

# DOE-ID NEPA CX DETERMINATION Idaho National Laboratory

## SECTION A. Project Title: Bond Strength Laser Shock Testing

## SECTION B. Project Description:

The proposed action is to install a laser shock system in the hot cell at the Hot Fuels Examination Facility (HFEF) at Idaho National Laboratory's (INL's) Materials and Fuels Complex (MFC). The system is needed to study bond strength of cladding on nuclear fuel associated with the Reduced Enrichment Research and Test Reactor (RERTR).

The Laser Shock System delivers a high energy pulse that generates a shock wave on the surface of a mini fuel plate. The energy pulse travels into the plate until a velocimeter detection head senses movement on the plate surface indicating mechanical debonding of the cladding from the fuel meat. No emissions result from the debonding.

It is anticipated that multiple test points on a single plate would occur in order to gather statistical information concerning plate bond strength. The environmental impacts of post-irradiation examination of fuel for the RERTR program at HFEF, including waste management, have been disclosed in environmental checklist Idaho National Laboratory (INL)-13-039. Other programs or projects proposing to use the laser shock system would require project specific environmental checklists.

A basic sketch of the proposed system is shown in Figure 1. The system would consist of a vendor provided shock and detection laser system located in the HFEF operating corridor near shield window 8M. The high powered shocking laser beam would be directed into the hot-cell by a laser feed-through with appropriate turning mirrors and focusing lens. A specially designed conversion box containing fiber optics to transfer the detection laser light through a cell wall feed-through to the HFEF hot cell would be included. The shocking laser light transmitted into the hot cell would be turned by a mirror and focused on an aluminum-clad UMo mini-fuel plate specimen (approximately 4"x 6" in size). The fuel-meat-to-cladding interface bond strength would then be calculated based on the measured response from the detection head velocimeter.

The system would also provide a way to examine fuel plates with a laser ultrasonic C-scan system to non-destructively examine both the front and backside of it for indications of bonding discontinuities at the cladding and fuel meat interface. The equipment is designed to be assembled, operated, and maintained by use of a master slave manipulator (MSM), electro-mechanical manipulator (EMM), or in-cell cranes.

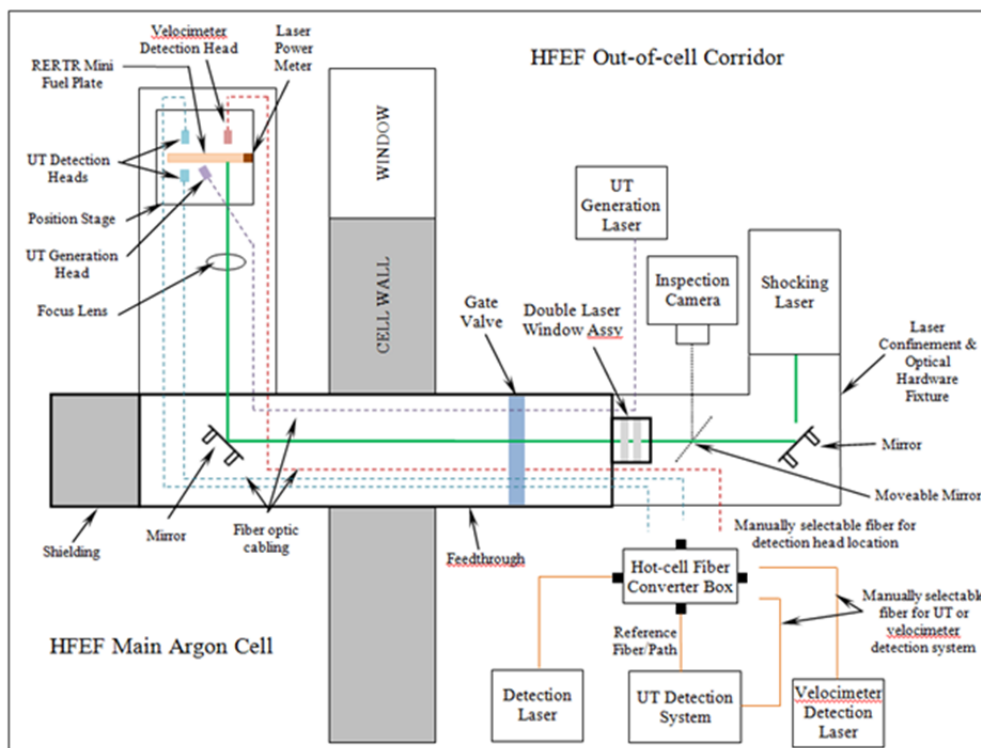


Figure 1. RERTR Laser Shock System

## SECTION C. Environmental Aspects or Potential Sources of Impact:

**Generating and Managing Waste:** Installation of the laser shock system would generate construction and industrial waste. There is also the potential to generate radioactive waste. The project manager would ensure Waste Generator Services (WGS) is provided with a charge number to perform waste determinations and waste characterization. This characterization would be performed according to

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WGS published procedures. All waste generated would be managed in accordance with laboratory procedures. Pollution Prevention would be incorporated whenever economically practicable to reduce the volume and/or toxicity of waste generated.

**SECTION D. Determine the Recommended Level of Environmental Review (or Documentation) and Reference(s):** Identify the applicable categorical exclusion from 10 Code of Federal Regulation (CFR) 1021, Appendix B, give the appropriate justification, and the approval date.

For Categorical Exclusions (CXs), the proposed action must not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environmental, safety, and health, or similar requirements of Department of Energy (DOE) or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment or facilities; (3) disturb hazardous substances, pollutants, contaminants, or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources (see 10 CFR 1021). In addition, no extraordinary circumstances related to the proposal exist that would affect the significance of the action. In addition, the action is not "connected" to other action actions (40 CFR 1508.25(a)(1) and is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1608.27(b)(7)).

**References:** 10 CFR 1021, Appendix B to Subpart D item B1.31 Installation or relocation of machinery and equipment

**Justification:** The proposed Research and Development (R&D) activities are consistent with CX B1.31 "Installation or relocation and operation of machinery and equipment (including, but not limited to, laboratory equipment, electronic hardware, manufacturing machinery, maintenance equipment, and health and safety equipment), provided that uses of the installed or relocated items are consistent with the general missions of the receiving structure. Covered actions include modifications to an existing building, within or contiguous to a previously disturbed or developed area, that are necessary for equipment installation and relocation. Such modifications would not appreciably increase the footprint or height of the existing building or have the potential to cause significant changes to the type and magnitude of environmental impacts."

Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act)       Yes     No

Approved by Jack Depperschmidt, DOE-ID NEPA Compliance Officer on: 2/18/2015