PVC-U Windows

and

Doorsets

Standards

Sustainability

Specification

A British Plastics Federation Windows Group Publication
Foreword

This Guide has been prepared by the British Plastics Federation Windows Group (BPFWG) to assist Architects and other Specifiers in the preparation of specifications to ensure the required performance in the use of PVC-U windows and doorsets in domestic and light commercial applications.

Information is included on the sustainability credentials of PVC-U windows and doorsets.

The BPFWG has also produced a RIBA approved CPD presentation on the use of PVC-U windows and doorsets. There is also a CPD presentation on sustainability. These are available from the BPF. See Annex 6 for contact details.

Annex 8 gives a model specification that can be used by specifiers to develop their own without confusion or repetition.

Compliance with this guide does not of itself confer immunity from legal obligations.

The BPF is
- The leading trade association of the plastics industry
- It represents 90% of turnover
- A springboard for industry action
- To explore opportunities
- Resolve common issues

The Windows Group within the BPF is
- Authoritative
- Well respected
- Objective source of unique information for the industry

It represents
- Raw materials suppliers
- Additive suppliers
- System suppliers
- Fabricators
- Installers

www.bpfwindowsgroup.co.uk
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2 Overview

The purpose of this document is to provide a “one-stop-shopping guide” to the current standards scene as it affects manufacturers and installers of PVC-U windows, doors, roofs and trims. It gives information on the sustainability of PVC-U products and dispels many of the myths surrounding the topic. It is also a useful guide for specifiers and PVC-U products manufacturers and includes a sample specification which can be used as the basis for specifying PVC-U products for specific applications.

Some time ago, the British Plastics Federation Windows Group (BPFWG) undertook a major market research survey involving 100 fabricators and installers of PVC-U windows and doors on the subject of standards in the UK and Europe. The findings of this survey showed that there was widespread confusion and misunderstanding with regard to standards and their impact on our industry. It was also clear that many of the survey respondents did not realise the importance of performance and quality standards and were therefore not planning to do anything to improve their own position. Although knowledge of standards has increased there is still a need for information on the standards that are relevant to our industry and how manufacturers can use them to improve their businesses.

3 Uses for PVC-U in the house

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<td>Pipes and fittings</td>
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<td>12.</td>
<td>Doors</td>
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4 Benefits of PVC-U products

4.1 Low Maintenance
The pristine appearance of PVC-U windows and doorsets is maintained by an occasional cleaning with mild detergent such as soapy water.
Some items of window hardware may need occasional lubrication in accordance with the hardware manufacturer’s recommendations. Generally, hardware, gaskets and weatherstrips can be easily replaced without removing the window from the structure.
In the event of breakage, glazing can be quickly and easily replaced by glaziers.

4.2 No Painting
Unlike timber frames, finished PVC-U frames never need repainting or re-staining.
PVC-U profiles can be self-coloured, foil laminated, or surface-coated.
PVC-U frames should not be painted at a later date, unless the work is undertaken by a specialist coating company.

4.3 Colour Fast
PVC-U frame materials are subjected to rigorous tests to ensure that the appearance of the frames will not deteriorate with time. Regular cleaning will help maintain the original appearance

4.4 No Rotting, Rusting or Corroding
Timber and metal frames are normally subject to rotting, rusting and corroding. This cannot happen to PVC-U frames.

4.5 No Warping or Twisting
Unlike timber, PVC-U frames do not warp, twist or split.

4.6 Tough and Durable
PVC-U profiles have special additives to make the material both tough and durable, and ideally suited to UK requirements.
4.7 Resists Combustion

PVC-U frames will only burn when subjected to an intense fire source. The material is classified as self-extinguishing.

Independent tests by the Fire Research Station show that PVC-U windows do not exhibit any aspects of performance which could create new hazards in building fires.

4.8 Insulation

PVC-U frames have inherently high thermal and acoustic performance. This can be further enhanced by the use of gas filled Double Glazed Units and/or different types of glass.

4.9 Cost Competitive

PVC-U windows are long lasting with minimal maintenance and therefore are the most cost-effective option. It is for this reason that Local Authorities and other Specifiers throughout the world use PVC-U windows in their housing stocks.

4.10 High Performance

PVC-U windows can comply with the requirements of BS 6375-1 and -2 and all other relevant British Standards. When installed in accordance with the BPF "Code of Practice for the Survey and Installation of Replacement Plastics Windows and Doorsets" W362, they will give high performance in service.
4.11 Design Capabilities

It is possible to produce most styles of window, including Tilt & Turn, Vertical Sliding, Pivot, Fully Reversible and traditional Casement windows in a variety of finishes. Ribbon composites and Curtain Walling are also available.

5 The environment

There are many definitions of “sustainable development” but the one most commonly quoted is from the UN – Brundtland Report “Our common future” in 1997.

“Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Various life cycle analyses have shown that there is little difference in the environmental performance of PVC-U compared with other materials for windows. A recent study of all publicly available LCA studies commissioned by the European Commission into the Life Cycle Assessment of PVC and of principal competing materials carried out by PE Europe gmbh and Stuttgart University concluded

“For windows one of the most important PVC applications, the available studies conclude that there is no “winner” in terms of a preferable material since most of the studies conclude that none of the materials has an overall advantage for the standard impact categories. The most promising potential for lowering environmental impacts of windows is expected through the optimisation of the design. Therefore the choice of material is of rather minor importance, as long as the material can provide the required system quality of the window.”

NB This report is freely available from the BPF but interested parties should be aware that it is 325 pages long.

Across Europe, the PVC industry has made a voluntary commitment, termed Vinyl2010, to increase recycling of PVC. For windows, this means the recycling of 50% of collectable available end-of-life windows. There are currently a number of trial schemes where PVC windows are being replaced,
mainly due to upgraded thermal and security performances rather than the end of life of the frames. In addition, best practice guidelines for the removal and recycling of frames have been developed in a project funded by the Waste and Resources Action Programme (WRAP) and the Building Research Establishment (BRE).

6 Circle of sustainability

Where raw material is extracted and that material is not recycled at the end of the life of the product the situation can be termed non-sustainable.

Where the material is recycled at the end of the life of the product, the situation can be termed sustainable.

Sustainability is generally accepted to have three factors sometimes termed the “Three Pillars of Sustainability” or the “Triple bottom line of sustainability”.
For information on how to arrange for the recycling of windows, contact the BPF.

### 6.1 The economic factor

- UK PVC-U window, door and conservatory industry is worth over £4billion annually employing many thousands of people.
- PVC-U window supply chains in the main start and finish in the UK
- Direct and indirect labour employed in the locale
- Use of local labour for installation
- Contributes significantly to the local economy
- Has dominant market share*.
- Regularly offers the best-value solution of any window material at time of purchase and during the life cycle

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<th></th>
<th>PVC-U</th>
<th>Ali</th>
<th>Timber</th>
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<tr>
<td>Domestic refurbishment</td>
<td>84%</td>
<td>3%</td>
<td>13%</td>
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<tr>
<td>New house build</td>
<td>79%</td>
<td>5%</td>
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<td>Social housing</td>
<td>85%</td>
<td>3%</td>
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The British Fenestration Rating Council Domestic Window Energy Ratings scheme is now making significant gains in recognition. PVC-U windows form the vast majority of A rated windows. A rated windows give a net energy gain as solar gain is greater than thermal losses.
6.2 The social factor

The PVC-U industry is strong on social factors of sustainability:

- Investment in training the workforce;
- Industry provides a safe working environment;
- Industry provides a forum for open communication with all stakeholders;
- Industry commitment to invest in the future
- The PVC-U industry supply chain employs many thousands of people in the UK
  - Material & Additive Manufacturers
  - System extruders
  - Fabricators
  - Installers
  - Machinery Manufacturers

WER Certificate numbers as at 26th April 2007

<table>
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<th>WER</th>
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*From the BFRC website www.bfrc.org*
6.3 The environmental factor

All materials have issues when it comes to sustainability – steel, aluminium, composites, PVC-U, wood.

PVC-U products are:

- of low impact on the environment
- have no need for paints and preservatives
- are fully recyclable
- have a BRE endorsed Reference Service Life 35-years
- are almost exclusively manufactured in the UK
- are easy to repair
  - functional repairs – handles, locks, hinges, gaskets and glazing are all easily replaced on site.
  - profile repairs (surface and structural; white, coloured and textured)

There are 8 common myths about PVC

“PVC is not a sustainable proposition as long as it is made with chlorine” – Greenpeace

Greenpeace have long taken an anti-PVC stance for no apparent logical reason. There abundant supplies of common salt, the source for chlorine which forms 57% of the molecular weight. 50 quadrillion tonnes of salt are dissolved in the world’s oceans, enough to cover the surface of the earth to a depth of 45m. There are also 200 billion tonnes of salt underground. (www.saltinstitute.org).

The remainder of the molecular weight is from hydrocarbon feedstocks. Ethylene is used, mainly from oil but also from biomass. Life cycle analyses recognise the advantage of salt and the low reliance on hydrocarbons by PVC production.

“Organochlorines are alien to nature”

PVC is an organochlorine and therefore accused of being alien to nature. Organochlorines, basically organic compounds containing chlorine, are a sub-set of organohalogens which some environmentalists claim are exclusively man made. This is wrong. Naturally occurring organohalogens are being discovered at the rate of 100-200 every year. So far, more than 4000 naturally occurring organohalogens have been discovered of which 2400 are organochlorines. Vinyl chloride, the monomer for PVC, was thought for some time to be man made but has now been discovered (obviously in very small quantities) as a natural soil product.

“The presumption that Vinyl Chloride is solely man-made must now be considered as incorrect”

Dr Frank Keppler Department of Atmospheric Chemistry Max Planck Institute for Chemistry

“PVC production operations are “dioxin factories” – Greenpeace.

Like all industry, the PVC industry is strictly regulated when it comes to emissions. The current legal amount of dioxin emissions from industrial discharges is 0.1 nanogrammes per cubic metre of emission.
In comparison, the dioxin concentration in the vicinity of a standard barbeque cooking meat has been measured in France at 0.7 nanogrammes per cubic metre of air, seven times the maximum permitted industrial concentration limit. (Robin des Bois, France, 2003)

“Substituting PVC products provides cost and environmental benefits”

Because of the competing claims about the life cycle costs of PVC, DEFRA commissioned a study by the independent environmental consultancy organisation, Entec. On the basis of their report, Michael Meacher MP, commented, on behalf of the government - “The life cycle costs of PVC products would appear to involve significantly lower costs than equivalent products made out of alternative materials”.

This was not good enough for some organisations who took their battle into Europe. The European Commission retained a respected environmental body, PE Europe, who, in conjunction with other leading environmental organisations, carried out a review of all life cycle studies comparing PVC with alternative materials for a variety of applications of which windows was one. They considered well over 100 such studies published over the last 15 years and they published it on the Europa website in June 2004. Its key conclusions were that there was no reason to discriminate against PVC on environmental grounds and that there was no need to substitute PVC for any other material in any application. For windows its conclusions were that the design of the window was much more important than the framing material.

“PVC production is highly energy intensive and needs more energy to manufacture than other plastics”

In fact, PVC uses the least amount of energy to produce than the other leading plastics and the amount of energy used and emissions is going down as technology continues to improve. Carbon offsetting has its proponents and opponents. Should an individual company wish to offset the PVC element of their windows the cost would be low. One tonne of PVC resin produces 1.8 tonnes of CO$_2$ throughout the supply process. An average window uses approximately 15 kg profile which equates to 27kg of CO$_2$. Current trading prices are around £10/tonne or 27p per window. Of course a company’s carbon footprint is more than just the PVC element of a window but it must also be remembered that energy efficient windows are responsible for reducing CO$_2$ emissions due to heat loss from buildings during their working lives.

“PVC is particularly dangerous in accidental fires”

ALL natural AND synthetic organic materials can burn and ALL fires will release toxic fumes. But PVC is actually very difficult to ignite. If it is ignited and the source of flame is taken away, PVC self extinguishes. PVC will not spread the fire on its own. It has one of the lowest surface spread of flame ratings of ALL materials.

When burning, PVC does not release much heat. Very few materials have a lower rate of heat release than PVC.
All fires produce smoke and toxic fumes but PVC lies in the middle of the range for both smoke obscuration and toxicity of fumes.
PVC cannot start a fire and cannot spread one, so if the fire doesn’t start and doesn’t spread, then it doesn’t kill!
However it should be noted that PVC-U is not normally used where specific fire resistance is required (as in the case of 30min fire doors, for instance) because retention of structural integrity would require uneconomic levels of reinforcement and build complexity.

"PVC contains harmful additives"

Without additives PVC is pretty much useless. The main additives are stabilisers and, for flexible PVC products such as blood bags, plasticisers. Other additives are needed depending on the final application. Stabilisers are essential for all applications of PVC. They prevent decomposition by heat and stresses during processing. They also give enhanced resistance to daylight, weathering and heat ageing and have an important influence on the PVC formulation—ultimately extending the life of the end products. There are many different types of stabilisers. The PVC-U window industry is currently in the process of introducing the latest calcium organic stabilisers and phasing out the lead salt stabilisers used in recent years. These are not elemental lead and so do not present any significant risk to health. All stabilisers remain within the polymer matrix so can never leach out. Calcium organic stabilisers account for around 0.2% of the PVC formulation.

The rest of the formulations comprises lubricants and other process aids, modifiers to ensure that the windows are resistant to the impacts they can expect to received during their lifetimes, fillers and pigments. The result is a material that is hard weathering, colourfast and capable of being manufactured into many styles of windows and doors suitable for just about any location.

"PVC is not recyclable"

PVC can be, and is being recycled. Recovinyl is a pan-European system set up to facilitate the collection and recycling of PVC. This is a voluntary initiative set up by the PVC industry to increase the amount of recycling of PVC as part of the industry’s Voluntary Commitment. It is a market based system which targets post-use PVC which would otherwise go to landfill.

Post-industrial waste consists of waste generated during the extrusion process. This could include profiles which are out of tolerance for instance. Fabricators of windows produce off-cuts from the bar lengths they buy from the extruder. This post-industrial waste is not waste at all, in fact. It is a valuable resource for which there is a competitive market. In-house waste at the extruders is immediately re-used by the extruder with little unusable material being produced. There are around 15 recyclers collecting and processing approximately 40,000 tonnes of off-cuts from fabricators. There may be isolated cases of fabricators sending off cuts to landfill but they will be few and far between as the recyclers would pay
them good money to collect their scrap and they would save on landfill.

Post use material comes from

- Installation off cuts of trims and the like;
- Mis-measures;
- End of life products. These are only recently entering the waste stream, frequently as a result of local authorities buying replacement windows in the early 80s on price alone and ending up with windows which were single glazed, externally beaded with cockspur handles. Bringing them up to modern standards of thermal efficiency and security can sometimes be done, but frequently it is cheaper to replace them. The frames themselves are in good condition however.
- Demolition. Demolition waste is a more difficult source to capture. Demolishers going in with a wrecking ball are not going to be able to separate out the PVC windows from the rest of the rubble so we need to move from the concept of demolition to deconstruction where useful products are removed prior to the wrecking ball moving in. This is currently done with, for example, slates from roofs, and we need to extend this to glass and window frames.

Recovinyl is developing a collection infrastructure to encourage waste management companies separate out the PVC waste and sell it to recyclers who in turn are being encouraged to invest in the sophisticated equipment to produce high quality recyclate. Initially, volumes are insufficient for this to be commercially viable and subsidies are needed. This is where Recovinyl operates. Recovinyl members collect and sort the PVC and deliver it to the Recovinyl recycler. The Recovinyl members receive incentive payments to do this. These payments come from the PVC industry as a whole. The Recovinyl recycler then recycles the PVC and sells it to a manufacturer. They receive a small audit fee for the extra paperwork involved. An independent auditor verifies the tonnage anticipated to be 40,000 tonnes during 2007.
Despite tales of some waste materials being shipped to poor African countries and dumped, this is not the case with PVC. The recovered and recycled material is valuable. All the recycled material is kept within Europe. UK recycled material is mainly sold to UK converters and almost all of it goes into long life, high grade applications. Short life material, mis-measures, etc., generally go back into windows. Long life material is recycled some into windows, some into pipes and conduits and some into other long life applications.

In summary, there is usually some element of truth in criticisms of PVC, however there is also a lot of misinformation and gross exaggeration. PVC is not perfect. Nothing is. Like all other materials used in any product it faces environmental and sustainability challenges. This doesn’t mean that the PVC industry will not develop. Progress is always being made in developing techniques in manufacture that use less power and so cause less emissions. Year on year progress is made improving environmental and safety performance. Despite what Greenpeace and other anti-PVC bodies may write, PVC-U windows are not only highly efficient and cost-effective, they are safe, durable, not harmful to the environment, can be, and are being recycled in a sustainable way.

### 6.4 Some further independent third party views on PVC

"The past year saw the publication of our 2020 Vision report on PVC...it has...succeeded in making people think more strategically and constructively about the future of PVC and other potentially sustainable materials." Extract from the Forum for the Future Annual Report 2001
Hans Christian Schmidt, Danish Environment Minister, in an article in Ingeniøren, in August 2003, said "I think it is now time for Greenpeace to change its attitude towards PVC. To me PVC is a very good material...I realise that the issues connected to the use as well as the disposal of the material will be solved."

Life Cycle Analyses of PVC and timber in window profiles were recently conducted by Entec UK Ltd for what is now DEFRA in early 2001 and for Manchester City Council in September 2001. Entec state that, "the difference found by the German Federal Environmental Agency between the environmental performance of wood and PVC-U profiles, are consistent with the findings of the DETR 2000 study such that, there are only marginal differences in the environmental performance. This will particularly be the case where recycled PVC-U is used in the profiles and lead and cadmium based stabilisers are avoided."

John Emsley, Science Writer in Residence, Department of Chemistry, Cambridge University, concluded in a chapter on PVC in his book, The Consumer's Good Chemicals Guide (1994): “As far as I am aware, no member of the public has ever been harmed by PVC, and many people owe their lives to it. It is time we learned to live in peace with a rather wonderful plastic”.

An Environmental Guideline Report published by the Dutch Foundation for Building Research (April 1996), and officially sponsored by the Dutch Ministry of the Environment (VROM), which lists PVC as an environmentally preferred material for almost all applications in housing construction.

A study on the environment health impacts of PVC in packaging and construction materials, carried out by The National Centre for Business & Ecology (June 1997) on behalf of a group of UK retailers, concluded that on the balance of probabilities 'none of the evidence reviewed provides an overriding scientific reason for the PVC Retailers' Group to immediately abandon the use of PVC in either food packaging or building/insulation materials...(provided that) the Retailers' Group is able to satisfy itself that the PVC it purchases is responsibly manufactured, used and disposed of...’
Reports published by Australia’s Commonwealth Scientific and Industrial Research Organisation (1996 and 1998) which concluded that, ‘the balance of evidence suggests that there is no alternative material to PVC in its major product applications that has less overall effect on the environment’.

The Minister of State for Science Energy and Industry in the UK Government, John Battle MP, confirmed support for PVC when he stated that, “...concerning PVC and the chlorine based industry in general, Ministers have made clear that independent evidence, such as that from Professor Rappe, the independent scientific advisor to the EU and the World Health organisation, demonstrates that PVC is a safe material in use and emissions from its manufacture and disposal are controlled by the Environment Agency”.

The German Council of Environmental Advisors (SRU), which reports to the German Federal Government, included a new evaluation of PVC in its latest environmental report (1998). The SRU concluded that PVC related “risks” to health and the environment are not significant enough to justify any ban or wide restrictions. The SRU’s chairman noted that “there are no longer reasons to discriminate against PVC”. This is a very different view to that expressed by the SRU in 1991, and reflects the PVC industry’s commitment and ability to successfully address environmental issues.

“There is absolutely no evidence that Vinyl damages human health or the environment. PVC is durable, low maintenance, recyclable and performs well in LCA tests” – Dr. Patrick Moore, founding member of Greenpeace (2006)

7 Relevant Standards Overview

7.1 Product Standards

- The requirements for white PVC-U profiles (bar lengths) are specified in BS EN 12608.
- The requirements for surface covered profiles (woodgrain foils and the like) are specified in BS 7722.
- The BPF have a draft for development for surface coated profiles (painted). (More information from the BPF).
- Self-coloured non-white profiles and acrylic capped profiles are currently not covered by any British or Trade Standards.
- The requirements for PVC-U windows and doorsets are specified in BS 7412 and, where enhanced security is required, to BS 7950.
- The requirements for enhanced security of doorsets are given in PAS 24-1.
- CEN, the European Standardisation body has produced a standard for windows and external doorsets published in the UK as BS EN 14351-1, Windows and pedestrian doorsets - Product
standard, performance characteristics - Part 1: Windows and external pedestrian doorsets without resistance to fire and smoke leakage characteristics but including external fire performance for roof windows. This standard contains a list of performance characteristics and classes of performance. BS 6375 has been revised and extended to give rules or guidance on the selection of appropriate classes. All conflicting requirements have been removed from the previous versions of BS 7412 and PAS 23-1 and the residual elements specifying the performance of components have been aligned with the standards for windows and doorsets of other materials.

Some of these standards are being developed to cover a wider range of products and it is wise to check the latest version for their scopes.

7.2 Survey and Installation

BS8213-4 Windows, doors and rooflights. Code of practice for the survey and installation of windows and external doorsets is published by BSI.

See annex 1 for details of the relevant standards.

7.3 BBA Guides

The British Board of Agrément (BBA) publish 4 Methods of Assessment and Test (MOATs) which are gradually being superseded with the latest European Standards but which can contain some useful aspects and there is significant historical detail based on them. See Annex 2 for details.

7.4 Management Standards

Quality Management Systems are covered by BS EN ISO 9001:2000
Environmental Management Systems are covered by BS EN ISO 14001:1996
Guidelines to Occupational Health and Safety Management Systems are covered by BS 8800:2004
Specification of Occupational Health and Safety management Systems is covered by OHSAS 18001:1999

More information is given in annex 3.

7.5 BPF Publications

The BPF publish a range of documents to help the industry. They are:

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<td>323/1</td>
<td>COP for the reinforcement of high impact modified PVC-U windows and doors</td>
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More information is given in annex 4.

7.6 Certification schemes

There are a number of third party certification schemes within the window and door industry. Such schemes involve UKAS Accredited bodies carrying out tests on products and assessing the management systems of the manufacturer’s. Usually, type testing is carried out on behalf of the system supplier on a number of samples designed to cover the whole range available. The fabricator then
usually has one window tested. Audit visits and tests are carried out at regular intervals to ensure that neither the product or the management system has deteriorated in any way.

The schemes include

Kitemark for BS EN 12608
Kitemark for BS 12608/BS7950
Kitemark for BS 7412
Kitemark for BS7412/BS7950
Kitemark for PAS23-1
Kitemark for PAS23-1/PAS24-1
Kitemark for installation to BS 8213-4

BBA Certificates for windows
BBA Certificates for doors
BBA Certificates for conservatory roofs

NQA Certification to BS7412
NQA Certification to BS 7412/BS 7950

BM Trada Q Mark to BS 7412
BM Trada Q Mark to BS 7412/BS7950

In addition, system suppliers frequently run Approved Installer schemes.

For more information and details of certificate holders contact the relevant certification body. See annex 6 for contact details.

8 Regulations overview

8.1 Building regulations (England and Wales)
Parts B, C, F, L, M, and N are relevant to windows and doors. To demonstrate compliance with these regulations, window installers have to have their work certified by a Building Control Authority, Approved Inspectors. For replacement windows and doors, installers may alternatively be covered by FENSA registration. Conservatories under 30m² are exempt from Building Regulations in England and Wales.

See Annex 5 for more details.
8.2 CDM

The object of this legislation is to bring into the design arena at the earliest stage considerations of the health and safety, not only of the occupants of the property on completion but also the operatives engaged in the construction of the building and the operatives later engaged in the ongoing maintenance and repair. The legislation imposes duties on the owner developer as well as on the professional team and in particular requires the appointment of an individual (the Planning Supervisor) to prepare the health and safety plan. This entails detailed involvement in the design process and is a separate and distinct appointment from that of designer for which a separate fee is payable. The tendency to award such appointments based solely on price has perhaps contributed to the failure of the legislation to achieve a reduction in major accidents on construction sites.

The major bonus however, has been the requirement for the preparation on the completion of the building of a health and safety file which incorporates original construction information and which acts for the life of the building as a "Log Book". This file needs to be amended on each and every occasion that the building is altered or extended. The Planning Supervisor is not only required to be involved in the design of the project and to ensure that health and safety issues are addressed at all stages but is also required to ensure that the health and safety plan is produced and that notice is given to the Health and Safety Executive. It is normal for the Planning Supervisor to be involved throughout the life of the construction project and at conclusion to ensure that the health and safety file is prepared and delivered to the client.

The involvement and the responsibilities of the Planning Supervisor should not be underestimated. It is a requirement of the Act that the client must allocate sufficient resource to enable the Planning Supervisor to perform his role properly. It is to be remembered that criminal proceedings apply to offences under the Act.

At the time of writing, the Health and Safety Commission is proposing amendments to the regulations which they say have:

- simplified the proposed Regulations, to improve clarity and therefore make it easier for duty holders to know what is expected of them;
- focused on planning and management, rather than the plan and other paperwork, to emphasise active management and minimise bureaucracy;
- maximised their flexibility to fit with the vast range of contractual arrangements;
- strengthened the requirements regarding co-ordination and co-operation, particularly between designers and contractors, to encourage integration; and
- simplified the assessment of organisations’ competence.
9 Specification requirements

9.1 Design

Unlike many British Standards Product Specifications BS 7412 does not give a complete specification for windows or doorsets because design may alter due to differing exposure conditions. Therefore, extra information is required by the Fabricator to allow him to manufacture the window. When specifying the basic performance of PVC-U windows it is necessary for the specifier to supply additional information to the window fabricator, a straight reference to BS 7412 is not sufficient. An example specification is given in annex … which may form the basis for a specification for a particular project.

9.1.1 Reinforcement

To ensure that the window or door is adequately reinforced without costly over-specification, reference should be made to BPF/GGF Code of Practice for Reinforcement Ref: 323/1. This will ensure that the product will withstand any imposed loads.

9.1.2 Classes from BS EN 12608

BS EN 12608 contains characteristics for which classifications are included. They are

- Classification of climatic zones, clause 4.2
- Classification of impact by falling mass of main profiles, clause 4.3
- Classification of wall thickness of main profiles, clause 4.4

9.1.2.1 Classification of climatic zones

BS EN 12608 has been written to cover all the climates in Europe from the colder North to the warm south. Consequently, the amount of solar energy on profiles will vary. To deal with this, two climatic zones have been defined in clause 4.2:

a) Moderate climate, M
b) Severe climate, S.

*The UK is a Moderate zone and so profiles with classification M are suitable for use throughout the UK.*

In addition, this standard notes that profiles designed for use in a severe climate (S) are also suitable for use in a moderate climate (M).
9.1.2.2 Classification of impact by falling mass of main profiles

Clause has two classes of resistance to impact by falling mass at –10 °C with a 1000 g weight being dropped from either 1 000 mm or 1 500 mm with no more than 1 test specimen showing rupture in the wall. In line with countries with a similar climate to the UK, 1 000 mm (Class I) is considered adequate although some manufacturers may chose to use 1 500 mm (Class II).

Sub-sills are not considered main profiles and therefore do not have to be subjected to this test.

9.1.2.3 Classification of wall thickness of main profiles, clause 4.4

For the external walls of main profiles, three classifications are given in clause 4.4. The classification is intended to represent the wide variations in profiles and window design for the various applications which are in use in Europe. It is not intended to imply differences in profile quality or in the performance of windows provided that the relevant performance requirements for both profiles and windows are met. Regardless of wall thickness, all PVC-U profiles for windows and doors that claim compliance with this standard have to comply with all the requirements of this standard. All windows and doorsets made from these profiles must comply with BS 7412, therefore, it is considered Class C is appropriate in the UK.

It is recommended not to measure external wall thickness within 3 mm of a junction of profile walls.

Over-specification of external wall thickness can lead to unnecessary excessive use of raw materials without any commensurate increase in performance.

It is perfectly feasible and acceptable that a profile within a suite of profiles may be classified differently from other profiles in that suite, including sub-sills.

9.1.3 Exposure category

The weathertightness exposure category shall be selected from the appropriate clause of BS 6375. The selection of unnecessarily high exposure categories will result in over design and may incur extra costs. The table in annex 7 shows the link between design wind pressure, wind speed and likely damage.

9.1.4 Style

9.1.4.1 Conservation area/listed building

It is possible that PVC-U windows and doors, of a suitable design, may be acceptable for the refurbishment of listed buildings. Advice should be sought in advance from the Local Planning Officer, and additional care in specification to ensure sympathetic styles should be taken.

In certain conservation areas planning permission may be required for the replacement of windows. Even where this is not the case great care should be exercised in the selection of styles and finishes. It
is advisable to check with the local Planning Officer before replacing windows in conservation areas. More information can be obtained from the BPF publication *Replacement Windows and Planning Law*.

### 9.1.4.2 Windows

Virtually any style of window can be produced in plastic including traditional casement, the continental style tilt and turn, pivot and fully reversible windows. Each of these styles has its own particular attributes; for instance a fully reversible window can be cleaned from the inside of the building. Modern high-performance finishes give a wide selection of colours to enhance further the appearance. Imitation leaded lights and stained glass may also be used to great effect.

When choosing a particular style of window consideration should be given to the following:

- **a)** Cleaning from inside and safety in use - BS 8213-1 gives detailed guidance on the selection of appropriate styles and sizes.
- **b)** Safety in case of fire - it is important to ensure that means of escape in case of fire are provided.
- **c)** Security
- **d)** Thermal performance
- **e)** Acoustic performance
- **f)** Where Building Regulations apply the minimum size of opening lights is defined for ventilation and fire safety. Where Building Regulations do not apply the specifier should state whether he requires the fire safety requirements of the Building Regulations to be incorporated.
- **g)** Very large opening lights can be manufactured. However, the weight applied to the hardware will limit the size as going beyond the hardware manufacturer’s size and weight limitations could lead to failure.

### 9.1.4.3 Hinged entrance doors

Locking mechanisms for doors range from simple latch-roller devices which have little or no burglar resistance to sophisticated multi-point locking devices such as hook, mortice and shoot bolts which give a high degree of weather performance and security. The specifier should discuss and agree on the correct specification with the supplier. At this stage the provision of bell pushes, knockers, numbers, letterplates, spy holes, etc., should be clearly identified by the specifier.

High performance locking systems should be complemented by High Performance hinges. BS 7352 gives Test Methods and Specifications for Strength and Durability of Door Hinges. For certain applications, particularly where wheelchair access is required low thresholds may be desirable. It should be noted that this ease of access may reduce the weather performance.

Some applications, e.g. entrance doors to flats from common landings, may not require a threshold.
Where the doorset incorporates a side panel the mullion should be designed to avoid excessive deflection.

Particular considerations for special access requirements may include minimum opening widths, low threshold, outward opening doors and other design features.

9.1.4.4 Sliding (patio) doors
Traditionally the easiest point of access for a burglar is a patio door. However, modern PVC-U patio doors either contain or can contain highly sophisticated operating locking systems.

Styles available include:
- In-Line
- In-Front
- Lift, Tilt, Slide

Most suppliers will have explanatory leaflets or will be able to demonstrate the differences in function.

9.1.4.5 Conservatories
PVC-U conservatories should be designed, manufactured and installed in accordance with the guidelines for The Design and Installation of PVC-U Conservatories (Reference 337/2 February 1995) published by the British Plastics Federation Windows Group and the Conservatory Association and in accordance with the system supplier's manufacturing recommendations.

9.1.5 Finishes
It must be clearly identified what, if any, the finish to the PVC-U material is to be, e.g., the woodgrain effect to be used or the colour of the surface coating to be used.

9.1.6 Jointing methods and finishing
For PVC-U windows, 2 methods are currently employed for joining the mullions and transoms to the outer frame; heat-fusion welding and mechanical jointing. Both methods are capable of high performance. The specifier should state any preference.
The welded joint of a PVC-U window or door produces a sprue during the welding process. There are 3 methods commonly used to remove the sprue.

(i) Grooving – the sprue is removed by cutting a shallow groove along the weld line approximately 4-5mm wide and 0.5mm deep.

(ii) Knifing – The sprue is removed by a sharp knife leaving a slight ridge along the weld line.

(iii) Polishing – the sprue is removed by grinding and polishing the profile in the area of the weld to produce a smooth finish. This method is labour intensive and not frequently used due to the additional costs involved.

The specifier should state any preference.

9.1.7 Safety/security

When specifying the hardware and glazing for windows, consideration should be given to the differing requirements of:

- a) Burglary Resistance
- b) Safety in Use
- c) Safety in the Case of Fire

The selection of hardware to increase burglary resistance, for instance, may have an adverse effect on safety in case of fire. On the one hand it is intended to reduce the likelihood of unauthorized entry whilst on the other hand this would hinder rescue attempts in the case of a fire.

Components which could improve burglary resistance include the following:

- Mushroom headed espagnolettes
- Shoot bolts
Security glazing blocks
Adhesive glazing tape
Internal beads
Enhancing glazing (thicker glass, laminated or wired glass, double glazing).
Key-locking handles.
Hinge-side security devices.

Specification of any or all of the above is no guarantee that products will comply with BS 7950 and PAS24-1 for enhanced security. Only testing to the specifications can ensure compliance. These specifications do not address the balance between security and safety in case of fire. This balance can only be drawn by discussions around any particular installation and occupancy conditions. See BS 8213-1 : 2004 and BS5588 for more guidance.

For emergency escape it is important that opening lights are provided at critical points which are large enough to permit escape. Building Regulations give details of minimum sizes of escape openings and maximum heights above floor level. The specification of styles should take these into account. Restrictors are often specified when there is a danger of children falling from opening windows. Commonly, these restrict the opening to 100 mm. Work is currently under way in BSI to draft a specification for the operation of these devices.

The specifier should specify the components to be used to achieve the best compromise for the particular application.

9.1.8 Corrosion resistance

BS 7412 specifies high levels of corrosion resistance for hardware and fasteners. However, the use of even more corrosion resistant hardware is recommended for parts that are frequently wetted by condensation or for service in marine or polluted industrial environments. If the specifier considers that the application falls into one of these categories then this should be clearly stated in the specification. It should be remembered that the use of more corrosion resistant hardware and fasteners (where available) will incur additional cost but will dramatically reduce the risk of corrosion.

In addition, because the design of hardware is often hardware manufacturer specific, system specific and even profile specific, it may prove difficult to source replacement parts in the future. The additional cost of specifying hardware with a higher level of corrosion resistance is outweighed by the longer life. It is recommended that hardware with a minimum corrosion resistance of 240 hours when tested in a neutral salt spray test to BS 7479 be specified. Hardware with much longer periods of corrosion resistance is available and specifiers are recommended to discuss this with potential suppliers.
9.1.9 Sub-sill/drainage

Where a PVC-U sub-sill is used, it is frequently possible to conceal the drainage slots so that any moisture that gets past the seals drains out from the bottom of the window on to the sub-sill. Where the window bottom rail is fitted directly on to the sub-strate, e.g. a stone sill, this concealed drainage may not be possible.

**Face drainage**

![Face drainage diagram]

Drainage slot concealed by cover
Background ventilation

Where background ventilators are to be provided - through frame, over head or glazed-in - the size, type and location of them must be clearly identified. Habitable rooms require 8000mm$^2$ of controllable background ventilation. Depending on the size of an opening light, a trickle vent (night vent) position on espagnolette locking systems may satisfy this but could reduce security. More information is given in Approved Document F.

Over head background ventilator

9.2 Installation

Generally, windows and doors in replacement applications should be installed in accordance with BS 8213-4 and for new build BPF W356.

9.2.1 Special considerations

Where special considerations occur, such as unusual construction techniques, or there are other non-standard requirements, these should be clearly stated.
9.2.2 Removal and disposal of existing (including recycling)

The responsibility for the removal, disposal or recycling of existing must be clearly identified. Where old windows are to be recycled, this may add a small amount to the total cost and it is strongly recommended that this is included in any Bill of Quantities.

9.2.3 Hand over

At hand over, the appearance and function of the window, together with the workmanship of installation and, where appropriate, making good should be checked. Drainage paths should be free from debris and any steel swarf removed. Failure to do this may cause rust stains that cannot be removed. For face drained products, the presence of all drainage caps should be checked. The presence of sub-sill end caps and any other cover caps should also be checked.

9.3 Boarding up

Where it is necessary to board up windows e.g. in an occupied dwelling, this should be done in a way that the fixings used do not penetrate the PVC-U frame as would normally be the case with a timber frame. One method would be to replace the glass in the frames with boards. If this method is not considered suitable, the specifier should discuss alternatives with the manufacturer and the solution incorporated in the specification.

9.4 Operation, maintenance and repair

The installer should provide clear instructions on the safe operation of the window, including the use of the locks and restrictors. Instructions for the maintenance of the window should also be provided by the installer.

The pristine appearance of PVC-U windows is maintained by an occasional cleaning. The frequency of this cleaning will depend on the local conditions. For instance, products installed in an industrial area are likely to need cleaning more often.

Particular care should be taken to ensure that nothing that may cause a rust stain comes into contact with PVC-U products, as rust stains are not easily removable.

Generally the little maintenance that is required by PVC-U products can be split into 2 categories:

9.4.1 Routine cleaning and maintenance that can be carried out by people with no particular experience with PVC-U products.

The cleaning of both gaskets and profiles should be carried out periodically to maintain the appearance. Failure to do this will not reduce the performance of the product but it will spoil the appearance.
Stains that are not removable by soapy water may be removable using a domestic non-abrasive cream cleaner. However, these should not be used to excess as they may affect the gloss finish.

For PVC-U products with decorative finishes, e.g. paints and woodgrain laminates, the supplier’s advice should be sought as to which products are suitable for attempting to remove stubborn stains.

On no account should any solvent-based cleaners be used without prior approval from the supplier as some of these may seriously damage the profiles.

Should painting (or re-painting), be desirable then this should only be undertaken by suitably qualified companies. The use of the wrong type of paint may seriously damage the profiles.

During routine cleaning it is advisable to check for damage such as scratches, abrasions, signs of tampering, faulty operation of hardware and that drainage paths are clear.

Should any damage be found it is advisable to seek advice from the suppliers or another suitably qualified company.

The hardware is likely to require some simple lubrication during its lifetime. The supplier should give information as to the lubrication points and an advised frequency. Following these recommendations will ensure that the product continues to operate smoothly and efficiently.

It is likely that the PVC-U frames will out-last all the other components such as double glazed units, hardware and gaskets. All these items can be replaced by experienced personnel. If a frame is scratched or damaged in an unsightly position it may be possible to effect a repair. In these cases it is advisable to contact the supplier.

**9.4.2 Repairs which can only be carried out by someone with the requisite skills.**

Replacement components should only be fitted by trained personnel as the correct adjustment of the glazing; the gaskets and the hardware are critical to the performance of the windows and doors.

The frequency of replacement will depend on the original component specification, the environment in which the products are installed, the level of care exercised in use and routine maintenance and the frequency of opening and closing.

The provision of details of the hardware and other components used by the supplier may be useful in expediting any repairs or replacements.
It is recommended that a contact name and telephone number be provided in case of any queries.

9.5 Warranty

The installer should ensure that all the necessary warranty documentation is provided to the customer.
Annex 1 Product Standards

BS 7412:2007 – Specification for windows and doorsets made from unplasticized polyvinyl chloride (PVC-U) extruded hollow profiles

This is the main standard used for the specification of white PVC-U windows. The following standards are called up in BS 7412:2002

BS 952-1 - Glass for glazing. Classification
BS 952-2 - Glass for glazing. Terminology for work on glass
BS 5713 - Specification for hermetically sealed flat double-glazing units
BS 6100-1.0 - Glossary of building and civil engineering terms. General and miscellaneous. General
BS 6100-1.3.5:1999 - Glossary of building and civil engineering terms. General and miscellaneous. Parts of construction works. Doors, windows and openings
BS 6100-1.3.6 - Glossary of building and civil engineering terms. General and miscellaneous. Parts of construction works. Jointing products, builders’ hardware and accessories
BS 6100-1.6 - Glossary of building and civil engineering terms. General and miscellaneous. Persons
BS 6262 - Code of practice for glazing for buildings.
BS 6375-1:2004 - Performance of windows. Classification for weathertightness and guidance on selection and specification
BS 6375-2:1987 - Performance of windows. Specification for operation and strength characteristics
BS 7413:2002 – (superseded by BS EN 12608)
BS EN 12608:2003 - Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors. Classification, requirements and test methods

The following standards are called up in BS EN 12608:2003

BS EN 477:1999 - Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors. Determination of the resistance to impact of main profiles by falling mass
BS EN 478:1999 - Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors. Appearance after exposure at 150°C. Test method
BS EN 479:1999 - Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors. Determination of heat reversion
BS EN 513:1999 - Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors. Determination of the resistance to artificial weathering
BS EN 514:2000 - Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors. Determination of the strength of welded corners and T-joints
BS EN ISO 105-A01: 1996 - Textiles. Tests for colour fastness. General principles of testing
BS EN ISO 178:2003 - Plastics. Determination of flexural properties
BS EN ISO 8256:2004 - Plastics. Determination of tensile-impact strength


BS 7950:1997 - Specification for enhanced security performance of casement and tilt/turn windows for domestic applications

This is the standard used to specify the enhanced security of windows. The Scope of this standard is currently being extended to include reversible windows and soon to include sliding windows. The following standards are called up in BS7950:

BS 6206:1981 - Specification for impact performance requirements for flat safety glass and safety plastics for use in buildings
This standard is used to specify surface covered (i.e. foil covered, such as woodgrains) profiles. There is no corresponding specification for windows made from these profiles although many of the requirements in BS 7412 apply.

The following standards are called up in BS 7722 : 2002.

Determination of the thermal stability of polyvinyl chloride by the Congo red method
BS 2782-3:Methods 320A to 320F - Methods of testing plastics. Mechanical properties. Tensile strength, elongation and elastic modulus
BS 2782-5:Method 520A - Methods of testing plastics. Optical and colour properties, weathering. Determination of specular gloss
BS 3900-D8, ISO 7724-1 - Methods of test for paints. Optical tests on paint films. Determination of colour and colour difference: principles
BS 3900-D9, ISO 7724-2 - Methods of test for paints. Optical tests on paint films. Determination of colour and colour difference: measurement
BS 3900-D10, ISO 7724-3 - Methods of test for paints. Determination of colour and colour difference: calculation
BS 6100-1.3.5 - Glossary of building and civil engineering terms. General and miscellaneous. Parts of construction works. Doors, windows and openings
BS 7412 - Plastics windows made from unplasticized polyvinyl chloride (PVC-U) extruded hollow profiles. Specification
BS 7413:2002 – (superseded by BS EN 12608)
BS EN 12608:2003 - Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors. Classification, requirements and test methods See BS 7412 on page ...
BS EN 477 - Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors. Determination of the resistance to impact of main profiles by falling mass
BS EN 478 - Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors. Appearance after exposure at 150°C. Test method
BS EN 479 - Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors. Determination of heat reversion
BS EN 12956:1999 - Wallcoverings in roll form. Determination of dimensions, straightness, spongeability and washability
BS EN ISO 105-A01 Colour Scale - Textiles. Tests for colour fastness. Standard depths: matt
BS EN ISO 178 - Plastics. Determination of flexural properties
BS EN ISO 178, BS 2782-3:Method 335A - Plastics. Determination of flexural properties
BS EN ISO 179:1997 - Plastics. Determination of Charpy impact strength
BS EN ISO 306, BS 2782-1:Methods 120A, 120B, 120D and 120E - Plastics. Thermoplastic materials. Determination of Vicat softening temperature (VST)
BS EN ISO 1163-2 - Plastics. Unplasticized poly(vinyl chloride) (PVC-U) moulding and extrusion materials. Preparation of test specimens and determination of properties
BS EN ISO 2409, BS 3900-E6 - Paints and varnishes. Crosscut test
BS ISO 10526:1999 - CIE standard illuminants for colorimetry
PAS24 – Enhanced security performance requirements for door assemblies

This standard specifies those requirements over and above those in PAS23 to provide doors with enhanced security.

The following standards are called up in PAS24:

- **BS 2911** - Specification for letter plates.
- **BS 6262** - Code of practice for glazing for buildings.
- **BS 6262-4** - Glazing for buildings — Part 4: Safety related to human impact.
- **BS 7950** - Specification for enhanced security performance of casement and tilt/turn windows for domestic applications.
- **PAS 23-1** - General performance requirements for door assemblies — Part 1: Single leaf, external door assemblies to dwellings. See PAS23 on page …
Annex 2 BBA Guides

MOAT No.1: Directive for the Assessment of Windows
Scope: General assessment guidelines for windows of any material

MOAT No.11: Directive for the Assessment of Doors
Scope: General assessment guidelines for doors of any material

MOAT No.17: UEAtc Technical Guide for the Agrément of windows in PVC-U
Scope: Assessment and testing guidelines for PVC-U profiles and windows to allow 'confirmation' of approval data around Europe via UEAtc organisations.

MOAT No.57: UEAtc Technical Report for the assessment of windows in coloured PVC-U
Scope: Guidance on the assessment of coloured PVC-U profiles and windows, covers foiling, painting, co-extrusions and through colouring.
Annex 3 Management standards

BS EN ISO 9000:2000 - Quality management systems. Fundamentals and vocabulary

This is the generic Quality Management Systems standard that describes the fundamentals of Quality Management Systems and defines the terms used in the ISO 9000 series of standards. This standard does not specify any requirements and therefore companies cannot be certified against it. Requirements are covered in BS EN ISO 9001:2000

The following standards are called up in BS EN ISO 9000:2000

- ISO 704 - Terminology work. Principles and methods
- ISO 1087-1 - Terminology work. Vocabulary. Theory and application
- ISO 3534-2 - Statistics. Vocabulary and symbols. Statistical quality control
- ISO 9001:2000 - Quality management systems. Requirements
- ISO 10012 - Measurement management systems. Requirements for measurement processes and measuring equipment
- ISO 10013:1995 - Guidelines for developing quality manuals
- ISO/TR 13425 - Guidelines for the selection of statistical methods in standardization and specification
- ISO 14001:1996 - Environmental management systems. Requirements with guidance for use
- ISO 19011 - Guidelines for quality and/or environmental management systems auditing
This is similar to BS EN ISO 9001:2000 but relates to management systems for environmental matters.

The following standards are called up in BS EN ISO 14001:1996

- **ISO 9000-1**: Quality management and quality assurance standards. Guidelines for selection and use
- **ISO 9000-2**: Quality management and quality assurance standards. Generic guidelines for the application of ISO 9001, ISO 9002 and ISO 9003
- **ISO 9000-3**: Quality management and quality assurance standards. Guidelines for the application of ISO 9001:1994 to the development, supply, installation and maintenance of computer software
- **ISO 9000-4**: Quality systems. Guide to dependability programme management
- **ISO 9001**: Quality management systems. Requirements
- **ISO 14004**: Environmental management systems. General guidelines on principles, systems and support techniques
- **ISO 14010**: Guidelines for environmental auditing. General principles
- **ISO 14011**: Guidelines for environmental auditing. Audit procedures. Auditing of environmental management systems
- **ISO 14012**: Guidelines for environmental auditing. Qualification criteria for environmental auditors
OHSAS 18001:1999 - Occupational health and safety management systems. Specification

This is similar to BS EN ISO 9001:2000 but relates to management systems for health and safety matters.

The following standards are called up in OHSAS 18001:1999

- **OHSAS 18002:2000** - Occupational health and safety management systems. Guidelines for the implementation of OHSAS 18001
- **BS 8800:1996** - Occupational health and safety management systems. Guide
- **BS EN ISO 9001:1994** - Quality systems. Model for quality assurance in design, development, production, installation and servicing
- **BS EN ISO 9001:2000** - Quality management systems. Requirements
- **BS EN ISO 14001:1996** - Environmental management systems. Specification with guidance for use
- **BS EN ISO 19011:2002** - Guidelines for quality and/or environmental management systems auditing
### Annex 4 BPFWG Publications

<table>
<thead>
<tr>
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<tr>
<td>323/1</td>
<td><strong>COP for the reinforcement of high impact modified PVC-U windows and doors</strong>&lt;br&gt;The purpose of the Code is to state the requirements and recommendations for reinforcement of PVC-U windows and doors, in new and replacement products. It is intended to provide sufficient information to help Specifiers and Fabricators to choose the correct levels of reinforcements without costly over-specification, and to harmonise the approach throughout the industry towards reinforcement. 1991</td>
</tr>
<tr>
<td>332/1</td>
<td><strong>Guidelines for the welding of PVC-U profiles for windows and doors</strong>&lt;br&gt;These Guidelines apply to the welding of PVC-U profiles as defined in BS 7413 and BS 7722. It lists the requirements and techniques necessary to achieve satisfactory welds. It represents the best of industry and academic expertise. 1992. (Research is currently under way which may lead to updating of these guidelines, particularly with respects to 'T' joint welds.)</td>
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<tr>
<td>333/1</td>
<td><strong>Guidelines for welding : Laminated shopfloor checklist, A4 size</strong>&lt;br&gt;Convenient checklist, smaller size</td>
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<tr>
<td>334/1</td>
<td><strong>Guidelines for welding : Laminated shopfloor checklist, A3 size</strong>&lt;br&gt;Convenient checklist, larger size</td>
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<td>336/1</td>
<td><strong>Guidelines for the measurement of PVC-U colour and gloss</strong>&lt;br&gt;These Guidelines are the result of industry expertise and collaborative trials by members of the British Plastics Federation Windows Group. They offer advice on instrumentation, measurement, prefabrication and procedures. They offer a Form of Report for production-line sampling. Properly applied, they should form a basis for the settlement of disputes on colour. 1993</td>
</tr>
<tr>
<td>337/2</td>
<td><strong>Guidelines for the design and installation of PVC-U conservatories</strong>&lt;br&gt;These Guidelines supersede and extend the original publication (337/1) issued in 1993. They deal with surveys, building regulations, design, materials and construction for Victorian, Lean-to and Edwardian types of conservatories with floor areas of 30sq. metres or less. 1995</td>
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<td>340/1</td>
<td><strong>Conservatories - Laminated planning permission flow chart, A4 size, 1993</strong>&lt;br&gt;Convenient flow chart determining whether Planning Permission is required – smaller size</td>
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<td>342/1</td>
<td><strong>Conservatories - Laminated building regulations flow chart, A3 size, 1993</strong>&lt;br&gt;Convenient flow chart determining whether Planning Permission is required – smaller size</td>
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<tr>
<td>345/2</td>
<td>Materials for gaskets and weatherstrips for windows doors, conservatories and curtain walling – Specification and performance requirements</td>
</tr>
<tr>
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<td>This Trade Standard lays down the specification and the performance requirements for materials used in and the functionality of gaskets, co-extruded glazing beads, weatherstrips, cellular adhesive glazing tapes used in windows, doors, conservatories and curtain walling, primarily for domestic and residential use. It excludes butyl glazing tapes and other mastic materials, and any materials used in shutters.</td>
</tr>
<tr>
<td>351/1</td>
<td>Guidelines for the use of PVC-U windows and frames in commercial/light industrial applications</td>
</tr>
<tr>
<td></td>
<td>These Guidelines have been prepared for both Specifiers and Manufacturers who are concerned with the design, materials, construction and performance requirements of light duty curtain walling incorporating PVC-U windows in commercial and light Industrial applications. 1995</td>
</tr>
<tr>
<td>355/1</td>
<td>Infill panels for doors and windows</td>
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<tr>
<td></td>
<td>This product performance standard has been published as a Draft for Development, to allow suppliers and their customers to review and agree performance levels based on the tests included in the standard for use as acceptance criteria for specific applications. June 1996</td>
</tr>
<tr>
<td>356/2</td>
<td>COP for the installation of PVC-U windows and doorsets in new domestic dwellings</td>
</tr>
<tr>
<td></td>
<td>This Code has been written for the growing use and application of PVC-U windows and doorsets in new buildings. It is an essential good practice guide for use by System Designers, Installers and On-site Operatives alike detailing Design Requirements, Site Practice, Location, Fixing and Sealing, Glazing and Finishing Off. March 2005</td>
</tr>
<tr>
<td>357/1</td>
<td>Replacement windows and planning law</td>
</tr>
<tr>
<td></td>
<td>A document to provide guidance for both consumers and the window industry in the selection of windows for use in historic buildings and conservation areas. It outlines some of the key points of the law and a number of the penalties for not complying with the various regulations. 1997</td>
</tr>
<tr>
<td>358/1</td>
<td>Guidelines to Good Business Practice</td>
</tr>
<tr>
<td></td>
<td>The document outlines what is considered 'best practice' within the sales, marketing and customer care spheres of a domestic installer's activities. It gives clear do's and don'ts in relation to the areas that give most cause for concern and seeks to promote fair play between the industry and its customers. 1997</td>
</tr>
<tr>
<td>360/1</td>
<td>Specification for sliding patio doors made from PVC-U extruded hollow profiles</td>
</tr>
<tr>
<td></td>
<td>This specification details the test methods and acceptance criteria applicable to PVC-U framed sliding patio doors in domestic applications. It applies to in-line and tilt/slide patio doors.</td>
</tr>
<tr>
<td>Ref</td>
<td>Title</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>W363/1</td>
<td>Guidelines for the selection and application of fasteners for the manufacture of plastics windows and doorsets</td>
</tr>
<tr>
<td></td>
<td>The Technical Committee of the British Plastics Federation Windows Group in conjunction has prepared these guidelines with manufacturers and suppliers of fasteners. It is intended to help the fabricator to understand the importance of correct fastener selection in relation to the performance of the finished product. In addition these guidelines will help to assess the performance of the fastener. February 2001</td>
</tr>
</tbody>
</table>
Annex 5 Building Regulations England and Wales

For new build situations, the dwelling designer is responsible for ensuring that the windows and doors comply with the Building Regulations.

For replacement situations, the householder is legally responsible for ensuring that the replacement windows and doors comply with Building Regulations. However, this responsibility is usually passed on to the installation company who must ensure that the replacement windows and doors comply with Parts L1 and the relevant sections of Part N. In addition, the dwelling must be made no worse with respect to the other regulations.

Part B1 2000, amended 2002

The following clauses are extracted from Part B1 of the Building Regulations:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Limits on application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Means of warning and escape</strong></td>
<td></td>
</tr>
<tr>
<td>B1. The building shall be designed and constructed so that there are appropriate provisions for the early warning of fire, and appropriate means of escape in case of fire from the building to a place of safety outside the building capable of being safely and effectively used at all material times.</td>
<td>Requirement B1 does not apply to any prison provided under section 33 of the Prisons Act 1952 (power to provide prisons etc.).</td>
</tr>
</tbody>
</table>

Provisions for escape from floors not more than 4.5m above ground level

2.7 Except for kitchens, all habitable rooms in the upper storey(s) of a house served by only one stair should be provided with a window (or external door) which complies with paragraph 2.11.

**Note:** A single window can be accepted to serve two rooms provided both rooms have their own access to the stairs. A communicating door between the rooms must be provided so that it is possible to gain access to the window without passing through the stair enclosure.

Emergency egress windows and external doors

2.11 Any window provided for emergency egress purposes and any external door provided for escape should comply with the following conditions.

a. The window should have an unobstructed openable area that is at least 0.33m² and at least 450mm high and 450mm wide (the route through the window may be at an angle rather than straight through). The bottom of the openable area should be not more than 1100mm above the floor.

b. The window or door should enable the person escaping to reach a place free from danger from fire.

**Note:** Approved Document K Protection from falling, collision and impact specifies a minimum guarding height of 800mm, except in the case of a window in a roof where the bottom of the opening may be 600mm above the floor.

Additional provisions for houses with a floor more than 4.5m above ground level

2.23 Windows provided for emergency egress purposes from basement, ground or first storeys, provide a means of self-rescue. At higher level escape may depend on a ladder being set up. While this is a departure from the general principle that escape should be without outside assistance it is considered that, in the case of a three storey domestic residential loft conversion this is reasonable as an emergency measure. A fixed ladder on the slope of the roof is not recommended.
Joints between doors and windows

5.29 The joint between walls and door and window frames should:
a) resist the penetration of precipitation to the inside of the building; and
b) not be damaged by precipitation and not permit precipitation to reach any part of
the building which would be damaged by it.

5.30 Damp-proof courses should be provided to direct moisture towards the outside:
a) where the downward flow of moisture would be interrupted at an obstruction, eg at
a lintel;
b) where sill elements, including joints, do not form a complete barrier to the transfer of
precipitation, eg under openings, windows and doors;
c) where reveal elements, including joints, do not form a complete barrier to the
transfer of rain and snow, eg at openings, windows and doors.

5.31 In some cases the width of the cavity due to thermal insulation and the 50mm
clearance for drainage may be such that the window frame is not wide enough to
completely cover the cavity closer. The reveal may need lined with plasterboard, dry
lining, a support system, or a thermal backing board. Direct plastering of the internal
reveal should only be used with a backing of expanded metal lathing or similar. 5.32 In
areas of the country in driving rain exposure zone 4 checked rebates should be used in
all window and door reveals. The frame should be set back behind the outer leaf of
masonry, which should overlap it as shown in Diagram 13. Alternatively an insulated
finned cavity closer may be used.

Door thresholds

5.33 Where an accessible threshold is provided to allow unimpeded access, as
specified in Part M, Access to and use of buildings, it will meet the requirement if:

a) the external landing (Diagram 14) is laid to a fall between 1 in 40 and 1 in 60 in
a single direction away from the doorway;
b) the sill leading up to the door threshold has a maximum slope of 15°.

Further advice for the development of accessible thresholds is given in BRE GBG 47 and the TSO document.
The following clauses are extracted from Part F1 of the Building Regulations:

### Part F 1995 amended 2000

The following clauses are extracted from Part F1 of the Building Regulations:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Limits on application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Means of Ventilation</strong></td>
<td>Requirement F1 does not apply to a building or space within a building—</td>
</tr>
<tr>
<td><strong>F1.</strong> There shall be adequate means of ventilation provided for people in the building</td>
<td>(a) into which people do not normally go; or</td>
</tr>
<tr>
<td></td>
<td>(b) which is used solely for storage; or</td>
</tr>
<tr>
<td></td>
<td>(c) which is a garage used solely in connection with a single dwelling.</td>
</tr>
</tbody>
</table>

#### Definitions

0.1 **A ventilation opening** can include any means of ventilation (whether it is permanent or closable) which opens directly to external air, such as the openable parts of a window, a louver, airbrick, progressively openable ventilator, or window trickle ventilator. It also includes any door which opens directly to external air.

0.2 **Habitable room** means a room used for dwelling purposes but which is not solely a kitchen.

#### Section 1 Domestic buildings, introduction to provisions

1.1 This Approved Document shows two main ways of complying with the requirement by:

- a. following the provisions set out in paragraphs 1.1 to 1.8 or
- b. alternative approaches set out in paragraph 1.9

The key paragraphs for windows and doors are:

#### General

1.1 The performance will be achieved if the following provisions are made in accordance with Table 1:

- a. for rapid ventilation, one or more ventilation opening with some part of the ventilation opening at high level (typically 1.75m above the floor level), e.g. an opening window; and

- b. for background ventilation, a ventilation opening (or openings), e.g. trickle ventilators, air bricks with a “hit and miss” ventilator, or where appropriate, suitably designed opening windows (see Diagram 1 [in Approved Document F]). The ventilation opening(s) should be reasonably secure, adjustable and located (typically 1.75m above the floor level) so as to avoid discomfort due to cold draughts and to prevent rain ingress; and

- c. for extract ventilation, either by:

  - i. mechanical extract ventilation operated manually and/or automatically by sensor or controller; or
ii. passive stack ventilation operated manually and/or automatically by sensor or controller (see note 2 to Table 1 [in Approved Document F]); or
iii. an appropriate open-flued heating appliance (see note 3 to Table 1 [in Approved Document F]).

1.2 For kitchens, utility rooms, bathrooms and sanitary accommodation not containing openable windows (see paragraph 1.5 [in Approved Document F]).

1.3 If the ventilation of a habitable room is through another room is through another room or space, see paragraphs 1.6 and 1.7 [in Approved Document F].

<table>
<thead>
<tr>
<th>Room</th>
<th>Rapid ventilation (eg opening windows)</th>
<th>Background ventilation</th>
<th>Extract ventilation fan rates or passive stack (PSV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitable room</td>
<td>1/20th of floor area</td>
<td>8000 mm²</td>
<td>-</td>
</tr>
<tr>
<td>Kitchen</td>
<td>Opening window (no minimum size)</td>
<td>4000 mm²</td>
<td>30 litres/second adjacent to a hob or 60 litres/second elsewhere or PSV</td>
</tr>
<tr>
<td>Utility room</td>
<td>Opening window (no minimum size)</td>
<td>4000 mm²</td>
<td>30 litres/second or PSV</td>
</tr>
<tr>
<td>Bathroom (with or without WC)</td>
<td>Opening window (no minimum size)</td>
<td>4000 mm²</td>
<td>15 litres/second or PSV</td>
</tr>
<tr>
<td>Sanitary accommodation</td>
<td>1/20th floor area or mechanical extract at 6 litres/second</td>
<td>4000 mm²</td>
<td>-</td>
</tr>
</tbody>
</table>

At the time of writing this Part of the Building Regulations is under review for amendment.
The following clauses are extracted from Part L1 of the Building Regulations:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Limits on application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dwellings</strong></td>
<td></td>
</tr>
<tr>
<td>L1. Reasonable provision shall be made for the conservation of fuel and power in dwellings by –</td>
<td>The requirement for sufficient controls in requirement L1(c) applies only to external lighting systems fixed to the building.</td>
</tr>
<tr>
<td>(a) limiting the heat loss:</td>
<td></td>
</tr>
<tr>
<td>(i) through the fabric of the building;</td>
<td></td>
</tr>
<tr>
<td>(ii) from hot water pipes and hot air ducts used for space heating;</td>
<td></td>
</tr>
<tr>
<td>(iii) from hot water vessels;</td>
<td></td>
</tr>
<tr>
<td>(b) providing space heating and hot water systems which are energy-efficient;</td>
<td></td>
</tr>
<tr>
<td>(c) providing lighting systems with appropriate lamps and sufficient controls so that energy can be used efficiently;</td>
<td></td>
</tr>
<tr>
<td>(d) providing sufficient information with the heating and hot water services so that building occupiers can operate and maintain the services in such a manner as to use no more energy than is reasonable in the circumstances.</td>
<td></td>
</tr>
</tbody>
</table>

For replacement windows and doors, the current version of Part L calls for U values of no more than 2.0 for PVC-U windows and glazed doors. Current proposals for amending this Part of the Building Regulations envisages the recognition of Window Energy Ratings, see [www.bfrc.org](http://www.bfrc.org), the web site of the British Fenestration Rating Council for more details and a list of rated products.

For new dwellings, three methods of showing compliance are given.

a) An Elemental method;
b) A Target U-value method;
c) A Carbon Index method.

The Elemental Method can be used only when the heating system will be based on an efficient gas or oil boiler, on a heat pump, on community heating with CHP or on biogas or biomass fuel, but not for direct electric heating or other systems. The Target U-value Method and the Carbon Index Method can be used with any heating system.

When the Elemental method is used, the U value for PVC-U windows and glazed doors should be no more than 2.0

Current proposals for revision include the use of Total Carbon Emission Ratings (TCER) and exclude other methods.
Part M 2004

The following table is extracted from Part M of the Building Regulations. Part M1 is the relevant section.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Limits on application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access and Use</strong></td>
<td></td>
</tr>
<tr>
<td>M1. Reasonable provision shall be made for people to –</td>
<td>The requirements of this Part do not apply to -</td>
</tr>
<tr>
<td>a. gain access to, and</td>
<td>a. an extension of or material alteration of a</td>
</tr>
<tr>
<td>b. use the building and its facilities.</td>
<td>dwelling; or</td>
</tr>
<tr>
<td></td>
<td>b. any part of a building which is used solely to</td>
</tr>
<tr>
<td></td>
<td>enable the building or any service or fitting in the</td>
</tr>
<tr>
<td></td>
<td>building to be inspected, repaired or maintained.</td>
</tr>
</tbody>
</table>

For new buildings, there are far more requirements than just entrance doors and Part M needs to be consulted in full.

For replacement doors, the requirement is that access to the dwelling is not made worse. In effect, this means that door widths and thresholds should remain nominally the same within the same structural opening.

Part N 1998 amended 2000

The following table is extracted from Part N of the Building Regulations. Part N1 is the relevant section.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Limits on application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection against impact</strong></td>
<td></td>
</tr>
<tr>
<td>N1. Glazing with which people are likely to come into contact when moving in or about the building, shall</td>
<td></td>
</tr>
<tr>
<td>(a) if broken on impact break in a way which is unlikely to cause injury; or</td>
<td></td>
</tr>
<tr>
<td>(b) resist impact without breaking or</td>
<td></td>
</tr>
<tr>
<td>(c) be shielded or protected from impact</td>
<td></td>
</tr>
</tbody>
</table>

Part N1 requires the use of safety glazing to BS 6206 Class C in certain critical areas as outlined in the figure below.
If the glass is in a door or side panel and has a pane width exceeding 900 mm then safety glazing to BS6206 Class B must be used.

Shaded areas show critical locations to which requirement N1 applies.
(i.e. glazing in areas numbered 2, 4, 5, 6, 7, 8, 11)
# Annex 6 Contact details

<table>
<thead>
<tr>
<th>British Plastics Federation Windows Group</th>
<th>British Board of Agrément</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Bath Place</td>
<td>PO Box 195</td>
</tr>
<tr>
<td>Rivington Street</td>
<td>Bucknalls Lane</td>
</tr>
<tr>
<td>London</td>
<td>Garston</td>
</tr>
<tr>
<td>EC2A 3JE</td>
<td>Watford</td>
</tr>
<tr>
<td>Telephone : 020 7457 5000</td>
<td>WD2 7NG</td>
</tr>
<tr>
<td>Fax : 020 7457 5045</td>
<td>Telephone : 01923 670844</td>
</tr>
<tr>
<td>Email : <a href="mailto:bpf@bpf.co.uk">bpf@bpf.co.uk</a></td>
<td>Fax : 01923 662133</td>
</tr>
<tr>
<td>Web : <a href="http://www.bpfwindowsgroup.com">www.bpfwindowsgroup.com</a></td>
<td>Web : <a href="http://www.bbacerts.co.uk">www.bbacerts.co.uk</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BSI Standards</th>
<th>NQA</th>
</tr>
</thead>
<tbody>
<tr>
<td>389 Chiswick High Road</td>
<td>Warwick House</td>
</tr>
<tr>
<td>London</td>
<td>Houghton Hall Park</td>
</tr>
<tr>
<td>W4 4AL</td>
<td>Houghton Regis</td>
</tr>
<tr>
<td>Telephone : 020 8996 9000</td>
<td>Dunstable</td>
</tr>
<tr>
<td>Fax : 020 8996 7400</td>
<td>Beds</td>
</tr>
<tr>
<td>Web : <a href="http://www.bsi-global.com">www.bsi-global.com</a></td>
<td>LU5 5ZX</td>
</tr>
<tr>
<td></td>
<td>Telephone : 01582 539000</td>
</tr>
<tr>
<td></td>
<td>Fax : 01582 539090</td>
</tr>
<tr>
<td></td>
<td>E-mail : <a href="mailto:enquiries@nqa.com">enquiries@nqa.com</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BSI Product Services</th>
<th>BM Trada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maylands Avenue</td>
<td>Chiltern House</td>
</tr>
<tr>
<td>Hemel Hempstead</td>
<td>Stocking Lane</td>
</tr>
<tr>
<td>Hertfordshire</td>
<td>Hughenden Valley</td>
</tr>
<tr>
<td>HP2 4SQ</td>
<td>High Wycombe</td>
</tr>
<tr>
<td>Main Switch Board : 01442 230 442</td>
<td>HP14 4NR</td>
</tr>
<tr>
<td>Enquiries Tel No. : 01442 278 607</td>
<td>Telephone : 01494 569700</td>
</tr>
<tr>
<td>Enquires Fax No. : 01442 278 630</td>
<td>Fax : 01494 565487</td>
</tr>
<tr>
<td>Web : <a href="http://www.bsi-global.com/productservices">www.bsi-global.com/productservices</a></td>
<td>Web : <a href="http://www.bmtrada.com">www.bmtrada.com</a></td>
</tr>
<tr>
<td></td>
<td>Email : <a href="mailto:sbeer@bmtrada.com">sbeer@bmtrada.com</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Glass and Glazing Federation</th>
<th>British Woodworking Federation</th>
</tr>
</thead>
<tbody>
<tr>
<td>44 48 Borough High Street</td>
<td>55 Tufton Street</td>
</tr>
<tr>
<td>London</td>
<td>SW1P 3QL</td>
</tr>
<tr>
<td>SE1 1XB</td>
<td>Telephone : 0870 458 6939</td>
</tr>
<tr>
<td>Telephone : 0870 042 4255</td>
<td>Fax : 0870 458 6949</td>
</tr>
<tr>
<td>Fax : 0870 042 4266</td>
<td>Web : <a href="http://www.bwf.org.uk">www.bwf.org.uk</a></td>
</tr>
<tr>
<td>Web : <a href="http://www.ggf.org.uk">www.ggf.org.uk</a></td>
<td>Email : <a href="mailto:bwf@bwf.org.uk">bwf@bwf.org.uk</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Council for Aluminium in Building</th>
<th>Steel Window Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>River View House</td>
<td>The Building Centre</td>
</tr>
<tr>
<td>Bond’s Mill</td>
<td>26 Store Street</td>
</tr>
<tr>
<td>Stonehouse</td>
<td>London</td>
</tr>
<tr>
<td>Glos</td>
<td>WC1E 7BT</td>
</tr>
<tr>
<td>GL10 3RF</td>
<td>Telephone : 020 7637 3571</td>
</tr>
<tr>
<td>Telephone : 01453 828851</td>
<td>Fax : 020 7637 3572</td>
</tr>
<tr>
<td>Fax : 01453 828861</td>
<td>Web : <a href="http://www.steel-window">www.steel-window</a> -association.co.uk</td>
</tr>
<tr>
<td>Email : <a href="mailto:enquiries@c-a-b.org.uk">enquiries@c-a-b.org.uk</a></td>
<td>Email : info@steel-window -association.co.uk</td>
</tr>
</tbody>
</table>
## Annex 7 Beaufort scale comparisons

<table>
<thead>
<tr>
<th>PRESSURE</th>
<th>m/s</th>
<th>Km/h</th>
<th>mph</th>
<th>Description</th>
<th>Gale Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pa</td>
<td>lb/ft(^2)</td>
<td>Pa</td>
<td>m/s</td>
<td>Km/h</td>
<td>mph</td>
</tr>
<tr>
<td>50</td>
<td>9.0</td>
<td>32.5</td>
<td>20.2</td>
<td>Fresh Breeze (19.5–24.0 mph). Small trees in leaf begin to sway; crested wavelets form on inland waters</td>
<td>5</td>
</tr>
<tr>
<td>100</td>
<td>12.7</td>
<td>46.0</td>
<td>28.6</td>
<td>Strong Breeze (25–31 mph). Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.</td>
<td>6</td>
</tr>
<tr>
<td>150</td>
<td>15.5</td>
<td>56.3</td>
<td>35.0</td>
<td>Near Gale (32–38 mph). Whole trees in motion; inconvenience felt when walking against the wind.</td>
<td>7</td>
</tr>
<tr>
<td>200</td>
<td>18.0</td>
<td>65.0</td>
<td>40.4</td>
<td>Gale (39–46 mph). Breaks twigs off trees; generally impedes progress.</td>
<td>8</td>
</tr>
<tr>
<td>250</td>
<td>20.1</td>
<td>72.7</td>
<td>45.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>22.0</td>
<td>79.7</td>
<td>49.5</td>
<td>Strong Gale (47–54 mph). Slight structural damage occurs (chimney pots and slates removed).</td>
<td>9</td>
</tr>
<tr>
<td>350</td>
<td>23.8</td>
<td>85.9</td>
<td>53.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>25.4</td>
<td>91.9</td>
<td>57.1</td>
<td>Storm (55–63 mph). Seldom experienced inland; trees uprooted; considerable structural damage occurs.</td>
<td>10</td>
</tr>
<tr>
<td>450</td>
<td>27.0</td>
<td>97.5</td>
<td>60.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>28.5</td>
<td>102.8</td>
<td>63.9</td>
<td>Violent Storm (64–72 mph). Very rarely experienced; accompanied by wide spread damage.</td>
<td>11</td>
</tr>
<tr>
<td>550</td>
<td>29.8</td>
<td>107.8</td>
<td>67.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>31.1</td>
<td>112.6</td>
<td>70.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>32.5</td>
<td>117.2</td>
<td>72.8</td>
<td>Hurricane (73+ mph). Very rarely experienced; accompanied by wide spread damage.</td>
<td>12</td>
</tr>
<tr>
<td>700</td>
<td>33.6</td>
<td>121.7</td>
<td>75.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>750</td>
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<td>139.9</td>
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Annex 8 List of brochures available FOC from BPF

The BPF have a range of brochures available free of charge from the following web site. Below are details of some.

http://www.bpf.co.uk/bpfissues/vinyls_downloads.cfm

The following resources have been produced to promote PVC in the marketplace for various key sectors and applications, and to demonstrate the contribution of PVC to sustainable development. These are available to download from this page. For more information, mailto:pvc@bpf.co.uk, telephone 020 7457 5000.

'Vinyl in Construction - building a sustainable future'

Demonstrates the massive contribution of PVC to the construction sector, including diagrams of where vinyl products are used and why. To download a copy (pdf format) click here. For further information, email: pvc@bpf.co.uk

'Windows - A Transparent Case for PVC'

A factual appraisal of PVC-U windows with regard to false and misleading statements made about the environmental impact of raw material production, the use of PVC-U windows, and their waste management.

Download as a pdf document
‘The UK PVC Industry - a major social and economic contributor’

A profile of the UK PVC Industry demonstrating the vital contributions to society PVC makes, both in terms of the products and sustainable development. Includes a comprehensive cross-section of the UK PVC Industry with details of companies' contributions to the community in terms of employment and supporting initiatives. This document is not available electronically.

For copies of this brochure, mailto:pvc@bpf.co.uk

Overview notes about PVC (set of 6) - Over the years, there have been various concerns expressed about aspects of PVC material ranging from its manufacture to recycling - these concerns are usually misplaced - to find out more, download the factsheets below from http://www.bpf.co.uk/bpfissues/vinyls_downloads.cfm

PVC overview note 1: PVC Manufacture

PVC overview note 2: Recycling PVC
PVC overview note 3: Dioxins and PVC

PVC overview note 4: Phthalates and PVC

PVC overview note 5: Metallic Stabilisers and PVC

PVC overview note 6: PVC and Accidental Fires
Responding to false and misleading claims about PVC –

In the past, misleading claims have been made about the health and environmental impact of PVC - the downloadable factsheets below were designed to respond to these claims, each with a catchy title - click on the following links to find out more:

Who wants the bloody facts? - click here to download
Mad about the environment? - click here to download
If it wasn't for PVC... - click here to download
One slip and we could all suffer - click here to download
Is being kind to the environment just a pipe dream? - click here to download
PVC in the environment? Don't get your lines crossed - click here to download
Which is more dangerous to humans? - click here to download
We treat rumours about PVC like water off a duck's back - click here to download
It doesn't take a lot of bottle to give you the real facts - click here to download
Give us some credit - click here to download
If you say burning PVC is dangerous, you're talking a load of old rubbish - click here to download

**PVC Explained**

Polyvinyl Chloride (PVC), a major plastics material which finds widespread use in building, transport, packaging, electrical/electronic and healthcare applications, has been under unfair attack from extreme environmental pressure groups world-wide - the BPF explains the full story.

**Construction: The PVC Option**

An examination of Greenpeace publication: Building the Future - A Guide to Building Without PVC. It points out errors of fact and misleading statements in their document, and provides users with the assurance that PVC is a safe material, PVC is a socially valuable resource and that calls to ban or phase out PVC are unjustified. Click here.
Annex 9 Model Specification for PVC-U windows and doorsets

Introduction
Many specifications encountered contain redundant requirements. For instance, there is no need for any specification to repeat the requirements contained within product standards such as BS 7412. This model specification is designed to ensure that a specification writer can ensure that all necessary aspects are included without repetition or confusion. Where classes of performance are available, this document attempts to give guidance as to the appropriate class to be selected without costly over-specification.

General
All windows and external doorsets shall be manufactured in accordance with BS 7412.

Colour/finish
Windows and doors shall be … (e.g. white, oak, mahogany, etc.)

Selection of classes from BS EN 12608 for white profiles

Climatic zone
Profiles shall be classified Moderate (Or other as desired)

BS EN 12608 has been written to cover all the climates in Europe from the colder North to the warm south. Consequently, the amount of solar energy on profiles will vary. To deal with this, two climatic zones have been defined:

- Moderate climate, M
- Severe climate, S.

The UK is a Moderate zone and so profiles with classification M are suitable for use throughout the UK.

In addition, BS EN 12608 notes that profiles designed for use in a severe climate (S) are also suitable for use in a moderate climate (M).

Resistance to impact by falling mass
Profiles shall be Class II (Or other as desired)

BS EN 12608 has two classes of resistance to impact by falling mass at –10 °C with a 1000 g weight being dropped from either 1 000 mm or 1 500 mm with no more than 1 test specimen showing rupture in the wall. BS 7413 used “cracking through the entire wall profile” in place of rupture.

For many years the UK has used the 1 500 mm drop height, class II, because of the lower temperatures experienced here than in the south of Europe.
Wall thickness
Profiles shall be Class C (or other as desired)

For the external walls of main profiles, three classifications are given. The classification is intended to represent the wide variations in profiles and window design for the various applications which are in use in Europe. It is not intended to imply differences in profile quality or in the performance of windows provided that the relevant performance requirements for both profiles and windows are met. Regardless of wall thickness, all PVC-U profiles for windows and doors that claim compliance with BS EN 12608 have to comply with all the requirements of that standard. All windows made from these profiles must comply with BS 7412, Plastics windows made from unplasticized poly vinyl chloride (PVC-U) extruded hollow profiles – Specification. Therefore, it is considered unnecessary in the UK to specify a particular classification for external wall thickness. However, where wall thickness declarations are made they must be made in accordance with BS EN 12608 clauses 4.4, 5.3.2 and figure 2. It is recommended not to measure wall thickness within 3 mm of a junction of profile walls.

Over specification of wall thickness can lead to unnecessary excessive use of raw materials without any commensurate increase in performance.

BS EN 12608 recognises that it is uneconomic to manufacture new extrusion tools to increase the thickness of certain minor elements of the profiles to meet the exact requirements of the classification and notes:

“It is recognized that in practice the values specified in Figure 2 for the wall thickness in the grooves and for certain parts of the non-sight surfaces are not always met. It is not the intention to force the manufacturers to change their tools directly after publication of this standard so that their profiles meet the wall thickness requirements. Therefore, a transition period of 10 years [is granted] to ensure that after this period all the profiles meet the intended requirements”

It is perfectly feasible and acceptable that a profile within a suite of profiles may be classified differently from other profiles in that suite, including subsills.

Weathertightness
All windows and doors shall be manufactured to meet a minimum exposure category of … in accordance with BS 6375-1

The specifier must identify the weathertightness performance required for the particular site or provide the manufacturer with sufficient information for it to be determined. Specifying a higher than necessary exposure rating can lead to extra cost. BS 6375-1 provides guidance on the selection of performance classes.
Strength and operating characteristics

Performance classes to be selected from tables 1 to 7 in BS 6375-2 as appropriate.

Windows
Operating forces shall be Class 1
Mechanical strength shall be Class 3
Safety devices shall conform to the requirements of BS EN 14351-1
Impact resistance shall be Class 0
Resistance to repeated opening and closing shall be Class 2.

External doorsets
Category of use Medium
Operating forces shall be Class 1 (Class 2 may be suitable for disabled use)
Mechanical strength shall be Class 2
Safety devices shall conform to the requirements of BS EN 14351-1
Resistance to repeated opening and closing shall be Class 2

BS 6375-2 Classification for operation and strength characteristics and guidance on selection and specification, includes the following topics:
Windows:
- Operating forces
- Mechanical strength
- Load-bearing capacity of safety devices
- Impact resistance
- Resistance to repeated opening and closing

The UK does not have a requirement for the impact resistance of windows

External doorsets
Category of duty
Operating forces
Mechanical strength
Load-bearing capacity of safety devices
Resistance to repeated opening and closing

4 categories of use are identified in BS 6375-2
Light – Secondary external doors to dwellings
Medium – External doorsets to dwellings providing primary access. Office doors providing access to areas not visited by members of the public
Heavy – Doors of shops, hospitals wards, school classrooms and of other buildings which provide access to designated public areas.
Severe – Doors to stockrooms, school and hospital corridors etc. commonly opened by driving trolleys at them.

The examples to the left are based on average requirements for domestic windows and external doorsets.

Specification of style, handing, hardware, restrictors, locking devices, etc.

Windows shall be … in accordance with window schedule …

Casement windows shall use “Brand X” espagnolette system or other approved.

Restrictors shall be fitted to all opening lights so as to restrict the maximum opening to 100mm.

BS 8213-1 gives advice on the selection and use of restrictors. Where restrictors are not to be fitted, this clause can be omitted.
Windows … on the schedule shall be egress windows

Part B of the Building Regulations require egress windows to be fitted to windows in habitable rooms under certain conditions. Any windows designed to have egress openings must be identified on the window schedule. For existing dwellings, egress openings must be provided where the windows being removed have such openings. The provision of egress openings is preferred but the dwelling must not be made worse by the replacement of windows.

BS EN 1670:2007 gives the following guidance.
Grade 0: No defined corrosion resistance. No specific service conditions, service conditions where a defined corrosion resistance is not relevant.
Grade 1: Low corrosion resistance. Service indoors in warm dry atmosphere.
Grade 2: Moderate corrosion resistance. Service indoors where condensation resistance may occur.
Grade 3: High corrosion resistance. Service outdoors where occasional or frequent wetting by rain or dew may occur.
Grade 4: Very high corrosion resistance. Service outdoors in very severe conditions.
Grade 5: Exceptionally high corrosion resistance. Service outdoors in exceptionally severe conditions where long-term protection of the product is required.

All hardware, fasteners and fixings shall be corrosion resistant to a minimum Grade 3 of BS EN 1670:2007

BS EN 1670:2007 gives the following guidance.
Grade 0: No defined corrosion resistance. No specific service conditions, service conditions where a defined corrosion resistance is not relevant.
Grade 1: Low corrosion resistance. Service indoors in warm dry atmosphere.
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Grade 3: High corrosion resistance. Service outdoors where occasional or frequent wetting by rain or dew may occur.
Grade 4: Very high corrosion resistance. Service outdoors in very severe conditions.
Grade 5: Exceptionally high corrosion resistance. Service outdoors in exceptionally severe conditions where long-term protection of the product is required.

Windows shall comply with BS 7950 for enhanced security.
Doorsets shall comply with PAS24-1 for enhanced security

Manufacturing windows and doorsets to these standards entails extra cost. Where enhanced security is not required, this clause can be omitted.

Main entrance doors shall be fitted with a low threshold no more than … mm high

Where low thresholds are required, the specifier should clearly identify which doors are to be fitted with them and the maximum height.

Main entrance doors shall be suitable for disabled access.

Part M of the Building regulations gives dimensional requirements for disabled access. On existing dwellings, achieving the minimum opening width may not be possible within the structural opening.

Construction

All windows and doorsets shall be internally/externally (choose as appropriate) beaded.

The manufacture of windows and doorsets can include internal or external glazing beads. Both types must pass the basic security test in BS 7412 and, where specified, the requirements of BS 7950 and PAS 24-1 for enhanced security. Internally beaded products may be more expensive.

All windows to habitable rooms shall be fitted with Brand Y trickle vents

Where trickle vents are required it is necessary to specify which ones are to be used or to specify the effective area. 5000mm$^2$ is required for habitable rooms and 2500mm$^2$ for other rooms for new build. For existing dwellings trickle ventilators are only required by Building Regulations where the existing windows being removed have them although fitting to all windows may be considered.
### PVC-U windows and doors Standards, Sustainability and Specification

<table>
<thead>
<tr>
<th>Topic</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>All windows and doorsets shall be fitted with a sub-sill to project a minimum of 25 mm from the face of the brickwork.</td>
<td>Where a sub-sill is required, it must be clearly stated and the minimum overhang specified. The use of cant brick or tiles may obviate the need for sub-sills.</td>
</tr>
<tr>
<td>Windows and doorsets shall have bottom drainage</td>
<td>Face drainage or bottom drainage is generally a function of the window system design or the arrangement of the interface between the bottom rail and the structure where a PVC-U sub-sill is not used. The type of drainage to be used should be agreed between specifier and manufacturer. Either form of drainage is effective.</td>
</tr>
<tr>
<td>Obscure glass of pattern… shall be used in windows to bathrooms and toilets identified in the schedule.</td>
<td>Where patterned, coloured or leaded glass is required for modesty or decorative reasons this should be clearly laid out on the schedule.</td>
</tr>
<tr>
<td>All solid infill panels shall be … and have a U value of …</td>
<td>The choice of solid panels, colour, type, supplier, etc., must be specified. Generally they would need to have the same or better U value as the insulating glass units</td>
</tr>
<tr>
<td>Gaskets and weatherseals shall be …</td>
<td>BS 7412 specifies the performance requirements for gaskets but additional characteristics, such as colour or preferred type can be specified here.</td>
</tr>
<tr>
<td>Mullion/transom joints</td>
<td>Mullion and transom joints can be either mechanically jointed or welded. The specifier should state any preference.</td>
</tr>
<tr>
<td>All mullion and transom joints should be …</td>
<td></td>
</tr>
<tr>
<td>Weld finishes</td>
<td>Welds can be grooved, knifed or sanded and polished, the latter generally being significantly more expensive. The specifier must identify which method of weld finishing is required.</td>
</tr>
<tr>
<td>All welds shall be groove finished</td>
<td></td>
</tr>
<tr>
<td>Thermal performance</td>
<td>Window Energy Ratings are for domestic replacement windows. For new build, the Standard Assessment Procedure (SAP) uses the thermal performance, U value, and the solar gain, g value, in calculating the Domestic Emission Rate for CO₂. Specifying low U values can reduce the g value and worsen the overall energy performance of the window.</td>
</tr>
<tr>
<td>Windows shall have a maximum U value of …</td>
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</tr>
<tr>
<td>Or</td>
<td></td>
</tr>
<tr>
<td>Windows shall have a minimum Window Energy Rating (WER) of …</td>
<td></td>
</tr>
<tr>
<td>Doors shall have a maximum U value of …</td>
<td>There is currently no Energy Rating system for doors</td>
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<tr>
<td>Additional performance characteristics</td>
<td>BS 6375.3 gives classifications for performance characteristics not covered in Parts 1 and 2 and gives guidance on selection and specification.</td>
</tr>
</tbody>
</table>
Where any of the identified characteristics are to form part of the contract, they should be specified here in accordance with BS 6375-3

Characteristics within BS 6375-3 are
- Resistance to snow and permanent load
- Fire characteristics
- Dangerous substance
- Ability to release
- Acoustic performance
- Thermal transmittance
- Radiation properties
- Durability
- Bullet resistance
- Explosion resistance
- Behaviour between different climates
- Behaviour under humidity variations in successive uniform climates
- Burglar resistance
- Unframed glass doorsets
- Power-operated products

Surveying

All window and door openings shall be surveyed to determine manufacturing sizes in accordance with BS 8213-4

Permission to use side extension pieces shall be sought from the architect in charge before manufacture and installation.

Bays windows … on the schedule are to be considered to be load-bearing and the bay construction shall be designed to carry those loads.

Coupled frames … on the schedule shall be joined together with supporting mullions in accordance with system suppliers recommendations.

Surveys shall be carried out at appointed times in liaison with the tenants. Where access to premises proves difficult, the Clerk of Works shall be informed.

Installation

Surveying a sample of window and door openings can save on costs but can result in windows being too small or too large in individual openings.

Manufacturing to common sizes and using side extension pieces to adjust for larger openings can save costs. The specifier shall give requirements for surveying.

Where load-bearing is suspected, the specifier must identify which window constructions are to be designed to carry dead loads.

Coupling of frames is necessary on ribbon composites and frequently involves the use of specially designed coupling profiles with additional reinforcement to withstand loads.

This example uses occupied dwellings as the example, but it can be adapted for new or unoccupied dwellings.
All installation shall conform to BS 8213-4. Variations for these requirements shall only be with the written permission of the Clerk of Works.

All fixings shall be of the through-frame type except where substrate conditions prevent this. PU foam can only be used with the prior permission of the Clerk of Works.

Where head and/or sill conditions necessitate the use of reduced numbers of fixings, the prior permission of the Clerk of Works shall be obtained.

Installation shall conform to the agreed schedule in liaison with tenants.

**Final Checklist**

The installers must complete the final checklist for each property prior to handover. This checklist must be passed to the Clerk of Works for signing off.

**Operation and maintenance**

The suppliers shall provide each tenant with operating instructions and basic maintenance/cleaning instructions. The suppliers shall demonstrate the operation of all windows, doors, safety devices, etc., to tenants.

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**BS 8213-4 lists best practice for survey and installation but cannot cover all possibilities.**

Frequently, it is necessary to adapt those techniques for individual sites but this should only be done after agreement between the specifier and the installers.

**PU foam is a useful adjunct to mechanical fixings. Its use should be agreed beforehand.**

Fixings include through-frame, lugs and proprietary types each suitable for certain installation conditions.