



Trailer Consultation

TrailerWIN - CraneWIN - FrameWIN The Guided Example RD

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Truck and Crane Calculation with TrailerWIN, CraneWIN and FrameWIN:

We will step thru a calculation in TrailerWIN – CraneWIN – FrameWIN where we use a crane and additional stabilizers. This example is only for learning use of program and should not be used as a model for assembling cranes to chassis.

TrailerWIN, Starting the Calculation

To start calculating a new vehicle. Click the Begin button or New button.

🐺 TrailerWIN 2012-06	
File Help	
	15:33 10.7 2012 End Begin
New button	Begin/Start button
	Calculation
To easily find this calculation later, type in the task name and customer name in the window that pops up.	
Then click on the Truck button to begin choosing the truck.	Task name Customer Text 1
	Calculation made by :
Choosing Chassis	



From Chassis Window you can choose the chassis fabricate -> model series -> wheelbase and finally cab.

In this example we choose:

VOLVO FH 62R Rear air tag FH 62R B3HA 4300 L2EH2 AIRIN-HI

In Chassis data window you can check and change chassis weights and dimensions.



Guided example

Chassis						_
truck make				•	Cancel	
Туре	FH 62R Rear air tag FH 62R B3H	A	- 1			
model (wheelbase, cab etc.)	-4300 L1EH1 AIRIN-HI					
G.V.W. front axle kg		7100			ок	
Max G.V.W. front axle kg		7100				
Minimum truck front axle we	ight kg	0				
G.V.W. rear axle kg		19000				
Max G.V.W. rear axle kg		19000				
G.V.W. total kg		26000		_		

When you are ready, click **OK**.

Now you will get the chosen chassis in the big picture.





Choosing Crane:

To have a crane behind the cab do as follows Click on the **Equipment** button.



In the following equipment window you will see the crane button (yellow crane) on the left side. The other crane button (green crane) on the right side is for rear-mounted crane.

Buttons for choosing the device type:

(Please check the TrailerWIN manual for more information regarding equipments.)





Click the yellow crane on the left side.

Now you can choose the crane model, in this example we choose Hiab 244, and then the model **244EP-3 Duo.**

Click OK.

Truck Devices :						
	Cancel					
HIAB 200225 HIAB 211 HIAB 244 HIAB 288						
244EP-2 CL 244EP-2 CLX 244EP-2 Duo 244EP-2 HiDuo 244EP-3 HiPro 244EP-3 CL 244EP-3 CL						
244EP-3 HiDuo 244EP-3 HiDuo 244EP-4 CL 244EP-4 CL 244EP-4 CL 244EP-4 Duo 244EP-4 HiDuo	Ţ	ОК				
244EP-3 Duo						

On the following screen You can choose the crane position: folded or unfolded during transport. You also choose the position of stabilizer legs for the crane. Note that choosing different positions will affect also the weight calculation because COG is taken into account from the position of boom.





In the following Crane Data Window you can check and edit crane weight and dimension data.

You can also choose stabilizer leg model. You can go back to Crane Position window by clicking the button above ok-button.

Click Ok



The chosen crane appears on the chassis.



Now we want to move the crane rearwards.

We can do this with 3 different methods.

1. Double-Click the red dimension number at the top of the picture (hot dimension) 486, and type new value 650, and then click OK.



- 2. Drag the crane with your mouse from the small grey rectangle under the crane.
 - The crane moves to a new place, but be aware that very exact movements are difficult with this method.
- Click on the Equipment button, and choose the crane in question from the list. You will now come back to the Crane Data Window. Type in the new value: 650





Choosing the Bodywork

Click on the Bodywork button.



The Bodywork Window opens. Here You can choose standard body types and also get bodydrawings from DXF-files on the left scroll-box. (See TrailerWIN manual for more instructions.)

Body							
Cancel							
Own Body DXF							
Container NORBA 12		~~					
NURBA 35 NORBA 200 NORBA 300	Ŧ			\bigcirc			1
		\succ		6058		•	<u> </u>

If you've already chosen the bodywork, you will now see the Body data window instead.

Body							
Body		Input box		-			
bodys startpoint backwards from front axle	1882			Truck Tr	ailer Options	Special	Help
Body length	5918,012			Chassis			
body height	1000	OK		Chassis (Optional		
thickness front wall	30			C-h	optional		
thickness rear wall	30			Cab			
wall thickness left	30			Bodu			
o go back to choose the boo	ly type, click	Menu: Truck - B	ody	Body typ	e		
and choose the desired	hody type			Loads de	entre of gravity		
ype and choose the desired	bouy type.			Devices			
				Weights			Ctrl+G
				Eromo ro	or overbong		oana
				Frante le	ar overnang	-	
				Fifth Whe	ieel Coupling /	Trailer Cou	ipling
				Lood Cur			
n this example we choose O	oen Body hu	tton					
in this chample we thouse of	Jen bouy bu			I ruck: T	lurnina		

Now the Body data window appears.

The program first calculates the body length to optimize the rear axle weight to near maximum allowed, when the body is evenly loaded.

If you have a specific body length that you'd like to have, you can type this length into the input box.

Click Ok.



You can also change the body length later directly from picture; double-click the red dimension or drag the small grey rectangle at the end of the body with your mouse.



Next You will see the rear overhang Towing coupling window. Here You can modify the rear overhang of the frame. You can also choose different types of trailer couplings and rear bumpers if needed. This window will always appear after You have chosen a body. You can't add a trailer without first having a trailer coupling on the truck.

We choose low-mounted trailer coupling and click ok.



	2100,012	
Chassis frame original overhang To Body Rear	2375 2130	ОК
owing couplings location : from rear axle owing couplings location : backwards from centre of bo wing couplings under body measurement	1835 2520 295	┙┓
wing coupling Weight		× = ×

Now you see:

The axle weight without load and with load, under the picture.

First row shows axle loads without payload and the second row with payload.

The numbers in brackets "**{64%}**" mean that the front axle takes 64% of the vehicle weight.



For changing the max. allowed front-axle load, click the chassis button

TrailerWIN – CraneWIN – FrameWIN

Guided example

Chassis				
—	kuon uo			Cancel
truck make	VULVU			
Туре	FH 62R Rear air tag FH 62R B3HA	۱		
model (wheelbase, cab etc.)	-4300 L1EH1 AIRIN-HI			
G.V.W. front axle kg		7500 -		change to 7500
Max G.V.W. front axle kg	Max G.V.W. front axle kg			
Minimum truck front axle weig	ht kg	0		
G.V.W. rear axle kg		19000		
Max G.V.W. rear axle kg		19000		
G.V.W. total kg		26000	_	

Change **G.V.W. front axle** to 7500 kg, we must also change total weight manually if needed. In this case 26000 kg is ok. Click OK button.

If we now want to see, what the optimum body length with these weights is, we click the Bodywork button again.

- 			1 000	· · · · · · · · · · · · · · · · · · ·	001	
	E Body	ywork	/ Equ	uipment		

	Body				
				 Cancel	
U	Body	NAME			
l	bodys startpoint backwards fr	om front axle	1882	Uptimum	
	Body length		5836	01	
	body height		1000	UK	
	thickness front wall		30		Optimize
	thickness rear wall		30		body length
	wall thickness left		30		

In bodywork window, click the **Optimum** button You will see that the body length changes.

Body weight (body own weight) can be given in Body data window as kg/m or in the Load data window as total body weight or kg/m.

<mark>، مص</mark> م		
Bodywork	Load ,	Equipment

Click the Load button on the toolbar.

Load		
carrying capacity Max. = 14540	7961, 533	Cancel
- I May		
Beduced pavload		
14540 kg		
Special load		
	i	
		N
	89 II	
,		IH > <
kg	mm mm mm	
Arrow - 145	40 4800 185	ок
body centre of gravity mm	4800 185	
body weight kg	500	
body weight/m kg/m	86	

We change **load spaces own weight kg** to value 500 kg. Then click OK.



Now you have succesfully built up the truck in TrailerWIN.



Use a logical name. It helps you to find this calculation later.

Hide Folders

You have several options to save drawings and print out the calculation. For more details, please check TrailerWIN manual.

Save Cancel

CraneWIN





Chassis weight Front axle	WchFront x xChFront = xxx
Chassis weight Rear axle	WchRear x xChRear = xxx
Weight of support legs	WLegs x xLegs = xxx
Weight of base	Wbase x xBase = xxx
Stabilizing moment	Sum = xxxx
Weight of boom	WBoom x xBoom = xxx
Load * Max outreach	Wload x xLoad = xxx
Tilting moment	Sum = xxxxx



Reading the stability diagram:



The circle diagram shows stability in all directions. Truck front is upwards in the picture.

Imagine the boom in the picture to this direction, for which you want to read stability. The point where the boom direction line crosses the red stability curve, shows the stability.

If this point is for example on scale circle 2.0, the stability is 2.0 to this direction (see example point on the picture).

Note that You can also see the tilting line in the diagram. It is shown as black lines between stabilizers and to the middle of the front axle.

Later we will see how we can modify the tilting line on front axle.

Checking stability with CraneWIN



Now you can check the Crane Stability.

We get to the CraneWIN Program by clicking on the \rightarrow CraneWIN button or by choosing Menu **Special - CraneWIN**.



CraneWIN will now start and all data will automatically be transferred from TrailerWIN to CraneWIN.

Note that modifications made in CraneWIN will not be copied back to TrailerWIN :

Stability chart of Guided example



This diagram shows, that the stability is very bad and additional stabilizer legs are absolutely needed.



Click on the **End**-button to go back to the TrailerWIN picture and add stabilizers.



Click on the **equipment** button.

Truck Devices :		
	Cancel	
上 ≽ 🗷 🅴 Íœœ	Stabilizers	
HIAB MAXISTAB EFFER FASSI		•
1 EHA 1 EHA/L 2 EMA/S 2 EMA 2 EMA/L 2 EHA/S 2 EHA		
2 EHA/L 3 EHA/S 3 EHA 3 EHA/L 4 EHA/S 4 EHA/S-AR		ОК
4 EHA 3 EHA/S		

Choose Stabilizer legs-button and You will then see a list of Manufacturers of Stabilizers. We click on **Maxistab** and choose model **3 EHA/S**.

In the following window You can check and edit data for the stabilizer.

2		
extra devices name MAXISTAB 3 EHA/S		Cancel
extra devices weight	420	
length	235	
extra supports width	5000	UK
devices centre of gravitys location, backwards from front axle	6570]
dy ^ move up ^	0	



The chosen stabilizers are now added to the picture and it is now possible to test the stability again:

Click on the "CraneWIN" button again.



Now we can see that the stability is much better, but there are still problems to the front.



Modifications in CraneWIN

As we can see from the picture, the Tilting line goes to the middle of the front-axle. If we want to see how much it affects to set the Tilting line to the middle of the front wheels, we can click on the **Tilting Line**- button.



Here we can choose 3 different positions for the tilting line; in the middle of front axle (no stabilizing effect sideways), between wheel and midpoint or in the position of wheel. Note that we can also give own values in the textboxes.



Choose the "best" option: in the middle of the wheel.



Now we can see that the stability still isn't good enough and we will need front stabilizers too.

We can check the stability with front stabilizers in CraneWIN by giving own measurements to the Tilting line. However then the weight of front stabilizers would not be in the TrailerWIN weight calculation.

We will do a quick check to see how this works:

Click on the "Tilting line" -button

Fill in the value **475** for width (950/2) and **-1500** for longitual direction because we want to check the stability when we have a stability point in front of front axle. Then click "OK".

Be aware that by doing it this way, we're not taking into account the stabilizing effect of the front stabilizers, this method is only for checking purposes.



Note also that the measurement shown in TrailerWIN is to the first point of stabilizer leg, not the middle of the stabilizer leg.



As we can see the stability is very good but the weights of the front stabilizers are not taken into account here.



To do this correctly we add the front stabilizers in TrailerWIN.

Go back to TrailerWIN and choose the Equipment button again. Then choose stabilizer and scroll down the list to the end.

Choose Front Stabilizers and make necessary modifications to the data. Click **ok**.

Truck Devices :		
	Cancel 1 = HIAB 244EP-3 Duo 2 = MAXISTAB 3 EHA/S 3 =	
PALFINGER AMCO VEBA FERRARI COPMA HYYA PM LIV HIDRAVLIKA TADAND BIXMAX TECNODRAULICS XXX XXX FRONT STABILIZER		E
		ОК

Now we can see the front stabilizers in the TrailerWIN picture and they are also added into the weight calculation. This way the weight of the front stabilizers will also be in the stability calculation.





Go back to CraneWIN and check the stability once again.



Now we can see that the stability is very good in all directions. Now we also have the weight of the front stabilizers in the calculation. They do not affect the stability forwards because they are in the tilting line but to other directions their weight will be taken into account in the calculation.

Forwards	
	kg x m = kgm
Chassis weight Front axle	4576 x 1.510 = 6910
Chassis weight Rear axle	4181 x 6.351 =
26554	
Weight of support legs	459 x 2.343 =
1075	
Weight of extra support legs	420 x 8.080 =
1000	



Changes to Crane and stabilizers in CraneWIN

It's possible to check and change crane and stabilizer data in CraneWIN; e.g. change load, outreach, stabilizer width etc. Note that if you change something in CraneWIN, it does not have any influence to the TrailerWIN calculation.

To change the Crane load, outreach etc, click on the Crane button.

File Crane WIN 2012-06 File Crane button Tel A	gs button Text End 6898 < -43	
Here You can make changes to Lifting capacity, outreach, weights and COG-point of the crane.	Task name / Customer / Truck VDLVD FH 62R Rear air tag FH 62R B3HA Crane HIAB 244EP-3 Duo Loading Moment Lifting capacity kg 1980 Outreach mm 10200 M1 = 198 kNm Crane weight kg 2620 Dist. Cranes slew. centre - COG of crane at max outreach mm 1940 M2 = 50 kNm M1 + M2 = 248 kNm	Cancel

For changing Stabilizer legs data click on the **Legs**-button.

Here You can make modifications to all support leg data.

	Front Stabilizers Cancel
_	Span of extra support legs mm 950
Y Y	Weight of extra support legs kg 250
	Distance Extra support legs - Front axle mm 1510
	Distance Cranes slewing centre - First front axle
	<< >>
	Span of support legs mm 2895 2895 5790 •
	Dist. Cranes slew. centre - Centre of support legs bean -354 -196 -275
	Weight of support legs kg 459
	Dist. Cranes slew.centre - Centre line of truck mm 150 C
Z	Span of extra support legs mm 5000
F	Weight of extra support legs kg 420 OK
\sim	Distance Extra support legs - Front axle mm 6570

Note that these changes will not be saved back into TrailerWIN, You must save this CraneWIN calculation separately to a CraneWIN file.



Printing in CraneWIN

When you have finished the calculation you can print out the stability chart and stability calculation.

To do this, choose print from Menu.

Print	
Canon MF8300 Series UFRII LT	 Cancel
Colors	
Picture	
Data Sheet	ок
Data Sheet 2	
Calculation made by :]

You can choose to print all pages or select a part of the calculation.

You can preview the text-page before printing by selecting **Picture-Text** from the menu.

This is the same information that will be printed out on printer.



On the next page you can see a part of the text as a print out. You can see that all calculations are presented here to help checking the calculation.

_____ Distance Cranes slewing centre - First front axle mm 1108 kg 2620 Crane weight Dist. Cranes slew. centre - COG of crane at max outreach mm 1940 Outreach mm 10200 Lifting capacity kg 1980 Chassis weight Front axle kg 4576 Chassis weight Rear axle kg 4181 Dist. Cranes slew.centre - Centre line of truck mm 150 Dist. Cranes slew. centre – Centre of support legs beam mm < = -354 > = -196 Span of support legs mm 5790 Weight of support legs kg 459 Distance Extra support legs - Front axle mm 6570 Span of extra support legs 5000 mm kg 420 Weight of extra support legs Front Stabilizers mm –1510 Distance Extra support legs – Front axle Span of extra support legs mm 950 kg 250 Weight of extra support legs Distance Front axle - Rear axle support point mm 4841 Track front axle mm 2000 Track Rear axle mm 1800 CRANES STABILITY CALCULATION (Measures from tilting line) _____ _____ Rearwards right kg x m = kgm _____ -----Chassis weight Front axle 4576 x 2.951 = 13506 Chassis weight Rear axle Weight of support legs 4181 x 2.614 = 10931 459 x 2.893 = 1328 Weight of extra support legs 420 x 2.494 = 1047 250 x 3.057 = 764 Front Stabilizers Crane weight 2620 x 0.785 = 2056 _____ Stabilizing moment Sum = 29632 _____ Load * Max outreach 1980 x 7.475 = 14801 _____ Tilting moment Sum = 14801

_____ 29632 / 14801 = 2.00 Stability factor n _____ Maximum load 1980 kg _____ _____ _____ Forwards right kg x m = kqm _____ Chassis weight Front axle 4576 x 1.403 = 6422 4181 x 4.825 = 20173 459 x 1.992 = 914 420 x 6.047 = 2540 Chassis weight Rear axle Weight of support legs Weight of extra support legs

250 x 0.336 = 84

2620 x 0.140 = 368

Front Stabilizers

Crane weight

SUBFRAME CALCULATION IN FRAMEWIN THEORY

STRESS CALCULATION : BENDING MOMENT ON U-BEAM

Bending moment M at a certain cross-section makes the normal stress σ on a longitudinal fiber at a distance y from the neutral axis of the beam:

$$\sigma = \frac{M y}{I} = \frac{M}{W}$$



The second moment I_X (moment of inertia) and section modulus W_X of a symmetrical Ucross-section area can be calculated as follows:

$$I_{x} = \frac{B H^{3}}{12} - \frac{b h^{3}}{12}$$

$$W_x = \frac{I_x}{H/2} = \frac{I_x^2}{H}$$

COMBINED BEAM : Chassis Frame + Subframe

Subframe can be mounted on different systems:

- Flexible mounting : subframe mounted with brackets or clamps
- Rigid mounting : subframe mounted with shear resisting plates

Flexible mounting : subframe mounted with brackets or clamps







With a flexible mounting I_x and W_x can be calculated for a combined beam as follows:

$$I_{c} = I_{F} + I_{S}$$

$$W_{c} = \frac{I_{F} + I_{S}}{e_{c}}$$

$$e_{c} = \max e_{F1}, e_{F2}, e_{S1}, e_{S2}$$

Maximum normal stresses $\,\sigma\,\,$ with bending moment ${\it M}\,$ at a combined beam cross-section with flexible mounting are $\,$:

$$\sigma_{F1} = \frac{M e_{F1}}{I_c} \quad on \ chassis \ frame \ lower \ fibers$$

$$\sigma_{F2} = \frac{M e_{F2}}{I_c} \quad on \ chassis \ frame \ upper \ fibers$$

$$\sigma_{S1} = \frac{M e_{S1}}{I_c} \quad on \ subframe \ lower \ fibers$$

$$\sigma_{S2} = \frac{M e_{S2}}{I_c} \quad on \ subframe \ upper \ fibers$$



With a rigid mounting the calculation of I_x and W_x for a combined beam turns out to be more complicated :

At first we have to calculate the centroid (Center of gravity) y_C for the combined cross-section. With dimension y_C we calculate z_F and z_S and then the second moment of combined cross-section I_C and the section modulus for the combined cross-section W_C .

$$y_{C} = \frac{A_{F} y_{F} + A_{S} (H_{F} + y_{S})}{A_{F} + A_{S}}$$

$$z_{F} = y_{C} - y_{F}$$

$$z_{S} = H_{F} + y_{S} - y_{C}$$

$$I_{C} = (I_{F} + A_{F} z_{F}^{2}) + (I_{S} + A_{S} z_{S}^{2})$$

$$W_{C} = \frac{I_{C}}{e_{C}} \qquad e_{C} = \max(y_{C1}, y_{c2})$$

Maximum normal stresses $\,\sigma\,$ with bending moment ${\it M}\,$ at a combined beam cross-section with rigid mounting are $\,$:

$$\sigma_F = \frac{M \ y_{Cl}}{I_C} \quad on \ frame \ lower \ fibers$$

$$\sigma_S = \frac{M \ y_{C2}}{I_C} \quad on \ subframe \ upper \ fibers$$

In both cases :

The normal stress distribution in figures: Young's modulus E for chassis frame material = Young's modulus E for subframe material. With all steel qualities $E \approx 210\ 000\ \text{N/mm}^2$

Safety factor can be calculated:

$$n = \frac{R_e}{\sigma} \qquad R_e = Yield \ point \qquad ; \ for \ material \ Fe52, \ R_e = 350 \ N \ / \ mm^2} \\ \sigma = calculated \ stress$$

Bending Moment M

In *FrameWIN software by Trailer Consultation* the bending moment *M* is the lifting moment of the crane multiplied by dynamic coefficient υ (default υ = 1.3).

TrailerWIN – CraneWIN – FrameWIN

Guided example

CALCULATION WITH NEW STANDARD EN12999

Subframe safety factor can now be made by two different systems, Basic FrameWIN System or EN12999/EN13001. The main difference from the Basic FrameWIN System is that it uses different safety-factors for crane-weight and the load. The new standard also takes notice of differencies in operation methods. On a crane with automatic speed control the forces on sudden rising/stopping will be much lower than on cranes with On/Off-type valve. FrameWIN now gives you the possibility to choose the calculation method.

Choosing new calculation system EN12999 in FrameWIN

In FrameWIN You can choose calculation system for dynamic forces. By choosing Options->Calculation system or by clicking on Dynamic coefficient-button on menu.

When choosin EN12999, EN13001 You will have to choose following settings:



Vertical hook Speed Load Combination A1/C1 HD class of Hoist Drive. HD1/HD4/HD5. Safety factors for Frame and Subframe. Recommendation by standard is: γm = 1.1

The calculation is made for mobile cranes, Hoist Class 1 (HC1).

You will also get the settings and formulas on the outprint.

Dynamic coefficient c dyn / n		
EN 12999 , EN 13001 🔹		Cancel
EN 13001		
vertical hook speed		
Calculated with vertical hook speed	1,5	
Load Combination		
A1, regular load, lifting/lowering speed from one function		
C1, exceptional load, total speed from all functions		
Classes of the type of hoist drive and its operation method		
O HC1 - HD1, On/Off valve	ø2 = 1.05 + 0.17	* v
☞ HC1 - HD4, Normal spool valve	ø2 = 1.05 + 0.17	* v/ 2
C HC1 - HD5, Automatic speed control	ø2 = 1.05	
n Safety factor : Subframe 1,1 Safety factor : Chassis Frame 1,1		ОК

About calculation system EN12999/EN13001

Here is a short description of the new standard EN12999. For more information, please refer to the standards EN12999, EN13001.

FrameWIN makes calculation by Hoist Class 1 (HC1) which is the Hoist Class for mobile- and flexible mounted cranes. (HC2 is for rigidly mounted cranes)

From options window You can make the following selections for Hoist Drive Class:

HD1 for cranes with On/Off –type valves regulating lifting and lowering

HD4 for cranes with normal spool valve operated by user. HD5 for cranes with automatic speed control



Formulas and symbols



Formula for calculating stresses and safety factor

$$\frac{(\gamma_{p_1} \varphi_2 P R + \gamma_{p_2} \varphi_1 G_b Y_b)}{W} g = \frac{\sigma a}{\gamma_m}$$

Symbols and coefficients

- Gf = Crane own weight without boom system
- Gb = Boom system weight (or total crane weight)
- Yb = Center of gravity for boom system (or crane)
- P = Payload
- R = Center of gravity for payload
- Vh = Rising/lowering hook speed used for calculating Φ_1 , Φ_2
- Vhmax = Maximum hook speed
- $\begin{array}{ll} \gamma_{p_1} &= \mbox{Partial safety factor for payload} \\ &\mbox{For Load combination A1 safety factor } \gamma_{p_1} = 1.22 \\ &\mbox{For Load combination C1 safety factor } \gamma_{p_1} = 1.1 \\ \gamma_{p_2} &= \mbox{Partial safety factor for crane weight} \\ &\mbox{For Load combination A1 safety factor } \gamma_{p_2} = 1.34 \\ &\mbox{For Load combination C1 safety factor } \gamma_{p_2} = 1.1 \\ \Phi_1 &= \mbox{Crane weight factor for dynamic effects when rising/lowering suddenly stops} \end{array}$
- $\begin{aligned} & \phi_1 = 1.1 \text{ or max } \phi_2 \\ & \phi_2 = \text{Payload factor for dynamic effects when rising/lowering suddenly stops.} \\ & \phi_2 = 1.05 + 0.17 \text{ Vh} \\ & \text{For Load Combination A1 :} \\ & \text{Vh} = \text{Vh}_{\text{max}} \text{ for Hoist Drive Class 1 (HD1)} \\ & \text{Vh} = 0.5 \text{ Vh}_{\text{max}} \text{ for Hoist Drive Class 4 (HD4)} \\ & \text{Vh} = 0 \text{ for Hoist Drive Class 5 (HD5)} \\ & \text{For Load Combination C1:} \\ & \text{Vh} = \text{Vh}_{\text{max}} \text{ for Hoist Drive Class s 1 and 4 (HD1 / HD4)} \\ & \text{Vh} = 0.5 \text{ Vh}_{\text{max}} \text{ for Hoist Drive Class 5 (HD5)} \\ & \text{W} = \text{Bending moment} \end{aligned}$
- g = 9.81 Nm (=1 kg)
- $\sigma a = Calculated stress$
- Vm = Safety factor
 - γm >= 1.1

TrailerWIN - CraneWIN - FrameWIN

Guided example

FrameWIN Subframe calculation for Guided Example

Now when we have done the Stability calculation we can build up a Subframe with FrameWIN.

From TrailerWIN click on Menu Special – FrameWIN

🐺 TrailerWIN 2012-06: C:\TrailerW\Data\Guided Examp	ole TrailerWIN CraneWIN
File Edit Print Picture Truck Trailer Options	Special Help
D 😂 🔲 🚑 🖯 T 🗆 📉 O	Tipper Calculation
	CraneWIN
	FrameWIN
	CornerWIN
- 1	DriveLineWIN
	LifterWIN

When FrameWIN starts You will see a picture with Truck Frame and a small beam as Subframe:

The calculation is based on the Crane capacity selected in TrailerWIN.

First thing is to make correct selection for the Truck Chassis Frame. Program does not know which Frame is on the chassis and it chooses only first selection from the manufacturers list.

As Print IR Rear air tag FH 62R IS Rear air tag FH 62R IS Duo Coad at max outracch ne own weight 1 (Crane own weight 1 (Crane own weight 1 (Crane own weight 1 (Crane own weight 1 h vertical hook speed	Moment Subframe B3HA a) esch) , Hiting/owering speed from on = 1,5 mb	e function	1980kg × 2620kg × 2620kg × 1,34 × 1.1 1,22 × 1,1 ∞2 = 1.05	-257, 640	ext Sym n=1,1 , 0.2m x g = 4m x g =	198 50 313 67	End 12999) KNm KNm KNm EN12999 60	171.2
R Rear air tag FH 62R 3 Duo cload at max outreach (Max load at maxel) (Max load at maxel) (Maxel)	B3HA)) each)), lifting/owering speed from on output = 1,5 m/s	e function	1980kg x 2620kg x 1,34 x 1.1 1,22 x 1,1 a2 = 1.05	-257, 640	nest, in 10.2m x g = 4m x g ≠	198 50 313 67	kNm kNm kNm kNm EN12999	171.2
R Rear air tag FH 62R 2 Duo c load at max outreach (Max load at max outre (Crane own weight) ton = A1, regular load dive = HD4, fuer load in vertical hook speed	B3HA =) each) (Ming/owering speed from on = 1.5 m/s	e function	1980kg x 2620kg x 1,34 x 1:1 1,22 x 1,1 s2 = 1.05	10.2m x g = .94m x g = 78 x 1990kg x 19 x 2620kg x 1,9 + 0.17 * v/2	0.2m x g = 4m x g ≠	198 50 313 67	kNm kNm kNm kNm EN12999	171.2
R Rear air tag FH 62R S Juo Koad at max outreach ne own weight) (Carae own weight) Carae own weight) ato n = A1, regular) drive = HD4, Hormal s h vertical hook speed	BSHA)) each) I, Hingolowering speed from on pol vahe = 1,5 m/s	e function	1980kg x 2620kg x 1,34 x 1.1 1,22 x 1,1 s2 = 1.05	10.2m x g = .94m x g = 78 x 1980kg x x 2620kg x 1,9 + 0.17 * v/2	10.2m x g = 4m x g =	198 50 313 67	kNm kNm kNm kNm EN12999	171.2
R Rear air tag FH 62R S Duo c load at max outreach e own weight) (Max load at max outreach (Crane own weight) tion = A1, regular load drive = HD4, float load h vertical hook speed	B3HA each) I. Ming/owering speed from on pool valve = 1,5 m/a	e function	1980kg x 2620kg x 1,34 x 1.1 1,22 x 1,1 ø2 = 1.05	10.2m x g = 1,94m x g = 78 x 1980kg x 1 x 2620kg x 1,9 + 0.17 * v/2	10.2m x g = 4m x g =	198 50 313 67	kVm kNm kNm kVm EN12999	171.2
3 Duo k load at max outreach ne own weight) (Max load at max outr (Crane own weight) tion = A1, regular load at weight) tion = A1, regular load h vertical hook speed	i) each) I, Mhaylowering speed from on pool valve = 1,5 m/s	e function	1980kg x 2620kg x 1,34 x 1.1 1,22 x 1,1 a2 = 1.05	10.2m x g = 1,94m x g = 78 x 1980kg x 1 x 2620kg x 1,9 + 0.17 * v/2	0,2m x g = 4m x g =	198 50 313 67	kNm kNm kNm kNm EN12999	171.2
c lad at max outreach own weight) (Max lad at max outre (Crane own weight) tion = A1, regular lad drive = HD4, Normal s h vertical hook speed	n) each) , lifting/owering speed from on out of the speed from on = 1.5 mb	e function	1980kg x 2620kg x 1,34 x 1.1 1,22 x 1.1 p2 = 1.05	10,2m x g = 94m x g = 78 x 1990kg x 1 x 2620kg x 1,9 + 0.17 * v/2	10,2m x g = 4m x g =	198 50 313 67	kNm kNm kNm kNm EN12999	171,2
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(crane own weight) : tion = A1, regular bad drive = H04, Normal s h vertical hook speed	, lifting/lowering speed from on pool valve = 1.5 m/s	e function	1,22 x 1,1 s2 = 1.05	x 2020kg x 1,9	4m × 9 =	40	EN12999	171,2
drive = HD4, Normal s th vertical hook speed	pool valve = 1,5 m/s		o2 = 1.05	+ 0.17 * v/2		40	EN12999	171,2
						40	60	171,2
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<u> </u>						40	60	171,2
						40	60	171,2
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ubframe hassis Frame	Fe52 Fe52				Re = 355 Re = 355	5 N/mm2 5 N/mm2		
	[A) \$ \$	ş		(B) B	8-8-		
ubframe N/mm2		213			904		Upper flang	ge
hassis frame N/mm2		946			817		Lower nam	iyo
or on subframe: Uppe	r flange	1.66			0.39			
or on subframe: Lowe or on chassis frame	er flange	1.66			0.60	_ ⊽ _		
Drefiles (data per es	0 (02)	H mm	6.0002	by amd	Mbr am?	Safet	y factor o	n subframe
(40x3	o runy	60	402	23.45	7.82		Kg 3	3.2
sis Frame : VOLVO FI	RAME66 FRAMELOW 266x90x6	266	2604	2644.88	198.86		20	0.4
e + Subframe (one rail	D	H mm	A mm2	lx cm4	Wx cm3	RBM Nn	n mikg	/m
Stiff with shear resist	ting plates	326	3006	3593.56	209.90	74515	23	3.6
						V-		
						Safet	y factor o	on chassis fr
	ubram hassis frame ubrame ubrame Nome ubrame Nome ubrame Nome or on aubrame Lowo or on chassis frame or on aubrame (one and on aubrame (one and on aubrame (one and one aubrame (one aubrame) aubrame (one aubrame) aubrame) aubrame (one aubrame) aubrame) aubrame (one aubrame) aubrame) aubrame (one aubrame) au	what an example of the set of the	ubrame F652 hassis Frame F652 ubrame Nmm2 F652 ubrame Nmm2 11 jabasis frame Nmm2 11 jaba	basis Fa2 basis </td <td>what man Feig hashis Franz Feig what man Right what man Right</td> <td>what man FeS2 Re 953 what man FeS2 Re 953</td> <td>the second second</td> <td>brame hassis Frame Fe52 Res 355 Nime2 basis frame Nim2 basis frame Nime2 basis</td>	what man Feig hashis Franz Feig what man Right what man Right	what man FeS2 Re 953 what man FeS2 Re 953	the second	brame hassis Frame Fe52 Res 355 Nime2 basis frame Nim2 basis frame Nime2 basis

Click in Menu: Edit – Chassis Frame

In the lower left corner You see 2 listboxes, one for Manufacturer and second list for models.

These lists are not complete and other options might be available.

In this window the measurement between the subframe-beams can also be edited.

In this window select frame Volvo FRAME88P/F 300x90x8+277x80x5



The profiles can also be edited by choosing Menu Edit – Edit Chassis Frame Profil

💐 Subframe				
File	Edit	Picture		
		Edit Profil		
P		Edit Chassis Frame Profil		
1:L		Add Profile		
		Delete profile		

The measures of the profile can then be edited in a graphics view of the Frame profile:

The subframe profiles can be edited the same way by first selecting one of the added profiles and choosing menu **Edit- Edit Profile.**





Now we go to Calculation Method and choose EN12999, EN 13001 Calculation system.

Click on Menu Options –		
Calculation System	Dynamic coefficient c dyn / n	
	EN 12999, EN 13001	Cancel
	– EN 13001	
	retrical hook speed Calculated with vertical hook speed	17
	Load Combination	
	O A1, regular load, lifting/lowering speed from one function	
	O C1, exceptional load, total speed from all functions	
	Classes of the type of hoist drive and its operation method	
	C HC1 - HD1, On/Off valve	ø2 = 1.05 + 0.17 * v
	C HC1 - HD4, Normal spool valve	ø2 = 1.05 + 0.17 * v
	 HC1 - HD5, Automatic speed control 	ø2 = 1.05+ 0.17 * v/2
	n Safety factor : Subframe 1. Safety factor : Chassis Frame 1.	А. ОК

💐 Fram	eWIN 2012-0	6
File Ed	dit Picture	Options Help
á	-	Safety factor
Оре	en Save	Dynamic coefficient
1		Calculation system
	Moment : (I	Language 🕨
	Dyn Momer	Options

The window will then show data used for calculating Dynamic forces of the crane. In this case we will choose **C1** for Load Combination- Exceptional load and **HC1-HD5** Automatic Speed Control. The vertical hook speed we change to **1.7** and the safety Factor to **1.4**. Click **Ok**.



Click **Ok** and go back to main-window.

We go on adding a vertical plate between the Chassis frame and Subframe

Choose Add Profile – Plate Vertical

Modify the x-placement to -5 so it will go outside the Chassis Frame and Subframe.

Modify the height of the plate to 250 and move the plate so it will reach the top of the subframe by changing the y measure to -90.

We can now see that on Flexible mounting the safety factor on Chassis Frame is 1.27 but if we use a Fixed mounting we can reach a safety factor of 1.81.

💐 Subframe	And in case of the local division of the loc
File Edit Picture	
Add Profile	Side plate
1 : 160x80 Add Pro	file button
2 : 5x50	•
2	: 5x50
Plate vertical	•
5x50	_
Wx = 2cm3 G = 2kg/m	
5x50	
x =5	250 × 5
y = <mark>-90</mark>	
Fe52 : ReL = 355 N/mm2	>

•

•

TrailerWIN – CraneWIN – FrameWIN

Guided example

Stress on subframe N/mm2	178	196
Stress on subframe N/mm2	286	17
Stress on chassis frame N/mm2	279	197
Safety factor on subframe: Upper flange	1.99	1.81
Safety factor on subframe: Lower flange	1.24	20.37
Safety factor on chassis frame	1.27	1.81

Fe52

Fe52

We continue adding more profiles. We now add a horizontal plate on top of subframe that fills up the gap between the frame-beams.

Click on Subframe button or Menu Edit-Subframe

Then click Add Profile –button

Material: Subframe

Material: Chassis Frame

Choose Plate horizontal plate

Modify the measures, width to 500 and placement of the sideplate in x-direction to -5

Here we must notice that the width of the horizontal plate has to be set to **MIDPOINT OF TRUCK**

Now when we reinforced to top of the subframe we will get more force on lower part of the subframe. Instead of reinforcing the lower flange of subframe we can choose to reinforce the Truck frame on the bottom instead by inserting a Lreinforcement outside lower part of Truck frame.

Choose Add profile - L-Reinforcement for Chassis beam.



		4 : 5x50	l		
Plate horizontal					1
F 50					
5x50					-
Wx=0cm3 G=2	2kg/m				
Wx = 0cm3 G = 3	2kg/m				
Wx = 0cm3 G = 2	2kg/m				
Wx = 0cm3 G = 2 5x50 x = -5	2kg/m	5	×	505	

Re = 355 N/mm2

Re = 355 N/mm2

Upper flange Lower flange



Next window shows the profile of the reinforcement. Here we modify the reinforcement to add more strength to the lower part of frame by modifying the measures as follows:

r

	4 0		
	199,-15		Cancel
			OK
		4	-
			74.0
Now we must change the x- and		100 10	/1,5
y-measures to get the			28,7
rainforcement to outside of		¥ 10	-
reinforcement to outside of			
Chassis frame Change x-			
chassis frame. change x			- Name
measure to -10 and v-measure	+ L Reinforcement : 100 x 100 x 10		Automatic
ha 210			
to -310.			
-		1 : 160x80x5	A
		2 : 250x5	-
Click the small Ok-button .			
Now we have a good safety factor for	or Flexible mounting		
also.			
		L-Reinforcement for chassis beam	
		'	
			-
		Wx = 25cm3 G = 14,9kg/m	
		+ L Beinforcement : 100 v 100 v 10	
		L Hernorcement, Too X 100 X 10	
		N = 10	
		^- -10	
		y = .310	0K> 1
		1 Jord	
		EsE2 · Dol - 2EE N/mm2	
		JEEDZ . HEL = 300 N/MMZ	

When Printing You will get two pages. First page a detailed drawing of the Subframe:



TrailerWIN - CraneWIN - FrameWIN

Guided example

On the other page You will get details about the calculation as seen on screen:

VOLVO FH 62R Rear air tag FH 62R B3HA HIAB 244EP-3 Duo						
Moment : (Max load at max outreach) Moment : (Crane own weight) Dyn Moment : (Max load at max outreach) Dyn Moment : (Crane own weight)		1980kg x 1 2620kg x 1 1,1 x 1.194 1,1 x 1,1 x	0,2m x g = ,94m x g = x 1980kg x 10,2 2620kg x 1,94m :	m x g = x g =	198 50 260 60	kNm kNm kNm
Load Combination = C1, exceptional load, total speed from all functions Class of hoist drive = HD5, Automatic speed control Calculated with vertical hook speed = 1.7 m/s	5	ø2 = 1.05 +	+ 0.17 * v/2		1	EN12999
			505			5
					80	221,3
					90	300 253,7
Material: Subframe Fe52				Re = 355	N/mm2	
Material: Subframe Fe52 Material: Chassis Frame Fe52	[A]	\$ \$		Re = 355 Re = 355 [B]	N/mm2 N/mm2	
Material: Subframe Fe52 Material: Chassis Frame Fe52 Stress on subframe N/mm2 Stress on subframe N/mm2 Stress on chassis frame N/mm2	[A] <u> </u>	5 5 6 9		Re = 355 Re = 355 [B]	N/mm2 N/mm2	Upper flange Lower flange
Material: Subframe Fe52 Material: Chassis Frame Fe52 Stress on subframe N/mm2 Stress on subframe N/mm2 Stress on chassis frame N/mm2 Safety factor on subframe: Upper flange Safety factor on subframe: Lower flange Safety factor on chassis frame	[A] 576 24 18 4.1 1.1	5 5 8 9 9 10 10 10 10 10 10 10 10 10 10 10 10 10		Re = 385 Re = 365 [B] 87 13 100 4.09 26.87 3.57	N/mm2 N/mm2	Upper flange Lower flange
Material: Subframe Fe52 Material: Chassis Frame Fe52 Stress on subframe N/mm2 Stress on subframe N/mm2 Stress on chassis frame N/mm2 Safety factor on subframe: Upper flange Safety factor on subframe: Lower flange Safety factor on chassis frame List of Profiles (data per one rail)	[A] 76 24 18 4.1 1.1 H mm	5 5 6 9 30 14 38 A mm2	lx cm4	Re = 355 Re = 355 [8]	N/mm2 N/mm2	Upper flange Lower flange m kg/m
Material: Subframe Fe52 Material: Chassis Frame Fe52 Stress on subframe Nimm2 Stress on subframe Nimm2 Stress on chassis frame Nimm2 Safety factor on subframe: Upper flange Safety factor on subframe: Lower flange Safety factor on chassis frame List of Profiles (data per one rail) 1 160x80x5 2 250x5	[A] 76 24 18 4.1 1.1 1.1 H mm 160 250	<u>≶ §</u> 8 9 9 14 38 <u>A mm2</u> 2300 1250	lx cm4 781.92 651.04	Re = 355 Re = 355 [8]	N/mm2 N/mm2	Upper flange Lower flange m kg/m 18.1 9.8
Material: Subframe Fe52 Material: Chassis Frame Fe52 Stress on subframe Nmm2 Stress on subframe Nmm2 Stress on chassis frame Nmm2 Safety factor on subframe: Upper flange Safety factor on subframe: Lower flange Safety factor on chassis frame List of Profiles (data per one rail) 1 160x80x5 2 260x6 4 5x505 => Subframe Profiles together	[A] 76 24 18 4.1 1.1 1.1 H mm 160 250 5 255	≤ ≤ 9 9 10 14 18 88 A mm2 2300 1250 2525 2525 2525	ix cm4 761.92 651.04 0.53 3004 56	Re = 355 Re = 355 [8]	N/mm2 N/mm2	Upper flange Lower flange m kg/m 18.1 9.8 19.8 47.7
Material: Subframe Fe52 Material: Chassis Frame Fe52 Stress on subframe Nimm2 Stress on subframe Nimm2 Stress on chassis frame Nimm2 Safety factor on subframe: Upper flange Safety factor on subframe: Lower flange Safety factor on chassis frame List of Profiles (data per one rail) 1 160x80x5 2 250x6 4 5x505 => Subframe Chassis Frame : VOLVO FRAME88P/F 300x90x8+277x80x6	[A] 76 24 18 4.1 1.7 1.7 Hmm 160 250 5 255 5 000	5 5 8 9 8 9 14 14 18 8 2300 1250 1250 2525 6075 5 500	lx cm4 761.92 651.04 0.53 3004.56	Re = 355 Re = 355 [B]	N/mm2 N/mm2	Upper flange Lower flange m kg/m 18.1 9.8 19.8 47.7
Material: Subframe Fe52 Material: Chassis Frame Fe52 Stress on subframe Nimm2 Stress on subframe Nimm2 Stress on chassis frame Nimm2 Safety factor on subframe: Upper flange Safety factor on subframe: Lower flange Safety factor on subframe: Lower flange Safety factor on chassis frame Image List of Profiles (data per one rail) 1 1 160x80x5 2 250x6 4 5x605 => Subframe Profiles together Chassis Frame: VOLVO FRAME88P/F 300x80x8+277x80x6 5 + L Reinforcement : 100 x 100 x 10	[A] 76 24 18 4.1 1.7 1.7 1.7 1.0 250 5 255 5 300 100	≤ ≤ 9 9 14 18 2300 1250 2525 0075 5002 1900	lx cm4 761.92 651.04 0.53 3004.58 7050.39 180.00	Re = 355 Re = 355 [8] 37 13 100 4.09 26.87 3.57 Wx cm3 95.24 52.08 2.10 154.06 470.03 25.24	N/mm2 N/mm2	Upper flange Lower flange m kg/m 18.1 9.8 19.8 19.8 19.8 47.7 46.3 11.9
Material: Subframe Fe52 Material: Chassis Frame Fe52 Stress on subframe Nimm2 Stress on subframe Nimm2 Stress on chassis frame Nimm2 Safety factor on subframe: Upper flange Safety factor on subframe: Lower flange Safety factor on subframe: Lower flange Safety factor on chassis frame Image List of Profiles (data per one rail) 1 1 160x80x5 2 250x6 4 5x506 => Subframe Profiles together Chassis Frame : VOLVO FRAME88P/F 300x90x8+277x80x6 5 + L Reinforcement : 100 x 100 => Chassis Frame total	[A] 76 24 18 4.1 1.7 1.7 1.7 1.0 250 250 5 255 5 300 100 310	≤ ≤ 9 9 14 18 2300 1250 2525 6075 5902 1900 7802 7802	lx cm4 761.92 651.04 0.53 3004.58 7050.39 180.00 9708.85	Re = 355 Re = 355 [B]	N/mm2 N/mm2	Upper flange Lower flange m kg/m 18.1 9.8 19.8 19.8 47.7 46.3 14.9 61.2 0 bt/c
Material: Subframe Fe52 Material: Chassis Frame Fe52 Stress on subframe Nmm2 Stress on subframe Nmm2 Stress on chassis frame Nmm2 Safety factor on subframe: Upper flange Safety factor on subframe: Lower flange Safety factor on chassis frame Image List of Profiles (data per one rail) 1 1 160x80x5 2 250x5 4 5x005 => Subframe Profiles together Chassis Frame : VOLVO FRAME88P/F 300x80x8+277x80x5 5 + L Reinforcement : 100 x 100 x 10 => Chassis Frame (total action of the subframe (total action of total action of totaction of tot	[A] 76 24 18 4.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1	≤ ≤ ≤ 8 9 39 144 38 A mm2 2300 1260 2525 6075 5902 1900 7802 A mm2 13877	lx cm4 761.92 651.04 0.53 3004.56 7050.39 180.00 9708.85 1x cm4 12713.41	Re = 355 Re = 355 [8]	N/mm2 N/mm2	Upper flange Lower flange m kg/m 18.1 9.8 19.8 19.8 19.8 19.8 19.8 19.8
Material: Subframe Fe52 Material: Chassis Frame Fe52 Stress on subframe Nimm2 Stress on subframe Nimm2 Stress on subframe Nimm2 Safety factor on subframe: Upper flange Safety factor on subframe: Lower flange Safety factor on subframe: Lower flange Safety factor on chassis frame Safety factor on chassis frame List of Profiles (data per one rail) 1 1 160x80x5 2 250x6 4 5x605 => Subframe Profiles together Chassis Frame total Safety Factor and Stress Frame total => Frame + Subframe (one rail) [A] Flexible mounted [B] Stiff with shear resisting plates	[A] 76 24 18 4.1 1.7 1.7 1.7 1.7 1.0 250 5 255 5 300 100 310 H mm 475 475	≤ ≤ 8 9 9 144 188 2300 1250 2525 6075 5902 1900 7802 1900 7802 13877 13877	lx cm4 761.92 651.04 0.53 3004.58 7050.39 180.00 9708.85 lx cm4 12713.41 40848.83	Re = 355 Re = 355 [B]	N/mm2 N/mm2	Upper flange Lower flange 18.1 9.8 19.8 19.8 47.7 46.3 14.9 61.2 m kg/m 108.9 108.9



Guided example

Adding the subframe in TrailerWIN calculation

Now when we have built up the subframe we can read the mass of the subframe in Outprint:

	List of Profiles (data per one rail)	H mm	A mm2	lx cm4	Wx cm3	m kg/m	
1	160x80x5	160	2300	761.92	95.24	18.1	
2	250x5	250	1250	651.04	52.08	9.8	
4	5x505	5	2525	0.53	2.10	19.8	•
=>	Subframe Profiles together	255	6075	3004.56	154.06	47.7	_
	Chassis Frame : VOLVO FRAME88P/F 300x90x8+277x80x	5					
		200	6000	7050.00	470.00	40.0	

This calculation is purely based on the kg/m mass of different beams and gives You only rough weight data. In this case the subframe mass is calculated as 47.7 kg/m. We will use a value of 50 kg/m in TrailerWIN.

Go back to the TrailerWIN calculation and select **Subframe** button:

In this window You can now make selections for Subframe. First we choose the type of front-end by choosing the radio-buttons:



Then we can use our value for weight of subframe in

kg/m or we can use a total Subframe weight in the next textbox.

Then we can change start- and endpoint of subframe by entering x1- and x2-values or by giving a length (L). You can also use mouse and drag the yellow boxes to modify length.

Here we use the first option and modify the length of the subframe to **1400**mm in the box "L=".

Subframe	
	Cancel
Type of first end or no subframe	
• •	
Startpoint Length-> 140	0 Endpoint
x1 = 436 L = 7282 x2	= 7718
Subframe weight kg/m 50	
Subframe weight kg 364	1
centre of gravitys place xG 4077	or
	UK



The Subframe is now shown as a gray rectangle below the crane in the big picture:



On the text-page we can also verify that all equipments are listed in the weight calculation:

	x CoG	Fa	Ra	Total
+ Chassis weight		4776	2960	7736
+ number of persons 1 x 75 kg	0	75	0	75
+ body weight 86 kg/m	4800	4	496	500
+ Subframe weight 50 kg/m	1136	54	16	70
1 HIAB 244EP-3 Duo	1268	2273	806	3079
2 MAXISTAB 3 EHA/S	6570	-150	570	420
3 950	-1510	328	-78	250
+ Towing coupling	7505	-55	155	100
= weights unloaded :		7305	4925	12230
+ carrying capacity	4800	117	13653	13770
= Weights loaded :		7421	18579	26000
:: Gross Vehicle Weight		7500	19000	26000

This Guided example is only for learning use of the programs and shall not be used as a good practice of assembling Crane to a chassis. The subframe profile is only for practicing program use and must not be used as a model for good design of subframe.

For more information please use the Manuals in PDF-format in TrailerWIN/Manual-directory.