

# DLG Test Report 7107

Advanced Comfort Technology Inc.

## DCC Waterbed for Cubicles

Deformability/Elasticity, Permanent Tread Load, Abrasion, Slip resistance, Acid resistance, Cleaning distance



**ADVANCED COMFORT TECHNOLOGY  
DCC WATERBED**

- ✓ Deformability/Elasticity
- ✓ Permanent Tread Load
- ✓ Abrasion
- ✓ Slip resistance
- ✓ Acid resistance
- ✓ Cleaning distance

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## Overview

A test mark „DLG-APPROVED for individual criteria“ is awarded for agricultural products which have successfully fulfilled a scope-reduced usability testing conducted by DLG according to independent and recognised evaluation criteria. The test is intended to highlight particular innovations and key criteria of the test object. The test may contain criteria from the DLG test scope for overall tests, or focus on other value-determining characteristics and properties of the test subject.

The minimum requirements, test conditions and procedures as well as the evaluation bases of the test results will be specified in consultation with an expert group of DLG. They correspond to the recognised rules of technology, as well as scientific and agricultural knowledge and requirements. The successful testing is concluded with the publication of a test report, as well as the awarding of the test mark which is valid for five years from the date of awarding.

The DLG Approved Test “Deformability/Elasticity, Permanent Tread Load, Abrasion, Slip resistance, Acid resistance, Cleaning distance” includes technical measurements on test stands of the DLG Test Center. The deformability and elasticity, the abrasion resistance, the slip resistance, the acid resistance, the cleaning distance 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 and DIN 3763:2020-04 (Elastic floorings for cattle and dairy cows walking and rest surfaces – Requirements and testing). Other criteria were not investigated.



### ADVANCED COMFORT TECHNOLOGY DCC WATERBED

- ✓ Deformability/Elasticity
- ✓ Permanent Tread Load
- ✓ Abrasion
- ✓ Slip resistance
- ✓ Acid resistance
- ✓ Cleaning distance

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## Assessment in brief

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 Focus Test. The deformability and elasticity of the cubicle mat, the abrasion resistance, the slip resistance, the acid resistance, the cleaning resistance were measured and a permanent tread load was applied.

Requirements of DIN 3763 are fulfilled.

Deformation and Elasticity corresponds to class 2 DIN 3763.

Table 1:  
Assessment in brief

| DLG QUALITY PROFILE                                   | Evaluation* |
|---|-------------|
| Deformability and elasticity in new condition         | ■ ■ ■ ■ ■   |
| Deformability and elasticity following endurance test | ■ ■ ■ ■ ■   |
| Lasting deformation following endurance test          | ■ ■ ■ ■ ■   |
| Wear following endurance test                         | ■ ■ ■ ■ □   |
| Abrasion/Wear resistance                              | ■ ■ ■ ■ □   |
| Resistance to HD cleaner flat jet nozzle              | ■ ■ ■ □ □   |
| Resistance to HD cleaner dirt cutters                 | ■ ■ ■ □ □   |
| Resistance to feed acid mixture                       | ■ ■ ■ ***   |
| Resistance to uric acid                               | ■ ■ ■ ***   |
| Resistance to sulfurous acid                          | ■ ■ ■ ***   |
| Resistance to ammonia                                 | ■ ■ ■ ***   |
| Resistance to barn disinfectants                      | ■ ■ □ ***   |
| Resistance to peracetic acid                          | ■ ■ □ ***   |
| Slip resistance                                       | ■ ■ **      |

DLG Evaluation range:

\* ■ ■ ■ or better = meets, exceeds or significantly exceeds the established DLG standards, ■ ■ = meets the legal requirements for marketability, ■ = failed

\*\* Single criteria slip resistance: ■ ■ = passed, ■ = failed

\*\*\* Single criteria acid resistance: ■ ■ ■ = resistant, ■ ■ = limited resistant, ■ = failed

## The Product

### Manufacturer and Applicant

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North America

Product:  
DCC Wasserbett

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### Distribution

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Zeppelinlaan 3, 9207 JG Drachten, Nederlande  
Telephone 0031 (0)5122 37801  
sales@spinder.nl

### Description and technical data

The black DCC waterbed tested here made of rubber is an elastic floor covering in the lying area for high-cubicles.

The barn flooring is available as rolled goods and is reinforced with synthetic fabrics. Surface and bottom: impregnated tissue structure.

During the production process arises between the two layers of the fabric, the individual berth, whereby two chambers per berth arise. The two chambers (waterbed with 120.0 cm width: front chamber approx. 483 mm x 1000 mm, rear chamber approx. 965 mm x 1000 mm) are provided with one filling opening each. Through this openings, for each chamber, the corresponding amount of water (front chamber approx. 15.2 litres, rear chamber approx. 30.3 litres). Close two stainless steel clamps filling openings for the two chambers.

Table 2:  
Main dimensions and weight

|  |                                |
|--|--------------------------------|
| <b>Length</b>                          | rolled goods                   |
| <b>Thickness with water filling</b>    | approx. 50 mm                  |
| <b>Thickness without water filling</b> | approx. 9 mm                   |
| <b>Weight without water filling</b>    | approx. 10.9 kg/m <sup>2</sup> |

Table 3:  
Available box width and water filling

| box width | water filling       |                     |
|-----------|---------------------|---------------------|
|           | front chamber       | rear chamber        |
| 110.0 cm  | approx. 12.30 liter | approx. 24.60 liter |
| 112.5 cm  | approx. 13.25 liter | approx. 27.50 liter |
| 115.0 cm  | approx. 14.20 liter | approx. 28.40 liter |
| 120.0 cm  | approx. 15.20 liter | approx. 30.30 liter |
| 125.0 cm  | approx. 15.20 liter | approx. 30.30 liter |
| 130.0 cm  | approx. 17.00 liter | approx. 34.00 liter |

## 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).

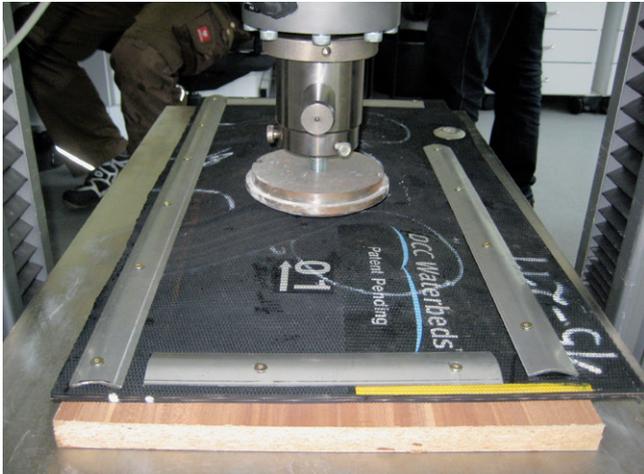


Figure 2:  
Deformation measurement

### 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 cm<sup>2</sup>; 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/cm<sup>2</sup> surface pressure). The friction element was cooled continuous with water to prevent an influence of the generated heat during the abrasion test. The size of the grinded area was 61,5 cm<sup>2</sup>.

### 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 75 cm<sup>2</sup>, 3 mm wide ring at the periphery of the ground) was pulled with a velocity of 20 mm/s across the mat.

### Acid resistance

A permanent dipping test in accordance to DIN EN ISO 175:2000 (performance of synthetic material against liquid chemicals) was carried out. Test samples (size 30 x 30 mm) were completely dipped into different test liquids for 24 hours and 28 days (room temperature 20° Celsius). In the 28 days test the liquids were changed weekly. After the 28 days the samples were washed with distillate water and dried for 24 hours. Before and after the dipping the weight, the dimensions and the shore hardness (shore A) of the test samples were measured. Additional visual evaluation was done for alterations like colour changing, swelling, destruction or crystallisation. All samples were evaluated in comparison to the standard water.

### Cleaning distance

In test stand trials with a high pressure cleaner (approximately 145 bar, exposure period 1 minute with a 25° flat jet nozzle and a coarse dirt remover) the distance was measured where no damage occurs.

## Detailed account of the test results

### 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/cm<sup>2</sup> indicates a low 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:  $75$  cm<sup>2</sup>) 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/cm<sup>2</sup> to  $16.0$  N/cm<sup>2</sup> (see Fig. 3). This means that deformability and elasticity slightly decrease.

### Permanent tread load

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

### 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. The abrasion depth and the slight grit implicate a good wear resistance of the water bed.

### 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 ( $\mu$ ) surpassed the minimal value of  $\mu = 0,40$  (DIN 3763) and  $\mu = 0.45$  (DLG test program).

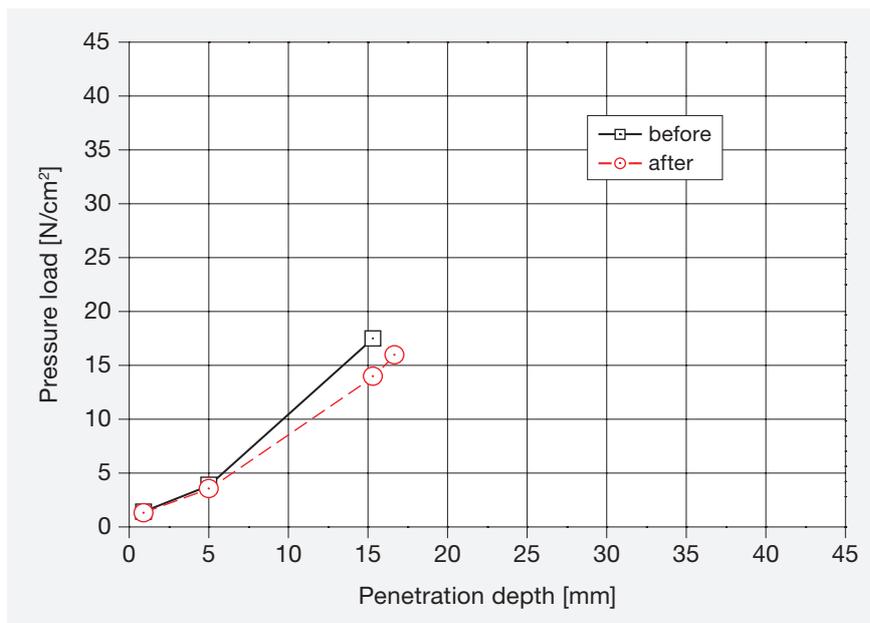


Figure 3:  
Deformability as a function of bearing pressure

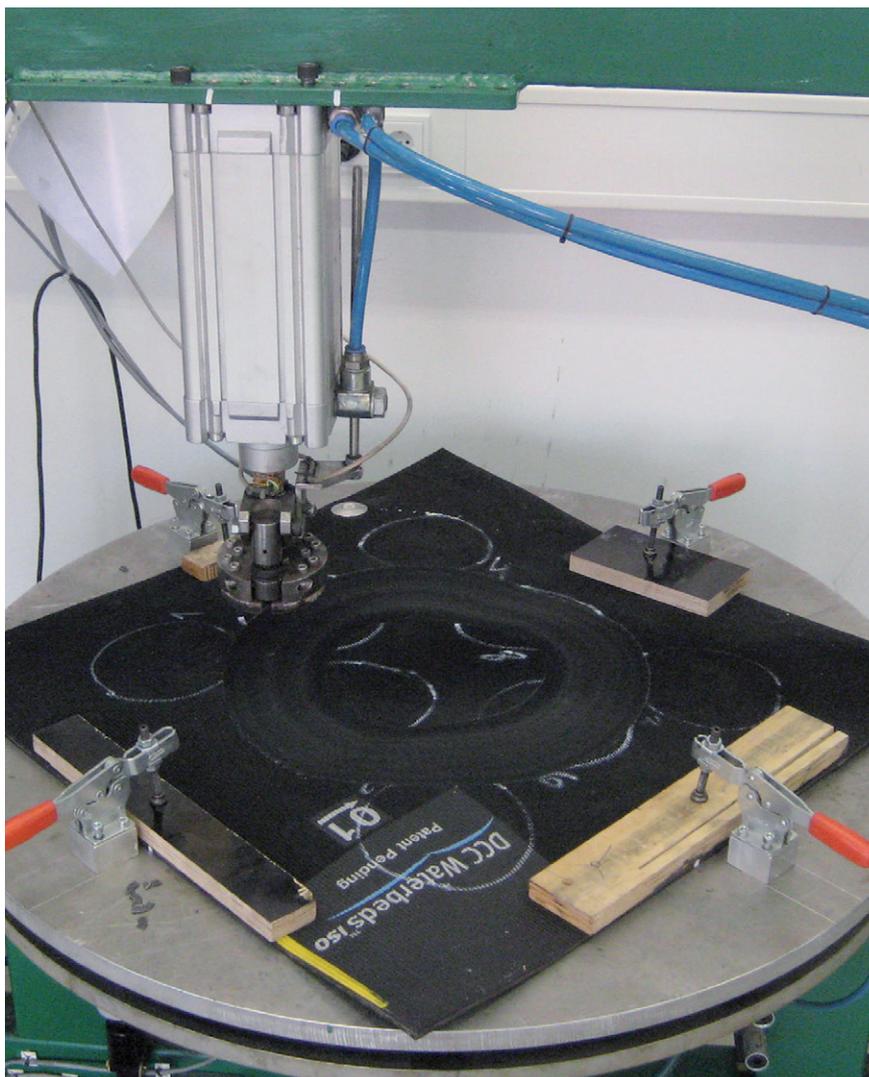


Figure 4:  
Permanent tread load



Figure 5:  
test sample after abrasion test

### Acid resistance

The rubber mat was resistant against feed acid mixture and excrement acids and limited resistant against barn desinfection liquid and peracetic acid.

The differences in weight, thickness and Shore A hardness between the acid treated and not acid treated samples were with feed acid mixture and excrement acids minor and lay in the range of water as standard. Against the used liquids the rubber mat seems to be suited for the described use.

### Cleaning distance

In test stand trials with a high pressure cleaner damage to the water bed only occurred when a minimum distance of 40 cm (with a coarse dirt remover) and 25 cm (with a flat-jet nozzle) was not kept.

For cleaning and disinfection of the floor cover, only the cleaning agents permitted by the manufacturer should be used.

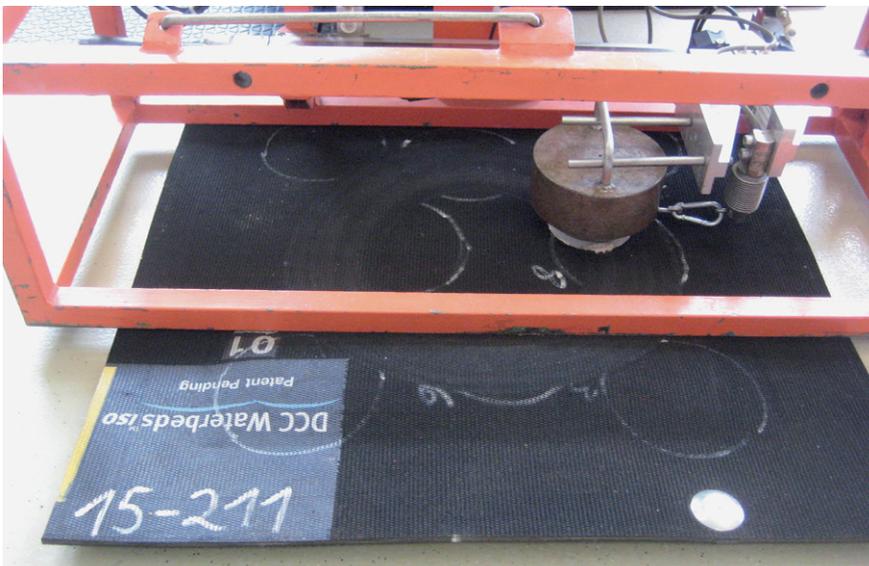


Figure 6:  
Slip resistant measurement



Figure 7:  
Test samples after acid test

Table 4:  
Test liquids and results – acid resistance

| Test liquid                | Concentration  | Result after 24 hours residence time | Result after 28 days residence time                                    | Evaluation        |
|----------------------------|--|--------------------------------------|--|-------------------|
| <b>Feed acid mixture</b>   |  |                                      |  |                   |
|                            | concentrate, pH 2  | no changing                          | no changing  | resistant         |
| <b>Excrement acids</b>     |  |                                      |  |                   |
| Uric acid                  | saturated urea solution (0,4 %)                            | no changing                          | no changing  | resistant         |
| Sulfurous acid             | 5-6 % SO <sub>2</sub>                                      | no changing                          | no changing  | resistant         |
| Ammonia solution           | 32 % solution  | no changing                          | no changing  | resistant         |
| <b>Disinfection liquid</b> |  |                                      |  |                   |
| Barn Disinfection liquid   | 2%-solution of a product with formic acid and glyoxyl acid | no changing                          | slight bubble formation on the bottom of the mat                       | limited resistant |
| Peracetic acid             | 3000 ppm   | colour change                        | change in material thickness; Shore hardness and weight around 10-15 % | limited resistant |



Figure 8:  
Cleaning distance test

## Summary

Based on test-stand investigations, the criteria tested in this DLG Approved Test 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 DIN 3763 and the DLG Testing Framework with respect to the investigated criteria.

## Further information

### Testing agency

DLG TestService GmbH,  
Gross-Umstadt location

The tests are conducted on behalf of DLG e.V.

### DLG test framework

DLG Testing Framework for elastic stable flooring,  
as of April 2010

DIN 3763:2020-04 (Elastic floorings for cattle and  
dairy cows walking and rest surfaces – Requirements  
and testing)

### Department

Betriebsmittel

### Division head

Dr. Michael Eise

### Test engineer(s)

Dr. Harald Reubold\*

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## DLG – the open network and professional voice

Founded in 1885 by the German engineer Max Eyth, DLG (Deutsche Landwirtschafts-Gesellschaft – German Agricultural Society) is an expert organisation in the fields of agriculture, agribusiness and the food sector. Its mission is to promote progress through the transfer of knowledge, quality standards and technology. As such, DLG is an open network and acts as the professional voice of the agricultural, agribusiness and food sectors.

As one of the leading organisations in the agricultural and food market, DLG organises international trade fairs and events in the specialist areas of crop production, animal husbandry, machinery and equipment for farming and forestry work as well as energy supply and food technology. DLG's quality tests for food, agricultural equipment and farm inputs are highly acclaimed around the world.

For more than 130 years, our mission has also been to promote dialogue between academia, farmers and

the general public across disciplines and national borders. As an open and independent organisation, our network of experts collaborate with farmers, academics, consultants, policymakers and specialists in administration in the development of future-proof solutions for the challenges facing the agriculture and the food industry.

### Leaders in the testing of agricultural equipment and input products

The DLG Test Center Technology and Farm Inputs and its test methods, test profiles and quality seals hold a leading position in testing and certifying equipment and inputs for the agricultural industry. Our test methods and test profiles are developed by an independent and impartial commission to simulate in-field applications of the products. All tests are carried out using state-of-the-art measuring and test methods applying also international standards.

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