11.- Calculating Sling Angles

Why are Sling Angles important?

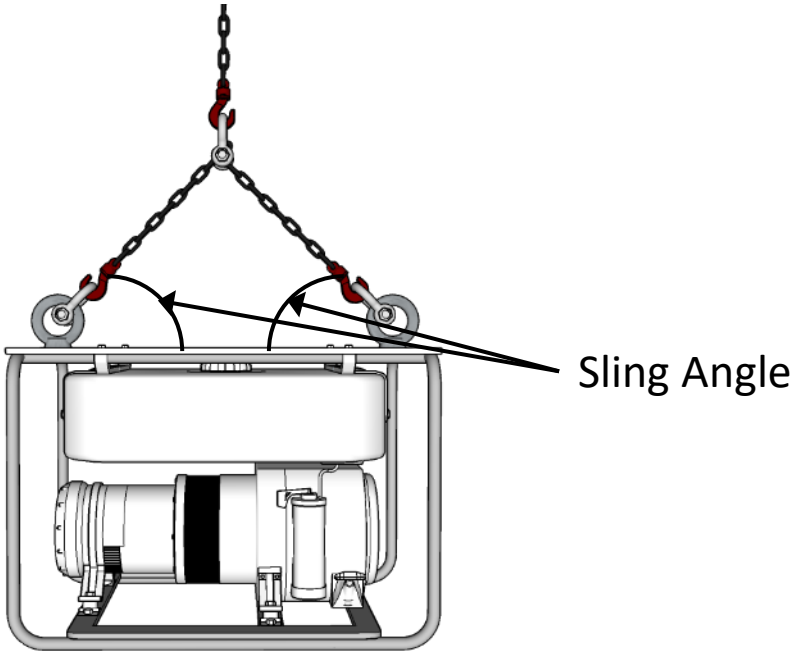
Rigging slings and lifting slings are made of cable, chain, rope or webbing, and are used to safely move large loads.

When connecting slings to the loads, sling angles can change from 90° (vertical) to smaller angles (i.e.30°) , as this happens the loads that the sling needs to carry increases, and if the angle gets small enough the load will be double that of the load that it carries, which can result in having an extremely dangerous situation on your hands .

So before deciding to casually lower the sling angle to gain additional headroom, it is important to calculate loads based on the sling angles and load factors associated with them to make sure we are able to move large heavy loads safely.

Sling Angle Factor

- What is a Sling Angle Factor? Simply put, the sling angle factor (SAF) is the multiplier used to determine the additional tension on a sling (or other rigging hardware) when angles are applied.
- It is generally recommended to avoid angles of less than 30° as the additional tension on the sling can get up to twice the weight of the load being moved.



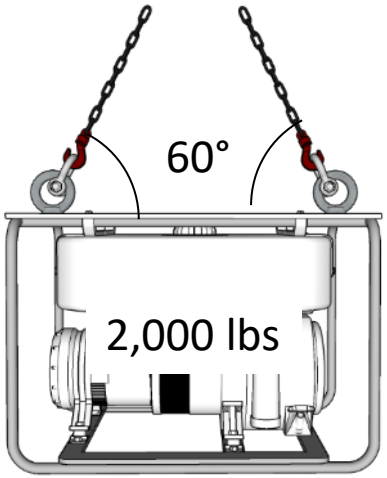
1 lift 2 connectors

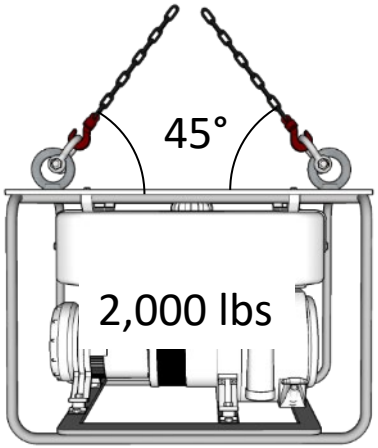
Sling Angle	Sling Angle Factor
90°	1.00
60°	1.15
45°	1.41
30°	2

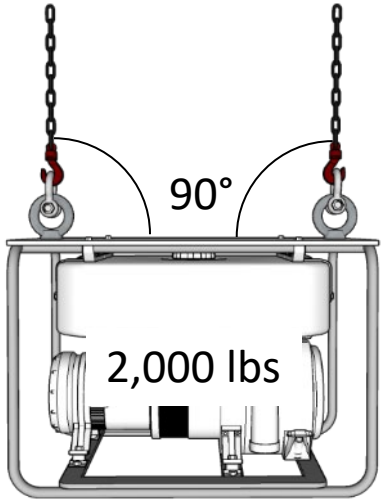
Sling Load (SL) Calculation Exercise

1 lift eye 2 connectors

- The examples below demonstrate how to calculate the Sling Load (SL) each Sling must carry based on their corresponding Sling angle and the Sling angle factor from the table before.







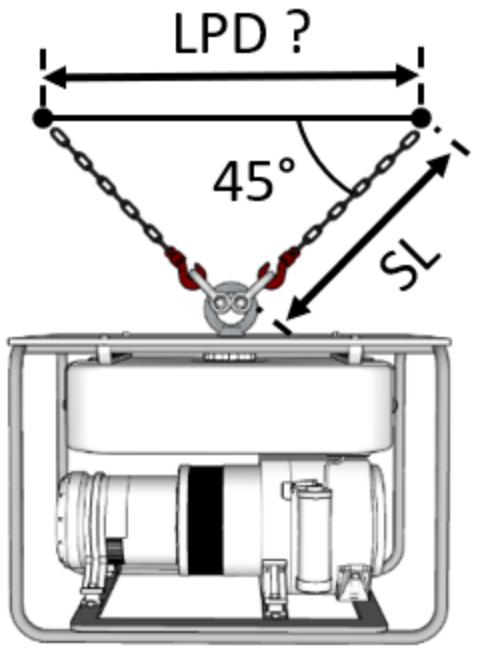
SL = Load x Sling Angle Factor
SL = 2,000 lbs. x 1.15
SL = 2,300 lbs.

SL = Load x Sling Angle Factor
SL = 2,000 lbs. x 1.41
SL = 2,820 lbs.

SL = Load x Sling Angle Factor
SL = 2,000 lbs. x 1.00
SL = 2,000 lbs.

LIFT POINT DISTANCE

When using 2 hoists to lift loads using 2 equal length slings, it is important to know how far apart the hoists can be for the rigging gear being used. The Lift Point Distance (LPD) allows us to calculate the maximum distance between hoists for a given sling size and desired horizontal angle.



We will now learn how to calculate this distance

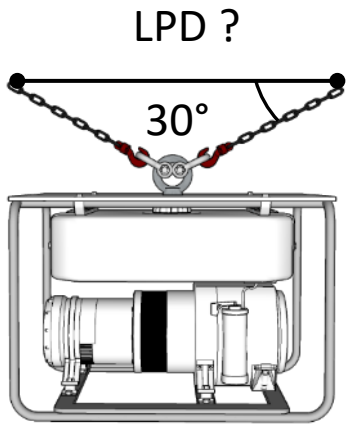
Calculating Distance between Lift Points (2 lift 1 connector) for desired Sling Angle

Lift Points Distance (LPD) = Sling Length (SL) X Sling Factor (SF)

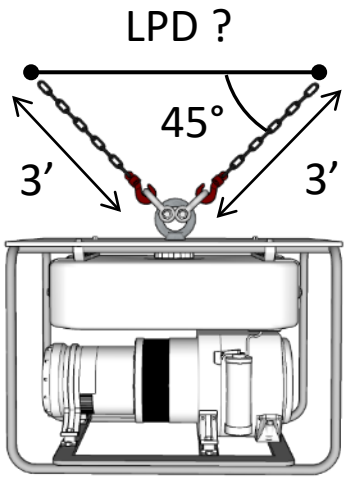
(Hint: Use your sling angle table for Sling Factors)

Sling Angle	Sling Angle Factor
90°	1.00
60°	1.15
45°	1.41
30°	2

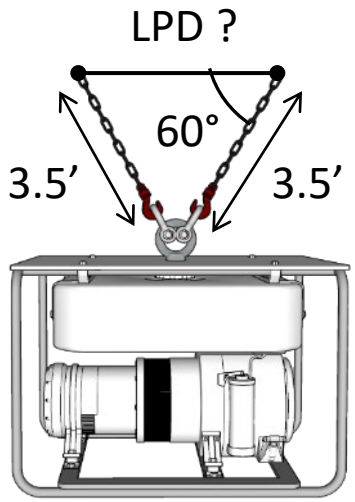
Calculate for SL = 2’2” @ 30°
LPD = SL x SF
LPD = 2’ 2” x 1.73
LPD = 2.17’ x 1.73
LPD = 3.75’
LPD = 3’ 9”



Calculate for SL = 3’ @ 45°
LPD = SL x SF
LPD = 3’ x 1.41
LPD = 3’ x 1.41
LPD = 4.23’
LPD = 4’ 3”



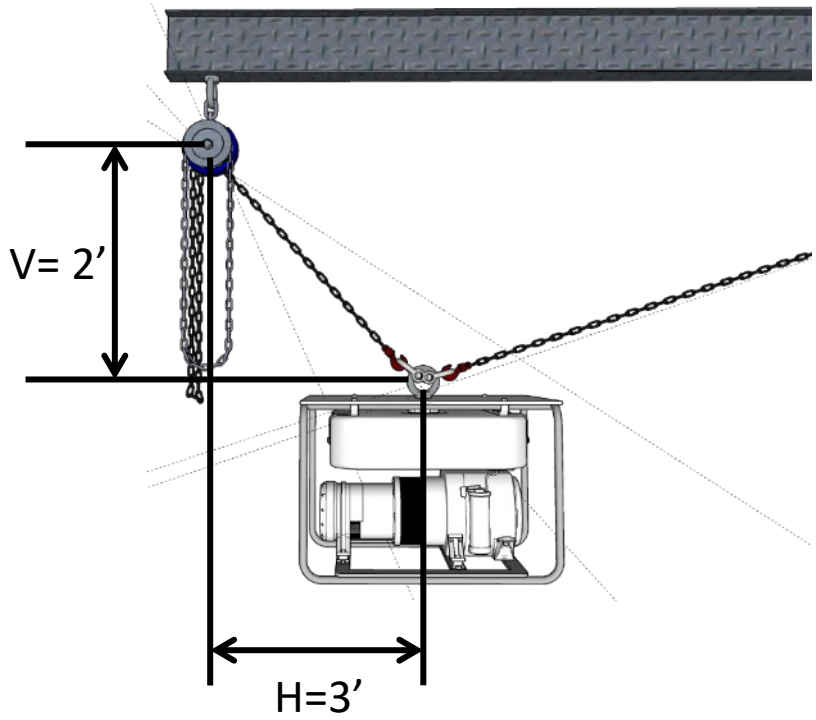
Calculate for SL = 3.5’ @ 60°
LPD = SL x SF
LPD = 3’ 6” x 1.15
LPD = 3.5’ x 1.15
LPD = 4.02’
LPD = 4’



Determining Lift Angle

To determine the lift angle in the arrangement shown:

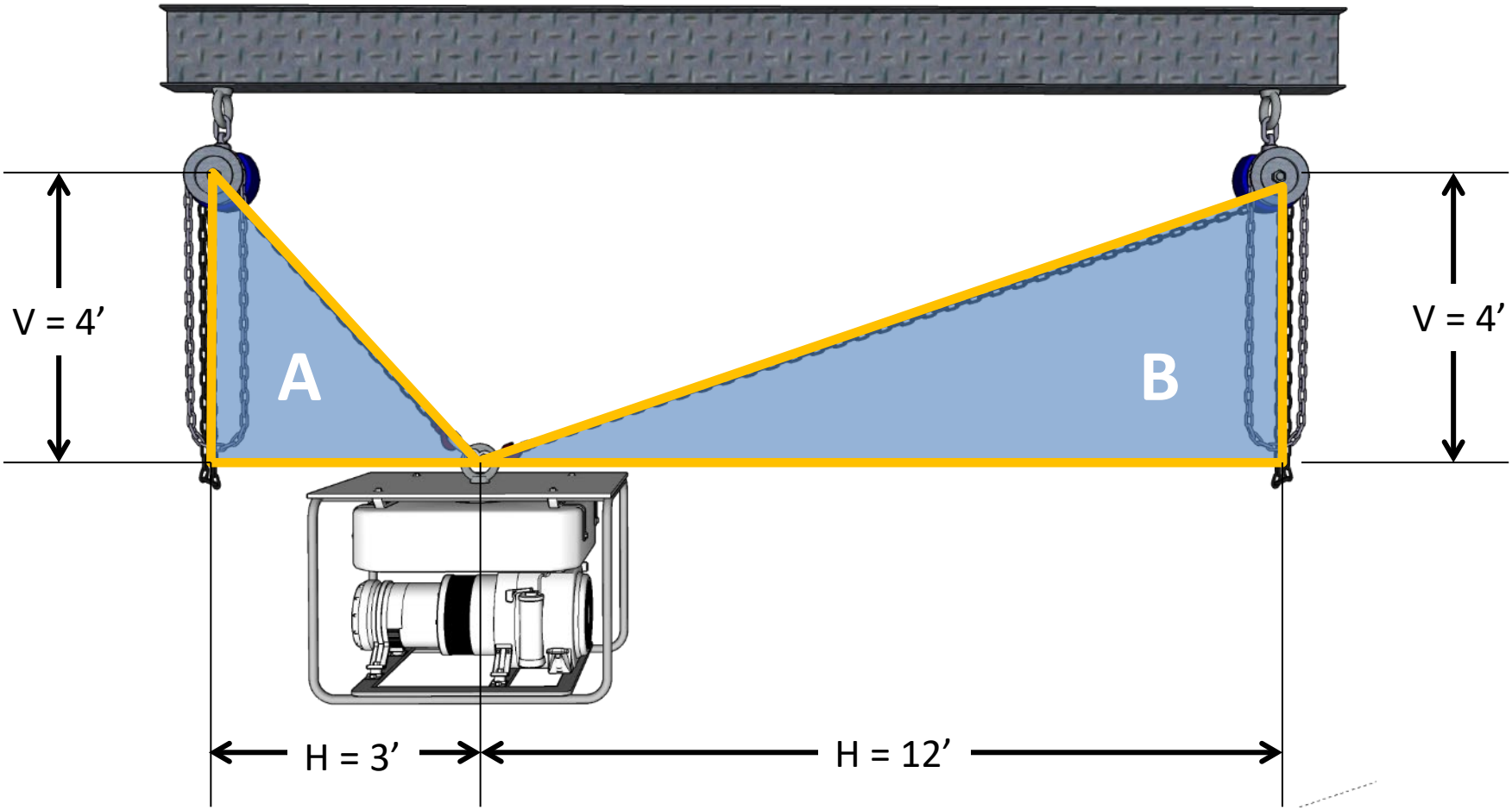
1. Measure the Horizontal (H) distance between the lift points
2. Measure the Vertical (V) distance between the lift points
3. Divide the Vertical (V) by the Horizontal (H) to find the Ratio
4. Use the answer (Ratio) to find the lift angle in the chart shown.



V ÷ H = Ratio
1.73 or greater = 60°
1.00 or greater = 45°
0.58 or greater = 30°
0.32 or greater = 17.5°
DO NOT lift with a ratio less than 0.32 !

V ÷ H = Ratio
2’ ÷ 3’ = 0.66
0.66 Ratio = 30° lift angle

Determining Lift Angle



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0.32 or greater = 17.5°
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Problem A

V ÷ H = Ratio
4’ ÷ 3’ = 1.33
1.33 Ratio = 45° lift angle

Problem B

V ÷ H = Ratio
4’ ÷ 12’ = 0.33
0.33 Ratio = 17.5° lift angle

Calculating Lift Point Distance

Lift Points Distance (LPD) = Sling Length (SL) X Sling Factor (SF)

(Hint: Use your sling angle table for Sling Factors)

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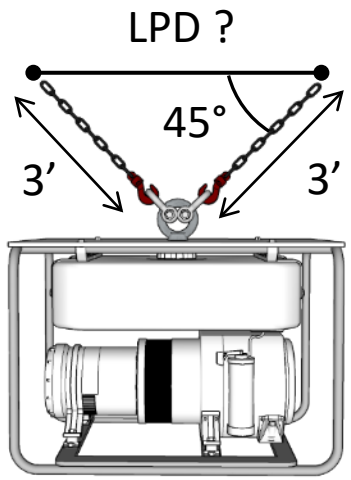

LPD = _____

Calculating Lift Point Distance

Lift Points Distance (LPD) = Sling Length (SL) X Sling Factor (SF)

(Hint: Use your sling angle table for Sling Factors)

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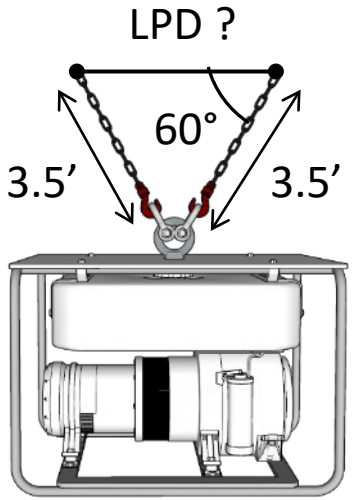
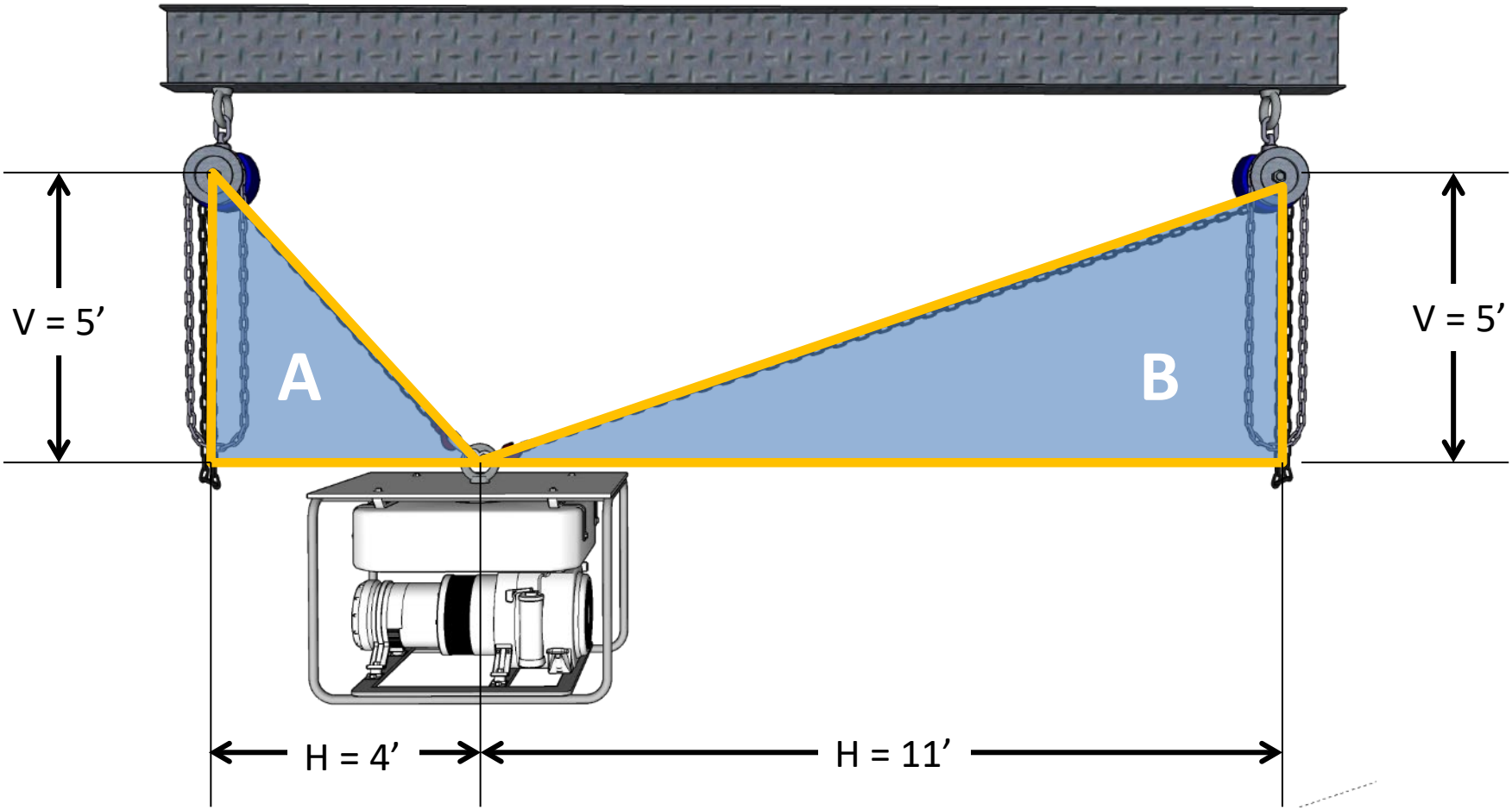
LPD = _____



Determining Lift Angle



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