

DuPont Personal Protection



Technical Data Package

DuPont™ Tychem® TK EX Ensembles

Compliant with Class 2 of NFPA 1994, 2007 Edition

Consult the
DuPont™ Tychem® User Manual
for Instructions on Use

Revised September 2008

This information packet may not be removed
except by the end user
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Style TK612T – Front Entry
Style TK613T – Rear Entry

Accessories and pass through options are listed in an attached document, “*DuPont™ Tychem® Accessories List*”.

NFPA 1994, Class 2 compliant DuPont™ Tychem® TK Ensembles are available in the following sizes: S/M, L/XL, 2XL/3XL and 4XL. The Tychem® User Manual contains a sizing chart for encapsulating garments.

The chemical barrier garment of the NFPA 1994, Class 2 compliant Tychem® TK ensembles are made from a proprietary multi-layer chemical barrier fabric. The chemical garment seams are sewn with a serge stitch with cotton/polyester thread and sealed with hot-air welded chemical barrier tape inside and outside.

The visor material in this inner chemical barrier garment consists of an outer layer of 40 mil PVC, a middle layer of 5 mil Teflon® FEP and an inner layer of 20 mil PVC. There are no detachable or replaceable visor components.

The chemical garment visor layers are sewn to the outside of the garment material with thread made of KEVLAR® fibers. The visor is sealed inside and out with the same tape used on the garment seams.

The glove configuration consists of:

Inner Glove: Ansell Barrier® Style 2-100

Outer Glove: Guardian #IN 35 Neoprene

These neoprene gloves are unlined and have no surface treatments. Gloves are available in five size combinations to fit hands from less than 9 inches to 11 inches in circumference. The inner and outer gloves are connected to the sleeve of the inner chemical barrier garment with a rigid plastic ring and metal ring clamp. The seal is accomplished by mechanical compression of the garment and glove materials.

Chemical barrier socks and boot top covers are attached to the garment. The attached socks and boot top cover are made from suit material. The socks provide the footwear barrier protection. The ensembles are certified with Onguard HazMax® 87012 boots that are worn over the socks and under the boot top covers. The boots are not physically attached to the garment. These boots have steel toes and ladder shanks and provide physical protection. There are no surface treatments applied to the boots. These boots are available in sizes 6 to 15. The boots are not provided with the ensemble and must be purchased separately.

The 48” inches long, vapor-protective closure has nickel-silver teeth. The slider components are aluminum-bronze. The closure is mounted on a PVC tape that is sewn to the outside of the chemical barrier garment and sealed with hot-air welded tape. The closures are covered by two flaps made of primary garment material. The flaps are fastened with hook-and-loop closures.

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The suit is fitted with two AUER Model #5135-927 exhaust valves. The valve is manufactured of an impact resistant plastic body and a removable flexible splash shield. The diaphragm is made of molded butyl rubber. The valves are inserted through the chemical suit material and secured with a threaded inner ring, sealed with mechanical compression. The valve assemblies are covered with a flap of primary suit material to reduce direct splash on the exhaust valve assembly. The exhaust valves can be replaced by DuPont.

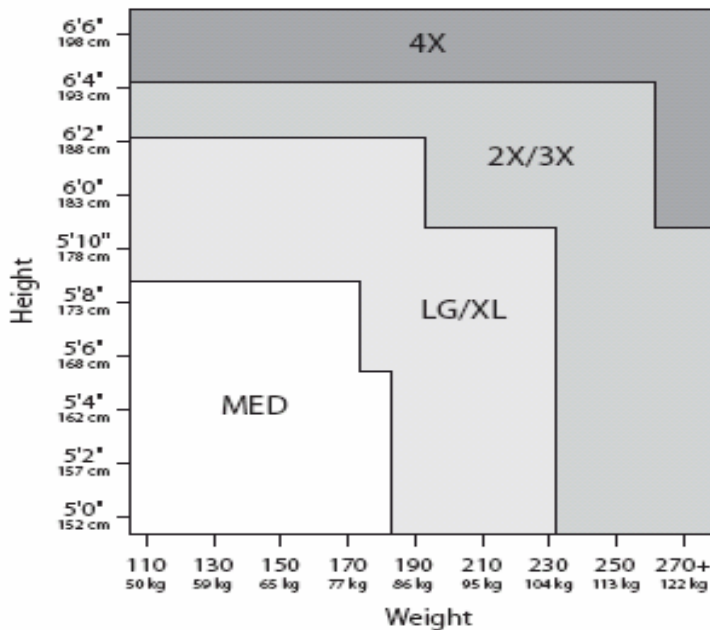
The diaphragm in each exhaust valve must be replaced by the end user every two years from date of manufacture. Instructions on purchasing replacement exhaust valve

diaphragms can be found on-line at www.personalprotection.com or by contacting DuPont Customer Service at 800-931-3456. Instructions for replacing the exhaust valve flapper can be found in the *DuPont Personal Protection Instruction Manual for Universal Pressure Test Kit*.

This ensemble will accommodate a Class G cap compliant with ANSI Z89.1 worn inside the suit. The suit was certified using a CBRN compliant Dräger Airboss system with 4500 psi tank and Panorama Nova facepiece.

This ensemble will accommodate a Class G cap compliant with ANSI Z89.1 worn inside the suit.

DuPont™ Tychem® Encapsulating Garment Sizing



PLEASE NOTE; This chart is based on a majority of individuals wearing SCBA, safety helmet and suggested undergarments. Proper fit will vary with individual body shape.

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Compliance with Design Requirements

Section	Chapter 6 - Design Requirement	
6.1	Protective Ensemble Requirements.	
6.1.1	Ensembles shall have at least the applicable design requirements specified in section 6.1) of this standard when inspected by the certification organization.	Compliant
6.1.2	Ensembles shall be designed to protect the wearer's upper and lower torso, head, hands, and feet.	Compliant
6.1.3	Ensembles elements shall include protective garments, protective gloves, and protective footwear.	Compliant
6.1.4	Ensembles shall be designed to be worn for a single exposure at incidents involving CBRN terrorism agents	Compliant
6.1.5	Ensembles shall be permitted to be designed as either encapsulating or non-encapsulating, and shall be so designated on the product label.	Encapsulating
6.1.6	Any ensemble certified as Class 2, Class 3, or Class 4 shall be permitted to also be certified to any other or both other class ensembles covered in NFPA 1994.	Not Applicable
6.1.7	Ensembles shall accommodate the respirators specified by the manufacturer for the specific ensemble.	Compliant
6.1.8	All respirators specified by the ensemble manufacturer for inclusion in Class 2, Class 3, or Class 4 ensembles shall be certified by the National Institute for Occupational Safety and Health (NIOSH) as compliant with the <i>Statement of Standard for NIOSH CBRN SCBA Testing</i> , or with the <i>Statement of Standard for NIOSH CBRN APR Testing</i> , or with the <i>Statement of Standard for NIOSH CBRN PAPR Testing</i> . All respirators shall cover the eyes, nose, and mouth at a minimum.	Compliant
6.1.8.1	All respirators specified in 6.1.8 for inclusion in Class 2 ensembles shall be CBRN self-contained breathing apparatus. (SCBA)	Compliant
6.1.8.2	Where the respirator specified in 6.1.8 is an open circuit SCBA, the SCBA shall also be certified as compliant with NFPA 1981, <i>Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire and Emergency Services</i> .	Compliant
6.2	Garment Element Requirements.	
6.2.1	Garments shall have at least the applicable design requirements specified in this section when inspected by the certification organization.	Compliant
6.2.2	Garments shall be designed and configured to protect at least the wearer's upper and lower torso, arms, and legs and the head with the respirator.	Compliant
6.2.3	Garments shall be designed for a single exposure wearing at incidents involving CBRN terrorism agents.	Compliant
6.2.4	Where garments incorporate booties, the booties shall be designed as an extension of the garment leg and shall cover the entire foot and ankle.	Compliant
6.2.5	Garments shall be offered in at least four unique and different sizes.	Compliant
6.2.6	All garment hardware and external fittings shall be free of rough spots, burrs, or sharp edges that could abrade or tear primary materials.	Compliant
6.3	Glove Element Requirements.	
6.3.1	Gloves shall have at least the applicable design requirements specified in this section where inspected by the certification organization.	Compliant
6.3.2	Gloves shall provide protection from the fingertips to at least 25 mm (1 in.) beyond the wrist crease.	Compliant
6.3.3	Gloves shall be designed to be worn for a single exposure at incidents involving CBRN terrorism agents.	Compliant

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6.3.4	In order to label or otherwise represent a glove that meets the requirements of this standard, the manufacturer shall provide gloves in not less than five separate and distinct sizes.	Compliant
6.3.5	All hardware and external fittings shall be free of rough spots, burrs, or sharp edges that could abrade or tear primary materials.	Compliant
6.4	Footwear Element Requirements.	
6.4.1	Footwear shall have at least the applicable design requirements specified in this section where inspected by the certification organization.	Compliant
6.4.2	Footwear shall provide protection of not less than 200 mm (8 in.) in height when measured from the plane of the sole bottom.	Compliant
6.4.3	Footwear shall be designed for a single exposure wearing at incidents involving CBRN terrorism agents.	Compliant
6.4.4	Protective footwear shall be offered in at least six unique and different sizes.	Compliant
6.4.5	Any metal parts of footwear shall not penetrate from the outside into the lining or insole at any point.	Compliant
6.4.6	No metal parts of footwear, including but not limited to nails or screws, shall be present or utilized in the construction or attachment of the sole with heel to the puncture-resistant device, insole, or upper.	Compliant
6.4.7	All hardware and external fittings shall be free of rough spots, burrs, or sharp edges that could tear primary materials.	Compliant

Compliance with Performance Requirements

Section	Chapter 7 - Performance Requirement	Compliance		
7.1	Class 2 Ensembles.			
7.1.1	Class 2 Ensemble General Requirements.			
7.1.1.1	MIST Performance Data for DuPont Tychem® TK Style TK612T Level A Ensemble	Compliant		
	Class 2 ensembles shall be tested for overall inward leakage using the Man-In-Simulant Test (MIST), and shall have an average local physiological protective dosage factor (PPDF _l) value at each PAD location for the four ensembles tested of no less than 360.0 and a systemic physiological protective dosage factor (PPDF _{sys}) value for each tested ensemble of no less than 361.0.	Systemic PPDF _i (ave. of 4) 4890		
Local PPDF _i Results	Locals PPDF_i Values (average of 4 determinations)			
	Scalp	35158	Chest	50192
	Forehead	36909	Right buttock	58111
	Behind Left Ear Upper	38514	Lower back	54267
	Behind Left Ear	24010	Groin	55718
	Neck Right	33639	Crotch (left)	14215
	Neck Left	35789	Crotch (right)	16198
	Nape	22840	Left inner thigh	56427
	Left Armpit	22020	Right inner thigh	63349
	Left inner upper arm	19938	Left inner shin	65456
	Left outer upper arm	26280	Right inner shin	44432
	Left forearm	18320	Right cheek	46461
	Right forearm	25716	Left cheek	62855
	Middle back	35029	Left hand	30255
	Middle back duplicate	55510	Right hand	21753
	Abdomen	52676	Foot	66321

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7.1.1.1	MIST Performance Data for DuPont Tychem® TL Style TK613T Level A Ensemble	Compliant		
	Class 2 ensembles shall be tested for overall inward leakage using the Man-In-Simulant Test (MIST), and shall have an average local physiological protective dosage factor (PPDF _i) value at each PAD location for the four ensembles tested of no less than 360.0 and a systemic physiological protective dosage factor (PPDF _{sys}) value for each tested ensemble of no less than 361.0.	Systemic PPDF _i (ave. of 4) 3828		
Local PPDF _i Results	Locals PPDF_i Values (average of 4 determinations)			
	Scalp	17688	Chest	28033
	Forehead	37490	Right buttock	44066
	Behind Left Ear Upper	40842	Lower back	42986
	Behind Left Ear	37967	Groin	43471
	Neck Right	40251	Crotch (left)	11187
	Neck Left	40251	Crotch (right)	10553
	Nape	22707	Left inner thigh	46047
	Left Armpit	18209	Right inner thigh	36828
	Left inner upper arm	18457	Left inner shin	44430
	Left outer upper arm	19795	Right inner shin	46599
	Left forearm	20081	Right cheek	29635
	Right forearm	20695	Left cheek	41282
	Middle back	38313	Left hand	21628
	Middle back duplicate	32195	Right hand	1774
Abdomen	39188	Foot	40801	
7.1.1.2	Class 2 ensembles shall be tested for overall function and shall allow the test subject to complete all tasks within 20 minutes, and shall allow no liquid penetration in subsequent liquid-tight integrity testing and the garment closure shall remain engaged during the entire garment function testing.	Compliant		
7.1.1.2.1	Where hoods are provided, garment shall accommodate head protection devices meeting the dimensional requirements of Type I, Class G helmets of ANSI Z89.1, <i>Standard on Industrial Head Protection</i> .	Compliant		
7.1.1.2.2	Where hoods with visors are provided, garments shall permit the test subject to see with a visual acuity of 20/35 or better through the combination of the hood visor and the respirator facepiece lens.	Compliant		
7.1.1.2.3	Where protective flaps cover the closure, the protective flaps shall remain closed for the duration of the overall garment function test.	Compliant		
7.1.1.3	External fittings installed in Class 2 ensembles shall be tested for pull-out strength and shall not have a failure force of less than 1000 N (225 lbf).	Not Applicable		
7.1.1.4	Exhaust valves installed in Class 2 ensembles shall be tested for mounting strength and shall have a failure force greater than 135 N (30 lbf).	Not Applicable		
7.1.1.5	Exhaust valves installed in Class 2 ensembles shall be tested for inward leakage and shall not exhibit a leakage rate exceeding 30 ml/min (1.83 in. ³ /min).	Not Applicable		
7.1.2	Class 2 Garment Element Requirements.			
7.1.2.1	Class 2 garment materials and seams shall be tested for permeation resistance and shall meet the following performance criteria:	Compliant		
7.1.2.1(1)	The average cumulative permeation in 1 hour shall not exceed 4.0 ug/cm ² for chemical warfare agents Distilled Mustard (HD)	Compliant		
7.1.2.1(2)	The average cumulative permeation in 1 hour shall not exceed 1.25 ug/cm ² for chemical warfare agent Soman (GD).	Compliant		
7.1.2.1(3)	For permeation testing of liquid and gaseous industrial chemicals, the average normalized breakthrough time shall be greater than 60 minutes.	Compliant		
7.1.2.2	Class 2 garment materials shall be tested for bursting strength and shall have a bursting strength of not less than	Compliant		

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	156 N (35 lbf).	
7.1.2.3	Class 2 garment materials shall be tested for puncture propagation tear resistance and shall have a puncture propagation tear resistance of not less than 31 N (7 lbf).	Compliant
7.1.2.4	Class 2 garment materials shall be tested for cold weather performance and shall have a bending moment of not greater than 0.057 N·m ($\frac{1}{2}$ in.-lbf) at an angular deflection of 60 degrees at -25°C (-13°F).	Compliant
7.1.2.5	Class 2 garment seams shall be tested for seam strength and shall have a breaking strength of not less than 1.31 kN/m (15 lbf/2 in.).	Compliant
7.1.2.6	Class 2 garment closure assemblies shall be tested for closure strength and shall have a breaking strength of not less than 1.31 kN/m (15 lbf/2 in.).	Compliant
7.1.2.7	Class 2 garment materials and seams shall be tested for resistance to liquid or bloodborne pathogens and shall allow no penetration of the Phi-X-174 bacteriophage for at least 1 hour.	Compliant
7.1.2.8	Class 2 Garment Visor Requirements.	
7.1.2.8.1	Class 2 garment visor materials and seams shall be tested for permeation resistance and shall meet the following performance criteria:	Not Applicable
7.1.2.8.1(1)	For permeation testing of chemical warfare agent Distilled Mustard (HD), the average cumulative permeation in 1 hour shall not exceed 4.0 $\mu\text{g}/\text{cm}^2$.	Not Applicable
7.1.2.8.1(2)	For permeation testing of chemical warfare agent Soman (GD), the average cumulative permeation in 1 hour shall not exceed 1.25 $\mu\text{g}/\text{cm}^2$.	Not Applicable
7.1.2.8.1(3)	For permeation testing of liquid and gaseous industrial chemicals, the average normalized breakthrough time shall be greater than 60 minutes.	Not Applicable
7.1.2.8.2	Class 2 garment visor materials shall be tested for bursting strength and shall have a bursting strength of not less than 156 N (35 lbf).	Not Applicable
7.1.2.8.3	Class 2 garment visor materials shall be tested for puncture propagation tear resistance and shall have a puncture propagation tear resistance of not less than 36 N (8 lbf).	Not Applicable
7.1.2.8.4	Class 2 garment visor materials shall be tested for cold temperature bending at -25°C (-13°F) and shall not crack or show evidence of visible damage.	Not Applicable
7.1.2.8.5	Class 2 garment visor material seams shall be tested for seam strength and shall have a breaking strength of not less than 1.31 kN/m (15 lbf/2 in.).	Not Applicable
7.1.2.8.6	Class 2 garment visor materials shall be tested for resistance to liquid or bloodborne pathogens and shall allow no penetration of the Phi-X-174 bacteriophage for at least 1 hour.	Not Applicable
7.1.3	Class 2 Glove Element Requirements.	
7.1.3.1	Class 2 gloves shall be tested for liquid-tight integrity and shall show no leakage.	Compliant
7.1.3.2	Class 2 glove materials and seams shall be tested for permeation resistance and shall meet the following performance criteria:	Compliant
7.1.3.2(1)	The average cumulative permeation in 1 hour shall not exceed 4.0 $\mu\text{g}/\text{cm}^2$ for chemical warfare agents Distilled Mustard (HD)	Compliant
7.1.3.2(2)	The average cumulative permeation in 1 hour shall not exceed 1.25 $\mu\text{g}/\text{cm}^2$ for chemical warfare agents Soman (GD).	Compliant
7.1.3.2(3)	For permeation testing of liquid and gaseous industrial chemicals, the average normalized breakthrough time shall be greater than 60 minutes.	Compliant
7.1.3.3	Class 2 glove materials shall be tested for cut resistance and shall have the distance of blade travel be not less than 25 mm (1 in.) at 200 g load.	Compliant
7.1.3.4	Class 2 glove materials shall be tested for puncture	Compliant

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	resistance and shall have a puncture resistance of not less than 15 N (3.8 lbf).	
7.1.3.5	Class 2 garment materials shall be tested for cold weather performance and shall have a bending moment of not greater than 0.057 N·m ($\frac{1}{2}$ in.-lbf) at an angular deflection of 60 degrees at -25°C (-13°F).	Compliant
7.1.3.6	Class 2 gloves shall be tested for hand function and shall have an average percent increase over barehanded control less than 300 percent.	Compliant
7.1.3.7	Class 2 glove materials and seams shall be tested for resistance to liquid or bloodborne pathogens and shall allow no penetration of the Phi-X-174 bacteriophage for at least 1 hour.	Compliant
7.1.4	Class 2 Footwear Element Requirements.	
7.1.4.1	Class 2 footwear shall be tested for liquid-tight integrity and shall show no leakage.	Compliant
7.1.4.2	Class 2 footwear upper material and sole shall be tested for permeation resistance and shall meet the following performance criteria:	Compliant
7.1.4.2(1)	The average cumulative permeation in 1 hour shall not exceed 4.0 ug/cm ² for chemical warfare agents Distilled Mustard (HD)	Compliant
7.1.4.1(2)	The average cumulative permeation in 1 hour shall not exceed 1.25 ug/cm ² for chemical warfare agents Soman (GD).	Compliant
7.1.4.1(3)	For permeation testing of liquid and gaseous industrial chemicals, the average normalized breakthrough time shall be greater than 60 minutes.	Compliant
7.1.4.3	Class 2 footwear upper materials shall be tested for cut resistance and shall have the distance of blade travel not be less than 25 mm (1 in.) at a load of 600 g.	Compliant
7.1.4.4	Class 2 footwear upper materials shall be tested for puncture resistance and shall have a puncture resistance of not less than 36 N (8 lbf).	Compliant
7.1.4.5	Class 2 footwear soles and heels shall be tested for abrasion resistance and have an abrasion-resistance rating of not less than 65.	Compliant
7.1.4.6	Class 2 footwear soles shall be tested for slip resistance and shall have a static coefficient of 0.75 or greater.	Compliant
7.1.4.7	Class 2 footwear upper materials shall be tested for resistance to liquid or bloodborne pathogens and shall allow no penetration of the Phi-X-174 bacteriophage for at least 1 hour.	Compliant
7.1.4.8	Where the manufacturer specifies the use of a footwear cover to be worn over standard footwear, Class 2 footwear covers shall meet the requirements specified in 7.1.4.1, 7.1.4.2, 7.1.4.3, 7.1.4.4, 7.1.4.6, and 7.1.4.7, excluding 7.1.4.5.	Compliant
7.1.4.9	Where the manufacturer specifies the use of a footwear cover to be worn over standard footwear, Class 2 footwear covers shall be tested for abrasion resistance and shall show no wear through 3000 cycles.	Compliant

Product safety information available upon request. This information corresponds to our current knowledge on this subject. It is offered solely to provide possible suggestions for your determination. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user's responsibility to determine the level of risk and the proper protective equipment needed for the user's particular purpose. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DUPONT MAKE NO WARRANTIES AND ASSUME NO LIABILITY IN CONNECTION WITH ANY USE OF THIS INFORMATION. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent rights.

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