

User Information for Frontline® 500 Vapor and Liquid Protective Ensemble

Certified Models NFPA 1990 (1991) – 2022 Edition
F5H582-91 • F5H583-91



Know What You're Getting Into.®

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THIS INFORMATION PACKET MAY NOT BE REMOVED EXCEPT BY THE END USER

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Know What You're Getting Into.®

SAFETY CONSIDERATIONS

It is the user's responsibility to read, understand and follow the information in this manual and on Kappler's website, www.kappler.com and all applicable Federal, State, and local occupation safety and health statutes. For users outside the United States, please consult national or other applicable personal protective equipment regulations. Proper use should be consistent with NFPA 1500 *Standard on Fire Department Occupational Safety and Health Program*, and 29 CFR 1910.132 "Personal Protective Equipment: General Requirements."

The Authority Having Jurisdiction (AHJ) responsible for approving equipment 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*.

SAFETY SYMBOLS USED IN THIS MANUAL

While reading this manual, you will see a number of warnings concerning some of the risks and dangers you may face while using the device. These warnings contain "signal" words that will alert you to the degree of hazard you may encounter. These words, and the hazards they describe, are as follows.



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in physical injury or damage to the product. It may also be used to alert against unsafe practices.

WARNINGS AND LIMITATIONS

This garment must be used in combination with additional PPE, which includes the following:

- Separate NIOSH approved full-face respiratory protection such as a self-contained breathing apparatus (SCBA) or an external breathing air supply (airline system with garment pass-through) with escape bottle. NFPA compliant garments must use NIOSH CBRN approved SCBA.
- RESPIRATOR CONSIDERATION FOR CERTIFIED ENSEMBLES: Certified ensembles must be used with NIOSH CBRN approved SCBA. The SCBA tested with this Frontline® ensemble was: Scott AV 3000 HT Sure Seal.
- Separate foot and lower leg protection such as chemical protective boots.
 - Chemical protective boots tested with this Frontline® ensemble were: OnGuard HazMax #87012 or Tingley #82330
- Supplied Airline Applications
 - To connect to an external supplied airline system these garments must be equipped with the appropriate NIOSH approved garment pass-through. Note that this pass-through connection will NOT serve as an anchor for a tether. Excess stress on this fitting may result in permanent damage to the garment.



Do not wear this garment without supplied breathing air. Vapor protective garments totally enclose the wearer and isolate the wearer from exposure to outside gases and vapors. Air may be supplied to the wearer by a self-contained breathing apparatus (SCBA) or supplied breathing airline.

ADDITIONAL EQUIPMENT

Additional personal protective equipment that might also be considered includes:

- Head protection.
- Hearing protection may be required due to high levels of external noise or high noise levels generated by supplied air systems.
- Other protective equipment that may be warranted based on the situation.



There are uses, environments, and chemicals for which these garments and/or fabrics are unsuitable. It is the responsibility of the user to review available data and verify that the garment and/or fabric is appropriate for the intended use and meets all specified and/or industry standards.

WEARERS MUST BE PHYSICALLY FIT

Garments should only be worn by persons who are in good physical condition. Working in a chemical protective garment 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, or excessive heat build-up should leave the work area immediately and doff the garment as quickly as possible. Persons in doubt about their physical condition should check with a physician before wearing these garments.

If any of the following symptoms develop during use of this garment, immediately leave the hot zone, 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



Always Use the Buddy System

Never work in this garment alone. A minimum of two people should enter contaminated areas together. It is important to have someone available to assist in the event of an emergency. That person will require the same level of protection as the person needing emergency assistance.

MANAGE AND PREVENT HEAT STRESS

This garment interferes 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 use of a cooling system, and working in accordance with a conservative work/rest schedule. The maximum time the garment can be worn depends on such variables as the air supply, ambient condition, climate inside the garment, 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 totally encapsulating garments. Similar information is available on the federal OSHA website (www.OSHA.gov).

OTHER ADVICE

Chemical Permeation Data

Before using a garment in a chemical situation, consult the chemical permeation data appropriate to the garment 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, etc. Due to the large number of variables, it is impossible for all garment 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 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 garment materials against the specific chemical hazard, at the temperature and in the concentrations to be encountered. Kappler, Inc. will provide free swatches of primary garment materials for testing and help arrange to have these tests performed.

Avoid Continuous Exposure

This garment should not be immersed in chemicals. This garment should not be exposed to continuous hazardous liquid chemical splash or deluge. Do not wade through liquid pools of hazardous chemicals if not necessary. Direct chemical exposure to the garment should

be as limited as possible. If exposed to direct splash or deluge of hazardous chemicals, leave the area immediately and decontaminate.

Static Electricity

Under certain conditions, such as cold and dry weather, it is possible for garments to build and discharge static electricity. Discharges are not normally dangerous except in situations where generation of an electrical spark could ignite a flammable atmosphere. When working around flammable chemicals, steps to eliminate potential static discharges should be used. In these situations, recommended precautionary steps include raising humidity level of the work area and/or using a commercial, anti-static application.

Sock Booties

The sock booties attached to this garment are designed to be worn inside outer boots. These sock booties do not have sufficient durability or slip resistance to be worn as outer boots.

Closure Lubricants

There are no lubricants recommended for the closure system.

Marking Recommendations and Restrictions

Ensembles may be marked with Kappler ChemTape®.

Sizing Considerations

The garment sizing chart should be used to determine accurate fit. The correct size garment should be worn. See Appendix A.

Recommended Undergarments

The wearer should consider wearing inherently flame resistant, woven clothing, with long sleeves and pants under this garment.

Retirement Considerations

It is recommended this garment be retired from service if any of the following criteria are met:

- Garment does not pass visual inspection.
- Garment does not pass pressure test (ASTM F1052).
- Garment is abraded, cut, torn, punctured, or otherwise in any way breached.
- Garment has received an exposure to a toxic chemical.

- Zipper has separated or imperfections are noted.

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

WARRANTY INFORMATION

It is the responsibility of the user to select suits and other products which are appropriate for each intended application and which meet all legal, regulatory and health standards. Kappler is available to consult on any proposed application or use. It is the responsibility of the user to visually inspect Kappler products upon receipt and prior to use. For gas-tight suit models, inspection includes both a visual assessment as well as an air pressure test. The user is responsible for exercising reasonable care in the maintenance, use, and storage of Kappler products.* The “use” of a Kappler product is defined as any situation in which a Kappler garment is donned, regardless of purpose, activity level, time duration, or hazard exposure. This Warranty shall not apply to damage or injury resulting from accident, misuse or neglect, or from alteration of any product.

KAPPLER, INC. EXPRESSLY DISCLAIMS ANY RESPONSIBILITY FOR ANY DAMAGE, INJURY, HARM, COST, EXPENSE, OR LIABILITY ARISING OUT OF OR RELATED TO YOUR USE OR MISUSE OF THIS PRODUCT. THIS PRODUCT IS PROVIDED ON AN AS-IS BASIS AND WITHOUT WARRANTY OF ANY KIND, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE, ACCURACY, NON-INFRINGEMENT, OR QUALITY. SOME JURISDICTIONS DO NOT ALLOW AN EXCLUSION OF IMPLIED WARRANTIES. IF YOU ARE LOCATED IN SUCH A JURISDICTION, YOU ARE ADVISED TO SEEK LEGAL ADVICE TO DETERMINE IF THIS EXCLUSION APPLIES TO YOU.

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**for more information on recommended storage and shelf life considerations, please visit www.kappler.com*

GARMENT INFORMATION

INSPECTION OF THE GARMENT

To perform a full visual inspection:

- Choose a clean, dry area that is free of potential sources of snags, tears and punctures.
- Mark suspected defects with colored adhesive tape.
- Visually inspect seams for tape lift or de-lamination.
- Visually inspect for surface damage or discoloration on material, respirator interface, gloves and closure.
- Check zipper closure for worn or damaged parts. Run your fingers along the zipper length to feel for imperfections or separations.
- Check function of zipper and slider.



The garment should undergo a full visual inspection at the following times:

- Upon receipt to ensure no damage has occurred during shipment.
- Prior to donning of garment.
- After a garment is worn and before the garment is made available for reuse.
- Annually. However, most performance properties of a vapor-protective ensemble cannot be tested by the user in the field.

Garments with visible holes, tears, rips, punctures, serious discoloration or abrasions should not be used.

Returning the Garment

If a garment fails a visual inspection or pressure test, the garment may be returned for inspection and possible replacement. Contact Kappler Inc. to authorize the return. No contaminated garments will be accepted for return. Discoloration or odors are evidence of contamination. Garments being returned must be accompanied by the inspection log and with a letter stating that the garment has not been contaminated. Note: Charges may be incurred. See warranty information.

PRESSURE TESTING INFORMATION

The steps in this procedure mirror those found in ASTM F1052 “Standard Test Method for Pressure Testing Vapor Protective Ensembles”. A copy of the standard may be obtained for a fee from ASTM International (www.ASTM.org).

The Kappler Pressure Test Kit used for pressure testing will require the use of an external air supply. For training purposes, a video of the pressure testing procedure is available at www.kappler.com. Additional literature may be obtained by contacting customer service at 1-800-600-4019 or by email, customerservice@kappler.com.

Note any remarks in the Inspection Log. If the garment is unsuitable for use by visual inspection, the garment may be retired for training use after being permanently labeled “For Training Use Only,” or disposed of properly.

CONDUCTING THE PRESSURE TEST

1. Unfold the garment and place face down on a smooth, clean surface where it can be inflated without obstruction.
2. On the inside of the garment, close off all valves and pass-throughs (if present) that are not needed for pressure testing.
3. Working from the outside of the garment, remove the exhalation valves caps and diaphragms from the valves. Firmly push the test kit adapters into the valve openings and turn clockwise to ensure a proper air-tight seal.

Note: If the adapters are not secured into place, a seal will not occur and the garment will not hold pressure. Important: After completion of the pressure test, the previous two steps should be performed in reverse order.
4. Close the zipper securely. Look for zipper separation that may have occurred.
5. Inflate the garment to a pressure of 5.0 inches of water column (or proceed to other approved test kit instructions).
6. Wait a minimum of three (3) minutes to allow wrinkles to fill out and air temperature to equalize in the suit.
7. Reduce the air pressure to 4.0 inches of water column (or according to the test kit instructions) by disconnecting the air supply and slowly opening the valve. Close the valve when the pressure reaches 4.0 inches water column and immediately start the timer.
8. After four (4) minutes, read the air pressure gauge. If the pressure has not dropped below 3.2 inches water column, the garment has passed.

Note: A pressure reading of 3.2 inches of water column is equivalent to a 20% drop in pressure allowed by the ASTM standard.

After completion of pressure testing, record the results on the Inspection Log provided in this manual. The information includes the serial number, the date of inspection, the initials of the inspector and results of Pass/Fail. The pressure test ending pressure can also be recorded if desired.

9. If the pressure falls below 3.2 inches water column before the end of the four (4) minutes, the garment should be removed from service and checked for leaks. Air leaks often occur at the glove interfaces, at the zipper closure point and around exhaust valves. Inflate the garment to 5.0 inches water column and spray a soapy water solution at various points over the garment to locate leaks. For additional information, contact Kappler.
10. After completion of the pressure test, remove the test kit adapters by twisting counter-clockwise and releasing from valves. Inspect valves and immediately replace diaphragms and valve caps or covers.

INSTRUCTIONS FOR FIELD REPLACEABLE ATTACHED GLOVES

Removing ring and clamp glove:

- Lay suit out on a clean, flat surface.
- Reach inside the suit sleeve and turn inside out.
- Fold back edge of inner film glove and pull over glove ring.
- Fold back edge of outer glove and pull over glove ring.
- Remove rubber band.
- Loosen ring clamp with screwdriver.
- Remove clamp and leather reinforcement.
- Remove second rubber band.
- Grasp glove ring and gently pull out of sleeve.
- Remove glove from sleeve.

Installing ring and clamp glove:

- The sleeve of the garment is turned inside out.
- Place rubber band over glove ring and sleeve, ensure it is flat.
- Place ring clamp over rubber band and ensure clamp screw is not positioned over the sleeve seam.
- Place leather reinforcement between the clamp and sleeve.
- Align large area of leather with clamp screw.

- Tighten the screw.
- Fold leather tab and excess sleeve fabric over the clamp.
- Place second rubber band over the ring and clamp assembly.
- Turn sleeve right side out.

STORAGE LIFE AND STORAGE CONDITIONS

Storage Life

Kappler's Frontline® 500 garments have a predicted storage life of 10 years from the date of manufacture when stored properly (see Storage Conditions), based on accelerated aging studies. Storage life is defined as the period in which a garment or element has undergone proper care and maintenance in accordance with this instruction manual, but has not been used in either training or in response to actual incidents. It is the responsibility of the employer or purchaser to determine when the garment should be taken out of service. It is recommended that garments be labeled and retired to "Training Use Only," if they do not pass the recommended visual and/or pressure test inspections.

Storage Conditions

In alignment with NFPA 1891 *Standard on Selection, Care, and Maintenance of Hazardous Materials, CBRN, and Emergency Medical Operations Clothing and Equipment*, routine storage of hazmat/CBRN/EMO PPE should be as follows:

- Garments must be stored away from direct sunlight or UV exposure.
- Garments must be stored in a cool (between 40° -90° F), dry, well-ventilated location that is not subjected to extreme hot or cold conditions.
- Garments must be stored dry to prohibit the formation of condensation, in their original boxes, in bags, or on hangers. Garments must be stored with the closures in the open position.



Failure to store garments in the proper environment as described above can adversely affect the protective performance of the garment and may void the Kappler warranty.

DONNING THE GARMENT

1. Conduct a brief visual inspection of the garment before beginning donning procedure.
 - Garment should be free of discoloration, or physical damage.
 - Inner gloves should be fully inserted in outer gloves.
 - Inside and outside of exhaust valves should be free of covers and plugs.
 - Garment should have passed a pressure test prior to use.
2. An assistant should help the wearer don the garment.
3. Remove all jewelry and personal items (pens, key rings, badges, knife cases, etc.) that might damage the garment.
4. Check function of respirator and place nearby donning location.
5. Visually check size and condition of outer boots and place nearby donning location.
6. Ensure garment zipper is completely open.
7. Read garment size label to assure proper fit.
8. Remove shoes. The sock booties on this garment are worn inside outer chemical boots. These sock booties do not have adequate durability or slip resistance to be worn over footwear as an outer covering.
9. While seated, insert feet into garment legs and down into sock booties. Stretch legs out to maximum extension while pulling garment up toward hips.
10. Pull boot splash flaps up and don outer boots. Fold splash flaps down over boots as far as possible.
11. While standing, connect and adjust garment waist belt.
12. While standing, with garment at waist level, don respirator face piece and tighten head straps to secure.
13. Don SCBA harness. To conserve SCBA air supply, disconnect the air supply from the face piece, if possible, as long as the wearer retains access to fresh air. In the case of an airline breathing system, complete all connections and adjustments.
14. Place one hand in the sleeve and pull garment sleeve to shoulder. Make sure hand is securely inside the glove.
15. Place other hand in sleeve and place hand into glove.
16. Place outer gloves over the attached gloves of both hands.

17. Pull the garment over respirator backpack making sure nothing will constrict or hamper air flow for your breathing apparatus or airline.

18. Attach the SCBA regulator air supply to the face piece, activate the air supply and ensure proper function of air supply before closing the zipper. If using an airline breathing system, ensure breathable air is now being supplied to the suit.

15. Slowly close the zipper. After checking that the zipper is completely closed, the flaps should be closed and sealed over the zipper.

19. Have assistant slowly close the gas-tight zipper closure. After checking that the zipper is completely closed, and there are no separations along the length of the zipper, the storm flaps should be closed and secured over the zipper closure.

Interface Issues

The user should ensure respirators, boots and gloves, as applicable, are properly interfaced. There are no special procedures for donning outer boots.

DOFFING THE GARMENT

1. An assistant should help the wearer doff the garment after gross decontamination.



If the garment has been contaminated or suspected of being contaminated:

- *The assistant should wear protective clothing and respiratory equipment.
- *The wearer should continue to use his respirator until the garment has been doffed and removed.

2. While the wearer stands, the assistant should open storm flap and zipper 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. To prevent inner gloves from inverting, grasp the fingers of both gloves while the other hand is being removed. External airlines should be disconnected from the garment and from the wearer's respirator while the wearer switches to his escape bottle.
3. 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.
4. Once the wearer is out of the garment, the air supply (as applicable) can be detached, and the garment removed to a remote location.
5. The wearer can doff the respiratory facepiece.

DECONTAMINATION OF CHEMICAL AND BIOLOGICAL CONTAMINATION



This garment is designed for multiple uses, single exposure. This garment is not designed to be repaired. Contaminated garments should be discarded. Contaminated garments are not suitable for training purposes.

The AHJ should develop and implement a decontamination procedure for each of the chemicals to which the garment has been exposed. The decontamination procedure should include complete information on the type of contamination, as well as the level of contamination involved.

Decontamination Solutions

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

Gross Decontamination

The purpose of gross 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 to have been exposed to chemical or biological contamination should be gross decontaminated before doffing. Gross decontamination does not make a garment safe for reuse. If you suspect or know that a garment has been contaminated, it must be discarded after gross decontamination.

Garment Contamination

After gross decontamination, place contaminated items inside a leak-proof container and marked appropriately. Dispose of these items according to the AHJ Standard Operating Procedure (SOP).

Inspections Before Reuse

It is the responsibility of the safety professional having jurisdiction over usage of the garment to determine whether the garment has not been contaminated and can be safely re-used.

Cleaning of Frontline® 500

The purpose of cleaning a garment is to remove soils caused by non-hazardous substances (i.e. dirt) and for hygienic purposes.

Only garments that have been thoroughly cleaned and dried may be considered for use. Garments contaminated with toxic chemicals or blood/body fluids, excluding sweat from the wearer, should not be considered for use.

- Water and mild household dishwashing liquid should be used to clean this garment.
- This garment may be lightly rubbed 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 this garment.
- Do not dry-clean this garment.
- Do not use hot air or a tumbling air dryer to dry this garment.
- Hang the garment in a cool, dry area to ensure proper drying of the garment.

TECHNICAL INFORMATION**NFPA 1990 (1991) Performance Data**

Available on request from Kappler.

Sizing Information

Sizes available: XS, SM/MD, LG/XL, 2X/3X, and 4X.

See attached chart (Appendix B).

Garment Material and Component Descriptions**Garment Material**

The primary garment material is Kappler Frontline® 500 chemical barrier fabric.

Visor/Faceshield Material

The visor system is 2 mil anti-fog treated inner, 40 mil FR PVC middle and 5 mil FEP outer.

Glove Material and Assembly

The glove assembly consists of three (3) layers:

- Inner glove: PE/EVOH Laminate
- Middle glove: 35mil butyl
- Outer glove: Kevlar® or Kevlar® and leather tip glove

These gloves are unlined and have no surface treatments applied.

Sock Bootie Material

The garment is made with an integrated sock bootie of Zytron® 500 material.

The user must wear separate outer safety boots.

Physical Foot Protection

The OnGuard HazMax #87012 or Tingley #82330 boot must be worn over the integrated bootie for compliance to NFPA 1990 (1991) - 2022.

The OnGuard HazMax #87012 is one piece injection molded with anti-slip resistance and steel toe, steel shank and steel midsole. Polyester lining. Men sizes 6-15. Green. The Tingley Hazproof #82330 is one piece injection molded with anti-slip resistance and steel toe, steel shank and steel midsole. No linings or surface treatments. Men sizes 7-13. Orange.

Zipper/Closure Type and Material

The zipper is a 40-48" long gas-tight polyurethane coated zipper with heavy duty molded nylon teeth. The slider components are stainless steel. The outside of the zipper is protected by a flap composed of garment material. The closure is fastened by a hook/loop system.



The Zipper/Closure system has not been tested for permeation resistance.

Material Seam Types and Composition

Seam Material - Garment

The seam is made using a single needle lock stitch seam. The sewing thread is Nylon. The tapes are composed of a chemical barrier film that is heat-sealed over the inside seam.

Seam Material - Visor

The visor is sewn to the outside of the garment material. The edge of the interface is covered with the same barrier film tape as the garment seams.

Seam Material - Glove

The glove assembly is connected to the sleeve via a steel clamp/PVC ring via mechanical screw compression.

Seam Material - Footwear

The footwear is not attached to the garment material. The protective footwear is worn over the integral sock bootie.

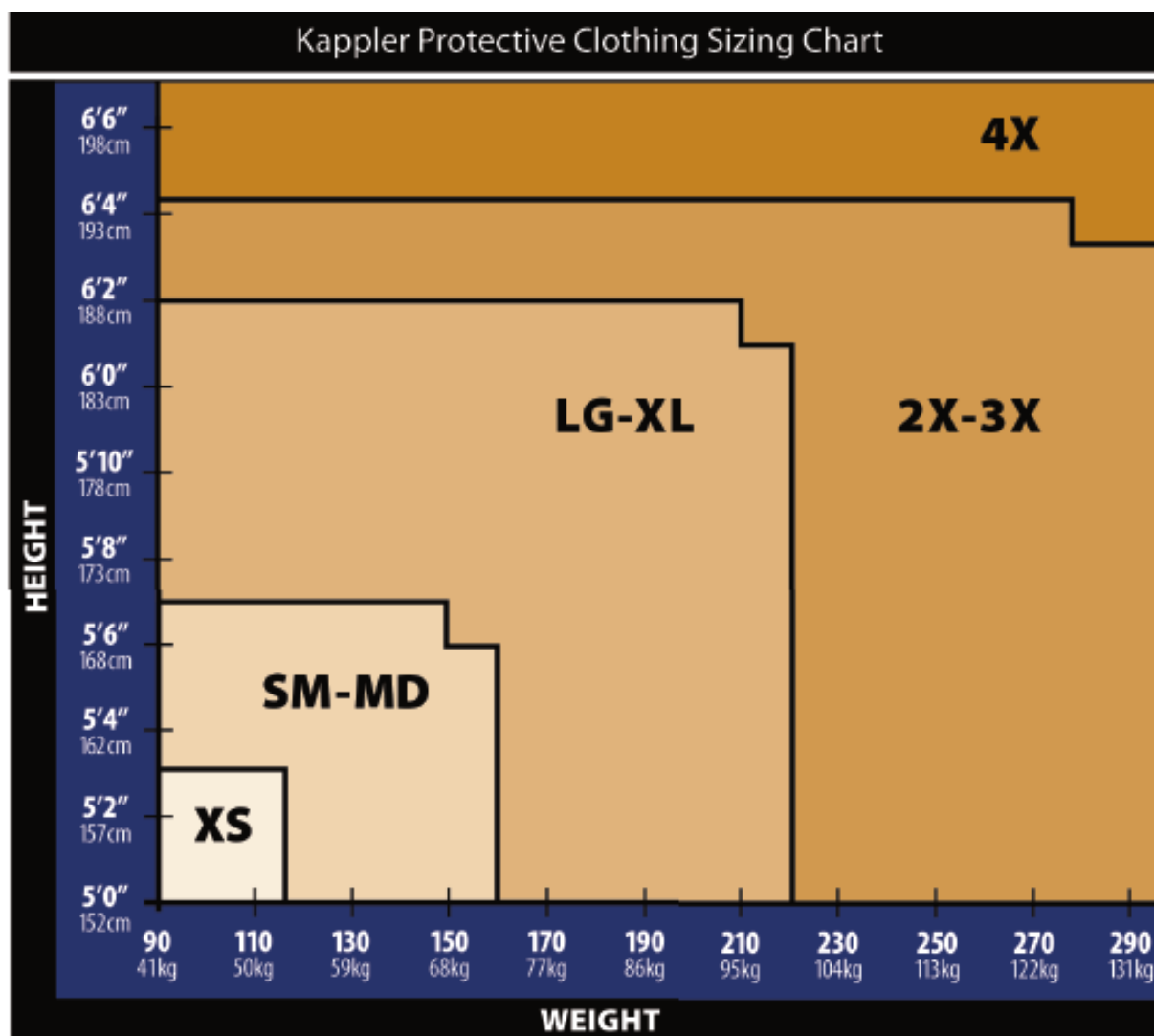
Seam Material - Garment Closure

The closure is sewn to the outside of the garment material. The edge of the zipper is covered with the same barrier tape used on material seams.

Exhaust Valve Type and Material

The valve body is manufactured of impact resistant plastic. The diaphragm is made of silicon rubber. The valves are attached to the garment via a mechanical screw compression seal. The valves have splash resistant covers made of the primary garment material. There are two valves incorporated into each ensemble.

APPENDIX A - SIZING CHARTS



Please Note: This chart is based on individuals wearing SCBA, safety helmet and suggested underclothing (see Recommended Undergarments).

Frontline® Glove Sizing Chart

Glove Size	Hand Circumference (in)	Hand Length (in)	Garment Size Option
Extra Small	7	6-3/4	XS
Small	7	6-3/4	SM/MD
Medium	8	7-3/16	SM/MD
Large	9	7-9/16	LG/XL
X-Large	10	8-1/16	LG/XL
2X-Large	11	8-7/16	2X/3X, 4X

