SCOSS
Standing Committee on Structural Safety

ALERT

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SNOW LOADS ON AGRICULTURAL AND OTHER BUILDING STRUCTURES

Snowfalls in 2010, and in the early part of 2011, caused a significant number of agricultural and associated buildings in Scotland, and a small number in the North of England, to partially fail or to collapse. The likely causes include the build-up or drifting of snow on roofs, the age of the buildings, weaknesses in original design or construction, and lack of maintenance. Prolonged periods of snow deposition and very low temperatures were experienced which contributed to snow compaction and increased snow densities. In some cases, snow depths of 50-60cm on roofs have been reported.

British Standards allow certain farm buildings to be designed to a reduced standard compared with other buildings in terms of snow loading due to their limited human occupation and consequent reduced risk to life. The 2010 Edition of the Scottish Technical Handbooks states:

"*BS 5502: Part 22: 2003 provides an alternative approach to the design of buildings to be constructed solely for the purposes of agriculture. Designers using this approach must be satisfied that the reduced loads permitted by this Standard are appropriate for the location of the building and for the intended use*."

However when repairing or replacing damaged buildings the Scottish Government have issued additional Guidance to farmers(1) recommending that advice be sought from a structural engineer and to consider applying a more demanding snow loading, under alternative provisions in BS 5502-Part 22: 2003, to buildings sited in exposed locations more than 200m above sea level. This is compatible with Guidance Note 9(2) issued by Structural Engineers Registration Ltd.

Other structures

Most collapses have been of agricultural and associated buildings with steel or timber portal frames but there have been other examples including some substantial warehouses. A significant number of minor types of structure have suffered damage or collapsed under the weight of snow for example storage buildings, showroom roofs, carports, conservatories, enclosures and canopies. There have also been widespread reports of rainwater channels freezing in the prolonged sub-zero temperatures and collapsing under the weight of ice. Substantial snowfalls from the sloping roofs of domestic properties have been experienced. CROSS received a number of these reports directly and their technical content was shared with the Scottish Authorities.

Future Research

Officials particularly from the Scottish Government, but also from Northern Ireland, Department for Communities and Local Government (England and Wales) and the Health and Safety Executive will continue to monitor the situation.

Summary and Action

The Scottish Government have not dismissed current design approaches, but highlighted the need for careful consideration of the appropriateness of the Building Design Classification. They suggest that farmers may wish to consider applying a more demanding snow loading under BS 5502-Part 22: 2003 to buildings sited in exposed locations. For example, designing agricultural buildings located more than 200m above sea level as Class 1 buildings.

SCOSS recommends that designers take account of the recent collapses when considering structures where significant snowfalls may occur.

Further structural collapses under snow loading should be reported to CROSS at www.cross-structural-safety.org.

References

1 Effect of severe weather on farming community – winter 2010/11: the Scottish Government. Available at: http://www.scotland.gov.uk/topics/farmingrural/agriculture/grants/A-Z/severeweather [Accessed 22.03.11]

2 Guidance Note 9 – Certification Practice: 2010 Revisions to the Technical Handbooks (SER Ltd, 2010). Available at: http://www.ser-ltd.com/scotland/Guidance/Guidance_Note_9-Certification_Practice.pdf [Accessed 22.03.11]