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WHITE PAPER

AireRx™ AireFlow™ SP and AireFlow™ SPP Cushions
Pressure Distribution Characteristics

Data Preparation and Report Prepared By:
Central Cost Testing, Ben Lomand California. Central Cost Testing is an independent clinical testing laboratory.

Testing Date:
September 8, 2006

Background
A study designed to measure the interface pressure characteristics of five commercially available wheelchair seat cushions was conducted by an independent test facility.

Ulcers in the buttocks area are prevalent among wheelchair users that have limited mobility, decreased sensation or both. Many wheelchair users tend to sit on their cushions for extended periods of time. Previously, high pressures have been identified as one of the principle contributing factors in causing skin ulcers. As a result, cushion selection continues to be focused on decreasing overall and peak pressures during sitting.

This study was designed to establish and observe the characteristics of pressure distribution while using the AireRx™ AireFlow™ SP and AireFlow™ SPP cushions and to compare the AireRx™ products with other comparable commercially available cushions commonly used in clinical practice.

Test Population
A total of three people who are wheelchair users due to Traumatic Brain Injury (TBI), Quadriplegia Spinal Cord Injury (SCI-Q) and Muscular Dystrophy (MD) participated in this study.

Test Equipment / Wheelchair / Seat Cushion
Interface pressure measurements were made using an FSA pressure measurement system (FSA Force Sensitive Applications, Winnipeg, Canada). The accuracy of the FSA system is reported to be within 10%. Figure 1.1 shows an example of the FSA mapping output. The participant either sat in his or her own wheelchair or an Invacare 9000 manual wheelchair that was provided. Test trials consisted of five wheelchair cushions: a ROHO® Quadtro,® (cushion 1), Jay2® Deep (cushion 2), Supracor Contour® (cushion 3), an AireFlow™ SP, and an AireFlow™ SPP cushions. All cushions were set up and adjusted according to the manufacture's recommendations.

Data Analysis
The interface pressure distribution characteristics of each cushion were calculated and compared. For each trial, zones were identified based upon peak pressure readings, palpation during the measurement procedure and anatomical dimensions. The five zones were: the right and left ischial tuberosities (RIT and LIT; 5 readings each), the right and left greater trochanters (Rtroch and Ltroch; 4 readings each), and the sacrum (1-2 readings). For each cushion, the average pressure reading for each zone across the three trials was calculated.

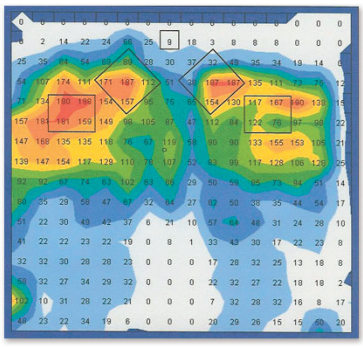
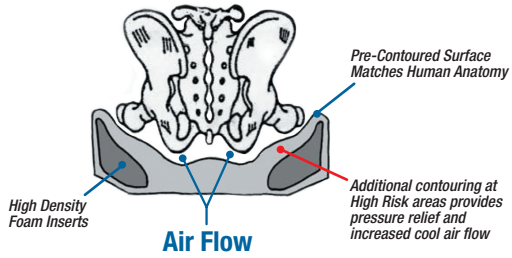


Figure 1.1: Sample Interface Pressure Reading Zones (Example only, not a part of data set.)

AireRx™ Cushion Technology Descriptions

AireRx™ cushion design features:

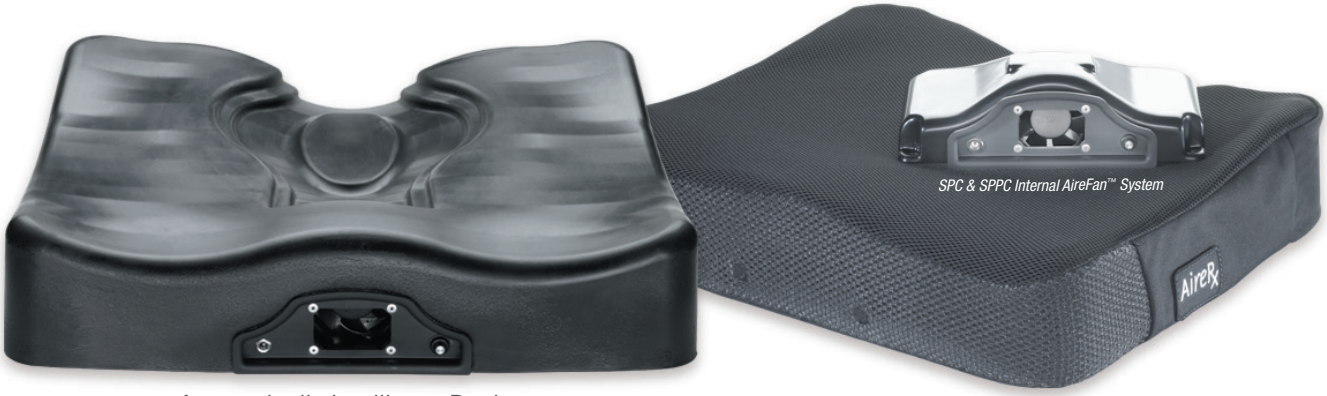


Pressure management on an AireRx™ cushion (as tested) is provided by:

- Pre-contoured anatomical shape—Anatomically Intelligent Design.
- Use of multi-density construction to provide firm support where needed to improve stability and softer support at high-risk areas for skin protection:
  - > Firmer support (higher density) foams under the lateral hip, lateral thigh and medial thigh.
  - > Softer (lower density) foams under the high-risk areas of the ischial tuberosities and greater trochanter/femur.
  - > Additional contoured relief areas under the areas of highest-risk (ischial tuberosities).

Postural Stability on an AireRx™ cushion (as tested) is achieved by:

- The use of a pre-contoured support surface that corresponds with the shape of the human body in a seated position.
- The use of contour and multi-density foam construction:
  - > The use of contour allows for broad base of support by shifting the load to the hip (trochanteric shelf) and leg (femur). Using support at the lateral sections of the pelvis/ hips, provides increased stability.
  - > The use of multi density foam construction, provides firmer support at the sides of the pelvis (areas of lower skin ulcer risk).
- Contoured areas on the cushion surface also provide centering of the pelvis and guidance for the lower extremities. The AireRx™ GU model has the least amount of postural control, stepping up to moderate postural control in the AireRx™ SP model, and aggressive postural control in the AireRx™ SPP model. Higher medial and lateral positioning feature contours are used to achieve the increased levels of postural support.



Anatomically Intelligent Design

(AireRx™ AireFlow™ SP – Shown above with AireFlow™ cover and insert removed.)

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Results

This study demonstrated that both the AireFlow™ SP and AireFlow™ SPP are a comparable option for pressure management compared to other commercially available "high-end" cushions commonly used in clinical practice. (See figure 1.2 – example results graph, and figures 1.3-1.6.) In fact, the data shows that in some cases, the AireFlow™ SP and AireFlow™ SPP perform better than the other tested cushions. (See figure 1.2 – example results graph, and figures 1.3-1.6.) The study data suggests that the best cushion for pressure relief varies with each individual, and that the AireFlow™ SP and AireFlow™ SPP cushions are viable options for pressure management. The pressure distribution characteristics of the AireFlow™ SP and AireFlow™ SPP cushions, combined with their temperature and humidity management features, make them an excellent candidate for people that are at high risk of skin ulcers.

The study may be viewed in its entirity at www.airerx.com.

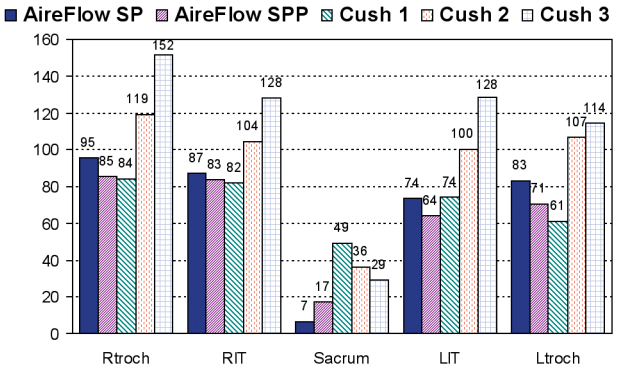

Figure 1.2: Example of Average Interface Pressure Readings

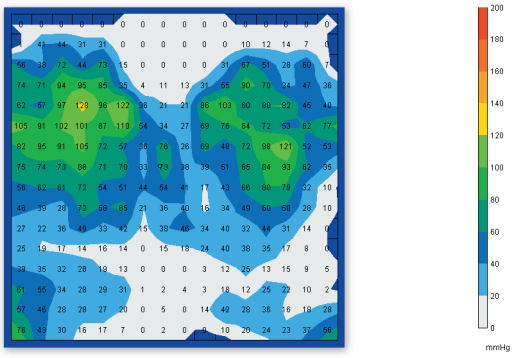

Figure 1.3: Subject 2 on AireFlow™ SPP

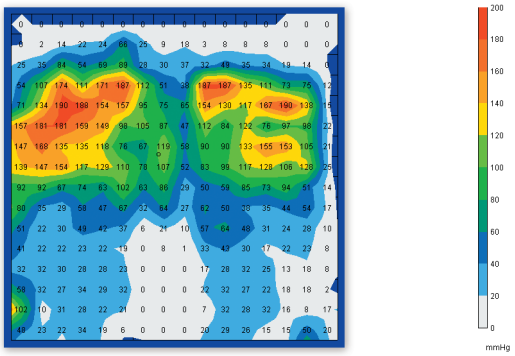

Figure 1.4: Subject 2 on Cushion 3

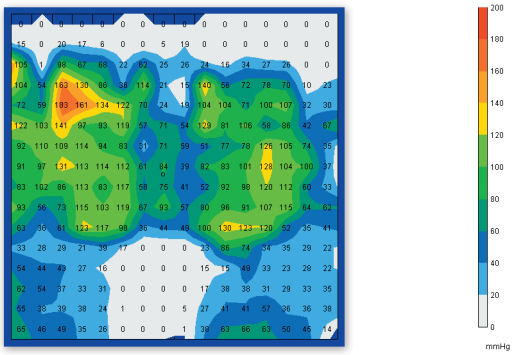

Figure 1.5: Subject 2 on Cushion 2

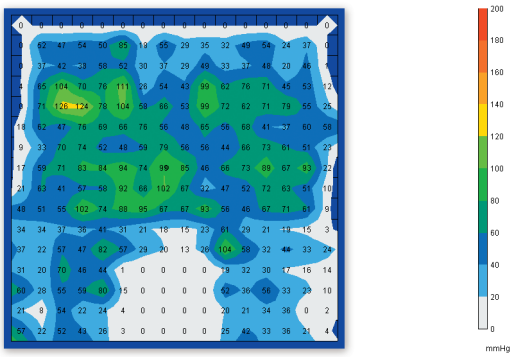

Figure 1.6: Subject 2 on Cushion 1

Wheelchair Cushion Interface Pressure Characteristics
Final Report Summary –
Full report available at www.airerx.com.

Prepared By:
Central Cost Testing
290 Ridge Road
Ben Lomond, California 95005
831.3363621 voice
831.336.8265 fax

Prepared For:
AireRx™ Healthcare, LLC.
1843 Air Lane Drive
Nashville, TN 37210
615.244.3327 voice
615.244.7745 fax

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www.airerx.com

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