REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8305160041 DOC.DATE: 83/05/10 NOTARIZED: NO DOCKET #
FACIL:50-397 WPPSS Nuclear Project, Unit 2, Washington Public Powe 05000397
AUTH.NAME AUTHOR AFFILIATION
BOUCHEY,G.D. Washington Public Power Supply System
RECIP.NAME RECIPIENT AFFILIATION
SCHWENCER,A. Licensing Branch 2

SUBJECT: Forwards marked-up FSAR pages describing equipment for sampling & monitoring process & effluent streams during postulated accidents. Submittal closes out commitment in Section 11.5.2 (Page 11-14) of SER,NUREG-0892.

DISTRIBUTION CODE: B001S COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 20
TITLE: Licensing Submittal: PSAR/FSAR Amdts & Related Correspondence

NOTES:

	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL
	NRR/DL/ADL		1	0	NRR LB2 BC		1	0
	NRR LB2 LA		1	0	AULUCK,R.	01	1	1
INTERNAL:	ELD/HDS2		1	0	IE FILE		1	1
	IE/DEPER/EPB	36	3	3	IE/DEPER/IRB	35	1	1
	IE/DEQA/QAB	21	1	1	NRR/DE/AEAB		1	0
	NRR/DE/CEB	11	1	1	NRR/DE/EHEB		1	1
	NRR/DE/EQB	13	2	2	NRR/DE/GB	28	2	2
	NRR/DE/HGEB	30	1	1	NRR/DE/MEB	18	1	1
	NRR/DE/MTEB	17	1	1	NRR/DE/SAB	24	1	1
	NRR/DE/SGEB	25	2	2	NRR/DHFS/HFEB	40	1	1
	NRR/DHFS/LQB	32	1	1	NRR/DL/SSPB		1	0
	NRR/DSI/AEB	26	1	1	NRR/DSI/ASB		1	1
	NRR/DSI/CPB	10	1	1	NRR/DSI/CSB	09	1	1
	NRR/DSI/ICSB	16	1	1	NRR/DSI/METB	12	1	1
	NRR/DSI/PSB	19	1	1	NRR/DSI/RAB	22	1	1
	NRR/DSI/RSB	23	1	1	REG FILE	04	1	1
	RGN5		3	3	RM/DDAMI/MIB		1	0
EXTERNAL:	ACRS	41	6	6	BNL(AMDTS ONLY)		1	1
	DMB/DSS (AMDTS)		1	1	FEMA-REP DIV	39	1	1
	LPDR	03	1	1	NRC PDR	02	1	1
	NSIC	05	1	1	NTIS		1	1

TOTAL NUMBER OF COPIES REQUIRED: LTTR 54 ENCL 47

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

May 10, 1983
G02-83-417
NS-L-02-JCA-83-045

Docket No. 50-397

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Schwencer:

Subject: NUCLEAR PROJECT NO. 2
PROCESS AND EFFLUENT RADIOLOGICAL MONITORING
AND SAMPLING SYSTEMS

Attached are sixty (60) copies of marked up FSAR pages describing WNP-2 equipment for sampling and monitoring process and effluent streams during postulated accidents.

This submittal closes out a commitment in section 11.5.2 (page 11-14) of the WNP-2 Safety Evaluation Report, NUREG-0892.

Very truly yours,

GC Sorensen

for G. D. Bouchey, Manager
Nuclear Safety and Regulatory Programs

CDT/cdp

cc: R Auluck - NRC
WS Chin - BPA
A Toth - NRC Site

B001

11.5.2 SYSTEM DESCRIPTION

11.5.2.1 Systems Required for Safety

Information on these systems is presented in Table 11.5-1, Section A, and the arrangements shown in Figures 11.5-1 through 11.5-3. The equipment is designed to Quality Class I and Seismic Category I Requirements. High reliability is further achieved by the use of redundancy.

11.5.2.1.1 Main Steam Line Radiation Monitoring System

This system monitors the gamma radiation level exterior to the main steam lines. The normal radiation level is produced primarily by coolant activation gases plus smaller quantities of fission gases being transported with the steam. In the event of a gross release of fission products from the core, this monitoring system provides channel trip signals to the reactor protection system to initiate protective action.

The system consists of four redundant instrument channels. Each channel consists of a local detector (gamma-sensitive ion chamber) and a control room radiation monitor with an auxiliary trip unit. Power for two channels (A and C) is supplied from RPS bus A and for the other two channels (B and D) from RPS bus B. Channels A and C are physically and electrically independent of channels B and D.

The detectors are physically located near the main steam lines in the steam tunnel as it enters the turbine building. The detectors are geometrically arranged so that this system is capable of detecting significant increases in radiation level with any number of main steam lines in operation.

Each radiation monitor has four trip circuits: two upscale (high-high and high), one downscale (low), and one inoperative. Each trip is visually displayed on the affected radiation monitor. A high-high or inoperative trip in the radiation monitor results in a channel trip in the auxiliary unit which is an input to the reactor protection system (RPS) logic as discussed in 7.2. An RPS logic trip from main steam line (MSL) channel input results in initiation of main steam isolation valve closure, reactor scram, mechanical vacuum pump shutdown and discharge valve closure. A high trip actuates a MSL high control room annunciator common to all channels. A downscale trip actuates a MSL downscale control room annunciator common to all channels. High and low trips do not result in a

channel trip. Each radiation monitor visually displays the measured radiation level.

Arrangement details are shown in Figure 11.5-1.

11.5.2.1.2 Reactor Building Exhaust Plenum Radiation Monitoring System

This system monitors the radiation level of the reactor building ventilation system exhaust ~~duct~~ PLENUM prior to its discharge from the building INTO THE ELEVATED RELEASE DUCT. A high radioactivity level in ~~that~~ THE EXHAUST SYSTEM ~~ductwork~~ could be due to fission gases from a leak or an accident.

The system consists of four redundant instrument channels. Each channel consists of a local detection assembly (a sensor and converter unit containing a GM tube and electronics) and a control room radiation monitor. Power for two channels (A and C) is supplied from RPS bus A and for the other two channels (B and D) from RPS bus B. Channels A and C are physically and electrically independent of channels B and D. One two-pen recorder powered from the 125 VAC bus A allows the output of any two channels to be recorded by the use of selection switches. The detection assemblies are physically located inside the exhaust air plenum upstream of the secondary containment discharge isolation valves. The distance upstream from the inboard discharge isolation valve is chosen such that the ventilation flow transport time at maximum design flow rate from the detector location to the inboard discharge valve is greater than the total time required to respond to trip level radiation and initiate and complete closure of the inboard discharge valve.

Each radiation monitor has two trip circuits: one upscale (high-high)/inoperative and one downscale. Two-out-of-two upscale/inoperative trips in channels A and B initiates closure of the reactor building ventilation outboard isolation valves and the primary containment outboard purge and vent valves, and initiates startup of standby gas treatment system (SGTS) train B. The same condition for channels C and D initiates closure of the corresponding inboard valves and initiates startup of SGTS train A.

An upscale/inoperative trip is visually displayed on the affected radiation monitor and actuates a reactor building vent high-high radiation control room annunciator common to all channels. A downscale trip is also visually displayed on the radiation monitor and actuates a reactor building vent downscale control room annunciator common to all channels.

An additional trip signal for high radiation alarm is provided by the recorder and actuates a reactor building vent high radiation control room annunciator. Each radiation monitor visually displays the measured radiation level.

Arrangement details are shown in Figure 11.5-2.

11.5.2.1.3 Control Room Fresh Air Intake Radiation Monitoring System

This monitor system measures the radioactivity in the two remote fresh air intake lines to the main control room. In the event of a release of abnormal gaseous radioactivity from the plant and the transporting of this radioactivity by wind currents to the remote air intakes, this monitoring system provides channel trip signals to initiate protective action by closing valves in the effected fresh air intake line(s). The system consists of two divisionally separated channels. Each channel consists of redundant local detectors (beta scintillation type) and redundant control room indicator-trip units, alarms and a two-pen radiation recorder.

Required 120 VAC supply for Division I and II equipment in both the main control room and remote locations is provided on a divisional basis by the 120/240 VAC critical (Class 1E) instrumentation power system.

Gas samples are withdrawn from sample probes in a continuously flowing section of the fresh air intake pipelines. These samples run in stainless steel tubing to four local cabinets located on the 437 foot level of the radwaste control building. The divisionally separated local cabinets each have a detector and preamplifier, blower and sample flow control equipment. The beta scintillation detectors are housed in lead shields to minimize the effects of background radiation and enhance response to low level radioactivity. Associated radiation monitors and recorders are mounted in the main control room.

Each radiation monitor has three trip circuits: one upscale for high radiation, one upscale for high-high radiation and air intake (channel) valve closure, and one downscale for instrument inoperative. All alarms annunciate in the main control room.

Arrangement details are shown on Figure 11.5-3.

11.5.2.2 Systems Required for Plant Operation

All systems associated with the plant process cycle provide for indication and recording of radiation levels in the main control room in conjunction with alarm annunciation features.

Information on these systems is presented in Table 11.5-1, Section B, and the arrangements are shown in Figures 11.5-2 and 11.5-4 through 11.5-10.

The bottle is then removed and the sample is analyzed in the counting room with a multichannel gamma pulse height analyzer to determine the concentration of the various noble gas radionuclides. A correlation between the observed activity and the monitor reading permits calibration of the monitor.

For arrangement details see Figure 11.5-4.

11.5.2.2.1.2 Off-Gas Post-treatment Radiation Monitoring System

This system monitors radioactivity in the off-gas piping downstream of the off-gas system charcoal vessels and upstream of the off-gas system discharge valve. A continuous sample is extracted from the off-gas system piping, passed through the off-gas post-treatment sample panel for monitoring and sampling, and returned to the off-gas system piping. The sample panel has a pair of filters (one for particulate collection and one for halogen collection) in parallel (with respect to flow) with two identical continuous gross radiation detection assemblies. Each gross radiation detection assembly consists of a shielded chamber, a ~~scintillation~~ GM detector, and a check source. Two radiation monitors in the main control room analyze and visually display the measured gross radiation level.

The sample panel shielded chambers can be purged with room air to check detector response to background radiation by using a three-way solenoid valve operated from the control room. The sample panel measures and indicates sample line flow. A solenoid operated check source for each detection assembly operated from the control room can be used to check operability of the gross radiation channel.

Power is supplied from ±24 VDC buses for the radiation monitors, from a 120 VAC instrument bus for a common two-pen recorder, and from a 120 VAC local bus for the sample panel.

Each radiation monitor has four trip circuits: two upscale (high-high-high, and high), one downscale (low) and one inoperative. Each trip is visually displayed on the radiation monitor. The first three trips actuate corresponding control room annunciators: off-gas post-treatment high-high-high radiation, off-gas post-treatment high radiation, and off-gas post-treatment downscale. The high-high trip circuit on the recorder actuates an off-gas post-treatment high radiation annunciator in the main control room. High or low sample flow measured at the sample panel actuates a control room off-gas vent pipe sample high-low flow annunciator.

continuously monitored via this process radiation monitoring system. Clean sealing steam is used on the turbine gland seals to maintain the releases of radionuclides to as low as reasonably achievable limits. The monitor complies with General Design Criterion 64 is Quality Class II and Seismic Category II.

The Channel includes a local sensor and auxiliary unit in the main control room an indicator and trip unit and a recorder. The channel provides for sensing and readout, both local and remote, of gamma radiation over a range of four logarithmic decades (~~0.1~~ 0.01 to 100 mR/hr).

The indicator and trip unit has one adjustable upscale trip circuit for high radiation alarm and to stop the mechanical vacuum pumps, and one adjustable downscale trip circuit for instrument inoperative that annunciate in the main control room.

For arrangement details see Figure 11.5-5.

11.5.2.2.1.5 Reactor Building Elevated Release Duct Radiation Monitoring System

THIS SUBSYSTEM PLUS THE LOCA TRACKING MONITORING SYSTEM (11.5.2.2.3.2) ~~satisfies~~ COMPLIES WITH NUREG 0737 REQUIREMENTS

~~This monitor subsystem measures the radioactivity in the reactor building exhaust prior to its discharge to the environment and in doing so complies with Regulatory Guide 1.21, Rev. 1 and General Design Criterion 64.~~ This monitor detects radioactivity in the exhaust from gland seal and mechanical vacuum pumps, the treated off-gas system effluent, standby gas treatment SYSTEM EXHAUST AND THE ~~and~~ exhaust air from the ~~entire~~ reactor building ventilation. ~~Samples of particulate and iodine activity are accumulated on filters which will be changed and analyzed at least weekly.~~

A continuous representative sample is extracted from the ~~elevated release duct~~ 230 FOOT VERTICAL TUBE through an isokinetic probe, passed through a filter paper to collect particulates and through an impregnated charcoal filter to collect iodine. These filters are analyzed AT LEAST WEEKLY to determine the quantities of the specific radionuclides released. These results, together with the strip chart recording of gaseous activity, provide a permanent record of the activity released to the environment. The sample travels through the gas monitor, a flow indicator and then a sample pump prior to being returned to the exhaust vent.

The RE ARE TWO gas monitors ~~is~~ mounted in a heavily shielded chambers. Table 11.5-1 lists the sensitivity and range of ~~this~~ EACH detector. In the event that the chamber becomes contaminated, increasing background, it can be disassembled for cleaning or replacement.

INSERT HERE

ARRANGEMENT DETAILS ARE SHOWN ON FIGURE 11.5-5. A LOW FLOW SAMPLER (0.1cfm) for particulates and iodines in event of a reactor accident is located outside the REACTOR BUILDING WHICH IS ACTIVATED BY THE HIGH-HIGH ALARM. (See App. B. section II. F. 1. 2)

~~The~~ EACH gas channel consists of the local detector and preamplifier, a radiation analyzer and a recorder in the main control room.

This monitor has no control functions. ~~There are~~ EACH MONITOR HAS: two adjustable trip circuits, one high AND ONE HIGH-HIGH for high radiation alarm ~~and one~~ PLUS A low for instrument inoperative that annunciate in the main control room. THE POWER SUPPLY IS FROM AN UNINTERRUPTABLE POWER SUPPLY.

Arrangement details are shown in Figure 11.5-5.
(ALSO SEE App. B section II. F. 1.1)

11.5.2.2.1.6 Turbine-Generator Building Ventilation Release Duct Radiation Monitoring System

This monitor system measures the radioactivity in the turbine building exhaust prior to its discharge to the environment and in doing so complies with Regulatory Guide 1.21, Rev. 1 ~~and~~, General Design Criterion 64 AND NUREG 0737. This monitor detects the fission and activation products from the steam which may leak from the turbine or the other primary components in the building. The gaseous activity in the exhaust is expected to normally be below detectable levels. The particulate and iodine activity is accumulated on filters for a week to obtain sufficient activity to be detectable. These filters are analyzed to determine the quantities of specific radionuclides present and these results together with the gaseous activity strip chart recorder, provide a permanent record of radioactivity released to the environment.

A continuous representative sample is extracted from the exhaust vent through a MULTIPORTED isokinetic probe, DOWN A 30 FOOT TUBE TO ~~passed~~ through a filter paper to collect particulates and through an impregnated charcoal filter to collect iodine. The sample travels through ~~the~~ ONE OF TWO gas monitors, a local flow indicator and then a sample pump prior to being returned to the exhaust vent.

The gas monitors ~~is~~ ARE mounted in a heavily shielded chambers. EACH ~~The~~ gas channel consists of the local detector and preamplifier count rate meter and a recorder in the main control room. Arrangement details are shown on Figure 11.5-6.

INSERT HERE

These monitors have no control functions. ~~There are two~~ Each monitor has two adjustable trip circuits, one high AND ONE HIGH-HIGH for high radiation alarm PLUS ~~and one~~ A low TRIP for instrument inoperative that annunciate in the main control room. The power supply is from an uninterruptable power source.

The low range (10^{-6} μCi/cc to 10^{-1} μCi/cc) gas channel receives the normal sample flow. If the gas activity increases high enough to trip the high-high alarm then the sample flow valving will change to direct the sample through the high range (10^{-2} μCi/cc to 10^{3} μCi/cc) gas channel.

(ALSO see App. B section II. F. 1.1)

11.5.2.2.1.7 Radwaste Building Ventilation Release Ducts Radiation Monitoring System

This monitor system measures the radioactivity in the radwaste building ventilation air exhaust as it is being discharged to the environment and in doing so complies with Regulatory Guide 1.21, Rev. 1 ~~and~~, Design Criterion 64 AND NUREG 0737. Radioactivity originates from radwaste tank vents, from primary water processing equipment and from laboratory sampling hoods as well as various cubicles having liquid process treatment systems within the building. A continuous sample is drawn from each of the two out of three fan exhausters that are operating. The representative sample is withdrawn through a MULTIPORTED ISOKINETIC duct probe, DOWN A 10 foot tube, TO passes through a particulate filter to collect particulates, AND ~~thence~~ through a charcoal filter to collect ~~halogens~~ IODINE. Filters are exchanged at least weekly for laboratory radiochemical analyses. The filtered air sample streams are combined to pass through ONE OF TWO ~~a single~~ gas monitors.

The gas monitors ARE ~~is~~ mounted in a heavily shielded chambers. EACH ~~The~~ gas channel consists of a local detector and preamplifier with countrate meter and a recorder in the main control room.

THE LOW RANGE ($10^{-6}\mu Ci/cc$ to $10^{-1}\mu Ci/cc$) GAS CHANNEL RECEIVES THE NORMAL SAMPLE FLOW. IF THE GAS ACTIVITY INCREASES HIGH ENOUGH TO TRIP THE HIGH-HIGH ALARM THEN THE SAMPLE FLOW VALVING WILL CHANGE TO DIRECT THE SAMPLE THROUGH THE HIGH RANGE ($10^{-2}\mu Ci/cc$ to $10^{3}\mu Ci/cc$) gas channel.

Arrangement details are shown in Figure 11.5-6.

These ~~This~~ monitors have ~~has~~ no control functions. EACH MONITOR HAS ~~There are~~ two adjustable trip circuits, one high AND ONE HIGH-HIGH for high radiation alarming ~~and~~ PLUS A ~~one~~ low for instrument inoperative that annunciate in the main control room. THE POWER SUPPLY IS FROM AN UNINTERRUPTABLE POWER SUPPLY. (Also see App. B section II. F. 1.1)

11.5.2.2.2 Liquid Process and Effluent Radiation Monitoring System

These systems monitor gamma radiation levels of liquid process and effluent streams.

Each monitor system consists of a scintillation detector inserted into a well in the process piping, ~~or~~ into a sump or in an off-line chamber to which a process stream sample is piped. The detector locations are selected to obtain a reasonable geometry and are positioned away from crud trap and associated high background regions. Full lead shielding is provided around detectors to further reduce background levels except for turbine-generator building drain sump monitors.

For each liquid off-line detector location, a continuous sample is extracted from the liquid process pipe, passed through a liquid sample panel which contains a detection assembly for gross radiation monitoring, and returned to the process pipe. The detection assembly consists of a scintillation detector mounted in a shielded sample chamber equipped with a check source. ~~A~~ the radiation monitor/meter in the control room ~~analyzes and~~ visually displays the measured gross radiation level. The sample panel chamber and lines can be drained to allow assessment of background buildup. The panel measures and indicates sample line flow. A solenoid operated check source operated from the control room can be used to check operability of the channel.

Power is supplied from 125 V DC non-divisional buses for the control room radiation monitors and recorders, and from a 120 V AC local bus for the sample panels.

The detector's local preamplifier unit is designed to remain fully operational in their expected environment. If exposed to radiation transients which exceed the channel range, the channel maintains full scale deflection and returns to normal functioning when the transient has subsided.

Each radiation monitor, except for THE CIRCULATING WATER AND the turbine generator building sump monitor, has four trip circuits: two upscale (high-high and high), and one downscale (low), and one inoperative. Each trip is visually displayed on the affected radiation monitor. Two of these trips actuate corresponding control room annunciators: one upscale (high radiation) and the downscale for the affected liquid monitoring channel. High or low sample flow measured at the sample panel actuates a control room high-low flow annunciator for the affected liquid channel.

All alarms are annunciated in the control room. Liquid monitor systems details are given in Table 11.5-2 and the monitor arrangements are shown in Figure 11.5-7 and 11.5-8.

11.5.2.2.2.1 Standby Service Water Radiation Monitoring System

A radiation detector is located off-line and samples the standby service piping downstream of each of the two residual heat removal (RHR) heater exchanger (loops A and B). These monitors are designed to detect any primary coolant leakage into the standby service water during operation of the RHR heat exchangers in the shutdown heat removal mode, or any leakage from the FPC heat exchangers into the standby service water system during emergency operation.

The high-high upscale trip on the radwaste effluent radiation monitor is used to initiate closure of the radwaste system discharge valve. The trip point is set such that closure is initiated prior to exceeding technical specification limits for liquid effluents. The high upscale trip actuates an annunciator in the radwaste control room as well as the main control room.

11.5.2.2.2.4 Circulating Water and Service Water Radiation Monitoring Systems

The circulating water monitor is located on the discharge side of the circulating water pumps for the main surface condenser in the coolant blowdown line to the Columbia River. The location of this monitor permits detection of radioactive material leakage (ing) to the circulating water from any source, including the standby service water system. If an alarm condition exists, circulating water blowdown to the Columbia River is terminated by automatic closure of the circulating water blowdown valve in the circulating water pumphouse (see 9.2.1.2) AND IT ANNUNCIATES IN THE CONTROL ROOM.

The service water radiation monitor is located in the service water return header to the circulating water system. An off-line type, the monitor continuously measures the radioactivity level of the service water returning flow to the circulating water system. The radiation detector is lead shielded to minimize background radiation effects. The amplified signal from the detector is displayed in the main control room. High and low level alarms are annunciated in the main control room.

11.5.2.2.2.5 Turbine-Generator Building Sump Radiation Monitoring System

The three nonradioactive drain sumps in the turbine building are equipped with liquid radiation monitors. In the event of any radioactive liquid system failure that contaminated these sumps, the process radiation monitor would activate a diversion valve to route these effluents to radwaste for processing. Process flow from the nonradioactive sumps is via the storm drain system to an evaporative basin. The sump monitor systems have detectors located in a well in the respective sumps, control room annunciators and automatic diversion valve logic.

system. A high-high trip signal from the monitor will automatically close the path to the storm sewer and open a diversion valve to the radwaste system. The drain monitor system additionally has control room annunciators and automatic diversion valve logic.

11.5.2.2.3 Primary Containment Radiation Monitoring System

This monitor system is composed of two parts, a sensitive two-channel leak detection system and a ~~two~~ four-channel high activity LOCA tracking system.

11.5.2.2.3.1 Leak Detection Monitors

This monitor ~~sub~~system measures the radioactivity in the drywell and in doing so complies with Regulatory Guide 1.45, Rev. 0 and General Design Criteria 30. The radioactivity in the drywell is from coolant and corrosion activation products plus fission products produced in the reactor and released through leaks.

This monitor system has two redundant subsystems, each having two detectors to individually monitor particulates, and the noble gas activity. Additionally a charcoal sample cartridge is provided to trap halogen gases. The detectors are housed in divisionally separated cabinets located in the reactor building sample room. The cabinets have incorporated blowers and flow controls to withdraw gas samples from the primary containment atmosphere via stainless steel sampling lines and vent back to the containment. The environment in which the local cabinets are located is maintained to limit upper temperature excursions that may occur in the reactor building during an accident. Associated radiation monitors and recorders are mounted in the main control room along with alarm annuciators.

Required 120 VAC supply for Division I and II equipment in both the main control room and the reactor building sample room is provided on a divisional basis by the 120/240 VAC critical (Class 1E) instrumentation power system.

The two-channel detector assemblies are provided with lead shielding to minimize the effects of background radiation to insure high sensitivity. The detectors are of the scintillation type and are provided with check sources to initiate an upscale response and verify system operability. The particulate detector views a moving tape filter collector upon which airborne particulates are trapped. The noble gas detector views a fixed volume of gas.

Each radiation monitor has three trip circuits: one upscale high-high to alarm and close sample line valve, one upscale for high radiation and one downscale for instrument inoperative. All alarms annunciate in the main control room. This monitoring subsystem provides no control function and is a diagnostic tool which enables the main control room operator to take appropriate action.

Arrangement details are shown on Figure 11.5-9.

11.5.2.2.3.2 LOCA Tracking Radiation Monitoring Systems (CONTAINMENT DRYWELL & ELEVATED RELEASE DUCT)

These subsystems monitor the atmosphere of the drywell from inside and outside and the gaseous effluents in the elevated release stack for abnormal radioactivity following an accident condition involving rupture of the pressure boundary. The inside subsystem will track the long term decrease in containment radioactivity that takes place with decay time and containment decontamination. The system will also track the level of radioactivity of the gaseous releases through the elevated release stack following a LOCA. The subsystem complies with General Design Criteria 23 and 64 and satisfies R.G. 1.97 Rev 2.

The monitor has two redundant divisionally separated subsystems, each having two ionization chambers to monitor gross gamma activity. Ionization chambers A and C are part of Division I, chambers B and D are in Division II. Chambers A and B are housed in inserts in the bioshield concrete walls against the containment steel shell to view the drywell. Chambers C and D are housed in inserts extending into the reactor building elevated release stack. From the detectors position, the range of the system extends from levels that can be measured by the primary containment leak detection monitoring system to a level resulting from a full core release of the noble gas fission products as could be created by a LOCA.

Each ionization chamber is wired to a logarithmic amplifier and high voltage power supply located in the reactor building sample room. Output from each log amplifier is wired to an indicator-trip unit and alarm located in the main control room. One two-pen recorder for each divisional subsystem is located in the main control room to record radiation levels within the primary containment.

For primary containment monitoring a second pair of ionization chambers parallel to chambers A and B are located inside the drywell. These chamber will respond to the low energy gamma radiation such as the 81KeV from Xe-133 fullfilling a R.G.-1.97 requirement.

airborne particulate and iodine,

Gamma spectrometry will be used ~~extensively~~ for isotopic analyses of gaseous, ~~airparticulate~~ and liquid samples. Two high-resolution GeLi detectors are available for this purpose. Both detectors are calibrated against gamma energy for a variety of sample detector geometries. Complex gamma spectra are resolved on the GeLi system by an applications software program developed for computer use.

Gaseous tritium samples are collected by condensations or adsorption and the resultant liquid is analyzed by liquid scintillation counting techniques.

Radiochemical separations are used for the routine analysis of Sr-89 and Sr-90.

11.5.2.3.4 Inservice Inspection, Calibration and Maintenance

During reactor operation, checks of system operability are made by observing channel behavior. At monthly intervals during reactor operation, the detector response of each monitor to remotely positioned check sources supplied with most of the monitors will be recorded together with the instrument background count rate to ensure proper functioning of the monitors. Any detector whose response cannot be verified by observation during normal operation or by using the remotely positioned check source will have its response checked with a portable check source with the exception of the charcoal vault monitor. A record will be maintained showing the background radiation level and the detector response.

The system has electronic testing and calibrating equipment which permits channel testing without relocating or dismounting channel components. An internal trip test circuit, adjustable over the full range of the readout meter, is used for testing. Each channel is tested prior to performing a calibration check. Verification of valve operation, ventilation diversion or other trip functions will be done at this time if it can be done without jeopardizing the plant safety. The tests will be performed in conformance with the technical specifications.

11.5.2.3.4.1 Calibration

The continuous radiation monitors are calibrated to commercial radionuclide standards traceable to the National Bureau of Standards. Each continuous monitor is calibrated semi-annually during plant operation, or during the refueling outage if the detector is not readily accessible, using the secondary radionuclide standard.

B. SYSTEMS REQUIRED FOR PLANT OPERATION

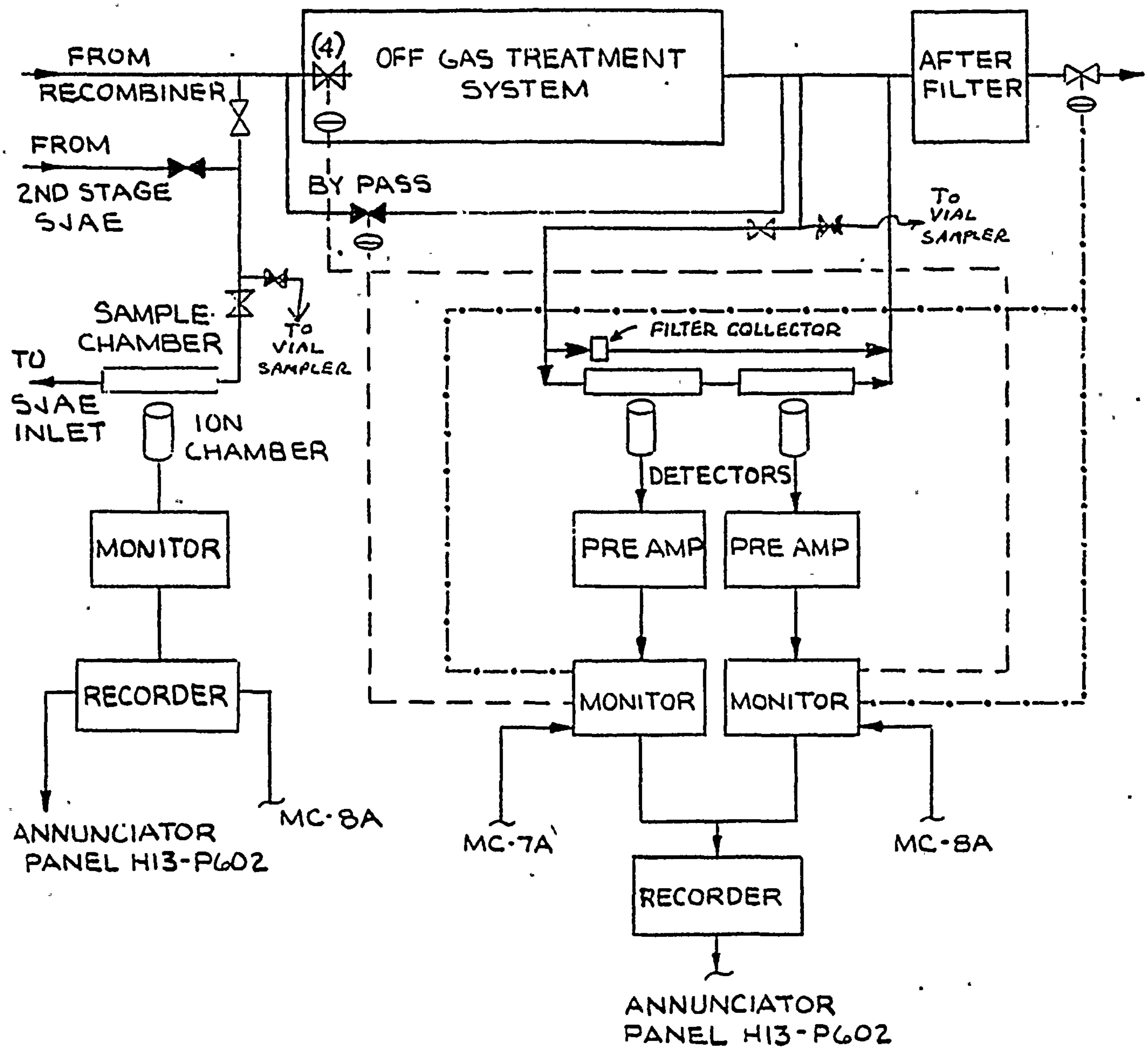
Monitor	Detector Location (No. of Channels)	Type	Sensitivity	Range (Scale)	Principle Radio-nuclides Measured	Expected Activity	Upscale Set Points Alarms	Upscale Set Points Trips
Off-Gas Pretreatment Radiation Monitor	Off-line, adjacent to sample chamber (1)	• γ-Ion Chamber	3×10^{-10} Amp/R/h	$10^{0}-10^{6}$ mR/h (6 dec. log)	Noble gas Fission Products	Off-Gas activity defined in Table 11.3-1	Above back-ground	Not Applic-able
Off-Gas Post Treatment Radia-ation Monitor	Off-line (2)	• GM • Part. Filter • Iodine Filter	250cpm/ pCi/cm^3	$10^{1}-10^{6}$ cpm (5 dec. log)	Kr-85[a]	Off-Gas activity defined in Table 11.3-7	Above back-ground	Tech. Spec.
Charcoal Bed Vault Radiation Monitor	Charcoal bed vault (1)	• GM		$10^{0}-10^{6}$ mR/h (6 dec. log)	Noble gas	Charcoal Bed Inven-tory de-fined in 11.3	Above back-ground	Not Applic-able
Mechanical Vacuum Pump Discharge	In-line (1)	• GM		~~$10^{-1}-10^{3}$~~ $10^{-2}-10^{2}$ mR/hr (4 dec. log)	Xe-133	Within Monitor Range	Above back-ground	Tech. Spec.
Reactor Bldg. Elevated Dis-charge Radi-ation Monitor	Off-line ~~(1)~~ (2)	• ~~GM~~ β-scint • Part. Filter • Iodine Filter • β-scint	~~250~~ 50 cmp/ pCi/cm^3	$10^{1}-10^{6}$ cpm (5 dec. log) $10^{-2}-10^{3}$ μCi/cc Xe-133 (5 dec. log)	Kr-85[a] Xe-133[a]	Reactor Bldg. activity defined in Table 11.3-7 LOCA (DBA) activity as defined in Table 15.6-18	Above back-ground	Tech. Spec.

B. SYSTEMS REQUIRED FOR PLANT OPERATION (Continued)

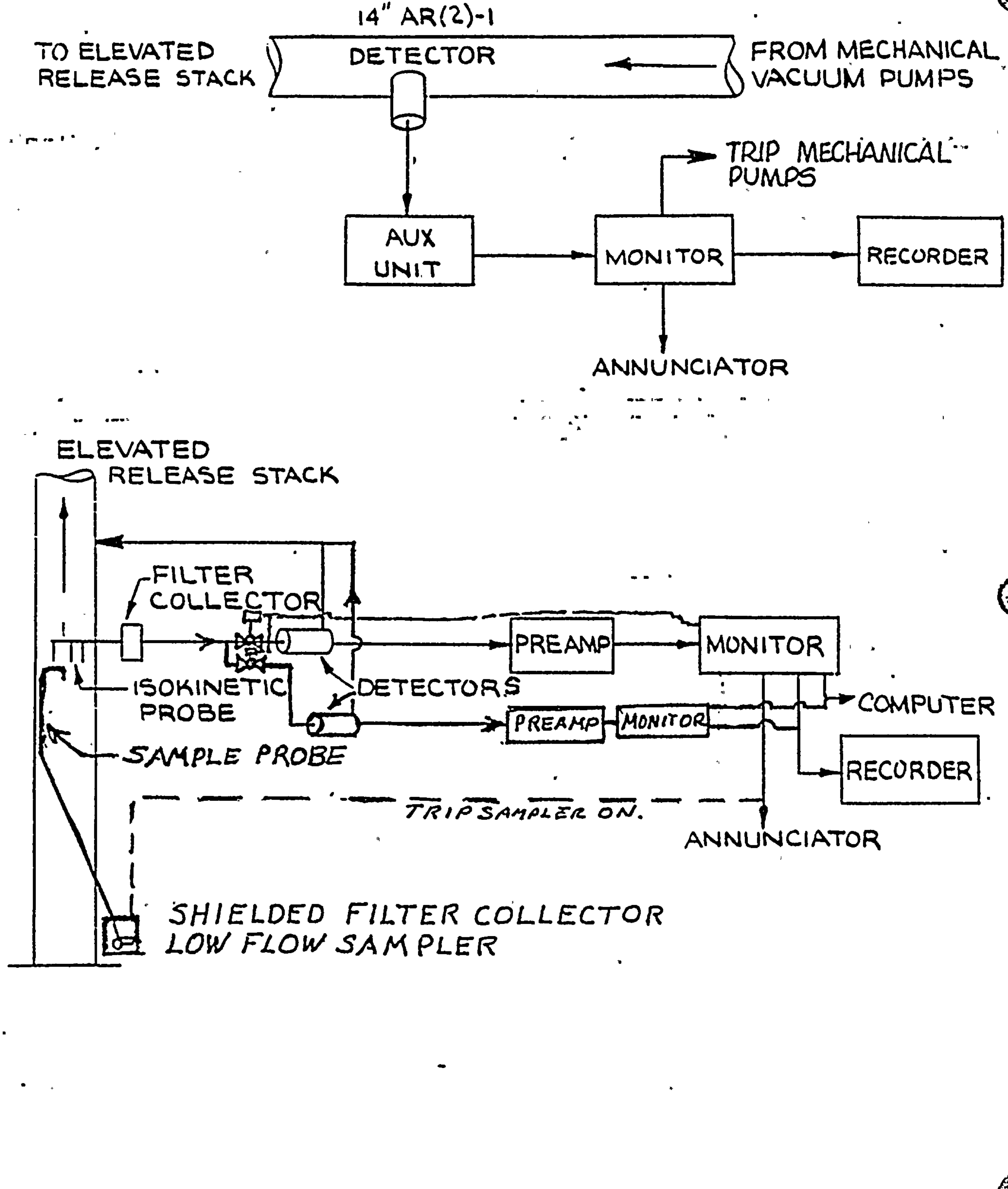
Monitor	Detector Location (No. of Channels)	Type	Sensitivity	Range (Scale)	Principle Radio-nuclides Measured	Expected Activity	Upscale Set Points Alarms	Trips
Turbine Bldg. Ventilation Exhaust Radiation Monitor	Off-line ~~(1)~~ (2)	• ~~GM~~ β-SCINT • Part. Filter • Iodine Filter	~~250~~ 50 cmp/ pCi/cm³	10^1-10^6 cpm (5 dec. log)	Kr-85[a]	Turbine Bldg. activity defined in Table 11.3-7	Above background	Tech. Spec.
		• β-SCINT		10^{-2}-10^3 μCi/cc Xe-133 (5 dec. log)	Xe-133[c]	LOCA Mixture of F.P. Activity see Table 15.6-18		
Radwaste Bldg. Ventilation Exhaust Radiation Monitor	Off-line ~~(1)~~ (2)	• ~~GM~~ β-SCINT • Part. Filter • Iodine Filter	~~250~~ 50 cmp/ pCi/cm³	10^1-10^6 cpm (5 dec. log)	Kr-85[a]	Radwaste Bldg ~~Negligible~~ activity defined ~~discussed~~ in 11.3-7	Above background	Tech. Spec.
		• β-SCINT		10^{-2}-10^3 μCi/cc Xe-133 (5 dec. log)	Xe-133[c]	L.O.C.A Mixture of F.P. activity See Table 15.6-18		
Primary Containment and ~~LOCA Monitor~~ Elevated Release LOCA monitors	Adjacent to containment steel walls	γ-Ion Chambers	Amp/R/h	R/h (6 dec. log)	Fission Product Gases	Within Monitor Range	Above background	Not Applicable
	Outside (2)		1×10^{-10}	10^{-2} - 10^4				
	Inside (2)		7×10^{-11}	10^0 - 10^7				
	Release Duct (2)		1×10^{-10}	10^{-2} - 10^4				
Primary Containment Radiation Monitor	Off-line					Containment discussed in 12.2		
Particulate	(2)	Part. Filter β-Scint	200 cpm/ nCi	10^0-10^6 cpm (6 dec.log)	Fission gas daughter & corrosion activation product		Above background, below trip	Full Scale
Gas	(2)	β-Scint	50cpm/ pCi/cm³	10^0-10^6 cmp (6 dec.log)	Xe-133 Kr-85		Above background, below trip	Full Scale

(a) Sensitivity based upon this radionuclide

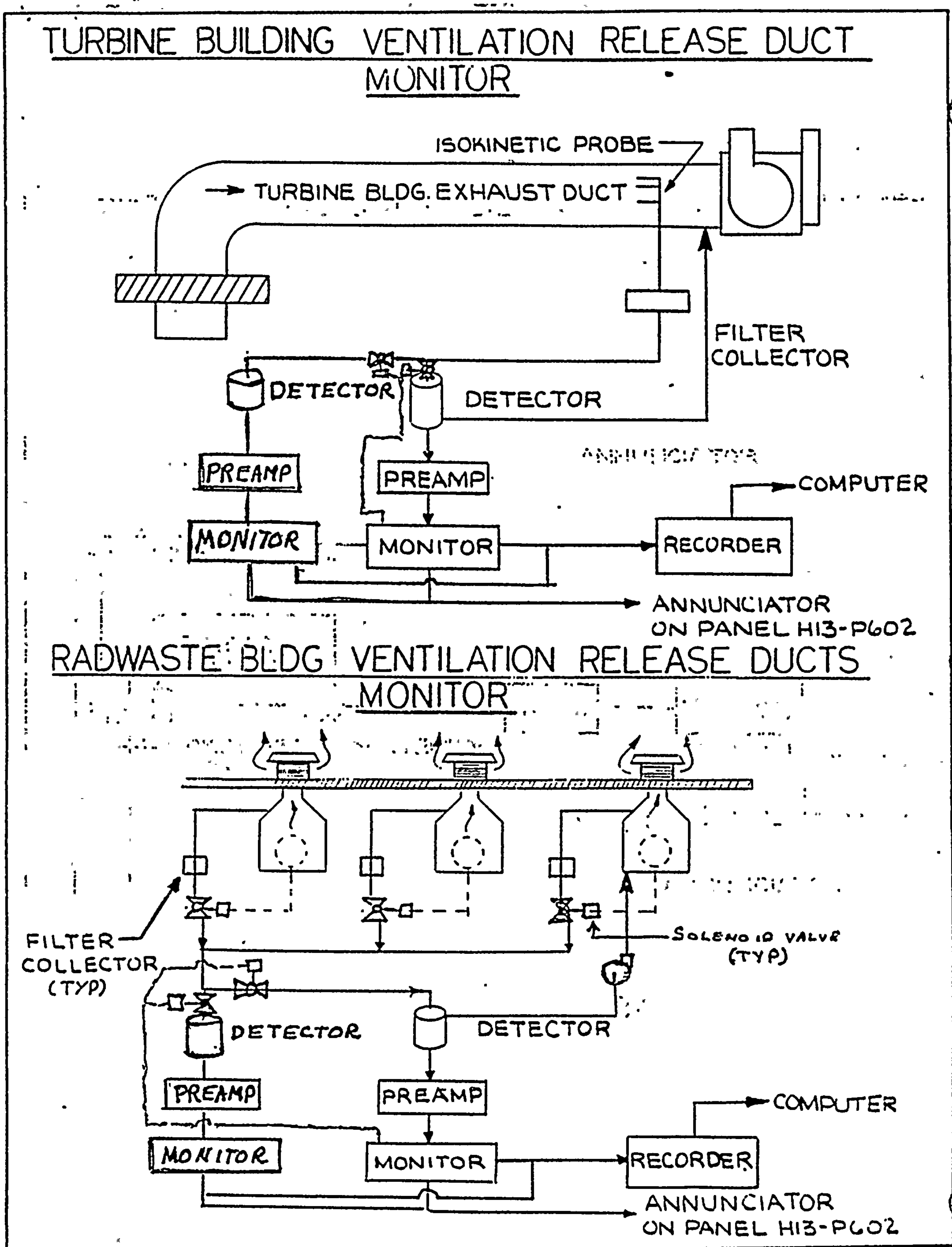
(b) Geiger-Muller Tube



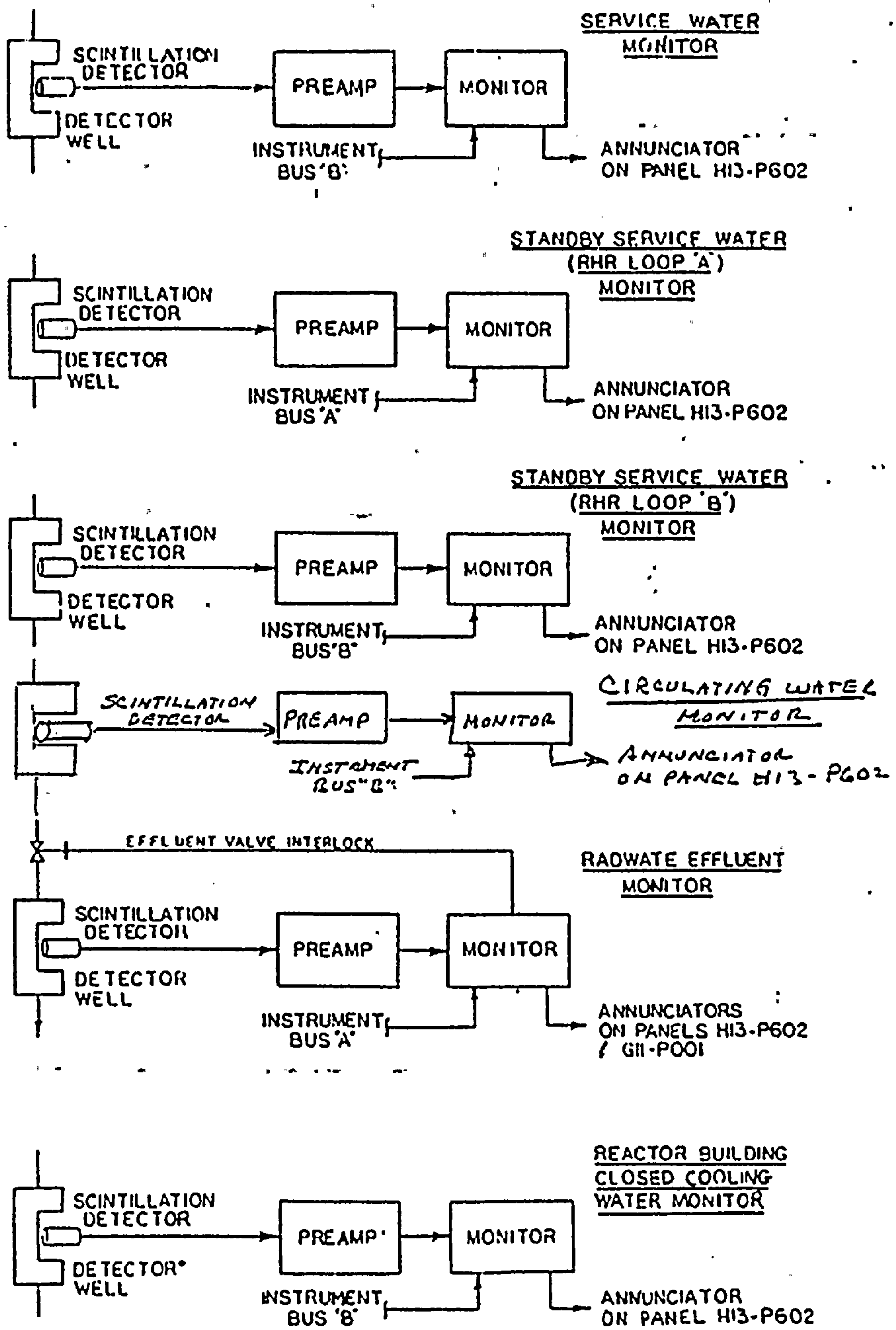
WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT NO. 2	OFF-GAS PRETREATMENT AND POST TREATMENT RADIATION MONITORS	FIGURE 11.5-4



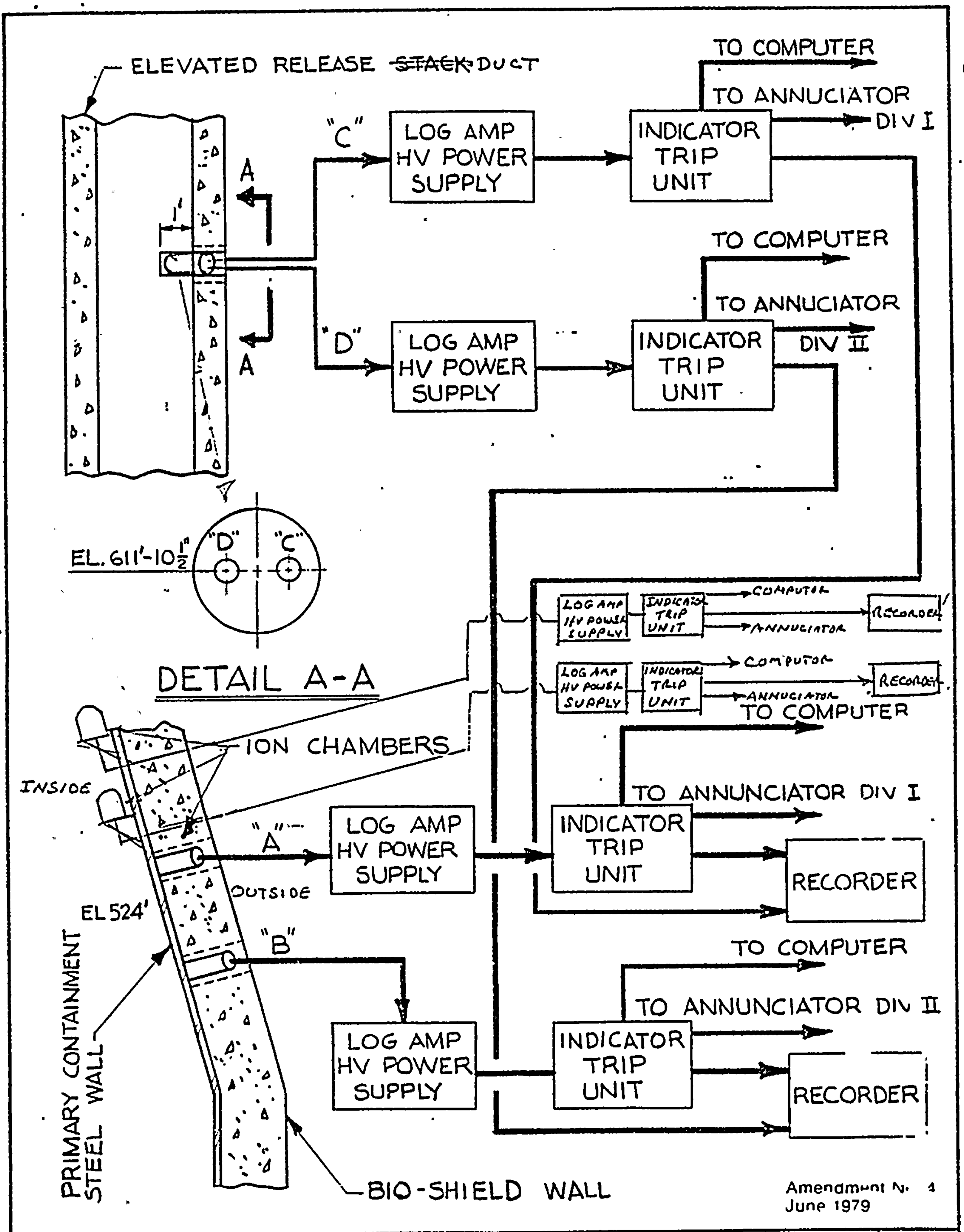
WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT NO. 2	MECHANICAL VACUUM PUMPS EXHAUST MONITOR AND REACTOR BUILDING ELEVATED RELEASE STACK MONITOR	FIGURE 11.5-5



WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT NO. 2	TURBINE AND RADWASTE BUILDING VENTILATION RELEASE DUCT MONITORS	FIGURE 11.5-6



WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT NO. 2	PROCESS AND EFFLUENT LIQUID RADIATION MONITORS	FIGURE 11.5-7



Amendment No. 4
June 1979

WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT NO. 2	PRIMARY CONTAINMENT AND ELEVATED RELEASE STACK LOCA TRACKING MONITORS	FIGURE 11.5-10