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RECIP.NAME RECIPIENT AFFILIATION
KNIGHTON,G.W. Licensing Branch 3

SUBJECT: Forwards marked-up FSAR & lessons learned implementation rept,reflecting

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Director of Nuclear Reactor Regulation
Attention: Mr. George W. Knighton, Chief
Licensing Branch 3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

September 26, 1985
ANPP-33573-EEVB/MAJ

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Post Accident Sampling System
Docket Nos. STN-50-528(License No. NPF-41)/529/530
File: 85-056-026; G.1.01.10

References: (1) Meeting between E. A. Licitra, M. Ley, F. Witt, USNRC, and T. Quan, and M. Jones, APS, dated July 31, 1985; Subject: PVNGS Unit 2 Licensing Issues.
(2) Letter to G. W. Knighton, NRC, from E. E. Van Brunt, ANPP, dated December 5, 1984 (ANPP-31333); Subject: Unit 1 PASS Schedular Exemption.

Dear Mr. Knighton:

During the above Reference (1) meeting, we informed your staff that the inline post accident sampling system, as described in the PVNGS Final Safety Analysis Report (Amendment 14) and the PVNGS Lessons Learned Implementation Report (Amendment 3), would not be implemented at PVNGS. Instead, APS has decided to use a grab sample type post accident sampling system to meet the requirements of NUREG-0737, Item II.B.3.

Attached for your review and approval are the marked up pages of the PVNGS Final Safety Analysis Report and Lessons Learned Implementation Report reflecting the PVNGS grab sample type post accident sampling system.

As previously discussed with your staff in the referenced meeting, the PVNGS Unit 2 grab sample post accident sampling system will be operable prior to Unit 2 exceeding 5% power. Additionally, the PVNGS Unit 3 grab sample post accident sampling system will also be operable prior to Unit 3 exceeding 5% power. For PVNGS Unit 1, the current interim PASS will be upgraded to the attached FSAR description prior to restart following the first refueling. This commitment supercedes the previous commitment contained in the Reference (2) letter to upgrade the temporary Unit 1 PASS to an inline type PASS.

B021 1/1

If you have any questions or require futher information on this subject, please contact William F. Quinn of my staff.

Very truly yours,

E. E. Van Brunt, Jr.
Executive Vice President
Project Director

EEVB/MAJ/slh
Attachment

cc: E. A. Licitra (all w/a)
M. Ley
R. P. Zimmerman
A. C. Gehr
F. J. Witt

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

I, Edwin E. Van Brunt, Jr., represent that I am Executive Vice President, Arizona Nuclear Power Project, 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

Edwin E. Van Brunt, Jr.

Sworn to before me this 26 day of September, 1985.

Nora E. Meador

Notary Public

My Commission Expires:

My Commission Expires April 6, 1987

[illegible]

[illegible]

[illegible]

[illegible]

locally mounted temperature and pressure switches, indicators, and automatic protection devices. The temperature and pressure switches support the automatic control modes of compressor and dryer operation. A manual or hand mode of operation is also provided for each control room. The compressed air system also includes additional local instrumentation and controls necessary to ensure the ability of the system to perform its design functions.

9.3.2 PROCESS SAMPLING SYSTEM

9.3.2.1 Design Bases

The process sampling system design bases are as follows:

A. General

The sampling system is designed to collect samples from the reactor coolant and auxiliary systems for analysis. It permits sampling during reactor operation and cooldown without requiring access to the containment. Remote samples can be taken of fluids in high radiation areas without requiring access to these areas. The sampling system performs no safety function. The radiological (shielding) evaluation for normal operation of the process sampling system is provided in section 12.2. The sample analyses may be performed:

1. Under normal conditions by drawing samples at a sample sink and conducting the analysis in the Hot Lab.

2. Under post-accident conditions by OBTAINING ~~using remote,~~ grab samples and performing the required analyses in an ~~in-line analyses to perform required samples and~~ appropriate laboratory facility. ~~evaluating remote readout in Hot Lab~~. (Samples include, RCS, safety injection, ~~all~~ containment radwaste sumps, ~~all~~ auxiliary building radwaste sumps, and containment air.) DESIGN PARAMETERS ARE BASED ON THE FULL RANGE OF DESIGN PRESSURE OF THE REACTOR COOLANT SYSTEM AND THE CONTAINMENT EXPECTED AT THE TIME SAMPLING BEGINS. THE PASS SAMPLING LINES AND COMPONENTS CONFORM TO QUALITY GROUP D REQUIREMENTS. Isolation Valves ARE USED WITH APPROPRIATE AUTOMATIC CLOSURE SIGNALS WHERE PASS PIPING interconnects with higher quality group classification piping.

cooling systems, provisions for extracting, processing, and analyzing samples from the following points are provided: each of the two shutdown cooling suction lines, and the safety injection pump mini-flow lines.

2. Post-Accident

Boron concentration may be performed for any liquid sample drawn for post-accident analysis. ~~Readout appears on a monitor in the Hot Lab.~~ 4

E. Chemical and Volume Control System (CVCS) Samples

Both liquid and gas sampling provisions are required to monitor CVCS performance.

1. In order to monitor the overall purification effectiveness, liquid samples are taken from the purification filter inlet stream for filterable corrosion products, the outlet stream for soluble activity, and the purification ion exchanger outlet for soluble activity.

2. Gas samples are taken from the volume control tank, gas stripper, equipment drain tank, and reactor drain tank. These samples are used to verify the oxygen content of these tanks.

F. Representative Samples

In order to ensure that representative samples are obtained, the sampling lines are purged prior to sampling. Purge flow shall be high enough (i.e., turbulent) to inhibit deposition of suspended solids and to remove crud from sampling lines. 14

Table 9.3-3.

SAMPLING SYSTEM DESIGN PARAMETERS (Sheet 12 of 14)

Sample Origin	Type of Sample Cooler	Typical Discrete Sample Analysis(b)	Pressurized Sample Capability	Continuous On Line Analysis Provided	Mode of Sample Removal and Location	Nominal Pressure (psig)	Nominal Temperature (°F)	Figure No.
Gas Sampling System (Cont'd)								
Holdup Tank	None	Radioactivity, H_2, O_2	No	H_2, O_2(d)	Remote Radwaste Bldg El-140'	Atmos.	120	9.3-13 9.3-2
Containment Atmosphere	None	Radioactivity	No	Radioactivity(c)	Local Aux Bldg 100' Level NE Quad	5	122	9.4-13
Containment Purge Exhaust	None	Radioactivity	No	Radioactivity(c)	Local Aux. Bldg 140' Level NE Quad	Atmos.	120	9.4-13
Plant Vent	None	Radioactivity	No	Radioactivity(c)	Local Turb Bldg 160' Level	Atmos.	120	9.4-13
Containment Atmosphere	None	Moisture (4 points)	No	Yes Moisture (4 points)	Local 1 at El-104'-6" NW Quad; 1 at El 124'-9" NW Quad; 2 later	5	122	9.4-12
Control Building Outside Air Intake	None	Radioactivity, Smoke, (2 points each)	No	Radioactivity(c), Smoke, (2 points each)	Remote Control Bldg, 140' Level in Outside Air Chase	Atmos.	113	9.4-1
Post-Accident Sampling System								
Hot Leg ~~Loop 1~~	Rough	Isotopic, ~~Gross Gamma,~~ pH, ~~Oxygen, Hydrogen,~~ Chloride, Boron, DISSOLVED HYDROGEN, TOTAL GAS	~~Yes~~ No	N/A ~~Isotopic, Gross Gamma, pH, Oxygen, Hydrogen, Chloride, Boron~~	Remote Aux Bldg, Elevation 140' ~~and 70' Syringe Grab Sample~~ GRAB Sample Station	2485 (max)	621	9.3-2A

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Table 9.3-3

SAMPLING SYSTEM DESIGN PARAMETERS (Sheet 13 of 14)

Sample Origin	Type of Sample Cooler	Typical Discrete Sample Analysis(b)	Pressurized Sample Capability	Continuous On Line Analysis Provided	Mode of Sample Removal and Location	Nominal Pressure (psig)	Nominal Temperature (°F)	Figure No.
Post-Accident Sampling System (Cont'd)								
~~Hot Leg Loop~~ 2	Rough	~~Isotopic, Gross Gamma, pH, Oxygen, Hydrogen, Chloride, Boron~~	~~Yes~~	~~Isotopic, Gross Gamma, pH, Oxygen, Hydrogen Chloride, Boron~~	~~Remote Aux Bldg, Elevations 140' and 70' Syringe Grab Sample~~	~~2485~~	~~621~~	~~9.3-2A~~
~~ESF A&B Safety Injection Sumps~~	~~Rough~~	~~Isotopic, Gross Gamma, pH, Oxygen, Hydrogen, Chloride, Boron~~	~~Yes~~	~~Isotopic, Gross Gamma, pH Oxygen, Hydrogen, Chloride, Boron~~	~~Remote Aux Bldg, Elevations 140' and 70' Syringe Grab Sample~~	~~60~~	~~350~~	~~9.3-2A~~
TRAIN ~~ESF~~ ~~A&B~~ Safety Injection Mini Flow Line	Rough	Isotopic, ~~Gross Gamma~~, pH, ~~Oxygen, Hydrogen~~, Chloride, Boron,	~~Yes~~ NO	~~Isotopic, Gross Gamma, pH, Oxygen, Hydrogen, Chloride, Boron~~ N/A.	Remote Aux Bldg, Elevations 140' ~~and 70' Syringe Grab Sample~~ GRAB SAMPLE STATION	2050	350	9.3-2A
Containment Radwaste Sumps	Rough	Isotopic, ~~Gross Gamma~~, pH, ~~Oxygen, Hydrogen~~, Chloride, Boron,	~~Yes~~ No.	~~Isotopic, Gross Gamma, pH, Oxygen, Hydrogen, Chloride, Boron~~	Remote Aux Bldg, Elevations 140' ~~and 70' Syringe~~ Grab Sample STATION	60	120	9.3-2A

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Table 9.3-3

SAMPLING SYSTEM DESIGN PARAMETERS (Sheet 14 of 14)

Sample Origin	Type of Sample Cooler	Typical Discrete Sample Analysis(b)	Pressurized Sample Capability	Continuous On Line Analysis Provided	Mode of Sample Removal and Location	Nominal Pressure (psig)	Nominal Temperature (°F)	Figure No.
Post-Accident Sampling System (Cont'd)								
Auxiliary Building Sumps (RADWASTE)	Rough	Isotopic, ~~Gross Gamma~~, pH, ~~Oxygen, Hydrogen~~, Chloride, Boron,	~~Yes~~ NO	N/A ~~Isotopic, Gross Gamma, pH Oxygen, Hydrogen, Chloride, Boron~~	Remote Aux Bldg, Elevations 140' ~~and 70' Syringe~~ Grab Sample STATION	50	120	9.3-2A
Containment Air	Rough	Isotopic, ~~Gross Gamma~~, Oxygen, HYDROGEN, (Hydrogen also provided by Containment Hydrogen Control System)	Yes	N/A ~~Isotopic, Gross Gamma, Oxygen (Hydrogen provided by Containment Hydrogen Control System)~~	Remote Aux Bldg, Elevations 140' ~~and 70' Syringe~~ Grab Sample STATION	35 (MAX.)	302°	9.3-2A
Letdown Line (cold leg)	Rough	Isotopic, pH, Chloride, Boron, DISSOLVED HYDROGEN, TOTAL GAS	Yes	N/A	Remote Aux Bldg. Elevation 140' Grab Sample Station	2235 (MAX)	405	Figure 9.3-2A

7

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~~APPENDIX 9A~~

Table ~~9A-2~~ 9.3-3A

POST-ACCIDENT SAMPLING SYSTEM
(Sheet 1 of 2)

Inputs

Liquid

~~Containment Recirculation Sump~~, Reactor Coolant System HOT LEG, Containment Radwaste Sump, Safety Injection ~~A~~ & B MINI FLOW LINE, ~~Safety Injection B~~, Auxiliary Building RADWASTE Sumps, Letdown ~~System~~ LINE

Gas

Containment Air~~, Volume Control Tank~~

6 Outputs

Liquid

Equipment Drain Tank, Reactor Drain Tank

Gas

Containment Air

Analyses — INSERT ATTACHMENT 1

Liquid

Gamma Spectrum	10^{-1} uCi/ml to 10 Ci/ml Isotopic
Gross Gamma	10^{-1} uCi/ml to 10 Ci/ml Gross
Boron	0 to 6000 ppm
pH	1 to 13 (temperature compensated)
Dissolved Oxygen	0 to 20 ppm
12 Total Dissolved Gas	0 to 2000 cc (STP)/Kg
6 Chloride	0 to 20 ppm

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~~APPENDIX 9A~~

9.3-3A
Table ~~9A-2~~

INSERT ATTACHMENT 1

POST-ACCIDENT SAMPLING SYSTEM
(Sheet 2 of 2)

Gas	
Gamma Spectrum	10^3 uCi/ml to 10^1 Ci/ml Isotopic
Gross Gamma	10^3 uCi/ml to 10^1 Ci/ml gross
Gaseous Oxygen	0 to 30%
Gaseous Hydrogen	0 to 10% (provided by the Containment Hydrogen Control System)

~~Chemical analyses are done in series. Chemical analyses are performed while the radiological analyses are being performed.~~

6
12
6

ATTACHMENT 1

ANALYSIS	RANGE	SENS.	ACCURACY	
pH	1-13	1	> 5, < 9 < 5, > 9	±0.3 ±0.5
Dissolved Hydrogen	10-2000 cc/kg	10.	< 50 cc/kg > 50 cc/kg	±5cc/kg ±10%
Chloride Ion	0.02-20 ppm	0.02 ppm	Full Range	±25%
Boron	100-6000 ppm	100 ppm	±50 ppm < 1000 ppm ±5% > 1000 ppm	
Total Dis. Gas	11-2000 cc/kg	11 cc/kg	±11 cc/kg	
Radio-Isotope (Liquid)	5E-7 µCi/cc to 1.4 mCi (dilution capability to 10 Ci/cc)	5E-7 µCi/cc	±15% (utilizing calibration verification)	
Gaseous Hydrogen	0.1%-20%	0.1%	±25%	
Gaseous Oxygen	0.5%-20%	0.5%	±10%	
Radio-Isotope (Gas)	5E-7 µCi/cc to 1.4 mCi (dilution capability to 10 Ci/cc)	5E-7 µCi/cc	±15% (utilizing calibration verification)	

INSERT ATTACHMENT 2

9.3.2.2.2 Post-Accident

Liquid samples are taken from both RCS hot legs, containment sumps, auxiliary building sumps and the ESF A&B mini-flow line. All samples are routed to a liquid input header. After sample selection, isotopic analysis is performed. The sample is then depressurized and cooled to allow chemical analyses to be performed. At this point a syringe grab sample can be taken,
4 or the sample can be discharged to the RDT or EDT. Upon completion of the analysis, the source is isolated, and the system is then purged with demineralized water, then nitrogen gas.

Gas samples are taken from containment air via the containment hydrogen control system. Samples are routed to a gas input header. Isotopic analysis is performed then the sample is depressurized and cooled to STP conditions in order to perform O_2 analysis. A syringe grab sample can be taken or the sample is returned to the containment. The normal hot lab counting
5 room at the 140-foot elevation in the auxiliary building is shielded to provide low background post accident. The counting chamber can be purged with instrument air or bottled gas. When the analysis is complete, the source is isolated, and the system is purged with nitrogen gas.

Liquid samples will provide information on isotopic content,
4 gross gamma, pH, chloride concentration, dissolved oxygen, dissolved hydrogen and boron. Gas samples will provide information on isotopic content, gross gamma, gaseous oxygen, and hydrogen (from hydrogen monitor of the containment hydrogen control system).

9.3.2.2.3 Secondary Systems Drain Sampling

7 There are eight sumps in or near Turbine Building Structures with potential for transferring radioactivity to flow paths leading to the retention basins/evaporation ponds. There are

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ATTACHMENT 2

9.3.2.2.2 POST-ACCIDENT

The Post-Accident Sampling System (PASS) for PVNGS will use grab sample methodology as its primary means of sampling reactor coolant and containment atmosphere to meet the requirements of NUREG-0737 ITEM II.B.3. Sample analyses will be performed by laboratory analysis by approved procedures in an appropriate laboratory facility. The PASS can be operated from the hot lab to obtain reactor coolant and containment atmosphere samples and does not require an isolated auxiliary system to be placed into service to obtain these samples. The capability exists to sample and analyze any required sample within the required time span (per NUREG-0737, II.B.3) from the time a decision is made to take a sample.

PASS consists of the following: sample conditioning racks, control panels, electrical interface panels, remote grab sample station. Refer to FSAR Figure 9.3-3A. The PASS equipment includes, heat exchangers, pumps, valves, piping and instrumentation necessary to obtain grab samples. The sample conditioning equipment is located on the 70 foot elevation of the auxiliary building and the remote grab sample station is located on the 140 foot elevation of the auxiliary building. The entire PASS can be operated from the hot lab to reduce operator exposure. All equipment necessary to obtain reactor coolant and containment atmosphere samples, including valves, piping, cabling, motors and instrumentation has been verified to be operable in the environment it would experienced under accident conditions. A manually loaded Class IE power source can be available within 30 minutes of an accident that assumes a loss of offsite power to allow the acquisition of reactor coolant and containment atmosphere samples.

PASS has been designed so that liquid samples can be taken from the RCS hot leg, letdown line, containment radwaste sump, auxiliary building radwaste sumps and the Trains A and B Safety Injection mini-flow line. All samples are routed to a liquid input header. After sample selection, the sample is depressurized and cooled to allow a grab sample to be taken. At this point, a syringe grab sample can be taken, or the sample can be discharged to the reactor drain tank or equipment drain tank. After obtaining the grab sample, the source is isolated, and the system is then flushed with demineralized water, and purged with nitrogen gas.

Gas samples are taken from containment air via the same piping as the containment hydrogen control system. Gaseous sample piping is heat traced to minimize plate-out of iodines and particulates in the sample stream. Containment air can be sampled under both positive and negative pressures. Samples are routed to the remote grab sample station in the Hot Lab located on th 140 foot elevation of the Auxiliary Building. A syringe grab sample can be taken or the sample is returned to the containment. After obtaining the grab sample, the source is isolated, and the system is purged with nitrogen gas.

Grab samples can be taken via a shielded syringe and transported by a lead PIG for analysis without exposing any individual to radiation levels in excess of the GDC 19 criteria (5 rem whole body, 75 rem to the extremities). Isotopic analysis can be performed to identify and quantify the isotopes of the nuclide categories corresponding to the source terms given in Regulatory Guide 1.4 and 1.7. Table 9.3-3A provides further information on sample points and ranges of analyses.

Refer to PVNGS LLIR Section II.B.3 for further details of the PASS.

Refer to PVNGS LLIR Section II.B.2 for further details on plant shielding.

9.3.2.3 Component Description

9.3.2.3.1 Sampling Lines

Sampling points are at locations where turbulence ensures representative sampling. Sampling nozzles are provided where deemed required as shown on the appropriate system P&ID. The sample line from the RCS hot leg has a delay that ensures adequate N-16 decay through a transit time of approximately 90 seconds to the secondary shield wall. Sampling lines from the primary coolant loop are provided with flow restriction orifices to limit coolant loss from a rupture of the sample line.

Fail-closed containment isolation valves are provided for sampling lines that penetrate the containment.

Relief valves provide protection to limit the pressure to a value below the design rating of the sampling system.

Waste handling is provided for purging the primary sample lines with sample fluid and flushing with demineralized water.

¶ INSERT 9.3.2.3.1

9.3.2.3.2 Sample Coolers

Rough and fine sample coolers are provided for remote sampling. These coolers are heat exchangers. Cooling is provided by the nuclear cooling water system for the primary sampling system and by the nuclear cooling water system, turbine cooling water system, and chilled water system for the secondary sampling system.

Where temperatures are above 140F, portable coolers are used for local grab sample points to prevent injury to sampling personnel.

The primary sampling heat exchangers are located in the hot laboratory in the auxiliary building. Post-accident sampling
4 heat exchangers are in the piping penetration area ~~at~~ on the 70 foot elevation of the auxiliary building.

Insert 9.3.2.3.1

Containment gaseous sample lines for post-accident sampling are heat traced to reduce plate-out of iodines and particulates. All post-accident liquid sample lines are filtered to prevent leakage by loose material in the reactor coolant system or containment sump samples.

The maximum sample temperature out of the heat exchangers is 120F for all operating modes.

Table 9.3-4 stipulates the primary sampling system design parameters.

Table 9.3-5 contains the operating parameters for the sample heat exchangers.

9.3.2.3.3 Sample Vessels

9.3.2.3.3.1 Normal

A capability is provided to take pressurized samples from the sources indicated in table 9.3-3. Each sample line from these sources is provided with quick-disconnect connections for a sample pressure vessel to provide the capability to sample at the local RCS operating pressure. The vessel is sized to contain a sufficient volume to perform an analysis of reactor coolant for dissolved hydrogen or fission gas content. The vessel material is chemically compatible with reactor coolant.

Table 9.3-4 stipulates the sample vessel design parameters.

9.3.2.3.3.2 Post-Accident

The ~~A~~ capability is provided to take depressurized samples from the sources indicated in table 9.3-3. A ~~micro-liter~~ syringe grab sample can withdraw a sufficient amount of fluid for analysis while maintaining doses within the requirements of GDC 19. ~~ALARA requirements~~. The grab sample and its transport cart can be ~~are~~ shielded. ~~The sample port is flushed with demineralized water after the sample is drawn to minimize airborne effects once the syringe is withdrawn.~~ The syringe grab sampler material is chemically compatible with reactor coolant. 4

Table 9.3-4 (Page 2 of 2)
PRIMARY SAMPLING SYSTEM DESIGN PARAMETERS
(POST-ACCIDENT)

Sample Heat Exchanger	
Quantity	2
Type	Shell and tube
Tube side (sample)	
Fluid	3.6 wt. % boric acid
Design pressure	2485 psig
Design temperature	700F
Pressure drop	~~(later)~~ 125 psid @ 0.6 gpm; 375 psid @ 1.0 gpm; 670 psid @ 1.4 gpm
Material	Stainless steel
Shell side (cooling water)	
Fluid	Nuclear cooling water
Design pressure	150 psig
Design temperature	200F
Pressure drop	~~(later)~~ 3psid @ 3gpm
Material	~~Carbon steel~~ STAINLESS STEEL
Safety class, tube/shell	NNS/NNS
Seismic class, tube/shell	None/None

9.3.2.3.8 Analysis Equipment and Instruments

4 Conductivity bridges, pH meters, in line measurement devices, various radiation detectors, gas detectors, ovens, centrifuges, laboratory glassware, chemical reagents, and portable test units are provided. Most sampling materials and devices are located in the sampling room. The hotwell analysis, circulating water chlorine, and feedwater and demineralizer turbidity stations are all located locally. Instruments for monitoring flow and pressure on the purge discharge line downstream of the common purge header are provided. The pressurizer steam space sample line, which is not connected to the header, has its own pressure and flow instruments. Post-accident analysis will be performed by laboratory analysis in an appropriate laboratory facility. ~~equipment is located in the piping penetration area of the~~
4 ~~auxiliary building~~. The post accident analysis Capability is described in TABLE 9.3-3A.

9.3.2.4 System Operation

Except as discussed in section 9.3.2.3.8, all points can be sampled in the cold and the hot laboratories. Remotely operated valves are controlled from the main control room or from the sampling laboratories.

INSERT ATTACHMENT 3

9.3.2.4.1 Sample Line Purging

Prior to discrete samples being taken, the sample line is purged with the fluid to be sampled so that a representative sample may be obtained. For RCS samples, initial purge of most of the sample line length can be directed to the equipment drain tank. Secondary sampling purge is directed to the liquid

ATTACHMENT 3

PASS OPERATION

The operation of the system requires communication between the chemistry technician in the hot lab and operators in the control room. Prior to sampling a specific point, the hot lab chemistry technician verifies with the control room operator to ensure that the system isolation valve is open. This may involve overriding a CIAS to re-open a valve.

The chemistry technician will then operate the PASS to obtain the desired sample. This is accomplished by the means provided on the PASS control panel for the operation of the PASS pumps and valves for the sample flow path, flushing and purging. Once the sample arrives at the remote grab sampler, the chemistry technician will obtain a sample for laboratory analysis via a shielded syringe. The grab sample is then transported to the appropriate laboratory for analysis.

B. Reactor Coolant System (RCS) Samples

4 1. Normal

Samples are taken from one hot leg, the pressurizer surge line, and the pressurizer steam space. Sampling lines are connected to the RCS piping downstream of a passive flow restriction device. Provisions can be made to permit sampling of the RCS during startup.

The sample line from the RCS hot leg is delayed in transit to the secondary shield wall to allow sufficient time for the decay of N^{16} to less than 10% of the total activity in the line.

2. Post-Accident

4 A Sample~~s~~ ~~are~~ is taken from ~~both~~ the hot leg~~s~~ of loop 1. THIS IS THE ~~The north hot leg is taken from the~~ same sample point as for the normal sampling line. ~~The south hot leg is taken from the letdown inlet.~~

C. Sample Temperature and Pressure

4 1. Normal

The high pressure, high temperature reactor coolant samples, and intermediate pressure and temperature samples are cooled to 120F or less, and depressurized. This permits analysis by standard sampling methods.

2. Post-Accident

4 ~~Isotopic analyses is performed at high temperature and high pressure.~~ LIQUID Samples are cooled to 120F or less and depressurized prior to chemical and/or radiochemical analysis.

Insert: CONTAINMENT GASEOUS SAMPLE IS TAKEN AT ACTUAL PRESSURE WITH COOLING/HEATING TO APPROXIMATELY 250°F.

D. Verification of Boron Concentration

4 1. Normal

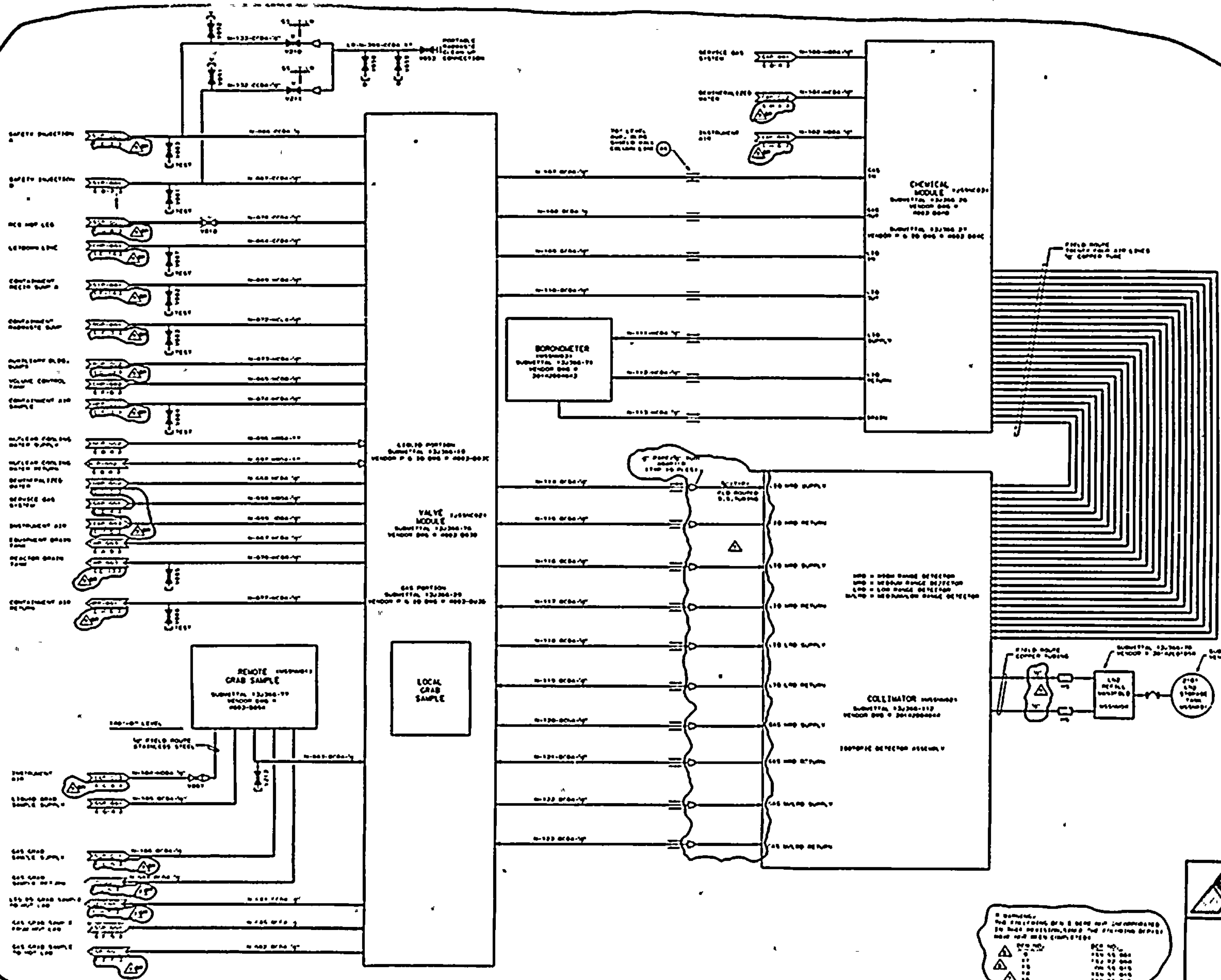
To verify the boron concentration of the water recirculated via the safety injection and shutdown

9.3.2.6 Testing, ~~and~~ Inspection and Training

The sampling system containment isolation valves will undergo inservice inspection as described in section 6.6.

PASS Surveillance testing will be performed on a routine basis (once per 31 days) to assure technical familiarity and to ensure long term operability. ~~and~~ Operator training requirements consist of classroom training on ~~in~~ the basis for PASS, applicable regulations and system operation. On-The-Job Training is conducted and qualification checkouts are conducted and documented in accordance with PVNGS Station Manual Procedures.

INSERT NEW FIGURE 9.3-2A

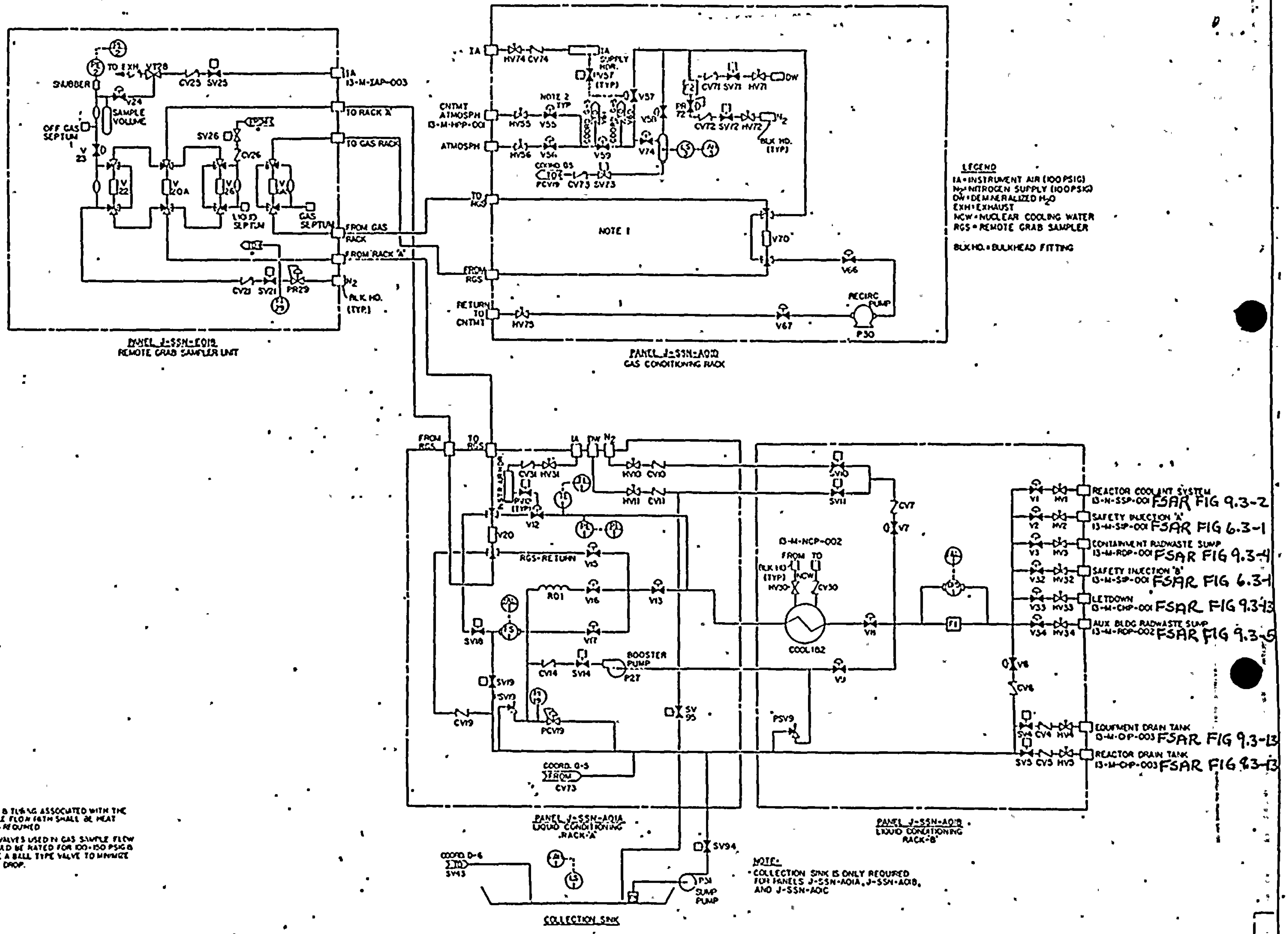


13-N-SSP-002, R

Palo Verde Nuclear Generating Station
FSAR

POST-ACCIDENT SAMPLING SYSTEM

Figure 9.3-2A



Arizona Nuclear Power Project

POST ACCIDENT SAMPLING SYSTEM

FIGURE 9.3-2A

require the applicant to make modifications as determined by our generic review.

SEE AMENDED SECTION 9.3.2.2 AND TABLES 9.3-3, 9.3-3A AND RESPONDS TO LLIR ITEM II.B.3

6 RESPONSE: The PVNGS design uses in-line chemical and
radionuclide analyses with backup grab sample capability
to meet the requirements of NUREG-0737. These analyses
fully meet the ranges and accuracies specified in Regula-
tory Guide 1.97, Revision 2. The capability exists to
12 sample and analyze any required sample over the required
ranges within the allotted three-hour time span.
Table 9A-2 provides further information on sample points
and analyses. All samples, including grab samples, may
6 be taken without exposing any individual to radiation
levels in excess of GDC 19 criteria. Isotopic analysis
is provided to identify and quantify the isotopes of the
nuclide categories corresponding to the source terms given
in Regulatory Guide 1.4 and 1.7. A manually loaded
12 Class IE power source will be available within 30 minutes of
an accident that assumes loss of offsite power. All equip-
ment in the post-accident sampling system (PASS),
6 including valves, piping, cabling, motors and analyzer
electronics, is qualified to the environment it would
experience under accident conditions.

12 A procedure will be developed to determine estimated core
damage by comparing the fraction of the core inventory in
6 the reactor coolant system (RCS) against the known core
isotopic inventory. All listed analyses can be performed
12 on any liquid sample taken. This provides a complete
6 picture of radiological and chemical data for historical
comparison. Carrier gases are not used in the analyses.

12 The entire PASS system can be operated from a central
6 computer which directs a controller to sample through
valve and pump operation sequences. All data will be

analyzed, stored and displayed on the computer. Manual control will be available on loss of the automatic functions. Grab samples can be taken remotely during post-accident conditions to minimize operator exposure. 6

Dissolved oxygen is verified to be below 0.1 ppm by the dissolved oxygen analyzer. 12 6

The PASS can provide weekly data during operations to meet various chemical and radiological technical specification sample times. Grab samples will be taken on a routine basis (once per 31 days) to assure technical familiarity. Operator training requirements will be determined at a later date. 12 6 12

Refer to section 9.3.2 and PVNGS LLIR Section II.B.3 for further details of the PASS. 6

Refer to PVNGS LLIR Section II.B.2 for further details on plant shielding.

Table 9A-2

POST-ACCIDENT SAMPLING SYSTEM
(Sheet 1 of 2)

Inputs

Liquid

Containment Recirculation Sump, Reactor Coolant System, Containment Radwaste Sump, Safety Injection A, Safety Injection B, Auxiliary Building Sumps, Letdown System

Gas

Containment Air, Volume Control Tank

6 **Outputs**

Liquid

Equipment Drain Tank, Reactor Drain Tank

Gas

Containment Air

Analyses

Liquid

Gamma Spectrum	10^{-1} uCi/ml to 10 Ci/ml Isotopic
Gross Gamma	10^{-1} uCi/ml to 10 Ci/ml Gross
Boron	0 to 6000 ppm
pH	1 to 13 (temperature compensated)
Dissolved Oxygen	0 to 20 ppm
12 Total Dissolved Gas	0 to 2000 cc (STP)/Kg
6 Chloride	0 to 20 ppm

Table 9A-2

POST-ACCIDENT SAMPLING SYSTEM
(Sheet 2 of 2)

Gas	
Gamma Spectrum	10^3 uCi/ml to 10^1 Ci/ml Isotopic
Gross Gamma	10^3 uCi/ml to 10^1 Ci/ml gross
Gaseous Oxygen	0 to 30%
Gaseous Hydrogen	0 to 10% (provided by the Containment Hydrogen Control System)

Chemical analyses are done in series. Chemical analyses are performed while the radiological analyses are being performed.

6
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6

II.B.3 POSTACCIDENT SAMPLING CAPABILITY

Position — INSERT A

A design and operational review of the reactor coolant and containment atmosphere sampling line systems shall be performed to determine the capability of personnel to promptly obtain (less than 1 hour) a sample under accident conditions without incurring a radiation exposure to any individual in excess of 3 and 18-3/4 rem to the whole body or extremities, respectively. Accident conditions should assume a Regulatory Guide 1.3 or 1.4 release of fission products. If the review indicates that personnel could not promptly and safely obtain the samples, additional design features or shielding should be provided to meet the criteria.

A design and operational review of the radiological spectrum analysis facilities shall be performed to determine the capability to promptly quantify (in less than 2 hours) certain radionuclides that are indicators of the degree of core damage. Such radionuclides are noble gases (which indicate cladding failure), iodines and cesiums (which indicate high fuel temperatures), and nonvolatile isotopes (which indicate fuel melting). The initial reactor coolant spectrum should correspond to a Regulatory Guide 1.3 or 1.4 release. The review should also consider the effects of direct radiation from piping and components in the auxiliary building and possible contamination and direct radiation from airborne effluents.

INSERT A   PVNGS LLIR   2062 28 of 49

II.B.3 POSTACCIDENT SAMPLING CAPABILITY

Position

A design and operational review of the reactor coolant and containment atmosphere sampling line systems shall be performed to determine the capability of personnel to promptly obtain (less than 1 hour) a sample under accident conditions without incurring a radiation exposure to any individual in excess of 3 and 18-3/4 rem to the whole body or extremities, respectively. Accident conditions should assume a Regulatory Guide 1.3 or 1.4 release of fission products. If the review indicates that personnel could not promptly and safely obtain the samples, additional design features or shielding should be provided to meet the criteria.

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In addition to the radiological analyses, certain chemical analyses are necessary for monitoring reactor conditions. Procedures shall be provided to perform boron and chloride chemical analyses assuming a highly radioactive initial sample (Regulatory Guide 1.3 or 1.4 source term). Both analyses shall be capable of being completed promptly (i.e., the boron sample analysis within an hour and the chloride sample analysis within a shift).

Changes to Previous Requirements and Guidance

This requirement was originally issued to all operating plants by letters dated September 13 and October 30, 1979. Significant changes in requirements or guidance are:

(1) Allows combined time of 3 hours or less for sampling and analysis.

(2) Specifies that licensee may use online sampling and analysis to meet the 3-hour time requirement but must provide capability to remove grab samples of reactor coolant and containment atmosphere for separate analysis.

(3) Implementation date has been changed to January 1, 1982.

(4) Provides design guidance for sampling and analytical capability.

Clarification

The following items are clarifications of requirements identified in NUREG-0578, NUREG-0660, or the September 13 and October 30, 1979 clarification letters.

(1) The licensee shall have the capability to promptly obtain reactor coolant samples and containment atmosphere samples. The combined time allotted for sampling and analysis should be 3 hours or less from the time a decision is made to take a sample.

(2) The licensee shall establish an onsite radiological and chemical analysis capability to provide, within the 3-hour time frame established above, quantification of the following:

(a) certain radionuclides in the reactor coolant and containment atmosphere that may be indicators of the degree of core damage (e.g., noble gases; iodines and cesiums, and nonvolatile isotopes);

(b) hydrogen levels in the containment atmosphere;

(c) dissolved gases (e.g., H_2), chloride (time allotted for analysis subject to discussion below), and boron concentration of liquids.

(d) Alternatively, have inline monitoring capabilities to perform all or part of the above analyses.

(3) Reactor coolant and containment atmosphere sampling during postaccident conditions shall not require an isolated auxiliary system [e.g., the letdown system, reactor water cleanup system (RWCUS)] to be placed in operation in order to use the sampling system.

(4) Pressurized reactor coolant samples are not required if the licensee can quantify the amount of dissolved gases with unpressurized reactor coolant samples. The measurement of either total dissolved gases or H_2 gas in reactor coolant samples is considered adequate. Measuring the O_2 concentration is recommended, but is not mandatory.

(5) The time for a chloride analysis to be performed is dependent upon two factors: (a) if the plant's coolant water is seawater or brackish water and (b) if there is only a single barrier between primary containment systems and the cooling water. Under both of the above conditions the licensee shall provide for a chloride analysis within 24 hours of the sample being taken. For all other cases, the licensee shall provide for the analysis to be completed within 4 days. The chloride analysis does not have to be done onsite.

(6) The design basis for plant equipment for reactor coolant and containment atmosphere sampling and analysis must assume that it is possible to obtain and analyze a sample without radiation exposures to any individual exceeding the criteria of GDC 19 (Appendix A, 10 CFR Part 50) (i.e., 5 rem whole body, 75 rem extremities). (Note that the design and operational review criterion was changed from the operational limits of 10 CFR Part 20 (NUREG-0578) to the GDC 19 criterion (October 30, 1979 letter from H. R. Denton to all licensees).)

(7) The analysis of primary coolant samples for boron is required for PWRs. (Note that Revision 2 of Regulatory Guide 1.97, when issued, will likely specify the need for primary coolant boron analysis capability at BWR plants.)

(8) If inline monitoring is used for any sampling and analytical capability specified herein, the licensee shall provide backup sampling through grab samples, and shall demonstrate the capability of analyzing the samples. Established planning for analysis at offsite facilities is acceptable. Equipment provided for backup sampling shall be capable of providing at least one sample per day for 7 days following onset of the accident and at least one sample per week until the accident condition no longer exists.

(9) The licensee's radiological and chemical sample analysis capability shall include provisions to:

(a) Identify and quantify the isotopes of the nuclide categories discussed above to levels corresponding to the source terms given in Regulatory Guide 1.3 or 1.4 and 1.7. Where necessary and practicable, the ability to dilute samples to provide capability for measurement and reduction of personnel exposure should be provided. Sensitivity of onsite liquid sample analysis capability should be such as to permit measurement of nuclide concentration in the range from approximately 1 μCi/g to 10 Ci/g.

(b) Restrict background levels of radiation in the radiological and chemical analysis facility from sources such that the sample analysis will provide results with an acceptably small error (approximately a factor of 2). This can be accomplished through the use of sufficient shielding around samples and outside sources, and by the use of ventilation system design which will control the presence of airborne radioactivity.

(10) Accuracy, range, and sensitivity shall be adequate to provide pertinent data to the operator in order to describe radiological and chemical status of the reactor coolant systems.

(11) In the design of the postaccident sampling and analysis capability, consideration should be given to the following items:

(a) Provisions for purging sample lines, for reducing plateout in sample lines, for minimizing sample loss or distortion, for preventing blockage of sample lines by loose material in the RCS or containment, for appropriate disposal of the samples, and for flow restrictions to limit reactor coolant loss from a rupture of the sample line. The postaccident reactor coolant and containment atmosphere samples should be representative of the reactor coolant in the core area and the containment atmosphere following a transient or accident. The sample lines should be as short as possible to minimize the volume of fluid to be taken from containment. The residues of sample collection should be returned to containment or to a closed system.

(b) The ventilation exhaust from the sampling station should be filtered with charcoal adsorbers and high-efficiency particulate air (HEPA) filters.

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If the review indicates that the analyses required cannot be performed in a prompt manner with existing equipment, then design modifications or equipment procurement shall be undertaken to meet the criteria.

In addition to the radiological analyses, certain chemical analyses are necessary for monitoring reactor conditions. Procedures shall be provided to perform boron and chloride chemical analyses assuming a highly radioactive initial sample (Regulatory Guide 1.3 or 1.4 source term). Both analyses shall be capable of being completed promptly (i.e., the boron sample analysis within an hour and the chloride sample analysis within a shift).

PVNGS Evaluation

INSERT II.B.3 RESPONSE

1 FSAR section 9.3 has a detailed description of the PVNGS nuclear sampling system. This includes additions to perform functions specifically required by NUREG 0737 and Reg Guide 1.97, Rev.2. These additions will be complete prior to fuel load.

A review of the reactor coolant and containment atmosphere sampling systems and the radiological spectrum and chemical facilities has been conducted. Plant modifications are being made to permit personnel to obtain samples within 1 hour after an accident (without incurring an exposure to an individual

INSERT II.B.3 RESPONSE

FSAR Section 9.3.2 provides a detailed description of the PVNGS nuclear sampling system which includes the PVNGS Post Accident Sampling System (PASS). The PASS Units 2 and 3 for PVNGS will be installed tested and operable prior to each unit exceeding 5% power. The PVNGS Unit 1 interim PASS will be upgraded to the design description contained in FSAR Section 9.3.2 and this response to II.B.3 prior to restart following the first refueling.

The following items respond to the 11 criteria contained in NUREG-0737 Item II.B.3 and supplement the description provided in FSAR Section 9.3.2.

(1) Refer to PVNGS FSAR Section 9.3.2.2.2.

(2)(a)(b)(c) Refer to PVNGS FSAR Table 9.3-3A for the onsite radiological and chemical analysis capabilities.

(d) PVNGS utilizes a grab sample type PASS for obtaining samples. Sample analysis is performed by laboratory analysis.

(3) Operation of the PVNGS PASS to obtain reactor coolant and containment atmosphere samples does not require an isolated auxiliary system to be placed into service.

(4) PVNGS has the capability to analyze depressurized off gas from reactor coolant grab samples for total dissolved gases or dissolved hydrogen. Refer to FSAR Table 9.3-3A for the laboratory analysis capabilities for these parameters.

(5) Reactor coolant post accident samples can be analyzed for chloride ions within 96 hours (4 days).

(6) PVNGS personnel can obtain and analyze post accident grab samples without radiation exposures to any individual in excess of 5 rem whole body and 75 rem to the extremities. Provisions are included to be able to draw a grab sample while maintaining ALARA radiation exposures and not exceeding General Design Criteria 19 stated above. Additional considerations are described below.

i. Shielding calculations were performed using source term specified in NUREG 0737 and Regulatory Guide 1.97 Rev 2 (Refer to Section II.B.2).

ii. A result of the shielding review, the remote grab sampler unit in the hot lab area is lead wrapped to keep operator doses ALARA.

iii. High range portable and fixed survey instruments and personnel dosimeters are provided to permit rapid assessment of exposure rates and accumulated personnel exposure.

(7) Reactor coolant samples can be analyzed for boron. Refer to FSAR Table 9.3-3A for the specific analysis capability for boron.

(8) The primary means for sampling the reactor coolant and containment atmosphere is a grab sample type PASS. Grab samples are analyzed in a appropriate laboratory facility. The PVNGS grab sample type PASS is capable of providing at least 1 sample per day for 7 days following start of an accident and at least 1 sample per week until the accident condition no longer exists.

(9)(a) Provisions are included to measure a wide range of isotopes for both gases and liquids from $5x10^{-7}$ $\mu Ci/cc$ to $1.4x10^{1}$ mCi (dilution to 10 Ci/cc). Sample dilution is available for grab sample analysis.

If background levels of radiation are too high in the sample analysis area to permit the analysis of the grab samples obtained, the sample can be transported to an unaffected PVNGS unit laboratory for analysis.

(b) Background levels of radiation in the sample analysis area of the hot lab are kept ALARA.

Grab samples can be taken with a shielded sample syringe and transported with a lead PIG.

Plant procedures identify the analyses requirements, measurement techniques and background level reduction methods, (e.g., sample dilution, transport and handling techniques).

The hot lab is provided with a ventilation system which will control the presence of airborne radioactivity.

(10) The post accident sample analysis capabilities are provided in FSAR Table 9.3-3A.

(11)(a) Provisions are made to purge sample lines, for reducing plate-out, to insure proper mixing, for minimizing leakage, preventing blockage, to back-flush, to blowdown, for appropriate sample disposal, minimizing crud traps, and for passive flow restrictions (when sampling high pressure systems).

The sample source pentrations are located such that reactor coolant and containment atmosphere samples are representative of core area and containment conditions.

Gas samples will be followed by a nitrogen purge to flush out remaining gases. Liquid samples will be first flushed with demineralized water and then purged with nitrogen gas. These flushing and purging steps help to reduce personnel exposure, minimize sample distortion, and sample line blockage.

Samples are returned to the following three points in each unit:

i. Containment Atmosphere (via the containment hydrogen control system return piping for gas samples only).

ii. Reactor drain tank - for post accident liquid samples.

iii. Equipment drain tank - for normal operation liquid samples.

Considerations were given in the PASS design to minimize the number of valves, threaded fittings (welded wherever possible), elbows (use 5 diameter bends), traps, sample line lengths, filters, etc. which could contribute to sample loss, distortion and plateout.

(b) The ventilation exhaust from the PASS sampling station is filtered through HEPA and charcoal filters AFU-HAN-J01A and AFU-HAN-J01B located in the Auxiliary Building. See FSAR Figures 9.4-3, Sheets 1-4.

ADDITIONAL INFORMATION

A. Piping and Instrumentation Diagrams are provided in FSAR Section 9.3 for the Nuclear Sampling System including the Post Accident Sampling System.

B. Procedures for obtaining post accident grab samples, transportation of the samples to the appropriate laboratory for analysis, sample analysis and sample disposal are in place for PVNGS Unit 1 and are contained in the PVNGS Station Manual. These procedures for Units 2 and 3 will be in place prior to exceeding 5% power for each unit.

Additionlly, the procedure to be utilized at PVNGS to estimate the degree of core damage was developed from the "Development of Comprehensive Procedure Guidelines for Core Damage Assessment", Combustion Engineering Owners Group Task 467, dated July, 1983. The PVNGS Procedure uses isotopic analysis data obtained from the Reactor Coolant, Containment Atmosphere, and Containment Sump PASS sample points. The data from specific noble and halogen gas gamma emitting isotopes are then used to determine whether the fission products have been released from the fuel rod gas gap or the fuel pellet. The activities from the group of isotopes are then compared to the full power corrected source inventory to assist in determining into which NRC fuel damage category the event may fall.

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in excess of three rem whole-body or 18 3/4 rem to the extremities), to analyze samples within 2 hours for radioactive noble gases, iodines, cesium and non-volatile isotopes, and to analyze samples within 1 hour for pH, boron, chlorides, dissolved oxygen, gaseous oxygen, and dissolved hydrogen. These plant modifications, collectively referred to as the post accident sampling system (PASS) are illustrated in figures II.B.3-1 and II.B.3-2. Procedures will be developed for obtaining and analyzing these samples.

Design Capability

Modification of currently existing plant facilities allows plant personnel to obtain samples, in less than 1 hour, of pressurized and depressurized reactor coolant, safety injection, containment air, ESF and radwaste containment sumps, auxiliary building sumps and volume control tank.

In-line analyses with automatic sequencing and computer control and readout will be backed up by a grab sample capability using manual controls. In-line analyses will include isotopic, gross gamma, pH, boron, dissolved hydrogen, chloride, dissolved oxygen and gaseous oxygen. Gaseous hydrogen will be sampled by the containment hydrogen control system.

The onsite facility design and procedures provide the following capabilities:

A. Containment air may be sampled under positive or negative pressures.

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B. Provisions are made to purge sample lines, for reducing plate-out, to insure proper mixing, for minimizing leakage, preventing blockage, to back-flush, to blowdown, for appropriate sample disposal, minimizing crud traps, and for passive flow restrictions (when sampling high pressure systems).

C. The PASS sampling lines and components conform to Quality Group D requirements. Isolation valves are used with appropriate automatic closure signals where PASS piping interconnects with higher quality group classification piping.

1 D. Provisions are included to measure a wide range of isotopes for liquids from 10^{-3} μCi/ml to 10^{+7} μCi/ml and for gases from 10^{-7} μCi/ml to 10^{+5} μCi/ml. Sample dilution is available for grab samples but is not required for in-line analysis.

E. Provisions are included to measure dissolved hydrogen from 0 to 2000 cc/kg.

F. Provisions are included to restrict background levels of radiation at the PASS sample area such that the sample analysis provides results with an acceptably small error (approximately a factor of 2).

G. Provisions are included to facilitate plant procedures to identify the analyses required, measurement techniques and background level reduction methods.

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H. Chemical analysis capability is provided which can meet all requirements when exposed to the specified source term.

I. Provisions are included to be able to draw a grab sample while maintaining ALARA radiation exposures and not exceeding General Design Criteria 19.

1. Shielding calculations were performed using source term specified in NUREG 0737 and Regulatory Guide 1.97 Rev 2 (Refer to section II.B.2).

2. A result of the shielding review, piping used for backup grab sampling in the hot lab sample room area will be lead wrapped to keep operator doses ALARA. 1

3. High range portable and fixed survey instruments and personnel dosimeters are provided to permit rapid assessment of exposure rates and accumulated personnel exposure.

J. Design parameters are based on the full range of design pressure of the reactor coolant system and containment.

K. Testing will be conducted to demonstrate the ability to obtain and analyze a sample by in-line and grab sample techniques. 2 1

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1 SAMPLE INLET PIPING

2 Samples can be drawn from the following nine points in each unit:

A. RCS hot leg - north side of RCS

B. Inlet to letdown system - south side of RCS

C. Safety injection mini flow line - Train A

D. Safety injection mini flow line - Train B

E. Containment recirculation sump

F. Containment radwaste sump

G. Auxiliary building sumps

H. Volume control tank

1 I. Containment atmosphere via the containment hydrogen control system

Isolation valves provide a quality and material classification break between the sample points and the PASS.

Sample Return Piping

Samples are returned to the following three points in each unit:

A. Containment Atmosphere (via the containment hydrogen control system) for gas samples only

B. Reactor drain tank - for post accident liquid samples

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C. Equipment drain tank - for normal operation liquid samples

Isolation valves provide a quality and material classification break between the sample return points and the PASS.

Sample Station

The PASS is a modular system. The valve module including pumps, heat exchangers, valves and other sources of possible leakage are located in the piping penetration room. The radiological and chemical module is located in the auxiliary building. This contains the in-line isotopic and chemical analysis equipment. The two modules are connected via short pipes through a shield wall that separates the remainder of the auxiliary building from the piping penetration room. 2

This method of separation provides for:

A. Ease of routing sample piping to and from the PASS

B. Isolation of any leakage during normal and post accident operation 1

C. Ability to repair and maintain the spectroscopic and chemical instruments during normal operation

D. Meeting space requirements in an existing building.

The valve module provides the ability to draw, purge, cool, degas, circulate, dilute, and route samples in the PASS.

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The radiological and chemical module provides isotopic, gross gamma, pH, chloride, boron, dissolved oxygen and gaseous
1 oxygen analysis. (Hydrogen analysis is provided by the containment hydrogen control system.)

Isotopic analysis is provided with a collimated high-purity germanium HP(Ge) detector with a 30-day supply of liquid nitrogen (LN_2). The HP(Ge) detectors may operate under
2 unlimited temperature cycling between room and LN_2 temperatures without performance degradation. The LN_2 storage container will be supplied with a roller base to aid in refilling from a convenient location or container change-out.

The entire sampling sequence is controlled by a valve sequencing controller which in turn is run by a pulse height analyzer (PHA) with extended capabilities. The PHA is operated by a technician.

1 Grab samples are available from the hot lab in either a depressurized, diluted or pressurized sample device. Instrumentation is provided for pressure, temperature and flow measurement. The radiological and chemical module is provided with sufficient
2 shielding to maintain radiation exposure criteria ALARA during normal and post accident operation.

1 Gas samples will be followed by a nitrogen purge to flush out remaining gases.

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Liquid samples will be followed by a demineralized water purge followed by a nitrogen gas purge to flush out remaining fluids. Nuclear cooling water will be provided for sample heat exchangers.

Instrument air will be provided for pneumatically controlled valves.

Control Panel

The PASS Control Panel is part of the hot lab PHA computer system. This is located in a shielded room, adjacent to the hot lab. This includes: 1

A. The valve control assembly with manual switching capability for all remote valves, pumps, and instruments

B. Recording devices

C. Mini status board

D. Microcomputer with CRT display

E. In-line instrumentation readout

PASS Operation

The operation of the system requires communication between
the chemistry technician in the hot lab and operators in the 2
control room. Prior to sampling a specific point, the hot 1
lab chemistry technician verifies with the control room 2
operator to ensure that the system isolation valve is open.
This may involve overriding a CIAS to re-open a valve. The 1
hot lab chemistry technician will then initialize the PHA 2

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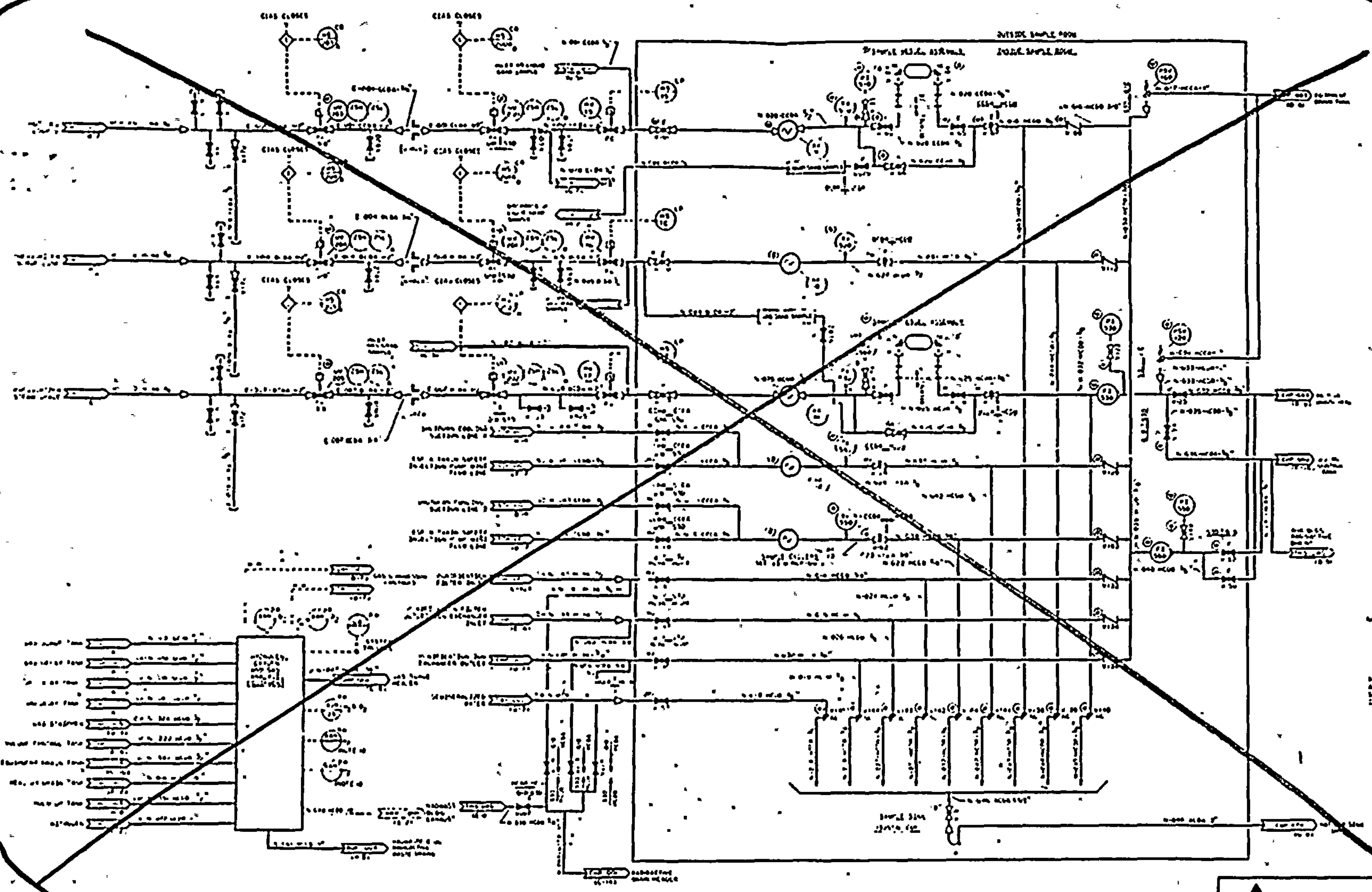
computer and perform radiological and chemical analysis, directing the sample to a predetermined discharge point. Results will be available on the PHA CRT and on the recorder printout.

Meeting Requirements

1 The process sampling system discussed in FSAR section 9.3.2 reflects the addition of the post accident sampling system. This fulfills the NRC requirements as outlined in NUREG 0578, NUREG 0737, and Reg Guide 1.97, Rev 2.



13-N-SSP-001 Rev

Palo Verde Nuclear Generating Station
LLIR

NUCLEAR SAMPLING SYSTEM
Figure II.B.3-1

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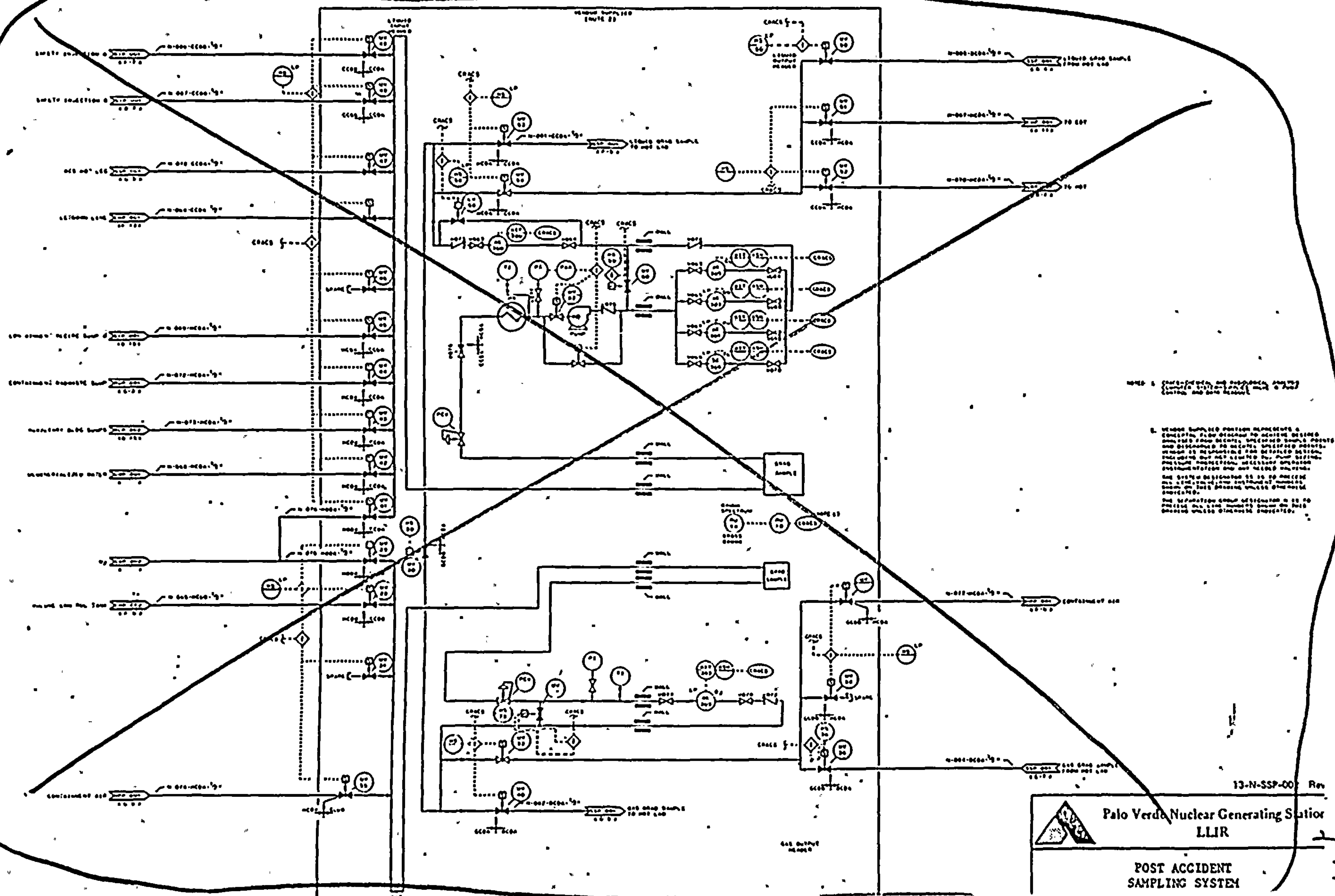

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Palo Verde Nuclear Generating Station
LLIR

POST ACCIDENT
SAMPLING SYSTEM

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12.1.2.4 General Design Considerations to Keep Post-Accident Exposures ALARA

The facility layout will assist in keeping occupational exposures ALARA even after a design basis accident. While exposures will be significantly higher than during normal operation, required access is provided to vital areas and systems without exceeding 5 rem/hr. Zone maps showing expected dose rates in the event of a LOCA with sump recirculation are provided in Section II.B.2 of the LLIR. Zone maps for the hypothetical condition of a LOCA with an intact primary but with a degraded core are also provided in Section II.B.2 of the LLIR. A discussion of the source terms for these events is provided in section 12.2.3. The dose rates projected for these two sets of drawings do not assume decay beyond that corresponding to the onset of recirculation. Even so, virtually unrestricted access will be permitted within the control and diesel generator buildings, as well as portions of the upper floor of the auxiliary building (such as the area of the operational support center).

To provide sampling capability with exposures kept ALARA, PVNGS will incorporate a ~~remote, automated,~~ post-accident sampling system that meets the requirements of NUREG 0737, and the guidelines of Regulatory Guide 1.97, Revision 2 as described in Section 9.3.2 and LLIR ITEM II.B.3. ~~This system can be operated from the radiochemistry counting room, the control room, or the technical support center. Backup grab sample capability will be provided in the hot lab sample room using microchemistry techniques to keep the volume of source as small as possible.~~

The only other area where access might be required is to the hydrogen monitors/recombiners. Projected dose rates without the recombiners in operation but at the onset of recirculation are expected to be approximately 10 to 30 rem/hr (sump recirculation). As the recombiners do not have to be installed until

To provide sampling capability with exposures kept ALARA, PVNGS will incorporate a ~~remote, automated,~~ post-accident sampling system that meets the requirements of NUREG 0737 and the guidelines of Regulatory Guide 1.97, Revision 2 as described in Section 9.3.2 and LLIR ITEM II.B.3. ~~This system can be operated from the radiochemistry counting room, the control room, or the technical support center. Backup grab sample capability will be provided in the hot lab sample room using microchemistry techniques to keep the volume of~~ 1
~~source as small as possible. Refer to section II.B.3 for further details.~~

The only other area where access might be required is to the hydrogen monitors/recombiners. Projected dose rates at the onset of recirculation are expected to be approximately 10 to 30 rem/hr (sump recirculation). As the recombiners do not have to be installed until at least 72 hours after the DBA, (refer to FSAR Figure 6.2.5-2) 2
dose rates will drop due to decay to about 1/10 the doses noted above. Thus, the installation dose rate (assuming sump recirculation) will be less than 5 rem/hr. While the dose rate would be greater than 5 rem/hr for an intact primary-degraded core event, the recombiners would not need to be installed since an intact primary 1
would not be consistent with hydrogen generation inside the containment. If hydrogen generation were postulated, this would necessitate a break or opening in the primary. Consequently, sump recirculation would be