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NE-ID--BEA-ATR-2008-0028

FINAL
Rev. 1

Occurrence Report
After 2003 Redesign

Advanced Test Reactor

(Name of Facility)

Category "A" Reactors

(Facility Function)

Idaho National Laboratory — Battelle Energy Alliance, LLC

(Site) (Contractor)

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(Authorized Classifier (AC))

1. Occurrence Report Number: NE-ID--BEA-ATR-2008-0028

Seismic Concerns Result in ATR Shutdown and Potential Inadequacy in the Safety Analysis (PISA)

2. Report Type and Date: FINAL

	Date	Time
Notification:	11/04/2008	17:33 (ETZ)
Initial Update:	11/04/2008	18:51 (ETZ)
Latest Update:	12/10/2008	18:40 (ETZ)
Final:	12/10/2008	18:40 (ETZ)
Revision 1:	12/11/2008	10:07 (ETZ)

3. Significance Category: 3

4. Division or Project: ATR Programs

5. Secretarial Office: NE - Nuclear Energy, Science and Technology

6. System, Bldg., or Equipment: Advanced Test Reactor, TRA-670

7. UCNI?: No

8. Plant Area: Utility Battery Room

9. Date and Time Discovered: 10/16/2008 11:45 (MTZ)

10. Date and Time Categorized: 10/30/2008 17:05 (MTZ)

11. DOE HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

12. Other Notifications:

Date	Time	Person Notified	Organization
10/30/2008	17:05 (MTZ)	R. Denning	DOE-ID

13. Subject or Title of Occurrence:

Seismic Concerns Result in ATR Shutdown and Potential Inadequacy in the Safety Analysis (PISA)

14. Reporting Criteria:

3B(2) - Declaration of a potential inadequacy of the documented safety analysis (a potential positive USQ), per 10 CFR 830.203(g).

15. Description of Occurrence:

On October 16, 2008, at 1233 the ATR was shut down due to seismic concerns that were raised as a result of the Life Extension Program (LEP) Seismic Upgrade report. ARES Corporation Report No. 060230101-002, Rev. 0, is the product of an experience-based seismic qualification of ATR seismic Category 1 equipment. Seismic Category 1 equipment are safety-related systems, structures, and components (SSC) relied upon in the ATR safety basis to mitigate the effects of the safe shutdown earthquake (SSE).

The decision to shut down the ATR was based on indication that the performance of the cinder block wall adjacent to the utility battery 670-E-58, could not be demonstrated to keep the seismically induced complete loss of flow event beyond design basis as described in the Upgraded Final Safety Analysis

Report (UFSAR). The ATR was shut down and moved to a defueled mode, while a team of ATR facility management and engineering personnel performed a screening of the seismic qualification report for the potential of systems to not have sufficient capacity to satisfy Performance Category (PC)-4 seismic design and evaluation criteria and not meet the current safety basis. The team screening of the seismic qualification report resulted in the declaration of a potential inadequacy in the safety analysis (PISA), ATR Complex-USQ-2008-805, on October 30, 2008, and DOE-ID was notified.

The delay between the initial action to shut down and defuel the ATR and the declaration of the PISA was due to this team screening and extent of conditions review. Seven SSCs were identified as having nonconforming conditions relating to the ATR safety basis assumptions, and the discrepancies would be required to be resolved prior to declaring the SSCs operable: 1) Utility uninterruptible power supply (UPS) battery room block wall, 2) primary coolant pump motor floor area wall, 3) plant protection system (PPS) cabinet anchorage, 4) emergency firewater supply diesel pumps battery racks, 5) DC emergency coolant pump (ECP) starting relay, 6) deepwell #3 lube oil pump mounting, and 7) six-tier cable tray.

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16. Is Subcontractor Involved? No

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17. Operating Conditions of Facility at Time of Occurrence:

The ATR was operating at nominal full power for Cycle 143A-1

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18. Activity Category:

03 - Normal Operations (other than Activities specifically listed in this Category)

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19. Immediate Actions Taken and Results:

Appropriate levels of BEA management and DOE-ID personnel were notified of this event.

The ATR critical operation was shut down and irradiated fuel was removed from the reactor core.

Technical Safety Requirements (TSR)-186 equipment operability requirements must be satisfied to change Reactor Operating Conditions; no additional controls are required.

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20. ISM:

2) Analyze the Hazards
3) Develop and Implement Hazard Controls

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21. Cause Code(s):

A1B1C02 - Design/Engineering Problem; Design input Less Than Adequate (LTA).; Design input obsolete

A1B3C02 - Design/Engineering Problem; Design / documentation LTA; Design/documentation not up-to-date
A4B5C04 - Management Problem; Change Management LTA; Risks / consequences associated with change not adequately reviewed / assessed

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22. Description of Cause:

Apparent cause analysis was performed per LWP-13845, Cause Analysis Program. The following cause codes are associated with the seismic issues identified by the review team. Note that two of the potential issues identified were actually deemed to not be discrepancies and therefore no causes or corrective actions are discussed.

A4B5C04 - Risks/consequences associated with change not adequately reviewed or assessed. This cause code is appropriate for issues associated with the cinder block wall adjacent to the utility battery 670-E-58. The review of the potential effect on the plant resulting from the modifications associated with the structures was not effective in assessing the risk. The modifications and the processes which controlled them are legacy issues. Current engineering and review processes are now more robust and it is not likely that this same type of error would be repeated, therefore no actions, other than correcting the specific discrepancy will be taken.

A1B1C02 - Design input obsolete. This cause code is appropriate for the issues involving the diesel firewater pump batteries, the wall between the primary coolant pump motor area and the electrical switchgear room, and the 6-tier cable tray. The original designs for the firewater pump starting battery racks, the wall between the primary coolant pump motor area, and the 6-tier cable tray met specifications, however subsequent changes to seismic requirements made these designs not compliant with the new standards.

A1B3C02 - Design/documentation not up-to-date. Drawings for the attachment and anchorage of the PPS cabinets to the building structure (floor) did not fully detail the anchorage design. Attempts to determine the adequacy of the existing anchorage would involve some actual destruction of the in place cabinets, therefore additional bracing and anchorage was installed.

The discrepancies on the #3 deepwell pump and emergency coolant pump starting relay were determined to not be issues.

The seismic vulnerabilities identified by the team screening and extent of conditions review and associated resolutions are summarized as follows:

The west and south block walls for the battery room in the first basement of ATR did not have adequate anchorage to the ceiling. Engineering modifications documented in EJ 7.0-1 element #1 provided for design and installation of additional metal braces attached to the ceiling with concrete anchors and attached to the top of the wall with through-wall threaded anchors. Completion of this engineering modification resolves this seismic vulnerability. An independent review of this engineering design was performed by an outside contractor who is highly respected for seismic related analyses. The contractor concluded that the design was adequate.

The PPS logic and comparator cabinet anchorage may not have been sufficient to handle seismic loads. Engineering modifications associated with EJ 7.0-1 element #2 provides for design and installation of seismically qualified anchors to the base of the cabinets to ensure secure seismically qualified bases. Completion of this engineering modification resolves this potential seismic vulnerability.

A block wall containing the power cables for the M-11 emergency pump may not have had adequate capacity in the brackets at the south end of the wall at the interface between the canal structure and door D-323. Engineering modifications associated with EJ 7.0-1 element #5 provide for an additional bracket with concrete anchors attached to the canal structure and welded to the heavy structural channel framing in the motor floor area wall. Completion of this engineering modification resolved this seismic vulnerability.

The ATR second basement 6-tier cable tray requires seismically qualified anchorage. Work Order (WO) 122819 and Drawing 600849 provide for installation of additional anchorage for this cable tray. This work order has been completed which resolves this seismic vulnerability.

Additional mechanical restraint was needed to keep the starting batteries for the TRA-688 diesel firewater pumps from tipping and rolling during a seismic event, which may allow contact between adjacent batteries within a rack. Engineering modifications documented in EJ 7.0-1 element #3 and engineering calculations documented in Engineering Calculations and Analysis Report ECAR-415, "Analysis of TRA-688 Battery hold-down Straps," provide for installation of additional hold-down straps to prevent seismic interaction. Completion of the installation of these straps resolved this seismic vulnerability.

A concern was identified with anchors for the Deep Well #3 oil cooler plate that the sleeves of the expansion anchors were not fully embedded in the concrete, rather a portion is protruding into the unistrut. This embedment may compromise the tensile capacity of these anchors. This concern was evaluated by ATR engineering and documented in Technical Evaluation TEV-343, Deep Well #3 Oil Cooler Anchorage. These anchors, as installed, provide adequate embedment to achieve the small required pullout force.

A concern was identified with respect to the monitoring relay CR2 that must function properly to start the M-11 emergency coolant pump on demand. This concern was that a seismic event may cause the CR2 relay to chatter, and that chatter may inhibit relay TDA1 pickup, and delay the emergency pump startup. ATR Engineering evaluated this concern as documented in TEV-346, ATR DC Emergency Coolant Pump Controller Relays Operation. This evaluation concludes that the seismically induced contact chatter on CR2 will not impede relay TDA1 from energizing and starting the emergency coolant pump. This TEV-346 has resolved the concern for delayed start of the M-11 emergency coolant pump during a seismic event.

An independent review of the ATR engineering extent of conditions review process was performed by the Site Technical Authority. Three senior engineering leadership personnel performed the independent review and concluded that both the approach and the results were adequate. This independent review is documented in TEV-345, Engineering Technical Authority Review Of Response Of ATR Programs Engineering To Experience-Based Seismic Qualification Report.

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23. Evaluation (by Facility Manager/Designee):

These seismic concerns resulted in a programmatic impact of 480.6 hours of lost reactor operating time.

Unreviewed safety question (USQ) determination for PISA ATR-Complex-2008-805 is negative. The operability of the seven SSCs that were identified by the PISA as nonconforming to the ATR safety basis assumptions has been restored or adequately documented. The restoration activities are described in the description of cause above. Restoring the operability of these seven nonconforming SSCs ensures

that the ATR operates within its safety basis analysis. Operation of the ATR poses no additional risk to the workers, public or environment. The ATR TSRs provide the necessary controls for safety plant operation as documented in the ATR safety basis. No interim controls were imposed by the PISA.

The paragraph above serves as the required evaluation of the safety of the situation (ESS).

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24. Is Further Evaluation Required?: No

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25. Corrective Actions
Local Tracking System Name: ICAMS

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Actions already taken are listed in the "Corrective Actions" section of the ICARE. There are no further actions necessary associated with this ORPS report.	
Target Completion Date: 12/09/2008	**Tracking ID:** ICARE 43477

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26. Lessons Learned:

A program review is required to ensure changes in requirements, such as seismic standards, are adequately evaluated against safety basis assumptions on plant design and accident analysis.

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27. Similar Occurrence Report Numbers:

None

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28. User-defined Field #1:

GB10

29. User-defined Field #2:

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30. HQ Keyword(s):

01B--Inadequate Conduct of Operations - Loss of Configuration Management/Control
01H--Inadequate Conduct of Operations - Inadequate Safety Analysis/USQs
01N--Inadequate Conduct of Operations - Inadequate Job Planning (Other)
05B--Mechanical/Structural - Seismic Qualification Deficiency
11F--Other - Inadequate Design
12A--EH Categories - Authorization Basis
14D--Quality Assurance - Documents and Records Deficiency
14F--Quality Assurance - Design Deficiency

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31. HQ Summary:

The ATR was shutdown, defueled, and a PISA declared after investigative efforts identified seismic concerns. Specifically, concerns with the anchorage of a cinder block wall adjacent to the utility battery 670-E-58 indicate that performance during a seismic event may not be as described in the ATR safety basis, and that a seismically induced complete loss of flow accident may not be beyond design basis as described in the UFSAR. A USQD was negative.

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32. DOE Facility Representative Input:

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33. DOE Program Manager Input:

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34. Approvals:

Approved by: MCDONOUGH, MARTIN B, Facility Manager/Designee
Date: 12/10/2008
Telephone No.: (208) 533-4321