Context	Potential problems that could lead to defects or failure
Dynamic loads	Fatigue failures are amongst the most common causes of failure in steel structures. Fatigue due to prolonged vibrations is rare, but fatigue caused by dynamic loads induced by mechanical equipment is much more common. Sometimes these are ignored by the designer, or equipment is installed later without reconsideration of the structural implications. Occasionally the frequency of equipment usage increases significantly beyond the design condition allowed for, reducing the fatigue life critically. Special care may be needed where fretting occurs, or corrosive conditions exist alongside cyclic actions.
Code usage	Design codes are carefully "drafted attempts" to provide a safe procedure for design. They are usually conservative. By their nature, the procedures are selective, and not all conceivable cases are covered. 'Blind' application of the code rules, without an understanding of the underlying principles, can lead to inappropriate use. Loading values given in codes are given as guides, albeit authoritative and conservative ones. Exceptional, unexpected loading can sometimes occur, for instance in store rooms, safes or battery rooms.
Specification	
Steel grades and subgrades	Extensive European standards (BS ENs) for steel products exist, and they define a wide range of materials. Some are unsuited to welding, possessing carbon equivalent values that are too high; some are unsuited to use externally, possessing Charpy impact values that are too low. Wrongly specified material can cause failure in, for example, thick tension members without adequate notch ductility.
Special steels	The range of steel materials used in mechanical engineering is much wider than the range of weldable structural steels. Some of the former may be used for structural components, for example machined pins or high strength ties. Particular care is needed however in their specification, as welding may be difficult if not impossible, and inappropriate welding may initiate defects.
Fastener selection	As with steels, the range of structural fasteners is wide, and the range of mechanical fasteners used structurally much wider. Care in specification and observance of manufacturer's instructions is essential. This is particularly important because many fasteners achieve high strengths at the expense of poor ductility, which can be critical in prying, or where stress concentrations occur (for example when too few threads share the strain).
Fastener treatment	Some fasteners, for instance those made from higher grade steels, are susceptible to hydrogen embrittlement. Pickling during galvanising, and other acid based treatment processes, introduces hydrogen into the steel surface. This hydrogen must be driven off by stoving if failure is to be avoided.

Context	Potential problems that could lead to defects or failure
Detailing	
Match to principal structural design	Design decisions made during detailing must be compatible with the main design concept and analysis. The incidence of mismatches, some potentially serious, has resulted in the development of a clear brief for the exchange of information between principal structural design and detailer. This information is listed in Appendix A of BS 5950: Part 2, and in more detail in the NSSS. An example of a potentially serious defect arising from such a mismatch would be the unrestricted use of hard stamping, introducing hard spots or cracks in critical zones such as plastic hinges.
Codes for detail design	Not all authoritative design practice is codified in British Standards. Industry standards can also provide essential guidance. The extensive range of books on tubular structures published by CIDECT are an example. Designers who do not seek or heed the advice given in such publications are more likely to produce defective designs.
Connection positions and types	Connections, including splices, are not always located at member ends. The choice of location and the type of detail may affect the way in which loads are distributed by the structure. Splices in compression members must be designed for initial imperfections that may exceed those assumed for the unspliced member, otherwise premature buckling may occur.
Corrosion	Sealed hollow sections do not corrode internally as there is no supply of oxygen or water to sustain the process. However, incomplete seal welds, porosity of seal welds, or penetrations of tube walls by fasteners can introduce holes through which moisture and air can pass. Poor details for open sections, when used externally or in humid environments, can also introduce water traps.
Bimetallic interfaces	Accelerated corrosion may occur at bimetallic interfaces. Lack of consideration of this effect at interfaces with stainless steel or aluminium can result, for example, in early failure of sheeting fasteners.
Following trades	Holes and attachments to suit the following trades are frequently added to the steel members at the detailing stage. Occasionally, these can have a critical influence on the performance of the steel member. An example would be the removal of a substantial portion of the web of a beam for service penetration.
Execution	
Quality control	Quality cannot be inspected into a product, it needs to be rooted in proper quality control practices that check the proper functioning of the processes involved, and include provision for action to be taken before the product in general reaches the minimum specified level. Without this, any sample testing of end products for acceptance will be at best haphazard, resulting in no confidence that the remaining unsampled selection does not contain a significant number of non-conforming items.