Summer Internship Report

on

Seismic Performance Assessment of Precast Structural System: From Non-linear Static to Incremental Dynamic Analysis

A project report submitted in partial fulfillment of the requirement of the award of the degree of Bachelor of Technology

GURU GHASIDAS VISHWAVIDYALAYA

B.Tech in Civil Engineering

SUBMITTED BY

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To Whom It May Concern

Subject: Summer Internship Certificate of Miss. Kajal Kumari

This is to certify that Miss. Kajal Kumari, BTech, Civil Engineering from Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh [Institute Id: GGV/21/01012] has completed the MNIT Summer Internship Programme, Internship Id. MNITSIP/24/45 on topic " **Seismic Performance Assessment of Precast Structural Systems: From Nonlinear Static to Incremental Dynamic Analysis**' under my supervision.

Duration of the Internship Programme was from 3rd June, 2024 to 18th July, 2024 at National Centre for Disaster Mitigation & Management (NCDMM), MNIT Jaipur. She has successfully completed the mentioned Internship Programme and her performance was excellent during the Internship Period.

I wish her a bright future ahead.

Sincerely,

Jagajyoti Panda

(Dr. JAGAJYOTI PANDA)
Assistant Professor
NCDMM, MNIT Jaipur

Abstract

Precast structural systems, widely adopted for their efficiency and quality control, face unique challenges under seismic loading. Evaluating their seismic performance requires advanced analytical methods, including Non-Linear Static Analysis (NLSA) and Incremental Dynamic Analysis (IDA). This abstract explores the effectiveness of these methods in assessing the seismic resilience of precast structures.

Non-Linear Static Analysis (NLSA): NLSA, or pushover analysis, is a fundamental tool for understanding the inelastic behavior and ultimate capacity of structures. By applying monotonically increasing lateral forces, NLSA captures the response of precast components and connections, identifying critical failure modes and performance levels. The analysis reveals that precast systems, particularly those with ductile detailing and robust connections, exhibit significant reserve strength and ductility.

Incremental Dynamic Analysis (IDA): IDA extends the assessment by subjecting the precast structure to a suite of ground motion records, incrementally scaled to increasing intensity levels. This method provides a comprehensive picture of structural performance across a range of seismic scenarios. IDA results highlight the importance of dynamic interactions and resonance effects, offering insights into peak responses, failure probabilities, and collapse margins.

Comparative Insights: Combining NLSA and IDA offers a holistic evaluation of precast structural systems. NLSA provides a clear understanding of static capacity and failure mechanisms, while IDA offers a probabilistic assessment of performance under realistic seismic events. Together, these analyses underscore the necessity of robust connection detailing and highlight potential areas for design improvements.

The integration of NLSA and IDA in the seismic assessment of precast structures demonstrates their complementary strengths. These methods enable a detailed and nuanced understanding of seismic performance, guiding the development of safer and more resilient precast designs. Future research should focus on enhancing modeling techniques and incorporating emerging materials and construction technologies to further improve seismic resilience.