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## Analytical Report
## TCD – 200921

**Method:** Moving Sled on a Stationary Plane

**Instrument:** TCD225 Digital Force Tester

**Sample(s):** Textile against Hardwood and Ceramic

**Customer:** Pro Shoe Covers USA, Inc.
211 10th Avenue South, Nampa ID 83651

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**Date:** 21 September 2020

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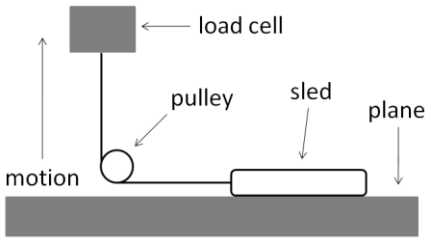
# MOVING SLED ON A STATIONARY PLANE

## Principle

This test method is used to determine the static and dynamic coefficients of friction.

Static coefficient of friction: the ratio of the force required to move one surface over another to the total force applied normal to those surfaces, at the instant motion starts.[1]

Dynamic coefficient of friction: the ratio of the force required to move one surface over another to the total force applied normal the those surfaces, once that motion is in progress.[1]




The Digital Force Tester and load cell used to perform the testing have the following specifications:

| | |
|---|---|
| Maximum force | 2,500gf |
| Force resolution | 0.2gf |
| Maximum displacement | 510mm |
| Displacement resolution | 0.01mm |
| Speed | 0.01 to 1 270mm/min |

## Standards and Practices

Testing was performed in accordance with ASTM D1894 except for the following:

- the samples were not plastic film and sheeting
- small coupons (textile) were cut in 2.5”x4.5” in order to fit on the test area of the planes (hardwood, ceramic)

## Instrument and Software

TCD225 Digital Force Tester from AMETEK/Chatillon; software version 1.13.

## Specimens

Textile (QTY 10), hardwood (QTY 4: 10”x5”x0.5”) and ceramic (QTY 5: 10”x5”x0.25”).

A fresh coupon of textile was used for each of the repeats. One of the hardwood planes was used twice.

## Test Conditions and Parameters

The following parameters were used:

| | |
|---|---|
| Speed (mm/min) | 150 |
| Travelled distance (mm) | 130 |
| Material - Sled | Textile |
| Material - Plane | Hardwood, Ceramic |
| Weight – Sled+Sample (g) | 203.3 to 203.7 |
| Cleaning - Sled | None |
| Cleaning - Plane | IPA |
| Temperature | 21-23°C |
| Relative humidity | 45-48% |

## Results

Note 1: The results relate only to the tested items. Samples were tested under laboratory conditions and environment. The use, interpretation and extrapolation of the results are customer's sole responsibility and liability.
Note 2: Customer requested the "moving sled on stationary plane" technique be used. Customer provided all the material.
Note 3: Textile against hardwood: stick and slip behaviour was observed.

The measured values of static coefficient of friction ($\mu_s$) and kinetic coefficient of friction ($\mu_k$) are tabulated below with their averages and standard deviations.

| Static COF $\mu_s$ | Repeat #1 | Repeat #2 | Repeat #3 | Repeat #4 | Repeat #5 | Average |
|---|---|---|---|---|---|---|
| Textile vs Hardwood | 1.111 | 1.401 | 1.151 | 1.392 | 1.674 | **1.346** ± 0.227 |
| Textile vs Ceramic | 1.029 | 0.904 | 0.950 | 0.840 | 0.811 | **0.907** ± 0.087 |

| Dynamic COF $\mu_k$ | Repeat #1 | Repeat #2 | Repeat #3 | Repeat #4 | Repeat #5 | Average |
|---|---|---|---|---|---|---|
| Textile vs Hardwood | 0.801 | 0.835 | 1.043 | 0.735 | 1.058 | **0.894** ± 0.147 |
| Textile vs Ceramic | 0.968 | 0.853 | 0.866 | 0.762 | 0.815 | **0.853** ± 0.076 |

## General comments pertaining to friction testing

The repeatability of tests on the same material will depend upon material homogeneity, machine and material interaction[2].

It is important to keep in mind that friction is a system property. Appropriate caution must be used when comparing or using data from different sources and systems. Friction coefficients of material couples obtained on one type of test apparatus may be significantly different from coefficients of the same material couples tested on a different apparatus[2].

Data obtained by this procedure may be extremely sensitive to the age of the film or sheet and the condition of the surfaces. It is sometime meaningless to compare slip and friction properties of films or sheets produced at different times, unless it is desired to study this effect.[1]

Reference 1: ASTM D1894 Standard Test Method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheeting
Reference 2: ASTM G115 Standard Guide for Measuring and Reporting Friction Coefficient

END OF REPORT