

DLG Test Report 6357

Advanced Comfort Technology Inc.

DCC Waterbed

Deformability/Elasticity, Permanent Tread Load,
Abrasion, Slip resistance



**ADVANCED COMFORT TECHNOLOGY
DCC WATERBED**

- ✓ Deformability/Elasticity
- ✓ Permanent Tread Load
- ✓ Abrasion
- ✓ Slip resistance

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Test Center
Technology and Farm Inputs

www.DLG-Test.de

Overview

A quality mark “DLG-APPROVED for single value-determining criteria” is awarded to agricultural products which successfully passed a smaller-scope DLG usability test according to independent and recognized evaluation criteria.

The test intends to highlight special innovations and key criteria of the test item. The test can focus on criteria from the DLG testing framework for full tests or on other individual features or qualitative criteria.

The minimum requirements, the test conditions and procedures as well as the evaluation guidelines of the test results are determined in consultation with a DLG expert

group. They comply with the generally recognized technology rules as well as with scientific and agricultural knowledge and requirements.

The successful test concludes with the publishing of a test report and the awarding of a quality mark which is valid for five years following the award date.

The DLG-APPROVED test for single value-determining criteria “Deformability/Elasticity, Permanent Tread Load, Abrasion, Slip resistance” includes technical



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measurements on test stands of the DLG Test Center. The deformability and elasticity, the abrasion resistance, the slip resistance were measured and a permanent tread load was applied. The test was based on the DLG Testing Framework for elastic stable flooring, as of April 2010.

Other criteria were not investigated.

Assessment – Brief Summary

The DCC Waterbed tested here, an elastic floor covering for the resting area in cubicle houses, was investigated with regard to durability and comfort properties on test stands in the DLG-APPROVED test for single

value-determining criteria. The deformability and elasticity of the waterbed, the abrasion resistance, the slip resistance were measured and a permanent tread load was applied.

Table 1:
Overview of results

| Test characteristic | Test result | Bewertung* |
|-------------------------------------|---|------------|
| Deformability and elasticity | | |
| in new condition | 15.3 mm | ++ |
| following endurance test | 16.6 mm | ++ |
| Permanent tread load | | |
| | no lasting deformation | ++ |
| | no appreciable wear | + |
| Abrasion test | | |
| | good wear resistance | + |
| Slip resistance** | | |
| | good slip resistance on dry and wet mat surface | + |

* Evaluation range: ++ / + / o / - / -- (o = standard)

** Evaluation range + / -

The Product

Manufacturer and Applicant

Advanced Comfort Technology Inc., 752 Lois Drive, Sun Prairie, WI 53590

Product:
DCC Waterbed

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www.dccwaterbeds.com

Main dimensions and weight

- Length:
Supplied as sheeting
- Thickness:
approx. 50 mm when filled with water
approx. 9 mm when not filled with water
- Weight:
approx. 10.9 kg/m² when not filled with water

Description and Technical Data

The black DCC Waterbed tested here is an elastic floor covering made of rubber and is intended for use in the resting area of high cubicles in cubicle houses. Supplied as a roll, this stable floor covering is reinforced with synthetic fabrics; top side and underside: fabric impregnated texture. During the production process, the individual resting area is formed between the two layers of reinforced rubber belting. There are two chambers at each individual resting area (waterbed with 120 cm width: front chamber approx. 483 mm x 1000 mm, rear chamber approx. 965 mm x 1000 mm). Each chamber has one filling hole through which the corresponding volume of water is introduced for each resting area (front chamber approx. 15.2 litre (5 gallons) and rear chamber approx. 30.3 litre (9 gallons)). A stainless steel clamp seals each filling hole for the resting area.

Available cubicle width and water fill volume

| Cubicle width | Water fill volume | |
|---------------|---------------------|--------------------|
| | Front chamber | Rear chamber |
| 110.0 cm | approx. 12.30 litre | approx. 24.6 litre |
| 112.5 cm | approx. 13.25 litre | approx. 27.5 litre |
| 115.0 cm | approx. 14.20 litre | approx. 28.4 litre |
| 120.0 cm | approx. 15.20 litre | approx. 30.3 litre |
| 125.0 cm | approx. 15.20 litre | approx. 30.3 litre |
| 130.0 cm | approx. 17.00 litre | approx. 34.0 litre |

Other sizes are available.

The Method

Deformability and elasticity

The deformability is measured in new condition and following permanent tread load using ball penetration tests with a calotte ($r = 120$ mm) and a penetration force of 2,000 N (corresponding to approx. 200 kg).

Permanent tread load

The permanent tread load is measured on a test stand with a round steel foot in the standard test programme with 100,000 alternating loads at 10,000 N (corresponding to approx. 1,000 kg). The steel foot is adapted to the natural conditions as an “artificial cow foot”. The foot has a diameter of

105 mm and therefore a contact area of 75 cm²; the carrying edge of the hoof is simulated by a 5 mm wide ring on the periphery of the sole that projects 1 mm above the rest of the surface.

Abrasion test

In a standardised abrasion test with 10,000 cycles the top cover was grinded with an emery cloth (granulation 280) and a grinding pressure of 500 N (= 8.1 N/cm² surface pressure). The friction element was cooled continuously with water to prevent an influence of the generated heat during the abrasion test. The size of the grinded area was 61,5 cm².

Slip resistance

The measurements were carried out with the ComfortControl test rig of the DLG test centre. A loaded (10 kg) round plastic foot (105 mm diameter, with a contact area of 70 cm², 3 mm wide ring at the periphery of the ground) was pulled with a velocity of 20 mm/s across the mat.

The Test Results in Detail

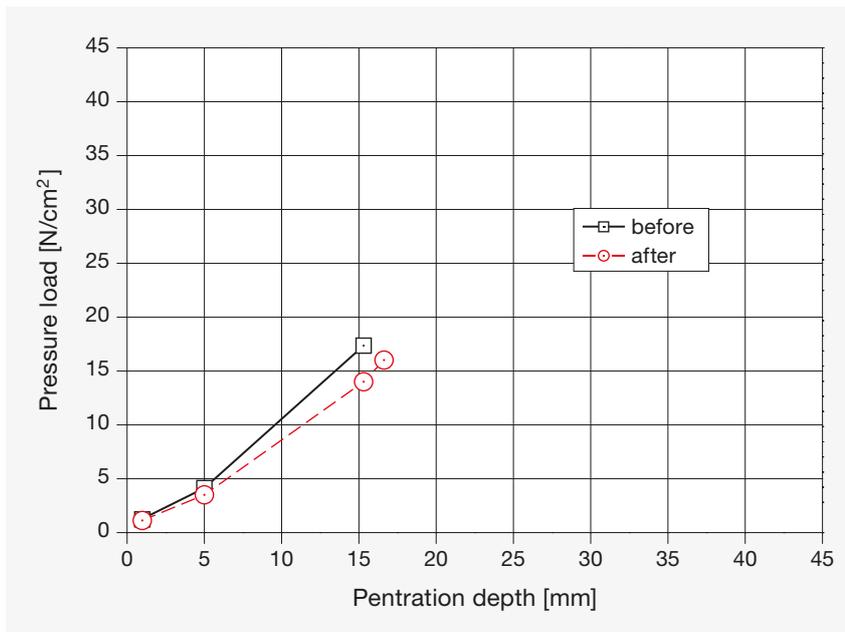


Figure 2:
Deformability as a function of bearing pressure

Deformability and elasticity

In the ball penetration tests in new condition with a calotte ($r = 120$ mm), penetration depth was 15.3 mm. The resulting calculated bearing pressure of 17.3 N/cm² indicates a small load on the carpal joints when lying down and getting up.

Elasticity was measured following a permanent tread load exerted by a steel foot (contact area: 75 cm²) with 100,000 alternating loads at 10,000 N. Following the endurance test, the penetration depth of the calotte increased from 15.3 mm to 16.6 mm. The bearing pressure decreased from 17.3 N/cm² to 16.0 N/cm² (see Fig. 2). This means that deformability and elasticity slightly increase.

Evaluation see Table 1.

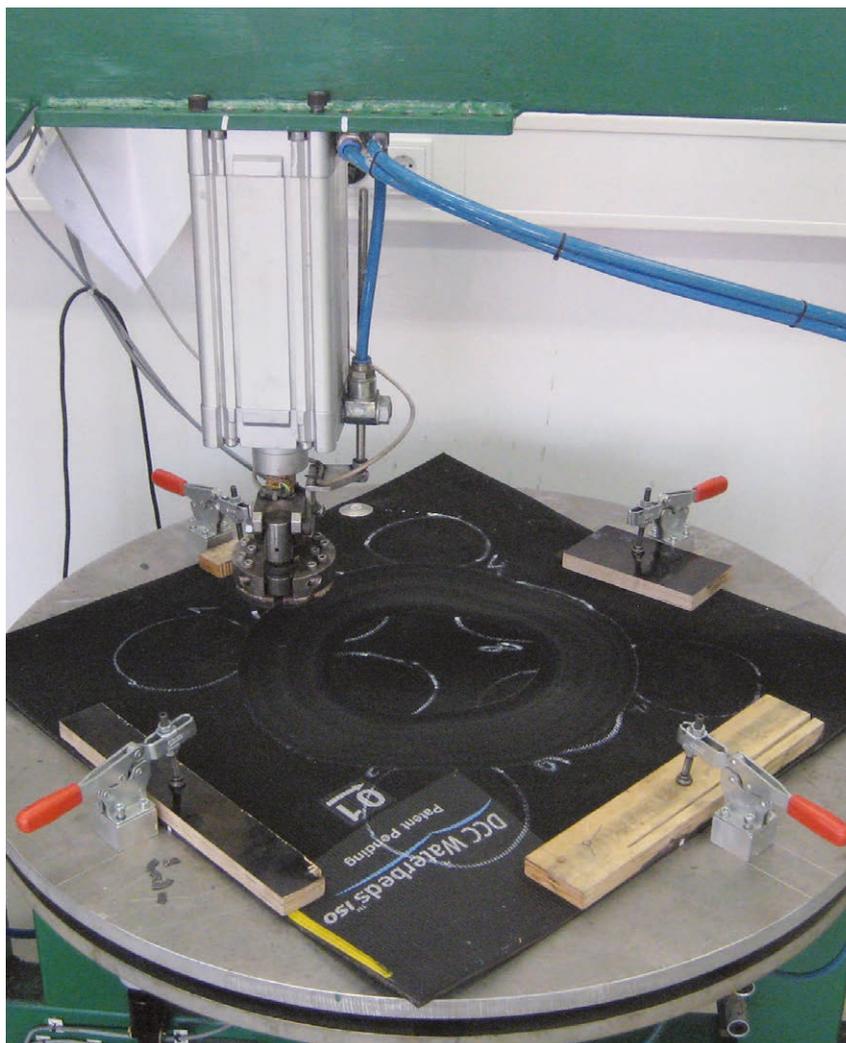


Figure 3:
Permanent tread load

Permanent tread load

No appreciable wear was observed on the waterbed following exposure to permanent tread load on a test stand with 100,000 alternating loads at 10,000 N. No lasting deformation was observed.

Evaluation see Table 1.

Abrasion test

The abrasion depth after 10,000 cycles amounted to 1.0 mm, this corresponds to approximately 22 % of the rubber thickness. Of the ground surface 3.5 grams were rubbed off.

Evaluation see Table 1.

Slip Resistance

The slide pulling tests showed a good slip resistance on the dry or wet rubber mat surface in new condition. The measured friction coefficients (μ) all surpassed the minimal value of $\mu = 0.45$ which speaks for a good foothold.

Evaluation see Table 1.

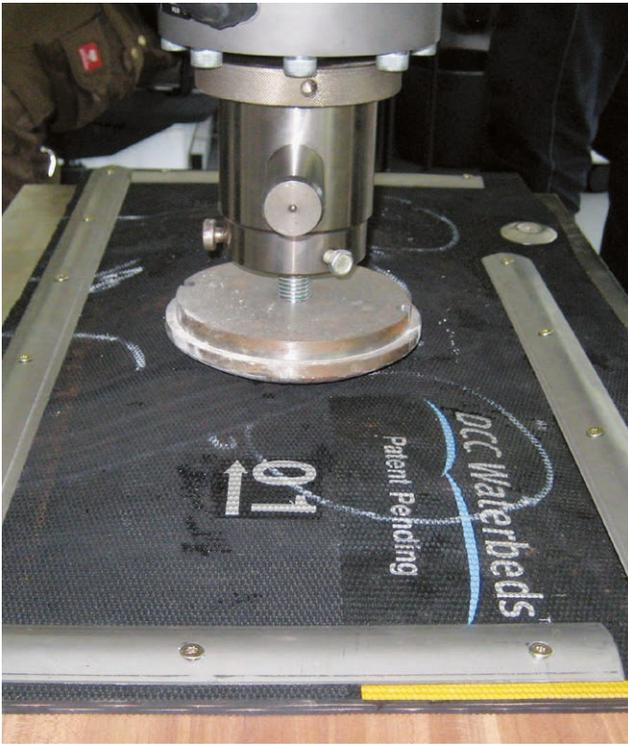


Figure 4:
Measuring the deformability

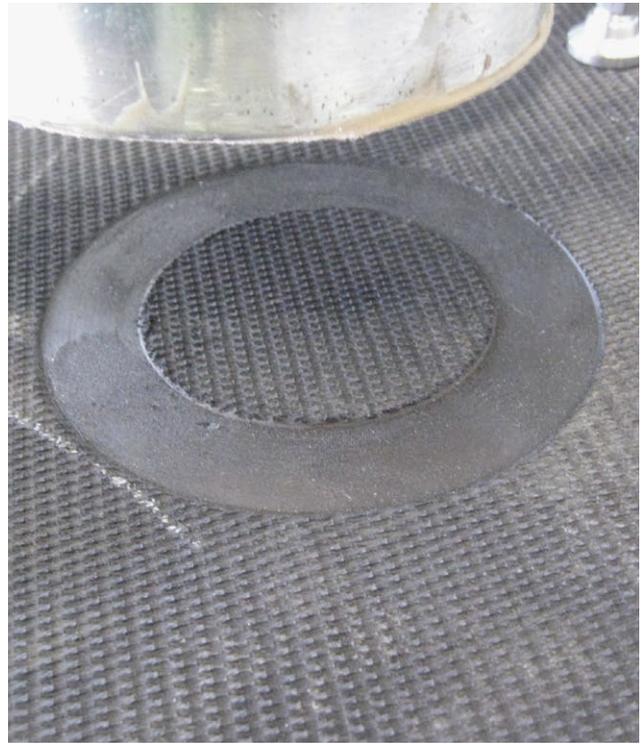


Figure 5:
Test sample after abrasion test

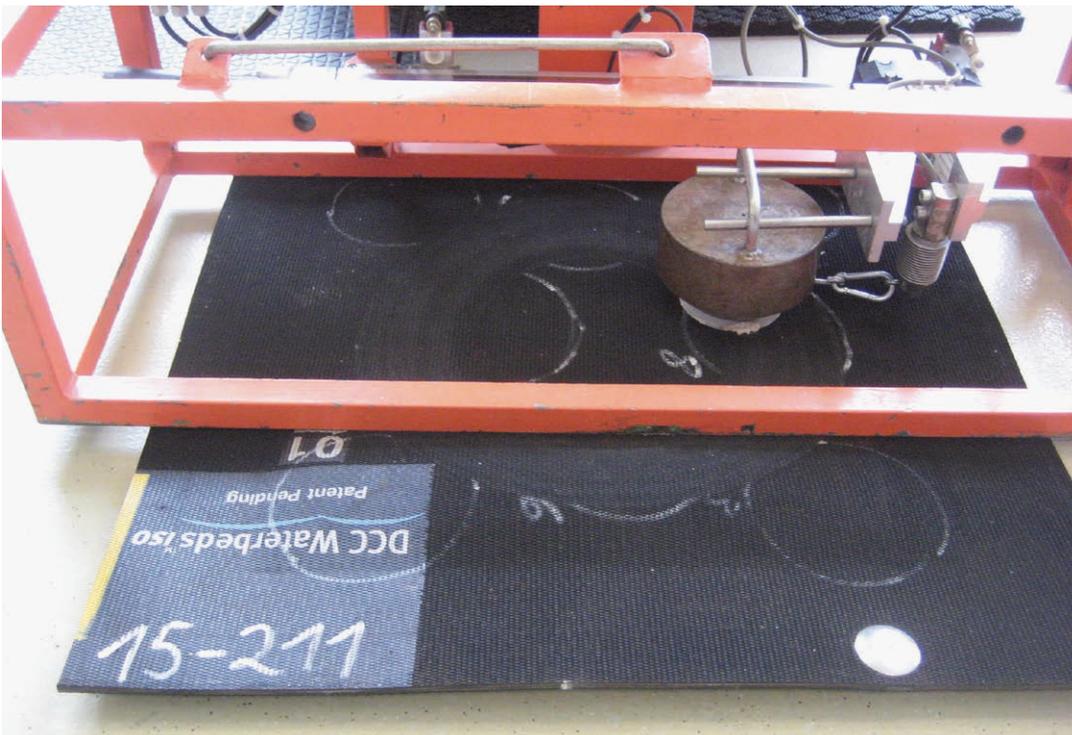


Figure 6:
Slip resistance
measurement

Summary

Based on test-stand investigations, the criteria tested in this DLG-APPROVED test for single value-determining criteria evaluate the

comfort and durability properties of the DCC Waterbed for use in the resting area of high cubicles in cubicle houses.

The tested DCC Waterbed met the requirements of the Testing Framework with respect to the investigated criteria.

Further Information

Further test results for cubicle flooring are available to download at: www.dlg-test.de/stalleinrichtungen

The relevant DLG committees have published various instruction leaflets on the topics of animal welfare and cattle farming. These are available free of charge in PDF format at: www.dlg.org/merkblaetter.html

Test execution

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DLG Testing Framework

DLG-APPROVED test for single value-determining criteria "Elastic Stable Flooring" (as at 04/2010)

Field

Indoor operations

Project manager

Dipl.-Ing. agr. Susanne Gäckler

Test engineer(s)

Dr Harald Reubold*

* Reporting engineer

The DLG

In addition to conducting its well-known tests of agricultural technology, farm inputs and foodstuffs, the DLG acts as a neutral, open forum for knowledge exchange and opinion-forming in the agricultural and food industry.

Around 180 full-time staff and more than 3,000 expert volunteers develop solutions to current problems. More than 80 committees, working groups and commissions form the basis for expertise and continuity in technical work. Work at the DLG includes the preparation of technical information for the agricultural sector in the form of instruction leaflets and working documents, as well as contributions to specialist magazines and books.

The DLG organises the world's leading trade exhibitions for the agriculture and food industry. In doing so, it helps to discover modern products, processes and services and to make these transparent to the public.

Obtain access to knowledge advancement and other advantages, and collaborate on expert knowledge in the agricultural industry! Please visit http://www.dlg.org/membership_agriculture.html for further information.

The DLG Test Center for Technology and Farm Inputs

The DLG Test Center Technology and Farm Inputs in Groß-Umstadt sets the benchmark for tested

agricultural technology and farm inputs and is the leading provider of testing and certification services for independent technology tests. With the latest measurement technology and practical testing methods, the DLG's test engineers carry out testing of both product developments and innovations.

As an EU-notified test laboratory with multiple accreditations, the DLG Test Center Technology and Farm Inputs provides farmers and practitioners with important information and decision-making aids, in the form of its recognised technology tests and DLG tests, to assist in the planning of investments in agricultural technologies and farm inputs.

15-211
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