2 GLASS

2.1 GENERAL GLASS TYPES AND GLAZING

2.1.1 Scope

1 This Part specifies various types of glass available.

2 Related Sections are as follows:

This Section

Part 1..... General
Part 3..... Workmanship

Section 15	Thermal Insulation
Section 17	Metalwork
Section 18	Carpentry, Joinery and Ironmongery
Section 24	Finishes to Buildings
Section 27	External Works to Buildings

2.1.2 References

1 The following standards are adopter and/or referred to in this Part:

ASTM C1036.....Standard Specification for Flat Glass

ASTM C1048.....Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

ASTM C1172 .....Standard Specification for Laminated Architectural Flat Glass.

ASTM C1376.....Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.

ASTM E998.....Standard Test Method for Structural Performance of Architectural Glass Products Under the Influence of Uniform Static Loads.

ASTM F2813 .....Standard Specification for Glass Used as a Horizontal Surface in Desks and Tables.

ASTM F3006 .....Standard Specification for Ball Drop Impact Resistance of Laminated Architectural Flat Glazing.

BS 952.....Glass for glazing; (BS 952-1 Glass for glazing – Classification; BS 952-2 Glass for glazing - Terminology for work on glass)

BS 2571.....Specification for general-purpose flexible PVC compounds for moulding and extrusion

BS 5051.....Security glazing; (BS 5051-1 Bullet-resistant glazing - Specification for glazing for interior use; BS 5051-2 Security glazing - Specification for bullet-resistant glazing for exterior use; ISO 16935 Glass in building — Bullet-resistant security glazing — Test and classification; EN 1063 Glass in building - Security glazing - Testing and classification of resistance against bullet attack)

BS 5544.....Specification for anti-bandit glazing (glazing resistant to manual attack); (ISO 16936-1 Glass in building — Forced-entry security glazing — Part 1: Test and classification by repetitive ball drop; ISO 16936-2 Glass in building - Forced-entry security glazing — Part 2: Test and classification by repetitive impact of a hammer and axe at room temperature; ISO 16936-3 Glass in building — Forced-entry security glazing — Part 3: Test and classification by manual attack; EN 356 Glass in building - Security glazing - Testing and classification of resistance against manual attack)

BS 5588.....Fire precautions in the design, construction and use of buildings; (BS 9999 Fire safety in the design, management and use of buildings. Code of practice)

BS 5588-3 .....Fire precautions in the design, construction and use of buildings - Code of practice for office buildings; (BS 9999 Fire safety in the design, management and use of buildings. Code of practice)

BS 5713.....Specification for hermetically sealed flat double glazing units

BS 6206.....Specification for impact performance requirements for flat safety glass and safety plastics for use in buildings; (ISO 12540 Glass in building — Tempered soda lime silicate safety glass; ISO 20657 Glass in building — Heat soaked tempered soda lime silicate safety glass)

BS 6262.....Glazing for buildings.

EN 572 .....Glass in building - Basic soda-lime silicate glass products

EN 572-3 .....Glass in building - Basic soda lime silicate glass products - Part 3: Polished wired glass

EN 1096 .....Glass in building - Coated glass.

EN 1279 .....Glass in Building - Insulating glass units.

EN 12150 .....Glass in building - Thermally toughened soda lime silicate safety glass.

EN 12488 .....Glass in building - Glazing recommendations - Assembly principles for vertical and sloping glazing.

EN 12600 .....Glass in building - Pendulum test - Impact test method and classification for flat glass.

EN 13022 .....Glass in building - Structural sealant glazing

EN 15434 .....Glass in building. Product standard for structural and/or ultra-violet resistant sealant (for use with structural sealant glazing and/or insulating glass units with exposed seals); (EN 15434 Bonding sealants).

EN 15651 .....Sealants for non-structural use in joints in buildings and pedestrian walkways.

EN 16477 .....Glass in building - Painted glass for internal use.

ISO 10077 .....Thermal performance of windows, doors and shutters — Calculation of thermal transmittance.

ISO 12543 .....Glass in building — Laminated glass and laminated safety glass.

ISO 21005 .....Ships and marine technology — Thermally toughened safety glass panes for windows and side scuttles.

ISO 28278 .....Glass in building — Glass products for structural sealant glazing.

ISO 52022 .....Energy performance of buildings — Thermal, solar and daylight properties of building components and elements.

2.2 GLASS TYPES AND REQUIREMENTS

2.2.1 General Requirements

1 Glass shall comply with the relevant provisions of BS 952 or adopted standard.

2 Glazing for buildings shall comply with the relevant provisions of BS 6262 or adopted standard.

3 Vacuum sealing requirements for double glazing units shall comply with the relevant provisions of BS 5713 or adopted standard.

2.2.2 Transparent Glass

1 Transparent glass shall be clear float or polished plate glass not less than 4 mm nominal thickness. Sheet glass shall not be used in the Works.

2.2.3 High Performance Glass

1 High performance glass (which includes reflective and insulating glass) is at minimum to comply with the following:

(a) high performance glass for vision areas shall be 6 mm toughened (heat strengthened) glass. The glass may be clear, coloured or colour coated. The characteristics of the glass shall be as detailed in the Project Documentation. Typically, the characteristics of the glass will be as shown in Table 2.1.

Table 2.1
Characteristics of Glass for Vision Areas

	Coloured or Colour Coated Glass	Clear Glass
Light Transmittance (%)	5 to 45	> 85
Light Reflectance (%)	5 to 45	< 10
Shading Coefficient	0.20 to 0.60	> 0.95
U-Value in W/(m^2.K) U-Value in Btu/($^oF.ft^2$.h)	4.0 to 5.5 0.70 to 0.95	5.5 to 6.0 0.95 to 1.05
Heat Gain Coefficient	0.17 to 0.50	> 0.80

(b) insulating high performance glass units for vision areas are to consist of an outer pane of 6 mm toughened (heat strengthened) glass and an inner pane of 6 mm clear toughened glass separated by a 12 mm airspace. The outer pane of glass may be clear, coloured or colour coated. The characteristics of the glass used in the units shall be as detailed in the Project Documentation. Typically, the characteristics of the units will be as shown in Table 2.2.

Table 2.2
Characteristics of Insulating Glass Units

	Coloured or Colour Coated Glass Units	Clear Glass Units
Light Transmittance (%)	2 to 75	80 to 85
Light Reflectance (%)	5 to 45	10 to 15
Shading Coefficient	0.25 to 0.70	0.80 to 0.85
U-Value in W/(m^2.K) U-Value in Btu/(^{o}F.ft^2.h)	1.5 to 3.0 0.25 to 0.55	3.15 to 3.20 0.55 to 0.56
Heat Gain Coefficient	0.10 to 0.60	0.7 to 0.75

(c) high performance reflective glass for spandrel areas shall be 6 mm toughened (heat strengthened) glass with colour coating or coloured glass. The characteristics of the glass used in the spandrel areas shall be as detailed in the Project Documentation. Typically, the characteristics of spandrel areas will be as shown in Table 2.3.

Table 2.3
Characteristics of Spandrel Glass

Light Transmittance (%)	2 to 75
Light Reflectance (%)	5 to 45
Shading Coefficient	> 0.70
U-Value in W/(m^2.K) U-Value in Btu/(^{o}F.ft^2.h)	2.5 to 4.5 0.55 to 0.80
Heat Gain Coefficient	> 0.60

(d) applicable standards:

(i) all substrates for coatings shall be of float quality and shall conform to BS 952

(ii) all fully tempered glass to be tested to BS 6206

(iii) all insulating glass units to be tested to BS 5713.

2.2.4 Mirror Glass

1 Mirror glass is to be 6 mm float glass or polished plate glass, silvered on one side. The silvering shall be protected by a copper backing and protective paint coating. Mirror edges shall be ground and polished. Mirror edges shall be bevelled.

2.2.5 Fire Resistant Glass

1 Fire rated clear glass to meet minimum 1 hour rating to Engineers approval. Resistance for integrity, stability and insulation shall comply with the relevant provisions of BS 5588-3.

2 Wired glass to be square pattern (13 mm square), 6 mm nominal thickness and shall conform to EN 572-3.

2.2.6 Patterned and Rough Cast (obscured) Glass

1 To be 6 mm nominal thickness unless otherwise to the approval of the Engineer.

2.2.7 Bullet Resisting Glass

1 Bullet resisting glass shall comply with the relevant provisions of BS 5051.

2.2.8 Anti-bandit Glass

1 Anti-bandit glass to shall comply with the relevant provisions of BS 5544.

2.2.9 Toughened Glass

1 Toughened glass shall be processed float or polished plate glass satisfying the impact requirements of BS 6206 Class B.

2.3 GLAZING MATERIALS

2.3.1 Glazing Compounds

1 Glazing compounds shall be non-setting oil based materials containing butyl rubber and shall be approved by the Engineer.

2.3.2 Distance Setting and Location Blocks

1 Distance pieces (for setting between glass panes), setting and location blocks shall be plasticised PVC complying with BS 2571 (softness numbers 35 to 45), rigid nylon or sealed hardwood. Plasticised PVC shall not be used for heavy glass panes, or solar control (reflective and insulating) glasses or sealed double glazing units.

2.3.3 Glazing Gasket

1 Glazing gaskets shall be of neoprene or EPDM material as approved by the Engineer.

END OF PART