



Rensselaer

DEPARTMENT OF MECHANICAL,
AEROSPACE, AND NUCLEAR ENGINEERING

RCF 19-03
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ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

50-225

To Whom It May Concern:

This letter requests a revision to the RPI Critical Experiments Facility, license CX-22, Technical Specifications.

Background

The RPI Critical Experiments Facility (RCF) is surrounded by two fences. The outermost fence is the civil exclusion zone. The inner fence defines the restricted area. These two fences are identified in the Technical Specification, section 5.1, as:

“An inner fence of greater than 30 feet radius defines the restricted area. An outer fence and riverbank of greater than 50 feet radius defines the exclusion area.”

Construction work around the RCF resulted in relocating the fences. Closer to the facility at some points and further away at others. However, the relocation did not move the fences such that the statement in the Technical Specification was untrue.

An NRC Inspection in September 2018 noted that rough measurements of the fence do not match those used in an analysis performed after the relocation and more accurate measurements should be made and evaluated for agreement with the Technical Specifications.

Discussion

The Technical Specification description of the fence location does not detail just where the reactor is within those two areas. It isn't clear where the center of the 30 feet and 50 feet circles is located, or if they share the same center.

The results of detailed measurements are in Table 1 below.

	North	South	West	East
Rx center to Bldg exterior, feet	39.4	13.3	21.3	26.7
Bldg exterior to inner fence, feet	-14.7	15.0	24.8	15.4
Total to inner fence, feet	54.0	28.3	46.0	42.1
Inner fence to outer fence, feet	11.3	7.1	12.0	12.3
Total to outer fence, feet	65.3	35.4	58.0	54.3

Table 1: RCF Fence Location Relative to Reactor Centerline

A020
NRR

Figure 1 shows the construction drawing of the fence locations. North is up on the Figure. Based on the measurements in Table 1, the center of the reactor is identified relative to the South and East building exteriors. The measurements and Figure 1 show the bias. The reactor is closest to the southern fence boundary. The measurements also show that, in fact, the reactor is within an area with 30 feet radius, just not at the center of that area. Attachment 1 is a 10CFR50.59 evaluation made after the September inspection. The evaluation used the information from Table 1 above and concluded that a change to the RCF Technical Specification was appropriate to clarify the separation from the reactor provided by both fences.

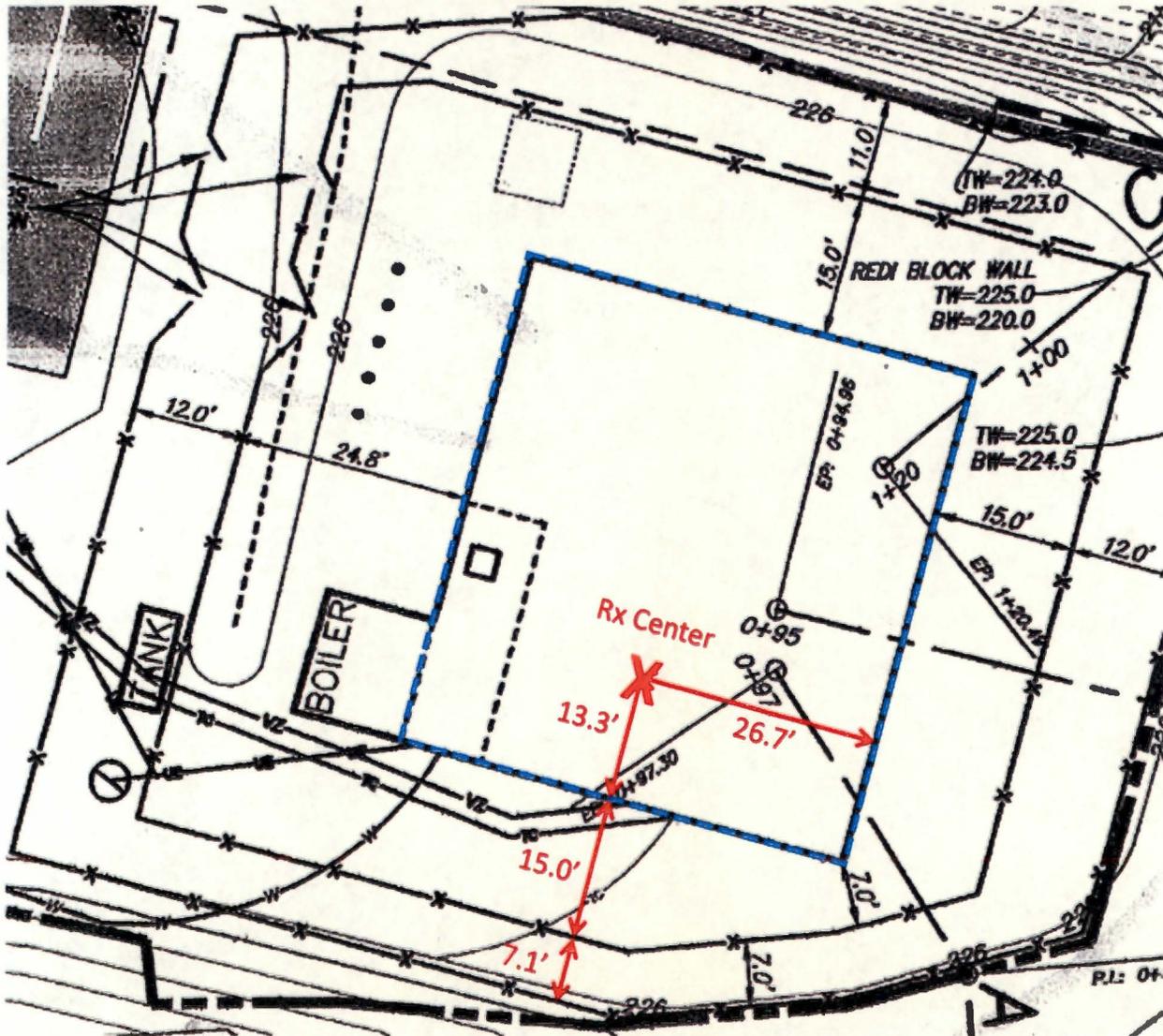


Figure 1: RCF Building Footprint and Exterior Fences

Radiation levels were measured during the relicensing process at a reactor power of 13 watts and extrapolated to the 100 watt license limit. No locations on the outer fence exceeded the 2 mr/hr limit for exposure to the general public in 10CFR20. The shortest distance from the reactor to the fence for that measurement was 45 feet and the extrapolated dose rate was 1.15 mr/hr. The

exclusion area fence is now 35.4 feet from the center of the reactor. Assuming a $1/r^2$ relationship, the dose rate at that outer fence location would be 1.85 mr/hr, below the 2 mr/hr limit.

Proposed Technical Specification Revision

Attachment 2 is a markup of the page in the Technical Specification that describes the location of the fences relative to the reactor.

RPI requests approval for this change to the RCF Technical Specification.

Yours truly;



Dr. Wei Ji, Facility Director
RPI Critical Experiments Facility

Attachments:

1. Safety Evaluation of RCF Fence Line Reconfiguration
2. Mark-up of RCF Technical Specifications, page 17

Cc:

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Safety Evaluation of RCF Fence Line Reconfiguration
Glenn C Winters, RCF Operations Supervisor
November 2018

Overview

Construction around the L David Walthousen Laboratory required relocation of the fencing around the facility and new access road. The prior access road from Erie Blvd was cut by a dredged canal into a newly formed marina harbor. The fencing moved closer to the facility in some locations and further away in others. Fencing establishes the civil exclusion, referred to as the site boundary in the Emergency Plan. An inner fence defines the restricted area and is referred to as the operations boundary in the Emergency Plan.

The description of the fences in the Technical Specifications is:

“An inner fence of greater than 30 feet radius defines the restricted area. An outer fence and riverbank of greater than 50 feet radius defines the exclusion area.”

A prior review of the effect of the relocated fencing compared the above description in the Technical Specification to the new location. This evaluation concluded that the new location for the fencing would fall outside the described circular areas. However, the prior evaluation did not consider the specific criteria in 10 CFR50.59(c)(2). This was noted by the NRC in a routine inspection performed in September 2018.

In the same inspection, the NRC suggested that the center of the reactor should be the center of the two circular areas described in the Technical Specification.

Evaluation

This is an evaluation of the repositioned fencing around the RCF in accordance with 10CFR50.59(c)(2). Included is a calculation of the radiation dose rates where fencing is closer to the reactor than the prior location and a proposed change to the description of the fencing in the Technical Specification.

- (1) Will the new fence positions result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the final safety analysis report (as updated)?

The repositioned fences do not affect the reactor accident described in the final safety analysis. This accident is an unplanned reactivity addition terminated by an automatic scram. The facility fences have no effect on the frequency of this accident.

- (2) Will the new fence positions result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety previously evaluated in the final safety analysis report (as updated)?

No structure, system or component important to safety is affected by the fencing around the facility. The fence is an important security structure and one that establishes a radiation safety boundary for the general public. Calculations below show that the 10CFR20 limits for radiation exposure to members of the general public are not exceeded.

- (3) Will the new fence positions result in more than a minimal increase in the consequences of an accident previously evaluated in the final safety analysis report (as updated)?

There is no increase in the consequences of an accident previously evaluated in the final safety analysis report.

- (4) Will the new fence positions result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the final safety analysis report (as updated)?

There is no increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the final safety analysis report

- (5) Will the new fence positions create a possibility for an accident of a different type than any previously evaluated in the final safety analysis report (as updated)?

The repositioned fencing does not create the possibility of a different accident than that previously evaluated in the final safety analysis report.

- (6) Will the new fence positions create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the final safety analysis report (as updated)?

The repositioned fencing cannot cause a malfunction of an SSC important to safety.

- (7) Will the new fence positions result in a design basis limit for a fission product barrier as described in the final safety analysis report (as updated) being exceeded or altered?

The repositioned fencing has no effect on the fission product barrier.

- (8) Will the new fence positions result in a departure from a method of evaluation described in the final safety analysis report (as updated) used in establishing the design bases or in the safety analyses?

The evaluation methods described in the final safety analysis report are unaffected by the repositioned fencing.

Radiation Exposure to the General Public

Radiation levels were measured during the relicensing process at a reactor power of 13 watts and extrapolated to the 100 watt license limit. No locations on the outer fence exceeded the 2 mr/hr limit for exposure to the general public in 10CFR20. The shortest distance from the reactor to the fence for that measurement was 45 feet and the extrapolated dose rate was 1.15 mr/hr. The exclusion area fence is now 35.4 feet from the center of the reactor. Assuming a $1/r^2$ relationship, the dose rate at that outer fence location would be 1.85 mr/hr, below the 2 mr/hr limit. It is noteworthy to acknowledge that the RCF limits power to 15 watts by operating procedures. This would reduce the dose rate by about a factor of 6.

Technical Specification

The description of the fences in the Technical Specification, Paragraph 5.1, does not provide a reference for the location of a point which is the center of the 30 feet radius and 50 feet radius areas. While a 30 feet radius circle can fit within the inner fence, it is not centered on the reactor.

Similarly, the 50 feet radius circle will fit within the outer fence, but it also is not centered on the reactor.

Measuring from the center of the reactor, the closest section of inner fence is 28.3 feet and for the outer fence, 35.4 feet.

A more correct, and clearer, description of the repositioned fences is:

“An inner fence more than 28 feet from the center of the reactor defines the restricted area.
An outer fence more than 35 feet from the center of the reactor defines the exclusion area.”

Specification

The criticality detector system, CAM and area gamma monitors shall be tested with a radiation source at least monthly and daily if the reactor is operated and calibrated semiannually.

Portable survey meters shall be calibrated at the manufacturer's recommended frequency.

Prior to discharge to the environment the moderator shall be monitored for radioactivity to prove that gross activity levels are lower than maximum levels permitted by 10 CFR 20 Appendix B Table 2.

Bases

Experience has demonstrated that calibration of the criticality detectors, CAM and gamma monitors semiannually is adequate to ensure that significant deterioration in accuracy does not occur. Furthermore, the operability of these radiation monitors is included in the daily pre-startup checklist. If the reactor is not operated for more than a month, the instruments are required to be checked to ensure operability. Portable instruments are calibrated at the manufacturer recommended frequency.

Experience has demonstrated that the moderator does not accumulate radioactive material due to the low operating neutron fluence. Therefore, periodic monitoring is not necessary. Verification is necessary, however, prior to discharge to the environment.

4.8 Experiments – None required

Since experiments may vary drastically no general surveillances are defined. However, approved experimental procedures may contain experiment specific surveillances.

4.9 Facility-specific Surveillance Requirements – None required

No facility specific surveillances are required.

5. DESIGN FEATURES

5.1 Site and Facility Description

Applicability

These specifications apply to the design of the RCF and the surrounding site.

Objective

The purpose of these specifications is to provide a layout of the site and the structures that contain the reactor in a means to protect personnel.

Specification

The facility is located on a site situated on the south bank of the Mohawk River in the City of Schenectady. An inner fence of greater than 30 feet radius defines the restricted area. An outer fence and riverbank of greater than 50 feet radius defines the exclusion

area. Replace highlighted text with "An inner fence more than 28 feet from the center of the reactor defines the restricted area. An outer fence more than 35 feet from the center of the reactor defines the exclusion area."