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AN INTERDEPARTMENTAL CENTER OF
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L. CLARK, JR.
Director of Reactor Operations

January 4, 1985

Mr. Cecil O. Thomas, Chief
Standardization and Special Projects Branch
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: SAR Revision No. 31, License No. R-37, Docket No. 50-20

Dear Mr. Thomas:

Massachusetts Institute of Technology submits herewith Revision No. 31 to the "Safety Analysis Report for the MIT Research Reactor (MITR-II)", Report No. MITNE-115 (October 22, 1970), as amended. The purpose of the revision is to update the SAR so that it will reflect some minor changes that have been incorporated in procedures and related documents.

Enclosure 1 describes the revisions and provides instructions for SAR page replacements. The revised pages, with margin lines to indicate the changes, are also enclosed.

The proposed SAR changes have been approved by the MIT Reactor Safeguards Committee.

Sincerely,

Lincoln Clark, Jr.

Lincoln Clark, Jr.

LC/gw

Enclosures: SAR Revision No. 31
Revised Pages

cc: MITRSC (with enclosure)
USNRC-NRR (1 signed and 12 copies, with enclosures)
USNRC-DMB (with enclosures)
USNRC-OMIPC (with enclosures)

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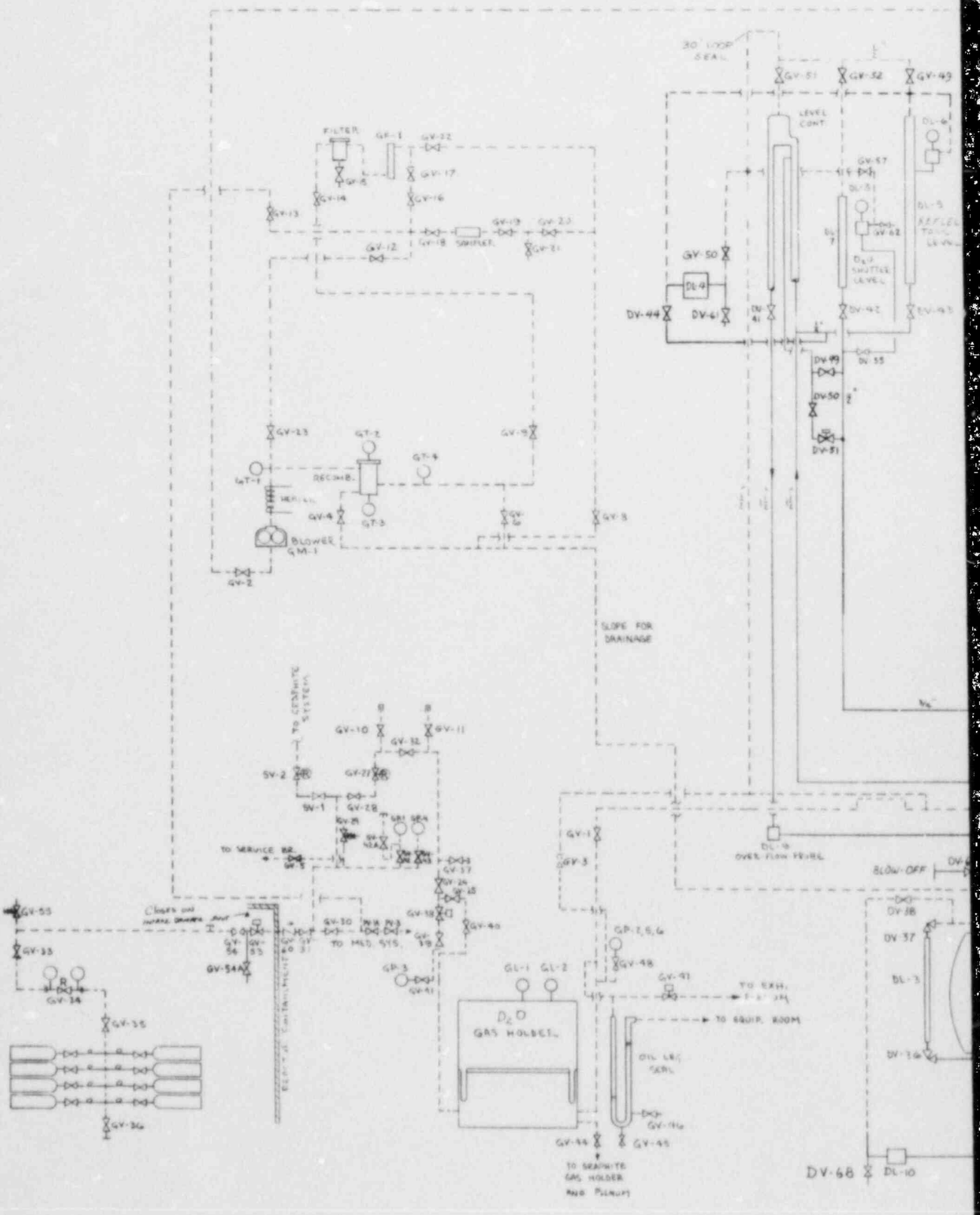
Enclosure 1

Mr. C. Thomas, USNRC, Division of Licensing, (1/4/85)

SAR Revision No. 31

Remove Page	Insert Page	Description of Change
Fig. 9.3.1-1 (9/24/76)	Fig. 9.3.1-1 (9/16/83)	Figure updated to include valve DV-69 which is normally locked open but can be used to isolate the helium cover gas system when the blow off patch is serviced.
11.3-2 (3/17/72)	11.3-2 (10/26/84)	The name of the checklist used to document QA activities has been made more descriptive of its use, i.e. "Quality Assurance Approval Requirements Checklist".
11.3-3 (5/6/82)	11.3-3 (10/26/84)	A footnote has been added as a reminder that the uncertainty allowed in the fuel density tolerance was actually 1.10 rather than the 1.05 envisaged when the SAR was first written.
11.10-3 (3/17/72)	11.10-3 (10/26/34)	Same as 11.3-2.
11.17-2 (6/30/78)	11.17-2 (10/26/84) & 11.17-3 (10/26/84)	Table 11.17-1 revised to reflect records retention requirement of nuclear insurer (policy termination plus 10 years). Retention time for Items 2 and 5 reduced to reflect actual requirements. Name of checklist in Item 17 updated.
(none) (2/10/81)	11.17-4 (10/26/84)	Fig. 11.1-1 revised to show MIT Radiation Protection Committee (inadvertently omitted) and changed Environmental Medical Service reporting structure.



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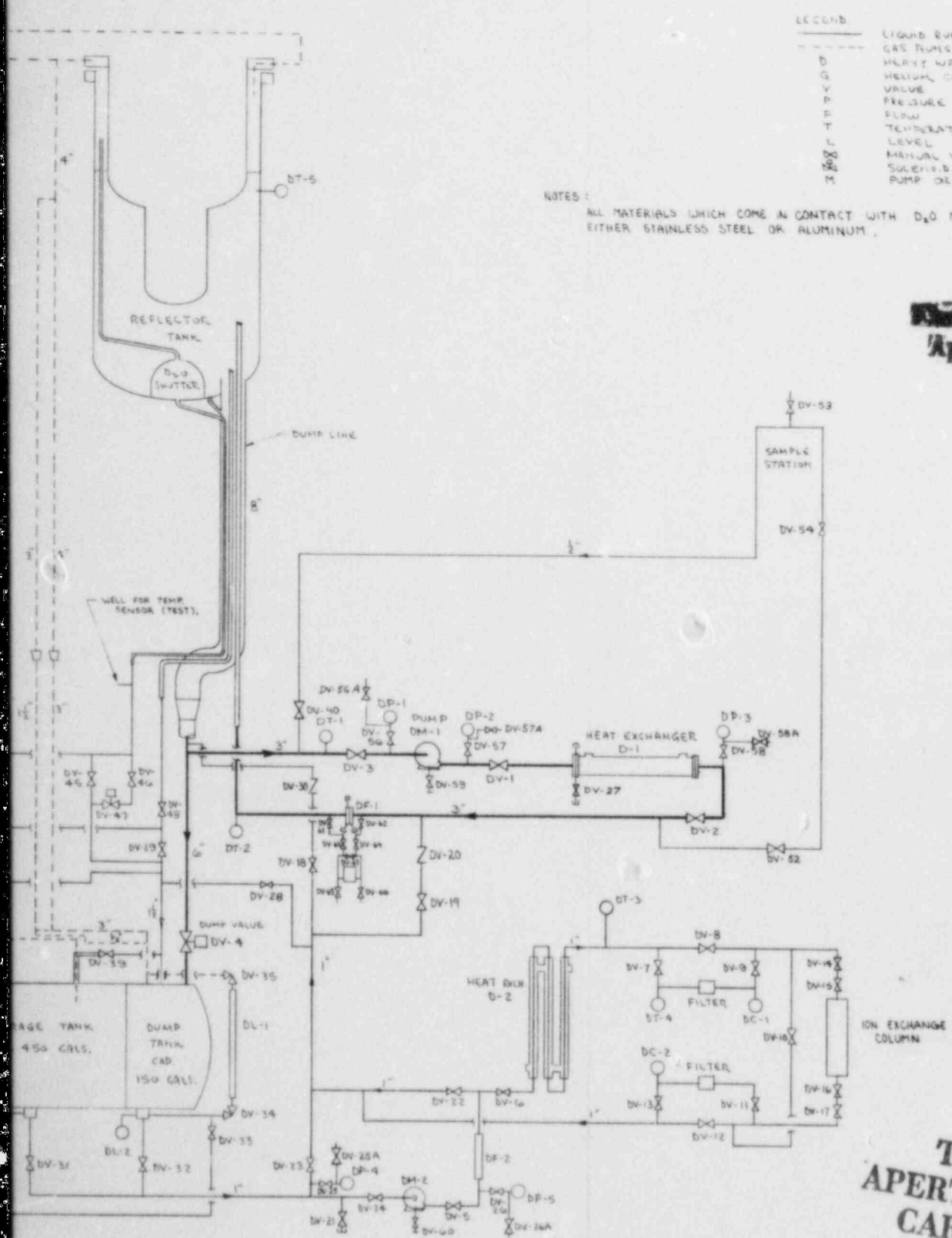

RE 9.3.1-1
CTOR FLOW SYSTEM

Committee, or an application to the NRC for an amendment to the Technical Specifications.

Assurance that the approved design is correctly translated into specifications, and installation, testing and operating drawings, procedures and instructions is accomplished by requiring that all such documents which fall within the scope of the quality assurance program, as defined in Subsection 11.2, shall be checked by a knowledgeable individual other than the one who prepared the document and that they shall be signed or initialed by both individuals.

In order to facilitate the preparation and revision of documents, to assure the appropriate reviews and approvals, and to document operation of the quality assurance program, a "Quality Assurance Approval Requirements Checklist" is used for specifying and recording the required actions and QA approvals. The checklist is used for the purposes of this subsection, Design Control, and also for most of the activities described in the following subsections.

The thermal and hydraulic characteristics of the MITR-II design are dependent in large part upon the assurance that the fuel design specifications reflect the uncertainties (hot channel factors) incorporated in the design calculations. As described in this SAR, Section 3.3.4, uncertainties are included in the derivations of both the safety limits and the operating limits. For the former case, equation 3.3.4.1-9 was derived; it contains the hot channel factor F_{HC}, which was estimated in the SAR but which will be measured during the preoperational tests both to determine its value and also the associated uncertainties. For F_{HC}, the fuel hot channel factors are given in Table 3.3.4.3.3-2, under enthalpy factors.

For the operating limits, equation 3.3.4.2-11 was derived; it contains the core design constant G, an upper limit for which was estimated in the SAR (Section 3.3.4.3.3, page 3.3.4-38) but which will be determined during the startup experiments. The uncertainties for each of the parameters in G are given in Table 3.3.4.3.3-2, under film temperature difference and heat flux factors.

For both the safety limits and the operating limits, the factors associated with the fuel are the channel tolerance, the eccentricity, and the fuel density tolerance. The channel tolerance uncertainties are based on the channel width specifications, and the eccentricity is based on the clad specifications, neglecting the small additional eccentricity which might be introduced by fin tolerances. The fuel density uncertainty in F_{HC} is based on the tolerance in the U-235 loading per plate. For G, not only the total plate loading but also the local variations in U-235 density due to core area, core thickness, and U-235 segregation must be considered. No quantitative specification is set on the permissible variation from the plate average due to U-235 segregation. However, the specifications will require that the variations in U-235 density from all four causes will not combine to cause a local heat flux in excess of a specified level. This will be controlled by comparing the area of maximum U-235 density on representative plate radiographs with test specimens fabricated to show average and limiting densities, and X-rayed along with the plate. A densitometer will be utilized to resolve questionable cases. An upper limit of +5% variation in the local heat flux compared to the nominal will be used to set the specification, but this may be relaxed if the fuel fabricators show that it is too stringent. In such event, the uncertainty of 1.05 to cover the fuel density tolerance will be increased correspondingly*, and the new value will be used in the evaluation of G during the preoperational tests (See SAR Section 3.3.4.3.3, page 3.3.4-39).

*1.10 has been used in fuel fabrication specifications and in the Technical Specifications (p. 3-6).

Work performed by Reactor Division personnel, including installations, modifications, maintenance, repairs, and refueling, shall also be subjected to inspections and tests. Before a job is considered complete, the supervisor, where necessary, initiates a "Quality Assurance Approval Requirements Checklist", if this has not already been done. The Shift Supervisor assures that the above form has the necessary approvals before he authorizes startup, startup after normal weekly checklist, startup after special test as specified, continued operation, etc. For those activities where special forms or data sheets are routinely in use, such as refueling, the special form or data sheet provides for two signatures.

All failures to meet the requirements of inspections or tests, which cannot be corrected, shall be reported to the Reactor Director or Co-Director, or their respective designees, as appropriate, prior to operation.

Some activities cannot be proven acceptable by test methods and must be subject to inspection by a second individual to assure satisfactory completion of the work. Such activities include the evaluation of experiments and irradiation series and the correct placement of fuel elements in the core on refueling. In these cases, the person performing the evaluation or fuel placement signs the evaluation form or instruction sheet as does the person approving the evaluation or witnessing the fuel transfer.

The MITR-II preoperation tests, criticality studies, and startup experiments are specified in Section 14. Written procedures and written reports of the test results will be prepared. A qualified supervisor may be assigned by the Co-Director to be responsible for a given test. He will prepare the written procedures, stating the purpose of the test, study, or experiment, the acceptance criteria as given in the SAR, Technical

Table 11.17-1

QUALITY ASSURANCE RECORDS

Record	Normal Location	Responsibility	Retention Code*
1. Reactor Operations Log	Control Room	Reactor Supervisors	A
2. Mechanical Maintenance Log	Maintenance Office	Maintenance Foreman	B
3. Instrument/Equipment History Log	Control Room	Reactor Supervisors	A
4. Instrument/Equipment Malfunction Worklist	Control Room	Reactor Supervisors	A
5. System Test and Calibration Book	Control Room	Operations Superintendent	B
6. Purchase Orders - Stock Items	Business Office	Business Manager	C
7. Purchase Orders - Fuel (with inspection records and certifications)	QA File (previously Business Office)	Director for Reactor Operations	B
8. Purchase Orders - Other	QA File (previously Business Office)	Director for Reactor Operations	B
9. Company or personnel qualifications	With applicable P.O.	Director for Reactor Operations	B
10. Irradiation and experiment requests, reviews, approvals and shipping forms	Operations Office	Operations Superintendent	A
11. MITR Safeguards Comm. records (Minutes, approvals, annual report, unusual occurrence reports)	Headquarters Office	MITRSC Secretary	A
12. Engineering drawings, specifications and procedures	QA File Room	Operations Superintendent	B

Table 11.17-1

QUALITY ASSURANCE RECORDS
(Continued)

Record	Normal Location	Responsibility	Retention Code*
13. Electrical and Electronics drawings, specifications and procedures	QA File Room	Electronics Supervisor	B
14. Design reviews: MITR-II	QA File Room	Co-Director for MITR-II	A
15. Design reviews: Other	QA File Room	Director for Reactor Operaitons	B
16. MITR-II initial test reports	Headquarters Office	Director for Reactor Operations	A
17. Quality Assurance Approval Requirements Checklist	QA File Room	Director for Reactor Operations	B
18. Audits	Dir. or Co-Dir. Office	Director for Reactor Operations	A

*Retention Code: A - Termination of reactor's nuclear liability insurance, plus 10 years;
B - until item disposed of, plus 5 years;
C - 2 years

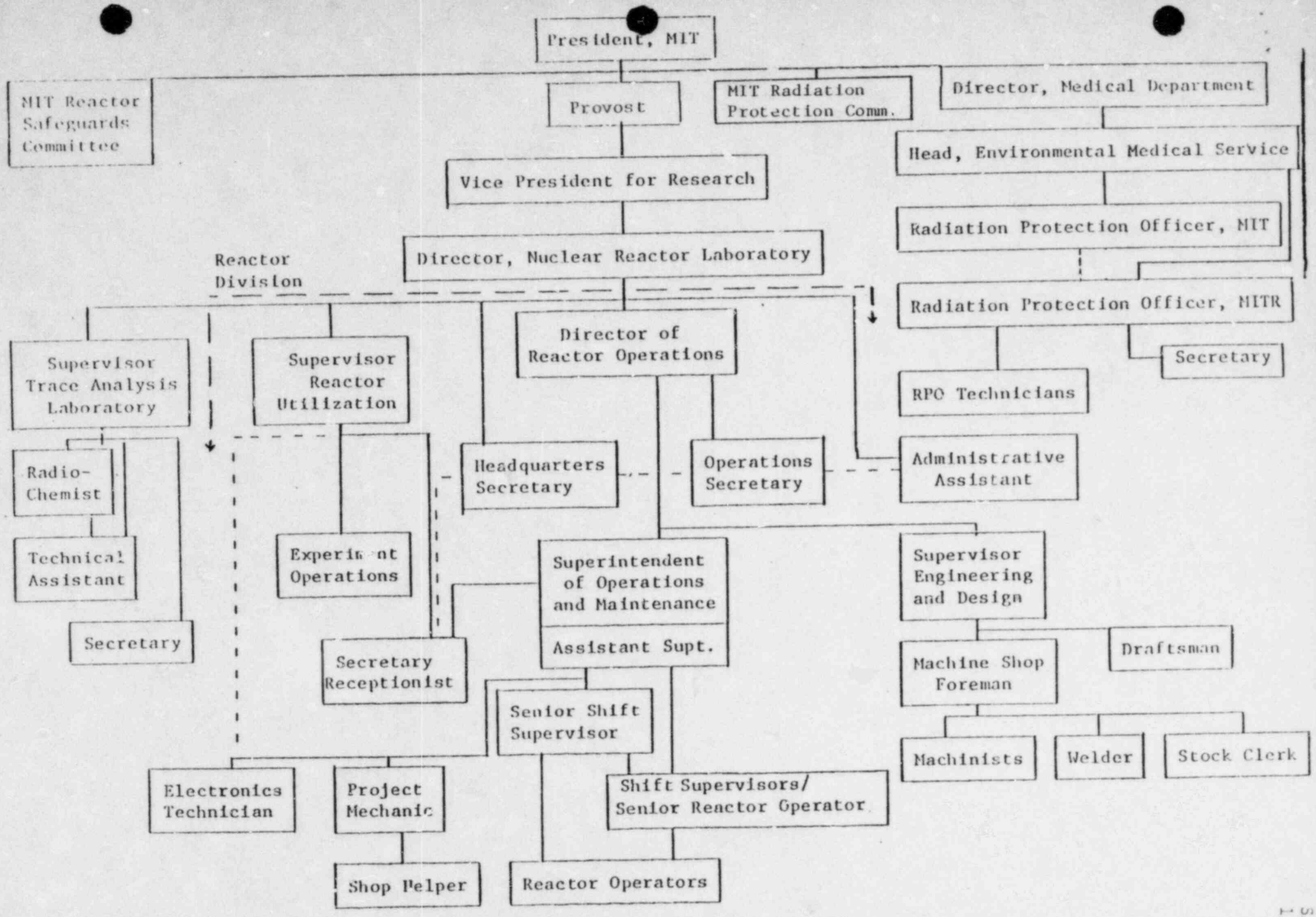

Fig.11.1-1 MITR Organization Chart