

CTCP - BIOCONFORT

EXPANSION PROJECT FOR TEST LABORATORY

Laboratory Tests for Materials, Components and Footwear

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Physical tests

Abrasion

Abrasion is the property related with the resistance that a material can addle, when it is subject to friction. Most all footwear materials can be tested and their abrasion resistance recorded.

The abrasion tests evaluate the surface resistance of uppers, linings, insocks, insoles, outsoles, laces and eyelets when rubbed with an abrandant fabric or by action of a mechanical machine, according to the applicable method.

CTCP performs the following tests:

Test	Standard
Abrasion resistance of uppers, lining and insocks	EN 13520 ISO 20344 (6.12)
Abrasion resistance of insole	EN ISO 20344 (7.3)
Abrasion resistance of outsoles	EN 12770 ISO 20871 ISO 4649 EN ISO 20344 (8.5)
Abrasion between shoe laces and eyelets	ISO 22774 EN ISO 22774



Adhesion

This property determines the strength of adhesion between two surfaces. It can be evaluated in whole shoe, in several coatings and its bases, in finishing's, lacquers, upper/outsole and sole interlayer.

CTCP performs the following tests:

Test	Standard
Whole shoe — Upper sole adhesion	ISO 17708 EN ISO 17708
Adhesion strength of a coating to its base	EN ISO 17698
Adhesion of finish	ISO 11644 EN ISO 11644
Determination of upper/outsole and sole interlayer bond strength	EN ISO 20344 (5.2)
Adhesion Resistance of: Platform/insole; platform/coating; outsole /lining; outsole/welt; welt/welt; outsole/accessory; upper/insole; sola/insole; insole/insock; separation between layers (heel)	ISO 17708 EN ISO 17708

Adhesion



Colour fastness

Colour fastness is the persistence of colour. Several tests can be made to simulate use and evaluate the colour fastness in several conditions. This property can be evaluated by several means and in diverse materials. It can be evaluated by simulating human perspiration or by water contact and rubbing for analyses of the maintenance of the material's colour.

CTCP performs the following tests:

Test	Standard
Test methods for uppers, linings and insoles - Colour fastness to rubbing	ISO 17700 EN ISO 17700
Colour fastness to perspiration	ISO 11641 EN ISO 11641
Colour fastness to water	ISO 11642 EN ISO 11642
Colour fastness to water spotting	ISO 15700 EN ISO 15700
Colour fastness to rubbing – Crockmeter test	ISO 105-X12 EN ISO 105-X12
Colour fastness to cycles of to-and-for rubbing	ISO 11640 EN ISO 11640
Colour fastness to light	EN ISO 105-B02



Density and mass per unit area

This property is related with the density of materials. It can be evaluated in leather, fireboards materials (used in footwear constructions), solid vulcanized rubber, all types of non-elasticated sewing threads, sheet materials and textiles.

CTCP performs the following tests:

Test	Standard
Determination of density of vulcanized or thermoplastic rubber	ISO 2781
Linear density	CTCP method CTCP1-07
Determination of apparent density	ISO 2420 EN ISO 2420
Density of sole	DIN 53543

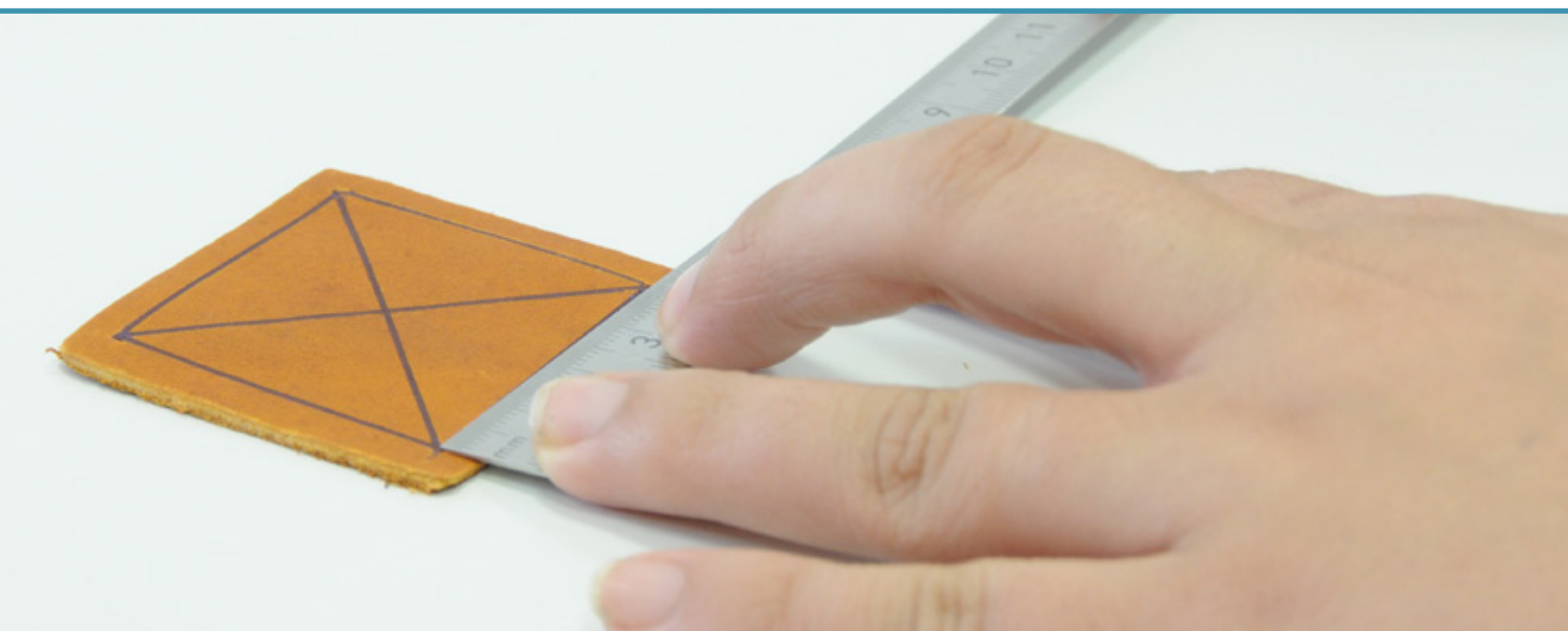


Dimensional stability

This method determines the dimensional stability of insoles, irrespective of material, for example swelling and increase in size after immersion in temperature and shrinkage after temperature.

CTCP performs the following tests:

Test	Standard
Test for insoles – Dimensional stability	EN 12800 ISO 22651
Test for outsoles para solas – Dimensional stability	ISO 20873



Hardness

Hardness is an intrinsic property of materials and normally is determined in plastics and rubbers by means of durometers.

Hardness is measured mostly to materials control. It's not possible establish a simple relation between hardness of material and a fundamental property of material.

CTCP performs the following tests:

Test	Standard
Determination of indentation hardness	ISO 7619-1
Determination of indentation hardness by means of a durometer (Shore hardness)	ISO 868



Thickness

Thickness can be determined for leather, insoles, non-woven materials, soles among others.

CTCP performs the following tests:

Test	Standard
Determination of leather thickness	ISO 2589
Determination of thickness of insoles	EN ISO 20344 (7.1)
Determination of thickness of non-woven	ISO 9073-2
Determination of thickness of soles, cleats,...	EN ISO 20344 (8.1)

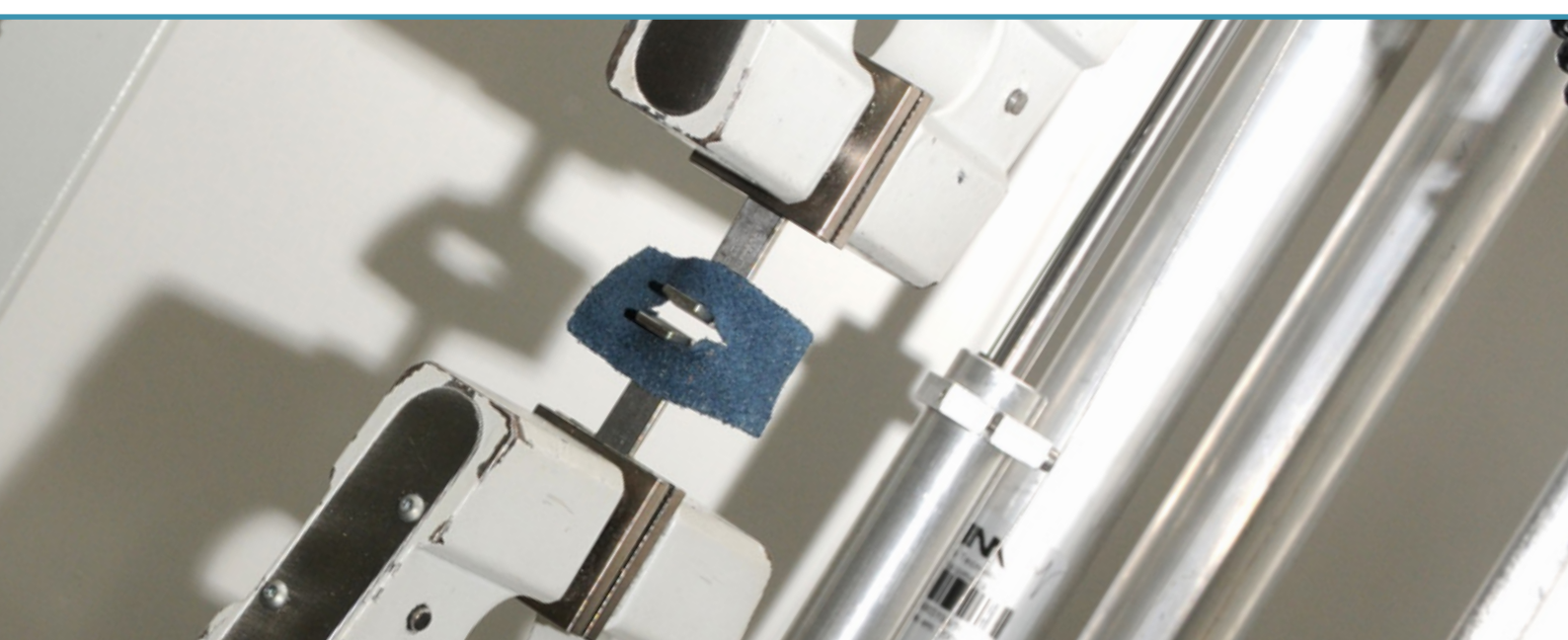


Tear strength

Tear strength is the force required to tear a material. CTCP provides tests for materials applied in uppers, lining, insoles, outsoles and even it is possible to evaluate the tear strength of seam stitches.

CTCP performs the following tests:

Test	Standard
Tear strength of uppers, lining and insoles	EN 13571 ISO 17696 ISO 3377 EN ISO 20344 (6.3)
Resistance to stitch tear of insoles	EN 12782 ISO 20876
Seam strength of uppers, lining and insoles	EN 13572 ISO 17697
Tear strength of outsoles	EN 12771 ISO 20872
Needle tear strength of outsoles	EN 12773 ISO 20874
Determination of split tear strength and delamination resistance of outsoles	EN 12774 ISO 20875
Stitch-tear strength	EN ISO 20874 ISO 20874
Determination of tear resistance of rubber or plastics-coated fabrics – Part 1: Constant rate of tear methods	ISO 4674-1
Determination of tear strength of rubber, vulcanized or thermoplastic	ISO 34-1



Tensile properties

These properties are related to the force required to break a test specimen. The procedures made at CTCP, include transverse or elongation strength in diverse materials applied in footwear. These materials can be applied as uppers, outsoles, insoles, eyelets, decorative pieces and other materials. There are different methods for this test that are done according to its use.

CTCP performs the following tests:

Test	Standard
Tensile strength and elongation of uppers	ISO 17706 EN 13522 ISO 3376 EN ISO 20344 (6.4)
Transverse tensile strength of fibreboard	BS 5131:4.13
Tensile strength and elongation of outsoles	EN 12803 ISO 22654
Strength of eyelet facings and other laced fastenings	CTCP 1-10
Attachment strength of decorative bows	CTCP 1-44
Strength of top-piece attachment	CTCP 1-03
Determination of the strength of buckle fastening assemblies	CTCP 1-44
Breaking strength of shoe laces	BS 5131:3.7
Measurement of the limit of useful extension of elastics	CTCP 1-10
Breaking force, extension at break, strength factor and tightness of threads	CTCP 1-08
Heel attachment	EN 12785 ISO 22650
Touch and close fasteners - Determination of longitudinal shear strength	EN 13780 EN ISO 22776

Tensile properties



Flex and fatigue resistance

Flex and fatigue tests simulate the use conditions of materials to evaluate its suitability to be applied on footwear. CTCP provides several tests, which include evaluation of uppers, linings, outsoles and heels in several materials in order to assess the suitability for the end use in footwear.

CTCP performs the following tests:

Test	Standard
Flex resistance for uppers and lining - Bally	ISO 17694 EN 13512
Flex resistance for outsoles - Benewar	ISO 17707
Flex resistance for outsoles - Ross	BS 5131-2.1
Vamp flex test – Resistance to creasing and cracking	ISO 22288 EN ISO 22288
Resistance to crack initiation and growth – Belt flex method	CTCP 1-14
Test methods for heels - Fatigue resistance	ISO 19956 EN ISO 19956
Cycling procedure for subsequent testing of touch and close fasteners	EN ISO 22777
Touch and close fasteners - Determination of longitudinal shear strength	EN 13780 EN ISO 22776



Impact resistance

Impact resistance is related to the resistance that a material can support when subject to a strength, without having deformation. This property can be accessed in whole footwear (protective and safety footwear) or in their components, as toe pieces or stiffeners. Basically it is used an impact apparatus that will fall into the test piece. The damages in the test piece will be analyzed.

CTCP performs the following tests:

Test	Standard
Determination of impact resistance	EN ISO 20344 (5.4)
Determination of impact resistance of metatarsal protective device	EN ISO 20344 (5.16)
Determination of compression resistance	EN ISO 20344 (5.5)
Determination of shock absorption capacity of ankle protection materials incorporated into upper	EN ISO 20344 (5.17)
Motorcyclists' protective clothing against mechanical impact	NP EN 1621-1
Impact Resistance of heels	EN ISO 19953

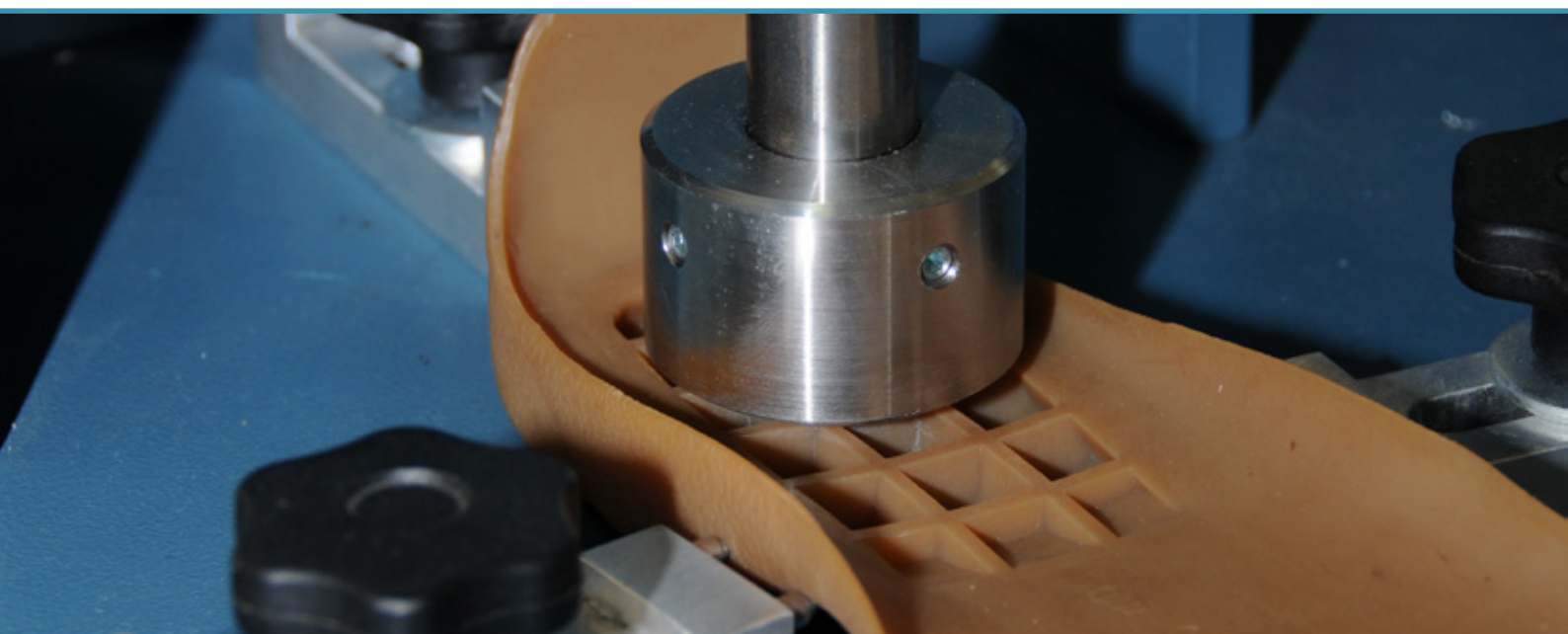


Cushioning and shock absorption

Cushioning and shock absorption are related with contact of footwear in ground during walking. This properties can be assessed in insoles, midsoles, whole shoes, uppers and in seat region and in materials intended for cushioning.

CTCP performs the following tests:

Test	Standard
Cushioning properties of foam	CTCP 1-16
Compression set – constant stress method	CTCP 1-05
Whole shoe cushion assessment test	CTCP 1-36
Energy absorption of seat region of whole shoe	EN ISO 20344 (5.14)



Perforation resistance

This property is related with the resistance of an insole to perforation. The resistance of perforation is calculated, in order to access the outsoles for safety and protective footwear.

CTCP performs the following tests:

Test	Standard
Resistance of insole to perforation	EN ISO 20344 (5.8)



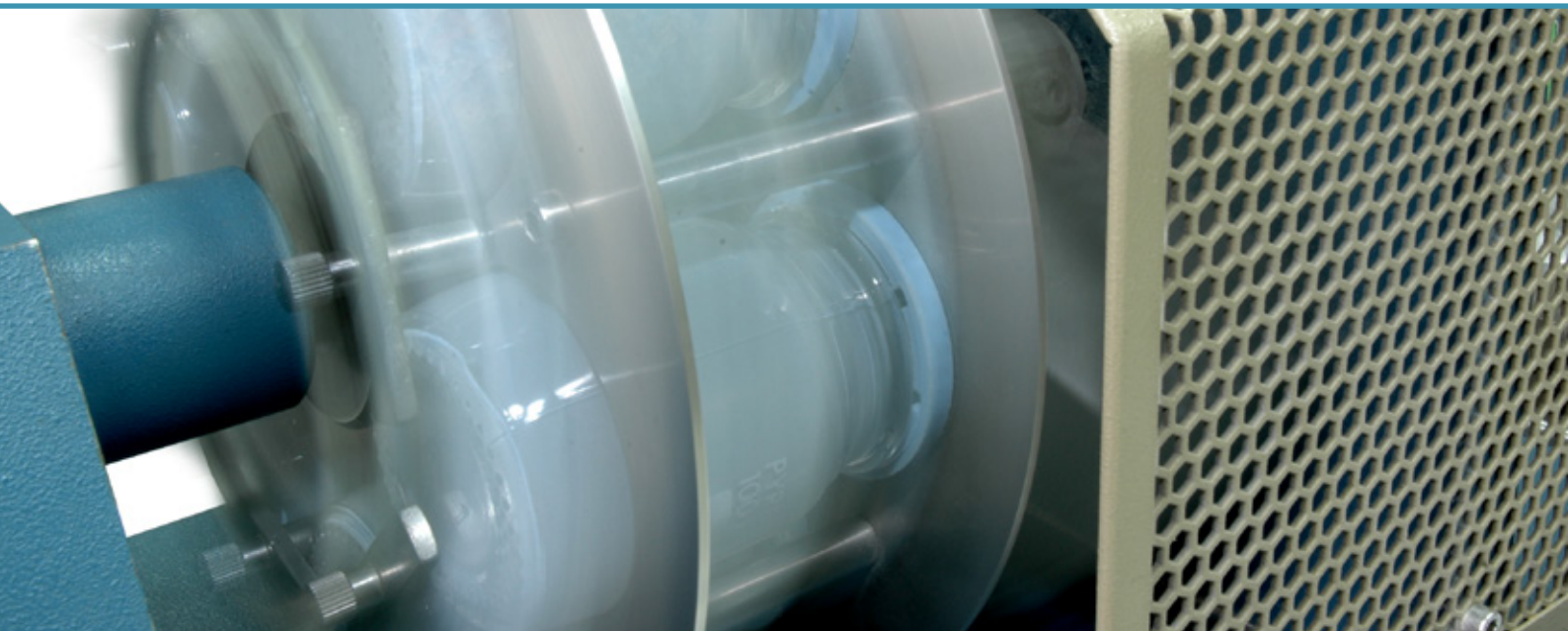
Water absorption/desorption and water vapour permeability

Water absorption and desorption is related with material capacity has to absorb and desorbs water. This property is important to remove humidity from foot skin surface and promote a higher comfort.

Water vapor permeability is related with materials breathability, in other words, its capacity in the passage and absorption of water vapor. It's necessary to assure a good breathability of materials in footwear to promote the feet comfort.

CTCP performs the following tests:

Test	Standard
Determination of water absorption and desorption of insole and insock	EN ISO 20344 (7.2) EN ISO 22649
Determination of water vapor permeability, water vapor absorption and water vapor coefficient for uppers and lining	EN ISO 20344 (6.6, 6.7 e 6.8) EN ISO 17699



Water resistance

This property is related to the penetration of water in footwear and the associated materials. It can be tested leather for uppers and whole footwear.

CTCP performs the following tests:

Test	Standard
Determination of water penetration and water absorption – Bally permeometer	EN ISO 20344 (6.13) ISO 17702
Test Method for Dynamic Water Resistance of Shoe Upper Leather by the Maeser Water Penetration Tester	ASTM D 2099 CTCP 1-31
Determination of resistance to water for whole footwear	EN ISO 20344 (5.15)
Test method to evaluate the water resistance of whole footwear in dynamic conditions	CTCP 1-20
Determination of leakproofness	EN ISO 20344 (5.7)



Thermal Insulation

Thermal insulation is a measure of the rate at which heat passes through a material or through a series of layers of different materials. High thermal insulation means that heat travels very slowly through the material, causing the temperature to build up on the side of heat source. Methods are available to evaluate the resistance of footwear to the passage of heat and cold when placed in hot and cold surfaces, respectively. A method to measure the thermal insulation of upper, lining and insoles is available.

CTCP performs the following tests:

Test	Standard
Thermal insulation of uppers, lining and insoles	EN 13521
Determination of insulation against heat	EN ISO 20344 (5.12)
Determination of insulation against cold	EN ISO 20344 (5.13) EN 12784 ISO 20877



Heat and fire protection

Heat and fire protection of materials are related to its heat transmission heat and combustion properties.

The methods available to evaluate the heat protection allow evaluating the materials and products capacity to heat insulation when subjected to high temperatures.

The properties of materials and products when subjected to fire can be evaluated through contact with the flame to assess the combustion rate, extension and combustion time. This is an important property because it can serve as a preliminary indication of the acceptability of certain materials or whole footwear for specific footwear. Also, can be measured the burning behavior by oxygen index.

CTCP performs the following tests:

Test	Standard
Evaluation of materials and material assemblies when exposed to a source of radiant heat	EN ISO 6942
Footwear for firefighters	EN 15090
Method of test for limited flame spread	ISO 15025
Road vehicles, and tractors and machinery for agriculture and forestry - Determination of burning behaviour of interior materials	FMVSS 302 ISO 3795 ASTM D5132
Rate of burning and/or extent and time of burning of plastics in a horizontal position	ASTM D635
Measuring the comparative burning characteristics and resistance to burn-through of solid plastics	ISO 10351
Determination of burning behavior by oxygen index (LOI)	ISO 4589-2
Determination of resistance to hot contact	EN ISO 20344 (8.7

Heat and fire protection



Electrical properties

There are specific uses that require the use of footwear with different electrical properties. May be required footwear with insulate, conductive and electrostatic properties and footwear that should protect the electronic devices.

Footwear when used in conjunction with other electrically insulating protective equipment such as gloves or blankets prevents dangerous current from passing through persons via their feet.

Electrical properties of footwear are also important for the manufacture and use of electronic devices.

CTCP performs the following tests:

Test	Standard
Determination of electrical resistance: - antistatic footwear - conductive footwear	EN ISO 20344 (5.10)
Determination of the electrical insulation Electrically insulating footwear for working on low voltage installation	EN ISO 20344 (5.11) EN 50321
Protection of electronic devices from electrostatic phenomena	EN 61340-5-1
Determination of footwear electrostatic resistance	EN 61340-4-3



Cut resistance

The necessity of footwear and clothing with specific protections, namely, a cut resistance to chain saw cutting and blade cut requires the use of testes that allow to test these properties.

Cut resistance is the resistance of security clothing and protective footwear against a hand-held chainsaw in movement. This property is very important in leg protectors, footwear, gaiters and body protectors to ensure the safety of user.

The system of CTCP allows controlling chain velocity, as well as kinetic energy amount available for cut.

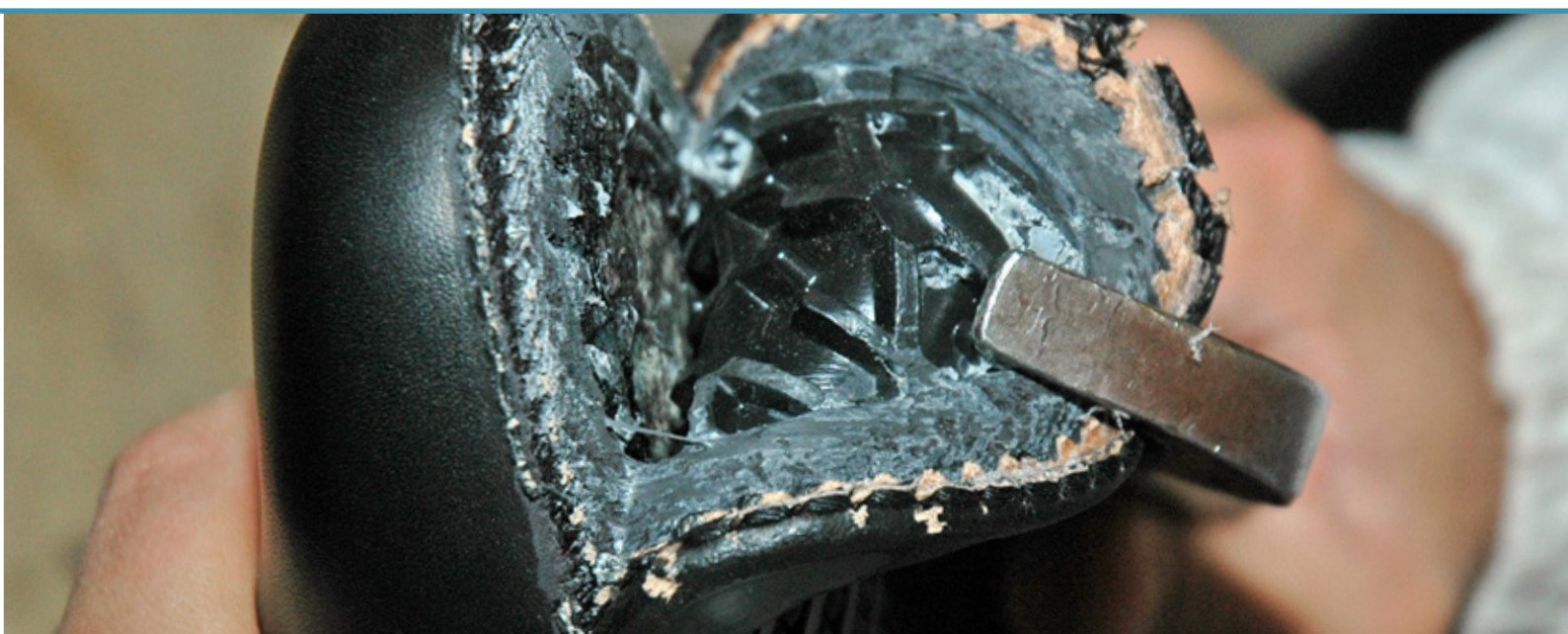
CTCP performs the following tests:

Test	Standard
Safety footwear with resistance to chain saw cutting	ISO 17249 EN ISO 17249
Protective clothing for users of hand-held chainsaw	NP EN 381
Protective gloves against mechanical risks – Blade cut resistance	EN 388



Defect analysis of whole footwear

CTCP laboratory analyze the existence of defects on whole footwear (e.g. bonding, stitches, cleaning, constructive aspects, etc).



Longitudinal and Torsional stiffness of footwear

The test of longitudinal stiffness determines the force required to flex the footwear to an angle representing a 50° flex of the foot or the maximum angle that can be achieved without exceeding a critical bending moment.

In the torsional stiffness test the footwear is twisted along its length to a fixed angle of twist. The moment required to twist the test specimen is recorded as a measure of the torsional stiffness.

CTCP performs the following tests:

Test	Standard
Longitudinal and stiffness of footwear	CTCP 1-46
Torsional stiffness of footwear	CTCP 1-46



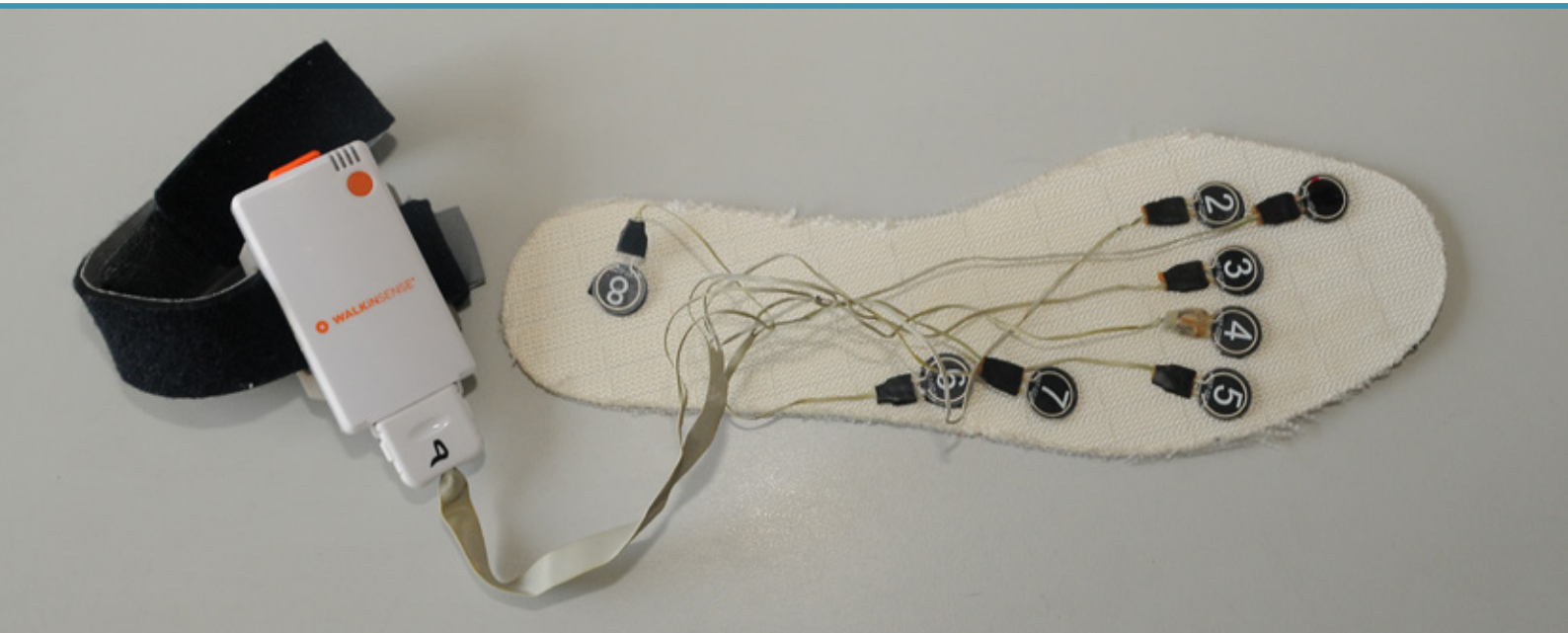
Biomechanical comfort: Plantar pressure distribution

CTCP is developing tests methods to evaluate the biomechanical comfort of footwear based on the measurement of plantar pressure distribution, using pressure sensors, and ground reaction forces, moments and a center of pressure, using a force plate. Additional this tests can be performed by a selected panel of wearers or using a mechanical simulator of human gait.

The aim of this tests is oi select the more suitable materials, construction's and models that promote the comfort of footwear. These tests are mainly used on the support of research & development of new products.

CTCP performs the following tests:

Test	Standard
Panel of wearers <ul style="list-style-type: none">• Plantar pressure distribution• Ground reaction forces, moments and center of pressure	CTCP Method
Mechanical simulator of human gait <ul style="list-style-type: none">• Plantar pressure distribution• Ground reaction forces, moments and center of pressure	CTCP method



Slip resistance

Slip resistance is related to the coefficient of friction between soles and the floor in which the footwear it's in use. The item of footwear to be tested is put on a surface, subjected to a given normal force, and moved horizontally relative to the surface (or the surface is moved horizontally relative to the item of footwear). The frictional force is measured and the dynamic coefficient of friction is calculated.

The Ramp Test is a method that involves test subjects wearing standard soled footwear (shod) on an floor surface. The floor is then inclined gradually until they slip. The ramp test is useful for measuring slip resistance in industrial areas and in wet areas.

CTCP performs the following tests:

Test	Standard
Slip resistance: Ceramic floor Inox floor Ice floor	EN ISO 13287 ISO 13287
Test method for slip resistance in plates	CTCP 1-19
Ramp Test	DIN 51130 Shod



Thermal comfort

Footwear thermal comfort is a combination of temperature and relative humidity inside the shoe. CTCP developed a method to measure the temperature and relative humidity inside the shoes, using small sensors, which are tested by a panel of selected wearer’s that perform a test in a treadmill in laboratory controlled conditions or in “real use conditions”, during several days. The test method can also be complemented by applying a questionnaire to evaluate the wearer’s comfort perception.

CTCP is developing a test method based on a thermal foot with “sweat” simulation to determine the thermal insulation of whole footwear. The thermal foot with “sweat” is divided in segment with an independent control of temperate and “sweat” rate.

CTCP performs the following tests:

Test	Standard
Evaluation of footwear thermal comfort: temperature and relative humidity measurement during wear trial and treadmill	CTCP Method
Evaluation of footwear thermal comfort – wearers perception	CTCP method
Thermal Insulation –Thermal Foot with sweat simulation	CTCP method



Ergonomic

The ergonomics of footwear is one of their most important properties to guarantee the comfort of user and the proper use of footwear. The method adopted by CTCP features the footwear that is assessed by examining the footwear using wear trials on the 3 wearers with appropriate foot size. During the trials the wearers wearing each pair of the correctly fitting footwear will simulate typical tasks likely to be undertaken in general use.

CTCP performs the following tests:

Test	Standard
Specific ergonomic features	EN ISO 20344 (5.1)



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Chemical tests

pH determination

This test determines the pH value and the difference figure of an aqueous leather extract. In this test is prepared an aqueous extract from a test portion of leather or textiles, or an aqueous dispersion in case of adhesives and electrometrically measurement of the pH-value at room temperature by means of a glass electrode.

A low pH value can promote the deterioration of footwear components and result in allergic reactions.

CTCP performs the following tests:

Test	Standard
Determination of pH of leather	ISO 4045
Determination of pH of textile materials	ISO 3071



Ash Content

The ash content allow to determine the amount of inorganic salts on leather and rubber products.

CTCP performs the following tests:

Test	Standard
Determination of sulphated total ash and sulphated water insoluble ash	NP EN ISO 4047
Rubber products – Fillers, referee ash test method	ASTM D 297-35
Rubber products – Ash determination by sulfation	ASTM D 297-37



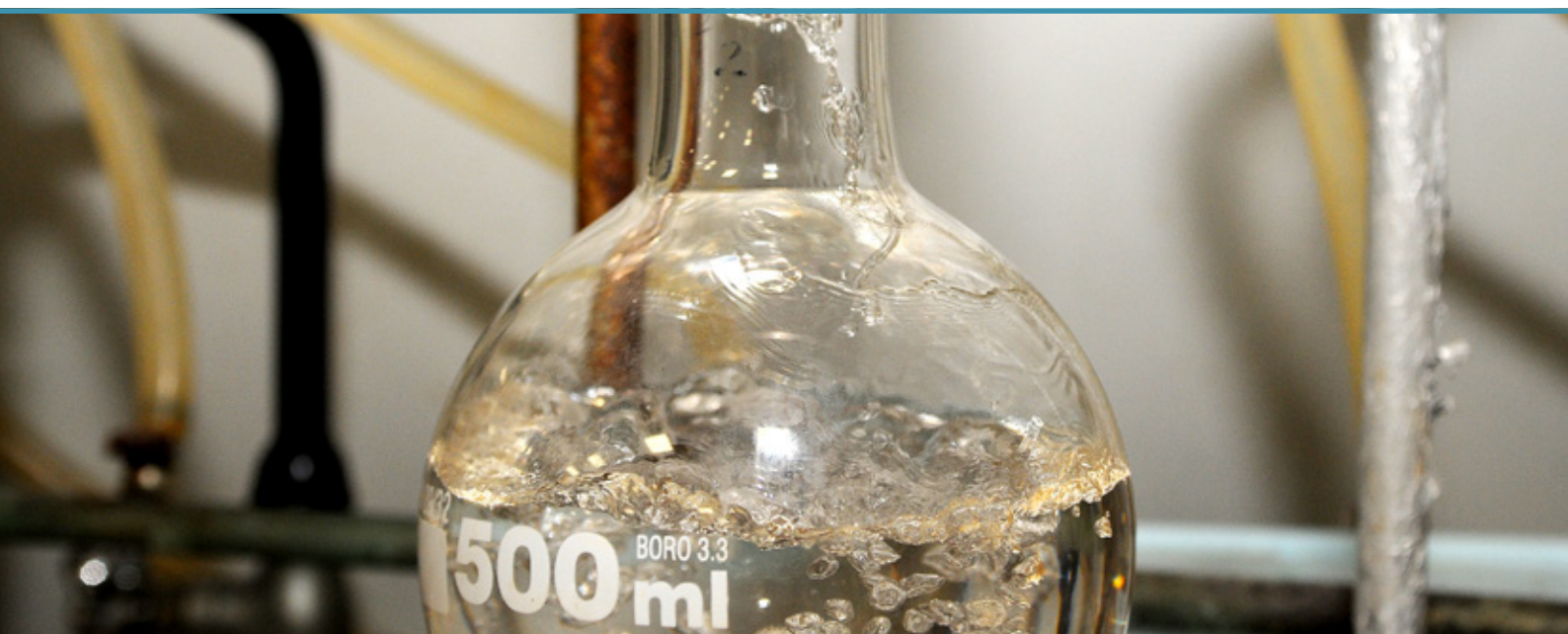
Soluble matter in dichloromethane

This property is related with the determination of the substances in leather which are soluble in dichloromethane.

In the tanning process of leather are added oils and fat products to make soft, flexible and sometimes improve the water impermeability properties. The content of these products is important to select the type of adhesives to be used. High levels of oils and fatty products can result in bond problems.

CTCP performs the following tests:

Test	Standard
Determination of matter soluble in dichloromethane and free fatty acid content	ISO 4048



Soluble matter in water

Water soluble matter, organic and inorganic matter, can be determined by evaporation at 102 ± 2 °C, after aqueous extraction of a prepared sample under specified conditions. Sulphating and aching of the residue at high temperatures yields the water-soluble inorganic matter. The water soluble organic matter is derived by difference.

CTCP performs the following tests:

Test	Standard
Determination of water-soluble matter, water-soluble inorganic matter and water-soluble and soluble organic matter - Leather	ISO 4098
Determination of water-soluble matter, water-soluble inorganic matter and water-soluble and soluble organic matter - outsoles, insoles, lining and insoles	EN 12748



Volatile matter

For determination of volatile matter the leather is finely ground and placed in an oven at $102 \pm 2\text{ }^{\circ}\text{C}$ to constant mass. The volatile matter is expressed as the ratio of the change in mass of the sample to the initial mass before drying.

CTCP performs the following tests:

Test	Standard
Determination of volatile matter	ISO 4684



Extractible matter

The extraction performed in acetone of rubber materials allow to determine the amount of unsaponifiable acetone extract, waxy hydrocarbons, mineral oil, sulphur in acetone extract, and in any procedure where an acetone-extracted specimen is required.

The extraction performed in acetone of rubber materials allow to determine the amount of material removed from a vulcanized rubber product by extraction with chloroform after the specimen has been extracted with acetone.

The total extraction can be performed to substitute the sum of extracts in acetone and chloroform. This testes are important to understand the behavior or rubber materials with different compositions.

CTCP performs the following tests:

Test	Standard
Rubber products – Acetone extraction	ASTM D 297-19
Rubber products – Chloroform extract	ASTM D 297-20
Rubber products – Total extract	ASTM D 297-21



Chromium determination

The chromium salts are the tanning agent mostly used in leather tanning process due to the properties that conferee to the final product. The use of chromium salts, as a tanning agent gives a softer, flexible, with higher physical resistance and stability. The chromium normally present in the leather is Cr (III), however by external conditions, sunlight and humidity the Cr (III) could oxidise to Cr (VI). The chromium (VI) can cause cancer and is environmental prejudicial.

CTCP performs the following tests:

Test	Standard
Chemical determination of chromium oxide content	ISO 5398-1
Determination of chromium (VI) content	ISO 17075



Heavy metals / Atomic absorption

Heavy metals are extremely reactive and bioaccumulative, which means that organisms can not eliminate.

The determination of arsenic, mercury, antimony, selenium, nickel, copper, cadmium, lead, barium and silver by atomic absorption technique, after acid digestion, it's very important because occurs many reactions of

skin in presence of these metals. For example, nickel is now the most frequent cause allergy in Europe, and 10-20% of female population is allergic to nickel. Skin absorption of nickel ions, which are released from some nickel-containing materials in direct and prolonged contact with the skin causes sensitivity. Further exposure to soluble nickel salts results in allergic contact dermatitis.

CTCP performs the following tests:

Test	Standard
Determination of arsenic, mercury, antimony, selenium, nickel, copper, cadmium, lead, barium and silver – Flame atomic absorption spectrometric methods	ISO 17072-2
Method for the simulation of wear and corrosion for the detection of nickel release from coated items	EN 12472
Test method for release of nickel from products intended to come into direct and prolonged contact with the skin	EN 1811



Formaldehyde Content

Formaldehyde is toxic and irritable substance. Its presence is normally due to the use on tanning (of leather), preserving and finishing products. The associated techniques for the determination of formaldehyde content are colorimetric and HPLC method.

CTCP performs the following tests:

Test	Standard
Determination of formaldehyde content	ISO 17226-1 ISO 17226-2
Determination of formaldehyde in textiles (water extraction	ISO 14184



Chlorophenols and ortophenilphenol

The penta (PCP), tri (TCP) and tetrachlorophenols (TeCP), mostly in gaseous form, can irritate the skin, eyes and skin. The amount of chlorophenols, its salts and esters, can be determined on leather and textiles after water extraction followed by n-hexane phase transfer and followed by acetylation with acetic anhydride.

The ortophenilphenol (OPP) is a preservative agent added to leather to protect against microbiologic attack.

The acetates of PCP, TCP and TeCP and OPP are analyzed by gas-chromatography.

CTCP performs the following tests:

Test	Standard
Determination of chlorophenols content on leather	ISO 17070
Determination of chlorophenols content on textiles	XP G 08-015
Determination of ortophenilphenol content PCP - pentachlorophenol TCP - Trichlorophenol TeCP - Tetrachlorophenol OPP - Ortophenilphenol	ISO 17070



Bisfenol A

The Bisfenol A is a monomer used in production of certain plastics designed to be in contact with food. After the process production the Bisfenol can remain in the final product and migrate to food.

CTCP performs the following tests:

Test	Standard
Determination of Bisfenol A in materials that are in contact with food	EN 14350-2 (value reported in mg/L) Methanol extraction and analysis by GC-MS



Azo colourants

The determination of certain azo colourants is very important once they may release certain aromatic amines. The aromatic amines are highly toxic and are responsible for vesicular irritation and tumors. The azo colourants may be determined in dyed leathers and textiles (with or without polyester).

CTCP performs the following tests:

Test	Standard
Determination of certain azo colourants in dyed leathers	ISO 17234-1
Methods for the determination of certain aromatic amines derived from azo colorants in textiles	EN 14362-1 EN 14362-2



Organotin compounds

The organotin compounds are identified and quantified in rubber materials. These compounds are very pollutant for the environment and can be introduced in outsoles by the pigments. These compounds after extraction are determined by gas chromatography-mass spectrometry (GC-MS).

CTCP performs the following tests:

Test	Standard
Determination of selected organotin compounds – Gas chromatographic method. MBT - Monobutyltin DBT - Dibutyltin TPT - Tripropyltin DOT - Dioctyltin TBT - Tributyltin TPhT - Triphenyltin TCT - tricyclohexyltin MOT - Monoctyltin	ISO16179

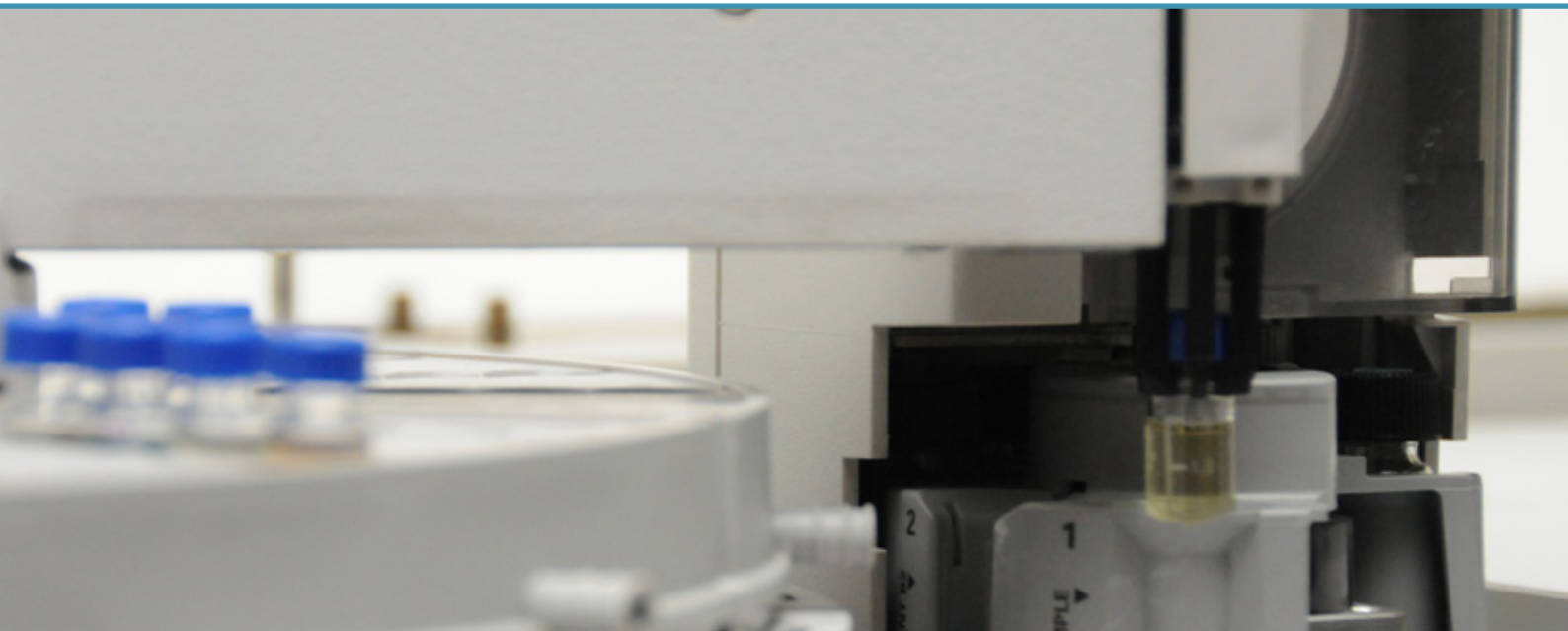


Phthalates

The phthalates are chemical compounds used as plasticizers in outsoles to conferee more flexibility. These compounds are extractable using suitable methods and the analyze is performed by gas chromatography.

CTCP performs the following tests:

Test	Standard
Phtalates determination	
DEHP - Di-(2-ethylhexyl) phthalate	
DBP - Di-butyl phthalate	
BBP - Butyl benzyl phthalate	
DINP - Di-iso-nonyl phthalate	ISO TS 16181
DIDP - Di-iso-decyl phthalate	
DNOP -Di-n-octyl phthalate	
DnHP - Di-n-hexyl phthalate	
DIBP - Di-isobutyl phthalate (DIBP)	



Dimethyl fumarate (DMF)

Dimethyl fumarate (DMF) is a powerful desiccant agent. However, is responsible for allergies extremely serious that could result in hospital internment. This chemical agent is applied directly in any footwear raw material (leather, textile and outsole) or placed inside the package.

CTCP performs the following tests:

Test	Standard
Determination of Dimethyl fumarate on footwear	ISO TS 16186



Short chain chlorinated paraffins

The Short Chain Chlorinated paraffins (CAS No. 85535-84-8) are employed mainly chemicals in the leather industry as degreaser after the tanning process and also as flame retardant and plasticizer.

It could be found in:

- leather products, such as footwear, apparel and accessories.
- in paints and surface coatings such as varnishes.

CTCP performs the following tests:

Test	Standard
Determination of Short Chain Chlorinated Paraffins (C10-C13)	DIN EN ISO 18219



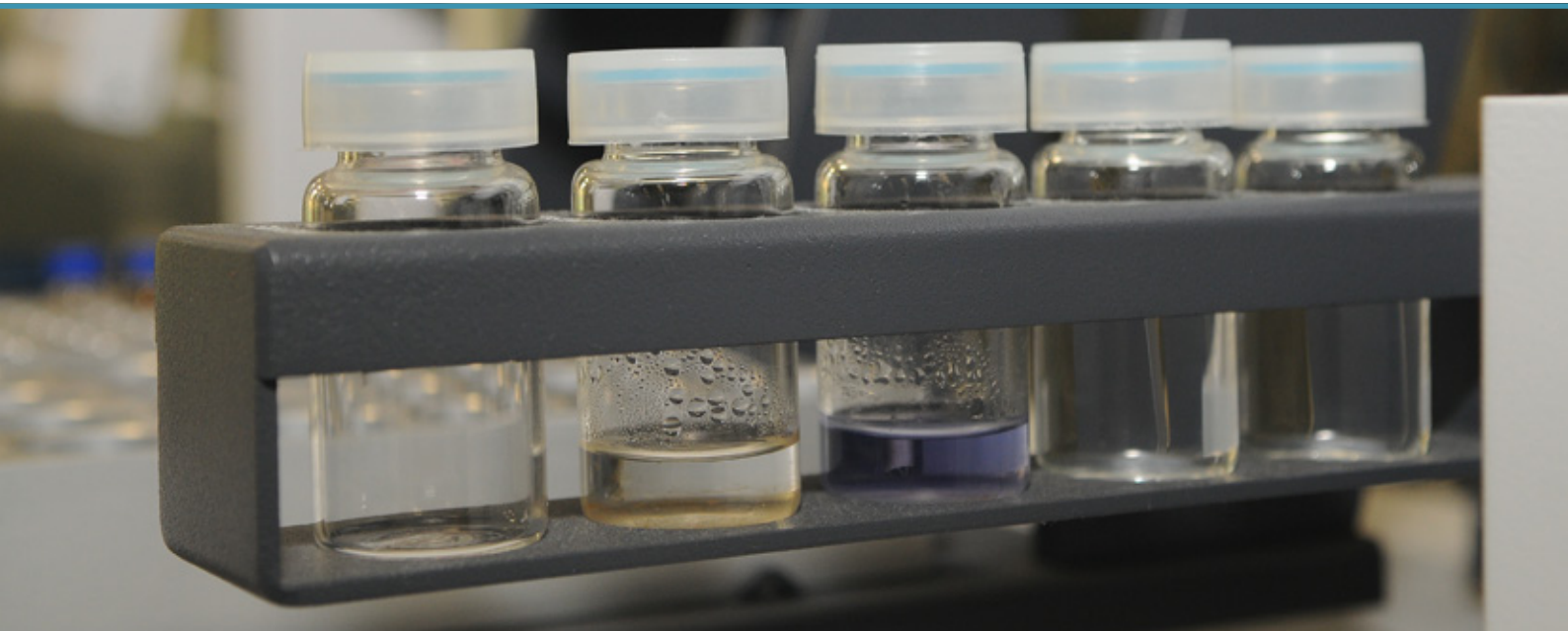
Allergic disperse dyes

Allergic Dyes are a range of “disperse dyes” that can cause allergic reactions to come into direct contact with skin.

Allergic Dyes are basically used in certain products of polyester, acetate and polyamide so in tinted and patterned textiles, as in dyed accessories such as buttons.

CTCP performs the following tests:

Test	Standard
Determination of Allergic Disperse Dyes	DIN 54231 DIN EN ISO 6373-2



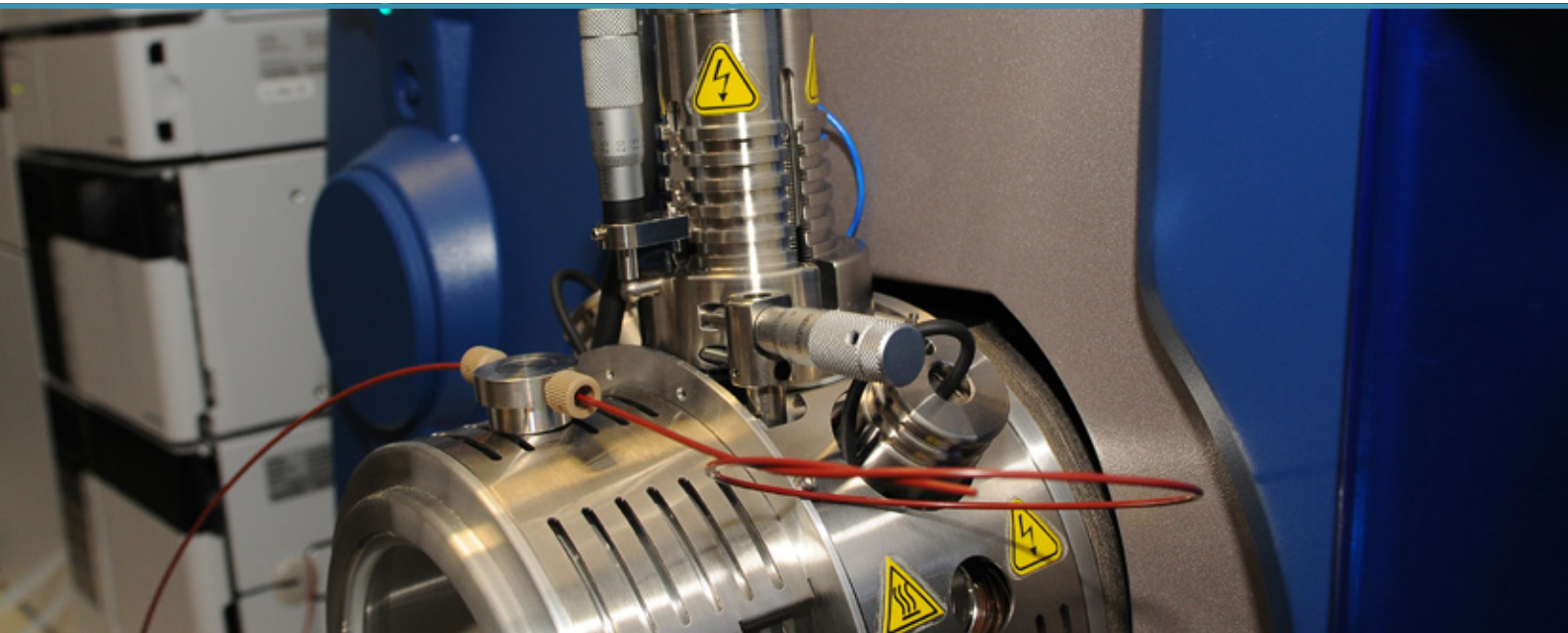
Perfluorooctane sulfonate / Perfluorooctanoic acid (pfos/pfoa)

Perfluorooctane sulfonate (PFOS) and Perfluorooctanoic acid (PFOA)) are polymers used promptly in textile and leather articles provide greater resistance to grease, oil and water.

PFOS may be present in waterproof textiles and / or stain treatments (hydrophobic and oil repellent) in apparel products, home textiles and footwear, mainly.

CTCP performs the following tests:

Test	Standard
Determination of PFOS/PFOA	Liquid chromatography-mass spectrometry/mass spectrometry (LC-MS/MS) CEN/TS 15968



Alkylphenoles

Alkylphenol Ethoxylates (APEs) are synthetic surfactants found in detergents, cleaning products, pesticides, lubricants, hair dyes and other hair care products. The most common APEs are nonylphenol ethoxylates.

In addition to being persistent, APEs are also bioaccumulative. This means that once they enter a living organism—whether it’s a fish or a person—they tend to accumulate in its tissues over time. This explains why APEs like nonylphenol ethoxylates have been detected in human blood and breast milk.

CTCP performs the following tests:

Test	Standard
Determination of APEs	NP and OP using GC-MS after solvent extraction with methanol NPEO and OPEO in leathers: DIN EN ISO 18218-1 NPEO and OPEO in textiles: DIN EN ISO 18254



Polycyclic aromatic hydrocarbons

Polycyclic aromatic hydrocarbons (PAHs) are naturally occurring substances in fossil fuels and may be formed during incomplete combustion of organic materials. Oils contaminated with PAHs may be used as softeners or extenders in rubber and plastic. PAHs also may be formed by thermal decomposition of recycled materials during reprocessing and may be present as impurities in carbon black pigments and dyestuff. Naphthalene is often present as an impurity from raw materials used as

intermediates in the production of textile dye dispersing agents and may be found in textiles.

Some PAHs can be very toxic to aquatic organisms and above certain exposure levels may cause long-term adverse effects in the aquatic environment. Above certain levels, long-term exposure to some PAHs may result in the development of particular cancers. Some PAHs, above certain exposure levels, may impair human fertility or cause harm to unborn children.

CTCP performs the following tests:

Test	Standard
Determination of PAH	ZEK 01.4-08 ISO/TS16181



Free phenol

Phenols and their derivatives commonly exist in the environment. These compounds are used as the components of dyes, polymers, drugs and other organic substances. The presence of Phenols in the ecosystems is also related with production and degradation of numerous Pesticides and the generation of industrial and municipal sewages.

CTCP performs the following tests:

Test	Standard
Determination of Free Phenol	in-house method (GC-MS analysis after solvent extraction)



Footwear protecting against chemicals

The test performed at CTCP determines the degradation, permeation and penetration resistance of footwear by chemicals. This test allows a comparison of the resistance of footwear against selected chemicals under laboratory conditions.

CTCP performs the following tests:

Test	Standard
Footwear protecting against chemicals	EN 13832-1 EN 13832-2 EN 13832-3



Corrosion resistance

The corrosion of metallic materials occurs due to contamination by atmospheric pollution or to corrode due to the action of salt water.

The resistance to corrosion is related with the propensity of metal surface to either change visually due to atmospheric pollution (spots of sulphides) or by contact with salt water.

CTCP performs the following tests:

Test	Standard
Metallic accessories – Resistance to corrosion	ISO 22775



Corrosion evaluation: salt spray

The salt spray test is a standardized and popular corrosion test method, used to check corrosion resistance of materials and surface coatings. Usually, the materials to be tested are metallic and finished with a surface coating which is intended to provide a degree of corrosion protection to the underlying metal. Salt spray testing is an accelerated corrosion test that produces a corrosive attack to coated samples in order to predict the suitability of

the coating in use as a protective finish. The appearance of corrosion products (oxides) is evaluated after a period of time. Test duration depends on the corrosion resistance of the coating; generally, the more corrosion resistant the coating is, the longer the period of testing before the appearance of oxides. The salt spray test is one of the most widespread and long established corrosion tests.

CTCP performs the following tests:

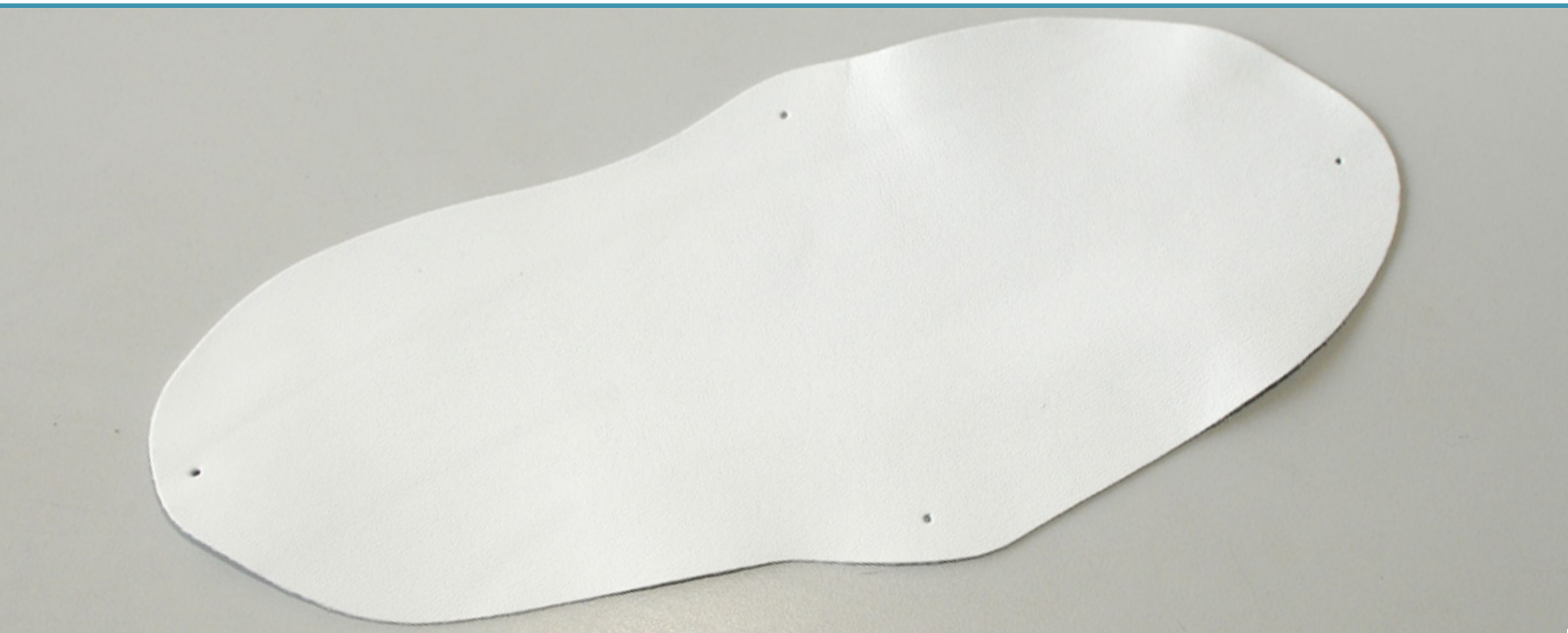
Test	Standard
Salt Spray Evaluation	ASTM B117 ASTM B287 ASTM B368 ASTM D1735 ASTM D2247

Nitrocellulose in finish of leather

This test method is used to identify nitrocellulose in the finish of leathers. This test method does not apply to wet blue.

CTCP performs the following tests:

Test	Standard
Nitrocellulose in the finish of leathers	ASTM D 4907



Odor evaluation – Sensory analysis

CTCP has a trained sensory panel to perform odor evaluation according to defined scales of intensity, pleasantness and durability of fragrances applied on materials and components for footwear and, when possible, identification of compound responsible for odor.

The tests performed on CTCP laboratory are based on described methods and “designed” in accordance with clients requirements.



Analysis of wastewater

The control/treatment of industrial wastewater should be considered an important public service on public health prevention, on fight against pollution of water resources and environment and in protection of ground water.

CTCP laboratory performs the characterization of wastewater to evaluate the conformity with actual legislation. This service is provided to particular, industry and other entities.

The characterization of wastewater samples is performed in accordance with Annex XVIII DL 236/1998.

CTCP performs the following tests:

Test	Standard
pH	SMEWW
Temperature	
Conductivity	
Free and total Clorine	
Odor	
Color	
Total hardness	
Total suspended solids	
Volatile suspended solids	
Total phosphorus	
Nitrates	
Nitrites	
Sulphates	
Detergents	
Total cyanides	
Phenols	
Ammoniacal nitrogen	
Total nitrogen	
Sulfites	
Sulphides	
Mineral oils	
Oils and fats	
CB05	
CQO	
Aldehydes	
Total iron	
Total lead	
Total cadmium	
Hexavalent chromium	
Total chromium	
Total nickel	
Copper	
Arsenic	
Mercury	

The background of the slide is a teal color with a geometric pattern of diagonal lines. The lines are white and form a series of parallel, slightly overlapping bands that create a sense of depth and movement. The text is centered within this pattern.

Microbiological tests

Antimicrobial activity

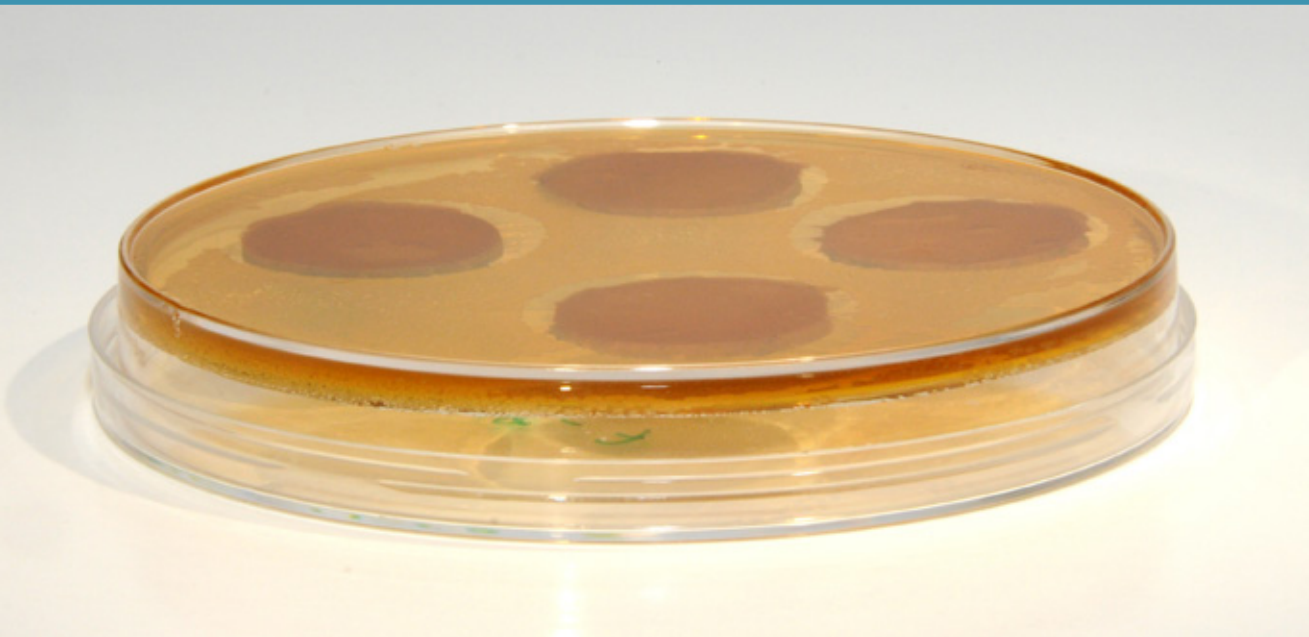
In the last years, we witnessed the development of a huge number of materials with antibacterial and antifungal properties to be applied in several fields, namely medical devices, clothing's, among other without missing the footwear industry. The control of bacterial and fungal growth in footwear is important from the point of view of comfort and well-being of the wearer, but also for the conservation and preservation of the materials.

CTCP has available a set of tests that allow to evaluate the antimicrobial properties of the materials and components of footwear.

These tests allow to evaluate the efficacy of the treatments/modifications done in the materials that claim antibacterial and/or antifungal activity. Normally, these tests require the comparison of treated and non-treated materials with antimicrobial products.

CTCP performs the following tests:

Test	Standard
Footwear – Tests for upper, lining and insoles – Antibacterial activity	ISO 16187
Antimicrobial activity of immobilized antimicrobial agents under dynamic contact conditions	ASTM E 2149
Antibacterial activity assessment of textile materials: Parallel streak method	AATCC 147
Antimicrobial activity – Spread method	CTCP method
Footwear and footwear components – Quantitative challenge test method to assess antifungal activity	ISO/NP 20150 (under implementation)
Footwear and footwear components – Qualitative test method to assess antifungal activity	CTCP method (under implementation)



Disintegration and biodegradability in composting conditions

In last year have emerged in the market various concepts associated to materials and products “more environmentally friendly” or “sustainable”, however these concepts are not completely understood by consumers and in many cases by the producers or commercial agents. It is frequent to find on the market products that have associated characteristics/properties, as a selling argument, that is not the more adequate to that case. It is also common to find products that are nominated as biodegradable, natural or recyclable, among others, without showing any evidence or tests proof. It is essential to test the materials properties.

Composting is a process of management that controls the biological decomposition and transformation of biodegradable materials into humus designated as compost; the mesophilic and thermophilic aerobic degradation of organic matter to produce the compost; transformation of material decomposable material through controlled bio oxidation processes that occurs during the mesophilic and thermophilic phases that result in the production of carbon dioxide, water minerals and stabilized organic matter

(compost or humus). The composting uses a natural process to stabilize a mixture of decomposable organic material recovered from municipal solids wastes, garden cuttings and bio solids (digested sewage sludge), certain industrial waste and commercial waste.

CTCP lab is able to perform tests to evaluate the disintegration and biodegradability (under development) of materials in composting conditions at laboratory scale, namely:

- a method of determining the degree of disintegration of plastic materials when exposed to a laboratory-scale composting environment. The method is not applicable to the determination of the biodegradability of plastic materials under composting conditions. Further testing is necessary to be able to claim compostability.
- method for the determination of the ultimate aerobic biodegradability of plastics, based on organic compounds, under controlled composting conditions by measurement of the amount of carbon dioxide evolved and the degree of disintegration of the plastic at the end of the test.

CTCP performs the following tests:

Test	Standard
Plastics — Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test	ISO 20200
Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions — Method by analysis of evolved carbon dioxide — Part 1	ISO 14855-1 (under implementation)

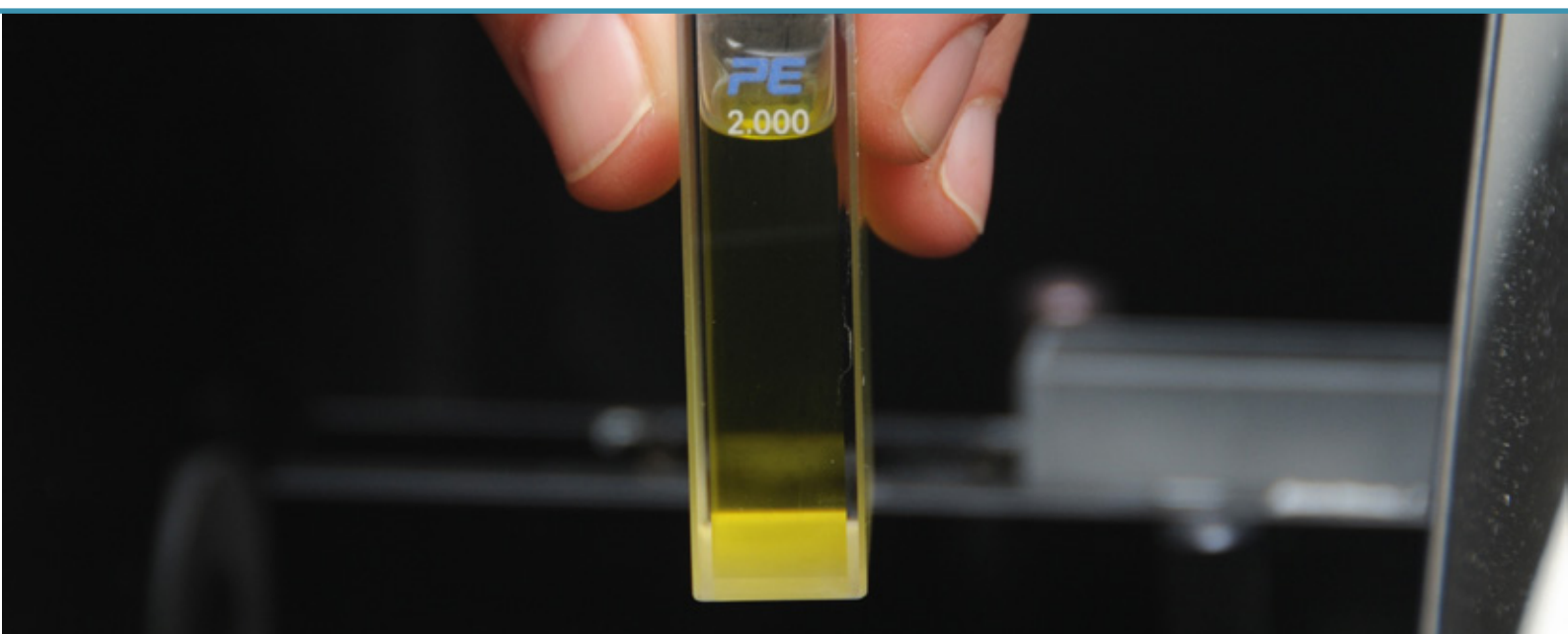
The image features a horizontal band with a teal background. Overlaid on this band are several overlapping geometric shapes, including triangles and parallelograms, in varying shades of teal. A series of thin, light-blue diagonal lines run across the band, creating a textured effect.

Other Services

Analysis techniques

CTCP possesses different chemical analysis techniques that are to the service of their clients, namely:

- Atomic absorption spectroscopy (Flame and Furnace);
- UV-Vis absorption spectroscopy;
- Infrared spectroscopy;
- Attenuated total reflection Fourier transform infrared (ATR – FTIR);
- Gas chromatography – mass spectrometry (GC - MS);
- High performance liquid chromatography with diode array detector (HPLC - DAD);
- Liquid chromatography mass spectrometer / mass spectrometer (LC - MS/MS);
- High definition X-ray Fluorescence detector (HDXRF).



Biocalce Certification

Biocalce certification intend to ensures the comfort and quality, resistance and durability in footwear that only uses materials free from toxic substances for the user and environment. To obtain the Biocalce label the materials and products are subjected to a wide range of laboratory testes and have to accomplish the established specifications. The models should present considerable resistant levels, keep the breathability properties, not stain the feet and should be free of chemical substances that in certain amounts are harmful to skin and environment.

Biocalce certification has a basic pack which could be added extra features, namely:

Extra care – products free of toxic substances dangerous to health;

Biodegradable – products degradable through biological agentes;

Natural – products obtained with materials and componentes from natural origin.

Water resistant – products resistant to water in extreme conditions;

Chromium free – products chromium free (that could be harmful to health when in excessive amounts);

Anti slip – products with anti slip properties.

More information's can be found in:
www.biocalce.org





Vegano

This symbol distinguishes products made exclusively from vegetal origin materials



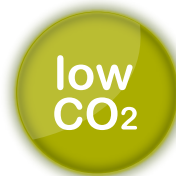
Recycled

This symbol distinguishes products made of materials and components from recycling



Green Buying

This symbol distinguishes products, packaging and process made in environmentally sustained conditions



Carbon Footprint

This symbol distinguishes products made in factories with in their productive process decreased the CO2 emissions into the atmosphere



Comfort

This symbol distinguishes products with extra comfort properties



Reach

This symbol distinguishes products that are according to the REACH requirements

CE Marking

CE marking is legal requirement for the Personal Protection Equipments (PPE) in the European Union Market. This certification informs the consumer that the product follows all the health and safety applied requirements in Directive 89/686/CEE.

The notified body of CTCP, is a legal entity appointed by the Member States of the European Union, with the number 1775, which provides services for conformity assessment with the objective of the CE marking.

CTCP is authorized to make the evaluation of EPI at the foot/leg and hand/arm, in the following assessment procedures:

- EC type-examination;
Quality Assurance System
- EC of the final product;
Quality Assurance System
EC of the production.

CTCP performs all the tests for certification of footwear - EC Type Examination, namely to:

- Safety shoes;
- Footwear of occupational use;
- Footwear for firefighters;
- Footwear resistant to cutting by a chainsaw;
- Protective footwear for motorcycle.

The certification process requires an analysis of technical documentation, evaluation of product quality, evaluation of the quality system of production and issuance of the Certificate of Compliance.



Client Specifications

CTCP support and prepare specifications in accordance with the needs and goals of each company.





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