

### Frame and mounting strength for additional seats

Designated certifiers are required to approve the installation of additional seating positions in light vehicles, often class NA vans, which may change the class relative to seating density, vehicle capability and driver position, to MA, MB, MC, MD1 or MD2. The issue of seat frame strength needs clarification due to variables in both design and quality of construction in the seats of vehicles presented for certification.

In the absence of any LTNZ Rule on seat frames and anchorages, and until such time as equivalent LVV technical requirements are issued, certifiers are requested to follow the following broad guidelines for seat frame compliance as 'fit for purpose' under the LVV Code:

#	situation	typical vehicle use	certification requirement
1	OE manufactured seat frame[s] into another model vehicle on one off basis. Unstressed frame [ref note 1].  Note: OE means a frame from a volume production vehicle, not a frame installed prior to sale of a new vehicle in New Zealand, unless that vehicle is certified in that configuration to an international standard by the manufacturer's NZ representative.	private or small business use, less than 9 seating positions.	Certifier judgement.  <ul style="list-style-type: none"> <li>Complete seat and seat back is restrained to prevent involuntary fold under braking or frontal impact.</li> <li>Latches &amp; mountings are capable to 20 x component mass under frontal impact [notes 3 &amp; 7].</li> <li>Mountings will resist a vehicle rear impact equivalent to applying 75kg x number of seat occupants to the top of the seat back in a horizontal rearward direction [notes 3 &amp; 9].</li> <li>Seat belt installation is compatible and in compliance.</li> </ul>
2	OE manufactured seat frame[s] into another model vehicle on one off basis. Stressed frame [ ref note 1 ].	private or small business use, less than 9 seating positions.	Certifier judgement as 1. above; and Mountings are capable to 20g for frontal impact, with 68kg occupancy in each position [ notes 2 & 4].
3	Fabricated but unstressed frame[s]	private or small business use, less than 9 seating positions.	Certifier judgement as 1. above; and  <ul style="list-style-type: none"> <li>Frame will resist a vehicle rear impact equivalent to applying 75kg x number of seat occupants to the top of the seat back in a horizontal rearward direction [notes 3 &amp; 9].</li> <li>The frame design and quality of construction is fit for purpose.</li> </ul>
4	Fabricated stressed frame[s]	private or small business use, less than 9 seats.	Certifier judgement as 1 and 3 above; and  <ul style="list-style-type: none"> <li>Engineer's certificate produced to indicate frame design capability to 20g for frontal impact with 68kg occupancy in each position.</li> </ul>
5	Fabricated but unstressed frame[s]	psv or institutional use with multi row seating,	Certifier judgement as 1 and 3 above; and

		commonly seat belts are not fitted or not used	<ul style="list-style-type: none"> <li>Mountings are as for stressed seat [ref note 6]</li> <li>Seat belts, where fitted are compatible and in compliance [ref note 8].</li> </ul> Seat structure provides substantial measures [padding and shielding] to minimise frontal impact injury to rearward unbelted occupants.
6	Fabricated stressed frame[s]	psv or institutional use with multi row seating, seat belts fitted but may not be used.	Certifier judgement as 1, 3 & 5 above; and <ul style="list-style-type: none"> <li>Engineers certificate produced to indicate frame capability to 20g for frontal impact with 68kg occupancy in each position.</li> </ul>

**Notes:**

Note 1. Terminology: Unstressed frame = all seat belt anchorages are separate from the seat structure.

Stressed frame = one or more seat belt anchorages are incorporated in the seat structure.

Note 2. This means that a 3 person seat will need to withstand distributed loadings of 4080kg [plus 20 x seat mass] applied in a horizontal forward direction, provided all the seat belt mountings are in the seat frame. If one or more seat belt mountings are situated in the vehicle structure the 4080 kg loading will be proportionately less.

Note 3. As a guide, the mounting of a non-stressed seat to a typical unitary construction van floor should incorporate doubler plates 40mm x 50mm x 3mm thick front and rear of each leg group of a 2 person seat. For a 3 person seat with only 2 leg groups the doubler plates should be 80mm x 50mm x 3mm.

Note 4. The mounting of a 2 person stressed seat to a typical unitary construction van floor needs to incorporate as a minimum, 4 doubler plates as specified for seat belt mountings in Figure 8D following page 126 of the NZHRA Code of Construction. A 3 person seat with 4 floor attachment points [instead of 6] requires a proportional increase in doubler plate area.

Note 5. Where practicable the base member of the seat in contact with the floor should span the front and rear floor attachment points. The higher the seat occupant relative to the floor, the greater the pitch between front and rear attachments [suggest 250mm minimum for unstressed seats and 300mm for stressed seats]. Side mountings of equivalent stability may also be used.

Note 6. The seat mountings on seat rows which potentially have unrestrained occupants in other rows behind should have the same mounting specifications as stressed seats to minimise the risk of 'domino effect' from impacting body mass from the rearward positions. This also applies to seats immediately forward of a cargo area, where no barrier is installed. It is also recommended that the latches on folding seats in a forward row are also capable of meeting the 68kg X 20g load factor where there are unrestrained occupants behind.

Note 7. This force is applied at the centre of gravity of the unoccupied seat and any independently folding part of that seat, which simply is the point of balance of the component were it suspended freely from above when turned face down through 90 degrees from its installed position.

Note 8. It is important to assess the seat belt installation in high density seating situations from a 'fitness for purpose' viewpoint. Installations which expose seat belt webbing anchorages to abrasion from other passengers shoes, or which may provide hazardous foot traps for those passengers, or allow buckles or straps to fall onto the floor, should be discouraged. The safest and most user-friendly installation is where 3 point reel type belts are installed, preferably seat mounted.

Note 9. This force should be distributed as if applied by the upper back of an occupant in each seating position. The frame may distort and deflect under this loading, but not fail either within the seat structure or at the seat mount.