



Technical Bulletin 5 – Revision A

Certifying the Structural Design of Protective Barriers

Introduction

The Building Bye-laws require that certain changes in level within or around a building be protected by the provision of barriers. Typically, the requirements apply where there is a risk of injury to people by falling more than 600mm in dwellings and 300mm in buildings other than dwellings. The requirements also apply and where vehicles have access to a floor, roof or ramp which forms part of a building.

Where the barrier is formed by a structural component (glazed screen, partition wall, handrail or balustrade for example) then the design of the barrier will fall within the scope of the Certificate of Design issued by an Approved Certifier under the SER Scheme.

Guidance on the design of protective barriers is given within the ‘Technical Guidance Document Part 7: Stairs, Ramps and Protective Barriers’ published in support of the Building Bye-laws. In the case of pedestrian barriers, and any wall, partition or fixed glazing provided in place of a barrier this guidance recommends that the barrier should be capable of resisting loads calculated in accordance with BS 6399 - Part 1:1996 ‘Loading for Buildings – Code of Practice for Dead and Imposed Loads’. A similar requirement relates to vehicle barriers.

Barriers within sports grounds require special consideration as these can be required to withstand high loads due to crowd conditions. When designing barriers within sporting venues the Technical Guidance Document advises that reference should be made to the BS 6399 – Part 1.

The purpose of this Technical Bulletin is to provide guidance to Certifiers on how the certification of barriers may be undertaken.

Design

The ‘Technical Guidance Document Part 7: Stairs, Ramps and Protective Barriers’ provides guidance on the design loadings for protective barriers. Further guidance is given in BS 6399 Part 1 and BS 6180:2011 ‘Barriers in and about Buildings – Code of Practice’ provides the serviceability criteria for different types of barriers. Clause 4 of BS 6180 allows for barriers to be assessed based on research and testing.

Clause 6.4 of BS6180 states that ‘Barriers for the protection of people should be of adequate strength and stiffness to sustain the applied loads given in Table 2. In addition, a barrier that is

structurally safe should not possess sufficient flexibility to alarm building users when subject to normal service conditions.’

The clause then states that ‘Therefore, for serviceability considerations, the limiting condition for deflection appropriate for a barrier for the protection of people is that the total horizontal displacement of the barrier at any point from its original unloaded position should not exceed the deflection limits determined from the relevant structural design code (where applicable) for the material used, or 25 mm, whichever is the smaller.’

Further design guidance on crowd loading situations can be found in Section 11 of the UK Guide to Safety at Sports Grounds [fifth edition 2008] provides design loads for different types of barrier in different load situations and provides guidance on proof testing.

General Approach to Certification

The requirements for protective barriers in and about buildings are set out in the Building Bye-laws and the ‘Technical Guidance Document Part 7: Stairs, Ramps and Protective Barriers’. However, there are a number of practical issues in relation to the certification of these structural elements that need to be considered. Barriers are required in a wide range of situations with very different risks associated with their failure. Certifiers must therefore adopt a flexible approach to certification based upon their assessment of the design risks involved.

Some guidance is available to assist certifiers in the assessment of risk by the statement in section 3.1 of the ‘Technical Guidance Document Part 7: Stairs, Ramps and Protective Barriers’ which makes reference to the provision of pedestrian guarding being provided ‘...where it is reasonably necessary for safety.’

In many domestic situations it is likely that the stairs and associated balustrades will be of traditional domestic timber construction with the possibility of structural failure resulting in severe injury being minimal. The Certifier, in this situation, needs only be satisfied that the balustrade specification makes sufficient provision for adequate construction. The design and construction of this type of balustrade is covered by BS 585, which details the construction of the hand rail and balustrade as well as that of the stairs, and the Certifier may, for example, be satisfied by a reference to BS 585 being noted on the Certified Plans.

On larger projects where, for example, mezzanine floors, longer spanning stairs or balconies are involved, individual unique designs may be produced by the architect. The structural adequacy of these designs must be assured by calculation or by test. Often a proprietary design will be used and some manufacturers have test information available for their products. It is the responsibility of the Certifier to make sure that the design of the balustrade, its fixings, and the supporting structure, meet the requirements of Part 7 of the Building Bye-laws and that calculations have been checked.

Design guidance on the testing of barriers for crowd loading can be found in Section 11 of the ‘Guide to Safety at Sports Grounds’.

The use of free-standing glass barriers for guarding stairs and balconies without a structural frame or handrail is becoming more common, and care needs to be taken to ensure the design meets the requirements of the Building Bye-laws. BS 6180 recommends that free-standing glass protective barriers should have a handrail attachment that will remain in position should the glass panel fracture. The use of this type of barrier without a handrail, or with one that is only decorative therefore needs to be carefully assessed to ensure the design adequately compensates for the

omission of the structural handrail. Whilst it is the responsibility of the Certifier to determine this, it is unlikely that a barrier without toughened laminated glass would be adequate. It is therefore advisable that each element of a toughened laminated design should be capable of withstanding the design loads (including the line load), with deflection being controlled by the full thickness.

The Role of the Certifier

In many cases barriers will be designed, manufactured and installed by a specialist supplier however they may also be designed by the Certifier, or by an in-house, or external, structural engineer. Regardless of how the design has been commissioned the basic duties and responsibilities of the Certifier are no different in principle for barrier design than for any other form of construction and include being satisfied that:

- The correct loadings have been used
- Individual components are being used in a way that is consistent with any test certification.
- The design is compatible with other building elements, floor elements for example, which are also covered by the design certificate
- Any structural calculations are in accordance with appropriate codes and standards
- Specifications for materials and components are consistent with assumptions contained in the design calculations
- The drawings listed in the schedule to the design certificate should be sufficiently detailed to show that the barrier will be constructed in accordance with all relevant Bye-law requirements
- The barrier has sufficient stiffness and its performance will not be impaired by deflections / distortions of the supporting structure
- The connections to the supporting structure have been designed for the correct loadings

October 2016