Rolled Beam Alternative Evaluation

$E \equiv 29000\ ksi$
$F_y \equiv 50\ ksi$

$L := 125\ ft = (1.5 \cdot 10^3)\ in$

$$w_L := \frac{(1.75 \cdot 122.35\ kip)}{125\ ft} = 1.713\ \frac{kip}{ft}$$

$$\Delta_{LLmax} := \frac{\left(125\ ft \cdot \frac{(12\ in)}{1\ ft}\right)}{800} = 1.875\ in$$

$$I_x := \frac{\left(5\ \frac{w_L}{12} \cdot L^4\right)}{(384 \cdot E \cdot \Delta_{LLmax})} = 14420.292\ in^4$$

from AISC Table 3-3:

W40x199 is the lightest section that meets the deflection requirements.

W40 x 199 Properties:

$\phi M_n := 3260\ ft \cdot kip$
$M_U := 10215.625\ ft \cdot kip$

$\phi M_n \geq M_U$ **INVALID**

Try W40 x 211

$\phi M_n := 3400\ ft \cdot kip$
$M_U := 10215.625\ ft \cdot kip$

$\phi M_n \geq M_U$ **INVALID**

Try **W40 x 593**

$\phi M_n := 10400\ ft \cdot kip$
$M_U := 10215.625\ ft \cdot kip$

$\phi M_n \geq M_U$
VALID, but heavy

Weight of 4 - W40 x 593 Girders

$$4 \cdot 593\ \frac{lb}{ft} \cdot 125\ ft = 296500\ lb$$

Total Weight of Plate Girder Alternative
= 135,260 lb

Therefore, the plate girder alternative would be cheaper.