Title	FABIG Technical Note 7: Simplified Methods for Analysis of Response to Dynamic Loading
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Scope	**Executive Summary** For steel members subject to dynamic loading, the most widely used SDOF model has so far been the BIGGS model which suffers from the following shortcomings: • It does not incorporate the effects of support stiffness. • It does not account for different moments capacities at the supports. • It ignores catenary action, which has a significant influence on the member response at large displacement, in the presence of axial restraints. • It ignores the influence of material strain rate sensitivity and strain-hardening. • It does not account for the beam column effect in load-bearing members that sustain significant compressive axial forces. This Technical Note provides a new SDOF model that addresses the first three shortcomings of the BIGGS model, is sophisticated enough to capture the main effects ignored by BIGGS, hut simple enough for practical application in a design office environment. The elastic and elasto-plastic stages are considered separately from the perfectly plastic and subsequent catenary stage. **Support Conditions** The new model is presented first in its most general form with regard to the support boundary conditions, assuming that the two supports have different degrees of axial and rotational stiffnesses. Next, three special cases, which lead to a simplification of the coefficients, are considered: • Two identical supports • One pinned support • One fixed support **Elasto-Plastic Bending Response** The new SDOF model deals with three generic cases for the static elasto-plastic response of the beam, which are related to the order of the occurrence of the plastic hinges. This order is determined by the relative moment capacities and bending stiffnesses of the supports and of the beam. **Plastic Bending and Catenary Response** The new SDOf model covers two types of plastic response, which differ in the extent of plastic bending stage and in the modelling of the first catenary stage. The first type of response is that, after the formation of a plastic mechanism, the static bending response becomes perfectly plastic until a critical mid-span displacement is reached. Subsequently a first catenary stage is initiated in which the axial force varies quadratically with displacement, leading to a cubic variation in the resistance. When the axial force reaches the overall plastic axial limit, a second catenary stage is initiated with a linear variation in resistance. In the second type of response, the first catenary stage is initiated with a linear variation in resistance.

	For each model, coefficients are presented in Tabular form. A variety of examples are included to demonstrate the accuracy of the proposed method. The examples also demonstrate the importance of catenary effects and support conditions on the beam response. It is shown that ignoring catenary effects, or assuming simplified boundary conditions, may lead to large inaccuracies.
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