

OSC 12
Ohio Safety Congress & Expo

WELL AT HOME. SAFE AT WORK.

543 Flame Resistant Clothing for Protection Against Flash Fire

Denise Statham

Wednesday, March 28, 11:15 a.m. to 12:15 p.m.

Ohio Bureau of Workers' Compensation

Does Your Uniform Protect Against Flash Fire?



Denise Statham
Technical Manager
Bulwark Protective Apparel
March 28, 2012

Industries Requiring FR Clothing for OSHA 1910.132




Primary Industries where Flash Fire is a Hazard

- O/G Exploration
- O/G Drilling
- O/G Field Services
- Oil refining
- Chemical plants




Topics for Today

- Flash Fire Hazard
- Benefit of FR Clothing
- Communication from OSHA
- Compliance with NFPA 2112
 - Fabrics/Findings/Garments
- FR Clothing Choices



Define the Hazard

- Flash Fire: A fire that spreads rapidly through a fuel such as dust, gas or the vapors of an ignitable liquid
 - Can generate temperatures of 1000-1900 deg F
 - Can last up to 5 seconds
 - Extended exposures possible in confined spaces



Why Not Wear Everyday Street Clothes?

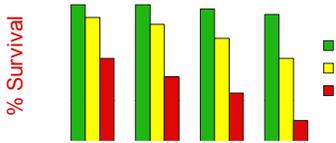
- Everyday fabrics can ignite, burn and possibly melt when exposed to a thermal hazard
 - Cotton
 - Polypropylene
 - Acetate
 - Polyester
 - Nylon
 - Wool
- **If everyday fabric does ignite and burn, it will increase the extent of a worker's injury**



The Benefit of FR Clothing



Burn Injury – Chances of Survival



Age Range, Years

Source: American Burn Association (1991-1993 Study)



The Role of OSHA



OSHA General Duty Clause

- Employer's responsibility

"Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm."




OSHA 29 CFR 1910.132

- Specifically addresses PPE
 - Hazard assessment
 - Selection of PPE
 - Training
 - Proper use, limitations, care/maint, disposal
 - Damage/Defects
 - Provided at no cost to the employee



OSHA Update

- March 19, 2010—The Occupational Safety and Health (OSHA) issued a memorandum clarifying enforcement policies for Flame Resistant Clothing in all oil and gas drilling, well servicing, and production-related operations
- OSHA will cite the general industry standard for personal protective equipment (PPE), 29 CFR 1910.132(a), for any failure to provide and use flame resistant clothing
- “OSHA has concluded that employers are required to provide and ensure the use of FRC....”
- Non-compliance will result in citations and fines



Citation Guidance for Other PPE Provisions

- CSHOs shall cite:
 - 29 CFR 1910.132(b) where there is a failure to assure that employee-owned FRC is properly maintained under NFPA 2113 guidance
 - 29 CFR 1910.132(c) where the employer fails to provide FRC that is of safe design & construction for the work being performed. Employers should consult standards such as NFPA 2112 and 2113 to comply
 - 29 CFR 1910.132(d) where the employer fails to conduct a hazard assessment to identify the potential for burn hazards where employees have occupational exposure(s) to flash fires
 - 29 CFR 1910.132(e) when defective or damaged FRC is used



OSHA memo summarized

- Clarifies OSHA's policy in citing the general industry standard for PPE: 29 CFR 1910.132
- Defines the flash fire hazard and the industry segments where it exists
- References NFPA 2112 & 2113 as appropriate industry standards for this application



Conclusions

- OSHA memo isn't a new directive; reinforces existing OSHA policy
- Affirms that OSHA will be more proactive in issuing citations/fines
- Does NOT require compliance with NFPA 2112
- Has created an industry demand for NFPA 2112 compliant garments



NFPA 2113

Standard on Selection, Care, Use and Maintenance of Flame Resistant Garments for Protection of Industrial Personnel Against Flash Fire

- Provides common sense protocol for issues like:
 - Conducting a Hazard Assessment
 - Selecting FR garments
 - Coverage
 - Cleaning & Care/Maintenance
 - Properly using FR garments
 - Collars, sleeves, cuffs
 - Layering



NFPA 2112

Standard on Flame Resistant Garments for Protection of Industrial Personnel Against Flash Fire



NFPA 2112
Standard on Flame Resistant Garments for Protection of Industrial Personnel Against Flash Fire

■ What it is....

- A means of certifying fabrics, findings and garments suitable for use in FR clothing to be worn as protection against possible flash fire exposure



Performance Standards/Testing

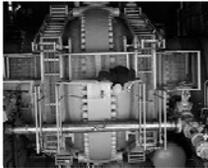
- Standards define minimum performance requirements
- Include a battery of test methods
- Are continuously under review/revision
- All reference one common test method.....



NFPA 2112

Requirements for Fabrics/Findings:

- Vertical Flame Test: 12 sec exposure, 2.0 sec max after flame, 4" max char length
- Oven Test: 10% max shrinkage after 5 minutes in 500 F, no melting, dripping
- Heat Thermal Performance (HTP):
 - 6 cal/cm² with spacer
 - 3 cal/cm² without spacer
- ASTM F1930 Instrumented Manikin:
 - 50% max predicted body burn following 3 sec 2.0 cal/cm² exposure



Vertical Flammability Test ASTM D6413



Test conducted on fabric before and after 100 cycles of industrial laundering
Specimen is exposed to flame for 12 seconds
NFPA 2112 allows a maximum of 2.0 seconds after flame



Vertical Flammability Test ASTM D6413



Char length is measured to assess damage to the specimen
NFPA 2112 allows no more than 4" char length

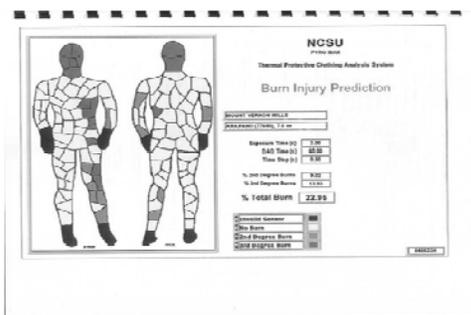


Instrumented Manikin Test

3 Second flash fire - Pyroman.vrm



Instrumented Manikin Results



NFPA 2112 requires less than 50% predicted body burn



What's UL?



What does it mean to be NFPA 2112 certified?

- UL inspects garments and mfg facilities to determine if:
 - Fabrics and findings are component recognized
 - Garments meet the requirements of the standard
 - Facilities have and maintain proper quality control procedures to ensure product consistency



Are all flame resistant fabrics and garments NFPA 2112 certified?

NO!



Choosing Flame Resistant Clothing

Protection, Comfort, Durability, Cost



Flame-Resistant Fabrics

- Treated vs. Inherent
 - Flame and thermal resistant fibers and fabrics can generally be divided into two groups:
 - Treated: Applied chemical treatment
 - Inherent: Essential characteristic
 - Pro's & Con's
 - Historical Significance



Fabric Types

- FR Treated
 - Fabrics made of natural fibers
 - Flame retardant finish applied
 - Guaranteed FR for the life of the garment provided that laundering guidelines are followed
 - No bleach
 - No fabric softener
 - Contaminants can mask FR properties



FR Treated Fabrics

<ul style="list-style-type: none"> ■ 100% FR Cotton <ul style="list-style-type: none"> - Treated for flame resistance - Cost about 1/2 of Nomex - Least durable among FR fabrics - Garment Life estimated to be 12-18 months 	<ul style="list-style-type: none"> ■ 88/12 FR Cotton/Nylon <ul style="list-style-type: none"> - Treated for flame resistance - Cost about 1/2 of Nomex - Added nylon improves durability - Garment life estimated to be 24-30 months
--	--



Fabric Types

<ul style="list-style-type: none"> ■ FR Treated <ul style="list-style-type: none"> - Fabrics made of natural fibers - Flame retardant finish applied - Guaranteed FR for the life of the garment provided that laundering guidelines are followed <ul style="list-style-type: none"> ▪ No bleach ▪ No fabric softener - Contaminants can mask FR properties 	<ul style="list-style-type: none"> ■ Inherently FR <ul style="list-style-type: none"> - Synthetic fibers synthesized to have permanent FR properties - FR characteristics will not wear out or wash out - Contaminants can mask FR properties - Color change does not indicate reduced FR performance
--	---



Inherently FR Fabrics

<ul style="list-style-type: none"> ■ Nomex IIIA <ul style="list-style-type: none"> - Inherently FR - Excellent durability - Garment life estimated to be 36-60 months - Relatively poor wicking performance - Comfort disadvantages - Cost about 2X 100% FR cotton 	<ul style="list-style-type: none"> ■ TecaSafe Plus/Cool Touch 2 <ul style="list-style-type: none"> - Inherently FR - Durability rivaling Nomex - Garment life estimated to be 36-60 months - Excellent wicking performance - Noticeable comfort advantages - Cost between FR cotton and Nomex IIIA
--	--



Questions?



- Points of view, ideas, products, demonstrations or devices presented or displayed at the Ohio Safety Congress & Expo do not constitute endorsements by BWC. BWC is not liable for any errors or omissions in event materials.

OSC 12
Ohio Safety Congress & Expo