

## ABSTRACT

Munzer Abdel-Karim Barakat. Ph.D., Purdue University, December 1988.  
Simplified Design Analysis of Frames with Semi-Rigid Connections. Major  
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Conventional frame analysis regards the behavior of beam-to-column connections as either simple (pin) or rigid joints. These are highly idealized models that rarely exist in real life. Furthermore, some methods of analysis deal with connections in a contradictory manner by treating them as pins in the analysis for certain types of loading and rigid for another type (wind frame method).

The extensive theoretical and experimental work conducted in recent years have produced more accurate representations for connection behavior as well as methods of its implementation in frame analysis. In general, these methods are very complex and their application by practicing engineers is a cumbersome task.

This study attempts to introduce a simplified method of flexible frame analysis that builds on some aspects of the already established AISC/LRFD design approaches, namely the  $B_1$  and  $B_2$  amplification factor method. Two idealized connection models are proposed: the first model is a modified initial stiffness representation, the second is a model determined by the so-called

beam-line method. The connection models are designed for implementation in the first-order analysis of frame, thus determining the moment values  $M_{nt}$  and  $M_{lt}$  for the nonsway and sway configuration of the flexible frame, respectively. The design moment  $M_u$  is obtained in a procedure similar to that conducted for rigid frames.

The concept of effective length factor is also utilized with some modifications to account for the connection flexibility. A modified relative stiffness factor for elastically-restrained members is suggested, which allows the use of existing alignment charts for determining the effective length factor of columns.

Finally, a methodology for conducting frame analysis on personal computers is presented. The use of spreadsheet programs is recommended for conducting various tasks of analysis and design for both rigid and flexible frames.