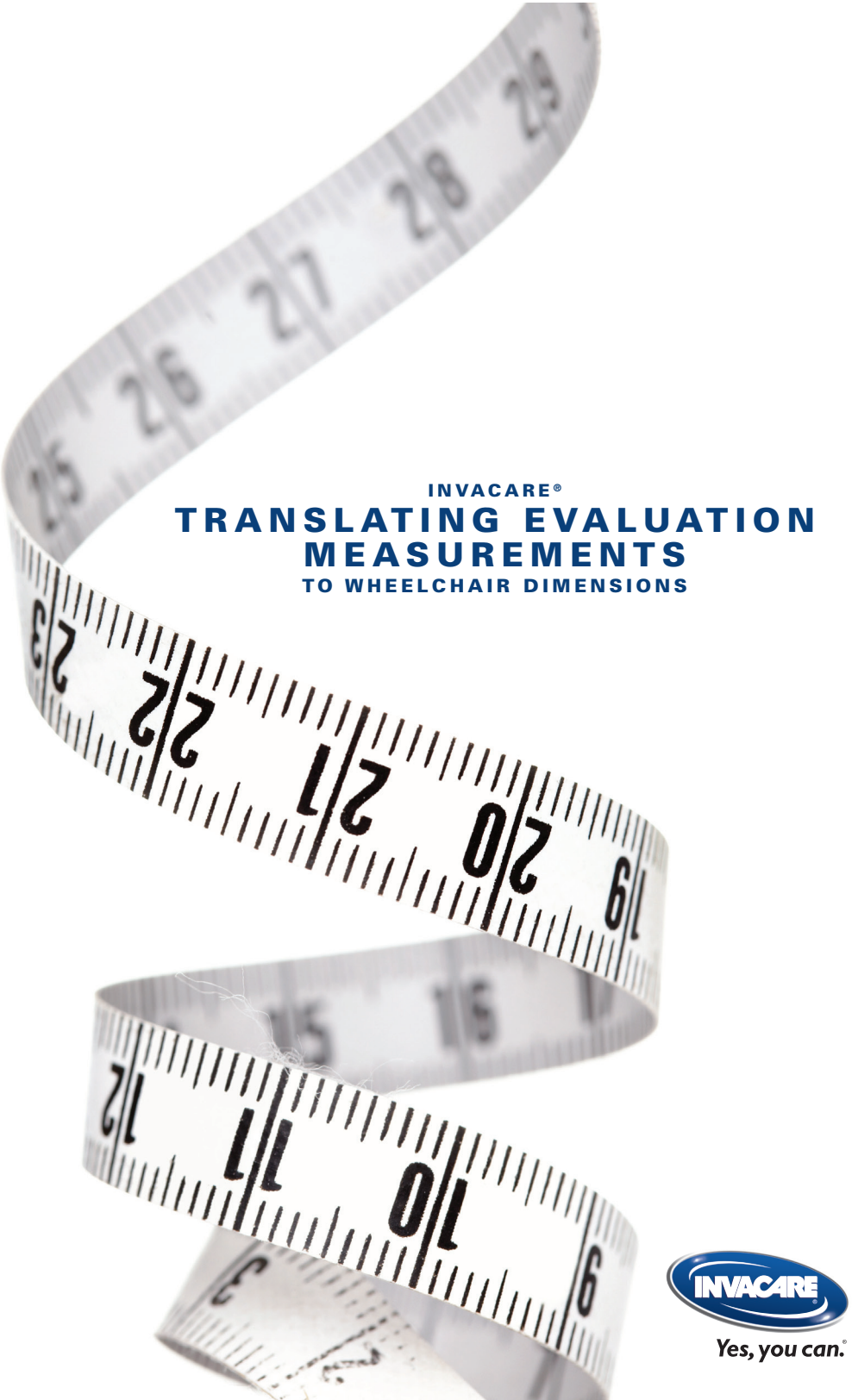

INVACARE®

TRANSLATING EVALUATION MEASUREMENTS

TO WHEELCHAIR DIMENSIONS

INVACARE®

Yes, you can.®

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SEAT WIDTH

Seat width is based on a measurement at the wheelchair user's widest point, usually at their hips or mid-thighs. Some things to consider include hip width versus upper trunk and/or shoulder width. If chair width needs to accommodate a torso that is wider than the hips, chair width will likely need to at least match torso width as measured at the top of the backrest. If you must accommodate windswept hips, measurement must still be at the widest points. These may now be at the hip on one side and the distal thigh or knee on the opposite side. Accommodating those with pronounced scoliosis may require measurements from the hip on one side and the apex of the trunk curve on the opposite side.

TOO WIDE CAN LEAD TO:	TOO NARROW CAN LEAD TO:
Difficult propulsion	Pressure Sore Concerns
Poor environmental accessibility	Discomfort
Inadequate Support	Inadequate Support
Postural asymmetry /Trunk rotation	Poor Sitting Tolerance
Poor Sitting Tolerance & Discomfort	

GENERAL GUIDELINES

When evaluating seat width, keep the overall width of the chair as narrow as feasible for optimal accessibility and efficient propulsion (i.e. 16" wide hips often fit well into a 16" wide wheelchair, 17" hips in an 18" wide wheelchair, etc).

When factoring in extraneous factors like a winter coat, for example, consider the amount of time the user will be wearing the coat versus not wearing the coat while using the wheelchair.

SEAT DEPTH

Seat depth is 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	"Slumped" Posture*
Pain / Discomfort	Sliding out of the chair due to poor fit
Poor Postural Support	Difficult arm propulsion from poor postures
Poor Sitting Tolerance	Difficult foot propulsion
Sliding out of the chair attempting to relieve discomfort	

**Posterior Pelvic Tilt & Kyphotic Trunk*

GENERAL GUIDELINES

When evaluating seat depth, avoid improper measurements while the user is sitting in a poor posture. You should also look to maximize seat depth to offer optimal support, stability and pressure distribution. Subtract up to two fingers' width (1-2 inches) from user's measurement for optimal support, and up to four fingers' width from user's measurement to allow adequate clearance for foot propulsion.

ACCOMMODATING LEG LENGTH DISCREPANCIES

When evaluating 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. Some things that you can do include ordering a cushion to fit the longer leg and cut it to fit the shorter leg, include a solid seat base to provide support under the side with the longer cushion and note that wheelchair depth needs to accommodate the shorter leg, with a solid seat insert to support the longer leg.

SEAT-TO-FLOOR HEIGHT

Seat-to-floor height is the distance from the seating surface (upholstery) to the floor.

SEAT-TO-FLOOR TOO LOW CAN RESULT IN:	SEAT-TO-FLOOR TOO HIGH CAN RESULT IN:
Difficult transfers	Difficult standing or lateral sliding transfers
Sliding out of the chair due to poor fit	Poor table / desk access
"Slumped" Posture*	Difficult wheel or foot propulsion
Inadequate leg rest length	Sliding out of the chair in an attempt to foot propel

**Posterior Pelvic Tilt & Kyphotic Trunk*

GENERAL GUIDELINES

When evaluating seat to floor height, there are a number of things to consider, including the ground clearance of the footrests (a minimum of 2-3 inches is usually recommended).Add the cushion thickness if it sits on top of the seat rails, and if using a drop base, subtract the length of the drop hooks. Remember to specify front and rear seat heights for fixed tilt of a manual wheelchair if gravity is needed to assist with positioning. Standard seat-to-floor height is 19.5", and the optimal height for foot propellers usually allows the propelling foot to rest comfortably on the ground with the knee at a 90 degree angle, which is often at a 17.5" seat to floor height.

SEAT-TO-FLOOR ANGLE

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

GENERAL GUIDELINES

Evaluating seat-to-floor angle can be accomplished by raising the rear axle, decreasing the rear wheel size or increasing the front caster/fork size. Remember to realign the front caster housing and keep it perpendicular to the floor when changing seat angle.

CHEST, BACK AND TRUNK 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

When evaluating a trunk width that is wider than hip width, the chair must 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 the 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

Chest depth measurement can be useful in determining the length of lateral supports, and should be measured at the point below the axilla where the lateral support will be placed.

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	Inadequate support
Difficult arm propulsion	Sliding out of the chair to achieve proper support
Limited shoulder active R.O.M. (through scapular mobility)	Poor sitting tolerance / fatigue
Sliding out of the chair to relieve sitting discomfort	

GENERAL GUIDELINES

Avoid improper measurements made with user 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

SEAT-TO-BACK ANGLE

Seat-to-back angle refers to the angle where the back canes meet the seat rails. Standard STB° = 90°. Closed STB° are those less than 90° and required when placing: "squeeze" into a wheelchair frame.

OPENED SEAT TO BACK ANGLES ARE THOSE GREATER THAN 90° 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

Front rigging length measurement is taken from the 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 internal rotation
Hip external rotation & Abduction	Popliteal & distal posterior thigh pressure
Pain / discomfort	Sliding down in the seat (to reach the footrest)
Decreased sitting tolerance	Footrests too close to ground may drag or catch on uneven terrain
Sliding down in the seat 2° to pain / discomfort	

GENERAL GUIDELINES

When evaluating footrest rigging length, measure from the popliteal fossa (behind the knee) to the heel with the shoes on. Remember that ankle contractures can affect this overall measurement. Make certain the adjustment range of the front riggings (taken from the manufacturer's spec/order sheet) accommodates this measurement.

Also remember to accommodate cushion height by subtracting these inches from the knee to heel measurement before matching with manufacturer's 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°).

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.

60°	70°	90°
Helpful with limited knee flexion	Helpful using Standard riggings while also promoting accessibility & stability	Helpful for many pediatric users
Helpful when lowering seat to floor with long legs		Helpful addressing tight hamstrings
Detrimental with 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 VS NON-TAPERED FRONT RIGGINGS

PROS:	CONS:
Smaller turning radius	Too much pressure on the lower legs
Increased accessibility	Pressure leads to pain, discomfort and wounds
Gentle leg positioning assistance/cues	

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 and retracted (back). Manufacturer's order forms / price sheets usually denote range availability for adjustable height arms.

ARM RESTS THAT ARE TOO HIGH CAN CAUSE:	ARM RESTS THAT ARE TOO LOW CAN CAUSE:
Elevated Shoulders	Inadequate Support
Difficult Propulsion	Sliding Downward Out of the Chair
Posterior Pelvic Tilt (arms resting in the lap)	Shoulder Discomfort

GENERAL GUIDELINES

When evaluating armrest height, avoid improper measurements made while the user is sitting in a poor posture. If needed, have positioning assistance while measuring and be certain to add cushion height to the user's measurement.

ARMREST LENGTH

Armrest length is determined by the need for support versus environmental accessibility, preference and the assistance required for transfers.

FULL LENGTH ARMS MAY BE REQUIRED FOR:	DESK LENGTH ARMS MAY BE REQUIRED FOR:
Arm or Hand Support	Desk or Table Access
Arm Tray or Lap Tray Support	Driver Control Placement
Assist with Transfers In or Out of the Chair	Transfer Requirements

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