27-August-2018

U.S. Nuclear Regulatory Commission
Document Control Desk
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Subject: Request for an amendment to The Ohio State University Research Reactor (OSURR, License R-75, Docket 50-150) Technical Specifications (TSs)

OSURR Technical Specification (TS) 3.5, ***Ventilation Systems***, is presently written as follows:

Applicability: This specification applies to all heating, ventilating, and air conditioning systems that exhaust building air to the outside environment.

Objective: To provide for normal ventilation and the reduction of airborne radioactivity within the reactor building during normal reactor operation and to provide a way to turn off all vent systems quickly in order to isolate the building for emergencies.

Specification:

(1) An exhaust fan with a capacity of at least 1000 cubic feet per minute shall be operable whenever the reactor is operating.

(2) This fan, as well as all other heating, ventilating, and air conditioning systems, shall have the capability to be shut off from a single switch in the control room.

Bases: In the unlikely event of a release of fission products or other airborne radioactivity, the ventilation system will reduce radioactivity inside the reactor building or be able to be isolated. Section 8.4.4 of the SAR includes an analysis of fission product release.

The corresponding surveillance requirement in Section 4.5 of the Technical Specifications is written:

Applicability: This specification applies to the surveillance requirements for the building ventilation system.

Objective: To ensure that the ventilation shutoff functions satisfactorily.

Specification: The shutoff switch for all fans and air conditioning systems shall be tested on a quarterly basis.

Bases: This surveillance will ensure that the building can be isolated quickly if necessary to prevent uncontrolled escape of airborne radioactivity to the unrestricted environment.

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During an NRC inspection at the OSURR, it was noted that while there was a mention of "a capacity of at least 1000 cubic feet per minute" in TS 3.5, there was no corresponding surveillance requirement to measure this flow rate. Beyond this, rather than clearly specifying a minimum volumetric flow rate, TS 3.5 specifies "a capacity of at least 1000 cubic feet per minute", which is ambiguous in its meaning. For example, if an exhaust fan is capable of providing a flow rate of 1000 cfm, but it is not being spun at a speed to actually do so, would this be consistent with a "capacity of at least 1000 cubic feet per minute"? Therefore, this request is being written to address these issues by revising TS 3.5 such that the words "with a capacity of at least 1000 cubic feet per minute" have been removed. A replacement Section 3.5 is proposed that also improves clarity by separating out normal from emergency operation requirements, and another related minor change is requested.

The mention of a particular flow rate in TS 3.5 is an historical relic that was carried forward when the OSURR was relicensed in 2008, and the inconsistency that this caused between operation requirements and surveillances was missed by both OSURR staff and NRC staff during that renewal process. The following evidence demonstrates why having a minimum flow rate capacity stated is not necessary and should be removed:

1) As can be seen in the Basis for TS 3.5, there is nothing to indicate a need for specifying an exhaust fan flow rate capability, as the basis does not indicate a need for a particular flow rate. Instead, it says that the "ventilation system will reduce radioactivity inside the reactor building or be able to be isolated". No particular flow rate is needed to achieve this.
2) As is seen above, the surveillance requirements in TS 4.5 do not specify measuring a flow rate. This is unlike other specifications in Section 3, for which corresponding surveillances are given, as is expected for the operational specifications in Section 3.
3) As is seen in TS 3.4, the exhaust fan of the OSURR helps provides confinement, which is defined in the TS *Definitions* section as "a closure on the overall facility which controls the movement of air into it and out of it through a controlled path". Nothing in Section 3.4 or its corresponding surveillance section, TS 4.4, indicates a need to specify an exhaust fan flow rate capability.
4) ANSI/ANS 15.1, which is the guidance document for technical specifications for research reactors, makes no mention of specifying an exhaust fan flow rate capability. Rather, it states that TS 3.5 should specify necessary ventilation system equipment for normal and emergency operations. This requirement is met without specifying an exhaust fan flow rate capability.
5) The building exhaust fan is operated for normal reactor operations in order to meet the requirement for confinement in TS 3.4 by maintaining a controlled path of release. During normal operations, low activities of Ar-41 produced by the reactor are released to the outside by the exhaust fan. However, as is seen by looking at the COMPLY code results included every year in the OSURR annual report to the NRC, the estimated annual dose to a member of the public from these releases is a fraction of a millirem. If the exhaust fan was exhausting air at either a smaller or greater volumetric flow rate than 1000 cfm, no limits for members of the public would be exceeded, and therefore public safety would not be impacted for normal operations
6) If there were to be a release of radioactive material in an emergency situation, the exhaust fan would be turned off to isolate the building in order to minimize release to the environment and exposure of the public. Thus, public safety is assured for emergency operations by the capability to shut off the exhaust fan rather than the flow rate of the fan. Therefore, the fan volumetric flow rate is unrelated to public safety in an emergency situation.

Given the above information, it is clear that the fan flow rate has no impact on either normal or emergency reactor operations, and thus removal of the stated flow rate in TS 3.5 will not negatively impact safe reactor operation. Therefore, we are requesting an amendment to the OSURR Technical Specifications in which the phrase "with a capacity of at least 1000 cubic feet per minute" has been removed from Section 3.5. In addition, we propose to reorganize the section to separate out normal from emergency requirements for better clarity and to be more consistent with the structure given in ANSI/ANS 15.1. We propose the resulting Section 3.5 to read as follows:

3.5 Ventilation Systems

3.5.1 Normal Operations

Applicability: This specification applies to ventilation equipment required for normal operations, which is only the exhaust fan.

Objective: To specify needed ventilation equipment for normal operations.

Specification: The exhaust fan shall be operating when the reactor is operating.

Bases: An operating exhaust fan is necessary to meet the requirements for confinement, as specified in Section 3.4.

3.5.2 Emergency Operations

Applicability: This specification applies to ventilation equipment related to emergency operations, which includes all heating, ventilating, and air conditioning systems that exhaust from the restricted area to the outside environment.

Objective: To specify a means to quickly turn off all heating, ventilating, and air conditioning systems that exhaust from the restricted area in order to isolate the building for emergencies.

Specification: Any heating, ventilating, and air conditioning systems that exhaust from the restricted area to the outside environment shall have the capability to be shut off from a single switch in the control room.

Bases: In the unlikely event of an emergency situation involving the release of fission products or other airborne radioactivity, a means must be available for shutting off ventilation fans and rapidly isolating the building. Section 8.4.4 of the SAR includes an analysis of fission product release.

The related minor change we are requesting is to update TS 5.1.2 to make its wording consistent with the Emergency Plan. A few years ago, a lobby structure was added to the front of the Reactor Building to provide a location for greeting and admitting visitors into the Reactor Building. The lobby addition is a free-standing structure with a wall and locked secure door separating it from the Reactor Building. The lobby addition has its own HVAC system that is independent of Reactor Building HVAC systems. While it is attached to the Reactor Building, it is an independent structure, and it is not part of the restricted area. This has been made clear in the Emergency Plan, and TS 5.1.2 should be revised to match. Therefore, we request to change TS 5.1.2 from:

> *The fence surrounding the reactor building shall describe the controlled area. The restricted area, as defined in 10 CFR Part 20, shall consist of the reactor building.*

to read as:

The fence surrounding the reactor building shall describe the controlled area. The restricted area, as defined in 10 CFR Part 20, shall consist of the reactor building, which does not include the lobby addition.

If you have any questions on this matter, please contact Mr. Andrew Kauffman at Kauffman.9@osu.edu or at 614-688-8220.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on 27-August-2018.

Sincerely,

Lei R. Cao

Dr. Lei Raymond Cao
Director, OSU Nuclear Reactor Laboratory
1298 Kinnear Rd
Columbus, OH 43212

Enclosure 1

Replacement pages for OSURR Technical Specifications

APPENDIX A

TO

RENEWED FACILITY OPERATING LICENSE NO. R-75

Technical Specifications

and Bases for

The Ohio State University

Pool-Type Nuclear Reactor

Columbus, Ohio

Docket No. 50-150

August 2018

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3.6 Radiation Monitoring Systems and Radioactive Effluents

3.6.1 Radiation Monitoring

Applicability: This specification applies to the availability of radiation monitoring equipment that shall be operable during reactor operation.

Objective: To ensure that monitoring equipment is available to evaluate radiation levels in restricted and unrestricted areas and to be consistent with the ALARA principle.

Specification:

(1) When the reactor is operating, the building gaseous effluent monitor shall be operating and have a readout and alarm in the control room. It may be used in either the "normal" mode or "sniffer" mode.

(2) When the reactor is operating, the following area radiation monitors (ARMs) shall be operating and have both local and control room readouts and alarms.

a. pool top
b. primary cooling system
c. beam port/rabbit area
d. thermal column area

(3) Portable survey instrumentation shall be available whenever the reactor is operating to measure beta-gamma exposure rates and neutron dose rates.

(4) When required monitors are inoperable, portable instruments, surveys, or analyses may be substituted for any of the normally installed monitors indicated in Section 3.6.1 above for periods of 1 week or for the duration of a reactor run in cases in which the reactor is continuously operated.

Bases:

(1) The gaseous effluent monitor will detect argon-41 levels in the reactor building. During "normal" mode operation, it will sample and monitor air just before it is released from the reactor building. (See SAR Section 6.3.1.) During "sniffer" mode of operation, it may be used for short periods to monitor in and around experimental facilities to determine local argon-41 levels.

(2) The ARMs provide a continuing evaluation of the radiation levels within the reactor building (see SAR Section 3.7) and provide a warning if levels are higher than anticipated.

(3) The availability of survey meters enables the reactor staff to independently confirm radiation levels throughout the building.

(4) In the event of instrument failure, short-term substitutions will enable the safe continued operation of the reactor.

3.6.2 Radioactive Effluents

Applicability: This specification applies to the monitoring of radioactive effluents from the facility.

Objectives:

(1) To ensure that liquid radioactive releases are safe and legal.

(2) To ensure that the release of argon-41 beyond the site boundary does not result in concentrations above the effluent concentration limit for unrestricted areas (see 10 CFR 20.1302, "Compliance with Dose Limits for Individual Members of the Public," and Table 2 of Appendix B, "Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent

Concentrations; Concentrations for Release to Sewerage," to 10 CFR Part 20).

(3) To ensure that the release of argon-41 in the restricted area does not result in concentrations above the derived air concentration (DACs).

Specification:

(1) The concentration of radioactive liquids released into the sanitary sewer shall not exceed the limits specified in 10 CFR 20.2003, "Disposal by Release into Sanitary Sewerage."

(2) The concentration of argon-41 at ground level below the point of release into the unrestricted area shall not exceed the unrestricted area effluent concentration limit (10 CFR 20.1302 and Table 2 of Appendix B to 10 CFR Part 20) when averaged over 1 year or 10 times the effluent concentration limit when averaged over 1 day.

(3) The concentration of argon-41 in the restricted area shall not exceed the DAC when averaged over a 2000-hour work year.

Bases:

(1) Section 6.2 of the SAR includes the basis for this specification.

(2) Section 6.3 of the SAR includes the basis for this specification.

(3) Section 6.3 of the SAR and 10 CFR 20.1003 include the basis for this specification.

3.7 Experiments

3.7.1 Reactivity Limits

Applicability: This specification applies to experiments to be installed in or near the reactor and associated experimental facilities.

Objectives: To prevent damage to the reactor or excessive release of radioactive materials in the event of an experiment failure.

Specification:

(1) The absolute value of the reactivity worth of any single secured experiment shall not exceed 0.7% $\Delta k/k$.

(2) The absolute value of the reactivity worth of any single movable experiment shall not exceed 0.4% $\Delta k/k$.

(3) The absolute value of the reactivity worth of all movable experiments shall not

exceed 0.6% Δk/k.

(4) The absolute value of the reactivity worth of experiments having moving parts shall be designed to have an insertion rate less than 0.05% Δk/k/s.

(5) The absolute value of the reactivity worth of any movable experiment that may be oscillated shall have a reactivity change of less than 0.05% Δk/k.

(6) The total reactivity worth of all experiments shall not be greater than 0.7% Δk/k.

Bases:

(1) Section 8.4.3.2 of the SAR, which evaluates a step insertion of reactivity from an experiment, includes the bases for specifications 1, 2, 3, and 6.

(2) The bases for specifications 4 and 5 allow for certain reactor kinetics experiments to be performed but still limits the rate of change of reactivity insertions to levels that have been analyzed. Section 8.4.3.2 of the SAR evaluates a step insertion of reactivity from an experiment.

3.7.2 Design and Materials

Specification:

(1) No experiment shall be installed that could shadow the nuclear instrumentation, interfere with the insertion of a control rod, or credibly result in fuel element damage.

(2) All materials to be irradiated in the reactor shall be either corrosion resistant or doubly encapsulated within corrosion-resistant containers.

(3) Explosive materials shall not be allowed in experiments, except for neutron radiographic exposures of items performed outside of the core and experimental facilities. The amount of explosive material contained in capsules used for radiographic exposures shall not exceed 5 grains of gunpowder.

Bases:

(1) Specification 1 ensures that no physical interference with the operation of the reactor detectors, control rods, or physical damage to fuel elements will take place.

(2) Limiting corrosive materials in specification 2 and explosives in specification 3 reduces the likelihood of damage to reactor components and/or releases of radioactivity resulting from experiment failure.

(3) Limiting explosive materials to neutron radiographic exposures done outside of the core and experimental facilities reduces the likelihood of damage resulting from this experimental failure.

5.0 DESIGN FEATURES

5.1 Site and Facility Description

5.1.1 Facility Location

The reactor and associated equipment is housed in a building at 1298 Kinnear Road, Columbus, Ohio, located on the West Campus of The Ohio State University. The minimum free air volume of the building housing the reactor will be greater than or equal to 70,000 cubic feet (ft^3). There is an exhaust fan with dampers providing control of the release of airborne radioactivity.

5.1.2 Controlled and Restricted Area

The fence surrounding the reactor building shall describe the controlled area. The restricted area, as defined in 10 CFR Part 20, shall consist of the reactor building, which does not include the lobby addition.

5.2 Reactor Coolant System

5.2.1 Primary Coolant Loop

Natural convective cooling is the primary means of heat removal from the core. Water enters the core at the bottom and flows upward through the flow channels in the fuel elements.

5.2.2 Secondary and Tertiary Coolant Loops

The secondary coolant loop removes heat from the primary coolant. The secondary coolant (ethylene glycol and water) passes through two separate heat exchangers to remove heat if necessary. Heat is removed from the first by an outside fan-forced dry cooler. City water flow through the secondary side of an additional heat exchanger makes up the tertiary loop. It provides additional cooling for the secondary coolant.

5.3 Reactor Core and Fuel

Up to 30 positions on the core grid plate are available for use as fuel element positions. Control rod fuel elements occupy four of these positions and one is reserved for the central irradiation facility flux trap. Several arrangements for the cold, clean, critical core have been investigated. Approximately 18 standard fuel elements, in addition to the control rod fuel elements, are currently required. Partial elements, blank elements, and graphite elements may be utilized in various combinations to achieve the proper excess reactivity.

The reactor fuel is plate-type U_3Si_2, with a uranium-235 enrichment of less than 20 percent. Standard fuel elements have a total of 16 fueled plates and 2 outer aluminum plates. The control rod fuel elements have inner fuel plates removed to allow the control rods to enter. Aluminum guide plates are on the inside of this gap. The outer two plates for each control