

# MAXIMUM REACH ENTERPRISES

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25 October 2011

## TRANSPORTATION OF CRANE COMPONENTS

Here is some information on moving heavy lift crane components in the USA that I thought would be interesting as most people wonder how a large crane is transported from one place to another and then erected. Also included are some comments on THE BIGGEST CRANES IN THE WORLD.

First let me point out some things about the transportation of crane components. The most common transportation unit in the USA is the 5 axle, 18 wheeler called a tractor-trailer with a three axle tractor and a two axle trailer, 8' wide out to out of tires. Three axle trailers are common in the eastern states, but the Department Of Transportation (DOT) of the western states do not give any more allowable loading for the third axle, so most 18 wheelers have two trailer axles. The trailer most used for crane component transportation is a flatbed 40' or 50' long commonly called a float.

Notice in the photo below of the tractor-trailer, that the cab does not have the aerodynamic shape that you see on all of the long haul trucks that supposedly reduces drag and provides better fuel mileage. Tractors used for local hauling don't usually have the aerodynamic shaped cab.



Mark Wayman Photo ©

FLATBED TRAILER OR A FLOAT

The photo below shows a long haul truck with an aerodynamic cab.



A LONG HAUL TRUCK WITH AN AERODYNAMIC CAB

Other trailers are also used, for example, a drop deck trailer which has a goose neck and the trailer deck level with the top of the trailer tires.



Mark Wayman Photo ©

A DROP DECK OR STEP TRAILER



DROP DECK OR STEP DECK TRAILER

Also used is a center drop deck or a double drop deck where the trailer deck is located between the goose neck and the rear axles and is fabricated so that there is about one foot of clearance between it and the highway.



CENTER DROP DECK OR DOUBLE DROP DECK TRAILER



The weight of the tractor is made up of the cab, engine, frame, fuel, driver, etc. and is divided between the front steering axle and the two drive axles. This weight is usually about 6,000 lbs. to the front axle and about 5,000 to the two rear axles and is called the tare weight. Add 12,000 lbs. from its share of the trailer weight and the total tare weight to the two drivers is about 17,000 lbs. The allowable load is 12,000 lbs. to the front axle and 34,000 lbs. for the two drivers.

The tare weight for the two axles of the trailer is usually about 17,000 and the allowable is 34,000 lbs. The allowable weight per axle is computed by the DOT for each state. This gives a payload of 6,000 for the front driving axle, 17,000 lbs. for the two drive axles of the tractor and 17,000 lbs. for the two trailer axles. This gives a total payload of 40,000 lbs. or 20 tons. If you have a very light tractor and trailer, say the frames are made out of aluminum, then the payload could reach 45,000 lbs. The gross weight of the loaded tractor-trailer cannot be **greater than 80,000 lbs.** Note that to get the tare weight, the driver has to go across some certified scales without any pay load where the weight to each axle is measured.

I should note here that moving crane components by truck is not the only way available, ie, they are also moved by barge, rail, air, etc. But in the USA, by trucking is the most common because it is cheaper, faster and the current location of the load can be tracked a lot easier. Sometimes loads sent by rail are lost for weeks at a time.

The driver starts out by locating the load on the trailer so that he gets the axle loadings about the same between the tractor drivers and the two trailer axles. To see some graphics on how this works, go to my website [www.maximumreach.com](http://www.maximumreach.com) (press Ctrl + click to follow the link) & look at quiz 7. The fifth wheel on the tractor is usually located slightly forward of center between the two drive axles and can be moved forward or backward about 12" by pulling some pins. This allows the driver to throw more or less load on the front axle. On some trailers, the two axles can be moved forward or backward by removing some pins. You can see that the driver wants to and is able to put every pound of payload on the trailer that he can and still be street legal.

Most crane counterweights are made out of steel and weight about 10 ton. At the jobsite they are stacked up one by one and side by side on the crane until the required amount of counterweight is reached for the lifting capacity chart being used for the crane. The more counterweight used, the greater the lifting capacity. Note that there is a maximum amount of counterweight that can be used with each crane based on the Manufacture's capacity chart.

So usually a driver will haul two 10 ton counterweights placed on the float in such a way to reduce bending to the trailer frame, ie, one counterweight closer to the front of the trailer and one closer to the back. A motorist driving by might think the 18 wheeler does not have a very big load and he is right but he does have a heavy load. The driver might use a center drop trailer and put one 10 ton counterweight down on the deck and one 50' section of boom over it where it will rest on the goose neck and on the raised portion of the deck over the tires. He could also have some smaller crane components on the deck to make up his 20 ton load.



CENTER DROP TRAILER WITH CWT. & BOOM

To see how to determine turning radii of tractor-trailers, go to quiz 16 on my website

Just for information if you wanted to have your RV hauled back home after it broke down, a float rents for somewhere around \$1.50 to \$2.00 per mile. You could even put your car on it and rent out the rest of the trailer. The \$2.00 per miles gives you use of the whole trailer. So, you can split the cost with another party and let him send his RV as well.

Go to my website, to slide show 1 and note that slide 60 shows the 1987 rental and assembly cost for a Lampson LTL-1200 (1,200 ton crane). It also shows that this crane was transported on 130 loads from Kennewick, WA to Chicago. Slide show 2, slides 1 thru 3 show the same crane after it was transported from Chicago to Duluth, Minn. and the assembly room required. Note that it took two 230 ton crawler cranes to assemble and disassemble this crane. Also note that the counterweight required in this case was 950 tons so instead of 30 truck loads ( $600/20$ ) of counterweight, it took 47.5 loads ( $950/20$ ) to move it to Duluth.

Just for information, on some of the larger cranes where lots of counterweight is required, ie, 1,000 tons plus, sea containers or big metal boxes are filled with gravel at the lift site and then weighed to determine their exact weight. This saves the transportation cost of the counterweight, but there are still costs for furnishing, handling, filling the containers and buying/removing the gravel, etc.

The other crane components that need to be transported from the yard to the jobsite are the house (the machinery deck), the car body, the tracks, the boom, etc. The manufacture designs these components to be broken down using pin connections until they have a maximum weight of between 40 and 60 tons. A regular 8' wide nine axle lowboy can haul up to 40 tons without to

many restrictions such as speed or hours of operation. A 10' wide 9 axle with special spacing's between the axles can haul up to 70 tons but is restricted to certain hours for movement.

Some smaller cranes can be hauled completely assembled minus the counterweight and boom.



50 TON CRAWLER CRANE ON 5 AXLE LOWBOY

Larger cranes can be hauled minus the counterweight, the boom, and/or the car body, the side frames, and the tracks. Just for information, the house sets on top of the car body and is connected to the car body by a center pin and hook rollers or by a Rotec bearing so that it can rotate 360 degrees. The side frames and tracks connect to both sides of the car body.

The photo below shows the house of an American 9310 crawler crane, 225 ton capacity, being transported on a 5 axle lowboy. The house weighs 92,000 lbs. (46 ton)





AMERICAN 9310 CRAWLER CRANE, 225 TON, W/O CAR BODY ON 5 AXLE LOWBOY

The photo below shows the house and car body of an American 9310 crawler crane being transported on a 9 axle lowboy. The weight of the house and the car body is 134,000 lbs. (67 ton)



AMERICAN 9310 CRAWLER 225 TON W/HOUSE & CAR BODY ON 9 AXLE TRAILER

The photo below shows the house on a Manitowoc 16000 (440 ton capacity crane) being transported on a 11 axle lowboy.



MANITOWOC 16000 CRAWLER, 440 TON, HOUSE BEING TRANSPORTED ON A 11 AXLE LOWBOY

The photo below shows the house, the car body and the butt section for an American 11320 crawler crane, 450 ton capacity, being transported on a 13 axle trailer. This crane combination weighs 252,000 lbs. (126 ton). There are several advantages of transporting the crane in this configuration, instead of breaking it down in to small components. 1) It can be quickly assembled at the job site by installing the side frames, tracks, boom and counterweight with small assist cranes. 2) There are forty 2" diameter x 30" long bolts connecting the house to the car body by a rotec bearing. The cost of buying new bolts and the labor of torquing them up would run about \$20,000 for each move. This would not include the cost of large assistant cranes for handling the house, another \$50,000 each way.

Note that the crane is being transported using a Schnabel type connection, where the crane is used as a tension/compression member to carry its own weight. The Schnabel is made up of beams that are pinned at the bottom to take the tension and have push plates at the top to transmit the compression.

The prime mover and the push tractor each have 700 hp and have Allison automatic transmissions. They are capable of moving this load as fast as the speed limit allows and are



only slightly slowed down on the hills, but are constrained by the limits of the permits, usually a maximum of 35 mph.



AMERICAN 11320 CRAWLER CRANE, 450 TON, HOUSE, CAR BODY & BUTT SECTION ON A 13 AXLE TRAILER

The photo below shows the same load being moved on a 16 axle trailer using the same prime mover and push tractor. Note that the construction of the Schnabel is different in this photo. Here the Schnabel is made up of lattice work frames where again they are pinned at the bottom and have push plates on the top. This frame gives the advantage of having the push tractor carry some of the load in addition to just being a push tractor, thus lowering the actual load per axle for the whole trailer.



AMERICAN 11320 CRAWLER CRANE, 450 TON, HOUSE, CAR BODY & BUTT SECTION ON A 16 AXLE TRAILER

## THE LARGEST CRANE IN THE WORLD

A lot of crane manufactures bill their crane as the largest crane in the world, but as a user and Rigging Engineer, I am more interested in what the crane can do rather than how it is billed. For example, I usually want to know how much it will pick and walk with. Lampson has a crane that will pick and walk with 2,600 tons and is working on one good for 3,000 tons. Being able to pick and walk with a load is usually very important if the load is assembled away from the foundation or structure that it will set on, or if all of the heavy lifts are not in the same location. Lampson is the only crane manufacture in the world that makes ultra large cranes that will pick and walk with a load. See website

<http://www.lampsoncrane.com/PDFs/LTL2600Spec.pdf> (Press Ctrl + click to follow the link) for some information on the Lampson LTL-2600. Lampson is the largest heavy lift crane owner in the world. He only rents cranes and transporters, he does not do contract work.

Bigge, from San Francisco, has developed a 7,500 ton crane that he bills as the largest crane in the world but it will not walk with a load. To make it work, a large area must be excavated and filled with concrete and steel and this becomes the counterweight. An embed is placed in the center of the counterweight and the front crawlers and boom merely swing around this pivot point. See website <http://www.bigge.com/heavy-lift-and-transportation/super-cranes.html> for information on this crane. It will take special coordination with a client to allow an excavation of this size to be made down thru their underground piping and grant permission to leave it there until the next lift.

ALE also has a crane billed as the largest in the world that will lift 5,500 ton, but again it will not pick and walk with a load. See website <http://www.ale-heavylift.com/services/> for information of this crane.

Mammoet also has cranes billed as the largest in the world that will lift 3,400 ton, but again they can not walk with a load. See website

[http://www.mammoet.com/MammoetUSA/Equipment/Mammoet ring cranes/](http://www.mammoet.com/MammoetUSA/Equipment/Mammoet_ring_cranes/) for information on these cranes. Mammoet is the largest heavy lift contractor in the world as they own all of their equipment and do the hauling/rigging work themselves. For example, they will load a vessel on a heavy lift ship in Japan, transport it to say Saudi Arabia, off load it onto their heavy haul trailers, move it to the site, and set it using one of their heavy lift cranes, all using their own manpower, some call it turnkey work. Their parent company is Van Seumeren from the Netherlands.

THE END