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NUCLEAR REACTOR LABORATORY
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July 8, 2003

U.S. Nuclear Regulatory Commission
Washington, DC 20555
Attn: Document Control Desk

Subject: Reportable Occurrence 50-20/2003-1, Violation of Technical Specification No. 7.2.1

Gentlemen:

The Massachusetts Institute of Technology hereby submits this ten-day report of an occurrence at the MIT Research Reactor (MITR) in accordance with paragraph 7.13.2(d) of the Technical Specifications. An initial report was made by telephone to Mr. Alexander Adams on 30 June 2003.

The format and content of this report are based on Regulatory Guide 1.16, Revision 1.

1. Report No.: 50-20/2003-1

2a. Report Date: 30 June 2003

2b. Date of Occurrence: 29 June 2003

3. Facility: MIT Nuclear Reactor Laboratory
138 Albany Street
Cambridge, MA 02139

4. Identification of Occurrence: Technical Specification No. 7.2.1(a) specifies a minimum shift coverage of two licensed individuals, one of whom shall be present in the control room. On 06/29/03, the control room operator was asleep for about thirty minutes and hence the required coverage was not achieved.

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5. Conditions Prior to Occurrence:

The reactor was operating routinely at 3.9 MW for on-going research and training. The reactor had been at power sufficiently long to be close to xenon equilibrium. The reactor's power level was being maintained by the analog automatic controller.

The shift complement consisted of one reactor supervisor (SRO) and one reactor operator (RO). A standard shift is eight hours. The operator usually covers console for five hours and the supervisor for three.

The reactor containment building entrances were configured according to post-9/11 protocols.

6. Description of Occurrence.

The SRO relieved the RO at 0411. As part of the turnover, the RO took possession of the radio-phone that is held by the SRO/RO not on console. The RO then left the control room and went to the reactor operations office which is outside the reactor containment building. The SRO took and logged hourly readings for both 5 a.m. and 6 a.m. with the last entry being at 0609. He then fell asleep sometime between 0609 and 0615. At 0615, while conducting a routine security walk through of the building perimeter, the RO tried to contact the SRO. The radio-phone was used, but there was no response. A second attempt also resulted in no response. The RO then called the control room on one of three possible telephone extensions. Again, there was no response. The RO then went to the containment building entrance in order to: 1) signal the control room; and 2) communicate with the control room via the airlock intercom station. There was still no response. The RO then returned to the operations office and repeated several of her earlier actions as well as using both a pager and the building general page. There was still no response. It was now 0640. The RO, acting in accordance with approved procedure, contacted both the MIT Police and the on-call reactor supervisor. Also, at 0640, the SRO awakened and realized that he had fallen asleep. However, he was not aware that the RO had been trying to contact him. He performed a reactor reshim (completed at 0647). In the interim, the on-call reactor supervisor directed the RO to shut down the reactor via a remote scram if the SRO in the control room could not be immediately contacted. The RO called the control room via the radio-phone while proceeding to the remote scram location. The RO received a response and therefore did not scram the reactor. Rather, the RO went to the control room and verified that the SRO was both okay and alert. The RO then contacted both the MIT Police and the on-call supervisor, who was now en route to MIT. The on-call supervisor then contacted

the control room and spoke with the SRO as well as with the RO. The methods of communication that had been attempted by the RO were all tested and verified operational except that the bell on the telephone was found to be at its lowest setting. (Note: The bells on the other telephone extensions that ring in the control room were on normal settings.) The SRO was directed to meet with the Reactor Superintendent on 6/30/03. It was verified that the reactor had operated normally for the entire time and that the SRO was now fully alert. The SRO continued to cover console until relieved at 0808 by the on-coming shift.

7. Description of Apparent Cause of Occurrence:

The apparent cause of the occurrence was human fallibility in that the SRO fell asleep for approximately thirty minutes. The SRO worked a total of 48.5 hours for the week ending 29 June 2003. These were: Monday – 11 hours; Tuesday – 4 hours; Wednesday - 8 hours; Thursday – 0 hours; Friday – 8 hours; Saturday – 8.75 hours; Sunday – 8.75 hours. The M-F hours were day shifts; the others were night shifts. (Note: Day shift is 0800-1600; swing is 1600-2400; and night is 0000-0800.) The SRO stated that he had slept from 0900-1700 and from 2100-2300 on 06/28/03. He had not used alcohol, drugs, or any medication (prescription or over-the-counter). The SRO is one of several individuals who voluntarily cover night shifts on weekends. (Note: Night shifts that occur during the week are covered by permanently assigned people.)

8. Analysis of Occurrence

Nothing of radiological significance occurred. The reactor was operating on analog automatic control. This system causes reactor power to be maintained constant at an operator-specified set point. It does this by withdrawing the regulating rod to compensate for the buildup of fission product poisons and fuel burn-up. This process continued during the interval of the operator's inattentiveness. Had the controller not been able to provide compensation, the accumulating fission products would have caused a slow decrease in reactor power and a loud alarm would have been activated. Also, both the nuclear and process systems safety systems were fully operational and would have caused a shutdown if one had been warranted.

9. Corrective Action:

a) Near Term

i. The SRO in question will not be allowed to operate the reactor controls unless a second licensed individual is present in the control room. This restriction remains in effect until a modification is approved by NRC. (Action in effect 30 June 03.)

ii. Positive communication will be established between the licensed operator who is at the reactor controls and another member of the reactor staff (normally the other licensed person who makes up the shift complement) approximately every thirty minutes whenever the console operator is alone in the control room. The restriction remains in effect until an alternate method to ensure alertness is implemented or otherwise deemed unnecessary. Any such alternate method will first be discussed with NRC. (Action in effect 1 July 03 for swing and night shift; in effect 7 July 03 for all shifts.)

iii. See attached Addendum.

iv. MITR Management will solicit input from all licensed personnel on possible methods for ensuring alertness while on console. (To be completed by 31 July 03.)

v. The NRL Director discussed this ROR with the Chairman of the MITRSC and with senior members of the MIT Administration. (Action completed 2 July 03.)

vi. Inspected the telephone that was used by the RO to contact the SRO. It was found that the lever that controls the loudness setting for the bell could be inadvertently moved. The lever is now permanently set to the loudest level. (Action completed 7 July 03.)

b) Long term

i. A review of this occurrence was held with all licensed personnel with emphasis on individual responsibility. (Action completed 2 July 03.)

ii. Convene a meeting of a subgroup of the MIT Reactor Safeguards Committee for the purpose of both reviewing this occurrence and evaluating the corrective actions. (MITRSC Subcommittee meeting scheduled for Wednesday, 9 July 03.)

iii. Require the SRO in question to have a medical physical to determine if there is any predisposition to a sleep disorder. (To be completed by 31 July 03.)

iv. Survey reactor operations staff and non-licensed support staff who work in the reactor administrative building that is adjacent to the

reactor containment building and which draws ventilation from a common origin to determine if anyone else is excessively drowsy. The reason for this survey is to rule out an environmental factor. (To be completed by 31 July 03.)

v. MIT Environmental Health and Safety will perform an air-quality check of the control room, also for the purpose of ruling out an environmental factor. (To be completed by 31 August 03.)

vi. Identify and consider implementation of a method to insure alertness while on the back shifts such as that enumerated under Action a(ii) above. This might be a more frequent console turnover during a shift or use of an audible alarm that has to be periodically reset or some other option. We note that this action has both positive and negative aspects. The positive is that it would provide alertness. The negative is that it has the potential to distract the console operator. This action might also be superfluous in that:

- The night shift is normally covered by permanently assigned individuals. Day shift people only rotate through night shift if one of the regulars is sick or on vacation or, as was the case here, for weekend coverage.

- The individuals who routinely cover night shifts are physically acclimated to that shift and hence might find the action contemplated here to be unnecessary and hence distractive.

- Individuals who change from days to nights report that the second night shift is often the most difficult in terms of alertness. We note that this ROR did occur during such a shift. Hence, the action considered here might be of value for a special case – the first few nights some one has rotated to a night shift.

- This is the only such occurrence in the 45 year operating history of the MIT NRL.

To summarize, there are arguments both for and against this proposed action. These will be discussed with the MIT Safeguards Committee. (To be completed by 30 September 03.)

10. Failure Data:

There have been no previous occurrences of this type.

Sincerely,

John P. Foster
Asst. Superintendent for Operations
MIT Research Reactor

Edward S. Lau
Superintendent for Operations
MIT Research Reactor

Thomas H. Newton
Reactor Engineer
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