

Will this wheelchair be fit for purpose? Posture and function

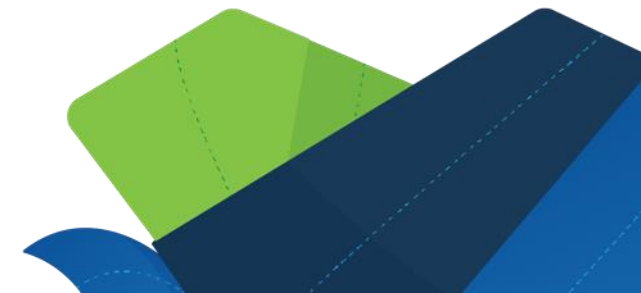
Medical Aids Subsidy Scheme
7 November 2019



Queensland
Government

Overview

- Overall width: doors, wheelchair loaders and much more
- Seat heights for posture/stability, and for propulsion and transfers
- Rear wheel position: stability, manoeuvrability, efficiency
- Ordering the right legrest for posture, pressure redistribution and environment access
- Ordering the right profile and height of backrest, adjusting back height, or choosing a custom back height



Overall width, length, seat height and head height



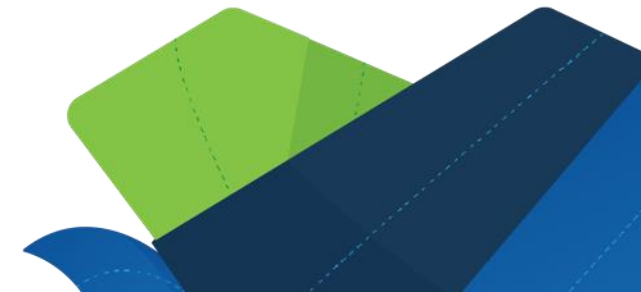
Power wheelchair overall width 740mm passing through a doorway clear open 803mm

Check overall dimensions:

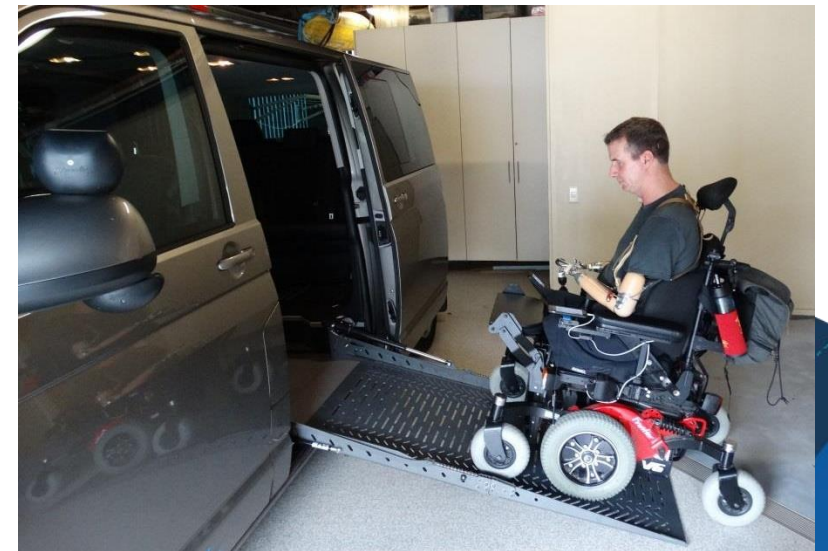
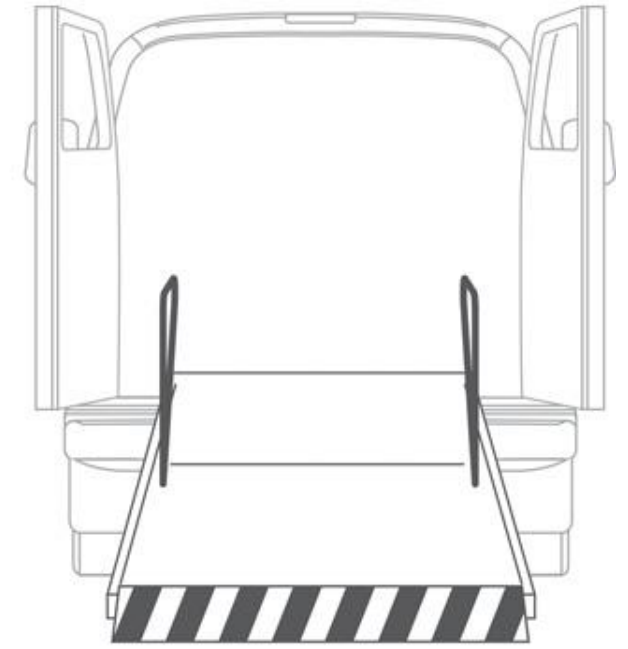
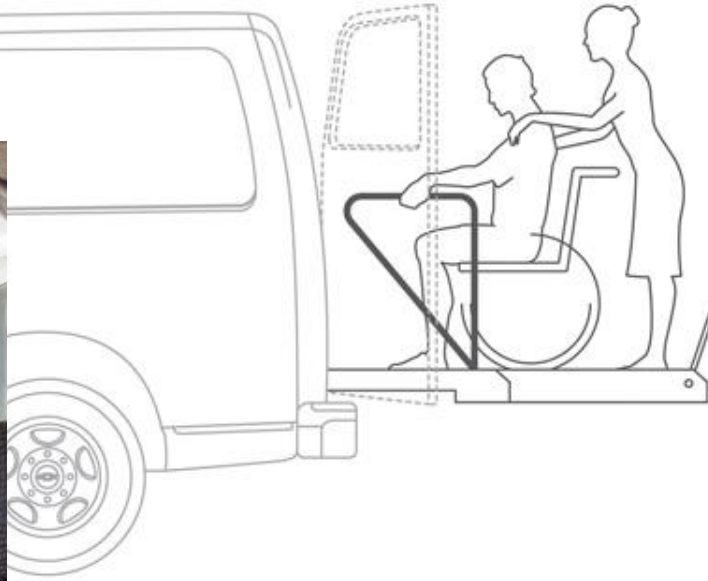
- Fit doorway clear opening
- Fit wheelchair loader clear inside platform width, clear inside platform length

e.g. Braun smallest Vista loader is 680mm wide by 1005mm long; Century CL995IBXT2052-2 is 755mm wide by 1330mm long while most models allow for 830-850mm wide by 1280-1440mm long

- Ramp width, dedicated wheelchair position in vehicle, roof/head height



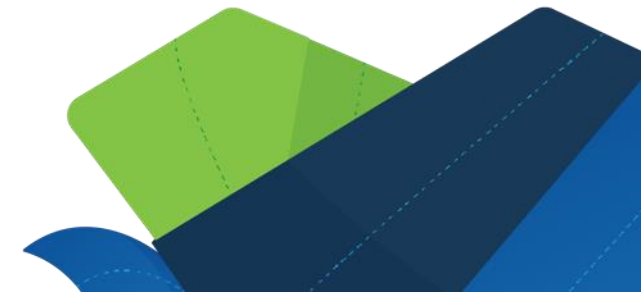
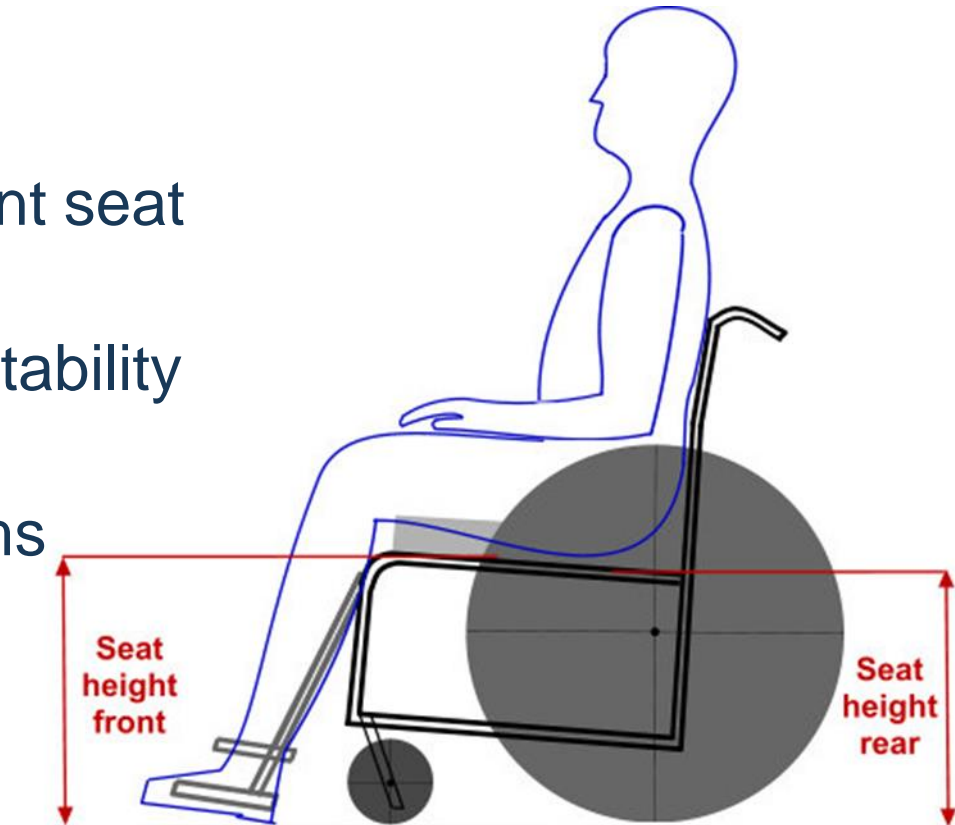
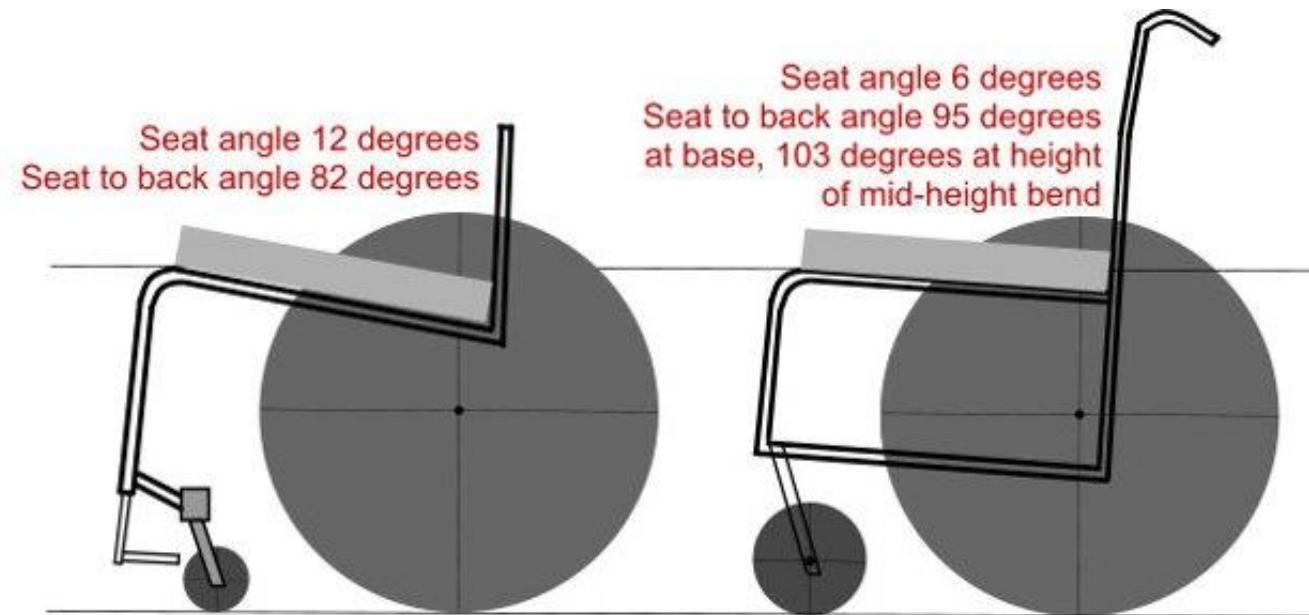
Head height



Seat height and seat angle

Posture and stability: How much higher should front seat height be relative to rear seat height?

- Seat dump, seat tilted to rear increases pelvic stability but makes transfers harder
- More seat dump may improve reach to push rims

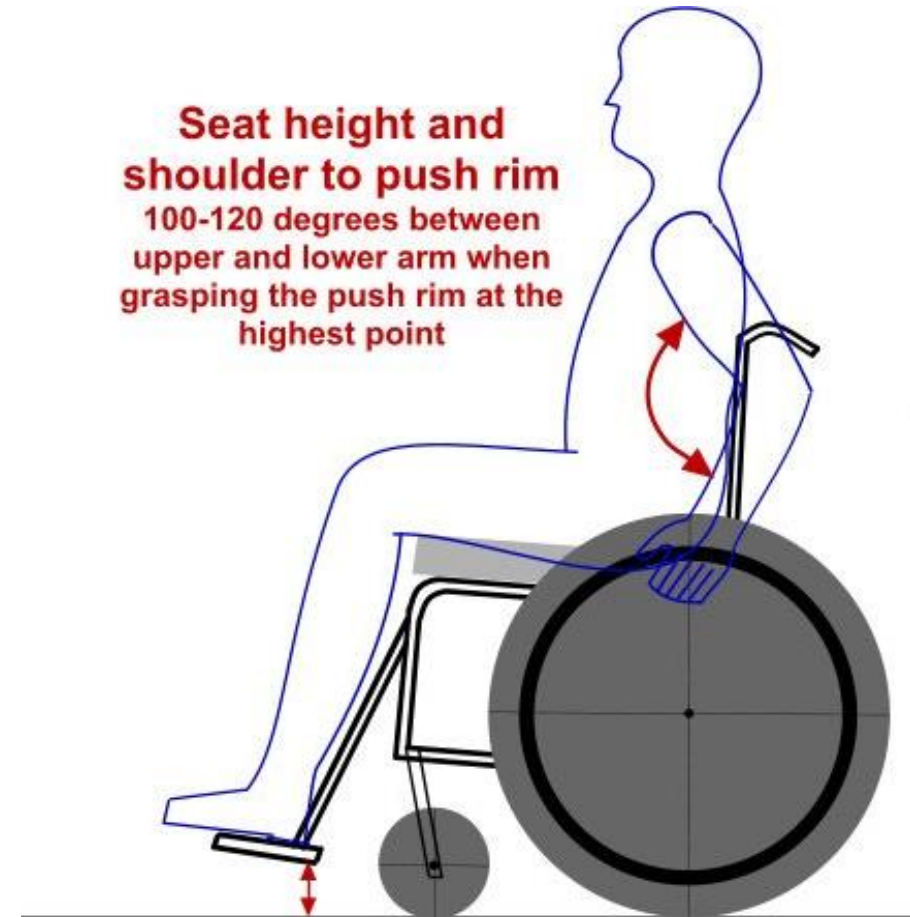
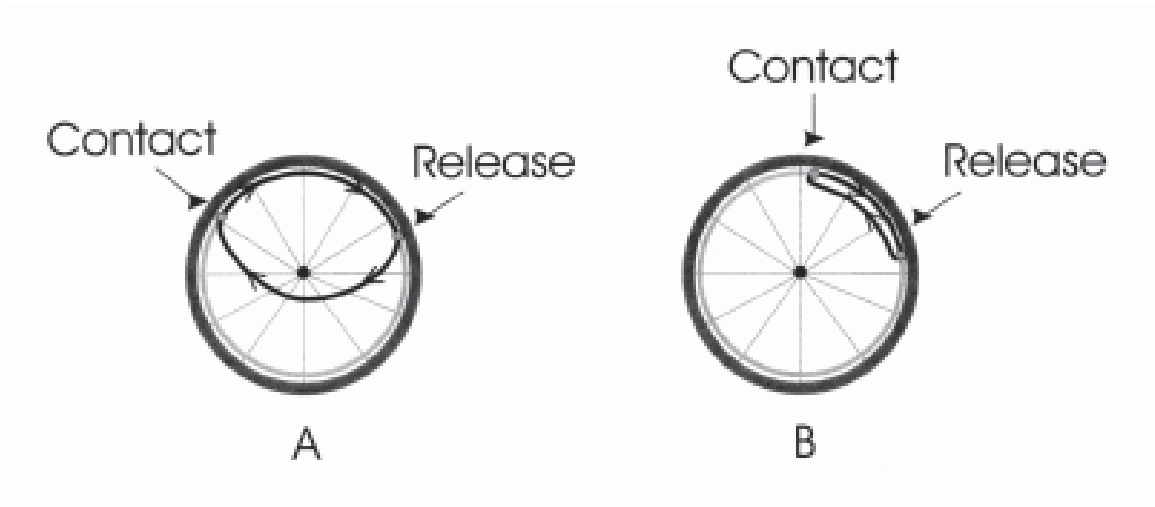


Larger amounts of seat dump



Seat height for propulsion and propulsion pattern

- 100-120 degrees at elbow, or axle between fingertips and knuckles?
- Arc or semi-circular propulsion pattern?

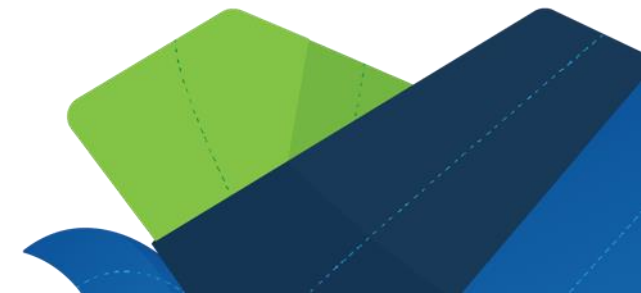


[Preservation of Upper Limb Function Following Spinal Cord Injury A Clinical Practice Guideline for Health-care Professionals](#)

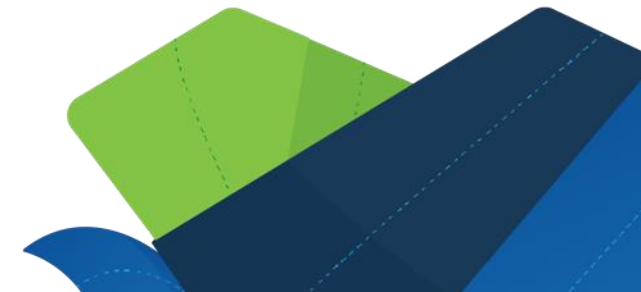
What does semi-circular propulsion look like?



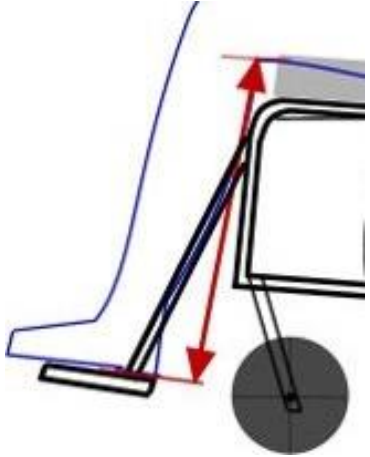
MAX Mobility - Propulsion Training 101 - YouTube
<https://www.youtube.com/watch?v=BD9kp4u89Gc>



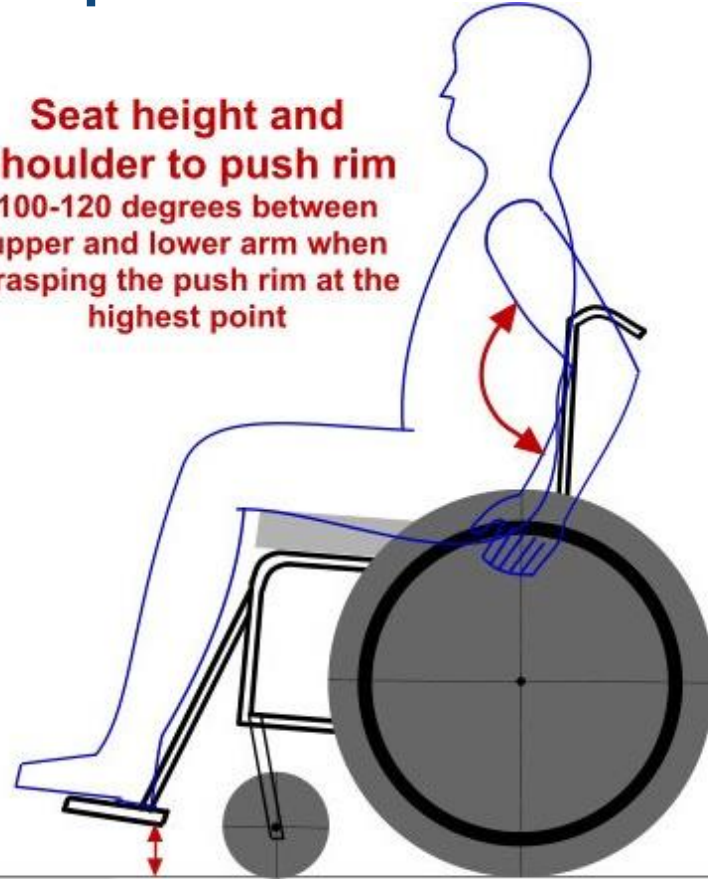
Video: propulsion pattern



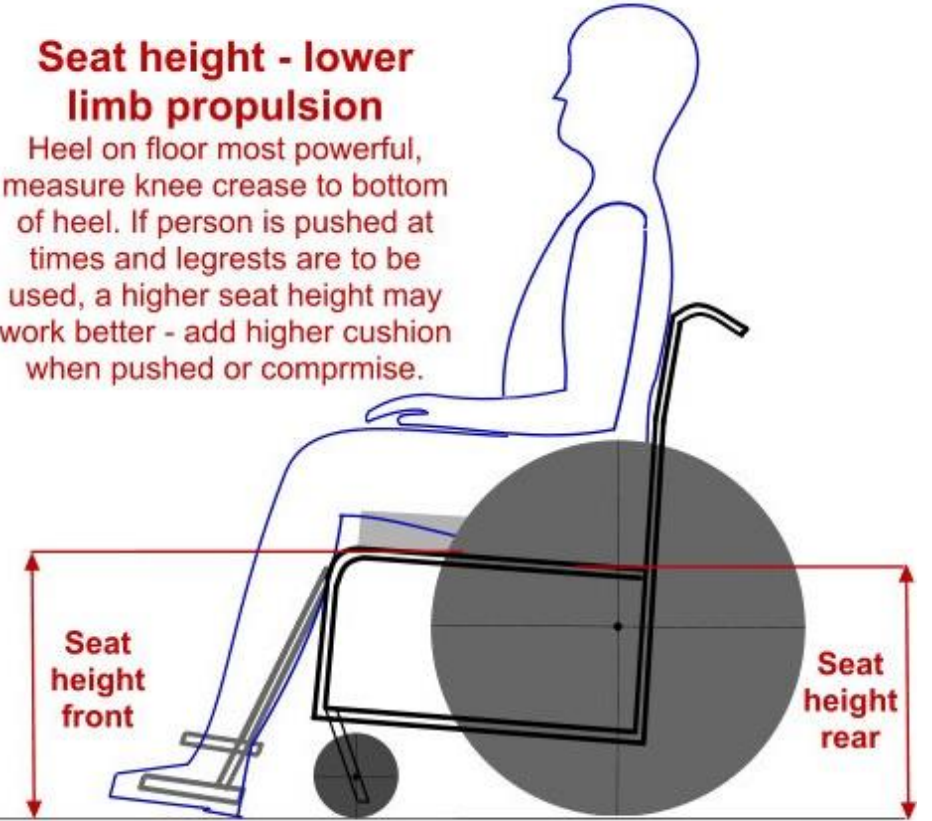
Seat height for propulsion and footrest clearance



Seat height and shoulder to push rim
100-120 degrees between upper and lower arm when grasping the push rim at the highest point



Seat height - lower limb propulsion
Heel on floor most powerful, measure knee crease to bottom of heel. If person is pushed at times and legrests are to be used, a higher seat height may work better - add higher cushion when pushed or compromise.



User's leg length (above) used to calculate seat to footrest measurement, critical to determine seat height at front

Seat height and footrest clearance: aim for 70mm clearance under lowest part of footrest when legrests are out at 70 degrees as shown here. Less clearance possible with vertical legrests as castors are closer to the footrest



Ordering the right legrest for posture, pressure redistribution and environment access

- Ensure footrests are low enough to distribute pressure across the full seat
- Depending on the cushion used and person, legs may or may not slope downward at the front of seat – the proximal thigh is very tolerant of pressure, while the buttocks and sacrum are not



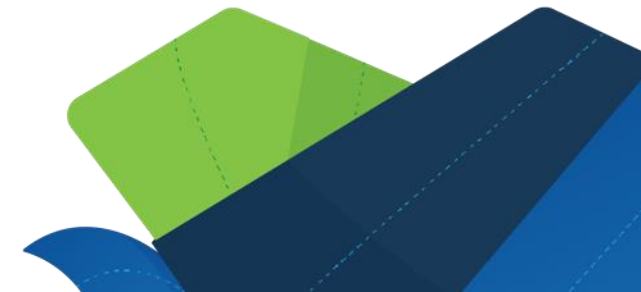
Example order form below

Footrest / Extension / Seat to Footrest Length

Select Seat to Footrest Length in row corresponding to desired Footrest and Extension. Footrest Length of at least 2.5" shorter than Front Seat Height recommended. Extension Tube Hanger measurements are based on 70° Hanger / Front Frame Bend.

Footrest	Extension	Seat to Footrest Length									
Extension Tube Hangers (60°, 70°, 80°)	Short	<input type="checkbox"/> 11	<input type="checkbox"/> 11.5	<input type="checkbox"/> 12	<input type="checkbox"/> 12.5	<input type="checkbox"/> 13	<input type="checkbox"/> 13.5	<input type="checkbox"/> 14	<input type="checkbox"/> 14.5	<input type="checkbox"/> 15	
	Medium	<input type="checkbox"/> 13	<input type="checkbox"/> 13.5	<input type="checkbox"/> 14	<input type="checkbox"/> 14.5	<input type="checkbox"/> 15	<input type="checkbox"/> 15.5	<input type="checkbox"/> 16	<input type="checkbox"/> 16.5	<input type="checkbox"/> 17	
	Long	<input type="checkbox"/> 15.5	<input type="checkbox"/> 16	<input type="checkbox"/> 16.5	<input type="checkbox"/> 17	<input type="checkbox"/> 17.5	<input type="checkbox"/> 18	<input type="checkbox"/> 18.5	<input type="checkbox"/> 19	<input type="checkbox"/> 19.5	

Video: reach to push rim, footrest clearance



Seat height for transfers

- If using hoist with spreader bar and loop sling, check bottom clears seat
- Standing transfers usually not an issue as wheelchair seat height positions hips higher than knees when shift to front of seat
- Lower seat height may be critical if using upper limbs to transfer



Rear wheel position: stability, manoeuvrability, efficiency

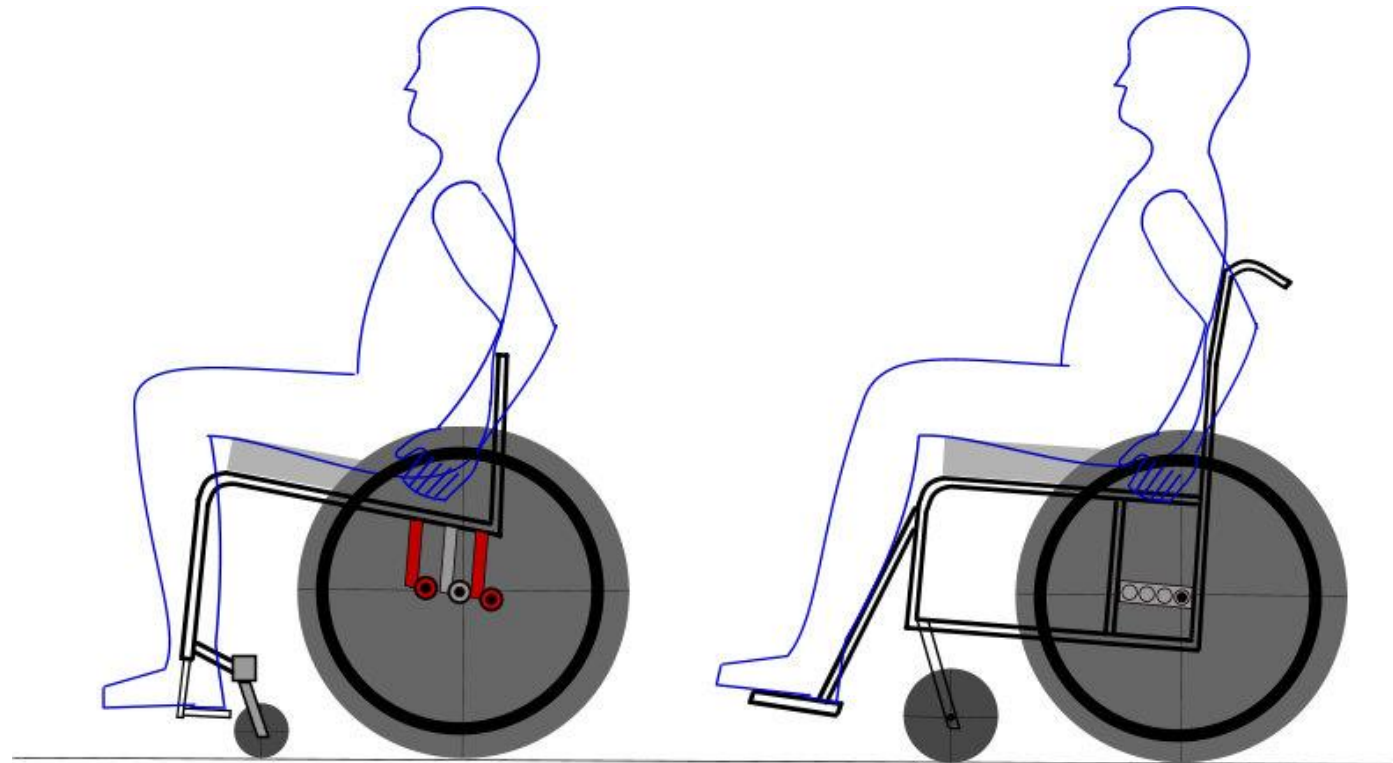
Stability is king

- Cannot have the chair tip over backwards on a ramp or slope
- Cannot have power wheelchair wheel stand on ramp or slope

If user can lean forward to compensate for casters lifting off ground, **we can and should move the rear wheels forward** from the standard position shown at right.

Tomlinson 2000: Moving the rear wheels forward 4.4cm: rolling resistance was reduced 18% and steering effort reduced 44%

<https://academic.oup.com/ptj/article/80/9/904/2842521>

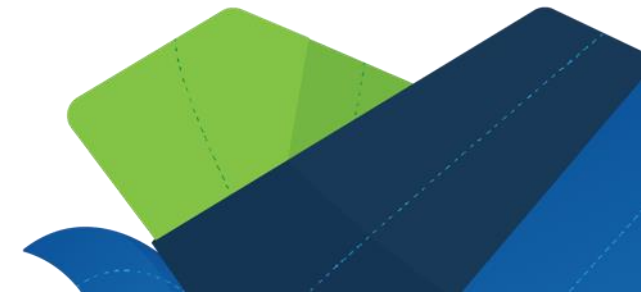


Wheelie skills enable more than efficiency – access much more of the world!



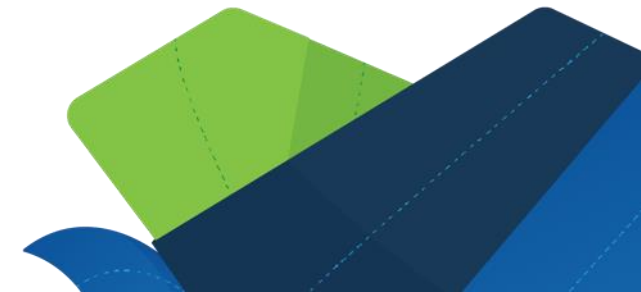
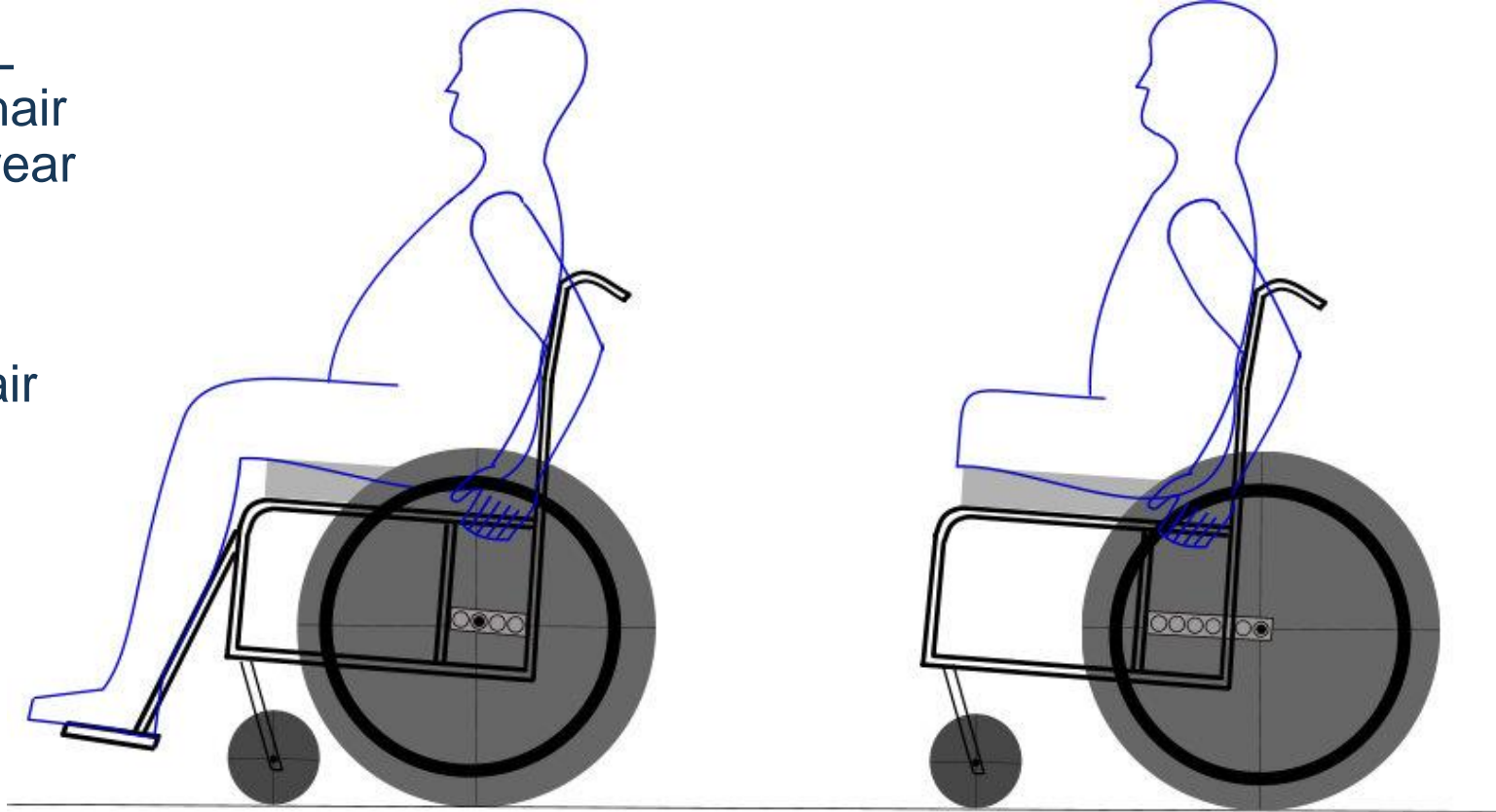
Introduction to Wheelchair Skills: SCI Empowerment Project Wheelchair Skills Video 1

https://www.youtube.com/watch?v=piNH0D3_uMU&list=PLOCF5umTFDIImWZ7bZzqv0co5rqXWOHkeT



Rear wheel position: stability, manoeuvrability, efficiency

- If weight forward in chair it WILL load the front casters making chair harder to push and turn, move rear wheels forward
- If no weight at all on front of chair move rear wheels backwards



Powered wheelchairs

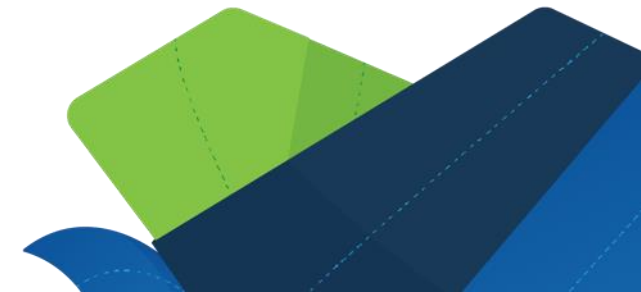
- Most high specification chairs have a way to move seat forward/backward relative to drive wheel position to change stability
- Front and rear stabilisers: need to order correct specification springs for weight and use



Back height

Low back height:

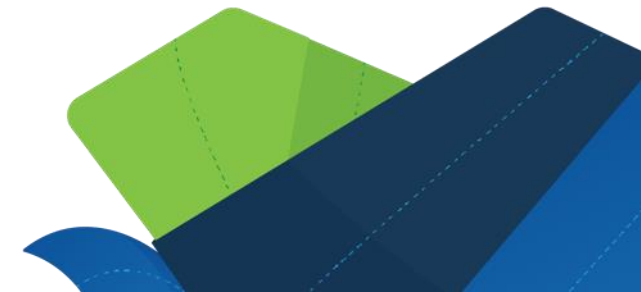
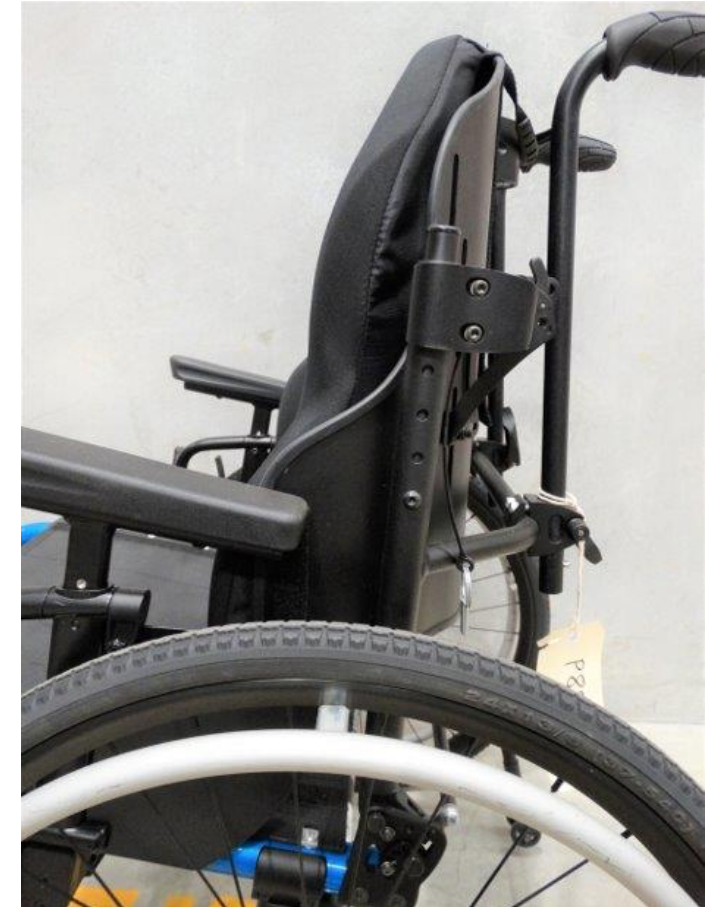
- active in chair, can move trunk forwards, sideways
- can lift and reposition using upper limbs
- pre-set heights can be ordered but many will prefer custom – backrest canes should be straight, no mid-height bend
- should there be support the lowest ribs, or only to the level of PSIS?



Back height

Standard or mid height:

- more passive in chair but active at times
- chair is manually propelled, need scapula movement
- user will spend time relaxing in chair
- suggest bent back canes best for slung upholstery
- suggest straight back canes best for solid backrest for ease of mounting attachment hardware at optimal height



Back height

High back support

- unusual with slung upholstery, e.g. economy PWC
- needing full trunk support to tilt, recline – should support to apex of thoracic spine
- needing full trunk support including chest harness – should support to top of shoulders or slightly above
- If not using slung upholstery, suggest straight back canes best for solid backrest for ease of mounting attachment hardware at optimal height

