

## राष्ट्रीय भूकंप परीक्षण प्रयोगशाला National Earthquake Testing Facility





The National Earthquake Testing Facility (NETF) at MNIT Jaipur is a unique and State of the Art Testing Facility for Seismic Performance Assessment of Full-Scale Structures (*quasi-static, reverse cyclic and pseudo-dynamic loading conditions*) especially:

- (1) Buildings up to three storied / sub-assemblages of height upto 10 m;
- (2) Bridge Girders of span up to 15 m;
- (3) Bridge Piers of height up to 10 m;
- (4) Base Isolation devices; and
- (5) Scaled model of Concrete Dams

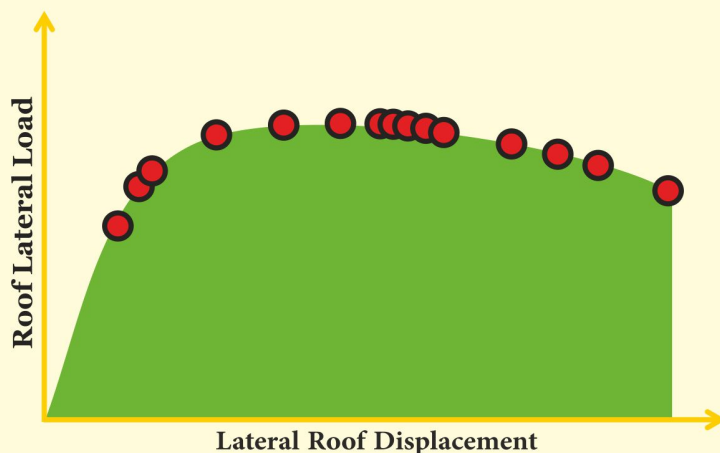
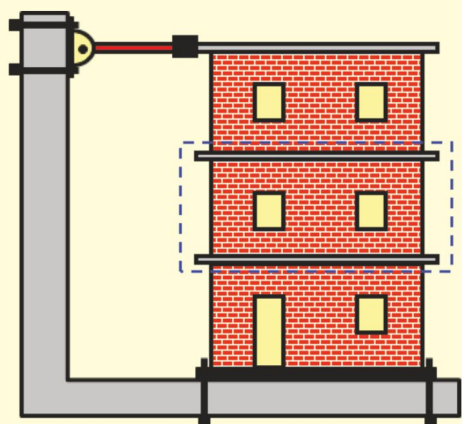
The **NETF**, hosted under the *National Centre for Disaster Mitigation and Management (NCDMM)* at MNIT Jaipur, is an *Academic & Research Center* established in 2013. The activities of the Center include: *Research* (experimental and analytical), *Technology Development & Validation*, and *Outreach* (*i.e.*, Training and Capacity building of Practicing Engineers, Faculty Members and Students). The Center is engaged in activities related to *earthquake safety of the built environment*, with special emphasis on housing, schools, hospitals, dams and bridges.

## OBJECTIVE

The **NETF** is engaged in **Technology Qualification, Certification and Development** through testing of full-scale specimen of buildings, bridge piers, bridge girders, base isolation bearings, dams, and other civil engineering systems, assemblages and components. The Center offers excellent opportunities for innovations in the housing and infrastructure projects for earthquake resistant design, for both public and private sector organisations. Also, it has the capabilities to test critical devices and systems to examine their compliance with earthquake regulations and to validate the effectiveness of earthquake retrofit strategies with the aim of mitigating damage with life safety during earthquakes.

## EXPERIMENTAL INVESTIGATION TO UNDERSTAND EARTHQUAKE BEHAVIOUR OF STRUCTURES

The design and detailing of civil engineering structures is required to allow desirable performance under lateral earthquake loading. To ensure safety, earthquake resistant design methods aim to control the mode of deformation and sequence of damage in structures during earthquakes. This is realized by facilitating their deformation and yielding (sustain damage) at pre-determined locations.



Earthquakes impose displacement loading on structures, which is *dynamic* and *reverse cyclic* in nature. Civil structures are required to be designed to sustain (without collapse) deformations in the nonlinear inelastic range of behaviour, under design level earthquake as prescribed by Codes. Due to the reverse cyclic nature of earthquake loading, the structural behaviour is hysteretic in nature, *i.e.*, it depends on loading history. Analytical models should be able to simulate this behaviour.

Experimental investigations are invaluable means to understand the behaviour of structures under earthquake effects. Also, this enables validation of analytical models of more complex and complicated structures, for which full-scale testing may not be feasible. The center will conduct investigations at three levels, namely *material*, *sub-assemblage* and *system levels*. Investigations at each of these levels help in gathering critical information regarding the behaviour of structures, particularly in the nonlinear range, which can be used to develop and fine-tune the analytical models used to better forecast the nonlinear structural behaviour.



# TESTING CAPABILITIES

## (1) Integrated Strong Floor-Wall System

The structural floor has a footprint of  $\sim 20\text{ m} \times 10\text{ m}$ . The wall is L-shaped in plan and 11 m tall with the short wall being 3 m thick and long wall 2 m thick. The integrated reaction floor-wall system is made of reinforced concrete, and has through holes (with MS sleeves) at a pitch of 600 mm. It is serviced by an Electrical Overhead Travelling crane of 20/5 Tonnes capacity.

The reaction system can be used for applying reverse cyclic quasi-static and pseudo-dynamic loads on full-scale test specimens.



## 2) Actuators, Power Pack, Control System, Sensors and Data Acquisition Systems

### Fatigue rated dynamic actuators :

1000 kN,  $\pm 250\text{ mm}$

500 kN,  $\pm 250\text{ mm}$

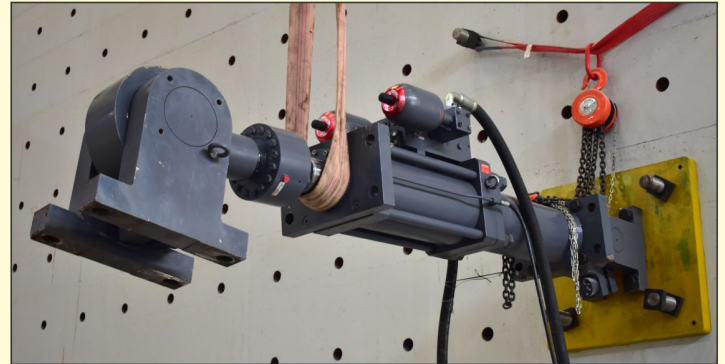
### Static actuators:

1000 kN,  $\pm 250\text{ mm}$

Controller: MOOG

Hydraulic Power Pack: 250 lpm

Sensors: LVDTs, Load Cells, Strain gauges, etc.

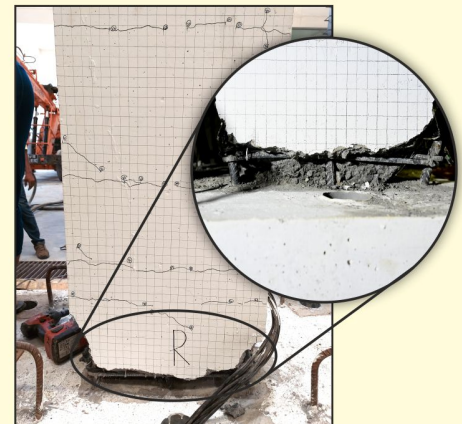
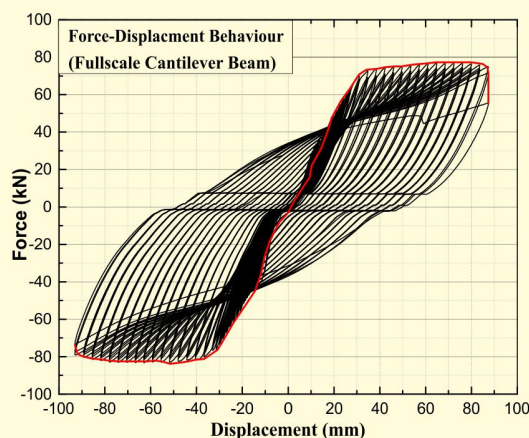


## (3) Base Isolation Test Rig

The rig can test isolation devices and bridge bearings under axial and lateral loads in one direction. The rig has vertical compression load capacity of 12,000 kN and horizontal cyclic load capacity of 3,000 kN with displacement capacity of  $\pm 250\text{ mm}$ .



## Reverse Cyclic Testing of Full Scale Cantilever Beam





## SERVICES OFFERED

### The NETF offers following services

- (1) Technology **QUALIFICATION** through Testing;
- (2) Technology **CERTIFICATION** through Nonlinear Analysis & Testing; and
- (3) Technology **DEVELOPMENT** through Design, Nonlinear Analysis & Testing.

The Test Protocol for testing can be provided by the **NETF** or may be indicated by the user.

### National Earthquake Testing Facility

- (a) Examines new technologies, and
- (b) Evaluates existing technologies that may or may not have been tested in full-scale.

Interested users may kindly approach the **NETF** to discuss their requirements towards developing earthquake resistant designs and technologies.



## CONTACT

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