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First + Middle (initial) + Last name[1*1a(Superscript—*:Corresponding, 1:affiliation, a:footnote info)],
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Abstract. According to the most recent seismic data, ground motions near a rupturing fault are distinct from conventional ground motions due to their potential to contain massive amounts of energy, referred to as 'directivity' pulses. This pulse can cause significant damage during an earthquake, particularly to structures whose natural frequencies align with the pulse's characteristics. ……

Keywords: finite element analysis; near fault ground motion; load-carrying capacity

1. Introduction

The occurrence of pulsing motions during an earthquake has the potential to inflict severe damage, particularly on structures that exhibit natural periods that closely align with the frequency of the seismic pulse. Moreover, near-fault effects are classified based on the characteristics of the pulses, specifically whether they show up as displacement, velocity, or acceleration. The cumulative effect of nearly all seismic radiation emanating from a fault is referred to as "velocity pulse motion" [1]. ……

2. Section title: Level 1

The model shows congruity with the beam specimen that was subjected to testing in terms of its geometric properties, material characteristics, and boundary conditions. Due to the uniformity of these parameters, a fractional representation, specifically one quarter, of each beam was utilized for modeling purposes. This configuration is illustrated in Fig. 1, and symmetry boundary constraints were imposed in two planes. As previously studied by Haryanto *et al.* [2], one advantage of this particular choice is its capacity to reduce the overall quantity of elements, resulting in significant time savings during processing. ……

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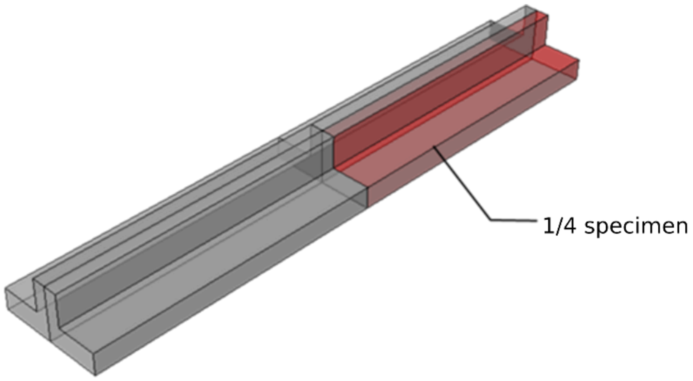


Fig. 1 Schematic of a quarter of the specimen

2.1 Material properties

The uniaxial concrete behavior under compression was examined using the nonlinear stress-strain model provided by Hsu and Hsu [3], as expressed in Eqs. (1)-(3). This was based on physically significant variables, determined through experiments, and had the capacity to represent both ascending and descending branches of the curve. Notably, the model accounts for the influence of shear stirrups or lateral steel in confining the concrete. ……

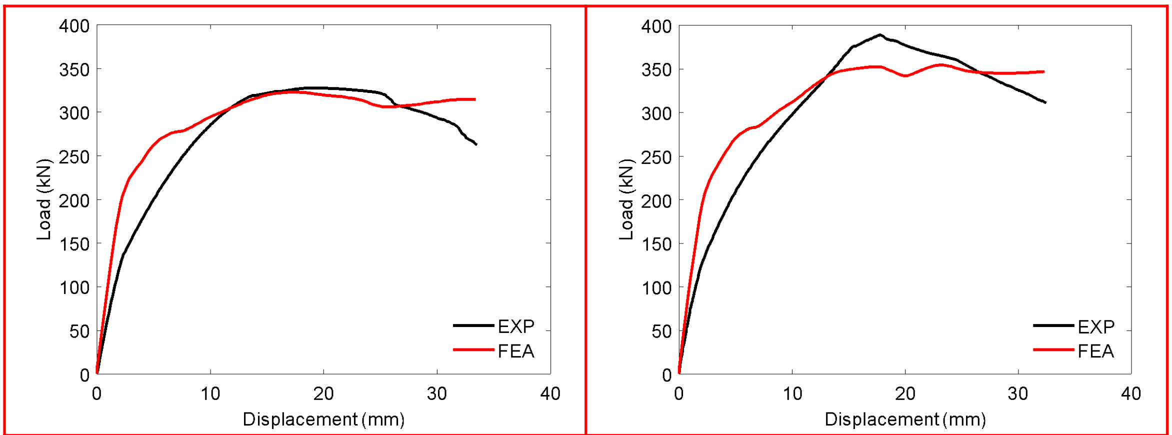
$$\sigma_c = \left(\frac{\beta(\varepsilon_c / \varepsilon_0)}{\beta - 1 + (\varepsilon_c / \varepsilon_0)} \right) \tag{1}$$

$$\beta = \frac{1}{1 - (\sigma_{cu} / \varepsilon_0 E_c)} \tag{2}$$

$$\varepsilon_0 = 8.9 \times 10^{-5} \sigma_{cu} + 2.144 \times 10^3 \tag{3}$$

3. Section title: Level 1

The beams' numerical and experimental load-displacement curves under monotonic loading are shown in Fig. 2. A reasonable agreement was duly noted between the two observations throughout the entire loading process, until the point of failure of all the specimens. Additionally, the values for the ultimate load and failure displacement were compared between the experimental and FE simulations. The results are presented in Table 1, which exhibits the normalized mean square error (NMSE) for each specimen, which was determined in accordance with Kumar *et al.* [4], and was found to be 0.005 for the ultimate load and 0.00001 for the failure displacement.



(a) Strengthened beam 1

(b) Strengthened beam 2

Fig. 2. Load-displacement curves of specimens under monotonic loading

Table 2. Experiment results and FE analysis comparison of monotonic loading

Beam	Ultimate load, P_u (kN)		Failure displacement, δf (mm)	
	EXP	FEA	EXP	FEA
Control beam	176.66	175.53	35.83	35.91
Strengthened beam 1	327.58	322.74	33.50	33.44
Strengthened beam 2	388.59	354.26	32.47	32.32

4. Section title: Level 1

4.1 Subtitle: Level 2

4.1.1 Subtitle: Level 3

One useful parameter for identifying the near-fault zone is the ratio of the source size to the distance separating the source and the observation point [5]. Bary and Rodriquez-Marek [6] claimed that the near-fault zone is usually only reachable up to 20 km around the ruptured fault. ……

Subtitle: Level 4

Nugroho *et al.* [7] carried out an experimental study with a focus on the application of CFRP to the flexural strengthening of RC T-beams exposed to high reversed cyclic loading. Promising results were shown by the study, which showed significant improvements in structural performance. ……

5. Conclusions

To assess the structural response of RC T-beams strengthened by steel-reinforced UHPC layers in the negative moment region, a three-dimensional finite element model (FEM) was constructed in ABAQUS. The findings from this research are, therefore, presented as follows:

- A reasonable agreement was established concerning the response of load–deflection in all flexural loading stages up to when the specimens failed between the findings from the numerical simulations and the data provided by the experimental research.

- The tensile damaged area of the beam at the support reduced under the same load after strengthening and this shows the material was effective in improving the beam's tensile strength at the bottom.
- The findings of this study have to be seen in light of some limitations; FE mesh improvement should be addressed in the future research to avoid the localized crack formation.

Acknowledgments

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