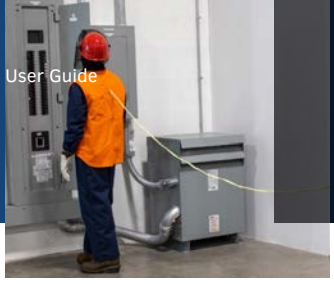
Escape Strap

User Guide & Instructions On Use

OBERON™



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Introduction

The Oberon Escape Strap is a revolutionary electrical safety component designed to enhance workplace safety during energized electrical equipment maintenance.

As an integrated rescue device, it is sewn directly into an arc flash garment or worn as a universal vest, providing workers with a vital lifeline during electric shock or arc flash incidents. This user guide offers valuable information on the proper selection, use, care, and maintenance of the Oberon Escape Strap.

Definition

The Escape Strap is a rescue system made up of a non-conductive Kevlar® rope harness integrated into an arc-rated garment or vest for emergency response after an electrical incident.

It enables non-vertical extraction following an arc flash event or facilitates the contact release of an electric shock victim, ensuring rapid and safe extraction of a worker while minimizing exposure to hazards for the first responder.

Design Specifications

The Escape Strap consists of a continuous length of Kevlar® rope sewn inside an arc-rated garment forming a figure 8 that encircles a worker's shoulders and extends out the back of the garment.

The standard product provides a 20' extension of Kevlar® rope extending from the upper back area and stowable in a provided pocket when not in use.

Coat with Escape Strap - Inside, Back and Side Views

Vest with Escape Strap - Inside and Back Views

Key design features include:

- **Inside:** Continuous loop of Kevlar® rope sewn directly to the inside of the garment to create a shoulder harness designed to be used as a drag rescue device – one single connection point where the rope overlaps and sewn with Nomex® thread.

- **Outside:** 20' length of Kevlar® rope with open end for use as a rescue lanyard and corresponding external pocket sewn directly to the back of the garment as a stowage location for storing the unused cord extension.

Performance

The Escape Strap functions to provide a reliable, non-conductive option for emergency rescue in both electric shock and arc flash scenarios without the need for insulated rescue hook sticks that are difficult to use, often impractical for the application and require regular dielectric retesting.

Advantage: It allows standby workers to position outside the hazard zone, often beyond the arc flash boundary, to pull, direct, drag, and/or lift a person during an emergency.

Replace Rescue (Sheppard) Hook: The Escape Strap is a superior alternative to the traditional rescue hook sticks due to the ease-of-use, flexibility of a body-worn rescue device, and limited maintenance requirements.

10x Safety Factor: The Kevlar® rope has a 10x safety factor for use on workers that weigh up to 350 lbs – total tensile strength rating is 3,500 lbf.

Post Exposure: During arc flash and long duration thermal exposure testing the tensile strength decreased up to 14% to result in >3,000 lbf pull strength post incident exposure.

Testing and Evaluation Protocols

Electric Shock Protection: Even though Kevlar® rope is inherently non-conductive, we continued to test the material for conductivity to evaluate its ability for use in contact release.

- ASTM F1701 Standard Testing for "Unused Rope with Special Electrical Properties."
- Passed Testing up to 100kV "Dry."
- Passed Testing up to 50kV "Wet."

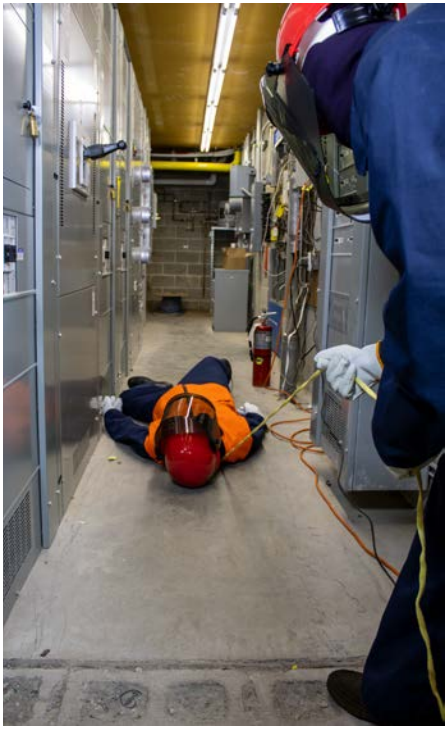
Arc Flash Exposure: Tested in a simulated incident to evaluate the material response and measure tensile strength post exposure to ensure the Escape Strap would be suitable for use following a catastrophic incident.

- ASTM F2621 Standard Testing in a 100 cal/cm^2 exposure.
- The exposed section was cut and sent to an independent lab for evaluation.
- Tensile strength test resulted in an 11% decrease in strength (3,100 lbf).

Long Duration Thermal Exposure: Tested in a simulated long duration thermal exposure to evaluate the product performance if a worker were engulfed in flames for a long duration.

- ASTM F1930 Standard Mannequin Test for an 8-Second Thermal Exposure.

- Only minor charring was observed on the surface of the rope.
- The exposed section was cut and sent to an independent lab.
- Tensile strength test resulted in a 14% decrease in strength (3,007 lbf).



Application

Typical applications include energized electrical work tasks with identified arc flash hazard, electric shock hazard, or long-duration thermal exposures. Use case examples:

Arc Flash Hazard: The Escape Strap allows for emergency response, enabling workers to pull, drag, or lift victims after an arc flash incident. In situations where a worker becomes incapacitated due to an arc flash, the Escape Strap is vital for swift extractions, minimizing exposure to ongoing thermal hazards. Arc flashes can evolve, spreading additional risks, which underscores the importance of quick action. For instance, if a worker is unable to move after an arc flash, the Escape Strap can be used as a rescue device to efficiently drag them to safety, reducing the chance of further injury from thermal exposure.

Shock Hazards: The Escape Strap is essential for the safe contact release of electric shock victims, allowing disconnection without exposing the rescuer to electrical hazards. Qualified Persons exposed to energized electrical conductors or circuit parts may experience an electric shock, reaching the “can’t let go” threshold where they cannot disengage. In such cases, the Escape Strap provides a critical tool; for example, if a Qualified Person is being shocked, the Electrical Safety Watch can use the strap to pull them away from the exposed electrical conductors or circuit parts without risking their own safety, thus effectively breaking the contact and preventing further injury.

Communication: The Escape Strap functions as a tool for Electrical Safety Watch personnel to alert primary workers without entering the hazard zone. In situations requiring teamwork, such as adhering to a two-person rule, the Escape Strap can be employed by a secondary worker to signal the primary worker’s attention. For example, if the secondary worker is positioned safely outside the arc flash boundary, they can use the Escape Strap to lightly tug on the primary worker to alert them, ensuring safety while maintaining effective communication during tasks.

Selection

Depending on the application, Escape Straps can be selected for use as an accessory built into either a primary garment or a universal vest.

The best solution incorporates both options, where all new arc flash PPE is purchased with an Escape Strap, and vests are used to retrofit older equipment or any time a worker may need to be rescued from either an electric shock or arc flash incident.

The two configurations include:

- **Primary Garment Accessory:** Built into an Oberon arc-rated garment, enhancing rescue capabilities. Oberon garments are available with arc rated protection ranging from 8 cal/cm^2 up to 140 cal/cm^2.

- **Universal Vest:** An arc-rated vest that can be worn over other PPE, providing flexibility for retrofitting existing gear. The Escape Strap Vest is constructed using orange 40 cal/cm^2 arc-rated fabric, two front pockets, and an FR high temperature front zipper.

Sizing

Oberon Arc Flash PPE is available in a full range of alpha sizes (Small up to 5XL), vertical heights (Short, Tall, etc.), and custom sizes.

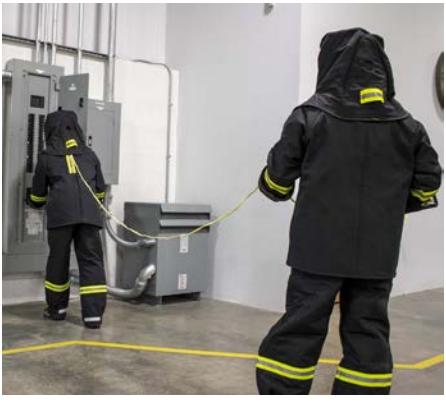
Depending on the Escape Strap configuration, sizing recommendations are as follows:

- **Primary Garment Accessory:** Refer to the **Oberon Sizing Chart** to order Oberon arc-rated garments by alpha size and vertical height depending on the measurements of the worker: body dimensions and height. The integrated Escape Strap does not affect the garment sizing.

- **Universal Vest:** Order the Escape Strap Vests one size larger to fit over primary garments. The Escape Strap vest is available in a full range of sizes.

Use Instructions

As with any rescue device, operating the Oberon Escape Strap requires a second person, known as the Electrical Safety Watch. This individual is responsible for using the Escape Strap for contact release or to pull the primary worker out of harm's way.



Electrical Job Safety Plan: Before beginning any work task, a Qualified Person must complete job safety planning, including documenting both electric shock and arc flash risk assessments.

Risk Assessment: The employer shall identify the requirements for rescue procedures and any special precautions that indicate when two or more workers are necessary to safely complete the energized electrical work task.

Designate at least one person to serve as the Electrical Safety Watch, responsible for operating the Escape Strap and performing rescue operations.

Pre-Use Inspection: Conduct a pre-use inspection to ensure the Escape Strap is in good condition. Visually inspect the rope by running your fingers along its entire length.

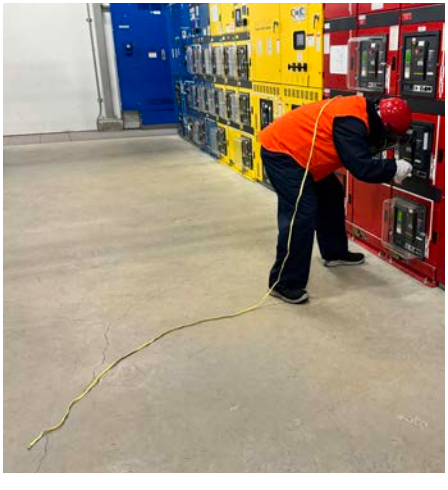
While minor dirt accumulation is acceptable and can occur with normal use, excessive dirt can pose risks. Electrical currents may "track" through dirt, potentially bypassing the protective properties of the Kevlar®

rope. Therefore, do not use the strap if you detect excessive wear, damage, significant discoloration, embedded materials, or noticeable contamination that could compromise safety.

Plan the Rescue Operation:

- Assess the work area to determine the best method for deploying the Escape Strap based on the energized electrical work task at hand.
- Identify a suitable location for the Electrical Safety Watch, ensuring they have a direct line of sight to the primary worker.
- Establish a safe work perimeter using tagged red danger tape and appropriate signage to create a barricade with an egress route for rescue.
- Position the Escape Strap towards the Electrical Safety Watch, who will manage its use in the event of an electrical incident.
- When possible, position the Electrical Safety Watch outside the arc flash boundary or hazard zone.

- **Method A:** Lay the Escape Strap on the floor. This method utilizes the full 20-foot length of rope. The Electrical Safety Watch can monitor the worker while holding the end of the rope or be ready to use it as needed. The Qualified Person manages the potential trip hazard; there will be limited movement while executing the energized electrical work task.



- **Method B:** Pull a section of the Escape Strap out of the stowage pocket to create a 2 - 3 foot loop, leaving the rest of the rope stowed. This makes it easier for the Electrical Safety Watch to grab the rope quickly in an emergency. This method prevents potential complications resulting from laying the full length of the rope on the floor, including tripping hazard and obstruction.

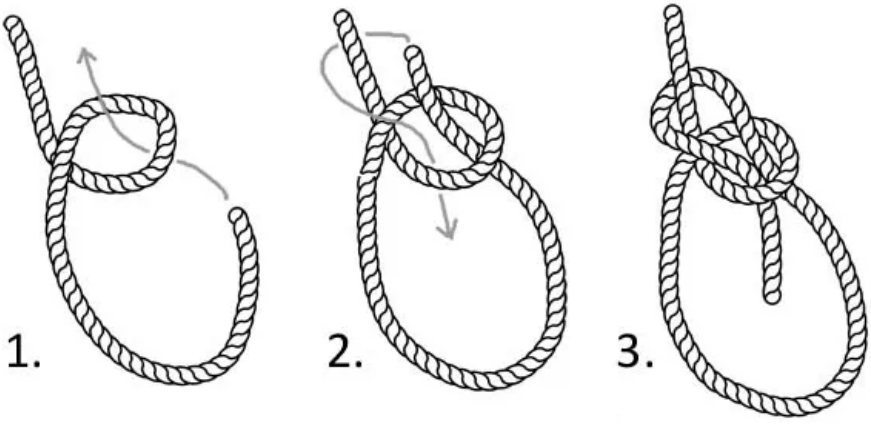
Electrical Safety Watch PPE: If the Electrical Safety Watch needs to enter the arc flash boundary to assist in the rescue (i.e., Method B), they must wear appropriate arc-rated PPE that meets or exceeds the minimum arc rating established in the risk assessment, matching the protection level of the primary worker.

- If crossing the Limited Approach Boundary for shock, the Electrical Safety Watch must be a Qualified Person and wear suitable electric shock protection.
- If remaining outside the arc flash boundary (i.e., Method A), they may not need the same level of protection.

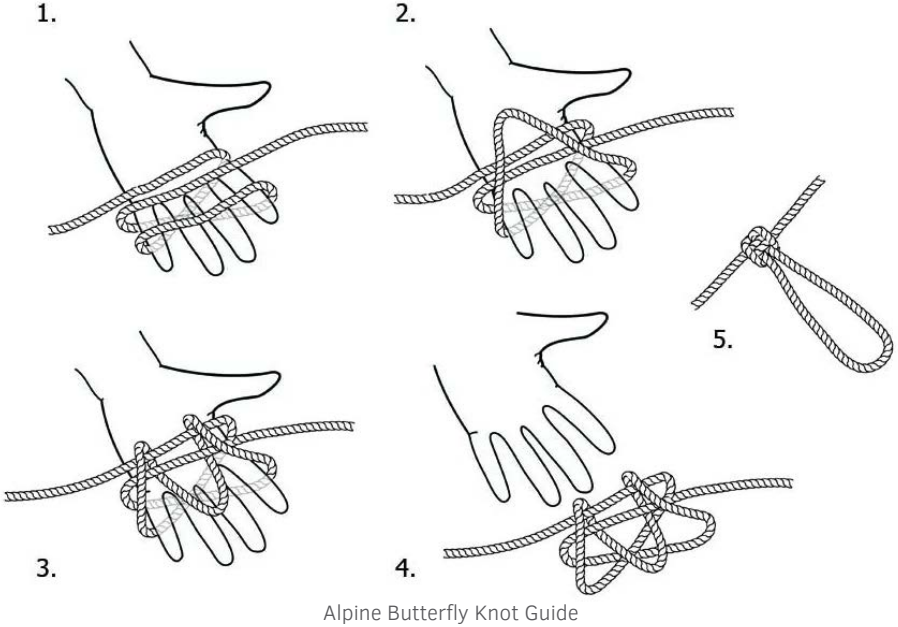
The Electrical Safety Watch should be properly qualified to perform rescue operations and wear appropriate hand protection, including gloves that provide adequate grip, as well as site-specific PPE.

Rope Pulling Techniques:

- Escape Strap has a single-length rope with an open end. Tie an Alpine Butterfly Knot anywhere along the rope to provide an additional grip position as needed.
- Wrap the rope around your waist to enhance leverage, allowing you to use your legs more effectively, especially helpful when managing weight differences.
- A Bowline knot can also be tied around your waist to keep both hands free and improve control during pulling.
- Use these techniques to maximize control, leverage, and safety during rescue efforts.



Bowline Knot Guide



Alpine Butterfly Knot Guide

Gas Extraction Suit with Escape Strap

Communication:
- Maintain clear, continuous communication with the primary worker. The strap can serve as a signaling tool: lightly tug to alert or communicate.

Stowage:
- After completing the energized electrical work task and when the Escape Strap is no longer needed, bundle the rope and stow it in the designated pocket.
- If necessary, an elastic band can be used to keep the rope in a secure, bundled position.

Electrical Safety Watch Responsibilities

The Electrical Safety Watch is a qualified individual, preferably a Qualified Person (QP), designated to oversee safety during electrical work activities.

This role involves operating the Oberon Escape Strap, monitoring energized electrical work tasks, calling the alert if an electrical incident occurs, maintaining a safe work environment, and ensuring the safety of all personnel.

Key responsibilities include:

- **Monitoring Safety:** Observing all activities in the work area to ensure unqualified personnel do not enter restricted zones and confirming that all safety measures are in place.
- **Communication:** Acting as the primary contact for reporting potential hazards, safety concerns, and emergency situations. Calling the alert if an electrical incident occurs (e.g., Call 911) before implementing rescue.

Emergency Preparedness: Being ready to act swiftly in the event of an incident.

Equipment Readiness: Ensuring that necessary safety equipment, such as fire extinguishers and first aid kits, are accessible and functioning.

Documentation: Reporting electrical incidents, near misses or safety concerns promptly to a supervisor.

Training: Completing annual training in Emergency Preparedness & Response, including the use of the Oberon Escape Strap

and other rescue equipment, arc flash rescue protocols, and first aid, CPR and AED training as required.

Rescue Operation Requirements

When performing rescue operations with the Oberon Escape Strap, the following requirements and precautions must be adhered to by the Qualified Person and the Electrical Safety Watch:

Qualified Person Requirements:
- The Qualified Person exposed to electrical hazards requiring rescue must wear the Escape Strap in a correctly fitted garment configuration.

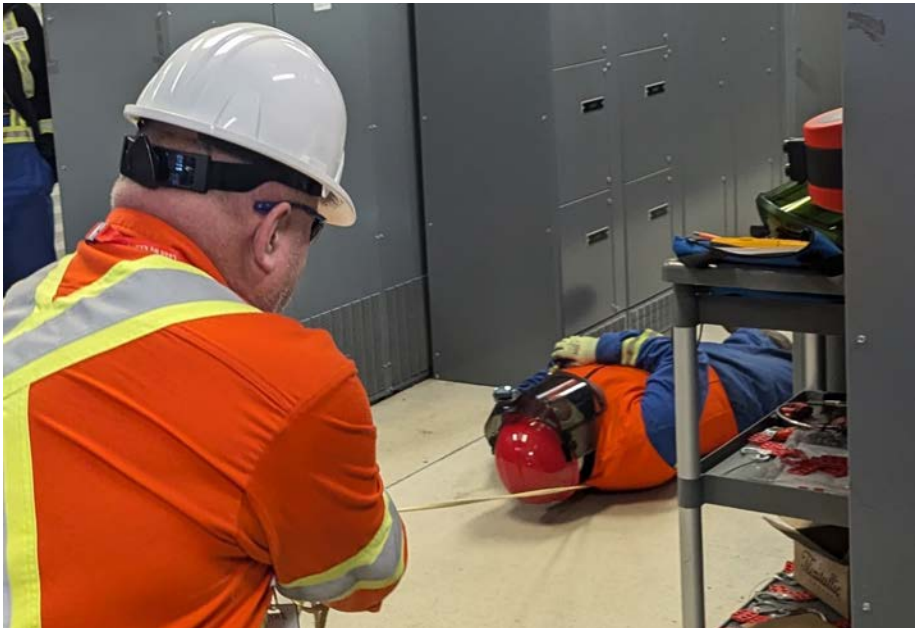
Electrical Safety Watch Responsibilities:
- The designated Electrical Safety Watch must be qualified and competent to perform rescue operations using the Escape Strap.
- The Electrical Safety Watch must remain focused on the primary worker, staying vigilant and prepared to act without distraction.

Safety Precautions During Ongoing Rescue Operations:
- The Electrical Safety Watch shall never wrap the rope around their hands during rescue, as this poses a serious risk of injury.
- Avoid direct contact with an electric shock victim to prevent becoming part of the electrical circuit.
- The Electrical Safety Watch shall not cross the Restricted Approach Boundary for shock.

Personal Protective Equipment (PPE):
- The Electrical Safety Watch must wear PPE appropriate to the findings of the Risk Assessment to ensure optimal safety.

Training and Safety Considerations

Workers exposed to electric shock and arc flash hazards, as well as those responsible for rescuing victims, must receive adequate training in contact release methods and emergency response. On-the-job training, where workers practice rescue procedures in real scenarios, is the most effective approach.



The training program should encompass:

Contact Release Procedures: Techniques for safely releasing an electric shock victim.

Arc Flash Rescue Procedures: Protocols for assisting individuals involved in arc flash incidents.

First Aid/Emergency Response Procedures: Comprehensive training on immediate medical response.

Cardiopulmonary Resuscitation (CPR): Training in CPR techniques.

Automated External Defibrillator (AED) Use: Instruction on AED usage if included in the employer's emergency response plan.

Training frequency must meet the certifying body's standards and varies by jurisdiction:

USA: NFPA 70E requires annual refresher training.

Canada: CSA Z462 mandates retraining every two years.

Additionally, employers must verify employee training status annually and document that all required training has been successfully completed.

Care and Storage

Keep the Escape Strap rope stored properly in its designated pocket, ensuring cleanliness and readiness for deployment.

Store in a dry, cool place away from direct sunlight and corrosive chemicals. Recommend using an Oberon storage bag or suitable locker.

Maintenance and Repair

The Escape Strap shall be maintained through regular pre-use inspections and removed from service when necessary, such as when it shows signs of damage, wear, contamination, or any condition that could compromise its integrity or performance.

The Escape Strap requires no ongoing retesting, reducing maintenance burdens compared to traditional insulated rescue hooks.

Criteria for Removal from Service:

Damage: Frayed or damaged threads.

Excessive Contamination: Minimal dirt is expected and acceptable, but excessive contamination will require removal from service for cleaning and reconditioning. No flammable contamination is acceptable.

Significant Discoloration: Some discoloration is expected as Kevlar® will discolor due to UV exposure – yellow turns brown. If the rope shows significant signs of discoloration, it shall be removed from service.

Garment Fit: Depending on the form factor, i.e., built-in accessory or worn as a universal vest, the garment must be properly sized to fit comfortably. Never wear tight-fitting garments or excessively oversized garments. The garment must not inhibit the ability for the primary worker to perform work safely.

Rescue Use and PPE Disposal

The garment's seams are strong enough for its original purpose. Use of the Escape Strap for rescue, such as dragging, is considered an extraordinary circumstance. The garment is not designed for repeated rescue loads.

After a rescue or incident involving significant force, the PPE should be discarded, as it is considered sacrificial and cannot be relied upon for future safety.

Arc flash PPE is intended for single use when exposed to hazards, including rescue efforts.

Damage Shown After Repeated Rescue Load Testing

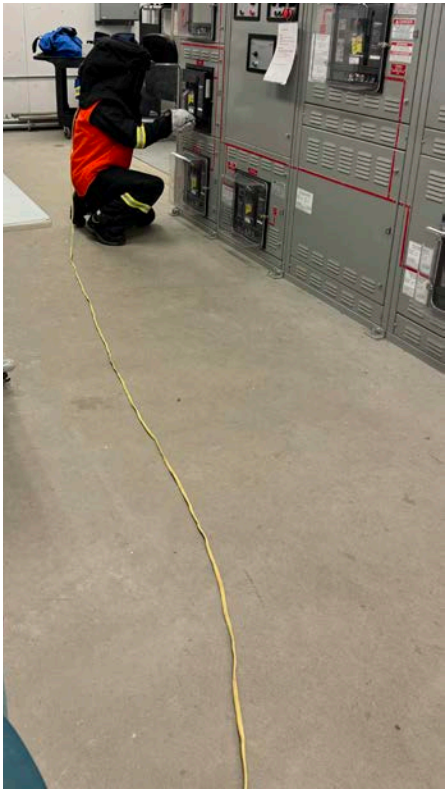
Cleaning Instructions

To clean the Escape Strap, wash the garment with the rope fully deployed inside a mesh laundry bag to prevent tangling. As with any Oberon garment follow the label for cleaning instructions.

For Oberon Arc Flash Suits with integrated Escape Strap, refer to the **Oberon Arc Flash Suit User Guide** for specific instructions on care and use.

General cleaning requirements:

- Wash arc flash PPE regularly.
- Repairs to the garment must be made with the same thread and fabric.
- Close all hook and loop fasteners before laundering to avoid unwanted pilling or clogging the hook portion of the fastener.



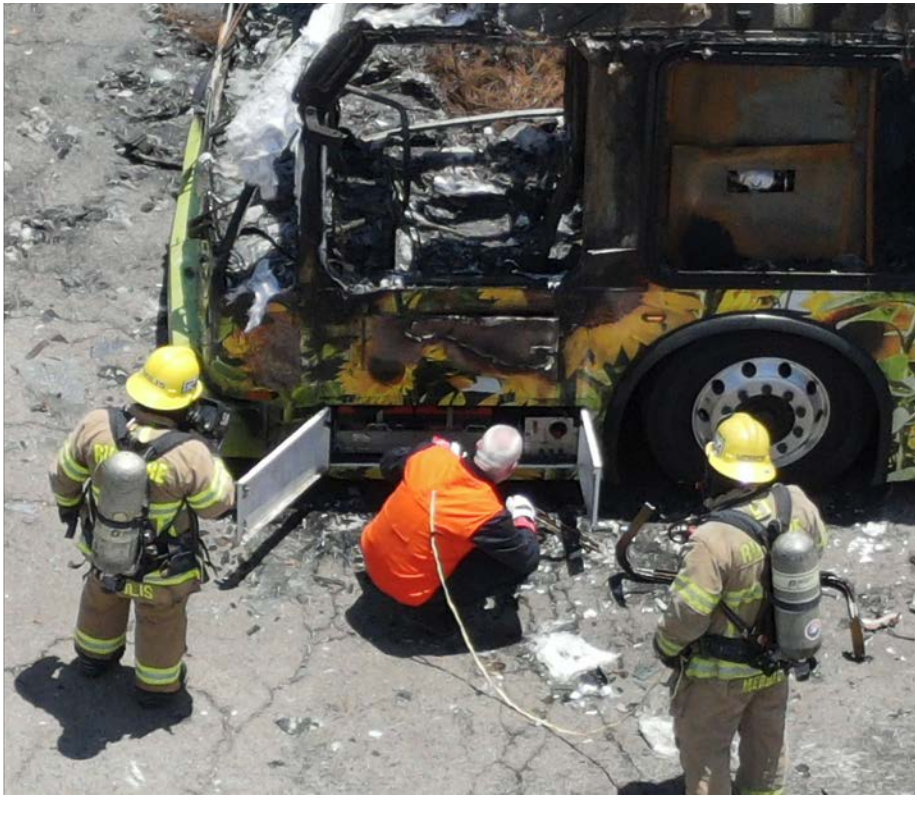
- Suits shall be washed or cleaned separately from any other clothing.
- Load washing machine evenly at 2/3 of volume of the drum.
- Machine wash at temperatures up to 40°C with a water to soap relation of 1:10.
- Wash bath water should have a pH value <10.
- General commercial detergents for colored clothing can be used and proportioned according to the detergent manufacturer's information.
- After washing, PPE shall be rinsed carefully to remove all remains of alkaline and/or possibly flammable residues of the detergent. Up to 2 - 3 rinsing cycles may be necessary.
- Garments may be spin-dried and dried in a cylinder drying machine with low or normal temperatures until a remaining humidity of 10 - 20%.
- Chemical dry cleaning is recommended when arc rated apparel becomes very dirty by e.g., oil or grease.

WARNING:

- Full detergents contain brighteners and are therefore not suitable.
- Do not use bleaching agents or products which contain bleaching agents.
- Do not use fabric softener.
- Do not iron.
- Chemical dry cleaning shall only be executed by experts.
- Before PPE is used again it should be completely free of solvents.

Reference Publications

- **NFPA 70E:** National Fire Protection Association standard for electrical safety in the workplace.
- **CSA Z462:** Canadian National Standard for the workplace electrical safety practices.
- **ASTM F1701:** Standard for testing the electrical properties of ropes.
- **ASTM F2621:** Standard relevant to arc flash and thermal performance testing.
- **NESC:** National Electrical Safety Code guidelines for safe electrical construction and maintenance.
- **CAN/ULC S801:** Canadian National standard for Electric Utilities workplace electrical safety.



How to Perform a Visual Pre-Inspection of an Oberon Arc Flash Suit

Coat, Bib-Overall, Hood, Ventilation System

Suit Pictured: TCG75 Series

Hard Cap: Check shield adapters, ensure no cracks and correctly fitted inside cap side slots. Inspect for cracks, shell expiration date and that the suspension adjusting mechanism works.

Hood: Inspect hood window inside/out and look for excessive scratching, cracks or other damage; replace if necessary. Ensure snaps are securely attached to the fabric and shield. Ensure fabric inside/out does not have rips, tears, or holes. Look for stains or other types of damage from contamination. Look for excessive discoloration or fading of material.

Coat: Ensure fabric inside/out does not have rips, tears, or holes. Look for stains or other types of damage from contamination. Look for excessive discoloration or fading of material. Check zipper and/or hook and loop closure; confirm no visible signs of damage.

Ventilation System: Perform system check by turning fan on. Replace batteries if needed. Check fan connection to coupling, ensure fully engaged into locked position. Fan unit fully secured inside pocket, loop or strap (located at back).

Escape Strap: Inspect for signs of excessive wear or fraying of strap or fabric around strap and confirm no visible signs of damage.

Leg Zippers: Check for any bent, missing, or misaligned teeth and ensure the zipper moves smoothly without catching. Confirm the slider and pull tab are intact and that the zipper fully closes and locks securely.

Bib-Overalls: Ensure fabric inside/out does not have rips, tears, or holes. Look for stains or other types of damage from contamination. Look for excessive discoloration or fading of material. Check suspenders, inspect for signs of excessive wear and confirm no visible signs of damage. Confirm buckles are operable and suspender strap is flat inside of the adjustment mechanism. Inspect cinch strap(s) for hook and loop seal.

Images used in this guide are for illustrative and marketing purposes only. They may not represent actual working conditions, procedures, or compliance with all applicable safety standards. The content contained herein is not intended to serve as safety advice or a substitute for proper training, supervision or risk assessment.

No PPE can guarantee absolute protection. Always follow your organization's electrical safety policies and applicable standards (e.g., NFPA 70E, CSA Z462). Proper hazard analysis, PPE selection and safe work practices remain the responsibility of the employer and worker.

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