



Technical Guidance Document 021-1a

Summer Works Scheme Window Replacement Primary & Post Primary Schools

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Planning & Building Unit
Department of
Education and Skills
Tullamore, Co. Offaly.

Telephone: (057) 9324300
Fax: (057) 9351119
Web: www.education.ie

www.energyineducation.ie

PLANNING and BUILDING UNIT

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1. INTRODUCTION

1.1 Scope and Purpose

- (a) The purpose of this document is to provide advice and guidance to School Authorities and Design Consultants undertaking window replacement in school buildings as part of the Summer Works Scheme.
- (b) The document is divided into two main sections – Section 2 provides advice and guidance for School Authorities and Section 3 provides technical guidance for Design Consultants employed by School Authority to design, specify and supervise the window replacement project.

2. Advice & Guidance for School Authorities

2.1 General

- (a) The window element in any building, but particularly in a school, is one of the most important building elements. The windows allow natural light and natural ventilation into teaching spaces – two vital ingredients in facilitating teaching and learning. When properly specified and installed they also provide improved comfort levels, reduce heat loss and improve energy efficiency.
- (b) Ventilation in teaching spaces is of paramount importance. When a relatively large number of people are congregated in a relatively small space the build-up of moisture and carbon dioxide in the air, simply as a result of breathing in and out, is significant. If the moisture and carbon dioxide is not dissipated through ventilation (i.e. displacement of stale air with fresh air) there are consequential effects on the occupants and the building fabric – the occupants become drowsy/sleepy and unreceptive to intellectual stimulus; the building fabric is damaged by condensation and mould growth.
- (c) When existing leaky/draughty windows are replaced with modern good quality airtight windows, ventilation of the spaces must be considered afresh. This means ensuring that there is adequate background ventilation to facilitate the dissipation of stale air even if the windows are closed. Background ventilation should be provided by wall vents. If existing wall vents are inadequate, or have been closed up, re-opening existing vents or installation of additional wall vents may be required. Where the building configuration does not permit the installation of additional wall vents, background ventilation can be integrated into the new window design.
- (d) Background ventilation is a requirement of the Building Regulations and the Design Consultant appointed by the School Authority to oversee the window replacement project will advise on these requirements.

2.2 Letter of Grant Approval

- (a) On receipt of a grant approval the first task for the School Authority is to read carefully the letter of approval and the accompanying appendices 1 – 4.
- (b) The second and main task is to engage professional advice to carry out the project. The cost of such professional services (including VAT and all expenses) must be met in full out of the approved grant.

2.3 Appointing Design Consultants

- (a) Engaging professional services requires the appointment of a suitably qualified Design Consultant to:
 - (i) design and specify the works,
 - (ii) procure a suitably qualified contractor to carry out the works, and
 - (iii) to oversee the works and certify compliance on completion.
- (b) To comply with public procurement requirements and the conditions of the grant a competitive process is required in order to appoint a Design Consultant. It is not permissible to extend the appointment of the Design Consultant who prepared the technical report submitted as part of the Summer Works application.

- (c) Guidance on how to appoint a Design Consultant is available on the Department’s website (under *School Building & Design > Appointment of Consultants > Small Works*) in a document called *Guidance on Procuring Consultants for Small Works*, 2nd Edition, March 2014. (See Sections 3 and 4.)
- (d) For all construction projects it is a legal requirement under health and Safety legislation to appoint a competent person to act as Project Supervisor Design Process (PSDP). While the role of PSDP is a separate appointment with a separate fee, normally the Design Consultant appointed to oversee the project (as (a) above) will also have the competence and capability to act as PSDP. The appointment of the PSDP is covered in Section 5 of *Guidance on Procuring Consultants for Small Works*.

2.4 Tender Documents for Appointing Design Consultants

- (a) To allow Design Consultants to properly tender for the service required it is essential that sufficient information is provided to all tenderers to enable them to assess as accurately as possible the resources required to deliver the service.
- (b) Sections 4.2 and 4.3 of *Guidance on Procuring Consultants for Small Works* set out the minimum information requirements for issue to tenderers as:
 - (i) Letter of Invitation
 - (ii) Copy of Technical Report (i.e. the report submitted as part of the Summer Works application)
 - (iii) Copy of the Form of Tender
 - (iv) Copy of the Tender Proposal Form
- (c) For window replacement it is also necessary to include:
 - (i) A copy of the Letter of Approval from the Department including Appendices 1-4 (downloaded from Esinet)
 - (ii) A copy of this document (which explains to tendering Consultants the technical requirements for window replacement in schools).
 - (iii) Where the building having its windows replaced is a protected structure (see 2.7 below) this information must be brought to the attention of tendering Consultants.

2.5 Documents to be provided to Appointed Design Consultant

- (a) The following documentation should be forwarded to the appointed Design Consultant when the appointment process is complete:
 - (i) A copy of the schools Safety Statement
 - (ii) If one or more construction projects were completed at the school during the last 10 years a Safety File should have been handed over to the school on completion of each project - any such safety files should be made available to the Design Consultant
 - (iii) A copy of the school’s Asbestos Report where it exists. In the absence of an asbestos report the Design Consultant will be responsible for procuring a stage 1 asbestos survey, if considered necessary.
 - (iv) Information on the availability of the school premises for the purpose of carrying out the proposed works.

2.6 Fire Safety Considerations

- (a) In some school buildings, particularly older buildings, a particular window (or windows) may be designated as a fire escape route. If the School Authority has knowledge of such an existing provision, the Design Consultant needs to be made aware of it so that it can be maintained when the new replacement windows are being designed and installed.

2.7 Protected Structures / Listed Buildings

(a) What is a Protected Structure?

A “Protected Structure” is a building/structure, an element or part of a building, or a series of buildings, and/or the attendant grounds (curtilage) of a property that is considered to be of interest on the basis of one or more of the following criteria or characteristics: *architectural; historical; archaeological; artistic; cultural; scientific; social; technical*.

“Protected Structures” were previously known as “Listed Buildings” in the Planning and Development Acts (P&D Acts) prior to 2000. This was based on the previous “list” system of recording such properties. This term is quite often still used in general terminology, but is not technically correct or current.

(b) How do I know if my building is a Protected Structure?

As property owner/occupier you should be aware of its status as a *protected structure* and your resultant obligations.

Under the P&D Act 2000 any protected structure should be included in a Local/Planning Authority’s *Development Plan* in a “*Record of Protected Structures*” (RPS). It should have a unique identifying number and address, include at least one map showing its location and have any other relevant information that the Local Authority considers necessary. During the process of compiling the RPS the owner/occupier of any candidate property should receive formal correspondence from the Planning Authority advising them of its intent to include the property on the *Record of Protected Structures*. Where the occupier is a school Board of Management, then the correspondence may issue to the Patron/Owner. In this case it is important to check the status of the property with the Patron/Owner.

It should be noted however that the RPS is not a static Record. Therefore any property with one or more of the characteristics listed above, not already on the RPS, can be included at any time. Another potential source to establish a property’s status as a protected structure is the National Inventory of Architectural Heritage (<http://www.buildingsofireland.ie/>).

(c) How should I approach proposed works to a Protected Structure?

In general there is very little published clear guidance from the Local Authorities that can be universally applied to all *protected structures*. If you, as building owner/occupier, consider that your building has one or more of these characteristics, then you should seek professional advice, or advice from the Planning Authority, or consult its current *Development Plan*. An owner or occupier

of a *protected structure* is expected and obliged to ensure that the structure, or any element of it that contributes to the characteristics of interest, is not endangered. It is an offence to cause damage to a *protected structure*.

Planning permission is a requirement for most building development. But sometimes works are exempt. In the case of a *protected structure* you can seek a declaration from the Planning Authority, known commonly as a *Section 57 Declaration*, which will define the type of work that will not materially affect the character of the protected structure. Your consultant should advise you further in this regard.

(d) **Does a Design Consultant require particular qualifications to work on a protected structure?**

A Conservation Architect or a Conservation Engineer are the only professionally qualified Design Consultants that can design/supervise remediation works to protected structures. If the school building, or the part of the school building having its windows replaced, is a protected structure a declaration (Declaration 57) should be sought from the Local Authority to replace windows in this case. Where a declaration does not exist the Conservation Architect or Conservation Engineer should consult the local authority regarding the extent and scope of the replacement works. Planning permission will most likely be required for any work to a protected structure. Meeting the ventilation requirements of the Building Regulations can be challenging when dealing with windows in a protected structure; however, they must still be achieved.

2.8 Documentation to be provided by the Design Consultant

- (a) Before seeking tenders from Contractors, the appointed Design Consultant should provide the following information to the School Authority:
- (i) A copy of the windows specification, and a window and door schedule in soft and hard copy.
 - (ii) Preliminary Health and Safety Plan
 - (iii) A dynamic model of a typical classroom on each floor for each general classroom orientation (East and South Facing only) depending on the orientation of the subject school premises. The dynamic model should be prepared by an appropriately qualified Design Consultant based on the sample template below. (The purpose of this information is to demonstrate that the openable sections being provided in the new windows are sufficient to ensure that any overheating arising from high outside temperatures can be managed within acceptable levels.)

Table 1 – Overheating Analysis Sample

Room Name	Floor	Floor area used for ventilation analysis	High level free area		Low level free area		Total free area expressed as m ² and as a percentage of the usable room floor area		Number of hours that the room dry resultant temperature shall exceed 25°C in the school year
			m ²	%	m ²	%	m ²	%	

- (iv) Tender Documentation for issue to contractors.
- (b) When tenders have been received from contractors, the appointed Design Consultant should provide for the School Authority a Tender Report in accordance with Section 4.8 of Technical Guidance Document TGD 007.

2.9 Tender Options

- (a) Tenders should be sought for one of the following options only:
 - (i) Supply and fit of aluminium alloy windows, in accordance with BS4873: 2009, Specification for Aluminium Alloy Windows
 - (ii) Supply and fit of Timber windows, in accordance with BS 644:2009, specification for fully finished factory-assembled windows of various types
 - (iii) Supply and fit of unplasticized polyvinyl chloride (PVC-U) windows, in accordance with BS 7412:2007, Specification for windows and door sets made from unplasticized polyvinyl chloride (PVC-U) extruded hollow profiles.
- (b) **NOTE:** The window supplier shall submit evidence that the windows offered conform to the standards set out in this document.

2.10 Handover Documentation

- (a) When the project is complete the Design Consultant will supply to the School Authority the information listed below:
 - (i) Certificate of Substantial Completion (as defined in the Building Contract)
 - (ii) Final Account and Details
 - (iii) Completed Health and Safety File (soft and hard copy).

3. Technical Guidance on the Design & Specification of Windows

3.1 COMPLIANCE REQUIREMENTS

3.1.1 General

- (a) All windows proposed for use in educational facilities must conform to this specification. It will be the responsibility of the window manufacturer to provide independent accredited test report conforming to this specification to the project supervisor prior to the selection of any proposed window system. The minimum requirements are set out in Table 2 below.
- (b) Where an independent test report cannot be produced or validated for the criteria in this specification the proposed window system will not be deemed acceptable for use in schools by the Department of Education and Skills and will not qualify for grant assistance.
- (c) Building materials and products - IS EN ISO 10456:2007 - Hygrothermal properties for determining declared and design thermal values (includes corrigendum 2009) – All individual materials used in the fabrication and manufacture of windows are to be compliant with this standard regarding the rounding up or down of the declared thermal values.

3.1.2 Independent Accreditation

- (a) The contractor is required to submit independent accredited approval from the manufacturer of the selected/proposed window system tested on a specimen size of 1500mm high x 1200mm wide full Top Hung opening sash to comply with the following Department of Education and Science product requirements:

Table 2 – Submittal / Design Statements

Reference	DOES Requirements
EN 12207:2000 Air Permeability	Class 3 at 600Pa. or better.
BS EN 12208:2000 Water tightness	Test Class 9A at 600Pa. or better.
IS EN 12211: 2000 Wind Resistance	P1= 1600Pa., P2 = 800Pa., P3 = 2400Pa.
BS 8200 Design of non-loadbearing external vertical enclosures of buildings	All windows and doors to comply with requirements of this standard.
BS EN ISO 140 Acoustic Performance	The Rw sound reduction index for the Glazing should not be less than 27db.
Thermal Transmittance ISO/NP 10077-1 and ISO 10077-2:2011	Table F.4 — Thermal transmittances for vertical windows with fraction of the frame area 20 % of the whole window area, glazing spacer bars with improved thermal performance 1.6W/m ² K. Design size: 1.2wide x 1.5m high top hung opening sash full size. Manufacturer to provide documentary evidence that the above sized window has a thermal performance of 1.6W/m ² K or better.
Glazing to BS 6262-1:2005	Glazing to conform to the guidelines set out in this standard. Thermal transmittance for standard glazing shall be no greater than - 1.15W/m ² K = Centre pane U value. All units to be 28mm minimum overall thickness. Typical centre pane make up: 4mm glazing – 20mm argon filled cavity (90%) – 4mm soft coat thermal glazing with glass having an emissivity value of 0.01. Where safety glazing is required the supplier shall submit calculations to show an overall U-value of 1.15 W/m ² K. The spacer used to separate the glazing should be a warm edge spacer bar and the space between the panes filled with Argon gas. A minimum requirement for the U-value of the glazing for a window Design size: 1.2wide x 1.5m high top hung opening sash full size shall be 1.6W/m ² K
EN12206-1 2004	Polyester Powder coating Interpon D or Syntapulvin applied by Qualicoat approved applicator using a standard RAL colour in matt finish.
BS EN 1670:2007 Building Hardware. Corrosion resistance. Requirement and test method	All Ironmongery to comply with the requirements this standard. Multipoint single lever locking system is to be incorporated in all opening sashes.

Note: All thermally modified window frames are to be fully tested in accordance with Table 2 in order to be considered for use in school buildings.

3.1.3 Product Data

- (a) The contractor is required to submit to the project supervisor manufacturer's product data for all materials in this specification.

3.1.4 Shop Drawings

- (a) The contractor is required to submit to the project supervisor profiles, accessories, location, and dimensions.

3.1.5 Site Dimensions

- (a) The dimensions provided on the tender documents are indicative and should only be used for pricing. It is the Contractor's responsibility to produce the dimensions to which the windows will be manufactured.

3.1.6 Samples

- (a) Manufacturer to provide sample upon request; sized to represent material adequately.

3.1.7 Contract Closeout

- (a) The contractor is required to submit to the project supervisor the window manufacturer's warranty prior to the contract closeout.

3.1.8 Handing

- (a) NOTE 1: Window types and examples of handing are shown in Figure C.1 and Figure C.2 of BS4873:2009. These handing illustrations show the traditional British designations. The forthcoming European designations (pr EN 125194)) are significantly different and shall be applied on its' release.
- (b) NOTE 2: The handing of a multi-light or a horizontally sliding window is related to the position of the largest opening light.
- (c) NOTE 3: The handing of a vertically pivoted window is described by the position of the pivots in relation to the opening out portion.
- (d) The handing shall be in accordance with the tender drawings provided.
- (e) In specifying the handing all windows shall be viewed from the outside unless otherwise stated.
- (f) For a multi-light window, the arrangement of the multi-light shall be shown on a diagram.
- (g) The handing of side-hung, top-hung and bottom-hung casements is related to the position of the hinges.
- (h) The proportion opening outwards of a vertically pivoted window shall be stated.

3.2 MATERIALS

3.2.1 Aluminium

- (a) Extruded aluminium profiles shall be fabricated from designated treated alloy 6060 or 6063 in tempers T4, T5 or T6 conforming to BS EN 755-9:2008.

- (b) When ancillary components such as sills, couplings etc. are formed from sheet materials they shall be fabricated from designated alloys 1200, 3103, 5005 or 5251 conforming to BS EN 485-2:2013 in temper suitable for the particular type of application and degree of forming to be adopted.
- (c) The aluminium profiles used in the construction of the frames excluding glazing beads, nibs, interlocks and similar features shall be, at minimum tolerance, not less than 1.2 mm thick.
- (d) Powder Coated Finish
 - (i) The aluminium shall be finished with the following:
 - (ii) A powder coating conforming to BS EN 12206-1:2004: 'Paints and varnishes - Coating of aluminium and aluminium alloys for architectural purposes'
- (e) Polyester Powder Coating
 - (i) A Polyester Powder coating Interpon D or Syntapulvin (Not a mixture of both) applied by Qualicoat approved applicator using a standard RAL colour in matt finish to BS EN 12206-1:2004. Prior to the application of the polyester power coating the aluminium profiles are to be pre-treated using an 8-stage process of acid etching, Chrome or Chrome Free process to Qualicoat approval and water rinsing. A guarantee of 25 years must be applied for in advance of starting the project on site. It is noted that this period of time is subject to the location or proximity of the school to marine environment. Therefore 'Architectural powder coating to Qualicoat 'Seaside' standard from approved supplier' is required.

3.2.2 Timber

- (a) All of the timber used in the manufacture of windows for Educational Facilities should be sourced from an approved sustainable source.
- (b) Quality
 - (i) Timber shall be of a species classified as suitable for its purpose in accordance with BS EN 942:2007, National Annex NA. The timber for window frames, casements and sashes shall be of the classes defined for the UK in BS EN 14220:2006, or better.
 - (ii) NOTE: Where for reasons of design or appearance a higher quality of timber is required, the specifier should discuss these special requirements with the manufacturer in respect of timber species and availability.
- (c) Preservation - the wood or wood-based components of a window shall either have sufficient natural durability, or be preservative treated.
- (d) NOTE 1: The sapwood of any species will require preservative treatment.
 - (i) The natural durability of wood or wood-based components of a window to be used without preservative treatment shall be at least durability class 3 as defined in BS EN 350-2:1994.
- (e) NOTE 2: If it is desired to use a species not listed in BS EN 350-2, its durability can be established in accordance with BS EN 350-1.
 - (i) Where the natural durability of the wood is class 4 or class 5 as defined in BS EN 350-2:1994, or where sapwood is present

- (ii) For preservatives assessed under BS EN 599-1:2009+A1:2013 for penetrating processes and other preservatives listed in BS 8417:2011+A1:2014 as suitable for Use Class 3 (as defined in BS EN 335:2013), the wood shall be preservative treated in accordance with BS 8417:2011+A1:2014 (Use Class 3.1, 30-year life);
- (iii) For preservatives assessed under BS EN 599-1:2009+A1:2013 for superficial processes, the wood shall be preservative treated using a preservative with a critical value (CV) derived from BS EN 599-1:2009+A1:2013, Use Class 3 (with coating), including testing to BS EN 330:2014, in which the preservative shall be applied using the manufacturer's proposed method of application and the reference preservative shall be applied by double vacuum. The treatment shall achieve penetration class P1 (BS EN 351-1:2007) and a retention of CV (factor $\times 1.5$).
- (iv) Any component or part of a component that is machined in a manner that exposes untreated timber shall receive further treatment to ensure continuity of the preservative envelope.
- (f) **NOTE 3:** The long-term performance of a window depends not only on the maintenance of the preservative envelope but on the maintenance of the window as a whole.

3.2.3 Unplasticized Polyvinyl Chloride (PVC-U)

- (a) White PVC-U extruded hollow profiles used in plastic windows and door sets shall conform to BS EN 12608:2003.
- (b) Surface covered PVC-U extruded hollow profiles used in plastic windows and door sets shall conform to BS 7722:2010.
- (c) PVC-U profiles manufactured in accordance with BS EN 12608:2003 only require an occasional wipe down for appearance purposes. A gradual loss of gloss might occur over time which has no effect on the functional performance of the window. As PVC-U profiles have been successfully used for windows and door sets for the last 40 years, PVC-U windows and door sets manufactured in accordance with this British Standard are expected to last in excess of 40 years.

3.2.4 Reinforcement

- (a) The use of reinforcement in plastic windows and door sets shall conform to the recommendations in British Plastics Federation publication 323/1.
- (b) **NOTE 1:** Reinforcement should be non-hygroscopic and should have no adverse effect on the performance of the window or door. Where metal reinforcement is used it shall be manufactured from one of the following metals:
 - (i) Mild steel sheet, hot-dip zinc coated, conforming to BS EN 10346:2009, coating designation Z275. This type of reinforcement shall only be used in profiles or systems designed and sealed so that no exterior moisture can come into contact with the reinforcement;
 - (ii) Mild steel sections which are subsequently given a corrosion resistant coating in order to conform to the requirements in (i). This type of reinforcement shall only be used in profiles or systems designed and sealed so that no exterior moisture can come into contact with the reinforcement;
 - (iii) Austenitic stainless steel sheet or strip conforming to BS EN 10088-2:2014;

- (iv) Extruded aluminium alloy conforming to BS EN 485-2:2013, BS EN 515:1993, or BS EN 755-9:2008. This type of reinforcement can be used in any type of profile or system.
- (c) Windows fabricated with reinforcement to comply with this document shall be tested to the requirements of Table 2 including reinforcement.

3.2.5 Thermally improved frames

- (a) Where window frames are thermally improved by the inclusion of an insulating barrier or cladding, the insulating material should be stable under the conditions of service, e.g. under wind and dead loads and within the likely surface temperature range of the frames. The thermal barrier or cladding system should be sufficiently robust to withstand tests carried out in accordance with BS 6375-1:2015 and BS 6375-2: 2009.
- (b) NOTE 1: BS 6375 specifies performance requirements for the strength of windows based on a series of mechanical tests that check the integrity of the frame.
- (c) NOTE 2: Requirements for thermal barriers are specified in prEN 140243.

3.2.6 Frame joint sealing materials

- (a) When the completed window is tested in accordance with BS 6375-1:2015 and BS 6375-2:2009, there shall be no degradation of the sealing or the operational function of the window due to failure of the sealing materials.
- (b) NOTE: Materials should be able to withstand stresses during assembly, transportation, installation and operation of the window.

3.2.7 Bearing devices and hardware

- (a) Metallic materials used for bearing devices and hardware shall have at least the equivalent corrosion resistance to BS EN 1670:2007, class 3 when subjected to a neutral salt spray test as specified in BS EN 1670:2007.
- (b) NOTE 1: For environments in highly contaminated localities such as those subject to combinations of industrial and coastal pollution, BS EN 1670:2007, class 4 should be used.
- (c) NOTE 2: Requirements for hardware materials are specified in BS EN 13126-5:2011+A1:2014). These requirements apply to both metallic and non-metallic materials.

3.2.8 Hardware

- (a) Where non-metallic components are incorporated, the material and specification for these should be selected according to the required function.

3.2.9 Hinges, stays and pivots

- (a) Friction hinges, variable geometry stays and friction pivots are expected to maintain friction without adjustment or, when adjustment devices are provided, with adjustment. Corrosion test reports to be submitted.

3.2.10 Balances for vertically sliding windows

- (a) Balance mechanisms are available in too many types and styles for this standard to specify materials, finishes and means of attachment to frames and sashes.

However, it is most important that the window design, including the provision of stops where required, is such that the balances can be fitted in a manner approved by the balance supplier. Balances should be ordered to the correct length and weight for the glazed-sash including an allowance for friction.

3.2.11 Weatherstripping

- (a) Weatherstripping shall be one of the following:
 - (i) Ethylene propylene diene monomer (epdm); or
 - (ii) Plasticized PVC (PVC-P); or
 - (iii) Polychloroprene (CR); or
 - (iv) Polypropylene pile; or
 - (v) Sheathed cellular elastomeric polymer; or
 - (vi) Silicone (Si); or
 - (vii) Thermoplastic elastomer (TPE).
- (b) NOTE 1: Non-cellular forms of materials i), ii) and iii) are specified in BS 4255-1:1986.
- (c) NOTE 2: Guidance on weatherstripping products is given in BPF WG 345/1 [1].

3.2.12 Glazing gaskets

- (a) To minimise gaps in joints and shrinkage internal gaskets are to be serrated to allow for the gasket to be continuous and not requiring mitre jointing at corners. The internal gaskets are to have one joint only which is to be sealed and located at a low critical area.
- (b) Glazing gaskets shall be one of the following:
 - (i) Chloroprene rubber, solid (cellular); or
 - (ii) Chloroprene rubber, solid (non-cellular) conforming to BS 4255-1:1986; or
 - (iii) Cured ethylene propylene diene monomer (epdm); or
 - (iv) Plasticized PVC; or
 - (v) NOTE: Plasticized PVC gaskets should not be used with polycarbonate glazing materials.
 - (vi) PVC nitrile; or
 - (vii) Thermoplastic elastomer (TPE); or
 - (viii) Uncured ethylene propylene diene monomer (epdm).
- (c) Glazing compounds shall be non-setting compounds, preformed mastic tapes, gun grade solvent release type sealants, one-part or two-part curing sealants or two-part rubberizing compounds. Gun grade sealants shall conform to BS EN ISO 11600:2003+A1:2011.

3.2.13 Fixings

- (a) All straps, clips, brackets, lugs, screws, nuts, bolts, rivets, metal washers, shims and other fixings shall be manufactured from one of the following: stainless steel grade A2, A4 or F1 conforming to BS EN ISO 3506-1:2009 or BS EN ISO 3506-2:2009; steel which has been finished by one of the following methods: zinc plating in accordance with BS EN ISO 2081:2008, code Fe/Zn 12 or Fe/Zn 25, and chromate passivation in accordance with BS 6338:1982, ISO 4520-1981, class 2C

or 2D; hot dip galvanizing in accordance with BS EN ISO 1461:2009 to a minimum coating mass of 460 g/m²; spraying with a zinc coating in accordance with BS EN ISO 2063:2005, symbol Zn4; any other protective treatment of equivalent performance to those specified in 4.1 Aluminium (a) to (c), of an alloy having mechanical strength properties at least equal to that of the frame.

- (b) **NOTE:** Spacer shims used at fixings, which serve only as packing and do not influence the structural integrity of the fixing, may be of extruded or moulded plastics material.
- (c) Fixing devices should be capable of withstanding the design wind load (see BS EN 1991-1-4:2005+A1:2010) and any operating forces of the windows. Provision should also be made to prevent water penetrating any holes provided for the fixings.

3.2.14 Glazing materials

- (a) Glazing type and thickness shall be selected, using the recommendations given in BS 6262, to withstand the design wind pressure calculated in accordance with BS 6375-1:2015 or BS EN 1991-1-4:2005+A1:2010. The type and quality of glass shall conform to BS 952-1:1995.
- (b) The exposed edges of glass adjustable louver blades shall be arrised, ground or polished.
- (c) Insulating glass units shall conform to BS 5713
- (d) **NOTE:** A series of standards specifying requirements and test methods for glass, prEN 1279, is currently in preparation.

3.3 DESIGN AND CONSTRUCTION

3.3.1 Work Sizes and Manufacturing Tolerances

- (a) The work sizes for overall length and height shall be documented. The site survey of the windows will be the responsibility of the window contractor and comply with BS 8213-4:2007, Windows, doors and roof lights – Part 4: Code of practice for the survey and installation of windows and external doorsteps.
- (b) The size of an assembled frame shall be within ± 1.5 mm of the documented work size in any dimension, and the difference between the diagonals of the assembled frame shall be not more than 4 mm.

3.3.2 Operation

- (a) The completed window shall conform to the performance requirements for operation and strength specified in BS 6375-2:2009.

3.3.3 Marking

- (a) Pre manufactured window components shall be marked or labelled with: The name or trade mark of the manufacturer; the number and date of the British Standard, i.e. the relevant standard for the appropriate material used to construct the window.

3.3.4 Weather-tightness

- (a) The following weather-tightness requirements apply to all types of window.

- (i) The completed window shall meet the weather-tightness requirements for the appropriate classification specified in BS 6375-1:2015, when tested in accordance with BS 6375-1:2015 and, for double windows, with the appropriate additional procedure given below.
- (ii) For air permeability, double windows shall be tested with both windows closed, the length of opening joint being that which is visible on the inner surface of the inner window only.
- (iii) For water-tightness, double windows shall be tested with both windows closed and the performance class shall be that obtained by the outer windows.
- (iv) For wind resistance, double windows shall be tested with the inner window open and the outer window closed. The test shall then be repeated with the inner window closed and, if the outer window contains opening light(s), this (they) shall be opened.

3.3.5 Daylighting calculations

- (a) In most cases replacement windows will be placed in existing openings that are already fixed in size, therefore the normal daylight calculations that would be required for new buildings are irrelevant and not required.
- (b) In some cases where, for example, a window panel system incorporating glazing and fixed insulated panels is being replaced by windows with new walls and cills underneath it may be possible to determine an appropriate size for the new window. In these cases daylighting calculations should be carried out to the standards outlined in Appendix 2 herein.

3.3.6 Ventilation of room direct to external air

- (a) Each window assembly must be manufactured in accordance with Part F Table 1 Ventilation of room direct to external air of the current Building Regulations and achieve a minimum rapid ventilation area of 1/20th of the floor area of the room. The selected fabricator must demonstrate compliance through calculations mentioned earlier.
- (b) The following criteria should be used for background ventilation:
 - (i) Floor area up to 10 m² - 6500 mm² -
 - (ii) Floor area over 10 m² - 650 mm²/m² of floor area
- (c) Window ventilators are only to be provided where no alternative means of passive ventilation can be provided. Designers are required to provide controllable passive wall ventilators where necessary. Wall vents should be of a high control standard and be capable of being completely turned off (Hit and Miss is not acceptable)
- (d) Where indicated on the window schedule, each window shall incorporate a Ventilator and shall be polyester powder coated offering a single colour facility to match the window profiles. They should be fitted with an external, aluminium hood. Each Ventilator should be fitted with rod control.
- (e) Each vent must be capable of providing a minimum free airflow in accordance with Part F of the current Building Regulations. Vents shall be tested to BS6375-1:2015, and achieve the same requirements of the window unit for purposes of Air permeability, water tightness and wind resistance.

3.3.7 Natural Ventilation & Overheating

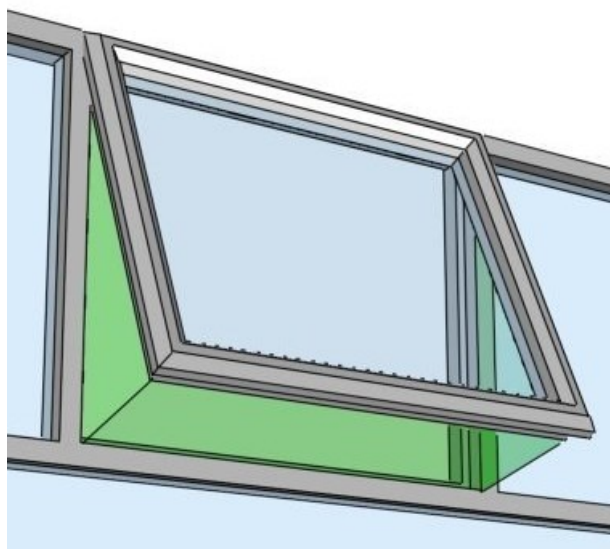
- (a) From a natural ventilation point of view all spaces other than storerooms, toilet areas and corridors, etc., in primary and post primary schools shall be deemed to be teaching spaces.
- (b) Good quality ventilation is critical to the functioning of a teaching space. When not adequately provided it results in a teaching space that is stuffy, overheating and not fit for purpose. Inadequate provision of natural ventilation cannot easily be rectified after a project is completed. Therefore it is necessary to provide details of the natural ventilation available to each room in the form of a room schedule. The ventilation should describe its area and location, i.e. walls, windows, floors, ceilings. The information should be submitted in the format outlined in Table 3 below.

Table 3 – Ventilation requirements sample

Room Name/ Number	Room Area (m ²)	Type of Existing Background Ventilation (Wall, Floor, Ceiling, None, etc.)	Area of Current Background Ventilation (mm ²)	Area of Proposed Background Ventilation (mm ²)

- (c) Inadequate ventilation and overheating problems that materialise when the finished building is occupied will be a matter for the Design Consultant to address in full with the school.
- (d) It is the responsibility of the Design Consultant to ensure that the window design meets the requirements of the room function.
- (e) The final window design should ensure that a minimum target ventilation rate of 8 litres per second per pupil is provided in the space. This rate will probably need to be higher to achieve the objectives outlined above and to prevent overheating in the space. The resultant dry bulb temperature shall not exceed 25°C for more than 5% of the school year in all habitable rooms and teaching spaces.
- (f) In Primary schools the school year consists of 183 full teaching days; a full school day comprises a period of not less than five hours and forty minutes; this equates to 1037 hours per annum. Therefore, based on the 5% criterion, the maximum time that an individual room shall exceed 25°C per annum for the academic year is 51.85 hours. This must be viewed as an absolute maximum. It is obvious that a design achieving significantly less than 51.85 hours will present a more comfortable internal environment for the occupants.
- (g) In Post Primary schools the school year consists of 167 full teaching days; a full school day comprises a period of not less than 6 hours and 40 minutes; this equates to 1114 hours per annum. Therefore, based on the 5% criterion, the maximum time that an individual room shall exceed 25°C per annum for the academic year is 55.70 hours. This must be viewed as an absolute maximum. It is obvious that a design achieving significantly less than 55.70 hours will present a more comfortable internal environment for the occupants.

- (h) The Design Consultant should always endeavour to maximise the thermal comfort potential in their design.
- (i) The Design Consultant shall also include a copy of the calculations for working out the 5% of annual hours and any other assumptions as part of a submission to the School Authority before seeking tenders.
- (j) The number of hours in the school year used in these calculations shall be based on normal daytime occupancy of a teaching space and shall not take into account possible after hours use.
- (k) The optimum working solution will require window openings at both high and low level distributed at regular intervals across the full structural width of the window. High level openings at one end of the window and low level openings at the other end will not achieve the desired level of ventilation.
- (l) It is important to remember that the final window design, geometry, opening sections and free areas will be influenced by a significant number of variables such as, the actual room construction, room geometry, occupancy, local weather data, glazing area, orientation, internal heat gains and the air tightness standard. Many of these variables are project specific and therefore a window design that works on one school may not necessarily work on another, therefore all solutions must be site/ project specific.
- (m) For the purpose of calculating overheating in teaching spaces the total opening area at high or low level shall be the sum of the individual opening areas at that level. An individual opening area is the sum of the areas of the plane segments for each opening area (outlined in green/shaded below) rather than the product of the width and the height.



Typical window opening for overheating calculations

- (n) All ventilation solutions must be modelled using dynamic simulation as detailed in section (p) below to ensure that adequate free area of window openings is provided for airflows into and out of a classroom to reduce odours, to provide fresh air for occupants and to maintain the teaching space temperature within the annual limits for overheating in the space.

- (o) The opening stroke on the window design is critical and must be fully determined at design stage. The high level and low level measured strokes on a window elevation can be different taking into account Health and Safety issues both internally and externally in relation to how far windows can open and the level of the opening sections above ground floor. Care should be taken to ensure that proximity to the window sill does not reduce the effectiveness of the lower free opening area.
- (i) The DOES encourages consideration of a minimum of 50% free area at low level but the final design is a matter for the Design Consultant, taking into account the site specific conditions included in the dynamic simulation that will apply when in use.
 - (ii) Opening areas in the middle section of windows can be provided but shall not be used when calculating the opening areas required.
 - (iii) The lower opening window should have its free area positioned above minimum sill height of 700mm and below 1.5 metres above finished floor level (or the lowest part of window)
 - (iv) The upper part of the window should have its free area above the level of the normal occupancy zone i.e. 2.0 metres above finished floor level (or the highest part of window)
 - (v) The upper and lower opening sections must be independent of each other. Side hung opening sections are to be avoided due to draught issues.
- (p) The following information in the format outlined below must be included for all rooms.

Table 4 – Overheating Analysis

Room Name	Floor	Floor area used for ventilation analysis	High level free area		Low level free area		Total free area expressed as m ² and as a percentage of usable room floor area		Number of hours that the room dry resultant temperature shall exceed 25°C in the school year
			m ²	%	m ²	%	m ²	%	

- (q) Permanent vent openings should be provided at high level in a draught free manner.
- (r) Opening sections of windows are not deemed as appropriate permanent background ventilation in habitable rooms.
- (s) Opening roof lights that require to be manually or automatically closed during rain are not to be used when calculating ventilation requirements.
- (t) A laminated label as outlined in 3.3.16 Labelling below that describes how natural ventilation should be addressed in teaching spaces should be provided in each classroom.

3.3.8 Design for glazing

- (a) The frame design shall be such that:
 - (i) The glazing shall comply with current Building Regulations;
 - (ii) The window can be glazed in accordance with BS 6262;
 - (iii) Re-glazing is possible without the need to remove the outer frame from the structure of the building;
 - (iv) It is possible to renew the weather-stripping without removing the outer frame from the structure of the building;
 - (v) It is possible to replace the hardware without removing the outer frame from the structure of the building.

3.3.9 Openable windows

- (a) For windows that are intended to be openable, the opening sashes however designed shall move freely and smoothly without hindrance throughout their intended range of movement.
- (b) The range shall be restricted to an opening for child safety and to ensure adequate free openable area.
- (c) In horizontally and vertically sliding windows, adjacent aluminium members shall not slide upon each other.
- (d) In horizontally sliding windows, the sashes shall be supported on bearing devices that facilitate movement and prevent direct contact between the sashes and the aluminium tracks.
- (e) In vertically sliding windows, the mechanism or balancing device shall be accessible for adjustment, repair or replacement, after the windows have been installed.

3.3.10 Remote window opening devices

- (a) Where opening window that are considered to be unreachable they shall be fitted with manual winding window gearing. Each set of windows shall be controlled by 1 No. operator; windows shall be opened using 250mm chain openers with conduit, winder cables and saddle fixings to wall. All components shall be finished in a selected polyester powder coated paint finish as per window schedule.

3.3.11 Frame joints

- (a) Joints in frames shall be made either by welding or by mechanical means (e.g. cleating and screwing) and shall have flush, stepped or lapped surfaces. For flush

- joints formed by mechanical means, any deviation from the same plane shall be within the limits set by the use of extrusion tolerances given in BS EN 755-9:2008.
- (b) Welded joints shall be cleaned off smooth on surfaces that are exposed when the window is in the closed position and where the joints would otherwise project into the glazing space.
 - (c) Sealing of joints
 - (i) Any frame joints, including those of the thermal barrier or cladding, which would otherwise cause loss of watertightness and/or increase of air permeability, should be sealed with sealant or by other means to achieve the performance required.
 - (d) Deviations in the plane of flush joints
 - (i) No allowance is given for assembly and machining tolerances. Therefore, to achieve the requirements specified it can be necessary to use extrusions with closer tolerances than those given in BS EN 755-9:2008. In practice, to avoid sharp exposed edges etc., manufacturers might need to agree tolerances with the extrusion supplier. It can be necessary to fit “L” shaping backing plates (chevrons) to flanges of mitred cornered frames to correct misalignment due to angular tolerances.

3.3.12 Glazing light transmittance factor

- (a) The total solar transmittance of the window shall comply with the requirements of BS 6262-2:2005 Glazing for buildings —Part 2: Code of practice for energy, light and sound.
- (b) The glazing light transmittance factor shall comply with the requirements of BS 8206-2:2008 Lighting for buildings –Part 2: Code of practice for day lighting.
- (c) NOTE: The accessible parts of finished windows should as far as reasonably practicable be free from all sharp edges, burrs etc.

3.3.13 Glass and Glazing

- (a) Windows shall be glazed in accordance with the recommendations given in BS 6262.
- (b) NOTE: Attention is drawn to the glazing safety recommendations of BS 6262-4:2005.
- (c) 28mm double glazed units, low “E” argon filled (90%) glazing units. Safety glass to be 6 mm laminated to BS 6262 & BS 6201- Glass in Buildings. All glazing must be installed in accordance with BS 6262 and the double glazed unit manufacturer’s and system supplier’s instructions.
- (d) To comply with BS 5713, hermetically sealed and Kite mark certified.
- (e) All windows shall contain sealed units, which shall be manufactured in accordance with EN1279 Parts 2 and 3 and carry the necessary and appropriate guarantee.
- (f) The glazing light transmittance factor shall not be less than 70%
- (g) Clerestory high-level windows to have sandblasted finish to Face 2 of double-glazed units to reduce glare (GP Halls).

- (h) U-value: Design size: 1.2wide x 1.5m high top hung opening sash full size. Manufacturer to provide documentary evidence that the above sized window has a thermal performance of 1.6 W/m²K or better. The centre pane “U” Value of each sealed unit when combined with the window frame should achieve a target figure of 1.6Wm²/K when treated as a single element. Each fabricator/installer must demonstrate compliant glass choice with tender return. All glazing shall conform to BS 6262. Use thermally broken warm edge spacer in the double glazed units to increase thermal efficiencies. All glazing to be Low E Hermetically Argon Filled double glazed Clear sealed units 4/20/4mm to BS 5713:1979 with a U value ≤ 1.15 W/M²K
- (i) Any perimeter taping must be transparent to permit inspection of unit edge condition.
- (j) Glazing System: All double-glazed units, panels and inserts shall be supported continuously along all four edges by specialised glazing support blocks. All windows shall be dry glazed using external ‘snap in’ extruded aluminium beads with captive ‘E’ gaskets externally and wedge gasket internally. The corners of the gaskets shall be accurately mitred together and sealed to ensure an effective joint. Setting blocks and location pieces shall be fitted in accordance with BS 6262 in order to ensure the windows are maintained square and rigid.
- (k) When designing replacement windows the Design Consultant should ensure that:
- (i) All glass below 800mm is safety glass, (it should be noted that safety glass is more expensive)
 - (ii) Safety glass, unless agreed in advance with the DOES due to localised issues, should not exceed 15% of the total glass area in a classroom window design and must not be used above a height of 1 metre above the finished floor level (this is to minimise installation and ongoing maintenance costs)
 - (iii) Safety glass is provided in all General Purpose (GP) Room windows above a height of 1 metre above the finished floor level for safety reasons
 - (iv) Schools are not left with large areas of safety glass that in the event of breakage can represent a significant drain on their maintenance budgets and may result in the proper glass not being refitted which in turn could contribute to Health & Safety issues for the school.

3.3.14 Security

- (a) When the completed window is tested in accordance with PAS 24:2012, it shall not be possible to gain entry.
- (b) **NOTE 1:** The manufacturer should establish whether any of the security devices listed in PAS 24:2012 is to be provided.
- (c) **NOTE 2:** A glazing system that prevents the removal of the glass by dismantling the system entirely from the outside is available as an optional feature PAS 24:2012.
- (d) **NOTE 3:** Guidance for security against crime is given in BS 8220.
- (e) Handles shall suit single lever wrap around multipoint locking type. The opening is to be restricted for child safety and to ensure adequate free openable area. To meet the required security level and safety standard all lower opening vent frames shall be fitted with one non releasable locking restrictor. These will restrict the window opening in line with the rapid ventilation calculations. These should be

fitted in accordance with manufacturer’s recommendations and as detailed in their technical literature.

3.3.15 Blinds

- (a) Blinds to teaching spaces receiving replacement windows shall be included as part of the contract. Blinds are not to be provided in non-teaching spaces or to existing windows that are not being replaced.
- (b) It is the responsibility of the Design Consultant to liaise with the school authority at an early stage in the design process and identify the teaching spaces requiring blinds.
- (c) Proper choice of electronic data projectors and white boards eliminates the need for black out blinds in teaching in teaching spaces and specialist rooms.
- (d) Blinds to windows in teaching spaces shall be manually operated heavy duty contract grade steel tube spring-less rollers, complete with side winder endless ball chain control units and child safety clips appropriately sized for each opening and shall be in compliance with Irish Standard ISEN 13120 – Internal Blinds.
- (e) The blind material shall be light coloured dense basket weave sunscreen material.
- (f) The blinds must perform such that they eliminate glare to the teaching walls and white/black boards, associated data projection screens and white interactive boards, reduce heat transfer to the room and still permit light transmission to the internal space.
- (g) The daylight transmission, solar absorption, openness factor and shading co-efficiency must all be taken into account when selecting the appropriate sun screen shade cloth for the teaching spaces.
- (h) In order to achieve the above requirements and ensure the blinds are fit for purpose as outlined consideration should be given to
 - (i) Light transmission values in the 9% to 12% range
 - (ii) Solar absorption in the 17% to 20% range
 - (iii) Optimum shading coefficient
 - (iv) Openness factor in the 3% to 5% range (All blinds on East and South facing Classroom windows to have a 3% openness factor, subject to mock up on site).
- (i) In addition on East and South facing elevations a second blind, with an openness factor of 1%, should be fitted to the classroom window nearest to a teaching wall containing an interactive whiteboard for use only when the interactive whiteboard is subject to direct sunlight, i.e. early in the morning, low winter sun, etc.
- (j) Both blinds to be light in colour and identical in colour.
- (k) **NOTE:** These are guidance values and should not be taken as absolute selection criteria. Each case must be assessed on its own circumstances.
- (l) A full size mock-up for a south facing teaching space with interactive white board and data projector operational must be conducted prior to final selection of the blind material.
- (m) Manufacture and installation of the blinds shall comply with the requirements of the Irish standards ISEN 13120 Internal blinds - performance including safety requirements.

- (n) Materials used in the manufacture should meet the designation of ‘flameproof’ when assessed in accordance with BS 3120:1959 (Withdrawn).
- (o) A test certificate as in Appendix C of “Fire safety of furnishings and fittings in places of assembly” should be supplied for each item specified.
- (p) Some administration areas such as the Principal’s Office and Administration Office may require blinds that allow privacy at night from external viewing. This should be taken into account when selecting blinds for these areas.
- (q) In the interests of reducing energy costs clear instructions outlining how blinds should be used in teaching spaces shall be provided in each classroom on a laminated label as outlined in Section 3.3.16 Labelling, below.

3.3.16 Labelling

- (a) A laminated label incorporating simple instructions for operating the following elements if present in the room shall be located in a suitable location near the door in each teaching space:
 - (i) Natural Ventilation: Advice on how the space can be naturally ventilated effectively and efficiently via the windows during schools hours
 - (ii) Blinds: Include the following “Raise blinds when not required in order to reduce lighting energy used”.

3.4 FURTHER INFORMATION

- (a) If further information or assistance is required in relation to this Document please refer to the Professional and Technical Section of the Department of Education and Skills Ph: +353 (0)57 9324300.

4. Appendix 1

4.1 Glossary of Terms

- (a) **Aluminium alloy window**: window incorporating aluminium alloy framing members and glazing rebates.
- (b) **Bearing device**: wheel, roller, skid or other device fitted at the head or sill of a horizontally sliding window to support the weight of the sash and to facilitate movement.
- (c) **Casement**: window, or part of a window, which opens on hinges, pivots or variable geometry stays.
- (d) **Coupled window**: glazed frame with another glazed frame hinged or fastened to it, so that both open together for ventilation and can be separated for cleaning purposes.
- (e) **Design wind pressure**: wind pressure that can be expected on a surface of a building having taken into account the S_a , S_d and S_b factors and the shape of the building by applying pressure coefficients to the dynamic pressure of the wind.
NOTE See BS 6399-2.
- (f) **Double window**: two separate glazed frames superimposed in the same wall opening.
- (g) **Fixing**: an item that is used to secure separate members of a window assembly to each other, to secure an item of hardware to a window member, or to secure a completed window assembly into the structure of a building.
- (h) **Glazing gasket**: plastics or synthetic rubber member, used between the glass and the frame and/or the glass and the bead.
- (i) **Hardware**: fitting attached to a window that is used to operate and/or secure it.
- (j) **Insulating glass unit**: two or more panes of glass manufactured to size and shape, spaced apart and then hermetically sealed in a factory, ready for glazing.
- (k) **Multi-light window**: window incorporating opening and/or fixed lights within one perimeter frame.
- (l) **Sash**: movable frame of a horizontally or vertically sliding window
- (m) **Secondary window**: window either fitted into the same wall opening as an existing window, or applied to an existing window, to provide improved thermal and/or sound insulation
- (n) **Thermally improved frame**: frame of an aluminium alloy window that incorporates an insulating material to improve the thermal performance NOTE: It may be of the thermal barrier type, where the inner and outer faces are separated by the insulating material.
- (o) **Weathertightness**: performance in respect of air permeability, watertightness and wind resistance.
- (p) **Weatherstripping**: material around opening lights to reduce air and/or water penetration.

5. Appendix 2

5.1 Daylight Distribution

- (a) A schedule of all rooms and associated daylight factor is to be provided. In calculating the above daylight factor the computer area and the area 700mm in front of the storage wall/ cloaks (if provided) may be excluded.
- (b) Primary Schools
- (i) Good quality daylight distribution is required in each teaching space, office, etc., with the average daylight factor for each room to be a minimum of 4.5% with the emphasis on an even light distribution through the space.
 - (ii) It should be noted that there is no significant additional value to average daylight factors above 4.5%. Higher levels just lead to unnecessary heat gains and losses.
 - (iii) In other occupied areas such as the Staff Room, Administration Office, etc., an average daylight factor of 4.5% while desirable is not critical if not achievable. These areas shall have reasonable daylight levels.
 - (iv) Elsewhere they shall be as outlined in TGD-002. (3.5% - 5.5%)
- (c) Post Primary Schools
- (i) Good quality daylight distribution is required in general teaching spaces and the Art Room with the average daylight factor for each space to be 4.2% with the emphasis on an even light distribution through the space.
 - (ii) It should be noted that there is no significant additional value to average daylight factors above 4.2%. Higher levels just lead to unnecessary heat gains and losses.
 - (iii) In other occupied areas such as the Specialist Rooms, Staff Room, Science Laboratory Preparation Rooms, Woodwork Preparation Rooms, offices, etc., an average daylight factor of 4.2%, while desirable is not critical if not achievable. These shall have reasonable daylight levels. Daylight Distribution General
 - (iv) Daylight requirements and potential within a PE hall differs from a standard classroom for the following reasons:
 - The hall is used more frequently than general classrooms in the evenings when there is limited or no daylight
 - Due to the height of the hall, larger glazed areas are required to achieve the same daylight levels at working height
 - Unpainted walls are often used to reduce maintenance costs for the school. It is very difficult to achieve high daylight factors if walls are unpainted
 - The available locations for glazing are limited due to the need to prevent glare
 - The space tends to be used for written work for relatively short periods in the year (exams) and sporting activities, which while benefiting from daylight, require an even distribution of light across the entire playing area.
 - Based on the above the design for PE halls should achieve a 3% average daylight factor.

- (d) In the case of a window replacement project where it is not possible to meet the full requirements of this specification (e.g. Daylight Factor) designers should maximise the potential of the existing openings.