Title		Reference
33 Grosvenor Place, London	Medium rise refurb of shell	Framed in Steel, No. 21
Hangars		
Raising the Roof - FFV Aerotech's Manchester Hangar		Steel Construction Today, Vol. 5, No. 2
Project Dragonfly	Large span tubular trusses	New Steel Construction, Vol. 1, No. 5
British Airways Heavy Maintenance Hangar, Cardiff	232.5 m total roof span over 3 bays	Case Studies, No. 6
Car Parks		
Farnham Road Car Park, Guildford		Steel Construction Today, Vol. 5, No. 5

* Steel Construction Today was published by the SCI.
New Steel Construction is published by the SCI/BCSA.
Framed in Steel is published by British Steel.
Case Studies are published by British Steel Tubes & Pipes.

A.4 Potential defects

Table A.3 contains a list of common potential defects. In interpreting the list, it is important to bear in mind that perfection is not an attainable goal. Some degree of imperfection or permissible deviation must always be tolerated, and suitable allowances made in the design. Small deviations do not generate defects.

Although defects do not always lead to failure, they do so sometimes with catastrophic consequences. The designer's aim must be to enable fail-safe construction, or construction that is robust against relatively minor defects.

A latent defect can become evident either by directly causing failure, with local or perhaps global collapse ensuing without warning, or by initially causing distress without structural failure. Clearly the latter type of behaviour is to be preferred, and in most cases the inherent ductility of steel is of great value. Care is needed to avoid brittle fracture, which is non-ductile, or buckling, where ductility is of little benefit.

Table A3 *List of potential defects*

Context	Potential problems that could lead to defects or failure
Design	
Checking of calculations for gross errors	Gross errors, including those due to 'blind' use of software, are most likely to occur during structural analysis. Misconceptions about the behaviour of the structure can occur, which may cause long term problems if they are not picked up before or during erection. Mistaken sizing may also occur, but this is more likely to be detected during the detailing process, provided experienced personnel are used.
Reliance on computer-based design	
Accidental load cases	The likely sources of overload need to be identified. In industrial structures, it is common for large moving objects, such as lorries, to damage or remove columns if such key elements are unshielded.
Stability against collapse	A frequent cause of flawed conceptual design is lack of provision for stability against collapse. Suitably strong and stiff system bracing or sway frames have to be provided in both lateral directions, and restraint against torsional collapse can be essential in asymmetric buildings. Distribution of these actions to the foundations must follow suitable load paths, with attention given to how load shedding would occur from one path to another under accidental load cases - to prevent disproportional collapse. For example, there is a code requirement for groups of multi-storey columns to be tied together.
Slender members	Local failure is often caused by instability of slender members, for example beams or trusses which fail due to lateral or lateral torsional buckling. A common cause is the omission or deterioration of the required restraint bracing.
Susceptibility to minor errors in execution	Whilst steel is generally a robust and ductile material able to accommodate 'errors', some members and configurations are susceptible to relatively minor errors of execution or damage. The thinner or more slender the member, the more likely this is to occur. For example, special care may be needed with large diameter thin-walled tubes, cold formed sections, and tie bars or cables.
Foundation movement	To the steelwork designer who is used to precision, soil mechanics can seem like a black art. Foundation movement, laterally or through settlement or heave, can severely strain the steel structure. Usually, however, noticeable distress gives warning of impending failure, and time for corrective action to be taken.
Extensions	It is dangerous to assume that an existing structure can be extended without reconsideration of the original design. For instance, the extension could increase the loads being picked up by wind bracing in the original structure. Fixing to an existing member can change its behaviour by, for example, introducing additional restraint. Furthermore, loads from the existing structure can be diverted inadvertently into the extension.