Personal Protection Equipment

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Objectives

Students will be able to:

- State protection offered by various levels of protective clothing
- Describe their response capability based on their assigned level of protective clothing and training

Domestic Preparedness

Levels of Protection

A B C D

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Chemical Resistance

- **Chemical Resistance is the measurement of specific fabric or material ability to resist exposure to chemical intrusion.**
- **This is measured in three ways**
  - **Degradation**
  - **Penetration**
  - **Permeation**

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Dupont 2003 Permeation Guide on Tyvek Fabrics – Tychem Limited Use

Permeation Guide for DuPont™ Tychem® Fabrics Effective January 2003
ASTM F1001 List of Challenge Chemicals (Permeation Test Method ASTM F739)
Standardized Breakthrough Times for DuPont™ Tychem® Limited Use Fabrics

Sub-Class	Chemical Name	CAS Number	Phase	Standardized Breakthrough Time (Minutes)											
				Tychem® QC	Tychem® CPF 1	Tychem® SL	Tychem® CPF 2	Tychem® 7500	Tychem® F	Tychem® CPF 3	Tychem® BR/ Tychem® LV	Tychem® CPF 4	Tychem® Responder®	Tychem® TK	Tychem® Refector®
391	Acetone	67-64-1	L	imm.	imm.	12	12	433	>480	>480	>480	>480	>480	>480	>480
431	Acetonitrile	75-05-8	L	imm.	imm.	12	12	14	157	imm.	>480	>480	>480	>480	>480
350	Ammonia gas	7664-41-7	G	imm.	nt	32	32	525	79	12	66	>480	>480	>480	>480
296	1,3-Butadiene	106-99-0	G	imm.	nt	>480	>480	>480	>480	>480	>480	>480	>480	>480	>480
502	Carbon disulfide	75-15-0	L	imm.	imm.	imm.	imm.	>480	>480	16	>480	>480	>480	>480	>480
330 / 350	Chlorine gas	7782-50-5	G	imm.	nt	>480	>480	>480	>480	>480	>480	>480	>480	>480	>480
261	Dichloromethane	75-09-2	L	imm.	imm.	imm.	imm.	imm.	imm.	imm.	432	114	>480	>480	>480
142	Diethylamine	109-89-7	L	imm.	imm.	12	12	>480	>480	>480	>480	>480	>480	>480	>480
132	N,N-Dimethylformamide	68-12-2	L	imm.	25	95	95	>480	>480	>480	>480	>480	>480	>480	>480
222	Ethyl acetate	141-78-6	L	imm.	imm.	14	14	>480	>480	>480	>480	>480	>480	>480	>480
275	Ethylene oxide gas	75-21-8	G	imm.	nt	imm.	imm.	75	65	>480	>480	305	>480	>480	>480
291	n-Hexane	110-54-3	L	imm.	imm.	10	10	>480	>480	>480	>480	>480	>480	>480	>480
350	Hydrogen chloride gas	7647-01-0	G	imm.	nt	>480	>480	195	>480	nt	>480	>480	>480	>480	>480
311	Methanol	67-56-1	L	imm.	imm.	>480	>480	65	77	imm.	157	>480	>480	>480	>480
261	Methyl chloride	74-87-3	G	imm.	nt	>480	>480	>480	>480	nt	>480	>480	>480	>480	>480
441	Nitrobenzene	98-95-3	L	imm.	imm.	102	102	>480	>480	>480	>480	>480	>480	>480	>480
380	Sodium hydroxide, 50%	1310-73-2	L	>480	>480	>480	>480	>480	>480	>480	>480	>480	>480	>480	>480
370	Sulfuric acid, 98%	7664-93-9	L	>480	>480	>480	>480	>480	>480	>480	>480	>480	>480	>480	>480
264	1,1,2,2-Tetrachloroethylene	127-18-4	L	imm.	imm.	imm.	imm.	>480	>480	>480	>480	>480	>480	>480	>480
241	Tetrahydrofuran	109-99-9	L	imm.	imm.	imm.	imm.	314	464	>480	>480	>480	>480	>480	>480
292	Toluene	108-88-3	L	imm.	imm.	imm.	imm.	>480	>480	>480	>480	>480	>480	>480	>480

> = greater than imm. = immediate (<10 minutes) nt = not tested L = Liquid G = Gas

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Permeation Guide for DuPont™ Tychem® Protective Fabrics
Effective January 2003. This guide replaces all previously published until superseded.

Chemical Warfare Agents

Permeation test results are shown as follows:
Average Breakthrough Time (minutes)
Minimum Detectable Permeation Rate (µg/cm²/min)

> = greater than
< = less than
nt = not tested

Agent	Common Name	CAS Number	Protocol	Tychem® SL	Tychem® CPF 2	Tychem® 7500	Tychem® F	Tychem® CPF 3	Tychem® BR and Tychem® LV	Tychem® CPF 4	Tychem® Responder®	Tychem® TK	Tychem® Refector®
GA	Tabun	77-81-6	DN5	nt	nt	nt	nt	nt	>720 8 X 10^{-3}	nt	>720 8 X 10^{-3}	>720 8 X 10^{-3}	>720 8 X 10^{-3}
			DN6	nt	nt	>720 2 X 10^{-4}	>720 2 X 10^{-4}		nt	nt	nt	>720 4 X 10^{-3}	nt
GB	Sarin	107-44-8	DN5	360	360			120	>720	360	>720	>720 4.2 X 10^{-3}	>720 4.2 X 10^{-3}
			DN6									>720 1 X 10^{-4}	>720 4 X 10^{-3}
GD	Soman	99-64-0	DN5	nt	nt	nt	nt	>480 0.004	>720 4.2 X 10^{-3}	nt	>720 4.2 X 10^{-3}	>720 2.1 X 10^{-3}	>720 4.2 X 10^{-3}
			DN6	nt	nt	>720 2 X 10^{-4}	>720 2 X 10^{-4}	nt	nt	nt	nt	>720 4 X 10^{-3}	nt
HD	Sulfur Mustard	505-60-2	DN3	180 0.002	180 0.002	nt	nt	120 0.004	>720 4.2 X 10^{-3}	180 0.002	>720 4.2 X 10^{-3}	>720 0.00021	>720 4.2 X 10^{-3}
			DN4	nt	nt	>720 <0.002	>720 <0.002	nt	>720 8 X 10^{-4}	nt	>720 8 X 10^{-4}	>720 8 X 10^{-4}	>720 8 X 10^{-4}
L	Lewisite	541-25-3	DN3	>360 8 X 10^{-4}	>360 8 X 10^{-4}	nt	nt	120 0.005	>720 2.5 X 10^{-4}	>360 8 X 10^{-4}	>720 2.5 X 10^{-4}	>720 0.0000125	>720 2.5 X 10^{-3}
			DN4	nt	nt	360 0.006	360 0.006	nt	120 7 X 10^{-3}	nt	120 7 X 10^{-3}	>720 8 X 10^{-4}	120 7 X 10^{-3}
VX	VX Nerve Agent	50782-69-9	DN5	>720 5 X 10^{-3}	>720 5 X 10^{-3}	nt	nt	>480 0.0042	>720 4.2 X 10^{-3}	>720 5 X 10^{-3}	>720 4.2 X 10^{-3}	>720 2.1 X 10^{-3}	>720 4.2 X 10^{-3}
			DN6	nt	nt	>720 2 X 10^{-4}	>720 2 X 10^{-4}	nt	>720 8 X 10^{-3}	nt	>720 8 X 10^{-3}	>720 8 X 10^{-3}	>720 8 X 10^{-3}

Fabric Test Protocols. All tests performed in triplicate for DuPont Personal Protection by an independent accredited laboratory at 22° C, 50% R.H.
Protocol DN3 - MIL-STD-282, Method T-209 (HD) or modified for Lewisite, for 12 hours at 10 g/m².
Protocol DN4 - MIL-STD-282, Method T-209 (HD) or modified for Lewisite, for 12 hours at 100 g/m² (total coverage).
Protocol DN5 - MIL-STD-282, Method T-208 (GB) or modified for GA, GD, and VX, for 12 hours at 10 g/m².
Protocol DN6 - MIL-STD-282, Method T-208 (GB) or modified for GA, GD, and VX, for 12 hours at 100 g/m² (total coverage).

EPA Level D Protection

Level D is your work uniform and generally offers little or no respiratory or chemical protection.

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Structural Firefighter Gear with SCBA

- Respiratory protection
- Limited splash protection
- Unknown protection against skin absorption of vapors/aerosols
- Considered Level D protection

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Firefighter Turn-out gear in CBRNE Event

SBCCOM Report June 2003

- Use of structural firefighting protective equipment for rescue in a chemical environment.

A Guideline

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Recommended Initial Protection Levels

- Hot Zone = Level A
- Possible to downgrade based on:
  - Agent identification
  - Agent concentration
  - Incident Commander approval

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Key Points

- Structural Firefighter Gear with SCBA provides respiratory protection but is not certified for hazardous chemical protection/CBRNE environments.
- Without proper protective clothing, you are limited in the activities you can perform

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