SAFETY ADVISORY NOTE SC/02/88

FAILURE OF CAST IRON BEAMS

Readers of the New Civil Engineer (NCE) will be aware of the recent collapse of a cast iron roof beam within a jack arch construction, in a house within a London terrace and of the referral of the investigation details to SCOSS.

As is normal with this type of beam there was no apparent warning of imminent collapse; fortunately the house was unoccupied at the time. A good description of the failure and other information may be obtained from the NCE articles.

SCOSS does not believe that this represents a general problem with cast iron beam construction. Many buildings utilising CI continue to give good service with adequate reliability when used in a risk assessed manner and current best practice documents. It should also be noted that, in this instance, the calculated stresses (with or without composite action) were very high, even ignoring the defect mentioned, compared to published data for recommended permissible and rupture stresses.

However SCOSS does believe that this occurrence reinforces the fact that certain combinations of actions may lead to an unsafe situation that should be investigated by a competent structural engineer.

These situations are:

- additional loading on a CI beam, typically arising from further deadweight added since original completion (in the case of the collapse at Hyde Park Gardens the depth of construction had been increased over the years by a factor of approximately 2). The unregulated increase of load on a structure should always be a matter of concern.
- longstanding ingress of water leading to corrosion, deterioration of the concrete infill, and loss of any composite action. Extended basements or roof garden arrangements are particularly prone to this action.
- the beams working at high levels of stress as originally installed. (more likely in a domestic structure where, as the NCE articles point out, the beam may have been sized by rule of thumb).
Although the reported incident occurred in a domestic use, by far the greater use of this type of construction was in textile mills.\(^{(7)}\)

It should be noted that, in respect of the NCE report\(^{(3)}\) in particular, the appropriate ‘permissible stress’ may vary from that quoted, and caution is also required given the spread of possible ultimate tensile strengths.\(^{(6,7)}\)

Professionals working in this field, or with clients responsible for property of this type and era, should be aware of these issues and be ready to advise the relevant parties of the need for a structural risk assessment if the identified conditions exist.

References

1. NCE 8/15 August 02 p12
2. NCE 22/29 August 02 p8
3. NCE 21 November 02 p5
6. Ref 4 section 8.5