

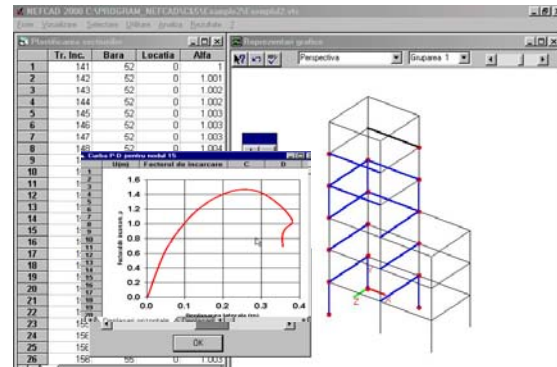
# NEFCAD-3D

## Non-Linear Elasto-Plastic Analysis

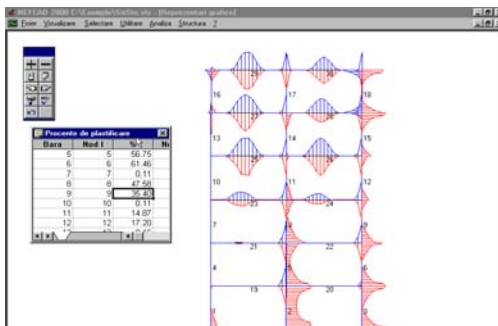
NEFCAD is a non-linear elasto-plastic analysis computer program for frame structures. NEFCAD consists of a control program that manages the database, an analysis and design engine and a graphical user interface (GUI) for user data input.

### NEFCAD capabilities include:

- Geometric and material non-linear behaviour
- Member buckling
- Joint flexibility and joint plasticity
- Strain hardening and residual stress
- Non-uniform members and finite joints
- One element per physical member to simulate distributed plasticity.
- Incremental iterative methods (load and arc-length control).
- Adaptive load incrementation

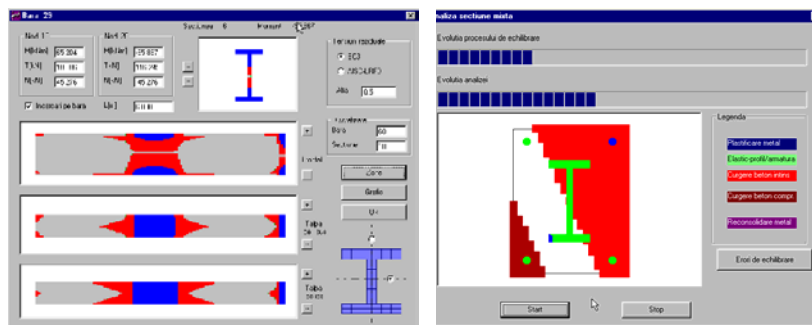


Push-over analysis: Plot indicating plastic hinges developed



Distribution of plastic zone along the member length

Load Combinations allow for combining the non-push load cases together with load factors before the push analysis is performed to capture effects of the structure's initial state of stress. Both concentrated and distributed plasticity models are allowed. The cross-section stiffness may be modeled by explicit integration of stresses and strains over the cross-section area or through calibrated parametric equations that represent force-generalized strain curvature response.



Plot showing spread of plasticity through cross-section and along the beam column element.

NEFCAD uses an event-to-event load incrementation strategy coupled with an equilibrium error correcting constant arc-length algorithm to solve for geometric and material nonlinearities associated with the ultimate load capacity of a structure. The size of load increment is controlled by using the following criteria: (1) constraint on the maximum incremental displacement; (2) load increment control due to the formation of full plastic sections (plastic hinges); constraint of force point movement at plastic hinges.

Graphically, during analysis, the user can observe clearly the structural deformation and the progression of plasticity as the load is incrementally applied to show the collapse mechanism, load-deflection curves, and various limit states of yielding. Element reports show local diagrams, plastic rotations, displaced shapes, and relevant member data.