

DuPont™ Tychem® Garment User Manual

Applies to:

DuPont™ Tychem® Vapor
Protective Level A Garments

DuPont™ Tychem® Encapsulated
Level B Garments

NFPA Compliant DuPont™ Tychem®
Ensembles and Garments

Certified to NFPA 1990 (NFPA 1992 or NFPA 1994 Class 2), 2022



User Manual for DuPont™ Tychem® Encapsulated Level A and Encapsulated Level B Suits

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Safety Considerations

IMMEDIATELY STOP WORK IF PERSONAL PROTECTIVE EQUIPMENT (PPE) FAILS. If any item of the personal protective equipment ensemble fails during use, immediately cease work activity, retreat from hazard zone, safely remove the PPE (may require decontamination procedure), determine the cause of the PPE failure and re-evaluate the selection and use of the PPE for that task.

Be sure to read, understand and follow the information in this manual and all applicable governmental occupation safety and health statutes. Serious injury or death may occur from improper use of these garments. These garments must be selected and used in accordance with applicable personal protective equipment regulations, which in the United States is 29 CFR 1910.132 or NFPA 1500 (Standard on Fire Department Occupational Safety, Health, and Wellness Program). For users of these garments outside of the United States, consult national or other applicable personal protective equipment laws and regulations.

Users must read this guide thoroughly and should take the following precautions into consideration:

- Avoid flame contact. These suits are not intended for exposure to an open flame.
- Do not knowingly enter an environment in which the concentration of flammable gas/vapor or combustible dust is within flammable or explosive limits when wearing a Tychem® garment.
- No Tychem® garment is intended for fire-fighting activities, nor for protection from hot liquids, steam, molten metals, welding, or thermal radiation. However, Tychem® 6000 FR (Tychem® ThermoPro) fabric was tested to EN ISO 11612:2015 (Protective clothing — Clothing to protect against heat and flame — Minimum performance requirements) and was rated as Class D1 for molten aluminum and Class E2 for molten iron.

- Good practice is to minimize, as much as possible, continuous exposure to any known hazardous substance.
- If you develop any of the following symptoms while you are wearing a Tychem® garment immediately leave the contaminated area, undergo field decontamination, and remove (doff) the garment:

Fever	Unusual odor or taste
Difficulty breathing	Eye or skin irritation
Nausea	Narrowing or dimming of vision
Excessive tiredness	Claustrophobia
Dizziness	Loss of balance or orientation
Numbness	

Tychem® garments will not protect the wearer in all situations and environments or protect the wearer from all hazardous materials. A trained and qualified safety professional must select the chemical protective clothing and other PPE based on a hazard assessment. It is your responsibility as a user of this garment to determine the level of exposure and the proper personal protective equipment needed. Many performance properties cannot be tested by the users in the field. Refer to DuPont™ SafeSPEC™ (www.safespec.dupont.com) for information regarding performance data for Tychem® Level A and Level B Encapsulating suits.

Wearer Qualifications

Do not wear these garments unless you are properly trained in their use. You must be in good physical condition to wear these garments. Consult a physician before donning one of these garments to ensure you are capable of wearing these garments and all required respiratory equipment under the expected work conditions and environment.

Encapsulating Design Garments

Per EPA/OSHA guidelines, encapsulating suits may be considered either Level A or Level B. Encapsulating garments that pass the inflation test described in ASTM F1052, Standard Test Method for Pressure Testing Vapor Protective Suits, are considered Level A. Encapsulating garments that are not designed to pass ASTM F1052 are considered Level B.

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Breathing Air Requirements for Encapsulating Design Garments

Encapsulating garments are designed to completely cover the wearer, including all respiratory equipment (except for external air supply lines, if applicable). Encapsulating garments require that fresh breathing air be supplied to the wearer at all times.

CAUTION: YOU MUST USE AN OPEN CIRCUIT SELF-CONTAINED BREATHING APPARATUS OR AIR-LINE SUPPLIED RESPIRATOR WITH ALL ENCAPSULATING GARMENTS.

Other Personal Protective Equipment

To help protect you while wearing a Tychem® garment, the use of other personal protective equipment (PPE) items is often required based on the hazard assessment. PPE selection must be conducted by a trained and experienced safety professional. Additional protective equipment may be required to deal with hazards such as, but not limited to, the following:

- Flammable or Explosive Environment
- Extreme Heat (Heat Stress)
- Extreme Cold (Hypothermia)
- Physical Hazards (Sharps, Puncture, Rough Surfaces, Falling Debris)
- Slipping Hazards
- Visibility Requirements
- Fall Protection
- Contamination Avoidance

Respirators

Tychem® encapsulating suits must be worn with a full face, supplied air respirator. The user must be trained and physically fit to use a respirator. The performance of your respirator must be verified with a performance based fit test. Failure to properly select, test, use and maintain your respirator can result in serious injury or death. The selection of the appropriate respirator is the responsibility of the safety professional or industrial hygienist.

The full face, supplied air respirator worn with encapsulating Level A or Level B Tychem® garments must include:

- An open circuit, self-contained breathing apparatus (SCBA) certified as compliant with NFPA 1981, Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services.
- or**
- An external, breathing air-quality, air-line system with garment pass-through and escape bottle.

Do not wear a closed-circuit (rebreather-type) SCBA with Tychem® encapsulating Level A or encapsulating Level B garments. Do not wear an air-purifying respirator (APR) or a powered, air-purifying respirator (PAPR) inside a Tychem® encapsulating Level A or encapsulating Level B suit.

Footwear

You must wear separate, user-supplied, protective footwear. The socks attached to encapsulated Level A and Level B Tychem® garments must be worn inside protective footwear. Failure to wear appropriate user supplied footwear will damage the attached sock. It is the user's responsibility to verify that appropriate footwear has been selected and used based on a hazard assessment. For NFPA certified Tychem® encapsulated ensembles, refer to the appropriate Technical Data Package for a list of approved footwear for use with those ensembles.

Gloves

All Tychem® Level A suits have attached chemical resistant glove systems. Tychem® Level B encapsulating suits may or may not have attached glove systems. For NFPA certified suits, refer to the Technical Data Package for glove system information. For non-certified encapsulated Level A or Level B suits contact DuPont for information regarding glove system details for specific suit models. It is the user's responsibility to verify that appropriate gloves have been selected and used based on a hazard assessment.

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Garment Inspection, Maintenance, and Testing

Garment Inspection

The wearer must inspect all encapsulated Tychem® garments at the following times to determine that the suit has not been damaged or compromised:

See Garment Maintenance Schedule (Table 1).

1. Immediately upon receipt from supplier.
2. Before it is placed in service to be worn.
3. After a garment is worn and before the garment is placed in service to be worn again. Do not use contaminated, damaged or altered garments.
4. Inspect annually.

Garment Inspection Steps:

1. Lay the garment on a clean, smooth surface.
2. The inspection should include all areas of the suit: body, visor, and gloves (if present).
3. Use a flashlight inside the suit to examine for holes, cuts, or tears. Confirm that any suspected visual imperfection is actually a void by using a small amount of water to confirm penetration.

NOTE: Visible stitch holes which are covered by seam sealing tape do not constitute a defect.

4. Examine all taped seam areas for proper seal. Look for areas where seam tape has lifted away from the suit or where seam tape does not fully cover stitch holes.

5. Examine the entire garment for signs of damage. A breach, rupture, or hole of any component of the suit is cause for rejection. Note that the fabric, visor, gloves, or seams may have visual blemishes that do not affect barrier performance. Such blemishes can include areas adjacent to the seam tape that appear to be dull, white, or frosted.
6. Examine the visor to ensure it offers a clear visual field.
7. If the garment includes a pass thru option, examine the garment's air distribution system to ensure that there are no obstructions and that it is connected properly and is in proper working order.
8. Examine the garment gloves (if present) to ensure that they are in good condition and properly attached to the suit. Gently pull on the gloves to ensure that they are firmly attached to the suit.

NOTE: You can potentially damage the gloves by pulling with excessive force.

9. Examine the garment zipper and zipper cover to make sure they are in good working order. Operate the zipper. Lubricate the zipper, if needed. Please refer to section on closure lubricants. Engage the hook and loop tape on the zipper storm flaps to ensure appropriate adhesion.
10. Examine all garment snaps, etc. to ensure they are in good working order.
11. Examine garment labels to ensure they are firmly attached and are legible.

Table 1: Garment Maintenance Schedule

Work To Be Performed	Upon Receipt	Prior To Use	After Each Use	Once Per Year
Garment Inspection	X	X	X	
Cleaning (for hygienic purposes only; not decontamination)			X	
Inflation Test (Level A)			X	X
Exhaust Valve Diaphragm Inspection			X	X
Closure Lubrication (as required)				

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12. There is a diaphragm in each exhaust valve in Level A suits that must be inspected and replaced by the end user if damaged. Inspection of these diaphragms should occur, at a minimum, at the time of the inflation test because the exhaust valve diaphragms must be removed to perform the inflation test. After removing the exhaust valve diaphragms, visually inspect them using a magnifying glass to look for cracks or deterioration. Replace damaged or deteriorated diaphragms. Instructions for purchasing replacement exhaust valve diaphragms can be found at www.safespec.dupont.com or by contacting DuPont Customer Service at 800-931-3456. Instructions for replacing the exhaust valve diaphragm can be found in the DuPont Instruction Manual for Universal Pressure Test Kit.
13. For Level A garments, perform an inflation test as described below. Instructional videos can also be found on www.safespec.dupont.com.

NOTE: Encapsulated Level B suits do not require an inflation test.

Cleaning

Garments, except Tychem® 2000 SFR and Tychem® 6000 FR (Tychem® ThermoPro) garments, that are not contaminated with hazardous substances can be cleaned. Use water, mild dishwashing liquid, a soft brush, and hand towel to remove the non-hazardous substance that soiled the garment. Thoroughly rinse the garments with clean water and allow it to air-dry. Do not re-use garments or accessories that have not been thoroughly cleaned and dried. Do not dry-clean or machine-wash these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach or harsh cleaning agents on these garments if they are intended to be re-used.

Cleaning procedures are not an acceptable procedure for decontamination (See Section on Field Decontamination). The user should develop and implement a decontamination procedure for all the chemicals to which the suit has been exposed. Tychem® 2000 SFR and Tychem® 6000 FR (Tychem® ThermoPro) garments should not be cleaned or laundered; dispose of them after use.

Pressure Testing Level A Tychem® Garments

The air-inflation test evaluates the gas tight integrity of Tychem® Level A garments.

Conduct inflation tests according to ASTM F1052, Standard Test Method for Pressure Testing Vapor Protective Suits. A copy of the standard may be obtained from ASTM (www.ASTM.org) or by calling ASTM at (877) 909-2786 or (610) 832-9585.

Read, understand and follow the instructions in the DuPont Instruction Manual for the Universal Pressure Test Kit when inflation testing Tychem® Level A garments. You can obtain a copy of these instructions by calling DuPont Personal Protection Customer Service at 800-931-3456 or from our website www.safespec.dupont.com.

Record the results of each inflation test on the log sheet provided with your garment. You can also find a blank log sheet at the end of this document.

In the event that a Level A suit does not pass a pressure test, the following should be checked before contacting DuPont.

1. Confirm that the pressure test kit is functioning properly using the self test adapter and following the step by step video, Calibrating the Pressure Test Kit, found on www.safespec.dupont.com in the library section for any Level A suit.
2. Confirm the vapor tight zipper is fully seated in the closed position.
3. Check the tightness of all exhaust valve pressure test adapters. Adapters must be firmly seated in the valves.
4. Confirm the tightness of each exhaust valve body to suit fabric. It may be useful to fully remove each valve by unscrewing the two body halves, inspecting all seating areas for obstructions or fabric wrinkles, and carefully reassembling and hand tightening.
5. Perform another pressure test procedure after each of these areas has been checked.

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Closure Lubricants

The wearer can lubricate a zipper closure that is difficult to operate. Before applying lubricant, confirm what zipper is used on the suit (see pictures below).



If the zipper is **black with plastic teeth**, use Molykote™ 33 Light lubricant. If the zipper is **white with bright metal teeth** apply paraffin wax lightly on the teeth of the closure while open. After lubricant is applied, close and open the zipper several times to ensure smooth function and to remove excess lubricant.

NOTE: EXCESSIVE FORCE OR IMPROPER TECHNIQUE CAN DAMAGE THE GAS-TIGHT ZIPPERS IN LEVEL A SUITS. When opening or closing the zipper, use one hand to hold the zipper assembly near the slider while pulling the slider in a direction that is parallel to the line of the zipper assembly. Using excessive force or not pulling the slider in the direction of the zipper installation can lead to permanent damage to the zipper which negatively affects the garment's gas tight seal.

Garment Repair

Do not use a damaged, altered, or contaminated garment. If an uncontaminated or unaltered garment fails a visual inspection or inflation test, contact the distributor from whom you purchased the suit or DuPont Personal Protection at 800-931-3456 to determine if the garment can be returned for repair. Note: Charges may be incurred; refer to the warranty section in this document.

Contaminated garments will not be accepted for repair. With each returned garment, you must provide the garment testing log and a declaration that the garment has not been exposed to chemicals or to biological pathogens.

DO NOT RETURN A GARMENT WITHOUT PRIOR AUTHORIZATION FROM DUPONT PERSONAL PROTECTION CUSTOMER SERVICE.

Glove Replacement

Contact DuPont Personal Protection at 800-931-3456 to determine if the attached gloves on your garment can be replaced.

Recommended Duration of Use

Tychem® Level A and Tychem® Level B encapsulating suits may be used for 5 years from date of manufacture as long as all of the following conditions are met:

1. The suit has been stored properly (see section on Storage Conditions)
2. The suit has not been damaged, altered, or contaminated
3. The suit passes a full visual inspection (as outlined above)
4. For Level A suits, the suit must also pass the ASTM F1052 inflation test.

After 5 years, if all of the above conditions are met, it is at the sole discretion of the end-user whether to continue using the suit or to retire the suit. It is suggested that garments be labeled and retired to "Training Use Only" after 5 years. DuPont™ Tychem® Level A and Level B encapsulating suits may contain materials such as gloves and closures for which there is no specific storage life data available.

Uncontaminated garments that do not pass a visual inspection and/or do not pass the inflation test (for Level A garments) should be retired from service and labeled "For Training Use Only" or discarded after mutilation.

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Storage Conditions

Store Tychem® garments in a cool, dark, dry location free of dirt and insects. Sunlight, ozone, high temperatures (>120 °F), exhaust fumes, compression under heavy weight and/or sharp protrusions are some conditions known to degrade or damage the materials in these suits.

Store Tychem® Level A and Level B encapsulating garments in boxes, in bags, or on hangers. Never step on or place heavy objects on top of chemical garments.

Sizing Considerations

Verify the fit of your Tychem® garment before actual use. Use the sizing chart found at the end of this document to select the appropriate size based on height and weight. Obtain the size suit you intend to wear, don that size garment, and perform a series of exercises to simulate your movements under actual work conditions. A garment larger or smaller than suggested in the chart may be preferred. Sizing fit tests must include outer boots, head protection and other PPE and accessories that the wearer will use during actual use.

Donning Encapsulating Level A and B Garments

A donning training video for Tychem® encapsulating suits is available at www.safespec.dupont.com.

Have another person present when donning your chemical protective ensemble. Use a stable chair, bench, or stool which is free of sharp edges. If outdoors or where the flooring is rough, use a ground cloth to avoid damaging your garment.

1. Conduct a visual inspection of the garment as described above before beginning the donning steps

Ensure that the inner gloves (if applicable) are fully inserted into the outer gloves (if applicable).

Check that the inside and outside of all exhaust valves are free of obstructions such as caps, plugs, tape, or foam padding.

2. Remove all jewelry and personal items (pens, key rings, badges, pagers, knife cases, etc.) that might damage the garment.

3. Check function of your respirator system per the manufacturer's instructions and place near donning location.
4. Inspect outer boots per the manufacturer's instructions and place them nearby.
5. Open the garment closure completely.
6. Check the garment size label to verify the suit meets your requirements.
7. Apply an antifogging solution to inside surface of the visor (if desired).
8. Remove your shoes. If the garment has attached socks, these socks are to be worn inside outer chemical boots (not provided with the Tychem® suit). The attached socks do not have adequate durability or slip resistance to be worn as the outer footwear covering.
9. While sitting, insert your feet into the garment legs and down into the attached socks, if so equipped. Stretch your legs to maximum extension while pulling garment up. Don outer chemical boots. If the garment is fitted with boot flap covers, pull boot flap covers up and don your outer boots. Then pull the boot flap covers down over the outer boots as far as possible.
10. Stand and continue pulling the garment up to your hips and connect and adjust the garment waist belt (if equipped) until comfortably snug.
11. While standing, with garment at waist level, don your respirator air tank.
12. Don your respirator face piece and check its function. To conserve SCBA air supply, disconnect the air supply from the face piece when the garment zipper closure is open and you have access to fresh air. In the case of an external airline breathing system, complete all other connections and adjustments.
13. Don protective headgear and communication equipment as appropriate.

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14. Connect the respirator face piece to the breathing air supply and make sure the respirator is functioning properly. Continue on supplied breathing air for rest of the donning steps.
15. Place one hand and arm into its sleeve and pull the garment sleeve to your shoulder. Make sure your hand is securely inside the glove(s), if attached.
16. Place your other hand and arm into its sleeve and pull the garment sleeve to your shoulder. Make sure your hand is securely inside the glove(s), if attached.
17. If gloves are not attached to the garment, next don your gloves. Pull the sleeves of the garment over the gauntlet of the gloves. Do not rely on taping to provide a liquid-tight or gas-tight seal. Only use tape to hold the sleeve in position over the glove gauntlet. If a leak-proof seal between the glove and sleeve is required, then wear a garment with attached gloves.
18. Pull the garment over the respirator back air tank (if present) and over your head making sure nothing will constrict or hamper breathing air flow or respirator face piece seal.
19. Have your assistant slowly close the suit zipper fully.
20. Have your assistant carefully close and secure the flaps over the zipper.
4. While standing, have your assistant open the zipper flaps and then open the zipper.
5. Peel the garment off over your head and down and away from your shoulders to avoid contaminating your inner clothing or skin. Have the assistant help you to remove your arms from the sleeves. If using external breathing air supply, disconnect external air lines from the garment while you switch to your escape bottle.
6. Lower the garment to below your hips and sit down. Disengage waist belt if applicable. Do not touch the outside of the garment as it may be contaminated. Have your assistant remove your outer boots, then pull the garment off of your legs and take the garment away from the doffing area.
7. Once the garment has been completely removed, you can doff the respirator face piece and its associated hardware.

Field Decontamination

The purpose of field decontamination is to permit the wearer to remove the garment without being harmed by contaminants on the outer garment surface. Field decontamination does not make a garment safe for re-use. If you suspect or know that a garment has been contaminated, it must be discarded after field decontamination.

Doffing Encapsulating Level A and B Garments

A doffing training video for Tychem® encapsulating suits is available at www.safespec.dupont.com.

1. If your garment has been contaminated or is suspected of being contaminated, you must first undergo field decontamination before removing the garment.
2. Continue to use your respirator until the garment has been doffed and removed.
3. Have an assistant help you doff the garment after field decontamination. If the garment has been contaminated, have your assistant wear appropriate PPE such as, but not limited to, protective clothing and gloves and respiratory equipment.

Decontamination

DuPont™ Tychem® garments are designed for limited-use applications; they can be worn until damaged, altered or contaminated. If the garment is damaged during use, retreat immediately, undergo field decontamination, and then discard the garment. If the garment is contaminated during use, it must be discarded after field decontamination and doffing.

It is the responsibility of the safety professional to determine that the suit has not been contaminated and can be safely re-used.

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Inspection Before Re-use

Thoroughly inspect a used and/or cleaned garment following the instructions provided in this manual before re-use. Do not re-use the garment if it fails the inspection or shows sign of alteration, damage or contamination.

Garment Retirement Considerations

Retire Tychem® garments from service if any of the following criteria are met:

- Garment fails to pass inspection.
- Level A garment fails the inflation test.
- Garment is altered, abraded, cut, torn, punctured, or otherwise breached.
- Garment has had prolonged exposure to intense heat and/or ultraviolet light.
- Garment has been contaminated as determined by the safety professional responsible for having knowledge of use and exposure conditions.
- Garment has had contact with an oxidative, corrosive or reactive decontamination agent.

Retired garments that are not contaminated may be labeled "For Training Use Only".

Disposal

If not contaminated, Tychem® garments can be disposed of per local regulations as non-hazardous waste. Garments that have been contaminated with hazardous materials must be disposed of as hazardous waste per local regulations after field decontamination. Before discarding, mutilate garments by cutting off a sleeve or a leg so they cannot be worn again.

Temperature Ranges

Do not store Tychem® garments at temperatures exceeding 120 °F (49 °C).

Tychem® garments can be used in ambient environments from -13 °F (-25 °C) to 165 °F (74 °C) for short durations. However, Tychem® garments offer limited thermal insulation to protect the wearer's skin from prolonged exposure to hot or cold temperatures. The usable temperature range for the materials in the garment can exceed the temperature at which human skin burn injury may occur. Additionally, chemical permeation testing is typically performed at 27 °C. Chemical permeation rates may be affected by temperature.

Limitations of Use

It is the user's responsibility to determine the level of exposure and the proper personal protective equipment needed.

Tychem® encapsulated Level A and Level B garments are not suitable for use in all situations and environments or with all hazardous materials. All decisions regarding the selection and use of chemical protective clothing must be done by trained and qualified safety professionals or an Authority Having Jurisdiction (AHJ). The AHJ must comply with the requirements of NFPA 1891, Standard on Selection, Care, and Maintenance of Hazardous Materials, CBRN, and Emergency Medical Operations Clothing and Equipment.

Do not use Tychem® encapsulated Level A or B garments for protection against ionizing radiation.

Do not use Tychem® encapsulated Level A or B garments for protection from cryogenic liquids or gases. A cryogenic liquid is defined by NFPA 990 (NFPA 1991), 2022 as "a refrigerated liquefied gas having a boiling point below -90 °C (-130 °F) at atmospheric pressure".

If there is a risk of exposure to liquefied gases, then consider use of a Level A ensemble which has been certified to the optional liquefied gas requirements of NFPA 990 (NFPA 1991), 2022. A liquefied gas is defined by NFPA 990 (NFPA 1991), 2022 as "a gas that, under its charged pressure, is partially liquid at 21 °C (70 °F)".

No Tychem® garment is intended for fire-fighting activities, nor for protection from hot liquids, steam, molten metals, welding, or thermal radiation. However, Tychem® 6000 FR (Tychem® ThermoPro) fabric was tested to EN ISO 11612:2015 (Protective clothing — Clothing to protect against heat and flame — Minimum performance requirements) and was rated as Class D1 for molten aluminum and Class E2 for molten iron.

Do not knowingly enter an environment in which the concentration of flammable gas/vapor or combustible dust is within flammable or explosive limits when wearing a Tychem® garment. Retreat immediately if you encounter such an environment.

Do not use Tychem® encapsulated Level A or B garments in situations with elevated oxygen concentrations. This includes spills involving liquid oxygen.

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Wearer Must Be Medically Approved

The wearer should be examined and approved by a physician as being physically capable to wear an encapsulated Tychem® suit.

Manage and Prevent Heat Stress

Chemical protective clothing interferes with the natural regulation of body temperature. This can lead to a rise in core body temperature and heat stress. The wearer can take steps to try to delay the onset of heat stress. This may include the use of a personal cooling system and/or implementation of a conservative work/rest schedule.

The maximum length of time that a Tychem® encapsulated Level A or B suit can be worn depends on such variables as the breathing air supply, ambient conditions, climate inside the suit, 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) provides corrected heat stress limits for some garments. Similar information is available on the federal OSHA web site (www.OSHA.gov). The wet bulb globe temperature (WBGT) correction factor for chemical protective garments is at least 10°C or higher for chemical garments made of impervious film fabrics like Tychem® and covering the entire body (hooded coverall or encapsulating designs).

Be aware of the common symptoms and treatment of heat stress. If you or your co-workers have symptoms of heat stress such as nausea, dizziness, high heart rate, or excessive heat build-up, leave the work area immediately, remove the suit or ensemble as quickly as possible after decontamination and seek professional medical care.

Chemical Permeation Data

Before using a Tychem® suit for skin protection from possible chemical exposure, review the chemical permeation data provided on DuPont™ SafeSPEC™ (www.safespec.dupont.com). The reported permeation data is based on performance under controlled laboratory conditions for new fabrics, not complete garments. This data is intended for informational use by persons having technical skill to consider this data along with their specific end-use conditions and hazards, at their own discretion and risk. Anyone intending to use this information should first verify that the garment selected is suitable for the intended use. In many cases, seams, visors, and closures have shorter breakthrough times and higher permeation rates than the base fabric used to assemble the suit.

The chemical permeation barrier performance of a material depends on a number of factors including chemical concentration, temperature, exposure 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 chemicals might be encountered.

No single protective material will protect against all chemicals in all situations. An ideal course of action is to test the primary garment materials against the specific chemical hazard, at the temperature and concentrations to be encountered. If requested, DuPont will provide free swatches of primary garment materials to end users to permit them to conduct their own barrier evaluations. DuPont can also provide a listing of test laboratories which are familiar with permeation barrier test methods.

Avoid Purposeful Exposure

Good practice is to minimize, as much as possible, continuous exposure to any known hazardous substance.

Static Electricity

It is possible that Tychem® garments might build and discharge static electricity while being worn, donned, or doffed. Discharges are not normally dangerous except in situations where the generation of an electrical spark could ignite a flammable atmosphere. In the case of explosive or flammable atmospheres, even if appropriate steps have been taken to manage static generation and to dissipate static charges, the risk of severe injury or death remains if an uncontrolled or accidental ignition occurs.

Do not knowingly enter an environment in which the concentration of flammable gas/vapor or combustible dust is within flammable or explosive limits when wearing any Tychem® garment. Retreat immediately if you encounter such an environment.

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Avoid Exothermic Reactions

Certain chemicals produce a large amount of heat when they contact water. If your garment is heavily contaminated with a water-reactive chemical, there is a possibility that the garment may be damaged during field decontamination with water. Remove the excess water-reactive chemical with dry sand or non-reactive absorbent before using a water decontamination procedure.

Supplied Air Line Limitations

To connect to an external supplied air-line system, encapsulating garments must be equipped with the appropriate NIOSH approved garment pass-through. Do not rely upon this pass-through connection as a physical anchor for a tether line. Excess force pulling on this pass-through fitting may result in permanent damage to the garment and possible injury to the wearer.

Avoid Suffocation

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

Never Use Pure Oxygen

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

Attached Socks

The socks attached to Tychem® garments are designed to be worn inside outer boots. These socks do not have sufficient durability or slip resistance to be worn as the outermost layer.

Communications

An encapsulating chemical protective garment often hampers clarity of voice communications. Consider using a personal communication system to improve voice clarity. The wearer may also use hand signals to communicate.

Positive Pressure

Excessive internal positive pressure can damage encapsulating garments. Do not inflate above a pressure of 8 inches water column.

Use of Adhesive Tape to Seal Chemical Garments

If properly done, taping of PPE interfaces may reduce bulk material flow, but cannot be relied on to provide a liquid-tight or vapor-tight seal. Additionally, during an emergency situation it may be difficult to carefully apply such tape. Therefore, taping is primarily viewed as a means to hold PPE items in place e.g. to hold a hood over a respirator face piece, a sleeve over a glove, a pant leg over a boot, or to keep a closure flap closed. Taping does not provide reliable liquid or gas barrier performance.

Marking Suggestions and Restrictions

Tychem® garments can be marked with a permanent, felt tip marker.

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Warnings

The following warning applies to all Tychem® garments, except for Tychem® 6000 FR (Tychem® ThermoPro) full body protection models.

Tychem® 6000 FR (Tychem® ThermoPro) full body protection models are designed and tested to help reduce injury during escape from a fire. Tychem® chemical protective garments except for Tychem® 6000 FR (Tychem® ThermoPro) full body protection models will ignite, melt and continue to burn when exposed to heat and flame and therefore should not be worn around heat, open flames, sparks, or any other possible ignition source or in potentially explosive or flammable environments. Wearing garments made of Nomex® or any other flame-resistant fabric under Tychem® garments, other than Tychem® 6000 FR (Tychem® ThermoPro) full body protection models may not reduce burn injury. Do not wear Tychem® garments, other than Tychem® 6000 FR (Tychem® ThermoPro) full body protection models, under a garment made of Nomex® or any other flame-resistant fabric, if the potential for fire exists.

Do not knowingly enter an environment in which the concentration of flammable gas/vapor or combustible dust is within flammable or explosive limits when wearing a Tychem® garment, including Tychem® 6000 FR (Tychem® ThermoPro) full body protection models. Retreat immediately if you encounter such an environment.

No Tychem® garment is intended for fire-fighting activities, nor for protection from hot liquids, steam, molten metals, welding, or thermal radiation. However, Tychem® 6000 FR (Tychem® ThermoPro) fabric was tested to EN ISO 11612:2015 (Protective clothing — Clothing to protect against heat and flame — Minimum performance requirements) and was rated as Class D1 for molten aluminum and Class E2 for molten iron.

Tychem® garments are not suitable for use when the concentration of oxygen is elevated.

Your Responsibility as a User

A trained and qualified safety professional or an Authority Having Jurisdiction (AHJ) must select chemical protective clothing and other PPE and provide user training. The AHJ must comply with the requirements of NFPA 1891, Standard on Selection, Care, and Maintenance of Hazardous Materials, CBRN, and Emergency Medical Operations Clothing and Equipment. It is your responsibility as a user of this garment to determine the level of possible exposure and the proper personal protective equipment needed. It is the responsibility of the garment wearer, the wearer's employer, or an Authority Having Jurisdiction to ensure that the garment is suitable for use in the environment.

It is your responsibility as a 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 garment alone can eliminate all risk of injury. Protective garments must be used in conjunction with general safety practices.

Tychem® garments are designed for limited use. It is the wearer's responsibility to inspect garments before use and 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. Level A garments must be pressure tested prior to use. Failure to fully inspect and test garments before use may result in serious injury or death to the wearer. Never wear garments that have not been fully inspected. Immediately remove from service any garment which does not pass inspection. Never wear a garment that is contaminated, altered or damaged.

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

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Glossary

Air-Inflation Test

A procedure in which a Level A garment is tested for gas-tight integrity. The test involves blocking off the exhaust valves, inflating the suit to a specified internal pressure and monitoring the drop in pressure over a set time period. The most common method used in the United States, ASTM F1052, allows a 20% pressure drop after 4 minutes. The air-inflation test is used to determine if a Level A garment has a leak.

APR (Air Purifying Respirator)

A respirator with an air- purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air- purifying element (per www.OSHA.gov section 1910.134(b)). Also see PAPR or Powered Air-Purifying Respirator.

ASTM

Originally known as the American Society for Testing and Materials, ASTM International is one of the largest voluntary standards development organizations in the world. ASTM Committee F23 on Protective Clothing and Equipment is responsible for many of the test methods used to evaluate the performance of protective clothing for protection against chemical, biological, physical, and radioactive hazards.

CBRN

(Chemical, Biological, Radiological and Nuclear) – Abbreviation for the hazards represented by terrorism weapons. Also seen as CBRNe where the “e” indicates explosives.

Certification

The process in which products are certified by an independent company as meeting the requirements set forth in specific performance standards. These performance standards are published by standards setting bodies such as ASTM, CEN, ISO, and NFPA. For 3rd party certification, the certification company is hired by the manufacturer to independently test the products and verify compliance with all requirements of the standard(s).

CFR (Code of Federal Regulations)

The published regulations of the executive departments and agencies of the United States Federal Government. The notations “29 CFR 1910.1200” refer to a specific regulations (.1200 – Blood- borne Pathogen) for a specific section (1910 – General Industry) of a specific federal agency (29- Occupational Safety and Health) of the United States Code of Federal Regulations.

Cryogenic Chemical

A chemical having a boiling point below -130 °F (-90 °C) at atmospheric pressure per NFPA 1990 (NFPA 1991), 2022. Also see Liquefied Gas.

Doffing

The act of removing a garment from one’s body.

Donning

The act of putting a garment on one’s body.

Encapsulating Garment

For chemical protective garments, a garment that provides protection to the torso, head, arms, legs, and completely covers the wearer’s breathing apparatus.

Exhaust Valve

For chemical protective garments, a device that releases air from inside an encapsulating garment while preventing inward leakage of external vapors, liquids or particles into the garment.

Exhaust Valve Diaphragm

A molded elastomeric disk which is a key component of an exhaust valve. The diaphragm blocks the flow of contaminants into the garment, but when actuated allows excess pressure inside the suit to vent to the outside environment.

Heat Stress

A serious human health condition caused by increased core body temperature. Heat stress can lead to permanent injury and death.

Hot Zone

Term used to describe the area around a hazardous material release that requires the highest level of chemical protection.

Inflation Test

See air-inflation test.

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Ionizing Radiation

Extremely short-wavelength, high energy penetrating electromagnetic waves, such as gamma and x-rays, emitted from radioactive elements and isotopes and certain electronic instruments. While alpha-particles and beta-particles are also considered ionizing radiation, they are unlikely to penetrate most chemical protective garments as particles.

ISO

(International Organization for Standardization)
An international standard-setting body composed of representatives from various national standards organizations. There are a number of ISO standards related to chemical protective clothing.

Kevlar®

A DuPont registered trademark for its para-aramid fiber that combines high strength with light weight to improve the performance of a variety of consumer and industrial products. Kevlar® gloves are often used by HazMat responders to provide increased cut resistance protection.

Level A Suit

An encapsulating chemical protective garment designed to provide the highest level of respiratory and skin protection. A Level A suit envelops the wearer and their breathing equipment to protect against hazardous vapors, liquids, and particles and it will hold air when inflated. Appropriate use of Level A garments is stipulated in the OSHA HAZWOPER standard (29CFR1910.120).

Level B Suit

A chemical protective garment designed to offer a high level of skin protection but less than that offered by a Level A suit. Level B suits are not gas-tight and are not intended to protect the skin from vapor contact. Level B garments may be encapsulating or non-encapsulating.

Liquefied Gas

A gas that has been turned into a liquid by cooling or compressing it.

NFPA (National Fire Protection Association)

An association that creates and maintains standards and codes that can be used and adopted by local government agencies. NFPA has a series of standards that pertain to chemical protective clothing.

NFPA 1990, 2022

Standard for Protective Ensembles for Hazardous Materials and CBRN Operations.

NFPA 1990 (NFPA 1991), 2022

Vapor-Protective Ensembles and Elements also contains optional performance requirements for protection from liquefied gases and for fire escape protection.

NFPA 1990 (NFPA 1992), 2022

Standard on Liquid Splash-Protective Ensembles and Elements.

NFPA 1990 (NFPA 1994), 2022

Standard on Hazardous Materials Emergencies and CBRN Terrorism Incidents.

NIOSH (National Institute of Occupational Safety and Health)

A division of the Centers for Disease Control and Prevention (CDC) which is in the Public Health Service of the U.S. Department of Health and Human Services. NIOSH is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. NIOSH has the specific responsibility for certifying the performance of all supplied air and air purifying respirators for use in the United States.

Nomex®

A DuPont registered trademark for its meta- aramid fiber and paper which is used across a diverse range of applications, from filtration to electrical insulation to protective fabrics. Garments of Nomex® are used as protective clothing for firefighters, military pilots, industrial workers, and electricians.

OSHA

Occupational Safety and Health Administration, is within the U.S. Department of Labor and is charged with the preparation and enforcement of regulations relating to worker safety.

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Oxidative Degradation

Deterioration in a material due to a chemical reaction with atmospheric oxygen.

PAPR (Powered Air Purifying Respirator)

An air-purifying respirator that uses a blower to force ambient air through air-purifying elements to the inlet covering (per www.OSHA.gov section 1910.134(b)).

Also see APR.

Pass-through

A fitting installed in a chemical protective garment to enable connection between external and internal accessories, such as an airline.

Penetration

Bulk movement of a chemical through a material without a change of state. Chemical penetration can occur through voids and imperfections in closures, seams, interfaces and protective clothing materials. Penetration does not require a change of state. Chemical penetration is distinctly different from chemical permeation.

Permeation

Movement of chemicals through materials without passing through voids or imperfections; it involves (1) absorption of the chemical into the contact surface of the material, (2) diffusion of the absorbed molecules throughout the material, and (3) desorption of the chemical from the opposite surface of the material.

PPE

Personal Protective Equipment

SCBA (Self Contained Breathing Apparatus)

A respirator that is carried by the wearer and provides safe breathing air without an external source of supply. The breathing air can be provided from a pressurized cylinder worn on the wearer's back (open-circuit SCBA) or a system that filters the wearer's exhaled air and adds oxygen (closed-circuit SCBA).

Socks

For chemical protective garments, an extension of the garment's lower leg which completely covers the wearer's foot. Socks generally lack significant abrasion and slip resistance and are intended to be worn inside boots or other outer footwear.

SAR (Supplied Air Respirator)

Provides the wearer with a source of breathing air.

The air can be provided from a pressurized cylinder worn on the wearer's back (open- circuit SCBA), a system that recirculates the wearer's exhaled air and adds oxygen (closed-circuit SCBA) or an airline that supplies fresh air from a source not worn by the wearer.

TLV™ (Threshold Limit Values™)

a trademark of the American Conference of Governmental Industrial Hygienist for recommended exposure limits to hazardous materials and situations (such as noise, radiation, sunlight, heat, and cold).

Tyvek®

A DuPont registered trademark for a family of tough, durable flash-spun olefin products that are stronger than paper and more cost-effective and versatile than traditionally prepared fabrics. Made with high density polyethylene fibers, Tyvek® fabric used in protective garments offers an ideal balance of protection, durability, and comfort.

Tychem®

A DuPont registered trademark for a family of chemical protective fabrics and garments. Tychem® garments offer protection from hazardous chemicals, biological agents, and particles.

WBGT (Wet Bulb Globe Temperature)

A temperature measurement used for assessing the heat stress potential of a work environment to predict safe work and rest cycle duration times.

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Warranty & Disclaimers

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 5 years from the date the Tychem® Level A suit or Tychem® Level B encapsulated suit was manufactured that the Tychem® Level A suits or encapsulated Tychem® Level B suits are free of defects in materials and workmanship. Since conditions of use are outside DuPont's control, DUPONT MAKES NO OTHER WARRANTIES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE and assumes 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.

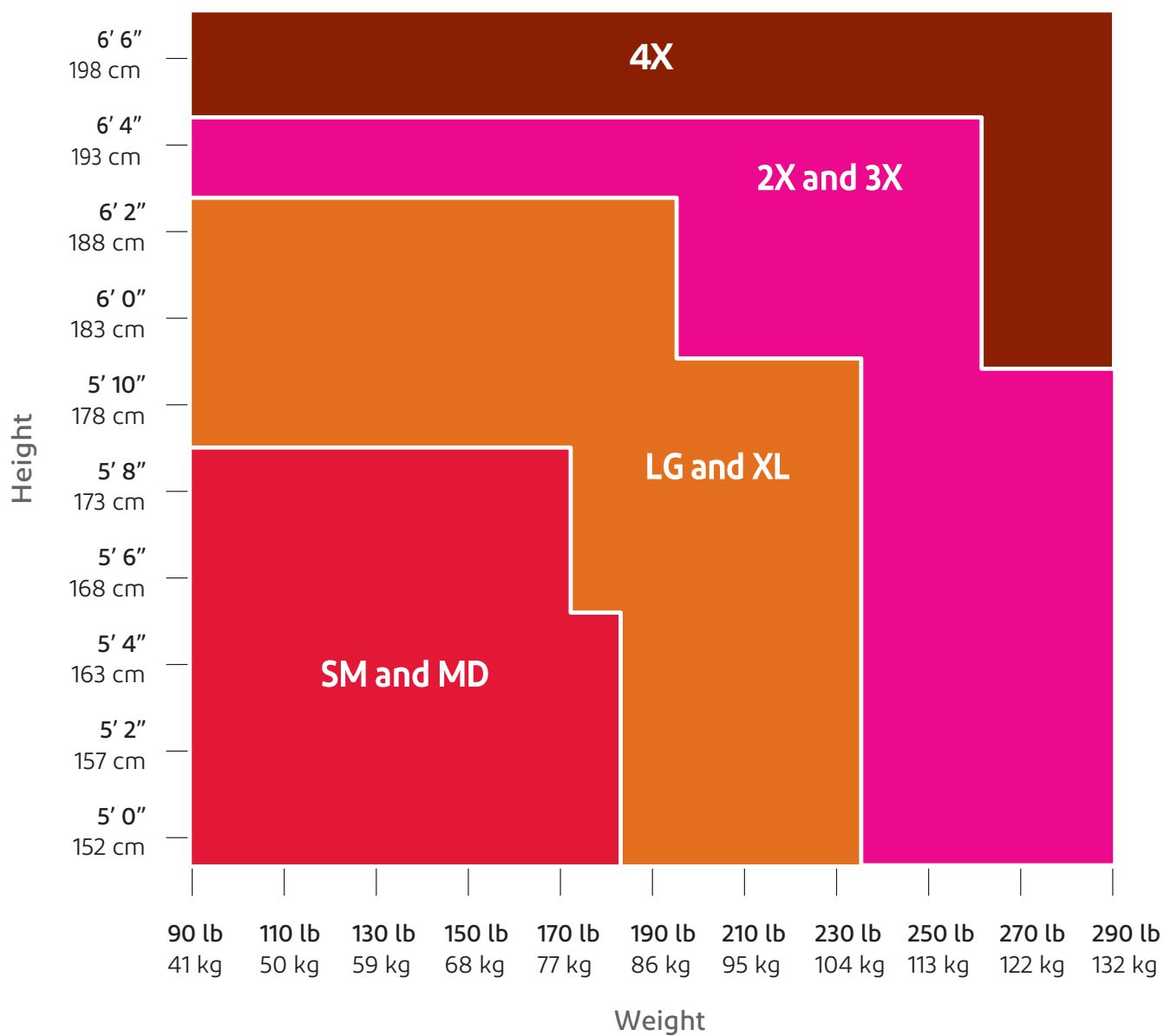
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IN NO EVENT SHALL DUPONT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT, PUNITIVE OR CONSEQUENTIAL DAMAGES, WHETHER ARISING FROM CONTRACT, TORT, DEFECTS, OR ANY OTHER CAUSE OR THEORY.

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Sizing Chart for Fully Encapsulated Suits



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

Visit us at www.safespec.dupont.com

Contact DuPont Personal Protection:

P.O. Box 27001, Richmond, VA 23261
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TLV™ is a trademark of the American Conference of Governmental Industrial Hygienists (ACGIH, Cincinnati).

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