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Topic of Research: Damage Assessment of RC Structures Subjected to Ground Motions

Findings

In this study, a new definition of "Damage Index" based on cumulative energy dissipation and distinct "Damage States" are proposed for seismic vulnerability assessment of RC bridges as below:

Damage States	Damage Index(DI)	Physical descriptions of damage states
No Damage	DI<0.05	No cracks
Slight Damage	0.05≤DI<0.20	Cracking of concrete cover; yielding of longitudinal bars;
Moderate Damage	0.20≤DI<0.45	Spalling of concrete cover;
Extensive Damage	0.45≤DI<0.80	Buckling of longitudinal bars;
Collapse	0.80≤DI≤1	Crushing of core concrete.

Further, seismic damage assessment has been done under a set of thirteen near fault (pulse-like) ground motions using Incremental Dynamic Analysis. Major outcomes are: (1) ground motions having high PGV, with PGV to PGA ratio greater than 0.13, are highly vulnerable to the structures (2) damage starts (cracking and yielding) when PGV value is greater than 20 cm/sec (3) each of the damage states occurs during velocity pulse and contribution of velocity pulse in damage progression is high and plays a vital role and (4) under the near fault ground motions; structure dissipates more than 50% energy during the velocity pulse.

This study will be used as a viable tool for health monitoring, seismic vulnerability assessment and formulating retrofit strategies of the reinforced concrete bridges.