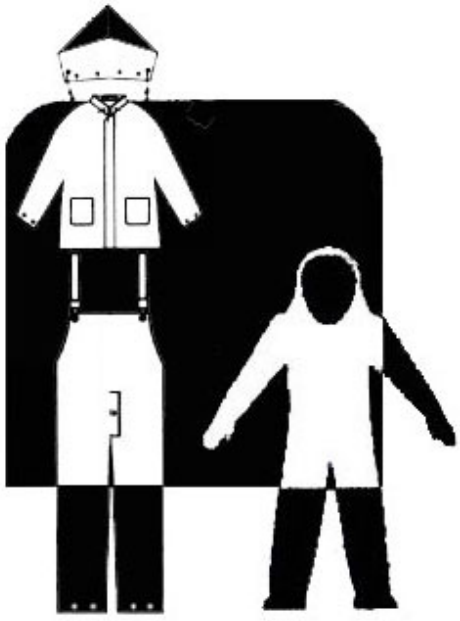
Body Protection



Training Guide

FABRICS

PVC: A synthetic thermoplastic polymer with a wide range of applications. Provides good protection against many acids, alcohols, alkalies, bases, oils and petroleum hydrocarbon.

Heavy Duty PVC: Comprised of unique blends of high molecular weight PVC resins and specialty plasticizers. These additives significantly improve the coatings resistance to a variety of elements, enhancing their performance over regular PVC coatings in similar environmental. Heavy Duty PVC formulas show better resistance to many fats, acids, hydrocarbons, caustics and other chemicals.

Nylon: Woven Nylon is popular for its lightweight, comfortable feel, along with its superior strength, toughness and drying characteristics.

Polyester: Polyester is known for its strength and mildew resistance along with its quick drying properties.

Knit Polyester: Provides strength and stretch for added comfort.

Non woven Polyester: High –loft substrates are utilized for their soft comfort and wicking properties.

Neoprene: A synthetic rubber, legendary for its toughness and durability. It is resistant to a board range of animal fats and blood, oils certain acids, alcohols, alkalies, caustics and certain solvents.

Polyurethane: A synthetic polymer that processes excellent durability and abrasion characteristics, with a light weight. Provides excellent protection against animal fats and oils. Is good in most hydrocarbon oils, organic acids, salts, alkalies and in some inorganic acids.

Tyvek: A nonwoven product consisting of flashspun high-density polyethylene fibers (HDPE) Light weight and flammability. It is difficult to tear but can easily be cut. Water vapor can pass through, but not liquid water. Tyvek is for dry particulate hazards.

Tychem is a sub-brand of Tyvek rated for a higher level of protection. Tychem is for liquid and gas chemical hazards.

Saranex: (Polyvinylidene Chloride) Lightweight and offers economical protection against a broad range of chemicals or occasional splash protection.

Polypropylene: PP spun-bonded olefin is a thermoplastic polymer. Ideal solution for non-hazardous environments. Economical and disposable, lightweight and breathability.

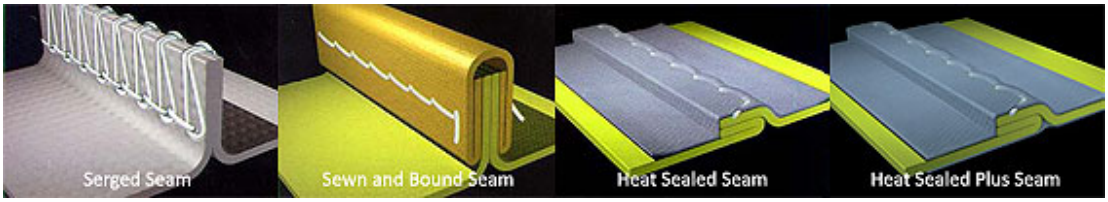
Microporous: Protects against in any non-hazardous environment where dirt, grime, splashes and spills are present. Economical and lightweight.

Nomex IIIA: (93%Nomex - 5%Kevlar - 2%Carbon) Inherently flame resistant anti-static fabric engineered to reduce nuisance static. Self-extinguishing, will not ignite, melt, drip or burn.

PBI: (Polybenzimidazole) An organic fiber, flame resistant and thermal stability. Will not burn in air, does not melt or drip and retain its strength and flexibility after exposure to flame.

Aluminized: Reflects 95% radiant heat. Reduce 50% ambient heat. Provides excellent protection against molten metal splash and high temperature steam.

SEAMS



Serged Seam: A serged seam joins two pieces of material with a thread stitch that interlocks.
This stitching method is generally not used for chemical protective clothing.

Sewn and Bound Seam: This seam joins two pieces of material with an overlay of similar material and is chain stitched through all of the layers for a clean finished edge.
This provides increased holdout of liquids and dry particulates.

Heat Sealed Seam: A heat sealed seam is sewn and then sealed with a heat activated tape.
This provides liquid proof seams, and is especially useful for Level A and B chemical protective clothing.

Heat Sealed Plus Seam: The seam is sewn and then heat sealed on the outside and inside to offer the highest strength and chemical resistance.

Recommendations for the Selection and Use of Chemical Protective Clothing

The basic OSHA standard calls for 4 levels of protection, A through D, and specifies in details the equipment and clothing required to adequately protect the wearer at corresponding danger levels

Level A provides the highest level of skin and respiratory protection available. This type of protection must be gas-tight, vapor-tight and splash resistant. It is worn when there is a possible threat to life and health, such as during spill response and cleanup. The minimum Level A equipment consists of:

- Positive-pressure, self-contained breathing apparatus (SCBA)
- Gas-tight suit
- Chemical-resistant inner and outer gloves
- Chemical-resistant boots with steel toe and shank

Used When: The chemical(s) have been identified and have high level of hazards to respiratory system, skin and eyes. Substances are present with known or suspected skin toxicity or carcinogenity. Operations must be conducted in confined or poorly ventilated areas.

Level B offers chemical splash protection, but does not prevent exposure to gases or vapors. As with Level A protective clothing, an SCBA is used for respiratory protection. The CPC may or may not be completely encapsulating, since a lower level of skin protection is required. The minimum Level B equipment consists of:

- Positive-pressure SCBA
- Chemical-resistant suit
- Chemical-resistant inner and outer gloves
- Chemical-resistant boots with steel toe and shank

Used When: The chemical(s) have been identified but do not require a high level of skin protection. Initial site surveys are required until higher levels of hazards are identified. The primary hazards associated with site entry are from liquid and not vapor contact.

Level C features the same type of clothing as Level B, but has a lower level of respiratory protection. An air-purifying respirator is used in place of an SCBA. This level is used when the chemicals are known and it has been established that an air-purifying respirator is appropriate protection for the hazard.
Used When: Contact with site chemical(s) will not affect the skin. Air contaminants have been identified and concentrations measured. A canister is available which can remove the contaminant. The site and its hazards have been completely characterized.
Not Acceptable for Chemical Emergency Response

Level D offers the lowest level of protection and is used when no potential or actual hazard exists. It consists of a normal work uniform (long sleeve coveralls, safety shoes, goggles, etc.), offering minimal protection for nuisance exposure.
Used When: The atmosphere contains no known hazard. Work functions preclude splashes, immersion, potential for inhalation, or direct contact with hazard chemicals.
Not Acceptable for Chemical Emergency Response

MATERIAL SELECTION

After the appropriate level of PPE has been determined, the choice of CPC material must be considered and measured by permeation testing. Permeation testing produces the following data: *breakthrough time* and *permeation rate*.
Breakthrough time is the time it takes the test chemical to pass through the clothing sample until it is first detected by an analytical instrument.
Permeation rate is the speed at which the test chemical passes through the clothing sample once breakthrough has occurred.

CLASSIFICATION OF PROTECTIVE CLOTHING

1. Personal protective clothing includes the following:

    - Fully encapsulating suits;
    - Nonencapsulating suits;
    - Gloves, boots, and hoods;
    - Firefighter's protective clothing;
    - Proximity, or approach clothing;
    - Blast or fragmentation suits; and
    - Radiation-protective suits.

2. Firefighter turnout clothing, proximity gear, blast suits, and radiation suits by themselves are not acceptable for providing adequate protection from hazardous chemicals.

CLASSIFICATION OF CHEMICAL PROTECTIVE CLOTHING

By Design	By Performance	By Service Life
gloves	particulate protection	single use
boots	liquid-splash protection	limited use
aprons, jackets, coveralls, full body suits	vapor protection	reusable

TYPES OF CONTAMINATION

Surface Contaminants. Surface contaminants may be easy to detect and remove.
Permeated Contaminants. Contaminants that have permeated a material are difficult or impossible to detect and remove. If contaminants that have permeated a material are not removed by decontamination, they may continue to permeate the material where they can cause an unexpected exposure.
Four major factors affect the extent of permeation:
Contact time: The longer a contaminant is in contact with an object, the greater the probability and extent of permeation. For this reason, minimizing contact time is one of the most important objectives of a decontamination program.
Concentration: Molecules flow from areas of high concentration to areas of low concentration. As concentrations of chemicals increase, the potential for permeation of personal protective clothing increases.
Temperature: An increase in temperature generally increases the permeation rate of contaminants.
Physical state of chemicals: As a rule, gases, vapors, and low-viscosity liquids tend to permeate more readily than high-viscosity liquids or solids.

SIZING CHART

Sizes	XS-S	S-M	M-L	L-XL	XL-2XL	2XL-3XL
Height in Centimeters	152-160	157-171	165-178	171-188	180-193	188-195
Height in Feet	5’-5’3”	5’2”-5’7”	5’-5”-5’10”	5’7”-6’2”	5’11”-6’4”	6’2”-6’5”
Weight in Pounds	90-115	100-160	140-200	150-220	180-240	230-280
Weight in Kilograms	41-52	45-73	64-91	68-100	82-109	104-127
Chest in Inches	32-34	36-38	40-42	44-46	48-50	52-54
Waist in Inches	28-30	32-34	36-38	40-42	44-46	48-50

If the clothing is too small, it will restrict movement, increase the likelihood of tearing the suit material, and accelerate wearer fatigue. If the clothing is too large, the possibility of snagging the material is increased, and the dexterity and coordination of the wearer may be compromised. In either case, the wearer should be recalled and better-fitting clothing provided.

Chemical Resistant Guide for Chemical Protective Clothing
Rated by Hazard Resistance

This chemical resistant chart should only be used as a guide only. The chemical resistance of chemical protective clothing can be affected by concentration, temperature, presence of other chemicals and other factors such as length of time. All safety equipment should be selected in conjunction with an OSHA approved safety program that evaluates your specific hazards. Improper selection and/or use of safety products may cause serious injury.

INORGANIC ACIDS		**ALKALIS & MISCELLANEOUS SALTS**	
Chlorine Water	1	Ammonium Hydroxide	2
Hydrochloric Acid	1	Ammonium Sulfate	1
Hydrofluoric Acid	2	Calcium Chloride	1
Nitric Acid 70%	2	Chlorox Sodium Hypochlorite	1
Nitric Acid 35%	1	Copper Sulfate	2
Phosphoric Acid	2	Detergent	1
Sulphuric Acid 96%	3	Diethanolamine	1
Sulphuric Acid 75%	1	Ethylene Glycol	1
Sulphuric Acid 50%	1	Glycerine	1
ORGANIC ACIDS		Hydrogen Peroxide	1
Acetic Acid Glacial	2	Potassium Hydroxide	1
Acetic Acid 30%	1	Sodium Chloride	1
Critic Acid	1	Sodium Hydroxide 50%	1
Carbolic Acid	2	Triethanolamine	1
Carbonic Acid	2	**SOLVENTS**	
Lactic Acid	1	Acetaldehyde	4
Maleic Acid	1	Acetone	4
Malic Acid	1	Amyl Alcohol	3
Oleic Acid	2	Chloroform	3
Stearic Acid	1	Cyclohexane	3
Tannic Acid	1	Dimethyl Formamide	4
FATS & OILS		Ethyl Alcohol	3
Aniline	3	Formaldehyde	2
ASTM Oil #3	2	Unleaded Gasoline	4
Canola Oil	2	Hexane	3
Chicken Fat	2	Kerosene	2
Coconut Oil	1	Methyl Chloride	4
Cod Liver Oil	2	Methyl Ethyl Ketone	4
Cotton Seed Oil	2	Naphtha	3
Cutting Oil	2	Perchloethylene	4
Lard	2	Propyl Alcohol	3
Linseed Oil	2	Tetrahydroforam	4
Motor Oil	2	Toluene	3
Olive Oil	2	Trichlorethane	4
Pine Oil	3	Xylene	3

KEY: 1=Excellent 2=Good 3=Fair 4=Poor

ANSI 103-2010 Standard for Classification and Performance Requirements for Chemical Protective Clothing

The standard establishes a set of six hazard-based categories, and includes material and garment performance tests for each:

- Category 1 is a gas-tight chemical protective suit with an internal independent breathing air supply, such as a self-contained breathing apparatus, used where there is an immediate danger to life and health (IDLH), immediate skin hazard or contamination hazard, or unknown atmosphere.
- Category 2 is a gas-tight chemical protective suit with an external independent breathing air-supply, used for responding to an IDLH hazard where the atmosphere is known, and not likely to contaminate the breathing apparatus.
- Category 3 is liquid-tight full body chemical protective clothing, used in non-IDLH atmosphere where the main hazard is from contact with liquid or splash.
- Category 4 is liquid spray-tight full body chemical protective clothing, used in non-IDLH situations where there is a potential for splash from liquids that are not immediately hazardous to the skin.
- Category 5 is particulate-tight full body chemical protective clothing, used in non-IDLH situations where the major hazard is contamination from particles that present no hazard to the skin
- Category 6 is limited spray-tight, full or partial body chemical protective clothing that offers protection for a particular part of the body from liquid penetration, such as protection for medical personnel from bloodborne pathogens.

ANSI 107-2010 Standard for High Visibility Safety Apparel

The 2010 edition does not make any changes to sections 1-8 found in the 2004 edition, however, the 2010 edition does highlight three significant changes/additions from the 2004 edition. The first is that the criteria for flame resistance (section 9.5) is added as an optional feature of high-visibility PPE and must be certified by the manufacturer as complying with one of the FR tests cited in the standard. The second includes the expansion and updates of testing/labeling requirements related to water repellency and resistance (Appendix D1). The third change involves useful service life guidelines which are now provided (Appendix E).

There are three classes of garments specified in the standard that are based on the wearer's activities.

Class 3: These garments provide the highest level of conspicuity for workers. These are for workers with high task loads in a wide range of weather conditions where traffic exceeds 50 mph. The standard "recommends these garments for all roadway construction personnel, vehicle operators, utility workers, survey crews, emergency responders, railway workers and accident site investigators".

These garments have the greatest visibility of the three classes. These will have more retroreflective material used in its construction than the Class 2 and it must have sleeves with retroreflective material between the shoulders and elbow. This requirement is in accordance with Table 1 in the standard. This table gives minimum areas of background and coverage areas of the retroreflective material. The width of the retroreflective material to be used according to Table 1; shall not be less than 50mm wide.

Class 2: These garments are for workers who work near roadways where traffic exceeds 25 mph and need greater visibility in inclement weather. Workers who would typically wear these garments are: railway workers, school crossing guards, parking and toll gate personnel, airport ground crews and law enforcement personnel directing traffic.

These garments have superior visibility and are more conspicuous than the Class 1 garments. The minimum width of the retroreflective material used on these is not less than 35mm.

Class 1: These garments are worn by workers where traffic does not exceed 25 mph and there is ample separation from the traffic. These workers typically are parking service attendants, warehouse workers in equipment traffic, shopping cart retrievers and those doing sidewalk maintenance.

These garments need to be conspicuous and use retroreflective materials not less than 25mm in width.

The three classes of garments are differentiated by the requirements for amounts of retroreflective material that needs to meet specified performance criteria, the width and placement of the material, design and the color of vest used.

Class E: When hi-visibility pants are worn without other ANSI 107 compliant garments, they are considered Class E. When pants are added to Class 2 or 3 vests or coats the ensemble is considered a Class 3 classification.

ANSI 107-2010
classes 1, 2 & 3 typically cover vests, shirts, jackets and coveralls
class E covers pants and shorts

ANSI 107-2015 Standard for High Visibility Safety Apparel and Accessories

This new edition consolidates the requirements of ANSI 107-2010 and ANSI 207, *American National Standard for High-Visibility Public Safety Vests* in an effort to establish a single, comprehensive document that considers all occupational tasks. The standard continues to present three performance classes of garments based on the amount of visible materials and design attributes incorporated into the final configuration, and identifies garment types based on expected use settings and work activities being performed. These are designated as off-road (type O), roadway and temporary traffic control (type R), or public safety activities (type P).

Responding to user concerns, the 2015 standard makes allowance for garments sized to fit smaller workers, and adds specifications for accessories such as gloves and armbands. The standard details the performance requirements for all materials used in the construction of compliant high-visibility safety apparel (HVSA), specifies labeling requirements to identify the garment by performance class, type and by its flame resistance characteristics as defined in the standard and expands the examples of garment configurations to illustrate compliant and non-compliant designs.

To comply with ANSI 107-2015, a garment's background material, and retro reflective or combined-performance material must be tested by an accredited laboratory. The manufacturer of the finished item then verifies that the garment or headwear meets all the requirements of the standard, and provides a Declaration of Conformity for each model. Examples of test forms and the Declaration of Conformity are included in the standard and located in the resource section below.

ANSI 207-2006 Standard for High Visibility Public Safety Vests

The standard will only affect the Law Enforcement, Emergency Responders, Fire Officials, and DOT Personnel sectors. It will improve the safety in multi-agency incidents by improving visibility and identification. It will reduce confusion and enhance communication between agencies. Basic vest requirements will include:

- Vest Dimensions
- Color: (Red for Fire Officials), (Blue for Law Enforcement), (Green for Emergency Responders), and (Orange for DOT Officials)
- Material Performance
- Special design features for users in fire, emergency medical, and law enforcement
- Higher Visibility (checkered color coded reflective trim)

Some of the notable design features reflect the specific needs of public safety workers such as the need to access belt mounted equipment (gun, radio, CPR barrier mask) and the ability for vests to tear away from the body. The primary distinction of ANSI 207 versus ANSI 107 lies in the amount of fluorescent background material. ANSI 207 requires a minimum of 450 in^2. This would fall between ANSI 107 Class 1 (217 in^2) and Class II (775 in^2) garments. The minimum amount of required retroreflective area (207 in^2) did not change from ANSI 107 and 207. The difference in fluorescent material allow for design accommodation of equipment belts and for flexibility to incorporate colored panels to enhance easy, on-scene identification of wearers.

ANSI 207-2006
No classes – PSV (Public safety Vest) compliant
Identification: Red-Fire
Blue-Police
Green-EMS
Orange-DOC (Department Of Transportation)

ANSI 207-2011 - Revision to High Visibility Public Safety Vests

GARMENT DESIGN REQUIREMENTS – Should Area
One major change is the requirement for vests to have a total of AT LEAST 23.25 in^2 of reflective material on the COMBINED FRONT and BACK shoulder area. This change mirrors the revision that was made to ANSI 107-2010 and intends to provide visible reflective material even when the wearer bends at the waist.

IDENTIFICATION PANELS, LETTERING and LOGOS
The 2011 revision also seeks to provide clarity regarding ID panels, lettering and logos on pubic safety vests. This information is important as these garments are often logoed to meet the needs of police, fire and EMS personnel. Section 6.2 states that logos and other lettering covering an area LESS THAN 72 in^2 will not subtract from the amount of background material required in Table 1. Logos and other lettering may cover more than 72 in^2 of the total background material; however any amount over 72 in^2 will begin to count against the required amount of background material.

Additionally, lettering and logos may not cover more than 22 in^2 of reflective or combined performance material on ANSI 207-2011 compliant public safety vests.

ANSI 201-2012 - Standard for Classification of Insulating Apparel Used in Cold Work Environments

- Performance Category 1:

Apparel in this category can serve as an outermost layer in mild conditions or as insulating inner layers in more extreme conditions. Typical examples would include: 1) a shell garment with a fabric liner, 2) a thin fleece garment, 3) heavy sweatshirt, etc.

- Performance Category 2-4:

Apparel in these categories would include, but would not be restricted to, medium to heavy weight outerwear and typically would include an insulated lining (either removable or fixed). Examples may include insulated jackets, coveralls, and parkas.

- Performance Category 5-6:

Apparel in this category would typically encompass heavily insulated apparel items that typically cover both the torso and legs, and which is intended for long exposure durations and/or extremely low environmental temperatures (e.g., heavy winter parkas, insulated pants, freezer wear coveralls, expedition suits, etc.).

ANSI 101-2014 - Standard for Limited-Use and Disposable Coveralls - Size and Labeling Requirements
This standard establishes minimum size requirements, as well as garment and package labeling requirements, for limited-use and disposable coveralls. This standard includes a sizing chart to assist the wearer in the selection of the correct garment size, and test protocols to validate size selection. Sizing criteria ranges from extra small to 6X.

NFPA Standards

Developments within the last few years have made the selection of chemical protective clothing easier for employers. The National Fire Protection Association (NFPA) has devised performance manufacturing standards for chemical protective clothing.

NFPA 1991: Standard on Vapor-Protective Suits for Hazardous Chemical Emergencies, (1994 Edition) covers gas-tight suits. A suit meeting NFPA 1991 requirements is equal to the clothing required by EPA's Level A.

NFPA 1992: Standard on Liquid Splash-Protective Suits for Hazardous Chemical Emergencies (1994 Edition) covers splash-protective garments. Garments meeting NFPA 1992 requirements are equal to the clothing required in EPA's Level B.

NFPA developed these standards to provide users with information on suit integrity, resistance to chemicals and flame, durability, and function of components. Garments that meet the NFPA requirements are approved and marked with a Safety Equipment Institute (SEI) label.

EU DIRECTRIVES CLASSIFY PPE IN THREE CATEGORIES

Category I

Covers the lowest level of PPE. The user is assumed to assess the needs for protection himself, and there is a limited risk of severe consequences of not using appropriate clothing.

The products under this category are self declared by the marketer to comply with the standards. Products under this category are waterproof clothing (EN 343) and protecting clothing against cold (EN 342)

Category II

Covers products intended to be used in environments with risk for severe, but no fatal consequences.

The products must be tested and certified by a notified body.

Products under this category are flame retardant clothing (EN 531/533), clothing for high visibility (EN 471) and lifejackets (EN 395, 396 and 399) and buoyancy aids (EN 393)

Category III

Covers products and environments where the user can be exposed to mortal danger or to dangers that may seriously and irreversibly harm health.

EN 340

General requirements of the protective garments, used only in combination with specific standards such as EN342 etc. General requirements are for ergonomics, aging, sizing, and marking of protective clothing, and for information supplied by the manufacturer.

Category I Standards EN 342, EN 343

EN 342: Protection Against Cold

Products are tested by measuring the insulation for an ensemble (jacket, trouser) worn. Air permeability and breathability are also measured. Figures (1, 2 or 3) are given against X for insulation, Y for air permeability and Z for breathability; higher figures are best.

X Insulations, actual data (higher figure is best)

Y Air permeability, level 1, 2 or 3

Z Breathability, level 1, 2 or 3

EN 343: Protection Against Foul Weather

These garments are intended to protect against wether conditions with combinations of precipitation, rain, fog, humidity and wind at temperatures down to +5°C. They are tested for waterproofness (X) and breathability (Y); figures (1, 2 or 3) are given and higher figures are best.

X Waterproofness, level 1, 2 or 3

Y Breathability, level 1, 2 or 3

Category II Standards EN 531, EN 533, EN 471

EN 531: Protection Against Heat and Flame *(for the workers of industry exposed to heat)*

The standard specifies the performance requirements for protective clothing for workers from industry against the brief contacts with a flame and against at least a type of heat. Heat can be presented in the form of convective heat, of radiant heat, significant projections of molten metals or a combination of these risks of heat.

A Limited flame spread
B Convective heat (level B1-B5)
C Radiant heat (level C1-C4)
D Molten aluminium splash (level D1-D3, X= not tested)
E Molten cast iron splash (level E1-E3, X= not tested)

EN 533: Protection Against Heat and Flame *(Index of resistance of outside shell)*

The standard specifies the performance requirements for the limited flame spread properties of materials and material assemblies used in protective clothing. The material is classified in accordance with an index for limitation of flame spread (X) before and after a standard washing procedure (Y).

X Index of resistance of outside shell flame Index 1, 2 or 3
Y Number of washes at a given temperatures

EN 471: High Visibility Clothing

The standard specifies requirements for clothing intended to provide visibility of the user in hazardous situations under any light conditions by day and under illumination by vehicle headlights in the dark (24 hours visibility). Effective visibility is to be provided by a fluorescent fabric and reflective stripes. The visibility is measured as a combination of the area and positioning of the reflective materials (X) and the quality of same (Y).

X Area reflex/fluorescent fabric, level 1, 2 or 3
Y Reflex type/quality 1 or 2

Category III Standards EN 1149, EN 470, EN 469, EN 1486, EN 13034, EN 465, EN 466, EN 467, EN 943-1

EN 1149: Antistatic Protective Clothing

The standard specifies the electrostatic requirements and the test methods for protective clothing dissipating static electricity to avoid sparks which could cause fires. The current European standard does not apply for protection against mains voltage.

EN 1149-1 Electrical surface resistivity (<5E+10 Ohms on at least one of the sides)
EN 1149-2 Measuring electrical vertical resistance
EN 1149-3 Dissipation of electrostatic charge from the surface of the materials for garments

EN 465: Protective Clothing Against Liquid Chemicals

The standard specifies the performance requirement for chemical protection garments with fogs tight joints between the different parts of the garment.

EN 466: Protective Clothing Against Liquid. Chemicals, connections tight with the liquids.

Performance requirements for chemical protective clothing with liquid-tight connections between different parts of the clothing (e.g. gloves, boots) intended to protect their carrier against the liquid chemicals.

EN 467: Protective Clothing Against Liquid and Solid Chemicals

The standard specifies the minimal requirements
requested from the garment for a protection against the chemicals with certain parts of the body (e.g. aprons, handles, hoods).

EN 469: Protective Clothing for Fire Fighters

Minimum performance levels are exceeded for flame spread, heat transfer from flame and radiant heat, residual strength and heat resistance. Additional requirements may be met for tensile strength, tear strength, surface wetting, dimensional change, penetration by liquid chemicals, water resistance and breathability.

EN 1486: Protective Clothing for Firefighters

Test methods and requirements for reflective clothing for specialised fire fighting.

Type 1 Hood / shoulder cape / visor and gloves

Type 2 Floor length coat / hood / visor and gloves

Type 3 Suit incorporating boots / hood / visor

EN 470: Welding & Similar Operations Protective Clothing

The clothing is intended to protect the user against small splashes of molten metal (EN 348), short contact time with flame (EN 532), and ultra violet radiation, and to be worn continuously for up to 8 hours at ambient temperature.

EN 943-1: Protective Clothing Against Liquid & Gaseous Chemicals, including liquid aerosols and solid particles

Performance requirements for ventilated and non-ventilated gas-tight (Type 1) and non-gas-tight (Type 2) chemical protective suits including components such as the eyespieces, respiratory apparatuses, gloves and boots.

EN13034: Protective Clothing Against Liquid Chemicals

Performance requirements for the combinations of chemical protection of limited use and reusable. Garment offers a limited protection against the exposure to the liquid aerosols, the fog and the light splashes where the type of potential exposure, for, mist, etc. is defined.

Standards and Pictograms

PPE **Category 1:** Protection against minor hazards; minimal risks.

Category 2: Protection against medium hazards; not being classified in Cat. I or III.

Category 3: Protection against major hazards; high, irreversible and life-endangering risks.

The EN Standard: Six Types of Protection

Type 1 EN 943-1 EN 943-2		**Gastight protective clothing** Protective clothing against liquid and gaseous chemicals, aerosols and solid particles.
Type 2 EN 943-1		**Non gastight protective clothing** Suits to retain positive pressure to prevent ingress of dusts, liquids and vapours.
Type 3 EN 14605 EN 466		**Liquid tight suits** Protective clothing against liquid chemicals (jets) with liquid-proof connections.
Type 4 EN 14605 EN 465		**Spraytight suits** Protective Clothing against spray-proof chemicals, saturation of chemicals with spray-proof connections.
Type 5 EN ISO 13982-1		Protective clothing against solid particles Part 1: protection against airborne solid particles
Type 6 EN 13034		**Protective clothing against light spray of chemicals** with limited performance requirements.
EN 1073-2		**Protective clothing against radioactive particulate contamination** Part 2: Protective clothing with un-ventilated performance (no protection against radiation)
EN 14126		**Protective clothing against infective agents**
EN 1149-1		**Protective Clothing with electrostatic properties** Part 1: Surface resistance
EN 533-Index 1		**Protective clothing against heat and fire** Materials with limited flame spread.
EN 369		**Protective clothing against liquid chemicals** Resistance of materials to the permeation of liquids
EN 12941		**Respiratory protection equipment** Fan filter equipment with helmet or hood

ANSI/ISEA 103 vs ISO 16602 & CEN

Both the ISO and CEN systems refer to each of the six levels of garment performance as "Types"
While the ISEA document was processed through the American National Standards Institute (ANSI) and are referred to as "Categories"

Garment Classification Levels:

Category	ANSI/ISEA 103	Type	ISO 16602 & CEN
1	Encapsulating, vapor protective garment with SCBA worn inside or with airline	1a	Encapsulating, vapor protective garment with SCBA worn inside
		1b	Vapor protective garment with SCBA worn outside suit
		1c	Vapor protective garment with air line supplied breathing air
2	Vapor protective garment with SCBA worn outside	2	Positive pressure, vapor protective garment
3	High volume, high pressure, liquid protective garment	3	High volume, high pressure, liquid protective garment
		3PB	Type 3 partial body garment
4	Liquid spray protective garments	4	Liquid spray protective garments
		4PB	Type 4 partial body garment
5	Particle protective garments	5	Particle protective garments
6	Limited-spray protection garment or particle body garment	6	Limited-spray protection garment
		6PB	Type 6 partial body garment

An example of how tear resistance results allows you to fine-tune your garment selection.
In the ISO/CEN documents, these levels are called "Classes," while in the ANSI/ISEA document they are called "Levels."

Tear Resistance Levels:

Level	ANSI/ISEA 103	Class	ISO 16602 & CEN
H	>200	6	>150
		5	>100
M	>100	4	>60
		3	>40
L	>25	2	>20
		1	>10

The requirements for ISO/CEN Type 2 and ANSI/ISEA Category 2 are the most obvious differences in these classification systems. The ANSI/ISEA standard makes no special provision for positive-pressure air-fed suits. When worn without a separate respirator, these garments provide respiratory protection and are classified as respirators under U.S. regulations. Performance specifications for air-fed ensembles are addressed in ASTM F2704, *Standard Specification for Air-Fed Protective Ensembles*.

Partial body garments are also handled differently. Under the ANSI/ISEA structure, partial body garments are considered only in light liquid exposure situations (Category 6). The ISO and CEN systems anticipated partial body garments under higher volume and higher pressure liquid exposure situations (Type 3 & 4).

References:

Occupational Safety and Health Administration https://www.osha.gov
The National Institute for Occupational Safety and Health https://www.cdc.gov/niosh
The Safety Equipment Institute http://www.seinet.org
International Safety Equipment Association https://safetyequipment.org
The European Union https://europa.eu
The British Standards Institution https://www.bsigroup.com
National Fire Protection Association http://www.nfpa.org