

# User Information for Frontline<sup>®</sup> 500 Vapor and Liquid Protective Ensemble

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



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*Know What You're Getting Into.<sup>®</sup>*

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

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User Information for  
Frontline® 500 Vapor and Liquid Protective Ensemble

Certified Model  
NFPA 1990 (1991) - 2022 Edition

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## 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](http://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.

The Authority Having Jurisdiction (AHJ) responsible for approving equipment must comply with the requirements of NFPA 1891 for the selection, care, and maintenance of protective ensembles and elements.

## SAFETY SYMBOLS USED IN THIS MANUAL

While reading this manual, you will come across 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.



### WARNING

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



### CAUTION

*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.*

**NOTICE**

*Indicates additional information on how to use the garment.*

## WARNINGS AND LIMITATIONS

**WARNING**

*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.*

**CAUTION**

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

*Separate 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.*

*Separate foot and lower leg protection such as chemical protective boots.*

## 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.



### CAUTION

#### Wearers Must be Physically Fit

*Garments should only be worn by persons who are in good physical condition. Working in a totally encapsulating 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*

*continued*

- *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](http://www.OSHA.gov)).

*continued*

## ***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.

## ***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.

## 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.

## 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.



### WARNING

#### *Avoid Suffocation*

*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.*

## Sock Booties

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

## Provide Hearing Protection

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

## Communications

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

## INSPECTION OF THE GARMENT



### CAUTION

The garment should be pressure tested and undergo a full visual inspection at the following times:

- *Upon receipt to ensure no damage has occurred during shipment **OR** prior to first 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.*

## FULL VISUAL INSPECTION

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.
- Check the visor for scratches or flaws.
- Visually inspect seams for tape lift or de-lamination.
- Visually inspect for surface damage or discoloration on material, visor, 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 zipper fitting. Garment should be stored with zipper open.
- Exhaust valve diaphragms should be visually examined during the pressure test procedure to ensure they are soft, pliable and free of defects.

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

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

## PRESSURE TESTING THE GARMENT

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](http://www.ASTM.org)).

*The Kappler Pressure Test Kit used for pressure testing will contain either an airline supply, self-contained blower or both. For training purposes, a video of the pressure testing procedure is available at [www.kappler.com](http://www.kappler.com). Additional literature may be obtained by contacting customer service at 1-800-600-4019 or by email, [customerservice@kappler.com](mailto:customerservice@kappler.com).*

## CONDUCTING THE 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. If the adapters are not locked into place, a seal will not occur and the garment will not hold pressure.

**NOTICE**

*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.

**NOTICE**

*Special attention and caution should be used in closing gas tight zippers for pressure testing of level A garments. If proper technique and care are not used, potential damage of the zipper will occur. When closing the gas tight zipper, it should be in a position so that a corner or sharp curve is not encountered. If excess force is used to pull the slider around the corner or sharp curve, the zipper could be damaged.*

*The following procedure will help to eliminate this issue:*

- *Lay the garment visor up on a flat surface.*
- *Fold the visor in half lengthwise and roll away from zipper onto the flat surface.*
- *This allows the zipper to be in a straight position from top to bottom.*
- *Close the zipper in two to three short increments and do not try to pull the entire length at once.*

*continued*

**NOTICE**

- *Hold the bottom of zipper with one hand and pull the slider up to a point just below the visor.*
- *Reposition the garment slightly to ensure the remaining open zipper is straight.*
- *Close the slider the rest of the way to the top stop.*
- *Always ensure the zipper is as straight as possible when closing.*
- *Do not hold storm flap when closing or opening zipper.*
- *Always pull the slider in a straight line along the zipper length and do not pull at an angle, which will result in potential damage.*
- *Place thumb on slider while gripping pull strap and use thumb to push slider against top stop of zipper.*
- *Use the same precautions and method for opening the zipper as well.*
- *If resistance is encountered during opening or closing, do not try to force, but reverse direction and inspect zipper teeth (elements) for damage.*

*For additional information and a video on zipper care and maintenance, go to [www.kappler.com/resources](http://www.kappler.com/resources) tab.*

## 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 usage log and with a letter stating that the garment has not been contaminated. Note: Charges may be incurred. See warranty information.

## INSTRUCTIONS FOR FIELD REPLACEABLE COMPONENTS REPLACING ATTACHED GLOVES

### Remove 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.

## Install 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. The useable *service life* of the garment is dependent on the chemicals exposed to the garment, the concentration of those chemicals, the work environment, frequency of use, and the maintenance program. 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.

The gloves and boots specific to this ensemble have no storage life data available.

### **Storage Conditions**

Garments should be stored away from direct sunlight, preferably in a cool, dry location that is not subjected to extreme hot or cold conditions (between 40° - 90° F). Garments should be stored in their original boxes, in bags, or on hangers. Garments should be stored with the zipper open.

## **VISOR ANTI-FOG TREATMENT**

Kappler vapor protective totally encapsulated garments are now available with a permanently attached layer insider the PVC visor which reduces condensation (fogging). The anti-fog treatment is permanent and is not designed to be replenished or replaced.

## **CLOSURE LUBRICANTS**

There are no zipper closure lubricants required for proper operation.

## MARKING RECOMMENDATIONS AND RESTRICTIONS

Ensembles may be marked with Kappler ChemTape for identification. Refer to part number 99402.

## RECOMMENDED UNDERGARMENTS

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

## RESPIRATOR CONSIDERATION FOR ENSEMBLES

Ensembles must be used with NIOSH CBRN approved self-contained breathing apparatus (SCBA). The SCBA tested with this Frontline® ensemble was a Scott AV 3000 Sure Seal.

## SIZING CONSIDERATIONS

The garment sizing chart should be used to determine accurate fit. The correct size garment should be worn. See Appendix B pg. 30

## 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 and visual inspection prior to use (ASTM F1052)
  - Make sure there are no imperfections or separations along the length of the zipper.
2. An assistant should help the wearer don the garment.
3. Remove all jewelry and personal items (pens, keyrings, badges, pagers, 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 near donning location.
6. Open garment zipper closure completely, ensuring slider is fully open to the bottom stop before donning.
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 sitting, insert feet into garment legs and down into sock booties. Stretch legs out to maximum extension while pulling garment up around 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 SCBA respirator harness and backpack.
13. Don respirator face piece and check its function. 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 glove.
16. Place outer Nomex®/leather 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.
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.

## DOFFING THE GARMENT

1. If the garment has been contaminated, or suspected of being contaminated, the wearer should continue to use his respirator until the garment has been doffed and removed.
2. An assistant should help the wearer doff the garment after field decontamination. If the garment has been contaminated, the assistant should wear protective clothing and respiratory equipment.
3. While the wearer stands, the assistant should open 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.
4. 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.

5. Once the garment has been removed, the wearer can doff the respiratory face piece and harness.

## INTERFACE ISSUES

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

## DECONTAMINATION AND CLEANING OF CHEMICAL AND BIOLOGICAL CONTAMINATION

### *Decontamination Solutions*

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

### *Field Decontamination*

The purpose of field decontamination is to allow the wearer to doff the garment without being harmed by contaminants on the garment surface. Garments that have been exposed to or that are suspected to have been exposed to chemical or biological contamination should be field decontaminated before doffing.

Additional cleaning, decontamination, a full visual inspection and a pressure test are required before a garment may be reused.

1. Leave the hot zone with adequate air supply for decontamination and removal of the garment. The wearer should continue to wear the respirator until the garment has been completely doffed and removed from the area.
2. If the garment has been exposed or is suspected to have been exposed, thoroughly scrub the garment using household dishwashing liquid and soft scrub brushes, followed by a thorough rinsing in water.
3. If possible, the excess rinse water should be removed from the garment by individuals wearing gloves, liquid-splash protective clothing and respiratory protection. At a minimum, the rinse water on and near the closure assembly should be removed.

**CAUTION**

*This garment is designed for multiple use, single exposure. It is priced to make disposal after use economically justified when the effectiveness of decontamination is in question. This garment is not designed for multiple exposures and multiple decontaminations. This garment is not designed to be repaired.*

## DECONTAMINATION BEFORE REUSE

It is the responsibility of the safety professional having jurisdiction over usage of the garment to determine whether the garment has been adequately decontaminated and can be safely re-used.

A decontamination procedure for each of the chemicals the garment has been exposed to should be developed and implemented by a qualified individual and with complete information on the type of contaminant, as well as the level of contamination involved.

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

No reactive or corrosive decontamination solutions should be used with this garment. Only water and mild, household dishwashing liquid should be used as decontamination liquids.

### ***Maintenance and Cleaning***

Only garments that have been thoroughly cleaned and dried may be considered for use.

- Water and mild, household dishwashing liquid should be used to clean this garment.
- This garment may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water and air-dried.
- Do not use any oxidative, corrosive or reactive decontamination solutions with this garment.
- Do not dry-clean this garment.
- Do not use hot air or a tumbling air dryer to dry this garment.
- Make sure no zipper separations occur during cleaning.
- Hang the garment in a cool, dry area to ensure proper drying of the garment.

## RETIREMENT CONSIDERATIONS



### CAUTION

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

- *Garment fails to pass the positive pressure test (ASTM F1052).*
- *Garment is abraded, cut, torn, or punctured.*
- *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.

## DISPOSAL

This garment may be safely disposed of in a facility capable of handling plastic items containing polyolefin, polyester and vinyl plastics. Severely contaminated garments may need to be treated as and disposed of as hazardous wastes.

## WARRANTY INFORMATION

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

Kappler Frontline® 500 garments are designed for multiple use, single exposure. It is the responsibility of the wearer to inspect garments periodically to ensure that all components, including fabric, valves, visors, gloves, zippers, seams, and interfaces are in good working condition, and provide adequate protection for the operation and chemicals to be encountered. Failure to fully inspect garments may result in serious injury or death to the wearer. Never wear garments that have not been fully inspected and pressure tested prior to use. Any garment that does not pass the visual inspection or pressure test should be removed from service immediately.

Kappler warrants for a period of 90 days after the delivery of a Frontline® 500 garment that the garment is free from defects in materials and workmanship when used in accordance with the instructions contained in this care and use manual. Garment should be inspected by the user upon receipt. NO OTHER EXPRESSED OR IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR OF MERCHANTABILITY OR OTHERWISE IS MADE. Purchaser and all garment users shall promptly notify Kappler of any claim, whether based on contract, negligence, strict liability or otherwise.

The sole and exclusive remedy of the purchaser and all end users and the limit of liability of Kappler for any and all losses, injuries or damages shall be the

refund of the purchase price or the replacement or repair of any product found to be defective within 90 days after the product is delivered. In no event shall Kappler be liable for any special, incidental or consequential damages, whether in contract or in tort, arising out of any warranties, representations, instructions, or defects from any cause in connection with the Frontline® 500 series garment, or the sale thereof.

Purchaser and all users are responsible for inspection and proper care of this product as described in this care and use manual and are responsible for all loss or damages from use or handling which results from conditions beyond the control of the manufacturer.

Frontline® 500 is a Kappler registered trademark.

## APPENDIX A - TECHNICAL DATA PACKAGE

### *NFPA 1991 Performance Data*

Available on request from Kappler.

### *Sizing Information*

Sizes available: XS, SM-MD, LG-XL, 2X-3X, & 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: Nylon film liner
- Middle glove: 35mil Butyl
- Outer glove: Nomex®/leather 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 chemical 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 48" long gas tight urethane coated zipper with heavy duty molded nylon teeth. The slider components are stainless steel. The outside of the zipper is protected by a double flap storm system 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**

### ***Garment Material***

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

### ***Garment Material - Visor***

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

### ***Garment Material - Glove***

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

### ***Garment Material - Footwear***

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

### ***Garment Material - 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 MATERIALS**

The exhaust valve type is a Draeger valve. 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.

## **RESPIRATORY EQUIPMENT**

This ensemble was tested with a Scott AV3000 face-piece with SCBA. It may, however, be used with any SCBA certified as compliant with NFPA 1981.

## TESTING DEVICES

Kappler Pressure Test Kit Model AKMOC.

## EXTERNAL GASKET TYPES AND MATERIALS

Flat rubber gasket and plastic ring on exhaust valves.

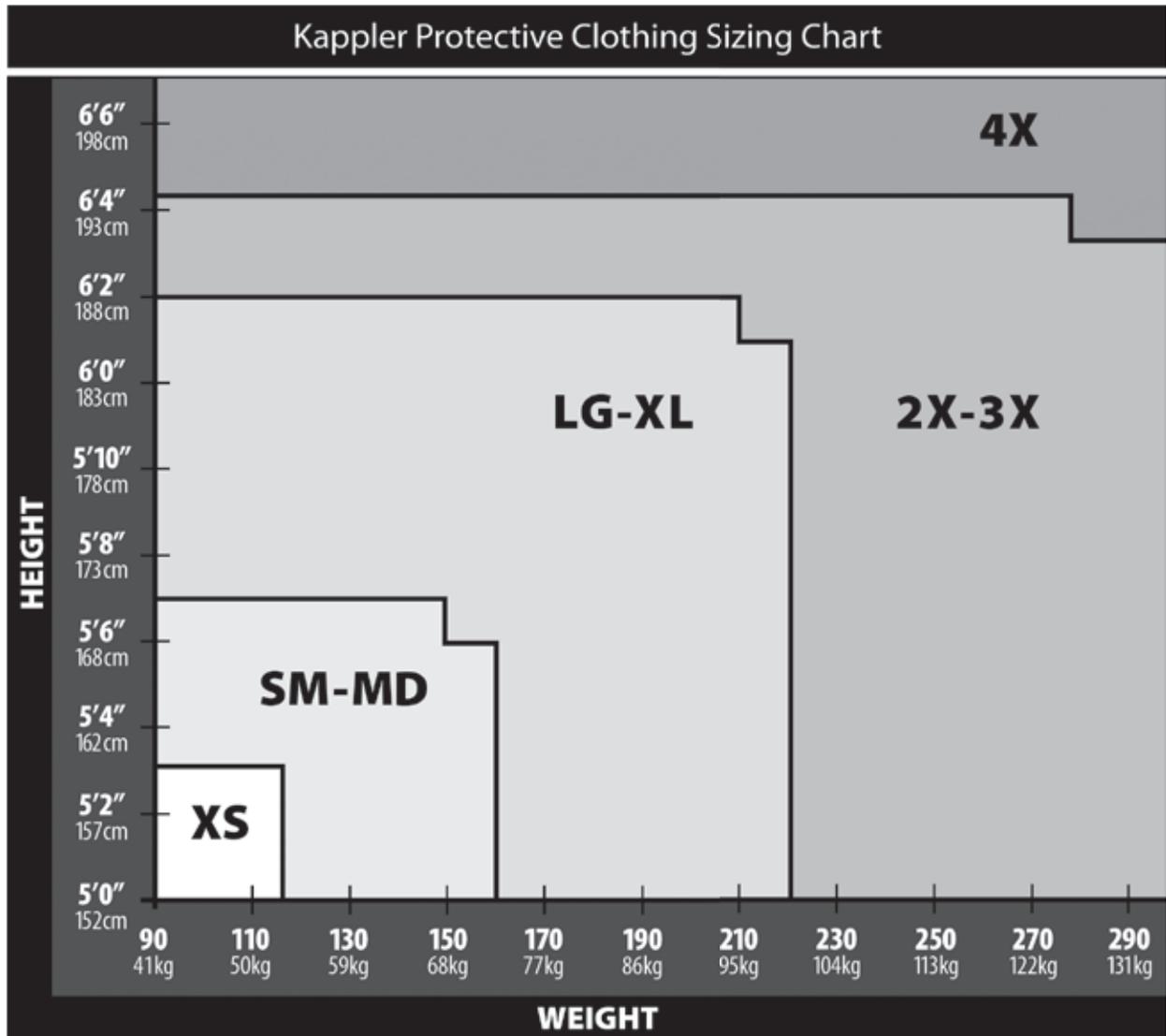
## HEAD PROTECTION ACCOMMODATED WITH THIS SUIT

The Frontline® 500 ensemble will accommodate Type 1 Class G helmets of ANSI Z89.1.

## 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

## APPENDIX B - SIZING CHART



**Please Note:** This chart is based on individuals wearing S.C.B.A., safety helmet and suggested underclothing (see Recommended Undergarments).

