DTAPS Level A Suit Test Data

The suit provides protection against dual-use industrial chemicals, chemical warfare agents, and biological warfare agents. The fabric used in the DTAPS® Level A suit, Tychem® LV, is an improved version of one of DuPont's commercial fabrics. Tychem® LV is constructed with the same multi-laminant film technology as DuPont's current line of fabrics. DuPont also developed a new seam sealing tape for use with the improved fabric. This combination delivers a superior chemical barrier combined with physical strength, durability, and enhanced comfort and flexibility. Extensive chemical testing has been conducted by DuPont and GEOMET to evaluate and document the performance of both the material and seams to ensure continued excellent chemical protection. A dull green color (i.e., olive drab) was specified at the request of users to provide a lower on-scene profile compared to the high-visibility suit colors normally used for hazardous waste operations.

CW Protection: Suit material tested against GA, GB, GD, HD, L, and VX. Test results are reproduced in the following table.

Chemical Warfare Agent
Permeation Data for Tychem® LV

Agent (common name)	Protocol*	Average Breakthrough Time	Minimum Detectable Permeation (µg/cm^2)
GA (Tabun)	C	> 12 hrs.	< 0.0001
GB (Sarin)	C D	> 12 hrs. > 12 hrs.	< 0.0001 < 0.0001
GD (Soman)	C	> 12 hrs.	< 0.0001
HD (sulfur mustard)	A B	> 12 hrs. > 12 hrs.	<1.000 <1.000
L (Lewisite)	A B	> 12 hrs. 2 hrs.	<0.060 <0.042
VX (V-agent)	C D	> 12 hrs. > 12 hrs.	< 0.0001 < 0.0001

All tests conducted in triplicate for DuPont Nonwovens by an independent accredited laboratory at 22ºC, 50% R.H.

* Fabric test protocols:

A - MIL-STD-282, Method T-209 for HD (or modified for L) for 12 hours at 10 g/m^2.
B - MIL-STD-282, Method T-209 for HD (or modified for L) for 12 hours at 100 g/m^2 (total coverage).
C - MIL-STD-282, Method T-208 for GB (or modified for GA, GD, & VX) for 12 hours at 10 g/m^2.
D - MIL-STD-282, Method T-208 for GB (or modified for GA, GD, & VX) for 12 hours at 100 g/m^2 (total coverage).

BW Protection: Suit material is protective against bacteria, protozoans, rickettsia, toxins, and viruses. Biopenetration resistance is measured in accordance with ASTM F1671, *Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Blood-Borne Pathogens Using Phi-X174 Bacteriophage Penetration as a Test System*.

TIMs Protection: Suit material is protective against the 21 chemicals listed in ASTM F 1001 and numerous other toxic industrial materials (TIMs). Permeation data is available for more than 250 chemicals. For specific chemicals, refer to DuPont's Permeation Guide for Tychem® Fabrics and the DuPont Fax-on-Demand Data Service (800-558-9329).

Duration of Protection: Over 8 hours for most ASTM F 1001 chemicals (see table below).

Tychem® LV Permeation Data for ASTM F 1001 Recommended List of Chemicals for Evaluating Protective Clothing Materials

Chemical Name (Physical Phase)	Average Normalized Breakthrough Time (minutes)	Average Permeation Rate ($\mu g/cm^2/min$)
Acetone (liquid)	> 480	< 0.001
Acetonitrile (liquid)	> 480	< 0.003
Ammonia (gas)	46	0.62
1,2-Butadiene (gas)	> 480	< 0.001
Carbon disulfide (liquid)	> 480	< 0.001
Chlorine (gas)	> 480	< 0.01
Dichloromethane (liquid)	432	0.06
Diethylamine (liquid)	> 480	< 0.001
N,N-Dimethylformamide (liquid)	> 480	< 0.001
Ethyl acetate (liquid)	> 480	< 0.001
Ethylene oxide (gas)	> 480	< 0.01
n-Hexane (liquid)	> 480	< 0.001
Hydrogen chloride (gas)	> 480	< 0.1
Methanol (liquid)	157	0.81
Methyl chloride (gas)	> 480	< 0.001
Nitrobenzene (liquid)	> 480	< 0.001
Sodium hydroxide, 50% (liquid)	> 480	< 0.1
Sulfuric acid, 98% (liquid)	> 480	< 0.1
Tetrachloroethylene (liquid)	> 480	< 0.001
Tetrahydrofuran (liquid)	> 480	< 0.001
Toluene (liquid)	> 480	< 0.001

Numbers reported are averages of samples tested by the ASTM F 739 test method.