



Capacity Facts

Keys to determining what size of forklift you will need for your marina and keys to understanding critical components you should watch for.



How big of a forklift do I need?

There are many factors that need to be considered when determining the correct size of forklift you will need for your facility.

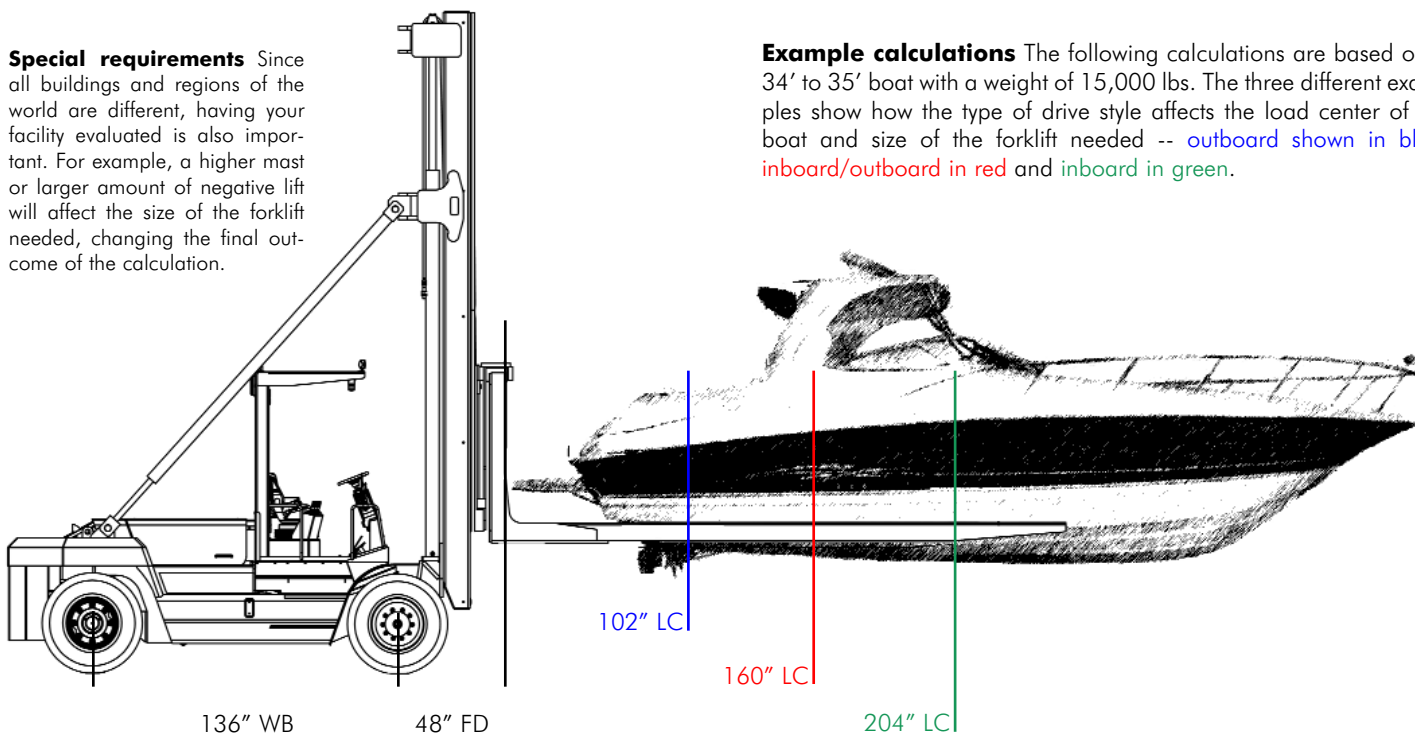
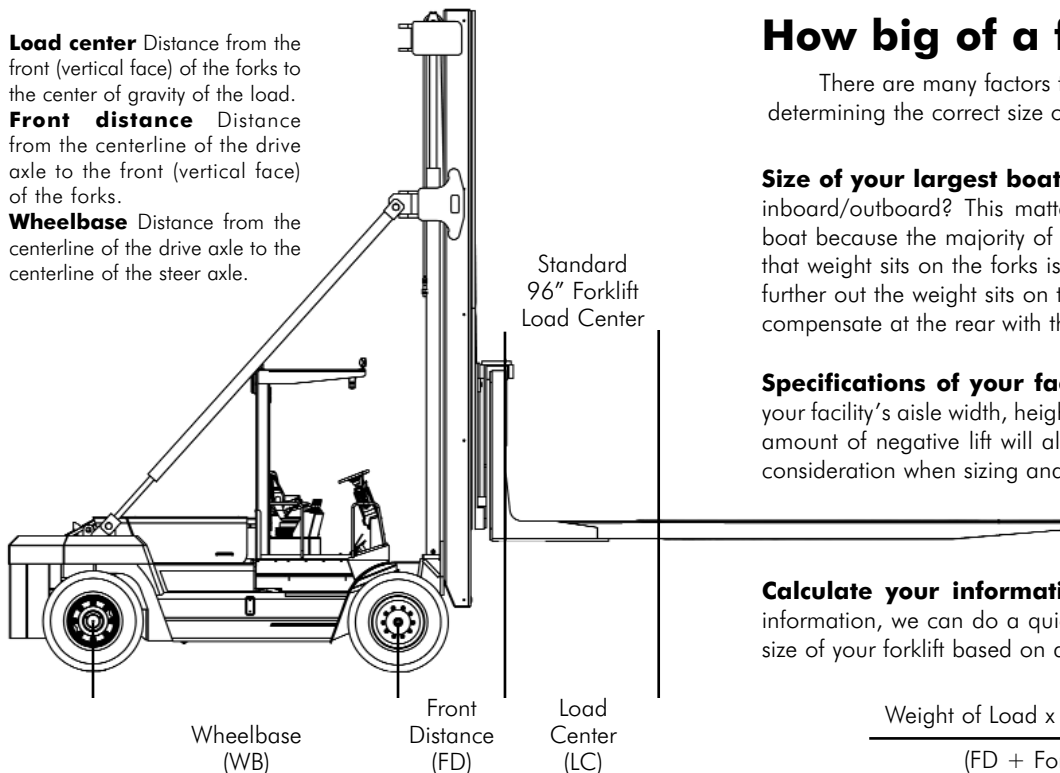
Size of your largest boat Is the drive style inboard, outboard or inboard/outboard? This matters just as much as the length of the boat because the majority of the weight will be in the motor. Where that weight sits on the forks is a key factor in sizing the forklift -- the further out the weight sits on the forks, the more the forklift needs to compensate at the rear with the counterweight and wheelbase.

Specifications of your facility Finding out information such as your facility's aisle width, height of the doorway and top rack, and the amount of negative lift will allow us to take these requirements into consideration when sizing and engineering your forklift.

Calculate your information Once we have all the necessary information, we can do a quick calculation to determine the correct size of your forklift based on a standard 96" load center...

$$\frac{\text{Weight of Load} \times (\text{FD} + \text{Boat Load Center})}{(\text{FD} + \text{Forklift Load Center})}$$

Example calculations The following calculations are based on a 34' to 35' boat with a weight of 15,000 lbs. The three different examples show how the type of drive style affects the load center of the boat and size of the forklift needed -- **outboard shown in blue**, **inboard/outboard in red** and **inboard in green**.



Step 1

$$\frac{15,000 \text{ lbs} \times (48" + 102")}{(48" + 96")}$$

Step 2

$$\frac{2,250,000}{144}$$

Forklift Size
=15,625 lbs [M170]

Step 1

$$\frac{15,000 \text{ lbs} \times (48" + 160")}{(48" + 96")}$$

Step 2

$$\frac{3,120,000}{144}$$

Forklift Size
=21,667 lbs [M220]

Step 1

$$\frac{15,000 \text{ lbs} \times (48" + 204")}{(48" + 96")}$$

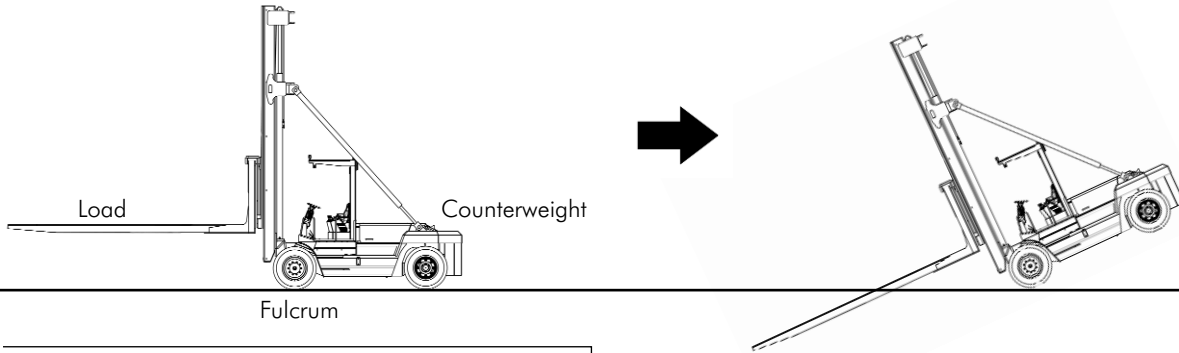
Step 2

$$\frac{3,780,000}{144}$$

Forklift Size
=26,250 lbs [M270]

What's the teeter-totter effect?

Think of the forklift as a teeter-totter. The drive axle/tires act as the middle point or fulcrum, which bears a significant amount of weight from the load on the forks and the overall weight of the forklift. Remember, in order to compensate for the load in front and keep the forklift level, we have to address the weight in the counterweight and length of the wheelbase. Also keep in mind that the further out the load is on the forks or away from the fulcrum, the more the forklift needs to compensate as well.



As you can see, the drive axle/tires are the middle point of the forklift bearing a significant amount of weight from the load and the forklift itself. You will see later the affect this will have on the drive axle/tires, as well as other components if improper calculations are taken.

How much weight needs to be in the counterweight and how long does the wheelbase need to be?

Calculating weight in counterweight

Example based on a maximum load capacity of 25,000 lbs. and a 136" wheelbase.

$$\frac{\text{Weight of Load} \times (\text{FD} + \text{Forklift Load Center})}{(\text{Wheelbase})}$$

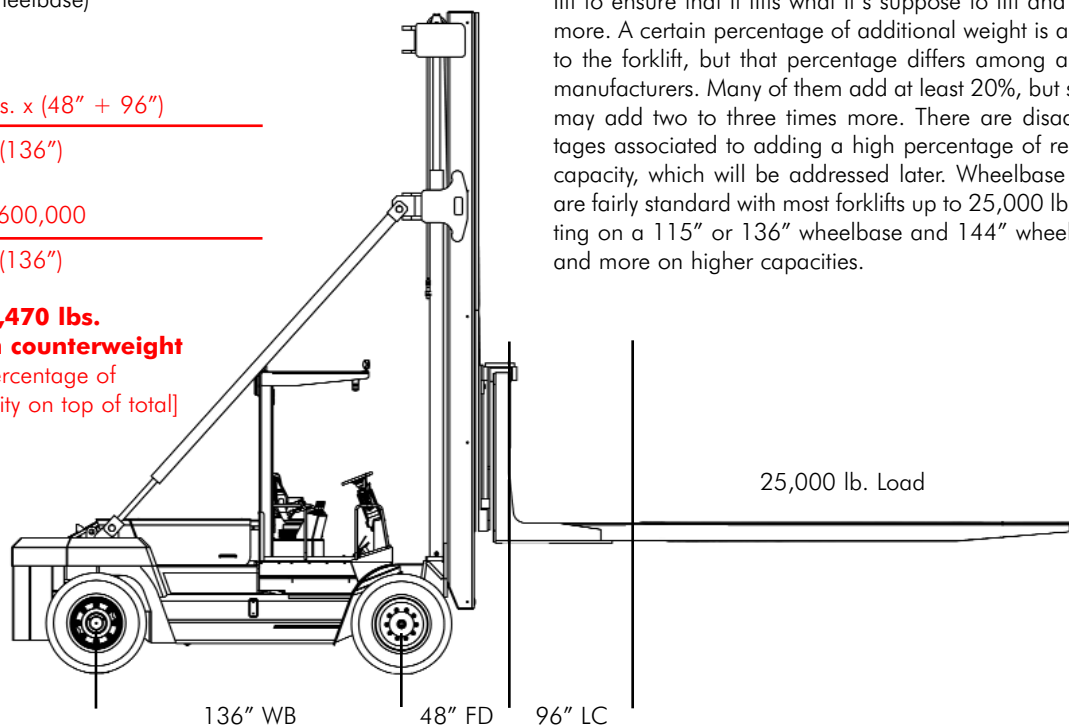
Step 1

$$\frac{25,000 \text{ lbs.} \times (48" + 96")}{(136")}$$

Step 2

$$\frac{3,600,000}{(136")}$$

= 26,470 lbs.
minimum in counterweight
 [add percentage of reserve capacity on top of total]



There is a formula similar to the capacity formula to determine the minimum weight needed to compensate for the maximum capacity of the forklift. There is a reserve capacity that all manufacturers include on their respective forklift to ensure that it lifts what it's suppose to lift and a bit more. A certain percentage of additional weight is added to the forklift, but that percentage differs among all the manufacturers. Many of them add at least 20%, but some may add two to three times more. There are disadvantages associated to adding a high percentage of reserve capacity, which will be addressed later. Wheelbase sizes are fairly standard with most forklifts up to 25,000 lbs. sitting on a 115" or 136" wheelbase and 144" wheelbase and more on higher capacities.

Can my forklift lift more than the rated capacity?

Yes, technically speaking. Earlier, we explained the reserve capacity that all marina forklift manufacturers include on their forklift with each manufacturer adding a different percentage of it. In addition to ensuring the forklift will lift the rated capacity, the reserve capacity is also there for safety and stability reasons. Depending on the percentage of reserve capacity, the forklift will lift that additional load weight though we highly discourage that practice. There are reasons why there are different capacities of forklifts available and why obtaining specifications on your facility are important.

How much is too much?

Having a forklift that can lift a significant amount more than its rated capacity may seem great and probably save you money from not going with a larger forklift, but it may cost you down the road. The larger the capacity of the forklift, the longer the wheelbase, taller the counterweight and/or wider the chassis need to be. This also goes for the components used in a higher capacity forklift. As more weight is added to a forklift, more stress is added to its components especially the drive axle and tires.

Remember the teeter-toter example? Since the drive axle/tires bear a significant amount of weight from acting as the fulcrum, the drive axle/tires must be rated properly to handle the weight. If there is too much reserve capacity on a forklift and it includes components rated only to a limited capacity, those components will falter over a period of time. Some manufacturers try stretching out the rated capacity and ability of components to keep costs down up front, but you will probably pay more in repairs and downtime later on.

Two of the most popular drive axles used on marina forklifts



AxleTech Planetary Axle
Neptune Series

Drive Axle Rating

PRC 775 - 83,000 lbs. | PRLC1794 - 130,000 lbs.

Features

Outboard wet disc brakes
Engineered for heavy-duty lift truck industry



John Deere Funk Axle
Competitor

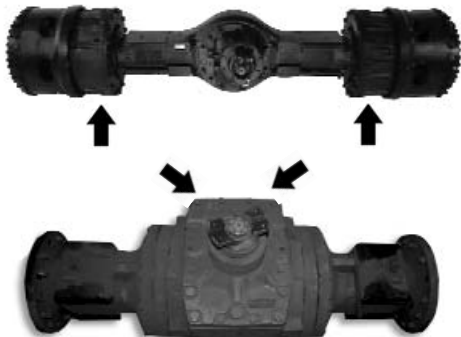
Drive Axle Rating

1400 Series - 67,000 lbs. | 1600 Series - 88,000 lbs.

Features

Inboard wet disc brakes
Off-road, heavy-duty applications

As you can see, there is a significant difference in rating between the two brands of axles. There are also additional differences...



Outboard v Inboard brakes

Though both have wet disc brakes, access to those brakes are entirely different. Look at the location of the brakes in each axle, as shown by the arrows on the photos to the left...

In order to service the inboard brakes, you would need to dismantle the entire drive axle and disassemble the center section to gain access. With outboard brakes, you would only need to remove the tires and disassemble the ends.

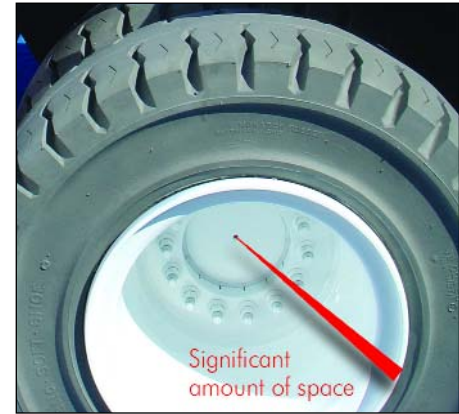
Location of tires

With the outer tire sitting out on the end of the Funk drive axle, added stress is being put on the axle, tires and rims, as well as decreased stability. Both tires on the AxleTech sit on the hub, creating more stability and decreasing the amount of stress on the axle, tires and rims. You can also see the difference in location of the tires in the photos below. The AxleTech axle is almost flush with the outer tire and the Funk axle sits far inside the outer tire. You can also see general capacities of solid pneumatic tires below. The chart shows capacities of a single tire at 6 mph and the total capacity of all four tires for three different sizes.

AxleTech Planetary Axle



John Deere Funk Axle



Solid Pneumatic Tire Ratings

Tire Size	Capacity at 6 mph	Capacity x4 Tires
12:00 x 20	18,600 lbs.	74,400 lbs.
14:00 x 24	26,130 lbs.	104,520 lbs.
16:00 x 25	34,180 lbs.	136,720 lbs.

The 12:00 x 20 tires are usually used on forklifts up to 25,000 lbs; and 14:00 x 24 and 16:00 x 25 are used on forklifts 27,000 lbs. and higher.

You can define the type of John Deere axle by looking at the serial number plate attached to the axle. The plate on the 1400 is located on the input, lower left side. The plate on the 1600 is located on the input side, upper right side. Also, digits 5-7 in the serial number identify the series [251 = 1400 Series and 252 = 1600 Series].

Now, that you have a general understanding of how to determine the size of your marina forklift and the aspects to keep an eye out for, take a look at the following case study...

Case study

An east coast marina owner recently solicited quotations for a new forklift. His requirements were to move a Formula 34 PC with a wet weight of approximately 18,000 lbs. with a load center of 167". Based on the forklift capacity formula, we found the required capacity at a 96" forklift load center equaled 26,192 Lbs.

$$\frac{\text{Weight of Load} \times (\text{FD} + \text{Boat Load Center})}{(\text{FD} + \text{Forklift Load Center})}$$

Step 1

$$\frac{18,000 \text{ lbs.} \times (60" + 167")}{(60" + 96")}$$

Step 2

$$\frac{4,086,000}{156}$$

Forklift Size
=26,192 lbs [M270]

Hoist Liftruck provided a quote for an M270 with a capacity rating of 27,000 lbs. at a 96" load center. A competitor provided a quote for the same owner for a "heavy" 24,000 lb. forklift at a 96" load center, while assuring the owner that by adding extra weight in the counterweight the forklift would lift the boat. What was not communicated to the owner, however, was how grossly overloaded many of the components would be by attempting to build a heavier, yet lower rated-capacity forklift. A look at the numbers on each manufacturer's axle rating on this boat reveals the following...

Neptune M270

Drive Axle Rating

130,000 lbs. [AxleTech PRLC1794]

Drive Axle Loaded Weight

112,650 lbs.

17,350 lbs. UNDER rated axle capacity

Competitor 24K

Drive Axle Rating

88,000 lbs. [JD Funk 1600 Series]

Drive Axle Loaded Weight

120,100 lbs.

32,100 lbs. OVER rated axle capacity

In this case, the marina owner chose the Neptune Series M270. After examining the facts, the owner did not want a forklift with a drive axle that was 36% overloaded. The owner also feared the additional axle loading would result in failed tires, rims, as well as the mast, which has been reported in some cases. In the end, the owner chose to purchase the proper size of forklift to do the job.

You can see the drastic difference and how much the JD Funk axle is overloaded and why it is important to correctly calculate the size of the forklift and use the appropriate components. Over a short period of time, the additional stress put on the axle and other components (i.e. mast and tires) will cause premature damage that is extremely costly in repairs and downtime. In addition to damage to the forklift, overloaded components and a heavy forklift pose a huge safety concern in an environment populated with people and valuable property. Unless accounted for, a heavy forklift will gradually tear up your concrete or asphalt surface generated by the concentration of weight not only on the front section of the forklift, but also the rear section. Take a look at the photos and see the result of an overloaded axle and rims on a forklift, and damage to a floor...



Location of most cracks in overloaded rims and wheels. (photo does not reflect actual damaged rim)

Key points in finding and receiving the right marina forklift

Make sure the manufacturer obtains accurate information

Finding out the size of the largest boat you handle, as well as the type of boat (i.e. inboard or outboard motor) is just one of many details the manufacturer needs to obtain to correctly calculate the size of your forklift. Other details include doorway height, aisle width, rack height and amount of negative lift.

Understand the facts involved in sizing your forklift correctly

Some manufacturers focus on the forklift's overall weight to be able to accomplish its tasks, but there are several other factors to consider -- length of the forklift, height of the counterweight and design of the chassis are also key factors. Some forklifts have a high percentage of reserve weight and technically could handle loads well beyond its rated capacity, but issues of overloaded components and surface damage can cost you thousands of dollars in repairs and downtime, as well as pose a significant safety risk.

Take the time to learn about components used on the forklift

Does the engine meet federal emissions standards and noise regulations? Can the axles handle the weight of the forklift and load over a long period of time? Are there corrosion-resistant components throughout the forklift? There are many different engines, axles and other components on the market, but make sure these components meet your needs and will perform over a long period of time.

Find out the terms of the manufacturer's warranty and service/parts support

Ask the manufacturer if the warranty is based on operating hours and/or years, as well as what it covers. Some manufacturers may also offer a buy-back guarantee or other special deals. Also, ask about the level of service and parts support. Does the manufacturer have servicing dealers in your area or do they contract out to a third-party? Do they have around-the-clock support or parts in stock?

Check out references and ask for a demo

What better way to know the performance of the forklift you're considering than to talk to the people who currently own it? Current owners can give you the positive and negatives aspects of the forklift, as well as give you advice in the decision process. Also, ask the manufacturer for a demo on the forklift either at their factory or a customer's facility. This way, you can view the forklift in action, as well as test it and its features out first-hand.

Visit the factory where your forklift would be manufactured

If you check out the references of the forklift, why not check out the actual manufacturer? See if you can arrange a plant tour with the manufacturer to see where and how the forklift you're considering will be manufactured. You can see first-hand what level of quality and craftsmanship will go into your forklift. View the work from the chassis to the finished product. You can look to see if the steel used is treated or sandblasted to ensure a solid, rust-free core to visiting the service and parts department to determine how quickly you could receive parts and the level of service. This would also give you an opportunity to meet the people behind the scenes that will help you get the forklift you need and keep it performing at its best.



Taking your products to greater heights.

6499 W. 65th Street | Bedford Park, Illinois 60638

Phone: **800.367.5600** (US & Canada) | **708.458.2200** (International)

Fax: **800.367.5605** | **708.458.1176**

www.hoistlift.com