INTRODUCTION

The following pages show the estimated reaction forces of a backstop- up to the point of structure that is custom designed for each individual project. Custom-designed structure may add overall weight to the assembly, but normally distributes these reaction forces to the building attachment points.

Final reaction magnitude and locations cannot be determined until the backstop is engineered, but this document is meant to serve as a worst-case guide for your project. The reaction forces are based on the weight of the backstop (including the heaviest backboard, height adjuster, etc) and a 0.7 Seismic Factor.

CLICK ON YOUR ATTACHMENT HEIGHT BELOW:

- 21' Attachment Height
- 22' Attachment Height
- 23' Attachment Height
- 24' Attachment Height
- 25' Attachment Height
- 26' Attachment Height
- 27' Attachment Height
- 28' Attachment Height
- 29' Attachment Height
- 30' Attachment Height
- 31' Attachment Height
- 32' Attachment Height
WEIGHT LOAD CALCULATIONS (WITH BANK DOWN)

\[
\text{BACKSTOP'S TOTAL WEIGHT LOAD} = 588 \text{ lbs} \quad (\text{WEIGHT OF FRONT BRACE} + \text{WEIGHT OF MAST} + \text{WEIGHT OF BANK})
\]

\[
\text{WEIGHT LOAD AT POINT "A"} = 538 \text{ lbs} \quad \left(\frac{\text{WEIGHT OF FRONT BRACE}}{2} + \text{WEIGHT OF MAST} + \text{WEIGHT OF BANK}\right)
\]

\[
\text{WEIGHT LOAD AT POINT "B"} = 50 \text{ lbs} \quad \left(\frac{\text{WEIGHT OF FRONT BRACE}}{2}\right) + \text{WEIGHT OF PULLEY}
\]

**SEISMIC FACTORED MOMENTS AND SUM OF MOMENTS FOR BACKSTOP ELEMENTS**

\[
\text{SEISMIC FACTOR} = 0.7 \quad (\text{VARIES WITH SEISMIC ZONE, RIGIDITY OF SUPPORT \& ROOM USE})
\]

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEIGHT OF BANK</td>
<td>264 lbs</td>
</tr>
<tr>
<td>WEIGHT OF FRONT BRACE</td>
<td>28 lbs</td>
</tr>
<tr>
<td>WEIGHT OF MAST</td>
<td>262 lbs</td>
</tr>
<tr>
<td>SEISMIC MOMENT (MB)</td>
<td>1788 lbs</td>
</tr>
<tr>
<td>SEISMIC MOMENT (MFB)</td>
<td>95 lbs</td>
</tr>
<tr>
<td>SEISMIC MOMENT (MM)</td>
<td>566 lbs</td>
</tr>
</tbody>
</table>

**DISTANCE TO HINGE LINE**

\[
\text{DISTANCE TO HINGE LINE} = 20.4'\]

**SUM OF THE MOMENTS**

\[
\text{SUM OF THE MOMENTS} = 2878 \text{ ft-lbs}
\]

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK DOWN

**REACTIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)**

\[
R_{\text{H, A}} = \text{VERTICAL REACTIONS AT POINT A: } \frac{793 \text{ lbs}}{2} \times \text{SUM OF THE MOMENTS} \div \text{DISTANCE BETWEEN SUPPORTS (A-A)}\]

\[
R_{\text{H, A}} = \text{HORIZONTAL REACTIONS AT POINT A: } \frac{266 \text{ lbs}}{2} \times \text{BACKSTOP'S TOTAL WEIGHT LOAD} \times \text{SEISMIC FACTOR}
\]

**REACTIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PERPENDICULAR TO BANK (FIG. 1)**

\[
R_{\text{H, B}} = \text{VERTICAL REACTIONS AT POINT B: } \frac{627 \text{ lbs}}{2} \times \text{WEIGHT OF FRONT BRACE} + \text{WEIGHT OF PULLEY} \div \text{SUM OF THE MOMENTS} \div \text{DISTANCE BETWEEN SUPPORTS (A-B)}\]

\[
R_{\text{H, B}} = \text{HORIZONTAL REACTIONS AT POINT B: } \frac{234 \text{ lbs}}{2} \times \text{SUM OF THE MOMENTS} \div \text{DISTANCE TO MIDPOINT OF FRONT BRACE} \times 2
\]

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK UP

**HOST CABLE TENSION AT POINT A**

\[
R_{\text{H, A}} = \text{VERTICAL REACTIONS AT POINT A: } \frac{753 \text{ lbs}}{2} \times \text{SUM OF THE MOMENTS} \div \text{SEISMIC FACTOR} \times \text{DISTANCE FROM A TO B}
\]

**HOST CABLE TENSION AT POINT B**

\[
R_{\text{H, B}} = \text{VERTICAL REACTIONS AT POINT B: } \frac{803 \text{ lbs}}{2} \times \text{WEIGHT OF FRONT BRACE} + \text{WEIGHT OF PULLEY} \div \text{SUM OF THE MOMENTS} \div \text{DISTANCE FROM A TO B}
\]

**HOST CABLE TENSION AT POINT C**

\[
R_{\text{H, C}} = \text{VERTICAL REACTIONS AT POINT C: } \frac{753 \text{ lbs}}{2} \times \text{SUM OF THE MOMENTS} \div \text{SEISMIC FACTOR} \times \text{DISTANCE FROM A TO B}
\]
WEIGHT LOAD CALCULATIONS (WITH BANK DOWN)

BACKSTOP'S TOTAL WEIGHT LOAD = 585 lbs
WEIGHT LOAD AT POINT "A" = 548 lbs (WEIGHT OF FRONT BRACE + WEIGHT OF MAST + WEIGHT OF BANK)
WEIGHT LOAD AT POINT "B" = 50 lbs (WEIGHT OF FRONT BRACE + WEIGHT OF MAST + WEIGHT OF PULLEY)

SEISMIC FACTORED MOMENTS AND SUM OF MOMENTS FOR BACKSTOP ELEMENTS

SEISMIC FACTOR = 0.7

WEIGHT OF BANK (WB) = 264 lbs X SEISMIC FACTOR X DISTANCE TO MIDPOINT OF BANK (DB)
WEIGHT OF FRONT BRACE (WFB) = 28 lbs X SEISMIC FACTOR X DISTANCE TO MIDPOINT OF FRONT BRACE (DFB)
WEIGHT OF MAST (WM) = 270 lbs X SEISMIC FACTOR X DISTANCE TO MIDPOINT OF MAST (DM)

WB + WFB + WM = BACKSTOP'S TOTAL WEIGHT LOAD

SUM OF THE MOMENTS = MB + MFB + MM

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK DOWN

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK DOWN

\[ R_{ax}^{\text{vertical at point A:}} = \frac{\text{WEIGHT LOAD AT POINT "A"}}{2 \text{ SUPPORTS}} \]

\[ R_{dx}^{\text{horizontal at point A:}} = \frac{\text{BACKSTOP'S TOTAL WEIGHT LOAD X SEISMIC FACTOR}}{2 \text{ SUPPORTS}} \]

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PERPENDICULAR TO BANK (FIG. 1)

BANK DOWN

\[ R_{bx}^{\text{vertical at point B:}} = \frac{\text{WEIGHT OF FRONT BRACE}}{2 \text{ SUPPORTS}} + \frac{\text{WEIGHT OF PULLEY}}{2 \text{ SUPPORTS}} \]

\[ R_{cb}^{\text{horizontal at point B:}} = \frac{\text{SUM OF THE MOMENTS}}{\text{DISTANCE BETWEEN SUPPORTS (A-B)}} \]

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK UP

REATIONS AT HINGE LINE AT POINT C FROM WEIGHT LOADS AND SEISMIC PERPENDICULAR TO BANK (FIG. 1)

\[ R_{cx}^{\text{vertical at point C:}} = \frac{\text{HOST CABLE TENSION}}{2 \text{ SUPPORTS}} + \frac{\text{SEISMIC FACTOR X DISTANCE FROM A TO B}}{2 \text{ SUPPORTS}} \]

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

\[ R_{ax}^{\text{vertical at point A:}} = \frac{\text{BACKSTOP'S TOTAL WEIGHT LOAD + HOST CABLE TENSION}}{2 \text{ SUPPORTS}} \]

\[ R_{dx}^{\text{horizontal at point A:}} = \frac{\text{SUM OF THE MOMENTS}}{\text{DISTANCE FROM A TO A m}} \]

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

\[ R_{bx}^{\text{vertical at point B:}} = \frac{\text{HOST CABLE TENSION}}{2 \text{ SUPPORTS}} + \frac{\text{WEIGHT OF FRONT BRACE}}{2 \text{ SUPPORTS}} + \frac{\text{WEIGHT OF PULLEY}}{2 \text{ SUPPORTS}} \]

\[ R_{cb}^{\text{horizontal at point B:}} = \frac{\text{SUM OF THE MOMENTS}}{\text{DISTANCE BETWEEN SUPPORTS (A-B)}} \]
WEIGHT LOAD CALCULATIONS (WITH BANK DOWN)

BACKSTOP'S TOTAL WEIGHT LOAD = 623 lbs
WEIGHT LOAD AT POINT "A" = 573 lbs
WEIGHT LOAD AT POINT "B" = 53 lbs

WEIGHT OF BANK (WB) = 264 lbs
WEIGHT OF FRONT BRACE (WFB) = 33 lbs
WEIGHT OF MAST (WM) = 200 lbs

SEISMIC FACTORED MOMENTS AND SUM OF MOMENTS FOR BACKSTOP ELEMENTS

SEISMIC FACTOR = 0.7

SUM OF THE MOMENTS = 3531 ft-lbs

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK DOWN

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK DOWN

R_{Amax}^V Vertical Reaction at Point A: 874 lbs = \frac{WEIGHT LOAD AT POINT "A"}{2 SUPPORTS} + \frac{SUM OF THE MOMENTS}{DISTANCE BETWEEN SUPPORTS (A-A)_{h}}

R_{Amax}^H Horizontal Reaction at Point A: 218 lbs = \frac{BACKSTOP'S TOTAL WEIGHT LOAD X SEISMIC FACTOR}{2 SUPPORTS}

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PERPENDICULAR TO BANK (FIG. 1)

BANK DOWN

R_{Bmax}^V Vertical Reaction at Point B: 590 lbs = \frac{WEIGHT OF FRONT BRACE X WEIGHT OF PULLEY}{2 SUPPORTS} + \frac{SUM OF THE MOMENTS}{DISTANCE BETWEEN SUPPORTS (A-B)}

R_{Bmax}^H Horizontal Reaction at Point B: 256 lbs = \frac{SUM OF THE MOMENTS}{DISTANCE TO M IDPOINT OF FRONT BRACE X 2}

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK UP

HOST CABLE TENSION AT POINT C: 693 lbs

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

R_{Amax}^V Vertical Reaction at Point A: 35 lbs = \frac{BACKSTOP'S TOTAL WEIGHT LOAD X HOST CABLE TENSION}{2 SUPPORTS}

R_{Amax}^H Horizontal Reaction at Point A: 589 lbs = \frac{SUM OF THE MOMENTS}{DISTANCE FROM A TO A_{h}}

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

R_{Bmax}^V Vertical Reaction at Point B: 745 lbs = \frac{HOST CABLE TENSION X WEIGHT OF FRONT BRACE}{2 SUPPORTS} + \frac{WEIGHT OF PULLEY}{2 SUPPORTS}

R_{Bmax}^H Horizontal Reaction at Point B: 693 lbs = \frac{HOST CABLE TENSION}{2 SUPPORTS}
WEIGHT LOAD CALCULATIONS (WITH BANK DOWN)

BACKSTOP'S TOTAL WEIGHT LOAD = 632 lbs
WEIGHT LOAD AT POINT "A" = \( \frac{580 \text{ lbs}}{2} \times \frac{\text{WEIGHT OF FRONT BRACE}}{2} + \text{WEIGHT OF MAST} + \text{WEIGHT OF BANK} \)
WEIGHT LOAD AT POINT "B" = \( \frac{53 \text{ lbs}}{2} \times \frac{\text{WEIGHT OF FRONT BRACE}}{2} + \text{WEIGHT OF PULLEY} \)

SEISMIC FACTORED MOMENTS AND SUM OF MOMENTS FOR BACKSTOP ELEMENTS

SEISMIC FACTOR = 0.7

WEIGHT OF BANK (WB) = 264 lbs
WEIGHT OF FRONT BRACE (WFB) = 33 lbs
WEIGHT OF MAST (WM) = 93 lbs

WB + WFB + WM = BACKSTOP'S TOTAL WEIGHT LOAD = 397 lbs

DISTANCE TO MIDPOINT OF BANK (DB) = 936 lbs
DISTANCE TO MIDPOINT OF FRONT BRACE (DFB) = 221 lbs
DISTANCE TO MIDPOINT OF MAST (DM) = 263 lbs

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK DOWN

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

- BANK DOWN:
  \[ R_{vA} = \frac{936 \text{ lbs}}{2 \text{ supports}} \times \frac{\text{WEIGHT LOAD AT POINT "A"}}{\text{DISTANCE BETWEEN SUPPORTS (A-A) x}} \]
  \[ R_{hA} = \frac{221 \text{ lbs}}{2 \text{ supports}} \times \frac{\text{BACKSTOP'S TOTAL WEIGHT LOAD X SEISMIC FACTOR}}{\text{DISTANCE BETWEEN SUPPORTS (A-B) x}} \]

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PERPENDICULAR TO BANK (FIG. 1)

- BANK DOWN:
  \[ R_{vB} = \frac{571 \text{ lbs}}{2 \text{ supports}} \times \frac{\text{WEIGHT OF FRONT BRACE}}{\text{DISTANCE BETWEEN SUPPORTS (A-B)}} \]
  \[ R_{hB} = \frac{263 \text{ lbs}}{2 \text{ supports}} \times \frac{\text{SUM OF THE MOMENTS}}{\text{DISTANCE TO MIDPOINT OF FRONT BRACE X 2}} \]

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK UP

HOIST CABLE TENSION AT POINT C = 665 lbs

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

- BANK UP:
  \[ R_{vA} = \frac{171 \text{ lbs}}{2 \text{ supports}} \times \frac{\text{BACKSTOP'S TOTAL WEIGHT LOAD + HOIST CABLE TENSION}}{\text{DISTANCE FROM A TO A x}} \]
  \[ R_{hA} = \frac{666 \text{ lbs}}{2 \text{ supports}} \times \frac{\text{SUM OF THE MOMENTS}}{\text{DISTANCE FROM A TO A x}} \]

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

- BANK UP:
  \[ R_{vB} = \frac{718 \text{ lbs}}{2 \text{ supports}} \times \frac{\text{HOIST CABLE TENSION + WEIGHT OF FRONT BRACE}}{\text{DISTANCE TO MIDPOINT OF FRONT BRACE X 2}} \]
  \[ R_{hB} = \frac{665 \text{ lbs}}{2 \text{ supports}} \times \frac{\text{HOIST CABLE TENSION}}{\text{DISTANCE TO MIDPOINT OF FRONT BRACE X 2}} \]
WEIGHT LOAD CALCULATIONS (WITH BANK DOWN)

<table>
<thead>
<tr>
<th>Weight Load</th>
<th>Description</th>
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<tbody>
<tr>
<td>653 lbs</td>
<td>bank down</td>
</tr>
<tr>
<td>609 lbs</td>
<td>front brace</td>
</tr>
<tr>
<td>53 lbs</td>
<td>front brace</td>
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PLEASE NOTE THESE ARE ESTIMATED WEIGHT LOADS FROM THE BACKSTOP MAST HANGERS TO THE FLOOR. THESE ESTIMATES DO NOT INCLUDE ANY SUPERSTRUCTURE WEIGHS.

SEISMIC FACTORED MOMENTS AND SUM OF MOMENTS FOR BACKSTOP ELEMENTS

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>0.7</td>
<td>seismic factor</td>
</tr>
</tbody>
</table>

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK DOWN

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK DOWN

\[ R_{v_{ax}} = \frac{\text{weight load at point } A}{2} \]

\[ R_{h_{ax}} = \frac{\text{backstop total weight load} \times \text{seismic factor}}{2} \]

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PERPENDICULAR TO BANK (FIG. 1)

BANK DOWN

\[ R_{v_{ax}} = \frac{\text{weight load at point } B}{2} \]

\[ R_{h_{ax}} = \frac{\text{sum of the moments}}{\text{distance to midpoint of front brace} \times 2} \]

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK UP

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

\[ R_{v_{ax}} = \frac{\text{weight load at point } A}{2} \]

\[ R_{h_{ax}} = \frac{\text{backstop total weight load} \times \text{seismic factor}}{2} \]

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

\[ R_{v_{ax}} = \frac{\text{weight load at point } B}{2} \]

\[ R_{h_{ax}} = \frac{\text{weight load at point } B}{2} \]

\[ R_{h_{ax}} = \frac{\text{backstop total weight load} \times \text{seismic factor}}{2} \]
WEIGHT LOAD CALCULATIONS (WITH BANK DOWN)

BACKSTOP'S TOTAL WEIGHT LOAD = 670 lbs (WEIGHT OF FRONT BRACE + WEIGHT OF MAST + WEIGHT OF BANK)

WEIGHT LOAD AT POINT "A" = 613 lbs (WEIGHT OF FRONT BRACE + WEIGHT OF MAST + WEIGHT OF BANK)

WEIGHT LOAD AT POINT "B" = 57 lbs (WEIGHT OF FRONT BRACE) + WEIGHT OF PULLEY

SEISMIC FACTORED MOMENTS AND SUM OF MOMENTS FOR BACKSTOP ELEMENTS

SEISMIC FACTOR = 0.7 (VARIES WITH SEISMIC ZONE, RIGIDITY OF SUPPORT & ROOM USE)

WEIGHT OF BANK (WB) = 264 lbs x SEISMIC FACTOR
WEIGHT OF FRONT BRACE (WFB) = 41 lbs x SEISMIC FACTOR
WEIGHT OF MAST (WM) = 329 lbs x SEISMIC FACTOR

WEIGHT OF BANK = 264 lbs x SEISMIC FACTOR = 267 lb-ft (SEISMIC MOMENT MB, FT-Lbs)
WEIGHT OF FRONT BRACE = 41 lbs x SEISMIC FACTOR = 207 lb-ft (SEISMIC MOMENT MFB, FT-Lbs)
WEIGHT OF MAST = 329 lbs x SEISMIC FACTOR = 190 lb-ft (SEISMIC MOMENT MM, FT-Lbs)

WB + WFB + WM = BACKSTOP'S TOTAL WEIGHT LOAD = 460 lb-ft SUM OF THE MOMENTS = MFB + MM + MB

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK DOWN

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK DOWN

\[ R_{va} = \frac{\text{WEIGHT LOAD AT POINT } A}{2 \text{ SUPPORTS}} \]
\[ R_{va} = \frac{1027 \text{ lbs}}{2} \]

HORIZONTAL REACTION AT POINT A = 513.5 lbs

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PERPENDICULAR TO BANK (FIG. 1)

BANK DOWN

\[ R_{vb} = \frac{\text{WEIGHT LOAD AT POINT } B}{2 \text{ SUPPORTS}} \]
\[ R_{vb} = \frac{564 \text{ lbs}}{2} \]

HORIZONTAL REACTION AT POINT B = 282 lbs

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK UP

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

\[ R_{va} = \frac{\text{WEIGHT LOAD AT POINT } A}{2 \text{ SUPPORTS}} \]
\[ R_{va} = \frac{131 \text{ lbs}}{2} \]

HORIZONTAL REACTION AT POINT A = 65.5 lbs

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

\[ R_{vb} = \frac{\text{WEIGHT LOAD AT POINT } B}{2 \text{ SUPPORTS}} \]
\[ R_{vb} = \frac{700 \text{ lbs}}{2} \]

HORIZONTAL REACTION AT POINT B = 350 lbs

HOIST CABLE TENSION AT POINT C = 644 lbs

SUM OF THE MOMENTS = SEISMIC FACTOR x DISTANCE FROM A TO B
WEIGHT LOAD CALCULATIONS (WITH BANK DOWN)

| BACKSTOPS TOTAL WEIGHT LOAD | 691 lbs [WEIGHT OF FRONT BRACE + WEIGHT OF MAST + WEIGHT OF BANK] |
| WEIGHT LOAD AT POINT "A" | 634 lbs [WEIGHT OF FRONT BRACE / 2 + WEIGHT OF MAST + WEIGHT OF BANK] |
| WEIGHT LOAD AT POINT "B" | 57 lbs [WEIGHT OF FRONT BRACE / 2 + WEIGHT OF PULLEY] |

PLEASE NOTE THESE ARE ESTIMATED WEIGHT LOADS FROM THE BACKSTOP MAST HANGERS TO THE FLOOR. THESE ESTIMATES DO NOT INCLUDE ANY SUPERSTRUCTURE WEIGHTS.

SEISMIC FACTORED MOMENTS AND SUM OF MOMENTS FOR BACKSTOP ELEMENTS

| SEISMIC FACTOR = 0.7 | VARIES WITH SEISMIC ZONE, RIGIDITY OF SUPPORT & ROOM USE |
| WEIGHT OF BANK (WB) | 264 lbs x SEISMIC FACTOR | DISTANCE TO MIDPOINT OF BANK (DB) | 2852 ft-lbs SEISMIC MOMENT (MB) (FT-LBS) |
| WEIGHT OF FRONT BRACE (WFB) | 41 lbs x SEISMIC FACTOR | DISTANCE TO MIDPOINT OF FRONT BRACE (DFB) | 221 lbs SEISMIC MOMENT (MB) (FT-LBS) |
| WEIGHT OF MAST (WM) | 582 lbs x SEISMIC FACTOR | DISTANCE TO MIDPOINT OF MAST (DM) | 2042 lbs SEISMIC MOMENT (MM) (FT-LBS) |

WB + WFB + WM = BACKSTOPS TOTAL WEIGHT LOAD

5115 ft-lbs SUM OF THE MOMENTS = MB + MFB + MM

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK DOWN

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

| HORIZONTAL REACTION AT POINT A: 242 lbs = BACKSTOPS TOTAL WEIGHT LOAD X SEISMIC FACTOR / 2 SUPPORTS |

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PERPENDICULAR TO BANK (FIG. 1)

| BANK DOWN | VERTICAL REACTIONS AT POINT B: 581 lbs = [WEIGHT OF FRONT BRACE / 2 SUPPORTS] + WEIGHT OF PULLEY ± SUM OF THE MOMENTS BETWEEN SUPPORTS (A-B) |
| HORIZONTAL REACTION AT POINT B: 202 lbs = DISTANCE BETWEEN MIDPOINT OF FRONT BRACE X 2 |

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK UP

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

| BANK UP | VERTICAL REACTIONS AT POINT A: 731 lbs = BACKSTOPS TOTAL WEIGHT LOAD + HOIST CABLE TENSION / 2 SUPPORTS |
| HORIZONTAL REACTION AT POINT A: FROM SEISMIC PARALLEL TO BANK |

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

| BANK UP | VERTICAL REACTIONS AT POINT B: 696 lbs = HOIST CABLE TENSION + [WEIGHT OF FRONT BRACE / 2 SUPPORTS] + WEIGHT OF PULLEY |

| HOIST CABLE TENSION AT POINT C: 640 lbs = SUM OF THE MOMENTS | SEISMIC FACTOR X DISTANCE FROM A TO B |

| CUSTOMER NO. | DRAWING BY |
| 952 Style Backstop | Porter Athletic Equipment Co. |
| 27" Attachment Height | WORLD LEADER IN QUALITY SPORTS EQUIPMENT |
| 2500 S. 25TH AVENUE, ILLINOIS 60155 | BROADVIEW, ILLINOIS 60155 |
| www.porterath.com | 2500 S. 25TH AVENUE, ILLINOIS 60155 |
| www.porterath.com | 2500 S. 25TH AVENUE, ILLINOIS 60155 |
WEIGHT LOAD CALCULATIONS (WITH BANK DOWN)

BACKSTOP'S TOTAL WEIGHT LOAD = 700 lbs
WEIGHT LOAD AT POINT "A" = 644 lbs
WEIGHT LOAD AT POINT "B" = 57 lbs

SEISMIC FACTORED MOMENTS AND SUM OF MOMENTS FOR BACKSTOP ELEMENTS

SEISMIC FACTOR = 0.7 (VARIES WITH SEISMIC ZONE, RIGIDITY OF SUPPORT & ROOM USE)

WEIGHT OF BANK (WB) = 264 lbs X SEISMIC FACTOR X DISTANCE TO MIDPOINT OF BANK (DB)
WEIGHT OF FRONT BRACE (WFB) = 41 lbs X SEISMIC FACTOR X DISTANCE TO MIDPOINT OF FRONT BRACE (DFB)
WEIGHT OF MAST (WM) = 569 lbs X SEISMIC FACTOR X DISTANCE TO MIDPOINT OF MAST (DM)

WB + WFB + WM = BACKSTOP'S TOTAL WEIGHT LOAD = 5404 lbs

SUM OF THE MOMENTS = MB + MFB + MM

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK DOWN

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK DOWN

\[ R_{\text{VA}} = \frac{\text{WEIGHT LOAD AT POINT "A"}}{2 \text{ SUPPORTS}} = \frac{1107 \text{ lbs}}{2} = 553.5 \text{ lbs} \]

\[ R_{\text{HA}} = \frac{\text{HORIZONTAL REACTION AT POINT A}}{2 \text{ SUPPORTS}} = \frac{245 \text{ lbs}}{2} = 122.5 \text{ lbs} \]

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PERPENDICULAR TO BANK (FIG. 1)

BANK DOWN

\[ R_{\text{VB}} = \frac{\text{VERTICAL REACTION AT POINT "B"}}{2 \text{ SUPPORTS}} = \frac{554 \text{ lbs}}{2} = 277 \text{ lbs} \]

\[ R_{\text{HB}} = \frac{\text{HORIZONTAL REACTION AT POINT "B"}}{2 \text{ SUPPORTS}} = \frac{257 \text{ lbs}}{2} = 128.5 \text{ lbs} \]

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK UP

REATIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

\[ R_{\text{VA}} = \frac{\text{WEIGHT LOAD AT POINT "A"}}{2 \text{ SUPPORTS}} = \frac{700 \text{ lbs}}{2} = 350 \text{ lbs} \]

\[ R_{\text{HA}} = \frac{\text{HORIZONTAL REACTION AT POINT A}}{2 \text{ SUPPORTS}} = \frac{705 \text{ lbs}}{2} = 352.5 \text{ lbs} \]

REATIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

\[ R_{\text{VB}} = \frac{\text{VERTICAL REACTION AT POINT "B"}}{2 \text{ SUPPORTS}} = \frac{630 \text{ lbs}}{2} = 315 \text{ lbs} \]

\[ R_{\text{HB}} = \frac{\text{HORIZONTAL REACTION AT POINT "B"}}{2 \text{ SUPPORTS}} = \frac{630 \text{ lbs}}{2} = 315 \text{ lbs} \]
WEIGHT LOAD CALCULATIONS (WITH BANK DOWN)

BACKSTOP'S TOTAL WEIGHT LOAD

WEIGHT LOAD AT POINT "A" = 782 lbs
WEIGHT LOAD AT POINT "B" = 74 lbs

SEISMIC FACTORED MOMENTS AND SUM OF MOMENTS FOR BACKSTOP ELEMENTS

WEIGHT OF BANK (WB) 280 lbs X SEISMIC FACTOR X DISTANCE TO MIDPOINT OF BANK (DB) = 3417 ft-lbs SEISMIC MOMENT (MB) (FT-LBS)
WEIGHT OF FRONT BRACE (WFB) 76 lbs X SEISMIC FACTOR X DISTANCE TO MIDPOINT OF FRONT BRACE (DBF) = 464 ft-lbs SEISMIC MOMENT (MFB) (FT-LBS)
WEIGHT OF MAST (WM) 300 lbs X SEISMIC FACTOR X DISTANCE TO MIDPOINT OF MAST (DM) = 2551 ft-lbs SEISMIC MOMENT (MM) (FT-LBS)

WB + WFB + WM = BACKSTOP'S TOTAL WEIGHT LOAD = 6432 ft-lbs

SUM OF THE MOMENTS = MB + MFB + MM

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK DOWN

REACTIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK DOWN

R<sub>max</sub> = VERTICAL REACTIONS AT POINT A: 1158 lbs = WEIGHT LOAD AT POINT "A" / 2 SUPPORTS
R<sub>hor</sub> = HORIZONTAL REACTION AT POINT A: 274 lbs = BACKSTOP'S TOTAL WEIGHT LOAD X SEISMIC FACTOR / 2 SUPPORTS

REACTIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PERPENDICULAR TO BANK (FIG. 1)

BANK DOWN

R<sub>max</sub> = VERTICAL REACTIONS AT POINT B: 606 lbs = WEIGHT OF FRONT BRACE / 2 SUPPORTS
R<sub>hor</sub> = HORIZONTAL REACTION AT POINT B: 351 lbs = SUM OF THE MOMENTS / DISTANCE TO MIDPOINT OF FRONT BRACE X 2

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK UP

HOIST CABLE TENSION AT POINT C: 655 lbs = SUM OF THE MOMENTS / SEISMIC FACTOR X DISTANCE FROM A TO B

REACTIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

R<sub>max</sub> = VERTICAL REACTIONS AT POINT A: 84 lbs = BACKSTOP'S TOTAL WEIGHT LOAD + HOIST CABLE TENSION / 2 SUPPORTS
R<sub>hor</sub> = HORIZONTAL REACTION AT POINT A: 804 lbs = SUM OF THE MOMENTS / DISTANCE FROM A TO A'

REACTIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

R<sub>max</sub> = VERTICAL REACTIONS AT POINT B: 729 lbs = HOIST CABLE TENSION + WEIGHT OF FRONT BRACE / 2 SUPPORTS
R<sub>hor</sub> = HORIZONTAL REACTION AT POINT B: 655 lbs = HOIST CABLE TENSION
WEIGHT LOAD CALCULATIONS (WITH BANK DOWN)

BACKSTOP’S TOTAL WEIGHT LOAD

WEIGHT LOAD AT POINT "A" = 716 lbs
WEIGHT LOAD AT POINT "B" = 74 lbs

SEISMIC FACTORED MOMENTS AND SUM OF MOMENTS FOR BACKSTOP ELEMENTS

SEAISIC FACTOR = 0.7

WEIGHT OF BANK (WB) 280 lbs X SEISMIC FACTOR X DISTANCE TO MIDPOINT OF BANK (DB)
WEIGHT OF FRONT BRACE (WFB) 76 lbs X SEISMIC FACTOR X DISTANCE TO MIDPOINT OF FRONT BRACE (DBF)
WEIGHT OF MAST (WM) 400 lbs X SEISMIC FACTOR X DISTANCE TO MIDPOINT OF MAST (DM)

WB + WFB + WM = BACKSTOP’S TOTAL WEIGHT LOAD

SUM OF THE MOMENTS = MB + MFB + MM

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK DOWN

REACTIIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK DOWN

VERTICAL REACTIONS AT POINT A:

HORIZONTAL REACTIONS AT POINT A:

REACTIIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PERPENDICULAR TO BANK (FIG. 1)

BANK DOWN

VERTICAL REACTIONS AT POINT B:

HORIZONTAL REACTIONS AT POINT B:

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK UP

HOST CABLE TENSION AT POINT C:

REACTIIONS AT HINGE LINE AT POINT A FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

VERTICAL REACTIONS AT POINT A:

HORIZONTAL REACTIONS AT POINT A:

REACTIIONS AT HINGE LINE AT POINT B FROM WEIGHT LOADS AND SEISMIC PARALLEL TO BANK (FIG. 2)

BANK UP

VERTICAL REACTIONS AT POINT B:

HORIZONTAL REACTIONS AT POINT B:
WEIGHT LOAD CALCULATIONS (WITH BANK DOWN)

- **Backstop's Total Weight Load**
  - **Weight of Backstop** = 817 lbs
  - **Weight of Mast** = 738 lbs
  - **Weight of Pulley** = 76 lbs

**Weight Load at Point 'A'**

- **Weight of Front Brace** = 613# (Bank Up)
- **Weight of Mast** = 731# (Bank Up)

**Weight Load at Point 'B'**

- **Weight of Front Brace** = 370# (Bank Up)
- **Weight of Mast** = 371# (Bank Up)

- **Seismic Factored Moments and Sum of Moments for Backstop Elements**
  - **Seismic Factor** = 0.7
  - (Varies with seismic zone, rigidity of support & room use)

- **Weight of Bank (WB)**
- **Weight of Front Brace (WFB)**
- **Weight of Mast (WM)**

- **Distance to Midpoint of Bank (DB)**
- **Distance to Midpoint of Front Brace (DFB)**
- **Distance to Midpoint of Mast (DM)**

**WB + WFB + WM = Backstop's Total Weight Load**

- **Backstop's Total Weight Load X Seismic Factor**
- **Distance Between Supports (A-A) X**

**Point Reactions from Weight Loads and Seismic with Bank Down**

**Reactions at Hinge Line at Point A from Weight Loads and Seismic Parallel to Bank (Fig. 2)**

- **Bank Down**
  - **Vertical Reaction at Point A**
    - **Weight Load at Point 'A'**
    - **Sum of the Moments**
    - **Distance Between Supports (A-A) X**

- **Horizontal Reaction at Point A**
  - **Bank Down**
    - **2 Supports**

**Reactions at Hinge Line at Point B from Weight Loads and Seismic Perpendicular to Bank (Fig. 1)**

- **Bank Down**
  - **Vertical Reaction at Point B**
    - **Weight of Front Brace**
    - **Sum of the Moments**
    - **Distance Between Supports (A-B)**

- **Horizontal Reaction at Point B**
  - **Bank Down**
    - **2 Supports**

**Point Reactions from Weight Loads and Seismic with Bank Up**

**Host Cable Tension at Point C**

- **Host Cable Tension**
- **Sum of the Moments**
- **Seismic Factor X Distance from A to B**

**Reactions at Hinge Line at Point A from Weight Loads and Seismic Parallel to Bank (Fig. 2)**

- **Bank Up**
  - **Vertical Reaction at Point A**
    - **2 Supports**

- **Horizontal Reaction at Point A**
  - **From Seismic Parallel to Bank**
    - **Backstop's Total Weight Load X Host Cable Tension**

**Reactions at Hinge Line at Point B from Weight Loads and Seismic Parallel to Bank (Fig. 2)**

- **Bank Up**
  - **Vertical Reaction at Point B**
    - **Host Cable Tension**
    - **Weight of Front Brace**
    - **Weight of Pulley**

- **Horizontal Reaction at Point B**
  - **Bank Up**
    - **2 Supports**

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**Static Equivalent Loading for:**

952 Style Backstop
31' Attachment Height

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www.porter-ath.com
WEIGHT LOAD CALCULATIONS (WITH BANK DOWN)

<table>
<thead>
<tr>
<th>Backstop's Total Weight Load</th>
<th>826 lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Load at Point &quot;A&quot;</td>
<td>748 lbs</td>
</tr>
<tr>
<td>Weight Load at Point &quot;B&quot;</td>
<td>78 lbs</td>
</tr>
</tbody>
</table>

*PLEASE NOTE THESE ARE ESTIMATED WEIGHT LOADS FROM THE BACKSTOP MAST HANGERS TO THE FLOOR. THESE ESTIMATES DO NOT INCLUDE ANY SUPERSTRUCTURE WEIGHTS.*

SEISMIC FACTORED MOMENTS AND SUM OF MOMENTS FOR BACKSTOP ELEMENTS

\[ \text{Seismic Factor} = 0.7 \]

<table>
<thead>
<tr>
<th>Component</th>
<th>Formula</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight of Bank (Wb)</td>
<td>[ 280 \times \text{Seismic Factor} \times \text{Distance to Midpoint of Bank (DB)} ]</td>
<td>4035 lbs</td>
</tr>
<tr>
<td>Weight of Front Brace (WFB)</td>
<td>[ 84 \times \text{Seismic Factor} \times \text{Distance to Midpoint of Front Brace (DFB)} ]</td>
<td>601 lbs</td>
</tr>
<tr>
<td>Weight of Mast (WM)</td>
<td>[ 426 \times \text{Seismic Factor} \times \text{Distance to Midpoint of Mast (DM)} ]</td>
<td>3232 lbs</td>
</tr>
</tbody>
</table>

\[ Wb + Wfb + Wm = \text{Backstop's Total Weight Load} \]

\[ 7838 \text{ lbs} = \text{Sum of the Moments} = \text{MB} + \text{MFB} + \text{MM} \]

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK DOWN

**Reactions at Hinge Line at Point A from Weight Loads and Seismic Parallel to Bank (Fig. 2)**

- **Bank Down**
  - \[ R_{va}^0 = \frac{\text{Weight Load at Point "A"}}{2 \times \text{Distance between Supports (A-A)}} \]
  - \[ R_{ha}^0 = \frac{\text{Backstop's Total Weight Load} \times \text{Seismic Factor}}{2 \times \text{Distance between Supports (A-A)}} \]

**Reactions at Hinge Line at Point B from Weight Loads and Seismic Perpendicular to Bank (Fig. 1)**

- **Bank Down**
  - \[ R_{vb}^0 = \frac{\text{Weight of Front Brace} \times \text{Weight of Pulley}}{2 \times \text{Distance between Supports (A-B)}} \]
  - \[ R_{hb}^0 = \frac{\text{Sum of the Moments}}{\text{Distance to Midpoint of Front Brace} \times 2} \]

POINT REACTIONS FROM WEIGHT LOADS AND SEISMIC WITH BANK UP

**Reactions at Hinge Line at Point A from Weight Loads and Seismic Parallel to Bank (Fig. 2)**

- **Bank Up**
  - \[ R_{va}^u = \frac{\text{Backstop's Total Weight Load} + \text{Hoist Cable Tension}}{2 \times \text{Distance from A to B}} \]
  - \[ R_{ha}^u = \frac{\text{Sum of the Moments}}{\text{Distance from A to B}} \]

**Reactions at Hinge Line at Point B from Weight Loads and Seismic Parallel to Bank (Fig. 2)**

- **Bank Up**
  - \[ R_{vb}^u = \frac{\text{Hoist Cable Tension} + \text{Weight of Front Brace}}{2 \times \text{Distance}} \]
  - \[ R_{hb}^u = \frac{\text{Hoist Cable Tension} \times \text{Weight of Pulley}}{2} \]