickness measurements, hardness, radio signal cable tracing, and concrete probes.

III. CONTACTS AND LICENSEE/NRC MEETINGS

The inspection was unannounced until the morning of September 6, 1983. On that day all team members and the NRC Nondestructive Examination (NDE) Van arrived on site. The teams primary point of contact during the course of this inspection was the Arizona Public Service (APS) Construction Quality Assurance organization at the site. This organization is managed by Mr. W. E. Ide.

An entrance meeting was held at the start of the inspection to acquaint the licensee with what the NRC inspection team intended to accomplish, arrange for needed drawings and documentation, arrange for off shift radiography, define organizational points of contact, and arrange necessary Saturday coverage since September 10, 1983, was a day of work for the inspection team. This meeting was attended by Mr. E. E. Van Brunt, APS Vice President for Nuclear Projects Management, Mr. J. A. Roedel, APS Corporate Quality Assurance Manager, Mr. W. J. Stubblefield, Bechtel Field Construction Manager and 20 other staff members of the APS and Bechtel Site Organizations.

On September 14, 1983, a brief meeting was held between the NRC team leader Mr. W. G. Albert, Mr. E. E. Van Brunt, APS Vice President of Nuclear Projects and Mr. D. B. Fasnacht, APS Nuclear Construction Manager. The purpose of this meeting was to provide highlights of tentative findings up to that time since Mr. Van Brunt could not attend the meeting on September 16th.

On September 16, 1983, a meeting was held between the team leader and the team lead inspectors with Mr. J. A. Roedel, APS Corporate Quality Assurance Manager, Mr. D. B. Fasnacht, APS Nuclear Construction Manager, Mr. W. G. Bingham, Bechtel Project Engineering Manager and approximately ten other APS and Bechtel Staff. The purpose of this meeting was to provide APS with a progress report on the type and nature of NRC findings at that point in the inspection.

This was a status meeting and, therefore, no attempt was made to categorize the findings as to their seriousness or to define which would be items of noncompliance. The NRC stated at that time that they perceived a weakness at the interface between construction and operations and while the basic construction appeared satisfactory, a significant number of findings indicated that either final inspections were not properly performed and/or there was a lack of control of work after completion of construction by the startup organization.

The principal exit interview for this inspection was held in the APS corporate offices on September 30, 1983. This meeting was attended by Mr. J. B. Martin, NRC Regional Administrator, Mr. T. W. Bishop, NRC Division Director and three NRC observers from headquarters organizations. The APS attendees included Mr. K. L. Turley, Chairman of the Board, Mr. O. M. DeMichele, President, Mr. T. G. Woods, Jr., Executive Vice President, Mr. E. E. Van Brunt, Vice President Nuclear

Projects, Mr. G. C. Andognini, Vice President Nuclear Operations, and eight other APS staff members. Bechtel attendance consisted of Mr. W. J. Stubblefield, Site Construction Manager and Mr. D. R. Hawkinson, Projects Quality Assurance Manager. In addition to the above, the meeting was also attended by representatives of the five other owner organizations for the Palo Verde Nuclear Generating Station which are: Southern California Edison Company, Salt River Project, Los Angeles Department of Water and Power, El Paso Electric and Public Service of New Mexico. At this meeting, the individual team members reported upon the areas examined and the significant findings in each area as detailed in this report.

The NRC management again reiterated their concern with regard to the quality controls exercised at the time of system turnover from construction to the APS startup organization and the apparent need for more definitive quality control by maintenance organizations. However, the NRC expressed general satisfaction with basic construction, particularly pipe welding, and the results of over 100 private but informal contacts with craftsmen and first-line inspectors.

The applicant expressed their intent to immediately and thoroughly followup on the NRC findings. Except for disagreement with the NRC finding regarding the readability of certain primary loop pipe radiographs, the applicant did not comment on the NRC findings at the time of this meeting and questions were generally oriented toward the clarification of issues.

On November 1, 1983, a meeting was held between the Section Chief, the Technical Assistant to the Regional Administrator, Mr. E. E. Van Brunt, APS Vice President of Nuclear Projects, Mr. J. A. Roedel, APS Corporate Quality Assurance Manager, Mr. D. B. Fasnacht, APS Nuclear Construction Manager and other members of the APS staff. The purpose this meeting was to discuss the additional facts obtained (during the last two days of the inspection) surrounding the more significant violations.

IV. Electrical and Instrumentation Construction

Objective

The primary objective of the appraisal of electrical and instrumentation construction was to determine whether safety-related components and systems were installed in accordance with regulatory requirements, SAR commitments, and approved construction specifications and drawings. Additional objectives were to determine whether procedures, instructions and drawings used to accomplish construction activities were adequate and whether quality-related records accurately reflect the completed work.

Particular attention was concentrated on the "A" train of the high pressure safety injection (HPSI) system to demonstrate specific areas within the broad categories of electrical and instrumentation construction. These areas include electrical raceway (cable tray and conduit) and raceway supports; electrical motors; electrical cable and cable terminations; electrical penetrations; instrumentation (sensors and logic); diesel generator; and onsite AC power distribution system and DC power system. Portions of the HPSI B train were also examined.

A. Electrical Raceways and Raceway Supports Raceways

1. Areas Examined Electrical Raceways

The NRC Team Inspectors examined approximately 1,690 feet of cable trays and 26 conduit runs. These raceways were inspected for: separation, proper identification and color coding, tray/conduit size and routing in accordance with design drawings, raceway bend radii conformance to criteria, bolted connection are tightness, weld conformance to applicable requirements, raceways free of debris and sharp edges, and installation and inspection documentation completeness and accuracy.

Findings

The inspection found that the raceways were in conformance with requirements regarding size, bend radii, bolting, welding, debris, sharp edges, general installation and inspection. However, deficiencies were identified in the areas of identification and separation, as indicated below. One instance of a damaged flexible conduit jacket repair is an open item and will be examined during a subsequent inspection.

- a. Temporary alphanumeric identification on cable tray 1EZAIDBTXF had not been replaced with permanent identification (OII 50-528/83-34-11).
- b. Nonsafety-related conduit 1EZADCNRQ506 for thermostat 1EQFNT1243C in HPSI A pump room was separated from safety-related group 1 junction box 1EZACCAKKJ03 by less than one inch (OII 50-528/83-34-12).
- c. At diesel generator E-PEA-G01 nonsafety-related flexible conduit 1EZG1ANRX11 at junction box 4 is in contact with safety-related flexible conduit 1EZG1AARR20 at junction box 6 (OII 50-528/83-34-13).

- d. Separation group 1 cable tray located in HPSI pump room A was not marked with red color identification (round emblems) between points 1EZACEATCBA and 1EZACCARC03 (OII 50-528/83-34-14).
- e. The following separation group I conduits were not identified by alphanumeric markings (OII 50-528/83-34-15):
 - 1) Conduits 1EZJ1AARC12,-14 and -16, on both sides of the wall between group 1, 4.16 KV switchgear area and channel A remote shutdown panel area, at the 100 foot elevation.
 - 2) Conduit sleeves 1EZJ1BARC13, 14 and 15 on control building wall in channel B remote shutdown area, at the 100 foot elevation.
- f. Round blue identification emblems were missing from channel D conduit (PT-351) for a distance of approximately 40/50 ft at elevation 120' (OII 50-528/83-34-16).
- g. At diesel generator E-PEA-G01, vendor supplied nonsafety-related ALS flexible cable at junction box 14 could potentially move and come in contact with safety related flexible conduit 1EZG1AARX27 at junction box 7.
- h. The vinyl jacket on safety related flexible (anaconda metal hose type NWC), conduit ER1EZC1CARK13 inside containment was damaged and subsequently repaired in accordance with established procedures (Procedure for Raceway Installation, WPP/QCI 251.0, Revision 18, Section 5.10) by taping over the damaged vinyl with Scotch 33 tape (Unresolved Item 50-528/83-34-02).

2. Raceway Supports

The NRC Team examined 60 raceway supports. These supports were inspected for conformance to design drawings including: support spacing, configuration, location, mounting, material, support member size, and weld joints.

Findings

The raceway supports were found to be in general conformance with design drawings and regulatory requirements. The following deficiencies were identified:

- a. The bolted connections attaching tray 1EZA1BBTXCV to hanger H7 (drawing 13-E-ZAC-016 Rev. 20) were disconnected (OII 50-528/83-34-17).

- b. The as-installed configuration of the welds attaching the longitudinal bracing for hangers H212, H10, H11 and H12 on drawing 13-E-ZJC-044 Rev. 9 to embedded plates is not as specified by detail 21, alternate, on drawing 13-E-ZAC-043 rev. 18. In addition, slag remains on the referenced welds for hanger H12. The raceway installation cards for trays 1EZJ4AATXHA and 1EZJ4AATXHB indicate that these welds have been inspected and accepted by QC (OII 50-528/83-34-18).
- c. The fifth support from instrument rack 1JSBAA01 for conduit 1EZC1AARX-10 was found to contain welds which exhibited overlap, which is prohibited by AWS D1.1-72 (OII 50-528/83-34-19).
- d. The priming and painting of welds on raceway supports in channel c (green) riser room adjacent to cable spreading room at the 120 foot elevation was incomplete.
- e. The fourth support from junction box J-RCA-PT-190A for conduit 1EZCAAARX08 contains a damaged P1001A3 unistrut member which prohibits the full engagement of a unistrut spring nut within the unistrut channel.

B. Electric Motor Installation
Areas Examined

The NRC Team Inspectors examined a sample of installed electric motors within the HPSI system. The motors selected were two HPSI pump motors, IMSIAP02 (Train A) and IMSIBP02 (Train B); and 17 motor-operated valve motors included in the HPSI System (Trains A and B);

UV-617	HV-530	UV-673	HV-531	UV-647
UV-667	HV-604	UV-674	UV-626	
HV-699	UV-627	UV-616	UV-636	
HV-609	HV-698	UV-637	UV-646	

For the motors, the inspectors reviewed associated vendor drawings and documents, and plant maintenance, test, and installation records which define the design and installation methods for the equipment. A physical inspection of the installed equipment was performed to determine compliance to design requirements and vendor installation criteria, mounting, bolting, identification, nameplate date, location, grounding, and protection. The following documents and areas were reviewed: equipment specifications; purchase order documentation; vendor drawings and instruction manuals, including maintenance and installation requirements; seismic analysis or test and equipment qualification documentation, including special mounting and maintenance requirements; equipment maintenance records for warehouse, construction, and startup phases; warehouse records including receipt, storage, and release documentation; material receiving reports, including equipment certifications from vendors; electrical testing records for pre-operational phase; and associated quality control and installation records.

The power cables for the motors were inspected in the field and the terminations were examined at the motors. The routing of the cables for the HPSI motors and approximately one-third of the MOVs were traced back to their respective 4160 volt or 480 volt power sources to verify physical separation of trains, cable tray/conduit arrangement, and cable tray fill. Specific cable numbers are identified below in Section C, electrical cable installation.

Findings

The following deficiencies were identified:

1. It was found that the installation of the dowel pins in the motor mounting (following alignment), as required by the manufacturer, had not been installed. Doweling of the motor mounts could not be identified on the master list of items to be completed prior to fuel load. However, it was established that the maintenance division, charged with the installation of these dowel pins, was aware of this remaining requirement in the mounting of the HPSI pump motors and tools were ordered in August 1983 to perform the job.
2. HPSI pump 1MSIAP02 motor, ground cable hold-down clamp was missing.
3. Motor heater (M-SIA-PO2H) nameplate missing at MCC 1EPHAM37.
4. There are no permanent identification signs at entrances to HPSI pump rooms, Train A and Train B.
5. Revision 3 of Specification SYS.80-PE-410 for the HPSI pumps is not contained in Purchase Order 9500088, as required. Revision 2 of the specification is included in the purchase order.
5. MOV nameplate error at MCC 1EPHAM33. The nameplate reads JSIA-UH-604, but should read 1J-SIA-HV-604.
7. Material Receiving Report 42220 is missing from Purchase Order 960-1231 for MOV 1JSIA-HV 604.

No items of noncompliance or deviations were identified.

C. Electrical Cable Installation

Electrical Cable Installation Areas Examined

The NRC Team inspectors selected a sample as listed below of installed electrical high and low voltage power, and control cables within the HPSI systems Trains A (and some in Train B) and the Class IE power systems. For each selected cable, the NRC inspectors reviewed associated drawings and documents which define the location, design route, and installation methods for cable installation within tray and conduit. A

physical inspection of the as-built cable installation was performed by inspecting the entire length of cable run between the associated equipment and its respective load center/control cabinet. The objective of the inspection was to ascertain compliance with design, installation, and quality assurance documents. During the course of the inspection, the following documents and areas were reviewed: elementary and cable block diagrams; cable code and cable scheme numbers; single line diagrams, cable type and identification, including separation color and cable markers; E580 computer program sorts for routing, identification of cables at tray points, actual and allowable tray fill at tray points, and size and type of cable; physical separation criteria, including raceway and tray designations; conduit and tray arrangement drawing; raceway installation cards; cable installation cards; and cable installation specifications. The physical inspection of the cable runs included a determination of size, type, routing, protection, separation, identification, loading, cable supports and cable spacing. The actual cable installation and routing was compared to the design as determined from the E580 computer program and the cable installation cards.

The installation was examined for the following power, control and instrument cables, totaling approximately 8680 feet for the HPSI system, Trains A and B and Instrument Channels A, B, C, and D.

<u>CABLES</u>	<u>EQUIPMENT</u>	<u>TO LOCATION</u>
1ESI01BC1CA	HPSI Pump/Motor B	1EPBBS04E
1ESI01AC1CA	HPSI Pump/Motor A	1EPBAS03E
1ERC65CC1XA	PT-102C	1ESACZ28I
1ERC65CC1XB	Penetration Z28	1JSBCC02A
1ERC65DC1XA	PT-102D	1ESFDZ77I
1ERC65DC1XB	Penetration Z77	1JSBDC02A
1EHC62CC1XA	PT-351C	1JSBCC02A
1EHC62DC1XA	PT-351D	1JSBDC02A
1ESI40BC1KA	V-609	1EPHBM3410
1ESI1BBC1KA	V-667	1EPHBM3608
1ESI39BC1KA	V-699	1EPHBM3807
1ERC64AC1XB	PT-102A	1ESAAZ47I
1ERC64BC1XA	PT-102B	1ESFBZ38I
1ERC64BC1XB	Penetration Z38	1JZJBE02
1EHC61AC1XA	PT-351A	1JSBAC02A
1EHC61BC1XA	PT-351B	1JSBBC02A
1EPE01AC1CA	Diesel Generator	1JDGAB03
1EPE01AC1CB	1EPEAG01	1JDGAB03
1EPE01AC1CC	1EPEAG01	1JDGAB03
1ESI40AC1KA	MOV HV-604	1EPHAM3305
1ESI39AC1KA	MOV HV-698	1EPHAM3708
1ESI40AC1RA	MOV HV-604	1EPHAM3305
1ESI39AC1RA	MOV HV-698	1EPHAM3708

<u>CABLES</u>	<u>EQUIPMENT</u>	<u>TO LOCATION</u>
1ESI21AC1RC	Penetration Z46	1EPHAM3512
1ESI21AC1RB	MOV UV-673	1EPHAZ46I
1ESI21AC1KA	Penetration Z46	1EPHAM3512
1ESI21AC1KB	MOV UV-673	- 1EPHAZ46I
1EBC64BC1XD	Remote Shutdown Pnl.	1JSBBC02A
1ESB01AC1RM	Distrib. Pnl. (1EPNA-D25)	1JSBAC02B
1ESB01AC1RS	Distrib. Pnl. (1EPNA-D25)	1JRMAB02B
1EPN02AC1RB	Isolat'n.Pnl. (1JSAA-C04)	1EPNAN11

Findings

Cable installation activities were found to be in conformance with requirements. Two apparent violations were identified in this area.

1. Scaffolding lumber was found stored in channel C electrical raceway/cable chase located in the lower cable spreading room at the 120 foot elevation (OII 50-528/83-34-20).
2. In tray 1EZJ4AATSCE, cables are projecting above the level of the tray siderails, and are in physical contact with fire protection piping and two HVAC ducts (OII 50-528/83-34-21).

In addition to the violations, the following two concerns were identified:

1. While inspecting the traceability of Anaconda 5 KV cable, it was found that the identification, required to be permanently marked on the outer jacket of the cable at three-foot intervals, could easily be rubbed off. This resulted in the cable jacket markings becoming illegible following handling during installation.
2. Traceability of 5KV cable was found to lack clarity. The cable is received on site from the vendor under a material receiving record (MRR) which identifies the cable, vendor and receiving cable reels. Following receipt, the vendors cable reels are assigned Bechtel cable reel numbers for storage and future processing. The Bulk Material Inventory (computer readout), the principle cable record, correlates Bechtel cable reel numbers to vendor reel numbers, but does not list the MRR numbers under which the vendor cable reels were delivered. Therefore, it is difficult to trace cable directly from the Bechtel storage reels to the material receipt records.

D. Cable Terminations

The NRC Team inspectors examined the terminations of 31 cables identified above under cable installation. The terminations at both ends of the cables were inspected for: cable terminations as shown on engineering documents, identification with enclosure, separation, size of conductor, tie-down, bend radius, grounding of cable shield, disposition of spare wires, proper size terminal lugs, neatness and workmanship, and installation and inspection documentation.

Findings

Except as noted below, cable terminations were found to be in conformance with requirements. The following deficiency was identified:

1. Electrical installation, Specification FM-306, Section 7.2R, requires spare wires in a cable to be coiled and insulated with tape or a shrink sleeve. The end of green/black tracer, spare wire cable ESI21AC1RC at EPHAM3512 was bare and not insulated. The quality of insulating the ends of other spare wires was inconsistent and insecure in some instances. No items of noncompliance or deviations were identified.

E. Electrical Penetrations
Areas Examined

The following installed containment electrical penetration assemblies were inspected:

<u>Number</u>	<u>Elevation</u>
Z28	100-foot
Z38	100-foot
Z46	120-foot
Z47	120-foot
Z77	120-foot

The location, type, mounting, and identification were compared with the installation drawings. The cable terminations at the penetrations were examined both inside and outside of containment. The QC records associated with receiving, storage and installation of these penetrations were also reviewed.

Finding

Activities observed and documentation reviewed indicated work performed in this area was in accordance with requirements. No items of noncompliance or deviations were identified.

F. Electrical Instrumentation
Areas Examined

The actuation of HPSI is initiated from either of two parameters (four channels); low-pressurized pressure and high containment pressure. The four pressurizer low-pressure transmitters, PT-102A, 102B, 102C and 102D; and the four containment high pressure transmitters, PT-351A, 351B, 351C, and 351D were inspected in the field.

These pressure transmitters were inspected for proper mounting, physical separation, identification of correct instruments and safety channel (color code), instrument calibration, etc. The stainless steel tubing runs were traced from the transmitters back to the containment isolation/root valves to verify; proper grade (slope) and tubing support.

The instrument cabinets and panels were inspected for technical requirements as contained in the Procurement Specifications 13-JM-200 (COMSIP, Inc) and 13-EM-022 (HARLO Corp.), and Installation Specification for Instrumentation and Control Equipment, 13-JM-702, Revision 8. The physical inspection also included inspection of internal wire routing and separation, cable marking (identification), termination connections, module mountings, overall workmanship, and cleanliness. Operator controls and displays for the HPSI system were examined at the B02 and B05 main control room benchboards. The interface between the HPSI system and remote shutdown panel was also examined.

The following engineered safety features (HPSI) systems cabinets and instrument panels were inspected:

1. NSSS Analog Instrument Cabinets A, B, C, and D:

1-J-SBA-C02A 1-J-SBB-C02A 1-J-SBC-C02A 1-J-SBD-C02A
1-J-SBA-C02B 1-J-SBB-C02B

2. Plant Protection System Cabinets A, B, C, and D:

1-J-SBA-C01 1-J-SBB-C01 1-J-SBC-C01 1-J-SBD-C01

3. Main Control Room Panels:

1-J-RMA-B02 1-J-RMB-B02 1-J-RMC-B02 1-J-RMD-B02
1-J-RMA-B05 1-J-RMB-B05 1-J-RMC-B05 1-J-RMD-B05

4. ESFAS Auxiliary Relay Cabinets A and B:

1-J-SAA-C01 1-J-SAB-C01

5. BOP ESFAS Cabinets A and B:

1-J-SAA-C02A 1-J-SAB-C02A 1-J-SAA-C02B 1-J-SAB-C02A

6. Isolation Cabinets A, B, C, and D:

1-J-SAA-C04 1-J-SAB-C04 1-J-SAC-C04 1-J-SAD-C04

7. Status Display Panel Inserts A and B:

1-J-ESA-C01 1-J-ESB-C01

8. Remote Shut Down Panel Sections (HPSI Valve Controls):
1-J-ZJA-E01 1-J-ZJB-E01 1-J-ZJC-E01 1-J-ZJD-E01

The following quality control records for the HPSI instrument systems were examined: purchasing/receiving records, storage/maintenance records, installation records, cable installation, and termination records.

Findings

Inspection of instrumentation revealed a significant violation which reflects a weakness in the preoperational/startup test program:

1. The sensing lines for four channels of containment pressure (PT-351A, 351B, 351C and 351D) were found to be capped immediately inside containment. The sensing lines were capped with threaded pipe caps and could only be removed with the aid of a pipe wrench. The presence of these pipe caps made this system inoperative. There were no records to indicate when the caps were installed. The inspectors were unable to determine whether the caps were installed by construction or preoperational personnel. It was not apparent that any preoperational or startup program action would have assured the removal of the caps prior to plant operations. This is an apparent violation (OII 50-528/83-34-22).

In addition to the apparent violation identified above, three items of concern were identified:

1. The instrument sensing line support shown in Detail 1 on Drawing 13-J-01D-105, Revision 4 has a weld which contains undercut measuring approximately 1/32-inch in depth. The 1/32-inch value does not satisfy the requirements of the .01-inch criteria for undercut transverse to the primary tensile stress of the member in question as stated in AWS D1.1-72, Revision 1973 as defined in specification 13 CM 320.
2. An internal separation barrier cover was missing from remote shutdown panel 1JZJBE01, and no status tag noting its removal was observed.
3. It was found that temporary nonconformance report hold tags for level transmitters LT 1123A and LT 1124A at the 100 foot elevation inside containment were reversed.

G. Emergency Diesel Generator Areas Examined

The electrical aspects of the Emergency Diesel Generator 1, 1EPEAG01, including control cabinet wiring, were inspected for location, mounting, separation, protection, and identification.

Findings

These reviewed aspects indicated work was performed in accordance with installation requirements. Some minor deficiencies that were found in raceways (flexible conduit) separation were address under raceway and support section of this report Paragraph IV.A-1. No other violations or deviations were identified.

H. Onsite AC Power Distribution System
Areas Examined

The NRC inspector examined the following components of the Class I 4160-volt and 480-volt power distribution system:

1E-PBB-S04	4.16 KV switchgear, separation group 2
1E-PBA-S03	4.16 KV switchgear, separation group 1
1E-PGA-L35	480 V switchgear, separation group 1
1E-PGA-L33	480 V switchgear, separation group 1
1E-PHA-M33	480 V MCC, separation group 1
1E-PHA-M35	480 V MCC, separation group 1
1E-PHA-M37	480 V MCC, separation group 1
1E-PHB-M34	480 V MCC, separation group 2
1E-PHB-M36	480 V MCC, separation group 2
1E-PHB-M38	480 V MCC, separation group 2

The 4160-volt switchgear, 480-volt switchgear and 480-volt motor control centers (MCC) were inspected and compared to installation drawings relative to configuration, location, mounting, identification, installation documentation, and protection.

Findings

Inspection of this area revealed three apparent violations related to cabinet installation and electrical separation:

1. It was found that 87 3/8-inch bolts were missing from the base frames for the six separation groups 1 and 2 motor control centers identified. The failure to identify this condition, adverse to quality, is an apparent violation (OII 50-528/83-34-23).
2. In 4160-volt switchgear cubicle E-PBA-503L nonsafety-related flexible conduit 1EZJ1ANRR52 is separated from safety-related wiring by less than 1 inch which does not satisfy the separation requirements (OII 50-528/83-34-24).
3. In 4160-volt switchgear cubicle E-PBA-503K nonsafety-related flexible conduit 1EZJ1ANRR51 is separated from safety-related wiring by less than one inch, contrary to separation criteria (OII 50-528/83-34-25).

In addition to the violations noted above, two items of concern were identified:

1. An error was found in the identification of compartment 05 of MCCEPMAM33 on drawing 13-E-PHA-003. Long term cooling valve JSIAHV604 was identified as JSIAUV604.
2. It was found that three cubicle tie-down bolts in MCC 1E-PHA-M35 were not fully engaged. The licensee had in progress design change package (DCP) 1SE-PH-035 requiring certain modifications to the tie-down method for the above identified MCCs. These modifications were required to assure the MCCs comply with the seismic analysis requirements.

I. DC Power System
Areas Examined

The four main DC batteries, battery chargers, and Vital AC bus inverters were inspected for electrical separation aspects, fluid levels, termination connections, bolting materials, spacers, mounting arrangements, and general workmanship and cleanliness. Equipment that was inspected is identified in the following list:

DC Batteries and Mounting Racks A, B, C, and D:
1-E-PKA-F11 1-E-PKB-F12 1-E-PKC-F13 1-E-PKD-F14

DC Battery Chargers A, B, C, and D:
1-E-PKA-H11 1-E-PKB-H12 1-E-PKC-H13 1-E-PYD-H14
1-E-PKA-H15 1-E-PKB-H16

Vital AC Bus Inverters A, B, C, and D:
1-E-PNA-N11 1-E-PNB-N12 1-E-PNC-N13 1-E-PND-N14

Technical requirements for the batteries, battery chargers, and inverters contained in Procurement Specifications 13-EM-050 for Exide, 13-EM-051 for Power Conversion Products, Inc., and 13-EM-054, respectively, were reviewed.

Each battery was physically inspected for adequate fluid levels, conductor termination connections, bolting materials used, and absence of battery case cracks. Each battery rack was inspected for battery-to-end plate spacing, battery-to-battery spacers, alignment of frame spring-nuts, and frame welding to the battery room floor imbeds. The location, floor mounting, panel displays, and electrical conduit configuration for each battery charger and Vital AC inverter were inspected.

Revisions 0 and 1 of the PM-410 Startup Generic Maintenance Procedure for Station Batteries were reviewed for technical requirements and test acceptance criteria. Records were inspected for each of the four safety-related batteries, such as on-site receiving records, mid-1981 test results during warehouse storage, and periodic maintenance test result records during construction for the period from February 1982 through September 1983.

Installation, in-site modification, and periodic maintenance records for each battery charger, and Vital AC inverter (prior to turnover to Startup) were also inspected.

Findings

The following deficiencies were identified:

1. The batteries were received on site during the summer of 1981. It was found that no procedure existed for performing the required periodic tests (IEEE Std. 308) to maintain the batteries. The required procedure came into effect in the spring of 1982. This item was the subject of a violation during the team inspection of 1981.

2. The earliest maintenance records are for August 1981, and proceed monthly through November. However, no records can be found for December 1981 and January 1982.
3. The storage of periodic maintenance records did not satisfy the storage requirements of Section 1.8 of the FSAR. These records, required to be stored in a manner which minimizes the risk of destruction from fire, were found stored in a paper-board box. A licensee representative stated that this was temporary for field use.
4. No records exist to indicate that baseline annual cell-to-cell and terminal detail connection resistance data was ever recorded during factory acceptance tests for these batteries. However, the licensee startup generic test procedure addresses the requirement to record intercell resistance checks, during preoperational testing. ()
5. It was found that the vendor testing (at the factory) of battery C did not completely fulfill the discharge rate requirements. However, the licensee identified this, at the time, by issuing supplier deviation disposition request (SDDR) 2763 which requires the capacity discharge test to be run on the job site. This test is scheduled to be accomplished by the startup group during preoperational testing. ()

V. Hangers and Supports, Snubbers and Restraints

A. Areas examined

1. Hardware: The inspector examined all pipe hangers, supports, snubbers, and restraints on the HPSI A piping system from the start of suction line SIA-008-GCBC-10-inch through discharge lines SI-A-100-CCBA-4 inch and SI-A-106 CCBA-3-inch, throughout the 40-foot elevation, up through the vertical pipe chase to the 89-foot elevation pipe chase. At this juncture, one of the five injection branch lines, SI-E-176-CCBA-3", was followed to the injection point and all pipe supports, hangers, snubbers, and restraints were examined. Additionally, miscellaneous branch lines from the HPSI discharge path were examined for supports (to the first isolation valve on the branch). Additionally, a few supports not involved in the line description above were examined if a condition was noted which warranted follow up. All supports examined are listed in Table V-1.

In most cases, pipe insulation was removed for inspection. In those cases where a support was only partially examined, Table 1 so notes. These cases generally fall into the following conditions:

- . Insulation not removed. This condition precluded examining pipe lug welds only. The hanger members and welds are not covered by insulation and can be thoroughly inspected.
- . Lug welds only. In these cases, the inspector examined only the lug welds to increase the sample of lug welds by inspecting supports which were not on the selected branch line, but were part of HPSI-A.
- . One aspect only (e.g., "base plate only"). In these cases, the support was not included in the lines selected but was partially examined because a condition warranting follow up was noted.
- . Location and configuration only. These cases involved a series of replicate supports in a horizontal run. The location of the support and the configuration were checked against drawing requirements, and support member sizes and weld sizes were checked by visual examination rather than by measurement.

All other supports were examined fully.

The inspector examined the supports to determine that:

- . All supports shown on the piping isometric drawings were installed.
- . No additional supports were installed.
- . The support configuration was as shown on the support drawing.
- . The support member material was per the drawing.
- . The welds on the support were the correct size and met the applicable code and standard requirements.
- . The welded attachments to piping were per drawing.
- . The attachment welds to pipe were per drawing and met code and standard requirements.
- . Mechanical snubbers and restraints were installed where required by drawing.
- . The snubber and restraints were the proper size (load rating).
- . The snubbers and restraints had the proper cold setting shown on the drawing.
- . The supports were properly located per the drawing relative to the piping and the structure.

There are a total of 116 pipe supports involved in all of the HPSI-A system. The inspector examined 68 supports or about 60 percent. Of the 68 supports examined 14 supports had one or more problems. This is about a 20 percent reject rate. The problems identified are discussed in the "Findings" section below.

2. Drawings, Specifications, and Procedures

The inspector gathered and reviewed the applicable piping drawings, hanger drawings, specifications, work and inspection procedures, and pertinent vendor information.

Other safety-related documentation, including documents, authorizing deviations from the drawings, records of hanger inspection by QC, non-destructive examination records, welding inspection records, nonconformance reports, vendor certification records, code reports, and piping spool fabrication records were reviewed as they were identified in the pursuit of questions raised on a particular support's apparent anomalies.

The inspector also reviewed the FSAR and ASME codes for applicable requirements.

The documents discussed above will be listed and specifically addressed only as they apply to findings, discussed in the "Findings" section below.

3. Tools

The inspection was conducted utilizing unaided visual examination, tape measure, weld gages, angle finder, and adequate lighting. Safety equipment was utilized as required. No NRC independent non-destructive examination was performed on the pipe supports due to other priorities. In the one case where the visual inspection indicated a possible weld defect, the inspector requested the licensee reexamine the weld using liquid penetrant examination. The inspector observed the entire performance of the examination.

B. Findings

Table V-1 lists all supports inspected and shows which supports were found unsatisfactory and provides a brief description of the problem(s) found.

The problems found group into four areas which are considered apparent violations of NRC regulations. Each problem identified in Table V-1 is explained more fully below.

- (1) Failure of the pipe support QC personnel to identify support conditions which are not in accordance with drawing or specification requirements (five examples).

10 CFR 50, Appendix B, Criterion 5, requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, and drawings, and shall be accomplished in accordance with these instructions.

The licensee's procedure WPP/QCI 201.1, Revision 18, dated May 25, 1983, "Nuclear Pipe Hangers and Supports Installation," Appendix I, requires the Piping QC Engineer to verify each completed task on the "CIP for Nuclear Pipe Supports." The inspection requirement for Task 1 is to verify the support assembly correct per approved engineering drawings and specifications.

- . Support SI-100-H003 was found with a loose pipe clamp and installed at an angle of $4\ 1/2^\circ$ from vertical. Procedure WPP/QCI 201.1, paragraph 8.9, requires the clamp to be snug on the pipe. Procedure WPP/QCI, paragraph 9.2.7.1, requires the angle to be no greater than 2 degrees. The support was accepted by QC on November 20, 1983.
- . Support SI-100-H005 was found with the drawing specified dimension of $3\ 3/4$ inches between the centerline of the pipe stanchion and the centerline of the insert plate to be actually $7\ 1/2$ inches. This difference exceeds the tolerances of ± 2 inches paragraph 9.3.12 of the WPP/QCI. The support was accepted by QC on November 13, 1981.
- . Support SI-100-H036 was found in a condition which did not match the hanger drawing and modifying Field Change Request (FCR) 15, 123P. Item D of the FCR was not installed. The support was accepted by QC on October 22, 1983 to the drawing and FCR.
- . Support SI-101-H00A was found with a loose jam nut on Item 61, the sway strut assembly. The support was accepted by QC on October 2, 1981.
- . Support SI-106 H001 was found with the 2" long pipe lugs, Item 38, bearing on the supporting steel for only $3/16$ inch and $7/16$ inch, respectively. Paragraph 9.4.1 of the WPP/QCI indicates full bearing surface should be provided as indicated on the support drawing. The support was accepted by QC on May 23, 1980.

The failure of pipe support QC personnel to identify pipe support conditions which were not in accordance with drawing or specification requirements is an apparent violation of NRC regulations (OII50-528/83-34-01).

- (2) Failure of the welding QC personnel to identify weld conditions which are not in accordance with the drawing or the welding code requirements (eight examples).

10 CFR 50, Appendix B, Criterion 5, requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, and drawings, and shall be accomplished in accordance with these instructions.

Licensee's procedure WPP/QCI 201.1, Revision 18, dated May 25, 1983, "Nuclear Pipe Hangers and Supports Installation," Appendix I, requires the Piping QC Engineer to verify each completed task on the "CIP for Nuclear Pipe Supports."

The inspection requirements for Task 8 require the welding QCE to verify that field welding is complete. For Task 9, he is to verify the vendor welding was checked for size and length. The instructions to the QCE in Appendix I instruct the QCE to verify welding acceptability.

Support SI-100-H005 was found with an underfill condition in the stanchion, Item 30, to pipe weld. The weld is required to be a 5/16-inch fillet weld. The actual fill was measured to be 1/4 inch. The weld was accepted on the field weld check list on November 9, 1981.

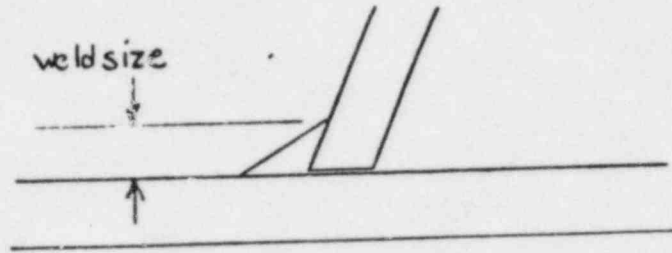
Support SI-100-H010 was observed to have an apparent lap in the weld of Item 38 to the pipe. This was a vendor weld. Minor slag was also present in the toe of the weld. These conditions would have precluded a satisfactory liquid penetrant examination by the vendor. The vendor records show the weld was liquid penetrant examined and accepted on December 4, 1977 (Job 2810, Piece 1-SI-100-S-009, "F" No. 261). The NRC inspector had the visual indication on the weld reexamined by licensee personnel by liquid penetrant examination in his presence. The liquid penetrant examination resulted in an unacceptable linear indication.

The vendor weld had been last inspected by site QC personnel per Task 8 on June 17, 1981, and was accepted.

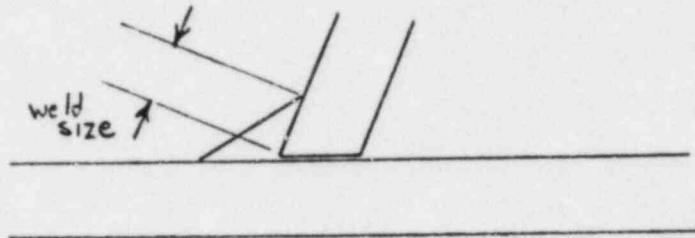
- . Support SI-100-H015 has the lug, item 38A, field welded to the pipe. The weld was 1/32-inch undersize. The welds were originally accepted on January 22, 1979, and were accepted again during the support inspection on October 28, 1981.
- . Support SI-100-H034 was found with one undersized vendor lug weld (Item 38 to the pipe). The weld was required to be a 1/4-inch fillet and measured to be 3/16 inch. The vendor welds were checked by site QC for size and accepted on September 11, 1982.
- . Support SI-102-H00R was found with several weld problems. The vendor weld of Item E to Item B was required to be a 3/16-inch fillet, but was 1/8 inch on three sides. Additionally, there was rollover (or laps) at the corners. The field weld of Item C to existing structure was required to have one-inch end returns on the welds, but did not. The vendor weld was accepted by site QC on August 18, 1981. The field weld was originally accepted on October 14, 1980, and was accepted again on August 18, 1981.
- . Support SI-106-H011 was found with the pipe lug welds (Items 38 and 38A to pipe) closer than 1 inch to the adjacent pipe-to-pipe circumferential weld. The actual distance was 3/4 inch. Specification 13-PM-204, "Field Fabrication and Installation of Nuclear Piping Systems," paragraph 12.2.9, states that welded attachments shall not be installed within 1.0 inch of existing circumferential welds. The field lug welds were originally accepted on February 12, 1979, and again during final support acceptance on October 2, 1980.
- . Support SI-176 H001 was found with an undimensioned weld on the drawing, therefore, the proper size of the weld could not be properly verified by the QC inspector. The 3-inch long fillet field welds of Item 84 to Item B are not dimensioned on the support drawing 13-SI-176-H001, Revision 1. The welds were originally accepted on December 18, 1980, and were accepted again on September 15, 1982.
- . Support SI-176-H003 was found to have an undersize weld. The skewed (120-degree) fillet weld of Item A to the containment insert plate measured 1/4 inch rather than the required 5/16 inch. The support weld was accepted on July 14, 1980.

Further discussions with the Lead QC Engineer for Pipe Supports and the Lead Welding Engineer disclosed that the Welding Engineer had given verbal instructions to the QC Engineer that were contrary to the AWS D.1.1 code requirements for measuring the size of skewed fillet welds. Hence, this undersize weld may be considered caused by improper engineering information. It follows that all skewed fillet welds may require reinspection to the proper criteria.

The AWS D.1.1 Code 1974 shows, in Figure 2.7.1, that skewed fillet welds are measured thus:



At Palo Verde the QC Engineer states weld are "measured" as shown below (it is not clear how this is "measured" since there is no access to one of the measurement points):



To "measure" by the Palo Verde method to a given size (e.g., 5/16 inch on a 120-degree weld) will result in an undersize weld by the Code definition (in this case by 3/64 inch). Nonetheless, QC inspectors are required by WPP/QCI 201.1 to inspect to AWS D.1.1 criteria for this weld. The AWS D.1.1 criteria are clear and are not superceded by verbal instructions from engineering.

The failure of welding QC to identify pipe support weld conditions which are not in accordance with the drawing or welding code requirements is an apparent violation of NRC regulations(OII 50-528/83-34-02).

(3) Failure of engineering to include a non-safety loads in a safe related pipe support calculation (one example).

10 CFR 50, Appendix B, Criterion 5, requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures and drawings and shall be accomplished in accordance with these instructions.

Specification 13-PM-204, Revision 12, Paragraph 12.1.2 dated April 7, 1983, states the design and location of all pipe supports shall be the responsibility of project engineering. Paragraph 12.1.4 states pipe supports designed by engineering will be shown on drawings and all design details will be shown including miscellaneous steel.

Support SI-100-H-012 was found with a miscellaneous steel member installed which was used as a support for an Instrument Air Line. The miscellaneous steel was not shown on the pipe support drawing, 13 SI-100-H-012, Revision 1. The drawing does show the engineering design loads used in the analysis of the pipe support and the applicable calculation number (Problem No. 513-E, point number 293).

Engineering was contacted by telephone, and the responsible engineer stated that the loads from the miscellaneous steel member used as an instrument air support (IA-116-H00A) were not included in the design load for the pipe support, SI-100-H-012.

The engineer stated that loads were inconsequential (29 pounds) and the instrument air calculation had been annotated to state that the attachment to the Safety Injection Support was satisfactory. Nonetheless, he stated the procedure requires the safety injection support calculation be amended to include such loads. The failure of engineering to include a nonsafety design load in a safety-related pipe support calculation is considered an apparent violation of NRC regulations.

(4) Failure to maintain an accepted pipe support in an acceptable condition

Appendix B, of 10 CFR 50, Criterion II, as implemented by Chapter 17 of the PSAR and FSAR requires in part that "The quality assurance program shall provide control over

activities affecting the quality of the identified structures, systems, and components, to an extent consistent with their importance to safety".

Support SI-089-H008 was found with rubber seal material injected in the space by the Flourogold slides plates, Items 54 and 55 on the drawing. The drawing does not show rubber sealant material. It is probable that the material was inadvertently injected after the support inspection on November 29, 1979, but the material had been neatly trimmed away and the edges painted in the area painting.

The failure to provide control over activities affecting quality, resulting in a challenge to the sliding function of support SI-089 H008 is considered a violation (OII 50-528/83-34-03).

TABLE V-1

	<u>SUPPORT</u>	<u>TYPE</u>	<u>FINDING</u>	<u>PROBLEM DESCRIPTION</u>	<u>DEGREE OF INSPECTION</u>
1.	SI 008 H001	S	Sat		Full
2.	SI 008 H002	SS	Sat		Full
3.	SI 008 H003	S	Sat		Full
4.	SI 008 H004	SNB	Sat		Full
5.	SI 008 H005	S	Sat		Full
6.	SI 089 H008	S	Unsat	Penetration Seal Material on Slide Plate	Slide Plate only
7.	SI 099 H001	SNB	Sat		Full
8.	SI 099 H002	S	Sat		Full
9.	SI 100 H001	S	Sat		Presence only - seal boot on
10.	SI 100 H002	S	Sat		Full
11.	SI 100 H003	S	Unsat	(1) Loose clamp (2) Excessive Angle	Full
12.	SI 100 H004	S	Sat		Full
13.	SI 100 H005	S	Unsat	(1) Location dimension varies more than allowed (2) Lack of fill on stanchion to pipe field weld	Full
14.	SI 100 H006	S	Sat		All but lug welds
15.	SI 100 H007	SNB	Sat		Full
16.	SI 100 H008	S	Sat		Full
17.	SI 100 H009	S	Sat		All but lug welds
18.	SI 100 H010	S	Unsat	PT accepted (by Vendor) w. lap and slag	Full
19.	SI 100 H011	S	Sat		Full
20.	SI 100 H012	S	Unsat	Nonsafety hanger loads not included	Full
21.	SI 100 H013	S	Sat		Full
22.	SI 100 H015	S	Unsat	Lug weld size	Full
23.	SI 100 H016	S	Sat		Full
24.	SI 100 H017	S	Sat		Full
25.	SI 100 H018	S	Sat		Full
26.	SI 100 H019	S	Sat		Full
27.	SI 100 H020	SNB	Sat		Full
28.	SI 100 H021	S	Sat		Full
29.	SI 100 H022	S	Sat		Location/ Configuration/ Clearances only
30.	SI 100 H023	S	Sat		"
31.	SI 100 H024	S	Sat		"
32.	SI 100 H025	S	Sat		"
33.	SI 100 H026	S	Sat		"
34.	SI 100 H027	S	Sat		"
35.	SI 100 H028	S	Sat		Full

36.	SI 100 H029	S	Sat		All but pipe lugs
37.	SI 100 H031	S	Sat		Lug welds only
38.	SI 100 H032	○	Sat		Lug welds only
39.	SI 100 H034	S	Unsat	Undersize lug weld	Full
40.	SI 100 H035	S	Sat		Lug welds only
41.	SI 100 H036	S	Unsat	Configuration differs from drawing	Full
42.	SI 101 H00A	SS	Unsat	Loose Locknut	Lock nut only
43.	SI 102 H00A	S	Sat		Full
44.	SI 102 H00B	S	Unsat	Welds deficient (Undersize weld, rollover, no end returns)	Full
45.	SI 105 H00B	S	Sat		Full
46.	SI 105 H00C	S	Sat		Full
47.	SI 105 H00D	S	Sat		Full
48.	SI 105 H00E	S	Sat		Full
49.	SI 106 H001	S	Unsat	Lack of Lug Contact area with support members	Full
50.	SI 106 H002	S	Sat		Full
51.	SI 106 H003	S	Sat		Full
52.	SI 106 H004	S	Sat		Full
53.	SI 106 H005	S	Sat		Full
54.	SI 106 H006	S	Sat		Full
55.	SI 106 H007	S	Sat		Full
56.	SI 106 H008	SNB	Sat		Full
56.	SI 106 H009	S	Sat		Full
57.	SI 106 H010	S	Sat		Full
58.	SI 106 H011	S	Unsat	Pipe lug weld w/in 1" of circumferential weld	Full
59.	SI 106 H012	S	Sat		All but pipe lugs
60.	SI 106 H013	S	Sat		All but pipe lugs
61.	SI 106 H014	S	Sat		Full
62.	SI 106 H015	S	Sat		Full
63.	SI 106 H016	S	Sat		Full
64.	SI 106 H023	S	Sat		Full
65.	SI 176 H001	S	Unsat	Undimensioned weld on drawing	Full
66.	SI 176 H002	S	Sat		Full
67.	SI 176 H003	S	Unsat	Undersize fillet weld	Full
68.	SI 176 H004	SS	Sat		Full

LEGEND

S = Support
SS = Restraint (Sway Strut)
SNB = Snubber

VI. PIPING SYSTEMS INSPECTION

Approximately 826 feet of HPSI-Train A piping was selected for inspection. Inspection was performed on 64 percent, which represents 530 feet of the HPSI piping, to verify compliance with the isometric drawings and ASME Section III requirements. This included 64 feet of piping on the suction line of HPSI pump A; the balance of piping inspected was on the discharge lines located in the auxiliary and containment buildings respectively. Piping system inspection includes visual inspection of pipe welds, welder qualifications, piping size and quality, and valve installation.

A. Piping System Welds

1. Areas Examined

Visual inspection of 200 pipe welds, out of a total of approximately 900 weld joints (pipe and socket) in the entire HPSI systems was made for quality and compliance with ASME Section III requirements. Characteristics examined included weld surface appearance, location, weld reinforcement, and absence of surface defects including cracks, lack of fusion, porosity, slag and undercut exceeding prescribed limits.

The records associated with one percent of the total welds were reviewed in detail and compared with the information obtained at the weld joint. Records examined included certified material test reports, piping class sheets, Bechtel's Form 84 which specifies the welding and nondestructive examination requirements for field erected piping, welder qualifications, field welding check list, and filler material certifications.

2. Findings

The type of pipe weld joints examined included pipe-to-pipe, pipe-to-fittings and pipe-to-valves. The visual inspection of these weld joints and the associated records reviewed indicated that the components were welded together by qualified welders using qualified filler materials and qualified welding procedures, the components being joined were certified, that the base material and the filler material were compatible for welding, and the required nondestructive examinations and weld inspections were performed. No items of noncompliance or deviations were identified.

B. Piping

1. Areas Examined

Field inspection activities included visual examination of the 530 feet of piping. This was to assure that the installed piping was as specified on the design drawing, and that the piping was reasonably straight, had a workmanlike finish and was free from injurious defects such as mechanical marks, abrasions and pits.

2. Findings

Inspection of piping quality revealed one section of pipe to have ~~X~~ mechanical marks. This was identified on pipe spool 28 line number A106-CCBA, adjacent to pipe-to-valve weld number W025. The quality control instruction, WPP/QCI No. 204, Revision 3, "Piping Systems Release for Insulation," Appendix I, requires that piping systems, prior to insulation, be checked for surface damage by the quality control engineer. Any unacceptable surface damage is then required to be documented on the construction inspection plan (CIP), and then evaluated in accordance with procedure ED-1, entitled "Elimination of Defects". The CIP for the pipe spool in question did not identify any unacceptable surface damage on this system. The main concern was whether the pipe minimum wall thickness requirements were violated. The Licensee initiated NCR No. SM 2976; the pipe was re-inspected and dispositioned "accept-as-is" in accordance with the acceptance standards specified in ED-1. In this case minimum wall had not been violated.

Also during this examination of pipe quality the inspector observed an apparently unacceptable pit-like defect on the outer-surface of pipe spool SI-008-S002 adjacent to pipe support SI-008-H002. The pit was unusual in that it did not appear to be typical mechanical damage or a typical welding arc strike. It appeared to be a minor blow hole from the original pipe manufacturer. The pit appeared to violate minimum wall requirements. The inspector requested the Licensee to have the pipe hanger removed for access to the pipe pit; measurements were taken by the piping QC engineer in the presence of the NRC inspector with a calibrated pit gage. The pit was measured to be 0.059 inches deep. The allowable minimum wall for pipe spool SI-009-S 002 is 0.219 inches and the remaining wall (calculated from nominal wall) is 0.191 inches. Therefore the pit represents an underwall condition requiring an engineering evaluation.

Procedure WPP/QCI 204, Revision 2 "Piping Systems Release for Insulation", requires the final inspection of piping to be performed by a piping QC engineer prior to covering the pipe with insulation. Paragraph 3.1 of Appendix 1 requires an inspection for surface damage per specification (ED-1). The specification "Welding Standard ED-1 Elimination of Defects" states in paragraph 4.1 that defects may be removed provided wall thickness is not reduced below the minimum specified.

The pipe spool was inspected in accordance with the above and improperly accepted on November 14, 1982, as certified on the Piping Release No. 301-398. The failure of the piping QC engineer to identify an unacceptable defect during the piping inspection prior to insulation is considered an apparent item of noncompliance. (OII 50-528/83-34-04)

C. Valves

1. Areas Examined

All valves in the HPSI A train were examined during the walkdown inspection for compliance with the isometric drawing; specifically to assure proper valve size, location, type, orientation and installation. In addition, torque verifications were performed on a few selected valves to assure that the torque values were within the valve manufacturer's acceptable range.

2. Findings

Inspection of this area revealed three instances which are apparent violations, indicating a weakness with the preoperational test/startup program.

- (a) During the inspection of valve No. 470 on the suction side of the HPSI pump "A", it was observed that the manual operator assembly was totally disconnected from the valve and resting on the sprinkler system piping. There was no documentary evidence to indicate that maintenance was being performed on the operator assembly. It does not appear that the preoperational testing program organization was fully cognizant of the valve's unsatisfactory status nor were procedures being applied which would assure control of this activity. Neither the valve or the operator had been recorded as deficient or nonconforming. The failure to control activities affecting quality is an apparent violation. (OII 50-528/83-34-05)

- (b) Three additional adverse conditions were identified on valve No. 470. First, visual examination revealed that the bonnet was leaking; second, that one stud nut was missing from one of the studs connecting the bonnet to the valve body. These two conditions resulted in the inspector's request for torque verification on the stud nuts. The torque verification revealed a number of loose stud nuts which connect the bonnet to the valve. This third item, failure of the stud nuts to meet the torque requirements specified on the design drawings, represents a condition adverse to quality, and is an apparent violation. (OII 50-528/83-34-06)
- (c) Valve No. 402 was found with the position indicator positioned so that the valve could only be opened about 30-35 percent. There was no documentary evidence to indicate that maintenance was being performed or that the licensee was aware of the condition of the valve. Preoperational testing was being conducted on this subsystem. The failure to identify this condition adverse to quality, is an apparent violation. (OII 50-528/83-34-07)

D. Welder Qualifications

1. Areas Examined

Bechtel specification WQ-1, Revision 17, of March 10, 1983, "Welding Standard Performance Specification," was examined. This specification describes the requirements for determining the ability of welders to make acceptable welds. The Welding Test Lab where welder performance qualifications are performed was examined for compliance with WQ-1 and ASME Section IX requirements. Also examined was the ability of the Welding Test Lab to detect "stand-ins" for welder qualification tests. The qualification records of 22 percent of the welders who field-welded on the 530 feet of pipe selected for the inspection were examined for compliance with WQ-1 and the latest issue of ASME Section IX.

2. Findings

The welders records examined revealed that the welders were qualified, on the date the weld was made, to the requirements of Bechtel specification WQ-1. WQ-1 meets the requirements of the latest issue of ASME Section IX. The welder performance qualification records were being properly maintained and were up-to-date.

Although no new welders were being qualified during this inspection, the Welding Test Lab was examined and found to be well organized and controlled. The weld rod is properly controlled, rod ovens are calibrated and kept at the correct temperature, and testing booths and welders' records are properly maintained.

Bechtel welder qualification procedures do not specifically address the subject of welder identity during qualification testing. However, Bechtel's current system requiring the welder's signature, social security number, and a photo badge appears to be satisfactory in preventing any practices of using stand-ins for welder qualifications. No items of noncompliance or deviations were identified.

~~Field inspection activities included visual examination of the 530 feet of piping. This was to assure that the installed piping was as specified on the design drawing, and that the piping was reasonably straight, had a workmanlike finish and free from injurious defects such as mechanical marks, abrasions and pits.~~

~~After arranging for pipe insulation removal to inspect a pipe support. The inspector observed an apparently unacceptable pit-like defect on the outer-surface of pipe spool SI-008-S-002 adjacent to pipe support SI-008-H002. The pit was unusual in that it did not appear to be typical mechanical damage or a typed welding arc strike. It appeared to be a minor blow hole from the original pipe manufacture. The pit appeared to violate minimum wall requirements. The inspector requested the licensee to have the pipe hanger removed for access to the pipe pit and a measurement was taken by the piping QC engineer in the presence of the NRC inspector with a calibrated pit gage. The pit was measured to be 0.059 inches deep.~~

(2) Findings

Inspection of piping quality revealed one section of pipe to have an excessive amount of mechanical marks. This was identified on line number A106-CCBA, adjacent to pipe-to-valve weld number W025. The quality control instruction, WPP/QC1 No. 204, Revision 3, entitled "Piping Systems Release for Insulation" Appendix I, requires that piping systems, prior to insulation, be checked for surface damage by the quality control engineer. Any identified surface damage is then required to be documented on the construction inspection plan (CIP), and then evaluated in accordance with procedure ED-1, entitled "Elimination of Defects". The CIP for the pipe spool in question did not identify any surface damage on this system.

VII. Inspection Results - Civil/Structural

A. Concrete Tests

1. Areas Examined

Eleven test areas were selected for examination using the "Windsor Probe Test" (WPT). These areas are identified in Table VII-1. They were selected as representative of concrete in the HPSI A pump room and in the vicinity of selected portions of the connected piping. The WPT measures the resistance of concrete to penetration by an explosively driven probe. Correlation to actual concrete strength is by reference to the Windsor Probe manufacturer's charts which relate probe penetration distance to strength for different aggregate hardness values.

2. Inspection Findings

Maximum aggregate size in the concrete tested was 1 1/2-inches. The Moh number for the aggregate selected from the probe manufacturer chart was number 6 (Far Southwestern United States). The indicated concrete strengths ranged from 5,800 to 7,600 psi, indicating adequate concrete strength exists in all areas measured. Detailed data are given in Table VII-1. No items of noncompliance or deviations were identified.

B. Structural Steel Framing

1. Areas Examined

Building and platform structural steel was examined to verify that the sizes, types and materials were in accordance with design requirements. The areas examined were in the HPSI A pump room, the auxiliary building northwest pipeway at the 40' elevation, and the 100 feet elevation on the south side of the containment building. The governing documents were as follows:

- . Specification 13-CM-320 - Erection of Structural and Miscellaneous Steel.
- . Drawing 13-C-00A-001 - Civil/Structural General Notes.

- . Drawing 13-C-ZADS-500 - Auxiliary Building - Framing Plan for Elevation 51'-6".
- . Drawing 13-C-ZCS-529 - Containment Internals - Structural Steel Platforms below Elevation 100.
- . Drawing 13-C-ZAS-570 - Auxiliary Building - Structural Steel Sections and Details - Sheet 1.
- . Drawing 13-C-ZAS-571 - Auxiliary Building - Structural Steel Sections and Details - Sheet 2.
- . Drawing 13-C-ZAS-572 - Auxiliary Building - Structural Steel Sections and Details - Sheet 3
- . WPP/QCI 58.0 - Erection of Structural and Miscellaneous Steel.

2. Inspection Findings

The steel that was examined was installed as specified and was of the required type and size. Certified Mill Test Reports were on file which verified that the proper material had been furnished. These were spot checked and were found to be in order. No items of noncompliance or deviations were identified.

Bolting and welding of the steel is addressed in Sections VII.3 and VII.4 of this report.

3. Structural Steel-Bolted Connections

a. Areas Examined

Bolted connections in selected portions of the building and platform structural steel in areas associated with HPSI A train system were examined for compliance with design requirements. Particular attention was given to bolt size and type, presence of washers where required, adequacy of thread engagement. Tightness of a representative sample of bolts was tested using a calibrated torque wrench. The joints were located in the HPSI A pump room, the northwest pipeway at the 40-foot elevation and the 88-foot elevation pipeway in the auxiliary building, the 82 to 95-foot elevations of both "wrap-around" portions of the auxiliary building, and at

various elevations in the containment building. Additional structural steel joints not associated with the HPSI A train system were also examined. They were in the containment building and in the HPSI B pump room. Details are provided in Table VII-2. In addition to the documents listed in paragraph VII.B.1, the governing documents also include the following:

- . Drawing 13-C-ZAS-510 - Auxiliary Building Framing Plan for Elevation 88' - Area AAA.
- . Drawing 13-C-ZAS-511 - Auxiliary Building Framing Plan for Elevation 88' - Area AAB.
- . Drawing 13-S-ZAS-535 - Auxiliary Building Miscellaneous Steel Plan @ Elevation 88'.
- . Drawing 13-S-ZAS-536 - Auxiliary Building Miscellaneous Steel Sections and Details - Sheet 1.
- . Drawing 13-C-ZAS-581 - Auxiliary Building Miscellaneous Steel Platforms and Details - Sheet 2.
- . American Institute of Steel Construction (AISC) - Specification for Structural Joints Using ASTM A325 or A490 Bolts.

2. Findings

Detailed inspection findings are given in Table VII-2. Except as described below, all bolted joints examined satisfied the specified requirements.

Table 3 of the AISC specification requires that 7/8-inch diameter A325 bolts be tightened to a minimum tension of 39 kips. The following departures from that requirement were found:

- (a) Four bolts in one joint in the AC-6 platform at the 51'6" elevation of the HPSI A pump room were only "finger tight."
- (b) One bolt in a 4-bolt I-beam to I-beam connection at the 125 degree azimuth, 10 feet from the liner, elevation 88-feet in the containment building, required a nut rotation of 45 degrees before achieving the tightness equivalent to the required 39 kips.

- (c) One bolt in a 4-bolt floor beam connection in the auxiliary building northwest pipeway, 6 feet east of column line AD, 51'-6" elevation, require a nut rotation of 60 degrees to achieve the 39 kip requirement.

In all three cases, the connections had been inspected and accepted by Bechtel Quality Control personnel. The unsatisfactory bolting accepted by QC is an apparent violation. (OII 50-528/83-34-08)

D. Structural Steel Welded Connections

1. Areas Examined

Welded connections in selected segments of the building and platform structural steel in areas associated with HPSI A train system were examined for compliance with design requirements. Attributes examined were fillet leg size and length, weld contour, and absence of overlap and undercut. The joints examined were located in the auxiliary building (pipeways at the southwest 40 foot elevation and at the 88 foot elevation), and in the containment building (80-87 foot elevation and the 125 foot elevation). Details are provided in Table VII-3. In addition to the documents listed in paragraphs VII.B.1. and VII.C.1., the governing documents also include the following:

- . Drawing 13-C-00A-050 - Welding and Nondestructive Examination Requirements for Civil Structural - "Form 84C".
- . Structural Welding Code AWS D1.1 1972, with Revision 1, 1973.

2. Findings

Detailed inspection findings are given in Table VII-3. The welded connections in the containment building that were examined were found acceptable. In the auxiliary building pipeway, elevation 88 foot, the inspector found six fillet welds with undersize leg length and four welds with unacceptable undercut. The welds are portions of a W8X31 pipe support rack, number B-79, fabricated by Marathon Steel Company.

In the auxiliary building northwest pipeway, elevation 51'6", the inspector found six fillet welds with undersize leg lengths. The welds are portions of a W16X36 floor beam clip connection. The inspector measured fillet weld sizes down to 5/32 inch, whereas 5/16 inch size was specified for these welds. The undercut criteria specified in AWS D1.1 requires that it be no more than .01 inch deep when its direction is transverse to primary tensile stress in the part that is undercut, and no more than 1/32 inch for all other situations. Contrary to this requirement, the inspector found undercut of approximately 1/16 inch deep.

The undersize and undercut welds had been inspected and accepted by Bechtel Quality Control personnel. The acceptance of welds which are not in conformance with specification requirements is an apparent violation.

FSAR Section 3.8.1.6.6 states: "The acceptance criteria for visual acceptance for welding is done in accordance with AWS D1.1-72, Revision 1, 1973." During the inspection, the following items were noted which appear to be deviations from this commitment:

- . AWS D1.1-72, Revision 1973, paragraph 3.6.6 states "welds shall be free from overlap." Specification 13-CM-320, Appendix A, paragraphs 3.1.4, 3.2, and 3.3.4 allow a maximum of 1/8" of overlap.
- . AWS D1.1-72, Revision 1973, paragraph 8.15.1.3 requires that "all craters are filled to the full cross section of the welds." Specification 13-CM-320, Appendix A, paragraphs 3.1.5, 3.2, and 3.3.8 allow underfilled weld craters.
- . AWS D1.1-72, Revision 73, paragraph 3.6.4 states that "...undercut shall not be more than 0.01" deep when its direction is transverse to primary tensile stress in the part that is undercut, nor more than 1/32" for all other situations." Specification 13-CM-320, Appendix A, paragraph 3.3.7 allows up to a maximum of 1/16" of undercut under certain circumstances and does not address undercutting transverse to primary tensile stress.
- . AWS D1.1-72 does not permit incomplete fusion. Specification 13-CM-320, Appendix A, paragraphs 3.1.8, 3.2 and 3.3.6 allow an exception to the requirement for complete fusion between weld metal and base metal.

Paragraph 9.2 of Specification 13-EM-302, Cable Tray Hangers, states that..." all quality Class Q cable tray hanger welds shall be inspected in accordance with AWS D1.1-79." (emphasis added)

These discrepancies are considered to constitute a deviation from the FSAR commitment. (OII 50-528-83-34-09)

E. Containment Structure Penetrations

1. Areas Examined

Five piping penetrations (nos. 13, 14, 15, 16, and 77) and one electrical penetration (no. 47), all associated with the HPSI train A system were visually examined and their records reviewed to ascertain compliance with the requirements of the ASME Boiler and Pressure Vessel Code, Section III-1974 Edition. In addition, piping penetration No. 62, monitoring containment internal pressure, and spare penetration No. 69 were examined. The visual examination was related to weld reinforcement height and surface finish. The records review addressed the presence and validity of the supplier's material test report, and the adequacy of the Field Welding check list (Form WR-5) and the Filler Metal Withdrawal Record (Form WR-6). Other factors examined were the qualification of the specified welding procedure, control of preheat and interpass temperatures, and nondestructive examination of the completed welds.

2. Findings

All work in this area was found to be in conformance with requirements. No items of noncompliance or deviations were identified.

F. Steel Embed Plates In Concrete

1. Areas Examined

Except for 3 or 4 plates in the vertical pipe chase in the northwest corner of the auxiliary building, all embedded plates carrying pipe hangers/supports for the HPSI A system lines in the auxiliary building were examined. These were 3 plates on the suction line and 35 plates on the discharge lines. In addition, approximately 30 plates were randomly selected in various walls in the auxiliary and containment buildings, of which approximately 20 were not loaded. The examination included measurement of plate thickness and anchor bolt

length using an ultrasonic transducer and CRT videoscope (only 2 or 3 bolts in each embed plate were measured), and a graduated depth gauge measurement of bolt thread engagement. The governing documents were as follows:

- . Specification 13-CM-308 - Installation and Testing of Concrete Embeds and Insert Plates.
- . Drawing 13-C-00A-001 - Civil Structural - General Notes.
- . Drawing 13-C-00A-010 - Typical Insert Plate Schedules and Details.
- . Drawing 13-C-00A-011 - Anchor Bolt Schedule and Details.
- . Drawing 13-C-ZAS-110 - Auxiliary Building - Plan at Elevation 40'.
- . Drawing 13-C-ZAS-112 - Auxiliary Building - Insert Plan at Elevation 40'.
- . Drawing 13-C-ZAS-146 - Auxiliary Building - Plan at Elevation 120'.
- . Drawing 13-C-ZAS-200 - Auxiliary Building - Wall Elevations - Sheet 1.
- . Drawing 13-C-ZAS-224 - Auxiliary Building - Wall Elevations - Sheet 25.
- . Drawing 13-C-ZCS-413 - Containment Internals - Wall Inserts and Penetrations - Sheet 1.
- . Drawing 13-C-ZCS-406 - Containment Internals - Wall Inserts and Penetrations - South Secondary Shield Wall.

2. Findings

All embedded plates examined were found to be installed in the specified locations and were the specified thickness. All anchor bolt lengths were as specified. One plate was found with three of eight bolts apparently missing; search with the UT transducer, however, found that all three had been relocated (by welding) as permitted by the specification when interference with reinforcing steel was encountered. Two other plates were

found with documented relocation of anchor bolts. For one case of suspected insufficient bolt thread engagement, documentation was on file which showed that the bolt had been circumferentially welded to the back of the plate, also as permitted by the specification. No items of noncompliance or deviations were identified.

G. Concrete Expansion Anchors

1. Areas Examined

A representative sample of concrete expansion anchors was examined to ascertain conformance with the installation requirements. At Palo Verde, the design intent is to avoid the use of expansion anchors to the maximum possible extent. A generous quantity of embedded steel plates and unistrut channels were provided for fastening equipment generally and, except for specifically identified lightly loaded applications, expansion anchors were to be used only after all other methods had been evaluated and determined unfeasible or unacceptable by Engineering. For these situations, documented licensee approval is required on a case-by-case basis. The previously mentioned lightly loaded applications include electrical raceway (except cable tray) instruments, instrument sensing lines, and local panels.

A total of 88 anchor bolts were examined for depth of embed and proper torquing of the tensioning nut. These were comprised of the following:

- . 20 Hilti Kwik-Bolts associated with 1 electrical panel box and all Class IE raceway supports (9) in the HPSI A pump room.
- . 29 Hilti Kwik-Bolts fastening raceway supports in the east "wrap-around" section (100' elevation) of the auxiliary building.
- . 8 Hilti-Kwik-Bolts anchoring 2 instrument sensing line support plates in the east "wrap around" section (80' elev.) of the auxiliary building.
- . 8 Hilti Kwik-Bolts anchoring 2 switchbox panels in Battery Rooms C and D in the Control Building (100' elevation).
- . 17 Drillco Maxi-Bolts anchoring control center panels to the floor (100' elevation) in Battery Rooms A, C and D in the Control Building. (Only 8 of these bolts were torque tested).

- . 6 Drillco Maxi-Bolts anchoring 6" fire-line support plates (2) to the MSSS wall (108' elevation) in the corridor adjacent to the turbine building.

All torque testing was performed by a Quality Control Inspector or a journeyman electrician using a calibrated torque wrench in the presence of the NRC inspector. The governing documents were:

- . Specification 13-CM-307 - Design, Installation and Testing of Concrete Anchors.
- . WPP/QCI 24.1 - Installation and Testing of Concrete Expansion Anchors.

2. Findings

Of the 23 Drillco Maxi-Bolts examined, all were found to be embedded and torqued to the required values. For the bolts anchoring the equipment panels in the battery rooms, there was no documentary evidence that Bechtel had obtained the required licensee approval prior to their installation. Similarly, no approval documentation was available for 4 Hilti Kwik-Bolts used for a strut supporting a cable tray hanger in the auxiliary building east "wrap-around" at the 100' elevation (east wall).

In the HPSI A pump room, 6 miscellaneous Hilti Kwik-Bolts (1 raceway support) could not be properly torqued due to the absence of washers under the tensioning nut (support holes too large). Due to the proximity of adjacent supports, this one probably could have been eliminated and the raceway would have been adequately anchored. Also in the HPSI A pump room, one anchor bolt was insufficiently embedded (3") because it was located too close (1 1/2") to an ungrouted, unused hole. Embed depth should have been 6 1/4". Two unused holes were found ungrouted, contrary to the specified requirements. Additionally, there were two bolts that violated the specified minimum distance from other anchor bolts.

In the auxiliary building "wrap-around" section (100' elevation), 9 bolts, randomly located, were found undertorqued (all four in one 4-bolt plate), one bolt was too close (2 1/8") to the edge of a wall opening, one bolt was insufficiently embedded (2 1/4" instead of 5" required), and two bolts had nuts with insufficient thread engagement.

All bolts examined in this sample had been given the requisite inspection by Bechtel Quality Control inspection and had been judged acceptable. The failure of QC to identify nonconforming conditions to specification requirements is considered an apparent violation. (50-528/83-34-10)

TABLE VII - 1

CONCRETE STRENGTH MEASUREMENT

Test No.	LOCATION/DESCRIPTION	No.	Date	PLACEMENT		Meas.(1) Probe Exten-in.	STRENGTH (psi)		
				Age	Max. Agg. Size		Probe Meas	Break	Cylind.(2) Design
1	HPSI A Pump Room-Aux.Bldg. Floor (El. 40') Adjacent to Pump	1A05-1	11/24/76	6 Yrs.-11 Mo.	1 1/2	2.25	7400	5870	4000 @ 28 Da.
2	HPSI A Pump Room-Aux. Bldg. East Wall (Elev. 44') Adjacent to Pump	1A12-1	1/21/77	6 Yrs.-9 Mo.	3/4	2.20	7000	5185	"
3	HPSI A Pump Room-Aux.Bldg. South Wall (Elev 43') Adjacent to Pump Motor	1A12-1	1/21/77	6 Yrs.-9 Mo.	3/4	2.25	7400	5155	"
4	North Pipeway-Aux. Bldg- South Wall (elev.44') Between Col Lines AE & AF	1A08-1	12/23/76	6 Yrs.-11 Mo.	3/4	2.275	7600	5960	"
5	HPSI A Pump Room-Aux.Bldg. Floor (Elev.40') Adjacent to West Wall & Floor Embed under Suction Line to Contain. Sump	1A04-1	11/24/76	6 Yrs.-11 Mo.	1 1/2	2.125	6400	5870	"
6	Control Bldg. Floor (Elev.100') 125 V Battery A Charging Equipment Room	1J016	3/10/78	5 Yrs.-6 Mo.	1 1/2	2.050	5800	5875	4000 @ 91 Da.
7	Control Bldg. Floor (Elev.100') 125V Battery A Room	"	"	"	"	2.075	6000	5875	"
8.	Control Bldg. Floor (Elev.200') 125V Battery C Room	"	"	"	"	2.100	6200	5230	"

TABLE VII - 1

CONCRETE STRENGTH MEASUREMENT

Test No.	LOCATION/DESCRIPTION	PLACEMENT				Meas. (1)	STRENGTH (Psi)		
		No.	Date	Age	Max. Agg. Size	Probe Exten-in	Probe Meas	Cylind. (2) Break	Design
9	Control Bldg. Floor (Elev. 100') In front of HPSI A 4160V Motor Breaker Cubicle	"	"	"	"	2.150	6600	5875	"
10	Containment Bldg. Base Mat Floor (Elev. 80') Adjacent to South stairway	1C013-1	7/8/77	6 Yrs. -2 Mo.	1 1/2	2.200	7000	5350	5000 @ 91 Da.
11.	Containment Bldg. Base Mat Floor (Elev. 80') West Side Under Safety Injection Piping Runs	"	"	"	1 1/2	2.100	6200	6040	"

Notes

- (1) Windsor Probe Test-Average of 3 driven probes
 (2) Average of compression test of 2 cylinders

TABLE VII-2

STRUCTURAL STEEL BOLTED CONNECTIONS

<u>Inspection Location</u>	<u>Elevation</u>	<u>Amount of Inspection Versus Total Available</u>	<u>Type of Inspection</u>	<u>Inspection Findings</u>
Auxiliary Bldg. HPSI A Pump Room	51'6"	15 joints of approx. 30	Visual	Four Loose bolts in a 4-bolt Joint - Platform AC-6
Northwest Pipeway Auxiliary Bldg.	51'6"	13 joints of approx. 15	Visual	Acceptable
Wrap-Around Areas Auxiliary Bldg.	82'-95'	94 joints of approx. 200	Visual	Acceptable
Pipeway Area Auxiliary Bldg.	88'	40 joints of approx. 300	Visual	Acceptable
Containment Bldg.	80'-87'	110 joints of approx. 500	Visual	Acceptable
Auxiliary Bldg. HPSI A Pump Room	51'6"	10 bolts of approx. 120	Torque Test	Acceptable
Northwest Pipeway Auxiliary Bldg.	51'6"	28 bolts of approx. 52	Torque Test	One bolt rotated 60 degrees before minimum tightness was achieved.
Containment Bldg.	87'	24 bolts of approx. 2500	Torque Test	One bolt rotated 45 degrees before minimum tightness tightness was achieved.
Containment Bldg.	98'	34 joints of approx. 100	Visual	Acceptable
*Containment Bldg.	125'	12 joints	Visual	Acceptable
*Containment Bldg.	140'	15 joints	Visual	Acceptable
*Containment Bldg. Pressurizer Compartment	-	20 joints	Visual	Acceptable
*Auxiliary Bldg. HPSI B Pump Room	51'6"	15 joints	Visual	Acceptable

*Items inspected which are not associated with the HPSI train A system.

TABLE VII-3

STRUCTURAL STEEL WELDED CONNECTIONS

<u>Inspection Location</u>	<u>Elevation</u>	<u>Amount of Inspection Versus Total Available</u>	<u>Type Of Inspection</u>	<u>Inspection Findings</u>
Northwest Pipeway Auxiliary Bldg.	51'6"	13 joints of approx. 15	Weld gauge Visual	Six undersize fillet welds
Pipeway Area Auxiliary Bldg.	88'	50 joints of approx. 200	Weld gauge Visual	Six undersize fillet welds, Four welds with undercut.
Containment Bldg.	80'-87'	110 joints of approx. 250	Weld gauge Visual	Acceptable
*Containment Bldg.	125'	4 joints	Weld gauge Visual	Acceptable

*Items inspected which are not associated with the HPSI Train A system.

VIII. NRC Nondestructive Examination and Quality Review of Safety Related Systems

A. Purpose

The purpose of the independent, NRC nondestructive examination (NDE) was to verify the adequacy of the licensee's welding quality control program. This was accomplished by duplicating those examinations required of the licensee by regulations and evaluating the results. In addition to the required examinations, several additional confirmatory examinations designed to verify conformance with material specifications were performed and compared to quality assurance records. The NRC inspection team selected the HPSI A system to inspect at the Palo Verde Unit 1. There are approximately 900 piping welds in the HPSI A system. This system was undergoing pre-operational testing and was full of water under pressure. A selection of welds from this system that could be drained and inspected was made. Due to preoperational testing of Unit 1, a selection of welds from Unit 3 was also made. The selection of these welds was intended to provide a representative sample of piping components, sizes, materials, of shop and field welds. All the welds selected were previously accepted by the licensee based on vendor, shop, or field NDE records.

B. Document Reviews

The following quality assurance documents were reviewed to verify compliance with regulatory and code requirements:

1. Twelve weld document packages were reviewed for:

- Material Certifications
- NDE results
- Fabrication records shop and field
- Drawings (Isometric)
- PWHT Charts

(Note: The twelve welds reviewed are listed at the end of Table VIII-2. See those listed for drawing 13-P-ZCG-103)

2. Two quality procedures were reviewed.

- 13PM-201 Shop Fabrication of Nuclear Piping Systems
- 13PM-204 Field Fabrication and Installation of Nuclear Piping Systems

3. A review of GEO's (site NDE subcontractor) internal audit, dated June 10, 1983, was performed. This audit reviewed all of GEO's NDE site personnel qualification at Palo Verde.

4. Verification of NDE Personnel Qualifications to SNT-TC-1A

The NRC inspector reviewed all of Bechtel's individual film interpreter qualification and certification records. He also reviewed 6 out of 39 of GEO's NDE records for personnel qualifications.

All the above documents were verified to satisfy NRC requirements and licensee commitments to industry codes and standards.

C. NRC Independent Examinations

(Note: Refer to Table VIII-1 for specific listings of independent inspection items)

1. Radiography

Twenty-one welds were re-examined by the NRC using an Iridium 192 source. Welds that were radiographed were ASME Code Class 1 and 2, carbon and stainless steel.

Results: All re-radiographed welds were found acceptable to ASME Section III acceptance criteria.

2. Pipe Wall Thickness Measurement - Eleven pipe welds and adjacent pipe material were examined per NRC procedure NDE-1., Revision 0, using a NORTEC NDT thickness gauge. Minimum wall thickness was determined by using an ASTM standard pipe sizes and nominal thickness chart.

Results: All areas examined were within tolerance requirements.

3. Ferrite Measurements - Thirteen pipe welds were checked for delta ferrite content using a Type II Ferrite Indicator (Severn Gauge).

Results: All measurements were within acceptable limits of material test results.

4. Hardness Measurements - Fourteen welds were checked for hardness (base material adjacent to welds) using the Equo-tip hardness tester per NRC Procedure NDE-12, Revision 0. Hardness numbers were converted to Brinnell values and the approximate tensile strengths were determined by use of conversion tables.

Results: All areas examined were within acceptable limits of material test reports.

5. Alloy Analyzer - Four pipe welds and adjacent base metals were examined using a Texas Nuclear Alloy Analyzer. A quantitative chemical analysis was made on two stainless steel, type 304, and two stainless steel, type 316 materials.

Results: Areas examined were within $\pm 2\%$ of chemical analysis indicated on corresponding certified mill test reports and were within acceptable limits.

6. Liquid Penetrant Examination - Eight safety related pipe weldments were liquid penetrant examined per NRC procedure NDE-9, Revision 0. All weldments examined were ASME Class 2 welds.

Results: All areas inspected were acceptable.

7. Visual Examination - Thirty-four weldments and adjacent base material were visually inspected for weld reinforcement, overall workmanship and surface condition per NRC procedure NDE 14, Revision 0.

Results: All areas inspected were acceptable.

8. Radiography of Socket Welds - Ten socket welds were radiographed to verify pipe engagement.

Results: All radiographs show at least a minimum of 1/16 inch gap per ASME Section III, paragraph NC4427 requirements.

9. Radiographic Review of Licensee Field Welds and Vendor Welds - A review of licensee's pipe weld radiographs was made during this inspection of ASME Class 1 and 2 weldments. Out of 746 sets of radiographs, 204 were reviewed as listed below, with results as listed in Table VIII-2.

The radiographic film review disclosed 6 welds which are in the "as-welded" condition and present weld ripple images in the film. The ASME V Code, paragraph T-221-2, requires that weld irregularities be removed to the extent that they cannot mask or be confused with actual discontinuities. The weld ripple images for ISO 01-P-SIF 105 Line 1RC-051-S-001-16, welds A and B; 1RC-051-S-002; weld A; and ISO-13-P-ZCG-103, 1RC-079, 030 and 073 are considered excessive and capable of masking or being confused with discontinuities in the opinion of the NRC Level III examiner.

On October 12, 1983 licensee representatives and the Bechtel Corporation Level III examiner telephoned the Regional office to express a difference of professional opinion. The Bechtel examiner did not consider that the weld ripple images could mask discontinuities. This item is considered unresolved. (Unresolved item 50-528/83-34-01)

No items of noncompliance or deviations were identified.

Table VIII-1

INDEPENDENT MEASUREMENTS PALO VERDE

Line/ISO	Weld No.	Class	INDEPENDENT MEASUREMENTS PROGRAM				USNRC R. MOBILE NDE VAN				Page 1	
			Date	RT	NT	PT	UT	Hard ness	Thick ness	Ferrite		Alloy Anal
HPSI F-375 Elev 45'	YW-D	2	X	X		X	X	X			X	10" S/S 5.0 to 7.5 FN Results
	YW-B	2	X	X		X	X	X			X	10" S/S 5.0 to 7.5 FN
F-375 Aux Bldg Elev 45' "A" Pump Line	YW-A	2	X	X		X	X	X			X	10" S/S 5.0 to 7.5 FN Spool SF-008-006 Spool SF-008-005
HPSI F-422 Elev 45' "A" Pump Line	SH-5	2	X	X		X	X	X			X	10" S/S 5.0 to 7.5 FN
HPSI "A" Line	YW-A	2	X	X		X	X	X			X	10" S/S 5.0 to 7.5 FN
F-423 Elev 45'	YW-B	2	X	X		X	X	X			X	10" S/S 5.0 to 7.5 FN
F-423 Elev 45' Aux Bldg	YW-A	2	X			X	X	X			X	10" S/S 5.0 to 7.5 FN
	YW-C	2	X			X	X	X			X	10" S/S 5.0 to 7.5 FN
SI-099-4 Aux Bldg "A" Line	YW-E	2	X	X							X	4" S/S
F-149	YW-B	2	X	X				X			X	4" S/S
SI-099-4 HPSI "A" Line Elev 45'	F149 YW-A	2	X	X				X			X	4" S/S
SI-099-4 HPSI "A" Line	Not Rec'd	2	X									4" S/S
SI-106-3 HPSI Line A	FW-1	2	X					X				4" S/S
	FW-2	2	X					X				
SI-106-3 HPSI Line A	FW-3	2	X	X				X		X	X	3" S/S
	FW-4	2	X	X				X			X	
SI-100-004 F156	YW-A	2	X	X				X		X	X	4" S/S
	YW-B	2	X	X				X		X	X	4" S/S

Table VIII-2
Review of Licensee RT Films and Records

<u>Line</u>	<u>ISO</u>	<u>WELD</u>	<u>RESULTS</u>
SI-008-CCBC-10"	13-P-SIF-201	FW 5	Acceptable
"	"	FW 1	Acceptable
"	"	FW 2	Acceptable
"	"	FW 3	Acceptable
"	"	FW 4	Acceptable
"	"	FW 6	Acceptable
"	"	*FW 7	Acceptable
SI-008-GCBC-10"	13-P-SIF-201	VW-D-F375	Acceptable
"	"	VW-B-F375	Acceptable
"	"	VW-A-F375	Acceptable
"	"	VW-A-422	Acceptable
"	"	VW-B-423	Acceptable
"	"	VW-A-423	Acceptable
SI-A-009-CCBC-4"	13-P-SIF-203	FW 1	Acceptable
"	"	FW 2	Acceptable
SI-099-CCBB-4"	13-P-SIF-203	VW-E-F149	Acceptable
"	"	VW-B-F149	Acceptable
"	"	VW-A-F149	Acceptable
SI-099-S-001-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
SI-A-100-CCBA-4"	"	FW 1	Acceptable
"	"	FW 2	Acceptable
"	"	FW 3	Acceptable
SI-100-CCBB-4"	13-P-SIF-203	VW-A-156	Acceptable
"	"	VW-B-156	Acceptable
"	"	VW-3-156	Acceptable
SI-A-101-CCBA-1"	13-P-SIF-204	FW 00L	Acceptable
2"	"	FW 00A	Acceptable
2"	"	FW 00B	Acceptable
2"	"	FW 00C	Acceptable
2"	"	FW 00H	Acceptable
2"	"	FW 00J	Acceptable
2"	"	FW 00K	Acceptable

*Visually verified RT root indication (concavity) between RT station numbers 12 and 15 by using a fiberscope. All areas of concern are acceptable.

<u>Line</u>	<u>ISO</u>	<u>WELD</u>	<u>RESULTS</u>
2"	"	FW 00L	Acceptable
2"	"	FW 00N	Acceptable
2"	"	FW 00P	Acceptable
2"	"	FW 00R(C)	Acceptable
2"	"	FW 00S(C)	Acceptable
2"	"	FW 00T	Acceptable
2"	"	FW 000	Acceptable
SI-A-102-CCBA-2"	13-P-SIP-204	FW 00A	Acceptable
"	"	FW 00E	Acceptable
"	"	FW 00C	Acceptable
"	"	FW 00D	Acceptable
"	"	FW 00E	Acceptable
"	"	FW 00F	Acceptable
"	"	FW 00G	Acceptable
"	"	FW 00H	Acceptable
"	"	FW 00J	Acceptable
"	"	FW 00K	Acceptable
"	"	FW 00L	Acceptable
"	"	FW 00M(C)	Acceptable
SI-103-CCBA-2"	13-P-SIF-203	FW 300	Acceptable
"	"	FW 00A	Acceptable
"	"	FW 00B	Acceptable
"	"	FW 00C	Acceptable
"	"	FW 00D	Acceptable
"	"	FW 00E	Acceptable
SI-103-CCBA-2"	13-P-SIF-203	FW 00G	Acceptable
"	"	FW 00I	Acceptable
"	"	FW 00J	Acceptable
"	"	FW 00K(C)	Acceptable
"	"	FW 00P	Acceptable
"	"	FW 00R	Acceptable
SI-105-S-003-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
SI-105-S-004-4"	13-P-SIF-203	A	Acceptable
SI-105-S-005-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
SI-105-S-002-4"	13-P-SIF-202	A	Acceptable
SI-105-S-001-4"	13-P-SIF-202	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
SI-157-CCBA-4"	13-P-SIF-204	FW 300	Acceptable
4"	"	FW 301	Acceptable
1"	"	FW 00C(C1)	Acceptable
2"	"	FW 00A	Acceptable
2"	"	FW 00B(C)	Acceptable
2"	"	FW 00C(C1)	Acceptable
2"	"	FW 00D(C)	Acceptable
1"	"	FW 00E	Acceptable
SI-157-CCBA-1"	13-P-SIF-204	FW 00E	Acceptable
2"	"	FW 00H	Acceptable

<u>Line</u>	<u>ISO</u>	<u>WELD</u>	<u>RESULTS</u>
1"	"	FW 001	Acceptable
4"	"	FW 001	Acceptable
4"	"	FW 002	Acceptable
4"	"	FW 003	Acceptable
3"	"	FW 004	Acceptable
3"	"	FW 006	Acceptable
3"	"	FW 007	Acceptable
3"	"	FW 008	Acceptable
SI-157-S-001-4"	13-P-SIF-136	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
SI-157-S-002-4"	13-P-SIF-136	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
SI-157-S-003-4"	13-P-SIF-136	A	Acceptable
SI-157-S-004-4"	13-P-SIF-136	A	Acceptable
SI-157-S-005-4"	13-P-SIF-136	A	Acceptable
"	"	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	13-P-ZG108	U-77(c-1)	Acceptable
SI-157-S-006-3"	13-P-SIF-136	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
SI-157-S-007-3"	13-P-SIF-136	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
RC-051-S-001-16"	01-P-SIF-105	A	Rejected Beads
"	"	B	Rejected Beads
RC-051-S-002-16"	01-P-SIF-105	A	Rejected Beads
RC-051-S-003-16"	01-P-SIF-105	G	Acceptable
"	"	H	Acceptable
"	"	A	Acceptable
"	"	B	Acceptable
"	"	D	Acceptable
SI-176-S-001-4"	13-P-SIF-204	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
SI-176-S-002-3"	13-P-SIF-204	A	Acceptable
SI-176-S-003-3"	13-P-SIF-204	A	Acceptable
SI-176-S-004-3"	13-P-SIF-204	A	Acceptable

<u>Line</u>	<u>ISO</u>	<u>WELD</u>	<u>RESULTS</u>
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
SI-176-S-006-3"	13-P-SIF-204	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
SI-218-S-001-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
SI-218-S-002-4"	13-P-SIF-203	A	Acceptable
SI-236-S-003-4"	13-P-SIF-203	A	Acceptable
SI-236-S-005-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
SI-236-S-006-3"	13-P-SIF-203	B	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
"	"	H	Acceptable
"	"	J	Acceptable
"	"	K	Acceptable
"	"	L	Acceptable
"	"	M	Acceptable
"	"	N	Acceptable
SI-248-S-003-3"	01-P-SIF-105	A	Acceptable
"	"	E	Acceptable
"	"	D	Acceptable
SI-248-S-007-3"	01-P-SIF-105	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	G	Acceptable
"	"	H	Acceptable
"	"	J	Acceptable
"	"	K	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
SI-248-S-008-3"	01-P-SIF-105	H	Acceptable
"	"	J	Acceptable
"	"	K	Acceptable
SI-248-S-009-3"	01-P-SIF-105	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable

"	"	D	Acceptable
SI-248-S-011-3"	01-P-SIF-105	G	Acceptable
"	"	H	Acceptable
"	"	J	Acceptable
SI-248-S-012-3"	01-P-SIF-105	F	Acceptable
"	"	G	Acceptable
"	"	H	Acceptable

<u>O.D. Size</u>	<u>Line</u>	<u>Document Review</u>	<u>ISO</u>	<u>Weld S/N</u>	<u>Results</u>
30"	1-RC079	"	13-P-ZCG-103	W001	Rejected Beads
30"	1-RC030	"	"	"	Rejected Beads
30"	1-RC073	"	"	"	Rejected Beads
30"	1-RC031	"	"	"	Acceptable
Unit 2					
30"	2-RC079	"	13-P-ZCG-103	W001	Acceptable
30"	2-RC030	"	"	"	Acceptable
30"	2-RC073	"	"	"	Acceptable
30"	2-RC031	"	"	"	Acceptable
Unit 3					
30"	3-RC079	"	13-P-ZCG-103	W001	Acceptable
30"	3-RC030	"	"	"	Acceptable
30"	3-RC073	"	"	"	Acceptable
30"	3-RC031	"	"	"	Acceptable

IX. CRAFT AND QC INSPECTOR INTERVIEWS

During the course of the inspection interviews were conducted by the team members with various craft persons and QC inspectors. These interviews were conducted on a one on one basis at random in the field, predominantly at Unit 1, but some were conducted at Units 2/3 and in the senior resident inspector's office. There were 115 of these interviews conducted with the idea of finding whether there was pressure by management to "cut corners," to obtain the interviewee's reception of quality on the project and to give the interviewee an opportunity to discuss any problems he/she may know of with a NRC inspector.

None of the workers indicated that there was any pressure to cut corners, all thought that the quality on this project was above average to excellent and none knew of major problems on this project that NRC did not know about. Some reservations were expressed about the quality of work done in vendor shops on components that were later shipped to the site.

Table IX-1
Workers Interviewed

<u>Craft</u>	<u>No. Interviewed</u>
1. Electrician	23
2. Millwright	2
3. Ironworker	7
4. Boilermaker	1
5. Pipefitter	21
6. Carpenter	4
7. Janitor	1
8. QC Welder	7
9. QC Elect	16
10. QC Mech/Piping/NSSS	12
11. Laborer	3
12. Insulator	2
13. Welder	7
14. NDE Tech	4
15. Sprinkler	2
16. Operating Engineer	1
17. QC CSC	2

A typical comment was that the work was marginally acceptable but it did not meet the standard that would be acceptable if the work were done onsite. No items of noncompliance or deviations were identified.

Attachment A

A. Persons Contacted

1. Arizona Public Service Company

E. Van Brunt Jr., V.P. Nuclear Projects
J. Roedel, Corporation QA Manager
D. Fasnacht, Nuclear Construction Manager
J. Keiley, Startup Manager
J. Bynum, Nuclear Operations Manager
W. Ide, Construction (QA/QC) Manager
P. Moore, QA Engineer
B. Love, QA Engineer
R. J. Kimmel, Field Engineering Supervisor
G. Pankonin, Startup QA/QC Manager
F. Godwin, Nuclear Projects Records Manager
K. Gross, Compliance/Operations Supervisor
C. Rogers, Nuclear Engineer
L. Souza, Construction QA Supervisor
J. Hayes, Startup Manager, Unit 1

2. Bechtel Power Corporation

W. Stubblefield, Field Construction Manager
D. Hawkinson, Project QA Manager
J. White, Lead Pipe Support QCE
G. Stam, Weld Engineering Supervisor
J. Sabol, Lead Pipe Support Engineer
D. Keitch, Bechtel, Downey
H. Miller, Lead Field Welding Engineer
M. Rosen, QC Supervisor
T. Mack, Assistant Project Manager
A. Priest, Construction Engineer
C. Berg, Construction Engineer

Other persons contacted during the inspection included construction craftsmen, QC inspectors, startup personnel, QA personnel and Supervisory Personnel.

Young



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CALIFORNIA 94596

NOV 11 1983

Docket No. 50-528

Arizona Public Service Company
P. O. Box 21666
Phoenix, Arizona 85036

Attention: Mr. T. G. Woods Jr.
Executive Vice President

Gentlemen:

Subject: Construction Appraisal Inspection 50-528/83-34

This refers to the construction appraisal inspection conducted by Region V on September 6-16, 26-30, October 31 and November 1, 1983 at Palo Verde Unit 1. The Construction Appraisal Team was composed of members of Region I, Region V and a number of consultants. This inspection covered construction activities authorized by NRC Construction Permit CPPR-141.

The enclosed report identifies the areas examined during the inspection. Within these areas, the effort consisted of detailed inspection of selected hardware subsequent to APS Quality Control inspections, examination of procedures and records, observation of work activities and interviews with management and other personnel.

The inspection concentrated on hardware and was intended to assess whether the construction of Unit 1 was performed in accordance with quality requirements by comparing the as-built condition to the design requirements.

The method used in this inspection was to select a meaningful sample of completed safety-related construction for rigorous examination. The method further required the sample to be of high safety significance and to be generally representative of the work controls, procedures, methodology and documentation of the other safety-related work performed at the Palo Verde Nuclear Generating Station.

The team's approach was to direct 70 percent of its effort on system installation verification of the High Pressure Safety Injection (HPSI) System, "A" train. This included an in-depth examination of a large number of elements related to that system (on the order of 25 percent) including: piping; supports; pumps; valves; welding; nondestructive examination; electrical supplies; (including redundancy/separation); electrical motors; cables; terminations; supporting structural steel elements; related concrete structures; and other systems. Within the sample special emphasis was directed to the area of welding and electrical activities because of the multiple allegations received in these areas in the past. The other 30 percent of the team's effort was focused on inspection of other important areas (including the Reactor Coolant System).

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The HPSI "A" train was selected because of its high safety significance, its representativeness in terms of construction practices, and the fact that the system had not previously been independently examined by a third party.

OVERALL CONCLUSIONS

The team found that basic construction appeared to be generally satisfactory, however large numbers of deficiencies were not being identified during final QC inspections. The majority of these deficiencies appeared to be minor in nature but some were significant and reflected a weakness in quality assurance and/or a lack of management control by the APS Operations and Startup Groups. Although the team's focus was construction, a number of problems identified indicated that some of the deficiencies may have resulted from activities performed after the system or component had been turned over to operations and startup. General findings are discussed below:

AREAS INSPECTED AND RESULTS

A. Electrical and Instrumentation Construction

The inspections in this area revealed deficiencies in the thoroughness of the final inspections and/or in control of maintenance following testing. Of major significance was the finding of pipe caps left in place on the containment pressure sensing lines with no administrative requirement in place to insure their removal prior to operation of the plant. The existence of these caps was therefore lost. Had these caps remained in place during operation the response capability of the HPSI system would have been defeated. The inspectors were unable to reconstruct the circumstances of the caps being installed: whether the caps were installed and left on by the construction personnel or whether they were later installed by the preoperational testing personnel.

Missing bolts were identified in the base frames of the six separation groups 1 and 2 motor control centers. These bolts appear to be required for the seismic qualifications of these cabinets.

Some problems with cable separation were identified. These problems did not appear to be pervasive or indicate a lack of control in the area of cable separation.

Additionally, discrepancies associated with concrete expansion anchor bolts and supporting electrical raceways were found.

B. Mechanical Construction

Again the inspections in this area revealed deficiencies in the thoroughness of the final inspections and/or in maintenance following testing.

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The manual operating mechanism of a 10 inch suction line valve was completely disconnected from the valve and flange bolts on the same valve had not been adequately torqued. As a result, the valve couldn't be operated and the valve bonnet was leaking. It appeared that the valve disassembly had been performed after construction personnel had completed their work on the valve. There was no indication that the preoperational testing or startup personnel had control measures in effect to recognize and repair the unsatisfactory valve condition. The same valve in train B was found in a condition which would not allow it to open fully.

An examination of 68 pipe hangers or supports of a total of 116 (60 percent) in the HPSI system showed that fourteen such structures have deficiencies such as undersize fillet welds.

C. Welding and Nondestructive Examination

The NRC examined 18 circumferential and 10 socket welds in the HPSI system by independent radiography. Also, 34 welds were visually examined in the field, and the radiographs on file for 192 welds were read by NRC. This resulted in looking at 28 percent of the welds in the HPSI systems. No deficiencies were found. In addition to the HPSI examination, system radiographs and weld records for twelve welds in the primary loop were examined. Three primary loop welds in PVNGS Unit 3 was examined radiographically for comparison of radiographic techniques with similar Licensee radiographs. One unresolved item was identified dealing with weld ripple images which could possibly mask weld defects.

D. Structures

Examinations in this area included concrete in situ testing, penetrations, structural bolting and welding. Some problems with bolting and welding of gallery steel were noted as described in the enclosed inspection report.

Most deficiencies appear to result from inadequate inspections prior to or inadequate control of systems after turnover to operations and startup.

WORKER INTERVIEWS

In order to determine if there were intimidation or undue pressure felt by workers to cut corners, 115 craftsmen and first line quality control inspectors were interviewed. The team considered that if such pressure and intimidation were widespread, the problem would surface in these interviews.

These interviews were face to face, and were made in private between one or two workers and a NRC inspector.

The tabulated results of these contacts, the crafts represented by the contacts are contained in the enclosed inspection report. None of the workers interviewed indicated that he or she felt intimidated or felt any pressure to cut corners for the sake of production.

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NCV 11 1983

Enforcement action related to this inspection will be the subject of separate correspondence.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosures will be placed in the NRC Public Document Room unless you notify this office, by telephone, within ten days of the date of this letter and submit written application to withhold information contained therein within thirty days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

Should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely,



J. B. Martin
Regional Administrator

Enclosure:

1. Inspection Report 50-528/83-34

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Division of Resident, Reactor Projects and Engineering Programs

Report No. 50-528/83-34

Docket No. 50-528

License No. CPPR-141

Licensee: Arizona Public Service Company
P. O. Box 21666
Phoenix, Arizona 85036

Facility Name: Palo Verde Nuclear Generating Station - Unit 1

Inspection at: Construction Site

Inspection conducted: September 6-16, 26-30 October 31 and
November 1, 1983

Inspectors:

Albert Young Jr. for
W. G. Albert, Senior Resident Inspector
WNP-3 (Team Leader)

11-10-83
Date Signed

J. F. Bardon
J. F. Bardon, Reactor Inspector

11-10-83
Date Signed

Albert Young Jr. for
R. H. Campbell, Engineering Technician

11-10-83
Date Signed

Albert Young Jr. for
R. H. Harris, Engineering Technician

11-10-83
Date Signed

Albert Young Jr. for
H. W. Kerch, Lead Reactor Engineer

11-10-83
Date Signed

PP Narbut
P. P. Narbut, Project Inspector

11-10-83
Date Signed

Albert Young Jr. for
L. E. Vorderbruggen, Senior Resident Inspector
PVNGS

11-10-83
Date Signed

Salbert Young Jr. for 11-10-83
W. J. Wagner, Reactor Inspector Date Signed

Salbert Young Jr. for 11-10-83
G. E. Walton, Senior Resident Inspector Date Signed
BVPS-2

Salbert Young Jr. for 11-10-83
J. L. Crews, Technical Assistant to the Date Signed
Regional Administrator

Salbert Young Jr. 11-10-83
T. Young, Jr., Chief Date Signed
Reactor Projects Section 2

Consultants: W. Marini, C. Crane, and L. Stanley

Contract Technicians: K. Grevenow and J. Ludiwissi

Approved By: T. W. Bishop 11/10/83
T. W. Bishop, Director, Division of Residents, Date Signed
Reactor Projects and Engineering Programs

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I. INSPECTION SCOPE AND OBJECTIVES

The scope of this inspection was the evaluation of on-site construction for Palo Verde Nuclear Generating Station Unit 1.

The objective was to provide an overall assessment of the actual as-built condition of the Palo Verde Nuclear Generating Station Unit 1 (PVNGS-1) by comparing the as-built condition to design requirements of a representative sample. Therefore, the inspection concentrated on hardware and assessed whether the construction of PVNGS-1 was performed in accordance with quality requirements applicable to the plant.

In the areas inspected, the following was determined:

- The construction observed was in conformance to the drawings and specifications.
- Necessary quality verifications were performed during the construction process with appropriate hold points and other controls.
- Nonconforming conditions were properly addressed in accordance with approved procedures.
- Equipment was turned over to the startup organization in operable condition and it was being maintained properly as evidenced by the as-found condition.

II. TEAM ORGANIZATION AND METHODS

The NRC inspection team consisted of ten NRC employees, three consultants, and two technicians from Wisconsin Testing, Inc., as follows:

William G. Albert - Team Leader

Registered Professional Engineer (Mechanical) with 33 years experience in reactor construction, engineering and operation. Currently the NRC's Senior Resident Inspector for the WNP-3 plant in Washington State.

Paul P. Narbut - Lead Inspector, Mechanical Area

Nuclear Engineer (Nuclear) with 20 years experience in the design, construction and testing of nuclear power plants. Currently a Project Inspector for the NRC's Region V office.

John F. Burdoin - Lead Inspector, Electrical Area

Registered Professional Engineer (Electrical, Mechanical and Nuclear), with 36 years experience in the field of electrical engineering. Currently a Reactor Inspector with the NRC's Region V office, specializing in electrical inspection.

Tolbert Young, Jr. - Interview and Report Coordination

Registered Professional Engineer (Nuclear) with 22 years experience in nuclear power plant operation. Currently a Section Chief with the NRC's Region V office.

Glen A. Walton - Welding and NDE Specialist

Twenty-seven years experience in regulation and management of NDE and QA/QC. Currently the NRC's Senior Resident Inspector for the Beaver Valley plant in Pennsylvania.

William J. Wagner - Welding Inspection

Registered Professional Engineer (Quality) and AWS-Certified Welding Inspector with 24 years of experience in the field of metallurgy, quality assurance and NDE. Currently a Reactor Inspector with NRC's Region V office, specializing in welding.

Harry W. Keach - NDE Van Supervisor

Registered Professional Engineer (Quality) and Certified ASNT Level III Examiner with 35 years of NDE experience. Currently a Lead Reactor Engineer with the NRC's Region I office.

L. E. Vorderbrueggen - Team Support and Civil/Structural Coordinator

Electrical engineer with 36 years experience in the design and construction of industrial plants. Currently the NRC's Senior Resident Inspector at Palo Verde.

Richard H. Harris - NDE Inspection

Certified ASNT Level II Examiner and AWS Welding Inspector with 22 years experience in NDE and QC. Currently an Engineering Technician with the NRC's Region I office.

R. M. Campbell - NDE Inspection

Certified ASNT Level II Examiner and AWS Welding Inspector with nine years experience in NDE and QC. Currently an Engineering Technician with the NRC's Region I office.

Loren Stanley - Electrical Consultant

Registered Professional Engineer (Electrical) with 27 years electrical engineering experience. Currently in private consulting.

William Marini - Electrical Consultant

Electrical Inspection Specialist with 13 years experience in the field of electrical and welding inspection. Currently with Resource Technical Services.

Cyril J. Crane - Electrical Consultant

Registered Professional Engineer (Electrical) with 27 years experience in reactor operation and electrical engineering. Currently with Westec Services, Inc.

Jesse L. Crews - Registered Professional Engineer (Nuclear) with 22 years experience in reactor construction, engineering and operations. Currently Technical Assistant to the Regional Administrator.

K. Grevenow - NDE Technician

Wisconsin Testing

J. Ludiwissi - NDE Technician

Wisconsin Testing

The methods used for this inspection were to select a meaningful sample of Palo Verde safety-related construction for rigorous examination. The sample was of high safety significance and was deemed to be representative of the work controls, procedures, methodology, and documentation of safety-related work performed at Palo Verde Nuclear Generating Station. Selection and in-depth examination of a representative sample of this nature allowed extrapolation of the Team's findings to the adequacy of other safety-related construction at Palo Verde.

Accordingly, the team's approach was to direct 70 percent of its effort to the verification of system installation for the High Pressure Safety Injection System (HPSI) A train. This included in-depth examination of a large number of elements related to this system, including piping, pipe supports, pumps, valves, welding, nondestructive examination, electrical power supplies, electrical cables (including redundancy and separation), instrumentation, control, electrical motors, supporting structural steel elements, and related concrete structures. Within this sample, special emphasis was directed to the areas of welding and electrical construction since both of these areas had been the subject of allegations. The other 30 percent of the team's effort was focused on inspection in other important areas such as the Reactor Coolant System.

The examinations discussed above were conducted by:

- (a) Physical inspection of systems, components, and structures.
- (b) Independent NDE of welds and structures.
- (c) Examination of documentation, where necessary, to support physical inspections.
- (d) Private interviews and discussions with over 100 craft and inspection personnel.
- (e) Examination of radiographs and other direct evidence of the quality of work such as postweld heat treatment charts.
- (f) Testing of components by ultrasonic thickness measurements, hardness, radio signal cable tracing, and concrete probes.

III. CONTACTS AND LICENSEE/NRC MEETINGS

The inspection was unannounced until the morning of September 6, 1983. On that day all team members and the NRC Nondestructive Examination (NDE) Van arrived on site. The teams primary point of contact during the course of this inspection was the Arizona Public Service (APS) Construction Quality Assurance organization at the site. This organization is managed by Mr. W. E. Ide.

An entrance meeting was held at the start of the inspection to acquaint the licensee with what the NRC inspection team intended to accomplish, arrange for needed drawings and documentation, arrange for off shift radiography, define organizational points of contact, and arrange necessary Saturday coverage since September 10, 1983, was a day of work for the inspection team. This meeting was attended by Mr. E. E. Van Brunt, APS Vice President for Nuclear Projects Management, Mr. J. A. Roedel, APS Corporate Quality Assurance Manager, Mr. W. J. Stubblefield, Bechtel Field Construction Manager and 20 other staff members of the APS and Bechtel Site Organizations.

On September 14, 1983, a brief meeting was held between the NRC team leader Mr. W. G. Albert, Mr. E. E. Van Brunt, APS Vice President of Nuclear Projects and Mr. D. B. Fasnacht, APS Nuclear Construction Manager. The purpose of this meeting was to provide highlights of tentative findings up to that time since Mr. Van Brunt could not attend the meeting on September 16th.

On September 16, 1983, a meeting was held between the team leader and the team lead inspectors with Mr. J. A. Roedel, APS Corporate Quality Assurance Manager, Mr. D. B. Fasnacht, APS Nuclear Construction Manager, Mr. W. G. Bingham, Bechtel Project Engineering Manager and approximately ten other APS and Bechtel Staff. The purpose of this meeting was to provide APS with a progress report on the type and nature of NRC findings at that point in the inspection.

This was a status meeting and, therefore, no attempt was made to categorize the findings as to their seriousness or to define which would be items of noncompliance. The NRC stated at that time that they perceived a weakness at the interface between construction and operations and while the basic construction appeared satisfactory, a significant number of findings indicated that either final inspections were not properly performed and/or there was a lack of control of work after completion of construction by the startup organization.

The principal exit interview for this inspection was held in the APS corporate offices on September 30, 1983. This meeting was attended by Mr. J. B. Martin, NRC Regional Administrator, Mr. T. W. Bishop, NRC Division Director and three NRC observers from headquarters organizations. The APS attendees included Mr. K. L. Turley, Chairman of the Board, Mr. O. M. DeMichele, President, Mr. T. G. Woods, Jr., Executive Vice President, Mr. E. E. Van Brunt, Vice President Nuclear

Projects, Mr. G. C. Andognini, Vice President Nuclear Operations, and eight other APS staff members. Bechtel attendance consisted of Mr. W. J. Stubblefield, Site Construction Manager and Mr. D. R. Hawkinson, Projects Quality Assurance Manager. In addition to the above, the meeting was also attended by representatives of the five other owner organizations for the Palo Verde Nuclear Generating Station which are: Southern California Edison Company, Salt River Project, Los Angeles Department of Water and Power, El Paso Electric and Public Service of New Mexico. At this meeting, the individual team members reported upon the areas examined and the significant findings in each area as detailed in this report.

The NRC management again reiterated their concern with regard to the quality controls exercised at the time of system turnover from construction to the APS startup organization and the apparent need for more definitive quality control by maintenance organizations. However, the NRC expressed general satisfaction with basic construction, particularly pipe welding, and the results of over 100 private but informal contacts with craftsmen and first-line inspectors.

The applicant expressed their intent to immediately and thoroughly followup on the NRC findings. Except for disagreement with the NRC finding regarding the readability of certain primary loop pipe radiographs, the applicant did not comment on the NRC findings at the time of this meeting and questions were generally oriented toward the clarification of issues.

On November 1, 1983, a meeting was held between the Section Chief, the Technical Assistant to the Regional Administrator, Mr. E. E. Van Brunt, APS Vice President of Nuclear Projects, Mr. J. A. Roedel, APS Corporate Quality Assurance Manager, Mr. D. B. Fasnacht, APS Nuclear Construction Manager and other members of the APS staff. The purpose this meeting was to discuss the additional facts obtained (during the last two days of the inspection) surrounding the more significant violations.

IV. Electrical and Instrumentation Construction

Objective

The primary objective of the appraisal of electrical and instrumentation construction was to determine whether safety-related components and systems were installed in accordance with regulatory requirements, SAR commitments, and approved construction specifications and drawings. Additional objectives were to determine whether procedures, instructions and drawings used to accomplish construction activities were adequate and whether quality-related records accurately reflect the completed work.

Particular attention was concentrated on the "A" train of the high pressure safety injection (HPSI) system to demonstrate specific areas within the broad categories of electrical and instrumentation construction. These areas include electrical raceway (cable tray and conduit) and raceway supports; electrical motors; electrical cable and cable terminations; electrical penetrations; instrumentation (sensors and logic); diesel generator; and onsite AC power distribution system and DC power system. Portions of the HPSI B train were also examined.

A. Electrical Raceways and Raceway Supports Areas Examined

1. Electrical Raceways

The NRC Team Inspectors examined approximately 1,690 feet of cable trays and 26 conduit runs. These raceways were inspected for: separation, proper identification and color coding, tray/conduit size and routing in accordance with design drawings, raceway bend radii conformance to criteria, bolted connection are tightness, weld conformance to applicable requirements, raceways free of debris and sharp edges, and installation and inspection documentation completeness and accuracy.

Findings

The inspection found that the raceways were in conformance with requirements regarding size, bend radii, bolting, welding, debris, sharp edges, general installation and inspection. However, deficiencies were identified in the areas of identification and separation, as indicated below. One instance of a damaged flexible conduit jacket repair is an open item and will be examined during a subsequent inspection.

- a. Temporary alphanumeric identification on cable tray 1EZAIDBTXF had not been replaced with permanent identification (OII 50-528/83-34-11).
- b. Nonsafety-related conduit 1EZADCNRQ506 for thermostat 1EQFNT1243C in HPSI A pump room was separated from safety-related group 1 junction box 1EZACCAKKJ03 by less than one inch (OII 50-528/83-34-12).
- c. At diesel generator E-PEA-G01 nonsafety-related flexible conduit 1EZG1ANRX11 at junction box 4 is in contact with safety-related flexible conduit 1EZG1AARR20 at junction box 6 (OII 50-528/83-34-13).

- d. Separation group 1 cable tray located in HPSI pump room A was not marked with red color identification (round emblems) between points 1EZACEATCBA and 1EZACCARCO3 (OII 50-528/83-34-14).
- e. The following separation group I conduits were not identified by alphanumeric markings (OII 50-528/83-34-15):
 - 1) Conduits 1EZJ1AARC12,-14 and -16, on both sides of the wall between group 1, 4.16 KV switchgear area and channel A remote shutdown panel area, at the 100 foot elevation.
 - 2) Conduit sleeves 1EZJ1BARC13, 14 and 15 on control building wall in channel B remote shutdown area, at the 100 foot elevation.
- f. Round blue identification emblems were missing from channel D conduit (PT-351) for a distance of approximately 40/50 ft at elevation 120' (OII 50-528/83-34-16).
- g. At diesel generator E-PEA-G01, vendor supplied nonsafety-related ALS flexible cable at junction box 14 could potentially move and come in contact with safety related flexible conduit 1EZG1AARX27 at junction box 7.
- h. The vinyl jacket on safety related flexible (anaconda metal hose type NWC), conduit ER1EZC1CARK13 inside containment was damaged and subsequently repaired in accordance with established procedures (Procedure for Raceway Installation, WPP/QCI 251.0, Revision 18, Section 5.10) by taping over the damaged vinyl with Scotch 33 tape (Unresolved Item 50-528/83-34-02).

2. Raceway Supports

The NRC Team examined 60 raceway supports. These supports were inspected for conformance to design drawings including: support spacing, configuration, location, mounting, material, support member size, and weld joints.

Findings

The raceway supports were found to be in general conformance with design drawings and regulatory requirements. The following deficiencies were identified:

- a. The bolted connections attaching tray 1EZA1BBTXCV to hanger H7 (drawing 13-E-ZAC-016 Rev. 20) were disconnected (OII 50-528/83-34-17).

- b. The as-installed configuration of the welds attaching the longitudinal bracing for hangers H212, H10, H11 and H12 on drawing 13-E-ZJC-044 Rev. 9 to embedded plates is not as specified by detail 21, alternate, on drawing 13-E-ZAC-043 rev. 18. In addition, slag remains on the referenced welds for hanger H12. The raceway installation cards for trays 1EZJ4AATXHA and 1EZJ4AATXHB indicate that these welds have been inspected and accepted by QC (OII 50-528/83-34-18).
- c. The fifth support from instrument rack 1JSBAA01 for conduit 1EZC1AARX-10 was found to contain welds which exhibited overlap, which is prohibited by AWS D1.1-72 (OII 50-528/83-34-19).
- d. The priming and painting of welds on raceway supports in channel c (green) riser room adjacent to cable spreading room at the 120 foot elevation was incomplete.
- e. The fourth support from junction box J-RCA-PT-190A for conduit 1EZCAAARX08 contains a damaged P1001A3 unistrut member which prohibits the full engagement of a unistrut spring nut within the unistrut channel.

B. Electric Motor Installation
Areas Examined

The NRC Team Inspectors examined a sample of installed electric motors within the HPSI system. The motors selected were two HPSI pump motors, IMSIAP02 (Train A) and IMSIBP02 (Train B); and 17 motor-operated valve motors included in the HPSI System (Trains A and B);

UV-617	HV-530	UV-673	HV-531	UV-647
UV-667	HV-604	UV-674	UV-626	
HV-699	UV-627	UV-616	UV-636	
HV-609	HV-698	UV-637	UV-646	

For the motors, the inspectors reviewed associated vendor drawings and documents, and plant maintenance, test, and installation records which define the design and installation methods for the equipment. A physical inspection of the installed equipment was performed to determine compliance to design requirements and vendor installation criteria, mounting, bolting, identification, nameplate date, location, grounding, and protection. The following documents and areas were reviewed: equipment specifications; purchase order documentation; vendor drawings and instruction manuals, including maintenance and installation requirements; seismic analysis or test and equipment qualification documentation, including special mounting and maintenance requirements; equipment maintenance records for warehouse, construction, and startup phases; warehouse records including receipt, storage, and release documentation; material receiving reports, including equipment certifications from vendors; electrical testing records for pre-operational phase; and associated quality control and installation records.

The power cables for the motors were inspected in the field and the terminations were examined at the motors. The routing of the cables for the HPSI motors and approximately one-third of the MOVs were traced back to their respective 4160 volt or 480 volt power sources to verify physical separation of trains, cable tray/conduit arrangement, and cable tray fill. Specific cable numbers are identified below in Section C, electrical cable installation.

Findings

The following deficiencies were identified:

1. It was found that the installation of the dowel pins in the motor mounting (following alignment), as required by the manufacturer, had not been installed. Doweling of the motor mounts could not be identified on the master list of items to be completed prior to fuel load. However, it was established that the maintenance division, charged with the installation of these dowel pins, was aware of this remaining requirement in the mounting of the HPSI pump motors and tools were ordered in August 1983 to perform the job.
2. HPSI pump 1MSIAP02 motor, ground cable hold-down clamp was missing.
3. Motor heater (M-SIA-P02H) nameplate missing at MCC 1EPHAM37.
4. There are no permanent identification signs at entrances to HPSI pump rooms, Train A and Train B.
5. Revision 3 of Specification SYS.80-PE-410 for the HPSI pumps is not contained in Purchase Order 9500088, as required. Revision 2 of the specification is included in the purchase order.
5. MOV nameplate error at MCC 1EPHAM33. The nameplate reads JSIA-UM-604, but should read 1J-SIA-HV-604.
7. Material Receiving Report 42220 is missing from Purchase Order 960-1231 for MOV 1JSIA-HV 604.

No items of noncompliance or deviations were identified.

C. Electrical Cable Installation

Electrical Cable Installation Areas Examined

The NRC Team inspectors selected a sample as listed below of installed electrical high and low voltage power, and control cables within the HPSI systems Trains A (and some in Train B) and the Class IE power systems. For each selected cable, the NRC inspectors reviewed associated drawings and documents which define the location, design route, and installation methods for cable installation within tray and conduit. A

physical inspection of the as-built cable installation was performed by inspecting the entire length of cable run between the associated equipment and its respective load center/control cabinet. The objective of the inspection was to ascertain compliance with design, installation, and quality assurance documents. During the course of the inspection, the following documents and areas were reviewed: elementary and cable block diagrams; cable code and cable scheme numbers; single line diagrams, cable type and identification, including separation color and cable markers; E580 computer program sorts for routing, identification of cables at tray points, actual and allowable tray fill at tray points, and size and type of cable; physical separation criteria, including raceway and tray designations; conduit and tray arrangement drawing; raceway installation cards; cable installation cards; and cable installation specifications. The physical inspection of the cable runs included a determination of size, type, routing, protection, separation, identification, loading, cable supports and cable spacing. The actual cable installation and routing was compared to the design as determined from the E580 computer program and the cable installation cards.

The installation was examined for the following power, control and instrument cables, totaling approximately 8680 feet for the HPSI system, Trains A and B and Instrument Channels A, B, C, and D.

<u>CABLES</u>	<u>EQUIPMENT</u>	<u>TO LOCATION</u>
1ESI01BC1CA	HPSI Pump/Motor B	1EPBBS04E
1ESI01AC1CA	HPSI Pump/Motor A	1EPBAS03E
1ERC65CC1XA	PT-102C	1ESACZ28I
1ERC65CC1XB	Penetration Z28	1JSBCC02A
1ERC65DC1XA	PT-102D	1ESFDZ77I
1ERC65DC1XB	Penetration Z77	1JSBDC02A
1EHC62CC1XA	PT-351C	1JSBCC02A
1EHC62DC1XA	PT-351D	1JSBDC02A
1ESI40BC1KA	V-609	1EPHBM3410
1ESI1BBC1KA	V-667	1EPHBM3608
1ESI39BC1KA	V-699	1EPHBM38C7
1ERC64AC1XB	PT-102A	1ESAAZ47I
1ERC64BC1XA	PT-102B	1ESFBZ38I
1ERC64BC1XB	Penetration Z38	1JZJBE02
1EHC61AC1XA	PT-351A	1JSBAC02A
1EHC61BC1XA	PT-351B	1JSBBC02A
1EPE01AC1CA	Diesel Generator	1JDGAB03
1EPE01AC1CB	1EPEAG01	1JDGAB03
1EPE01AC1CC	1EPEAG01	1JDGAB03
1ESI40AC1KA	MOV HV-604	1EPHAM3305
1ESI39AC1KA	MOV HV-698	1EPHAM3708
1ESI40AC1RA	MOV HV-604	1EPHAM3305
1ESI39AC1RA	MOV HV-698	1EPHAM3708

<u>CABLES</u>	<u>EQUIPMENT</u>	<u>TO LOCATION</u>
1ESI21AC1RC	Penetration Z46	1EPHAM3512
1ESI21AC1RB	MOV UV-673	1EPHAZ461
1ESI21AC1KA	Penetration Z46	1EPHAM3512
1ESI21AC1KB	MOV UV-673	1EPHAZ461
1EBC64BC1XD	Remote Shutdown Pnl.	1JSBBC02A
1ESB01AC1RM	Distrib. Pnl. (1EPNA-D25)	1JSBAC02B
1ESB01AC1RS	Distrib. Pnl. (1EPNA-D25)	1JRMAB02B
1EPNO2AC1RB	Isolat'n. Pnl. (1JSAA-C04)	1EPNAN11

Findings

Cable installation activities were found to be in conformance with requirements. Two apparent violations were identified in this area.

1. Scaffolding lumber was found stored in channel C electrical raceway/cable chase located in the lower cable spreading room at the 120 foot elevation (OII 50-528/83-34-20).
2. In tray 1EZJ4AATSCE, cables are projecting above the level of the tray siderails, and are in physical contact with fire protection piping and two HVAC ducts (OII 50-528/83-34-21).

In addition to the violations, the following two concerns were identified:

1. While inspecting the traceability of Anaconda 5 KV cable, it was found that the identification, required to be permanently marked on the outer jacket of the cable at three-foot intervals, could easily be rubbed off. This resulted in the cable jacket markings becoming illegible following handling during installation.
2. Traceability of 5KV cable was found to lack clarity. The cable is received on site from the vendor under a material receiving record (MRR) which identifies the cable, vendor and receiving cable reels. Following receipt, the vendors cable reels are assigned Bechtel cable reel numbers for storage and future processing. The Bulk Material Inventory (computer readout), the principle cable record, correlates Bechtel cable reel numbers to vendor reel numbers, but does not list the MRR numbers under which the vendor cable reels were delivered. Therefore, it is difficult to trace cable directly from the Bechtel storage reels to the material receipt records.

D. Cable Terminations

The NRC Team inspectors examined the terminations of 31 cables identified above under cable installation. The terminations at both ends of the cables were inspected for: cable terminations as shown on engineering documents, identification with enclosure, separation, size of conductor, tie-down, bend radius, grounding of cable shield, disposition of spare wires, proper size terminal lugs, neatness and workmanship, and installation and inspection documentation.

Findings

Except as noted below, cable terminations were found to be in conformance with requirements. The following deficiency was identified:

1. Electrical installation, Specification EM-306, Section 7.2R, requires spare wires in a cable to be coiled and insulated with tape or a shrink sleeve. The end of green/black tracer, spare wire cable ESI21AC1RC at EPHAM3512 was bare and not insulated. The quality of insulating the ends of other spare wires was inconsistent and insecure in some instances. No items of noncompliance or deviations were identified.

E. Electrical Penetrations

Areas Examined

The following installed containment electrical penetration assemblies were inspected:

<u>Number</u>	<u>Elevation</u>
Z28	100-foot
Z38	100-foot
Z46	120-foot
Z47	120-foot
Z77	120-foot

The location, type, mounting, and identification were compared with the installation drawings. The cable terminations at the penetrations were examined both inside and outside of containment. The QC records associated with receiving, storage and installation of these penetrations were also reviewed.

Finding

Activities observed and documentation reviewed indicated work performed in this area was in accordance with requirements. No items of noncompliance or deviations were identified.

F. Electrical Instrumentation

Areas Examined

The actuation of HPSI is initiated from either of two parameters (four channels); low-pressurized pressure and high containment pressure. The four pressurizer low-pressure transmitters, PT-102A, 102B, 102C and 102D; and the four containment high pressure transmitters, PT-351A, 351B, 351C, and 351D were inspected in the field.

These pressure transmitters were inspected for proper mounting, physical separation, identification of correct instruments and safety channel (color code), instrument calibration, etc. The stainless steel tubing runs were traced from the transmitters back to the containment isolation/root valves to verify; proper grade (slope) and tubing support.

The instrument cabinets and panels were inspected for technical requirements as contained in the Procurement Specifications 13-JM-200 (COMSIP, Inc) and 13-EM-022 (HARLO Corp.), and Installation Specification for Instrumentation and Control Equipment, 13-JM-702, Revision 8. The physical inspection also included inspection of internal wire routing and separation, cable marking (identification), termination connections, module mountings, overall workmanship, and cleanliness. Operator controls and displays for the HPSI system were examined at the B02 and B05 main control room benchboards. The interface between the HPSI system and remote shutdown panel was also examined.

The following engineered safety features (EPSI) systems cabinets and instrument panels were inspected:

1. WSSS Analog Instrument Cabinets A, B, C, and D:

1-J-SBA-C02A 1-J-SBB-C02A 1-J-SBC-C02A 1-J-SBD-C02A
1-J-SBA-C02B 1-J-SBB-C02B

2. Plant Protection System Cabinets A, B, C, and D:

1-J-SBA-C01 1-J-SBB-C01 1-J-SBC-C01 1-J-SBD-C01

3. Main Control Room Panels:

1-J-RMA-B02 1-J-RMB-B02 1-J-RMC-B02 1-J-RMD-B02
1-J-RMA-B05 1-J-RMB-B05 1-J-RMC-B05 1-J-RMD-B05

4. ESFAS Auxiliary Relay Cabinets A and B:

1-J-SAA-C01 1-J-SAB-C01

5. BOP ESFAS Cabinets A and B:

1-J-SAA-C02A 1-J-SAB-C02A 1-J-SAA-C02B 1-J-SAB-C02A

6. Isolation Cabinets A, B, C, and D:

1-J-SAA-C04 1-J-SAB-C04 1-J-SAC-C04 1-J-SAD-C04

7. Status Display Panel Inserts A and B:

1-J-ESA-C01 1-J-ESB-C01

8. Remote Shut Down Panel Sections (HPSI Valve Controls):
1-J-ZJA-E01 1-J-ZJB-E01 1-J-ZJC-E01 1-J-ZJD-E01

The following quality control records for the HPSI instrument systems were examined: purchasing/receiving records, storage/maintenance records, installation records, cable installation, and termination records.

Findings

Inspection of instrumentation revealed a significant violation which reflects a weakness in the preoperational/startup test program:

1. The sensing lines for the four channels of containment pressure (PT-351A, 351B, 351C and 351D) were found to be capped immediately inside containment. The sensing lines were capped with threaded pipe caps and could only be removed with the aid of a pipe wrench. The presence of these pipe caps made this system inoperative. There were no records to indicate when the caps were installed. The inspectors were unable to determine whether the caps were installed by construction or preoperational personnel. It was not apparent that any preoperational or startup program action would have assured the removal of the caps prior to plant operations. This is an apparent violation (OII 50-528/83-34-22).

In addition to the apparent violation identified above, three items of concern were identified:

1. The instrument sensing line support shown in Detail 1 on Drawing 13-J-01D-105, Revision 4 has a weld which contains undercut measuring approximately 1/32-inch in depth. The 1/32-inch value does not satisfy the requirements of the .01-inch criteria for undercut transverse to the primary tensile stress of the member in question as stated in AWS D1.1-72, Revision 1973 as defined in specification 13 CM 320.
2. An internal separation barrier cover was missing from remote shutdown panel 1JZJBE01, and no status tag noting its removal was observed.
3. It was found that temporary nonconformance report hold tags for level transmitters LT 1123A and LT 1124A at the 100 foot elevation inside containment were reversed.

G. Emergency Diesel Generator
Areas Examined

The electrical aspects of the Emergency Diesel Generator 1, 1EPEAG01, including control cabinet wiring, were inspected for location, mounting, separation, protection, and identification.

Findings

These reviewed aspects indicated work was performed in accordance with installation requirements. Some minor deficiencies that were found in raceways (flexible conduit) separation were address under raceway and support section of this report Paragraph IV.A-1. No other violations or deviations were identified.

H. Onsite AC Power Distribution System
Areas Examined

The NRC inspector examined the following components of the Class I 4160-volt and 480-volt power distribution system:

1E-PBB-804	4.16 KV switchgear, separation group 2
1E-PBA-803	4.16 KV switchgear, separation group 1
1E-PGA-L35	480 V switchgear, separation group 1
1E-PGA-L33	480 V switchgear, separation group 1
1E-PHA-M33	480 V MCC, separation group 1
1E-PHA-M35	480 V MCC, separation group 1
1E-PHA-M37	480 V MCC, separation group 1
1E-PHB-M34	480 V MCC, separation group 2
1E-PHB-M36	480 V MCC, separation group 2
1E-PHB-M38	480 V MCC, separation group 2

The 4160-volt switchgear, 480-volt switchgear and 480-volt motor control centers (MCC) were inspected and compared to installation drawings relative to configuration, location, mounting, identification, installation documentation, and protection.

Findings

Inspection of this area revealed three apparent violations related to cabinet installation and electrical separation:

1. It was found that 87 3/8-inch bolts were missing from the base frames for the six separation groups 1 and 2 motor control centers identified. The failure to identify this condition, adverse to quality, is an apparent violation (OII 50-528/83-34-23).
2. In 4160-volt switchgear cubicle E-PBA-503L nonsafety-related flexible conduit 1EZJ1ANRR52 is separated from safety-related wiring by less than 1 inch which does not satisfy the separation requirements (OII 50-528/83-34-24).
3. In 4160-volt switchgear cubicle E-PBA-503K nonsafety-related flexible conduit 1EZJ1ANRR51 is separated from safety-related wiring by less than one inch, contrary to separation criteria (OII 50-528/83-34-25).

In addition to the violations noted above, two items of concern were identified:

1. An error was found in the identification of compartment 05 of MCCEPHAM33 on drawing 13-E-PHA-003. Long term cooling valve JSIAHV604 was identified as JSIAUV604.
2. It was found that three cubicle tie-down bolts in MCC 1E-PHA-M35 were not fully engaged. The licensee had in progress design change package (DCP) 1SE-PH-035 requiring certain modifications to the tie-down method for the above identified MCCs. These modifications were required to assure the MCCs comply with the seismic analysis requirements.

I. DC Power System
Areas Examined

The four main DC batteries, battery chargers, and Vital AC bus inverters were inspected for electrical separation aspects, fluid levels, termination connections, bolting materials, spacers, mounting arrangements, and general workmanship and cleanliness. Equipment that was inspected is identified in the following list:

DC Batteries and Mounting Racks A, B, C, and D:
1-E-PKA-F11 1-E-PKB-F12 1-E-PKC-F13 1-E-PKD-F14

DC Battery Chargers A, B, C, and D:
1-E-PKA-H11 1-E-PKB-H12 1-E-PKC-H13 1-E-PKD-H14
1-E-PKA-H15 1-E-PKB-H16

Vital AC Bus Inverters A, B, C, and D:
1-E-PNA-N11 1-E-PNB-N12 1-E-PNC-N13 1-E-PND-N14

Technical requirements for the batteries, battery chargers, and inverters contained in Procurement Specifications 13-EM-050 for Exide, 13-EM-051 for Power Conversion Products, Inc., and 13-EM-054, respectively, were reviewed.

Each battery was physically inspected for adequate fluid levels, conductor termination connections, bolting materials used, and absence of battery case cracks. Each battery rack was inspected for battery-to-end plate spacing, battery-to-battery spacers, alignment of frame spring-nuts, and frame welding to the battery room floor imbeds. The location, floor mounting, panel displays, and electrical conduit configuration for each battery charger and Vital AC inverter were inspected.

Revisions 0 and 1 of the FM-410 Startup Generic Maintenance Procedure for Station Batteries were reviewed for technical requirements and test acceptance criteria. Records were inspected for each of the four safety-related batteries, such as on-site receiving records, mid-1981 test results during warehouse storage, and periodic maintenance test result records during construction for the period from February 1982 through September 1983.

Installation, in-site modification, and periodic maintenance records for each battery charger, and Vital AC inverter (prior to turnover to Startup) were also inspected.

Findings

The following deficiencies were identified:

1. The batteries were received on site during the summer of 1981. It was found that no procedure existed for performing the required periodic tests (IEEE Std. 308) to maintain the batteries. The required procedure came into effect in the spring of 1982. This item was the subject of a violation during the team inspection of 1981.

2. The earliest maintenance records are for August 1981, and proceed monthly through November. However, no records can be found for December 1981 and January 1982.
3. The storage of periodic maintenance records did not satisfy the storage requirements of Section 1.8 of the FSAR. These records, required to be stored in a manner which minimizes the risk of destruction from fire, were found stored in a paper-board box. A licensee representative stated that this was temporary for field use.
4. No records exist to indicate that baseline annual cell-to-cell and terminal detail connection resistance data was ever recorded during factory acceptance tests for these batteries. However, the licensee startup generic test procedure addresses the requirement to record intercell resistance checks, during preoperational testing.
5. It was found that the vendor testing (at the factory) of battery C did not completely fulfill the discharge rate requirements. However, the licensee identified this, at the time, by issuing supplier deviation disposition request (SDDR) 2763 which requires the capacity discharge test to be run on the job site. This test is scheduled to be accomplished by the startup group during preoperational testing.

V. Hangers and Supports, Snubbers and Restraints

A. Areas examined

1. Hardware: The inspector examined all pipe hangers, supports, snubbers, and restraints on the HPSI A piping system from the start of suction line SIA-008-GCBC-10-inch through discharge lines SI-A-100-CCBA-4 inch were and SI-A-106 CCBA-3-inch, throughout the 40-foot elevation, up through the vertical pipe chase to the 89-foot elevation pipe chase. At this juncture, one of the five injection branch lines, SI-E-176-CCBA-3", was followed to the injection point and all pipe supports, hangers, snubbers, and restraints were examined. Additionally, miscellaneous branch lines from the HPSI discharge path were examined for supports (to the first isolation valve on the branch). Additionally, a few supports not involved in the line description above were examined if a condition was noted which warranted follow up. All supports examined are listed in Table V-1.

In most cases, pipe insulation was removed for inspection. In those cases where a support was only partially examined, Table 1 so notes. These cases generally fall into the following conditions:

- Insulation not removed. This condition precluded examining pipe lug welds only. The hanger members and welds are not covered by insulation and can be thoroughly inspected.
- Lug welds only. In these cases, the inspector examined only the lug welds to increase the sample of lug welds by inspecting supports which were not on the selected branch line, but were part of HPSI-A.
- One aspect only (e.g., "base plate only"). In these cases, the support was not included in the lines selected but was partially examined because a condition warranting follow up was noted.
- Location and configuration only. These cases involved a series of replicate supports in a horizontal run. The location of the support and the configuration were checked against drawing requirements, and support member sizes and weld sizes were checked by visual examination rather than by measurement.

All other supports were examined fully.

The inspector examined the supports to determine that:

- . All supports shown on the piping isometric drawings were installed.
- . No additional supports were installed.
- . The support configuration was as shown on the support drawing.
- . The support member material was per the drawing.
- . The welds on the support were the correct size and met the applicable code and standard requirements.
- . The welded attachments to piping were per drawing.
- . The attachment welds to pipe were per drawing and met code and standard requirements.
- . Mechanical snubbers and restraints were installed where required by drawing.
- . The snubber and restraints were the proper size (load rating).
- . The snubbers and restraints had the proper cold setting shown on the drawing.
- . The supports were properly located per the drawing relative to the piping and the structure.

There are a total of 116 pipe supports involved in all of the HPSI-A system. The inspector examined 68 supports or about 60 percent. Of the 68 supports examined 14 supports had one or more problems. This is about a 20 percent reject rate. The problems identified are discussed in the "Findings" section below.

2. Drawings, Specifications, and Procedures

The inspector gathered and reviewed the applicable piping drawings, hanger drawings, specifications, work and inspection procedures, and pertinent vendor information.

Other safety-related documentation, including documents, authorizing deviations from the drawings, records of hanger inspection by QC, non-destructive examination records, welding inspection records, nonconformance reports, vendor certification records, code reports, and piping spool fabrication records were reviewed as they were identified in the pursuit of questions raised on a particular support's apparent anomalies.

The inspector also reviewed the FSAR and ASME codes for applicable requirements.

The documents discussed above will be listed and specifically addressed only as they apply to findings, discussed in the "Findings" section below.

3. Tools

The inspection was conducted utilizing unaided visual examination, tape measure, weld gages, angle finder, and adequate lighting. Safety equipment was utilized as required. No NRC independent non-destructive examination was performed on the pipe supports due to other priorities. In the one case where the visual inspection indicated a possible weld defect, the inspector requested the licensee reexamine the weld using liquid penetrant examination. The inspector observed the entire performance of the examination.

B. Findings

Table V-1 lists all supports inspected and shows which supports were found unsatisfactory and provides a brief description of the problem(s) found.

The problems found group into four areas which are considered apparent violations of NRC regulations. Each problem identified in Table V-1 is explained more fully below.

- (1) Failure of the pipe support QC personnel to identify support conditions which are not in accordance with drawing or specification requirements (five examples).

10 CFR 50, Appendix B, Criterion 5, requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, and drawings, and shall be accomplished in accordance with these instructions.

The licensee's procedure WPP/QCI 201.1, Revision 18, dated May 25, 1983, "Nuclear Pipe Hangers and Supports Installation," Appendix I, requires the Piping QC Engineer to verify each completed task on the "CIP for Nuclear Pipe Supports." The inspection requirement for Task 1 is to verify the support assembly correct per approved engineering drawings and specifications.

- . Support SI-100-H003 was found with a loose pipe clamp and installed at an angle of $4\ 1/2^\circ$ from vertical. Procedure WPP/QCI 201.1, paragraph 8.9, requires the clamp to be snug on the pipe. Procedure WPP/QCI, paragraph 9.2.7.1, requires the angle to be no greater than 2 degrees. The support was accepted by QC on November 20, 1983.
- . Support SI-100-H005 was found with the drawing specified dimension of $3\ 3/4$ inches between the centerline of the pipe stanchion and the centerline of the insert plate to be actually $7\ 1/2$ inches. This difference exceeds the tolerances of ± 2 inches paragraph 9.3.12 of the WPP/QCI. The support was accepted by QC on November 13, 1981.
- . Support SI-100-H036 was found in a condition which did not match the hanger drawing and modifying Field Change Request (FCR) 15, 123P. Item D of the FCR was not installed. The support was accepted by QC on October 22, 1983 to the drawing and FCR.
- . Support SI-101-H00A was found with a loose jam nut on Item 61, the sway strut assembly. The support was accepted by QC on October 2, 1981.
- . Support SI-106 H001 was found with the 2" long pipe lugs, Item 38, bearing on the supporting steel for only $3/16$ inch and $7/16$ inch, respectively. Paragraph 9.4.1 of the WPP/QCI indicates full bearing surface should be provided as indicated on the support drawing. The support was accepted by QC on May 23, 1980.

The failure of pipe support QC personnel to identify pipe support conditions which were not in accordance with drawing or specification requirements is an apparent violation of NRC regulations (OII50-528/83-34-01).

- (2) Failure of the welding QC personnel to identify weld conditions which are not in accordance with the drawing or the welding code requirements (eight examples).

10 CFR 50, Appendix B, Criterion 5, requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, and drawings, and shall be accomplished in accordance with these instructions.

Licensee's procedure WPP/QCI 201.1, Revision 18, dated May 25, 1983, "Nuclear Pipe Hangers and Supports Installation," Appendix I, requires the Piping QC Engineer to verify each completed task on the "CIP for Nuclear Pipe Supports."

The inspection requirements for Task 8 require the welding QCE to verify that field welding is complete. For Task 9, he is to verify the vendor welding was checked for size and length. The instructions to the QCE in Appendix I instruct the QCE to verify welding acceptability.

Support SI-100-H005 was found with an underfill condition in the stanchion, Item 30, to pipe weld. The weld is required to be a 5/16-inch fillet weld. The actual fill was measured to be 1/4 inch. The weld was accepted on the field weld check list on November 9, 1981.

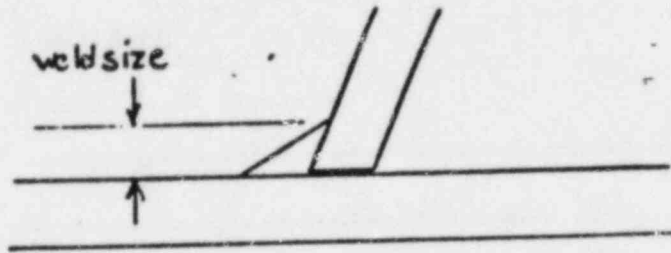
Support SI-100-H010 was observed to have an apparent lap in the weld of Item 38 to the pipe. This was a vendor weld. Minor slag was also present in the toe of the weld. These conditions would have precluded a satisfactory liquid penetrant examination by the vendor. The vendor records show the weld was liquid penetrant examined and accepted on December 4, 1977 (Job 2810, Piece 1-SI-100-S-009, "F" No. 261). The NRC inspector had the visual indication on the weld reexamined by licensee personnel by liquid penetrant examination in his presence. The liquid penetrant examination resulted in an unacceptable linear indication.

The vendor weld had been last inspected by site QC personnel per Task 8 on June 17, 1981, and was accepted.

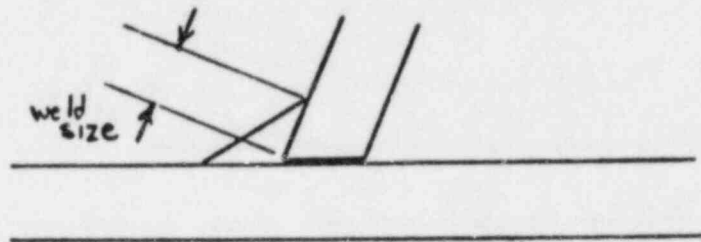
- Support SI-100-H015 has the lug, item 38A, field welded to the pipe. The weld was 1/32-inch undersize. The welds were originally accepted on January 22, 1979, and were accepted again during the support inspection on October 28, 1981.
- Support SI-100-H034 was found with one undersized vendor lug weld (Item 38 to the pipe). The weld was required to be a 1/4-inch fillet and measured to be 3/16 inch. The vendor welds were checked by site QC for size and accepted on September 11, 1982.
- Support SI-102-H00B was found with several weld problems. The vendor weld of Item E to Item B was required to be a 3/16-inch fillet, but was 1/8 inch on three sides. Additionally, there was rollover (or laps) at the corners. The field weld of Item C to existing structure was required to have one-inch end returns on the welds, but did not. The vendor weld was accepted by site QC on August 18, 1981. The field weld was originally accepted on October 14, 1980, and was accepted again on August 18, 1981.
- Support SI-106-H011 was found with the pipe lug welds (Items 38 and 38A to pipe) closer than 1 inch to the adjacent pipe-to-pipe circumferential weld. The actual distance was 3/4 inch. Specification 13-PM-204, "Field Fabrication and Installation of Nuclear Piping Systems," paragraph 12.2.9, states that welded attachments shall not be installed within 1.0 inch of existing circumferential welds. The field lug welds were originally accepted on February 12, 1979, and again during final support acceptance on October 2, 1980.
- Support SI-176 H001 was found with an undimensioned weld on the drawing, therefore, the proper size of the weld could not be properly verified by the QC inspector. The 3-inch long fillet field welds of Item 84 to Item B are not dimensioned on the support drawing 13-SI-176-H001, Revision 1. The welds were originally accepted on December 18, 1980, and were accepted again on September 15, 1982.
- Support SI-176-H003 was found to have an undersize weld. The skewed (120-degree) fillet weld of Item A to the containment insert plate measured 1/4 inch rather than the required 5/16 inch. The support weld was accepted on July 14, 1980.

Further discussions with the Lead QC Engineer for Pipe Supports and the Lead Welding Engineer disclosed that the Welding Engineer had given verbal instructions to the QC Engineer that were contrary to the AWS D.1.1 code requirements for measuring the size of skewed fillet welds. Hence, this undersize weld may be considered caused by improper engineering information. It follows that all skewed fillet welds may require reinspection to the proper criteria.

The AWS D.1.1 Code 1974 shows, in Figure 2.7.1, that skewed fillet welds are measured thus:



At Palo Verde the QC Engineer states weld are "measured" as shown below (it is not clear how this is "measured" since there is no access to one of the measurement points):



To "measure" by the Palo Verde method to a given size (e.g., 5/16 inch on a 120-degree weld) will result in an undersize weld by the Code definition (in this case by 3/64 inch). Nonetheless, QC inspectors are required by WPP/QCI 201.1 to inspect to AWS D.1.1 criteria for this weld. The AWS D.1.1 criteria are clear and are not superceded by verbal instructions from engineering.

The failure of welding QC to identify pipe support weld conditions which are not in accordance with the drawing or welding code requirements is an apparent violation of NRC regulations(OII 50-528/83-34-02).

(3) Failure of engineering to include a non-safety loads in a safe related pipe support calculation (one example).

10 CFR 50, Appendix B, Criterion 5, requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures and drawings and shall be accomplished in accordance with these instructions.

Specification 13-PM-204, Revision 12, Paragraph 12.1.2 dated April 7, 1983, states the design and location of all pipe supports shall be the responsibility of project engineering. Paragraph 12.1.4 states pipe supports designed by engineering will be shown on drawings and all design details will be shown including miscellaneous steel.

Support SI-100-H-012 was found with a miscellaneous steel member installed which was used as a support for an Instrument Air Line. The miscellaneous steel was not shown on the pipe support drawing, 13 SI-100-H-012, Revision 1. The drawing does show the engineering design loads used in the analysis of the pipe support and the applicable calculation number (Problem No. 513-E, point number 293).

Engineering was contacted by telephone, and the responsible engineer stated that the loads from the miscellaneous steel member used as an instrument air support (IA-116-H00A) were not included in the design load for the pipe support, SI-100-H-012.

The engineer stated that loads were inconsequential (29 pounds) and the instrument air calculation had been annotated to state that the attachment to the Safety Injection Support was satisfactory. Nonetheless, he stated the procedure requires the safety injection support calculation be amended to include such loads. The failure of engineering to include a nonsafety design load in a safety-related pipe support calculation is considered an apparent violation of NRC regulations.

(4) Failure to maintain an accepted pipe support in an acceptable condition

Appendix B, of 10 CFR 50, Criterion II, as implemented by Chapter 17 of the PSAR and FSAR requires in part that "The quality assurance program shall provide control over

activities affecting the quality of the identified structures, systems, and components, to an extent consistent with their importance to safety".

Support SI-089-H008 was found with rubber seal material injected in the space by the Flourogold slides plates, Items 54 and 55 on the drawing. The drawing does not show rubber sealant material. It is probable that the material was inadvertently injected after the support inspection on November 29, 1979, but the material had been neatly trimmed away and the edges painted in the area painting.

The failure to provide control over activities affecting quality, resulting in a challenge to the sliding function of support SI-089 H008 is considered a violation (OII 50-528/83-34-03).

TABLE V-1

<u>SUPPORT</u>	<u>TYPE</u>	<u>FINDING</u>	<u>PROBLEM DESCRIPTION</u>	<u>DEGREE OF INSPECTION</u>
1. SI 008 H001	E	Sat		Full
2. SI 008 H002	ES	Sat		Full
3. SI 008 H003	S	Sat		Full
4. SI 008 H004	SNB	Sat		Full
5. SI 008 H005	S	Sat		Full
6. SI 089 H008	S	Unsat	Penetration Seal Material on Slide Plate	Slide Plate only
7. SI 099 H001	SNB	Sat		Full
8. SI 099 H002	S	Sat		Full
9. SI 100 H001	S	Sat		Presence only - seal boot on
10. SI 100 H002	S	Sat		Full
11. SI 100 H003	S	Unsat	(1) Loose clamp (2) Excessive Angle	Full
12. SI 100 H004	S	Sat		Full
13. SI 100 H005	S	Unsat	(1) Location dimension varies more than allowed (2) Lack of fill on stanchion to pipe field weld	Full
14. SI 100 H006	S	Sat		All but lug welds
15. SI 100 H007	SNB	Sat		Full
16. SI 100 H008	S	Sat		Full
17. SI 100 H009	S	Sat		All but lug welds
18. SI 100 H010	S	Unsat	PT accepted (by Vendor) w. lap and slag	Full
19. SI 100 H011	S	Sat		Full
20. SI 100 H012	S	Unsat	Nonsafety hanger loads not included	Full
21. SI 100 H013	S	Sat		Full
22. SI 100 H015	S	Unsat	Lug weld size	Full
23. SI 100 H016	S	Sat		Full
24. SI 100 H017	S	Sat		Full
25. SI 100 H018	S	Sat		Full
26. SI 100 H019	S	Sat		Full
27. SI 100 H020	SNB	Sat		Full
28. SI 100 H021	S	Sat		Full
29. SI 100 H022	S	Sat		Location/ Configuration/ Clearances only
30. SI 100 H023	S	Sat		"
31. SI 100 H024	S	Sat		"
32. SI 100 H025	S	Sat		"
33. SI 100 H026	S	Sat		"
34. SI 100 H027	S	Sat		"
35. SI 100 H028	S	Sat		Full

36.	SI 100 H029	S	Sat		All but pipe lugs
37.	SI 100 H031	S	Sat		Lug welds only
38.	SI 100 H032	S	Sat		Lug welds only
39.	SI 100 H034	S	Unsat	Undersize lug weld	Full
40.	SI 100 H035	S	Sat		Lug welds only
41.	SI 100 H036	S	Unsat	Configuration differs from drawing	Full
42.	SI 101 H00A	SS	Unsat	Loose Locknut	Lock nut only
43.	SI 102 H00A	S	Sat		Full
44.	SI 102 H00B	S	Unsat	Welds deficient (Undersize weld, rollover, no end returns)	Full
45.	SI 105 H00B	S	Sat		Full
46.	SI 105 H00C	S	Sat		Full
47.	SI 105 H00D	S	Sat		Full
48.	SI 105 H00E	S	Sat		Full
49.	SI 106 H001	S	Unsat	Lack of Lug Contact area with support members	Full
50.	SI 106 H002	S	Sat		Full
51.	SI 106 H003	S	Sat		Full
52.	SI 106 H004	S	Sat		Full
53.	SI 106 H005	S	Sat		Full
54.	SI 106 H006	S	Sat		Full
55.	SI 106 H007	S	Sat		Full
56.	SI 106 H008	SNB	Sat		Full
56.	SI 106 H009	S	Sat		Full
57.	SI 106 H010	S	Sat		Full
58.	SI 106 H011	S	Unsat	Pipe lug weld w/in 1" of circumferential weld	Full
59.	SI 106 H012	S	Sat		All but pipe lugs
60.	SI 106 H013	S	Sat		All but pipe lugs
61.	SI 106 H014	S	Sat		Full
62.	SI 106 H015	S	Sat		Full
63.	SI 106 H016	S	Sat		Full
64.	SI 106 H023	S	Sat		Full
65.	SI 176 H001	S	Unsat	Undimensioned weld on drawing	Full
66.	SI 176 H002	S	Sat		Full
67.	SI 176 H003	S	Unsat	Undersize fillet weld	Full
68.	SI 176 H004	SS	Sat		Full

LEGEND

S = Support
SS = Restraint (Sway Strut)
SNB = Snubber

VI. PIPING SYSTEMS INSPECTION

Approximately 826 feet of HPSI-Train A piping was selected for inspection. Inspection was performed on 64 percent, which represents 530 feet of the HPSI piping, to verify compliance with the isometric drawings and ASME Section III requirements. This included 64 feet of piping on the suction line of HPSI pump A; the balance of piping inspected was on the discharge lines located in the auxiliary and containment buildings respectively. Piping system inspection includes visual inspection of pipe welds, welder qualifications, piping size and quality, and valve installation.

A. Piping System Welds

1. Areas Examined

Visual inspection of 200 pipe welds, out of a total of approximately 900 weld joints (pipe and socket) in the entire HPSI systems was made for quality and compliance with ASME Section III requirements. Characteristics examined included weld surface appearance, location, weld reinforcement, and absence of surface defects including cracks, lack of fusion, porosity, slag and undercut exceeding prescribed limits.

The records associated with one percent of the total welds were reviewed in detail and compared with the information obtained at the weld joint. Records examined included certified material test reports, piping class sheets, Bechtel's Form 84 which specifies the welding and nondestructive examination requirements for field erected piping, welder qualifications, field welding check list, and filler material certifications.

2. Findings

The type of pipe weld joints examined included pipe-to-pipe, pipe-to-fittings and pipe-to-valves. The visual inspection of these weld joints and the associated records reviewed indicated that the components were welded together by qualified welders using qualified filler materials and qualified welding procedures, the components being joined were certified, that the base material and the filler material were compatible for welding, and the required nondestructive examinations and weld inspections were performed. No items of noncompliance or deviations were identified.

B. Piping

1. Areas Examined

Field inspection activities included visual examination of the 530 feet of piping. This was to assure that the installed piping was as specified on the design drawing, and that the piping was reasonably straight, had a workmanlike finish and was free from injurious defects such as mechanical marks, abrasions and pits.

2. Findings

Inspection of piping quality revealed one section of pipe to have mechanical marks. This was identified on pipe spool 28 line number A106-CCBA, adjacent to pipe-to-valve weld number W025. The quality control instruction, WPP/QCI No. 204, Revision 3, "Piping Systems Release for Insulation," Appendix I, requires that piping systems, prior to insulation, be checked for surface damage by the quality control engineer. Any unacceptable surface damage is then required to be documented on the construction inspection plan (CIP), and then evaluated in accordance with procedure ED-1, entitled "Elimination of Defects". The CIP for the pipe spool in question did not identify any unacceptable surface damage on this system. The main concern was whether the pipe minimum wall thickness requirements were violated. The Licensee initiated NCR No. SM 2976; the pipe was re-inspected and dispositioned "accept-as-is" in accordance with the acceptance standards specified in ED-1. In this case minimum wall had not been violated.

Also during this examination of pipe quality the inspector observed an apparently unacceptable pit-like defect on the outer-surface of pipe spool SI-008-S002 adjacent to pipe support SI-008-H002. The pit was unusual in that it did not appear to be typical mechanical damage or a typical welding arc strike. It appeared to be a minor blow hole from the original pipe manufacturer. The pit appeared to violate minimum wall requirements. The inspector requested the Licensee to have the pipe hanger removed for access to the pipe pit; measurements were taken by the piping QC engineer in the presence of the NRC inspector with a calibrated pit gage. The pit was measured to be 0.059 inches deep. The allowable minimum wall for pipe spool SI-009-S 002 is 0.219 inches and the remaining wall (calculated from nominal wall) is 0.191 inches. Therefore the pit represents an underwall condition requiring an engineering evaluation.

Procedure WPP/QCI 204, Revision 2 "Piping Systems Release for Insulation", requires the final inspection of piping to be performed by a piping QC engineer prior to covering the pipe with insulation. Paragraph 3.1 of Appendix 1 requires an inspection for surface damage per specification (ED-1). The specification "Welding Standard ED-1 Elimination of Defects" states in paragraph 4.3 that defects may be removed provided wall thickness is not reduced below the minimum specified.

The pipe spool was inspected in accordance with the above and improperly accepted on November 14, 1982, as certified on the Piping Release No. 301-398. The failure of the piping QC engineer to identify an unacceptable defect during the piping inspection prior to insulation is considered an apparent item of noncompliance. (OII 50-528/83-34-04)

C. Valves

1. Areas Examined

All valves in the HPSI A train were examined during the walkdown inspection for compliance with the isometric drawing; specifically to assure proper valve size, location, type, orientation and installation. In addition, torque verifications were performed on a few selected valves to assure that the torque values were within the valve manufacturer's acceptable range.

2. Findings

Inspection of this area revealed three instances which are apparent violations, indicating a weakness with the preoperational test/startup program.

- (a) During the inspection of valve No. 470 on the suction side of the HPSI pump "A", it was observed that the manual operator assembly was totally disconnected from the valve and resting on the sprinkler system piping. There was no documentary evidence to indicate that maintenance was being performed on the operator assembly. It does not appear that the preoperational testing program organization was fully cognizant of the valve's unsatisfactory status nor were procedures being applied which would assure control of this activity. Neither the valve or the operator had been recorded as deficient or nonconforming. The failure to control activities affecting quality is an apparent violation. (OII 50-528/83-34-05)

- (b) Three additional adverse conditions were identified on valve No. 470. First, visual examination revealed that the bonnet was leaking; second, that one stud nut was missing from one of the studs connecting the bonnet to the valve body. These two conditions resulted in the inspector's request for torque verification on the stud nuts. The torque verification revealed a number of loose stud nuts which connect the bonnet to the valve. This third item, failure of the stud nuts to meet the torque requirements specified on the design drawings, represents a condition adverse to quality, and is an apparent violation. (OII 50-528/83-34-06)
- (c) Valve No. 402 was found with the position indicator positioned so that the valve could only be opened about 30-35 percent. There was no documentary evidence to indicate that maintenance was being performed or that the licensee was aware of the condition of the valve. Preoperational testing was being conducted on this subsystem. The failure to identify this condition adverse to quality, is an apparent violation. (OII 50-528/83-34-07)

D. Welder Qualifications

1. Areas Examined

Bechtel specification WQ-1, Revision 17, of March 10, 1983, "Welding Standard Performance Specification," was examined. This specification describes the requirements for determining the ability of welders to make acceptable welds. The Welding Test Lab where welder performance qualifications are performed was examined for compliance with WQ-1 and ASME Section IX requirements. Also examined was the ability of the Welding Test Lab to detect "stand-ins" for welder qualification tests. The qualification records of 22 percent of the welders who field-welded on the 530 feet of pipe selected for the inspection were examined for compliance with WQ-1 and the latest issue of ASME Section IX.

2. Findings

The welders records examined revealed that the welders were qualified, on the date the weld was made, to the requirements of Bechtel specification WQ-1. WQ-1 meets the requirements of the latest issue of ASME Section IX. The welder performance qualification records were being properly maintained and were up-to-date.

Although no new welders were being qualified during this inspection, the Welding Test Lab was examined and found to be well organized and controlled. The weld rod is properly controlled, rod ovens are calibrated and kept at the correct temperature, and testing booths and welders' records are properly maintained.

Bechtel welder qualification procedures do not specifically address the subject of welder identity during qualification testing. However, Bechtel's current system requiring the welder's signature, social security number, and a photo badge appears to be satisfactory in preventing any practices of using stand-ins for welder qualifications. No items of noncompliance or deviations were identified.

VII. Inspection Results - Civil/Structural

A. Concrete Tests

1. Areas Examined

Eleven test areas were selected for examination using the "Windsor Probe Test" (WPT). These areas are identified in Table VII-1. They were selected as representative of concrete in the HPSI A pump room and in the vicinity of selected portions of the connected piping. The WPT measures the resistance of concrete to penetration by an explosively driven probe. Correlation to actual concrete strength is by reference to the Windsor Probe manufacturer's charts which relate probe penetration distance to strength for different aggregate hardness values.

2. Inspection Findings

Maximum aggregate size in the concrete tested was 1 1/2-inches. The Moh number for the aggregate selected from the probe manufacturer chart was number 6 (Far Southwestern United States). The indicated concrete strengths ranged from 5,800 to 7,600 psi, indicating adequate concrete strength exists in all areas measured. Detailed data are given in Table VII-1. No items of noncompliance or deviations were identified.

B. Structural Steel Framing

1. Areas Examined

Building and platform structural steel was examined to verify that the sizes, types and materials were in accordance with design requirements. The areas examined were in the HPSI A pump room, the auxiliary building northwest pipeway at the 40' elevation, and the 100 feet elevation on the south side of the containment building. The governing documents were as follows:

- . Specification 13-CM-320 - Erection of Structural and Miscellaneous Steel.
- . Drawing 13-C-00A-001 - Civil/Structural General Notes.

- . Drawing 13-C-ZADS-500 - Auxiliary Building - Framing Plan for Elevation 51'-6".
- . Drawing 13-C-ZCS-529 - Containment Internals - Structural Steel Platforms below Elevation 100.
- . Drawing 13-C-ZAS-570 - Auxiliary Building - Structural Steel Sections and Details - Sheet 1.
- . Drawing 13-C-ZAS-571 - Auxiliary Building - Structural Steel Sections and Details - Sheet 2.
- . Drawing 13-C-ZAS-572 - Auxiliary Building - Structural Steel Sections and Details - Sheet 3
- . WPP/QCI 58.0 - Erection of Structural and Miscellaneous Steel.

2. Inspection Findings

The steel that was examined was installed as specified and was of the required type and size. Certified Mill Test Reports were on file which verified that the proper material had been furnished. These were spot checked and were found to be in order. No items of noncompliance or deviations were identified.

Bolting and welding of the steel is addressed in Sections VII.3 and VII.4 of this report.

3. Structural Steel-Bolted Connections

a. Areas Examined

Bolted connections in selected portions of the building and platform structural steel in areas associated with HPSI A train system were examined for compliance with design requirements. Particular attention was given to bolt size and type, presence of washers where required, adequacy of thread engagement. Tightness of a representative sample of bolts was tested using a calibrated torque wrench. The joints were located in the HPSI A pump room, the northwest pipeway at the 40-foot elevation and the 88-foot elevation pipeway in the auxiliary building, the 82 to 95-foot elevations of both "wrap-around" portions of the auxiliary building, and at

various elevations in the containment building. Additional structural steel joints not associated with the HPSI A train system were also examined. They were in the containment building and in the HPSI B pump room. Details are provided in Table VII-2. In addition to the documents listed in paragraph VII.B.1, the governing documents also include the following:

- . Drawing 13-C-ZAS-510 - Auxiliary Building Framing Plan for Elevation 88' - Area AAA.
- . Drawing 13-C-ZAS-511 - Auxiliary Building Framing Plan for Elevation 88' - Area AAB.
- . Drawing 13-S-ZAS-535 - Auxiliary Building Miscellaneous Steel Plan @ Elevation 88'.
- . Drawing 13-S-ZAS-536 - Auxiliary Building Miscellaneous Steel Sections and Details - Sheet 1.
- . Drawing 13-C-ZAS-581 - Auxiliary Building Miscellaneous Steel Platforms and Details - Sheet 2.
- . American Institute of Steel Construction (AISC) - Specification for Structural Joints Using ASTM A325 or A490 Bolts.

2. Findings

Detailed inspection findings are given in Table VII-2. Except as described below, all bolted joints examined satisfied the specified requirements.

Table 3 of the AISC specification requires that 7/8-inch diameter A325 bolts be tightened to a minimum tension of 39 kips. The following departures from that requirement were found:

- (a) Four bolts in one joint in the AC-6 platform at the 51'6" elevation of the HPSI A pump room were only "finger tight."
- (b) One bolt in a 4-bolt I-beam to I-beam connection at the 125 degree azimuth, 10 feet from the liner, elevation 88-feet in the containment building, required a nut rotation of 45 degrees before achieving the tightness equivalent to the required 39 kips.

- (c) One bolt in a 4-bolt floor beam connection in the auxiliary building northwest pipeway, 6 feet east of column line AD, 51'-6" elevation, required a nut rotation of 60 degrees to achieve the 39 kip requirement.

In all three cases, the connections had been inspected and accepted by Bechtel Quality Control personnel. The unsatisfactory bolting accepted by QC is an apparent violation. (OII 50-528/83-34-08)

D. Structural Steel Welded Connections

1. Areas Examined

Welded connections in selected segments of the building and platform structural steel in areas associated with HPSI A train system were examined for compliance with design requirements. Attributes examined were fillet leg size and length, weld contour, and absence of overlap and undercut. The joints examined were located in the auxiliary building (pipeways at the southwest 40 foot elevation and at the 88 foot elevation), and in the containment building (80-87 foot elevation and the 125 foot elevation). Details are provided in Table VII-3. In addition to the documents listed in paragraphs VII.B.1. and VII.C.1., the governing documents also include the following:

- . Drawing 13-C-00A-050 - Welding and Nondestructive Examination Requirements for Civil Structural - "Form 84C".
- . Structural Welding Code AWS D1.1 1972, with Revision 1, 1973.

2. Findings

Detailed inspection findings are given in Table VII-3. The welded connections in the containment building that were examined were found acceptable. In the auxiliary building pipeway, elevation 88 foot, the inspector found six fillet welds with undersize leg length and four welds with unacceptable undercut. The welds are portions of a W8X31 pipe support rack, number B-79, fabricated by Marathon Steel Company.

In the auxiliary building northwest pipeway, elevation 51'6", the inspector found six fillet welds with undersize leg lengths. The welds are portions of a W16X36 floor beam clip connection. The inspector measured fillet weld sizes down to 5/32 inch, whereas 5/16 inch size was specified for these welds. The undercut criteria specified in AWS D1.1 requires that it be no more than .01 inch deep when its direction is transverse to primary tensile stress in the part that is undercut, and no more than 1/32 inch for all other situations. Contrary to this requirement, the inspector found undercut of approximately 1/16 inch deep.

The undersize and undercut welds had been inspected and accepted by Bechtel Quality Control personnel. The acceptance of welds which are not in conformance with specification requirements is an apparent violation.

FSAR Section 3.8.1.6.6 states: "The acceptance criteria for visual acceptance for welding is done in accordance with AWS D1.1-72, Revision 1, 1973." During the inspection, the following items were noted which appear to be deviations from this commitment:

- . AWS D1.1-72, Revision 1973, paragraph 3.6.6 states "welds shall be free from overlap." Specification 13-CM-320, Appendix A, paragraphs 3.1.4, 3.2, and 3.3.4 allow a maximum of 1/8" of overlap.
- . AWS D1.1-72, Revision 1973, paragraph 8.15.1.3 requires that "all craters are filled to the full cross section of the welds." Specification 13-CM-320, Appendix A, paragraphs 3.1.5, 3.2, and 3.3.8 allow underfilled weld craters.
- . AWS D1.1-72, Revision 73, paragraph 3.6.4 states that "...undercut shall not be more than 0.01" deep when its direction is transverse to primary tensile stress in the part that is undercut, nor more than 1/32" for all other situations." Specification 13-CM-320, Appendix A, paragraph 3.3.7 allows up to a maximum of 1/16" of undercut under certain circumstances and does not address undercutting transverse to primary tensile stress.
- . AWS D1.1-72 does not permit incomplete fusion. Specification 13-CM-320, Appendix A, paragraphs 3.1.8, 3.2 and 3.3.6 allow an exception to the requirement for complete fusion between weld metal and base metal.

Paragraph 9.2 of Specification 13-EM-302, Cable Tray Hangers, states that..." all quality Class Q cable tray hanger welds shall be inspected in accordance with AWS D1.1-79." (emphasis added)

These discrepancies are considered to constitute a deviation from the FSAR commitment. (OII 50-528-83-34-09)

E. Containment Structure Penetrations

1. Areas Examined

Five piping penetrations (nos. 13, 14, 15, 16, and 77) and one electrical penetration (no. 47), all associated with the HPSI train A system were visually examined and their records reviewed to ascertain compliance with the requirements of the ASME Boiler and Pressure Vessel Code, Section III-1974 Edition. In addition, piping penetration No. 62, monitoring containment internal pressure, and spare penetration No. 69 were examined. The visual examination was related to weld reinforcement height and surface finish. The records review addressed the presence and validity of the supplier's material test report, and the adequacy of the Field Welding check list (Form WR-5) and the Filler Metal Withdrawal Record (Form WR-6). Other factors examined were the qualification of the specified welding procedure, control of preheat and interpass temperatures, and nondestructive examination of the completed welds.

2. Findings

All work in this area was found to be in conformance with requirements. No items of noncompliance or deviations were identified.

F. Steel Embed Plates In Concrete

1. Areas Examined

Except for 3 or 4 plates in the vertical pipe chase in the northwest corner of the auxiliary building, all embedded plates carrying pipe hangers/supports for the HPSI A system lines in the auxiliary building were examined. These were 3 plates on the suction line and 35 plates on the discharge lines. In addition, approximately 30 plates were randomly selected in various walls in the auxiliary and containment buildings, of which approximately 20 were not loaded. The examination included measurement of plate thickness and anchor bolt

length using an ultrasonic transducer and CRT videoscope (only 2 or 3 bolts in each embed plate were measured), and a graduated depth gauge measurement of bolt thread engagement. The governing documents were as follows:

- . Specification 13-CM-308 - Installation and Testing of Concrete Embeds and Insert Plates.
- . Drawing 13-C-00A-001 - Civil Structural - General Notes.
- . Drawing 13-C-00A-010 - Typical Insert Plate Schedules and Details.
- . Drawing 13-C-00A-011 - Anchor Bolt Schedule and Details.
- . Drawing 13-C-ZAS-110 - Auxiliary Building - Plan at Elevation 40'.
- . Drawing 13-C-ZAS-112 - Auxiliary Building - Insert Plan at Elevation 40'.
- . Drawing 13-C-ZAS-146 - Auxiliary Building - Plan at Elevation 120'.
- . Drawing 13-C-ZAS-200 - Auxiliary Building - Wall Elevations - Sheet 1.
- . Drawing 13-C-ZAS-224 - Auxiliary Building - Wall Elevations - Sheet 25.
- . Drawing 13-C-ZCS-413 - Containment Internals - Wall Inserts and Penetrations - Sheet 1.
- . Drawing 13-C-ZCS-406 - Containment Internals - Wall Inserts and Penetrations - South Secondary Shield Wall.

2. Findings

All embedded plates examined were found to be installed in the specified locations and were the specified thickness. All anchor bolt lengths were as specified. One plate was found with three of eight bolts apparently missing; search with the UT transducer, however, found that all three had been relocated (by welding) as permitted by the specification when interference with reinforcing steel was encountered. Two other plates were

found with documented relocation of anchor bolts. For one case of suspected insufficient bolt thread engagement, documentation was on file which showed that the bolt had been circumferentially welded to the back of the plate, also as permitted by the specification. No items of noncompliance or deviations were identified.

G. Concrete Expansion Anchors

1. Areas Examined

A representative sample of concrete expansion anchors was examined to ascertain conformance with the installation requirements. At Palo Verde, the design intent is to avoid the use of expansion anchors to the maximum possible extent. A generous quantity of embedded steel plates and unistrut channels were provided for fastening equipment generally and, except for specifically identified lightly loaded applications, expansion anchors were to be used only after all other methods had been evaluated and determined unfeasible or unacceptable by Engineering. For these situations, documented licensee approval is required on a case-by-case basis. The previously mentioned lightly loaded applications include electrical raceway (except cable tray) instruments, instrument sensing lines, and local panels.

A total of 88 anchor bolts were examined for depth of embed and proper torquing of the tensioning nut. These were comprised of the following:

- . 20 Hilti Kwik-Bolts associated with 1 electrical panel box and all Class IE raceway supports (9) in the HPSI A pump room.
- . 29 Hilti Kwik-Bolts fastening raceway supports in the east "wrap-around" section (100' elevation) of the auxiliary building.
- . 8 Hilti-Kwik-Bolts anchoring 2 instrument sensing line support plates in the east "wrap around" section (80' elev.) of the auxiliary building.
- . 8 Hilti Kwik-Bolts anchoring 2 switchbox panels in Battery Rooms C and D in the Control Building (100' elevation).
- . 17 Drillco Maxi-Bolts anchoring control center panels to the floor (100' elevation) in Battery Rooms A, C and D in the Control Building. (Only 8 of these bolts were torque tested).

- . 6 Drillco Maxi-Bolts anchoring 6" fire-line support plates (2) to the MSSS wall (108' elevation) in the corridor adjacent to the turbine building.

All torque testing was performed by a Quality Control Inspector or a journeyman electrician using a calibrated torque wrench in the presence of the NRC inspector. The governing documents were:

- . Specification 13-CM-307 - Design, Installation and Testing of Concrete Anchors.
- . WPP/QCI 24.1 - Installation and Testing of Concrete Expansion Anchors.

2. Findings

Of the 23 Drillco Maxi-Bolts examined, all were found to be embedded and torqued to the required values. For the bolts anchoring the equipment panels in the battery rooms, there was no documentary evidence that Pechtel had obtained the required licensee approval prior to their installation. Similarly, no approval documentation was available for 4 Hilti Kwik-Bolts used for a strut supporting a cable tray hanger in the auxiliary building east "wrap-around" at the 100' elevation (east wall).

In the HPSI A pump room, 6 miscellaneous Hilti Kwik-Bolts (1 raceway support) could not be properly torqued due to the absence of washers under the tensioning nut (support holes too large). Due to the proximity of adjacent supports, this one probably could have been eliminated and the raceway would have been adequately anchored. Also in the HPSI A pump room, one anchor bolt was insufficiently embedded (3") because it was located too close (1 1/2") to an ungrouted, unused hole. Embed depth should have been 6 1/4". Two unused holes were found ungrouted, contrary to the specified requirements. Additionally, there were two bolts that violated the specified minimum distance from other anchor bolts.

In the auxiliary building "wrap-around" section (100' elevation), 9 bolts, randomly located, were found undertorqued (all four in one 4-bolt plate), one bolt was too close (2 1/8") to the edge of a wall opening, one bolt was insufficiently embedded (2 1/4" instead of 5" required), and two bolts had nuts with insufficient thread engagement.

All bolts examined in this sample had been given the requisite inspection by Bechtel Quality Control inspection and had been judged acceptable. The failure of QC to identify nonconforming conditions to specification requirements is considered an apparent violation. (50-528/83-34-10)

TABLE VII - 1

CONCRETE STRENGTH MEASUREMENT

Test No.	LOCATION/DESCRIPTION	No	Date	PLACEMENT		Meas. (i) Probe Exten-in.	STRENGTH (psi)		
				Age	Max. Agg. Size		Probe Meas	Break	Cylind. (2) Design
1	HPSI A Pump Room-Aux. Bldg. Floor (El. 40') Adjacent to Pump	1A05-1	11/24/76	6 Yrs.-11 Mo.	1 1/2	2.25	7400	5870	4000 @ 28 Da.
2	HPSI A Pump Room-Aux. Bldg. East Wall (Elev. 44') Adjacent to Pump	1A12-1	1/21/77	6 Yrs.-9 Mo.	3/4	2.20	7000	5185	"
3	HPSI A Pump Room-Aux. Bldg. South Wall (Elev 43') Adjacent to Pump Motor	1A12-1	1/21/77	6 Yrs.-9 Mo.	3/4	2.25	7400	5155	"
4	North Pipeway-Aux. Bldg- South Wall (elev.44') Between Col Lines AE & AF	1A08-1	12/23/76	6 Yrs.-11 Mo.	3/4	2.275	7600	5960	"
5	HPSI A Pump Room-Aux. Bldg. Floor (Elev.40') Adjacent to West Wall & Floor Embed under Suction Line to Contain. Sump	1A04-1	11/24/76	6 Yrs.-11 Mo.	1 1/2	2.125	6400	5870	"
6	Control Bldg. Floor (Elev.100') 125 V Battery A Charging Equipment Room	1J016	3/10/78	5 Yrs.-6 Mo.	1 1/2	2.050	5800	5875	4000 @ 91 Da.
7	Control Bldg. Floor (Elev.100') 125V Battery A Room	"	"	"	"	2.075	6000	5875	"
8.	Control Bldg. Floor (Elev.200') 125V Battery C Room	"	"	"	"	2.100	6200	5230	"

TABLE VII - 1

CONCRETE STRENGTH MEASUREMENT

Test No.	LOCATION/DESCRIPTION	No.	Date	PLACEMENT		Meas.(1) Probe Exten-in	STRENGTH (Psi)		
				Age	Max. Agg. Size		Probe Meas	Cylind.(2) Break	Design
9	Control Bldg. Floor (Elev. 100') In front of HPSI A 4160V Motor Breaker Cubicle	"	"	"	"	2.150	6600	5875	"
10	Containment Bldg. Base Mat Floor (Elev. 80') Adjacent to South stairway	1C013-1	7/8/77	6 Yrs. -2 Mo.	1 1/2	2.200	7000	5350	5000 @ 91 Da.
11.	Containment Bldg. Base Mat Floor (Elev. 80') West Side Under Safety Injection Piping Runs	"	"	"	1 1/2	2.100	6200	6040	"

Notes

- (1) Windsor Probe Test-Average of 3 driven probes
(2) Average of compression test of 2 cylinders

TABLE VII-2

STRUCTURAL STEEL BOLTED CONNECTIONS

<u>Inspection Location</u>	<u>Elevation</u>	<u>Amount of Inspection Versus Total Available</u>	<u>Type of Inspection</u>	<u>Inspection Findings</u>
Auxiliary Bldg. HPSI A Pump Room	51'6"	15 joints of approx. 30	Visual	Four Loose bolts in a 4-bolt Joint - Platform AC-6
Northwest Pipeway Auxiliary Bldg.	51'6"	13 joints of approx. 15	Visual	Acceptable
Wrap-Around Areas Auxiliary Bldg.	82'-95'	94 joints of approx. 200	Visual	Acceptable
Pipeway Area Auxiliary Bldg.	88'	40 joints of approx. 300	Visual	Acceptable
Containment Bldg.	80'-87'	110 joints of approx. 500	Visual	Acceptable
Auxiliary Bldg. HPSI A Pump Room	51'6"	10 bolts of approx. 120	Torque Test	Acceptable
Northwest Pipeway Auxiliary Bldg.	51'6"	28 bolts of approx. 52	Torque Test	One bolt rotated 60 degrees before minimum tightness was achieved.
Containment Bldg.	87'	24 bolts of approx. 2500	Torque Test	One bolt rotated 45 degrees before minimum tightness was achieved.
Containment Bldg.	98'	34 joints of approx. 100	Visual	Acceptable
*Containment Bldg.	125'	12 joints	Visual	Acceptable
*Containment Bldg.	140'	15 joints	Visual	Acceptable
*Containment Bldg. Pressurizer Compartment	-	20 joints	Visual	Acceptable
*Auxiliary Bldg. HPSI B Pump Room	51'6"	15 joints	Visual	Acceptable

*Items inspected which are not associated with the HPSI train A system.

TABLE VII-3

STRUCTURAL STEEL WELDED CONNECTIONS

<u>Inspection Location</u>	<u>Elevation</u>	<u>Amount of Inspection Versus Total Available</u>	<u>Type Of Inspection</u>	<u>Inspection Findings</u>
Northwest Pipeway Auxiliary Bldg.	51'6"	13 joints of approx. 15	Weld gauge Visual	Six undersize fillet welds
Pipeway Area Auxiliary Bldg.	88'	50 joints of approx. 200	Weld gauge Visual	Six undersize fillet welds, Four welds with undercut.
Containment Bldg.	80'-87'	110 joints of approx. 250	Weld gauge Visual	Acceptable
*Containment Bldg.	125'	4 joints	Weld gauge Visual	Acceptable

*Items inspected which are not associated with the HPSI Train A system.

VIII.

NRC Nondestructive Examination and Quality Review of Safety Related Systems

A. Purpose

The purpose of the independent, NRC nondestructive examination (NDE) was to verify the adequacy of the licensee's welding quality control program. This was accomplished by duplicating those examinations required of the licensee by regulations and evaluating the results. In addition to the required examinations, several additional confirmatory examinations designed to verify conformance with material specifications were performed and compared to quality assurance records. The NRC inspection team selected the HPSI A system to inspect at the Palo Verde Unit 1. There are approximately 900 piping welds in the HPSI A system. This system was undergoing pre-operational testing and was full of water under pressure. A selection of welds from this system that could be drained and inspected was made. Due to preoperational testing of Unit 1, a selection of welds from Unit 3 was also made. The selection of these welds was intended to provide a representative sample of piping components, sizes, materials, of shop and field welds. All the welds selected were previously accepted by the licensee based on vendor, shop, or field NDE records.

B. Document Reviews

The following quality assurance documents were reviewed to verify compliance with regulatory and code requirements:

1. Twelve weld document packages were reviewed for:
 - Material Certifications
 - NDE results
 - Fabrication records shop and field
 - Drawings (Isometric)
 - PWHT Charts

(Note: The twelve welds reviewed are listed at the end of Table VIII-2. See those listed for drawing 13-P-ZCG-103)

2. Two quality procedures were reviewed.
 - 13PM-201 Shop Fabrication of Nuclear Piping Systems
 - 13PM-204 Field Fabrication and Installation of Nuclear Piping Systems

3. A review of GEO's (site NDE subcontractor) internal audit, dated June 10, 1983, was performed. This audit reviewed all of GEO's NDE site personnel qualification at Palo Verde.

4. Verification of NDE Personnel Qualifications to SNT-TC-1A

The NRC inspector reviewed all of Bechtel's individual film interpreter qualification and certification records. He also reviewed 6 out of 39 of GEO's NDE records for personnel qualifications.

All the above documents were verified to satisfy NRC requirements and licensee commitments to industry codes and standards.

C. NRC Independent Examinations

(Note: Refer to Table VIII-1 for specific listings of independent inspection items)

1. Radiography

Twenty-one welds were re-examined by the NRC using an Iridium 192 source. Welds that were radiographed were ASME Code Class 1 and 2, carbon and stainless steel.

Results: All re-radiographed welds were found acceptable to ASME Section III acceptance criteria.

2. Pipe Wall Thickness Measurement - Eleven pipe welds and adjacent pipe material were examined per NRC procedure NDE-11, Revision 0, using a NORTEC NDT thickness gauge. Minimum wall thickness was determined by using an ASTM standard pipe sizes and nominal thickness chart.

Results: All areas examined were within tolerance requirements.

3. Ferrite Measurements - Thirteen pipe welds were checked for delta ferrite content using a Type II Ferrite Indicator (Severn Gauge).

Results: All measurements were within acceptable limits of material test results.

4. Hardness Measurements - Fourteen welds were checked for hardness (base material adjacent to welds) using the Equo-tip hardness tester per NRC Procedure NDE-12, Revision 0. Hardness numbers were converted to Brinnell values and the approximate tensile strengths were determined by use of conversion tables.

Results: All areas examined were within acceptable limits of material test reports.

5. Alloy Analyzer - Four pipe welds and adjacent base metals were examined using a Texas Nuclear Alloy Analyzer. A quantitative chemical analysis was made on two stainless steel, type 304, and two stainless steel, type 316 materials.

Results: Areas examined were within $\pm 2\%$ of chemical analysis indicated on corresponding certified mill test reports and were within acceptable limits.

6. Liquid Penetrant Examination - Eight safety related pipe weldments were liquid penetrant examined per NRC procedure NDE-9, Revision 0. All weldments examined were ASME Class 2 welds.

Results: All areas inspected were acceptable.

7. Visual Examination - Thirty-four weldments and adjacent base material were visually inspected for weld reinforcement, overall workmanship and surface condition per NRC procedure NDE 14, Revision 0.

Results: All areas inspected were acceptable.

8. Radiography of Socket Welds - Ten socket welds were radiographed to verify pipe engagement.

Results: All radiographs show at least a minimum of 1/16 inch gap per ASME Section III, paragraph NC4427 requirements.

9. Radiographic Review of Licensee Field Welds and Vendor Welds - A review of licensee's pipe weld radiographs was made during this inspection of ASME Class 1 and 2 weldments. Out of 746 sets of radiographs, 204 were reviewed as listed below, with results as listed in Table VIII-2.

The radiographic film review disclosed 6 welds which are in the "as-welded" condition and present weld ripple images in the film. The ASME V Code, paragraph T-221-2, requires that weld irregularities be removed to the extent that they cannot mask or be confused with actual discontinuities. The weld ripple images for ISO 01-P-SIF 105 Line 1RC-051-S-001-16, welds A and B; 1RC-051-S-002; weld A; and ISO-13-P-ZCG-103, 1RC-079, 030 and 073 are considered excessive and capable of masking or being confused with discontinuities in the opinion of the NRC Level III examiner.

On October 12, 1983 licensee representatives and the Bechtel Corporation Level III examiner telephoned the Regional office to express a difference of professional opinion. The Bechtel examiner did not consider that the weld ripple images could mask discontinuities. This item is considered unresolved. (Unresolved item 50-528/83-34-01)

No items of noncompliance or deviations were identified.

Table VIII-1

INDEPENDENT MEASUREMENTS PALO VERDE

INDEPENDENT MEASUREMENTS PROGRAM											USMRC R. MOB. L. RIDE VAN	Page 1	
Line/ISO	Weld No.	Class	Date	RT	MT	PT	UT	Hardness	Thick Wall	Ferrite	Alloy	Visual	Comments
HPSI F-375 Elev 45'	VM-D	2	X	X		X		X	X	X		X	10" S/S 5.0 to 7.5 FN REHBLS
F-375 Aux Bldg Elev 45' "A" Pump Line	VM-B	2	X	X		X		X	X	X		X	10" S/S 5.0 to 7.5 FN
F-375 Aux Bldg Elev 45' "A" Pump Line	VM-A	2	X	X		X		X	X	X		X	10" S/S 5.0 to 7.5 FN
HPSI F-422 Elev 45' "A" Pump Line	SM-S	2	X	X		X		X	X	X		X	Spool SF-008-006 Spool SF-008-002 10" S/S 5.0 to 7.5 FN
HPSI F-423 Elev 45' Aux Bldg	VM-A	2	X	X		X		X	X	X		X	10" S/S 5.0 to 7.5 FN
HPSI F-423 Elev 45' Aux Bldg	VM-B	2	X	X		X		X	X	X		X	10" S/S 5.0 to 7.5 FN
HPSI F-423 Elev 45' Aux Bldg	VM-A	2	X	X		X		X	X	X		X	10" S/S 5.0 to 7.5 FN
HPSI F-423 Elev 45' Aux Bldg	VM-E	2	X	X		X		X	X	X		X	10" S/S 5.0 to 7.5 FN
SI-099-4 Aux Bldg "A" Line	VM-E	2	X	X								X	8" S/S
F-199 SI-099-4 "A" Line	VM-B F149	2	X	X					X			X	8" S/S
HPSI F-199 "A" Line	VM-A	2	X	X					X			X	8" S/S
HPSI F-199 "A" Line	Not-Req'd	2	X									X	8" S/S
SI-106-3 HPSI Line A	VM-1	2	X	X						X		X	8" S/S
SI-106-3 HPSI Line A	VM-1	2	X					X					
SI-106-3 HPSI Line A	VM-2	2	X					X				X	3" S/S
SI-106-3 HPSI Line A	VM-3	2	X	X				X				X	8" S/S
SI-106-3 HPSI Line A	VM-4	2	X	X				X				X	8" S/S
SI-106-3 HPSI Line A	VM-A	2	X	X				X				X	8" S/S
SI-106-3 HPSI Line A	VM-B	2	X	X				X				X	8" S/S

Table VIII-1 (continued)

INDUSTRY MEASUREMENTS PROGRAM										USNRC N MOBILE MOE VAN		Page 2
Line/ISO	Weld No.	Class	Data	RT	WT	PT	UT	Hard [ross Mill]	Thick [ross Mill]	Ferrite [Anal]	Alloy [Visual]	Comments
SI-100-3 F156	VW-3	2	X	X					X	X	X	4" S/S
SI-106-3	VW-2 FW 301	2	X X X	X X X						X X X		3" S/S Weld
SI-105-2	SU 004 004 004 SW SW 003	2		X						X X X X		HPSI Socket Welds Elev 45 HPSI Line A Socket Welds Socket Welds S/S Socket Welds S/S
SI-105-2 HPSI "A" Line	004 SW SW 003	2		X X X						X X X		
SI-105-1 HPSI "A" Line	004 W 006 007 W Y023 Q18 NOT Rec'd	2		X X X X X X						X X X X X X		S/S Socket Welds S/S Socket Welds S/S Socket Welds Socket Welds 3" S/S Weld 3" S/S Weld
SI-106-3 "A" Line Elev 92	W W W B	2		X X X						X X X		3" S/S Weld Socket Weld 3" S/S Socket Welds
SI-106-1 MA 7833	W W W B	2		X X X						X X X		Loop #1 Steam Generator Unit 3 30" Dia Loop #2 Steam Generator #2 30" Dia
Reactor Cool- ant Contain- ment Bldg. Steam Gen. #1 RC-030 073 #2	VW-1 VW-1	1		X X						X X		Loop #1 Steam Generator to Pump Unit #3 30" Dia
Reactor Cool- ant Contain- ment Bldg. Loop Pump 18 RC-031	VW-1	1		X						X		

Table VIII-2
Review of Licensee RT Films and Records

<u>Line</u>	<u>ISO</u>	<u>WELD</u>	<u>RESULTS</u>
SI-008-CCBC-10"	13-P-SIF-201	FW 5	Acceptable
"	"	FW 1	Acceptable
"	"	FW 2	Acceptable
"	"	FW 3	Acceptable
"	"	FW 4	Acceptable
"	"	FW 6	Acceptable
"	"	*FW 7	Acceptable
SI-008-GCBC-10"	13-P-SIF-201	VW-D-F375	Acceptable
"	"	VW-B-F375	Acceptable
"	"	VW-A-F375	Acceptable
"	"	VW-A-422	Acceptable
"	"	VW-B-423	Acceptable
"	"	VW-A-423	Acceptable
SI-A-009-CCBC-4"	13-P-SIF-203	FW 1	Acceptable
"	"	FW 2	Acceptable
SI-099-CCBB-4"	13-P-SIF-203	VW-E-F149	Acceptable
"	"	VW-B-F149	Acceptable
"	"	VW-A-F149	Acceptable
SI-099-S-001-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
SI-A-100-CCBA-4"	"	FW 1	Acceptable
"	"	FW 2	Acceptable
"	"	FW 3	Acceptable
SI-100-CCBB-4"	13-P-SIF-203	VW-A-156	Acceptable
"	"	VW-B-156	Acceptable
"	"	VW-3-156	Acceptable
SI-A-101-CCBA-1"	13-P-SIF-204	FW 00L	Acceptable
2"	"	FW 00A	Acceptable
2"	"	FW 00B	Acceptable
2"	"	FW 00C	Acceptable
2"	"	FW 00H	Acceptable
2"	"	FW 00J	Acceptable
2"	"	FW 00K	Acceptable

*Visually verified RT root indication (concavity) between RT station numbers 12 and 15 by using a fiberscope. All areas of concern are acceptable.

<u>Line</u>	<u>ISO</u>	<u>WELD</u>	<u>RESULTS</u>
2"	"	FW 00L	Acceptable
2"	"	FW 00N	Acceptable
2"	"	FW 00P	Acceptable
2"	"	FW 00R(C)	Acceptable
2"	"	FW 00S(C)	Acceptable
2"	"	FW 00T	Acceptable
2"	"	FW 000	Acceptable
SI-A-102-CCBA-2"	13-P-SIP-204	FW 00A	Acceptable
"	"	FW 00B	Acceptable
"	"	FW 00C	Acceptable
"	"	FW 00D	Acceptable
"	"	FW 00E	Acceptable
"	"	FW 00F	Acceptable
"	"	FW 00G	Acceptable
"	"	FW 00H	Acceptable
"	"	FW 00J	Acceptable
"	"	FW 00K	Acceptable
"	"	FW 00L	Acceptable
"	"	FW 00M(C)	Acceptable
SI-103-CCBA-2"	13-P-SIF-203	FW 300	Acceptable
"	"	FW 00A	Acceptable
"	"	FW 00B	Acceptable
"	"	FW 00C	Acceptable
"	"	FW 00D	Acceptable
"	"	FW 00E	Acceptable
SI-103-CCBA-2"	13-P-SIF-203	FW 00G	Acceptable
"	"	FW 00I	Acceptable
"	"	FW 00J	Acceptable
"	"	FW 00K(C)	Acceptable
"	"	FW 00P	Acceptable
"	"	FW 00R	Acceptable
SI-105-S-003-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
SI-105-S-004-4"	13-P-SIF-203	A	Acceptable
SI-105-S-005-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
SI-105-S-002-4"	13-P-SIF-202	A	Acceptable
SI-105-S-001-4"	13-P-SIF-202	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
SI-157-CCBA-4"	13-P-SIF-204	FW 300	Acceptable
4"	"	FW 301	Acceptable
1"	"	FW 00C(C1)	Acceptable
2"	"	FW 00A	Acceptable
2"	"	FW 00B(C)	Acceptable
2"	"	FW 00C(C1)	Acceptable
2"	"	FW 00D(C)	Acceptable
1"	"	FW 00E	Acceptable
SI-157-CCBA-1"	13-P-SIF-204	FW 00E	Acceptable
2"	"	FW 00H	Acceptable

<u>Line</u>	<u>ISO</u>	<u>WELD</u>	<u>RESULTS</u>
1"	"	FW 001	Acceptable
4"	"	FW 001	Acceptable
4"	"	FW 002	Acceptable
4"	"	FW 003	Acceptable
3"	"	FW 004	Acceptable
3"	"	FW 006	Acceptable
3"	"	FW 007	Acceptable
3"	"	FW 008	Acceptable
SI-157-S-001-4"	13-P-SIF-136	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
SI-157-S-002-4"	13-P-SIF-136	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
SI-157-S-003-4"	13-P-SIF-136	A	Acceptable
SI-157-S-004-4"	13-P-SIF-136	A	Acceptable
SI-157-S-005-4"	13-P-SIF-136	A	Acceptable
"	"	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	13-P-ZG108	U-77(c-1)	Acceptable
SI-157-S-006-3"	13-P-SIF-136	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
SI-157-S-007-3"	13-P-SIF-136	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
RC-051-S-001-16"	01-P-SIF-105	A	Rejected Beads
"	"	B	Rejected Beads
RC-051-S-002-16"	01-P-SIF-105	A	Rejected Beads
RC-051-S-003-16"	01-P-SIF-105	G	Acceptable
"	"	H	Acceptable
"	"	A	Acceptable
"	"	B	Acceptable
"	"	D	Acceptable
SI-176-S-001-4"	13-P-SIF-204	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
SI-176-S-002-3"	13-P-SIF-204	A	Acceptable
SI-176-S-003-3"	13-P-SIF-204	A	Acceptable
SI-176-S-004-3"	13-P-SIF-204	A	Acceptable

<u>Line</u>	<u>ISO</u>	<u>WELD</u>	<u>RESULTS</u>
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
SI-176-S-006-3"	13-P-SIF-204	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
SI-218-S-001-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
SI-218-S-002-4"	13-P-SIF-203	A	Acceptable
SI-236-S-003-4"	13-P-SIF-203	A	Acceptable
SI-236-S-005-4"	13-P-SIF-203	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	D	Acceptable
SI-236-S-006-3"	13-P-SIF-203	B	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
"	"	H	Acceptable
"	"	J	Acceptable
"	"	K	Acceptable
"	"	L	Acceptable
"	"	M	Acceptable
"	"	N	Acceptable
SI-248-S-003-3"	01-P-SIF-105	A	Acceptable
"	"	B	Acceptable
"	"	D	Acceptable
SI-248-S-007-3"	01-P-SIF-105	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable
"	"	G	Acceptable
"	"	H	Acceptable
"	"	J	Acceptable
"	"	K	Acceptable
"	"	D	Acceptable
"	"	E	Acceptable
"	"	F	Acceptable
SI-248-S-008-3"	01-P-SIF-105	H	Acceptable
"	"	J	Acceptable
"	"	K	Acceptable
SI-248-S-009-3"	01-P-SIF-105	A	Acceptable
"	"	B	Acceptable
"	"	C	Acceptable

"	"	D	Acceptable
SI-248-S-011-3"	01-P-SIF-105	G	Acceptable
"	"	H	Acceptable
"	"	J	Acceptable
SI-248-S-012-3"	01-P-SIF-105	F	Acceptable
"	"	G	Acceptable
"	"	H	Acceptable

<u>O.D. Size</u>	<u>Line</u>	<u>Document Review</u>	<u>ISO</u>	<u>Weld S/N</u>	<u>Results</u>
30"	1-RC079	"	13-P-ZCG-103	W001	Rejected Beads
30"	1-RC030	"	"	"	Rejected Beads
30"	1-RC073	"	"	"	Rejected Beads
30"	1-RC031	"	"	"	Acceptable
Unit 2					
30"	2-RC079	"	13-P-ZCG-103	W001	Acceptable
30"	2-RC030	"	"	"	Acceptable
30"	2-RC073	"	"	"	Acceptable
30"	2-RC031	"	"	"	Acceptable
Unit 3					
30"	3-RC079	"	13-P-ZCG-103	W001	Acceptable
30"	3-RC030	"	"	"	Acceptable
30"	3-RC073	"	"	"	Acceptable
30"	3-RC031	"	"	"	Acceptable

IX. CRAFT AND QC INSPECTOR INTERVIEWS

During the course of the inspection interviews were conducted by the team members with various craft persons and QC inspectors. These interviews were conducted on a one on one basis at random in the field, predominantly at Unit 1, but some were conducted at Units 2/3 and in the senior resident inspector's office. There were 115 of these interviews conducted with the idea of finding whether there was pressure by management to "cut corners," and to give the interviewee an opportunity to discuss any problems he/she may know of with a NRC inspector.

None of the workers indicated that he/she felt intimidated or that there was any pressure to cut corners, all thought that the quality on this project was above average to excellent and none knew of major problems on this project that NRC did not know about.

Table IX-1
Workers Interviewed

<u>Craft</u>	<u>No. Interviewed</u>
1. Electrician	23
2. Millwright	2
3. Ironworker	7
4. Boilermaker	1
5. Pipefitter	21
6. Carpenter	4
7. Janitor	1
8. QC Welder	7
9. QC Elect	16
10. QC Mech/Piping/NSSS	12
11. Laborer	3
12. Insulator	2
13. Welder	7
14. NDE Tech	4
15. Sprinkler	2
16. Operating Engineer	1
17. QC CSC	2

Attachment A

A. Persons Contacted

1. Arizona Public Service Company

E. Van Brunt Jr., V.F. Nuclear Projects
J. Roedel, Corporation QA Manager
D. Fasnacht, Nuclear Construction Manager
J. Keiley, Startup Manager
J. Bynum, Nuclear Operations Manager
W. Ide, Construction (QA/QC) Manager
P. Moore, QA Engineer
B. Love, QA Engineer
R. J. Kimmel, Field Engineering Supervisor
G. Pankonin, Startup QA/QC Manager
F. Godwin, Nuclear Projects Records Manager
K. Gross, Compliance/Operations Supervisor
C. Rogers, Nuclear Engineer
L. Souza, Construction QA Supervisor
J. Hayes, Startup Manager, Unit 1

2. Bechtel Power Corporation

W. Stubblefield, Field Construction Manager
D. Hawkinson, Project QA Manager
J. White, Lead Pipe Support QCE
G. Stam, Weld Engineering Supervisor
J. Sabol, Lead Pipe Support Engineer
D. Keitch, Bechtel, Downey
H. Miller, Lead Field Welding Engineer
M. Rosen, QC Supervisor
T. Mack, Assistant Project Manager
A. Priest, Construction Engineer
C. Berg, Construction Engineer

Other persons contacted during the inspection included construction craftsmen, QC inspectors, startup personnel, QA personnel and Supervisory Personnel.