

## Technical review of Building Bulletin 100: Design for fire safety in schools

### RIBA Response 31.05.19

#### Introduction

The RIBA supports a consultation on the Department for Education's (DfE) guidance to those who design and build schools (Building Bulletin 100), to ensure that it is fit for purpose and aligns with the Ministry of Housing Communities and Local Government's (MHCLG) wider review of fire safety.

The RIBA has responded to the call for evidence on the Technical Review of Approved Document B of the Building Regulations ([RIBA ADB Consultation Response](#)), and likewise urges the government to provide sufficient resources for a swift, thorough and comprehensive review of Building Bulletin 100.

This review should include research on standards, fundamental life safety requirements and an inclusion of the baseline recommendations we have made, to safeguard the continuity of education for children, where uncontrolled fires can devastate the lifetime development of a whole generation in a given community. The impact of a significant event like fire could have wide ranging and long-term psychological effects, especially where the community has to be displaced, which far outweighs its financial implications.

The RIBA recommends the inclusion of prescriptive baseline requirements on life safety measures, for example, maximum travel distances, ventilation, protected lobbies and refuges, to prevent the inappropriate use of fire engineered solutions which stretch travel distances, reduce the number of escape routes and increase compartment sizes. The RIBA recognise that school design can be complex and recommends that research is undertaken to set the scope and parameters for the acceptable use of fire engineering, to ensure that significant baseline fire safety requirements are not degraded.

The RIBA recommends that BB100 should include all guidance necessary to design school buildings. If applicable guidance is provided elsewhere, such as Approved Document B, then this should be replicated in BB100. If clauses must be referenced, rather than replicated, then guidance should be provided on how to address conflicts when they emerge.

The RIBA recommends that British Standards BS 9999, BS 9991, Approved Document B and BB100 are reviewed and revised in parallel, to ensure that all documents maintain the correct guidance and diagrams, to avoid conflicting information and provide clarity for users.

**Question 1**

We would welcome views and evidence around the design opportunities, or limitations, that sprinklers can provide specifically in school building design for compliance with Building Regulations.

BB100 notes an expectation ‘that all new schools will have sprinklers fitted. Any exceptions to this will have to be justified by demonstrating that a school is low risk and that the use of sprinklers would not be good value for money’.

The National Fire Chiefs Council (NFCC) published figures ([Sprinklers in schools position statement, 2018](#)) agreed by former Minister Vernon Coaker MP at a meeting with Zurich Mutual Insurance, which noted that ‘whilst Government’s expectation was that most if not all new schools would be fitted with sprinklers, recent estimations show that the rate has diminished from around 70% of new schools being built with sprinklers in 2007, down to a mere 30% as of December 2016’. The data highlights that alternative routes to compliance and the justification that sprinklers are not good value for money, stemming from the outcome of the available cost benefit analysis tool is being abused, and used to mitigate vital life safety / fire safety measures.

Sprinklers/automatic fire suppression systems are a highly effective means of life protection. The RIBA recommends:

- a mandatory requirement for sprinklers/automatic fire suppression systems to be installed in all new educational buildings and;
- in all existing educational buildings, as ‘consequential improvements’ where a building is subject to ‘material alterations’

The RIBA recommends that the practical aid assessment methods provided, which provides a risk-based approach to assess the level of risk and validity of providing sprinklers in education buildings, should not be permitted. Equally, sprinklers should not be used as a compensatory feature for other key fire safety measures, varying the design from the guidelines, or fire engineering purposes to increase travel distances, sizes of compartments or unprotected areas, or reducing the proximity of schools to boundaries.

The RIBA recommends that, where principles of asset protection are inextricably linked to life safety, these should be considered as means of life safety protection. In turn this would benefit asset protection and help to ensure the continuity of education for children, where uncontrolled fires can devastate the lifetime development of a whole generation in a given community. The impact of a significant event like fire could have wide ranging and long-term psychological effects, especially where the community has to be displaced, which far outweighs the financial implications.

**What evidence already exists?**

**London Fire Brigade (LFB), The National Fire Chiefs Council (NFCC) and The National Fire Sprinkler Network (NFSN)**

The London Fire Brigade (LFB) have also called for sprinklers to be installed in all school new builds and major refurbishments. The National Fire Chiefs Council (NFCC) released a ‘[Sprinklers in schools position statement, 2018](#)’, outlining their position on the inclusion of sprinklers in schools and the associated risks if omitted. The publication highlights, ‘according to UK Fire statistics in England, that there were 686 fires in schools in 2016/17. The Association of British Insurers say the most expensive school fires typically cost around £2.8 million to address, and over the last four years an average of 24 of these large loss fires have occurred every year totalling £67.2million. Aside from the financial impact, UK school fires disrupt the education of an estimated 90,000 children and students annually’.

'The [National Fire Chiefs Council](#) (NFCC) and the [National Fire Sprinkler Network](#) (NFSN) have worked together to investigate the '[Efficiency and Effectiveness of sprinkler systems](#)'. This report indicates that in all educational sub-sectors where sprinklers were installed correctly, in operation and maintained, the sprinkler system contained/controlled or extinguished the fire in every case, resulting in a performance effectiveness of sprinklers in educational establishments of 100%.

This research investigates when sprinklers did not operate, though they had been installed. However, 'across all education sub-sectors where the system did not operate, the available data indicates that the systems could not have been expected to operate in 94% of cases'.

### **Wales Automatic Fire Suppression Systems (AFSS) Requirements**

In line with Welsh Government policy, where grant funding is being provided for the investment in new school buildings or significant refurbishment, the Grantee will be required to install fire sprinklers. This policy ensures that sprinklers are mandated, compared to BB100 whereby exceptions to install sprinklers can be justified by demonstrating that a school is low risk and that the use of sprinklers would not be good value for money.

### **Scotland Automatic Fire Suppression Systems (AFSS) Requirements**

The [Scottish Technical Handbook for Non-Domestic buildings](#) (Standard 2.15) stipulates the requirement for sprinklers in schools, 'Every building must be designed and constructed in such a way that, in the event of an outbreak of fire within the building, fire growth will be inhibited by the operation of an automatic fire suppression system'.

### **Details of evidence provided**

- National Fire Chiefs Council (NFCC), Sprinklers in schools position statement, March 2018. Accessed 03.05.2019  
[https://www.nationalfirechiefs.org.uk/write/MediaUploads/Position%20statements/Protection/NFCC\\_Sprinklers\\_schools\\_position\\_statement\\_march\\_2018.pdf](https://www.nationalfirechiefs.org.uk/write/MediaUploads/Position%20statements/Protection/NFCC_Sprinklers_schools_position_statement_march_2018.pdf)
- Efficiency and Effectiveness of Sprinkler Systems in the United Kingdom: An Analysis from Fire Service Data, May 2017. Accessed 29.05.2019  
[https://docs.wixstatic.com/ugd/f44fe5\\_6953a66099984107b6c44a52c1ad0973.pdf](https://docs.wixstatic.com/ugd/f44fe5_6953a66099984107b6c44a52c1ad0973.pdf)
- Scottish Technical Handbook for Non-Domestic buildings, 2017. Accessed 29.05.2019  
<https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2017/01/building-standards-2017-non-domestic/documents/building-standards-technical-handbook---non-domestic-2017/building-standards-technical-handbook---non-domestic-2017/govscot%3Adocument/Building%2Bstandards%2Btechnical%2Bhandbook%2B-%2Bnon%2Bdomestic%2B2017.pdf>

**Question 2**

We would welcome evidence on the technical issues associated with compartmentation, specifically related to schools, including whether the maximum compartment size should be reviewed and amended.

The RIBA recommends that there should be a required level of documentary evidence to demonstrate that compartmentation and the firestopping of services has been achieved on all completed buildings, which may also include audit testing (QA) and/or physical testing, applied by the regulatory body. Auditing and evidencing compartmentation will require an independent onsite inspection process.

Although [BB100](#) applies smaller un-sprinklered compartment areas (m<sup>2</sup>) than [Approved Document B](#) (800m<sup>2</sup> vs 2000m<sup>2</sup>), the RIBA recommends that further research is undertaken to quantify if these maximum dimensions of compartments are still appropriate. The use of sprinklers should not be used to justify increased compartment sizes, and the RIBA recommends that any assessment omits this key life safety feature as a means to substantiate larger compartment sizes.

The use of fire engineering is commonly used to increase minimum compartment sizes, travel distances and reduce minimum periods of fire resistance and passive fire protection measures as set out in BB100 and Approved Document B. This degradation of the layers of fire safety, with a requirement for passive fire protection and a reliance on a high level of construction and engineering quality places considerable weighting beyond that of a more controlled and prescriptive route to compliance.

The RIBA recommends that parts of the school used out of normal hours should be compartments of their own. As explained in the property protection recommendations on page 80 'Parts of the school used out of normal hours by school clubs or members of the public could be considered as higher risk, by virtue of the fact that they are in use for longer periods of the day. If these parts form separate compartments, the benefits for property protection are twofold:

- there is less chance that a fire starting in the area used outside normal school hours will spread to the rest of the school; and
- there is less chance that a fire starting elsewhere in the school will spread to affect the areas of community use.'

The RIBA recommends that the benefit of adequate compartmentation, throughout the school as a whole is a key life safety feature, which in turn provides an added benefit of a greater level of property protection, allowing for flexibility in the use of all spaces by others throughout the lifetime of the building. Research should consider how the design of spaces and compartment sizes work together, to ensure that when spaces are enclosed, issues around supervision, which may lead to concerns regarding safety, safeguarding and bullying are not exacerbated.

**Details of evidence provided**

- Building Bulletin 100: Design for fire safety in schools, 2007. Accessed 18.03.2019 [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/276389/buildingbulletin100\\_onlineversion.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/276389/buildingbulletin100_onlineversion.pdf)
- Approved Document B, Volume 2, Buildings other than dwellinghouses. Accessed 18.03.2019 [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/441669/BR\\_PDF\\_AD\\_B2\\_2013.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/441669/BR_PDF_AD_B2_2013.pdf)

**Question 3**

We welcome views and any evidence on the number and type of staircases, limits on occupation and safe escape approaches in multi-storeyed schools.

**Fire alarm and fire detection systems**

The RIBA recommends;

- a mandatory requirement for centrally addressable fire alarms to be installed in all new educational buildings and;
- in all existing educational buildings, as 'consequential improvements' where a building is subject to 'material alterations'

The guidance for raising the alarm in the event of a fire in existing small schools on one storey with no more than 160 pupils, permits the use of manually operated sounders (such as rotary gongs or hand bells). In all other cases, there is a requirement for a suitable electrically operated fire warning system in accordance with [BS 5839-1:2017](#) (Fire detection and alarm systems for buildings). BB100 should require centrally addressable fire alarms to be installed in all existing educational buildings, as 'consequential improvements' where a building is subject to 'material alterations' and separate legislation may be needed to require all existing schools to have centrally addressable fire alarms installed.

**Type of fire alarm and fire detection systems**

BS 5839-1 specifies three categories of alarm system, Category M (Manual Alarm System), Category P (Property) or Category L (Life Protection). Category M, the entry level for fire alarm and fire detection systems, is sufficient to satisfy the Building Regulations and other statutory requirements for schools. The RIBA recommends a mandatory requirement of a Life protection standard is applied of no less than Category L1 (by virtue this also incorporates Category M), which are systems installed throughout the building to ensure all areas are protected.

A Category L1 systems mirrors the extent of fire detection outlined in Category P1 (Property Protection), but the RIBA recommends that the benefits of a Category P1 system providing a means for automatic transmission of alarm signals to the Fire and Rescue Service should be included. It is imperative that where a sprinkler system has been installed in the building and linked to the alarm system, this should not act a substitute as an alternative to providing fire detectors for property protection.

Further research should be undertaken to ensure that the most suitable fire alarm system is mandated, considering the needs of users and areas of school buildings which are extended to community uses, generally used out-of-hours by many groups, school clubs or members of the public who are not familiar with its layout or evacuation procedure.

**Means of Escape**

The RIBA recommends that alternative means of escape should be provided in all new schools, including the requirement for at least two staircases where there is more than one storey. The RIBA recommends that single direction of escape (dead ends) should not be permitted in corridors and alternative means of escape should be available from every room exit. The RIBA does not have any additional recommendations on the current guidance on alternative means of escape from within a room.

The RIBA recommends that research should be undertaken to establish the required refuge space (area) that should be provided in each protected stair lobby, reviewed in line with occupancy levels and to establish the advantages for the inclusion of horizontal evacuation

measures / strategies. This can provide those who require mechanical assistance (in their own wheelchairs) to move from one compartment to another on one level should the need prevail, or if sufficient refuge space is not available or provided under the review at any one given time.

The RIBA recommends that the guidance provided in 'Table 1: Guidance to suitable travel distances' (BB100), should be reviewed to fix travel distance dimensions, with the maximum Required Safe Egress Time (RSET) as the limiting factor. The RIBA recommends that research is undertaken to set a new maximum safe egress time based on the capabilities of less mobile people. The use of the Available Safe Egress Time (ASET), as described in BS 7974 'Application of fire safety engineering principles to the design on buildings. Code of Practice', should not be used to extend travel distances, which effectively circumvents the technical requirement to provide appropriate means of escape in the event of a fire.

This research and review of travel distances should also consider dead ends, intermediate corridors and corridor spurs and both horizontal and vertical distances to ascertain what is an acceptable distance for the least mobile person.

The use of risk assessments ([Fire Safety Risk Assessment: educational premises, 2006](#)) which promotes some flexibility' in 'normal' and 'lower' fire risk areas and alternative provisions to compensate extended travel distances in excess of the norm should be removed, as this degrades the quality of the basic fire safety requirements. The RIBA recommends that travel distances should be based on research on the Required Safe Egress Time (RSET) only, considering the range of people that may use the building.

Access to storey exits should be reviewed, to omit the acceptable route to pass through one stairway's protected lobby to reach another stair. The RIBA recommends that each stair should have primary access from the route of escape, and not be solely linked through one stairway lobby.

#### **Details of evidence provided**

- BS 5839, Fire detection and fire alarm systems for buildings. Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises, August 2017.  
<https://shop.bsigroup.com/ProductDetail?pid=00000000030373864>
- BS 7974, Fire Safety Engineering. Application of fire safety engineering principles to the design of buildings.  
<https://shop.bsigroup.com/ProductDetail?pid=00000000030353758>
- Fire Safety Risk Assessment: educational premises, May 2006. Accessed 18.03.2019.  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/14887/fsra-educational-premises.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/14887/fsra-educational-premises.pdf)

**Question 4**

We would welcome views on the impact of community and out of hours use by school and non-school bodies, on fire safety design.

The RIBA recommends a mandatory requirement for emergency lighting to be installed in all areas of schools, except for spaces that are adequately daylight and inaccessible outside of school hours. Further consideration should be given to the requirements of cleaning and maintenance, which usually occurs outside of school hours, and would justify a mandatory requirement for emergency lighting in all areas.

Areas which may be used for out of hours activities by school clubs or members of the public, and if these spaces are not sufficiently separated to prevent access from the main school areas, or that they form part of a wider fire escape strategy, then the RIBA recommends a mandatory requirement for emergency lighting to be installed. The RIBA recommends that research is undertaken to also ensure the most appropriate means of warning is considered (see Question 3 response for further information).

Out of hours use also highlights issues relating to the management strategy for evacuation. Currently, emergency voice communication (EVC) systems should be provided, however, these call to a dedicated point (likely a staff office which would be closed out of hours). The RIBA recommends that systems, such as EVCs, are also connected to a fire control room (see Question 14 response for further information) and can be redirected out of hours to a responsible person that can manage the evacuation during after school hours.

**Question 5**

We would welcome views on whether BB100 should recommend that all new school buildings over 18 metres, within the scope of the guidance, should not use combustible materials in the external walls, in line with the terms of MHCLG's ban.

The RIBA recommends that a restriction on combustible materials in external walls of A2-s1, d0 should be applied to all schools with a storey at 11m above ground level, or more than 3 storeys above ground level. BB100 and Approved Document B should be updated to restrict plasterboard, sheathing boards, insulation and outermost cladding products to A2-s1, d0 products only. The restriction should not cover the building's primary structure, which should have adequate fire protection (see Building Regulation's Requirement B3).

The RIBA recommends that for asset protection, this restriction should be applied to schools of any height.

As stated in the consultation document, the RIBA supports the restriction on the use of combustible materials to A2-s1, d0 as they can reduce:

- 'the opportunity for an offender to start a fire' (arson)
- 'the scope for potential fire damage'
- 'subsequent losses and disruption resulting from a fire'

**Question 6**

We would welcome views on whether we should provide greater guidance, through BB100, on meeting fire safety management long-term, to support school building users to meet the requirements of the Fire Safety Order?

The RIBA recommends that further operation guidance which can be simply understood (for designers and responsible persons that manage buildings, in considering the varied levels of experience) should be provided, both for the design stage and for handover. This could include guidance on information that should be provided to meet Regulation 38, with a consideration of the design to facilitate escape. For example, this may include plans with information on zones, refuges, room numbers, vital fire safety equipment, operational information and maintenance requirements, to assist the responsible person with their risk assessment and planning.

The RIBA recommends that training and appropriate guidance is also provided by the local fire service including the principles of escape and use of special equipment like evacuation chairs.

**Details of evidence provided**

- The Building Regulations 2010 No. 2214, Regulation 38: Fire safety information, October 2010.  
[http://www.legislation.gov.uk/uksi/2010/2214/pdfs/uksi\\_20102214\\_en.pdf](http://www.legislation.gov.uk/uksi/2010/2214/pdfs/uksi_20102214_en.pdf)

**Question 7**

We would welcome views on whether there are any school specific issues in relation to MMC. We appreciate that there are elements of both life safety and property protection in relation to MMC and would welcome views on both.

**Design for Manufacture and Assembly (DfMA) and Modern Methods of Construction (MMC)**

The RIBA supports the increased use of MMC, so as long as it is done in a way that adds value to the process without reducing quality or safety.

The RIBA recommends that consideration should be given to the junctions between modular systems, to ensure that the technical requirements for compartmentation can be met. Guidance should be provided for the requirements of property protection, to ensure that that the primary structure has suitable fire protection.

The RIBA recommends that there should be a required level of documentary evidence to demonstrate that compartmentation and the firestopping of services has been achieved on all completed buildings (see Question 2 response for further information).

**Cross Laminated Timber (CLT) and Glued Laminated Timber GLT**

Further research into the use of Cross Laminated Timber and Glue Laminated Timber should be undertaken, to obtain relevant scientific data or experimental evidence to determine and quantify the performance of timber buildings when subject to real fire loads. The paper 'Needs for Total Fire Engineering of Mass Timber Buildings', Bartlett, et al (2016), refers to the need for future research priorities.

**Guidance Documents**

The relationship between BB100, Approved Document B and BS 9999, provides standards that conflict, and there is no clear baseline requirement. Variance in design guides can

require enhanced fire rating, which would not be required under other available routes to compliance. The RIBA recommends that BB100, ADB, BS 9991 (Residential Schools) and BS 9999 are all reviewed in parallel, to research, evaluate and stipulate minimum baseline requirements, which should not be subject to alteration by any risk assessment or fire engineering route to compliance.

**Details of evidence provided**

- Needs for Total Fire Engineering of Mass Timber Buildings. Bartlett, Alastair; Wiesner, Felix; Hadden, Rory; Bisby, Luke; Lane, Barbara; Lawrence, Andrew; Palma, Pedro; Frangi, Andrea. 2016 World Conference on Timber Engineering (WCTE 2016). Vienna, 2016.  
[https://www.research.ed.ac.uk/portal/files/33151493/Joint\\_WCTE\\_full\\_paper\\_Final.pdf](https://www.research.ed.ac.uk/portal/files/33151493/Joint_WCTE_full_paper_Final.pdf)
- Building Bulletin 100: Design for fire safety in schools, 2007. Accessed 18.03.2019  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/276389/buildingbulletin100\\_onlineversion.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/276389/buildingbulletin100_onlineversion.pdf)
- Approved Document B, Volume 2, Buildings other than dwellinghouses. Accessed 18.03.2019  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/441669/BR\\_PDF\\_AD\\_B2\\_2013.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/441669/BR_PDF_AD_B2_2013.pdf)
- BS 9991:2015, Fire safety in the design, management and use of residential buildings. Code of practice.  
<https://shop.bsigroup.com/ProductDetail?pid=00000000030351309>
- BS 9999:2017, Fire safety in the design, management and use of buildings. Code of practice.  
<https://shop.bsigroup.com/ProductDetail?pid=00000000030357099>

**Question 8**

What school specific property protection measures should BB100 cover in addition to the topics covered below in questions 9 to 13?

The RIBA, in its response to the Technical Review of Approved Document B of the Building Regulations ([RIBA Response – ADB](#)), made the following additional recommendations, which cover aspects of both life and property protection:

**Asset Protection**

The RIBA recommends that, where principles of asset protection are inextricably linked to life safety, these should not be considered as means of asset protection, but rather as means of life safety protection, which provide the added benefit of asset protection and thus sit within the scope of the review.

**Capabilities and Behaviour of People**

The capabilities and behaviour of people should be assessed, as this underpins the guidance and evacuation strategy. Means of escape, including travel distances, horizontal and vertical escape strategies, stair and landing widths should be reviewed to ensure that building design allows all people a safe means of escape to a place of safety outside the building and provides vulnerable people with safe refuge till they can be evacuated.

In considering the escape for disabled people, BS8300 permits a stair width of 2m between handrails without a sub-division, which can facilitate carry down and the use of equipment, which a central handrail would inhibit. Further research should be undertaken to assess the most appropriate stair and landing widths (where some evacuation equipment requires 2.1m deep landings), taking into consideration the needs to evacuate and the conflicting requirements set out in guidance documents.

### **Smoke Production and Toxicity of Construction Materials**

The RIBA recommends that smoke production is limited in all products in external walls and internal linings to the European classification sub category s1 (when tested to BS EN 13501-1), to ensure that residents (residential school buildings), the public and the fire service are not exposed to unnecessary risk. Guidance should be prescriptive, with reference to limitations for the use of materials where there is no set limit for smoke production and/or flaming droplets/particles, to provide clear requirements for acceptable materials to specifiers. The classifications of materials should be extended to also include the toxicity of combustion products and suitable limitations imposed.

The scope should include all materials that are not considered as part of any restriction on materials that are deemed as part of the external wall (see Question 5 response for further information).

### **Construction Details**

A holistic review of details and associated exemptions should be undertaken, to ensure that products when used in combination, do not lead to unintended consequences (i.e. curtain walling, spandrel panels and fire breaks all have different requirements, when specified as individual products, yet the system fails when used in combination).

### **Electrical Cabling**

On 1 July 2017, the Construction Products Regulation (CPR) came into force, and, as a result, all cables sold in the EU now have to adhere to new, improved common standards. However, the EU hasn't been prescriptive in specifying which classification of cable performance should be used for buildings and infrastructure. Instead it is the responsibility of each EU member states' regulator to decide this.

MHCLG has not specified which class of cable should be used for buildings, and instead requires all electrical installations in buildings to comply with BS 7671 – a minimum performance requirement, equivalent to Euro Class E – that allows for more flammable cables that are less resistant to the spread of flames. The RIBA recommends that a minimum requirement of Euro Class Cca should be required in the UK.

### **Space separation**

It is the RIBA's view that further research should be undertaken to assess the distance of notional boundaries, based on current design characteristics to provide guidance for other boundary/geometry and circumstances, and ensure that the guidance is relevant and clear. Currently, the guidance only assumes straight edge building typologies and based on 'a number of assumptions'.

### **Unprotected Areas**

Guidance on unprotected areas which may be disregarded in assessing the separation distance from the boundary, is unclear and complicated. There are currently four different ways to calculate unprotected areas which creates confusion.

Research and clarification is required to enable users to assess the requirements. Currently, unprotected areas shown either side of a compartment have no restriction on separation distance, yet unprotected areas within the same compartment are restricted. The RIBA recommends that restrictions should be made on the distance between unprotected areas either side of compartment wall/floor, and further clarified to show the requirements clearly.

#### **Curtain walling systems**

Further research and testing should be undertaken to understand how curtain walling systems are deemed to meet the requirement of B4. - (1), which stipulates that;

*'the external walls of the building shall adequately resist the spread of fire over the walls and from one building to another, having regard to the height, use and position of the building'*

or whether these systems should only be used in unprotected areas. The RIBA recommends a standard test procedure is developed to assess the fire performance of curtain walling systems.

#### **Fire breaks**

The RIBA recommends that the current testing procedures for fire breaks (BS 472-20 and BS EN 1364-4) at compartment floors are reviewed, to ensure that testing for such elements reflects real-world conditions - for example, how a fire break at a compartment floor is tested with the actual external wall system that will be applied to the building. Currently, testing of these products is completed in isolation between two solid elements and does not fully represent the fire performance when part of a curtain walling system which would inevitably fail first.

#### **Details of evidence provided**

- RIBA consultation response to the Technical Review of Approved Document B of the Building Regulations - A Call for Evidence, 01.03.19.  
<https://www.architecture.com/-/media/files/press-release/riba-response-technical-review-adb-010319.pdf>

#### **Question 9**

We would welcome views on which fire suppression systems, (including sprinklers, misting systems etc.), are most effective in a school environment and any supporting evidence.

The RIBA has recommended a mandatory requirement for sprinklers/automatic fire suppression systems to be installed in all new educational buildings and in all existing educational buildings, as 'consequential improvements' where a building is subject to 'material alterations' (see Question 1 response for further information). Guidance on the type and suitability of fire suppression systems should be provided to assist designers, including adequate technical detail to address, for example, the interface between sprinklers and alarm systems and their operation when one or both systems are activated.

**Question 10**

We would welcome evidence relating to the effectiveness of compartment floors in schools.

In relation to life safety, BB100 does not require compartment floors in schools and only compartment walls are required to ensure that each compartment area does not exceed 800m<sup>2</sup>. The RIBA recommends that all floors in a multi-storey schools (with the proviso that the lowest floor in a building does not need to be constructed as a compartment floor, provided there is no basement) are constructed as compartment floors, which would also provide the added benefit of reducing the extent of property damage. The RIBA recommends that the minimum periods of fire resistance are reviewed, and that the mandatory inclusion of sprinklers is not used as a means to reduce the minimum periods of fire resistance when compared to unsprinkled schools.

The [Education and Skills Funding Agency \(ESFA\) baseline designs for schools](#), developed to demonstrate good practice that can be achieved within the set cost and area allowances, raises conflicting requirements with BB100. For example, a 'superblock' baseline design for a 1,200-place occupancy secondary school, provides 'a compact and efficient building form, with all but the sports facilities in a single block, reducing circulation distances and facilitating links between departments'. However, the learning spaces, which inevitably lead off the 'balcony' access, conflicts with the guidance requirements for fire, natural light and acoustics.

The RIBA recommends that any supplementary design guidance, which promotes good practice for school design and within set cost and area allowances, should be taken into consideration within the review to ensure that design guidance is not conflicting, and baseline standards can be developed.

**Details of evidence provided**

- Education and Skills Funding Agency (ESFA) - Baseline designs for schools: guidance. Accessed 22.05.2019  
<https://www.gov.uk/government/publications/baseline-designs-for-schools-guidance/baseline-designs-for-schools-guidance>
- School Premises Regulations and design guidance, School baseline designs, 2014. Accessed 08.05.2019  
<https://www.gov.uk/government/collections/school-building-design-and-maintenance>

**Question 11**

What measures, if any, should BB100 provide guidance for around property protection for special schools? Do these measures differ for types of special school or particular pupil needs?

The RIBA has recommended a mandatory requirement for sprinklers/automatic fire suppression systems to be installed in all new educational buildings and in all existing educational buildings, as 'consequential improvements' where a building is subject to 'material alterations' (see Question 1 response for further information).

Sprinklers/automatic fire suppression systems are a highly effective means of life protection, which also provides the added benefit of asset protection and help to ensure the continuity of education for children with Special Educational Needs (SEN), whereby it may be more difficult to find alternative school places with the correct spaces and equipment for those pupils should an uncontrolled fire break out.

The RIBA recommends that research is undertaken to assess the most suitable sprinkler/automatic fire suppression system to address both life safety and asset protection,

considering the needs, vulnerability and requirements of children with Special Educational Needs.

The RIBA recommends that research should be undertaken to establish the required refuge space (area) that should be provided in each protected stair lobby at every level. This is likely to be larger for SEN schools to accommodate more children who may need to wait in a refuge.

The RIBA recommends that all SEN schools should have firefighting shafts with firefighting lifts, when there is more than one storey.

**Question 12**

What issues, if any, should BB100 provide guidance for schools on constrained sites? Alternatively, should the guidance simply refer to the relevant section of AD B on buildings over 18 metres and deep basements?

The RIBA recommends that BB100 should include all guidance necessary to design school buildings. If applicable guidance is provided elsewhere, such as Approved Document B, then this should be replicated in BB100.

The RIBA recommends that British Standards BS 9999, BS 9991, Approved Document B and BB100 are reviewed and revised in parallel, to ensure that all documents maintain the correct guidance and diagrams, to avoid conflicting information and provide clarity for users.

**Question 13**

We would welcome views on whether guidance, in addition to what is covered by AD B, is required for residential schools and whether any specific measures are required for residential schools.

The RIBA recommends that the most onerous requirements between combined or separate residential areas and education areas are adopted, and that guidance on the requirements for specialist residential schools should be provided. This should include design guidance on escape, security and the combined needs of residential (sleeping accommodation) and education areas.

**Question 14**

We would welcome views on whether there are any school specific changes to the guidance we should consider, in addition to what you may be recommending to MHCLG in their review of AD B.

The RIBA recommends that refuge lobbies are provided adjacent to all stairway doors and lifts (including firefighting lifts) to provide adequate means of refuge at all storeys above ground level.

The RIBA recommends a requirement for firefighting shafts when there is more than one storey, and a requirement for fire-fighting lifts in schools with a storey at 11m above ground level, or more than 3 storeys above ground level and in basements of more than 1 storey below ground level.

The RIBA recommends that dry riser outlets be located in staircases and refuge/firefighting lobbies, adjacent to the stairway, to minimise stairway contamination by hoses through doors.

Fire mains outlets at each floor should be always be located within the protected enclosure of a stairway and in a protected refuge/firefighting lobby adjacent to the stairway and firefighting lifts. This enables the fire service to connect to an outlet within the stairway at the Bridgehead to protect the staircases and connect to a second fire main outlet at the fire incident floor

within the protected lobby. This will eliminate the need for firefighters to jam stairway doors open with hoses, preventing the protected staircases from becoming smoke logged.

The RIBA recommends that the fire service have access to a ground/entrance storey fire control room with fire protection, containing fire alarm and sprinkler controls, and intercoms to any refuges.

Firefighting lifts and evacuation lifts should always open into a protected lobby, not directly into protected corridors, where minimum fire resistance requirements of lobbies are much greater. Where refuges are located on external escape staircases, weather protection should be a requirement.

**Question 15**

We are interested in views and evidence on the effectiveness of fire engineering approaches in school building design.

The RIBA recommends the inclusion of prescriptive baseline requirements on life safety measures, for example, maximum travel distances, ventilation, protected lobbies and refuges, to prevent the inappropriate use of fire engineered solutions which stretch travel distances, reduce the number of escape routes and increase compartment sizes. The RIBA recognise that school design can be complex and recommends that research is undertaken to set the scope and parameters for the acceptable use of fire engineering, to ensure that significant baseline fire safety requirements are not degraded.

**Question 16**

We would welcome evidence or views on whether a revised guidance should continue to replicate advice provided elsewhere.

The RIBA recommends that BB100 should include all guidance necessary to design school buildings. If applicable guidance is provided elsewhere, such as Approved Document B, then this should be replicated in BB100. If clauses must be referenced, rather than replicated, then guidance should be provided on how to address conflicts when they emerge.

The RIBA recommends that British Standards BS 9999, BS 9991, Approved Document B and BB100 are reviewed and revised in parallel, to ensure that all documents maintain the correct guidance and diagrams, to avoid conflicting information and provide clarity for users.

Where guidance has been withdrawn, such as ‘Building Bulletin 102: Designing for disabled children and children with special educational needs’, and although noted that its general guidance is still relevant, the RIBA recommends that such guidance (Section D Technical 11 – Fire Safety and evacuation) should not be lost and should be maintained to assist designers to develop safe and well considered educational buildings that meets the needs of its users, and could be considered in the review of BB100 and included in the revised guidance where appropriate.

**Details of evidence provided**

- Building Bulletin 102, Designing for disabled children and children with special educational needs, Guidance for mainstream and special schools, Withdrawn 25 June 2018.  
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