



Report

Prepared by

K Nimmo CChem, MRSC, AIFireE, MBEng, FISPP
Principal Consultant - Fire & Safety Department

Approved by

M W Pullin BSc, CPhys, MInstP, FIFireE, MRSH
Head of Fire and Safety Department

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Stanger Science & Environment
Great Guildford House
30 Great Guildford Street
London
SE1 0ES

T 020 7902 6100
F 020 7902 6140
Customer helpline
Y 0345 585605
info@stanger.co.uk

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1 Introduction

- 1.1 PORTAPATH is designed for use as an all weather modular temporary floor covering and protection to grassed or other areas, providing a raised floor for pedestrian and light vehicular traffic. The system is based on the use of modules manufactured from thermoplastics materials. At the request of the manufacturers, fire tests have been carried out to assess the fire properties of the system using regular production product laid on grass in outdoor conditions, e.g., at an entertainment or leisure event.

This combined report, issue 2:-

- contains the results of a realistic reaction to fire test carried out on 24 April 1997 on the production product then known as PORTAFLOOR, now known as PORTAPATH;
- discusses the use of the PORTAPATH system during open-air public concerts or exhibitions.

- 1.2 PORTAPATH is based on rigid plastic tiles of polypropylene each nominally 311mm x 85mm with a profiled surface and raised above ground level by 16mm. The flooring modules lock together in use directly over the ground and are removed for storage elsewhere after use.

2 Ignition tests

- 2.1 Small scale ignitability tests were carried out to establish the ease of ignition of the wear surface of the moulded production product.
- 2.2 In tests using small flaming sources representing smoker's materials such as matches and cigarette lighters all the samples were found to be difficult to ignite on the upper surface when held horizontally.
- 2.3 In tests to BS 4790: 1987 'Method of determination of the effects of a small source of ignition on textile floor coverings - hot metal nut method' the sample achieved a 'high radius of effects of ignition', but perhaps more importantly it spread flame at an average rate of only 10.3mm/minute.



- 2.4 In tests using the method BS 6307: 1982 'Determination of the effects of a small ignition source on textile floor coverings (methenamine tablet test)' the sample did not continue to burn or spread flame.
- 2.5 None of these tests simulate the effects of radiation from a developing fire but they do show that the wear surface was difficult to ignite or did not continue to burn or spread flame in the presence of small ignition sources, or did not spread flame rapidly e.g., not exceeding 10.3mm/minute.

3 Radiation tests

- 3.1 To evaluate the effects of thermal radiation alone on the sample, tests using the ignitability apparatus in BS 476: Part 13 could be used. Because of the virtual absence of combustible materials in the construction of the public stands at many stadia and the open air nature of the use considered, determination of appropriate radiation levels to simulate a fire was difficult. As an alternative, a rubbish fire simulating a possible real fire situation was used to provide a level of radiated heat for evaluation (see 4).

4 Realistic reaction to fire assessment

- 4.1 The effects of flame and radiation from a test fire set on the wear face of the loose laid PORTAPATH were demonstrated at an open grassed area in the presence of representatives from the manufacturers 1. 24 April 1997.

The fire source was a timber crib consisting of nominal 25mm square planed softwood sticks approximately 300mm long. Twelve layers of sticks, 6 per layer, were supported on two 50mm square sticks. This crib is designed to produce direct radiation to the surface below, indirect radiation from rising flames to the surrounding surface and overall to produce a reasonably intense but short duration fire. The effects of the crib may be considered comparable with certain types of rubbish fires, or a local vehicle fire, both in terms of duration and overall intensity. The total mass of the timber was 5.45kg.



The test fire was set on 100 modules (2.1m x 1.2m) which were locked together as in normal use (picture 1). After ignition the crib was allowed to burn to completion in order to assess the potential of the sample to continue burning and/or spread flame (pictures 2-7). Throughout the test the amounts of smoke produced were assessed visually.

- 4.2 The observations taken during the fire test are summarised below and illustrated in the pictures.

TIME (Minutes)	OBSERVATIONS
0	ignition;
1¼	surface melting and collapsing under crib;
2	surface flaming;
2½	wind effects, etc., carried surface flaming 150mm to one side, flaming throughout thickness and almost burned through;
3½	flame spread 250mm;
6	peak fire intensity, flame spread 500mm;
7	crib collapsed;
10	burning maximum 700mm from crib, flame propagation continued at perimeter;
16	flames extinguished using less than one 9 l water extinguisher

- 4.3 PORTAPATH may be used on hard surfaces such as concrete, asphalt, etc., but is principally designed for use on grassed areas. For this reason grass was used as the test sub base. No flaming of the grass was noted beyond the area affected by direct flaming of the PORTAPATH.

- 4.4 No significant amounts of smoke were produced at any point during the test.

- 4.5 In the case of an established fire such as a rubbish fire burning on the surface, or local vehicle fire, flame spread rates away from the source were limited principally by the rate of melting of the plastics material. This factor would also control the flow of molten material irrespective of the substrate. The maximum flame spread rate was calculated to be about 100mm/minute.



- 4.6 For the size of fire used in the test, simulating a rubbish fire on the surface, or a local vehicle fire, the means of escape of the public from the pitch area at, e.g., a sports ground or stadium would not be expected to be significantly affected by this type of fire because of the slow rate of propagation observed. It was some 6 minutes before significant spread and development was noted.

Extinguishment was considered easy after 16 minutes using a single hand held water extinguisher. Extinguishment of the sample at an earlier stage would be expected to be easier because of the smaller amount of molten plastics but the nature of any material burning could affect the overall ease of extinguishment.

If the test fire or similar had been set on a large area of PORTAPATH and then allowed to burn freely it is considered likely that the entire area might have been eventually destroyed by flame spread but that the rate of progress would not exceed that in the tests and would probably be slower for most fires.

5 Alternative fire scenarios

- 5.1 The fire scenarios for PORTAPATH considered in addition to open air pedestrian cases are:-

- 5.1.1 Walkways between exhibition stands
- 5.1.2 Exhibition stand areas and exhibits
- 5.1.3 Enclosed exhibition stands, e.g., tented structures

5.2 Basis of assessment

- 5.2.1 PORTAPATH is resistant to ignition when in contact with small flaming sources such as smoker's materials, but has no significant resistance to ignition by a larger flaming source or radiation sources. Smouldering sources are not likely to cause progressive smouldering or flaming ignition.
- 5.2.2 The amounts of smoke produced by a fire on PORTAPATH on the ground are not considered likely to constitute a hazard to escape or fire fighting operations. No significant amounts of noxious fumes are likely other than 'normal' products of combustion.



- 5.2.3 In the case of a rubbish fire, or a local vehicle fire, on the surface of PORTAPATH effects such as flaming beyond the ignited area, are not likely to occur for at least approximately 3½ minutes.
- 5.2.4 Significant flame spread by molten material or across the sample surface is not likely to occur until approximately 6 minutes after ignition.
- 5.2.5 Under the conditions of test (open air, slight breeze, grassed substrate) it is considered likely that flame spread would continue away from the original fire source in all directions if additional and adjacent PORTAPATH was present.

5.3 Exhibition uses

5.3.1 Isolated walkways between exhibition stands

Walkways would cover less than the total area of a sports field or stadium and would therefore present a proportionally smaller overall fire load than a fully covered area. Ignitability and fire spread characteristics would therefore be expected to be no worse than for a fully covered area. Fire spread could only occur along a walkway rather than radially, except at intersections where four way spread could occur. As established before, fire spread would still be expected to be controlled by the rate of melting and to occur in a linear fashion. In the absence of additional materials the open air situation does not produce an obvious source of radiation likely to cause simultaneous ignition of large areas of the PORTAPATH material. This would require the close proximity of a large fire, such as at Bradford City Football Club stand.

Significant fire spread by molten material would not be expected. Overall, the means of escape by the public would not therefore be affected. Fire fighting using hand-held foam extinguishers would be expected to control fires quickly on walkways, subject to the nature and amounts of fuel initiating the fire.

5.3.2 Exhibition stand areas

An open exhibition stand is considered as any size area of PORTAPATH on a grassed area which is not a walkway or other designated area. Most of the comments in 5.3.1 apply.



The fire load on an exhibition stand could range in size up to, e.g., a caravan or vehicle etc. A fire in such an exhibit would be expected to affect the PORTAPATH by direct flame contact and by radiation. Melting and ignition would therefore occur. The time scale for involvement in a fire would depend on the size, nature and rate of growth of the fire. It is considered that most possible fires would be unlikely to affect PORTAPATH more rapidly than in the tests already conducted. In the case of an unusually large or very rapidly growing exhibit fire then more PORTAPATH would become involved at an earlier stage. The rate of spread and smoke produced could also be greater and would be dependent on the overall size of the exhibit fire.

Ultimately fire induced or spread to PORTAPATH from an exhibit would depend on the distance from the source and the intensity of the source.

The nature of the exhibit fire is thus the controlling factor in initial fire spread. If the PORTAPATH became ignited around an exhibit fire then initial fire fighting would have to be adequate to tackle both the exhibit and the PORTAPATH. This may appear no worse than a similar exhibit on fire on a grassed area: fire spread on grass could be more rapid than on PORTAPATH.

Where an exhibit fire is tackled quickly, e.g., within say 5 minutes, there may be little or no involvement of the PORTAPATH and therefore insignificant effects on the means of escape of the public. In a case where a large fire developed it would either have to be left to burn out or additional fire fighting equipment brought into action, e.g., hose reels. In either case it is considered possible to evacuate the public safely.

The use of sterile fire breaks around exhibits is considered at this stage. If the exhibit area is separated from walkways and other designated areas, except for connecting walkways to a stand areas, then fire damage to adjacent stands and walkways should be minimised. It is therefore considered that where practicable sterile fire breaks should be included in the design philosophy used for exhibition stands. The use of fire breaks is not likely to have any significant adverse effects on the means of escape of the public.



5.3.3 Enclosed exhibition stands

Enclosed stands are considered in terms of tented structures. These would be weather-proof construction due to the open air situation. Materials used in the construction of tents and marquees for use in entertainment's premises or sports grounds would be expected to be controlled by the local authority and/or fire brigade. The standard typically required for tenting materials is resistance to ignition by small flaming sources representing smokers' materials. Under these circumstances the use of PORTAPATH as a flooring inside a tent or marquee may be considered of no greater hazard with respect to means of escape than acceptable materials such as timber or carpeting. Rapid fire spread across a floor is unlikely and the size of fire required to cause significant surface ignition would also penetrate a conventional tenting and vent fire gases outside. There is little possibility within a tented structure for radiation from a hot ceiling layer igniting the flooring. Nor would smoke and toxic gases be likely to accumulate.

If cooking, space heating or other heat generating appliances were to be used in a tent with PORTAPATH damage could occur by softening or melting. It is important to prevent this happening because of the instability that could result to apparatus thus increasing the risk of fire occurring. Either PORTAPATH should be removed or replaced or protected by rigid insulation in such areas.

Hand held foam fire extinguishers would be recommended in a tented enclosure with PORTAPATH where other combustible materials were present, e.g., upholstered seating, furniture, decor, stands, etc. Such materials would be subject to approval by the local authority and/or the fire brigade. A rigid base should be provided below each floor-standing extinguisher to prevent bonding of the extinguisher to the PORTAPATH in case of softening or melting.

With the exception of entrance walkways, emergency exits, etc., a sterile fire break area is recommended around a tented area. This has a number of functions including:

- fire separation between walkways, stands or other parts of the same stand and tented areas;
- fire separation between adjacent tented areas;
- provision of areas for services, waste disposal, etc.;
- provision of areas for generators or other equipment not suitable for inside a tent;



- provision of areas where any molten material from a fire can be cooled or extinguished.

6 Approval

- 6.1 As a temporary covering to an open area for events such as pop-concerts or exhibitions it is considered that the PORTAPATH system tested was:
- i unlikely to be easily ignited by small flaming sources, but;
 - ii likely to be ignited by larger flaming sources and lead to continued flaming and flame spread but not likely to prejudice means to escape of the public from the pitch area, e.g., by rapid flame spread or smoke or noxious fumes
- 6.2 The PORTAPATH system would therefore appear to be acceptable to the licensing authority in terms of public safety in a fire if they were satisfied in respect of the following points:
- 6.2.1 The product would be stored off-site when not in use such that if involved with fire it would not effect the public.
 - 6.2.2 A 'sterile' fire break would be provided around any stand, stage, exhibit, tent or other special hazard identified.
 - 6.2.3 Upstands and protective barriers of board or other combustible materials would be controlled by the licensing authority.
 - 6.2.4 Combustible materials such as tents, fittings and decor would be subject to control and approval by the licensing authority.
 - 6.2.5 The on-site fire fighting facilities would be to the licensing authority's satisfaction, including a rigid base for extinguishers.
 - 6.2.6 Sterile areas would be provided, as required, for hazards such as rubbish storage, bottled gas supplies, external heating or electrical equipment, etc.
 - 6.2.7 Heat generating apparatus would not be used within tented stands unless adequately insulated from the PORTAPATH.



7 Restrictions

- 7.1 Local authority/Fire Brigade approval for PORTAPATH based on this report would be in respect of the product for use only for open-air pop concerts or exhibitions: other purposes would need to be considered on their merits.
- 7.2 The basis of the report is in respect of PORTAPATH out doors on grass. Other locations would need to be considered on their merits by reference to SS&E.
- 7.3 It should be noted that the recommendations made herein do not take account of the effects of other possible fire scenarios such as a stage fire, stadium fire etc.

Quality Statement

"We confirm that in preparing this report we have exercised all reasonable skill and care.

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K A Nimmo, Principal Consultant
FIRE AND SAFETY DEPARTMENT

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