DISCUSSION

Design of Pipe Column Base Plates Under Gravity Load

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The equations presented in Thomas Sputo's paper will help design engineers to determine the necessary thickness of base plates for pipe columns. Designers should check the bearing pressure on the underlying concrete to make sure that

$$f_p \le F_p = 0.35 f_c' \sqrt{\frac{A_2}{A_1}} \le 0.70 f_c'$$

in accordance with Section J9 of the 1989 ASD Specification (or applicable standards for concrete design). Also keep in mind that this method assumes a uniform bearing pressure on the concrete under the base plate. As this method produces thinner and therefore more flexible base plates, the contact pressure becomes less uniform. In special circumstances where the pressure on the underlying material might be critical, this non-uniform bearing pressure should be considered.

It might also be noted that while base plate design according to the Ninth Edition usually involves the limitation of the resisting moment to $0.75F_yS$, the yield line approach adopted by the author lends itself to an application of the provisions of Chapter N of the Ninth Edition, "Plastic Design." According to these provisions, the applied gravity loads should be multiplied by a factor of 1.7 and the resulting demand may then be compared to a resisting moment of F_yZ. This comparison of the plastic moment capacity to the factored demand appears to be more consistent with the yield line method. Using this approach, required thicknesses are about 8.5 percent less than when the unfactored loads are balanced by the elastic capacity. The three numbered equations noted below correspond to the numbered equations in Thomas Sputo's paper.

$$t = R\sqrt{\frac{1.7 f_p}{3F_y}} \tag{1}$$

$$t = \sqrt{\frac{3.4 f_p}{3F_y}\left(2D^2 - 3RD + \frac{R^3}{D}\right)} \tag{2}$$

$$t = \sqrt{\frac{1.7 F_p}{3F_y}\left(R^2 - 3R_c^2 + \frac{2R_c^3}{R}\right)} \tag{3}$$

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