INL uses this hydraulic shake table to apply variable dynamic loads while performing structural component response testing.

Structural Testing

Validation testing of structural components is a capability INL has been recognized for since its inception in 1949 as the National Reactor Test Site. Building on this tradition, the structural engineers at INL have unique capabilities associated with structural and material testing.

Overview

Although finite element method (FEM) computer analyses have gained widespread acceptance for use in the development of many component designs, there are many situations that require testing of structural components to confirm their functionality and operability.

Testing provides significant insights to engineers and helps clarify which design parameters are critical for achieving successful designs. For example, if structural components are subjected to dynamic loads, variable inputs, or moving parts, FEM analysis results are difficult to interpret without testing to validate results.

Another example is a situation where high-strain levels result from dynamic loadings. This condition makes FEM plastic analyses difficult to perform due to the lack of proper material data needed to accurately reflect the temperature, strain rate, strain level, and aging degradation effects on the material used in the component or structure.

INL Solutions

The INL structural test bed focuses on large and small scale precision testing. It uses the applied engineering capabilities of INL and collaborates with Idaho State University and incorporates three major infrastructure features to test specific behavioral aspects of components—especially those used in the storage, transport and disposal of spent nuclear fuel. These features are described below.

An Impact Testing Machine, or drop weight tower, has been fabricated for the purpose of determining material response data for plastic analyses that consider strain rate effects.

Both vertical and horizontal hydraulic shake tables are available to perform structural response testing of components subjected to dynamic loads.

A 75-ton drop pad is available to investigate structural

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Science

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For more information

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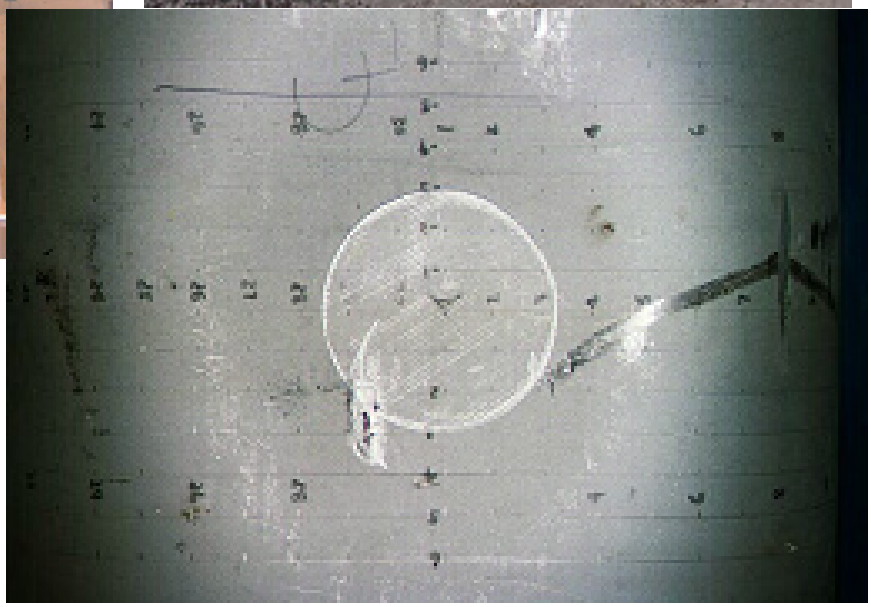
INL is a U.S. Department of Energy national laboratory operated by Battelle Energy Alliance

Impact testing machine used for material strain rate testing.

This 75-ton reinforced pad is used to perform a variety of drop tests.



This photo demonstrates the precision achieved during a drop test. The circle identifies the point of impact from a 6-inch puncture bar.

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responses of components dropped from heights up to 50 feet or more depending on specimen geometry.

Benefits

- Wide variety of standard and unique structural testing capabilities and facilities to address difficult design problems
- Analysis group team members average more than 25 years of structural experience
- University collaboration offering research opportunities and a greater variety of facilities.

Business Products and Services

The Science and Engineering Division at INL has the expertise and technology to perform structural testing of equipment and facilities to fulfill customer-specific requests and specifications.