

## Column Section Demand-Capacity Ratio Determination

Column sections capacity determination is always related to the interaction of axial load with uniaxial or biaxial bending. In each case a 2D P-M interaction diagram or a full 3D failure surface (where  $M_x$  and  $M_y$  are considered (biaxial)) is constructed by hand or software such as [spColumn](#). Most engineers are interested in finding the safety margin for the section under consideration for each loading conditions. There is a number of ways to do this assessment but [spColumn](#) provides two methods:

- 1) Moment Capacity Method.
- 2) Critical Capacity Method.

This article is provided to illustrate how to interpret the output for the margin provided (Capacity to Demand Ratio (DCR)) in the [spColumn](#) output.

For each point on a P-M interaction diagram or on a 3D failure surface, [spColumn](#) calculates the location of the neutral axis (expressed in terms of depth and angle of the neutral axis), maximum steel strain, and (for ACI codes only) the strength reduction factor. These results are reported for the maximum capacity of the section based on the ultimate limit states and **not for the given loading input**. The information can however be used to draw conclusions or make additional calculations for a given loading condition.

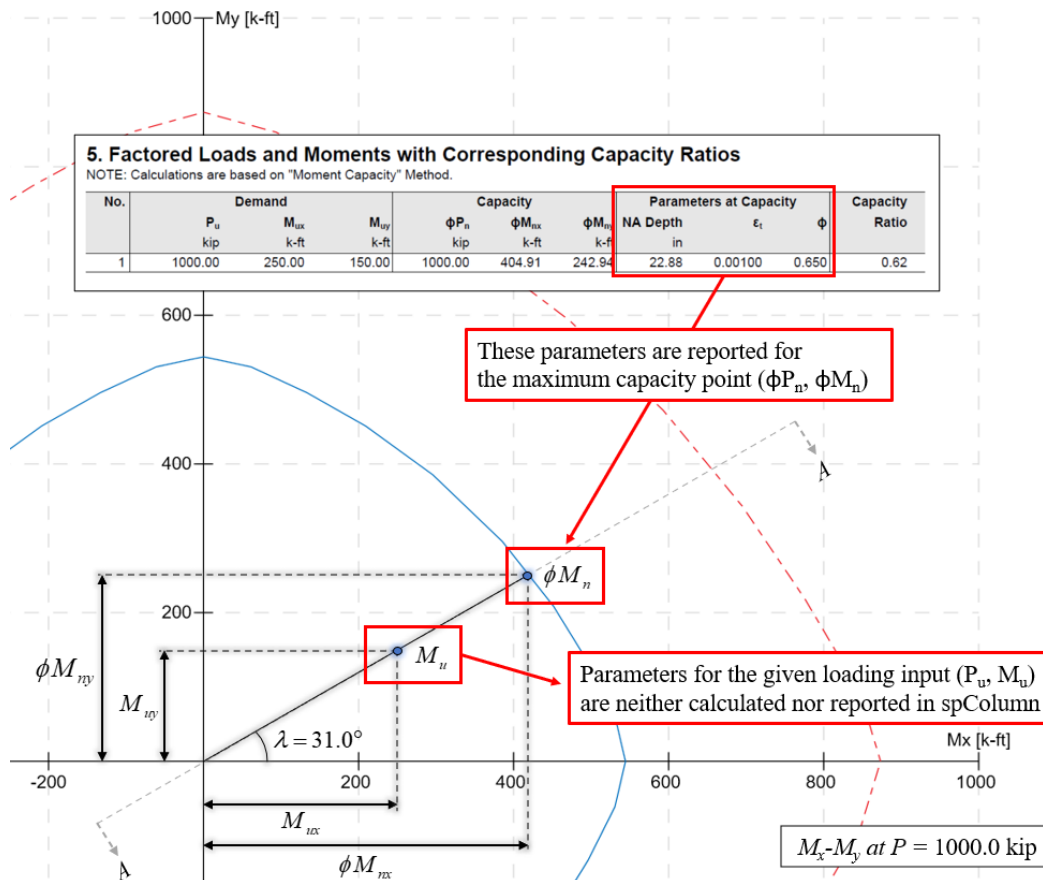


Figure 1  $-M_x$ - $M_y$  Horizontal Cut at  $P = 1000$  kip

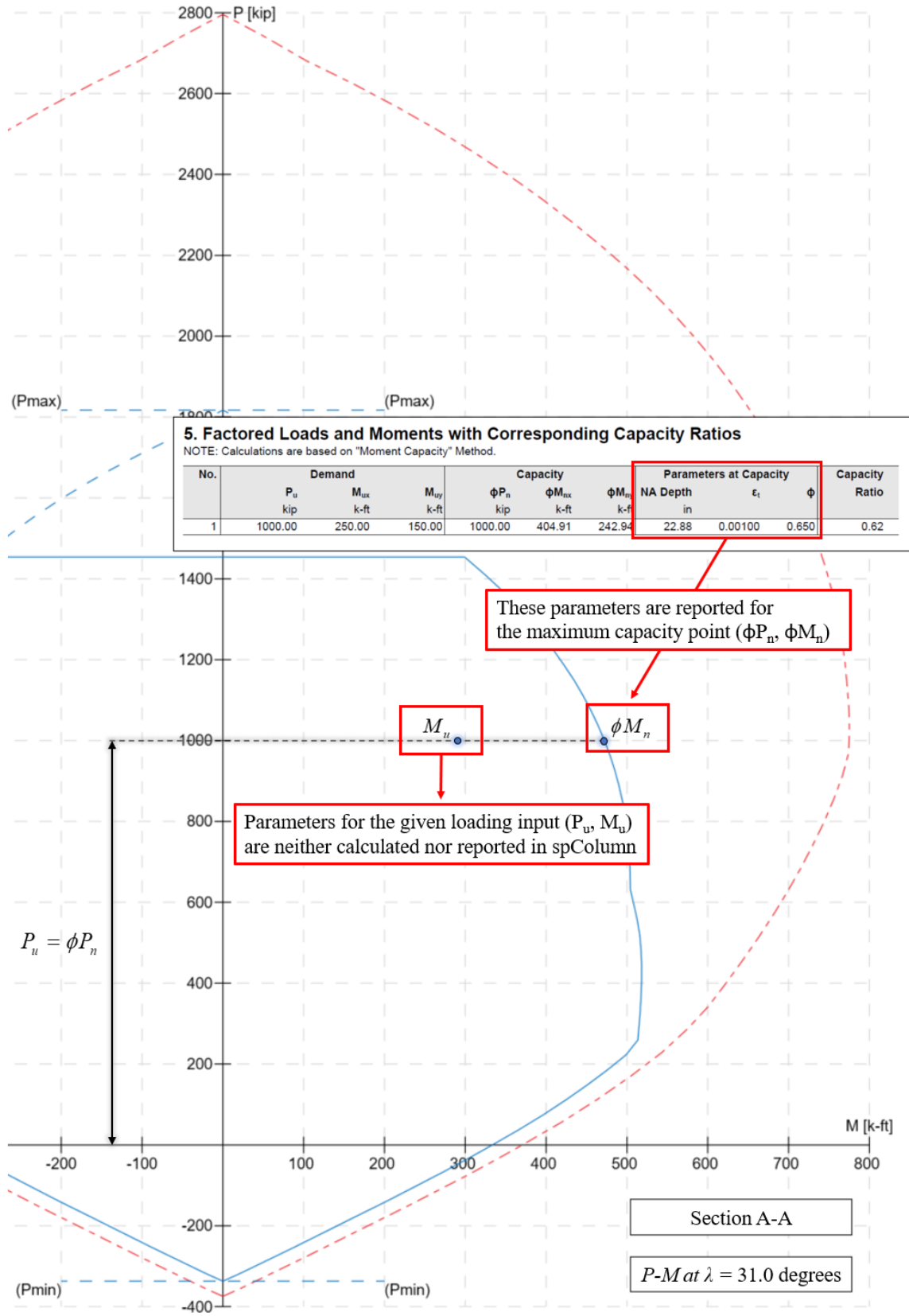


Figure 2 – P-M Vertical Cut at  $\lambda = 31$  degrees