

### Before you begin

Review the resources section to familiarize yourself with the National Fire Protection Association (NFPA) standards and their requirements. Have samples of flame-resistant (FR) clothing with legible garment tags for demonstration purposes (if not already being worn by participants). If possible, have one sample of FR clothing that doesn't provide adequate protection to showcase differences during the group activity. Know the total percent of body burn and the percentage of garment shrinkage for the FR clothing.



### Introduction

Oil and gas operations have long required the use of FR clothing. However, not all FR clothing meets the NFPA 2112 criteria. As a result, the clothing can provide different levels of protection from flash fires. As a user of FR clothing, you need to ask additional questions about the garment such as what are the total percent of body burn and the percentage of garment shrinkage, before relying on the garment to provide adequate flash fire protection.

### Definitions

**Hierarchy of controls** – A systematic approach to hazard control ranked from most effective to least effective:

1. Elimination.
2. Substitution.
3. Engineering controls
4. Administrative controls
5. Personal protective equipment.

**Flame resistant** – the property of a material that is inherently resistant to catching fire and does not melt or drip when exposed directly to extreme heat.

**Flame retardant** – a material that has been chemically treated to be slow burning or self-extinguishing when exposed to an open flame.

**Flash fire** – a sudden and rapidly moving, short duration, flame front caused by ignition of flammable substances in the air.

**NFPA** -The National Fire Protection Association is a global, self-funded nonprofit organization, established in 1896. It is devoted to eliminating death, injury, property, and economic loss due to fire, electrical, and related hazards.

## Discussion

You may have heard of NFPA 2112 when purchasing FR clothing or during a previous safety meeting. NFPA 2112 is the Standard on Flame-Resistant Clothing for Protection of Industrial Personnel Against Short-Duration Thermal Exposures from Fire. In short, this standard tells manufacturers what requirements the clothing must meet to be labeled as: “This garment meets the requirements of NFPA 2112.” The standard provides the minimum requirements for the design, construction, evaluation, and certification of flame-resistant garments commonly called FR clothing. It is the responsibility of your employer to determine if this clothing is necessary to protect you from hazards on your job.

FR clothing is used in the oil and gas industry as everyday work clothes. Because of this, it’s important to understand how clothing protects you from flash fire hazards. The NFPA 2112 standard allows the clothing to have a 50% or less total body burn. This means the clothing will not prevent your body from being burned. Rather, it limits the amount of your body that is burned when properly wearing the clothing. It’s important to ask for information from your employer or the manufacturer of the clothing about the percent of the body burned. The specific question you need to ask of the manufacturer is “what percent body burn did the standardized burn injury model provide?” The lower the percentage, the greater the protection provided by the fabric when exposed to a flash fire. All percentages of burn under 50% receive the same label! If you don’t ask this question, then you could be wearing FR clothing that could result in your body being 50% burned! Wouldn’t you rather have a fabric that only allows a 10% or 20% burn?

FR clothing will not prevent all burns. It is designed to prevent the burns from becoming third-degree burns, where the clothing covers the body. Why is that important? A third-degree burn destroys all layers of the skin and the body cannot heal itself. This level of burn requires extensive medical attention, hospital stays, and follow-up care. Your chances of surviving a flash fire depend on the amount of your body covered in burns and the type of burns. First-degree burns, like a sunburn, and second-degree burns, burns with blisters, can take up to days or weeks to heal. The point is, your body can help heal this type of damage. The human body cannot heal third-degree burns.

Another aspect of the NFPA 2112 standard evaluates the percent of fabric shrinkage after exposure to a fire. This is referred to as thermal shrinkage resistance by the fabric manufacturer. To meet NFPA 2112, the fabric cannot shrink more than 10% in any direction. Anything under a 10% shrinkage is a pass for this test and the clothing will be labeled as meeting NFPA 2112. Ask the fabric manufacturer or your employer for the thermal shrinkage percentage. Why is it important to evaluate your clothing using this information? A greater percentage of shrinkage can make it difficult to remove the clothing after a fire, increasing the chances for bodily injury.

You may have purchased or your employer may have provided you with clothing that is marked with a Hazard Rating Category (HRC) or Arc Rating (AR). These ratings may be in addition to the NFPA 2112 rating or the clothing may only have an HRC or AR. These ratings are not related to the flash fire protection. HRC and AR come from a different standard for the protection of workers who are conducting live electrical work or troubleshooting of live circuits. NFPA 70E Standard for Electrical Safety in the Workplace is used to determine the HRC or AR required for

the task. It is not the same as the NFPA 2112 rating requirements. NFPA 70E provides a different level of protection from a different hazard. It is the responsibility of your employer to determine the clothing necessary to protect you from hazards on your job.

## Conclusion

When asked to wear FR clothing or purchase FR clothing for the protection of a flash fire on an oil and gas site, it pays to ask questions. Not all NFPA 2112 compliant fabrics provide the same level of protection. Important characteristics of the fabric to consider are percent of total body burn and percent of thermal shrinkage. Remember, the lower these two percentages are, the greater protection provided by the garment.

## Group activity

### Ask the group:

- To find the tag on their FR shirt. Have them look for the NFPA 2112 marking or Arc Rated marking. It may also include a hazard rating category marking of HRC 1, 2, or 3.
- (If you obtain FR clothing from a clothing provider and all employees have the same brand of FR, you can ask the employees) what is the total percent of body burn and the percentage of garment shrinkage of their FR clothing.
  - o To answer this question, you will need this information from the product manufacturer before you start the safety talk. Have the employees guess the percentages and tell them the correct answer.
- What does NFPA 2112 mean to you?  
Possible answers from the group may include:
  - o Required/mandated gear.
  - o Provides protection if incident occurs.
  - o Provides a degree of protection and reduces the severity of burn injuries.
- What hazards on the job does the flame resistant (FR) clothing protect you from?  
Possible answers from the group may include:
  - o Flash fire from flammable vapors coming in contact with an ignition source.
  - o Mechanical failures.
  - o Lines breaking.

### Resources

NFPA 2112: Standard on Flame-Resistant Clothing for Protection of Industrial Personnel Against Short-Duration Thermal Exposures from Fire

<https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=2112>

NFPA 2113: Standard on Selection, Care, Use, and Maintenance of Flame-Resistant Garments for Protection of Industrial Personnel Against Short-Duration Thermal Exposures from Fire

<https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=2113>

NFPA 70E: Standard for Electrical Safety in the Workplace

<https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70E>

OSHA: Safety and Health Topics – Personal Protective Equipment

<https://www.osha.gov/SLTC/personalprotectiveequipment/index.html>