

Oberon White Paper

Protective Performance of Arc Flash Suits for Wet Conditions

Electrical workers wearing arc flash suits may be exposed to inclement weather conditions as they perform electrical tasks. Arc flash suits could also become wet due to perspiration from the worker's body accumulating during electrical work. The possibility of working in a wet arc flash suit naturally raises a question on whether the protection level offered by an arc flash suit changes when the suit is wet.

There are two separate situations that need to be considered for the case of a multilayer arc flash suit such as an Oberon ARC25, ARC40, ARC65 or ARC100 garment:

1. Water primarily on the outside or exterior layer of the arc flash garment from sources such as rain, snow or fire suppression systems
2. Water throughout the arc flash garment from a combination of sources such as prolonged exposure to rain or snow combined with prolonged perspiration

Water on the Outside of the Arc Flash Garment:

Heat exposure testing has shown that water on the outside or outer layer of protective clothing tends to slightly improve the protection level. This is because the water on or near the outside surface of an arc flash protective garment will need to be evaporated before the fabric surface can be heated. Evaporating this water essentially uses up some of the heat from the arc flash exposure, and consequently there is less heat remaining to be transmitted through the arc flash suit onto the skin of the wearer. An outer layer of an arc flash garment with 3 grams of water per square yard of fabric would represent a relatively wet outer surface, and this amount of water would require approximately 3 cal/cm^2 to evaporate. Consequently, water on the outside of the garment would slightly increase (by $\sim 3 \text{ cal/cm}^2$) the "effective arc rating" or protection level of the textile material portion of the wet arc flash suit.

Water Throughout the Arc Flash Garment

In this case, the water in and on the arc flash garment is undergoing two competing processes during an arc flash exposure. First, water on the outside of the garment is evaporating which will tend to slightly increase the "effective arc rating" as described above. The second process is heat transfer through the wet layers of the arc flash suit. Since water has only about one eighth the insulative performance of air, the effective arc rating of the arc flash suit will decrease. The loss of insulative performance for a wet garment can readily be observed when a wet pot holder is used to handle hot pots and pans. In the case of the wet arc flash suit, the wet fabrics will still contain some air, but the insulative performance of the wet arc flash garment will decrease. As the water within the arc flash layers is heated, the transfer of heat to the skin increases and scald burns could occur.

Water on a Face Shield or Hood Shield Window

Since essentially no water would adhere to the face shield or shield window, the protection level or arc rating of the shield would not be expected to change.

Conclusions

If the outer surface of an arc flash garment becomes wet due to precipitation, the protection level or “effective arc rating” of the flash suit would not be expected to change significantly.

If the outer surface of the a face shield or shield window becomes wet due to precipitation, the protection level or “effective arc rating” of the face shield or shield window would not be expected to change significantly.

If the an arc flash suit becomes wet throughout all material layers, the protection level or “effective arc rating” of the flash suit would be expected to decrease and the loss of protection could be significant.

Recommended Safety Practices for Electrical Work during Inclement Weather

- When precipitation begins during electrical work, add flame resistant rainwear over the arc flash PPE to avoid getting the arc flash suit wet.
- If flame resistant rainwear is not immediately available, discontinue electrical work before the arc flash suit becomes wet throughout the material layers. Change to dry arc flash PPE before continuing electrical work.