

DuPont Personal Protection



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User Manual for

Tychem[®] Vapor Protective Garments

Certified to NFPA 1991
(2000 Edition) and
Class 1, NFPA 1994
(2001 Edition)

Tychem[®] Vapor Protective Garments

Tychem[®] Liquid Splash Protective Garments

Tychem[®] Liquid Splash Protective Garments

Certified to Class 3,
NFPA 1994 (2001 Edition)

Tychem[®] ThermoPro Liquid-Splash Protective Garments

Certified to NFPA 1992, (2000
Edition) and NFPA 2112 (2000
Edition)

All Other Tychem[®] Protective Garments

This manual only pertains to Tychem[®] garments manufactured in the United States by DuPont Personal Protection.
This information packet may not be removed except by the end user.

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Table of Contents

Safety Considerations.....	3
Wearer Qualifications.....	3
Required and Additional Equipment.....	4
Inspection of Garment.....	8
Storage.....	12
Visor Antifog Procedures.....	12
Closure Lubricants.....	13
Marking Suggestions and Restrictions.....	13
Suggested Undergarments.....	13
Sizing Considerations.....	13
Donning the Garment.....	14
Doffing the Garment.....	17
Decontamination and Cleaning.....	18
Garment Retirement Considerations.....	19
Disposal.....	20
Limitations of Use.....	20
Warnings.....	25
Responsibility of Users.....	25
Warranty Information.....	26
Garment Inspection and Test Log.....	27
Garment Sizing Chart.....	28

Safety Considerations

Be sure to read and follow the information in this manual and all applicable federal, state and local occupation safety and health statutes. Serious injury or death may occur from improper use of these garments. Proper use must be consistent with NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, and 29 CFR 1910.132.

NOTE: Only Tychem[®] ThermoPro garments are designed and tested to help reduce injury during escape from a flash fire. Users of Tychem[®] ThermoPro garments should not knowingly enter an explosive environment, i.e., an environment in which the concentration of flammable gas or solids is within flammable limits.

These garments are not suitable for use in all situations and environments with all chemical and hazardous materials. All decisions regarding the choice of chemical protective clothing and its' use must be made by trained and qualified safety professionals. It is the user's responsibility to determine the level of exposure and the proper personal protective equipment (PPE) needed. Most performance properties cannot be tested by the users in the field. Refer to the DuPont[™] Tychem[®] Permeation Guide for chemicals specific to your situation.

If any of the following symptoms develop during use of these garments, immediately leave the contaminated area, undergo field decontamination (if exposed), and doff the garment:

- Fever
- Difficulty breathing
- Nausea
- Excessive Tiredness
- Dizziness
- Numbness
- Any unusual odor or taste
- Eye or skin irritation
- Narrowing or dimming of vision
- Claustrophobia
- Loss of balance or orientation

Wearer Qualifications

These garments should be worn only by persons who are properly trained in the usage of these garments and who are in good physical condition to perform tasks involving the use of these garments. Consult a physician before donning one of these garments to ensure you are capable of wearing these garments under the expected work conditions and environment.

Required and Additional Equipment

To help protect the wearer and to perform as intended, these chemical protective garments must be worn with several additional items of personal protective equipment (PPE). At a minimum the following must be worn with each category of chemical protective garments:

Encapsulating and non-encapsulating garments: Encapsulating garments fully cover the wearer and the wearer's respirator. Encapsulating garments require supplied fresh air; there is not enough fresh air for breathing and, by design, the replenishment of fresh air is restricted within an encapsulating garment

In general, encapsulating garments that pass the inflation test described in ASTM F 1052, *Standard Test Method for Pressure Testing Vapor Protective Ensembles* are considered Level A; encapsulating garments that are not designed to pass this test are considered Level B. Not all Level B suits are encapsulating; a garment/respirator configuration is considered Level B if it provides liquid splash protection and involves a supplied air respirator (29CFR1910.120).

Encapsulating Tychem[®] Garments Compliant with NFPA 1991 and Class 1 of NFPA 1994, and Non-Encapsulating Garments Compliant with Class 3 of NFPA 1994

- Separate, user-supplied, full-face respiratory protection such as: 1) an open circuit, self-contained breathing apparatus (SCBA) which is also certified as compliant with NFPA 1981 *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Service*, or 2) an external, breathing air quality, air line system with garment pass-through and escape bottle.

The oxygen level within an encapsulating suit may rise if worn with a closed-circuit (rebreather) respirator. The oxygen concentration will depend on the type of closed-circuit respirator, the level of wearer exertion and the duration of use.

Air-purifying respirators (APR) cannot be worn with Level A garments, Level B encapsulating garments or with NFPA 1994 *Standard on Protective Ensembles for Chemical/Biological Terrorism Incidents*, Class 3 ensembles with separate protective hoods that extend below the clavicle.

Powered air-purifying respirators (PAPR) cannot be worn with encapsulating garments. PAPR's can be worn with NFPA 1994, Class 3 ensembles utilizing separate hoods, if the configuration provides adequate ventilation at the intake of the unit and if the unit is adequately protected from contamination.

- NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies* compliant Tychem[®] TK and Responder[®] ensembles must be worn with a separate over-cover to achieve abrasion resistance, puncture resistance, and protection from direct flame impingement requirements of that standard. An

over-cover should be considered for NFPA 1994, Class 1 and Class 3 garments where there is a risk of abrasion, puncture, cut, tear or flame impingement to the garment

- Separate, user-supplied protective footwear specified in the Technical Data Package must be worn with Tychem[®] garments compliant with NFPA 1991 and NFPA 1994. These garments have socks made of the garment material. These socks must be worn inside the specified protective footwear. These socks are not suitable as outer footwear.
- NFPA compliant Tychem[®] garments with attached socks are also equipped with outer boot covers to prevent liquid pooling inside the boot. After the garment is donned, the boots are donned and the outer cover is pulled down over the upper portion of the boot.
- Chemical protective gloves are attached to Tychem[®] ensembles compliant with NFPA 1991 and NFPA 1994. Separate, cut-resistant outer gloves are required on NFPA 1991 compliant garments. Cut-resistant outer gloves are not required on garments compliant with NFPA 1994, Class 1 and Class 3, but should be considered if a high level of cut protection is required.

NFPA compliant garments utilize multiple chemical resistant gloves to achieve the chemical barrier and physical performance requirements of the standard. All chemical gloves must be present in compliant ensembles.

It is the user's responsibility to verify that the glove will provide adequate barrier.

- User-supplied head protection.

Encapsulating and Non-Encapsulating Tychem[®] Garments Not Certified to NFPA Standards and Including Tychem[®] Responder[®] CSM

- Separate, user-supplied, full-face respiratory protection such as: 1) an open circuit, self-contained breathing apparatus (SCBA), 2) an external, breathing air quality, air line system with garment pass-through and escape bottle.

The oxygen level within an encapsulating suit may rise if worn with a closed-circuit (rebreather) respirator. The oxygen concentration will depend on the type of closed-circuit respirator, the level of wearer exertion and the duration of use.

Air-purifying respirators (APR) cannot be worn with encapsulating garments, nor with NFPA 1994, Class 3 ensembles with separate protective hoods that extend below the clavicle.

Powered air-purifying respirators (PAPR) cannot be worn with encapsulating garments. PAPR's can be worn with NFPA 1994, Class 3 ensembles utilizing separate hoods, if the configuration provides adequate ventilation at the intake of the unit and if the unit is adequately protected from contamination.

- Separate, user-supplied, protective footwear. Attached socks made of garment material must be worn inside protective outer footwear. These socks are not suitable as outer footwear.
- An over-cover should be considered when there is a risk of abrasion, puncture, cut, tear or flame impingement to the garment
- Tychem[®] garments with attached socks may also be equipped with outer boot covers to prevent liquid pooling inside the boot. After the garment is donned, the boots are donned and the outer cover is pulled down over the upper portion of the boot.

The cuffs of Tychem[®] garments that do not have socks should be worn over the upper portion of the user's boot to prevent run-off and pooling of liquid within the boot. Adhesive taping of the garment cuff to the boot does not provide a leak-proof seal. Taping should only be used to hold the garment cuff in position over the boot. If a leak-proof seal is required, then garments with attached socks and boot covers should be selected.

The use of footwear with toe crush protection, cut-resistant, and slip-resistant soles should be considered

- Separate, outer, cut-resistant gloves should be considered if a high level of cut protection is required.
- If gloves are not attached to the garment sleeve, user-supplied chemical protective gloves should be worn with the sleeve of the garment over the gauntlet of the glove. Adhesive taping of the glove to sleeve interface does not provide a leak-proof seal. Taping should only be used to hold the sleeve in position over the glove gauntlet. If a leak-proof seal between the glove and sleeve is required, then a garment with attached gloves should be selected.

Some Tychem[®] garments utilize multiple chemical-resistant gloves to achieve the chemical barrier and physical performance requirements. Removal of one of the glove layers may compromise chemical barrier or glove durability.

It is the user's responsibility to verify that the glove and the glove/sleeve interface will provide adequate barrier and physical performance for the intended task.

- User-supplied head protection.

Tychem[®] ThermoPro Garments

- Separate, user-supplied, full-face respiratory protection such as: 1) an open circuit, self-contained breathing apparatus (SCBA) which is also certified as compliant with NFPA 1981 *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Service*, or 2) an external, breathing air supply, air line system with garment pass-through and escape bottle.

Full-face air-purifying respirators (APR) and powered air-purifying respirators (PAPR) worn with Tychem[®] ThermoPro garments should be suitable for use in a flash-fire environment.

- An over-cover should be considered for Tychem[®] ThermoPro garments where there is a risk of abrasion, puncture, cut, tear or flame impingement to the garment.
- Separate, user-supplied protective footwear. If the Tychem[®] ThermoPro garment has attached socks, these socks must be worn inside the protective outer footwear. These socks are not suitable as outer footwear.
- Tychem[®] ThermoPro garments with attached socks are also equipped with outer boot covers to prevent liquid pooling inside the boot. After the garment is donned, the boots are donned and the outer cover is pulled down over the upper portion of the boot.
- Outer gloves tested suitable for thermal protection, such as those compliant with NFPA 1971 or NFPA 1951. For additional chemical protection, an intermediate chemical barrier glove, such as an Ansell Barrier[®] or North Silver Shield[®] worn over an inner cotton or knit KEVLAR[®] glove may be considered.
- Separate, outer, cut-resistant gloves should be considered if a high level of cut protection is required.
- The sleeve of the Tychem[®] ThermoPro suit should be worn over the gauntlet of the gloves. Adhesive taping of the glove to sleeve interface does not provide a leak-proof or reliable seal. Taping should be used, primarily, to hold the sleeve in position over the glove gauntlet. Do not use a taped configuration if a totally leak proof seal is required and hazard cannot be abated by other means such as engineering controls, work practices or administrative controls.

It is the user's responsibility to verify that the glove will provide adequate barrier and physical performance for the intended task.

- User-supplied head protection.

With all garment configurations, other personal protective equipment may be required. Consult with a trained and experienced safety professional to determine the additional PPE components required for your specific situation. For example:

- Hearing protection may be required due to high levels of external noise or high noise levels generated by supplied air systems.
- Other protective equipment may be warranted based on the situation to deal with additional hazards which may include, but are not limited to:
 - Flammable or Explosive Environment
 - Decontamination
 - Extreme Heat (Heat Stress)
 - Extreme Cold (Hypothermia)
 - Asphyxiating Atmosphere
 - Physical Hazards (Sharps, Puncture, Rough Surfaces, Falling Debris)
 - Slipping or falling
 - Visibility - of wearer & by wearer
 - Communications

Inspection of Garment

(applies to all categories of Tychem[®] garments)

Tychem[®] Garment Inspection

All Tychem[®] garments should be inspected at the following times:

1. Upon receipt from supplier
2. After the garment is worn and before the garment is worn again.
Contaminated, damaged or altered garments should not be re-used.
3. Annually.

Garment inspection is important. It ensures that the integrity of the garment has been maintained. The first inspection should be performed upon receipt to ensure that the integrity was not compromised during transit. This inspection should be done immediately upon receipt in order to ensure no damage occurred during shipping. An inspection must also be performed before wearing. Contaminated, damaged or altered Tychem[®] garments should not be used. Annual follow-up inspection is recommended for garments in storage.

Inspection of garments should include the following steps:

1. Lay the garment on a clean, smooth surface.
2. Use a flashlight inside and examine the outside of the garment for holes, cuts, or tears. Note: Apparent stitch holes covered by seam sealing tape do not constitute a defect.

3. Examine the seam tape for lifts or inadequate seal.
4. Examine the garment material and seams for signs of damage. Fabrics and seams sometimes have visual blemishes that do not affect barrier performance. Such blemishes can include dullness or white frosted areas adjacent to the seam tape. A breach or rupture of the barrier film is cause for rejection.

Tincture of Iodine is used to confirm a physical breach. Apply Tincture of Iodine to the suspect area and wipe off the excess with a dry towel. If a dark brown stain remains, the barrier layer has been breached and the garment should be rejected. Areas immediately adjacent to the seam tape may take a slight yellow stain as a result of heat exposure during manufacture. This slight yellow stain is not a defect. The edges of the seam tape may also develop a thin, but prominent staining of the exposed edge. This is not a defect.

5. Examine the visor (if present) for a tight seal and make sure the visor offers clear vision.
6. Examine the garment air distribution system (if present) to make sure that it is connected properly and appears to be in working order.
7. Examine the garment gloves (if present) to make sure they are in good working order.
8. Examine the interface between the gloves and the garment if gloves are attached to the garment.
9. Examine the interface between the boots and the garment if the boots are attached to the garment.
10. Examine the garment zipper and zipper cover to make sure they are in good working order. Lubricate the zipper using a small amount of paraffin wax or lubricant supplied by the closure manufacturer.
11. Examine the garment exhalation valves (if present) to make sure they are not obstructed and are in good working order.
12. Examine all garment snaps, closures, adjustment straps and options to make sure they are not obstructed and are in good working order.
13. Examine garment-warning label(s) to make sure they are firmly attached and can be read easily.
14. Non-certified vapor-protective (Level A) garments and garments compliant with NFPA 1991 and Class 1 of NFPA 1994 should be checked for pressure integrity during each garment inspection.

Pressure Testing Vapor-Protective (Level A) Garments

The purpose of the air-inflation test is to test the integrity of the Tychem[®] vapor-protective garments fitted with Auer or Pirelli exhaust valves. Pirelli valves are fitted with a rigid outer cover that is perforated with small holes. Auer valves are fitted with

a flexible outer “snorkel” cover that opens at right angles to the throat of the exhaust valve.



Auer valve fitted with flexible outer cover

The steps in this procedure are similar to those found in ASTM F1052-97 “Standard Test Method for Pressure Testing Vapor Protective Ensembles”. A copy of the standard may be obtained for a fee from ASTM (www.ASTM.org) or by calling (610) 832-9585.

The procedure below assumes the use of the DuPont™ Universal Pressure Test Kit (P/N 990810-001). The pressure test kit consists of:

- Self-contained blower unit with pressure gauge and timer
- Two valve fittings for Auer valves and two valve fittings for Pirelli valves
- Hoses which attach the valve fittings to the pressure test kit
- Plugs to block extra Auer valves in Tychem® TK Ensembles compliant with NFPA 1991 or Class 1 of NFPA 1994

Users of other pressure test kits will have to modify the steps by which they attach the test kit to the garment.

NOTE: Air and garment temperature can affect the results of this test. If the temperature of the garment, the air outside the garment, or the air inside the garment changes during the test, an incorrect result may be obtained. Avoid circumstances that will heat or cool the garment during the test, such as conducting the test in the presence of drafts, under air conditioning ducts, or in the presence of direct sunlight.

Conduct the inflation test as follows:

1. Place the vapor-protective garment on a clean, smooth surface.
2. If the garment utilizes a snap to secure the exhaust valve pocket, unsnap and unfold that pocket cover.
3. Remove the outer cover of the exhaust valve body.
3. Visually inspect the exhaust valve body of each exhaust valve for visible cracks.
4. Remove diaphragm from one exhaust valve body, insert the air outlet fitting into the valve body and gently twist the fitting to lock it in place.

5. Remove the diaphragm from the second exhaust valve, insert the air outlet fitting into the valve body and gently twist the fitting to lock it in place. Ensembles certified to NFPA 1991 and NFPA 1994, Class 1 have additional exhaust valves. The extra Auer valves in the Tychem® TK ensembles can be blocked with the stoppers provided in the test kit. When conducting inflation tests on NFPA 1991 certified Tychem® Responder® or Tychem® Reflector® ensembles, the extra exhaust valve can be blocked by reversing the flapper valves.
6. Locate and connect the test kit to a power source. Open the valve and engage the blower motor. When the pressure gauge indicates 5 inches of water, close the valve and turn the blower off. Excessive, internal positive pressure can damage these garments. Do not inflate the garment above a pressure of 7 inches water column.
7. Wait at least 1 minute and reduce the air pressure to 4 inches of water. Set and start the timer. Read the pressure after 4 minutes. Note the test result and record the ending pressure on the inspection log. The garment is considered to “pass” if the pressure remains at or above 3.2 inches (80%) during these 4 minutes.
8. After the pressure test is completed, remove the fitting from each exhaust valve.
9. Re-install the diaphragm into each valve body.
10. Visually inspect each exhaust valve diaphragm to ensure it is properly sealed and not torn. Be sure that all exhaust valve diaphragms are installed to enable the air to flow out of the suit. CAUTION: Double check the diaphragms in the Pirelli exhaust valves installed in the Tychem® Responder® and Tychem® Reflector® vapor protective suits. These diaphragms can be installed incorrectly and block air-flow out of the ensemble.
11. Re-install the exhaust valve outer cover on the valve body.
12. If the garment provides a snap to secure the exhaust valve pocket, fold and snap that pocket cover.

Repairing the Garment

If a garment fails a visual inspection or pressure test upon receipt, contact DuPont Personal Protection at 800-931-3456 to determine if the garment can be returned for inspection or repair. **Note:** Charges may be incurred.

Contaminated garments will not be accepted for repair. Discoloration or odors are evidence of contamination. Garments being returned for repairs must be accompanied by the usage log and a letter stating that the garments are not contaminated.

Storage

(applies to all categories of Tychem® garments)

Storage Life

All DuPont™ Tychem® chemical protective garments may contain materials, including gloves, closures and exhaust valves for which there is no specific storage life data available. It is suggested that garments be labeled and retired to “Training Use Only” after 5 years. Garments may be used as long as they pass a full visual inspection. In addition to the visual inspection, Level A garments should pass the ASTM F1052 inflation test.

Uncontaminated garments that do not pass a visual inspection should be retired and labeled “For Training Use Only” or be discarded. This includes Level A garments that do not pass the inflation test

Optimum Storage Conditions

Preferably, garments should be stored in a cool, dark, dry location free of dirt and insects. Sunlight, ozone, high temperatures (>120° F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers.

Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Visor Antifog Procedures

(applies to all Tychem® garments with visors)

User-applied anti-fog treatments can be applied to the interior of the Tychem® garment visors. Use either the anti-fog wipes supplied with Tychem® TK, Tychem® BR or Tychem® LV garments or the Anti-fog/Antistatic Lens Cleaner (P/N 999650) available separately from DuPont Personal Protection.

1. Apply the anti-fog/anti-static cleaner to a clean, dry cloth or open the pre-packaged anti-fog wipe and unfold it.
2. Apply the anti-fog solution evenly to interior visor surface.
2. Buff to a clear finish with soft cloth.

For Tychem® CPF3, Tychem® CPF4, Tychem® Responder® and Tychem® Reflector® garments, you can purchase a separate anti-fog spray to apply to the visors before donning.

Closure Lubricants

(applies to all categories of Tychem[®] garments)

If the zipper or closure is difficult to operate, it can be lubricated lightly on the outer and inner components with paraffin (wax) or a lubricant supplied by the closure manufacturer. After lubrication, the zipper should be closed and opened a number of times to ensure smooth function and to remove excess lubricant.

Marking Suggestions and Restrictions

(applies to all categories of Tychem[®] garments)

The garment can be marked with a permanent, felt tip marker.

Suggested Undergarments

(applies to all categories of Tychem[®] garments)

Tychem[®] garments are designed and sized to be worn over standard work clothing. Thick, bulky clothing worn under these garments will affect the fit of the garment and limit the movement of the wearer.

Wearing garments made of NOMEX[®] or any other flame-resistant fabric, under Tychem[®] garments, other than Tychem[®] ThermoPro, will not reduce burn injury during a flash-fire. Tychem[®] garments, other than Tychem[®] ThermoPro, will burn and possibly melt when exposed to a flash-fire. This is likely to increase burn injuries even when worn over garments made of NOMEX[®] or any other flame-resistant fabric.

With Tychem[®] ThermoPro, garments made of NOMEX[®] or other non-melting fabrics such as wool, cotton, silk and rayon should be worn underneath.

Sizing Considerations

(applies to all categories of Tychem[®] garments)

The DuPont sizing chart should be used to determine accurate fit. The correct size garment should be worn. Users should verify sizing by donning the correct size garment and performing a series of exercises to simulate movements that may be required under actual usage conditions. These sizing tests should include outer boots, head protection

and, if used, radio equipment and other accessories the wearer may carry during actual use. Such exercises may include:

- read the SCBA gauge
 - pick up a box, carry it and set the box down in a separate location
 - pick up a wrench from the ground
 - open the garment closure
 - climb up and down stairs and ladder
 - adjust respirator face piece straps
 - remove the SCBA without dislodging the full face respirator
 - remove and refit full face respirator
 - send and receive radio transmissions
 - communicate with co-worker wearing the same type of garment and additional equipment
 - For encapsulating garments, remove hand, wipe faceshield and adjust regulator on facepiece.
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Donning the Garment

(applies to all categories of Tychem[®] garments)

The wearer should be helped by a second person in donning and doffing a chemical protective ensemble. A ground cloth should be used to avoid contamination and damage to the garment. A stable chair, bench or stool which is free of sharp edges and projections should also be utilized.

Encapsulating Level A and B Garments

1. Conduct a visual inspection of the garment before you begin donning:
 - garment should be free of discoloration or physical damage
 - inner gloves should be fully inserted into outer gloves
 - inside and outside of exhaust valves should be free of caps and plugs
2. Remove all jewelry and personal items (pens, key rings, badges, pagers, knife cases, etc.) that might damage the garment.
3. Check function of respirator and place near donning location.
4. Visually check size and condition of outer boots and place them nearby.
5. Open garment closure completely.
6. Read garment size label to assure proper fit.

7. Apply anti-fog to inside of visor.
8. Remove shoes. If the garment has socks, these socks are worn inside additional outer chemical boots. These socks do not have adequate durability or slip resistance to be worn as the outer footwear covering.
9. An assistant should help the wearer don the garment.
10. While sitting, insert feet into garment legs and down into sock boots, if so equipped. Stretch legs out to maximum extension while pulling garment up around hips.

If the garment is fitted with boot covers, pull boot covers up and don outer boots. Then pull the boot covers down over the boots as far as possible.
11. While standing, connect and adjust garment waist belt (if equipped) until comfortably snug.
12. While standing, with garment at waist level, don respirator harness and back piece.
13. Don respirator facepiece and check its function. To conserve SCBA air supply, disconnect the air supply from the facepiece, if possible, as long as the closure is open and the wearer has access to fresh air. In the case of an air line breathing system, complete all connections and adjustments.
14. Don protective headgear and communication equipment.
15. If not already done, connect the respirator facepiece to the air supply and make sure the respirator is functioning properly and adequate air is being provided to the wearer.
16. Place one hand in the sleeve and pull the garment sleeve to the shoulder. Make sure hand is securely inside the glove.
17. Place other hand in sleeve and glove.
18. If gloves are not attached to the garment, then don gloves. Taping should only be used to hold the sleeve in position over the glove gauntlet. Taping of the glove to sleeve interface does not provide a leak-proof seal. If a leak-proof seal between the glove and sleeve is required, then a garment with attached gloves should be selected.
19. Pull the garment over respirator backpack making sure nothing will constrict or hamper airflow.
20. Have assistant slowly close the gas-tight closure. After checking that the closure is completely closed, the flaps should be closed and sealed over the closure.

Donning Non-Encapsulating Garments

1. Conduct a visual inspection of the garment before you begin donning:
 - garment should be free of discoloration, alterations or physical damage
 - inner gloves should be fully inserted into outer gloves
2. Remove all jewelry and personal items (pens, key rings, badges, pagers, knife cases, etc.) that might damage the garment.
3. Check function of respirator and place nearby donning location.
4. Visually check size and condition of outer boots and place nearby.
5. Open garment closure completely.
6. Read garment size label to assure proper fit.
7. Apply anti-fog to inside of visor, if present.
8. Remove shoes. If the garment has attached socks, these socks are worn inside outer chemical boots. These sock boots do not have adequate durability or slip resistance to be worn as the outer footwear covering.
9. An assistant should help the wearer don the garment.
10. While sitting, insert feet into garment legs and down into sock boot, if so equipped. Stretch legs out to maximum extension while pulling garment up around hips.
11. If the garment has outer boot covers, pull the boot covers up and don outer boots. Then pull boot cover down over boots as far as possible. If the garment does not have socks, pull the garment cuff up before donning the boot, then pull the cuff down over the outside of the boot.
12. Place one hand in the sleeve and pull garment sleeve to shoulder. Make sure hand is securely inside the glove, if attached.
13. Place other hand in sleeve and glove, if attached, and pull the garment over that shoulder.
14. If gloves are not attached to the garment, pull up the sleeve, don the gloves and pull the sleeve opening over the gauntlet of the glove.
15. Don respirator facepiece and check its function. If using an SCBA, disconnect the air supply from the facepiece, if possible, to save air supply.
16. Don protective headgear, if it is worn underneath the garment hood, and communication equipment.

17. Place attached hood over the head and close zipper.
 18. After checking that the zipper is completely closed, the flaps should be folded over the zipper and sealed.
 19. In the case of an air-line breathing system, complete all connections and adjustments.
 20. If not already done, connect the respirator facepiece to the air supply and make sure the respirator is functioning properly and adequate air is being provided to the wearer.
 21. Place separate hood over head and attach underarm straps (NFPA 1994, Class 3 only).
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Doffing the Garment

(applies to all categories of Tychem[®] garments)

Encapsulating Garments

1. If the garment has been contaminated or is suspected of being contaminated, the wearer should continue to use his respirator until the garment has been doffed and removed.
2. An assistant should help the wearer doff the garment after field decontamination. If the garment has been contaminated, the assistant should wear protective clothing and respiratory equipment.
3. While the wearer stands, the assistant should open the closure and peel the garment down and away from the wearer's shoulders. The assistant should help the wearer remove his arms from the sleeves. External air lines should be disconnected from the garment and from the wearer's respirator, while the wearer switches to his escape bottle.
4. Lower garment below the hips and sit down. Have the assistant remove the boots, pull the garment off the legs and remove the garment to a remote location.
5. Once the garment has been removed, the wearer can doff the respiratory facepiece and harness.

Non-Encapsulating Garments

1. If the garment has been contaminated or is suspected of being contaminated, the wearer should continue to use his respirator until the garment has been doffed and removed.

2. An assistant should help the wearer doff the garment after field decontamination. If the garment has been contaminated, the assistant should wear protective clothing and respiratory equipment.
 3. If a separate outer hood is used, it should be removed and discarded.
 4. If the wearer is wearing an SCBA or PAPR, the assistant should help the wearer remove the respirator tank or filter unit without disconnecting the facepiece. The tank or filter unit should either be held by another person or placed in a safe, dry position. While the wearer stands, the assistant should remove the hood, then open the closure and peel the garment down and away from the wearer's shoulders. The assistant should help the wearer remove his arms from the sleeves.
 5. Lower the garment below the hips and sit down. Have the assistant remove the boots, pull the garment off the legs and remove the garment to a remote location.
 6. Once the garment has been removed, the wearer can disconnect and remove the respiratory facepiece and harness.
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Decontamination and Cleaning

(applies to all categories of Tychem[®] garments)

Decontamination Solutions

Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. The only decontamination solutions to use with these garments are water and mild, household dishwashing liquid.

Field Decontamination

The purpose of field decontamination is to allow the wearer to doff the garment without being harmed by contaminants on the garment surface. Garments that have been exposed to or that are suspected of being exposed to hazardous chemicals should be thoroughly decontaminated in the field before doffing. Additional cleaning and decontamination, as well as a full inspection, are required before a garment may be re-used.

1. Leave the hot zone with adequate air supply for decontamination and removal of the garment. The wearer should continue to wear the respirator until the garment has been completely doffed and removed from the area.
2. If the garment has been exposed or is suspected to have been exposed, thoroughly scrub the garment using household dishwashing liquid and soft scrub brushes, followed by a thorough rinsing in water.

3. If possible, the excess rinse water should be removed from the garment by individuals wearing gloves, liquid-splash protective clothing and respiratory protection. At a minimum, the rinse water on and near the closure assembly should be absorbed.

Decontamination before Re-use

Contaminated garments should be discarded and are not suitable for training.

It is the responsibility of the safety professional having responsibility over usage of the garment to determine whether the suit has been contaminated or can safely be re-used.

These garments are designed for limited-use applications – they can be worn until damaged, altered or contaminated. When the effectiveness of decontamination is in question, the garment should be discarded. If the garment is contaminated during use, it should be discarded.

Cleaning

Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry-clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Garment Retirement Considerations

(applies to all categories of Tychem[®] garments)

Tychem[®] garments should be retired from service if any of the following criteria are met:

- Garment fails to pass inspection.
- Vapor-protective garment fails the inflation test.
- Garment is altered, abraded, cut, torn, punctured, or otherwise, and in any way, breached.
- Garment has had prolonged exposure to intense heat and/or ultraviolet light.
- Garment has been contaminated which is determined by responsible end-user knowledge of use and exposure.

Retired garments that are not contaminated may be labeled and used “For Training Only”. The labeling should be done with a permanent marker.

Disposal

(applies to all categories of Tychem[®] garments)

If not contaminated, Tychem[®] garment may be buried or incinerated. Because Tychem[®] garments contain several different plastics, they are not suitable for recycling. The uncontaminated chemical protective garment may be incinerated in a facility that is capable of handling mixtures containing plastics. Likewise, an uncontaminated chemical protective garment may be buried in a facility that accepts plastic materials.

Contaminated garments that cannot be handled safely without protective equipment may have to be disposed of with other hazardous wastes, either through incineration or burial.

Limitations of Use

(applies to all categories of Tychem[®] garments)

Required Equipment

All DuPont[™] Tychem[®] garments must be worn with additional personal protective equipment described in the “Required and Additional Equipment” section of this guide.

Potential Misuse

All Tychem[®] garments are not intended for protection against ionizing radiation.

All Tychem[®] garments are not intended for protection from cryogenic liquids and gases (colder than -200° C). If there is a risk of exposure to liquefied gases warmer than 163° K (-100° C), the use of an ensemble certified to the optional liquefied gas requirements of NFPA 1991 (2000 edition) should be considered. Note: The wearer should be protected from cold temperature hazards, such as frostbite, by use of insulating undergarments.

If the danger of exposure to biological aerosols or chemical warfare chemicals exists, the use of a protective ensemble certified to the optional Chemical and Biological Terrorism requirements of NFPA 1991 (2000 Edition) or garments certified to Class 1 or Class 3 of NFPA 1994 should be considered. Each of these provides a different level of performance.

If the danger of flash-fire exists, actions such as substitution, engineering controls, work practices and administrative controls should be implemented to mitigate that risk. Exposure of personnel should be minimized or avoided. At a minimum, fire-suppression equipment and personnel should be ready and manned to conduct fire suppression should a flash fire occur.

No Tychem[®] garment is intended for fire fighting activities, nor for protection from hot liquids, steam, molten metals, welding, electrical arc or thermal radiation.

All Tychem[®] garments are not suitable for use in all situations and environments with all chemical and hazardous materials. All decisions regarding the choice and usage of chemical protective clothing must be done by trained and qualified safety professionals. It is the user's responsibility to determine the level of exposure and the proper personal protective equipment needed.

NOTE for Tychem[®] ThermoPro garment only: Users of Tychem[®] ThermoPro should not knowingly enter an environment in which the concentration of flammable gas is within flammable or explosive limits. Should wearers of any Tychem[®] garments determine they are in such an environment, they should retreat immediately.

Wearers Must be Physically Fit

All Tychem[®] garments should only be worn by persons who are in good physical condition. Working in chemical protective clothing is strenuous. In an emergency situation or hot environment, the wearer may experience heat stress. Persons who show symptoms of heat stress such as nausea, dizziness, high heart rates, or excessive heat build-up should leave the work area immediately and remove the ensemble as quickly as possible after decontamination. Persons in doubt about their physical condition should check with a physician before wearing chemical protective ensembles.

Always Use the Buddy System

Never enter a contaminated area alone. A minimum of two people should enter contaminated areas together. Two additional people, in equally protective garments should be available to affect rescue of the entry team. All persons entering the contaminated area should wear appropriate protective equipment.

Manage and Prevent Heat Stress

These garments interfere with the natural regulation of body temperature. This can lead to a rise in core body temperature and heat stress. The wearer should be aware of the symptoms and treatment of heat stress. The wearer can take several steps to limit and/or prevent heat stress, such as the use of a cooling system, and implementing a conservative work/rest schedule.

The maximum time the ensemble can be worn depends on such variables as the air supply, ambient condition, climate inside the ensemble, physical and psychological condition of the wearer, work rate and work load. The TLV[™] pocket guide from the American Conference of Governmental Industrial Hygienists (ACGIH, Cincinnati) provides corrected heat stress limits for some garments. Similar information is available on the federal OSHA web site (www.OSHA.gov). The WBGT correction factor for chemical protective garments is at least 10° C or higher for chemical garments made of impervious film and covering the entire body (hooded coverall or encapsulating designs).

Chemical Permeation Data

Before using a protective ensemble in a chemical situation, consult the chemical permeation data appropriate to the garment material. Note that seams, visors and closures will generally have lower or different permeation times than the garments' material. This information is to be used as a guide only. The permeation performance of any material depends on a number of factors including chemical concentration, temperature, time and amount of exposure. Due to the large number of variables, it is impossible for all ensemble materials to be tested against all chemicals, all combinations or mixtures, and all temperatures at which the chemical might be encountered.

Chemical permeation tests are performed under laboratory conditions -- not actual workplace conditions. They address chemical breakthrough characteristics and do not account for physical performance characteristics that affect a barrier such as abrasion, flex fatigue, puncture, tear, oxidative degradation, or degraded performance due to previous contamination.

No single protective material will protect against all chemicals for all situations. The best course of action is to test the primary protective garment materials against the specific chemical hazard, at the temperature and in the concentrations to be encountered. DuPont will provide free swatches of primary garment materials for testing and can provide you with a list of testing facilities.

Static Electricity

Under certain conditions, such as cold and dry weather, it is possible that garments might build and discharge static electricity. Discharges are not normally dangerous except in situations where the generation of an electrical spark could ignite a flammable atmosphere or startle the wearer. When operating around flammable chemicals, steps to eliminate potential static discharges should be used. In these situations, steps have been recommended such as, but not limited to, water spray, the use of an over-cover, raising humidity level of the work area, use of a commercial, anti-static application coating, grounding straps on equipment and personnel, inherently static-dissipating under- and over-garments, and testing of the worker's static dissipation before entry into the classified area.

However, in the case of explosive or flammable atmospheres, even if sophisticated and elaborate steps are taken to manage static formation and dissipate static charge, the risk of severe injury remains if an uncontrolled or accidental ignition occurs. Tychem[®] chemical protective garments should not be worn in potentially flammable or explosive atmospheres. Wearers of Tychem[®] ThermoPro garments should not knowingly enter an environment in which the concentration of flammable gas is within flammable or explosive limits. Should wearers of any Tychem[®] garments determine they are in such an environment, they should retreat immediately.

Avoid Exothermic Reactions

Certain chemicals produce a large amount of heat when they react with water. If garments are heavily contaminated with a water-reactive chemical, there is a possibility that the garment may be damaged during field decontamination from the

high reactive heat. The excess chemical may have to be removed with dry sand or non-reactive absorbent before water decontamination.

Avoid Continuous Exposure

These garments should not be immersed in chemicals. These garments should not be exposed to continuous hazardous liquid chemical splash or deluge. Do not wade through liquid pools of hazardous chemicals if it is not necessary. Direct, liquid chemical exposure to the ensemble should be as limited as possible. If exposed to direct splash or a deluge of hazardous chemicals, leave the area immediately and decontaminate.

Supplied Air Line Applications

To connect to an external supplied air-line system, encapsulating garments must be equipped with the appropriate, NIOSH approved garment pass-through. This pass-through connection should not be relied upon as an anchor for a tether. Excess pull on this fitting may result in permanent damage to the garment.

Avoid Suffocation

Do not attempt to wear a totally-encapsulating, chemical protective garment without supplied fresh air, whether Level A or Level B. Use separate, user-supplied, full-face respiratory protection such as: 1) an open circuit, self-contained breathing apparatus (SCBA) or 2) an external, breathing air quality, air line system with garment pass-through and escape bottle.

The oxygen level within an encapsulating suit may rise if worn with a closed-circuit (rebreather) respirator. The oxygen concentration will depend on the type of closed-circuit respirator, the level of wearer exertion and the duration of user and physical performance for the intended task.

Air-purifying respirators (APR) cannot be worn with totally-encapsulating garments, whether Level A or Level B.

Air-purifying respirators (APR) cannot be worn under separate protective hoods that extend below the clavicle.

Powered air-purifying respirators (PAPR) cannot be worn with encapsulating garments, whether Level A or Level B. PAPR's can be worn with ensembles utilizing separate hoods, if the configuration provides adequate ventilation at the intake of the unit and the unit is adequately protected from contamination.

Never Use Pure Oxygen

The use of 100% oxygen in these garments presents serious fire safety and health hazards. Use only breathing quality compressed air or air-line breathing air.

The oxygen level within an encapsulating suit may rise if worn with a closed-circuit (rebreather) respirator. The oxygen concentration will depend on the type of closed-

circuit respirator, the level of wearer exertion and the duration of user and physical performance for the intended task.

Sock Booties

The socks attached to chemical protective garments are designed to be worn inside outer boots. These sock boots do not have sufficient durability or slip resistance to be worn as outer boots.

Provide Hearing Protection

If noise levels inside these garments exceed regulatory noise levels, hearing protection must be provided. Use hearing protection recommended by a safety professional which does not interfere with the operation or use of the garment.

Communications

A chemical protective garment hampers communication. The use of a personal communication system should be considered. Users should also consider the use of hand signals to communicate during training, work, and for emergency situations where respirators and chemical protective garments are worn.

Positive Pressure

Excessive, internal positive pressure can damage these garments. Do not inflate the vapor-protective garments above a pressure of 7 inches water column.

Use of Adhesive Tape to Seal Tychem[®] Garments

Adhesive tape cannot provide a completely liquid- or vapor-tight seal. Taping can reduce bulk flow if carefully applied. During an emergency situation it may be difficult to carefully apply tape. Taping should be viewed, primarily, as a means to hold clothing items in place; to hold a hood over the respirator, to hold a sleeve over a glove, to hold a pant leg over a boot, or to hold a closure flap closed. Taping does not provide reliable barrier performance

Limitations of Liquid-Splash Protection

Hooded Tychem[®] garments without visors are not liquid-tight around the hood/respiratory interface. Careful taping may reduce bulk liquid flow around this interface, but should not be relied upon for total barrier. The wrist and ankle openings of garments without attached gloves or socks have similar limitations. Garments with more protective designs should be used in lieu of taping as well as implementation of engineering controls, work practices and administrative controls to reduce the potential for exposure.

Warnings

(applies to all categories of Tychem[®] garments)

Tychem[®] chemical protective garments, other than Tychem[®] ThermoPro, will burn. No Tychem[®] garment should be worn around heat, open flames, sparks or any other possible ignition source nor in potentially explosive or flammable environments.

Wearing garments made of NOMEX[®] or any other flame-resistant fabric, under Tychem[®] garments, other than Tychem[®] ThermoPro, will not reduce burn injury during a flash-fire. Tychem[®] garments, other than Tychem[®] ThermoPro, will burn and possibly melt when exposed to a flash-fire; this is likely to increase burn injuries even when worn over garments made of NOMEX[®] or any other flame-resistant fabric.

Tychem[®] garments, other than Tychem[®] ThermoPro, melt when exposed to heat and flame, these garments should not be worn under a garment made of NOMEX[®] or any other flame resistant fabric, if the potential for flash-fire exists.

NOTE for Tychem[®] ThermoPro garments only: Users of Tychem[®] ThermoPro garments should not knowingly enter an environment in which the concentration of flammable gas is within flammable or explosive limits. Should wearers of Tychem[®] garments determine they are in such an environment, they should retreat immediately.

Tychem[®] ThermoPro garments are not intended for fire fighting activities, nor for protection from hot liquids, steam, molten metals, welding, electrical arc or thermal radiation. Tychem[®] ThermoPro garments are designed and tested to help reduce injury during escape from a flash fire. Users of Tychem[®] ThermoPro garments should not knowingly enter an explosive environment, i.e., an environment in which the concentration of flammable gas or solids is within flammable limits.

Responsibility of Users; Disclaimers

(applies to all categories of Tychem[®] garments)

It is the responsibility of the user to select garments which are appropriate for each intended use and which meet all specified government and industry standards.

Tychem[®] garments are intended to help reduce the potential for injury, but no protective apparel alone, can eliminate all risk of injury. Protective apparel must be used in conjunction with general safety practices.

Tychem[®] garments are designed for limited use. It is the responsibility of the wearer to inspect garments periodically to ensure that all components, including fabric, valves, visors, gloves, zippers, seams, and interfaces are in good working condition, and provide adequate protection for the operation and chemicals to be encountered. Failure to fully inspect garments may result in serious injury or death to the wearer. Never wear garments that have not been fully inspected and in the case of Level A garments, pressure tested prior to use. Any garment which does not pass inspection should be removed from service immediately. Never wear a garment that is contaminated, altered or damaged.

If the Tychem[®] garment is altered, abraded, cut, torn, punctured or otherwise and in any way breached, do not use. The chemical protective garment material has finite resistance to abrasion, cut, tear and puncture.

If the Tychem[®] garment is damaged during use, retreat immediately to a safe environment, thoroughly decontaminate the garment, then dispose of it in a safe manner.

It is the responsibility of the garment wearer, and the wearer's supervisor and employer to examine the condition of the garment before and during use to be sure that the garment is suitable for use in that environment by that employee.

Warranty Information

(applies to all categories of Tychem[®] garments)

DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is user's responsibility to determine the level of hazards and the proper personal protective equipment needed.

DuPont warrants to the purchaser/end user only for a period of ninety (90) days from date the garment or accessory was shipped to the purchaser/end user or, for a period of twelve (12) months from the date the encapsulated garment was shipped to the purchaser/enduser that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont's control, DUPONT MAKE NO OTHER WARRANTIES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE and assume no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way.

The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 days of the date the garment or accessory was shipped to the purchaser and/or end user or, within twelve (12) months from the date the encapsulated garment was shipped to the purchaser/end user.

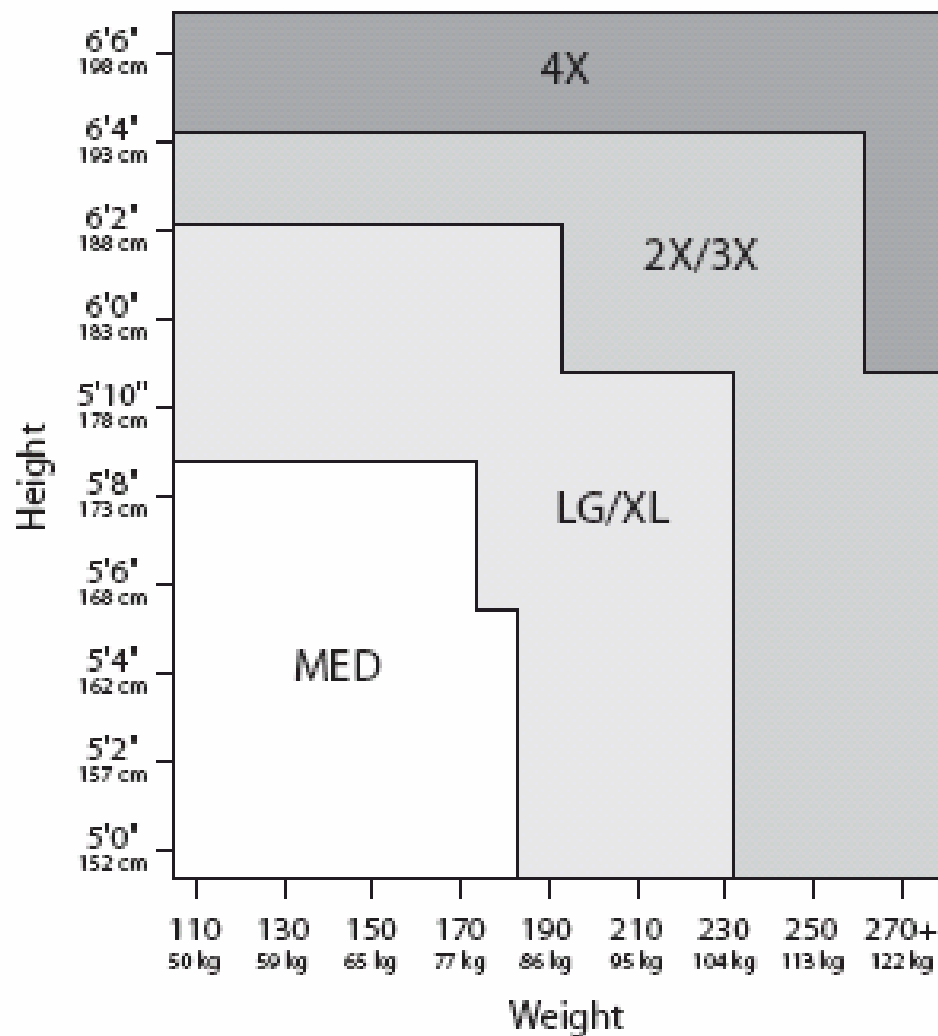
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DuPont™ Tychem®
GARMENT INSPECTION & TEST LOG

SERIAL #

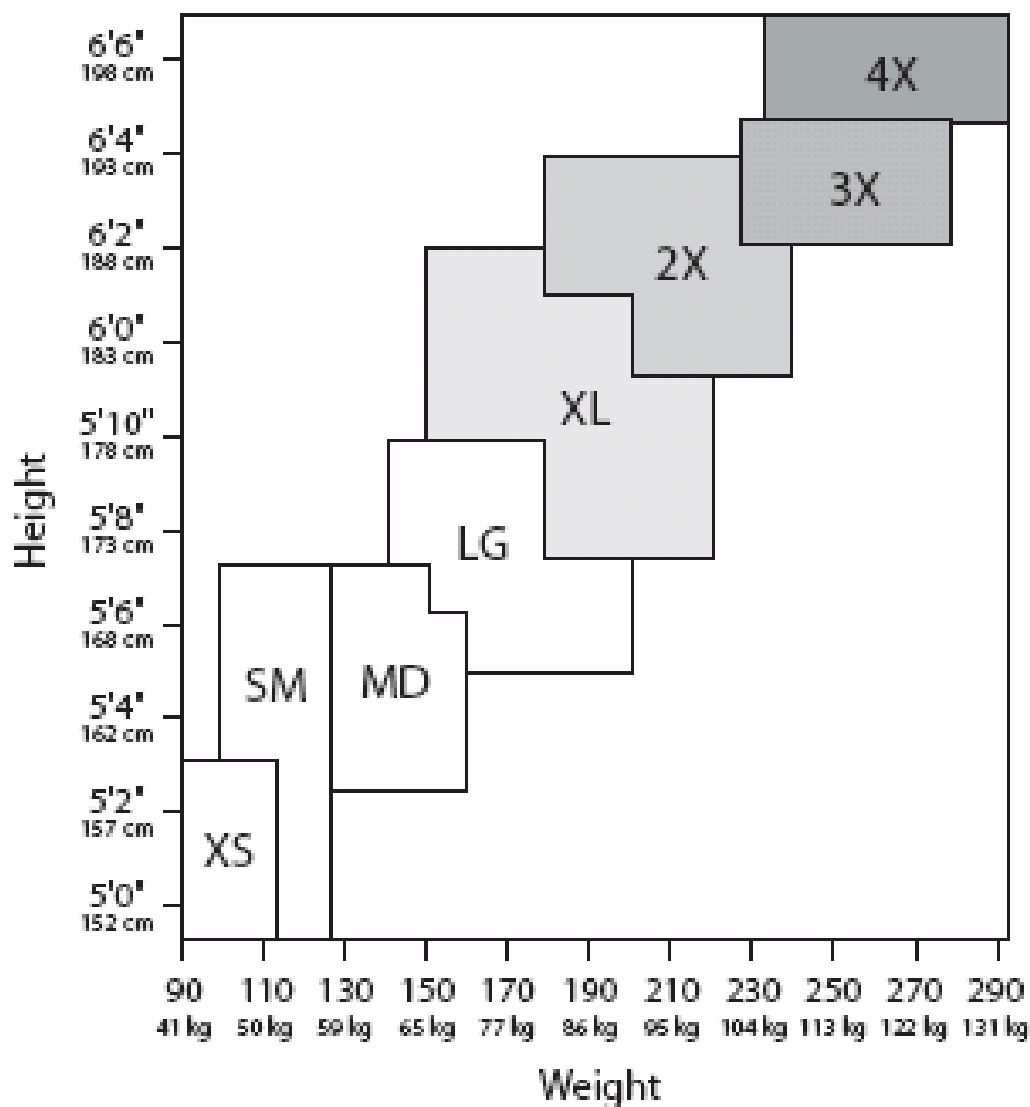
DATE	INSPECTOR	REMARKS	TEST RESULTS

DuPont™ Tychem® Garment Sizing Chart: Fully Encapsulated Garments



Please note: This chart is based on individuals wearing S.C.B.A., safety helmet and suggested underclothing (see recommended undergarments). Proper fit varies with individual body shape.

DuPont™ Tychem® Garment Sizing Chart: Non-Encapsulated Garments



Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own experimentations. 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 purposes. 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 MAKES NO WARRANTIES AND ASSUMES 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 right.

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