Intro to Machine Rigging 110: Load Calculation

The most important part of rigging is calculating the weight of the load that has to be moved. To calculate the weight, two things must be known, 1) the type of material to be moved and its weight per cubic foot, and 2) the volume of the load in cubic feet.

Based on the type of material to be moved, the weight per cubic foot of the material can be calculated using the table of values shown from ToolingU-SME Intro to Machine Rigging 110 or any available handbook of standard weights.

According to the table, 1 square foot of iron that is 1 inch thick weighs 37.5 lbs. To determine the weight for 1 cubic foot of iron, a square foot of iron must be 12 inches thick. Therefore, the weight of 1 square foot of iron that is 1 inch thick must be multiplied by 12 to represent a thickness of 12 inches.

Weights (1sq. ft. x 1in.)
Steel: 40.6lbs Iron: 37.5lbs Aluminum: 13.3lbs Pine lumber: 2.5 - 3.6lbs.

Weight of 1 cubic foot of iron = 37.5 lbs. X 12 = 450 lbs.

To find the volume of the load moved, substitute the length, width, and height of the load into the formula for the volume of a rectangular solid.

Volume = length x width x height

$V = lwh$

For example, a 4 ft. x 8 ft. sheet of iron 1/2″ thick would have the following volume in cubic feet.

width = 4 ft.

length = 8 ft.

height (thickness) = $\frac{1}{2}$ in = $\frac{1}{2}$ in x $\frac{1 \text{ ft}}{12 \text{ in}}$ = $\frac{1}{24}$ ft

V = lwh = (8 ft)(4 ft)(1/24 ft) = 1 ⅓ ft^3 = 1.33 ft^3

Knowing the weight per cubic foot of the material moved, and the volume of material moved, the weight of the load can be determined.

Weight of load = weight per ft^3 x volume in ft^3

For the iron example: Weight of load $= 450 \frac{\text{lb}}{\text{ft}^3}$ x $1\frac{1}{3}$ ft^3 $= 600$ lbs

The weight of the 4 ft. x 8 ft. sheet of 1/2" thick iron is 600 lbs.

EXERCISES:

1. Using the table of weights provided, determine the weight of 1 cubic foot of aluminum.

2. Determine the weight of six sheets of steel measuring 4 ft. x 10 ft. x 1 in.

3. Determine how much heavier a load of 48 pine 2″ x 4″ studs are if they are 10 ft. long instead of 8 ft. in length. Use a weight of 3 lbs. for a 1 sq. ft. x 1 in. piece of pine lumber.