Structural Engineers Registration Ltd

SER TECHNICAL BULLETIN NUMBER 5

Certifying The Structural Design Of Protective Barriers

1.0 Introduction

1.1 The Building (Scotland) Regulations require that sudden changes in level within or around a building be protected by the provision of barriers. Mandatory Standard 4.4 applies to the protection of pedestrians and Standard 4.12 applies to vehicles. These barriers are required where there is a possibility of a severe injury resulting from a fall.

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

1.3 Guidance on the design of protective barriers is given within the Technical Handbooks[1] [both Domestic and Non-Domestic] that accompany the Regulations. 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. A similar requirement relates to vehicle barriers.

1.4 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 non-domestic Technical Handbook advises that reference should be made to the Guide to Safety at Sports Grounds [fourth edition 1997].

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

2.0 Design.

2.1 Appendix B to the Technical Handbooks lists BS 6180, Barriers in and About Buildings, in relation to Section 4 Standards. This gives recommendations for the design and construction of the temporary and permanent protective barriers. Loadings are defined in BS 6399 part 1 and BS 6180 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.

2.2 The latest amendment to BS 6180 is a minor change to clause 6.4 which states “Barriers for the protection of people should be of adequate strength and stiffness to sustain the applied loads given in BS 6399 without permanent deflection or distortion”. The clause goes on further to say that a barrier that is structurally safe should not possess sufficient flexibility to alarm building users when subjected to normal service conditions.

2.3 Section 11 of the Guide to Safety at Sports Grounds [fourth edition 1997] provides design loads for different types of barrier in different load situations and provides guidance on proof testing.

[1] The Technical Handbooks are issued by the Scottish Government Building Standards department and provide guidance with respect to the requirements of the Scottish Building Regulations.

3.0 General Approach to Certification

3.1 The requirements for protective barriers in and about buildings are defined in the Scottish Building Standards and the Guide to Safety at Sports Grounds. 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.

3.2 Some guidance is available to assist certifiers in the assessment of risk by the statement in section 4.4.1 of the Technical Handbooks which makes reference to the provision of pedestrian protection barriers being necessary where there exists a possibility of *"….severe injury from a fall."*

3.3 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 Warrant Plans.

3.4 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. Very 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 and its fixings meet the requirements of Section 1 of the Building Standards and that calculations have been checked.

3.5 Guidance on the testing of barriers for crowd loading is given in Section 11 of the Guide to Safety at Sports Grounds

4.0 The Role of the Certifier

4.1 The basic duties and responsibilities of the building structure 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.
- Construction drawings are sufficiently detailed at building warrant stage to show that the barrier will be constructed in accordance with the appropriate regulations and standards.
- The barrier has sufficient stiffness

5.0 Use of Contractor Designed Details Option

5.1. Frequently barrier design and certification will not be possible at building warrant stage, as the architect or client may not have determined the visual appearance of the protective barrier at this time. This situation can be addressed by using the Schedule 1 Contractor designed detail approach described in SER Technical Bulletin 1 however care must be taken to check that the designer has included an adequate performance specification with the warrant plans.

5.2 If a Contractor designed element is scheduled for the barrier, the Certifier must be satisfied that the detailed design has embraced the loadings and stiffness specified on the warrant plans and the requirements of the Building Standards have been met prior to the issuing of a form Q.

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