

# PetroWear™ Flash Fire Outerwear

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## Summary of relevant information contained in ASTM F 1930-00 Standard Test Method for Evaluation of Flame Resistant Clothing for Protection against Flash Fire Simulations Using an Instrumented Manikin

**Scope:** This test method covers quantitative measurements and subjective observations that characterize the performance of single layer garments or protective clothing ensembles in a simulated flash fire environment having controlled heat flux, flame distribution, and duration. This test method is extremely complex and requires a high degree of technical expertise in both the test setup and operation.

### Key Definitions:

**Instrumented Manikin:** A model representing an adult-size human and fitted with sensors on the surface for use in testing.

**Burn Injury:** Burn damage that occurs at various levels of depth within human tissue.  
*Discussion*-burn injury in human tissue occurs when the tissue is heated and kept at an elevated temperature for a critical period of time. The amount of burn injury, first, second, or third-degree, depends upon both the level of the elevated temperature and the duration of time.

**Predicted total area of burn injury:** In the flash fire testing of clothing, the sum of areas represented by the sensors that calculate at least a second degree burn injury.

**Second-degree burn injury:** Irreversible burn damage at the epidermis/dermis interface in human tissue.

**Third-degree burn injury:** The irreversible burn damage at the dermis/subcutaneous interface in human tissue.

**Thermal protection:** The property that characterizes the overall performance of a garment or protective clothing ensemble relative to how it prevents the transfer of heat that is sufficient enough to cause burn injury.

## Test Method Description:

The test method evaluates the protective performance of the materials of construction and design of the test specimen, which is either a garment or an ensemble. The test specimen is placed on an adult-size manikin at ambient atmospheric conditions and exposed to a laboratory fuel rich propane flash fire simulation with controlled heat flux, duration, and flame distribution. The test procedure, data acquisition, results calculations, and preparation of the test report are performed with computer hardware and software programs. Heat energy, which is transferred through the test specimen during and after the exposure, is measured by heat energy sensors. The sensor data are used with the specified burn injury model to calculate the predicted second-degree burn injury, predicted third-degree burn injury, and total predicted burn injury areas resulting from the flash fire exposure. Identification of the test specimen, test conditions, comments and remarks about the test purpose, and the response of the test garment specimen to the exposure are recorded and are included as part of the report. The performance of the test specimen is indicated by the calculated burn injury area and the way the specimen responds to the test exposure.

## Significance of Test Results:

This test method can be used to measure and compare the thermal protection provided by different materials, garments, garment designs, clothing ensembles, and systems when exposed on a stationary and upright manikin to a laboratory controlled, fuel rich flash fire using propane as the fuel.

## Application of F1930 Standard Test Method:

This test method is required for the NFPA 2112 *Standard on Flame Resistant Garments Protection of Industrial Personnel Against Flash Fire*. Flame resistant (FR) garment materials must exhibit less than 50% predicted total area burn injury including both second-degree and third-degree burn injury when a specified coverall design made of the test material is positioned on the manikin over specified cotton undergarments (T-shirt and briefs) is exposed to a 3 second flash fire with a controlled heat flux of 2.0 cal/cm<sup>2</sup>second.