BSF GREENWICH: CROWN WOODS SCHOOL

FIRE SAFETY STRATEGY

Report for

Building Design Partnership
16 Brewhouse Yard
Clerkenwell
LONDON
EC1V 4LJ

TS06651-R01-Issue 4
**Issue and amendment record**

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<td>30 March 2007</td>
<td>R Clinton</td>
<td>J Lavender</td>
<td>First draft for comment by Design team and Building Control</td>
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<td>I2</td>
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In preparing this fire strategy report it has been assumed that detailed aspects of the design and construction will, unless stated otherwise in this report, be in accordance with the recommendations of Approved Document B, applicable DfES Building Bulletins, British Standards and codes of practice.

This report relates only to statutory requirements when the building is completed. Additional fire safety measures may be appropriate during construction or for insurance, loss prevention or environmental protection purposes.

The terminology “will” or “will be” as used in this report represents the recommendation/understanding of Tenos Ltd regarding the proposed design, construction or management of the facility. The validity of this report is dependent upon these items being implemented as described.

This report relates to a project that is subject to third party approval. It must be ensured that the contents of this report are agreed with all relevant approval bodies prior to implementation.
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Introduction

1.1 This report presents the fire safety strategy for the Greenwich BSF Crown Woods School development.

1.2 The strategy sets out the measures that are proposed to satisfy the functional requirements of the Building Regulations 2000\(^{1.1}\) and the Regulatory Reform (Fire Safety) Order 2005\(^{1.2}\).

1.3 The strategy proposes measures that are generally based on the guidance in the 2000 edition of Approved Document B to the Building Regulations (ADB)\(^{1.3}\), on the basis that the Building Regulations application will be made before 6 April 2007. Where an alternative approach to the guidance in ADB is proposed, this is discussed in this report.

1.4 In developing detailed designs and specifications it is essential that the guidance in ADB, DfES Building Bulletins, British Standards and codes of practice are followed unless specifically stated otherwise in this report.

1.5 Legislation is concerned only with protecting the health and safety of people in and around a building and is not specifically intended to provide protection against damage or consequent financial losses. Whilst measures for life safety will often provide an element of property protection, it is recommended that consideration be given to a separate study regarding the limitation of direct and indirect losses that could occur as a result of fire damage and that early consultation be carried out with the prospective insurers (if applicable).

1.6 The fire safety strategy as set out in this report is intended to be consistent with the level of detail required at RIBA work stage E. Whilst some background information on the various fire protection systems is presented in Annex A.2, reference should be made to Approved Document B, applicable British Standards and other guidance in relation to detailed specifications and system design.

1.7 Where a particular approach or fire safety measure is proposed, this should be taken as the intended approach at the time of writing. The strategy will be subject to confirmation and further development during subsequent design stages and some approaches or measures may change as a result of this process.

1.8 This fire safety strategy has been developed on the basis of the drawings and other design information listed in Annex A.1.
2 Brief description of the buildings

2.1 The new secondary school will comprise a total of nine separate buildings arranged on a campus site.

2.2 A summary of the building dimensions is set out below in Table 1.

Table 1: Building dimensions

<table>
<thead>
<tr>
<th>Building</th>
<th>No. of storeys</th>
<th>Ht. of top storey above ground</th>
<th>Approx. footprint</th>
<th>Approx. total area</th>
</tr>
</thead>
<tbody>
<tr>
<td>College A</td>
<td>3</td>
<td>7.5m</td>
<td>600m²</td>
<td>1750m²</td>
</tr>
<tr>
<td>College B</td>
<td>3</td>
<td>7.5m</td>
<td>600m²</td>
<td>1750m²</td>
</tr>
<tr>
<td>College C</td>
<td>3</td>
<td>7.5m</td>
<td>700m²</td>
<td>2000m²</td>
</tr>
<tr>
<td>6th Form</td>
<td>3</td>
<td>7.5m</td>
<td>1100m²</td>
<td>3200m²</td>
</tr>
<tr>
<td>DT &amp; Arts</td>
<td>3</td>
<td>7.5m</td>
<td>900m²</td>
<td>2700m²</td>
</tr>
<tr>
<td>SEN/Music</td>
<td>3</td>
<td>7.5m</td>
<td>700m²</td>
<td>2000m²</td>
</tr>
<tr>
<td>Central Facilities</td>
<td>2</td>
<td>3.75m</td>
<td>1350m²</td>
<td>1800m²</td>
</tr>
<tr>
<td>Sports and PE</td>
<td>1</td>
<td>0m</td>
<td>1630m²</td>
<td>1630m²</td>
</tr>
<tr>
<td>Dining/Kitchen</td>
<td>1</td>
<td>0m</td>
<td>1000m²</td>
<td>1000m²</td>
</tr>
</tbody>
</table>

2.3 Colleges A, B, C, the Sixth Form College, DT & Art and Central Facilities will each contain a central circulation space with void(s) linking the ground and upper floor(s).

2.4 The buildings will provide secondary level teaching and community accommodation and will therefore be classified in purpose group 5: Assembly and Recreation as defined in Appendix D of Approved Document B1.3.

2.5 The site is located on Bexley Road, which provides vehicular access to the site. A site plan is shown in Figure 1 overleaf.
3  Statutory requirements

Building Regulations

3.1 The building will be subject to the provisions of the Building Regulations 2000, which are the primary basis for statutory control of building design in England and Wales.

3.2 For fire safety, the functional requirements of the Building Regulations are set out under the following headings:

   Requirement B1 - Means of warning and escape
   Requirement B2 - Internal fire spread (linings)
   Requirement B3 - Internal fire spread (structure)
   Requirement B4 - External fire spread
   Requirement B5 - Access and facilities for the fire service.

3.3 For ease of reference this report addresses each of these requirements in order.

Standard guidance

3.4 Guidance on compliance with the requirements of Part B of the Building Regulations is presented in Approved Document B (ADB) which applies to applications under Part B Building Regulations made before 6 April 2007.

3.5 However, there is no obligation to adopt the recommendations given in ADB, or other guidance documents, if the functional requirements of the Regulations are met in some other way.

3.6 The Department for Education and Skills (DfES) are planning to publish BB100 “Designing against the risk of fire in schools” which, for applications made after its publication, will replace ADB as the guidance document for statutory compliance with Part B of the Building Regulations. The fire safety strategy proposed in this report does not address potential future recommendations of BB100, since it does not apply to Building Regulations applications made before 6 April 2007.

Regulatory Reform (Fire Safety) Order

3.7 The Regulatory Reform (Fire Safety) Order 2005 (FSO) came into effect in 2006 and replaced the Fire Precautions Act, the Fire Precautions (Workplace) Regulations and various other pieces of fire safety legislation.

3.8 Responsibility for compliance with the FSO will rest with the “responsible person”. In a school this will usually be the employer together with persons who may have control of other parts of the premises. In other cases the person(s) who has control of the premises will be the “responsible person”.

3.9 Where building work and fire protection measures comply with Part B of the current Building Regulations, additional physical measures should not normally be required under the FSO unless high-hazard materials or processes are introduced into the building.

3.10 The Fire Safety Order places on the “responsible person” specific duties such as carrying out a risk assessment and providing first-aid firefighting equipment. The main requirements of the Order are outlined in section 9 of this report and more detailed guidance is available in a series of Fire Safety Risk Assessment Guides published by the ODPM.
4 Means of warning and escape

Fire alarm and detection systems

Alarm

4.1 An electrical fire alarm system will be provided in accordance with BS 5839: Part 11.8 incorporating sufficient traditional sounders to be clearly audible throughout the new and refurbished buildings. Flashing beacons will also be provided in areas where people with hearing impairment may be in relative isolation (e.g. toilets) or where ambient noise levels are high (>90dbA).

4.2 Manual call points in accordance with BS 5839: Part 211.9 or BS EN 54-1111.11 will be provided adjacent to all storey exits and final exits.

Detection

4.3 Automatic fire detection systems are not normally needed to comply with the recommendations of ADB for assembly premises. However, to meet client requirements and provide an enhanced level of safety, an automatic fire detection system in accordance with the recommendations of BS 5839: Part 111.8 will be provided the system will be specified to an L2 standard.

4.4 The system will be of the analogue addressable type. A main panel will be installed at a location to be agreed with the fire and rescue service with individual panels in each building.

4.5 The system will generally utilise optical smoke detectors but heat detectors will be installed where there is a potential for steam or fumes, etc., to give rise to unwanted alarms (e.g. in kitchens and plant rooms). Beam detectors or other types of smoke detection will be considered for use at the top of the voids connecting the common circulation spaces.

4.6 Since the building will benefit from sprinkler protection throughout, each sprinkler head will effectively act as an automatic heat detector. Operation of a sprinkler head will activate the fire alarm.

Cause and effects

4.7 Activation of a single device (detector, call point or water flow device i.e. sprinkler flow switch) will cause the evacuation signal throughout the building in which fire has been detected.

4.8 The evacuation signal will be sounded throughout the remaining buildings on activation of a second device or on expiry of a three minute investigation period.

4.9 During the hours of normal occupancy, the reception office staff (secretary) will make a manual call to the emergency services 999 facility, where safe to do so, in addition to the automatic call to the fire service.
**Occupant numbers**

4.10 For colleges A, B and C, the SEN and 6th Form building occupancy figures have been confirmed by Nicholas Hare Architects, as set out in tables 2 – 5, below. The ground floor populations of colleges A, B and C include a 93 person lecture theatre at ground floor.

4.11 For the remainder of the buildings for the purposes of means of escape from each storey, the maximum number of occupants on each teaching level has generally been assessed on the onerous assumption that all classrooms, laboratories, studios and workrooms are simultaneously occupied by with 32 occupants.

4.12 For other areas the, the population has either been based on floor space factors from ADB or assumptions based on the proposed maximum population for the school.

4.13 The following tables summarise the building populations and the populations on the upper floors. The storey populations have been used to calculate the storey exits. Since the ground floor population will be able to exit independent of the stairs, the population of the upper floors has been used to establish stair widths as set out in Table 11.

4.14 On the above basis, for each building, the total number of occupants on each storey is as follows:

**Table 2: College A**

<table>
<thead>
<tr>
<th>Floor</th>
<th>No. of classrooms</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>First</td>
<td>5</td>
<td>160</td>
</tr>
<tr>
<td><strong>Total upper floor population</strong></td>
<td><strong>260</strong></td>
<td></td>
</tr>
<tr>
<td>Ground</td>
<td>3</td>
<td>189</td>
</tr>
<tr>
<td><strong>Total building population</strong></td>
<td><strong>449</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Table 3: College B**

<table>
<thead>
<tr>
<th>Floor</th>
<th>No. of classrooms</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>First</td>
<td>5</td>
<td>160</td>
</tr>
<tr>
<td><strong>Total upper floor population</strong></td>
<td><strong>260</strong></td>
<td></td>
</tr>
<tr>
<td>Ground</td>
<td>3</td>
<td>189</td>
</tr>
<tr>
<td><strong>Total building population</strong></td>
<td><strong>449</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Table 4: College C**

<table>
<thead>
<tr>
<th>Floor</th>
<th>No. of classrooms</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td>4</td>
<td>130</td>
</tr>
<tr>
<td>First</td>
<td>6</td>
<td>190</td>
</tr>
<tr>
<td><strong>Total upper floor population</strong></td>
<td><strong>320</strong></td>
<td></td>
</tr>
<tr>
<td>Ground</td>
<td>4</td>
<td>213</td>
</tr>
<tr>
<td><strong>Total building population</strong></td>
<td><strong>533</strong></td>
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</table>
### Table 5: DT & Art

<table>
<thead>
<tr>
<th>Floor</th>
<th>No. classrooms</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td>6</td>
<td>170</td>
</tr>
<tr>
<td>First</td>
<td>5</td>
<td>105</td>
</tr>
<tr>
<td><strong>Total upper floor population</strong></td>
<td><strong>275</strong></td>
<td></td>
</tr>
<tr>
<td>Ground</td>
<td>4</td>
<td>88</td>
</tr>
<tr>
<td><strong>Total building population</strong></td>
<td><strong>363</strong></td>
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### Table 6: 6th Form College

<table>
<thead>
<tr>
<th>Floor</th>
<th>No. classrooms</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td>8</td>
<td>250</td>
</tr>
<tr>
<td>First</td>
<td>8</td>
<td>250</td>
</tr>
<tr>
<td><strong>Total upper floor population</strong></td>
<td><strong>500</strong></td>
<td></td>
</tr>
<tr>
<td>Ground</td>
<td>4</td>
<td>189</td>
</tr>
<tr>
<td><strong>Total building population</strong></td>
<td><strong>689</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Table 7: SEN & Music

<table>
<thead>
<tr>
<th>Floor</th>
<th>No. classrooms</th>
<th>Population</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td>3</td>
<td>143</td>
<td>Includes 47 in practice &amp; ensemble</td>
</tr>
<tr>
<td>First</td>
<td>2</td>
<td>133</td>
<td>Inc. 69 in group rooms, PSU &amp; LSU</td>
</tr>
<tr>
<td><strong>Total upper floor population</strong></td>
<td><strong>276</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground</td>
<td>3</td>
<td>72</td>
<td>Includes higher staff ratio</td>
</tr>
<tr>
<td><strong>Total building population</strong></td>
<td><strong>381</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 8: Central Facilities

<table>
<thead>
<tr>
<th>Floor</th>
<th>Use</th>
<th>Area (m²)</th>
<th>Popn.</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Library</td>
<td>285</td>
<td>43</td>
<td>7m²/person + 2 admin</td>
</tr>
<tr>
<td></td>
<td>Hall</td>
<td>450</td>
<td>465</td>
<td>Design occupancy for one college</td>
</tr>
<tr>
<td>Ground</td>
<td>Drama</td>
<td>180</td>
<td>64</td>
<td>Design occupancy for 2 classes</td>
</tr>
<tr>
<td></td>
<td>Offices</td>
<td>233</td>
<td>24</td>
<td>Assessed at 10m²/person</td>
</tr>
<tr>
<td><strong>Total building population</strong></td>
<td><strong>596</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 9: Sports & PE

<table>
<thead>
<tr>
<th>Use</th>
<th>Area (m²)</th>
<th>Popn.</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sports Hall</td>
<td>598</td>
<td>&lt;600</td>
<td>Less than occupancy for one college</td>
</tr>
<tr>
<td>Activity Studio</td>
<td>180</td>
<td>&lt;180</td>
<td>Assumed as less than 1m²/person</td>
</tr>
<tr>
<td>classrooms</td>
<td>112</td>
<td>64</td>
<td>Assumed 32/classroom</td>
</tr>
<tr>
<td><strong>Total building population</strong></td>
<td><strong>844</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 10: Dining & Kitchen

<table>
<thead>
<tr>
<th>Use</th>
<th>Area (m²)</th>
<th>Pop.</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dining Hall</td>
<td>443</td>
<td>443</td>
<td>Assume 1m²/person</td>
</tr>
<tr>
<td>Kitchen</td>
<td>167</td>
<td>24</td>
<td>Assume 7m²/person</td>
</tr>
<tr>
<td>6th Form Lounge</td>
<td>81</td>
<td>48</td>
<td>Based on number of seats</td>
</tr>
</tbody>
</table>

**Total building population** 515

### Design of horizontal escape routes

4.15 All rooms and sections of the buildings will generally be provided with at least two escape routes except where the single-direction distance of travel is less than 18m and the room or area has an occupant capacity of 60 or less. This is consistent with the recommendations of ADB.

4.16 Where escape is available in at least two directions (separated by at least 45°) the maximum travel distance to the nearest exit will generally not exceed 45m and is therefore consistent with the recommendations of ADB.

4.17 For places of special fire hazard, the travel distances in a single direction and at least two directions within the room will be limited to 9m and 18m, respectively. The rooms affected will be:

- oil-filled-transformer/switchgear rooms;
- boiler rooms;
- storage for fuel or other highly flammable materials;
- rooms housing fixed internal combustion engines;
- school laboratories;
- school technology rooms with open heat sources;
- school kitchens;
- school stores for chemicals or PE mats.

4.18 There will be a Food Technology room where the maximum single direction travel distance will be approximately 18m. However, the open heat source in this room will be fixed gas cookers. The cookers will be located remote from the entrance door additionally the gas supplies to the cookers will be shut off on activation of the fire alarm system. It is therefore considered that the proposed arrangement complies with the functional requirements of the Building Regulations.

4.19 Where more than 600 people occupy a storey, at least three exits will be provided in accordance with the recommendations of ADB.

4.20 All doors on escape routes that accommodate more than 60 people will be hung to open in the direction of escape.
Inner rooms

4.21 All inner rooms with only a single escape route will accommodate less than 60 people and the dead-end travel distance will not exceed 18m. In accordance with the recommendations of ADB the access room will be provided with automatic smoke detection and a suitable alarm system to give immediate warning of a fire in the access room.

4.22 There will be no inner-inner rooms. (The central circulation areas in Colleges A, B, C, the Sixth Form College, DT & Art and Facilities, are not considered as rooms).

Access to storey exits

4.23 Colleges A, B, C, the Sixth Form College, DT & Art and Facilities will each contain a central circulation space with void(s) linking the ground and upper floor(s).

4.24 ADB does not provide any specific guidance on this issue and therefore the design complies with the letter of the guidance in ADB without any limit to travel distance on the balcony, subject to overall travel distances to escape stairs being compliant. Moreover, ADB does not normally recommend the provision of automatic fire detection in schools (paragraph 1.31) or sprinkler protection.

4.25 Notwithstanding this, it is considered that the risks to occupants on the upper floors from a fire occurring on a level below need to be addressed. In functional terms, the risks to occupants of these rooms are considered comparable to those for occupants in inner rooms: the common circulation space acts as the “access room”. Accordingly, it is considered that the means of escape for the accommodation that will be reliant on balcony escape, will be satisfactory by:

- providing comprehensive automatic fire detection to the common circulation spaces and all accommodation accessed off them;
- limiting the travel distance on the balcony to either a storey exit or an exit to a separate fire compartment to a maximum of 18m in two directions (the usual limit for a dead end travel distance); and

4.26 In addition all the buildings will be provided with comprehensive sprinkler protection to all areas.

4.27 There will be a limited number of rooms on the upper floors of the Sixth Form College and for a plant room in Facilities, where, because the stairs are not at the ends of the building (to limit balcony travel distance) the travel distance on the balcony will be in one direction only. However, the overall travel distance from within the room to the storey exit will not exceed 18m. This arrangement is considered to be consistent with the principles set out above.

4.28 Accordingly, by providing the additional protection described above and limiting the travel distance on the balcony, it is considered that the means of escape arrangements will meet the functional objectives of Part B of the Building Regulations, without additional measures such as smoke management.

Dining Hall

4.29 The Dining Hall will be provided with at least two escape routes leading directly to a storey exit without passing through a kitchen or other area of high fire hazard.
Plant rooms

4.30 Escape travel distances in plant rooms that contain only air handling plant and other low-hazard equipment will not exceed 18m where only a single direction of escape is available.

4.31 In higher-hazard rooms (e.g. boiler plant rooms and rooms containing oil filled transformers) the travel distance within the room will be restricted to 9m and 35m respectively.

4.32 Roof top plant will be accessed via the central atria of each building. Alternative escape will be available to the head of a protected stair where a vertical ladder will be available to provide access to the top floor landing. Travel distances will comply with the recommendations of ADB i.e. 60m in a single direction and 100m where escape will be available in two directions.

Protected corridors

4.33 ADB recommends that where corridors form part of a dead-end escape route they be constructed as protected corridors (i.e. enclosed in 30 minutes fire-resisting construction with FD30S fire doors) and that every dead-end corridor more than 4.5m long be separated from any part of a connecting corridor that provides two means of escape or continues past one storey exit to another.

4.34 These recommendations are impractical for limited accommodation accessed off short corridors open to the central circulation spaces in Colleges A, B, C, the Sixth Form College, DT & Art and Facilities. It is considered that, in view of the limited numbers of occupants in the rooms affected, the provision of automatic fire detection provides an equivalent level of protection to that which would be provided by a protected corridor. In addition the buildings will be provided with an automatic sprinkler system.

Subdivision of corridors

4.35 Corridors more than 12m long that connect two or more storey exits will be subdivided by self-closing fire doors located approximately half way between the storey exits.

Width of escape routes

4.36 The clear width of horizontal escape routes from the building will comply with the recommendations of table 5 of ADB. In all areas needing to be served by two exits the exit capacity has been calculated assuming that the largest exit is unavailable.

4.37 Based on the occupant numbers set out in 4.10 et seq. the storey exits will be as set out below:

Colleges A, B, C, DT/Art and SEN/Music

4.38 The storey exits on upper floors and independent exits at ground floor will each provide a minimum clear width of 1050mm. Capable of accommodating 220 people.
Sixth Form College

4.39 The storey exits on upper floors will provide a minimum clear width of 1500mm. The independent exits at ground floor will each provide a minimum clear width of 1250mm.

Central Facilities

4.40 The storey exits on the first floor will both provide a minimum clear width of 850mm. Access to the exit from the A/V balcony will be available from the library via the bridge link at all times.

4.41 The exits from the main circulation space at ground floor will each provide a minimum clear width of 1050mm. The 2 no. independent exits from the Assembly Hall will each provide a minimum clear width of 1200mm.

Sport/PE

4.42 The exits from the main circulation space at ground floor will each provide a minimum clear width of 1500mm. The 2 no. independent exits from the Sports Hall will each provide a minimum clear width of 1500mm. The sports hall will therefore have capacity for up to 600 people.

Dining Hall

4.43 The independent exits from the Dining Hall will provide a combined minimum clear width of 2405mm, evenly distributed, having discounted one exit.

4.44 Accessibility requirements are outside the scope of this report but it should be noted that wider corridors and doorways may be required to satisfy the requirements of Part M of the Building Regulations. Guidance is given in Approved Document M (ADM) 11.6.

Vertical escape

Width of escape stairs

4.45 The means of escape from the buildings have been designed on the basis of simultaneous evacuation and therefore the stair capacity has been calculated on the basis of table 7 of ADB.

4.46 The escape stairs will not be provided with protected lobbies and it is therefore necessary to discount a stair.

4.47 Based on the occupant numbers on the upper floors set out in 4.10 et seq, the stair widths will be as set out overleaf.
Table 11: Stair widths

<table>
<thead>
<tr>
<th>Building</th>
<th>No. of stairs</th>
<th>Popn. on upper floors</th>
<th>Min. Stair Width (mm)</th>
<th>Stair capacity (persons)</th>
<th>Stair capacity as % of building capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>College A</td>
<td>2</td>
<td>260</td>
<td>1100</td>
<td>260</td>
<td>100</td>
</tr>
<tr>
<td>College B</td>
<td>2</td>
<td>260</td>
<td>1100</td>
<td>260</td>
<td>100</td>
</tr>
<tr>
<td>College C</td>
<td>2</td>
<td>320</td>
<td>1400</td>
<td>335</td>
<td>104</td>
</tr>
<tr>
<td>6th Form</td>
<td>2</td>
<td>500</td>
<td>1700</td>
<td>410</td>
<td>82*</td>
</tr>
<tr>
<td>DT &amp; Art</td>
<td>2</td>
<td>275</td>
<td>1400</td>
<td>335</td>
<td>121</td>
</tr>
<tr>
<td>SEN/Music</td>
<td>2</td>
<td>280</td>
<td>1200</td>
<td>285</td>
<td>101</td>
</tr>
<tr>
<td>Central Facilities</td>
<td>2</td>
<td>45</td>
<td>1100</td>
<td>260</td>
<td>570</td>
</tr>
</tbody>
</table>

* see 4.48 - 1.1, below

4.48 For the Sixth Form College, in the event that the building were fully occupied at any one time, there would be a total of 500 on the upper floors. This would exceed the stair exit capacity of 410 people.

4.49 A diversity factor of 80% is commonly applied to schools when considering stair capacities since, due to timetabling constraints, it is extremely unlikely that both floors will be occupied to capacity simultaneously.

4.50 The proposed arrangement will provide capacity for 82% of the total occupancy capacity of the building and the arrangement is therefore considered to comply with the functional requirements of the Building Regulations. The school will need to confirm that a maximum upper floor population of 410 at any one time satisfies their operational requirements and that this limit can be managed.

4.51 This approach has been confirmed in principle with Building Control; however, this will be subject to detailed approval.

4.52 For all buildings with more than one floor, the Ground Floor accommodation does not escape via the stair enclosures and therefore the ground floor population does not need to be considered when assessing stair capacities.

**Protection of escape stairs**

4.53 All escape stairs will be enclosed in construction having a fire resistance of at least 30 minutes.

**Use of space within stairways**

4.54 The space within the stairways will be restricted to sanitary accommodation and lift-wells.

**Provisions for mobility impaired people**

4.55 Flat or ramped access will be provided to enable wheelchair users to reach a final exit or a refuge.
4.56 Protected refuges will be provided within or immediately adjacent to every protected escape stair (i.e. in a protected lobby, protected corridor, external balcony or a compartment).

4.57 Each refuge space will be an area accessible to a wheelchair of minimum dimensions 900mm by 1400mm, in which a wheelchair user can await assistance. The wheelchair space will not obstruct the flow of other people escaping.

4.58 We understand, from Balfour Beatty, that the school have requested that a communications system at disabled refuge points not be provided due to the potential for misuse / vandalism. The school will develop a management system based on nominated staff being responsible for checking wheelchair refuges. This may include the use of wireless communication. Where parts of the school may be used out of hours the operator of the school during this time will be responsible for maintaining the system developed by the school.

4.59 The management procedures will include the preparation of Personal Evacuation Plans for persons who may need assistance. — Visitors out of hours elaborate

**General escape provisions**

**External walls of protected stairs**

4.60 Where a protected stair projects or is recessed such that there is an internal angle between the external wall of the stair and the building façade, B100 recommends that the distance between unprotected areas in the stair and unprotected areas in the façade should not be less than 1800mm.

4.61 At Crown Woods parts of the external elevation within 1.8m of the stair will not be fire rated. This arrangement is considered to comply with the functional requirements of the Building Regulations since:

- The accommodation will be adjacent to the glazing will predominantly used for circulation within the atrium
- The atrium will be provided with a sprinkler system
- The glazing in the external wall will be toughened.
- The escape stair capacities have been calculated assuming that one stair will be unavailable.

**Fire-resisting protection to escape routes**

4.62 All walls, floors, doors and partitions that need to be fire-resisting to protect escape routes will provide a minimum of 30 minutes fire resistance.

**Doors protecting escape routes**

4.63 All fire doors protecting escape routes will be provided with smoke seals complying with the recommendations of Appendix B of ADB; i.e. they will be designated FD30S.

4.64 Where doors are hung to swing in both directions, or where they are used to subdivide corridors, they will be provided with vision panels.
Height of escape routes

4.65 All escape routes will have a clear headroom of at least 2m with no projections below this height, except for doorways.

Design of ramps and stairs

4.66 All ramps on escape routes will meet the provisions of Approved Document M11.6(ADM).

4.67 Stairs that are used only for escape in the downward direction may not need to be designed in accordance with Approved Document M11.6. However, it should be noted that there may then be additional requirements for accessibility contained in ADM that fall outside the scope of this report.

Lifts

4.68 Since the lift wells do not connect different compartments ADB does not require that they be constructed as protected shafts.

Final exits

4.69 Final exits will be of sufficient width to accommodate the number of persons expected to use them.

4.70 Final exits will be sited to ensure rapid dispersal from the building and be located away from smoke outlets and from openings to hazardous rooms such as transformer rooms, refuse or boiler rooms.

4.71 Where final exits serve a level or ramped escape route, a level threshold will be provided.

Lighting of escape routes

4.72 All escape routes will be provided with adequate artificial lighting, and lighting on escape stairs will be on a separate circuit from that supplying any other part of the escape route.

4.73 Emergency escape lighting is not required for schools operating during normal school hours. However, to address the use of the buildings outside these hours an emergency escape lighting system in accordance with BS 5266: Part 11.12 will be provided throughout all escape routes and the occupied areas of the building, as recommended in table 9 of ADB. On power failure the emergency escape lighting will be capable of operating for 3 hours.

Exit signs

4.74 Every escape route (other than those in ordinary use) will be marked by emergency exit signs complying with BS 5499: Part 11.14 and be located in accordance with the recommendations of BS 5499: Part 411.15.

4.75 Refuges will also be identified with appropriate signage which will include a blue mandatory sign worded “Refuge - keep clear”.
**Access control measures**

4.76 Measures designed to restrict access into or within the building for security purposes will not adversely affect the escape provisions. Where a door on an escape route needs to be secured when the building is occupied it will be capable of being readily operated, without a key, from the side approached by persons making their escape.

4.77 Further consideration of escape provisions will be necessary if electronic security measures are envisaged.
5  Internal fire spread (linings)

Linings

5.1 The wall and ceiling linings throughout the building will comply with either the national or European classifications given in Table 1 (see also table 10 of ADB).

Table 12. Classification of wall and ceiling linings

<table>
<thead>
<tr>
<th>Location</th>
<th>National class</th>
<th>European class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walls and ceilings in rooms up to 30m²</td>
<td>3</td>
<td>D-s3, d2</td>
</tr>
<tr>
<td>Walls and ceilings in other rooms</td>
<td>1</td>
<td>C-s3, d2</td>
</tr>
<tr>
<td>Circulation spaces</td>
<td>0</td>
<td>B-s3, d2</td>
</tr>
</tbody>
</table>

Plastic roof-lights, glazing and lighting diffusers, etc.

5.2 Plastic roof-lights, glazing, suspended ceilings and lighting diffusers will comply with the recommendations of paragraphs 5.7 to 5.16 of ADB.
6 Internal fire spread (structure)

Loadbearing elements of structure

6.1 In accordance with Table A2 of Approved Document B loadbearing elements of structure will have 60 minutes fire resistance.

6.2 ADB states that structural elements that support only the roof and that do not fulfil any other structural role (e.g. providing bracing to the structural frame) do not normally need to be fire-resisting. However, where the roof structure supports heavy items of plant those elements of structure will be fire-resisting.

Sprinklers

6.3 There is no statutory requirement for sprinkler protection in schools. However, sprinklers will be installed throughout the new buildings primarily to satisfy insurance requirements.

6.4 Whilst the system will not contain all of the additional requirements for a life safety sprinkler system, (e.g. the provision of a single tank and pump-set is proposed) it will be designed to provide a high degree of reliability and will offer an enhanced level of protection to occupants. The system will incorporate fast response heads. Therefore in certain specific circumstances, described elsewhere in this report, the benefits of sprinkler protection have been taken into account when considering variations from the recommendations of ADB.


6.6 The Joint Code of Practice states that the design should comply with The Loss Prevention Council (LPC) Rules for Automatic Sprinklers Installations; incorporating BS EN 12845: Fixed firefighting systems - Automatic Sprinkler Systems - Design, installation and maintenance. The LPC rules include Technical Bulletin (TB) 221 Sprinkler Protection of Schools, which includes specific guidance for the sprinkler protection of Schools.

Compartment walls

6.7 ADB recommends that large buildings are subdivided into fire-resisting compartments with the objective of:

a) preventing rapid fire spread that could trap the occupants;

b) reducing the chances of a fire becoming so large that it threatens fire service personnel and people in the vicinity of the building.
6.8 Fire-resisting or compartment walls may be needed to:

a) comply with recommended compartment size limits;
b) separate adjacent buildings;
c) separate different purpose groups within the same building;
d) separate different occupancies;
e) provide for progressive horizontal evacuation;
f) enclose places of special fire hazard;
g) divide the building into separated parts;
h) reduce limitations on unprotected areas.

6.9 In this instance items (a) and (f) are applicable and are discussed below.

Limitation of compartment size

6.10 Table 12 of ADB sets out maximum recommended compartment areas for a single floor level. For school buildings, an area limit of 800m² is recommended.

6.11 However, the guidance takes no account of the additional levels of protection provided by sprinklers that will be provided (see 6.3 et seq.)

6.12 Accordingly, a compartment size limit of 2000m², which is applied to all other non-sprinklered assembly buildings, is considered appropriate for a sprinklered school. It can be seen form Table 1, that each of the buildings will have compartment sizes well within this limit and therefore compartment walls are not proposed for any building to limit compartment size.

Places of special fire hazard

6.13 The areas listed below are designated as places of special fire hazard and will be enclosed within 30 minute fire-resisting construction (walls, floors and doors); penetrating services will be fire stopped and provided with fusible-link fire dampers as appropriate.

- oil-filled-transformer and switchgear rooms;
- boiler rooms;
- storage for fuel or other highly flammable materials;
- rooms housing fixed internal combustion engines;
- school laboratories;
- school technology rooms with open heat sources;
- school kitchens;
- school stores for chemicals or PE mats.
However, in order to facilitate a natural ventilation system, slots approximately 100mm deep will be provided at high level between technology and science rooms and the central atrium. The proposed arrangement, shown diagrammatically in Figure 2 is considered to comply with the functional requirements of the Building Regulations since:

- The rooms will be provided with sprinkler protection, reducing the hazard presented by the use of these rooms (this is consistent with the recommendations of BS9999).
- The Building will be provided with a Category L2 automatic fire detection and alarm system.
- Due to the arrangement of the suspended ceiling a 900mm smoke reservoir will be formed within the room delaying smoke leakage into the atrium - see figure 2, below.
- The remainder of the wall separating the rooms from the atrium will achieve a fire resistance of at least 30 minutes.

Figure 2 – Slot ventilation arrangement.

Construction of compartment walls

Compartment walls will extend to the soffit of the structural slab above (i.e. go from slab to slab) except at the top storey, where they will be continued through the roof space. Allowance will be made for structural movement and flexible fire stopping will be provided at the junctions between fire-resisting elements.

Where a compartment wall meets external glazing, the junction will be fire stopped with suitable materials (e.g. mineral fibre or a proprietary fire stopping system).
Floors

6.17 Since the building falls within the assembly purpose group, ADB does not recommend that each floor be constructed as a compartment floor. Accordingly compartment floors will not be provided.

Shafts for services

6.18 Since the buildings will not contain any compartment floors, shafts for lifts, chutes, ducts and pipes that pass through floors will not generally be constructed as protected shafts.

Concealed spaces (cavities)

6.19 Any concealed spaces or cavities in the construction will be sealed with cavity barriers in accordance with the recommendations of section 10 (and Table 13) of ADB. Cavity barriers will be constructed of materials capable of providing a fire resistance of 30 minutes integrity and 15 minutes insulation.

6.20 Cavity barriers will be provided:

a) at the edges of cavities and around openings penetrating them;

b) at the junctions between external cavity walls and compartment walls and floors;

c) at junctions between a cavity wall and every compartment or fire resisting barrier;

d) on protected escape routes, above and below any fire resisting construction that is not carried the full storey height;

e) above any fire doors provided in corridors to sub-divide escape corridors;

g) to subdivide any cavity (including roof spaces) so that the distance between cavity barriers does not exceed 20m (10m for any cavity other than a roof void that has surfaces in the void that do not meet at least Class 1 or Euroclass C).

6.21 Various exceptions and additions to the above can apply and therefore reference should be made to section 10 and table 13 of ADB for specific guidance.

Protection of openings and fire stopping

6.22 All penetrations through fire resisting separating elements (e.g. protected escape routes and compartment walls/floors) will be provided with fire doors, fire stopping, fire seals and dampers in accordance with the recommendations of section 11 of ADB and BS 5588: Part 9.
Fire doors

6.23 Doors in compartment walls will have the same fire resistance as the wall in which they are installed but do not need to be smoke sealed unless they also support the means of escape. For further information on the recommendations relating to fire doors see Annex A.2 of this report and Appendix B of ADB.

Fire stopping

6.24 Where cables, conduits, ducts or pipes pass through a fire resisting barrier the penetrations will be sealed with a proprietary sealing system which has been shown by test to maintain the fire resistance of the barrier.

6.25 Alternatively the opening through the barrier will be kept as small as practical and any gaps filled with suitable fire-stopping materials (e.g. mineral fibre, cement mortar or gypsum plaster). Where non-rigid materials are utilised or the unsupported span is 100mm or more the fire-stopping material will be reinforced or supported by suitable non-combustible materials.

Pipes

6.26 Non combustible pipes with a melting point greater than 800°C (e.g. cast iron, copper, steel) with a maximum diameter of 160mm and pipes of other materials of 40mm diameter or less will not be provided with dampers or fire collars. uPVC pipes of up to 110mm diameter will not be provided with fire collars where they penetrate into a fire resisting service riser (protected shaft).

6.27 Pipes of a larger diameter will be provided with a suitable means of preventing fire spread via the pipe (e.g. intumescent collar or fire damper).

Protection of ventilation ductwork

6.28 Where ductwork penetrates fire resisting construction, securely fixed mechanical fire dampers will be installed within the thickness of the construction. The dampers will be installed so as to allow inspection, testing and maintenance of the damper and actuator.

6.29 Fire dampers will be classified to BS EN 13501-3 (or BS 476 Part 8 or Part 22) and will have the same fire resistance (integrity) as the wall or floor they penetrate (subject to a minimum fire resistance of 60 minutes).

6.30 The installation of fire dampers or protection of ductwork will be in accordance with the recommendations of BS 5588: Part 9.

6.31 Where ductwork is used for smoke control or kitchen extract purposes fire dampers will not be installed. Where a kitchen or smoke control duct passes through another fire compartment the ductwork will be fire resisting or be enclosed within a fire resisting shaft.

6.32 Dampers will be activated by means of a thermal device that will cause damper closure at a temperature of approximately 74°C.
7 External fire spread

External walls

Fire resistance

7.1 Except for the allowable unprotected areas, the external walls that are located more than 1m from the site (or notional) boundary will be of fire-resisting construction providing 60 minutes integrity and 15 minutes insulation when tested from the internal face of the building.

7.2 Allowable unprotected areas need not be provided with any specific level of fire resistance. (e.g. windows may be glazed with non-fire-resisting glass).

External surfaces and construction

7.3 The external wall surfaces (where located more than 1m from the boundary) will meet the following surface classification index (i) not more than 20 when tested in accordance with BS 476: Part 6.

Space separation

7.4 Since the buildings will be classed as assembly buildings, ADB recommends that external fire spread between buildings on the same site be considered. The site plan shows that, in general, the buildings will be arranged such that 100% unprotected areas will be permitted. In the limited areas where building facades will be opposing (parts of Sports Hall/6th Form and Sports Hall/SEN), the sections of wall in the 6th form and SEN Blocks will be brick cladding and will achieve 60 minutes fire resistance.

Roof coverings

7.5 The minimum separation distance to any point on a relevant boundary is 8m and therefore in accordance with Table 17 of ADB all roof covering materials will comply with the designation BA, BB or BC when tested in accordance with BS 476: Part 3.

Plastic rooflights

7.6 Any plastic rooflights will comply with the recommendations of paragraphs 15.6 and 15.7 of ADB.
8 Access and facilities for the fire service

Vehicle access

8.1 The buildings will not be of sufficient height to warrant the provision of firefighting shafts, therefore perimeter access will be provided for the fire service vehicles. Based on the total floor areas in Table 1, in accordance with table 20 of ADB each building will need 15% perimeter access or fire service vehicle access to within 45m of the building footprint.

8.2 Access will be available to 15% of the perimeter of each building. Therefore the proposed arrangement complies with guidance. Fire service vehicle access will be available to the SEN building and Colleges A, B and C via a perimeter roadway accessed from Bexley Road. In addition the playgrounds of Colleges A, B and C will be arranged to allow fire service vehicle access. Access to the remainder of the building will be provided via the service yards and car park.

8.3 In addition to the main school there is an existing Exclusion Centre located in a modular building remote from the main school buildings with no route for fire tender access. Since access to the building is being made no worse with respect to Requirement B5 the building complies with the Building Regulations by virtue of Regulation 4(2).

8.4 The design of fire service vehicle access routes and hard standings will generally be in accordance with paragraphs 17.8 to 17.11 of ADB. In particular the route will comply with the following:

- Minimum road width between kerbs = 3.7m
- Minimum turning circle between kerbs = 16.8m
- Minimum carrying capacity = 12.5 tonnes

8.5 However, the perimeter roadway will not be provided with an ADB compliant hammerhead or turning circle at the end of the road adjacent to College A. Turning facilities will be provided in each playground of Colleges A, B and C. This arrangement has been agreed with the fire service.
9 Regulatory Reform (Fire Safety) Order

First aid firefighting equipment

9.1 To comply with the Fire Safety Order, suitable portable fire extinguishers will need to be provided throughout the buildings in accordance with the recommendations of BS 5306: Part 8.10.

Risk assessment

9.2 The responsible person(s) will be required to carry out a fire risk assessment as soon as the buildings are occupied.

9.3 Guidance on the risk assessment process is given in a series of ODPM guides entitled Fire Safety Risk Assessment. Unless hazardous materials or processes are introduced into a building complying with the Building Regulations it should not normally be necessary to provide additional physical fire safety measures over and above those required to satisfy Part B of the Building Regulations (other than portable fire extinguishers).

Fire safety management procedures

9.4 This fire safety strategy has been developed on the assumption that the building will be properly managed.

9.5 Procedures for the management of fire safety should be developed and documented in a fire safety manual. Guidance on fire safety management procedures is given in BS 5588: Part 12 and a typical fire safety manual might include:

1. Fire safety policy statement
2. Fire safety management structure
3. Coordination with other parties (e.g. in a shared building)
4. Emergency response
5. Evacuation of people with special needs
6. Contingency and salvage plans
7. Emergency responsibilities of designated staff
8. Summary of fire safety strategy and plans for the building
9. Fire risk assessment
10. Procedures for dissemination of information
11. Selection and control of materials
12. Maintenance and testing of fire safety equipment
13. Routine housekeeping (e.g. removal of combustible waste)
14. Fire safety training
15. Fire drills
16. Decoration, alteration and building work
17. Audit procedures and updating of the manual
18. Fire safety records
19. References.

9.6 When the building is in use a suitable fire safety management regime should be established and any variations to the procedures should be the subject of a risk assessment.
10 Conclusions

10.1 On the basis of the fire safety strategy presented in this report, it is our opinion that the buildings will satisfy the functional requirements of Part B (fire safety) of the Building Regulations.

10.2 To comply with the Regulatory Reform (Fire Safety) Order, the building user(s) will need to implement suitable fire safety management procedures and carry out a fire risk assessment (see section 9). Subject to suitable operational procedures and risk assessment, the physical fire safety measures described in this report would be expected to satisfy the requirements of the Fire Safety Order.

10.3 As the requirements of the Building Regulations and Fire Safety Order are set out in functional terms and can be interpreted in differing ways, it is essential that the recommendations of this report are agreed with the relevant approvals bodies prior to implementation.
11 References

11.1 The Building Regulations 2000, (Office of the Deputy Prime Minister) HMSO

11.2 Regulatory Reform (Fire Safety) Order 2005, SI 2005 No 1541, the Stationery Office 2005


11.7 Fire Safety Risk Assessment, Office of the Deputy Prime Minister 2006


11.10 BS 5839: Part 8: 1998, Fire detection and alarm systems for buildings, Code of practice for the design and installation and servicing of voice alarm systems

11.11 BS EN 54-11, Fire detection and fire alarm systems, Manual call points


11.15 BS 5499: Part 4: 2000, Safety signs including fire safety signs, Code of practice for escape route signing

11.16 BS 5588: Part 5: 2004, Fire precautions in the design construction and use of buildings, Access and facilities for firefighting


11.20 BS 5588: Part 12: 2004, Fire precautions in the design, construction and use of buildings, Managing fire safety

11.21 BS EN 12101-2: 2003, Smoke and heat control systems. Specification for natural smoke and heat exhaust ventilators

11.22 BS EN 12101-3: 2002, Smoke and heat control systems. Specification for powered smoke and heat exhaust ventilators

11.23 External fire spread, Building separation and boundary distances, Report BR 187. BRE 1991

11.24 BS 476: Part 3 1958 or 2004, Fire tests on building materials and structures. External fire exposure roof tests

11.25 BS 476: Part 8: 1972, Fire tests on building materials and structures. Test methods and criteria for the fire resistance of elements of building construction


11.27 BS EN 13501-2, Fire classification of construction products and building elements. Classification using data from fire resistance tests, excluding fire ventilation services

11.28 BS EN 13501-5, Fire classification of construction products and building elements, Classification using test data from external fire exposure roof tests


11.30 BS 5306: Part 8: 2000, Fire extinguishing installations and equipment on premises, Selection and installation of portable fire extinguishers

11.31 BS EN 12845: 2003, Fixed firefighting systems, Automatic sprinkler systems. Design installation and maintenance
A.1 Annex 1 - Drawings and information

A.1.1 The following information has been used in the preparation of this report:

**Drawings**

Nicholas Hare Architects:

FF & E drawings uploaded to the project web portal on 2nd August 2007 as follows:

- 561CA-0-000/A
- 561CA-0-001/A
- 561CA-0-002/A
- 561CA-0-003/A
- 561CB-0-000/A
- 561CB-0-001/A
- 561CB-0-002/A
- 561CB-0-003/A
- 561CC-0-000/A
- 561CC-0-001/A
- 561CC-0-002/A
- 561CC-0-003/A
- 561CF-0-000/A
- 561CF-0-001/13
- 561CF-0-002/A
- 561DH-0-000/A
- 561DH-0-001/13
- 561DH-0-002/A
- 561DT-0-000/C
- 561DT-0-001/C
- 561DT-0-002/E
- 561DT-0-003/A
- 561SF-0-000/B
- 561SF-0-001/B
- 561SF-0-002/B
- 561SF-0-003/A
- 561SH-0-010/10
- 561SH-0-011/A
- 561SH-0-012/A
- 561SN-0-000/A
- 561SN-0-001/A
- 561SN-0-002/15
- 561SN-0-003/A
A.2 **Annex 2 - Fire protection systems**

**Fire doors**

A.2.1 Fire doors will be specified in accordance with the recommendations of Appendix B of ADB. For initial guidance some of the key recommendations are summarised below.

A.2.2 All fire doors will satisfy the appropriate fire resistance criteria in accordance with BS 476: Part 22 or BS EN 13501-2.

A.2.3 For example, doors satisfying these criteria for 30 minutes fire resistance would be designated FD30 or E30 respectively.

A.2.4 Doors protecting escape routes also need to restrict smoke leakage. A suffix (S) is added to denote compliance with national tests for smoke leakage and (Sa) for compliance with the European system.

A.2.5 For example doors satisfying the smoke leakage criteria and providing 60 minutes fire resistance would be designated either FD60S or E60Sa.

A.2.6 The test evidence used to substantiate the rating of a door should be checked to ensure that it is applicable to the whole installed assembly.

**Closers**

A.2.7 All fire doors will be fitted with self-closing devices or automatic release devices except for fire doors to cupboards and service shafts that will normally be kept locked shut.

**Signage**

A.2.8 Except for lift landing doors, all fire doors will be marked with the appropriate fire safety signs complying with BS 5499: Part 11 according to whether it is to be:

a) kept closed when not in use;

b) kept locked when not in use;

c) held open by an automatic release mechanism.

A.2.9 Fire doors to cupboards and service ducts will be marked on the outside and all other fire doors should be marked on both sides.
**Fire-resisting construction**

A.2.10 The fire resistance of various forms of construction is classified in terms of national (British Standard) tests or European tests.

A.2.11 Classification under the national system is based on BS 476: Parts 20 to 24 (or BS 476: Part 8 for items tested prior to 1988).

A.2.12 In the European system products are classified in accordance with BS EN 13501-2.

A.2.13 The fire resistance performance of a building element in a fire resistance test is specified in terms of the following criteria:

a) **Resistance to collapse** (loadbearing capacity). This applies only to loadbearing elements such as beams, columns, floors and loadbearing walls.

b) **Resistance to fire penetration** (integrity). This applies to separating elements such as compartment walls and doors, and indicates the length of time taken before the element is penetrated by significant gaps or flames.

c) **Resistance to heat transfer** (insulation). This indicates the length of time taken before a specified temperature is reached on the unexposed (cold) face of the element.

A.2.14 A compartment wall would need to satisfy all three criteria for the specified period whereas a door is normally only assessed in terms of its integrity performance.

A.2.15 Fire-resisting glazing must always satisfy the integrity criterion but does not always need to meet the insulation criterion.

A.2.16 Glazing in compartment walls will satisfy both the integrity and insulation criteria for the specified period of fire resistance. However, where glazed screens provide protection to escape routes, uninsulated glazing may be acceptable in limited areas. Guidance on the use of uninsulated glazing protecting escape routes is given in table A4 of ADB.
**Sprinklers**

A.2.17 Sprinkler systems will comply with the recommendations of BS 5306: Part 2\textsuperscript{11,29} or BS EN 12845\textsuperscript{11,31} for the relevant occupancy. Unless specified elsewhere in this report, the sprinkler system should incorporate the special provisions for life safety, which includes:

- subdivision into zones with a maximum of 200 heads per zone;
- electronic valve monitoring of each zone;
- wet pipe systems only;
- quick response heads (normally);
- duplicate installation control valve sets;
- duplicate water supplies.

A.2.18 Where the design includes variations from either of the above codes the sprinkler contractor may be unable to issue a certificate of conformity.

**Fire detection and alarm systems**

A.2.19 Fire detection and alarm systems will comply with BS 5839: Part 1.

A.2.20 The extent of detector coverage is determined by the category of system. Life safety systems are subdivided into different system types depending upon the extent of detector coverage:

- **L1** Detectors installed throughout all areas of the building.
- **L2** Includes areas covered by an L3 system plus full coverage of specified higher risk rooms.
- **L3** Includes the areas covered by an L4 system plus additional detectors in the rooms opening onto escape routes adjacent to the doors onto those escape routes.
- **L4** Detectors installed within all escape stairways, corridors and other areas forming common escape routes.
- **L5** Systems in which the protected area(s) and/or location of detectors are designed to satisfy a specific fire safety objective (with coverage different from categories L1 to L4). The extent of coverage may be more or less than in the other categories.

A.2.21 Detector spacing will vary according to room and ceiling geometry but typically under a flat ceiling smoke detectors will be located so that any point within a room is within 7.5m of a smoke detector or 5.3m of a heat detector.
**Emergency lighting**

A.2.22 Emergency lighting will be installed in accordance with the recommendations of BS 5266: Part 111.12 and Part 711.13.

A.2.23 The primary purpose of emergency lighting is to illuminate escape routes and safety equipment.

A.2.24 Specific recommendations are given in table 9 of ADB but an emergency lighting system would typically cover the following areas:

- exit doors;
- escape routes;
- areas immediately outside final exits; and external escape routes;
- emergency escape signs;
- stairways;
- open plan areas of more than 60m;
- changes in floor level;
- windowless rooms;
- all areas open to the public;
- toilet accommodation over 8m²;
- emergency control room;
- electrical generator, switchgear and battery rooms.

A.2.25 It is recommended that units with a standby power duration of 3 hours be utilised as this will often enable reoccupation of the building immediately after a power failure.

**Electrical power supplies**

A.2.26 Where it is essential for certain electrical equipment to continue to function during a fire, provisions should be made to ensure a secure supply. Relevant guidance is given in BS 5588: Part 5 and Part 11 but some of the main recommendations are highlighted below.

A.2.27 Electrical systems for fire extinguishing systems, sprinkler systems, smoke control systems, firefighting shaft systems, motorised fire shutters, CCTV systems installed for monitoring means of escape, and data communications systems that link fire safety systems will meet the following criteria.

**Wiring systems**

A.2.28 Wiring systems will meet the following criteria:

a) Wiring should:

1) consist of mineral-insulated, copper-sheathed cables conforming to BS 6207-1; or
2) consist of cables conforming to the requirements for classification as CWZ in accordance with BS 6387:1994; or
3) be protected against exposure to the fire by separation from any significant fire risk by a wall, partition or floor with a fire resistance not less than that required for the building.
b) The wiring systems will be separate from any circuit provided for any other purpose.

c) Jointing and termination methods will conform to BS 6207-2 and should be chosen to minimise any reduction in reliability and fire-resistance below that of un-jointed cable.

d) The wiring systems will be protected from mechanical damage.

Secondary power supply

A secondary power supply, such as an automatically starting generator or a supply from another substation, should be provided. The secondary supply should provide power within 15s of failure of the primary supply and be of sufficient capacity to maintain all life safety systems in operation for a minimum of 3 hours.

a) The electrical power supply to life safety and fire protection equipment should be separate from all other circuits in the building so that the failure of other equipment does not render the installation inoperative.

b) Each connection to the power supply should be via an isolating protective device reserved solely for the life safety and fire protection equipment and independent of any other main or sub-main circuit. Such isolating protective devices (with high-rupturing safety devices) should be clearly labelled and identified as to their purpose. They should be secured against unauthorized operation and should, except for maintenance, be kept locked on.

c) The supply to these isolating protective devices should be independent of the main switch for the building and be appropriately labelled.

d) The distribution should be so organised that the secondary supply remains live when the remainder of the building supplies are isolated in an emergency.

e) The primary and secondary sources of power should be protected against fire and water damage. They should be separated from each other, so that a failure of one system does not affect the other.

f) Cables, switchgear and other equipment transmitting the secondary power supply should be separated from those of the primary supply.

g) Monitoring facilities should be provided in the central control room (when provided) to show that power is available up to the final control point, e.g. motor contactor, for all fire safety systems.