MICROGARD®

High Performance Protection in Comfort

BS EN 14605: 2005 – Type 3 or 4 Protective Clothing

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Protective Clothing against liquid chemicals

Performance requirements for clothing with liquid-tight (Type 3) or spray tight (Type 4) connections, including items providing protection to parts of the body only (Type PB (3) and PB (4)

- **Products must comply with EN340: 2003**
  This standard sets out the general requirements for protective clothing i.e. materials shall not be known to cause skin irritation or have any adverse effect to health. This also details garment sizing, labelling etc.

Test Requirements for Materials *(fabric)*

Materials for Type 3 & 4 clothing are tested for the following properties;

EN14325: 2004 details the test methods & performance classification of chemical protection clothing materials, seams, joins and assemblages.

Clause in EN 14325: 2004	Performance requirement
4.4	EN530 Abrasion
4.5	EN ISO 7854 Flex Cracking
4.6(a)	EN ISO 7854 Flex Cracking
4.7	EN ISO 9073-4 Trapezoidal tear resistance
4.9	EN ISO 13934-1 Tensile Strength
4.10	EN863 Puncture Resistance
4.11	EN374-3 or EN ISO 6529 Resistance to permeation by chemicals *(replaced EN369)*
4.14	EN 13274-4 Resistance to ignition *(replaced ISO 6941)*
(a) Only applicable if clothing intended for use at very low temperatures.	

Test Requirements for seams, joins & assemblages

Performance Requirement	Reference
Resistance to permeation of liquids (b)	EN 14325: 2003, 4.11 (see above)
Resistance to penetration by liquids (c)	EN463 *(Type 3)* or EN468 *(Type 4)*
Seam strength	EN 14325: 2003, 5.5 – the test method specified is EN ISO 13935-2
Seams, joins and assemblages of Type PB (3) clothing shall be tested to the jet test (EN463) (b) Applicable only to seams which are exposed in use. For PB protection items only seams relevant to the construction shall be considered and a performance level of at least 1 shall be obtained. (c) To be tested by whole suit tests, i.e. EN463 (jet test) for Type 3 clothing and EN468 (High level spray test) for Type 4 clothing *	

** There is no mandatory requirement for EN368 or EN ISO 6530:2005* ***chemical*** *repellence and penetration tests on materials, seams, joins or assemblages for Type 3&4*

EN463: 1994 – "Jet Test" – Determination of resistance to penetration by a jet of liquid

The principle of this test method is that a jet of water, containing a fluorescent or visible dye tracer, is directed under controlled conditions at chemical protective clothing worn by a test mannequin or human test subject. Inspection of the inside surface of the protective clothing and outside surface of absorbent clothing worn underneath allows any points of inward leakage to be identified.

Prior to entering the test chamber, a series of movements, including climbing a ladder and crawling on the floor are performed to check the whole suit doesn't split or tear.

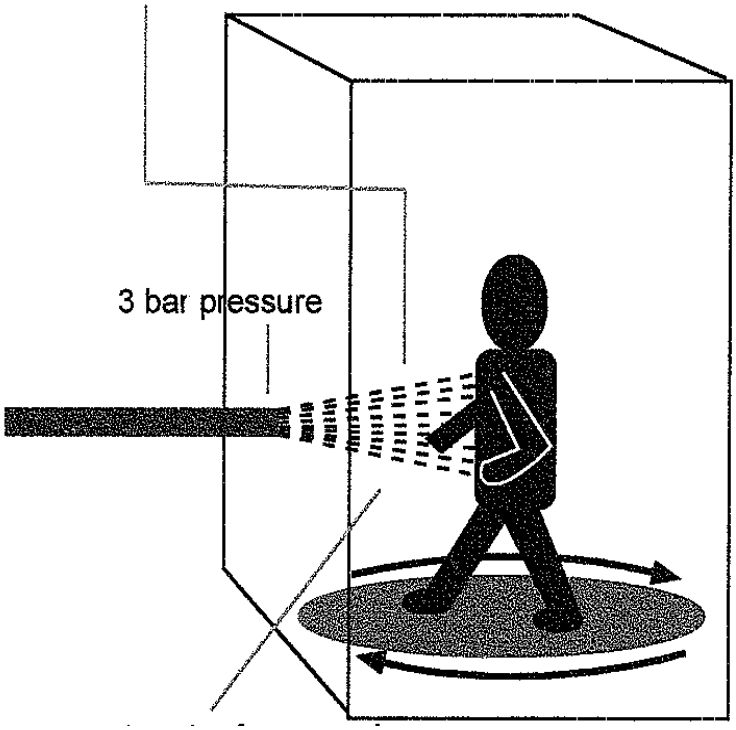
The wearer then enters the chamber and stands on a rotating platform. (The platform turns at 360º/min) A series of short jets of the water, at pressures of 3 Bar are then directed at the coverall. There is a 1m gap between the jet nozzle and the test subject.

Pass or Fail Criteria – If any penetration is greater than 3 times the total calibration stain area. *The calibration stain area is 2.0cm²*

The test is repeated on 3 suits – and all 3 must pass!

Diagram illustrating EN463 “Jet Test”

Water containing the visible dye tracer



1 metre from nozzle to test suit

EN468: 1995 – “Spray Test” – Determination of resistance to penetration by spray

The principle of this test method is that an aqueous spray, containing a fluorescent or visible dye tracer, is directed under controlled conditions at chemical protective clothing worn by a test mannequin or human test subject. Inspection of the inside surface of the protective clothing and outside surface of absorbent clothing worn underneath allows any points of inward leakage to be identified.

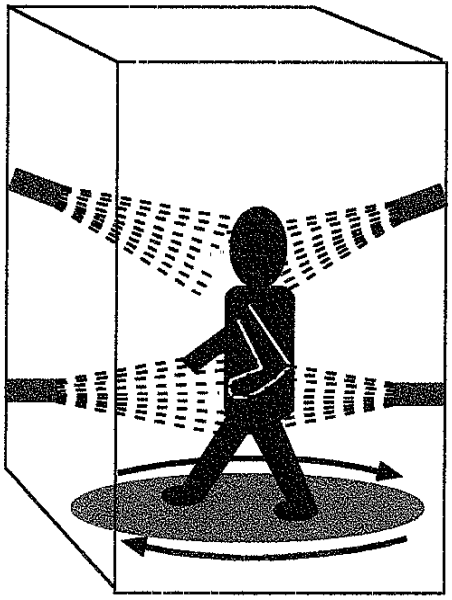
Prior to entering the test chamber, a series of movements, including climbing a ladder and crawling on the floor are performed to check the whole suit doesn’t split or tear.

The wearer then enters the chamber and stands on a rotating platform. (The platform turns at 360º/min) The suit is sprayed from all sides (saturated) by approx 4.5litres of the dyed water. There is a 1m gap between the spray nozzles and the test subject.

Pass or Fail Criteria – If any penetration is greater than 3 times the total calibration stain area. *The calibration stain area is 2.0cm²*

The test is repeated on 3 suits – and all 3 must pass!

Diagram illustrating EN468 “Spray Test”



Chemical Permeation

What is permeation?

Permeation is the process by which a hazardous liquid chemical moves through a protective clothing fabric on a molecular level.

Measuring permeation

The resistance of a protective clothing fabric to permeation by a potentially hazardous chemical is determined by measuring the breakthrough time and the permeation rate of the chemical through the fabric.

Permeation Test Methods

There are various permeation test methods in use today. Which one to use depends on a number of factors including the country of use for the protective clothing, and the type of chemical (i.e. gas or liquid).

Results are recorded as follows;

Permeation rate – this is the rate at which the hazardous chemical permeates through the test fabric and is expressed as a mass of hazardous chemical flowing through a fabric area per unit of time i.e. 1.0ug/cm²/min or 1.0 millionth of a gram per square centimetre per minute.

Actual breakthrough time – the average time elapsed between initial contact of the chemical with the outside surface of the fabric and the detection of the chemical at the inside surface of the analytical device.

An actual breakthrough time of >480mins and a permeation rate of "nd" (not detected) does not mean breakthrough has not occurred. It means that permeation was not detected after an observation time of eight hours. Permeation may have occurred, but at a rate less than the minimum detectable permeation rate or MDPR. MDPR can vary depending on the chemical or the analytical device/test method.

Normalised breakthrough time – this is the average time between initial contact of the chemical with the outside surface of the fabric and the time at which the chemical is detected at the inside surface of the fabric at the permeation rate specified by the appropriate standard.

The key test methods and the normalised permeation rates required are listed below;

1) EN374-3 specifies a normalised permeation rate of 1.0ug/cm²/min

2) ISO 6529: 2001 allows results to be reported at the normalised permeation rate of 1.0ug/cm²/min or 0.1ug/cm²/min

3) ASTM F739 specifies a normalised breakthrough time (NBT) of 0.1ug/cm²/min

In Europe (as specified in EN 14325:2004) either EN374-3 or EN ISO 6529: 2001 can be used for permeation testing, providing the normalised breakthrough time is recorded at the permeation rate of 1.0ug/cm²/min

In Europe we have a system of performance classification for normalised breakthrough times, as illustrated in Table A;

Table A	
Breakthrough time in minutes	**EN Classification**
≥ 10	1
≥ 30	2
≥ 60	3
≥ 120	4
≥ 240	5
≥ 480	6

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