

3.4 Radiation Monitoring Systems and Radioactive Effluents

3.4.1 Area Radiation Monitors

The reactor cell shall be monitored by at least three area radiation monitors, two of which shall be capable of audibly warning personnel of high radiation levels. The output of at least two of the monitors shall be indicated and recorded in the control room. The setpoints for the radiation monitors shall be in accordance with Table 3.3.

3.4.2 Argon-41 Discharge

The following operational limits are specified for the discharge of Argon-41 to the environment:

- (1) The concentration of Argon-41 in the gaseous effluent discharge of the UFTR is determined by averaging it over a consecutive 30-day period.
- (2) The dilution resulting from the operation of the stack dilution fan (flow rate of 10,000 cfm or more) and atmospheric dilution of the stack plume (a factor of 200) may be taken into account when calculating this concentration.
- (3) When calculated as above, discharge concentration of Argon-41 shall not exceed $(1.0 \times 10^{-6} \mu\text{Ci/ml})$. Operation of the UFTR shall be such that this maximum concentration (averaged over a month) is not exceeded.

Table 3.3 Radiation Monitoring System Settings

Type	No. of Required Operable Functions	Alarm(s) Setting	Purpose
Area Radiation Monitors	3 detecting 2 audio alarming 2 recording	5 mr/hr low level 25 mr/hr high level	Detect/alarm/record low and high level external radiation
Air Particulate Monitors	1 detecting 1 audio alarming 1 recording	Range adjusted according to APD* type (according to monitoring requirements)	Detect/alarm/record airborne radioactivity in the reactor cell
Stack Radiation Monitor	1 detecting 1 audio alarming 1 recording	(1) Fixed alarm at 4000 cps (2) Adjustable alarm as per power level	Detect/alarm/record release of gaseous radioactive effluents in the reactor vent duct to the environs

*Air particulate detector

NOTE: For maintenance or repair, the required radiation monitors may be replaced by suitable portable instruments provided the intended function is being accomplished. Service, calibration, and testing interruptions for brief periods are permissible when the reactor is not in operation.

3.4.3 Reactor Vent/Stack Monitoring System

- (1) Whenever the reactor vent system is operating, air drawn through the reactor vent system shall be continuously monitored for gross concentration of radioactive gases. The output of the monitor shall be indicated and recorded in the control room.
- (2) Whenever venting is to be used to reduce cell radionuclide concentrations during abnormal or emergency conditions, then the radioactivity in the effluent must be quantified prior to initiating controlled venting.

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- (3) The reactor air cavity flow shall be periodically analyzed to minimize Argon-41 releases to the environment while maintaining a negative pressure within the reactor cavity to minimize radioactive hazards to reactor personnel.

3.4.4 Air Particulate Monitor

The reactor cell environment shall be monitored by at least one air particulate monitor, capable of audibly warning personnel of radioactive particulate airborne contamination in the cell atmosphere.

3.4.5 Liquid Effluents Discharge

- (1) The liquid waste from the radioactive liquid waste holding tanks shall be sampled and the activity measured before release to the sanitary sewage system.
- (2) Releases of radioactive liquid waste from the holding tanks/campus sanitary sewage system shall be in compliance with the limits specified in 10 CFR 20, Appendix B, Table 3, as specified in 10 CFR 20.2003.

3.4.6 Solid Radioactive Waste Disposal

Solid radioactive waste disposal shall be accomplished in compliance with applicable regulations and under the control of the Radiation Control Office of the University of Florida.

3.4.7 Bases

The area radiation monitoring system, stack monitoring system and air particulate detector provide information to the operator indicating radiation and airborne contamination levels under the full range of operating conditions. Audible indicators and alarm lights indicate (via monitored parameters) when corrective operator action is required, and (in the case of the area radiation monitors) a warning light indicates situations recommending or requiring special operator attention and evaluation. Argon-41 discharges are limited to a monthly average which is less than the effluent concentration limit in 10 CFR 20, Appendix B, Table 2, and liquid and solid radioactive wastes are regulated and controlled to assure compliance with legal requirements.

3.5 Limitations on Experiments

Applicability: These specifications apply to all experiments or experimental devices installed in the reactor core or its experimental facilities.

Objectives: The objectives are to maintain operational safety and prevent damage to the reactor facility, reactor fuel, reactor core, and associated equipment; to prevent exceeding the reactor safety limits; and to minimize potential hazards from experimental devices.

Specifications:

(1) General

The reactor manager and the radiation control officer (or their duly appointed representative) shall review and approve in writing all proposed experiments prior to their performance. The reactor manager shall refer to the Reactor Safety Review Subcommittee (RSRS) the evaluation of the safety aspects of new experiments and all changes to the facility that may be necessitated by the requirements of the experiments and that may have safety significance. When experiments contain substances that irradiation in the reactor can convert into a material with significant

7.0 AS LOW AS IS REASONABLY ACHIEVABLE (ALARA) (10 CFR 50.36A)

The principal routine emission from the UFTR facility complex is argon-41 discharged by the reactor vent system. There is no known biological uptake of argon-41 and exposure limits are based upon external, total body irradiation.

The concentration of argon-41 in the stack effluent is continuously monitored when the reactor is operating, and is normally less than 1×10^{-5} $\mu\text{Ci/ml}$ after several hours of full power operation. The annual release is related to the number of equivalent hours of 100 kW operation (kWt per year). Reactor operations are limited by prior agreement, and by these Technical Specifications, to limit the argon-41 discharges to the maximum concentration when averaged over a month and using the established atmospheric dilution factor of 200.

The offsite environmental radioactive surveillance program has proven that exposure to the general public from the reactor radioactive effluents approaches consistently the nondetectable level and certainly is always well below the 100 mrem/yr federal limit.

The ALARA program at the UFTR minimizes unnecessary production of radioactive effluents by selectivity of operations. The potential reduction of argon-41 releases is frequently reviewed, and was a major item of consideration during reviews to upgrade facility operations to 500 kWt. A reduction of the vent flow as well as the argon dissolving in the primary coolant has been proposed in the past, as well as the possibility of utilizing storage tanks.

Radioactive liquid effluents and personnel radioactive exposure are well within ALARA guidelines.