Safety Related

System Diagram: 806-032
806-033
806-034
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INFORMATION ONLY

FINAL

SYSTEM DESIGN DESCRIPTION

POST ACCIDENT RADIATION MONITORING SYSTEM

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNITS 1 AND 2

N/A
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System Designation D19

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1.0 INTRODUCTION

This document presents a description of the Post Accident Radiation Monitoring System for Perry Nuclear Power Plant Units 1 and 2. The Post Accident Radiation Monitoring System consists of in-plant radiation monitors and samplers which provide sampling, measurement, and indication of the radioactivity in selected plant areas and plant effluent exhaust streams.

The Post Accident Radition Monitoring System includes the following:

a. Plant Effluent Gaseous Airborne Monitors

b. Plant Effluent Particulate and Iodine Samplers

c. In-Containment High Range and Drywell Radiation Monitors

d. Technical Support Center (TSC) and Emergency Operations Facility (EOF) Area Monitors

e. TSC and EOF Airborne Monitors

TSC and EOF monitoring system components are supplied under Specification 790-88 and 790-89. The components of this portion of the System are non-safety related.

High Range Area gamma radiation monitoring components are supplied under Specification 621-4549-00. The components of this portion of the system are safety related.

Effluent Gaseous monitors and Particulate and Iodine samplers are supplied under Specification 622-4549-00. The components of this portion of the system are non-safety related, not redundant, but procured qualified to IEEE-323 and IEEE-344.

1.1 SYSTEM FUNCTIONS

The Post Accident Monitoring System is provided to monitor containment radiation and plant releases associated with certain types of accidents. The functions of the system are:

a. To sample, detect, indicate, and record the radioactivity levels within:

   1) Main Plant Vent Stack

   2) Off-Gas System Exhaust Stack

   3) Turbine Building/Heater Bay Vent

b. To detect, measure, indicate and record high radiation levels within:

   1) The Reactor Primary Containment (Drywell)

   2) The Reactor Secondary Containment (Steel Containment)

c. To alarm when predetermined radiation levels are exceeded.

d. To provide a sampling and collection medium for laboratory analysis of samples.

e. To record the release activity of radioactive material from the plant.

f. To provide data to follow and determine the severity of an accident.

g. To provide data used in determining the habitability of the TSC and EOF.

1.2 CRITERIA REQUIREMENTS

The codes, standards and guides to which this system and its components comply, the interface relationship with other systems, the system component ambient environmental requirements, and the system design bases are as follows:

1.2.1 Codes and Standards

The system is designed in accordance with the applicable requirements or guidelines set forth in the following codes, guides and standards:

a. U.S. NRC Regulatory Guide 1.97, Rev. 2 (December 1980), "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident" as clarified by NUREG-0737 (November 1980, "Clarification of TMI Action Plan Requirements", Section II.F.1.

b. American National Standards Institute (ANSI) Standards:

ANSI N13.1-1969, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities".

1.2.2 System Interfaces

The Area Radiation Monitoring portion of the system interfaces with the following plant systems:

a. The Electrical System

b. The Main Plant Annunciator System

c. The ERIS Computer System

The Airborne Radiation monitoring and sampling portions of the system interface with the following plant systems:

a. Plant Exhaust Ventilation Systems

b. The Electrical System

c. The ERIS Computer System

d. The Main Annunciator System

e. The Plant Radiation Monitoring System (D17)

f. The Containment Isolation System

The TSC and EOF portion of the system interfaces with the following plant systems:

a. The Electrical System

b. The HVAC System

c. The ERIS Computer System

1.2.3 Ambient Environmental Conditions

The Post Accident Radiation Monitoring System is designed to operate under all expected normal and LOCA environmental conditions during which their function is required.

1.2.4 Design Basis

The design bases for the Post Accident Radiation Monitoring System are as follows:

a. To furnish quantitative information to plant personnel on the radiation levels inside the containment and drywell to aid in the determination of accident severity.

b. To furnish quantitative information to plant personnel on the levels of gaseous radioactivity in the plant gaseous effluent exhaust to aid in assessment of accident severity.

c. To provide monitoring of radioactive releases generated as a result of emergency operation of the plant, in effluent discharge paths as required by Reg. Guide 1.97.

d. To provide a sample medium from which the quantity of each principal radionuclide released to the environment can be determined following an incident.

e. To provide instrumentation to monitor plant effluent discharge paths, for level of radioactivity during and following an incident.

f. To augment and supplement other monitoring systems, such as the Area Radiation Monitoring System and the Plant Radiation Monitoring System in the measurement of severity of incidents involving the release of radioactive material.

g. To provide a hard copy record of radiation levels in the monitored systems.

1.3 SUMMARY DESCRIPTION OF SYSTEM

The Post Accident Monitoring System provides sampling, detection, measurement, and indication of radiation or radioactivity level in containment or plant effluents. Effluent monitoring and sampling operation is initiated automatically on receipt of signals from the containment isolation system or when radiation levels exceed predetermined set points. Indication and alarms for effluent and high range instrumentation channels are provided in the Control Room or to the ERIS Computer.

The Post Accident Monitoring System includes the following groups of instruments:

In-Containment High Range Area Monitors
Plant Effluent Gaseous Monitors
Plant Effluent Particulate and Iodine Sampling Systems
TSC and EOF Airborne Monitors
TSC and EOF Area Monitors

The Post Accident Monitoring System supplements the Area Radiation Monitoring System and the Plant Radiation Monitoring System by providing instrumentation that may be used for monitoring radiation levels in the containment and activity levels in the plant gaseous effluents after an incident. This system complies with the regulatory requirements of Reg. Guide 1.97 as clarified by NUREG-0737.

Channels associated with Unit 1 effluent gas monitors and high range area monitors have instrumentation readout modules and recorders located in the Unit 1 Control Room. Similar channels associated with Unit 2 have instrumentation readout modules and recorders located in the Unit 2 Control Room. TSC and EOF have only local alarm and indicating units.

A summary description of each monitor group follows:

a. High Range Area Radiation Monitors (D-806-033)

The High Range Area Radiation Monitoring System provides redundant safety grade channels to monitor Containment and Drywell Radiation Levels.

The High Range Area Monitoring portion of the system continously monitors containment and drywell radiation levels to provide operating personnel with these levels and to alarm if levels increase past a predetermined setpoint.

The High Range Area Monitoring portion of the system provides indication of in-containment radiation levels over the range of 1 R/hr to 1 x 10^8 R/hr. Recorders are provided in the control room.

The High Range Area Monitoring portion of the system consists of the following monitors:

1. Drywell Radiation Monitors
2. Secondary Containment Radiation Monitors

b. Plant Effluent Gaseous Monitors (D-806-033)

Monitors are provided with two detectors to cover the entire range of interest from 1.7×10^{-3} uci/cc to 1×10^{5} uci/cc/Xe-133. These monitors are non-safety related non-redundant but are procured qualified to IEEE-323 and IEEE-344.

The detectors provided are as follows:

Intermediate Range (1.7×10^{-3} uci/cc - 1×10^{2} uci/cc Xe-133)
High Range (1×10^{1} uci/cc - 1×10^{5} uci/cc Xe-133)

1. Intermediate and High Range Gaseous Effluent Monitors

The Intermediate Range Gaseous Effluent monitors augments the normal exhaust radiation monitoring system and provides plant personnel with information to be used in determining the magnitude of radioactivity released to the environment during post accident situations.

A representative effluent sample is continuously extracted from the effluent path through an isokinetic probe with the additional feature of regulating the sample flow in proportion to the effluent flow (autokinetic). The sample is supplied through a 1-inch sample line which is also used to supply a representative sample to the D17 equipment. This sample line is heat traced to preclude any condensation. Approximately a 0.1 CFM portion of this representative sample is taken by another isokinetic probe and passed through the three Particulate and Iodine filter cartridge assemblies arranged in parallel and then through the Intermediate and High Range Gaseous Monitors. This portion of the system receives actuation signals from the Containment Isolation and Plant Radiation Monitoring Systems (D17). Alarms and indication for each channel are provided in the control room. Recorders are provided in the control room.

The effluent vents that are monitored are as follows:

(a) Main plant vent

(b) Off-Gas Vent

(c) Turbine Building/Heater Bay Vent

2. Particulate and Iodine Sampling Stations. (See Section (b.)(1.)

The Particulate and Iodine Sampling Stations, which are located in the Intermediate and High Range Gaseous Effluent Monitor Cabinets, provide batch samples for laboratory analysis by passing the sample through silver zeolite cartridges and fiber filters. Three Particulate and Iodine filter cartridge assemblies are arranged in parallel ahead of the Intermediate and High Range Gaseous Effluent Monitors as part of the High Range Effluent Monitors. The analysis results are used to assess the severity of an accident and magnitude of radioactivity releases.

Since these sampling stations are a part of the Intermediate and High Range Gaseous Effluent Monitors, the actuation signals for the Gaseous Effluent Monitors also serve the Particulate and Iodine Sampling Stations. See Section (b.)(1.).

The effluent vents that have Particulate and Iodine Sampling Stations are the same as for the Gaseous Effluent Monitors, see previous Section (b.)(1.).

This portion of the system is non-safety related non-redundant but procured qualified to IEEE-323 and IEEE-344.

c. The EOF and TSC Monitoring System provides monitoring of the TSC and EOF air supplies for levels of radiactivity and area monitoring. This system is provided with local alarm and indication in each respective facility.

2.0 DETAILED DESCRIPTION OF SYSTEM

2.1 COMPONENTS

2.1.1 Radiation Monitoring Panels

Post accident radiation monitoring panels H13P884 and H13P885 are located in the main control room. Panel H13P884 contains the Drywell and Reactor Building high range area monitor Channel A readout module D19K100 and its associated recorder D19R100; the main plant vent intermediate and high range monitor readout module D19K300; the off-gas vent intermediate and high range monitor readout module D19K400 and the effluent recorders D19R300 and D19R400. Panel H13P885 contains the Drywell and Reactor Building high range area monitor Channel B readout module D19K200 and its associated recorder D19R200 along with the turbine building/ heater bay vent intermediate and high range monitor readout module D19K500 and the associated recorder D19R500.

TSC and EOF Monitors have local indication in the respective facility.

2.1.2 Annunciator

In each control room, two annuciator windows are provided on panel H13P680. One is a common trouble alarm for instruments in panel H13P884, the other for H13P885.

2.1.3 Power Supply

Power is supplied from the IE bus to the high range area monitors and to the effluent intermediate and high range gas monitors which include the high range particulate and Iodine Samplers on the main plant vent, the off-gas vent and the TB/HB vent.

Power to the autokinetic sample supply pumps is backed by the diesel to ensure availability after a LOCA or LOOP. Power is available after a LOCA plus LOOP through administrative action after a LOCA has been cleared.

Invertor backed 120 Vac power is used for the TSC area and airborne radiation monitors. The EOF airborne and area monitors uses local 120 Vac UPS power.

2.1.4 Monitors

A. High Range Area Monitors (D-806-033)

Two ion chamber detectors, redundant to each other in the drywell provide measurement of 1 to 10^8 R/hr gamma dose rate. Two ion chamber detectors, redundant to each other are also in the secondary containment to provide measurement of 1 to 10^8 R/hr gamma dose rate. The detector signals are routed to microcomputers located on the 638'6" elevation of the control complex. A portable readout control module is provided to allow readings to be made at the microcomputers. The output from the microcomputers is routed to the control room where digital readouts and multipoint recorders are provided. Alarms upon monitor fail, alert radiation or high radiation are displayed at the readouts and a common alarm is annunciated at panel H13P680.

The components are listed as follows:

Detector:

Type	Ion-chamber
Model	KDA-HR
Weight Lbs.	11.5
MPL No.	1D19N100A, 2D19N100A 1D19N100B, 2D19N100B 1D19N200A, 2D19N200A 1D19N200B, 2D19N200B

Microcomputer:

Type	Dual-chamber
Model	KEM
Power	120 Vac, 2 amps
Weight Lbs.	150
MPL No.	1D19J100, 2D19J100 1D19J200, 2D19J200

Readout:

Type	Digital
Model	KERIC
Range	10^{0} to 10^{8} R/hr
Power	120 Vac, 0.5 amps
Weight Lbs.	18 (including Nim Bin)
Outputs:	4-20 madc (Recorder)
	0-10 vdc (ERIS computer)
	High Rad, Alert Rad & Fail Alarms
MPL No.	1D19K100, 2D19K100 1D19K200, 2D19K200

Vendor:	Kaman Instrumentation
Specification	SP-621
Bill of Material:	RKA 13
Classification:	IE
Qualification	IEEE-323, IEEE-344

B. Intermediate and High Range Gas Effluent Monitors (D-806-033)

The D17 AMC autokinetic sample supply pump is utilized to supply a sample to this D19 equipment and, therefore, the monitoring sampling points are ahown on Drawings D-912-613, D-912-621, and D-912-622.

A representative sample is continuously extracted from the exhaust vent effluent path through an isokinetic probe in accordance with ANSI N13.1-1969 with the feature of regulating the sample flow in proportion to the effluent flow (autokinetic). Approximately a 0.1 CFM portion of this representative sample is taken by another isokinetic probe and passes through a Particulate and Iodine filter cartridge and is then monitored for intermediate and high gas activity. The signal is routed to the microcomputer in the Control Building, 638' Elevation. The microcomputer may be used to subtract the background count rate from the observed count rate prior to calculating the noble gas concentration. Each microcomputer interfaces with the ERIS and

MIDAS computer systems in order to provide for the dissemination of data used to calculate release rates. Also, the microcomputer may be used to calculate and display noble gas concentration or release rate based on radiation count rate, user programmable engineering conversion factors, and real time acquired effluent flow rate data. Both the microcomputer and MIDAS may be used to calculate and display release rates within the accuracy specified in Reg. Guide 1.97, Rev. 2. A portable readout control module may also be used for readings at the microcomputer. Output from the microcomputer is routed to the control room digital readouts and multipoint recorders. Monitor fail, alert radiation, high radiation, and iodine/particulate filter activity are annunciated on common alarms at panel H13P680. An isolated exhaust vent flow rate signal is provided to the microcomputer to allow indication of release rate on the digital readouts. This system is activated upon a containment isolation signal or upon a high radiation signal from the D17 system monitor associated with the effluent monitored.

The detectors have been located in low radiation areas and the gas and iodine/particulate detectors are shielded from background by 6 and 3 inches of lead, respectivly, which will effectively minimize background effects.

The components are listed as follows:

Sampler:

Model	KMG-HRH
Sample Flow	Approx. 2832 cc/min
Sample Lines	1-inch (non-seismic) 1/4-inch (non-seismic)
Pump	1-1/2 Hp, Metal Bellows
Power	480 Vac, 3 phase, 2 amp 120 Vac, 5 amp
Weight Lbs.	4,000
Filter Particulate -	LB5211
Filter Iodine -	Silver Zeolite or SAI CP100 Charcoal
Filter Shields -	3 inch, lead, 4 pi
MPL No.	1D19P300, 2D19P300 1D19P400, 2D19P400 1D19P500, 2D19P500

Detectors: (Intermediate & High Range)	
Model	KDGM (Geiger-Mueller)
Energy Response	Kaman Instrumentation Reports K-82-69-U-(R), K-82-108-U-(R)
Range	1.7×10^{-3} to 1×10^{5} µCi/cc Xe-133
MPL No.	1D19N300, 2D19N300 1D19N340, 2D19N340 1D19N400, 2D19N400 1D19N440, 2D19N440 1D19N500, 2D19N500 1D19N540, 2D19N540
Microcomputer:	
Model	KEM
Power	120 Vac, 2 amp
Weight Lbs.	150
MPL No.	1D19J300, 2D19J300 1D19J400, 2D19J400 1D19J500, 2D19J500
Readout:	
Model	KERIC
Range	
Inter.	1×10^{-3} to 1×10^{3} µCi/cc
High	1×10^{0} to 1×10^{6} µCi/cc
Power	120 Vac, 0.5 amp
Weight Lbs.	18 (single unit), 28 (dual unit)
Outputs	4-20 madc (Recorder) 0-10 vdc (ERIS computer) High Rad Alert Rad Monitor Fail P&I collector all chan. high P&I collector any chan. high P&I collector any chan. fail
MPL No.	1D19K300, 2D19K300 1D19K400, 2D19K400 1D19K500, 2D19K500
Vendor:	Kaman Instrumentation
Specification	SP-622
Bill of Material:	RKA14
Qualification:	IEEE-323, IEEE-344

1. Particulate and Iodine Sampling Stations

The high range Particulate and Iodine sampling stations are a part of the Intermediate and High Range Gaseous Effluent Monitors and thus use the same representative effluent sample. See Section B. There are three Particulate and Iodine filter cartridge assemblies arranged in parallel just upstream of the Gaseous Monitors. Each of the three filter cartridge assemblies is shielded by a 3-inch thick 4-pi lead shield with a door to allow for filter cartridge removal. The high range Particulate and Iodine samping station is designed to provide sampling at activity levels up to 10^2 µCi/cc.

C. TSC and EOF Airborne Radiation Monitors (D-806-034)

The TSC and EOF atmospheric monitors are each a cart mounted three channel NMC model AM-221B monitor which provides detection of particulate, Iodine, and gas activity in a air sample drawn from the ventilation supply duct through an isokinetic sample nozzle. The sample flow rate can be adjusted from approximately 1 to 4 cfm to compensate for variation in the monitored duct ventilation flow. The particulate filter and the Iodine collection cartridge are removable for lab analysis. High radiation alarm is supplied by a bell and light mounted on the cart. The measured activity is recorded by a three channel strip chart recorder and computer outputs are used to input TSC particulate, Iodine, and gas activity data to the ERIS computer. The TSC atmospheric monitor also provides a trip signal upon Hi-Rad to the TSC HVAC System.

The components are listed as follows:

Model	AM-221B
Sample	Isokinetic
Sample flow	1-4 cfm (3 cfm nominal)
Pump	1-HP Roots AF-22
Power	120 Vac, 25 amp start, 10 amp run
Readout	Three 4-inch 5 decade meters
Range	10 to 10^6 cpm (for each channel)
Response	
Particulate	~1 x 10^{-11} µCi/cc (6.4 x 10^5 CPM/µCi) CS-137
Iodine	~1 x 10^{-11} µCi/cc (2.4 x 10^5 CPM/µCi) I-131
Gas	~5.5 x 10^{-7} µCi/cc (4.2 x 10^7 CPM/µCi/CC) Kr-85

Outputs	0-5 vdc (ERIS Computer)/channel-TSC (TSC, Hi Rad Trip to HVAC)
Detectors	
Particulate	Beta scintillator SC-2B
Iodine	Gamma scintillator SC-2-1S
Gas	Beta Scintillator SC-2B
Filter - Particulate	99% eff. Model FA-2
Filter - Iodine	2 x 1-inch charcoal Model FA-2I
Recorder	3-pen, stripchart, 5 decade
Alarms	Audible and visual local (Hi Rad & Fail)
MPL No.	D19K600 D19K700
Vendor	Nuclear Measurements Corp.
Specification	SP-790-89
Bill of Material	RKF10
Classification	Commercial, Non-seismic

D. TSC and EOF Area Radiation Monitors (D-806-034)

The TSC and EOF area monitors are each a wall mounted NMC model GA-6 area radiation monitor with a measurement and indication range of 0.1 to 100 mr/hr. Indication and alarm is provided at the monitor and an analog 0-5 vdc signal (TSC) is supplied to the ERIS computer.

The components are listed as follows:

Model:	GA-6-2-2-1-S1-1-S000
Detector:	Scintillation model GD-6
Meter:	4-inch, 3 decade, 0.1 to 100 mr/hr
Alarms:	Audible and visual (Local)
Output:	0-5 vdc (ERIS computer) - TSC
Power:	120 vac, 3 amp
MPL No:	D19K650 D19K750
Vendor:	Nuclear Measurements Corp.
Specification:	SP-790-88
Bill of Material:	RKF9
Classification:	Commercial, Non-seismic

2.1.5 Post Accident Monitoring Equipment Locations

a. Drywell

The Drywell Monitor detectors are mounted at approximately core mid-plane, 630' level. The microcomputers for these detectors are located in the Control Building, elevation 638'.

b. Secondary Containment

The Secondary containment Monitor detectors are mounted at the 689' level. The microcomputers for these detectors are located in the Control Building elevation 638'.

c. Main Plant Exhaust Vent Gaseous Effluent

The Plant Exhaust Vent Gaseous Effluent Monitors are located in the Control Building on the 679' level. The microcomputers are in the Control Building, elevation 638'.

d. Off-Gas Exhaust Vent Gaseous Effluent

The Off-Gas Exhaust Vent Gaseous Effluent Monitors are located in the Turbine Building near the exhaust vent on the 620' level. The microcomputers are in the Control Building, elevation 638'.

e. Turbine Building/Heater Bay Exhaust Vent

These Monitors are located in the Turbine Building/Heater Bay near the exhaust vent on approximately the 667' level. The microcomputers are in the Control Building, elevation 638'.

f. Particulate and Iodine Sampling

The main plant exhaust vent, the Off-Gas Exhaust Vent and the Turbine Building/Heater Bay Exhaust vent sampling systems are an integral part of the respective intermediate and high range gaseous effluent monitors. See previous Sections (c.)-(e.)

g. The readouts and recorders for the high range area monitors and effluent monitors are located in the main control rooms elevation 654' in panels H13P884 and H13P885.

h. TSC & EOF Monitors

The TSC area monitor is wall mounted in the TSC display room, elevation 604'. The EOF area monitor is wall mounted in the EOF display room, elevation 630'. The TSC airborne monitor is in the TSC electrical equipment room, Elevation 603' and the EOF airborne monitor is in the EOF mechanical equipment room, elevation 647'.

3.0 MODES OF OPERATION

3.1 STARTUP

a. Drywell & Reactor Building High Range Area Monitors.

These channels are to be normally operational and are operated in accordance with instructions provided in the vendor manual. Readout and control is provided at the readout modules D19K100 and D19K200 located in the main control room panels H13P884 and H13P885. Readout and control may also be obtained at the microcomputers D19J100 and D19J200 (Control Building, elevation 638') by use of the portable Kaman KEPIC digital readout and control module.

b. Intermediate and High Range Gas Effluent Monitors

These channels are to be normally operational however in the standby mode awaiting receipt of an activation signal from containment isolation or from the D17 system high radiation signal. Operational details are provided in the vendor manual and the equipment is controlled from the readout modules D19K300, D19K400, and D19K500 in the control room panels H13P884 and H13P885. Readout and control may also be obtained at the microcomputer D19J300, D19J400 and D19J500 (Control Building, elevation 638') by use of the portable "KEPIC" digital readout and control module.

c. Particulate and Iodine Samplers.

The Particulate and Iodine samplers are an integral part of the Intermediate and High Range Gas Effluent Monitors and consequently the startup mode of operation is basically the same. See Section b.

d. TSC & EOF Radiation Monitors.

These require no special startup requirements and may easily be turned on or off. Operating details are in the vendor manual. Verify appropriate filters are installed in the atmospheric monitors D19K600 and D19K700 and that the sample flow is adjusted to 3SCFM or as required for isokinetic sampling.

3.2 NORMAL OPERATION

The high range gamma monitor channels for the drywell and reactor building are operated on a continuous basis except during maintenance of those channels. Readouts remote from the control room may be obtained with a portable digital readout and control unit which can be plugged into a connector on the microcomputer.

The intermediate and high range gas effluent monitors and the Particulate and Iodine sampling units are normally in the standby (auto) mode and operation is initiated by interlocks from the high

radiation alarm of the associated normal range effluent radiation monitor (D17) or from containment isolation. In addition these interlocks also initiate the Gas Monitor recorder chart and print operation for the duration of the interlock signal. Gas Monitor readouts remote from the control room may be obtained with a portable digital readout and control unit which can be plugged into a connector on the microcomputer. Particulate and Iodine filter cartridge assemblies should not be removed without health physics monitoring the dose rates when the shield door is opened.

The calibration frequency of high range area and mid and high range noble gas monitor channels is specified in PNPP Technical Specifications. The high range area monitor channels will be calibrated with Cs^{137} at one point below 10R/hr and electronically for decades above 10R/hr. The mid and high range noble gas channels will be calibrated with NBS traceable Cs^{137} solid sources which are also traceable to the factory primary calibration.

The TSC and EOF area radiation monitors and airborne radiation monitors are operated on a continuous basis except during maintenance.

3.3 SHUTDOWN

There are no special shutdown requirements, however, refer to the vendor manuals for specific details.

3.4 EMERGENCY OPERATION

If access is limited in the main control room the high range area gamma monitors and the gas effluent monitors may be read and controlled by use of the portable KEPIC indication and control module by attaching its cable to a connector on the microcomputer D19J100, D19J200, D19J300, D19J400 and D19J500.

The intermediate and high range gas monitor sample stations have Particulate and Iodine pre-filters which may require periodic replacement if the system has been operational. Excessive activity collected on these filters will be detected by built-in G-M detectors and alarmed through the control room readouts.

The high range Particulate and Iodine samplers in the high range gas monitor sampling cabinet have shield assemblies surrounding the filters. After the shield assembly door has been opened, the filter should be monitored for dose rate prior to being removed and inserted in the portable lead pig for transport to the count lab for measurement.

4.0 SAFETY PRECAUTIONS

The equipment in this system has power supplies which produce high voltages. Procedures to be followed for operation and maintenance of the system are described in the vendor instruction manuals.

Standard Health physics procedures must be followed in handling test and calibration radioactive sources and radioactive check sources.

Iodine and particulate filter assemblies in the sampling units associated with the Intermediate and High range gas effluent samplers will require health physics monitoring during removal after operation following an accidental release.

Utilization of the field calibration kit for the Drywell and Reactor building high range area gamma monitors will require health physics procedures and monitoring as this kit uses a 100 millicurie cesium 137 radioisotope source.

The calibration kit, Kaman Instrument Model KTFC, for the gas effluent monitors uses three cesium - 137 radioisotope sources approximately .8, 8 and 80 microcurie each. Use health physics procedures and monitoring when these are used.

5.0 MAINTENANCE

Fixed filters and cartridges used for collection of particulate and Iodine samples will require periodic replacement at a frequency dependant upon operational use and plant Health Physics operational procedures. This is applicable to D19K600, D19K700, D19P300, D19P400, and D19P500.

Recorders will require periodic maintenance for chart replacement, ink, and as required by the instruction manuals. This is applicable to D19K600, D19K700, and panel recorders K19R100, D19R200, D19R300, D19R400 and D19R500.

TSC and EOF atmospheric monitors may require disconnection of the sample line and the electrical cables prior to movement of the cart monitor during maintenance in that area.

Refer to vendor manuals for pump and instrumentation maintenance information.

5.1 SPECIAL DESIGN CONSIDERATIONS

Special design considerations for this system are as follows:

1. Accessibility to the equipment post accident
2. Transportation of samples to lab for analysis
3. Ability to remove samples from the system
4. Sample systems are located after all discharges into monitored effluent path.