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# Calculating the Flexural Stress on the Base Plates

Pedro Berges

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If the base plate is analyzed as a cantilevered beam, both the moment of inertia and moment vary with distance "l" from the edge of the beam. Flexural stress is a result of the combination of these two variables. It could be posible that the maximum flexural stress occurs at a place different that the maximum moment (l=2.5").

Flexural stress is a function of moment and moment of inertia.

$f_b(m,i) = (m * T * 0.5)/i$

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However, both the moment and the moment of inertia are functions of the lenght,

$m(l) = Pl = 5l$ in ft-kips

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$i(w) - w * T^3/12$

$w(0) = 3.6$

$w(2.5) = 8.8$

$w(l) = ((8.8 - 3.6)/2.5)l + 3.6$

Therefore, $i(l) = (((8.8 - 3.6)/2.5)l + 3.6) * T^3/12$

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Consequently,

$f_b(m(l), i(l)) = f_b(l) = (5l) * T * 0.5)/((((8.8 - 3.6)/2.5)l + 3.6) * T^3/12)$

$T = \{3/8, 1/2, 5/8, 3/4\}$ To test different plate thickness

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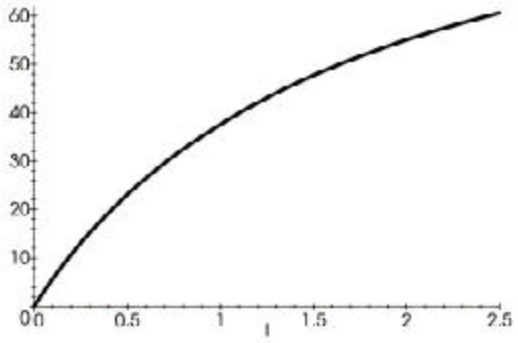
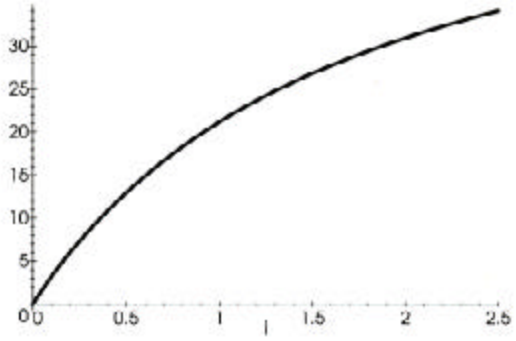
$T - 3/8$

$f_b(l) - (5l) * T * 0.5)/((((8.8 - 3.6)/2.5)l + 3.6) * T^3/12)$




$T = 1/2$

$f_b(l) = (5l) * T * 0.5)/((((8.8 - 3.6)/2.5)l + 3.6) * T^3/12)$




$f_b(2.5) = (5*2.5)*1/2*0.5)/((((8.8-3.6)/2.5)*2.5+3.6)*(1/2)^3/12) = 34.091$ NOT OK

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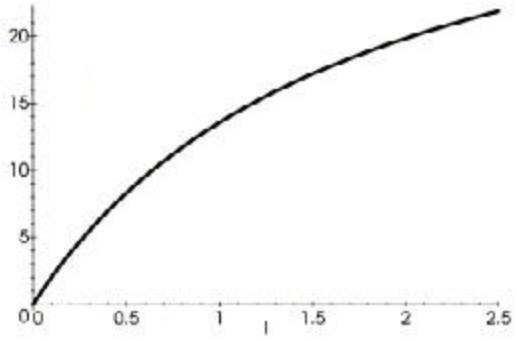
$T = 5/8$

$f_b(l) = (5l)*T*0.5)/((((8.8-3.6)/2.5)l+3.6)*T^3/12)$




$f_b(2.5) = (5*2.5)*5/8*0.5)/((((8.8-3.6)/2.5)*2.5+3.6)*(5/8)^3/12) = 21.818$ OK

$\sim T = 3/4$ OK

$f_b(l) = (5l)*T*0.5)/((((8.8-3.6)/2.5)l+3.6)*T^3/12)$

21.818 < 30.36

$f_b(2.5) < f_{allow}$

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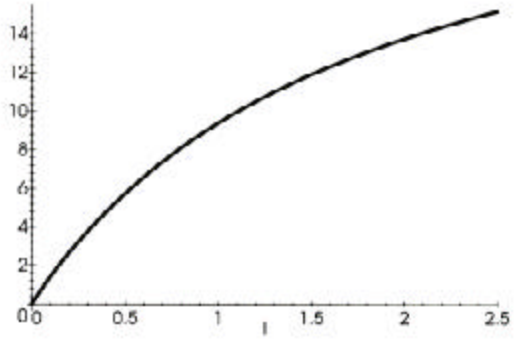


$f_b(l) = (5 * 2.5) * 3/4 * 0.5)/((((8.8 - 3.6)/2.5) * 2.5 + 3.6) * (3/4)^3/12)$ — 15.152 ok