

WHEELCHAIR SET UP

The test wheelchair was supplied by **Free Wheelchair Mission** for testing by Beneficial Designs, Inc.

Maximum payload: **99.8 kg (220.0 lb)**

Empty wheelchair weight: **19.9 kg (43.8 lb)**

Weight of heaviest component: **19.9 kg (43.8 lb)**

Seating system includes: **Arm supports, foot supports, and back support**

Seating system: **Sling seat with removable, hook loop attached rigid plastic seat pan**

Accessories: **None**

Total test load – Driver:

Not Applicable

Total test load – ISO Dummy:

99.8 kg (220.0 lb)

Position of all adjustable parts:

Foot support – **Lowest position**

Fore / Aft Seat support position – **Not Adjustable**

Back support angle – **Not Adjustable**

Back support angle– Reference position (**12°**) according to test specifications

Drive wheels – **Not Adjustable**

Casters – **Not Adjustable**

Position of all user adjustable control settings: **Not Applicable**

Power options: **Not Applicable**

Ambient testing conditions:

Temperature **20° C (68° F)**

Humidity **19%**

Barometric Pressure **1009 hPa (29.80 in Hg)**

SECTION 22 – SET-UP PROCEDURES FOR REFERENCE TESTING CONDITION

Clause 5, equipping and adjusting the wheelchair

- Manufacture max user mass **220.0 lb**
- Backpack location: **None** Weight **N/A**
- Accessory location: **None** Weight **N/A**
- Seat type: Sling Solid Captain
- Cushion Type (min recommended) **2.0 in**
- Supports: Arm Head Leg Foot
- Remove cushions/straps not integral to chair
- Seat Back Other _____

Clause 6.1.1 Pneumatic Tires

Clause 6.3.2 Drive wheels

- Tire type: non-pneumatic pneumatic
- Drive wheels mid-position **vertical** or lower (± 0.12 in (± 3 mm)) (6.2.2.2) **N/Adj**
- Tire size (smallest recommended) **25.7 in x 1.8 in**
- Drive wheel **camber** mid-position or greater ($2^{\circ} \pm 1^{\circ}$) (6.2.2.3) **4°**
- Tire pressure (max recommended) (6.1.1) **50 psi**
- Drive wheel **track width** mid-position (6.2.2.4) **23.4 in**
- Drive wheels mid-position **horizontal** or longer (± 0.12 in (± 3 mm)) (6.2.2.1) **N/Adj**

Clause 6.3.3 Caster Wheel

- Tire type: non-pneumatic pneumatic
- Caster **wheel axle vertical** mid-position (± 0.12 in (± 3 mm)) (6.2.3.3) **N/Adj**
- Tire size (smallest recommended) **7.9 in x 1.5 in**
- Caster wheel **track width** mid-position (6.2.3.4) **19.7 in**
- Tire pressure (max recommended) (6.1.1) **N/A**
- Caster **stem fore-aft** ($+1^{\circ}/-0^{\circ}$) (6.2.3.5) **2°**
- Caster **stem lateral** ($+1^{\circ}/-0^{\circ}$) (6.2.3.6) **2°**
- Caster **stem** mid-position **horizontal** (± 0.12 in (± 3 mm)) (6.2.3.1) **N/Adj**
- Caster **stem** mid-position **vertical** or lower (± 0.12 in (± 3 mm)) (6.2.3.2) **N/Adj**

Clause 6 Adjusting the wheelchair

- Position adjustable parts per manufacture
- Fore/Aft seat position: Non/Adj
- Seat depth** mid-position Non/Adj **18.4 in**
- Seat height** highest position **21.8 in**
- Back support height** mid-position ((13.86-18.11 in) (340-460 mm)) Non/Adj **17.4 in**
- Back support angle** $+10^{\circ}$ ($+3/-0$) **12°**
- Foot support clearance** ≥ 1.97 in ($+0.12/-0$) ((50 mm ($+3/-0$)) **5.9 in**
- Seat plane angle** nearest $+4^{\circ}$ or greater ($+3/-0$)(5.2) **10°**
- Leg-to-seat-surface angle** $\geq 90^{\circ}$ **120°**
- Control device mid-position or greater
- Foot support **angle** $\geq 90^{\circ}$ **120°**
- Adjust parking brakes per manufacturer or distance between brake block to the released position
- All other mechanical components mid-position
- User adjustable speed and sensitivity maximum
- Other programmable control device settings manufacturer recommended or mid-position

Clause 7 Final adjustments

- Back support angle close to +10° **12°**
- Seat support angle close to +4° **10°**
- Caster stem angle close to vertical +1/-0° **2°**
- Adjust parking brakes per manufacturer

Clause 8 Final check

- Tighten all fasteners in accordance with manufactures specifications

Clause 9 Set-up procedures for test dummies

- ISO Dummy (use 50 kg)

Test Load Mass kg **99.8**
 lb. **220.0**

Record Max User Mass **99.8 kg (220.0 lb)**

- Seat to back support angle **92°**
- Test dummy equal to max user mass
- Position dummy symmetrically (± 0.4 in (10 mm))
- Test dummy body to seat hinge free
- Test dummy fore-aft position to seat-back angle $\pm 3^\circ$
- Secure test dummy (9.1)
- Wheelchair not deformed in any way (9.1)

WHEELCHAIR PHOTOS

Date of test **1 April 2014**

Wheelchair Make/Model **Free Wheelchair Mission /Gen_3 M**



Figure 1. Front view



Figure 2. Side view

PART 1 – DETERMINATION OF STATIC STABILITY

Date of test **2 April 2014**

Tipping Angle with Test Dummy	Degree
Clause 9.2 Forward - Wheels unlocked and the wheelchair in the least stable configuration	21.6°
Clause 9.3 Forward - Wheels locked and the wheelchair in the least stable configuration	N/A¹
Clause 9.4* Forward - Wheels unlocked and the wheelchair in the most stable configuration	21.6°
Clause 10.3 Rearward – Wheels locked and the wheelchair in the least stable configuration	11.6°
Clause 10.4 Rearward – Wheels unlocked and the wheelchair in the most stable configuration	17.2°
Clause 10.5* Rearward – Wheels locked and the wheelchair in the most stable configuration	11.6°
Clause 11.2 Anti-tip device in the least stable configuration (wheels blocked)	N/A²
Clause 12.1 Lateral – Wheelchair in the least stable configuration	18.0°
Clause 12.2* Lateral – Wheelchair in the most stable configuration	18.0°

*Note: There are no adjustable components that affect stability, therefore the most stable and the least stable positions are the same.

¹ Front wheels do not lock

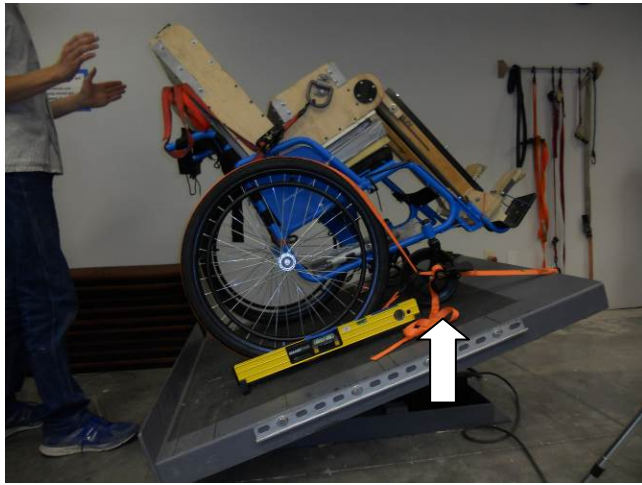
² No anti-tip device on this wheelchair



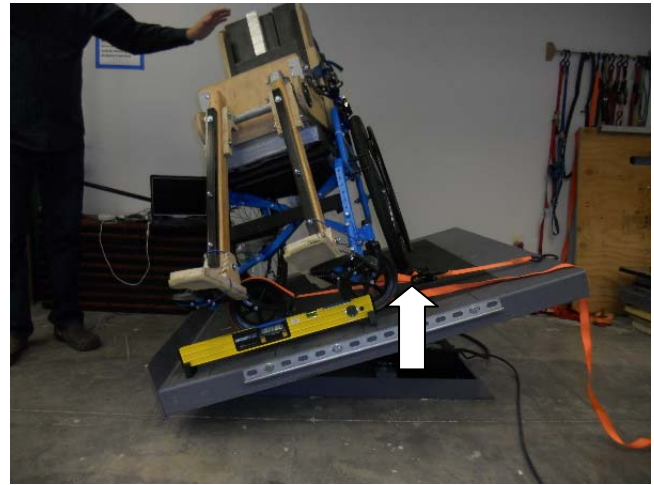
**Figure 3. Clause 9.2 & 9.4
Forward - Wheels unlocked**



**Figure 4. Clause 10.3 & 10.5
Rearward- wheels locked**



**Figure 5. Clause 10.4
Rearward- wheels unlocked**



**Figure 6. Clause 12.1 & 12.2 Lateral –
Wheelchair in the least/most stable configuration**

PART 5 – DETERMINATION OF DIMENSIONS, MASS AND MANEUVERING SPACE

Date of test 1 April 2014

	Dimension without feet	Dimension with feet
Clause 8.2 Full overall length	1196.3 mm (47.1 in)	1341.1 mm (52.8 in)
Clause 8.3 Overall width	693.4 mm (27.3 in)	693.4 mm (27.3 in)
Clause 8.4 Handgrip height	777.2 mm (30.6 in)	777.2 mm (30.6 in)
Clause 8.9 Total mass	19.9 kg (43.8 lb)	19.9 kg (43.8 lb)
Clause 8.11 Pivot width – differential steering	1333.5 mm (52.5 in)	1478.3 mm (58.2 in)
Clause 8.12 Reversing width – tiller steering	N/A	N/A
Clause 8.13 Turning Diameter	1333.5 mm (52.5 in)	1478.3 mm (58.2 in)
Clause 8.14 Ground Clearance	149.9 mm (5.9 in)	149.9 mm (5.9 in)
Clause 8.15 Required width of angled corridor	1104.9 mm (43.5 in)	1249.7 mm (49.2 in)
Clause 8.16 Required doorway entry depth	1440.2 mm (56.7 in)	1440.2 mm (56.7 in)
Clause 8.17 Required corridor width for side opening	1320.8 mm (52.0 in)	1465.6 mm (57.7 in)

N/A = Not Applicable

PART 7 – METHOD OF MEASUREMENT OF SEATING AND WHEEL DIMENSIONS

Date of test 1 April 2014

	Dimension	Number of Positions
Clause 7.3.3 Effective seat depth	467.4 mm (18.4 in)	1
Clause 7.3.4 Seat width	375.9 mm (14.8 in)	1
Clause 7.3.5 Effective seat width	383.5 mm (15.1 in)	1
Clause 7.3.6 Seat surface height at front edge	553.7 mm (21.8 in)	1
Clause 7.3.8 Back support height	289.6 mm (11.4 in) to 442.0 mm (17.4 in)	4
Clause 7.3.9 Back support width	381.0 mm (15.0 in)	1
Clause 7.3.12 Footrest to seat	523.2 mm (20.6 in)	1
Clause 7.3.14 Footrest length	152.4 mm (6.0 in)	1
Clause 7.3.17 Armrest height	190.5 mm (7.5 in)	1
Clause 7.3.18 Front-of-armrest to backrest	228.6 mm (9.0 in)	1
Clause 7.3.19 Armrest length	228.6 mm (9.0 in)	1
Clause 7.3.20 Armrest width	25.4 mm (1.0 in)	1
Clause 7.3.22 Distance between armrests	383.5 mm (15.1 in)	1
Clause 7.3.23 Front location of armrest structure	266.7 mm (10.5 in)	1
Clause 7.3.24 Handrim diameter	492.8 mm (19.4 in)	1
Clause 7.3.25 Propelling wheel diameter	652.8 mm (25.7 in)	1
Clause 7.3.26 Horizontal displacement of wheel axle	12.7 mm (0.5 in)	1
Clause 7.3.27 Vertical displacement of wheel axle	149.9 mm (5.9 in)	1
Clause 7.3.28 Castor wheel diameter	200.7 mm (7.9 in)	1

	Degree	Number of Positions
Clause 7.3.2 Seat plane angle	10°	1
Clause 7.3.7 Back support angle	12°	1
Clause 7.3.15 Footrest-to-leg angle	120°	1
Clause 7.3.16 Leg-to-seat-surface angle	120°	1
Clause 7.3.21 Armrest angle	-4°	1

COMMENTS

The back upholstery is adjustable with four pairs of 2-inch flat nylon webbing. A parachute type cord laces back and forth between the pieces of nylon webbing across the back of the wheelchair. The tension on the back support upholstery was tightened such that the back support tubes are under slight tension toward one another.

The seat support surface is a composite plastic plate that sits on top of three pairs of two-inch flat nylon webbing. A parachute type cord laces back and forth between the pieces of nylon webbing across the seat of the wheelchair. The tension on the seat support upholstery was tightened until the straps were snug between the seat support tube. Then the composite plastic plate was installed over the top of the three pairs of straps.

A test was conducted with the large version of this product to determine the effect of loosening the back support upholstery. It was determined that with the upholstery loose, that the chair tips at an angle that is 2.3° less than it tips with tight upholstery. A similar result would be expected with each of the four sizes of Gen-3 wheelchairs. The manufacturer has agreed to include the following text in the user manual:

The back upholstery is adjustable with four pairs of 2-inch flat nylon webbing. A parachute type cord laces back and forth between the pieces of nylon webbing across the back of the wheelchair. The tension on the back support upholstery should be tightened such that the back support tubes are under slight tension toward one another. Loosening the tension in the back support webbing will result in a slightly increased rearward deflection of the back support upholstery. This will result in a 20% decrease in the rearward stability of the wheelchair. Loosening the back upholstery will make the chair slightly tippier but will make it easier to balance in a wheelie and to perform curb climbing and other wheelchair skills that require wheelies.

The seat upholstery is adjustable with four pairs of 2-inch flat nylon webbing. A parachute type cord laces back and forth between the pieces of nylon webbing across the seat of the wheelchair. The tension on the seat support upholstery should be tightened such that the seat support tubes are under slight tension toward one another.