

CROSS spotlight on failures

Alastair Soane, Director, CROSS, reports on the latest findings from the confidential reporting system

The range of reports received by CROSS continue to give valuable data on matters of concern about structures. Half are sent by IStructE members, a quarter by engineers who are members of both IStructE and ICE, and the remainder by members of the surveying profession.

The data is divided into three main categories: design, construction, and operation, and then sub-divided into typical headings as shown in the figures in this report. These are updated as new reports are received so the proportions change with time, and categorisation is somewhat subjective as there are no standard headings for such analysis. Nevertheless the results are beginning to show patterns with 50% of reports describing collapses, failures, or the need for repairs and remedial work, 40% saying there could be possible repairs in the future, and the balance being for less serious matters.

Poor design where basic principles were ignored accounts for the largest proportion of concerns as shown in Fig 1, with other significant issues being conflicts with regulations

and responsibilities being passed on to others. Only the principle reason for concern in a report is given here, but many reports contain more than one reason for a problem being encountered.

In the construction phase there is a broader range of concerns including inadequate experience and inadequate supervision on site,

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unsafe temporary works, the use of unsuitable materials, poor workmanship and divided responsibilities (Fig 2). It is difficult to distinguish between some of the categories. For example, there may be little to choose between inadequate experience and poor workmanship. Poor communication seems to be at the heart of many reports; be it communication between designer and constructor, realisation

of the importance of specified materials or components, or communication in training. A typical situation is where the choice of material or component is passed on to another and an unsuitable choice is made by someone not fully cognisant of the consequences of a wrong selection.

Problems that occur during the normal operation of a structure are categorised as deriving from about 10 causes. The two largest are component or fixing failures, and refurbishment and alteration processes. Other categories are shown in Fig 3 but the number of reports on failures during operations is not yet large enough to enable meaningful conclusions to be drawn.

From Scotland however there are now over 1200 reports sent by Building Control officers on material and items falling, or about to fall, from buildings. A great deal is being learned about the profile of buildings that are liable to be at risk and a report on the SCOTCROSS findings will be published later this year. Age, type of building material, and weather are, as might be expected, significant aspects in

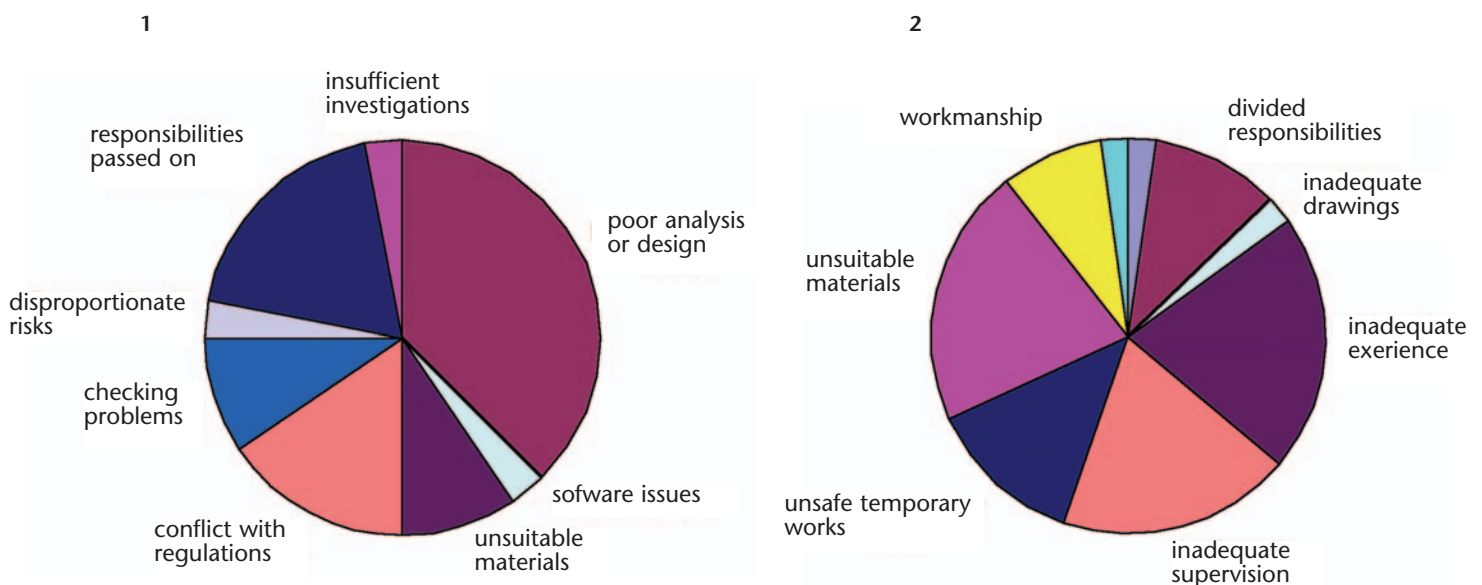


Fig 1

Fig 1. Concerns about design / Fig 2. Concerns about construction

determining risks.

Drawing from both CROSS and SCOT-CROSS experiences and from press reports there are a disturbing number of collapses of free standing walls. These can cause fatalities, especially to children. They may have been built of the wrong materials, made too thin for their height, and subject to undesirable lateral loads. The reports from Scotland indicate that they have not been maintained.

Experiences from CROSS show the importance of learning from the lessons of others. As a philosophy this could be taught at all levels in the educational system for engineers, surveyors and builders. Lack of knowledge is a problem particularly affecting small works where the method of working can be critical particularly when there are alterations being made. Conversion projects may have planning permission and Building Regulation approval for the finished product, but collapse part way through the construction because stability is compromised. It is a sobering fact that some builders can remove loadbearing walls with no thought as to the consequences.

There have been several reports of fixings that have failed and led to collapses. Some have been because bolts do not appear to meet British Standards or the properties of the bolts have been misunderstood. Some are due to corrosion of hidden fixings or the wrong choice of fixing type. There may be an attitude that fixings are regarded as of minor importance but, as has been stressed in several CROSS Newsletters, design responsibility extends right down to the specification and selection of the right fixings. Construction responsibility extends to using the specified

product in the right way and with the right supervision.

This type of failure can also be caused by having divided responsibilities as exemplified by reports of wind damage. These have been concerned with secondary elements being sucked or blown off buildings and range from whole wall panels down to flashings and trims. Again these are due to inadequate fixings. Some reports have been about balconies and horizontal balustrades. Traditionally these can have weaknesses because they are cantilevered structures, both

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the balconies and the balustrades.

The quality of design has been the subject of a number of reports and so far the largest number of reports on a single type of structure has been about timber frames. This may not be representative and could change as more reports about other forms and materials are submitted. The issue is that designs, usually of small structures, are being made by people who do not have the appropriate training or experience. The lesson to be learned is that qualified and suitably experienced engineers have to be engaged when timber frames are being designed.

From a number of cases concerning local


authority (LA) matters it is evident that some submissions under Part A (Structure) of the Building Regulations are made by non-engineers and contain fundamental flaws. These are usually picked up by Building Control but may not be due to resource shortages in some LAs. When there is a shortage of staff to carry out checking LAs may use a risk control process to decide which submissions have to be checked. The basis on which this is done deserves further examination but the message that comes through is that the standards both of submissions and of checking have dropped.

Follow up

Several lines are being pursued to take action as a consequence the trends found in reports so far. SCOSS (the Standing Committee on Structural Safety) has just published its 16th biennial report and one recommendation is that there could be guidance to LAs on who should be permitted to make Part A submissions.

As a result of concerns expressed about some forms of bolted fixings SCOSS is considering what action should be taken to give advice to designers and indeed to suppliers.

Instability during alteration works is being examined by the Health & Safety Executive (HSE) which is using the CROSS reports amongst other data and will be issuing recommendations.

The Institution of Structural Engineers and the Institution of Civil Engineers recognise that the lessons highlighted by CROSS should be disseminated amongst their members and used for educational purposes. 

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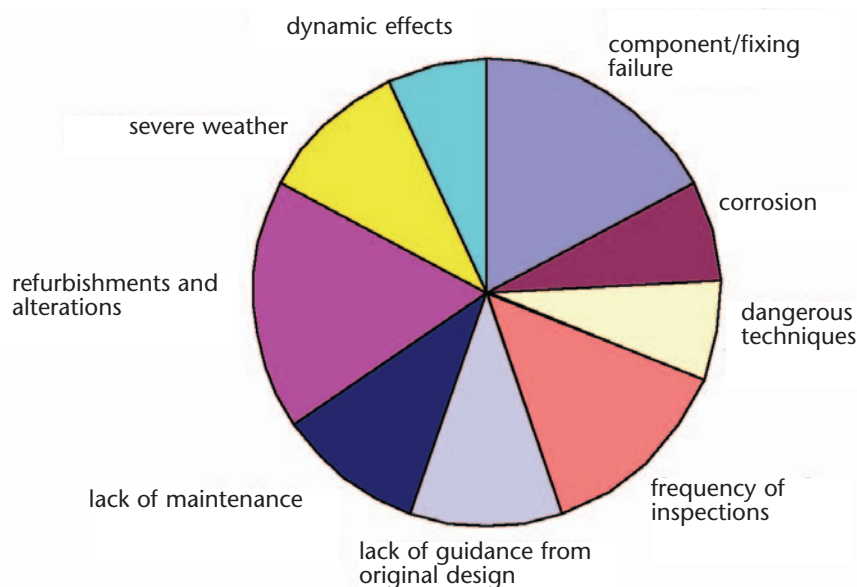


Fig 3. Operational concerns

CROSS IN ACTION

The 7th CROSS Newsletter has been published and is available on www.scoss.org.uk/cross. Those who wish to automatically receive the Newsletters, which are free, have to subscribe and details are given on the web site.

More reports are needed and can be submitted by following the guidance in the web site. They are completely confidential and can relate to any type of structural concern that, through publicity from CROSS and SCOSS, will benefit other engineers and the public. Every engineer has experiences to relate and here it can be done with safety and reliability.