Weight distribution calculator

Truck Weight Distribution Calculator

The Truck Weight Distribution Calculator Slide Rule has been designed to assist Rootes Truck Salesmen to overcome the many difficulties which arise when advising potential customers on body and trailer application.

By using the Weight Distribution Calculator in conjunction with the simple operating examples given in this publication, Salesmen will become more qualified to discuss with customers their particular transport problems and be better able to advise on a bodywork specification best suited to their requirements. All examples given, with the exception of No. 1b are for checking if loading of vehicle is legally acceptable. Example 1b is to find the maximum permissible body length for an evenly distributed payload.

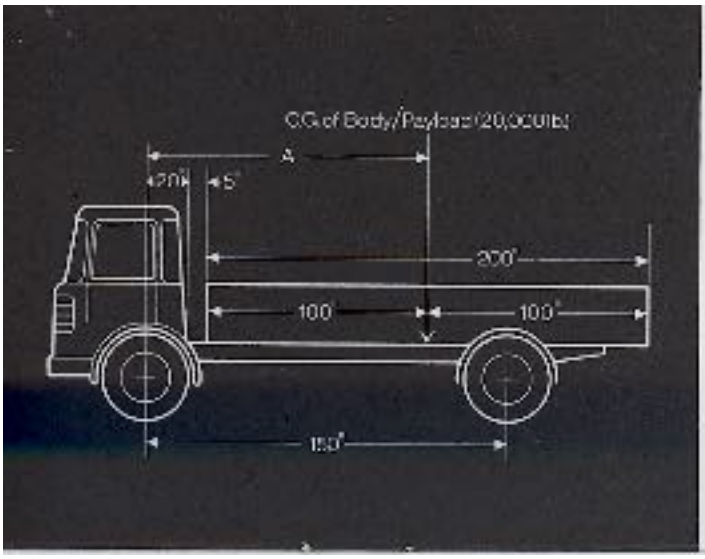
The Vehicle Weight Data required when using the Calculator is given in a special section at the rear of the relative Truck Salesman's Handbook.

Truck Performance Calculator

On the all-important subject of vehicle performance, a Truck Performance Calculator is also available, this provides estimated figures on Road Speeds and vehicle Gradeability. Operating instructions for using this calculator are given on the body of the slide rule.

Practice makes Perfect

Obviously to become competent in using these sales aids constant practice is required and you are therefore advised to take every opportunity in acquainting yourself with their operation.



1 Evenly distributed payload in a normal truck body

(a) To check that proposed body length and positioning are correct.

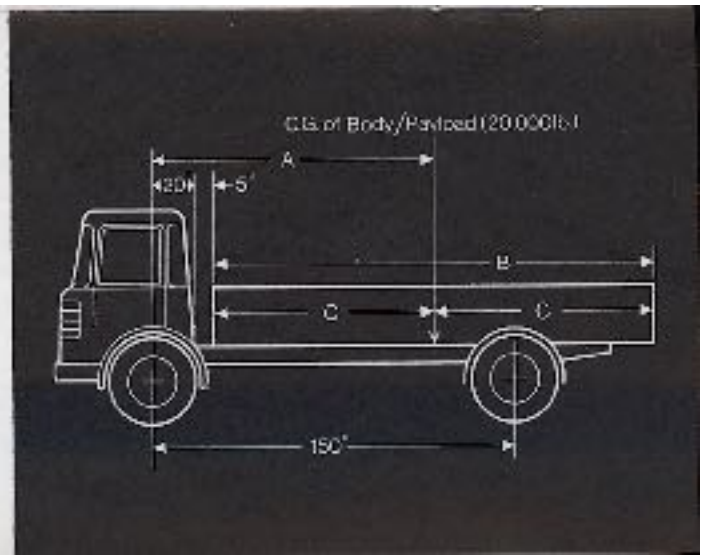
The facts shown in the drawing opposite will be known in this case. In addition chassis/cab road weights and plated weights will be known as below.

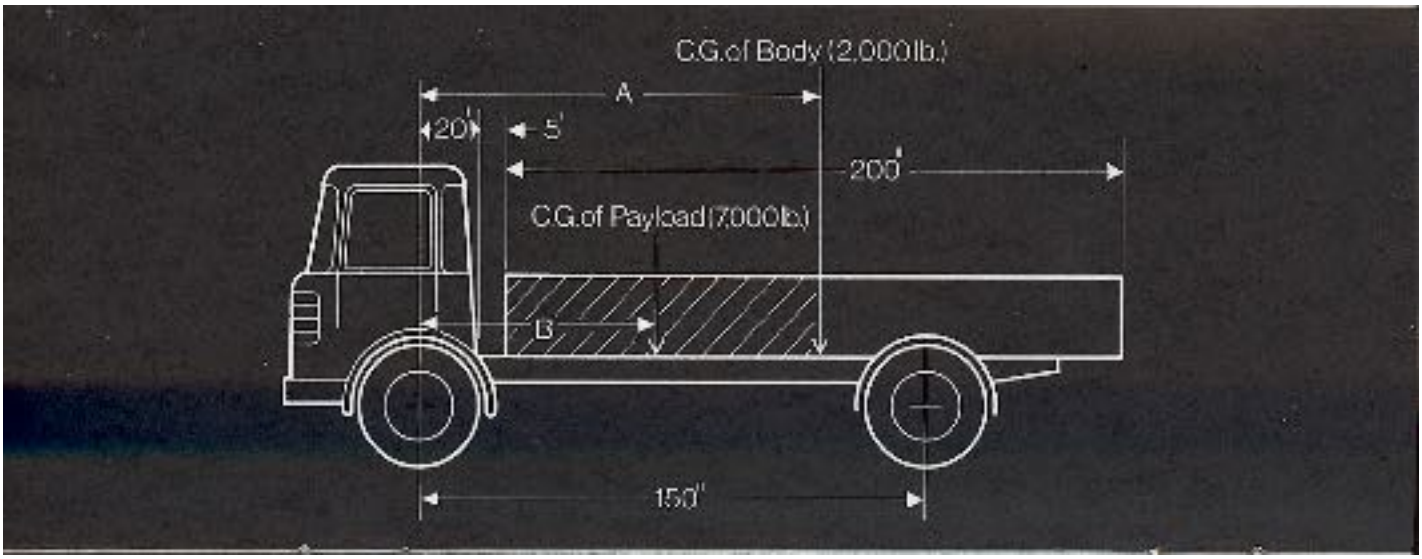
	FRONT	REAR	TOTAL
Plated weights (lb.)	9000	20000	28000
Road weights (lb.)	5000	3000	8000
Max. permissible body with payload (lb.)	4000	17000	20000

Centre of Gravity (C.G.) will be in the centre of the body for an evenly distributed load, therefore C.G. distance to front axle (dimension A) is 20 + 5 + 100 = 125". Using calculator find % distribution using Scale 1 and convert this to front and rear axle loads using 20,000 lb. max. permissible body with payload on Scale 2. This gives axle loads of; rear 16,667 lb., front 3,333 lb. These are within the maximum permissible body with payload figures given above.

(b) To find the maximum body length.
Using the weights as in previous example set the arrow ▲ in Scale 2 against 20,000 lb. and read off % distribution on rear axle against 17,000 lb. on the weight distribution scale. Set the arrow in Scale 1 against this % distribution figure and read off C.G. to front axle dimensions (dimension A) against wheelbase. This will be seen as 127.5". Subtract front axle centre line to front of body dimensions (25") from 127.5" which gives 102.5". This is half the maximum body length (dimension C). Therefore maximum body length (dimension B) is 205".

Note: Always check that this body will be within maximum legal overhang which is 60% of the wheelbase on two-axle rigids and 60% of the mean wheelbase + 4" measured from a point 4" behind the centre of the rear bogie for three-axle rigids.




C.G.of Body (2,000lb.)
A
20"
5'
200"
C.G.of Payload (7,000lb.)
B
150"

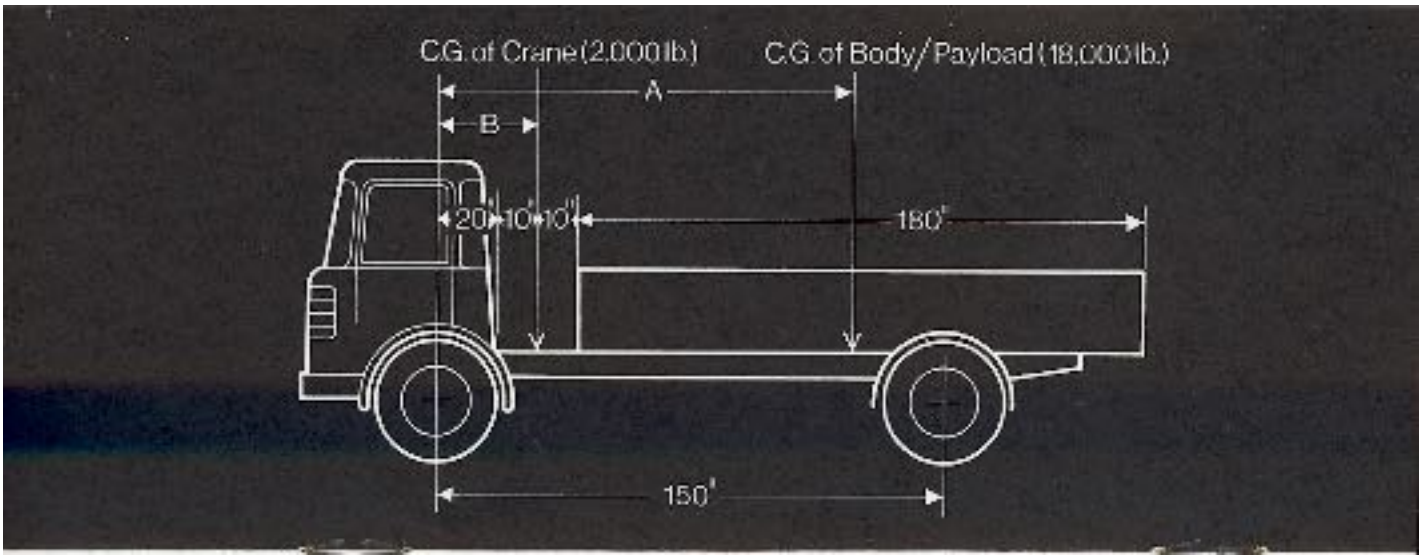
2 Unevenly distributed payload

(a) To check if loading of vehicle is acceptable.

Assume only the front half of the body is loaded. In addition to the facts shown above it is necessary to know.
Body weight say 2000 lb.
Payload in front half of body say 7000 lb.
C.G. distance to front axle is 125" (dimension A) for body and 75" (dimension B) for payload. By using the instructions on the calculator obtain front and rear axle loads for body and payload in separate stages and set down as at right.

	FRONT	REAR	TOTAL
Road wt. (chassis/cab) (lb.)	5000	3000	8000
Body weight (lb.)	333	1667	2000
Payload weight (lb.)	3500	3500	7000
Totals (lb.)	8833	8167	1700
Plated weights (lb.)	9000	20000	28000

This loading is therefore acceptable since total weights are within maximum plated weights.


C.G. of Crane (2,000 lb.)
C.G. of Body/Payload (18,000 lb.)
A
B
20'
10'
10'
180'
150'

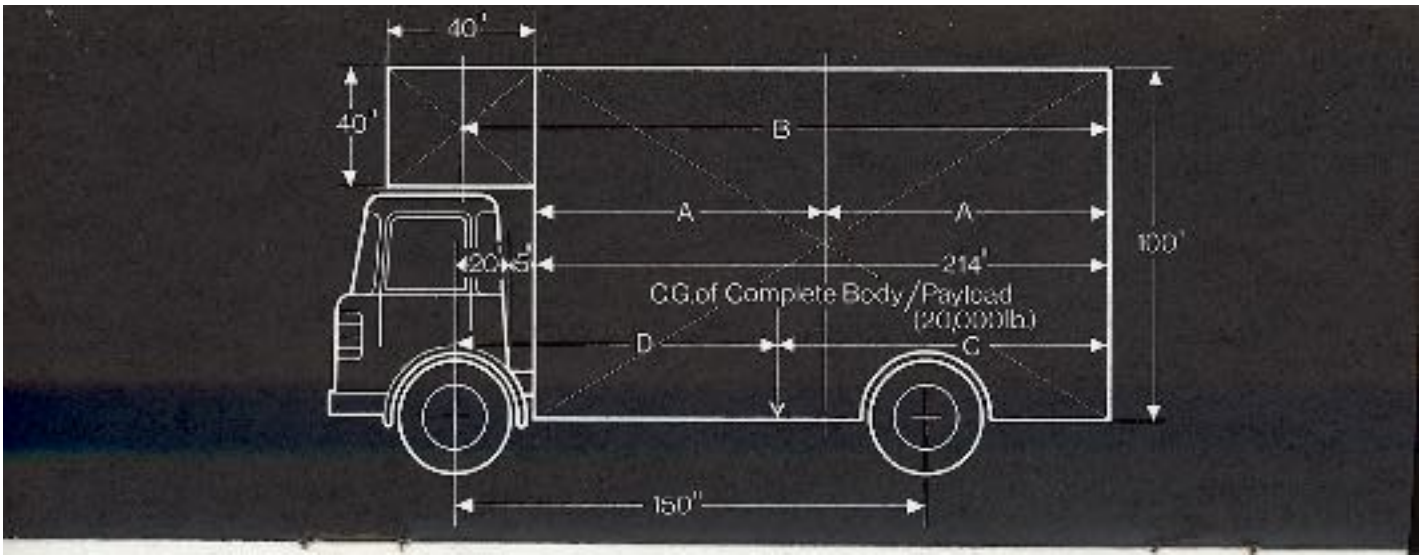
3 Truck mounted crane with evenly distributed payload

(a) To check if loading of vehicle is acceptable.
Assume that the above condition is required. The maximum permissible body and payload in this example is the total chassis/cab road weight including the crane, subtracted from the G.V.W. Using figures as before the maximum gross payload is 28000 — (8000 + 2000) = 18000 lb. This 18000 lb. will act half way along the body for an evenly distributed payload. Therefore the distance of C.G. of gross payload from front axle (dimension A) = 20 + 10 + 10 + 90 — 130". Distance of C.G. of crane from front axle (dimension B) = 30".

By using the instructions on the calculator find front and rear axle loads of both crane and body with payload and tabulate results as below.

	FRONT	REAR	TOTAL
Road wt. (chassis/cab) lb.	5000	3000	8000
Crane weight (lb.)	1600	400	2000
Body with payload wt. (lb.)	2400	15600	18000
Totals (lb.)	9000	19000	28000
Plated weights (lb.)	9000	20000	28000

This loading is therefore acceptable since total weights are within maximum plated weights.


40'
40'
B
A
A
100'
20'-5"
214'
C.G.of Complete Body/Payload
(20,000lb.)
D
C
150"

4 Luton Van

(a) To check if loading of vehicle is acceptable.

Consider a Luton body in two parts; a box van and a Luton head as shown.

Assuming an evenly distributed load the C.G. for each part will be in the centre of each part. In the example shown the C.G. of the box van will be (dimension A) 107" from the rearmost point. And that of the Luton head will be (dimension B) 234" from the rearmost point. The C.G. for the whole Luton body may be calculated as follows:—

Distance of C.G. for whole Luton body (dimension C) =

$$\frac{\text{(Area of box body x dim.A) + (Area of Luton head x dim.B)}}{\text{Total Area of Luton body}}$$

In this example (dim. C) $= \dfrac{(100 \times 214 \times 107) + (40 \times 40 \times 234)}{(100 \times 214) + (40 \times 40)}$

$$= \frac{2664200}{23000} - 116"$$

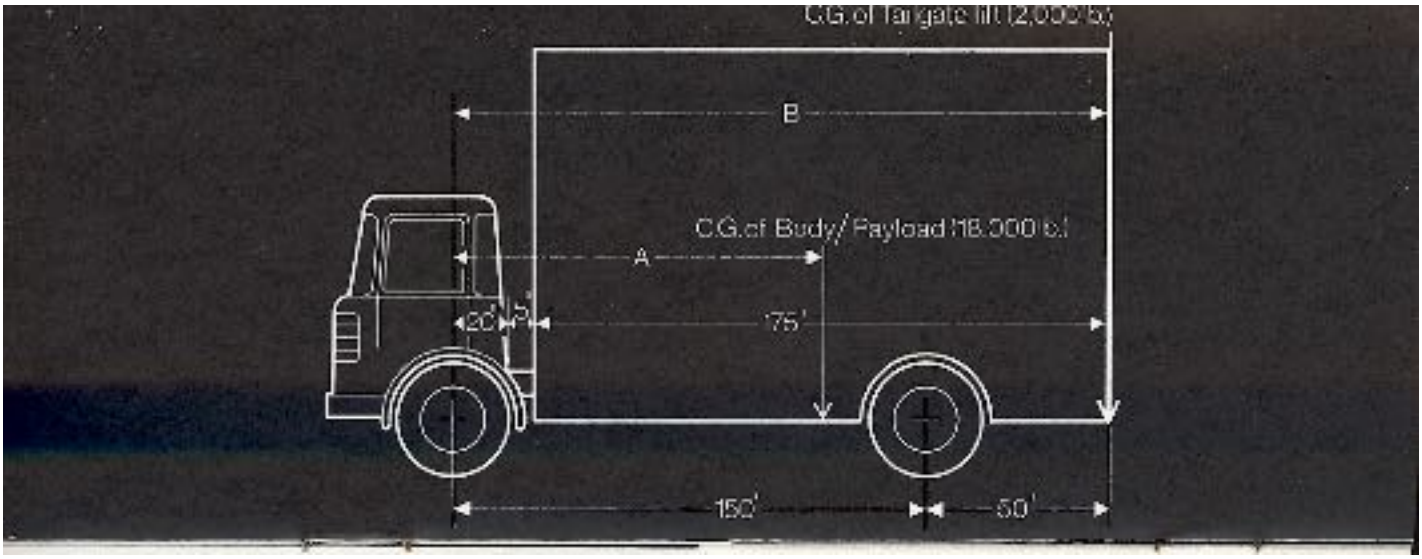
Distance of C.G. to front axle (dimension D) — (20 + 5 + 214) —(dimension C) 116 — 123"

The maximum permissible body and payload weight in this example is the G.V.W. less the chassis/cab road weight and using the same weights as before this is 28000 — 8000 — 20000 lb.

Using this weight (20000 lb.) and the C.G. to front axle dimension (D) already established use the calculator to find the load on front and rear axle loads and tabulate as below.

	FRONT	REAR	TOTAL
Road wt. (chassis/cab) lb.	5000	3000	8000
Ltn body & payload (lb.)	3600	16400	20000
Totals (lb.)	8600	19400	28000
Plated weights (lb.)	9000	20000	28000

This loading is therefore acceptable since total weights are within maximum plated weights.


C.G. of Tailgate lift (2,000 lb.)
B
C.G. of Body/ Payload (18,000 lb.)
A
20"
75"
150"
50"

5 Box Van with tailgate lift.

(a) To check if loading of vehicle is acceptable.

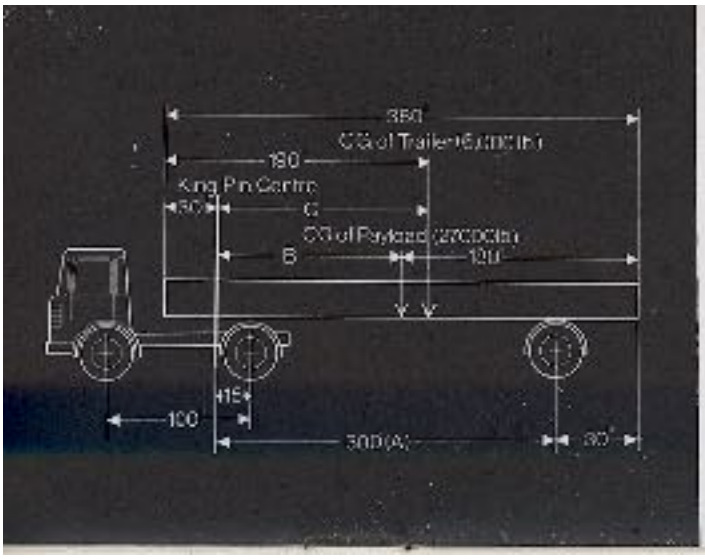
Assume conditions as above and a tailgate lift of 2000 lb. The maximum permissible body and payload weight is the total chassis/cab road weight including the tailgate lift subtracted from the G.V.W. Using figures as before 28000 — (8000 + 2000) — 18000 lb. This 18000 lb. will act half way along the body for an evenly distributed payload. Therefore the distance of the C.G. of the gross payload from the front axle (dimension A) = 20 + 5 + 87.5 = 112.5". Distance of C.G. of tailgate lift from front axle is (dimension B) = 200".

By using the instructions on calculator find front and rear axle loads of both tailgate lift and body with payload then tabulate as right.

	FRONT	REAR	TOTAL
Road weights (chassis/cab) (lb.)	5000	3000	8000
Body with payload (lb.)	4500	13500	18000
Tailgate lift* (lb.)	—667	2667	2000
Totals (lb.)	8833	19167	28000
Plated weights (lb.)	9000	20000	28000

This loading is therefore acceptable since total weights are within the maximum plated weights.

*It will be noted that when using the calculator to determine the weight distribution of the tailgate lift the answer is 133% on rear axle and — 33% on front axle. When reading Scale 2 remember that the front axle weight is a minus figure.



6 Artics

To check if loading of vehicle is acceptable.

Assume in this example:—Road weight (lb)		Plated weight (lb)
Tractor front axle	5000	8500
Tractor rear axle	2000	16500
Tractor total	7000	24000 (GVW.)
Trailer total	6000	28000
Complete unit	13000	40000(GTW.)

From this the maximum permissible payload is the G.T.W. less the road weight of the complete unit i.e. 40000 — 13000 = 27000 lb.

(a) To calculate king pin centre line to C.G. of payload. Assuming an evenly distributed load, the C.G. will be in the centre of the trailer length; in this example 180" from the front or rear of trailer. Subtract from this figure the trailer front overhang. This gives C.G. of payload to king pin centre line (dimension B) In this example — 180 — 30 — 150".

(b) In the same way calculate the trailer C.G. from king pin centre line (dimension C). Obtain C.G. of trailer from the trailer manufacturer. Then dimension C is this distance less trailer front overhang. 190 — 30 = 160".

On Scale 1 of the calculator substitute dimension A for wheelbase scale and substitute C.G. to king pin for C.G. to front axle Scale. Using Scale 1 calculate % distribution front and rear for both payload and trailer. Convert these to actual weight distribution front and rear using Scale 2. The result for the front will in fact give the load on the king pin and the rear will give the trailer axle load.

The results in this example are:—

	King Pin Load	Trailer Axle Load	Totals
Trailer road weight (lb.)	2800	3200	6000
Payload (lb.)	13500	13500	27000
Totals (lb.)	16300	16700	33000

(c) Now consider the tractor. This has a king pin load of 16300 (as above) and its C.G. to front axle dimension is 100 — 15 — 85" (i.e. Wheelbase — king pin offset). Using Scale 1 of the calculator find front and rear axle distribution using the C.G. to front axle (85") and the wheelbase (100") dimensions. Using Scale 2 find the actual weight distribution of the total king pin load — 16300lb.

	FRONT	REAR	TOTAL
Tractor road weight (lb.)	5000	2000	7000
King pin load (lb.)	2445	13855	16300
Totals (lb.)	7445	15855	23300

Check that Front and Rear tractor axle, trailer axle, G.V.W. and G.T.W. are within plated weights (Note actual G.T.W. — Total tractor weight + trailer axle weight).

	Front Axle	Rear Axle	Trailer Axle	G.V.W.	G.T.W.
Actual (lb)	7445	15855	16700	23300	40000
Plated (lb)	8500	16500	18000	24000	40000

It can be seen that these actual weights are within the plated weights therefore this loading is acceptable.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