Translating Evaluation Measurements to Wheelchair Dimensions:

Seat Width:

- Based on a measurement at the wheelchair user's widest point (usually hips or mid- thighs)
- Consider hip width versus upper trunk and/or shoulder width. If chair width needs to accommodate a torso wider than hips, chair width will likely need to at least match torso width as measured at the top of the backrest.
- Accommodating Wind Swept Hips still requires measurement to be at the widest points. These may now be at the hip on one side & the distal thigh or knee on the opposite side.
- Accommodating those with a pronounced scoliosis may require measurements from the hip on one side, & the apex of the trunk curve on the opposite side.

Too wide can lead to:	**Too narrow** can lead to:
▪ Difficult propulsion ▪ Poor environmental accessibility ▪ Inadequate Support ▪ Postural asymmetry /Trunk rotation ▪ Poor Sitting Tolerance & Discomfort	• Pressure Sore Concerns • Discomfort • Inadequate Support • Poor Sitting Tolerance

"General" Guidelines

- Keep the overall width of the chair as narrow as feasible for optimal accessibility & efficient propulsion. (i.e., 16" wide hips often fit well into a 16" wide wheelchair), (17" hips into an 18" wide wheelchair, etc.).
- If addressing winter coats, consider % of time the user will be using the wheelchair wearing the coat v/s not wearing the coat. Often, coats can be modified, (or tolerated), to allow proper wheelchair width for the larger % of time spent in the chair with no coat.

Seat Depth:

- Based on a measurement from the sacrum (back of the pelvis) to the popliteal fossa (behind the knee).
- Leg length discrepancies require this measurement on both right and left sides.

Seat depth too short can result in:	**Seat depth too long** can result in:
▪ Inadequate Pressure Distribution ▪ Pain / Discomfort ▪ Poor Postural Support ▪ Poor Sitting Tolerance ▪ Sliding out of the chair attempting to relieve discomfort	• "Slumped" Posture (Posterior pelvic tilt & Kyphotic Trunk) • Sliding out of the chair due to poor fit • Difficult arm propulsion from poor postures • Difficult foot propulsion

"General" Guidelines

- Avoid improper measurements made while the user is sitting in a poor posture
- Maximize Seat Depth to offer optimal support / stability / pressure distribution
- Subtract up to 2 fingers width (1- 2 inches) from users measurement for optimal support
- Subtract up to four fingers width from users measurement for to allow adequate clearance for foot propulsion

Accommodating Leg Length Discrepancies

- (Be certain it is a true length discrepancy and not a posture caused by a flexible pelvic rotation or limited hip flexion. These postures may require additional accommodation by modifying "Seat to Back" Angle).
- Order cushion to fit the longer leg and cut to fit the shorter.
- Solid seat base can provide support under the longer cushion side.
- Wheelchair depth needs to accommodate shorter leg – solid seat insert to support longer

Seat to Floor Height:

- Seat height is the distance from the seating surface (upholstery) to the floor.
  (Remember to include cushion thickness when considering this measurement).

Seat to Floor too low can result in:	**Seat to Floor too high** can result in:
• Difficult transfers • Sliding out of the chair due to poor fit • "Slumped" Posture (Post. pelvic tilt & Kyphotic Trunk) • Inadequate leg rest length	▪ Difficult standing or lateral sliding transfers ▪ Poor table / desk access ▪ Difficult wheel or foot propulsion ▪ Sliding out of the chair in an attempt to foot propel

"General" Guidelines

- Consider ground clearance of footrests. (Min. of 2 to 3 inches usually recommended).
- Add the cushion thickness if it sits on top of the seat rails. If using a drop base, subtract the length of the drop hooks.
- Specify front and rear seat heights for fixed tilt of the manual wheelchair if gravity is needed to assist with positioning.
- Standard Ht is ~19 ½".
- Optimal height for foot propellers usually allows the propelling foot to rest comfortably on the ground with the knee at ~90°.
  (Often at ~17 ½")

Seat to Floor Angle:

- Refers to the angle of the wheelchair seat in relation to the floor.
- Lowering the rear seat to floor measurement will place the wheelchair in a permanent (static) posterior tilt.

Benefits of Static Tilt beyond 0°

• Gravity Assisted Positioning • Improved vision • Improved stability / balance • Improved Trunk Control	• Improved U.E. Function 2° to increased proximal stability • Improved swallowing • Increased comfort / Sitting Tolerance

General" Guidelines

- Can be accomplished by 1. Raising rear axle, 2. Decreasing rear wheel size, or 3. Increasing front caster / fork size.
- Remember to re-align front caster housing & keep it perpendicular to the floor when changing seat angle

Back Height:

- Back height is measured from the seat upholstery to the top of the back upholstery. (Be certain to add cushion thickness when matching user measurement to wheelchair geometry).
- Back height requirements depend on the height of the user, balance requirements, and the need for support

Back Height too High can result in:	**Back Height too Low** can result in:
▪ Kyphotic sitting postures ▪ Difficult arm propulsion ▪ Limited shoulder active R.O.M. (through ↓ scapular mobility) ▪ Sliding out of the chair to relieve sitting discomfort	• Inadequate support • Sliding out of the chair to achieve proper support • Poor sitting tolerance / fatigue

"General" Guidelines

- Avoid improper measurements made with user is sitting in a poor posture. Have assistance positioning the user while measuring if needed.

Five Landmarks for Back Height Measurements:

1. Active Paraplegic: Low Back support - Seating Surface to Thoraco-Lumbar spine
2. Active User needing support without Upper Extremity Interference: To Inferior Angle (bottom) of the Scapula
3. Kyphotic Posture: 1" to 2" above the apex of the Kyphotic curvature on the spine
4. Full Back Support (Tilt or Recline): To the Acromion Process (Tip of the Shoulder)
5. Users with Anterior Chest Support: To the Top of the Shoulder

Chest Width:

- Chest width measurements are taken at the widest point of the trunk – typically at or near the axilla. Accurate measurements are often best taken from behind the patient – across the scapulae.
- Typically the back width of a wheelchair is the same as the seat width. There are several scenarios where chest width measurements may be required.

General" Guidelines:

- Trunk width that is wider than hip width will require the chair to be at least as wide as the trunk where it meets the top of the backrest.
- A significant scoliosis may require increased width to accommodate curvature of spine. This would be measured from the apex of the curve of the spine on one side to the outside opposite hip on the other to obtain overall width.
- Use of lateral thoracic supports often requires increased back width, particularly if planning to mount the back between the back canes.

Chest Depth:

- This measurement can be useful for determining the length of lateral supports.
- Measured at the point below the axilla where the lateral support will be placed

Seat to Back Angle:

- Refers to the angle where the back canes meet the seat rails. Standard STB^{o} = 90^{o}.
- Closed STB^{o}'s are those less than 90^{o} and required when placing ":squeeze" into a wheelchair frame.
- Opened STB angles are those greater than 90^{o} and may be required when accommodating:

Kyphotic Trunk Postures	Limited Hip Flexion	Positioning for Swallowing
Impaired Trunk Balance	Posterior Pelvic Tilt	Impaired Visual Field
Poor Postural Stability	Impaired Respiratory Function	User Comfort or Preferences

Front Rigging Length:

- The measurement to determine length is taken from popliteal fossa (behind the knee) to the heel.
- Ankle contractures can affect this overall measurement.

Footrest length too high can cause:	**Footrest length too low can cause:**
• increased ischial pressure, • hip external rotation & Abduction • pain / discomfort, • Decreased sitting tolerance. • Sliding down in the seat 2° to pain / discomfort	• hip internal rotation, • popliteal & distal posterior thigh pressure, • sliding down in the seat (to reach the footrest • Footrests too close to ground may drag or catch on uneven terrain.

"General" Guidelines

- Measure from the popliteal fossa (behind the knee) to the heel with the shoes on (as to be worn when using the chair).
- Make certain the adjustment range of the front riggings (taken from the manufacturers spec / order sheet) accommodates this measurement.
- Remember to accommodate cushion height by subtracting these inches from the knee to heel measurement before matching with manufacturers specifications

Legrest Angle:

- Common choices are 60°, 70°, 80°, & 90°
- Larger angles (60°) = Longer overall footprints, less accessibility, more difficult maneuverability
- Tighter angles (90°) = smaller overall footprints, greater accessibility, generally greater postural stability.
- With one-sided foot propulsion, the opposite legrest (front rigging) angle may need to be decreased in order to allow ground clearance on that side and still maximize mobility (60° rather than 70° degree).
- Measure the knee angle with the hip flexed to its optimal sitting position. (Hamstring tightness will greatly affect the legrest angle).
- Extending the knee beyond the range of tight hamstrings will cause the pelvis to posteriorly tilt and the user to slide forward in the seat. Tighter angles that still allow adequate ground clearance often are better choices.
- Size of caster and frame design will limit some legrest angles for some chairs.

"General" Guidelines

60°	70°	90°
• Helpful with limited knee flexion • Helpful when lowering seat to floor with long legs • Detrimental with tight hamstrings	• Helpful using Standard riggings while also promoting accessibility & stability	• Helpful for many pediatric users • Helpful addressing tight hamstrings • Not always available on adult chairs in sufficient length to accommodate knee to heel measurement

70° riggings can be combined with adjustable footplates (adjusted rearward) and smaller casters (to minimize caster swing & optimize foot clearance) to accommodate tight hamstrings or knee flexion contractures.

Tapered v/s Non-tapered front Riggings

Pro's of tapered front riggings can include smaller turning radius, increased accessibility, gentle leg positioning assistance / cues.

Con's of tapered front riggings can include too much pressure on the lower legs which can cause pain / discomfort / wounds.

Armrest Height:

- Armrest height is determined by measuring from the seating surface to the users elbow (Flexed at 90°).
- Measure while users arms are positioned comfortably at the side, elbow flexed to 90°, shoulders relaxed & retracted (back).
- Manufacturers order forms / price sheets usually denote range availability for adjustable height arms.

Arm Rests too high can cause:	**Arm Rests too low can cause:**
• Elevated Shoulders • Difficult Propulsion • Posterior Pelvic Tilt (arms resting in the lap)	• Inadequate support • Sliding downward out of the chair • Shoulder Discomfort

"General" Guidelines

Avoid improper measurements made while the user is sitting in a poor posture. Have positioning assistance while measuring if needed.

Be certain to add cushion height to users measurement

Armrest Length:

- Length is determined by need for support v/s environmental accessibility v/s preference v/s assist required for transfers

Full Length Arms May be required for:	**Desk Length Arms May be required for:**
➢ Arm or Hand Support ➢ Arm Tray or Lap Tray Support ➢ Assist with Transfers in or out of the chair	➢ Desk or Table Access ➢ Driver Control Placement ➢ Transfer Requirements