

Review

Structural safety, writes **Alastair Soane**, is a responsibility that cannot be worn lightly and this book is useful for both graduates on the cusp of their careers and experienced engineers looking to learn from failures and evaluate their own practices.

Structural safety: Theory & practice

Author: Allan Mann

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THIS MONUMENTAL WORK

ENCOMPASSES a lifetime's knowledge and experience distilled for the benefit of others. Allan Mann roams the world of failures and disasters with complete authority to explain, rationalise and simplify the complex and the unpredictable. Unpredictable that is to those unaccustomed to the forensics of understanding what has gone wrong in structures large and small, complicated and simple. He dissects the evidence to reveal the reasons why structures fail and what should be done to avoid similar situations.

There is an introduction drawing attention to the fundamentals of safety, the history of structures, the development of materials and design techniques with glimpses of disasters that are dealt with in detail later in the book. 'All failures are traumatic, not just for the victims but for the parties involved. Costs are large, careers are blighted, and mental scars are great.' The take-away is to learn from the multiple examples given.

A key message for designers is to think robustness, robustness, robustness, as it is the lack of this attribute that has led to many collapses. Another crucial, and often overlooked, aspect is the need to consider structures holistically as systems in which the failure of one element can lead to the unzipping of others and complete failure. A classic example, which is frequently referenced, is the infamous Ronan Point. Other well-known, and many less well-known, events are described in locations from the depths of the oceans to space; the Tay Bridge disaster to the Challenger explosion.

Apart from the headline examples there is much detailed information on the theory of structural analysis and design with clear sketches and illustrations. How did concepts of safety develop? What are the modes of failure? How can safety be defined and quantified? These and numerous other questions are posed and answered in a manner very appealing to the engineering mind.

Much thought has been given to human error, which can stem from the fallibility of an unthinking individual to corporate failures in the creation of great enterprises. Many studies have

concluded that, to some degree, human error is the most common cause of engineering failures. Often the failures are the result of not anticipating the consequences of an action, and again many case studies are included. The sheer scale of the author's knowledge of the subject and his ability to conjure up events from obscure sources betokens a lifetime of collecting data. One leaves the work imagining a great store of newspaper cuttings and extracts from learned articles, no doubt with some later internet input, being filtered and processed by this master of the craft.

Graduates on the threshold of their careers will learn a huge amount and will have safety ingrained forever in their thinking. Experienced engineers will be given many reasons to evaluate and assess what they are doing in the light of learning more about failures. Deep knowledge of the subject is imbued in every chapter and all practitioners should read the final chapter on avoiding failure to make them think. It is easy to say that safety is paramount, and this is often done by those in authority when something has gone wrong, but without insight it is a meaningless statement. Ensuring structural safety is a responsibility that cannot be worn lightly and learning from this work will help to promote a safer world for engineers, their colleagues in construction, and the public.

For those not so involved in safety-related decision-making it is a great read and a work of reference to be kept at hand. In the new UK regime of the Building Safety Regulator and the widespread introduction of risk assessments, there is much food for thought when considering failure scenarios.

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Alastair is a founding member of CROSS, where he is now a consultant and member of the CROSS Technical Board. He was responsible for setting up CROSS-UK and for introducing CROSS in Australasia and the USA.

