BRIDLE THEORY
Basic Definition

- The use of multiple points to create a single point in a desired location. This is predominantly used when ceiling I-beams are not located in the same position as the desired motor point.
- You must think about bridles the same way you look at a math problem.
- It’s all about the triangle!!
Advantages of the Bridle

- The bridle is the most accurate way to locate a point for hanging.
- You can use two point to locate a central location.
- Aligning a bridle directly over the desired location allows the rigged object to raise and lower exactly vertically.
Main Disadvantage

- Cable lengths always come in standard sizes.
- 5’, 10’, 20’, 30’, 50’
Common Hardware Used

- Burlap Bag
- Wire rope slings of various sizes
- Shackles
- Pearing Rings
- Hauling Rope
If a bridle is too flat, the leg tension will be too high.

Bridles with larger than 3:1 S to H ratios may cause damage to rigging.

\[ S = D1 + D2 \]

Make sure your span is not 3x longer than the height of your bridle.
Bridles can be thought as two triangles sharing a common side.
Size Of Space
Low Ceilings under 70'

- Make changes at the floor.
- Less time to raise and lower the bridle.
- Riggers underestimate working at heights.
- Reduces mental strain and likelihood of dropping an object.
- Put short lengths near the bridle junction.
High Ceilings over 70'

- Faster to make changes at the beam.
- Takes too long to raise and lower the bridle.
- Exhaustion will set in raising and lowering the bridle.
- Shorter bridle lengths stay near the beam so change can be made by the rigger.
Using three 100’ tape measures can be useful for figuring bridle lengths.
The two riggers will lower the tape measures down and the ground crew will attach a third at the bridle junction.
Each point can accurately be measured.
This is the simplest way to obtain accurate measurements.
The easiest way to calculate the length of your legs is to use Pythagorean Theorem.

- $H =$ height
- $D =$ distance

$L_1 = \sqrt{D_1^2 + H^2}$

$L_2 = \sqrt{D_2^2 + H^2}$
Exercise 1

Distance = 22\'0"

Height = 10\'0"

Leg 1 = ?
You must understand the following

- Leg tension
- Horizontal Components of force
- Vertical Components of force

These three are always acting on bridle cables, beams and objects hanging.
The following equations assume that the beams are at the same height.

Establishing Vertical Force

\[ R1 = \frac{W \times D_2}{S} \]
Step 2

- Establishing Bridle Leg Stress
- You must use the R1 value to find the stress in the Bridle Leg

\[ \text{LEG1} = \frac{R1 \times L1}{H} \]
Example 1

SPAN = 30'

D1 = 20'

D2 = 10'

H = 8'

W = 500 lb.
Solve for L1 & L2

\[ L1 = \sqrt{D_1^2 + H^2} \]

\[ L2 = \sqrt{D_2^2 + H^2} \]

\[ L1 = \sqrt{20^2 + 8^2} = 22 \]

\[ L2 = \sqrt{10^2 + 8^2} = 13 \]
Solve for Vertical force

\[ R_1 = \frac{W(D2)}{500(10)} = \frac{500(10)}{30} = 167 \]

\[ R_2 = \frac{W(D1)}{500(20)} = \frac{500(20)}{30} = 333 \]
Solve for leg stress

- Leg1 = $R_1(L_1) = 167(22) = 459$
  
  $H \quad 8$

- Leg2 = $R_2(L_2) = 333(13) = 541$
  
  $H \quad 8$
Example 2

SPAN = 50'

D1 = 30'

D2 = 20'

H = 12'

L1

L2

W = 750 lb.
SOLVE FOR L1 & L2

\[ L_1 = \sqrt{D_1^2 + H^2} \]

\[ L_2 = \sqrt{D_2^2 + H^2} \]

\[ L_1 = \sqrt{30^2 + 12^2} = 32 \]

\[ L_2 = \sqrt{20^2 + 12^2} = 23 \]
Answer 1

- Solve for Vertical force

- $R_1 = \frac{W(D_2)}{750(20)} = \frac{50}{300} = 300$

- $R_2 = \frac{W(D_1)}{750(30)} = \frac{50}{450} = 450$
Answer 2

- Solve for leg stress

- Leg1 = \( R_1(L_1) = \frac{300}{12} \times 32 = 800 \)

- Leg2 = \( R_2(L_2) = \frac{450}{12} \times 23 = 862.5 \)
Sometime people will run a taut single wire from two beams and hang weight from it. This is extremely dangerous.

Remember 3:1 rule.
Span = 80'

D1 = 40'

H = 1'

D2 = 40'

L1

W = 2000 lb.

L2