

09ENG7.8– EARTHQUAKE RESISTANT STRUCTURES

Written by Administrator
Saturday, 31 October 2009 18:17 -

CONTACT PERIODS: 4(LECTURE) PER WEEK

PROGRESSIVE MARKS : 50

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Objective:

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To provide awareness and introduction to earthquake prevention measures in buildings

Outline:

Building Safety from natural Hazards: an introduction

Earthquake

Cyclone effects: High winds, storm surge, cyclone safety aspects in buildings

Floods

Landslides

Elementary Seismology

Earthquake occurrence in the world, plate tectonics, faults, earthquake hazard maps of India and the states

Causes of earthquake, seismic waves, magnitude, intensity, epicenter and energy release, characteristics of strong earthquake, ground motions

Seismological instruments: Seismograph, Accelerograph, Seismoscope/Multi SAR

Introduction to Theory of Vibration

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Single degree undamped and damped systems, resonance response to earthquakes, elastic response, concepts of response spectrum

Flexibility of long and short period structures; concepts of response spectrum

Site planning, Building Forms and Architectural Design Concepts for Earthquake resistance

Historical experience

Site selection

Site development

Building forms – Horizontal and vertical eccentricities, mass and stiffness distribution, soft storey etc.,

Seismic effects related to building configuration

Plan and vertical irregularities, redundancy and setbacks

Special Aspects – Torsion, appendages, staircases, adjacency, pounding, Contemporary international approaches

Performance of Ground and Building in past earthquakes

Earthquake effects – On ground, soil rupture, liquefaction, landslides

Behaviour of various types of buildings, structures, power plants, switch yards, equipment, life lines and collapse patterns

Behaviour of Non-structural elements like services, fixtures, mountings

Social and Economic consequences of earthquakes

Lab simulation of models

Seismic Design Principles

Concept of seismic design, stiffness, strength, period, ductility, damping, hysteric energy dissipation, center of mass, center of rigidity, torsion, design eccentricities.

Ductility based design: Design of energy absorbing

Seismic base isolation and seismic active control

Structural Detailing

Innovations and selection of appropriate materials

IS code provisions for the buildings

IS 1893-2002, IS 4326-1993

Horizontal and Vertical Seismic co-efficients, valuation of base shear, distribution of shear forces in multistory building.

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Seismic detailing provisions: Masonry and Wooden buildings (IS 4326, IS 13828) Adobe houses

Seismic Designs and detailing of RCC and steel buildings: IS 1893 – 2002, IS 13920- 1993 IS 456-2000 IS 800-2004

Special reinforcing and connection details in structural drawings.

Earthquake Resistant Construction Details

Various types of construction details of:

Foundations, soil stabilization, retaining walls, plinth fill, flooring, walls, openings, roofs, terraces, parapets, boundary walls, under ground and overhead tanks, staircases and isolation of structures

Local practices: traditional regional responses

Construction Quality Control

Sequence of Construction: Good supervision practices, critical check point and certification at certain stages, reporting, maintenance of records, testing

Vulnerability Assessment and Seismic strengthening of Buildings

Seismic vulnerability evaluation of existing buildings

Weakness in existing buildings, aging, weathering, development of cracks

Concepts in repair, restoration and seismic strengthening, materials and equipment for restoration of masonry and concrete structures

Methodologies for seismic retrofitting

Techno-legal and Techno-financial aspects in Building Projects

Building Bye-laws

Cost Benefit studies

References:

1. Manual of EQR, Non engineered construction, Indian Society of Earth Quake Technology, Roorkee.

2. Seismic Conceptual Design of Buildings, Basic principles for

Engineers, architects, building owners and authorities, Hugh

Bachmann