

FLASH FIRE TESTING

In Europe it is becoming more common to see FR garments claiming Flash Fire performance with reference to body burns a wearer would receive. However it is crucial to understand what the standards are and what these results mean in terms of CE marking, European law and protection.

The standard BS ISO 13506 Protective clothing against heat and flame, is a test method for complete garments by predicting burn injury using an instrumented manikin based on a set duration of flash fire engulfing the manikin. After the test a burn calculation is made showing the level of pain, and whether first, second or third degree burns would be received by the wearer.

The standard is a test method, not a performance requirement - put simply - a test for flash fire. It is up to the person conducting the test to decide the duration of the flash fire, which coverall to test, or whether to include added layers such as undergarments. None of these parameters are specified as the standard is a test method, not a performance standard. The ISO 13506 tells us how to do the testing but does not set any set pass / fail criteria, only with pass/fail criteria can you assess garments for flash fire. ISO 13506 reports the burn calculation a person would receive but again has no pass/fail criteria on whether somebody would survive such a flash fire. This is where the problems lie in Europe - we have a test method without any pass/fail criteria and this test method is not a European standard for the PPE Directive.

There are many examples of garment makers testing their products to this method and claiming their coveralls have low body burns, but in fact what some are testing is a coverall over a sweatshirt, trouser and base layers. The results are then reported as if it's the coverall that is providing the low body burns. It is not the coverall, but the system of the coverall with the added layers underneath. Therefore it is important that companies are very careful what companies claim on flash fire protection as what they state in body burn prediction could be on an assembly system rather than a single layer coverall. Another issue is loose fitting garments can give better results as air is a poor conductor of heat, so any air gap between the coverall and manikin heat sensors will improve results.

The problem has occurred, as we mentioned before, because the standard is a test method with no relation to the PPE Directive, it does not specify what you have to test, the time duration of flash fire, or any pass/fail requirements.

Therefore what can we do to examine flash fire performance? In this case we recommend looking at the American standard system for flash fire testing which contains a performance standard. This is NFPA 2112: Standard on Flame-Resistant Garments for Protection of Industrial Personnel against Flash Fire. However, this standard has no reference to the PPE Directive or European law, it can only be used as a reference to examine a garment's performance for flash fire.

Why is it important to have a performance standard? Very crucially it sets pass/fail criteria and allows garments to be compared like for like. For example, if you test to flash fire what does the body burn calculation mean in terms of somebody surviving a flash fire? This is where NFPA 2112 sets a requirement. It states the average predicted body burn rating (the combined 2nd and 3rd degree burns) should not be more than 50%, as research shows that a person's survival is much higher below the 50% burn prediction.

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NFPA 2112 specifies the test method for flash fire, but it details how you perform the test such as: - flash fire time duration and which undergarment should be worn. The flash fire duration is 3s, as research in the USA has shown flash fires do not last longer than this. The garments are tested with undergarments which are 100% cotton t-shirts and briefs at a weight of 150gsm. Therefore it sets a strict set of testing guidelines that must be followed and this is what allows garments to be assessed against a performance standard.

So if we have a performance standard that we can use to compare garments for flash fire, the next thing is to examine the weight of the coverall tested. As a general rule a garment manufactured from heavy weight fabric the better its performance for flash fire will be. So for example a 300gsm fabric will have a better performance than a 200gsm fabric, hence the suggestion to examine the burn prediction, which NFPA 2112 states must be less than 50% for a higher survival rate from flash flame exposure.

The best way to test a coverall is with the cotton based undergarments, which is a worst case scenario. Ideally the worst case would be 100% synthetic undergarments such as polyester or nylon, but the testing laboratory cannot put these on the manikin as they could damage the heat sensors if they melt onto them.

The advice therefore is to be very careful when garment makers talk about Flash fire performance of their coveralls. Check what they are testing, whether single layer, or with undergarments. Check the flash fire duration too, there are examples of companies testing at 4s flash fire because their systems achieve better results at 4s than they do when you compare with competitive products at 3s. Remember the research for NFPA 2112 states test flash fire at 3s, not 4s, and this is the only performance standard in the world for flash fire, it sets the benchmark. Also check the weight of the coveralls tested, remember heavier in weight usually means better performance. There are examples of companies testing their heavier weight coveralls against competitor light weight ones, and then claiming better flash fire protection, which would be expected. Again be careful what is being tested and remember the NFPA 2112 pass/fail for body burns index is less than 50%.

Again we must stress that NFPA 2112 has no relation to European law, but it makes a logical approach to use this as a guide for comparing flash fire protection. It sets the rule for testing with cotton undergarments at 3s flash fire duration, a worst case scenario that can be tested in a laboratory.