



Testing of Anti-Slip Device

Test items: **Yaktrax Walker®**
Yaktrax Pro®

Type: **Anti-slip device for outdoor footwear on ice and snow**

Customer: **TTH-Import**
Kaivokatu 29 A 26
06100 Porvoo
Finland

Applied methods: **Ergonomics 32 (1989), 979-995**
Int. J. Ind. Ergon. 16 (1995), 191-200
EN ISO 20344:2004

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1. Description and identification of test item

Yaktrax Walker®: Anti-slip device consisting rubber band frame, traction device is made up of four separate spiral shaped steel coils (diameter of the coil wire 1.2 mm). Coils are covering the whole sole area of the footwear attached to the device

Yaktrax Pro®: Same constructions as Walker expect that the diameter of coil wire was 1.4 mm and the added Velcro strap fastening in the ball area.

Owner of the trademarks: Yaktrax Inc., 9300 SW Barney White Road, Suite 100, Port Orchard, WA 98367, USA. The device is manufactured in China.

2. Scope of testing

2.1 Sampling and conditioning

Test items were supplied by the customer in April 2005. The samples were intact. The samples were stored in ambient conditions.

2.2 Testing

The samples were tested at the Department of Physics in June - July 2005.

2.2.1 Slip resistance on ice

The slip resistance, i.e. the coefficient of kinetic friction, of the anti-slip device was determined with an apparatus (a stationary slip simulator) described in Ergonomics 32 (1989) 979-995 and in International Journal of Industrial Ergonomics 16 (1995) 191-200.

Vertical force (500 ± 20 N) and horizontal sliding velocity ($0,40 \pm 0,02$ m/s) were adjusted by using the reference shoe (REF, size 42) without the anti-slip device. The surface of ice was smooth and the temperature was $-5 \text{ °C} \pm 1 \text{ °C}$ during the tests. Friction level of the ice was controlled using a reference shoe (REF, size 42).

The anti-slip devices were fastened to the reference shoe (REF, size 42). The shoe was fastened on a plastic footwear last acting as an artificial foot. The contact angle between the bottom of the footwear and the surface of ice was 0° (i.e. flat contact).

The testing comprised six consecutive measurements with one test item. Totally eight measurements were made. As a final result, the mean coefficient of kinetic friction and the standard deviation (SD) is reported. The slip resistance class is given as follows:

Class	Assessment	Coefficient of friction
1	Very slip-resistant	$\geq 0,30$
2	Slip-resistant	0,20 - 0,29
3	Unsure	0,15 - 0,19
4	Slippery	0,05 - 0,14
5	Very slippery	$< 0,05$

2.2.2 Tensile strength in cold (-20 °C)

The test item was stored four hours in the temperature of -20 °C before testing in a thermal chamber (Arctest 500). Each test item was taken out from the chamber just before the test and then actual tests were carried out in the normal room temperature (20 ± 2 °C).

The longitudinal tensile strength of the whole device was determined using a tensile strength testing machine (Lloyd LR10K) having a uniform rate of 100 mm/min \pm 20 mm/min. The machine was equipped with two \pm 8 mm round pivots. The test pieces were attached around the pivots. The machine was run until the break of the device or the extension limits of the tensile testing machine was reached. The highest force (N) and extension (mm) were taken as results.

2.2.3 Corrosion resistance of the metal parts

The corrosion resistance of the device was tested in accordance with standard EN ISO 20344, with method described in annex A.2.1.2. for safety, protective and occupational footwear for professional use. The anti-slip device was allowed to stand for 48 h in 1 % (m/m) aqueous solution of sodium chloride.

2.2.4 Weight of the device

The mass (g) of the whole device was determined using a Mettler Toledo PB 303 balance.

2.2.5 Practical performance

The adjustments of the device were tested subjectively by three test persons who put the device on the footwear and take it off. In addition, test persons walked on the surface of plywood and on the rough concrete flooring. The devices were fitted to different type and sizes of footwear.



3. Results

3.1 Slip resistance

Yaktrax Walker:

Size	Coefficient of friction	Standard deviation	Number of measurements
XS *	0,18	0,01	6
S	0,26	0,01	6
<i>Minimum requirement</i>	<i>0,20</i>		

*Note: Vertical force of 400 N was used

Yaktrax Pro:

Size	Coefficient of friction	Standard deviation	Number of measurements
L	0,25	0,01	6
<i>Minimum requirement</i>	<i>0,20</i>		

3.2 Tensile strength

Yaktrax Walker:

Size	Maximum force (N)	Extension (mm)
S	240	718 *
L	204	735 *
<i>Minimum requirement</i>	<i>200 N</i>	

*Note: Samples didn't broke during the test

Yaktrax Pro:

Size	Maximum force (N)	Extension (mm)
S	252	750 *
L	175	732 *
<i>Minimum requirement</i>	<i>200 N</i>	

*Note: Samples didn't broke during the test

3.3 Corrosion resistance of the metal parts

Test item	Corrosion (yes/no)
Yaktrax Walker	no
Yaktrax Pro	no



3.4 Weight of device

Yaktrax Walker:

Size	Weight (g)
S	48
M	51
L	54

Yaktrax Pro:

Size	Weight (g)
S	64
L	75

3.5 Practical performance

Three test persons evaluated that it was easy to put the devices on the shoe and take it off and the walking was convenient when the device was attached to the shoe.

End of test report