WHEELCHAIR ACCESS AND SECUREMENT FOR SAGE VEHICLE TRANSPORTATION

MOBILITY ENGINEERING

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Modules

- Vehicle safety
- Wheelchair access
- Wheelchair securement
- Wheelchair occupant safety restraints
- Further information

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Why is safe transport important?
For a CRASH

In a 50KMH Crash, you can experience a force of approximately 30G or 30 times your weight!

This force is transferred to the :

- Car
- Body
- Internal Organs

Video showing crash with and without seatbelt

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Crashed at 40km/h
NSW
GOVERNMENT
Transport
for NSW

Modules

- What is legislated, what is best practice?
- Wheelchair Access
- Wheelchair Securement
- Wheelchair Occupant Protection

Legislative Requirements for Transport

- For a vehicle to transport on the roads it needs to meet the road rules which are the Land Transport Act 1998.
- If the vehicle or seating position after a modification does not comply with the Road Rules and is considered to be a major modification then the Vehicle must be inspected and certified by a qualified engineer (Low Volume Vehicle – LVV)
- Once approved the vehicles registration and WoF (Warrant of Fitness) will reflect the modifications done to the vehicle.
- Combination of vehicle certification and product compliance needs to be met to ensure a safe outcome for the client and the vehicle is legal on New Zealand roads.

Legislative Requirements for Transport

For the relevant solutions to be compliant they need to comply with the New Zealand Standards

Main vehicle related Australian standards include:

- AS/NZS 10542.1 Technical systems and aids for people with disability - Wheelchair tiedown and occupant-restraint systems Requirements and test methods for all systems (ISO 10542-1:2012, MOD)
- AS/NZS 3856.1 & 2 Hoists and ramps for people with disabilities - Vehicle-mounted Part 1 and part 2
- AS/NZS 3696.19:2009/ISO 7176.19:2022/WC19 Wheelchairs Wheeled mobility devices for use as seats in motor vehicles
    - Not Legislated but highly recommended to meet as best practice

Depending on whether the modification is for private or public use, the technical requirements as per the standard will be different. It is always best to confirm this with NZ Transport Agency or your certifying engineer to see if there are any changes to the legislation.

Wheelchair Access options for Vehicles

Wheelchair Access

Wheelchair Access

Wheelchair Access

Wheelchair Access

Wheelchair Access

Standards relevant: AS/NZS 3856.1&2:1998, AS/NZS 3696.19:2009

- Can the client transfer into the factory vehicle seating position
  - This is always the preferred position of transport
- The wheelchair specifications: overall size and weight, manual or power chair
  - Will we have a winch?
  - Will we need a higher weight rated ramp?
- Driving environment: have you considered your access opportunities
  - 2-week log of where you drive regularly
  - Do I need to tow anything with my vehicle?
- Layout and use: Interior and exterior requirements of the vehicle
  - Camper setup, drive from wheelchair
  - Towing trailers or caravans

Wheelchair Access

Standards relevant: AS/NZS 3856.1&2:1998, AS/NZS 3696.19:2009

- Position of transport for the wheelchair occupant
  - 3rd row, 2nd row (Family conversion), front row
  - Where would you like to sit?
- Independent requirements
  - Automated doors, ramps, hoists and internal docking systems
- Communication and view within the vehicle with driver
  - For general psychological comfort to be able to clearly communicate with other occupants within the vehicle as well as be able to see outside the vehicle windows
  - In case of medical emergencies
- The vehicle is then the last consideration as it will be determined by the above outcomes. However, if prior consultation in the wheelchair assessment process is not done with vehicle modifiers, then the delivered wheelchair may not be suitable for any type of vehicle transport due to overall size and weight.

Wheelchair Access

Standards relevant: AS/NZS 3856.1&2:1998, AS/NZS 3696.19:2009

New Zealand Standards wheelchair ramps/hoist requirements:

- 1200mm clear length
- 800mm clear width
- 75mm edge barriers

For Ramps, same applies although there must be a minimum gradient of 1 in 4 once installed

Wheelchair Securement

Wheelchair Securement

Tie-down point examples

BraunAbility

Differences between seats for transport

Wheelchair Securement

Standards relevant: AS/NZS 10542.1:2015

- Is the wheelchair being used tested for vehicle transport to AS/NZS 3696.19:2009
  - As a minimum it should have a backrest that covers the shoulder and a headrest
- Wheelchair weight
  - Restraints are tested to a minimum of 85kg, if wheelchair is heavier best practice is to match with HD restraints matching weight of the wheelchair
- Size of the wheelchair
  - Tie-down point positioning needs to allow for proper securement of the straps to the wheelchair tie-down points and be pulled tight
- Driver or Passenger of the vehicle
  - If passenger tie-downs can be used, if driver must be docking system
- Mobility, Flexibility and Strength of the carer
  - Is the carer able to properly secure the tie-downs to the wheelchair for transport?

Wheelchair Securement

Standards relevant: AS/NZS 10542.1:2015

- Wheelchair add-ons such as Trays, Power-assist, oxygen tank, ventilators
  - Have they been crash tested with the wheelchair?
  - Should always be removed for transport and placed next to wheelchair restrained to the vehicle.
  - For Trays, hard trays cannot be used for transport and must be swapped with a soft tray

- The vehicle is then the last consideration as it will be determined by the above outcomes.

Wheelchair Securement

Standards relevant: AS/NZS 10542.1:2015

New Zealand Standards tie-down requirements:

Public Transport Vehicles or vehicles designed to transport more than 1 wheelchair occupant such as community transport vehicles

- 1300mm clear length, 800mm clear width
- Must consist of minimum 4 tie-downs

Wheelchair Securement

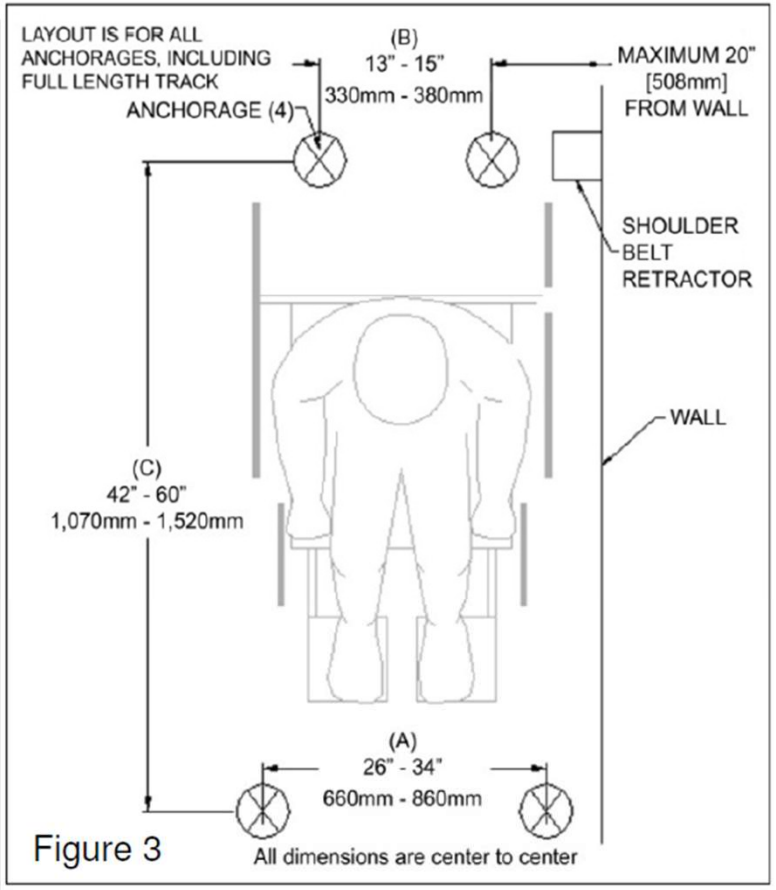


Figure 3

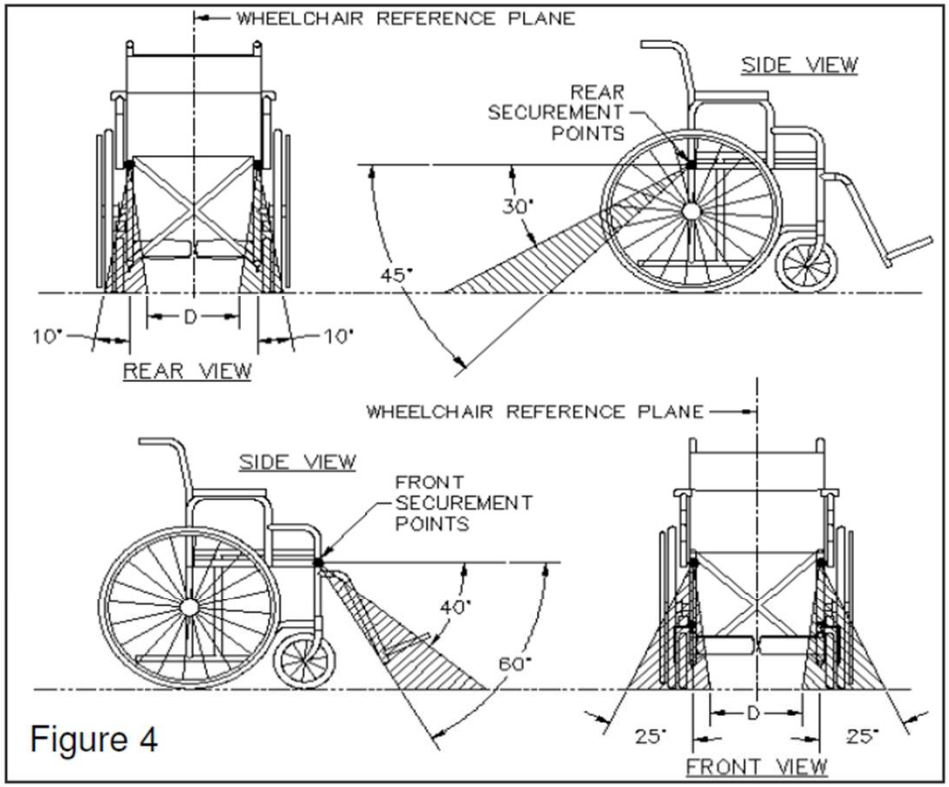
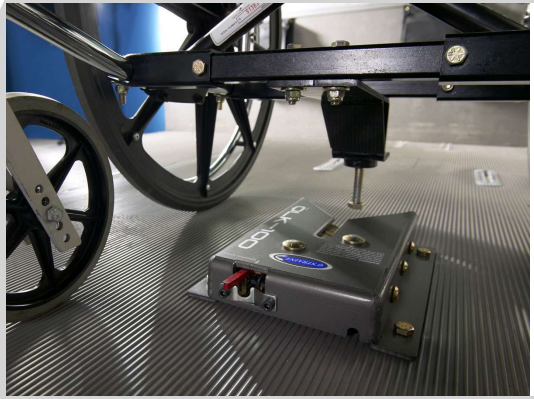
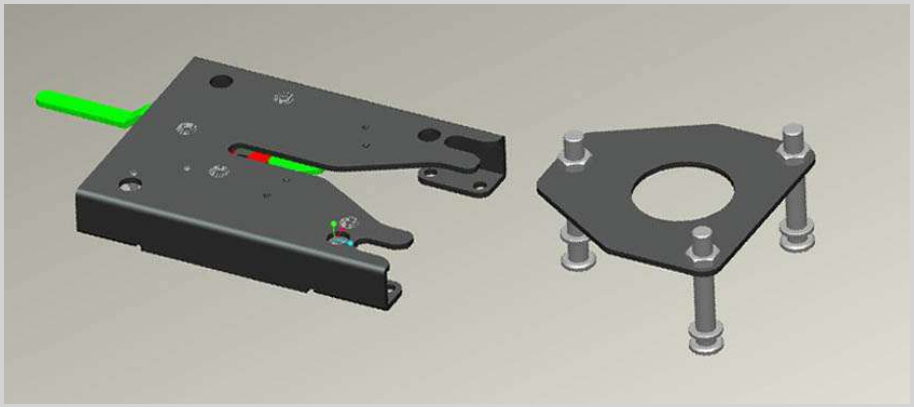


Figure 4

Preferred locations and angles of tiedowns from wheelchair securement points to vehicle anchor points. Front tiedowns should be angled out for lateral stability when possible. D=12" (305 mm)

Wheelchair Securement






TUBE TYPE
LOAD RANGE E

Wheelchair Securement

Standards relevant: AS/NZS 10542.1:2015

Docking Station Advantages:

- Safety assurances due to simplicity of installment process
- Occupant independence, can secure themselves into the vehicle
- Most Power wheelchair models already have pre-drilled holes for docks
  - Installation becomes simple and quick for the modifier
- Speed of access and egress from the vehicle
  - In emergencies can be removed quickly

Wheelchair Securement

Standards relevant: AS/NZS 10542.1:2015

Docking System limitations:

- Not suitable for vehicles with multiple wheelchairs, only private vehicle modifications currently
- Not suitable for Folding frame wheelchairs
- Lower ground clearance due to plate or pin underneath the wheelchair
- Higher cost, but preliminary data is showing that over a 7-10 year period the costs are comparable to tie-downs due to replacements of straps

Wheelchair Occupant Safety

Misuse:
Occupant Restraint

No 3-point belt restraint to secure pelvis & shoulder!

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Visit our website
www.dahlengineering.dk

Wheelchair Occupant Safety

Under 23kg Should Transport in Crash tested stroller or Child Restraint

When Transporting in stroller must use 5-point transport harness

Wheelchair Occupant Safety

Applicability is to all occupants transporting inside of a vehicle

The New Zealand standard for wheelchair tie downs and occupant restraints AS/NZS 10542.1:2015 states that the wheelchair occupant restraint must be 3-point consisting of a lap and shoulder component (i.e. lap sash seatbelt).

You should only be using a lap-only seatbelt if due to medical reasons the client is unable to use the sash component of the belt.

Wheelchair Occupant Safety

Standards relevant: AS/NZS 10542.1:2015

Occupant Safety

- Can the occupant transfer into the factory vehicle seating position
  - This is always the preferred position of transport
- The occupant: seated wheelchair height (100mm recommended head clearance)
  - Consider age and growth of client, different wheelchairs or cushion changes over time, may need more
- Behavioural considerations
  - Can they remove the seatbelt

Wheelchair Occupant Safety

Standards relevant: AS/NZS 10542.1:2015

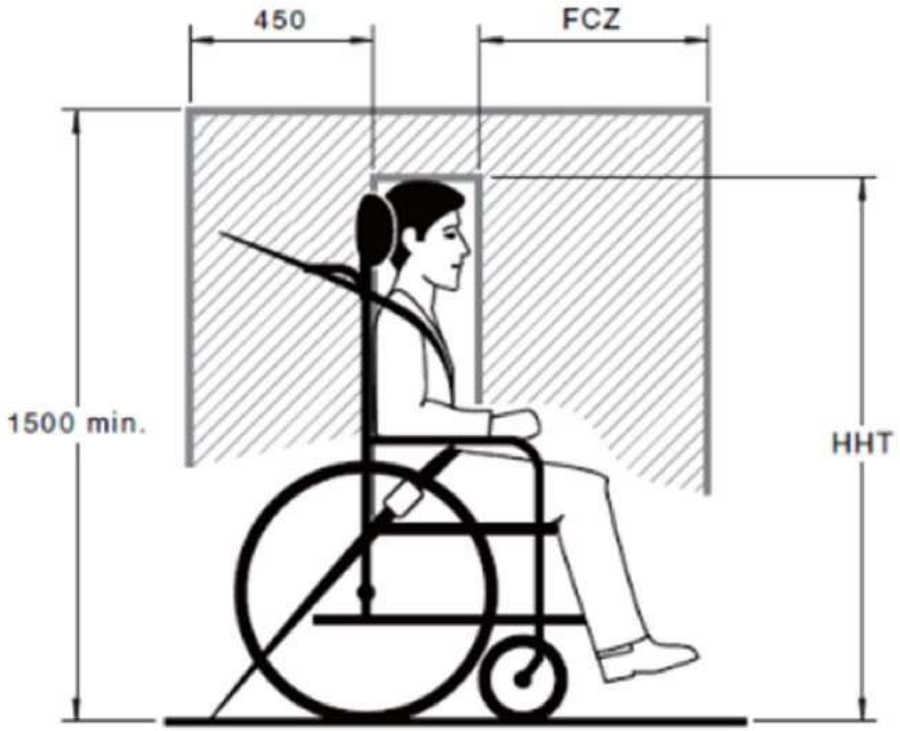
Occupant Safety

- Type of belt: Must be 3-point lap-sash seatbelt
- Medical consideration for seatbelt
  - Implants or severe discomforts that may affect seatbelt path location
- Positioning support
  - Ability to hold body in upright position for effective seatbelt positioning
  - Additional postural support systems may be required
- Wheelchair must haves for safety as a minimum
  - Crash tested base
  - Shoulder height backrest
  - Headrest
  - Additional vehicle mounted supports available if not on the wheelchair

Wheelchair Occupant Safety

Wheelchair Occupant Safety

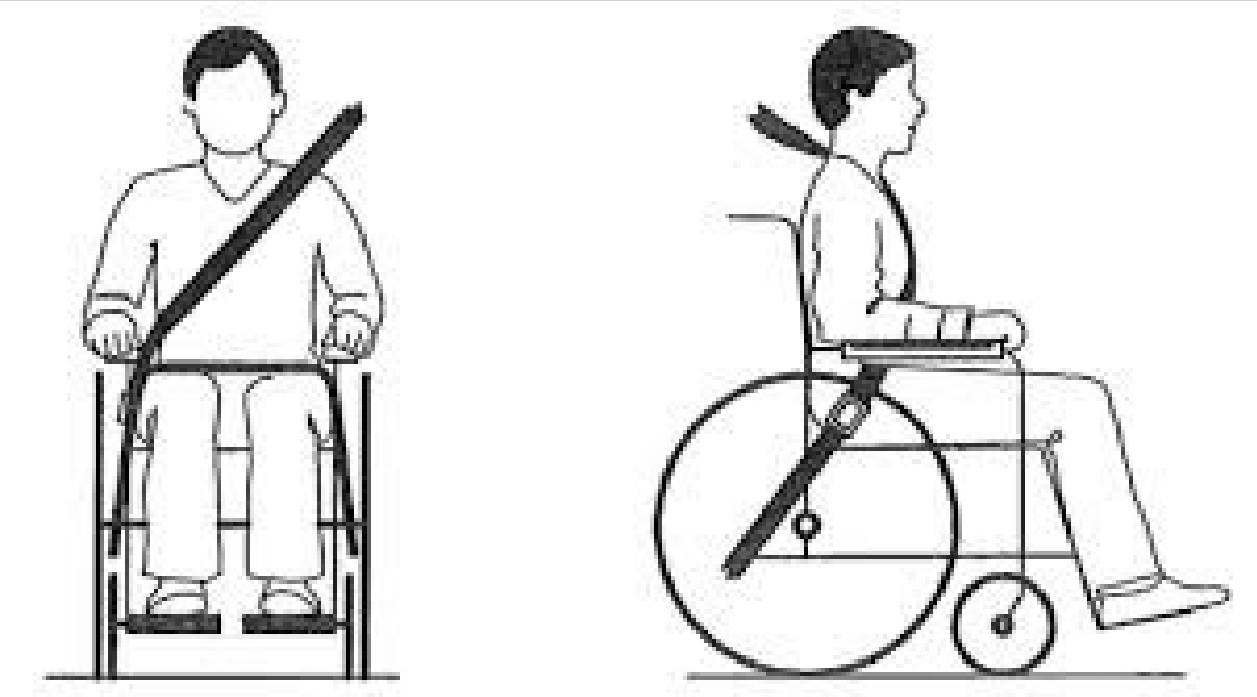
Clear zone requirements



- Frontal and rearward impact clear zones
- FCZ = 650mm for normal use of the 3-point lap sash seatbelt
- FCZ = 900mm for when exemption is required from 3-point lap sash to use lap only seatbelt
- Rear clear zone of 450mm is always needed due to crash force reactions

Wheelchair Occupant Safety

Correct path and seatbelt type



Wheelchair Occupant Safety

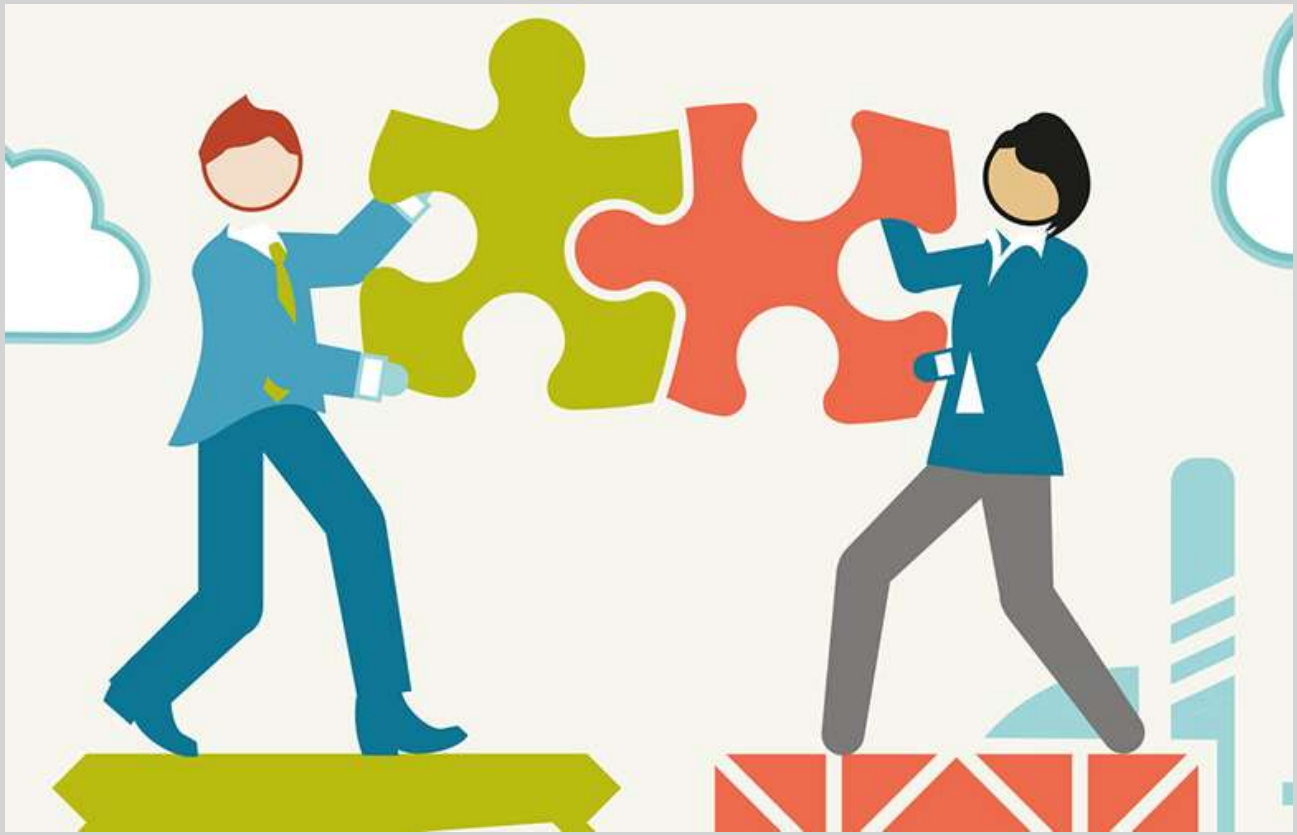
Incorrect path and seatbelt type

Imported Vehicles

- They are not always imported as a WAV so do not meet many of the necessary standards
- If used for wheelchair transport, must meet the same standards
- Retro-fit restraints and testing of ramp system
- Factory option does not mean its safe
- Japanese standard does not come close to the NZ or ISO requirements

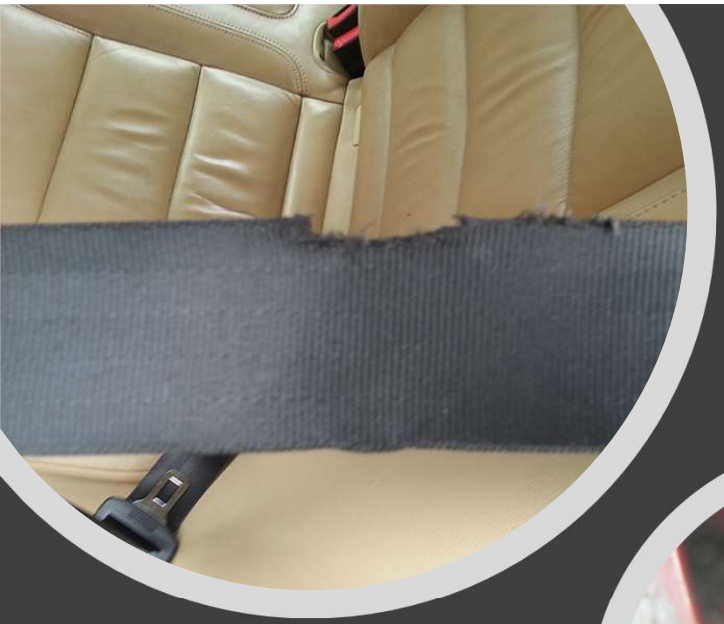
Transport is the Key to Community Access

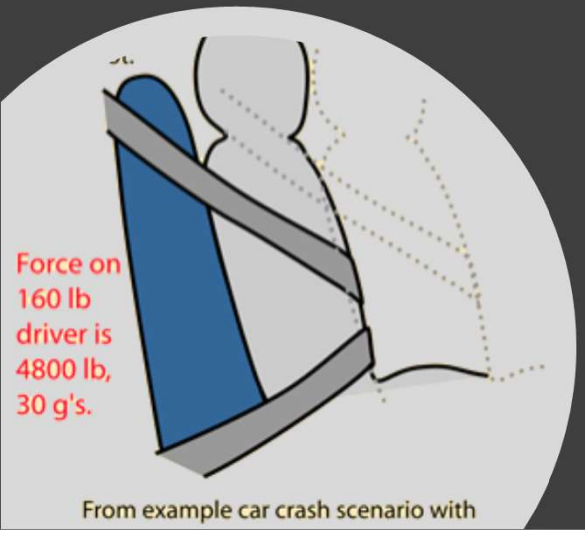
Compromising for Vehicle Transport



Compromising for Vehicle Transport

- If vehicle transport is a necessity for the client's access to the community, this needs to be considered during the wheelchair prescription process.
- We make compromises every day, vehicle transport requires this as a basis for working.
- What wheelchair supports can be compromised to allow for a safe vehicle transport outcome?
  - Is there a need for 2 wheelchairs?





From example car crash scenario with

Used restraints and accidents

- When purchasing secondhand vehicles or restraints it is very important to know the history
- If you do not know the history do not use the restraints

FURTHER INFORMATION

- Our website – www.mobilityengineering.com.au
  - You can find all the solutions we offer and brochures/videos on how they work
- Youtube channel – Mobility Engineering
  - Videos on vehicle mod questions
- Facebook/Instagram – Mobility Engineering
  - Where we will be, our movements and expos being attended
- Mailing list – info@mobilityengineering.com.au

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Thanks!!