

7.13 AREA RADIATION MONITORING SYSTEM

7.13.1 Power Generation Objective

The objective of the Area Radiation Monitoring System is to warn of abnormal gamma radiation levels in areas where radioactive material may be present, stored, handled, or inadvertently introduced.

7.13.2 Power Generation Design Basis

1. The Area Radiation Monitoring System shall provide operating personnel with a record and an indication in the control room of gamma radiation levels at selected locations within the various plant buildings.
2. The Area Radiation Monitoring System shall provide local alarms where it is necessary to warn personnel of substantial immediate changes in radiation levels.
3. The Reactor Building Ventilation Radiation Monitor provides a safeguards containment isolation signal in the event of a refueling accident, as described in Section 7.12.5. (Reactor Building Ventilation Radiation Monitoring is a part of the Process Radiation Monitoring System.)

7.13.3 Description

7.13.3.1 Monitors

The Area Radiation Monitoring System is shown as a mechanical control diagram in Figures 7.12-2a, Sheets I, 5, and 6. A typical channel consists of a combined sensor and convertor unit, a combined indicator and trip unit, a shared power supply, a shared multipoint recorder for Units 2 and 3, a digital paperless recorder for Unit 1, and a local audio alarm auxiliary unit.

Each monitor has an upscale trip that indicates high radiation and a downscale trip that may indicate instrument trouble. The Area Radiation Monitoring System trips sound alarms but causes no control action. The system is powered from the 120-V AC instrument bus (see Subsection 8.7). The trip circuits are set so that loss of power causes an alarm.

7.13.3.2 Locations

Work areas where monitors are located are tabulated in Table 7.13-2. Annunciation and indication are provided in the control room.

7.13.4 Inspection and Testing

An internal trip test circuit, adjustable over the full range of the trip circuit, is provided. The test signal is fed into the indicator and trip unit input so that a meter reading is provided in addition to a real trip. All trip circuits, with the exception of the upscale trip circuit, are of the latching type and must be manually reset at the front panel.

A portable calibration unit is also provided. This is a test unit designed for use in the adjustment procedure for the area radiation monitor sensor and converter unit.

7.13.5 Additional Area Radiation Monitoring Systems

7.13.5.1 Power Generation Objectives

The objective of the Additional Area Radiation Monitoring Systems is to provide diversity in radiation detection devices to warn of abnormal radiation conditions that may be present.

7.13.5.2 Power Generation Design Basis

The Additional Area Radiation Monitoring Systems shall provide operations personnel with alarms locally and/or in the Main Control Room of the presence of radiation levels in excess of pre-established limits based on the particular system design.

7.13.5.3 Description

The Additional Area Radiation Monitoring Systems are as follows:

7.13.5.3.1 Air Particulate Monitoring Subsystem

The continuous air particulate monitoring subsystem consists of self-contained units which sample and measure concentrations of radioactive airborne particulates at various plant locations. The continuous air monitors (CAMs) draw air through a sample assembly which contains a filter for particulate collection and detectors for measuring radioactivity levels in the collected particulates. Radioactive check sources and other means are provided to verify proper instrument response.

The CAMs located in the reactor, turbine, and radwaste buildings provide readouts and alarms locally and in unit control rooms. The remaining CAMs only provide local readout and alarms. The CAM units provide a means to alert personnel in the affected area as well as the control room (where applicable) of changes in airborne radioactivity concentration above predetermined levels.

CAMs are maintained in locations where significant radioactive airborne particulate concentrations could occur, such as equipment spaces for operational reactors versus those areas with equipment in long-term layup status. Additional airborne particulate monitoring is conducted by plant personnel using existing plant procedures.

7.13.5.3.2 Local Radiation Subsystem

The local radiation monitoring subsystem consists of count ratemeters mounted throughout the plant area. The units provide a means whereby personnel engaged in work areas, where their job may require physical contact with radioactive materials, can do their own checking either as a routine or in special or unusual cases such as accidental spills, etc. Each monitor is located for operator convenience in scanning clothing, hands, and feet. A front-mounted speaker with volume control provides audible count rate indication. There is also a high-frequency audible alarm, which is actuated from an adjustable setpoint for warning of high radioactive contamination levels.

7.13.5.3.3 Personnel Contamination Monitor Subsystem

Personnel contamination monitors are provided at major access points from designated radiologically controlled areas within the plant. Alarms are provided on these instruments to identify radioactive contamination on worker's skin or clothing.

7.13.5.3.4 Portal Monitoring Subsystem

The portal radiation monitoring subsystem monitors all personnel leaving the plant area for radioactivity, including hand-carried personal articles. The radiation monitors in the portal serve as a final check against the transport of radioactivity by personnel exiting plant protected area.

Radiation monitors are located in each plant access control building for personnel egress. The radiation monitors have visual and audible alarm capability to alert personnel of potential radioactivity release.

7.13.5.3.5 Door Access Control Subsystem

There are several areas in the Turbine, Reactor, and Radwaste Buildings where the entry of personnel must be controlled because of radiation levels. The door access control subsystem provides an audible and visual alarm in the control room of doors which are opened.

7.13.5.4 Inspection and Testing

Each Additional Area Radiation Monitoring Subsystem will be given periodic inspection and calibration using electronic test equipment and calibration sources as required to assure that all devices are calibrated properly and available for operations personnel. The high radiation area door alarms (part of the Door Access Control Subsystem) are also functionally tested periodically.