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The prediction of damage to structures caused by accidental collision - whether to automobiles, offshore installations or simply the packaging around an electrical appliance - is a crucial factor in their design. This important new study focuses on the way in which structures and materials can be designed to absorb kinetic energy in a controllable and predictable manner. An investigation into energy absorption requires an understanding of materials engineering, structural mechanics, the theory of plasticity and impact dynamics. Whilst a great deal of research has been undertaken on various aspects of these subjects, this knowledge is diffuse and widely scattered. Based on their extensive research and experience in the field, Guoxing Lu and Tongxi Yu have synthesised the most recent developments and latest research to form a detailed and comprehensive treatment of the subject.

The opening chapter covers the engineering background to energy absorption and the general requirements for impact energy absorbers based on the theory of plasticity and impact dynamics. Chapter 2 sets out the fundamental principles and methodology for analytical studies. Chapter 3 discusses dimensional analysis, the concept of small-scale model tests, and conventional experimental methods. Chapters 4, 5 and 6 explore the energy absorption of many simple structural members under different loading conditions. Chapters 7and 8 deal with the modelling of local deformation under impact, plastic deformation and tearing. Chapter 9 covers the plastic analysis of the four main deformation processes: tube inversion and tube internal nosing, inversion of a spherical sphere and buckle propagation in pipelines. Chapters 10 and 11 discuss the energy absorption in cellular and composite materials. Chapter 12 presents some fascinating case studies illustrating the application of the principles covered in previous chapters.

This book is an essential reference for engineers and materials scientists, practising mechanical and structural engineers, as well as researchers concerned with energy absorption prediction and the effective design of structures and materials to counter the effects of impacts and sudden loading.