NUCLEAR REACTOR LABORATORY

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L. CLARK, JR.
Director of Reactor Operations

March 13, 1980

Office of Nuclear Reactor Regulation
Division of Operating Reactors
ATT: Mr. Daniel Garner
Operating Reactors, Branch #4
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: SAR Revision No. 20 and License No. R-37 Amendment Request, Docket 50-20

Gentlemen:

Massachusetts Institute of Technology is writing this letter to the Commission for two purposes:

(1) to submit Safety Analysis Report Revision 20, which describes hot cells recently installed in the reactor containment building, and

(2) to request an amendment to the Facility Operating License which would authorize the receipt and possession of byproduct materials, activated in reactors other than the MIT Research Reactor, for use in the above hot cells.

SAR Revision No. 20

The hot cells were installed during 1978 and 1979 for use in connection with byproduct materials activated in the MIT Research Reactor. The installation and use was in accordance with the provisions of 10C 'R 50.59 (a)(1). Plans for the installation were reported to the Commission in the "Annual Report to USNRC for the Period July 1, 1977 - June 30, 1978," and partial installation was reported in the annual report for the following year, 1978-79. Installation should be completed during the current year.

The enclosed SAR Revision No. 20 is for the purpose of updating the "Safety Analysis Report for the MIT Research Reactor (MITR-II)," Report No. MITNE-115 (October 22, 1970), as amended. The revision incorporates a description of the hot cells, criteria for their use, and the purposes for which they are and will be utilized. An attached sheet lists the pages to be removed and inserted and also provides a description of each change.

Amendment to Facility Operating License

The purpose of the requested amendment is to broaden Facility Operating License No. R-37 so that byproduct materials activated in other reactors, as well as in MITR-II, may be received and possessed for utilization in the hot cells. The request is in response to the letter of July 31, 1979, from Mr. Robert W. Reid, USNRC-DOR, to Lincoln Clark, MIT.

It is expected that the possession of the above materials would be principally for examination and physical testing. Byproduct materials authorized under the amendment would be for atomic numbers 3 through 83 in solid form only. The total inventory of materials from other sources would not exceed 1,000,000 curies, with limits of 100,000 Ci for any one isotope and 10,000 Ci for any sample or specimen. Each sample or specimen would be further limited such that the dose rate at one meter would not exceed 1000 rads/hour unshielded.

For the above purposes it is requested that paragraph 2, B (3) of the license be amended by deleting the word "and" at its end and by adding the following clause:

> "to receive, possess, use and transfer byproduct materials activated in reactors other than the MIT Reactor, with atomic numbers 3 through 83 in solid form, and in quantities not to exceed 1,000,000 curies at any time, and"

In addition to matters pertaining directly to the reactor itself, the SAR for MITR-II describes the reactor organization, the containment in which the hot cells are located, the radiation protection program for the reactor, equipment and procedures available for the protection of the health and safety of on-site personnel and the general public, waste disposal, and procedures for the review and approval of experiments. SAR Revision No. 20 now adds the hot cells to the description of facilities and of the programs planned and provides the criteria for hot cell use with materials activated in the MITR-II. The same personnel, equipment and procedures will be utilized in the handling of byproduct materials activated in other reactors and, in addition, there will be limitations on the type and amounts of material and requirements for inventory, control and approval procedures as described in the enclosed SAR Revision No. 20.

The SAR revision submission and the amendment application have been approved by the MIT Reactor Safeguard Committee's mail ballot of February 28, 1980.

Your prompt attention to this mat er will be appreciated. Please contact me or Mr. William Fecych (617-253-4205) if further information should be required.

Sincerely,

Lincoln Clark, Jr.

Lincoln Clark, Jr.

LC:DKE

Enclosure: SAR Revision No. 20

Xc: MITRSC (w/o enclosure)
USNRC-NRR (3 signed and 19 copies, with enclosure)
USNRC-OMIPC (with enclosure)

Middlesex SS March 13, 1980

Subscribed and Sworn to before me this 13th day of

March, 1980.

Lincoln Clark, Jr.

(Signature)

Edward M. Dargan Notary Public

My commission expires October 15, 1982

Office of Nuclear Reactor Regulation
March 13, 1980

SAR Revision No. 20

Remove	Insert	Description of Revision
3.2.3-6 (8/15/70)	3.2.3-6 (2/6/80)	Brief description of hot cells added to section 3.2.3, Reactor Building.
Fig. 3.2.3.2 (11/14/72)	Fig. 3.2.3.2 (2/6/80)	Updates reactor floor plan to show location of hot cells.
---	10.6a, b (2/6/80)	New section 10.1.5 providing a description of the hot cells and information on ventilation, instrumentation and fire prevention.
---	10.8a, b (2/6/80)	New section 10.[illegible] 4 providing criteria for hot cell experiments.
---	10.31a (2/6/80)	New section 10.3.5 providing information on the experimental programs for which the hot cells are used.

Three access plugs, as shown, allow equipment transfer between the main floor and the basement when necessary. A 20 ton crane is provided for this and other handling jobs.

The personnel air lock as shown is 7 ft. wide by 8 ft. high by 16 ft. long, to accommodate a platform lift truck. The truck air lock is big enough to accommodate a truck with a 10 ton load, and as shown is approximately 10 ft. wide by 12 high by 25 ft. long.

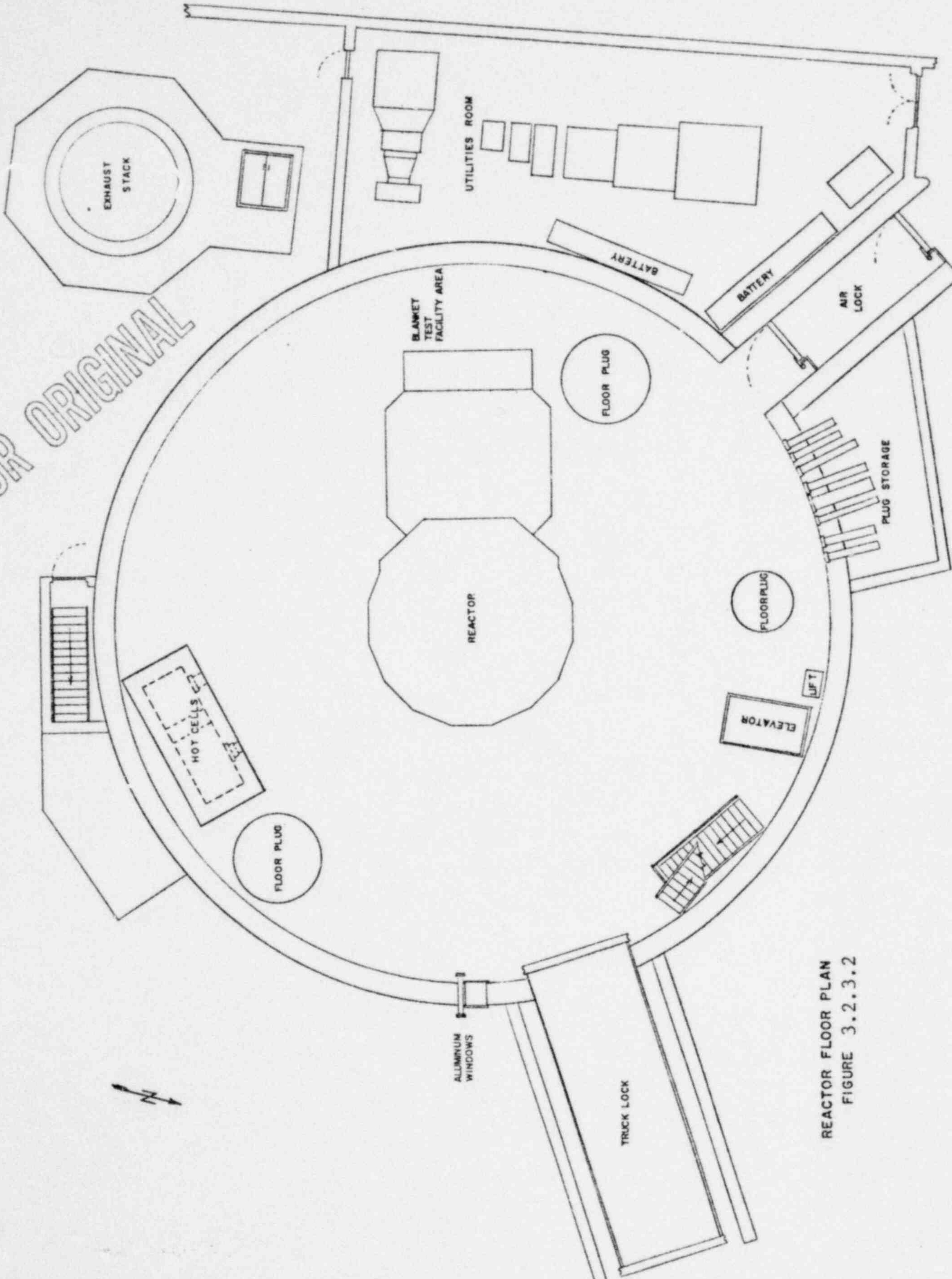
The hot plug storage in the wall of the reactor room consists of mild steel pipes welded into the gas-tight enclosure and extending outward into a shielded vault.

Two adjacent hot cells that are constructed of eighteen inch thick concrete slabs are located along the southeast wall of the first floor of the containment building. The two cells provide approximately forty square feet of floor space in which to study specimens that have been irradiated in the reactor. Access is through two roof ports that are normally closed with stepped concrete plugs. A master-slave manipulator is provided for each cell along with a high-density leaded glass viewing window. Each cell's shielding has been designed so that dose rates on the reactor floor will be maintained well within the limits as prescribed in 10 CFR 20.

iv. Second Floor

The second floor includes the reactor top, the moveable bridge, the circular platform around the building, various equipment platforms and the crane.

Access to the circular platform from the reactor floor is provided by a stairway. The top of the reactor and experiment platform is surrounded by guardrails.



REACTOR FLOOR PLAN
FIGURE 3.2.3.2

SR# O-80-4

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10.1.5 Hot Cells

10.1.5.1 Description

The hot cells are designed as a double unit located on the southeast side of the containment building opposite radial beam port 4DH5 and close to the containment wall. They are constructed of concrete and have approximate overall dimensions: 16 ft. wide, 7 ft. deep and 12 ft. high. This provides space for two cells (separated by a shielding wall), each approximately 5 ft. wide, 4 ft. deep and 10 1/2 ft. high. The back, sides and top are ordinary concrete, 18" thick, while the front is high density concrete to provide additional protection for the operators. Further shielding for the back of the cells is provided by the 2 ft. thick containment wall. The reactor main floor, on which the cells are located, is 3 ft. of ordinary reinforced concrete.

The cells are set so that they may be moved should there be any future interference with the use of beam tubes. They are assembled so as to minimize streaming, and the joints for non-removable blocks are grouted; removable blocks and shielded plugs are gasketed. Each cell has a high-density glass observation window in the front wall and access holes for the installation of remote manipulators. Interior benches and trays may be installed as required.

Access to the cells is normally through ports in the roof blocks, either manually or by the use of the building crane. Such ports may also be used for the installation inside the cells of additional local shielding if this should be necessary in order to reduce personnel exposure levels to as low as is reasonably achievable.

10.1.5.2 Ventilation

The cells are kept at a negative pressure (magnitude greater than 0.1" W.C.) with a flow of about 100 CFM per cell to the containment building ventilation system. Both inlet and outlet air passes through 2" roughing filters. The outlet air is then ducted to a fire-resistant 6" HEPA filter, a blower, and finally into the building exhaust upstream from the radiation monitors, holdup plenum and filters.

The hot cell blower is electrically interlocked with the building exhaust to shut off when the main ventilation is off (the same as other auxiliary blowers). Operation of the hot cell ventilation system is subject to the periodic inspection and approval of the Industrial Hygiene Group of the MIT Environmental Medical Service.

10.1.5.3 Instrumentation

Instrumentation is provided for measuring radiation levels and for monitoring operation of the ventilation system. A detector capable of gamma measurements up to 1000 r/hr is installed to check the dose rates for samples introduced into a hot cell. Reactor area monitors will provide backup readings. One of the reactor floor monitors (SAR paragraph 12.3.2.4.1), which alarms in the control room and at the detector site, will indicate the general radiation level exterior to the hot cell. The Reactor Radiation Protection Office also conducts periodic surveys.

Ventilation is monitored by means of a manometer on each cell, and procedures specify the minimum differential pressure required for cell use. A local alarm notifies the hot cell operator if the differential pressure is too low.

10.1.5.4 Fire Prevention

The potential for fire is minimized by limiting the amounts of flammable materials, such as paper used in reducing contamination. Decontamination of the hot cell interiors is done with non-flammable detergents, except that small amounts of solvents such as acetone may be needed to clean the manipulators. Rags and similar materials are stored in metal containers with self-closing lids. Provisions have been made to flood the cells with Halon and/or CO_2 from bottles installed at the location in the event that fire should occur.

10.2.4 Criteria for Hot Cell Experiments

10.2.4.1 Materials Activated in MITR-II

For byproduct materials activated in the MIT Reactor, the criteria are as follows:

a. Solid and liquid samples; gases and radioactive iodines not permitted. If corrosion or evaporation could lead to significant release of radioactive products, separate containment of the material must be provided to limit the release.

b. Activities of the following types are permitted:

   i. examination
   ii. mechanical and physical testing
   iii. packaging and repackaging of materials
   iv. dividing materials into smaller lots
   v. taking small samples for assay or fluence determination (other types of separation of byproduct materials is not permitted).

c. Proposed uses of the hot cells are reviewed and approved in accordance with the applicable parts of Technical Specification paragraphs 7.5.1e (iii), 7.9 and 6.1.

d. Proposed uses of the hot cells must comply with the written procedures established by the MIT Reactor Safeguard Committee concerning approvals, ventilation, shielding, handling, and other requirements. These procedures provide for limitation of dose rates and exposures based on calculated shielding factors and on measurements of actual radiation levels. A record book is maintained for cell utilization and maintenance.

e. Containment integrity will be maintained when any activity is being conducted in a hot cell.

10.2.4.2 Materials Activated in Other Reactors

For byproduct materials activated in other reactors and brought to MIT for utilization in one of the hot cells, the criteria are as follows:

a. Solid material only in any chemical form

b. Activity limits for materials activated in other reactors:

   i. 1,000,000 Ci total at any time
   ii. 100,000 Ci for any one isotope
   iii. 10,000 Ci for any one sample or specimen, and the dose rate at one meter unshielded shall not exceed 1000 rads/hour.

c. Activities of the following type are permitted:

   i. Examination

   ii. Mechanical and physical testing

d. Proposed uses of the hot cells are reviewed and approved in accordance with the applicable parts of Technical Specification paragraphs 7.5.1e (iii), 7.9 and 6.1.

e. Proposed uses of the hot cells must comply with the written procedures established by the MIT Reactor Safeguard Committee concerning approvals for acquisition, control, use and inventorying of materials activated in other reactors as well as other requirements for hot cell use specified in the above paragraph 10.2.4.1(d).

f. Containment integrity will be maintained when any activity is being conducted in a hot cell.

10.3.5 Hot Cells

10.3.5.1 Materials Activated in MITR-II

Utilization of the hot cells for byproduct materials formed by activation in the MITR-II is for such activities as inspection and examination of experiments irradiated in the reactor and of reactor components and structures, such as control blades or irradiation thimbles. They may also be used for packaging of radioisotopes made in MITR-II, for transferring materials from irradiation capsules to shipping containers, for assay sampling and similar purposes.

10.3.5.2 Materials Activated in Other Reactors

It is expected that the hot cell facilities at the MIT Research Reactor will prove useful for necessary activities in material science research. Inspection, examination, and the mechanical and physical testing (e.g. tensile, fatigue, impact, etc.) of solid byproduct materials activated in other reactors will be performed. Comparisons may be made with similar or other materisls activated in the MIT Research Reactor.