

**CODE OF PRACTICE –
REFURBISHMENT
of COMMUNAL BUILDINGS
and
The FIRE RISK
of MULTILAYER PAINTS**



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and the Fire Risk of Multilayer Paints**

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Code of Practice -

Refurbishment of Communal Buildings and the Fire Risk of Multilayer Paints

Executive Summary

Objectives of the Code of Practice

This Code of Practice provides guidance for the painting of surfaces in multi-occupancy buildings that have been previously decorated with surface coating products in order to maintain or achieve the required fire performance characteristics of surfaces in that end use.

The objectives of the Code are to raise awareness of the potential hazards posed by the build up of multilayer paint and to improve standards of fire safety by recommending standards that will drive good practice.

The Code informs: -

- Specifiers – what levels of fire performance are required for painted surfaces
- Paint manufacturers – what tests and conditions are needed so that flame retardant upgrade systems can meet the required fire performance
- Building owners, paint manufacturers and applicators, regulators, fire laboratories – what should be done to achieve the required fire safety in communal buildings such as schools, colleges, hospitals, care homes, detention centres etc
- Fire testing laboratories – how to test and control the preparation of test specimens for upgrading paint systems
- Site inspectors – how to assess the potential hazard of a painted surface and make suitable recommendations

Responsibilities

Approved Document B – Fire Safety in support of the Building Regulations of England and Wales provides guidance as to the level of fire performance required by use area for newly built properties in England and Wales. Technical Standards Regulation 2.5 Part 2.5.1 supports Scottish regulations and Technical Booklet E supports the Northern Ireland regulations in a similar manner. Other pieces of legislation for buildings in use relate back to the guidance provided in the supporting documents to the National Building Regulations.

It is the building owner that has the overall responsibility for attaining a satisfactory level of fire safety within a building. The Regulatory Reform (Fire Safety) Order requires that a risk assessment be conducted to determine what effect the additional paint system will have on the overall fire performance of the building. It is therefore the Building Owner's, or the Responsible Person's, responsibility to define and characterise the walls of that building to ensure that the redecoration process will not downgrade the performance of the building surfaces. This Code of Practice therefore sets out to provide a summary of the major parameters which the Building Owner or his designated Responsible Person need to factor into any risk assessment they may produce relating to the redecoration of their properties.

The paint manufacturer has a responsibility to ensure that the paint system he recommends for use to redecorate the surfaces of a building meets the standards set out in the regulations and those required by the owner when used on the type of surfaces defined by the Building Owner or his Representative.

The painting contractor employed to apply the chosen paint system has a responsibility to ensure that the paint system used to redecorate the surfaces of a building is applied in accordance with the required specification and/or the manufacturer's instructions.

Recognition of the fire hazards posed by multilayer painted (MLP) surfaces

At the design stage and prior to the occupation of residential blocks, there is an obligation to incorporate adequate fire precautionary measures to prevent the unrestricted spread of fire and smoke, particularly to circulation spaces, escape routes and other common access areas.

There has been a commonly held belief that when such buildings are redecorated, which tends to be a regular event, the standard of protection afforded to the occupants is not reduced in any way. However, investigations into a number of fires have shown this is not the case.

Because of the potential high fire risk scenarios, all UK paint specifiers should be aware of the potential flammability of multilayer paint and in particular the hazards posed in communal areas of multi-occupancy buildings in terms of fire spread.

Fire Testing Requirements

Tests shall be conducted in accordance with:

- 1) BS 476: Part 6: 1989 and BS 476: Part 7: 1997,
Or
- 2) BS EN 13823:2001 and BS EN ISO 11925-2: 2001,

The tests conducted shall be relevant to the classification sought and shall be undertaken at an accredited fire-testing laboratory.

Standard multilayer painted substrate

The test specimens shall be prepared on the standard multilayer painted substrate as defined in Annex B of the Code of Practice. The multilayer painted substrate is representative of painted surfaces of concrete, brick, breezeblock, and other masonry, plaster, paper-faced and skimmed plasterboard. It is not representative of painted combustible substrates.

Caution:

The multilayer substrate is well adhered and simulates a defined fire performance on walls which have paint surfaces which are well adhered and which when subjected to heat will blister at temperatures of 200°C and above.

At the moment, evidence does not exist that the paint systems which will upgrade this substrate will or will not upgrade paint systems on walls which will blister at temperatures below 200°C.

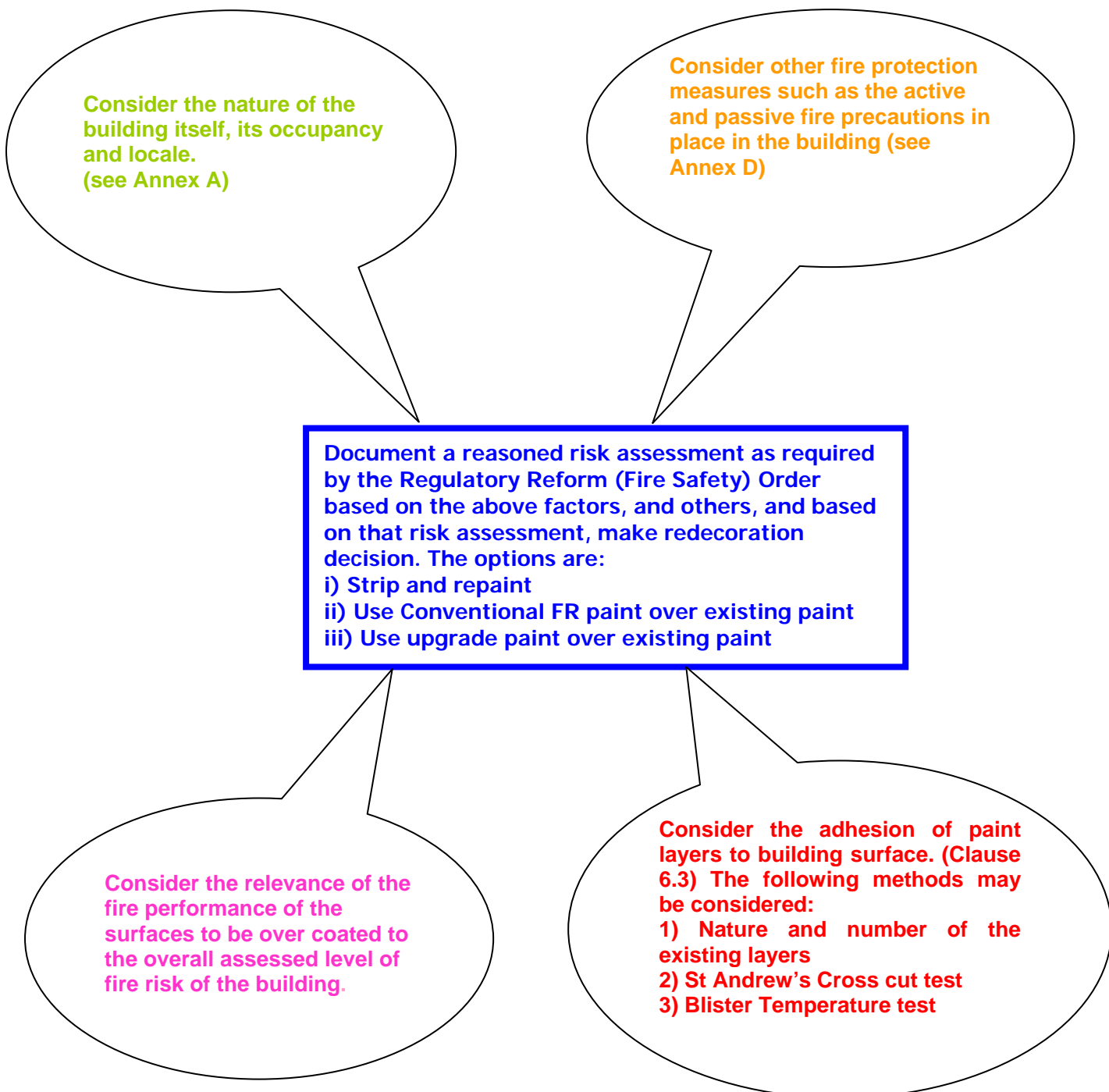
Building owners should consider this when deciding on the nature of the site survey conducted prior to any redecoration cycle.

Test Methodology

The samples of coating system shall be applied to the standard multi-layer painted substrate. The application may be by the manufacturer or his selected agent and must be under the full supervision of and recorded by the accredited Fire Test Laboratory. It is an important requirement that the test specimens and paint samples remain at all times under the supervision of the Fire Test Laboratory and under no circumstances shall the test specimens be released to a third party, including the manufacturer or his agent.

Guidance for Redecoration Decision

The diagram below is designed to aid the Building Owner or his Responsible Person in making any decision as to the Redecoration of his Buildings



The diagram provides an indication of the parameters to be considered in any risk assessment produced prior to any redecoration process. In general, the following need to be taken into consideration:

1. Nature of the building
2. Active and Passive Fire Precautions measures installed
3. The relevance of the area to be redecorated (i.e. escape route, large room, etc)
4. Nature of the existing surfaces

Code of Practice -

Refurbishment of Communal Buildings and the Fire Risk of Multilayer Paints

1. Introduction

This Code provides guidance for the painting of surfaces in multi-occupancy buildings that have been previously decorated with surface coating products in order to maintain the required fire performance characteristics of surfaces in that end use. The Code does not address other characteristics that may be exhibited or required by the coatings used, such as durability, weathering, aesthetics etc.

The flame retardant coatings referred to in this Code may be of both conventional and specialist type.

The recommendations in the Code are intended to facilitate the achievement of a defined standard of fire performance after redecoration and are aimed at providing harmonised guidance to paint manufacturers, paint system applicators, building owners and specifiers, all of which share in the responsibility for ensuring fire safety is achieved.

The multi-occupancy buildings to which this Code of Practice mainly applies are those administered by registered social landlords in the UK. The Code may also be applied to other communal buildings such as schools, colleges, hospitals, care homes, detention centres, etc.

2. Use of this Code

This Code is not intended to be the sole reference to any specification but should be used as guidance when producing such. It provides advice as to the steps to be considered in any redecoration process, from the decision to redecorate through to assessing the building, specifying the work, ensuring good practice in surface coating application, keeping records of work carried out, building management and trade off using other active or passive fire protection measures to ensure building occupant safety.

Definitions of the various terms used in this Code can be found in BS EN ISO 13943:2000 and in BS 2015:1993.

For the purpose of this code, the term “multilayer” is defined as a series of paint systems coated one on top of the other. In practical terms this would generally have occurred over a period of many years with ageing of each layer between redecoration cycles.

3. Background

At the design stage and prior to the occupation of residential blocks, there is an obligation to incorporate adequate fire precautionary measures to prevent the unrestricted spread of fire and smoke. However, there has been a commonly held belief that when such buildings are redecorated, which tends to be a regular event, the standard of protection afforded to the occupants is not reduced in any way. Legislation on the control of any surfaces in these and other types of building is diverse and often confusing as to relevance. Therefore, the need has arisen for a simple guidance document to allow ease of decision-making and knowledge of correct procedures to be widely disseminated.

Investigations into some serious fast spreading fires have shown that aged and multilayer painted surfaces can be the cause of rapid flame spread even though the individual paint systems may have demonstrated a satisfactory fire performance.

This Code of Practice is intended to provide guidance to the surface coatings industry, specifiers, building owners and other interested parties on methods which should be employed by those involved in the redecoration of coated building surfaces.

4. Reference documents

The following are reference documents applicable to this Code of Practice: -

BS 6150: 1991 Code of Practice for Painting of Buildings

BS 8000 Part 12 Workmanship on building sites – Code of practice for decorative wall coverings and painting

EN 45004: 1995 General Criteria for the operation of various types of bodies performing inspection

BS 476 Part 6: 1989 Fire tests on building materials and structures – Method of test for fire propagation for products

BS 476 Part 7: 1997 Method of test to determine the classification of the surface spread of flame of products

BS EN 13823: 2002 Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item

BS EN 13501-1: 2002 Fire classification of construction products and building elements, Part 1 – Classification using data from reaction to fire tests

BS ISO EN 11925-2: 2002 Reaction to fire tests for building products, Part 2 – Ignitability when subjected to direct impingement of a flame

BS EN 13238: 2001 Reaction to fire tests for building products – Conditioning procedures and general rules for selection of substrates

UK Building Regulations 1991 (2000 Edition) Approved Document B – Fire Safety

Building Regulations Scotland 2005 - Technical Standards Regulation 2.5 Part 2.5.1

Building Regulations Northern Ireland - Technical Booklet E

Amendments 2002 to UK Building Regulations Approved Document B (Fire safety) – Effective 1 March 2003

'Housing (Fire Safety in Houses in Multiple Occupation) Order, 1997, SI 230

Regulatory Reform (Fire Safety) Order, May 2004

BS EN ISO 13943:2000 Fire Safety – Vocabulary

BS 2015:1992 Glossary of Paint and Related Terms

Construction (Design and Management) Regulations 1994

Control of Substances Hazardous to Health Regulations, 2002.

5. Redecoration considerations

The first step in the process is the actual decision to redecorate a property. The finance available, the type of building and the occupancy of that building will determine the frequency at which properties are redecorated.

Painting and redecoration is often conducted at regular intervals and a planned approach is advised. This in itself is dependant on the availability of information and therefore it is recommended that accurate records be maintained. Desirable information includes:

- ❖ Dimensions and design of the building
- ❖ Details of surface preparation prior to each coat
- ❖ Details of the surface coatings used, type and application rate
- ❖ Costs involved
- ❖ Occupancy of the building (size and type)
- ❖ Building history; i.e. maintenance required, due to damp, vandalism, etc
- ❖ Inspection reports prior to redecoration
- ❖ Environment to which decoration exposed (outside weather, etc)
- ❖ Active Fire Precautions within the building
- ❖ Passive Fire Precautions within the building
- ❖ Building housekeeping
- ❖ Building security

If none of the above information is available, a 'conditions survey' needs to be instigated and the problems associated with that property need to be defined and recorded in order to be able to address all issues relating to that building before any decision is taken to redecorate. It is very important that, for buildings with no records, a site inspection should be conducted to determine the condition of the surfaces to be redecorated. The type of paint suitable for use in a refurbishment project will then be selected based on the fire risk associated with the building (see Annex A).

Note: The Regulatory Reform (Fire Safety) Order requires accurate record keeping which in time will aid in the assessment of the fire risk of a building, however with or without this information, the determination of the fire risk of a building will still need to be conducted by the Building Owner or his appointed Responsible Person or the Competent Person prior to the redecoration process. A documented site inspection will aid in this process and can be added to the records held to support the documented risk assessment conducted.

6. Site inspection

6.1 Introduction

The following criteria should apply to all individuals undertaking site survey work on existing multilayer paint coatings and the following methodology shall be applied to the survey of such coatings.

The procedure requires that the surveys are carried out in a systematic manner to a standard format to ensure consistency in approach, method of executing the survey, and recording of findings to ensure the survey is correctly executed. The methodology is

based on the requirements of EN 45004: 1995 – General criteria for the operation of various types of bodies performing inspection.

Site inspectors may be independent consultants, members of the paint industry, or local authority staff. Site Inspectors are responsible for carrying out site survey / inspection work of applied multilayer paint coatings in accordance with the procedure defined below. They are responsible for making arrangements with the appropriate client companies / organisations to facilitate the execution of the surveys / inspections and for recording the findings. They are also responsible for notifying the client of the outcome of the surveys / inspections undertaken and for forwarding the completed reports to the client.

Items of temperature measuring equipment used at site shall be calibrated prior to initial use and thereafter at yearly intervals.

The site inspectors will be responsible for the correct identification of location at which the measurements were taken within the property.

6.2 Assessment of refurbishment project

The primary task for any site inspector is to visit all floors of the building, inspecting all communal areas (lift lobbies, flat lobbies, refuse areas stairwells, etc) and noting the condition of the paint on the walls and the ceilings as well as any damage or graffiti.

A record shall also be made of the layout of the building with a sketch if necessary. Identification terms for each area shall be allocated to enable description in the report.

A decision should be made on the number and position of areas to be tested. On both low-rise and high-rise multi-storey blocks, it is important to check at least 2 different areas on every level.

Even if the building owner specifies which floors to address, it is recommended that, as a minimum, the ground and the first three floors are included since these often have additional layers of paint as they are more prone to damage and graffiti. Stairwells should be addressed as separate areas and not as part of the assessment for a floor level.

6.3 Adhesion tests

From the initial visual inspection of the building, if there are clear indications of peeling paint then these surfaces must be stripped back to the substrate. The adhesion of the existing paint is obviously not good and it is not sufficient to simply take back to a firm edge. For painted surfaces, adhesion must be assessed using a physical test method.

Although there are several published adhesion tests for paint and varnishes (e.g. ISO 4624 Part 2 and BS EN 24624), many of these require test specimens to be made from fresh paint onto metal substrates and are therefore not appropriate for the testing of multilayer painted surfaces of communal buildings. The following method shall be used for on site adhesion tests: -

Mechanical method

Using a sharp utility knife firmly cut a St Andrew's cross approx. 75mm long through the coatings to the substrate. It is important that the cut is through to the substrate as it is necessary to determine if there is any separation between the layers or from the substrate. The point of the knife blade is then inserted into the cut and pushed horizontally across the wall to cause the paint to chip. The blade must be held as parallel to the wall as possible to avoid digging into the substrate. This is repeated at different positions down the initial cut and in both directions.

The quality of the adhesion is evaluated from the ease with which the coatings separate and the size of the flake which can be generated.

If the flake is 10 mm or more in any direction, the recommendation for that surface should be to remove the existing paint layers and no further survey is required. If the paint flake is smaller than this dimension, or if there is any doubt about the adhesion of the paint to the walls, then it is very important that the thermal blister temperature test defined in Annex C is conducted (see below).

NOTE: When examining any flake, delamination of the surface of the substrate does not necessarily indicate poor adhesion of the coatings.

Adhesion at Elevated Temperatures

The temperature at which the paint layers on a wall or other surface begin to blister can provide a good indicator of its adhesion qualities at elevated temperatures as opposed to ambient. The following on-site blistering test, further detailed in Annex C, should be carried out provided adequate health and safety precautions are in operation: -

To obtain the blistering temperature of the surface coating, an electric or gas-powered hot air gun fitted with a surface contact thermocouple shall be used. There are two types of gun available; those that have a variable heat source and are held a fixed distance from the surface and those that have a stable heat source and the distance between the surface and the gun can be varied.

The type of blister determined is important and application of the heat gun shall continue until either a surface temperature of 200°C is reached or a blister forms that may be categorized as follows:

1. Blister remains on withdrawal of heat
2. Blister releases volatiles or decomposition gases
3. Blister extends for more than 10mm in any direction, or 6mm if the nozzle of the hot air gun is less than 20mm in diameter

6.4 Paint sampling

A sample of paint may be taken to enable laboratory analysis of the surface coatings to determine number of layers, thickness of each layer, colour and type. The recommended method by which this can be achieved is as follows: -

With a utility knife, cut a "V" through the paint layers and place a small piece of sticky tape over this. Using the point of a knife blade, remove a small sample, including, if possible, some of the substrate, which will adhere to the sticky tape thus preserving the specimen. Whenever possible, remove a sample of the entire coating and substrate with an area of approximately 25mm x 25mm using a chisel. Place the sample in an appropriate container and label. The sample should then be returned to the laboratory for analysis. (See clause 6.5).

6.5 Laboratory microscopic examination of paint samples

The microscopic examination should be conducted using a zoom stereomicroscope with binocular head, calibrated eyepiece and a light source with variable intensity and position.

The paint sample can be supported for microscopic examination using a pencil eraser with a vertical cut to hold the paint sample. Other mounting materials (such as plasticine or an equivalent) may also be used.

6.5.1 Sample preparation

The preparation of an edge suitable for examination can be difficult but the following methods are usually successful: -

- a) Using a sharp knife cut the sample to expose a clean sharp edge. The knife blade can be scraped across the edge to further smooth it. This method can cause layers to smudge together and so care is required.

Or

- b) Break the sample leaving a jagged edge with the layers visible. This method may not provide clearly visible layers.

6.5.2 Determining the number of layers

It can be difficult to distinguish the individual layers, particularly if they are all of a similar colour. The following points provide methods that can reveal the different layers: -

- The sample edge should be viewed from different angles and positions.
- The angle of incidence and the intensity of the light should be varied.
- The edge of the paint sample should be washed with a small amount of clean water or industrial methylated spirits. This can often cause the layers to separate slightly.

6.5.3 Measuring the layer thickness

The layer thickness should be measured using a graduated eyepiece in the microscope, but it should be remembered that the thickness is an "estimated average" as the thickness of each layer can vary even within a small sample. The layer thickness should be measured at 3 positions and the mean of these calculated.

6.5.4 Determining the type of paint

Although paint companies can identify different specific forms of paint by various instrumental methods, it is generally only necessary to distinguish between lacquers, organic solvent based and water based paints according to the following methods: -

(a) Lacquer layers within the paint layers are easily identified visually as they have a characteristic dark glassy appearance when viewed from the edge of the sample. However, where a lacquer is on the exposed surface, identification can be more difficult. Moving the light source on the microscope can make it easier to identify surface lacquers.

(b) To identify organic solvent based and water based paints, the edge of the sample shall be brushed with a small amount of Indian ink and after a few minutes washed off with clean water. Where the ink washes off cleanly, this is a good indication of an organic solvent-based paint, as this type of coating will not absorb the ink. Water-based paints conversely will retain some of the ink colouring.

NOTE: Other stains may also be used; for example, industrial methylated spirits into which methyl orange, methyl blue or similar dyestuff has been dissolved.

(c) An alternative method of determining layer type is to view the flat surface of the sample through the microscope and dissolve the individual layers with a small brush soaked with industrial methylated spirits.

Water-based layers will dissolve and cause the industrial methylated spirits to go cloudy whilst oil based layers will only show a slight softening and they have to be scraped away to expose the next layer.

6.6 Methods of reporting.

The site inspector shall record all inspection results and observations on forms applicable to the type of inspection undertaken.

The main report should include the following: -

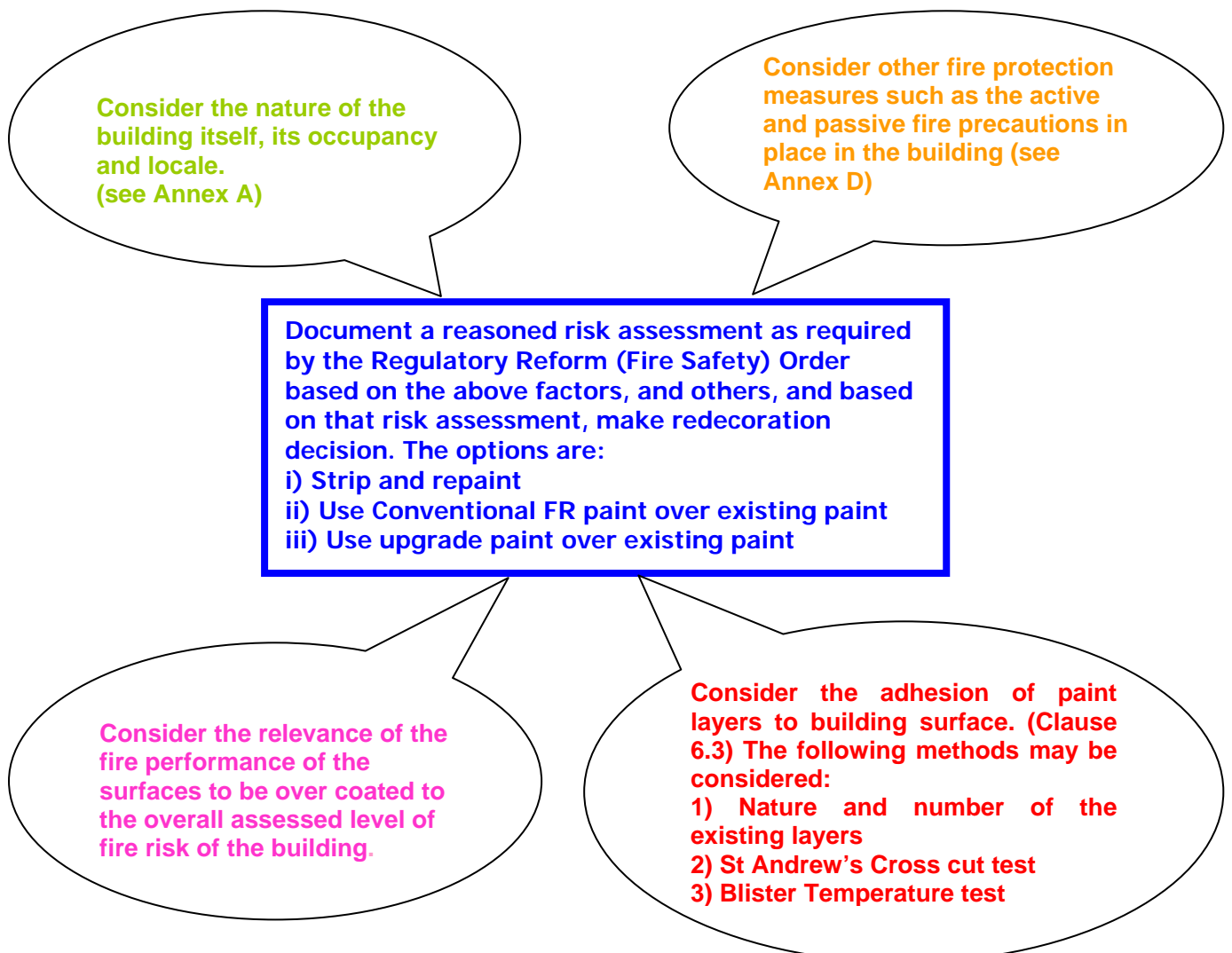
- Summary to give details of scope, location and date of inspection carried out, including any parameters specific to the inspection.
- Introduction stating the points being considered when conducting the inspection and preparing the report.
- Site description giving brief details of the building, including construction and layout, coating type (i.e. smooth, textured, multi coloured fleck, etc) and any other conditions such as damp, graffiti etc.
- Test method outlining procedures followed whilst conducting the inspection.
- Tables of results for the site inspection of samples taken.
The site inspection results shall include location of test, adhesion rating, blister temperature (where relevant), paint thickness, identification of paint layers (where relevant) and type of substrate.
- A discussion section analysing the results obtained. This section should usually be broken down into specific areas of the building, and will form a basis for the recommendations.
- Unambiguous and concise recommendations that state the course of action to be taken for redecoration of the inspected areas of the building(s). Ultimately, it is the specifier in discussion with the manufacturer who knows the capabilities of the various systems that they manufacture. The independent inspector shall not therefore recommend any commercially available paint system or systems.
- A conclusion usually giving an overview of the existing condition of the coatings.
- Validity statement limiting findings and recommendations to the building inspected.

7 Deciding on the appropriate redecoration method for multilayer paint situations

Prior to any redecoration process, the Building Owner or his nominated Responsible Person should ensure that a risk assessment is conducted and documented as required by the Regulatory Reform (Fire Safety) Order. One of the most important aspects of this assessment is to determine how important the fire performance of the surfaces of the building is to its overall fire risk and thus the nature of the site survey which may be required to be conducted.

The ultimate decision as to the redecoration process to take place rests with the building owner alone. The building owner may specify which tests he may require conducting to aid in the decision making process. He may also define the areas of the building he wishes surveying. The responsible inspector however should always conduct a walk through inspection of the entire building to determine the overall appearance of the building, which may help him in making his recommendations. The diagram below is designed provide an indication to the building owner of the factors he needs to consider when producing his reasoned risk prior to redecoration and also to decide the action to be taken based on the results of the site inspection.

In making the decision the building owner shall consider the following points:



In situations where the adhesion is poor in certain small discrete areas only, there may be no justification for removing the paint from the whole building since complete removal may

be expensive and disruptive. Consideration can be given, in these cases, to conducting a more detailed site survey to differentiate the areas which have good and bad adhesion and to consider removal of the paint coatings in areas of bad adhesion and then to use a fire upgrading coating system throughout the building.

8 Responsibilities of parties concerned

8.1 Building Owner

The ultimate responsibility for attaining a satisfactory level of fire safety within buildings rests with the building owner. However, both the manufacturer of the paint and the paint contractor employed to apply the chosen paint system shall ensure that the paint system used to redecorate the surfaces of a building does indeed meet the level of fire performance required by the use area. Guidance on the level of required fire performance may be found in Approved Document B – Fire Safety of the Building Regulations of England and Wales. Similar guidance is in the technical booklets that accompany the Building Regulations in Scotland and in Ireland (see Reference documents).

Prior to the painting process, the Regulatory Reform (Fire Safety) Order requires that a fully documented fire risk assessment be conducted to determine what effect the addition of the paint system will have on the fire performance of the building, in particular the communal areas. Records must be kept of any change to the building and any documentation relating to the fire performance of the materials used.

The building owner or his delegated 'Responsible Person' may nominate a Competent Person* to oversee the fire risks in a communal building and to ensure that those responsible for the building are able to fully define the nature of the substrate and existing surfaces to be redecorated, the nature of the building and the active and passive fire protection measures employed and that choice of paint system, the site preparation and paint application is conducted in a proper manner. An applicator employing operatives properly trained in the application of the chosen systems by the paint system manufacturer should apply the chosen paint system and the building owner or Responsible Person (or his nominated Competent Person) should ensure that this happens. If complete removal of defective coatings (stripping) is considered to be necessary, the building owner should arrange for this to be conducted according to standard 'health, safety and environment risk assessments, permits to work, etc' measures, which include the need for adequate ventilation and continuous air monitoring throughout the removal process. Additional legislation may also be applicable; e.g. COSHH.

*Note: A Competent person is defined as an employee or an outside contractor (e.g. Building Surveyor, Fire Prevention Officer). Competence is demonstrated through sufficient training, experience and knowledge.

8.2 Paint manufacturer

The paint manufacturer shall maintain a register of coating systems that provide a decorated surface to Class 0 or Class 1 (alternatively, Euroclass B or C) when applied to the standard multilayer painted substrate together with their fire test reports. The systems and procedures used for the refurbishment of communal buildings where there are previously applied multilayer paints shall comply fully with this Code of Practice.

Caution:

The multilayer substrate is well adhered and simulates a defined fire performance on walls which have paint surfaces which are well adhered and which when subjected to heat will blister at temperatures of 200°C and above. At the moment, evidence does not exist that the paint systems which will upgrade this substrate will or will not upgrade paint systems on walls which will blister at temperatures below 200°C.

The paint manufacturer should strongly recommend that the specification issued to the applicator accurately replicates the actual system that has been tested in respect of preparation of substrate, primer, number and thickness of coats and method of application. The paint manufacturer should provide evidence of the products and systems performance, including test report numbers & classifications.

A detailed painting specification, appropriate to the buildings to be coated may be provided to the specifier covering the due processes required to achieve the desired finish and level of protection. A copy of this specification should be made available to the applicator PRIOR to the tendering process.

When requested the paint manufacturer should offer training for building managers and/or building maintenance personnel. These courses may include demonstrations on graffiti removal and record keeping, including clear reference to the original specification to aid selection of touch-up systems.

8.3 Paint system applicator

It is strongly recommended that paint system applicators should register individuals who are trained as applicators of fire retardant paint systems.

Many paint manufacturers keep lists of applicators that have received training in the use of their products. The paint system applicator should ensure that the appropriate site preparation occurs and that they comply fully with the application instructions of the paint manufacturer and to British Standards relating to the decorating process (BS 6150: 1991 and BS8000). The paint system applicator shall issue a Correct Stage Application Document to the building owner.

The paint system applicator shall be responsible for adhering to the specification, particularly in respect of preparation of substrate, primer, number and thickness of coats and method of application. The applicator shall carry out a process of self-assessment during a contract, and shall sign the work off as having been carried out to the necessary standard. If specific issues occur whilst preparing or coating, these should be brought to the IMMEDIATE attention of the manufacturer, the building owner, or his delegated representative.

8.4 Regulatory Control

Guidance on the appropriate fire performance for communal buildings is given in the Building Regulations Approved Document B and equivalent guidance in Scotland and Northern Ireland.. Other pieces of legislation must also be taken into account, such as the Regulatory Reform (Fire Safety) Order and the Houses of Multiple Occupation Order. It is the building owner's responsibility to ensure this legislation is complied with. Specific advice on the relevant regulatory requirements may be available from local authority building control officers, fire precautions officers and environmental officer or appointed Approved Inspectors who control or police the systems in place within the UK.

8.5 Fire Test Laboratory

The Fire Test Laboratory shall be nationally accredited to carry out BS476 and EN reaction to fire tests. A Notified Body shall perform classification of painted surfaces based on the EN fire test reports according to the essential requirements of the European Construction Products Directive.

The Fire Test Laboratory shall ensure that paint manufacturers provide full descriptions of paint systems for inclusion in their laboratory reports. This is to ensure that sufficient information is available to uniquely identify the paint system, coverage rates, etc and to be able to ensure that the paint contractor can reproduce these exactly when applying the system in its end use. They will also monitor and record the preparation of test specimens to ensure that these also comply with the description of the systems.

8.6 Site Inspector

The responsibility of the Site Inspector is defined in Clause 6.1.

9 Fire performance of paint finishes

9.1 General

The suitability of a coating system will be determined by assessment of its ability to meet the requirements of Class 0 or Class 1 (alternatively Euroclass B-s3,d2 or C-s3,d2), as defined when applied to the standard multi-layer painted substrate (see Annex B). The standard multi-layer painted substrate is representative of painted surfaces of concrete, brick, breezeblock, and other masonry, plaster, paper-faced and skimmed plasterboard, where the blister temperature of that surface is 200°C or above. It is not representative of painted wood-based substrates or surfaces that blister below 200°C.

9.2 Information to be supplied to the Fire Test Laboratory

When submitting paint systems for test, the manufacturer must supply full details of the coating system, including all variables known to the manufacturer or considered by the test laboratory as likely to affect its fire performance. The manufacturer shall provide full details of the method of application for the complete coating system, including any preparation of the substrate, the method of application, any preparation of the 'in-can' coating product (e.g. thinning or dilution) and the nominal wet application weight for each coat. All possible variations shall be provided, including (but not limited to the following):-

- Preparation of the substrate (e.g. scoring, abrading, washing, etc).
- Primer or any other preparatory coats or treatments.
- All coatings used for upgrading purposes and/or decoration.
- The coverage rate of each of the coatings in the system, including the nominal mass per unit area as well as the maximum and minimum mass per unit area of application that are acceptable in practice. The mass per unit area must include the coverage value expressed in square metres per litre of coating (or other value as appropriate to the product) and how the volume of wet coating is determined (i.e. allowance for any thinning of the 'in can' coating).

- The specific gravity (or density) information for each coating in the system since this connects spreading rate and weight/volume data.
- The percentage solids, as this will link wet film and dry film thickness values.
- All possible methods of application (e.g. brush, roller, spray).
- Full details of how the actual application weights are determined during the application of the coatings in practice.
- The minimum (and if appropriate, the maximum) time between all coats.
- Colour variations in any of the coats.
- Variations in any of the coats within the system (e.g. different types of primer coat or finish coat).
- Different types of wall substrate (e.g. brick and plaster, plasterboard) to which the coating will be applied.
- Compositional detailing the presence of flame retardant ingredients*

*Some information that is commercially sensitive and may be retained on file by the Fire Test Laboratory may be excluded from any reports but the presence, or absence, of this information should be confirmed.

Where different conditions are used in the application of the coating system to obtain Class 1 and Class 0 performance levels (e.g. different numbers of coats or different application weights), this shall be clearly stated by the manufacturer.

9.3 Fire testing requirements

Tests shall be conducted in accordance with:

1) BS 476: Part 6: 1989 and/or BS 476: Part 7: 1997,

Or

2) BS EN 13823:2001 and BS EN ISO 11925-2: 2001,

as relevant to the classification concerned, at an accredited Fire Test Laboratory for performing these tests in relation to this type of product.

The test specimens shall be prepared on the standard multi-layer painted substrate as defined in Annex B of this Code of Practice.

For each full test conducted an additional multilayer substrate board shall be selected. Before preparation of specimens for test, the manufacturer shall select from the batch the substrates to be prepared (i.e. over coated) and the Fire Laboratory shall retain the other board.

The samples of coating system shall be applied to the standard multi-layer substrate. The application may be by the manufacturer or his selected agent but it is an essential requirement that the test specimen panels and paint samples remain at all times under the supervision and security of the Fire Test Laboratory. Under no circumstances shall the test specimens be released to a third party, including the manufacturer or his agent.

The Fire Test Laboratory shall witness and monitor the preparation and application of the complete coating to the standard multi-layer substrate and the application weight (in

g/m²) of each coating shall be monitored in accordance with the supplier's instructions for measurement on site and also (if different) as specified by the Fire Test Laboratory. The Fire Test Laboratory shall record the actual application weight of each coat.

It is recognised that the application of fire retardant paint systems is often difficult to accurately control and for this reason it is important to investigate the effects of practical variations that are possible from the nominal weights provided by the supplier. To assist in the consistent and accurate application of the required weights, special procedures may be necessary. For example, the multilayer substrate may be inserted into a matching hole in a larger board to provide a larger surface for the application of an increased amount of coating. Once the paint system has been applied the test specimens, still with the coating wet, shall be stored vertically.

Where specified by the manufacturer of the paint system, minimum or maximum prescribed periods may be left between some or all coats and if so specified, this information shall be included in the test report.

The test specimens and the extra multilayer substrate board shall be conditioned according to the conditions specified in the relevant fire test standards and by the manufacturer.

The manufacturer shall be given the opportunity to witness all fire testing of the prepared test specimens to the relevant standards.

The pre-selected standard multilayer substrate panel or panels shall be subjected to a control test to confirm its initial performance prior to testing the 'upgrade' coated panels to the relevant standard.

The results of the tests on both the uncoated standard multilayer painted substrate and on the coated substrate shall be incorporated into the same test report.

9.4 Reporting of results

The Fire Test Laboratory shall report the results of the test(s), as determined during the above procedures, directly to manufacturer.

The test report shall include the following information as a minimum. A clear distinction shall be made between the data provided by the manufacturer of the paint system and data determined by the Fire Test Laboratory.

- a) reference that the test was carried out in accordance with the relevant standard;
- b) any deviations from the test method;
- c) name and address of the Fire Test Laboratory;
- d) date and identification number of the report;
- e) name and address of the manufacturer/supplier, if known;
- f) date of sample arrival;
- g) identification of the product;
- h) a general description of the product as required in Clause 8.1 of this Code, together with the form of construction of the test specimen;

- i) details of conditioning;
- j) date of test;
- k) test results for the paint system applied to the multilayer substrate and test results for the multilayer substrate alone expressed in accordance with the relevant standard;
- l) observations made during the test;
- m) the statement 'The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test. They are not intended to be the sole criterion for assessing the potential fire hazard of the product in use'.

10 Site practice

Site management should comply with BS 8000 Part 12 and BS 6150, especially section 2 (design, specification and organization), section 5 (application and practice) and section 6 (maintenance). The Regulatory Reform (Fire Safety) Order which replaces the Fire Precautions (Workplace) Regulations also requires that a risk assessment be carried out as to the consequences of the work being conducted on fire safety, i.e. both during the work and after the work is completed. The risk assessment should be dynamic and grow or change as the building requires more maintenance.

The applicator must ensure that all operatives and visitors on site are provided with personnel protection equipment as necessary and adequate supervision to implement a 'Safe System of Work'. This should be in accordance with BS 7182 & BS 1651. Provision, at all times, must be made for the clear passage of building users. The contractor should obtain Material Safety Data Sheets for the products to be used and should carry out a COSHH assessment (where appropriate) to ensure that all materials can be used safely. Where necessary, additional Health & Safety procedures may need to be implemented.

All building occupants shall be notified in writing by the contractor prior to commencing work, with explanations about the nature of the works, limitations of access and egress, and possible health implications for persons with breathing or allergy problems.

During the application of the paint system, the site should be supervised and inspected periodically to ensure the paint system applied is that which has been approved and is being applied correctly.

Contractors should employ only applicators trained by the paint system manufacturer. The applicator(s) shall strictly adhere to the specification, particularly in respect of preparation of substrate, primer, number and thickness of coats and method of application. If it is not possible to use applicators trained by the paint system manufacturer, the site supervisor, who is independent of the paint applicator, must ensure that the paint system is applied following the specific instructions of the paint manufacturer.

The applicator must ensure that the substrate is in a sound condition for the full application of the proposed coatings. The paint system manufacturer shall also be made aware of the need for repairs to the substrate since repairs made may effect the performance of the paint systems.

The moisture content of the substrate and of the surface to be coated is important in terms of adhesion. Air temperature and relative humidity all have a bearing on drying

of applied materials. Issues should be brought to the attention of the specifying body and the paint manufacturer; any measures taken to ensure that conditions are improved (possibly by suitable methods), or that application is deferred until they improve should be discouraged. Pressure from a specifying body to ensure that contracts are completed (irrespective of prevailing site conditions) should also be discouraged.

It is recommended that all surfaces that are to be coated shall be tested for moisture content and temperature levels and shall be within the limits as specified by the system manufacturers prior to application.

Any problems encountered on site should be referred IMMEDIATELY to the specifier, his agent or the paint manufacturer as appropriate.

11 Record keeping

Building owners should maintain a database to show what has been done during refurbishment of communal buildings, including filing of supply and application certificates.

These database records should include, as a minimum, the following:

- Date of upgrading/ last painted
- Details of system applied
- Whether stripped or over coated
- Contractor and/or paint system applicator
- Health and Safety information

On schemes where the Construction (Design and Management) Regulations apply (which will be in the majority of cases), the Health and Safety File should also include this information but it may not necessarily be readily available when the next cycle of redecoration is programmed.

Trained paint system applicators shall complete site record forms that should be filed by their contracting organisation for possible audit by recognised site supervisors. They should also file procedural documents for possible auditing by the paint manufacturers.

Fire Test Laboratories shall maintain technical files on paint systems tested. These files shall include application weights of paints applied as well as the declared formulations and batch numbers.

12 House keeping

The building owner should maintain good fire safety management in communal buildings. Where these buildings fall under the Houses of Multiple Occupation legislation, the building owner must address these issues in his dynamic and on-going fire risk assessment. The strategy involved should include avoidance of potential fire sources such rubbish or furnishings stacked in escape ways (stairs, corridors or in front of fire doors).

ANNEX A

Fire Risks in Communal Buildings

A.1 General

Guidance on meeting provisions for fire safety in a building is detailed in Approved Document B of the Building Regulations. Much of the guidance is given in terms of performance to standard fire tests (such as BS 476 Parts 6 and 7 for heat propagation and fire spread on internal wall and ceiling linings).

A.2 Reaction-to-fire performance of wall and ceiling linings

Approved Document B gives guidance on satisfactory fire performance for internal wall and ceiling linings based on their ability to inhibit the spread of fire within the building. The internal linings shall adequately resist the spread of flame over their surfaces and, if ignited, they shall have a rate of heat release that is reasonable under the end-use circumstances.

Linings are classified according to the performance in either BS 476 tests or CEN methods such as BS EN 13823 (SBI) and BS EN ISO 11925-2 (Small flame). The comparative classification of linings according to the national and European systems is shown in Table 10 of Amendments 2002 to Approved Document B (Fire safety).

A.3 Assessment of fire risks in a communal building

All parameters given below should be considered by building owners (or their appointed Competent Person*) to determine how they should upgrade a well-adhered multilayer painted surface to the higher levels specified in Table 10 of Amendments 2002 to Approved Document B (Fire safety).

The listing given below is not definitive and there may be additional parameters which are relevant to the assessment. Based on the findings of the competent person, there may be an argument for trade-off in terms of the classification of the paint system to be applied.

*Note: A Competent person is defined as an employee or an outside contractor (e.g. Building Surveyor, Fire Prevention Officer). Competence is demonstrated through sufficient training, experience and knowledge.

Parameter

- 1) The nature of the building occupancy
- 2) The nature of the building's locale
- 3) There is more than 1 fire escape

- 4) Fire doors are well fitted and working correctly and encompass self closers on each landing into any stair well.
- 5) There are adequate fire detection systems within the building and these are all functioning properly
- 6) There are automatic active fire precaution systems within the building
- 7) There is easily accessible and well maintained fire extinguishing media within the building
- 8) No storage of rubbish within the building
- 9) A restricted entry system is present (or 10 applies)
- 10) A concierge is present (or 9 applies)
- 11) The building is less than 3 storeys
- 12) The building occupants do not have impaired mobility
- 13) Thickness of the existing paint layers and/or number of coats
- 14) All potential ignition sources should be removed from the areas of the building that are accessible to the public

ANNEX B

Specification of standard multilayer painted substrate for use in reaction to fire tests

B.1 General

A standard multilayer painted substrate is required for the laboratory evaluation of fire retardant protective coatings that are supplied for use on multilayer paints in communal buildings. A reference substrate has been developed that simulates the fire hazard of multilayer paint systems which blister at temperatures of 200°C and panels having this level of fire performance shall be used for determining the efficiency of fire upgrading coatings supplied by paint manufacturers.

B.2 Description of standard multilayer painted substrate

The standard painted substrate consists of 10 layers of assorted paint on 12.5 mm \pm 0.1 mm thick paper-faced plasterboard with a density of 800 kg/m³ \pm 100 kg/m³. The thickness of the multilayer paint coating shall be 0.5 mm \pm 0.1 mm. The paint layers are all well-adhered. This substrate shall be highly flammable and shall fully meet the performance specification given in clause B.3 below.

B.3 Specification of the fire performance of the multilayer painted substrate

The multilayer painted substrate shall meet the specification in the table below when tested to BS 476 Part 6 and 7. These test results shall be confirmed on the prepared panels both on preparation of a batch of substrates (20 boards) and on a single panel before each fire test is conducted.

If a substrate is prepared for tests to BS EN 13823 and BS EN ISO 11925-2, it shall be prepared in an identical manner and is required to have the following fire performance characteristics to the following European Norms.

Table B.1 Specification of Fire Performance

UK spread of flame performance (BS 476-7)	Not less than 400 mm flame spread at 90 seconds and Not less than 800 mm flame spread at 10 minutes
UK fire propagation performance (BS 476-6)	A sub-index (s_1) of between 32 and 38 and An index of performance (S) of 40 to 50
European reaction to fire (BS EN 13823)	FIGRA _{0,4MJ} >2500, <3500 W/s THR _{600s} >4, <8 MJ SMOGRA >50, <120 m ² /s ² TSP _{600s} >50, <80 m ²
European reaction to fire (BS EN ISO 11925-2)	Flame spread greater than 250 mm within the 15s surface flame attack

B. 4 Example of a Multilayer Painted Substrate

Table B.2 provides a general description of the layer-by-layer formulation of a typical multilayer painted substrate. The board consists of ten layers of paint each applied individually and with a time period of at least 7 days between coats during which each individual paint layer can dry and cure to ensure the absolute individuality of the layers.

Table B.2 One example of typical paint layers on highly flammable multilayer painted substrate

Coat No.	Description of Material	Type
1	Stabiliser	Cellulose
2	Gloss Paint	Cellulose
3	Undercoat	Cellulose
4	2 pack Lacquer	Polyurethane
5	Gloss Paint	Oil Based
6	Gloss Paint	Oil Based
7	2 pack Lacquer	Polyurethane
8	Isolator	Cellulose
9	Gloss Paint	Cellulose
10	Gloss Paint	Cellulose

ANNEX C

Evaluating Adhesion at Elevated Temperatures: On-site thermal test for checking the quality of adhesion of multilayer painted surfaces in communal buildings

The temperature at which the paint layers on a wall or other surface begin to blister can provide a good indicator of their adhesion to both the individual layers of paint and also to the substrate. The following on-site test method should be conducted by competent trained persons who are familiar with the use of the equipment and the health and safety precautions required. Prior to conducting any elevated temperature adhesion tests, the building owner's consent for carrying out this procedure shall be obtained.

CAUTION: When conducting elevated temperature adhesion tests, fire-extinguishing media must be available at the immediate location of said tests.

Test Method

The equipment should consist of an electric or gas-powered hot air gun fitted with a thermocouple that is connected to a precalibrated digital thermometer. The thermocouple shall be located in the centre of the "hot spot" created by the gun and in direct contact with the surface to be evaluated.

There are two types of gun available; those that have a variable heat source and are held a fixed distance from the surface and those that have a constant heat source and the distance between the surface and the gun can be varied.

In the case of heat guns with a constant heat source, where the distance between the surface and the nozzle is being varied, the operator should set the gun to the required heat range as prescribed by the manufacturer or as a result of previous calibration. The gun should then be held at a prescribed distance from the surface being evaluated. The initial distance from the surface should be predetermined to enable a temperature of approximately 150°C to be achieved and stabilised*. The heat gun shall be gradually moved closer to the surface in 10mm stages with the temperature being allowed to stabilise* at each stage, until the coating blisters or a maximum test temperature of 200°C is reached.

In the case of heat guns, where the distance between the nozzle and surface is fixed and the heat source is variable, the gun shall be held with the locating pins in contact with the surface being evaluated. The initial heat can be applied at an un-prescribed rate up to approximately 150 °C, allowed to stabilise*, then increased at a rate of approximately 1 °C/second until the coating blisters or a maximum test temperature of 200°C is reached.

The type and the temperature of blistering shall be recorded and included in the report.

* The temperature shall be deemed to have stabilised when rate of increase is less than 1 °C/2 seconds.

ANNEX D

Active and Passive Fire Precaution Measures

Escape routes in all buildings should enable all occupants to reach safety when their lives are threatened by fire.

There are at least eight major components in escape route design:

1. The type of building
2. The contents of the building
3. The types of people using the building
4. The geometry of the building
5. Passive fire protection elements; e.g. fire doors, fire resistant glazing, etc.
6. Fire detection and alarm systems
7. Active fire protection systems; i.e. sprinklers
8. Fire brigade action

Some of these components are controlled directly by the building design, building owner and building occupiers and are mentioned only briefly here. Others (5 to 8) are installed within a building to improve the time available to escape and are often used in trade off situations. As a minimum, all of the above must be considered when conducting any risk assessment.

D.1 Type of building

The type of building plays a role in the time to escape. Long low buildings up to three storeys high present fewer escape problems as the communal areas will mainly provide direct escape to the outside.

Cubical buildings of up to eight storeys can provide direction finding issues and therefore emergency lighting is recommended indicating the routes to escape stairs .

Tall buildings of greater than eight storeys can give the same problems as for lower rise structures but also have special problems such as fatigue before occupants can reach outside and often escape times can be far longer than for other building types.

D.2 Building Contents

Most communal buildings contain large quantities of easily ignitable materials which can produce large quantities of heat and smoke. In general building owners have no control over these contents. Therefore, it is important to have self closing fire doors fitted in escape routes to try to reduce the speed of the effect of these fire parameters on persons escaping in the event of fire.

D.3 Occupant Type

The type of occupants in the building will play a major role in determining the potential evacuation time for the building. The elderly, the young and the infirm will all need much greater time to escape than an active young adult. This should all be considered in the risk assessment produced.

D.4 Geometry of the building and escape routes

The longer and more complex an escape route, the greater the propensity for disorientation and hence delay when escaping from a fire when these areas may potentially have smoke obscuring views etc. This all adds to the time taken to escape and must therefore be a factor in any risk assessment.

D.5 Passive Fire Protection Elements

One method by which the time available for escape can be increased is to delay the passage of any fire which may occur and to ensure that all escape routes are 'protected'. This is achieved by compartmentation, to ensure that a fire which occurs within a defined area remains within that area for a minimum of a specified amount of time. Most commonly, compartments are required to have 30 or 60 minutes fire resistance, (stability, integrity and where appropriate insulation). Thus, the structural elements forming these compartments must also have this level of fire resistance. Therefore any fire doors used in corridors or stairwells must have a fire resistance performance as defined in Approved Document B for the use-area in which they are located. Similarly any glazing, or partitions used in these areas must also have the required level of fire resistance.

It is also of great importance to ensure that any passive fire protection elements are correctly fitted (as described in the test report) since ill-fitting doors, incorrectly sealed windows etc may have significantly reduced periods of fire resistance. Doors, partitions, and windows should all be inspected regularly for damage and fit to ensure they maintain their fire resistance performance throughout their use.

D.6 Fire detection and alarm systems

The presence of working fire detection systems leads to earlier warnings of the need for evacuation in the event of fire. These can be as simple as smoke detectors fitted within each living unit or a more comprehensive detector and alarm system fitted throughout the building which can be wired to an indicator control board for monitoring or directly to the fire brigade call centre. The inclusion of these systems in conjunction with correctly fitted passive fire protection elements can significantly increase the time available for escape to persons within the building.

D.7 Active fire protection systems, i.e. sprinklers

The installation of active fire precautions measures can sometimes be used in trade off situations where a lower level of performance (for example, for the wall surfaces) could be accepted due to the ability of the active system to control a potential fire.

There are various types of fixed pipe work systems using different extinguishing media each providing an efficient means of minimising fire damage and helping the fire brigade to contain any outbreak of fire. There are different sprinkler configurations which are recommended for envisaged different hazard classes. Advice on this and the types of sprinklers available together with type of sprinkler head and type of extinguishing media is available from any commercial sprinkler company.

D.8 Fire Brigade Action

The potential response time of the fire brigade should also be a factor in any risk assessment. If their location is at a long distance or the necessary fire fighting equipment is at a long distance, then higher fire performance levels may be a requirement of any risk management.

Fire brigade access is also a factor not only for vehicles but also for fire brigade personnel on entering the building. The location and nature of water supplies (i.e. rising mains, hydrants, etc) is also an important consideration.

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