Low Volume Vehicle Technical Association (inc)

INFORMATION SHEET
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Helping New Zealanders Build & Modify Safe Vehicles

Positioning of Wheelchairs, Restraints, and Seats in Vehicles not subject to PSV Rule

Differing interpretations of the wheelchair positioning, access, and aisle spacing requirements in LVV Standard 45-60 *Disability Transportation Systems,* and the application of LVV Standard 185-00 *Seats and Seat Anchorages* to disability vehicles has led to discrepancies in what is deemed acceptable for the layout of vehicles modified to transport people with disabilities. This Information Sheet aims to outline some basic parameters around wheelchair and access requirements in vehicles, and provide some reasoning behind these requirements. This is needed in order to achieve consistent outcomes across vehicles around the country.

Note that this Information Sheet relates to vehicles that are not subject to the Passenger Service Vehicle (PSV) Rule. Vehicles subject to the PSV Rule must meet set requirements that are over and above those specified for private vehicles, which take precedence over LVV requirements where there is a conflict. A vehicle must comply with the PSV Rule is if it used to transport passengers for hire or reward. Vehicles subject to the PSV Rule are outside the scope of this Information Sheet.

Key Points for LVV Certifiers

While the two are sometimes conflated (and the line can be blurred when two visually similar vehicles need to meet different requirements dictated by their end use), wheelchair spacing and access requirements do not need to meet PSV requirements unless the vehicle is subject to the PSV Rule. There is a clear and deliberate difference between this Rule and the LVV requirements surrounding wheelchair spacing and access, to allow greater flexibility and vehicle choice for the disabled community. Non-PSVs can be more tailored to the unique needs of the end user, rather than a PSV, which must accommodate various scenarios. The points are as follows:

1. The LVV *Seat and Seat Anchorage Standard* specifies that 300mm of aisle space is only necessary if there are multiple rows of seats, and that this space needs only to be '*over the majority of the height*'.
2. Because of variables inherent in the design of vehicle layouts, like the type of wheelchair fitted, the types of restraint, number of doors, number of seats, or the vehicle's loading procedure, it is not practicable to implement a 300mm floor-to-ceiling corridor. The definition of 'sufficient space' as per 2.6(3) of the *Disability Transportation Systems Standard* is **300mm over the majority of the height of the aisle**. Wheelchair restraints are permitted to encroach further than this 300mm minimum.
3. Where there is not 300mm over the majority of the height, a wheelchair position can be treated as folding seats, which means that they can be located between a seating position and an exit, provided that (like the release handle of a folding seat) their restraints are accessible to the obstructed seat occupant, and there is space available to move the wheelchair to enable access past the wheelchair position.
4. When space is limited, or a seating position is obstructed by a wheelchair, a loading procedure must be developed to ensure safe entry, seating, and egress for all passengers (and their wheelchairs). This needs to specify the order of loading and unloading passengers, and be readily available in the vehicle for caregivers or operators.
5. If the removal of a restraint is required to permit access to another restraint or seating position, this can be accepted, however the loading procedure must describe the order of passenger entry/egress and wheelchair positioning. Where space is limited, a loading procedure or a change of equipment (such as the type of restraint) type may make a position with marginal space surrounding it acceptable.

This may not apply to all vehicles modified for people with disabilities, however for vehicles with less space available, the points above may permit a vehicle layout that would not otherwise have been possible.

Note that LVV certifiers don't always have a wheelchair to use as part of their assessment of a vehicle, and so their assessment of a vehicle's layout must rely on their best judgement. While often no two wheelchairs are the same, and each vehicle layout is often tailored to the end user's specific chair, it can be useful for a certifier to have an averagely sized wheelchair that they can use as part of their assessment, or at least a rough idea of its size and floor area.

Background information

Demand from end users is causing vehicle modifiers to explore ways of maximising the number of wheelchair positions within the available occupant space, however currently requirements rely on the LVV certifier's assessment and best industry practice to determine whether the vehicle has sufficient spacing and clear access, rather than specifying set measurements. While a set measurement for access space around a wheelchair position and to its restraints would be ideal, this is not practical to implement in a lot of cases – there are too many variables in terms of wheelchair size and type, and vehicle layout for one measurement to fit all scenarios.

Balancing the requirements a vehicle must meet

A vehicle that is modified with retrofitted wheelchair positions must (as well as complying with the *Disability Transportation Systems Standard,* and other applicable requirements) comply with positioning requirements specified in LVV Standard 185-00 *Seats and Seat Anchorages*. The requirements in the *Seats and Seat Anchorages Standard* do not specifically cater for a wheelchair scenario, but are applicable for any retro-fitted seating position. As an occupied wheelchair position is counted as a seating position, it is reasonable to apply these requirements. Therefore, as a seating position, the same aisle spacing and access requirements can be applied.

This Information Sheet is intended to provide guidance to industry and certifiers on what is considered acceptable in general terms, rather than mandating a set figure that may not be applicable (or useful) in every case. The bottom line is that regardless of the size of vehicle, type of vehicle, or the number of wheelchair and/or seating positions needed, the layout of the vehicle needs to be such that sufficient space exists around a wheelchair for a caregiver to access the wheelchair restraints, and that there are no unreasonable hindrances in terms of access to seating positions.

Interpreting the Seat and Seat Anchorage Standard for a wheelchair context means that a wheelchair may be treated as a folding seat in terms of the access and aisleway requirements that must be met – both can be removed or repositioned to facilitate the entry or exit of other vehicle occupants. The same applies to folding seats positioned in front of a wheelchair – the seats can be moved to allow a caregiver access to a wheelchair occupant. Disability vehicle seating layouts can therefore be assessed based on the fact a wheelchair can be moved to gain access to a seat, or that a seat can be moved to gain access to a wheelchair or its restraints.

With a PSV, spacing and access requirements limit layout options which in turn limits the types and sizes of vehicles available, as PSVs must cater to a wide variety of wheelchairs and occupants. Unlike a PSV, the layout of a private vehicle, however, can be tailored to suit the individual user, their needs, and the type of wheelchair they use, so the same access requirements are not always necessary. A more specialised loading procedure for the vehicle can then be implemented to work within its space limitations. This can reduce the cost for the disabled person by allowing them a greater choice of vehicles, and a better seating layout – often, in commercial vehicle fitouts, because of the PSV spacing requirements a wheelchair occupant is left in isolation in the back of a van. A private vehicle can be tailored to incorporate the wheelchair occupant into the layout, meaning they can sit closer to the other vehicle occupants (family, caregivers, etc), reducing this feeling of isolation.

Due to the variety of layouts and vehicles available, it is not practical to have a set measurement for the access space required around a wheelchair – an LVV Certifier needs to use their experience and judgement of what is achievable and reasonable, in addition to referencing applicable LVV requirements (such as the LVV *Interior Impact Standard*).

Where necessary, a loading procedure can be implemented to ensure all occupants can be loaded and unloaded safely. This can be considered part of the 'written guidance for wheelchair straps' required in section 2.8(7) of the *Disability Transportation Systems Standard.* Common reasons for the development of a loading procedure are where

multiple wheelchairs cannot be loaded independently of each other, or able-bodied occupants cannot readily access or leave their seats because of a wheelchair position.

It's important to note, however, that relocating or repositioning a wheelchair to gain access to a seating position, or to gain access to restraints is only possible if there is space to move the wheelchair into. Like a seat being folded to allow access past it, if a wheelchair must be moved forward to gain access to a seating position, there must be sufficient space forward of the wheelchair to enable this to happen.

Above: an example of a wheelchair space in the rear of a Toyota Noah. Access space for restraints is limited either side of the wheelchair position, but a caregiver can access the forward restraints by sliding and folding the second-row seats forward.

Spacing and access requirements

A significant point of contention when interpreting the *Seat and Seat Anchorages Standard* requirements for a disability vehicle scenario relates to accessing a wheelchair position or a seat adjacent to a wheelchair position. Obviously, the more space there is around a wheelchair position, the better – however, depending on the layout of the vehicle and number of seating/wheelchair positions, some vehicles will have easier access to restraints or seating positions than others. The need for space and easy access needs to be balanced with the need for choice of vehicles for the disabled person.

The question of suitable access is most often raised where there is a mixture of seating and wheelchair positions in the rear of a van. Section 2.3(9) of the *Seat and Seat Anchorages Standard* states:

> *2.3(9)* *A low volume vehicle that has a permanent or fixed roof structure and more than one row of seats, must incorporate a ready means of entry and exit, by the most direct path practicable, for all rear seat passengers by having either:*
>
> *(a)* *one or more doors adjacent to each row of seating; or*

> (b) *an aisle space of a width of not less than 300 mm from each row of seating to one or more doors; or*
>
> (c) *one or more seats within each row of seating, other than the rear-most seating row, that folds or tilts forward sufficiently to enable ease of entry and exit.*
>
> *Note: A seat that tilts forward as referred to in 2.3(9)(c) needs to provide adequate space to allow reasonable access for the type of vehicle. If access is for more than one row of seating or the seats are intended for regular use, then the space provided needs to meet 2.3(9)(b) and be 300 mm wide over the majority of the height.*

As a wheelchair can be treated as a folding seat, 2.3(9) can be applied as written to a retrofitted wheelchair position, provided that the necessary restraints can be accessed by those seated in the obstructed seating positions if the wheelchair must be moved to gain access. Note that while this clause refers to occupant access, for a person in a wheelchair, this can be interpreted as caregiver and passenger access to (or past) the wheelchair occupant.

There are three options for access to the seating positions (including a wheelchair) – a 300mm aisleway is not the only option when retrofitting a wheelchair position to a vehicle. However, the note states that where multiple rows of seats are accessed, there must be an aisleway that is '*300mm wide over the majority of the height*'. The key difference between the PSV Rule and the *Seat and Seat Anchorages Standard* is that for the purposes of the Standard (unlike the Rule), **this is not considered a floor-to-ceiling corridor** – the 300mm aisleway must only be '*over the majority of the height*' (the majority of the distance from the floor to the roof, measured at the aisle space) meaning that wheelchair restraints can intrude on a portion of this space if necessary. Section 2.3(13) of the *Seat and Seat Anchorage Standard* permits a seatbelt to intrude on an aisleway providing the vehicle is not subject to PSV requirements, and that the diagonal section of the seatbelt does not '*unreasonably hinder*' occupant access. Based on this logic, placing wheelchair restraints within this aisleway area is also not considered unreasonable. Removing a restraint to permit access to another restraint or seating position is also a possibility in this scenario, but needs to be detailed in the loading procedure.

One proviso for restraints being positioned within an aisleway is that they must meet requirements for caregiver use and removal in an emergency from 2.8(6) of the *Disability Transportation Standard*:

> *2.8(6) A wheelchair restraint strap fitted to a low volume vehicle must be:*
>
> *(a) installed in accordance with the attachment instructions of the wheelchair restraint strap manufacturer; and*
>
> *(b) designed and attached so as to allow the securing and removal of a wheelchair to and from the wheelchair restraint strap anchorages without the use of tools; and*
>
> *(c) designed and attached in such a way that it cannot be partially or incorrectly engaged; and*
>
> *(d) able to be easily attached, secured, adjusted, and removed, both in normal and emergency situations, by:*
>
> *(i) the care-giver; and*
>
> *(ii) in the case where a wheelchair occupant is the driver of the vehicle, the wheelchair occupant.*

Spacing requirements also appear in the *Disability Transportation Standard*:

> *2.6(3) Sufficient space must be provided around each wheelchair position within a low volume vehicle that enables a care-giver to easily and comfortably secure the wheelchair into the vehicle.*
>
> *2.6(4) A wheelchair position must have sufficient clear-space immediately forward of it, so as to minimise the risk of a wheelchair occupant contacting other seating, or other passengers, in the event of a collision.*

As stated previously, an occupied wheelchair position is counted as a seating position. Therefore, because seating requirements apply, the definition of 'sufficient space' as per 2.6(3) is **300mm over the majority of the height** of the aisle. Wheelchair restraints are permitted to encroach further than this 300mm minimum.

It is worth noting that the wide scope of the *Disability Transportation Systems Standard* and the *Seat and Seat Anchorage Standard* means that they must be somewhat generalised and cannot cater to every scenario – they must cover anything from a VW Caddy with otherwise OEM seats and one wheelchair position added to the rear, to a VW Crafter with multiple retrofitted seats that are accessed past wheelchair positions.

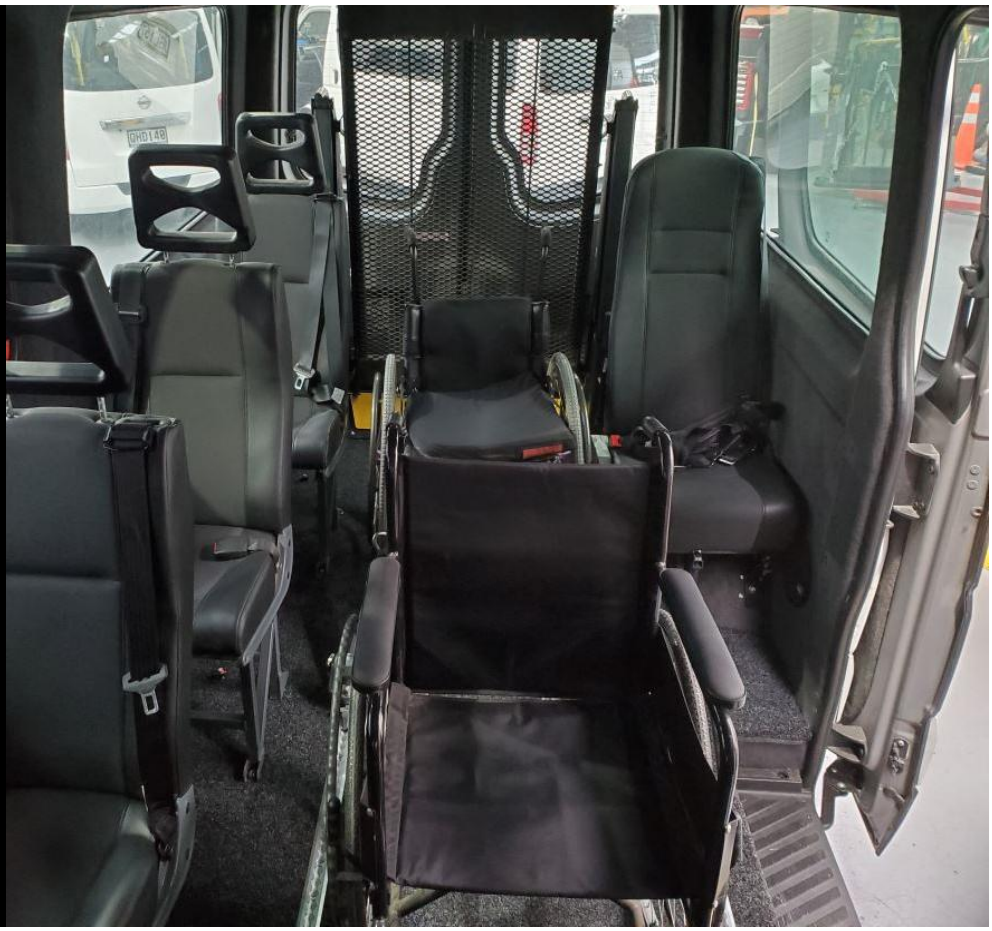
Loading procedures

Space around a wheelchair position for access is the main limiting factor when planning a vehicle layout, and for vehicles that have multiple wheelchair positions, this is one of the factors that dictates the proximity of wheelchairs to one another. For vehicles where the layout does not permit independent entry/egress of occupants (including those in a wheelchair), a loading procedure must be implemented – this is a key part of making the most of space available in a vehicle.

Part of the loading procedure for a wheelchair (which, as mentioned, is part of the 'written guidance for wheelchair straps' required by section 2.8(7) of the *Disability Transportation Systems Standard*) can be a plan to make sure that all of the vehicle occupants can reach their seats safely. This procedure would outline the order in which a vehicle must be loaded when at full capacity or when marginally accessible seats are in use, and needs to be approved by the LVV certifier as part of their certification of the vehicle. A copy of the procedure must stay with the vehicle in a readily accessible location for caregivers and/or vehicle operators to reference, and the procedure must specify the order for seating occupants and fastening wheelchair restraints. Where a wheelchair position hinders access to another seating position, the procedure would specify that the occupant of this position would be seated prior to the final wheelchair fitment.

The loading procedure and restraint fitment instructions must also meet the requirements specified in the *Disability Transportation Systems Standard*.

Right: this vehicle incorporates two wheelchair positions as part of the seating arrangement. Because wheelchair positions can be treated as folding seats, this allows all of the occupants a path of entry and egress. All seating positions have at least 300mm aisle space prior to the final positioning of the wheelchairs (which are removable), and a loading procedure would be implemented to ensure all occupants can find and leave their seats safely. Because 300mm floor-to-ceiling aisle space is not maintained once the wheelchairs are in place, this would not meet PSV requirements.



Entry and exit

Even if a vehicle doesn't need a loading procedure to be developed, it's still important to pay attention to access to any retrofitted seating positions. Requirements for this are stated in *Seat and Seat Anchorages Standard* section 2.3(8):

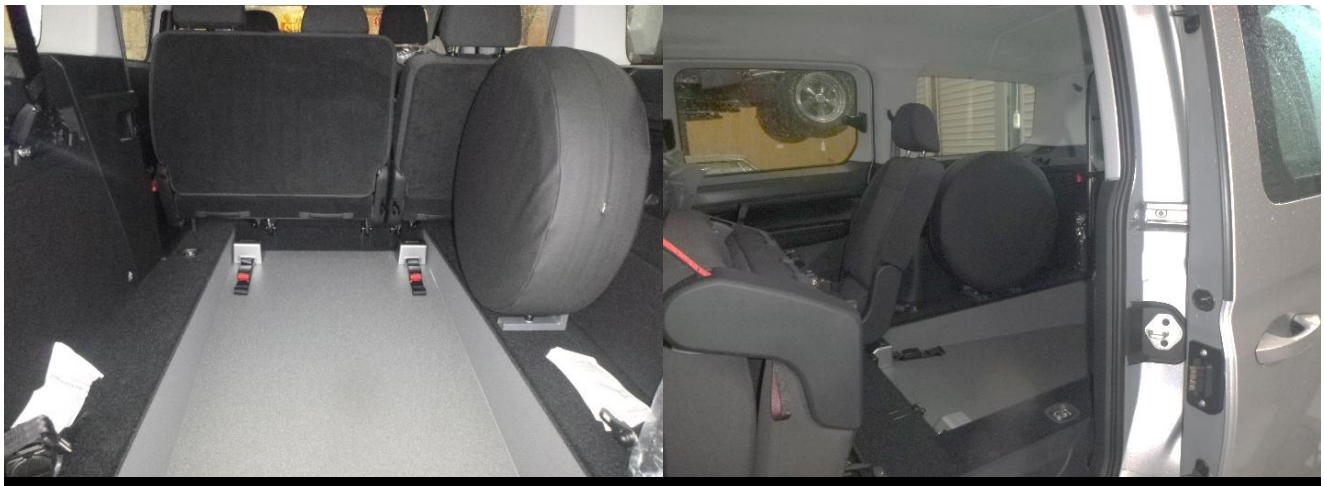
> *2.3(8)* *A retro-fitted seat within a low volume vehicle that has a permanent or fixed roof structure, must be located and positioned in such a way that there is sufficient room to enable each occupant to enter and exit the vehicle without assistance.*
>
> *Note: The requirement specified in 2.3(8) includes that sufficient access is available to occupants to reach and operate interior door opening handles.*

The intent of this requirement when applied to a disability vehicle context is for the seat arrangement to have access characteristics similar to an OE vehicle that has multiple rows of seats, so that other vehicle occupants can access seating positions around the wheelchair occupant, and the restraints for that wheelchair position if necessary. Note, again, that for this to be possible, there needs to be space to move the wheelchair into, to allow other occupants entry and egress. The statement 'without assistance' does not apply specifically to the wheelchair occupant – a caregiver or other able-bodied person will need to fasten or remove the wheelchair restraint straps to enter/exit the vehicle.

Some requirements in the *Disability Transportation Systems Standard* relate to passenger service vehicles, but this is not explicitly stated in the Standard:

> *2.8(5)* *A wheelchair restraint strap fitted to a low volume vehicle must not prevent a wheelchair from obstructing an emergency exit.*

A vehicle that is not a PSV does not have a dedicated emergency exit, therefore 2.8(5) cannot not be applied to a vehicle that is not a PSV. Note that while 2.8(6)(d) also mentions emergency situations and the two requirements are sometimes conflated, access to restraints in an emergency does not require a dedicated emergency exit.



This VW Caddy has five seating positions, and one wheelchair position. The front wheelchair restraints are accessed by folding the second-row seats forward, to give the caregiver access. Electric restraints could also be used to make it easier for a caregiver to restrain the front of the wheelchair. Because the second-row seats fold to make an aisleway, it is not mandatory to have an interior door handle fitted to the tailgate in case of emergency, however this is still advisable.

For a vehicle where the wheelchair is positioned behind the rearmost row of seats, the wheelchair occupant must have a ready means of egress with assistance from a caregiver where required – in most cases this means the row of seats in front of the wheelchair position must fold away, or that an accessible interior door handle is fitted to the rear door opening as per *Seat and Seat Anchorage Standard* section 2.3(11). This relates to section 2.13(2) of the *Disability Transportation Systems Standard*:

> *2.13(2)* *Any person seated in a wheelchair within a low volume vehicle must be provided with a ready means of egress, which has an operable door handle from inside the vehicle.*
>
> *NOTE: 2.13(2) would not allow a wheelchair occupant to be seated in an area immediately in front of a tailgate that does not have an interior door handle, for example, unless there is an alternative egress path through another door available to the wheelchair occupant.*

Note that this 'egress path' doesn't mean that the occupant needs to bring their wheelchair with them as they exit the vehicle – the intent of this is only to provide the person sitting in the wheelchair a way to be removed from the vehicle in an emergency.

Set measurements for aisle space

As stated previously, unlike the PSV Rule the LVV *Seat and Seat Anchorage Standard* does not specify one set measurement for aisle space – it provides several options, and this is intentional, as it allows for a greater range of vehicles to choose from, and for layouts to be tailored to the particular vehicle and its intended use.

Because of the general and all-purpose nature of passenger service vehicles, the PSV Rule specifies that a vehicle must have unobstructed access throughout the vehicle from each seat or row of seats to any other seat, row of seats or doorway used for passenger entry and exit. This aisleway must be 300mm wide. It should be noted that one of the options for aisle spacing in the LVV *Seat and Seat Anchorage Standard* section 2.3(9)(b) reflects a similar measurement (as per the Spacing and Access Requirements section) – however, as detailed in the *spacing and access requirements* section, this is not the only option for a vehicle that is not a PSV and is not achievable (or necessary) in all cases.

Also of note is that the PSV Rule allows for folding crew seats to be fitted in the front stairwell of a vehicle, and a caregiver would be defined as a crew member under the PSV Rule (4.2(1)). This supports the approach taken by LVVTA – that a folding or removable seat (i.e., wheelchair) can be positioned across an aisleway, as it can be moved by other occupants if necessary.

Leg space vs aisle space

Leg space for seat occupants is another often-misunderstood requirement. Section 2.3(5) of the *Seat and Seat Anchorage Standard* states:

> *2.3(5)* *Leg space must be provided for a retro-fitted seat fitted to a low volume vehicle forward of each seating position, that:*
>
> *(a)* *is not less than 150 mm in width on either side of the longitudinal centreline of the seat; and*
>
> *(b)* *extends forward from the seat not less than 300 mm, measured from a point at the vehicle floor immediately below the front of the seat cushion; and*
>
> *(c)* *is clear of any nearby sharp edges that may present a risk of injury to an occupant.*

It's important to note that where the leg space mentioned in 2.3(5) is present, separate aisle space is not also needed in front of a row of seats, unless 2.3(9) also needs to be met due to access requirements across the seating position to other seats – in which case, there needs to be clear space *over the majority of the height*.

In most cases, the length of the wheelchair footplates is close to the spacing requirements mentioned, so meeting this requirement should not present much difficulty for a wheelchair fitment. Note also that if a 300mm aisleway is needed, this can double as the 300mm leg room specified in 2.3(5) of the *Seat and Seat Anchorage Standard* – it is not necessary to have these as two separate spaces in addition to each other in front of a wheelchair.

Electric retractors are a good option for a scenario where there is limited space available around the front of a wheelchair. They allow restraints to be fitted while the wheelchair is a long way out of position, operated to take up slack as the wheelchair is pushed into position and locked into place, followed by fixing the rear restraints to secure the chair.

The difference between an 85kg restraint (left) and a 200kg restraint (right) is clear – aside from the increased physical size of the 200kg restraint, it often has a double loop hook and the webbing is doubled over. An electric reel type restraint is shown below:

Note that the electric reel shown is only suitable for use as a front restraint.

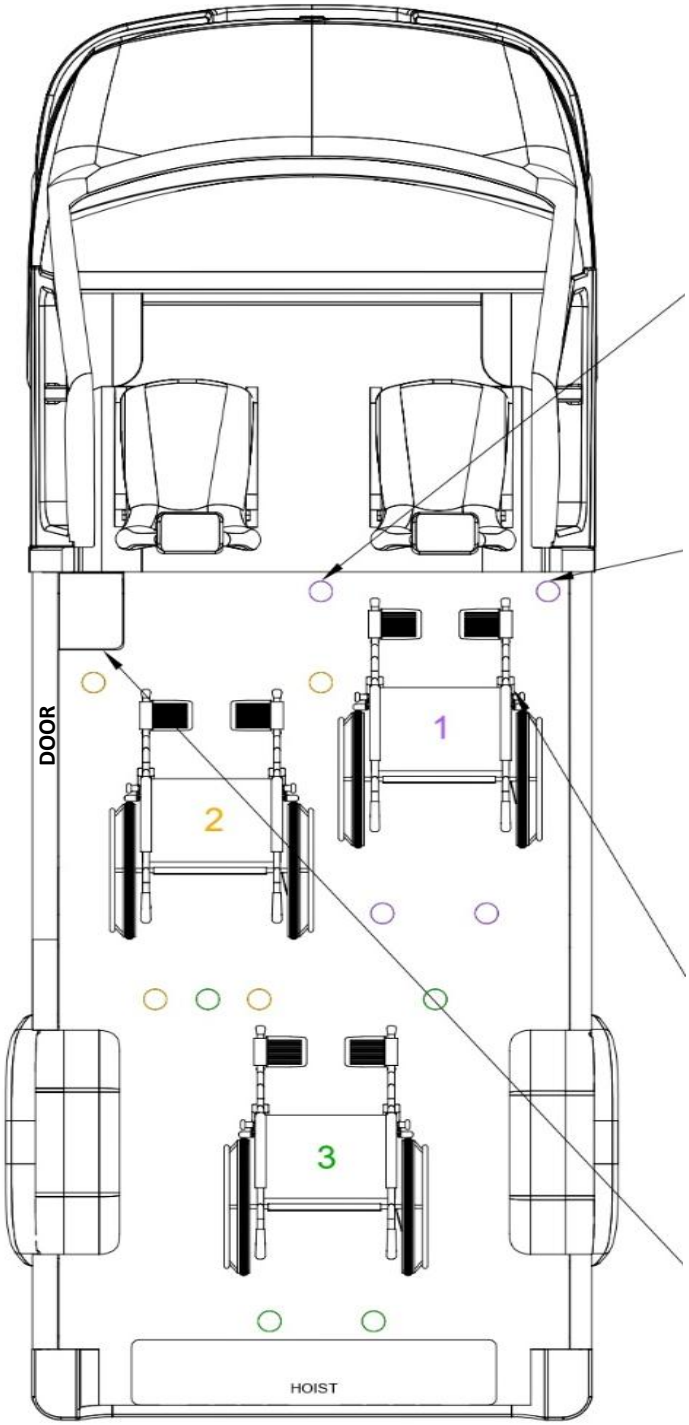
Example layouts

To follow are two example wheelchair layouts, based on previous proposals from modifiers, which at first glance could appear to be non-compliant. Depending on the size of the vehicle though, with careful placement of seating positions and wheelchairs, these can be made to meet LVV requirements. Certain aspects of the layout will depend on the size of the vehicle, and these layouts have been modelled on a medium-wheelbase Mercedes-Benz Sprinter van.

Both have a rear-mounted wheelchair hoist, and use tracking to mount the seats and wheelchair restraints. The first layout uses laterally mounted tracking, which can enable greater flexibility in layout, however only certain tracking manufacturers have tested their tracking in a lateral configuration. Lateral tracking will also normally have a lower weight rating than the equivalently sized longitudinal track, which can limit the size of wheelchair that can be used.

Example 1:

This vehicle has three wheelchair positions, with a left side sliding door and rear door/wheelchair hoist combination. The wheelchairs are loaded from the rear of the vehicle.



For a scenario such as this, laterally mounted tracking can provide greater layout flexibility. Some manufacturers have tested and approved their tracking in various orientations. Note that maximum allowable restraint ratings may be limited in lateral tracking applications.

The limited space in front of wheelchair #1 may make it difficult to access traditional ratchet restraints, especially higher-rated ones. Electric-retracting restraints could be a viable alternative for this.

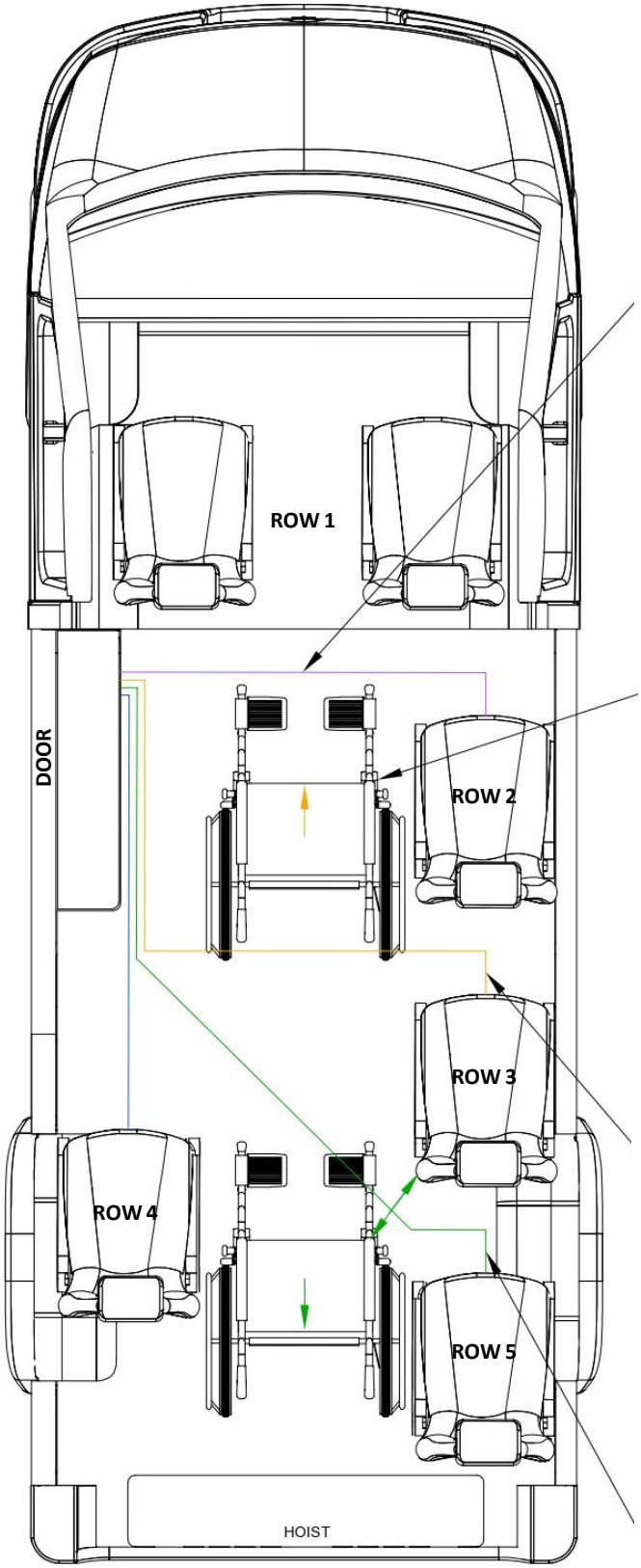
Because this layout does not allow wheelchairs to be loaded independently of each other, a loading procedure needs to be created for the vehicle, specifying the order for loading wheelchairs – which in this case would be wheelchair #1, then #2, and then #3. If electric-retracting restraints are not used, the procedure should also detail which restraints to attach first to ensure the caregiver can easily access each one.
Note that there does not need to be 300mm space between positions 1 &2, as this is not an aisleway.

Infilling side steps can increase floor area, but it must be approved as structurally suitable by an LVV certifier. It is recommended to keep 300mm of the step for easier access.

Note that if one of the wheelchairs had to be repositioned forward or rearward, two of its restraints would need to be released, and the length of the other restraint straps may change as the restraints ratchet up to take up the slack – so the restraints will need to remain accessible to whoever is moving the wheelchair in order to press the release lever to allow the restraints to pay out again, so the wheelchair can be moved back into place.

Example 2:

This vehicle has two wheelchair positions and three retrofitted seating positions for able-bodied people, with a left side sliding door and rear door/wheelchair hoist combination.



This area, as an aisleway to a seat that is in regular use, must have 300 mm over the majority of the height, to enable the row 2 seat passenger entry and egress past the wheelchair position. As this is not a floor-to-ceiling corridor, this access space is deemed acceptable, even if wheelchair restraints and footrests extend into it.

While the area in front of the wheelchair may meet the *300mm over the majority of the height* requirement, if access to the row 3 seat does not, this would mean accessing the seat requires a wheelchair to be moved or loaded afterward. Consequently, a loading procedure must be created. For this wheelchair, the procedure might specify that the restraints for this position can be attached only after the occupants in rows 2 and 3 are seated.

If there is not an access space available for the row 3 seating position past the wheelchair (the *300mm over the majority of the height* specified), this layout would require space forward of the wheelchair to move the chair into, which would create the 300mm access corridor to the sliding door. To be acceptable, the seated occupant in row 3 should be able to access the necessary restraints to achieve this.

Because of access limitations, it is unlikely that the rearmost right hand seat occupant could access the forward wheelchair restraints to move the wheelchair to allow access to and from the seating position. Therefore, similar to Row 3, there must be *300mm over the majority of the height* access space, between the wheelchair and the seat in Row 3, as indicated by the green arrow.

Finally

Wheelchair spacing and access requirements can be complex, and one basic measurement for access around a wheelchair cannot practicably be applied across all scenarios. LVV requirements must cater to a variety of vehicle types and layouts, from one wheelchair position in the rear of a small VW Caddy-type vehicle to multiple retrofitted seating and wheelchair positions in the rear of a large van (like a Mercedes Sprinter).

Where applicable, parts of this Information Sheet will be incorporated in a future update of the LVV *Disability Transportation Systems Standard*.

FOR FURTHER INFORMATION PLEASE CONTACT YOUR LVV CERTIFIER, OR LVVTA.