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SUBJECT: Forwards draft proposed FSAR changes that clarify details on radiation protection.Change also provided to correct description of transfer path of decontamination wastes. Changes will be incorporated in FSAR Amend 14.

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Arizona Public Service Company

ANPP-31397-EEVB/WFQ
December 10, 1984

Director of Nuclear Reactor Regulation
Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
PVNGS FSAR Update - Radiation Protection Design Features
File: 84-056-026; G.1.01.10

Dear Mr. Knighton:

Enclosed are draft proposed FSAR changes that clarify design details on radiation protection. Included are changes that specify where PVNGS has used alternative measures to achieve ALARA compliance, and that describe ALARA provisions for packaged, skid mounted, equipment. A change is also provided to correct the description of the transfer path of decontamination facility wastes. These wastes are now transferred to the chemical drain tanks, rather than the radwaste building sump, prior to processing.

These changes are expected to be incorporated in FSAR Amendment 14 to the FSAR which is scheduled for submittal in February 1985. Please contact William Quinn of my staff if you have any questions.

Very truly yours,

E. E. Van Brunt

E. E. Van Brunt, Jr.
APS Vice President
Nuclear Production
ANPP Project Director

EEVB/WFQ/mb
Enclosure

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STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

I, Edwin E. Van Brunt, Jr., represent that I am Vice President, Nuclear Production of Arizona Public Service Company, that the foregoing document has been signed by me on behalf of Arizona Public Service Company with full authority to do so, that I have read such document and know its contents, and that to the best of my knowledge and belief, the statements made therein are true.

Edwin E. Van Brunt, Jr.

Edwin E. Van Brunt, Jr.

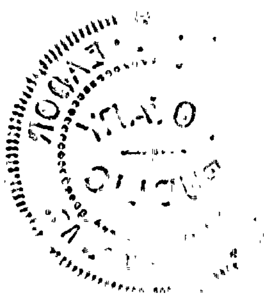
Sworn to before me this 10 day of December, 1984.

Nora E. Meador

Notary Public

My Commission Expires:

My Commission Expires April 6, 1987



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transferred to spent resin tanks prior to solidification, and that fresh resin can be loaded into the ion exchanger remotely. Underdrains and downstream strainers are designed for full system pressure drop. The ion exchangers and piping are designed with provisions for being flushed with compressed nitrogen or demineralized water.

12.3.1.1.1.3 Evaporators. The LRS evaporator is provided with chemical addition connections to allow the use of chemicals for descaling operations. Space is provided to allow uncomplicated removal of heating tube bundles. The ~~more~~ non-radioactive components are separated from those that are ~~less~~ radioactive by a shield wall. ~~Remote~~ Instruments and controls necessary for evaporator operation are located on the Zone 2 side of the shield wall. Frequently operated valves in radioactive lines are ~~located on~~ capable of being operated from the Zone 2 side of the shield wall. ~~Valves in nonradioactive lines are located outside the room.~~

12.3.1.1.1.4 Pumps. Pumps in radioactive and potentially radioactive systems are provided with mechanical seals to reduce seal servicing time. These pumps include those in the nuclear cooling water, essential cooling water, safety injection, containment spray, spent fuel pool cooling, radwaste, and chemical and volume control systems. Pumps and associated piping are arranged to provide adequate space for access to the pumps for servicing. Pumps in the above systems are provided with flanged connections for ease in removal. Pump casings are provided with drain connections for draining the pump for maintenance. Plant layout ensures that maintenance can be performed in such a way that exposure to major radiation sources is ~~reduced (e.g., pumps in separate rooms)~~ minimized.

12.3.1.1.1.6 Heat Exchangers. Heat exchangers are provided with corrosion-resistant tubes of stainless steel or other suitable materials with tube-to-tube sheet joints welded or expanded to minimize leakage. Impact baffles are provided, and tube side and shell side velocities are limited to minimize erosive effects.

12.3.1.1.1.7 Instruments. Instrument devices are located in low-radiation zones and away from radiation sources whenever practical. Primary instrument devices, which are located in high-radiation zones for functional reasons, are designed for easy removal to a lower radiation zone for calibration. ~~Transmitters and~~ readout devices are located in low-radiation zones, such as corridors and the control room, for servicing.

Some instruments (such as thermocouples) in high-radiation zones are provided in duplicate to reduce access and service time, ~~required.~~ In the containment most instruments are located outside the secondary shield (area of lowest at-power and shutdown radiation).

Integral radiation check sources for response verification for airborne radiation monitors and safety-related area radiation monitors are provided. This allows the remote removal of a shielding window to check the response of each detector.

12.3.1.1.1.8 Valves. To minimize personnel exposures from valve operations, motor-operated, diaphragm, or other remotely actuated valves are used in systems that require frequent operations or are exposed to high radiation sources.

Valves are located in valve galleries, so that they are shielded separately from the major components. Long runs of exposed piping are minimized in valve galleries. In areas where manual valves are used in frequently operated process lines, either valve stem extenders or shielding are provided, so that personnel need not enter the high-radiation area for normal valve operation.

For valves located in radiation areas, provisions are made to drain adjacent radioactive components when maintenance is required.

Valves for clean, nonradioactive systems are separated from radioactive sources and are located in readily accessible areas.

Manually operated valves in the filter and high activity ion exchanger valve compartments required for normal operation and shutdown are equipped with reach rods extending through the valve gallery walls. Personnel do not enter the valve galleries during flushing operations. The valve gallery shield walls are designed for maximum expected filter and ion exchanger activities.

For most larger valves (2-1/2 inches and larger) in lines
11 carrying radioactive fluids, a double set of packing is provided. Diaphragm or bellows seal valves are used on those systems where leakage is to be minimized.

a graphoil or graphite yarn packing is used. Diaphragm or bellows seal valves are used where minimal leakage is required.

12.3.1.1.1.9 Piping. The piping in pipe chases is designed for the life-time of the unit. There are no valves or instrumentation in pipe chases. Wherever radioactive piping is routed through areas where routine maintenance is required, pipe chases are provided to reduce the radiation contribution from these pipes to levels appropriate for the inspection requirements. Piping containing radioactive material is routed to minimize radiation exposure to the unit personnel.

12.3.1.1.1.10 Floor Drains. Floor drains and properly sloped floors are provided for each room or cubicle containing serviceable components containing radioactive liquids. Local gas traps or porous seals are not used on radwaste floor drains. Gas traps are provided at the common sump or tank.

Major components (such as tanks, ion exchangers, and filters)
in radioactive systems are isolated in individual shielded
compartments. Labyrinth entranceway shields or shielding
doors are provided for each compartment from which radiation
12 could stream or scatter to access areas and exceed the design
radiation zone dose limits for those areas. For potentially
12 high-radiation components (such as ion exchangers and tanks),
completely enclosed shielded compartments with hatch openings
are used. For some infrequently serviced components, completely enclosed shielded compartments with removable concrete
block walls are used.

Nonradioactive equipment that requires maintenance is located outside radiation areas.

Exposure from routine in-plant inspection is controlled by
locating, whenever possible, inspection points in properly
shielded low-background radiation areas. Radioactive and
nonradioactive systems are separated as far as practicable to
limit radiation exposure from routine inspection of non-
radioactive systems. For radioactive systems, emphasis is
placed on adequate space and ease of motion in a properly
shielded inspection area. Where longer times for routine
inspection are required, and permanent shielding is not
feasible, sufficient space for portable shielding is provided.
For example, a remotely operated device is provided for
inservice inspections of the reactor vessel. Access to high-
12 radiation areas is under the supervision of the radiation
protection personnel.

12.3.1.1.2.6 <u>Field-Run Piping</u>. Radioactive process piping
12 design (i.e., routing or shielding) is not performed in the
field.

12.3.1.1.2.7 <u>Packaged Units</u>

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12.3.1.1.2.7 Package Units. Each package unit is skid mounted with all motors and pumps located on the periphery at the skid for ease of access and for quick removal to low radiation area for maintenance or repair. Package components are provided with provisions for flushing, draining and chemical cleaning. Heat exhangers are readily accessible for maintenance. As many control elements as possible are mounted remotely from the radioactive components so that the package can be remotely controlled and monitored. Components are designed with a minimum of crevices to reduce the accumulation of radioactive materials.

are performed in the same machine which eliminates the pos-
5 sibility of any accidental contamination during transfer
between washers and dryers. Radioactive waste is trapped by
6 filters. Aqueous or hydrocarbon soluble contamination is
separated during solvent distillation and re-condensation.

The liquid waste from the laundry is contained in the dry
5 cleaning machines and processed separately from other liquid
waste. The dry, solid waste from the laundry is manually
bagged and carried to the radwaste baler in the Unit 1
6 Radwaste Building. This waste is compacted into 55 gallon
drums in preparation for offsite disposal.

The liquid wastes from the decontamination facility are piped
12 to a line common to the laundry building which goes to the Unit 1
Chemical Drain Tanks ~~Radwaste Building sump~~. The solid waste generated from the
6 decontamination facility is handled in a manner similar to
that discussed above.

12.5.3 PROCEDURES

Radiation protection procedures are established to keep personnel radiation exposures ALARA and within the limits of 10CFR20. These procedures are discussed in section 13.5.2. Policy and operational considerations for maintaining personnel radiation exposures are discussed in sections 12.1.1 and 12.1.3.

12.5.3.1 Radiation and Contamination Surveys

Radiation protection personnel normally perform routine radiation and contamination surveys of accessible areas of the units. These surveys consist of radiation dose rate measurements and/or contamination smears as appropriate for the specific area. Air samples are routinely taken in accessible portions of controlled areas. Surveys related to specific

C. Shielding design guidelines | 12

1. Significantly radioactive components such as tanks, filters, ion exchangers, pumps, and heat exchangers are located in shielded compartments.

2. In those process systems whose components contain major sources of radiation, valves and instrumentation are separated by shielding from the components.

3. Although use of permanent shielding is preferred, portable or temporary shielding and convenient means for handling it is provided where shielding is required but fixed shielding is impractical. Access and the capability of the structure to support such portable or temporary shielding has been evaluated during design review.

4. Access to shielded compartments is generally by means of shielded labyrinth arrangements such that direct exposure to radioactive equipment from normal access areas is eliminated. For highly radioactive passive components such as tanks, ion exchangers, and filters, completely enclosed compartments are provided with access via a shielded hatch, or labyrinth entry way with a locked gate.

5. Where space limitations preclude the use of ordinary concrete for shielding, lead, iron, or high density concrete is used instead.

6. Use of removable concrete shielding blocks for frequent personnel access or equipment removal has been avoided by design when practical.

3. If the radiation level within a valve gallery is high, valve stem extensions through the valve gallery wall to an adjacent corridor are supplied for frequently operated valves so that they may be operated from a design radiation Zone 2 area.

4. Sufficient space is provided in valve galleries to facilitate maintenance on valves.

12 E. Radioactive piping design guidelines

1. Radioactive piping is not field routed.

12 2. Piping is routed so that it does not exceed applicable design radiation zone level.

3. Radioactive piping routed through design radiation Zone 1 or Zone 2 areas is enclosed in a shielded pipe chase, if required.

12 4. Radioactive piping is routed through the highest design radiation zones practical.

5. Potentially radioactive piping is routed behind components or structures which provide shielding to areas where maintenance is likely to be performed.

12 6. Radioactive pipes are routed close to floors, ceilings and walls where practical, but are kept away from doors and entrances, outside containment.

12 7. When practical, radioactive piping is separated from nonradioactive piping.

12 8. If practical, valves or instrumentation should not be located within radioactive pipe chases.

In addition, the following special considerations are given to piping which processes spent resins:

14. DELETED ~~Such piping is continuously sloped. This sloping is in the direction of flow, where practical.~~

15. Ball, plug, or diaphragm valves are used, depending upon the function, in spent resin lines. Strainer, check, and Y-valves are not utilized in piping systems which process spent resins.

16. Orifices are not utilized in spent resin piping systems.

17. Butt welds are employed where practical for spent resin piping regardless of size. Large radius elbows, or large diameter bends, are used where practical in routing all such piping. 12

18. Ninety-degree tees are not used in spent resin piping systems except to introduce clean services such as nitrogen or water, into such lines. Dead legs are avoided and any necessary flushing connections are taken off above the horizontal centerplane of the resin piping.

19. Spent resin lines are sized to achieve turbulent flow to minimize resin deposits and subsequent buildup.

20. Provisions are made for the ion exchangers as well as the resin lines to be pressurized with nitrogen or water to clear plugged lines. The water or nitrogen is introduced at a tee downstream of each valve, and the leg of the tee is above the resin line to avoid clogging of the clean service inlet line.

piping be routed through corridors or other low-radiation
12 areas, shielded pipeways are provided. Whenever practical, valves and instruments are not placed in radioactive pipeways.
12 Whenever practical, equipment compartments are used as pipeways only for those pipes associated with equipment in the compartment.

12 When practical, radioactive and nonradioactive piping are separated to minimize personnel exposure. Should maintenance be required, provision is made to isolate and drain radioactive piping and associated equipment.

Piping is designed to minimize low points and dead legs. Drains are provided on piping where low points and dead legs cannot be eliminated. Long radius elbows, or bends of several
12 pipe diameters are utilized whenever practicable for pipes carrying radioactive material.

Piping, carrying resin slurries or evaporator bottoms, is run vertically as much as possible. ~~When practical, horizontal~~
12 ~~runs carrying spent resin are sloped toward the spent resin tanks wherever possible.~~

Whenever possible, branch lines having little or no flow during normal operation are connected above the horizontal midplane of the main pipe.

12.3.1.1.2.3 Penetrations. To minimize radiation streaming through penetrations, as many penetrations as practicable are located with an offset between the source and the accessible areas. If offsets are not practical, penetrations are located as far as possible above the floor elevation to reduce the exposure to personnel. If these two methods are not used, alternate means are employed, such as baffle shield walls or grouting the area around the penetration.

12.3.1.1.2.4 Contamination Control. Access control and traffic patterns are considered in the basic plant layout to minimize the spread of contamination. Equipment vents and drains from highly radioactive systems are piped directly to the collection system instead of allowing any radioactive fluid to flow across to the floor drain. All-welded piping systems are employed on radioactive systems to the maximum extent practicable to reduce system leakage and crud buildup at joints.

Decontamination of potentially contaminated areas and equipment within the plant is facilitated by the application of suitable smooth-surface coatings to the concrete floors and walls. 12

Sloped floors and floor drains are provided in potentially contaminated areas of the plant. In addition, radioactive and potentially radioactive drain systems are separated from non-radioactive drain systems. 12 Rooms with equipment or tanks that contain radioactive fluids have curbs to contain potential spills or leaks. Large tanks containing radioactive fluids are enclosed in water tight compartments or are surrounded by curbs. 12

In controlled access areas where contamination is expected, radiation monitoring equipment is provided (sections 11.5 and 12.3.4). Those systems that become highly radioactive, such as the spent resin lines in the radwaste system, are provided with flush and drain connections.

12.3.1.1.2.5 Equipment Layout. In systems where process cleanup equipment is a major radiation source, ~~(such as fuel pool cleanup, SVCS, or liquid radwaste),~~ pumps, valves, and instruments are separated from the process component. This allows servicing and maintenance of these items in reduced radiation areas. Control panels are located in low-radiation areas (Design Radiation Zones 1 or 2). 12

Major components (such as tanks, ion exchangers, and filters) in radioactive systems are isolated in individual shielded compartments. Labyrinth entranceway shields or shielding doors are provided for each compartment from which radiation
12 could stream or scatter to access areas and exceed the design radiation zone dose limits for those areas. For potentially
12 high-radiation components (such as ion exchangers and tanks), completely enclosed shielded compartments with hatch openings
or labrinth entryways with locked gates
are used. For some infrequently serviced components, completely enclosed shielded compartments with removable concrete block walls are used.

Nonradioactive equipment that requires maintenance is located outside radiation areas.

Exposure from routine in-plant inspection is controlled by locating, whenever possible, inspection points in properly shielded low-background radiation areas. Radioactive and nonradioactive systems are separated as far as practicable to limit radiation exposure from routine inspection of nonradioactive systems. For radioactive systems, emphasis is placed on adequate space and ease of motion in a properly shielded inspection area. Where longer times for routine inspection are required, and permanent shielding is not feasible, sufficient space for portable shielding is provided. For example, a remotely operated device is provided for inservice inspections of the reactor vessel. Access to high-
12 radiation areas is under the supervision of the radiation protection personnel.

12.3.1.1.2.6 <u>Field-Run Piping</u>. Radioactive process piping
12 design (i.e., routing or shielding) is not performed in the field.

N. Leakage of radioactive material is minimized by use of appropriate valve gaskets and valve packing. For example, one of the following is provided for radioactive valves 2-1/2 inches and larger:

1. Graphoil or graphic yarn packing

~~1. A double set of packing~~

~~2. A packing gland with a leakoff connection which can be piped to a collection header.~~

2 3. Diaphragm or bellows seal valves where essentially no leakage is required.

Radiation tolerant materials are used in valves in accordance with their radioactive service. Chemical seals are provided on instrument sensing lines for process piping which may contain highly radioactive solids to reduce the servicing time required to keep the lines free from solids.

12 O. Primary instrument devices, which for functional reasons are located in high radiation areas, have been designed for uncomplicated removal for calibration or servicing. Some instruments, such as thermocouples are provided in duplicate in highly radioactive areas to reduce access and service time.

P. The sample laboratory is equipped with adequate shielding and a fume hood. The sample laboratory and sample stations are equipped with a sink or funnel arrangement so that sample lines may be purged to the LRS or chemical and volume control system prior to sampling. Also, sample lines incorporate the capability of being flushed.

Q. An automated radwaste solidification system is employed to minimize exposure during radwaste processing. Remotely operated equipment is provided where practical to minimize operator radiation exposure.