

## **Fire Curtains & PAS 121: Guidance that should be handled with care**

Please note that as of April 2013 PAS 121 has been superceded by BS 8524-1 and BS 8524-2 but you may still find this white paper of interest.

For further information on this please visit the Colt blog.

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## The issue with PAS 121

Fire curtains, although developed from established smoke curtain designs, are a relatively new technology. Any new technology throws up problems in design, application, use and acceptance which need to be solved. PAS 121 was written to assist in that process until a full BSI standard is developed and published. While it attempts to address the various problems of this new technology, it is a temporary document written at a time when all the answers were not available. Consequently, it has weaknesses and omissions that mean it should be used with circumspection rather than followed blindly.

In this white paper we will see why.



### What is a PAS?

PAS stands for Publicly Available Specification. PAS are developed and published by BSI, but they do not carry the same status as a full BSI standard.

The purpose behind a PAS is to quickly provide a basic guide at a time when there may be insufficient experience or consensus to produce a full, peer reviewed, British Standard. A PAS is not intended to have a long life and is thus reviewed at 2 year intervals.

### PAS 121 status

In the case of PAS 121 the first review led to the decision to prepare two new full British Standards to replace it, BS 8524-1 and BS 8524-2. The former will be a product standard and the latter an application code of practice. The existing PAS combines the two, making it difficult to discern which requirements should be dealt with by the manufacturer and which by the system designer and installer. The new documents are currently committee drafts and are not yet published, although a draft for public comment for BS 8524-1 was published some time ago.

Unfortunately, until the new standards are published, PAS 121 remains in place and is the only available reference document. We say unfortunately because the new standards will be significantly different and better, and compliance with PAS 121 will certainly not guarantee compliance with BS 8524. Similarly the draft for public comment for BS 8524-1 is significantly different from the current committee draft and should not be relied upon as an indicator for the final standard.

## The insulating zone

Probably the major change is that the controversial insulating zone concept introduced by PAS 121 has been totally dropped. While it was an interesting concept and a genuine attempt to overcome a practical testing difficulty, it has caused a lot of confusion and difficulty in producing, interpreting and using the results. It is certainly not the simple replacement for an insulation (I) rating under European Standard tests that many seem to think.

The concept was that, since it is impossible to surface mount a temperature sensor onto a flexible fabric with an intumescent coating and expect it to reliably indicate the final surface temperature, some other means of temperature measurement was required. For the normal insulation test the surface temperature is not permitted to exceed

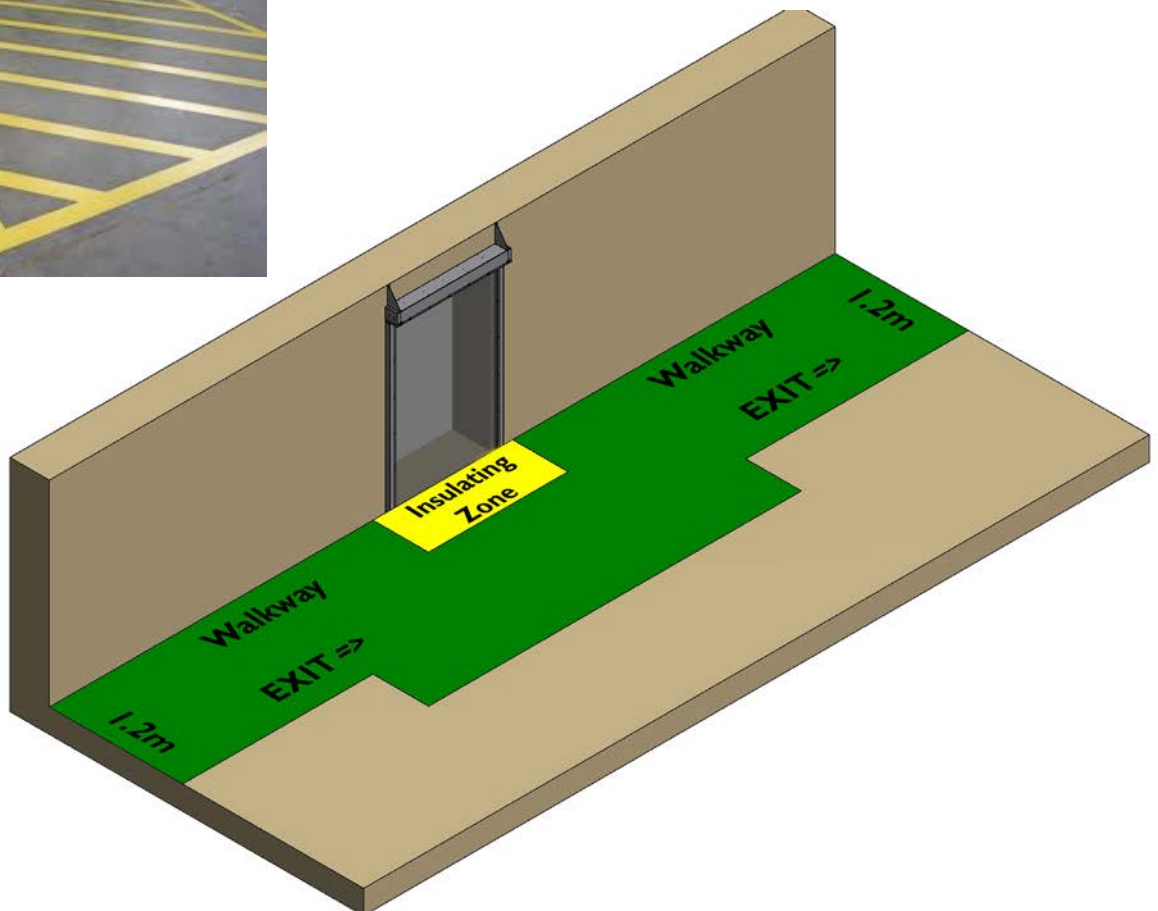
140°C average and 180°C maximum. For the insulating zone the maximum temperature was simply transferred from a surface temperature to an air + radiant temperature at the edge of the insulation zone. The intention was that at the edge of this zone heat transfer would be similar to that adjacent to a normal insulated surface and that the effects of curtain deflection would be included by keeping the furnace at a positive pressure. Since fire curtains are generally only used where passage is required, flammable materials should not be present directly adjacent to the curtain and therefore having a zone where storage is not permitted (or areas not counted as part of an escape route width) was not seen as unreasonable in order to achieve a supposed equivalent level of safety as for an insulated wall or door.

Since there was no suitable European Standard test suitable for the assessment of the insulating zone a special test was developed for the PAS.

In practice the test is difficult to carry out, the results are laboratory dependent, an insulating zone can always be claimed (although it may be large) and very few people really understand the concept or the correct application.

Instead, use of the existing European Standard test for radiation (which is already included in the PAS) is to be retained and work is in hand to provide simple guidance on how the results obtained can be interpreted and used in typical applications. Once beyond this guidance, fire engineering techniques will still be required to assess suitability, but these will now be based on the established and well understood radiation test.

## How do you show the insulating zone?



## Smoke leakage

In PAS 121 smoke leakage is measured in two ways. Firstly the edge leakage is measured, using the methods and limits used for smoke sealed fire doors. A maximum leakage of  $3\text{m}^3/\text{m}/\text{h}$  for the head and jambs is recommended, but only in a note. As for doors, the threshold may be sealed, a reasonable allowance as the manufacturer has no control of final floor finishes and flatness. A door however is expected to be impervious, whereas the fabric of a smoke curtain may not be. There is therefore a second test where the edges are sealed and the fabric leakage tested, with a maximum leakage rate of  $0.4\text{m}^3/\text{m}^2/\text{h}$ .

While the test methods are correct, the application of the results is not made clear and neither is the effect on curtain size on the balance of edge and fabric leakage, especially as larger curtains are often manufactured using overlapping lengths of fabric.

If smoke leakage is critical it is worth remembering that part of the fabric's resistance to smoke transmission may be due to the surface coatings, which may well change characteristics under fire conditions.

Again fire engineering techniques may be needed rather than simply specifying compliance with PAS 121.

## Impact

PAS 121 does not include any impact test. It is therefore possible under PAS 121 for a product to pass all the existing tests yet have the fabric pull out of the side guides under moderate impact or suction loads, thus losing its fire integrity. This is a particular concern where products use fabric tabs to retain the fabric in the side guide rails or where the retaining devices are widely spaced and therefore the body of the curtain is not very deeply embedded or well supported. We have seen this mode of failure occur on site.

As an aside, nothing to do with comment on the PAS, it is good practice to allow sufficient time for fire curtains to deploy before starting any smoke control systems, to ensure that any pressures generated do not result in the fire curtain sticking.



*Curtain side pocket sliding over continuous rail to ensure fabric remains within side guide rail (shown during site assembly).*

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## Other issues

The PAS has a number of other weaknesses and omissions. For example, there is in some cases a requirement for an emergency retract button to allow the curtain to be raised after initial deployment, but there is no test to ensure that the motor is capable of continuing to operate under any but ambient conditions. Similarly there are very few specific requirements for the ancillary equipment which is demanded for some applications.

Now that PAS 121 has been published and in use for some time, its flaws are more and more apparent and as the usage of fire curtains becomes more widespread it becomes more and more important that it is replaced by full British Standards as soon as possible.

## Specification: simple compliance with PAS 121 is not the answer

It is tempting, given the presence of PAS 121, to simply specify that fire curtains should comply with it. Doing so is easy, quick and refers to a published document from BSI; seemingly a perfect combination.

In practice, even forgetting the usual traps like not specifying the required classes to be met, unless one contractor supplies, installs, wires and commissions the curtains (and possibly even paints the cross hatching on the floor to mark clear space requirements), it's difficult for anyone except the main contractor to claim full compliance due to the wide scope of PAS 121.

In addition the confusion surrounding the insulating zone makes any requirement for, or claims regarding, insulation difficult to specify or verify.

What can you do? Well, apart from hoping that BSI publish the new standards as soon as possible, we suggest you read PAS 121, decide what you need your fire curtain to achieve and then write a full specification based on the relevant parts of PAS 121. And if you really do need insulation properties do not specify this using an insulating zone.

## Authorities: compliance with PAS 121 should not be the condition for acceptance

It's equally tempting for approving authorities to make compliance with PAS 121 a condition for acceptance. If applied with discretion and not as a rigidly enforced rule, this can be effective as a means of discouraging the worst suppliers. However, because of the weaknesses in PAS 121, compliance won't guarantee that, when installed, the fire curtain will actually perform as required.

We'd suggest waiting for the new BS 8524-1 before requiring product compliance and for BS 8524-2 before requiring system design and application compliance. Both are expected to be published in 2013.

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## About Colt

Since 1931 Colt has been harnessing the natural elements to provide healthy, comfortable and safe working and living conditions in buildings. Colt is a specialist in smoke control, climate control and HVAC systems, industrial ventilation and solar shading, with a presence in more than 50 countries.