Bending Formulas for Extruded Profiles

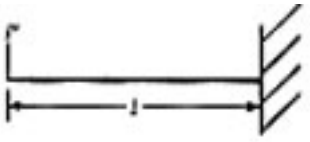
The deflection of a beam depends on how it is supported, the magnitude of the load it carries, the distribution of the load and the distance from the supports. Two examples will be considered — the simple beam and the cantilevered beam.

The deflection of a simple beam with the load concentrated at the center is given by the following equation:

$$y = \frac{Pl^3}{48El}$$

The deflection of a cantilevered beam with the load concentrated at the free end is given by the following equation:

$$y = \frac{Pl^3}{48El}$$



Where: y = beam deflection at the loading point, cm
P = concentrated loads, kgf
l = length of beam, cm
x = distance from support to any section, cm
E = modulus of elasticity. kg/cm²
I = moment of inertia, cm^4

Example 1:
Structural Profile 40 x 80 is used as a simple beam with 100cm between supports. If this beam carries a 100 kg load concentrated at the center of the beam, how much will the beam bend?

The modulus of elasticity of the aluminum alloy used for all the extrusions listed in this brochure is 702,949 kg/cm. The moment of inertia for this beam is given in the technical data section which describes this beam. Since this beam is not symmetrical, two moments of Inertia are given. Select the value corresponding to the way in which the beam will be used. For this example, we assume that the load is applied along the x-axis. From the technical data, we see that the moment of inertia is 21.17cm^4.

Substituting these values and the values from the example into the equation for the deflection of a simple beam, we obtain:

$$y = \frac{100\ kg\ (\ 100\ cm\ )^3}{48\ (\ 702949\ kg/cm^2\ )\ (\ 21.17\ cm^4)} = 0.14\ cm$$

Example 2:

Structural Profile 40 x 80 is supported at one end and a concentrated load Is applied to the free end, 100cm from the fixed end. Calcijlate the bending at the free end.

Substituting these values and the value for the modulus of elasticity and moment of inertia above, we obtain:

$$y = \frac{100\ kg\ (\ 100\ cm\ )^3}{3\ (\ 702949\ kg/cm^2\ )\ (\ 21.17\ cm^4)} = 2.24\ cm$$