

## Wheelchair Cushion Testing

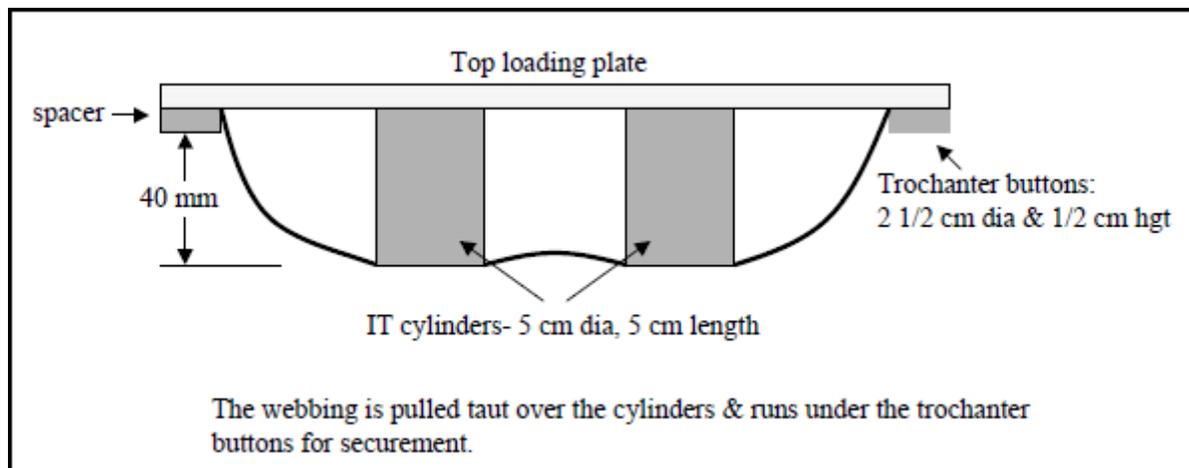
### Modified methodology for ISO 16840-2 loaded contour depth

#### UNICEF 2021 wheelchair tender: cushion standards:

ISO 16840 test reports as listed in the technical specification sheets are recommended. However, due to the limited time available between the call for proposal and date of submission for the 2021 UNICEF global wheelchair tender, the **minimum mandatory** test required is the **loaded contour depth and overload tests** of ISO 16840-2 as modified below. It is strongly recommended that the ageing component of the loaded contour depth test is also included. All cushions shortlisted and considered for the tender will be required to have fully completed both these tests. Please refer to **ISO 16840-2** for details on the **testing apparatus (5.7 Loaded contour indenter (LCI))** and details on **cushion size** for testing (**6.1 Choice of cushion**). However, use the methodology outlined below when performing **11. Loaded contour depth and overload tests**.

**Simulation Tests** Simulation tests are used to measure loaded contour depth and bottoming out using standardized models of the human buttocks known as cushion-loading indentors (CLIs). There are two CLIs that are used for simulation testing, a 25 mm CLI and a 40 mm CLI.

Loaded contour jig- 40 mm version schematic



Loaded contour depth stand & jig in use



**Test method for determining 25 mm and 40 mm of contour depth (mandatory)**

1. Place the test cushion on a flat, horizontal surface. Cushions with curved bases must be stable during contour measurement testing.
2. Align the CLI so that it is centered from the sides of the cushion and so that the ischial tuberosities of the models are 11-15 cm from the rear edge of the cushion. The ischial tuberosity portion of the CLI should be aligned with the analogous portion of the test cushion.
3. Load the CLI to 140 Newton's (31 pounds) & wait 5 minutes.
4. Contact of the lateral buttons indicates that the cushion has contoured to 25 or 40 mm depending on the CLI used.
5. Repeat the test two times waiting 5 minutes between trials

A cushion must pass the respective contour test during all trials to meet the

minimum criteria specified in the cushion definition section.

### **Overload test method for measuring bottoming out (mandatory)**

1. Record the height of the CLI from the horizontal surface at the end of the loaded contour depth test described above.
2. Add 47 Newton's (10 pounds) to the CLI and record the height from the horizontal surface after 1 minute.
3. Subtract the height at overload (#2) from the height at standard load (#1).
4. Round the value in #3 to the nearest 5mm.
5. Remove the overload weight and repeat the test twice, measuring the height in #1 and #2 each time. Wait period is same as above—at each test the first weight is applied, then the overload weight and then the whole thing is removed, wait 5 minutes and repeat.
6. Determine the median of the three values recorded in #4. This is the “overload deflection”.

If the overload deflection is greater than or equal to 5mm, then the cushion is determined not to have bottomed out during the overload test.

### **Simulated use testing (recommended)**

There must be simulation of 12 or 18 months of use of the cushion (depending on the cushion type – open cell foam cushions 12 months and 18 months for all other types of cushions). Following simulated use, the measurements for loaded contour depth and overload as described above must be repeated.

### **Test report (mandatory)**

There must be a report of the tests which includes:

- The name and address of the facility performing the tests and the date(s) of the tests; and

- The manufacturer and brand name/number of the test cushion; and
- The weight of the cushion to the nearest 250 gm; and
- The width and length of the cushion; and
- The temperature and relative humidity of the room where the tests are conducted; and
- Identification of which CLI was used (25 mm or 40mm); and
- The results of the three loaded contour depth tests and the overload deflection test prior to simulated used testing; and
- A description of the method used to simulate cushion use;
- A statement specifying the number of months of use that were simulated; and
- Measurements as described in #7 obtained after simulated use testing; and
- A statement attesting that the testing methodology described in this policy was followed; and
- The printed name and signature of the person performing or supervising the tests and the signature date.

### **Sources of Additional Information**

ANSI/ RESNA Subcommittee on Wheelchair Seating Standards, Wheelchair Seating- Part 2: Test methods for devices that manage tissue integrity - Seat Cushions, ISO16840-2, [www.wheelchairstandards.pitt.edu](http://www.wheelchairstandards.pitt.edu)

Brienza, et al, Seat Cushion Optimization: A comparison of interface pressure and tissue stiffness characteristics for spinal cord injured and elderly subjects, Arch Phys Med Rehabil, April 1998, 79:388-394

California Dept. of Consumer Affairs, Technical Bulletin 117 or 133, Requirements, Test Procedure and Apparatus for Testing the Flame Retardance of Resilient Materials Used in Upholstered Furniture, [www.dca.ca.gov/bhfti/bulletin.htm](http://www.dca.ca.gov/bhfti/bulletin.htm)

Sprigle, et al, Development of uniform terminology and procedures to describe wheelchair cushion characteristics, J Rehabil Res Devel, July/Aug 2001, 38(4):449-461

Sprigle, et al, Reduction of Sitting Pressures with Custom Contoured Cushions, J Rehab

Res Devel, 1990, 27(2):127-134