12.5 HEALTH PHYSICS PROGRAM

12.5.1 ORGANIZATION

12.5.1.1 Program and Staff Organization

➔(DRN 02-110, R12)

The health physics program specifies guidelines for handling all radioactive materials at Waterford 3, including those being received and those in preparation for shipment offsite. Guidelines cover special nuclear, source, and byproduct materials. The program assures that the station operation meets the radiation protection and training requirements of 10CFR19, 10CFR20, 10CFR50 Appendix I, and NRC Regulatory Guides 8.2, February 1973; 8.3, February 1973; 8.4, February 1973; 8.7, June 1992; 8.8, March 1977; 8.9, September 1973; 8.10, September 1975; 8.15, October 1976; 1.16, August 1975, and 1.39, September 1977. The program assures that radiation protection training is provided to workers, that personnel and inplant radiation monitoring is performed, and records of training, exposure, and surveys are maintained. It also assures a commitment to maintain exposures as low as reasonably achievable (ALARA) is fulfilled.

🡐(DRN 02-110, R12)

➔(DRN 03-1135, R13; LBDCR 13-005, R307)

The Waterford 3 organization, including the health physics organization, is discussed in Section 13.1. The General Manager-Plant Operations is responsible for the overall performance of the health physics program. He delegates the administration of the program to the Radiation Protection Manager. The Radiation Protection Manager is equivalent to the radiation protection manager referred to in NRC regulatory guides. He is responsible for administering the station radiation protection program, with support from the Chemistry Superintendent who is responsible for certain aspects of the health physics program including radioactive effluent releases, radiological environmental monitoring, and some radioactivity measurements in support of plant health physics activities.

🡐(LBDCR 13-005, R307)

Reporting to the Radiation Protection Manager are personnel functionally responsible for the areas of personnel dosimetry, ALARA, HP job coverage, instrument and respiratory protection program and radiological engineering.

🡐(DRN 03-1135, R13)

Reporting to the Chemistry Superintendent are supervisory personnel functionally responsible for the areas of primary chemistry, secondary/auxiliary chemistry, effluent releases and environmental monitoring. Also reporting to the Chemistry Superintendent are technical personnel providing expertise in the areas of radiochemistry/chemical engineering.

Personnel assigned to the health physics organization, as designated by administrative procedures, will perform various radiation protection activities. They observe work in progress and ensure that radiation safety guidelines are followed.

12.5.1.2 Program Objectives

The objectives of the health physics program are:

a) to provide radiation protection controls for personnel and operations onsite,

b) to ensure that personnel exposures to radiation and radioactive materials are within the guidelines of 10CFR20 and that such exposure is kept ALARA,

c) to ensure that all radioactive effluent releases and waste shipments meet guidelines established in plant procedures, and

d) to ensure that radioactive effluent releases are within Offsite Dose Calculation and Technical Requirements Manual requirements and kept ALARA.

12.5.1.3 Health Physics Program

The station health physics program was implemented when radioactive material under the Waterford 3 license was initially brought onsite, and will be maintained throughout the life of the plant. The program includes management and worker philosophies, practices, guidelines, and procedures to ensure that the program objectives stated above are fulfilled in a reasonable manner.

The health physics program ensures that:

a) all radiation workers receive radiation protection training commensurate with their respective responsibilities,

→(DRN 99-2362, R11)

b) respiratory protection equipment training is provided to radiation workers who may use the equipment,

←(DRN 99-2362, R11)

c) emergency plan training is provided as necessary for personnel who may be assigned to radiation emergency teams,

d) appropriate personnel dosimetry is available,

e) internal and external dose assessment is provided for monitored workers,

f) personnel contamination monitoring equipment is used to assess personnel contamination's,

g) respiratory protection equipment is provided if necessary to keep internal exposure ALARA,

→(DRN 99-2362, R11; EC-27665, R305)

h) Radiologically Controlled Areas (RCA) are segregated to control potential radiological exposures,

←(EC-27665, R305)

i) access to radiologically controlled areas is proceduralized to control potential radiological exposures,

j) radiological instrumentation is provided and maintained to assess potential exposure,

←(DRN 99-2362, R11)

k) incoming shipments of radioactive material are received and surveyed properly,

l) outgoing shipments of radioactive material are packaged, surveyed, and labeled properly, and

m) necessary measures are taken and guidelines followed to keep exposures and effluents ALARA while safely supplying a reliable source of power to the public.

12.5.2 EQUIPMENT, INSTRUMENTATION, AND FACILITIES

12.5.2.1 Health Physics Facilities

→(EC-27665, R305)
Access control to the Radiologically Controlled Area (RCA) may be through the Westside Facility or the –4 elevation of the Reactor Auxiliary Building. The preferred entry point is the Westside Access. Other control points are established as necessary. Access control points contain necessary equipment (i.e., access and egress terminals, personnel and tool contamination monitors, etc.) to prevent the spread of contamination.
←(EC-27665, R305)

Space is reserved for personnel at the –4 elevation control point for health physics/chemistry personnel. It provides for equipment, records and supply storage. Space for instrumentation issue and storage may be provided near the Westside Access or the –4 Control Point.

The counting room located in the –4 elevation RAB control point area provides facilities for analysis of samples. Portable sample counting instrumentation will be utilized at other control points as necessary.

Limited personnel decontaminations may be performed in the Westside Access. The –4 control point decon facility will be used on a case basis, for example in the event personnel showering is needed. Contaminated equipment will normally be decontaminated in the decontamination facility located on the +21.00 ft. west wing area. Other equipment decon locations may be approved by health physics. The decontamination facility is described in Subsection 12.1.2.

→(EC-27665, R305)
Personnel contamination monitors, tool and personnel contamination friskers are located at the –4 and Westside access control points. All personnel exiting the RCA will be monitored. Respiratory protection equipment is available and will be maintained, inspected, and used in accordance with Regulatory Guide 8.15, October 1976. Portal monitors are also located at the Primary Access Point in the administration building.
←(EC-27665, R305)

→(DRN 99-2362, R11)
Other control points inside the plant may be established as applicable to ensure positive radiation control and provide protective equipment and supplies.
←(DRN 99-2362, R11)

→(DRN 99-1051, R11; 03-1429, R13)
Storage space in the Radioactive Material Storage Building (RMSB) is provided to allow the storage of reusable radioactive material such as tools, previously contaminated PC's, etc.
←(DRN 99-1051, R11)

→(DRN 99-1697, R11-A)
The Radioactive Material Storage Building (RMSB) is a pre-engineered, prefabricated sheet metal building. The entire building is constructed on a reinforced concrete slab with curbing such that water is kept from entering the building. The RMSB facility will be used for storage of radiation protection consumables and for storage and maintenance of refueling tools.
←(DRN 99-1697, R11-A; 03-1429, R13)

12.5.2.2 Health Physics Instrumentation

12.5.2.2.1 Laboratory Instrumentation

Laboratory instrumentation allows plant personnel to ascertain the radioactive material present in survey samples. Typical samples would be contaminated survey smears, airborne survey filter, and charcoal cartridges; tritium surveys and other samples may be processed using radiochemistry counting room

equipment. The health physics counting instrumentation is listed in Table 12.5-1. Instrumentation with equivalent or better sensitivity may be used in lieu of those listed. The criteria for selection of these various counters was to obtain instrumentation that could reliably and quickly count samples; could provide the necessary low backgrounds and sensitivities and that could, to some extent, analyze the counting data to provide information in a more easily used form. Each laboratory counting system is checked and calibrated at regular intervals with standard radioactive sources traceable to a National Institute of Standards & Technology (NIST) source. Counting efficiency, background count rates, and high voltage settings are checked by plant personnel in accordance with plant procedures.

12.5.2.2.2 Portable Survey Instrumentation

→(DRN 99-2362, R11)

Portable survey instruments are located near the access control points and other control points inside the plant. This equipment will allow plant personnel to perform alpha, beta, gamma, and neutron surveys for radiation, airborne, and surface contamination control.

←(DRN 99-2362, R11)

The criteria for selection of these instruments was to obtain accurate and reliable instrumentation that could be easily serviced and that would cover the entire spectrum of radiation measurements expected to be made at the station during normal operation, shutdown, and accident conditions.

→(EC-27665, R305)

Each portable survey instrument will be calibrated, when in use. Dose rate meters will be calibrated using a multi source gamma calibrator as described in section 12.5.2.2.4 or in accordance with the instrument manufacture's approved calibration method. Instruments will be source checked to verify proper operation in accordance with plant procedures. Sufficient quantities of each type of instrument will be available to permit calibration, maintenance, and repair without causing a shortage in operational instrumentation. Portable radiological survey instrumentation is listed in Table 12.5-2. Instrumentation with equivalent or better sensitivity may be used in lieu of those listed.

←(EC-27665, R305)

12.5.2.2.3 Personnel Monitoring Instruments

→(DRN 06-625, R15; EC-14865, R303, EC-27665, R305)

Personnel monitoring will be provided by use of dosimeters of legal record (DLRs), direct-reading pocket dosimeters and survey instrumentation. The criteria for selection of the DLR for a dose measuring device was to have a device accepted as a legal record and that could be evaluated within a reasonable time by dosimetry personnel. The criteria for selection of (direct reading dosimeters) was to have a device that could be read immediately by exposed personnel. All personnel, with the exception of visitors that do not enter a high radiation, contaminated or airborne radioactivity area, entering the Radiologically Control Area (RCA) will be issued DLR badges which will be used to measure exposure to beta-gamma and Neutron radiation, or to measure only beta-gamma radiation when neutron radiation is not expected. These badges contain suitable filters to allow determination of penetrating vs. non-penetrating radiation. DLRs under normal conditions, will be processed periodically based on the fade test results. This will provide the official record of personnel exposure to beta, neutron and gamma radiation.

←(DRN 06-625, R15, EC-27665, R305)

Direct reading dosimeters will be worn by personnel in the Radiologically Control Area (RCA). These dosimeters will provide a day-to-day estimate of personnel exposure.

←(EC-14865, R303, EC-27665, R305)

→(DRN 06-625, R15, EC-27665, R305)

Direct-reading dosimeters will be tested for proper response. DLR chips will be checked for matched response periodically. Quality control of DLR performance is proceduralized.

←(DRN 06-625, R15)

Personnel survey instrumentation will consist of Personnel Contamination Monitors (PCM), G-M countrate meters (contamination friskers), portal monitors, and whole body counting capability. The criteria for selection of external contamination measuring equipment was to have devices available at checkpoints and other areas that could be used to determine the location of contamination (friskers), and to have devices that require minimum action by personnel being checked (PCM's). The criteria for selection of the whole body counting system was to have a system readily available to quickly supply information concerning internal contamination levels.

These instruments will be calibrated and source checked at a frequency specified by plant procedures. Personnel monitoring instrumentation is listed in Table 12.5-3. Instrumentation with equivalent or better sensitivity may be used in lieu of those listed.

12.5.2.2.4 Health Physics Equipment

→(EC-27665, R305)

Portable air samplers are used to survey airborne radioactive material concentrations. Mass flow calibrations for air samples are performed when in use. Surveys may be performed for radioactive particulate and radioiodine airborne concentrations. Portable continuous air monitors may be used to monitor airborne concentrations at specific work locations. Local indication will be provided as well as trend information. Alarm setpoints are variable and visual, and audible alarms are provided.

→(DRN 99-2362, R11)

Respiratory protection equipment must be available and can be easily accessed. Self-contained breathing apparatus are available at the emergency equipment storage lockers. Equipment will be maintained in accordance with Regulatory Guide 8.15, October 1976.

←(DRN 99-2362, R11; EC-27665, R305)

An instrument calibrator will be used for calibrating gamma dose rate instrumentation. This will be a self-contained, heavily shielded, multiple source calibrator or an open air calibration source. Beta and alpha radiation sources will also be available for instrument calibration. Sources are traceable to a NIST source. Neutron sources will be available for proper response checks with actual calibration of neutron instrumentation performed by an outside vendor.

Protective clothing will be supplied for personnel working in contamination areas. The clothing required for a particular instance will be prescribed by health physics personnel on a radiation work permit (see Subsection 12-5.3.4), based on actual or potential radiological conditions.

An adequate inventory of protective clothing will be maintained on hand as necessary to support plant operations and maintenance activities.

Additional contamination control consumables will be available to assist in identifying, deconning and barricading contamination areas.

A listing of health physics equipment is shown in Table 12.5-1

12.5.2.2.5 Other Health Physics Instrumentation

The Area Radiation Monitoring System will be installed in areas where it is desirable to have constant dose rate information. Monitors will indicate dose rate locally and/or in the main control room. Fixed continuous airborne radioactivity monitors are also provided at strategic locations where personnel exposure to airborne radionuclides is likely. More information on these fixed instruments is given in Subsection 12.3.4.

12.5.3 PROCEDURES

→ (DRN 99-2362, R11)
Procedures will be developed to cover all necessary areas of plant operations and maintenance activities and to control potential exposures. ALARA considerations will be embodied in applicable procedures, as Section 12.1 herein describes. In addition, certain methods that will be proceduralized to maintain radiological control over plant operations and maintenance activities are discussed below.
← (DRN 99-2362, R11)

The Waterford 3 commitment to regulatory guides will be incorporated into procedures as appropriate.

12.5.3.1 Radiation Surveys

Health physics and health physics qualified personnel normally perform radiation surveys, the techniques are delineated in plant health physics procedures. Surveys are performed on frequencies that vary with the potential radiological hazards associated with a given area. Frequencies are also delineated in plant health physics procedures.

→ (LBDCR 16-016, R309)
Surveys are normally performed to ascertain radiation/contamination levels and for airborne radionuclide concentration determination. Records of all surveys are maintained. Current survey information for some areas within the Radiologically Controlled area are normally posted. Survey information is factored into exposure stay time determination and radiation work permit specifications (see Subsection 12.5.3.4).
← (LBDCR 16-016, R309)

Radiation surveys may be performed for gamma, beta, and neutron exposure. Contamination surveys are normally performed to establish gross beta-gamma contamination level, but may be processed for specific types of radiation (beta-alpha-gamma) or specific radionuclides (via gamma spectroscopy). Air samples are normally taken to establish airborne concentrations of particulates and/or radioiodine, but specific nuclide information may also be obtained. Availability of current survey information will aid in keeping exposures ALARA.

12.5.3.2 Additional Methods To Maintain Exposures ALARA

The Waterford 3 ALARA policy is delineated in Section 12.1. ALARA considerations are incorporated into various plant and health physics procedures. In addition, various methods are used to maintain exposures ALARA.

12.5.3.2.1 Refueling

Some examples of methods of maintaining exposures ALARA during refueling are:

a) Refueling cavity water is filtered to remove radioactive material.

b) Refueling cavity water is maintained 140°F, and surface ventilation is provided to minimize airborne radioactive material.

c) Prior to removing the vessel head, the primary system is degassed and sampled to minimize expected airborne levels when the head is removed.

d) Movement of irradiated fuel assemblies will be accomplished with the assembly maintained under water.

→(EC-27665, R305)

e) Work performed in the RCA is staged, i.e., workers are briefed on assignments and familiarized with procedures and equipment needed to complete assignments.

←(EC-27665, R305)

f) Current survey information is used.

g) Ventilation is provided to minimize airborne radioactive material.

h) The radiation work permit system is used to maintain positive radiological control over work in progress.

12.5.3.2.2 In-service Inspection

Some examples of methods of maintaining exposures ALARA during in-service inspections are:

a) Equipment is calibrated and checked prior to entry into the radiation area.

b) Portable shielding is used where practicable.

→(EC-27665, R305)

c) Work performed in the RCA is staged, i.e., workers are briefed on assignments and familiarized with procedures and equipment needed to complete assignments.

←(EC-27665, R305)

d) Current survey information is used.

e) Ventilation is provided to minimize airborne radioactive material.

f) The radiation work permit system is used to maintain positive radiological control over work in progress.

12.5.3.2.3 Radwaste Handling

Some examples of methods of maintaining exposures ALARA during radwaste handling are:

a) The volume of radwaste generation has been minimized by station design.

b) Radwaste systems are heavily shielded and remotely located so that operator and other personnel exposure is minimized.

c) The spent resin collection and transfer system has been redesigned and modified to further reduce personnel exposure during normal operations.

d) Filter changeout will utilize a remotely operated extraction device.

e) Portable shielding is available for use when necessary.

f) Ventilation is provided, where appropriate, to minimize airborne radioactive material during waste handling operations.

g) Extension reach rods will be used, where appropriate for hard to reach valves in high radiation areas.

h) Administrative controls will be instituted in radioactive material storage areas to maximize the use of self shielding effects for packaged low-level waste containers such that personnel exposures will be minimized.

i) Current radiological survey information will be used.

→(EC-14275, R306)

12.5.3.2.4 Spent Fuel Handling, Loading, and Unloading

←(EC-14275, R306)

Some examples of methods of maintaining exposures ALARA during spent fuel handling are:

a) The spent fuel pool water is filtered to remove radioactive material.

b) The spent fuel pool water is cooled and surface air ventilation is provided to minimize airborne radioactive material.

→(EC-14275, R306)

c) Loading of the canister in the transfer cask is performed under water.

d) Fuel handling cranes and extension tools are used to handle transfer casks, fuel assemblies, and inserts.

←(EC-14275, R306)

e) Movement of irradiated fuel assemblies not contained in a transfer cask will be accomplished with the assembly maintained under water.

→(EC-27665, R305)

f) Work performed in the RCA is staged, i.e., workers are briefed on assignments and familiar with procedures and equipment needed to complete assignments.

←(EC-27665, R305)

g) Current survey information is used.

h) The radiation work permit system is used to maintain positive radiological control over work in progress.

i) Ventilation is provided to minimize airborne radioactive material.

→(EC-14275, R306)

j) After the transfer cask is loaded, it is decontaminated using a pressurized water washing device.

k) Use of temporary shielding.

←(EC-14275, R306)

12.5.3.2.5 Normal Operation

Some examples of methods of maintaining exposures ALARA during normal operation are:

a) The station is designed so that significant radiation sources are minimized and shielded.

b) An area radiation monitoring system is available and provides indication of radiation levels and, as applicable, local and/or remote alarms.

→(EC-27665, R305)

c) Work performed in the RCA is staged, i.e., workers are briefed on assignments and familiar with procedures and equipment needed to complete assignments.

←(EC-27665, R305)

d) Current survey information is used.

e) Ventilation is provided to minimize airborne radioactive material.

f) The radiation work permit system is used to maintain positive radiological control over work in progress.

g) During initial start-up, neutron and gamma dose rate surveys are performed to verify shielding adequacy.

h) Areas are conspicuously posted in accordance with 10CFR20.

→(DRN 99-2362, R11)

i) Standby low radiation areas are designated for ALARA purpose to minimize the radiation worker's exposure.

←(DRN 99-2362, R11)

12.5.3.2.6 Maintenance

Some examples of methods of maintaining exposures ALARA during maintenance are:

a) Equipment is moved to areas with lower radiation and contamination levels for maintenance when practicable.

b) Extension tools are used when practical.

c) Portable shielding is used as practical.

→(EC-27665, R305)

d) Work performed in the RCA is staged, i.e., workers are briefed on assignments and familiar with procedures and equipment needed to complete assignments.

←(EC-27665, R305)

e) Current survey information is used.

f) The radiation work permit system is used to maintain positive radiological control over work in progress.

g) Routine maintenance is proceduralized and precautions specified.

h) Required tools are specifically listed in procedures where practical.

12.5.3.2.7 Sampling

Some examples of methods of maintaining exposures ALARA during sampling are:

a) Sampling hoods are provided in the radiochemistry laboratory. Ventilation minimizes airborne radioactive material. The sampling hoods are located to reduce the exposure from sampling of radioactive liquids and gases.

b) Procedures specify proper sampling methods.

c) Radiation levels of samples are checked.

d) Extension tools are used when practicable.

e) The Radiation Work Permit System is used to maintain positive radiological control over work in progress.

12.5.3.2.8 Calibration

Some examples of methods of maintaining exposures ALARA during calibration are:

a) The instrument calibrator is heavily shielded.

b) An interlock is provided so that the calibrator door cannot be opened while sources are exposed.

c) Portable sources of a significant hazard used to calibrate fixed instruments are transported and maintained in shielded containers.

d) The radiation work permit system is used, where applicable, to maintain positive radiological control over calibration.

12.5.3.3 Access Control

→(EC-27665, R305)

Access to the RCA may be through the Westside Access or the –4 RAB control point. These control points provide positive access control over personnel entering controlled areas.

←(EC-27665, R305)

High radiation areas (as defined in Technical Specifications) also have access control features. Controls will be established (barricades, flashing lights, signs, etc.). Key control for such areas is delineated in administrative procedures. Access control to high radiation areas is provided through administrative and physical control features as delineated through plant procedures. These procedures adequately address the section of Technical Specifications concerning high radiation areas. Key control for such areas is delineated in administrative procedures.

12.5.3.4 Radiation Work Permit

All work in radiation, high radiation and other radiological areas (as determined by health physics) requires a Radiation Work Permit. The Radiation Work Permit establishes the minimum radiological requirements for tasks to be performed safely and efficiently. Violations of the Radiaiton Work Permit's instructions should be documented in accordance with station administrative procedures.

12.5.3.5 Contamination Control

Contamination limits for personnel, equipment, and areas are delineated in plant procedures. Surveys for contamination control are performed on a routine basis at various locations in the plant. Non-routine surveys are performed in areas whenever a change in contamination levels is likely and may be important for radiation protection. Areas found contaminated are posted, isolated (with ropes, barriers, etc.) and decontaminated as practical. Since the complete removal of surface contamination from some plant areas is not practical, these areas may be designated as contaminated areas. The level of contamination and number of such areas is minimized. Entrance to such an area normally requires authorization of, and adherence to the specifications of a radiation work permit.

→(EC-27665, R305)
Tools and equipment used in contaminated areas are surveyed for removable contamination and contaminated tools are bagged for transportation. If tools or equipment do not meet the clean area limits, they are decontaminated before leaving the RCA or released for restricted use only. Some tools and equipment are for use only in a controlled area. These items are surveyed and decontaminated as appropriate.
←(EC-27665, R305)

Personnel are protected from contamination by the protective clothing and equipment specified in radiation work permits. Personnel survey themselves for contamination upon exiting a contamination area (if practical). In addition, when personnel pass through the access control point (see Subsection 12.5.2), they pass through a Personnel Contamination Monitor. Contaminated personnel are decontaminated at the decontamination facility.

12.5.3.6 Radiation Protection Training

Plant personnel, both permanent and temporary, whose duties require such training, will be instructed in the fundamentals of radiation protection. Radiation protection training will be given annually as part of general employee retraining. Training is commensurate with the degree of hazard associated with personnel work assignments. Personnel must be acceptably cognizant of fundamentals presented in training to enter the radiologically controlled areas unescorted.

Training topics will include: instructions in applicable station and NRC exposure limits, station procedures, instructions to women concerning prenatal exposure, properties of radiation and radioactivity, biological effects of exposure, techniques of radiation protection, ALARA, emergency and fire alarm response, and other topics as pertinent. More detail on the Waterford 3 training program is given in Section 13.2. Additional training is given to plant personnel whose duties involve greater degrees of radiological hazard, such as health physics personnel and operators.

12.5.3.7 Personnel Monitoring

12.5.3.7.1 External Radiation Exposure
→(DRN 06-625, R15, EC-27665, R305)
All personnel with the exception of visitors that do not enter a high radiation, contaminated or airborne radioactivity area, who enter the RCA will wear a DLR badge and a direct-reading dosimeter.
←(DRN 06-625, R15, (EC-27665, R305)

→(DRN 06-625, R15)
Any individual or group of individuals who enter high radiation areas shall wear DLR badges and a direct-reading dosimeter and shall be provided with or accompanied by one or more of the following:
←(DRN 06-625, R15)

a) A radiation monitoring device which continuously indicates the radiation dose rate in the area.

b) A radiation monitoring device which continuously integrates the radiation dose rate in the area and alarms when a preset integrated dose is received. Entry into such areas with this monitoring device may be made after the dose rate level in the area has been established and personnel have been made knowledgeable of them.

c) A health physics qualified individual (i.e., qualified in radiation protection procedures) with a radiation dose rate monitoring device who is responsible for providing positive control over the activities within the area and shall perform periodic radiation surveys.

→(DRN 06-625, R15, EC-27665, R305)
DLR badges are processed periodically. A permanent exposure record is kept for all badged personnel, in accordance with Regulatory Guide 8.7, June, 1992, and 10CFR20.2106. Direct-reading dosimeters provide a daily estimate of personnel exposure.
←(DRN 06-625, R15; EC-27665, R305)

→(EC-14865, R303)
If a high dosimeter reading indicates potential unexpected exposure or overexposure, the individual's DLR badge may be processed to verify exposure.
←(EC-14865, R303)

12.5.3.7.2 Internal Exposure

→(DRN 03-1135, R13)
A bioassay program will be performed in accordance with Regulatory Guide 8.9, and the portions of ANSI N343-1978 directly applicable to nuclear power plants. The Health Physics procedures are the vehicle by which the bioassay program is implemented. All personnel who may regularly enter an airborne radioactivity area and any other area where unencapsulated radioactive material is present in a form and quantity such that the area has a significant potential for becoming an airborne radioactivity area will be included in the bioassay program. The need for bioassays for some individuals will be based on the Radiation Protection Manager's judgement as to the probability and potential magnitude of internal exposure. An excreta bioassay will be performed as deemed appropriate by the Radiation Protection Manager. Internal exposure assessments and results will be recorded in accordance with Regulatory Guide 8.7, June, 1992.
←(DRN 03-1135, R13)

12.5.3.8 Airborne Radionuclide Control, Assessment, and Personnel

The plant ventilation systems (refer to Subsection 6.5.1 and Section 9.4) provides the means for removing airborne radioactive material from the in-plant atmosphere. Airborne radionuclide concentrations are controlled by minimizing loose surface contamination levels and providing containment of sources.

Concentrations of airborne radionuclides are routinely assessed by fixed and portable continuous air monitors and air sample surveys. Air sample surveys are taken routinely at specified frequencies and nonroutinely when the potential for personnel exposure exists (as determined by health physics personnel).

Radiation work permits may specify air sampling prior to the start of work in a given area. Continuous air monitors alarm when airborne radio-nuclide concentrations exceed preset values in a given area. Internal exposures are minimized by this assessment and follow up control.

There may exist areas in which airborne radionuclide concentrations cannot be maintained below applicable station limits (normally, these are the Derived Air Concentration limits, as found in 10CFR20, Appendix B). Controls are established in plant procedures to maintain exposures ALARA if personnel entry into those areas is required.

→(EC-27665, R305)
Respiratory protection equipment is available and can be easily accessed. Equipment will be maintained, inspected and used in accordance with Regulatory Guide 8.15, October 1976.
←(EC-27665, R305)

To assure an adequate program for respiratory protection, the following controls are incorporated into the program:

a) Each respirator user is advised that he may leave an airborne radioactivity area for psychological or physical relief from respirator use. Each user must leave the area in the case of respirator malfunction or any other condition that might cause reduction in the protection afforded the user.

b) Sufficient air samples and surveys are made to identify the various radionuclides present and to estimate the individual exposures so that selection of appropriate respiratory equipment can be made in accordance with 10CFR20.1703.

c) Procedures are established to assure correct fitting, use, maintenance, and cleaning of the various types of respiratory equipment.

d) Bioassays, will be performed in accordance with plant procedures and, as required, to evaluate individual internal intake of radionuclides and to assess the overall effectiveness of the respiratory protection program.

12.5.3.9 Radioactive Material Safety Program

Radioactive material may be used by station personnel for calibration and other purposes. This will include both sealed sources and unsealed materials (gaseous, liquid, or solid). Calibration of radiochemistry counting, fixed monitoring, and portable survey instrumentation is the most common use of such material. Exempt quantities or exempt concentrations of radioactive material do not require special handling for radiation protection purposes.

Recognized methods for the safe handling of radioactive materials, such as those recommended by the National Council of Radiation Protection and Measurement, will be proceduralized to ensure proper usage. Procedures specify handling techniques, storage, and other safety considerations, as listed below:

a) proper labeling of all radioactive material (per 10CFR20),

b) inventorying of licensed sealed radioactive sources in accordance with plant procedures,

c) leak testing of sealed sources at six month intervals in accordance with license conditions, and

d) monitoring of all packages received containing radioactive material in accordance with 10CFR20.1906.

TABLE 12.5-1 Revision 305 (11/11)

COUNTING INSTRUMENTATION

Instrument	Sensitivity	Range	Quantity	Remarks
→(DRN 99-1034, R11, EC-27665, R305)				
Alpha Counter ←(EC-27665, R305)	α: 0.4 pCi	0-10^7cpm	1	For contamination levels on survey samples.
GM Counter	200 pCi	0-10^5cpm	2	May be portable and used at inplant control points.
Liquid Scintil-lation Counter →(EC-27665, R305) ←(EC-27665, R305)	~$1x10^{-6}\mu$Ci/ml	0-10^7cpm	1	For low energy β counting. Maintenance by Chemistry Department and kept in chemistry counting area.
Ge (Li) Detector →(EC-27665, R305) ←(EC-27665, R305)	Particulate ~$1x10^{-11}\mu$Ci/ml liquid ~$1x10^{-7}\mu$Ci/ml	N/A	1	With associated electronics and spectrum-stripping computer for isotopic analysis.

→(EC-27665, R305)

Note: Instrument accuracies, ranges, and quantities may vary depending upon station and ERO specific needs. Radiological instrumentation that is equivalent or better may be substituted to meet the specific monitoring function.

←(DRN 99-1034, R11, EC-27665, R305)

TABLE 12.5-2 Revision 305 (11/11)

PORTABLE RADIOLOGICAL SURVEY INSTRUMENTATION

Instrument	Accuracy	Range	Quantity	Remarks
→ (DRN 99-1034, R11) Alpha Survey Meter	±10%	0-10^5 counts	2	Scintillation
→(EC-27665, R305) Neutron Survey Meter	±15%	0-100 Rem/hr	2	Capable of detecting neutron over the range of .025 eV to 10 MeV.
←(EC-27665, R305) GM Survey Meter	±10%	0-10^3 Rem/hr	2 E-Plan 3 Normal ops	Telescoping probe.
GM Survey Meter	±10%	0-200 mRem/hr	2 E-Plan 2 Normal ops	Energy Compensated hand held probe.
→(EC-27665, R305) GM Survey Meter	±10%	0-10^5 cpm	20 E-Plan 20 Normal ops	Pancake probes.
Ion Chamber Survey Meter	±10%	0-5000 mRem/hr	4 E-Plan 10 Normal ops	Dose rate air filled chamber capable of detecting both ϑ and K radiation.
Ion Chamber Survey Meter	±10%	0-50,000 mRem/hr	6 E-Plan 10 Normal ops	Dose rate air filled chamber capable of detecting both ϑ and K radiation.
←(EC-27665, R305) Ion Chamber Survey Meter	±20%	0-10^4 Rem/hr	1	High range, remote probe. Energy compensated.

←(DRN 99-1034, R11)

→(EC-27665, R305)

Note: Instrument accuracies, ranges, and quantities may vary depending upon station and ERO specific needs. Radiological instrumentation that is equivalent or better may be substituted to meet the specified monitoring function.

←(EC-27665, R305)

TABLE 12.5-3 Revision 309 (06/16)

PERSONNEL MONITORING INSTRUMENTATION

Instrument	Sensitivity	Range	Quantity	Remarks
→(DRN 99-1034, R11) ←(DRN 99-1034, R11)				
Portal Monitors	1.0 μci Cs-137	NA	2	Scintillation type
→(DRN 99-1034, R11; EC-14865, R303) Whole Body Counter ←(EC-14865, R303)	.2% of most nuclide ALI	0-several nCi ALI	2	NaI Detector system
→(EC-27665, R305; LBDCR 16-016, R309) Direct Reading Dosimeters	50mr	0-1500 mr	≥40 E-Plan	
←(EC-27665, R305; LBDCR 16-016, R309) Direct Reading Dosimeters	500 mr	0-10,000 mr	10 Normal ops 27 E-Plan	
→(EC-27665, R305) Direct Reading Dosimeters	10 mr	0-200 mr	≥300 E-Plan	
←(EC-27665, R305) Dosimeter Chargers	---	---	4	

← (DRN 99-1034, R11)

→ (EC-27665, R305)

Note: Instrument accuracies, ranges, and quantities may vary depending upon station and ERO specific needs. Radiological instrumentation that is equivalent or better may be substituted to meet the specified monitoring function.

← (EC-27665, R305)

TABLE 12.5-4 Revision 305 (11/11)

HEALTH PHYSICS EQUIPMENT

Equipment	Quantity	Range	Remarks
→(DRN 99-1034, R11; EC-27665, R305)			
High Volume Air Sampler ←(EC-27665, R305)	6 E-Plan 5 Normal ops	1 to 5 ft^3/min	Used for rapid assessment of airborne levels.
Low Volume Air Sampler →(EC-27665, R305)	1 E-Plan 15 Normal ops	10 to 100 lpm	Used for long duration sampling and trending.
Air-Purifying Respirators ←(EC-27665, R305)	67 E-Plan 25 Normal ops	N/A	Full face, negative pressure.
Airline Respirators	19 E-Plan	N/A	Full face constant flow
Self-Contained Breathing Apparatus	E-Plan • 18 TSC • 15 Security • OSC (10)	N/A	Full face pressure demand
	Fire Brigade • 5 Locker #1 • 5 Locker #2 • 5 Locker #3	N/A	Full face pressure demand
	6 Normal ops	N/A	Full face pressure demand
	5 Training	N/A	Full face pressure demand
Portable Continuous Air Monitors	1 E-Plan 5 Normal ops	0 - 100,000 cpm	Monitoring of work areas.
Instrument Calibrator	1	.002-500 rem/hr	Multiple source shielded self-contained calibrator.

← (DRN 99-1034, R11)

→(EC-27665, R305)

Note: Instrument accuracies, ranges, and quantities may vary depending upon station and ERO specific needs. Radiological instrumentation that is equivalent or better may be substituted to meet the specified monitoring function.

←(EC-27665, R305)