

Towards wider use of the accidental load case

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Summary

It is only in Eurocodes that the concept of designing for specifically defined accidental actions using reduced partial safety factors has appeared in codes of practice outside the UK. This paper considers a range of accidental scenarios including gas explosion, bomb blast, burst water main, flood, roof ponding, car park barriers, horizontal human loads on barriers, snow load, ice accretion, wind load, helicopter hard landing, fire, and local failure. It is concluded that generally the Eurocodes identify accidental design situations successfully, but that both vehicle and human loading on barriers should be more explicitly and better treated, and that roof ponding and ice accretion should also be considered.

Keywords: accidental actions, barriers, Eurocodes, explosions, loading, ponding, snow, ice, wind.

1 Introduction

The concept of designing for exceptional loads with reduced partial safety factors was introduced in the United Kingdom in 1973 following the Ronan Point collapse in 1968. However, the approach was not taken up by other countries, and it is only with the introduction of Eurocodes that it has appeared more widely. This paper looks at the application of what are now called accidental actions into a range of scenarios in Eurocodes, and questions whether the accidental load case is being used sufficiently or in all the right circumstances.

2 What is an accidental action?

It is important to agree what is meant – and what is not meant – by an accidental action. It is an action that is not to be expected in the normal use of the building or structure, so not one that is included in the normal design process, even an extreme value of such an action. This is endorsed in EN 1991-1-1 [1], which includes in Section 6 *Imposed loads on buildings* that the values given include ‘anticipating rare events, such as concentrations of persons or of furniture, or the moving or stacking of objects which may occur during reorganisation or redecoration’.

EN 1990 [2] distinguishes between an accidental design situation (‘involving exceptional conditions of the structure or its exposure’) and an accidental action (‘usually of short duration but of significant magnitude, that is unlikely to occur’). These serve well to cover both the normally accepted accidental actions and the proposals made here.

As an example, snow loading on a roof is a normal design action, but ponding arising from rainfall that cannot escape is accidental. And in a car park, a convoy of laden 4x4s may be unusual but is (or should be) covered by the design imposed loading, but hitting a barrier is unintended so should be treated as accidental. These and other possible accidental actions are discussed below.