Effects of High Loading Rate on Reinforced Concrete Beams

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Abstract:

Majority of the past research on reinforced concrete (RC) beams have focused on their behavior under static and relatively slow loading rates; however limited attention has been paid to the corresponding behavior under high loading rates. Thus, a comprehensive literature review has been conducted on RC beams under varying loading rates to observe the overall trend of dynamic increase factor (DIF) of maximum resistance and failure modes. However, due to wide dispersion of results in DIF and apparent change in failure modes, some issues related to high loading rate testing have been discussed in which general agreement among the researchers are urgently needed. To supplement the literature which contains limited data in this field, 24 RC beams (with and without shear reinforcements) were tested under four different loading rates ranging from slow ($4 \times 10^{-4}$ m/s) to fast (2 m/s) to cover the wide range of loading scenarios (quasi-static, earthquakes and impact regime). Comparative analyses of RC beams under these varying loading rates highlighted several key aspects of their dynamic behavior.

Key words: Beam, Loading rate, Dynamic behavior, Reinforced Concrete, Dynamic Increase Factor

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