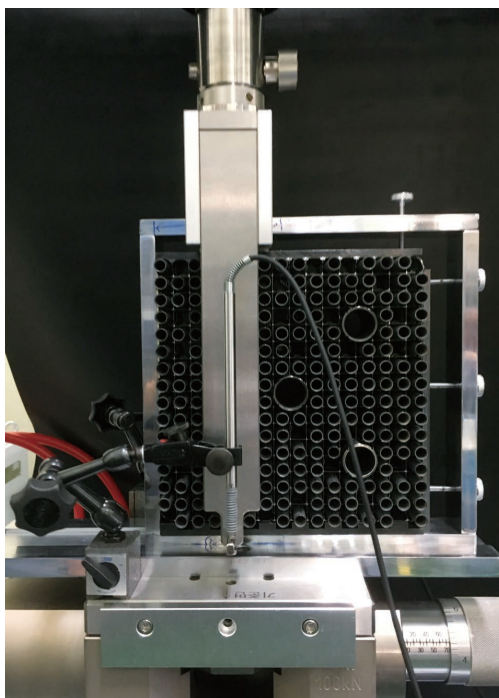


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Load-Deflection Test on Spacer Grid Cell

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The load-deflection characteristic of the spring and dimple of spacer grid is one of the design parameters used to evaluate the structural integrity of the fuel assembly. The load-deflection test on the spacer grid cell is performed to obtain the load-deflection curve of the spring and dimple of spacer grid.



Description

● Background

- The nuclear fuel assemblies in reactor core undergo the impact loads to each other due to vibration and/or collision in the event of accident such as SSE(Safe Shutdown Earthquake) and LOCA(Loss Of Coolant Accident). These impact loads are transferred to the guide tubes and the fuel rods through the spacer grids. In the worst case scenario, inserting the control rod may not be assured if spacer grids are crushed. Hence, the load-deflection test on the spacer grid is needed to evaluate the structural integrity of the fuel assembly.

● Purpose and Necessity

- The load-deflection test on the spacer grid is performed in order to characterize the spacer grid cell for commercial use or new development and it is used as a design parameter for seismic analysis of fuel assembly.

● Composition of Equipment

- The load-deflection tester of the spacer grid cell consists of a universal material testing machine, a test jig to fix the spacer grid specimen, and a LVDT to measure the deflection of the spring and dimple of spacer grid.

• **Universal Material Testing Machine**

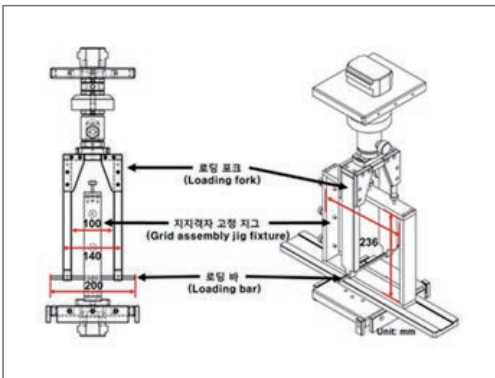
- Testing machine to perform the load-deflection test of spacer grid cell.

• **LVDT**

- LVDT, vertically installed to the loading bar of the testing machine, is used to measure the deflection of the spring and dimple of spacer grid and the displacement resolution is of less than 0.01 mm.

• **Test Zig and Specimen**

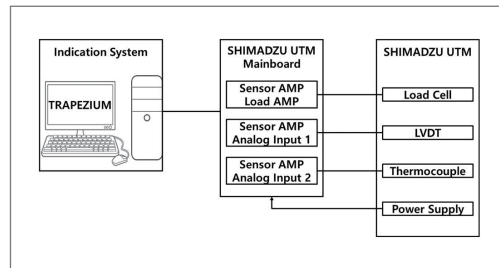
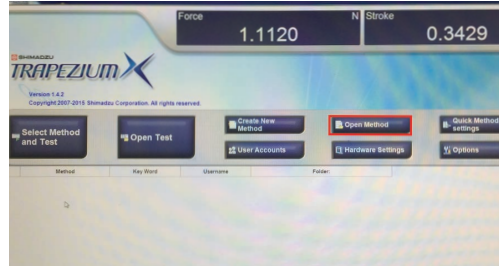
- Loading fork: To transfer the displacement of the crosshead to the grid spring and dimple specimens.
- Grid cell: The spacer grid cell specimen to be tested.
- Grid assembly jig fixture: To fix the grid cell specimen during the test.
- Loading bar: It is connected to the loading fork and transfers the test displacement through up-and-down movement of the crosshead, directly contacting the grid spring and dimple. The spring contact area is designed to be the same as the outer diameter of the fuel rod so as to simulate the geometric conditions of the assembled state of grid and fuel rod.



• **Control system**

- The control system operates and controls the cross head movement, measuring the displacement from the LVDT. It measures and stores in real time the test data from the LVDT, cross head, and load cell and is

capable saving more than ten data samples per second.



Distinctiveness

● **Characteristics**

- To perform the load-deflection test on the spacer grid spring and dimple at room temperature.

● **Benefits**

- By characterizing the spacer grid cell, to get feedback for enhancing the spacer grid performance and to use as a design parameter for seismic analysis of fuel assembly.

Experience

- To evaluate and verify the characteristics of the spacer grid which is in commercial use or under development.

Deliverables

- Load-deflection test report of spacer grid cell.

Technology Readiness Level (TRL)

Actual system proven through operation

Business Model

- Technology Transfer
- Licensing
- Joint Search
- Service Execution
- Others