

## **Flame Resistant Clothing (FRC)**

### **Purpose/Scope**

The objective of this program is to provide an added degree of protection to Personnel working in the Gulf of Mexico (GoM) upstream sector where an assessment of the hazard indicates a need due to potential flash burn injuries.

### **General Requirements**

Flame resistant clothing will be required for all BP employees and contractors when performing any Of the tasks listed in this section.

### **Key Responsibilities**

The Person in charge is responsible for implementing the program requirements.

### **Other Garment Materials**

When other garments are worn in conjunction with FRC, the FRC must be worn as the outermost

Layer of clothing. Garments worn underneath FRC should be made of material that does not melt when exposed to heat from fire.

The following is a list of known acceptable and unacceptable fabrics to be worn underneath

FRC clothing:

- Acceptable Fabrics: Cotton
  - Unacceptable Fabrics: 100% Nylon, 100% Polyester, 100% Acrylic
- Note: Outer work cloths made of 100% polyester, rayon or nylon acrylic are prohibited.**

### **Task Requiring FRC**

The following tasks require the FRC to be worn fully zipped or buttoned up with sleeves rolled down.

- Process equipment repairs involving hydrocarbon atmosphere where hot work is being conducted. (Initial absence of hydrocarbon does not ensure that conditions will remain safe  
For the duration of the job.)
- Collecting hydrocarbon samples.
- Drill stem testing.

- Lighting gas fired vessels.
- Situations where an employee and supervisor identify a site-specific job and/or area  
Exposure to flash burn injuries.

## **Scope/Field of application**

### Scope

This procedure provides the criteria for implementation of a Flame Resistant Clothing program to assure that employees are adequately protected while working in areas where flash fire or electrical arc hazards exists. These criteria shall be incorporated into the specific Flame/Arc protection program(s) developed by the facility.

### Field of Application

This procedure applies to all facilities owned and/or operated by Citgo Petroleum Corporation its affiliates, and subsidiaries. Contractors are responsible for developing and implementing their own procedures to protect against flash fire and electrical arc hazards.  
Such procedures shall be at least as protective as this best practice.

## **References**

### Laws and Regulations

OSHA Personal Protective Equipment – 29 CFR 1910.132

OSHA Electrical – 29 CFR 1010 Subpart S

OSHA Electrical – 29 CFR 1926 Subpart I

### Technical References

NFPA 1975 – “Station/Work Uniforms for Fire Fighters”

NFPA 701 – “Flame-Resistant Textiles and Films”

Method 5903 – “Flame Resistance of Cloth; Vertical” of Federal Test Method Standard 191A.

NFPA 70E – “Standard for Electrical Safety in the Workplace”

ASTM F1959 – “Standard Test Method for Determining the Arc Rating of Materials for Clothing”.

NFPA 30 – “Flammable and Combustible Liquids Code.”

NFPA 70 – “National Electric Code”.

API RP 500 – “Recommended Practice for Classification of Locations For Electrical Installations at Petroleum Facilities”.

ASTM F1449 – “Standard Guide for Care and Maintenance of Flame, Thermally and Arc Resistant Clothing”.

NFPA 2113 - :Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire”.

NFPA 1971 - :Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting”.

NFPA 1972 – “Standard on Helmets for Structural Fire Fighting”.

NFPA 1973 – “Standard on Gloves for Structural Fire Fighting”.

NFPA 1974 – “Standard on Protective Footwear for Structural Fire Fighting”.

## **Definitions**

### Flame-Resistant Clothing (FRC)

Clothing intended to provide protection to the wearer from the hazards posed by flash fire

Or electrical arc. FRC may be considered acceptable if it meets the requirements of NFPA

1975 or ASTM F1959 for electrical arc protection. Manufactures of FRC not tested to

NFPA 1975 specifications must be able to provide documentation that the garment fabric

exhibits a maximum 2.0 seconds after-flame and a maximum 6.0 inch char length when

tested in accordance with Method 5903 of Federal Test Methods Standard 191A.

In

addition, it must remain intact (not subject to dripping, melting, separation, of ignition)

when tested for heat resistance as specified in NFPA 1975 or the equivalent. For electrical

arc protection, manufacturers of FRC not tested to ASTM F1959 must be able to provide

documentation that the garment fabric exhibits characteristics suitable to meet the

requirements for the level of protection required by NFPA 70E. These desirable properties

must be retained after successive launderings, for the useful life of a garment.

## Self-Extinguishing

Those materials that pass either the “small” or “large” scale test when tested in Accordance with NFPA 701, Method 5903 of Federal Test Method 191A, or the Equivalent. Self-Extinguishing materials are not intended to provide thermal or electrical Protection.

## Inherently Flame-Resistant

Those fabrics which are naturally flame-resistant as opposed to fabrics which are Chemically treated to become flame-resistant.

## Treated Fabric

Fabric which is not naturally flame-resistant but which has been chemically treated, giving It flame-resistant properties.

## FRC Areas

Those “mandatory” Citgo operating areas that have been determined to have a potential For flash fire. These may include areas inside operating unit battery limits, laboratory Analytical areas, shops, tank farm areas, and marine docks as determined by local Management. In addition, electrical arc flash protective clothing will be required in any area or for any task where the potential for arc flash burns exist when evaluated using the criteria established in NFPA 70E.

## Temporary FRC Areas

Those areas that would not normally have a high potential for flash fire or electrical arc Burn requiring FRC, but which could during certain jobs or operations.

## Visitors To FRC Areas

Persons visiting (but not working) an FRC Area or a Temporary FRC Area. Visitors

May or may not be Citgo employees. Visitors are not allowed inside the Limited

Approach Boundary for electrical arc flash as established by the criteria of NFPA 70E

Without the required level of arc protective clothing.

## **Requirements**

### Commitment

Citgo management has committed to ensure that those who work in or visit Citgo's FRC Areas or Temporary FRC Areas are provided a degree of protection by wearing FRC.

### Establishment of FRC Areas

#### Permanent (Mandatory) FRC Areas

Citgo Management determines whether or not FRC Areas exist, and if so, establishes definite boundaries. Such decisions are based on sound engineering principles and management judgment taking into account information provided in NFPA 30, NFPA 70, NFPA 70E, and API RP 500. In addition, arc protective clothing may be required for work in or near load centers, sub stations, switch gear, etc. Permanent FRC boundaries are either physically identified or communicated to all affected employees.

#### Temporary FRC Areas

The type and potential amount of flammable gas or vapor, ventilation, wind direction, the type of work to be performed, and other factors are taken into consideration to aid in establishing boundaries. For such operations, boundaries are set up in advance of the job or operation and are either physically identified or communicated to all affected employees.

#### Arc Flash Hazard Analysis

A flash hazard analysis shall be completed to determine the flash protection Boundary, the incident energy, and the personal protective equipment that shall be Used with the flash protection boundary. The flash protection boundary (FPB) can

be calculated using the equations given in 70E. This boundary may also be calculated using one of many computer models commercially available.

Based on information provided in NFPA 70 E, Appendix D, where the incident energy

is determined to be greater than 40 cal/cm<sup>2</sup> a greater emphasis will be placed on deenergizing equipment prior to performing work when practical. Tasks such as “racking out” of energized high voltage breakers should utilize remote devices if practical. Tasks such as trouble shooting may not be practical without the equipment being energized. Sites shall have in place a process for reviewing and documenting that deenergizing high voltage equipment is not practical and that appropriate PPE is available and utilized.

In the event that deenergizing high voltage equipment is not practical, prudent practices shall be utilized to minimize the risk of arc flash. One example of a measure which can be taken is to have a switch on the protective relays. This switch, when it is in Arc Flash Protection Mode, bypasses the normal setting of the relay and enables the instantaneous trip of the nearest upstream breaker or breakers. In case of an arc flash fault, the breaker/breakers will trip more quickly resulting in a reduced arc flash energy level. After completion of the work the switch be returned to normal operation. Older equipment may not currently have this type of control in place but new equipment installed should have this type of modification if feasible.

## Enforcement

Citgo management at each facility is responsible for enforcing the requirements as established by this Standard.

## Citgo Employees

Every Citgo Employee (including summer/temporary and part-time employees) working or visiting within an FRC Area wears the required FRC at all times within the area. FRC is also worn while within a Temporary FRC Area during those times that the area is designated as such.

Every Citgo employee required to work within an FRC Area is provided with FRC clothing.

For those locations that issue FRC for individualized use, Citgo provides an adequate number of sets of clothing to allow employees to report for work in relatively clean clothing without requiring an unreasonable frequency of laundering. Issuance of additional sets of clothing to those more frequently required to wear FRC is taken into consideration.

For those locations that provide FRC for temporary or shared use, Citgo management is responsible to ensure that there is an adequate supply in a variety of sizes to accommodate most situations, and that the clothing will be maintained in a clean and serviceable manner.

### Contract Employees

It is the responsibility of the Contractor to ensure that their employees are properly outfitted in FRC and/or arc protective clothing prior to allowing them to report to a Citgo FRC Area or Temporary FRC Area.

### Visitors

Visitors to FRC Areas are provided with FRC, if they do not provide their own. Long sleeved, Flame-resistant smocks or lab coats extending at least to the knee, are considered acceptable for limited use by Visitors only (Visitors includes Citgo office employees visiting FRC Areas.) Care should be taken to ensure that smocks are not worn in areas where entanglement could become a hazard. Clothing worn under the smocks must include long pants which completely cover the legs and appropriate closed toed footwear. The wearing Of shorts, skirts, sandals, etc. Shall not be permitted.

### Manner Worn

All FRC must be worn so as to provide the maximum protection for which it was designed.

Shirts/coveralls/smocks are fastened up to the bottom of the neck (only top button unbuttoned).

Sleeves remain extended to cover the wrists. However, if approved by local management, cuffs may be rolled back while in Non-FRC Areas or where extended sleeves could create a

More immediate hazard (working with certain rotating equipment).

Legs are covered the full length.

The looser fitting the FRC, the more thermal protection the clothing system will provide. Air is a very effective insulator; therefore, maintaining an air gap between the clothing and skin will improve thermal protection. However, a loose fit must be balanced against the hazard of clothing being caught in moving equipment. Most FRC products will shrink either the same or less than standard work clothing, and should be sized accordingly.

FRC should be worn over non-melting fabrics or other flame resistant materials. For example, one recommended combination is wearing a Nomex IIIA coverall Over a 100% cotton tee shirt and underwear. Layering garments in this manner dramatically increases the thermal protection of the clothing system by adding “air gaps” that provide excellent thermal insulation.

FRC, where required, must be the outermost garment worn. Non-Flame Resistant Clothing is not allowed to be worn over FRC while in an FRC Area.

FRC Maintenance

Damaged FRC

FRC is replaced if it has been torn or otherwise damaged, or has become worn to the point that its fire resistance is questionable. If the damage is repairable, then repairs are made only by authorized individuals in a manner and with materials that will provide protection equivalent to the FRC when new.

Patches/Embroidery

Only patches or embroidery provided or authorized by Citgo are allowed on FRC worn by Citgo employees. Care must be taken to not add potential fuel sources to the FRC which will compromise the ability of the FRC to provide the intended protection. For example, embroidery work and patches might or might not be produced from flame retardant materials.

Laundering

Employees laundering their own FRC are responsible to ensure that the manufacture's

Recommendations are being followed. Care must be taken to assure that detergents or additives such as fabric softeners will not compromise the flame retardant properties of the FRC. FRC garment care and laundering requirements are specified by ASTM 1449 (2001 Edition): Standard Guide for Care and Maintenance of Flame, Thermally and ARC Resistant Clothing. In addition, inspection requirements for FRC garments are outlined in NFPA 2113 (2001 Edition): Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire.

Should local Citgo management choose to provide laundering service for FRC, assurance will be made that the FRC will be laundered according to the manufacturer's recommendations.

Evidence of laundering in such a manner as to make the flame resistance of the garment questionable, is considered justification for replacement of the FRC and a reassessment of the laundering technique(s). Replacement will be according to local policy.

Consideration should be given to the fact that FRC made from Treaded Fabric needs to be replaced at laundering intervals as recommended by the manufacturer.

## Training

All Citgo employees provided with FRC shall receive the following information:

- The limitations of the FRC provided.
- Manufacturers recommended Care and Use instructions (include laundering).
- The effects of various types of fabric worn under FRC in the event of a flash fire.
- The potential effects of wearing non-flame Resistant Clothing over FRC.
- Electricians shall be trained on the rating of their FRC and effects of arc flash.

## Special Jobs / Circumstances

### Jobs Requiring Disposable Coveralls

For tasks likely to ruin FRC (e.g. spray-painting) or for tasks requiring disposable coveralls (e.g. asbestos removal) in an FRC Area, disposable coveralls may be worn over, or in lieu of FRC if approved by the site safety department . This is provided that they are worn only during that task, with the total time worn minimized to the extent possible. Disposable or limited-use coveralls made from Self-Extinguishing materials shall be considered for use where feasible.

#### Jobs Requiring Acid or Rain Suits

Employees working in FRC Areas requiring protective clothing for potential acid exposure may wear appropriate chemical protective clothing instead of, or over FRC if approved by the site safety department. Rain gear may be worn over FRC. Rain gear and/or acid protective clothing made from Self-Extinguishing materials shall be considered for use where feasible.

#### Marine Dock Locations

Employees working in FRC Areas requiring the wearing of life preservers may wear life preservers over FRC. Life preservers that have an outside layer certified by the manufacturer to be Self-Extinguishing shall be considered for use where feasible.

#### Welders

Welders (and others subject to contact with molten metal) requiring FRC, may be provided FRC garments made from fabric not easily damaged by hot slag (e.g. flame-retardant cotton clothing) in lieu of types of FRC which can be easily ruined by contact with hot slag (e.g. lighter-weight Nomex III). Welder's vest and sleeves may be worn over FRC.

#### Electricians

Flame retardant clothing may not be sufficient for protection from electrical arc hazards.

Electricians (and others subject to exposure to electrical arc) requiring electrical arc protective clothing may be provided with garments which are rated for arc protection and may be worn over or in lieu of types of FRC which may not provide sufficient protection from electrical arc hazards.

## Laboratory Areas

Citgo employees assigned to work within laboratory analytical areas that are designated as FRC Areas must wear appropriate FRC smocks, coveralls or equivalent, e.g. pants and long sleeved shirts as designated by local management.

## Bunker Gear

Member of fire brigades or other groups acting as fire brigades may wear approved bunker gear over FRC. Firefighter's protective clothing includes gloves, helmet, bunker coat, bunker pants (NFPA No. 1971, 1972, 1973, and boots (1974).

## Vehicles within FRC Areas

Persons within a vehicle passenger compartment passing through FRC Areas are except

From wearing FRC as long as they remain within the vehicle, provided such practice is approved by local management.

## Flammable Gas and Vapor free FRC Areas

The requirement to wear FRC may be temporarily suspended by local Citgo management in FRC Areas that have had the hazard of flash fire eliminated. This situation will occur most often during turnarounds when entire units have been shut down and cleared of flammable liquids, vapors, and/or gases. Notifications as to exactly when the requirement to wear FRC is lifted and/or reinstated will be very clearly communicated.

## Allergic Reaction

Employees providing medical evidence from a physician supporting a claim of allergic reaction to the selected type of flame resistant fabric are given the option of receiving FRC made from an alternate type of fabric.

DEET, the active ingredient in most insect repellents, is a flammable product (as are the propellants used in the sprays) and may decrease the effectiveness of fire retardant clothing when the clothing is saturated with the product. DEET must not be sprayed directly on clothing and should only be applied to the skin.

## **Reports and Recordkeeping**

Any unauthorized exception of this standard meeting the reporting requirements of CIMS-101, Incident Investigation Standard shall be recorded and entered into IMPACT Enterprise database as a first report of an incident.

The initial incident report shall identify the potentially-exposed employees by job title only.

The initial incident report shall provide sufficient information to contact a responsible part for follow-up information.

Copies of arc flash reviews will be maintained per the Citgo Records Management Procedure 20-12 latest revision.