

## Cladding: the case for improving inspection (May 00)

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### **A survey of SCOSS reports over the past 23 years points up the problems relating to design and inspection of cladding, and the difficulties of changing bad and sometimes unsafe practice. Kathy Stansfield reports**

Inspection of structures in service is generally recognised as being necessary to contribute to assurance of safety and to provide a basis for decisions on maintenance and repair. Over the years, in the 12 reports which have appeared since 1977, SCOSS has drawn attention to structures where the current level of inspections appears to be insufficient to identify emerging unsafe situations, or where there is a particular inspection difficulty.

The list of topics is long, with some, such as cladding, appearing in five reports, post-tensioned structures of various types in four. Stadia and multi-storey car parks have also given rise to concern in several reports.

Cladding is interesting in that it illustrates how persistent problems are, despite constant repetitions and warnings of difficulties, and actual failures to back up concerns. It also points up the problems of attitudes to design and manufacture as new materials are more widely used, complacency or cost-cutting by clients, reluctance to use professional engineers, and the sheer difficulty of inspecting such elements and cladding fixings.

In its first report in 1977, SCOSS predicted, prophetically, that 'claddings form an area of structures which is likely to give trouble for several years to come'. It identified several problems, centring on awareness of building owners of the need for regular inspections, for guidance on methods and objectives for carrying out inspections, to take account of existing information on the design and erection of claddings, and the need to make provision for easy inspection and repair of fixings and other important features. These problems remain serious 23 years and many building failures later, despite reminders from SCOSS, and the publication of guidance from, amongst others, the [IStructE](#).

In its second report, in 1978, SCOSS pointed out that there were no special requirements for claddings, except for the London amending By-Laws of 1965 which required attention be given to the design and erection of claddings and fixings. Between 1950 and 1970, it said, 'guidance was inadequate and, consequently, there is a high risk that masonry and concrete claddings erected during this period will continue to fail'. SCOSS identified trends away from brickwork, with an external surface of natural or reconstituted stone well bonded into the backing walls, to use of lighter claddings, with ferrous and galvanised fixings, prone to corrosion, and with the work left to the stonework sub-contractor.

Fixing of precast concrete was also problematic, because dimensional variations in the structural framework resulted in omitting of some fixings. Movement joints were usually inadequate or not provided at all. Another trend was towards larger areas of glazing, with architects sometimes relying on the cladding sub-contractor to decide fixing arrangements without consulting the structural engineer.

It suggested that wide publicity be given to these shortcomings and the need to ensure that cladding material is of appropriate quality and, together with its fixings, can be inspected easily and maintained throughout the life of the building. Inspections should be made of buildings which were below standards known to be necessary, with priority given to those where cladding would be most dangerous: those fronting busy streets and crowded areas.

These points were reiterated again in the third report of 1979. By then, the Department of the Environment had rejected the proposal that reference to cladding be made in the Building Regulations on the grounds that 'in general structural safety was covered in the regulations and that there was pressure (not least from the professional institutions) to simplify the regulations'. Despite continuing concerns from SCOSS, this is still the current view.

### **Building complexity**

SCOSS stressed that, when it came to cladding, 'it is not sufficient for the owner of a building merely to conform to the statutory requirements and to insure against losses', pointing out the complexity of modern buildings and the need for professional advice on inspection and maintenance. It concluded: 'The Standing Committee can do no more than give a warning that claddings are one of the features of a building which should be watched, and watched more carefully as they age'.

A decade later, in its 8th report in 1989, SCOSS returned to the problem of cladding in the light of continuing failures and substantial numbers of court cases involving defective cladding.

It noted the increasing use of new types of cladding, such as steel, aluminium, glass fibre and glazed panels. Innovations such as the use of structural adhesives, suspended glass and the rigging and tensioning of facades, including, in some cases, structural castings, were noted.

This report found that engineers had frequently not been involved in the design or construction of claddings which had failed. Though some manufacturers appeared to have applied the recommendations of the second report, inadequate or insufficiently durable fixings 'are still common and too often, insufficient allowance is still made for temperature and other movements'.

SCOSS reiterated its 1978 advice, in particular 'that fixings and supports should adequately resist corrosion, bearing in mind the life required and the ease with which inspection and repair can be effected'.

The 8th report warned against giving the sub-contractor design responsibility for cladding. It also emphasised the importance of understanding the British climate: aggressive conditions from chloride attack in areas several miles from the coast, sulphate attack in industrial areas, and rapid wetting and drying as well as large diurnal temperature changes. It expressed concern about the use of new materials 'of unknown performance in service' for such conditions.

Building owners in both the public and private sectors were once again chastised for not devoting sufficient resources to periodic inspection and maintenance: 'financial considerations appear to keep these important

activities to a much lower general level than the Committee regards as necessary'.

This SCOSS report suggested that there was sufficient experience and information within the engineering professions which 'if applied to the design of cladding components, joints and fixings, would substantially reduce the number of cladding failures'. It recommended that cladding design and construction 'should be in the hands of qualified civil or structural engineers', acknowledging that the basis of design required some improvement. To this end it suggested an international conference to discuss this, and that guidance be prepared by the professional institutions. In response to this suggestion, the [IStructE](#) published a general guide on the design and erection of cladding, *Aspects of cladding*, in 1995.

### **Serious failures**

The 10th report (1994) was the next to look at the issues. By then SCOSS appeared to have become resigned to the fact that building controls were not going to be extended to claddings, but it did not back down on its recommendation. Examples of the effects of terrorist bombs on claddings were cited as a good reason for keeping on the pressure. 'Over the years' said SCOSS, 'investigation into blast-damaged cladding has shown the variability of workmanship and effectiveness of the cladding, bearings and fixings'.

The Standing Committee was pleased that a standard had been produced by the Centre for Window & Cladding Technology and strongly recommended that fixings be made by qualified staff under the direction of qualified supervisors to eliminate variations.

Returning to the ever-increasing variety of types of cladding, the Committee suggested that 'where information on durability or techniques used are relatively untested over a period of time, there should be mandatory monitoring of cladding by the building owners'. It noted that as a result of some serious cladding failures in the US, major cities such as New York, Chicago, Detroit and Miami had introduced laws requiring this.

The trend towards glazed facades illustrated the importance of good design. SCOSS pointed out that the technology relating to glazing as well as its structural mountings required a specialist's knowledge. It recommended that the Civils or [IStructE](#) should prepare a report giving guidance on the structural design of glass façade and roof systems. Six years later, the [IStructE](#) published its report *Structural use of glass in buildings*.

The Committee was also concerned about the use of adhesives and recommended that cladding relying solely upon adhesive systems for structural support and resistance against wind and thermal actions should not be used without evidence that adequate reliability will be obtained. The [IStructE](#) produced its report *The structural use of adhesives* in 1999.

The 11th SCOSS (1997) report drew attention to the requirements in some other countries for design, installation, alteration and periodic inspection of exterior walls of buildings above a certain height. It noted that there were statutory requirements for the periodic inspection of cladding on high-rise buildings in New York and Singapore and stressed, once again, the importance of inspections.

Cladding appeared as a cause for concern yet again in the 12th and most recent SCOSS report (1999). It referred back to the 11th report, and suggested that because of the increasing innovation and development in cladding, periodic inspections were more than ever necessary, especially for tall buildings where the risks were greater. 'The introduction of periodic checking of the safety of cladding at height, along the lines adopted in some other countries, is ... a desirable and prudent step that should be taken in the UK and more widely.' It recommended that owners of buildings should arrange for such periodic inspection to be carried out to check safety, and that the requirement for checking should be defined in the CDM health and safety file.

The report also discussed design issues relating to cladding. Attention had been drawn in 1998 to concerns about the performance of thin stone cladding on buildings in relation to possible failure due to fatigue of the stone and its fixings. SCOSS noted that 'the successful design and specification of stone cladding is a complex process', especially with the increased trend to use larger and thinner stone panels. But, as it pointed out, guidance had been prepared by this stage - there was the [IStructE](#) report mentioned above, *British Standard BS 8298 Code of practice for design and installation of natural stone cladding and lining* (1994) and the Centre for Window & Cladding Technology's *Guide to the selection and testing of stone panels for external use* (1998).

SCOSS looked again at glass cladding noting the need for designers to understand fully the behaviour of structural glazing systems before using them in innovative applications. It also stressed that 'glass constructions and glazing systems, including fixings, should be inspected carefully at the time of construction and subsequently. These issues, and others, are discussed further in the [IStructE](#)'s recently published report.

The problem of inspections of cladding - and other types of structures - comes up on a regular basis, in report after report from SCOSS. In the 12th report, the Committee once again lamented the lack of regulations to ensure that regular inspections in service are carried out. It suggested that the requirement for inspection should be stated on the health and safety file required by the CDM Regulations.

SCOSS recognised that the Building Regulations could be used to ensure inspections, as it had suggested 20 years ago, but, perhaps diplomatically, said that this was 'perhaps a less attractive suggestion'.

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