Need A Crane?

The Correct Selection and Installation of Vehicle Loading Cranes

www.liftandshift.co.za
0861 269 262

1st edition
The Bowman Crane Legacy

Our clients require tailor made solutions for individual applications, no “ONE” crane manufacturer supplies a full range of cranes for “ALL” applications! Over the past 45 years we have got to know and understand crane manufacturers, our decades of experience has allowed us to identify the leading manufactures in all sectors. Our company has blended these manufactures into our product offering allowing us to ensure we tailor make solutions to customers requirements.

Our range of cranes consists of the following various applications

- General purpose cranes
- Telescopic winch cranes
- Marine cranes
- Scrap handling loaders
- Mobile knuckle boom cranes
- Mini crawlers
- Truck mounted aerial platforms
- Container side loader cranes
- Low profile under-ground mining cranes
- Timber handling and production cranes
- Specialised brick and block cranes
- Mobile telescopic cranes
- Specialised railway cranes
- Tow behind aerial platforms
- Recovery cranes
- Multi crane with Auger, winch and basket cranes

Our team hopes this first edition will be helpful in gaining the understanding of vehicle loading cranes, ensuring you are able to ask the correct questions and provide your client with an accurate proposal. Lift and Shift are committed to your success and will continue to assist in passing on the knowledge and expertise in our industry.

Wishing you success and profitability

John Henry Bowman
Managing Director
Calculating the correct size capacity crane to offer your client

The crane size (lift capacity) is determined by what it can lift at a specific reach. This is known as TON METRE. If your client requires to lift 3065kg @ 4.3 metres your calculation will be as follows:

3065kg × 4.3m = 13.1 Ton Metre (weight × distance = Ton meter)

Your minimum size crane will be 13.1 ton metre. Vehicle loading cranes are measured with the term Ton Metre (T.M.). This is a measurement of force rather than weight.

Example

<table>
<thead>
<tr>
<th>3530Kg</th>
<th>2533Kg</th>
<th>1750Kg</th>
<th>1380Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.26m</td>
<td>6.13m</td>
<td>8.00m</td>
<td>9.95m</td>
</tr>
<tr>
<td>15.03Tm</td>
<td>14.42Tm</td>
<td>14.0Tm</td>
<td>13.73Tm</td>
</tr>
</tbody>
</table>

You will notice that as the crane boom extends further the weights of the crane load chart decreases. Therefore the ton metre capacity of the crane also decreases.

Why is this so?

A crane must lift the weight of its boom before it lifts the load. So the longer the boom, the greater the decrease of ton metre at reach.

Handy tip!

Don’t buy more boom reach than necessary for your work. It costs money, uses fuel, reduces payload and reduces the lift capacity of the crane.
If we had to lift 2 tons @ 3 metres we would look for a 6 ton metre crane. But with high or long slings and chains, this calculation can lead to under capacity of the crane. You would need a crane rated at 6 ton metre or better to do the job, BUT it is very important to consider the actual size of the load you are lifting (Example diagram A).

Diagram A

To handle a high load close to maximum capacity, the inner boom must be near vertical, and the outer boom pointing down, with the hook above the centre of the load.

In this configuration, only the outer boom can be raised. The operator may not get sufficient hook height to clear the base of the load over the truck body.
The resulting increase in the radius can be substantial and is often sufficient to over pressurize the lifting ram and to activate the pressure relief valve which may prevent the crane from lifting the load into position.

With our example of a 2 ton lift at 3 metres, if the load or sling length causes the hook to be so high that the inner boom cannot be used for the lift, then an 8 ton metre crane would be the required size.

A winch rope crane will give a vertical lift as seen in Diagram B (therefore no increase in radius), so this consideration is not applicable to Unic telescopic boom cranes fitted with a winch.

Diagram B

A winch crane with running rope makes a vertical lift, keeping the radius constant.
Always know the payload required from client.
Always know the required weight to be lifted, at what radius and up to what height above ground level.

**With this key information, the crane can be selected first, then only the truck.**

The truck should have the capacity to carry the crane in the determined mounting position (eg. behind cab or rear of truck chassis), without exceeding the truck axle rating and road ordinance.

The truck should also offer sufficient counter weight effect to remain stable and not tip over.

**Example:** A crane required to lift 7 tons at a radius of 4 metres (28 T.M) would normally require a double axle truck (ie. two rear axles) to legally carry the crane as well as provide sufficient counter weight to stabilize this capacity crane.

Some crane truck combinations do not require detailed calculations, they are within the norm!

*Right:* is a typical example of a rear mounted 28 ton metre crane weight distribution calculation picture.

<table>
<thead>
<tr>
<th>Payload</th>
<th>8434 Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unloaded</td>
<td>2966 (24%)</td>
</tr>
<tr>
<td>Loaded Max</td>
<td>5285 (25%)</td>
</tr>
<tr>
<td></td>
<td>7100</td>
</tr>
<tr>
<td>Additional stabilisers</td>
<td>4615</td>
</tr>
<tr>
<td></td>
<td>1300</td>
</tr>
<tr>
<td></td>
<td>9285</td>
</tr>
<tr>
<td></td>
<td>1400</td>
</tr>
<tr>
<td></td>
<td>850</td>
</tr>
<tr>
<td></td>
<td>6000</td>
</tr>
<tr>
<td></td>
<td>1115</td>
</tr>
</tbody>
</table>

Techn. 5265
2620 = 50%
Various installations and crane application

3 Ton telescopic crane with basket and auger drive

10 Ton mobile telescopic crane

160 meter mobile knuckle boom crane

40 Ton telescopic 8x4 freight carrier

Atlas 168 brick crane

Recovery cranes
Determining where to position the crane for mounting

Behind cab mounting:

Points to consider for behind cab mounting

Mounting a crane behind the cab of a truck has become increasingly complicated, this is due to the components such as; battery boxes, air and fuel tanks, as well as all piping and brackets.

This does not allow the crane installer to get the crane mounting bolts vertically through the inside and outside of the chassis. The only solution is to remove all tanks, brackets and piping and fit steel side plates to the chassis. The tanks and brackets can then be refitted.

(pic A)
Remote Mounting Blocks can be welded onto side plates to allow the mounting bolts to vertically be placed and secured.

(pic B)
This job can either be done by the body builder or crane installer. Additional costs can occur if *Not* discussed up front!
Remote mount block welded to side plate

Side plate for behind cab mount

Advantages of installing crane behind cabin

- The weight of the truck cabin engine etc., contributes towards additional counter weight which increases the stability while the crane is in use.
- The cost of installation is cheaper than rear mounted cranes.
- Maximise chassis length with longer body.
- Perfect application for long loads.
**Points to consider for rear mount installation**

Mounting a crane on the rear of the truck chassis can create a stability issue if the sub frame, cross bracing and side plates are not matched up correctly.

In most cases, a weight distribution and stability calculation should be carried out by a vehicle loading crane supplier. This will determine if the crane will be stable and if additional stabilizers are required for the front of the truck chassis.

The truck body length is also limited when fitting a rear mount crane.

No body builder should begin the body work without consulting with a vehicle loading crane supplier. It is important that both parties are aware of the requirements (sub frame, side plates and cross bracing) as well as crane mounting space.
Advantages of installing crane to rear of truck chassis

The crane can be used to load and off load a trailer.

Weights can be lifted very close to the crane, exploiting its maximum power, and allowing the driver to position the truck close to load.

The crane has a wide 360 degree operating area without obstacles.

In this crane/truck combination, the operating stability of the crane is ensured 360 degrees.
The truck will need to have a Power Take Off fitted to the gearbox to enable us to fit a hydraulic pump which will then provide pressure for the crane to operate.

Recently, O.E.M. truck suppliers have delivered trucks from the factory with P.T.O. fitted. This is only about 20% of the time.

In most cases, the crane supplier will fit the P.T.O., hydraulic pump and cabin controls with a fail safe system.
We need to have answers to the following questions:

- What is the weight and dimensions of the load, and at what radius do we need to lift the load? (This will determine the ton metre crane required)

- Where will the crane be installed? (Behind cab or rear mounted?)

- What truck will the crane be fitted to? We need this information to match up the correct Power Take Off, pump, sub-frame and body length to ensure the perfect marriage.

- If possible, let us know who will build the truck body, so we can ensure he prepares the sub-frame 100%.

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The Correct Selection and Installation of Vehicle Loading Cranes

Over the past 40 years we have had a consistent demand for vehicle loading cranes. We have seen major developments in both vehicle loading cranes as well as huge improvements in truck chassis technology and weights.

With these developments it is important to ensure the marriage between the crane and the truck is accurate and correct. Accurately matching the crane to chassis is critical to ensure the weight distribution, payload and road ordinance is legal.

Lift and Shift Equipment have decades of experience and passion for doing this well. Our Lift and Shift team are always available to assist with any crane/truck project.

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