Service Information	
Document No: S0039	STEELBRO

Installation Advice for SB450 Truck Mount Cranes

Category

Structural

Models and Markets

This document applies to SB450 cranes.

Information

When operating a Steelbro crane set, the stability of the crane is primarily governed by three factors:

1. Load position
2. Stabiliser foot position
3. Effective tare weight of the truck combination.

These can each be affected by other factors, i.e. the deck height limits how far out the stabiliser foot can reach when placed on the ground; the suspension lash effects the contribution of un-sprung mass to the effective tare.

When the cranes are not fitted with offside stabiliser legs, positioning the load past the centre of the deck in the offside direction can lead to instability.
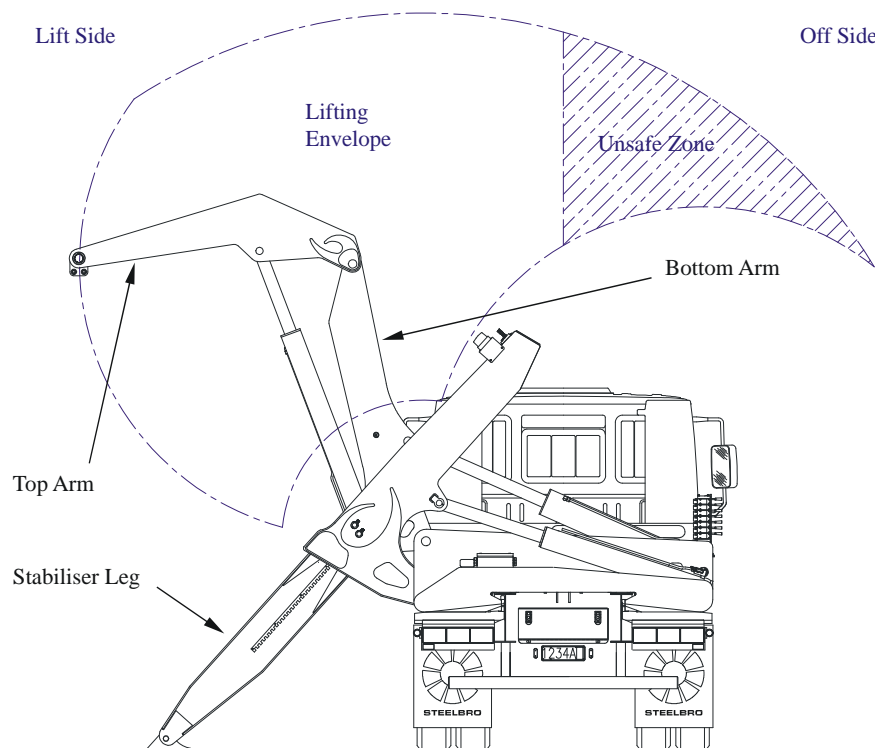

Figure 1 - Truck Mounted Sidelifter

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Crane Base Support Loads

There are two extreme load conditions subject to the crane supports.

1. When the load is lifted to maximum height directly above the deck. This produces the greatest amount of out-of-plane moment on the arms, causing the cranes to roll towards each other. The weight of the payload and the cranes is also fully bearing on the supports at this point. The load on the stabiliser leg is negligible. The mounting chassis/frame is required to be stiff enough to prevent these deflecting too far, causing the lifting pins or chains to contact the upper edges of the container.
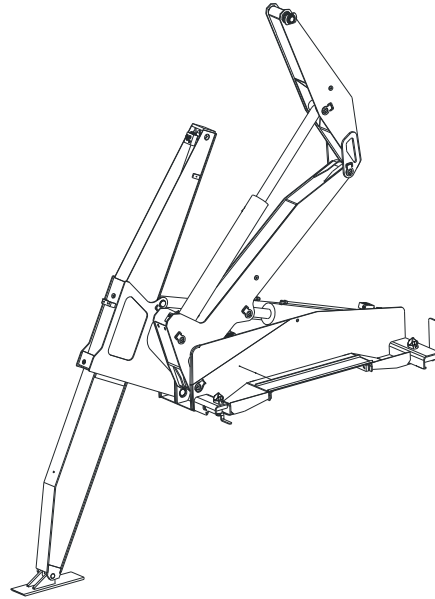

Figure 2 Sidelifter at max. height over deck

2. When the arms are at maximum reach. This makes the sum of all the support loads become vertically upward as the truck weight helps counterbalance the payload. The out-of-plane moment at the supports is greater as the stabiliser leg pushes the base upward and the load on the arms pushes down, causing the cranes to roll towards each other even more than condition 1.
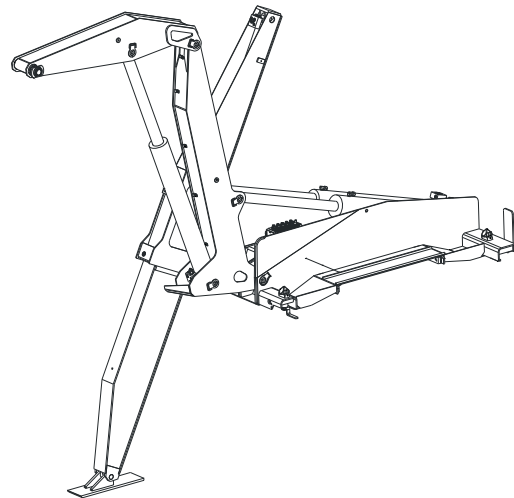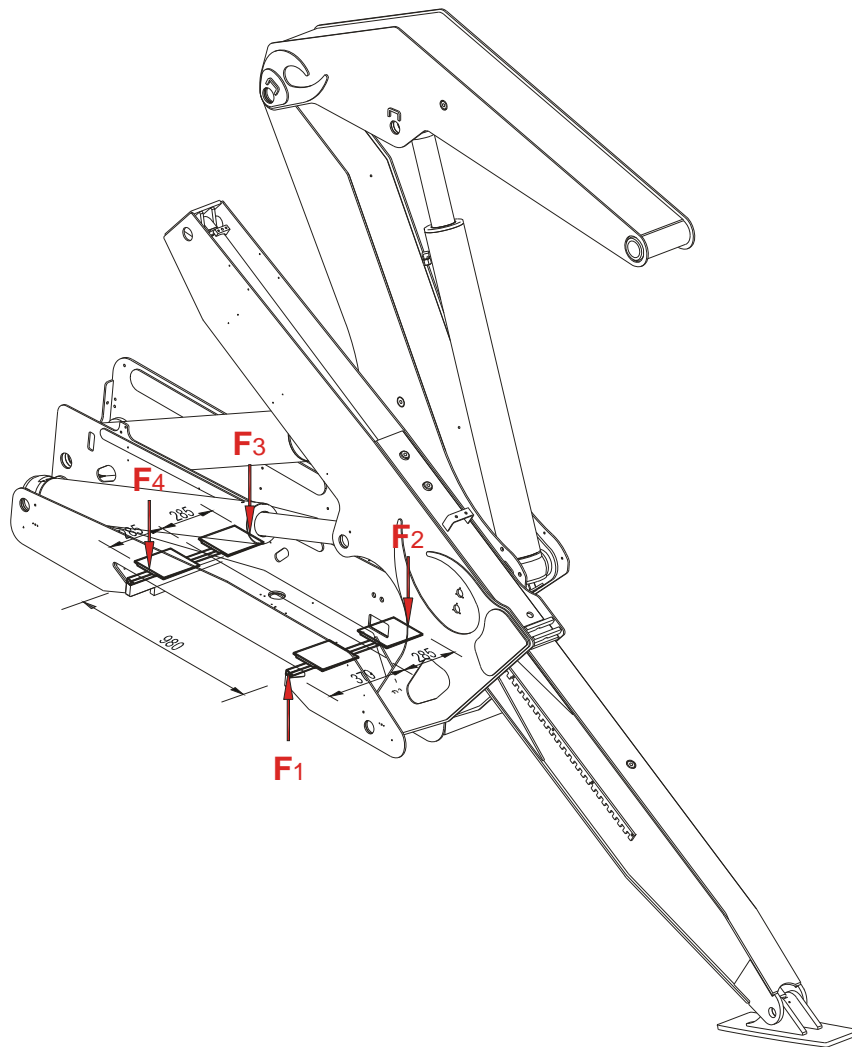

Figure 3 Sidelifter at max. reach

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Model	SB450	
Condition	1	2
Force F1	247.5 kN	274.5 kN
F2	271.1 kN	301.5 kN
F3	-12.4 kN	-13.5 kN
F4	-12.4 kN	-13.5 kN

Table 1 - Load Transferred into Chassis

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Truck Chassis Stiffness

The design of the support frame or chassis is required to be stiff enough to prevent excessive deflection at the lifting pin (G Pin) on the crane. As long as the deflection at each crane due to the loads specified above, does not exceed 30mm at a height of 4800 above the support flange, then the correct operation of these units will be ensured.
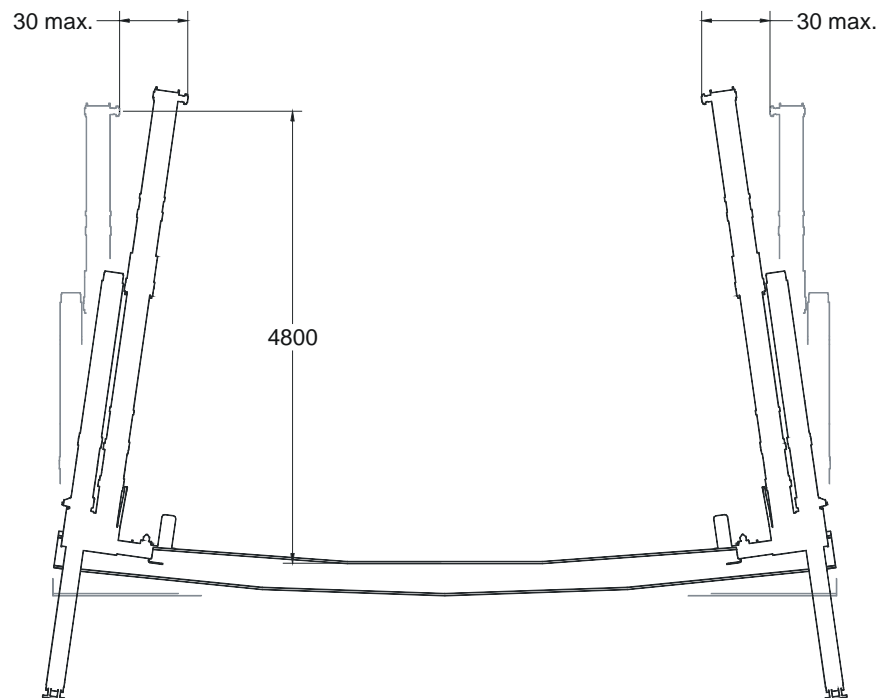
30 max.   30 max.

4800

Figure 5 – Maximum Allowable Deflection due to Operating Load

The load distribution for a typical truck mount is as shown below:

F_2 F_2
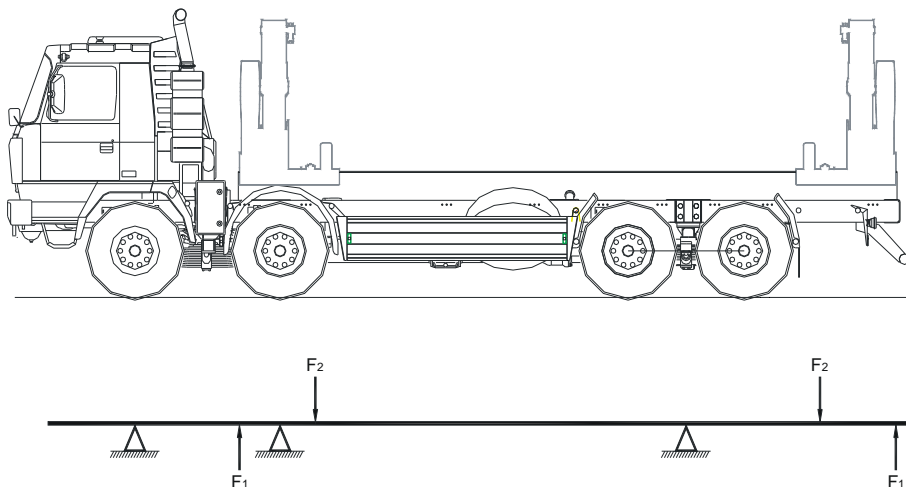
F_1 F_1

Figure 6 – Free Body Diagram for typical Truck Chassis

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The majority of truck manufacturers recommend that the sub-frame be attached to the chassis in such a way that the original bending and torsional characteristics of the vehicle are retained. This does create some conflict with the requirement for the two cranes to maintain alignment and minimise rolling of the chassis during the lifting process.

As the exact arrangement of supports will vary from installation to installation the following calculation has been carried out with assumptions i.e. consider the loads to be taken solely by one beam. The most critical aspect identified for proper crane operation is the amount of deflection allowed by the support frame/chassis. The following diagram considers only the opposing moment couples generated by the rolling of the cranes towards each other. From these we can determine the minimum chassis strength required to resist deflection if not taking axle supports into account.
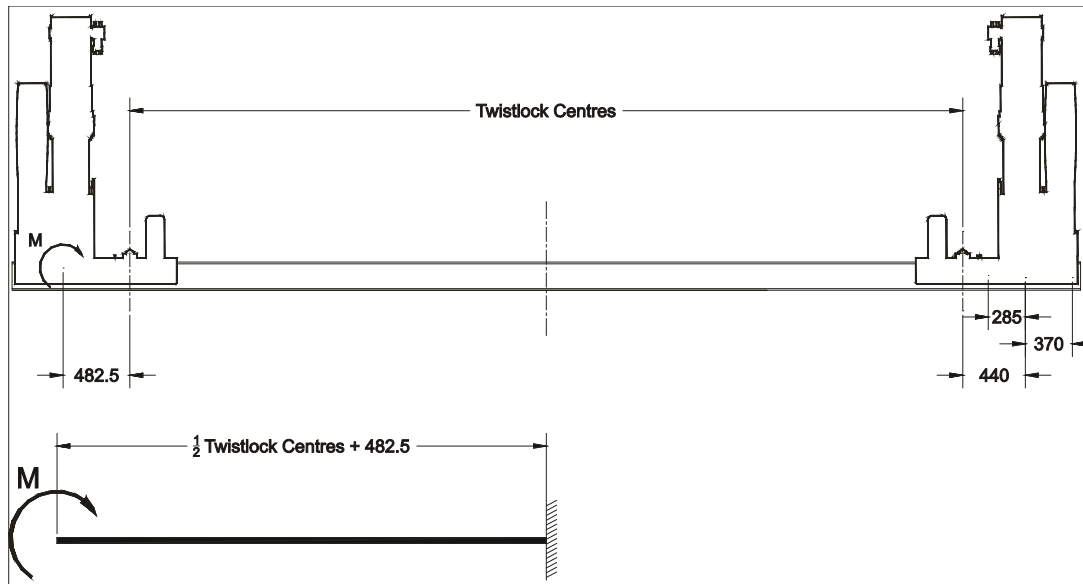

Figure 7 – Free Body Diagram for Simplified Truck Chassis

Considering only one beam on the lift side of the truck to be resisting the moment couple, this will give a conservative stiffness requirement.

Static Load Case for SB450 Truckmount

Geometry:

$$\text{dist} := 5853\,mm \qquad \text{Twistlock Centres}$$

$$F1 := \begin{pmatrix} 247.5 \\ 274.5 \end{pmatrix} kN \qquad \text{Load Transfer Foot Outside Load}$$

$$F2 := -\begin{pmatrix} 271.1 \\ 301.5 \end{pmatrix} kN \qquad \text{Wear Pad Inside Load}$$

$$\text{cen} := 327.5\,mm \qquad \text{Moment Couple Centre}$$

$$M_i := F2_i \cdot (\text{cen}) \qquad \text{Moment Couple}$$

$$L := \text{dist} + 965\,mm \qquad \text{Distance Between Moment Centres}$$

$$l := \frac{L}{2} \qquad \text{Effective Beam Length}$$

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Bending Moments due to Couple:

$$ax := 0\,mm \qquad bx := 370\,mm \qquad cx := bx + L \qquad dx := cx + 370\,mm$$

$$BM(x) := M \cdot \frac{s(x, bx)}{s(x, bx)} - M \cdot \frac{s(x, cx)}{s(x, cx)}$$

$$axx := ax - 1\,mm \qquad dxx := dx + 1\,mm$$

Bending Moment Diagram (1 beam only):

$BM(x)_0$

Minimum allowable Area Moment Of Inertia for Chassis

$$M = \begin{pmatrix} -89 \\ -99 \end{pmatrix} \cdot kNm$$

$$E := 210 \cdot 10^9\,Pa$$

$$\delta allow := 25\,mm$$

$$H := 4.18\,m$$

$$Imin_i := \frac{l \cdot |M|}{2E \cdot atan\left(\frac{\delta allow}{H}\right)} \qquad Imin = \begin{pmatrix} 180.21 \\ 180.21 \end{pmatrix} \cdot 10^{-6} \cdot m^4$$

Recommended double stacking twistlock height 1350mm.

Model	SB450
I (m^4)	180.21 x 10^{-6}

Table 2 - Recommended Minimum Area Moment of Inertia Values for 20 Foot Supporting Chassis

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Installation Details

Approximate SB450 crane tare 2800kg.
(per cranes – no fittings/subframe included)

To ensure correct operation of the cranes, it is important that the support frame is installed onto the vehicle such that it is parallel to the ground.

Recommended double-stacking twistlock height is 1350mm.

30 Support to Deck
Inside Stop Block (S3-26066)
SWL = 18000kg per Crane
152
250
564 Wear Pad Length
200 Outside Clearance
C of G for Crane Tare
Support Plate
12mm with S8-33305 Load Block
20mm with S8-33306 Load Block
(1mm maximum clearance)
Outside Stop Block (S1-33784)

Area To Keep Clear Underside of Crane For Hyd & Elec Services
Container Lifting Side
510
Ø300
275
713 +2 0
Between Stops

150 Clearance Under support plate
870 Wear Pad Inside Width
978 Inside Load Transfer Feet
1150 Outside Support Plates
top Block