6-15 GIVEN:

REQURED: Draw influence lines for:
(a) the moment at C
(b) the vertical rxn at A
(c) the vertical rxn at B

\[ \sum F_y = 0 \Rightarrow A_y = 1 \]
\[ \sum M = 0 \Rightarrow M_c = 1(5) + 1(5) \Rightarrow M_c = 0 \]

\[ \begin{array}{c|c}
   X & M_c \\
   \hline
   0 & 0 \\
   5 & 2.5 \\
   10 & 0 \\
   15 & -2.5 \\
   20 & -5 \\
   25 & -2.5 \\
   30 & 0 \\
\end{array} \]

\[ \sum M_A = 0 \Rightarrow B_y(10) - 1(15) \Rightarrow B_y = 1.5 \]
\[ \sum M_A = 0 \Rightarrow B_y(15) - 1(20) \Rightarrow B_y = 2 \]
\[ \sum F_y = 0 \Rightarrow -1 + 2 + A_y \Rightarrow A_y = -1 \]

\[ \sum M = 0 \Rightarrow M_c + 1(5) \Rightarrow M_c = -5 \]
### Table 6-15 cont'd

#### Influence line for $A_y$

<table>
<thead>
<tr>
<th>$x$</th>
<th>$A_y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>0.5</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>-0.5</td>
</tr>
<tr>
<td>20</td>
<td>-1</td>
</tr>
<tr>
<td>25</td>
<td>-0.5</td>
</tr>
<tr>
<td>30</td>
<td>0</td>
</tr>
</tbody>
</table>

*From part A*

#### Influence line for $B_y$

<table>
<thead>
<tr>
<th>$x$</th>
<th>$B_y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0.5</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>1.5</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td>0</td>
</tr>
</tbody>
</table>

*From part A*
**6-16** \[ \text{GIVEN:} \]

[Diagram of a beam with labeled points A, B, C, D, and E. Labels include dimensions: 5' x 5' x 10' x 10'.]

**REQUIRED:** Repeat 6-15 using Müller-Bresleu

(a) Replace point C with a pin connection and apply a positive moment.

(b) Replace pin A with a roller guide.

(c) Replace B with a roller guide.

(Influence line for Mc)

(Deflected shape)

(Influence line for Ay)

(Deflected shape)

(Influence line for By)
GIVEN:

REQUIRED: Draw the influence line for the tension in cable BC. Find the maximum tension.

FBD (x = 12)

\[ T = \frac{5}{12} (12) - 6 (12) \]

\[ T = 15.6 \text{ kN} \] (max tension in cable BC)

Table:

<table>
<thead>
<tr>
<th>x (in)</th>
<th>T (kN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>1.3</td>
</tr>
<tr>
<td>12</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Influence line for tension in cable BC
GIVEN:

REQUIRED: Determine:

(a) max negative moment created at A
(b) max positive shear at B

SOLUTION:

(a) Replace fixed support at A w/ a pin

FBD (at max neg. moment at A)

\[ MA = \frac{1}{2} \times (5 \times 5) + \frac{1}{2} \times (-5 \times 10) \times 1.5 = 56.25 \text{ kN}\cdot\text{m} \]

\[ MA = (-5) \times (10 \text{ kN}) = -50 \text{ kN}\cdot\text{m} \]

\[ MA_{\text{max}} = -50 - 56.25 = -106.25 \text{ kN}\cdot\text{m} \]

(b) Replace pin at B w/ a roller guide

\[ V_B = \frac{1}{2} \times (15m - 5m) \times (10 \text{ kN}) = 10 \text{ kN} \]

\[ V_B_{\text{max}} = 10 \text{ kN} + 7.5 \text{ kN} = 17.5 \text{ kN} \]
REQUIRED: Determine:
(a) largest live shear created at C
(b) largest moment created at C

* Assume the truck travels in either direction &

SOLUTION:
1/2 the load is transferred to each girder

(a) Replace splice at C w/ a roller guide

* Max live shear at C is created when the back tire of the truck is at C when moving from left to right.

\[
\frac{6.7}{40} = \frac{y}{25} \quad \Rightarrow \quad y = 0.419
\]

\[
V_c(\text{max}) = \frac{1}{2} \left[ (6.7)(8k) + (0.419)(4k) \right]
\]

\[
V_c(\text{max}) = 3.52 \text{ k}
\]

(b) Replace joint C w/ a pin and apply a positive moment.

* Max moment at C is also created when the back tire of the truck is at C when moving from left to right.

\[
\frac{13.4}{40} = \frac{z}{25} \quad \Rightarrow \quad z = 8.375
\]

\[
M_c(\text{max}) = \frac{1}{2} \left[ 13.4 (8k) + 8.375 (4k) \right]
\]

\[
M_c(\text{max}) = 70.4 \text{ k-ft}
\]
**Given:**

\[ 10 \text{ m} \times 5\text{ m} \times 5\text{ m} \times 10 \text{ m} \]

**Required:** Determine the max live moment at C caused by the moving loads.

**Solution:** Replace point C with a pin connection and apply a positive moment.

**Case 1**

\[ \frac{5}{10} = \frac{x}{8} \implies x = 4 \]

\[ M_c = (-5)(20) + (-4)(80) \]

\[ M_c = -420 \text{ kN} \cdot \text{m} \]

**Case 2**

\[ \frac{5}{10} = \frac{y}{4} \implies y = 4.5 \]

\[ \frac{5}{10} = \frac{z}{7} \implies z = 3.5 \]

\[ M_c = (-5)(40) + (-4.5)(20) + (-3.5)(80) \]

\[ M_c = -570 \text{ kN} \cdot \text{m} \]

**Case 3**

\[ M_c = (-5)(80) + (-4)(20) + (-3.5)(40) \]

\[ M_c = -620 \text{ kN} \cdot \text{m} \]

\[ M_c(\text{max L} \rightarrow \text{R}) = -570 \text{ kN} \cdot \text{m} \]

\[ M_c(\text{max R} \rightarrow \text{L}) = -620 \text{ kN} \cdot \text{m} \]