

4731.6140 DESIGN REQUIREMENTS.

Subpart 1. **Applicability.** This part applies to irradiators whose construction began after July 1, 1993.

Subp. 2. **Panoramic irradiators.** For panoramic irradiators, a licensee must:

A. design shielding walls to meet generally accepted building code requirements for reinforced concrete and design the walls, wall penetrations, and entranceways to meet the radiation shielding requirements of part 4731.6070. If the irradiator will use more than 5,000,000 curies (2×10^{17} becquerels) of activity, the licensee must evaluate the effects of heating of the shielding walls by the irradiator sources;

B. design the foundation, with consideration given to soil characteristics, to ensure it is adequate to support the weight of the facility shield walls;

C. verify from the design and logic diagram that the access control system will meet the requirements of part 4731.6060;

D. verify that the number, location, and spacing of the smoke and heat detectors are appropriate to detect fires and that the detectors are protected from mechanical and radiation damage;

E. verify that the design of the fire extinguishing system provides the necessary discharge patterns, densities, and flow characteristics for complete coverage of the radiation room and that the system is protected from mechanical and radiation damage;

F. verify that the source rack will automatically return to the fully shielded position if off-site power is lost for more than ten seconds;

G. if the irradiator is to be built in seismic areas, design the reinforced concrete radiation shields to retain their integrity in the event of an earthquake by designing to the seismic requirements of an appropriate source, including:

(1) "Building Code Requirements for Reinforced Concrete (ACI318-89)," American Concrete Institute, chapter 21 (1989). The chapter is incorporated by reference, is not subject to frequent change, and is available from the Minitex interlibrary loan system; or

(2) local building codes;

H. verify that electrical wiring and electrical equipment in the radiation room are selected to minimize failures due to prolonged exposure to radiation;

I. determine that source rack drops due to loss of power will not damage the source rack and that source rack drops due to failure of cables (or alternate means of support) will not cause loss of integrity of sealed sources; and

J. review the design of the mechanism that moves the sources to ensure that the likelihood of a stuck source is low and that, if the rack sticks, a means exists to free it with minimal risk to personnel.

Subp. 3. **Pool and underwater irradiators.** For pool and underwater irradiators, a licensee must:

- A. design the pool to ensure that:
 - (1) it is leak resistant;
 - (2) it is strong enough to bear the weight of the pool water and shipping casks;
 - (3) a dropped cask would not fall on sealed sources;
 - (4) all outlets or pipes meet the requirements under part 4731.6110, item C; and
 - (5) metal components are metallurgically compatible with other components in the pool;

B. verify that the design of the water purification system is adequate to meet the requirements of part 4731.6110, item F. The system must be designed so that water leaking from the system does not drain to unrestricted areas without being monitored;

C. when using radiation monitoring systems to detect contamination under part 4731.6200, subpart 2, verify that the design of radiation monitoring systems to detect pool contamination includes sensitive detectors located close to where contamination is likely to concentrate; and

D. verify that there are no crevices on the source or between the source and source holder that would promote corrosion on a critical area of the source.

Subp. 4. **All irradiators.** For all irradiators, a licensee must:

A. evaluate the location and sensitivity of the monitor to detect sources carried by the product conveyor system as required under part 4731.6090, subpart 1; and

B. verify that the product conveyor is designed to stop before a source on the product conveyor would cause a radiation overexposure to any person.

Statutory Authority: *MS s 144.1202; 144.1203*

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