Draw the shear and moment diagrams for the beams shown below.

(A) 10 kips 10 kips 20 kips 10 kips 10 kips

(B) 20 kips

(C) 20 kips

(D) 50 kips 50 kips
E. The reinforced concrete bridge pier shown below supports a three–girder structural steel highway bridge. Two loading cases are shown below.

For each loading condition, draw the shear and moment diagrams for the beam. Determine the moment for which the beam must be designed. Determine the moment for which the column must be designed.

**Load case 1**

- \( P_D + P_L \)
- \( P_D = 36 \text{ kips} \)
- \( P_L = 40 \text{ kips} \)

**Load case 2**

- \( P_D + P_L \)

PD = 36 kips
PL = 40 kips
A weightless cantilever supports a concentrated service load of magnitude $P$ as shown below. The beam is a reinforced concrete having both flexure and transverse steel. Denote the theoretical shear and moment strength of the beam as $V_n$ and $M_n$. Reliable strengths are obtained by the appropriate factors, $\phi$, respectively. Fictitious values for these factors are given below.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Shear</th>
<th>Flexure</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\phi$</td>
<td>0.65</td>
<td>0.90</td>
</tr>
</tbody>
</table>

If the live load factor is 1.6, and the theoretical flexure and shear capacity are 110 kip-ft and 11 kip, what magnitude of $P$ would be permitted using strength design?

Answer:

$P = ?$