**Removable cranes**

The installation of removable cranes on the rear overhang may be carried out according to the specifications of the previous paragraph provided the type of fixing used between the crane and the subframe does not cause additional stress to the vehicle chassis.

Since the vehicle may be used with or without the crane (where permitted), it is recommended that the position of the payload is marked on the superstructure.

If the possibility for the vehicle to tow a trailer is maintained, all the regulations for the correct coupling must be observed.

### 3.9 INSTALLATION OF TAIL LIFTS

**Note** The installation of tail lifts must be carried out with due regard for the maximum permissible weights on the rear axles of the vehicle and of the minimum load established for the front axle (see Chapter 1.15 (⇒ Page 48)). If this is not possible, the rear overhang will have to be reduced.

The tail lift must be fastened with a structure that ensures appropriate weight distribution, especially in the case of specific outfits with no adequate counter chassis (e.g., box truck bodies, pick-up bodies with cross-members).

In vans, lifts with a capacity of up to 3 kN (300 kg) can be applied after having ensured the presence of reinforcement structures on the chassis; capacities exceeding this value must be assessed on a case by case basis.

The dimensions of the sections to be used can be defined:

1. using Table 3.11, in the presence of trucks with rear overhangs as standard;
2. using the indications provided in Figure 23, with trucks with overhangs not as standard or specific tail lifts (for example, in aluminium);

In the first case the bending moments on the chassis, depending on the capacity of the tail lifts, have average values which are already defined; in the second case, these moments must be calculated from time to time.

**Table 3.11 - Installation of tail lifts (see Figure 23)**

<table>
<thead>
<tr>
<th>Models</th>
<th>Wheelbase [mm]</th>
<th>Overhang [mm]</th>
<th>Tail lift capacity in kN (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 (300) 5 (500) 7.5 (750) 10 (1000) 12.5 (1250) 15 (1500)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>S S S S S S S S S S S S</td>
</tr>
<tr>
<td>33S, 35S</td>
<td>3450 3750 4100</td>
<td>1355 1655 1305</td>
<td>16 16 16 31 16 49 31</td>
</tr>
<tr>
<td>35C, 40C 45C, 50C</td>
<td>3000 3450 3400 3150</td>
<td>1240 1355</td>
<td>16 16 16 16 21 16 36 21</td>
</tr>
<tr>
<td>45C, 50C</td>
<td>3435 4750</td>
<td>1885 2350</td>
<td>16 16 31 26 43 31 63 43 84 56</td>
</tr>
<tr>
<td>60C, 65C, 70C</td>
<td>3450 3750 4100</td>
<td>1355 1655 1715</td>
<td>16 16 16 16 16 16 16 16 31 16 50 26</td>
</tr>
<tr>
<td></td>
<td>4350 4750 5100</td>
<td>1885 2350 2000</td>
<td>16 16 16 16 16 16 31 21 56 31 70 56</td>
</tr>
</tbody>
</table>
The checks have been carried out considering a platform with a standard length (H = 1200 mm). For longer platforms, the load on the tail lift must be reduced in proportion to the increase in the length of the platform.

The position of the stabilisers is established according to the values existing in the reference market (S = 950 mm from the rear axle). If the stabilisers are positioned further forward (< 950 mm, the load on the tail lift must be reduced in proportion to the reduction of this distance.

To ensure the necessary strength and rigidity, and especially in the case of overhangs exceeding 1200 mm, the connection between the chassis and the counter chassis must be made using shear-resistant plates (spaced no further than 400 mm from one another) in the area of the overhang, and must continue up to the front mount of the rear suspension (see Figure 23).

\[ \begin{align*}
L_2 & = \text{Rear overhang} \\
W_L & = \text{Weight of tail lift} \\
W_L & = \text{Tail lift capacity} \\
S & = \text{Distance of the tail lift from the rear axle}
\end{align*} \]

The bending moment on the chassis may be obtained using the following ratio:

\[ \begin{align*}
M [\text{Nm}] & = W_L \cdot A + W_{TL} \cdot B & \text{for tail lifts without stabilisers} \\
M [\text{Nm}] & = W_L \cdot C + W_{TL} \cdot D & \text{for tail lifts with stabilisers}
\end{align*} \]

To compensate for frame flexing, which is inevitable when the tail lift is in operation, the body builder may use reinforcement structures with larger dimensions than those indicated in Table 3.1.1.

This consideration applies even more in the case of high and non-standard overhangs; in this case the necessity to adopt the stabilisers must also be verified.
The possibility of using materials with superior mechanical characteristics requires verification of the total moment of resistance of the chassis plus counter chassis.

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The Bodybuilder must carefully assess any variations in the stability and alignment of the vehicle caused by suspension compression and the chassis during all stages in the operation of the tail lift. Always evaluate whether installing stabilisers is advisable even if their use is not rendered necessary by the stresses sustained by the chassis.

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The stabilisers must be attached to the support structure of the tail lift, and should be preferably hydraulically operated.

When installing electro-hydraulic tail lifts, ensure that the capacity of the batteries and the power of the alternator are adequate (see Chapter 5.4).

The bodybuilder is also responsible for:

- type-approval of the application of the tail lift on the vehicle,
- any modifications to the underrun cross member or the arrangement of another new type (see Chapter 2.20 ( Page 56));
- the observance of the visibility of the rear lights,
- the observance of the overhang angles,
- the positioning of the tow hook,

based on the various national legislation.

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3.10 TILT BEDS (BREAKDOWN RECOVERY)

Using a tilt bed typically subjects the chassis to considerable stress. The vehicle used should therefore specifically indicated for this application. These vehicles are listed in Table 3.5 together with the indicative characteristics for the counter chassis necessary for this application.

Where a very long bed is necessary, it is preferable to use a vehicle that already has a sufficiently long wheelbase rather than create a long overhang.

The counter chassis must be suitably sized and stiffened at the rear with boxing and diagonal crossbraces (see Figures 6 and 7).

Connections to the chassis must be elastic (brackets or supports) at the front end and stiff at the rear end (cleat plates, see Figure 11) to allow the additional structure to contribute more effectively towards the rigidity of the assembly.

The rear tilt pivot must be installed on the counter chassis, and must be situated longitudinally as close as possible to the rear suspension mount. To prevent the risk of the tilt bed compromising vehicle stability when operating and to avoid excessively increasing the stress sustained by the chassis, the distance between the tilt pivot and the rear suspension mount must comply with the specifications given in Figure 16. Should this not be possible, the counter chassis profiles must be larger than normal and additional stiffening must be applied to the rear.

The position of the lift system must be defined with particular attention to protect the structural integrity of the rams and permit a precise and practically location for the mountings. The ram should preferably be situated in the most practical position available ahead of the centre of gravity of the combined body and payload in order to reduce localised load.

The bodybuilder must equip the vehicle appropriately to ensure stability during bed tilting manoeuvres.

All equipment and structures must comply with any applicable national legislation.