

Guidance Document

G0134A Guidance on Glazing

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MAYOR OF LONDON

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1 Purpose

- 1.1 The purpose of this Guidance Document is to provide guidance on the design, selection and maintenance of glazing on the LU network. Particular consideration is given to assessing and managing the risk of glazing, both at the design stage and on installed glazing.
- 1.2 This guidance is to support the delivery of project or maintenance works on glazing assets required to comply with LU Cat 1 standard S1134 Premises – Doorsets and Glazing.

2 Scope

- 2.1 This Guidance applies to all glazing on the LU network. This includes but is not limited to security glazing, glazing to barriers, cladding, windows, ticket office windows, screens, walls, poster frames, signage, canopies, roof lights and overhead glazing.
- 2.2 Glazing in public areas of stations should comply with the London Underground 12 Design Principles, 1-351 Station Decor Design and guidance available via the LU Design Management pages. Glazing in Operational staff accommodation should comply with G-371C Operational Staff Accommodation - Design Guidance Document.

Note: The LU Design Principles may be replaced by the Stations Design Idiom in due course.

3 Guidance

3.1 Design of Glazing – Risk Factors

- 3.1.1 Before designing a glazing system, consideration of the risks should be considered. Such risk areas include:
 - a) Glass at height or in vulnerable locations which may break and result in cutting/piercing injuries to people.
 - b) Glass in barriers or sloped/horizontal glass which may break and allow people to fall through, especially from height.
 - c) Glass which cannot be easily cleaned, maintained or replaced. This is especially an issue in the railway environment.
- 3.1.2 Where one or more of these risk areas exists, then the design of the glass should be considered in conjunction with a Risk Assessment. Refer to CIRIA Guidance on glazing at height chapter 7 'Introduction to risk assessments' & chapter 8 'Application of risk assessments to decision-making' for guidance on Risk Assessments.
- 3.1.2 Factors which may affect the level of risk and which should be considered include:
 - a. Environmental conditions e.g. thermal stress
 - b. Loading conditions
 - c. Aerodynamic effects of passing trains
 - d. Deliberate failure/damage of glazing through manual attack, bullets, explosion, vandalism;
 - e. Accidental failure/damage of glazing through impact from thrown/falling objects including ballast, signage, cladding, tiles etc.

- f. Failure of glazing as a result of residual manufacturing defects.
- g. Failure of glazing fixing, including structural silicone sealants
- h. Failure/damage of glass roofs by maintainers, trespassers and consequent potential falls from height
- i. Failure/damage of glass and injury to people in locations vulnerable to impact from collision
- j. Openable windows and falls from height
- k. Poor workmanship, which can lead to point loads on the glass and early failure.
- l. Fire damage, particularly from adjacent properties.

3.2 Design of Glazing – Environmental Control

3.2.1 The following environmental issues should be considered and the relevant energy conservation Building Regulations complied with where appropriate. The use of Insulated Glass Units (IGU's), Low Emissivity (Low-E) coatings and heavy gases in the space of IGU's can contribute towards the required performance for environmental criteria.

- a. Solar gain (Building Regulations – Conservation of fuel and power. Approved Documents L2A and L2B)
- b. Heat loss (Building Regulations – Conservation of fuel and power. Approved Documents L2A and L2B, CWCT U-Values and Condensation, CWCT TN48 U-values of windows, BS 6262-2)
- c. Acoustics – when required the glazing should provide appropriate sound reduction relative to the activities undertaken on one side and the noise source on the other (BS 6262-2).
- d. Condensation (BS 5250, CWCT U-Values and Condensation)
- e. Weathertightness (BS 6375 Part 1. Test Method documents are referenced in the BS)
- f. Sustainability – disposal, recycling of glazing and framing systems (Glass and Glazing Federation GGF - Project Green Good Glazing Guide)

3.3 Design of Glazing – Safety

3.3.1 The risk of glass failure and breakage in densely occupied building environments typical in London Underground is that people may be injured – see section 3.1.1 above. In relation to this, the following factors should be considered.

- a. Imposed loads such as wind and snow loads, crowd loads, access equipment used in maintenance, aero-dynamic effect of passing trains (BS 6180, BS EN 1991-1-1, BS EN 1991-1-3, BS EN 1991-1-4, BS EN 1991-1-7, S1053 Civil Engineering – Buildings and Station Structures).
- b. Impact loads (BS 6206 and BS EN 12600). Part N of the Building Regulations Glazing – safety in relation to impact, opening and cleaning, sets out requirements around protection of people from impact with glazing.