**Methode to calculate height of centre of gravity \( h_R \)**

Centre high of gravity over the ground for the complete vehicle (unladen, laden) including basically three parts of c.h.o.g. from chassis, body work (frame) and pay load (laden).

This methode might be useful the trailer manufacturer does not indicate the c.h.o.g.

- \( h_1 \) = h.o.c.o.g. from axles or axle assy. plus tyres, springs etc. \( = R \times 1.1 \)
- \( h_2 \) = h.o.c.o.g. from frame (laden) \( = (h_6 + h_8) \times 0.5 \)
- \( h_3 \) = h.o.c.o.g. from payload plus canvas, bows, racks, ramps etc. (laden) \( = 0.3 \times h_7 + h_6 \) \(^1\)
- \( h_4 \) = \( h_2 + \) plus spring deflection = \( \Delta s \) (unladen) \(^2\)
- \( h_5 \) = h.o.c.o.g. from canvas, bows, racks, ramps etc. (unladen) plus spring deflection \( = 0.5 \times h_7 + h_6 + \Delta s \) \(^2\)
- \( h_6 \) = frame height, top
- \( h_7 \) = body dimensions, inside
- \( h_8 \) = frame height, bottom
- \( P \) = gross vehicle weight, laden/unladen
- \( R \) = tyre radius
- \( W_1 \) = weight of axles or axle assy. plus tyres, springs etc. \( = P \times 0.1 \) \(^3\)
- \( W_2 \) = weight of chassis (frame), unladen \( = (P_{unl.} - W_1) \times 0.8 \)
- \( W_3 \) = weight of payload plus canvas, bows, racks, ramps etc.
- \( W_4 \) = weight of canvas, bows, racks, ramps etc. \( = (P_{unl.} - W_1) \times 0.2 \)

\(^1\) for unknown payload height to determine the c.h.o.g. ca. 0.3 of the inside dimensions of body can be taken.

\(^2\) for vehicles with air suspension: remove „plus spring deflection“

\(^3\) for semitrailer take for unsprung mass \( W_1 \) : axle assy. load \( P_R \times 0.1 \)

\[ h_R = \frac{(h_1 \times W_1) + (h_2 \times W_2) + (h_3 \times W_3)}{P_{laden}} \]

\[ h_{Runl.} = \frac{(h_1 \times W_1) + (h_4 \times W_2) + (h_5 \times W_4)}{P_{unladen}} \]
Example:

Vehicle gross weight, laden  \( P = 16000 \) kg
Vehicle gross weight, unladen  \( \text{Punl.} = 4000 \) kg
Tyre radius  \( R = 527 \) mm
Frame height, top  \( h_6 = 900 \) mm
Frame height, bottom  \( h_8 = 700 \) mm
Body dimensions, inside  \( h_7 = 2300 \) mm
Spring deflection (laden/unladen)  \( \Delta s = 50 \) mm

\[
\begin{align*}
\ h_1 & = R \cdot 1.1 = 527 \cdot 1.1 = 580 \text{ mm} \\
\ h_2 & = (h_6 + h_8) \cdot 0.5 = (900 + 700) \cdot 0.5 = 800 \text{ mm} \\
\ h_3 & = h_7 \cdot 0.3 + h_6 = 2300 \cdot 0.3 + 900 = 1590 \text{ mm} \\
\ h_4 & = h_2 + \Delta s = 800 + 50 = 850 \text{ mm} \\
\ h_5 & = (h_7 \cdot 0.5) + h_6 + \Delta s = (2300 \cdot 0.5) + 900 + 50 = 2100 \text{ mm} \\
W_1 & = P \cdot 0.1 = 16000 \cdot 0.1 = 1600 \text{ kg} \\
W_2 & = (\text{Punl.} - W_1) \cdot 0.8 = (4000 - 1600) \cdot 0.8 = 1920 \text{ kg} \\
W_3 & = (P - \text{Punl.}) + (\text{Punl.} - W_1) \cdot 0.2 = (16000 - 4000) + (4000 - 1600) \cdot 0.2 = 12480 \text{ kg} \\
W_4 & = (\text{Punl.} - W_1) \cdot 0.8 = (4000 - 1600) \cdot 0.8 = 1920 \text{ kg} \\
W_5 & = (\text{Punl.} - W_1) \cdot 0.2 = (4000 - 1600) \cdot 0.2 = 480 \text{ kg}
\end{align*}
\]

LADEN:

\[
\ h_R = \frac{(580 \cdot 1600) + (800 \cdot 1920) + (1590 \cdot 12480)}{16000}
\]

\( h_R = 1394 \text{ mm} \)

UNLADEN:

\[
\ h_{\text{Runl.}} = \frac{(580 \cdot 1600) + (850 \cdot 1920) + (2100 \cdot 480)}{4000}
\]

\( h_{\text{Runl.}} = 892 \text{ mm} \)