
MATTRESS EVALUATION

AN EVALUATION OF THE PRESSURE REDUCING MATTRESSES

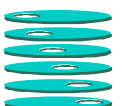
Dynaform Mercury

Softform Premier

Dynaform Saturn

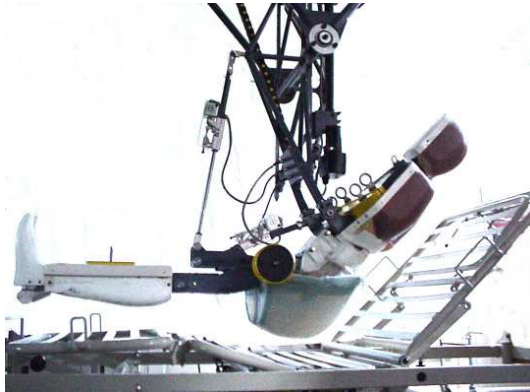
Conformex

17 April 2009



MATTRESS EVALUATION

Pressure distributive properties



UCL Phantom

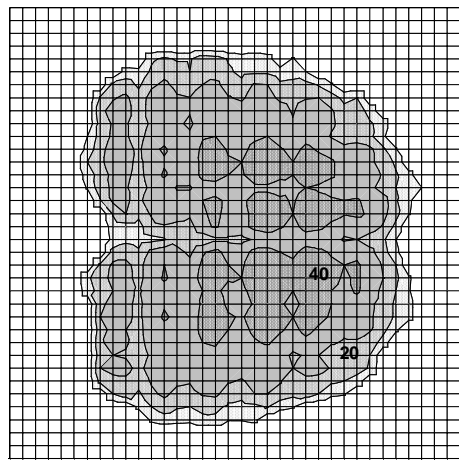
These are assessed using the UCL Phantom (developed by the RAFT Institute), a full technical description of which is published in the scientific literature.¹ This is a life-sized articulated dummy with soft tissues, and bony prominences within. The Phantom has an automated positioning system, which places it in exactly the same way on every mattress. Pressure measurements are made using a highly flexible pressure-mapping array, to locate the peak pressures (which occur in different anatomical regions on different mattresses).

The surface of the Phantom is warmed to 35 °C using special heated and temperature-controlled skin.

Tests are performed with the mattress on a 4-section profiling bed in standard position according to EPUAP draft guidelines, with the backrest inclined to 45°, the gatch section elevated to 20°, and made up with a loose sheet. The phantom is lowered onto the mattress in standard 45° rigid attitude, and then the hip and knee joints are released.

The phantom is left to dwell for 10 minutes on the mattress, to allow for initial stabilisation of the mattress.

Multiple measurements are made, to obtain confidence intervals for the peak pressures in the pelvic and heel regions. Low peak interface pressure is deemed to be the most valid measure of pressure reducing properties according to current evidence at the time of publication.²

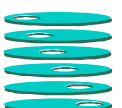


Pressure Map

Pressure maps reveal visually much information besides peak pressure about the way pressure is distributed. A picture of the pressure map is therefore also provided, to allow readers to judge features of the pressure distribution that may be of particular interest to them (eg contact area). The pressure maps are provided either with 10mmHg isobars, or with a sidebar scale to the colour map.

¹ Bain DS, Nicholson N, Scales JT. A Phantom for the Assessment of Patient Support Systems. *Journal of Medical Engineering and Physics*. 21 (1999).293-301

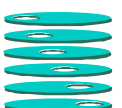
² Bain D, Ferguson-Pell M, McLeod A. Evaluation of mattresses using interface pressure mapping. *Journal of Wound Care* Vol 12, No. 6, June (2003) 231-235.



MATTRESS EVALUATION

Report Outputs, pressure distribution:

- **Peak Interface pressure Pelvic area (95% confidence limits) (mmHg)**
- **Peak Interface pressure Heels (95% confidence limits) (mmHg)**
- **Pressure map (10mmHg Isobars)**



MATTRESS EVALUATION

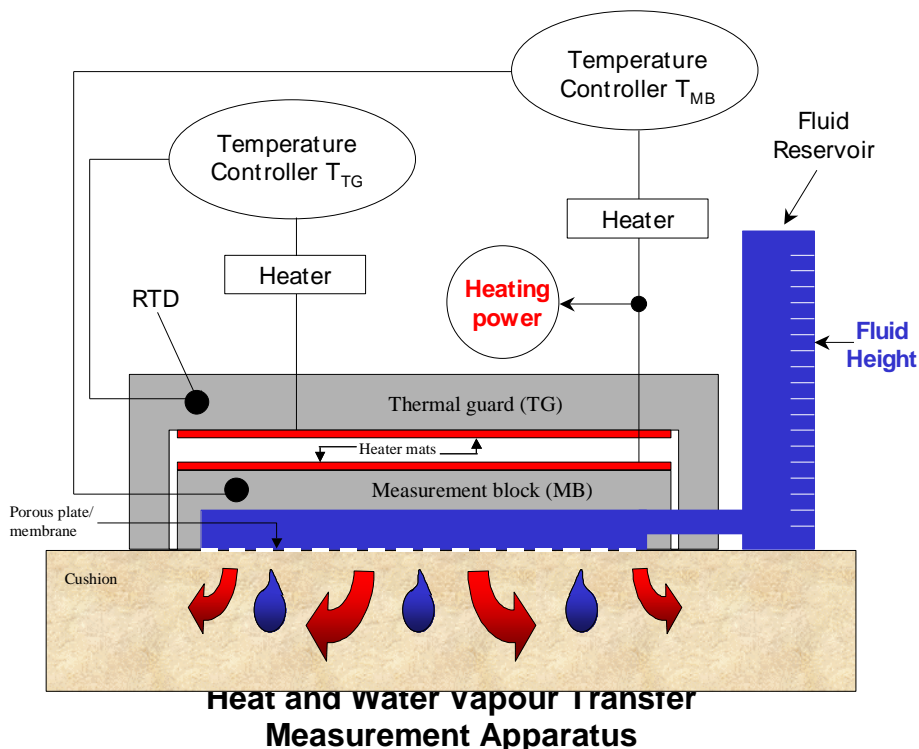
Heat and water vapour transfer properties

The ability of a mattress to dissipate body heat and moisture makes an important contribution to comfort. Excessively moist conditions at the skin/mattress interface are also known to macerate the skin, exacerbating the risk of mechanical damage to the skin.

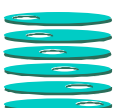
A controlled environment testing facility with a thermal-guarded sweating hot-plate³ is used. This permits accurate measurements to be made of both heat transfer rates and water-vapour transfer rates through the product.

The hot-plate is maintained at constant temperature and humidity at the interface to the mattress, and losses of heat and water vapour into the mattress are electronically monitored simultaneously.

Tests are conducted using the whole mattress construction, complete with cover. It has been shown that surface microclimate is determined by the transfer properties of the entire system, and cannot be inferred from data relating to individual components of the system, such as the cover.



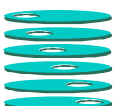
³ Nicholson GP et al. A method for determining the heat and water vapour permeability of patient support systems Medical Engineering and Physics 21 (1999) 701-712.



MATTRESS EVALUATION

Report outputs, heat and water vapour ptransfer properties:

- **Heat Transfer rate ($\text{Wm}^{-2}\text{K}^{-1}$)**
- **Water Vapour Transfer rate ($\text{gm}^{-2}\text{day}^{-1}$)**



MATTRESS EVALUATION

Fatigue Longevity

Mattresses are known to have a finite life-span. Their pressure-distributive properties degrade substantially over a period of years. Significant changes in these properties, if left undetected, may lead to increased risk of pressure ulcers.



Quince 2

Examination of the actual fatigue life of mattresses in service is impractical for the purposes of this protocol.

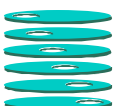
A representative sample of mattresses would have to be monitored in service for several years, by which time the sample would no longer be representative of the mattresses on the market. In the interests of currency, the preferred approach is to subject mattresses to an accelerated, artificial fatigue cycle.

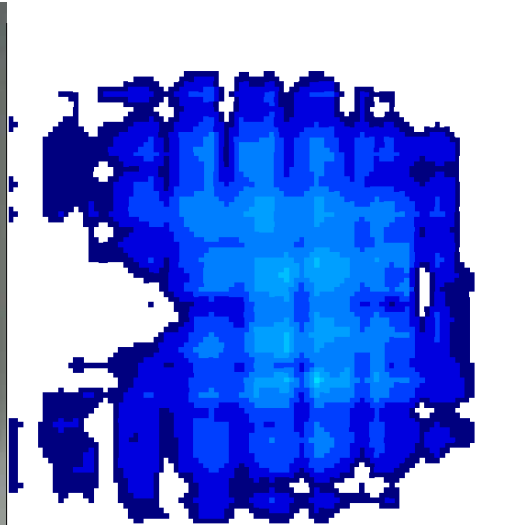
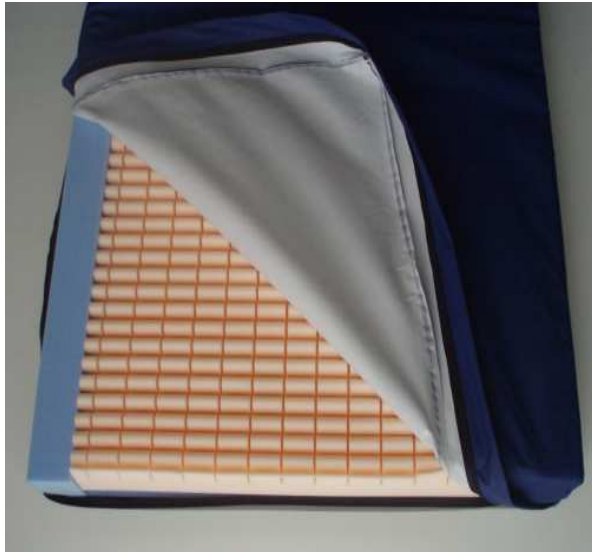
Products undergo 100,000 repetitive indentations using a cylindrical indenter of 80mm diameter. Force-indentation tests using a Quince 2 mattress audit device⁴ (having a matching 80mm cylindrical indenter) quantify changes in mattress properties relative to the starting point. A high percentage indicates a large change in indentation properties after fatigue.

This measure cannot be directly extrapolated to give an estimate of the service life of the mattress, since the fatigue conditions are artificial, and not accurately representative of the fatigue of a mattress in use. It does however allow indicative comparisons to be made between mattresses.

Report Outputs, fatigue longevity:

- **%Change in Quince2 bottoming force after 100,000 indentations**





Pressure Map

Technical Data

Peak Interface Pressure (pelvis)	57 +/-4	mmHg
Peak Interface pressure (heels)	75 +/-7	mmHg
Heat transfer rate	25.2 +/-0.05	Wm ⁻²
Vapour transfer rate	677 +/- 2	gm ⁻² day ⁻¹
Longevity (% reduction Quince after 10 ⁵ cycles)	6%	%
Turning	Rotate only, no turning	

Other Comments

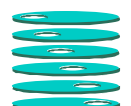
Consists of a U-channel of high resilience combustion modified foam, with an insert of foam into separate squares. Cover access is via a zip on 3 sides, with a protective flap to prevent ingress. Cleaning instructions are marked on the label.

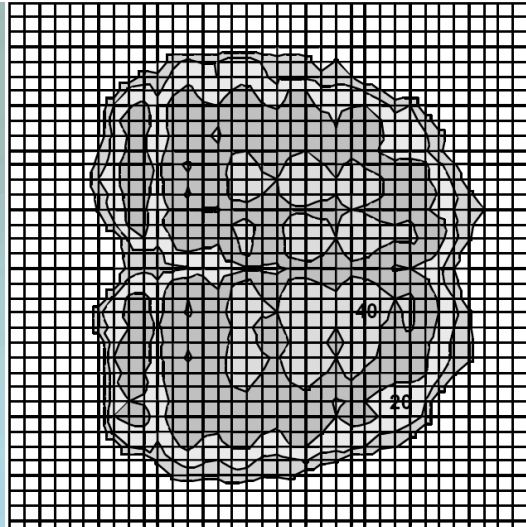
Supplier

Direct Healthcare Services Ltd
 Unit 16, Withey Court
 Western Industrial Estate
 Caerphilly, South Wales
 CF83 1BQ
www.direct-healthcare.org.uk

Evaluation

This report adheres to a standard protocol for evaluation of static mattresses, as described in the document MHRA 03129-0 Pressure Reducing Mattresses, available from MHRA.





Pressure Map
10mmHg isobars, archive data

Technical Data

Peak Interface Pressure (pelvis)	59 +/-6	mmHg
Peak Interface pressure (heels)	76 +/-14	mmHg
Heat transfer rate	24.2 +/-0.1	Wm ⁻²
Vapour transfer rate	679 +/- 3	gm ⁻² day ⁻¹
Longevity (% reduction Quince after 10 ⁵ cycles)	6%	%
Turning	Rotate only, no turning	

Other Comments

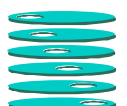
The Softform Premier comprises a U-channel of high resilience combustion modified foam, with an inlaid profiled section comprising squares that compress individually. No flipping required, only rotation. Cover access is via a zip on all four sides, with a protective flap to prevent ingress of fluids. Cleaning instructions are printed on the cover. A space is provided on the cover for audit records.

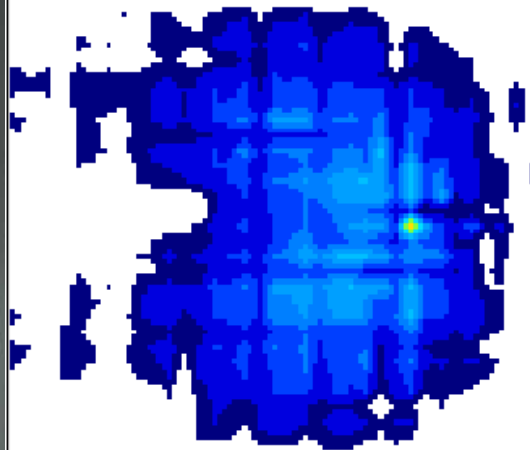
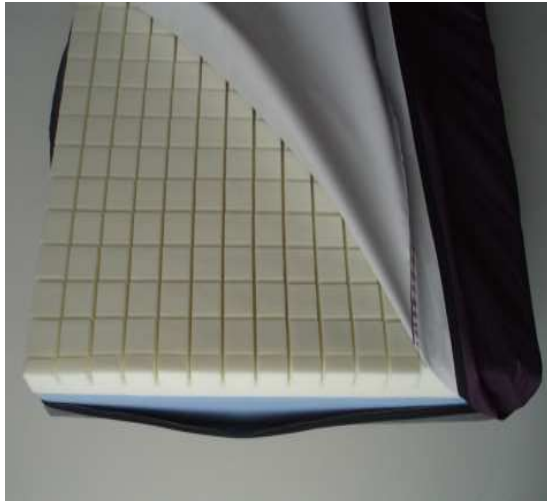
Supplier

MSS
Nantgarw Business Park,
Cardiff CF15 7QU

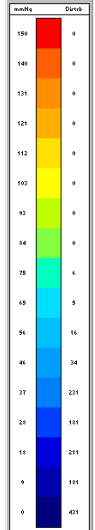
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Pressure Map



Technical Data

Peak Interface Pressure (pelvis)	67 +/-5	mmHg
Peak Interface pressure (heels)	72 +/-8	mmHg
Heat transfer rate	17.9 +/-0.1	Wm ⁻²
Vapour transfer rate	657 +/- 2	gm ⁻² day ⁻¹
Longevity (% reduction Quince after 10 ⁵ cycles)	5%	%
Turning	Rotate only, no turning	

Other Comments

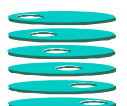
Consists of a base layer of high resilience combustion modified foam, with a top layer of visco-elastic foam, profiled into squares. Cover access is via a zip on 3 sides, with a protective flap to prevent ingress. Cleaning instructions are marked on the cover.

Supplier

Direct Healthcare Services Ltd
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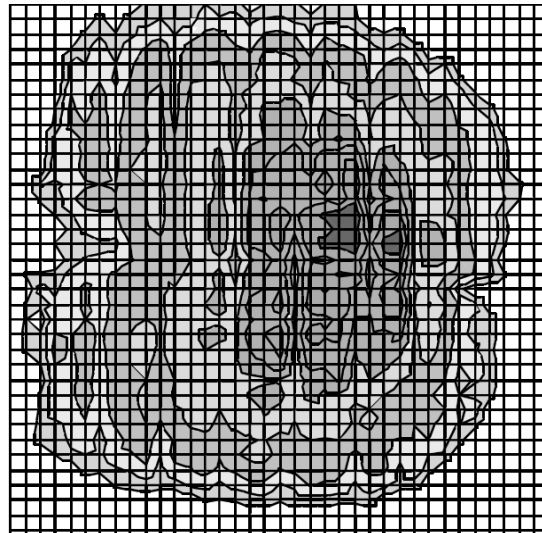
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MATTRESS EVALUATION

Conformex



Pressure Map
10mmHg isobars, archive data

Technical Data

Peak Interface Pressure (pelvis)	88 +/-4	mmHg
Peak Interface pressure (heels)	87 +/-7	mmHg
Heat transfer rate	18.0 +/-0.05	Wm ⁻²
Vapour transfer rate	530 +/- 2	gm ⁻² day ⁻¹
Longevity (% reduction Quince after 10 ⁵ cycles)	7%	%
Turning	Rotate only, no turning	

Other Comments

The Conformex comprises a base layer of high resilience combustion modified foam, with a profiled top layer of viscoelastic foam bonded to the base layer. Cover access is via a zip on two sides , with no protective flap to prevent ingress. Cleaning instructions are printed on the cover. The mattress does not require flipping, but top and bottom are not labelled, and correct orientation is not obvious.

Supplier

Huntleigh Healthcare Ltd
310 - 312 Dallow Road, Luton
Bedfordshire LU1 1TD

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