

Is Your OSHA Inspector Looking for NFPA 2112 Compliance?

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NFPA 2112, *Standard on Flame Resistant Garments for Protection of Industrial Personnel against Flash Fire*, has become recognized as the foremost performance standard for flame resistant clothing meant to protect workers from a flash fire hazard. The document details the minimum performance requirements for the thermal protective qualities of flame resistant fabrics and the garments. Since its original issue in 2001, NFPA 2112 has provided authoritative guidelines for manufacturers of flame resistant fabrics and garments.

Interest in compliance with NFPA 2112 increased significantly since the publication of a memo by OSHA in the spring of 2010. Much discussion has gone into the interpretation of the memo and its effect on end users in the oil and gas industry. While OSHA does not mandate compliance with any standards, nationally recognized consensus standards, such as NFPA 2112, are used as evidence of best practices being followed in considering General Duty Clause citations. The mere mention of the NFPA 2112 standard in the memo sparked an immediate response from organizations with employees at risk for exposure to flash fire.

OSHA's general industry standard for personal protective equipment (PPE), 29 CFR 1910.132(a), clearly states that PPE, including protective clothing, shall be provided and used if workplace hazards are identified as part of the required risk assessment. Despite the existence of OSHA regulation on PPE in the workplace, accidents continue to occur in facilities where flash fire is a hazard. Death and injury have been the result in workplace incidents involving explosions, the most notable among these being the Texas City, Anacortes, and Deepwater Horizon accidents.

In March 2010, OSHA released an internal memo to their regional administrators to *clarify OSHA's policy for citing the general industry standard for PPE* for the failure to provide flame resistant clothing in workplaces where a flash fire hazard exists. The memo acknowledges that the use of flame resistant clothing by workers in the oil and gas industries reduces the severity of burn injury and thereby increases the chances of surviving a catastrophic thermal exposure.

The March communication recognizes that NFPA 2112 and its companion standard, NFPA 2113 (*Standard on Selection, Care, Use, and Maintenance of Flame Resistant Garments for Protection of Industrial Personnel against Flash Fire*) apply to general industry workplaces but does not mandate compliance with either of these NFPA standards.

The impact on the marketplace has been a renewed interest in the standard and questions about compliance to it. As such, many in the FR clothing supply chain report an upswing in inquiries about NFPA 2112 and the products that are compliant with it.

During this presentation we will review:

- The performance requirements of NFPA 2112
- How fabrics & garments become compliant with NFPA 2112
- The significance and benefits of complying with NFPA 2112
- Evidence that market demand for NFPA 2112-compliant garments has increased since the issuance of the OSHA memo

NFPA 2112 was originally issued in July, 2001. It was developed by a Technical Committee appointed by the NFPA Standards Council for the purpose of specifying design, performance certification requirements, and test methods for flame resistant garments for use in areas at risk from flash fires. The standard received little notice when it was first issued. Another NFPA standard, 70E for protection of workers at risk from electric arcs, commanded most of the attention from OSHA and the end user public.

Protection from flash fire was not seen as an area of emphasis. Instead of an enforcement system of inspections and citations for violations, OSHA placed increased dependence on Voluntary Protection Programs (VPP). With an OSHA VPP Star designation, a worksite is not subject to routine OSHA inspections or special emphasis enforcement programs, but undergoes an OSHA review every 3-5 years.

Reported accidents and injuries in the oil and gas drilling, servicing and production operations continued. On March 23, 2005, a fire and explosion occurred at BP's Texas City Refinery in Texas City, Texas, killing 15 workers and injuring more than 170 others. BP was charged with criminal violations of federal environmental laws, and was subject to lawsuits from the victim's families. The Occupational Safety and Health Administration imposed a then-record fine for hundreds of safety violations, and subsequently imposed an even larger fine after claiming that BP had failed to implement safety improvements following the disaster. OSHA ultimately found over 700 safety violations and on October 30, 2009 fined BP \$87 million--the largest fine in OSHA history at that time. On August 12, 2010, BP announced that it had agreed to pay \$50.6 million of the fine while continuing to contest the remaining \$30.7 million; the fine had been reduced by \$6.1 million between when it was levied and when BP paid the first part.

Four workers were killed and four were hospitalized for burns in an April, 2010, explosion and fire in a naphtha hydrotreater unit at the Tesoro refinery in Anacortes, Washington. A four-member investigative team from the U.S. Chemical Safety Board (CSB) was deployed to the scene. The CSB is an independent federal agency charged with investigating serious chemical accidents.

CSB Chairman and CEO John Bresland said, "The CSB has eighteen ongoing investigations. Of those, seven of these accidents occurred at refineries across the country. This is a significant and disturbing trend that the refining industry needs to address immediately."

Among the incidents under investigation at that time were the Caribbean Petroleum fuel terminal fire near San Juan, Puerto Rico; the CITGO refinery hydrogen fluoride release and fire in Corpus Christi, Texas; the Goodyear heat exchanger rupture and ammonia release in Houston, Texas; and the Exxon Mobil refinery hydrogen fluoride release in Joliet, Illinois.

OSHA had had enough. On March 18, 2010 the Director of Enforcement Programs issued a memo to OSHA regional Administrators and State Plan Designees entitled *Enforcement Policy for Flame-Resistant Clothing in Oil and Gas Drilling, Well Servicing and Production-Related Operations*. The memo stated that where FRC (flame-resistant clothing) is not being used by workers in these operations, a citation under 29 CFR 1910.132(a) shall be issued when there is a potential for flash fire hazards. More specifically, in the sample language provided for guidance in issuing citations, OSHA stated that employers would be cited for failure to provide FRC that is of safe design and construction for the work being performed and that *employers may consult consensus standards such as NFPA 2112 and 2113 to comply*.

What are the performance requirements of NFPA 2112?

NFPA 2112 and its companion standard, NFPA 2113 on care, use and maintenance of garments for protection from flash fire, specifies design, performance, certification requirements, and test methods for flame-resistant garments for use in areas at risk from flash fires. A flash fire is defined as an unexpected, sudden intense fire caused by ignition of flammable solids (including dust), liquids, or gases. It is characterized by high-temperature, short-duration, considerable shock waves, and a rapidly moving flame front.

Compliance with NFPA 2112 requires that garments be certified by a third party certification organization. In addition to fabric performance requirements for flame resistance and thermal shrinkage, this standard also requires FR durability to laundering and/or dry cleaning, thermal protection and protection from a simulated flash fire.

1. Flame resistance of each fabric layer is required to be tested as received and after 100 cycles of washing and drying and/or dry cleaning. An industrial laundry procedure is prescribed for testing durability of the flame resistance. Specimens may not have more than 2.0 seconds Afterflame or 4.0 inches Char Length.
2. Labels must be legible following 100 launderings and/or dry cleanings.
3. All thread used must be made of inherently flame-resistant fiber.
4. Fabric, trim and findings used in the construction of certified garments are exposed in a forced air oven at 500° F for 5 minutes and may not ignite, melt, drip, separate or shrink more than 10%. Closures such as zippers must remain operable after this exposure. Labels and emblems are not required to be tested for heat resistance because they are not considered hazardous to the wearer in case of a thermal exposure.
5. Thermal Protective Performance (TPP) is tested both with the fabric specimen in contact with the sensor and separated from the sensor by a ¼ inch spacer. A minimum TPP rating of 6.0 is required for “spaced” and 3.0 for “contact”.
6. Coveralls made from a standard pattern from candidate fabrics are tested for overall flash fire exposure on an instrumented mannequin in accordance with ASTM Test Method F 1930. The exposure heat flux is 84 kW/m² (2.02 cal/cm²/sec) with an exposure time of 3.0 seconds. The average predicted body burn may not exceed 50%.

How do fabrics and garments achieve certification to NFPA 2112?

All FR garments labeled as being compliant with NFPA 2112 must meet all applicable requirements of the standard. The test data used to determine compliance must be provided by an accredited test lab and all compliant garments must be labeled and listed with the third party certification organization’s mark.

Suppliers of fabric trim and findings used in construction of certified garments submit their products to a third party certification organization such as Underwriters Laboratories (UL).

UL tests the products and provides Component Recognition certification identifying these items as acceptable for use in constructing certified garments.

Garment manufacturers also apply to a third party certification organization for certification. The style to be certified is completely identified including style number and finished garment construction details, the manufacturing location and all fabrics, thread, hardware and findings used to assemble the garment.

If an item used in garment construction is not Component Recognized, the third party certification organization conducts testing to ensure that it meets all of the requirements of the standard. If any certified garments are produced by a subcontractor, this manufacturing location is also required to be certified. Manufacturers are not allowed to claim compliance with a portion or segment of the requirements of NFPA 2112 or even use the name of the standard in any statement about their product unless the product is certified.

Once a garment is certified, it must be labeled as compliant. This label must contain the certification organizations label, symbol or mark, the product name, number or design, the manufacturer's name and address, lot identification information to allow traceability of the material back to the source, garment size, and fiber content. Together with a warning that the label is not to be removed, it must also contain the following statement:

THIS FLAME-RESISTANT GARMENT MEETS
THE REQUIREMENTS OF NFPA 2112,
STANDARD ON FLAME-RESISTANT GARMENTS
FOR PROTECTION OF INDUSTRIAL PERSONNEL
AGAINST FLASH FIRE, 2007 EDITION

The manufacturer is not allowed to ship certified garments until the manufacturing location is visited by an auditor representing the third-party certification organization to ensure that all required components are in place and that appropriate quality systems and controls exist within the facility. Once production is underway quarterly audit inspections are conducted. If any variations are noted during these inspections they are brought to the attention of the manufacturer for correction. Depending on the severity of the variation, it may result in a fine, or in extreme cases the third party organization will withdraw its approval and not allow garments to be shipped bearing its mark.

The significance and benefits of complying with NFPA 2112

Certification to NFPA 2112 provides the specified end user with assurance that the garments being purchased have been tested and certified by a recognized third party organization. In addition to the manufacturer's quality system, the third party organization also provides quarterly inspections to ensure that no variations are occurring that might jeopardize the integrity or performance of the certified products. Since NFPA 2112 has been identified by OSHA as one way to comply with the provisions of the March 2010 OSHA enforcement memo, use of certified garments will provide evidence of compliance.

Garment manufacturers benefit from third party scrutiny of their products by providing evidence of compliance to the requirements of NFPA 2112 for all of the components used in garment construction. Further, their manufacturing facilities benefit from the independent audit visits that help identify any shortcomings in their processes.

What has been the effect of the March 2010 OSHA Memo on demand for NFPA 2112-compliant garments?

The market response has been immediate and has impacted both manufacturers and third party certification organizations. Prior to the March 2010 OSHA memo, there was a limited demand for 2112-certified garments although many of these garments were made from NFPA 2112 component-recognized fabrics and findings. Many manufacturers only offered a limited selection of certified garments for those few customers requesting them. When the certification requirements for this important sector of the FR market changed, garment manufacturers struggled to obtain certification for a greater portion of their lines because the increased testing load strained the certifying organizations.

Amanda Newsom, Project Engineer for Underwriters Laboratories in Raleigh, NC reports that their business related to NFPA 2112 certification has increased 50% since March 2010. This has resulted in more than doubling their engineering staff responsible for witnessing testing. This demand has not only been from US finding, fabric and garment manufacturers but has been worldwide with many non-US organizations seeking certification. Rather than peaking and becoming stable, this worldwide demand is continuing to increase. As more and more end users in many areas at risk of garment ignition have become aware of NFPA 2112, garments certified to this standard have been requested in market segments unrelated to flash fire hazards such as molten metal and electric arc exposures. This has further driven demand for NFPA 2112 certification.

Barbara Woehner, Merchandising Operations Manager for Bulwark Protective Apparel in Nashville, TN reports that overall demand for NFPA certified garments has increased more than 50% since March 2010. The improved US economy has been responsible for some of the increased demand, but clearly NFPA 2112 is responsible for the lion's share of the increase.

The downturn in the worldwide economy in 2007 – 2009 resulted in restrained capacity throughout the flame-resistant garment supply chain. The spike in demand coupled with enforcement of garment certification requirements has led to manufacturing delays and material shortages in the market. The capacity and supply situation is improving, but demand continues to rise as certification to NFPA 2112 has become almost a “default” requirement for many end users in the oil and gas markets.

Summary

2112 has been an NFPA published standard for more than 10 years. In the Scope of the standard the purpose is described as *reducing the severity of burn injuries resulting from accidental exposure to hydrocarbon flash fires*. NFPA 2112 provides an excellent framework to ensure that all components of garments exposed to the hazard of flash fires have been tested and approved by a recognized third party certification organization. It gives both end users and manufacturer's confidence that certified garments will perform as designed when the need arises.

Some organizations in the oil and gas industry adopted NFPA 2112 as part of their health and safety policy, but many did not. By 2010 there were increasing reports of accidents resulting in death and injury related to failure to provide flame resistant clothing in workplaces where a flash fire hazard exists. OSHA acted by issuing the March 2010 enforcement memo. This has resulted in an increasing demand for certified garments which has impacted certifying organizations, fiber and fabric manufacturers and garment manufacturers. The worldwide economic downturn resulted in reduced capacity to meet this new market demand. As all

involved seek to respond there have been unavoidable delays in delivery, but the situation is improving.

The end result of OSHA's enforcement action will be increased worker safety. Providing effective, certified flame-resistant protective garments to workers at risk from flash fire will reduce the severity of injuries resulting from exposure to hydrocarbon flash fires.