U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-277/85-11

Docket No. 50-277

License No. DPR-44 Priority -- Category C

Licensee: Philadelphia Electric Company

2301 Market Street

Philadelphia, Pennsylvania 19101

Facility Name: Peach Bottom Atomic Power Station, Unit 2

Inspection At: Delta, Pennsylvania

Inspection Conducted: February 13-15, 1985

Inspectors: H. J. Bicehouse 2/27/85
H. J. Bicehouse date
Radiation Specialist

Approved by: W. J. Pasciak 2/27/85
W. Pasciak, Chief date
BWR Radiological Protection Section

Inspection Summary:

Inspection on February 13-15, 1985 (Report No. 50-277/85-11)

Areas Inspected: Special unannounced inspection to review the events associated with the contamination of several radiation workers on February 10, 1985. The inspection involved 19.5 hours on site by a regionally based inspector and 10 hours on site by the Chief, BWR Radiological Protection Section.

Results: Seven apparent violations were noted concerning the radiological controls associated with weld repair on weld joint 206 and three unresolved items concerning the exposures to the workers and the adequacy of a control for entry into a high radiation area within Valve "81A."

DETAILS

1. Persons Contacted

During the course of this special radiation protection inspection, the following personnel were interviewed:

1.1 Licensee Personnel

*R. S. Fleischmann, Station Superintendent, Peach Bottom Atomic Power Station
*N. Gazda, Applied Health Physicist
*A. Hilsmeir, Senior Health Physicist
*S. Nelson, Support Health Physicist
*D. C. Smith, Assistant Station Superintendent

Other licensee personnel were also contacted or interviewed during this inspection.

1.2 Contractor Personnel

W. Rogers, Unit 2 Drywell Health Physics Coordinator, Bartlett Nuclear Corporation
T. Stafford, ALARA Engineer, Bartlett Nuclear Corporation

Other contractor personnel were also contacted or interviewed during this inspection.

1.3 NRC Personnel

*T. P. Johnson, Senior Resident Inspector
*J. H. Williams, Resident Inspector

*Attended the exit interview on February 15, 1985.

The exit interview was also attended by Dr. W. Pasciak, Chief, Boiling Water Reactors Radiological Protection Section, NRC Region I.

2. Purpose

The purpose of this special inspection was to review the events associated with contamination of several radiation workers possibly in excess of 10 CFR 20.103 limits on February 10, 1985.

3. Description of Event

3.1 General

On February 10, 1985, at about 0820, a contractor worker without respiratory protection inserted his head and upper torso into the valve bonnet of Valve "81A." Also on February 10, 1985, at about 1200, a second contract worker entered newly installed 24-inch diameter piping to repair a weld attaching that piping to Valve "81A." Both workers were contaminated as a result of these entries. The licensee became aware of the second entry at about 1510 and stopped further work on Valve "81A." Subsequent investigation by the licensee identified additional workers who were contaminated. The licensee suspended all drywell work at Unit 2 at about 2330 on February 10, 1985. An NRC Radiation Specialist was detailed to investigate these events on February 13, 1985.

3.2 Description

The licensee's piping replacement contractor was assembling and welding replacement pipe into the Residual Heat Removal (RHR) System Loop "A" connecting it with existing valves from the previous RHR system. RHR System Loop "A" connects with the 28-inch diameter Recirculation System Loop "A" discharge riser. Valve "81A" connects through weld joint 206 with the 24-inch diameter RHR System Loop "A" discharge header.

Weld joint 206 is located at approximately the 145-foot elevation, azimuth 270°, in the Unit 2 drywell. Weld joint 206 was accessible from an adjacent platform for work on the outside surface of the weld. Weld joint 206 was also accessible from either the approximately horizontal valve bonnet of Valve "81A" or through 9 to 10 feet of 24-inch diameter RHR Loop "A" discharge side piping for work on the inside surfaces of the weld. A ladder at a lower elevation provided access to the discharge side 24-inch diameter piping opening.

A contractor welding coordinator entered the Unit 2 drywell at about 0815 on February 10, 1985, to inspect 4 welds, including weld joint 206. In order to inspect the inside surface of the weld, the welding coordinator inserted his head, upper torso and arms into the valve bonnet of Valve "81A." The estimated time for this inspection was approximately one minute. Health physics personnel were not aware that the inspection and repair involved entry into the valve bonnet. The welding coordinator was not wearing any respiratory protective equipment during the entry. The welding coordinator inspected 3 additional welds in other drywell locations, notified other contractor personnel that repair of weld joint 206

was needed and exited the drywell at approximately 0900. Contamination surveys of the welding coordinator showed that his elbows and other parts of his upper body were contaminated. He was decontaminated at the licensee's personnel decontamination area and released for continuation of his duties at approximately 1045 by a health physics technician. No nasal smears were taken at that time.

Two contractor pipefitters entered the Unit 2 drywell at approximately 0830 to grind weld joint 206 preparatory to subsequent repair welding. Both pipefitters wore airline respirators and ground the weld through the valve bonnet on Valve "81A." Similar to the inspection above, the pipefitters inserted their heads, upper torsos and arms to grind the weld through the valve bonnet on Valve "81A." The pipefitters exited the drywell at approximately 1025. These workers were also shown to be contaminated and were decontaminated at the personnel decontamination facility.

A contractor welder and his helper entered the Unit 2 drywell at approximately 1145 to repair the root pass of the weld on weld joint 206. The welder was instructed by contractor supervision to work through the valve bonnet on Valve "81A." However, the welder was unable to work through the valve bonnet. The welder descended to a lower drywell elevation and climbed up a ladder into the 24-inch diameter discharge side piping. He climbed an additional 10 feet through two 90-degree pipe bends to reach the weld. The helper assisted the welder through the valve bonnet of Valve "81A." Both workers wore airline respirators during the repair. They exited the drywell at approximately 1320 following completion of their work.

The welder had extensive contamination on his back and upper body. Assisted by [illegible]th physics technicians, the welder attempted to remove the contamination at the personnel decontamination area.

At approximately 1510, a contractor ALARA Engineer contacted the Unit 2 health physics drywell control point and learned of the welder's skin contamination. The ALARA Engineer instructed the health physics technicians to stop further work on Valve "81A."

At approximately 1600, the welding contractor reentered the Unit 2 drywell to inspect weld joint 308 (unrelated to Valve "81A"). At about 1615, he exited the drywell, surveyed himself for contamination, and put on his personal outer clothing preparatory to leaving the site.

At about 1700, a health physics technician made radiation/contamination measurements inside Valve "81A" and recorded them as survey No. 87 for the Unit 2 Area Survey Radiation Work Permit.

At approximately 1735, the welding coordinator, welder, and eight other individuals were unable to pass the portal contamination monitor at the exit point from the licensee's protected area. The licensee's health physics technicians took nasal contamination surveys of the welder and the welding coordinator. Both workers showed positive results for nasal contamination.

Whole body counts to assess the possible intake of radioactive material were made on the licensee's "moving bed" whole body counter. Initial results from those assessments showed the welding coordinator had apparently received approximately 50% of the maximum permissible organ burden (for the lungs) of cobalt-60. The welder's initial assessment showed he had apparently received 15% of the maximum permissible organ burden (for the lungs) of cobalt-60. ANSI N343-1978, ("American National Standard for Internal Dosimetry for Mixed Fission and Activation Products"), Table 5, lists a maximum permissible single deposition of cobalt-60 in the lung of 1.2 microcuries.

Both individuals showered again to remove additional surface contamination which could contribute to an erroneous assessment of their possible lung burdens. Following those showers, the welding coordinator's apparent lung burden was reduced to 33%. The welder's apparent lung burden was reduced to 7%.

At approximately 2000, the Senior Health Physicist was notified and he arrived on site at about 2115. Following his initial review of the events, the Senior Health Physicist suspended all Unit 2 drywell activities at approximately 2330 on February 10, 1985.

On February 11, 1985, a health physics technician retraced the welder's entry route to make radiation/contamination measurements. The technician became stuck in the RHR Loop "A" piping, removed his airline respirator and apparently received possible internal contamination of approximately 18% of the maximum permissible lung burden.

3.3 Other Contamination Events

On February 3, 1985, two contracted workers had recorded skin contaminations on their backs to 20 millirads per hour (mrad/hr) beta. At 1005, a contractor pipefitter attempting to remove a purge bag (used to maintain an inert atmosphere during welding) at weld joint 206 was contaminated over his head, upper torso and arms. At approximately 1030, a contractor engineer inspecting that weld joint was found to have skin contamination on his torso. Both individuals were wearing respiratory protective equipment as recorded on the Radiation Work Permit (RWP). Log entries made by Unit 2 Drywell health physics technicians indicated that both workers had inserted their heads, torsos and arms through the valve bonnet on Valve "81A" to attempt to remove the purge bag.

4. Exposure Control

The licensee's exposure controls for the inspection, welding, grinding and other activities conducted on weld joint 206 were reviewed against criteria provided in 10 CFR 20, Technical Specification 6.11, "Radiation Protection Program", and Technical Specification 6.13, "High Radiation Area."

4.1 Radiation Work Permit

The Radiation Work Permit (RWP) used by the welding coordinator and the weld repair crew on February 10, 1985, was reviewed against the criteria above and licensee's Procedure No. HPO/CO-4, "Radiation Work Permits." Within the scope of this review, the following violation was noted:

Technical Specification 6.11, "Radiation Protection Program," requires, in part, adherence to procedures for personnel radiation protection. Procedure No. HPO/CO-4 requires, in part, a radiation work permit containing specific requirements for radiological exposure controls. Radiation Work Permit (RWP) No. 2-10-5008, "Fit and Weld RHR Pipe and Valves," (January 1, 1985) failed to provide specific radiological exposure controls for work on the interior of the existing Valve "81A" in the RHR system.

RWP No. 2-10-5008 provided general radiological exposure controls and covered all contractor fitting and welding of RHR pipe and valves. ALARA Review Package No. IN-240 provided recommended controls for work done exterior to pipe with welding equipment. However, entry into existing Valve "81A" in the RHR system was not covered in that ALARA review.

Under ALARA Program Instruction No. 2 (API-2), "Specific Program Instruction For Maintaining Occupational Exposure To Radiation As Low As Is Reasonably Achievable (ALARA)," a job code number is used to signify that the supporting ALARA review has been conducted and that the task has been approved by the licensee's radiological engineering group ("ALARA engineers"). The assessment of radiological conditions and the specification of radiological exposure controls is the responsibility of the "ALARA engineers." Each RWP is generated by the operating health physics group following the specification of radiological exposure controls by the "ALARA engineers." Since entry into Valve "81A" had not been reviewed and specific radiological exposure controls had not been issued by the "ALARA engineers" prior to the entries on February 10, 1985, RWP No. 2-10-5008 failed to provide specific radiological exposure controls. Failure to provide specific radiological exposure controls is a violation of Technical Specification 6.11. (50-277/85-11-01)

The inspector noted the similarity between this violation and the RWP violation noted in Inspection Report No. 50-277/84-18 (i.e., 50-277/84-18-03). In the licensee's response to that violation (letter from S. L. Daltroff, PECO, to T. T. Martin, NRC, dated August 31, 1984), the licensee indicated that specific radiation work permits were prepared for each task performed prior to pipe decontamination. However, the licensee failed to initiate corrective steps to prevent recurrence in subsequent phases of the piping replacement as evidenced above.

4.2 Surveys

The licensee's evaluation of the radiation hazards associated with work on weld joint 206 was reviewed. Radiation and contamination measurements of the work area under the licensee's Unit 2 Drywell Area Survey Radiation Work Permits (i.e., RWP No. 02-01-5000 and its predecessor RWP No. 02-01-0543) were reviewed and discussed with cognizant health physics personnel. Evaluations of the radiological conditions by the licensee's "ALARA engineers" were also reviewed.

Within the scope of this review, the following violation was noted:

> 10 CFR 20.201(b) requires each licensee to make or cause to be made such surveys as (1) may be necessary for the licensee to comply with the regulations in Part 20, and (2) are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present. 10 CFR 20.201(a) defines a survey as an evaluation of the radiation hazards incident, among other things, to the presence of radioactive materials under a specific set of conditions.
>
> Contrary to the above, the licensee failed to evaluate the radiation hazards incident to the presence of radioactive materials in Valve "81A" prior to February 10, 1985. Evaluation was needed to comply with 10 CFR 20.103 and 20.202 as shown in subsequent details. Evaluations of the extent of radiation hazards were reasonable in view of the repeated entries by contractor personnel into the valve bonnet of Valve "81A" to complete work on weld joint 206 on February 3, 1985, and February 10, 1985.

Radiation/contamination measurements of the exterior of Valve "81A" and the general work area surrounding it were made by health physics technicians as shown below:

Date	Area Survey RWP	Survey Number
December 11, 1984	02-01-0543	641
December 18, 1984	02-01-0543	656
December 26, 1984	02-01-0543	676
January 17, 1985	02-01-5000	37
January 31, 1985	02-01-5000	74
February 6, 1985	02-01-5000	82

Radiation/contamination measurements of the interior of Valve "81A" (in response to the events of February 10, 1985) were made by health physics technicians under RWP No. 02-01-5000 on February 10, 1985, at 1700 (Survey Number 87), and on February 11, 1985, at 2000 (Survey Number 100). Survey Number 87 (February 10, 1985) showed gamma radiation levels up to 2,200 mrem/hr and beta radiation levels up to 15,200 mrad/hr on the inside surfaces of Valve "81A." Removable contamination levels recorded on the same survey ranged from 400 mrad/hr per square foot at weld joint 206 to 24 rad/hr per square foot on the inside surface of Valve "81A." However, these radiation/contamination levels inside Valve "81A" were not known until the work on weld joint 206 was complete. Failure to evaluate the extent of the radiation hazards present in Valve "81A" before the entries on February 3, 1985, and February 10, 1985, by work parties constitutes a violation of 10 CFR 20.201. (50-277/85-11-02)

4.3 Airborne Radioactivity

The licensee's measurement and control of airborne radioactivity during the entries into Valve "81A" on February 3, 1985, and February 10, 1985, were reviewed. The inspector noted that auxiliary ventilation and the drywell purge system were operating during the entries to limit the spread of airborne contamination within the drywell. Air samples approximately 3 feet above the valve bonnet were taken with low volume air samplers. Records of air sample results for February 10, 1985, were reviewed and discussed with cognizant health physics personnel.

Within the scope of this review, the following violation was noted:

10 CFR 20.103(a)(3) requires, in part, that the licensee use suitable measurements of the concentrations of radioactive materials in air for detecting and evaluating airborne radioactivity in restricted areas.

Contrary to this requirement, the licensee failed to make suitable measurements of the concentrations of radioactive materials in air within Valve "81A" during the entries by work parties on February 10, 1985. A single low volume air sample was taken approximately 3 feet above the opening to the valve bonnet of Valve "81A" from 0810 to 1415 on February 10, 1985. No air samples of the interior of Valve "81A" were taken. The air sample recorded an average air concentration above the valve bonnet opening of 2.35 E-9 microcuries per cubic centimeter. However, the air sample did not constitute a suitable measurement since:

-- it was not representative of the breathing zone of the weld repair work party during the insertion of the torso and head into the valve bonnet opening; and

-- it averaged air concentrations during periods of inactivity as well as during grinding and welding operations and thus did not record peak concentrations potentially present during those operations.

A low volume air sampler was used by the health physics technician during his entry on February 11, 1985. That air sample (recorded as part of Survey No. 100, RWP No. 02-01-5000) showed an air concentration of 2.45 E-8 microcuries per cubic centimeter. Gamma isotopic analysis showed 2.30 times the maximum permissible concentration in air in 10 CFR 20, Appendix B, Table 1, Column 1, for cobalt-60 (insoluble). Failure to make suitable measurements of the concentration of radioactive materials in air within Valve "81A" during the entries by work parties on February 10, 1985, constitutes a violation of 10 CFR 20.103(a)(3). (50-277/85-11-03)

The inspector noted that neither the air samples nor the contamination measurements included a determination of the presence or absence of alpha activity. Since grinding and welding activities were conducted on weld joint 206 joining an existing valve (Valve "81A") from the previous RHR system to new pipe, the potential for alpha activity existed during those operations. Cognizant health physics representatives stated that previous licensee surveys of the Unit 2 drywell had not detected any measurable long-lived alpha activity.

4.4 High Radiation Area Controls

The licensee's controls for entry into the high radiation area (as defined in 10 CFR 20.202(b)(3)) associated with entry into Valve "81A" were reviewed. The inspector noted that each member of the work party on February 10, 1985, wore an audible-alarm dosimeter at chest level during their entries. The inspector also noted that

health physics technicians did not accompany the workers and the workers did not have radiation dose rate monitoring devices (i.e., survey meters) during their entries. Within the scope of this review, the following violation was noted:

> Technical Specification 6.13 requires, in part, that the dose rate levels in the area have been established and the personnel have been made knowledgeable of them if an audible-alarming dosimeter provides primary radiological exposure control during entry into high radiation areas.
>
> Contrary to these requirements, dose rates inside the valve bonnet of Valve "81A" had not been established prior to the entries on February 10, 1985, and work party personnel were not knowledgeable of the dose rates prior to their entries. Failure to establish the dose rates inside the valve bonnet of Valve "81A" and to make work party personnel knowledgeable of those dose rates prior to their entries on February 10, 1985, constitutes a violation of Technical Specification 6.13. (50-277/85-11-04)

In addition, the following unresolved item was noted:

> Although gamma radiation levels to major portions of the head and torso exceeded 100 mrem/hr, beta radiation levels up to 24 rads/hr per square foot were also present. The beta response of the audible-alarm dosimeter used by the workers was not determined by the licensee. Beta/gamma ratios were not employed in setting the alarm setpoints. The adequacy of controlling external exposure to high beta fields with audible-alarm dosimeters during the weld repair is unresolved. (50-277/85-11-05)

4.5 Personnel Monitoring

The selection and placement of personnel monitoring equipment during the weld repair on February 10, 1985, was reviewed. Cognizant health physics personnel and several workers were interviewed to determine:

-- the suitability of the placement of personnel monitoring equipment to determine compliance with 10 CFR 20.101 radiation dose standards; and

-- whether supplemental and extremity personnel monitoring equipment was used.

The weld repair party, in addition to audible-alarm dosimeters, wore 0-500 mrem self-reading pocket dosimeters (SRD), a licensee supplied/read multielement thermoluminescent dosimeter (TLD) badge and a

contractor-supplied multielement TLD badge at chest level during their entries on February 10, 1985. Identical personnel monitoring equipment was worn by the pipefitter and engineer on February 3, 1985, during removal of the purge bag. The inspector noted the nonuniformity of the radiation fields shown in the licensee's surveys of February 10-11, 1985, and identified the following violation:

> 10 CFR 20.202(a)(1) requires, in part, that the licensee supply appropriate personnel monitoring equipment to and require the use of the equipment by each individual who enters a restricted area under such circumstances that he is likely to receive a dose in any calendar quarter in excess of 25 percent of the applicable value specified in paragraph (a) of 10 CFR 20.101.
>
> Contrary to this requirement, appropriate personnel monitoring equipment was not supplied and used during the grinding and welding of weld joint 206 on February 10, 1985:
>
> -- Two pipefitters ground weld joint 206 working through the valve bonnet of Valve "81A" from approximately 0830 to 1025 on February 10, 1985. Dose rates in their work area ranged from 1200 to 2200 mrem/hr gamma and 4000 to 15,200 mrad/hr beta (Licensee's Survey No. 87). Neither individual was provided with extremity monitoring equipment for monitoring possible exposure to the hands and supplemental monitoring equipment for monitoring possible gamma exposures to the lens of the eyes in excess of 25% of 10 CFR 20.101 dose limits.
>
> -- A welder repaired the root pass of weld joint 206 working from the 24-inch diameter RHR discharge piping from approximately 1145 to 1320 on February 10, 1985. Dose rates in his work area (Survey No. 87) were apparently 800-1200 mrem/hr gamma and 800 to 4000 mrad/hr beta. The welder was not provided with extremity monitoring equipment for monitoring possible exposure to his left hand (unprotected by his welder's glove) and supplemental monitoring equipment for monitoring possible gamma exposures to the lens of the eyes in excess of 25% of 10 CFR 20.101 dose limits.
>
> -- The welder's helper assisted the welder working through the valve bonnet of Valve "81A" from approximately 1145 to 1320 on February 10, 1985. Dose rates in his work area were similar to the pipefitters discussed above. The welder's helper was not provided with extremity monitoring equipment for monitoring possible exposure to the hands and supplemental monitoring equipment for monitoring possible gamma exposures to the lens of the eyes in excess of 25% of 10 CFR 20.101 dose limits.

Failure to supply and require the use of appropriate extremity and supplemental monitoring equipment in these instances constitutes a violation of 10 CFR 20.202(a)(1). (50-277/85-11-06)

4.6 Protective Clothing/Equipment

The protective clothing and equipment worn by the various workers during entries into Valve "81A" and its associated RHR system piping on February 3, 1985, and February 10, 1985, were reviewed against the criteria above and the following licensee procedures:

-- HPO/CO-5, "Selection and Use of Anti-C Clothing," Revision 6 (April 30, 1980);

-- HPO/CO-9b, "Respiratory Protective Equipment Selection and Use," Revision 9 (July 20, 1982);

-- HPO/CO-100, "Health Physics Guide Used In the Control of Exposure to Radioactive Material," Revision 15 (December 7, 1984).

The licensee's performance relative to these criteria was determined by interviews of several workers and examination of RWP No. 02-10-5008.

The inspector determined that protective clothing worn by each of the workers met minimum requirements established in HPO/CO-5. The inspector noted that minimum protective clothing requirements in HPO/CO-5 did not prevent skin contamination to 2 workers on February 3, 1985, and 5 workers on February 10, 1985.

Within the scope of this review, the following violation was noted:

Technical Specification 6.11, "Radiation Protection Program," requires, in part, adherence to procedures for personnel radiation protection. Procedure HPO/CO-100 requires, in part, a filter respirator if removable contamination levels are greater than 15 mrad/hr. .

Contrary to the above, on February 10, 1985, at approximately 0820, the welding coordinator inserted his head and torso in Valve "81A." Removable contamination levels up to 24,000 mrad/hr per square foot were present in the valve bonnet into which the welding coordinator entered. The welding coordinator was not wearing any respiratory protection during this entry. Failure to provide respiratory protection to the welding coordinator during his entry in the valve bonnet of Valve "81A" constitutes a violation of Technical Specification 6.11. (50-277/85-11-07)

4.7 Personnel Decontamination

The licensee's efforts to remove skin contamination from the workers were reviewed against the criteria above and licensee's procedure HPO/CO-7, "Personnel Decontamination," Revision 5 (October 26, 1984). The licensee's performance relative to these criteria was determined by interviews of workers and health physics technicians and examination of the licensee's personnel decontamination area.

Within the scope of this review, the following items were noted:

-- Procedure HPO/CO-7 states that an entire body frisk takes about 45 seconds minimum. A "pancake" probe's efficiency when moving is less than its efficiency when in a fixed geometry. As a probe moves, the amount of time available to detect the radioactive emissions from the surface of the skin is reduced, making the frisking process far less efficient than that for counting activity with the probe in a fixed position. The stated minimum body frisk time of 45 seconds is too short to constitute an adequate frisk and may have contributed to the number of personnel found to be contaminated at the exit portal monitor.

-- Procedure HPO/CO-7 also stated that showering to remove general body contamination should be done in lukewarm water. Several of the workers reported that the personnel decontamination shower was "ice cold" on February 3, 1985, and February 10, 1985. The inspector noted that the showers were significantly less than body temperature following approximately 5 minutes of operation of February 14, 1985. The inspector also noted that showering in cold water tends to cause the retention of skin contamination due to the body's reaction to cold temperatures.

At the exit interview on February 15, 1985, the licensee's representative stated that the water heater supplying water to the personnel decontamination shower may have been off on February 10, 1985. The licensee's representative also stated that actions would be taken to ensure that the personnel decontamination shower water was lukewarm as recommended in procedure HPO/CO-7.

These items will be examined in a subsequent inspection. (50-277/85-11-08)

5. Instructions to Workers

The licensee's instructions to contract workers performing inspection, welding, grinding and other activities associated with weld joint 206 were reviewed against criteria provided in:

-- 10 CFR 19.12, "Instructions to Workers;"
-- 10 CFR 20.206, "Instruction of Personnel;"
-- Technical Specification 6.11, "Radiation Protection Program;" and
-- ALARA Program Instruction #2 (API-2), "Specific Program Instruction For Maintaining Occupational Exposure to Radiation As Low As Is Reasonably Achievable (ALARA)."

Within the scope of this review, the following violation was determined:

Technical Specification 6.11 requires, in part, adherence to procedures for personnel radiation protection for all operations involving personnel radiation exposure. API-2 provides specific instructions for implementing the requirements of 10 CFR 20.206 and 10 CFR 19.12. API-2 requires, in part, that radiological controls personnel ensure that workers are aware of the radiological status (radiation, contamination and airborne radioactivity levels) of the work area.

Contrary to these requirements, radiological controls personnel did not ensure that at least 7 contract workers performing inspection, welding, grinding and other activities on weld joint 206 were aware of the radiation, contamination and airborne radioactivity within the valve bonnet of Valve "81A."

-- On February 3, 1985, a pipefitter and an engineer performing work in the valve bonnet were not aware of the radiation and contamination levels within the valve bonnet;

-- On February 10, 1985, a welding coordinator was not aware of the airborne radioactivity within the valve bonnet;

-- On February 10, 1985, two pipefitters, a welder, and his helper were not aware of the contamination levels within the valve bonnet; and

-- Radiological Controls personnel were themselves unaware of the radiation and contamination levels within the valve bonnet until 1700 February 10, 1985, when specific measurements were made.

Radiological Controls personnel were not aware that the workers were going to insert their torsos, heads and arms into the valve bonnet of Valve "81A" to gain access for work activities on weld joint 206. Failure to ensure that workers were aware of the radiological status of the work area within the valve bonnet of Valve "81A" constitutes a violation of Technical Specification 6.11. (50-277/85-11-09)

6. Individual Radiation Doses

The external and internal exposures for the first quarter of 1985 for the following were reviewed against criteria provided in 10 CFR 20.101 and 20.103:

-- the contractor pipefitter who attempted to remove the purge bag on February 3, 1985;

-- the contractor engineer who inspected weld joint 206 on February 3, 1985;

-- the welding coordinator who examined weld joint 206 on February 10, 1985;

-- the two pipefitters who ground weld joint 206 on February 10, 1985;

-- the welder and his helper who repaired the weld joint on February 10, 1985; and

-- the health physics technicians who made radiation/contamination measurements of the work area on February 10-11, 1985.

The inspector examined previous radiation exposure records and in vivo bioassay results for those individuals and discussed the assessment of possible external and internal exposures with the licensee.

6.1 External Exposures

The licensee's records showed that SRD and licensee-supplied TLD badge results were in reasonable agreement and indicative that whole body external exposures measured at chest level were within 10 CFR 20.101 radiation dose standards. However, neither personnel monitoring device records possible beta exposure to the skin and, due to body location, may not have recorded gamma exposure to the lens of the eyes. In addition, extremity monitoring equipment was not used necessitating an evaluation of the extremity exposures to the hands of the various workers discussed in detail 4.5.

At the exit interview on February 15, 1985, the licensee's representative stated that external dose assessments would be complete and available for NRC review by February 22, 1985. This item is unresolved pending completion of the licensee's dose assessment and review by the NRC. (50-277/85-11-10)

6.2 Internal Exposures

The licensee's bioassay records indicated less than maximum permissible organ burdens of gamma-emitting radionuclides were present in the various workers' bodies. However, additional

bioassays for determining the original intakes of radioactive material were incomplete.

At the exit interview on February 15, 1985, the licensee's representative stated that assessments of the intake of radioactive materials by the workers identified in this report would be complete and available for NRC review by February 26, 1985. This item is unresolved pending completion of the licensee's assessment of the intake of radioactive materials by the workers and review by the NRC. (50-277/85-11-11)

7. Management Controls

The management controls in radiation protection during the events described in this report were reviewed against criteria and commitments provided in:

-- Station Technical Specifications, Section 6;

-- Administrative Procedure No. 86 (A-86), "Administrative Procedure For Corrective Action; and

-- The letter dated June 15, 1984, from S. L. Daltroff, PECO, to J. F. Stolz, NRC, and its attachments describing the radiation protection program for Unit 2 piping replacement.

7.1 Staffing

The inspector reviewed the number of contractor health physics technicians assigned to Unit 2 drywell radiological control coverage on February 10, 1985, and determined that 4 health physics technicians were assigned to cover an estimated 70-80 contractor workers in the Unit 2 drywell. Those health physics technicians were in the Unit 2 drywell conducting routine surveillance activities for a total of 3 hours during the events described in this report. Although 4 were assigned, a health physics technician was late in arriving which left 3 to collect routine air samples, issue audible alarm dosimeters, question workers concerning their tasks, provide radiological status information, verify workers were properly attired for their work and cover any contingencies (e.g., decontamination of workers) during the entry of the welding coordinator and the pipefitters assigned to grind weld joint 206.

The inspector reviewed the total available health physics technician staff assigned to piping replacement over the course of the outage and noted:

-- 25 health physics technicians were assigned to Unit 2 drywell work in June 1984;

-- 35 health physics technicians were assigned during the recirculation pump decontamination;

-- 32 health physics technicians were assigned during the period February 3-10, 1985; and

-- the contractor work force to be covered by those technicians increased from approximately 400 to approximately 600 from June 1984 through early February 1985.

The inspector also noted that the scope of assigned coverage for those health physics technicians had increased from primarily Unit 2 drywell activities to coverage of all pipe replacement related activities on the site including:

-- operation of the equipment decontamination trailer;

-- Unit 2 and 3 turbine deck work;

-- Unit 2 torus work;

-- routine radiological surveillance of stored components related to pipe replacement throughout the site;

-- routine radiological surveillance for contractor equipment leaving the site; and

-- all licensee and contractor work in the Unit 2 drywell.*

*In June 1984, only piping contractor work in the drywell was the contractor health physics technicians' responsibility.

The piping replacement contractor works two 10-hour shifts per day for 7 days per week. The licensee and two additional contractors work two 8-hour shifts per day for 5 days and an additional 8 hour shift on Saturdays in the Unit 2 drywell. Under the licensee's Administrative Procedure No. 40, "Working Hour Restrictions," a health physics technician is restricted to 72 hours total in any 7 day period. In view of the available health physics technician man-hours, work coverage responsibilities and increased contractor work force to be covered, it appeared that the contractor health physics technicians were understaffed by the licensee. Health physics technician staffing will be reviewed in a subsequent inspection. (50-277/85-11-12)

7.2 Work Activities Control

The inspector reviewed the licensee's system for ensuring that Unit 2 drywell health physics personnel were aware of planned work activities, the scope of those activities and the radiological controls needed. Unit 2 contractor health physics technicians were

unaware that weld repair on weld joint 206 would require entry into the bonnet of Valve "81A" and 24-inch diameter discharge RHR piping.

Two administrative mechanisms provide information to the health physics technicians regarding planned work activities:

-- a daily morning meeting at approximately 0730 where work activities are discussed; and

-- shift work lists issued by the piping replacement contractor for each shift which includes priority, brief description, reference "traveler number," (i.e., special engineering instructions), responsible contractor engineer, ALARA Review Number and the need for a firewatch.

In addition, "ALARA engineers" and contractor piping engineers provide verbal information on an informal level.

On Sunday, February 10, 1985, no representation of the contractor health physics technicians was present at the daily morning meeting at 0730.

The shift work list is reviewed by the "ALARA engineer" to ensure that ALARA reviews under API-2 have been completed. The "ALARA engineer" signs the shift work list and sends it over to the Unit 2 drywell health physics control point. However, the shift work list can be changed by piping replacement contractor management since it is an uncontrolled document.

On February 10, 1985, the health physics technicians at the Unit 2 drywell received and used an unsigned copy of the Day Shift Work List. That copy did not indicate that work on the inside surface of weld joint 206 was planned. However, the Day Shift Work List containing the signature of the "ALARA engineer" clearly showed that work on the inside surface of weld joint 206 was planned.

The inspector concluded that .the licensee had not provided an administrative control system to ensure that health physics technicians, responsible for radiological control of Unit 2 drywell activities, were aware of:

-- the daily planned work activities;

-- the scope of those activities; and

-- the radiological controls needed to complete those activities.

7.3 Discrepancy Reports

Under licensee's procedure A-86, radiological discrepancies are investigated, documented, reported, tracked, closed and trended. On February 3, 1985, two workers had skin contamination on their torsos following efforts to remove the purge bag used in initially welding weld joint 206. The inspector reviewed the reporting of the event to determine if the causes were identified and reported to health physics management by cognizant health physics technicians.

The health physics technicians noted in the Unit 2 Drywell Control Point Log (page 25) that the pipefitter had not indicated that he would be going inside Valve "81A" to remove the purge bag. A discrepancy report under procedure A-86 was initiated by the health physics technicians describing the event and indicating that they were not aware of the planned entry into Valve "81A" prior to that entry. The health physics technicians also recorded the decontamination of the engineer and pipefitter under licensee's procedure HPO/CO-7, "Personnel Decontamination." Under procedure HPO/CO-7, the health physics technicians reported the skin contaminations to the Senior Health Physicist by telephone on February 3, 1985.

On February 4, 1985, the discrepancy report was reviewed by the Unit 2 Drywell Health Physics Coordinator and given to the Applied Health Physicist. On February 5, 1985, the Applied Health Physicist forwarded the discrepancy report to the Senior Health Physicist.

On February 14, 1985, the discrepancy report was not recorded in the licensee's Operational Quality Assurance organization's system for tracking and closing discrepancies. The Senior Health Physicist was unable to locate the report but he acknowledged that he had read it.

The inspector noted that under procedure A-86, a section manager can decide that additional action on a discrepancy report is unneeded and end the process. The inspector also noted that this discrepancy report clearly indicated that workers were entering Valve "81A" without the prior knowledge of the health physics technicians.

8. Exit Interview

The inspector met with the licensee's representative (denoted in Section 1.1) at the conclusion of the inspection on February 15, 1985. The Chief, BWR Radiological Protection Section, NRC Region I, was also present. The inspector summarized the purpose and scope of the inspection and identified findings as described in this report.

At no time during the inspection was written material provided to the licensee by the inspector. No information exempt from disclosure under 10 CFR 2.790 was discussed in this report.