

10

CONCLUSIONS

INTRODUCTION

The fact that most of the previous chapters in this book focus on specific areas or aspects of architecture suggests a need to summarize the main themes emerging from this study. This final chapter then, draws together the three principal strands that weave through each of the preceding chapters.

Before tying off these threads, it is necessary to recall briefly the main purpose of the book – to analyse structure architecturally rather than structurally. That is, to observe and read structure through the eyes of an architect and a building user, rather than adopting the narrower and more technically focused eye of a structural engineer. Structure, therefore, is viewed as a mainstream architectural element rather than as a secondary element originating from the often self-contained ‘Structures’ discipline of schools of architecture. Drawing upon examples from more than one hundred and seventy built works, this book presents a comprehensive analysis and categorization of the roles that structure plays in contemporary architecture.

As such, the book functions as a source book for designers. Although careful not to advocate the *necessity* of incorporating exposed structure into a building, it presents a vision of structure as a potentially exciting architectural element, and one that should always be integral with the design concept. Precedents in the book will trigger designers’ imaginations and suggest ways for them to further develop their individual ideas. The book can also be used as a mirror against which designs may be assessed. It may, for example, help designers to reflect on the architectural qualities of their own interior surfaces and spaces, and to ponder as to whether they have exploited structure fully enough. Does structure contribute explicitly to their architecture and help realize and communicate their design concepts?

In most cases, structure contributes to architecture aesthetically – stimulating one’s senses and engaging emotions and minds. Given its dominant visual presence, structure impacts most significantly upon our sense of sight. However, in some situations the surface smoothness of a structural member, or the manner in which it has been hand-crafted

might encourage us to physically connect with it through touch. Structure is rarely experienced through smell, although the fragrance of freshly milled and erected timbers might be savoured. And, apart from an awareness of the acoustic screening or the reverberation properties of concrete and masonry structural walls, structure rarely impinges upon one's sense of hearing.

TRANSFORMATIVE POWER OF STRUCTURE

Throughout this book many examples illustrate how structure transforms otherwise bland surfaces and spaces, both exterior and interior. By virtue of its composition-making and space-making qualities, structure introduces visual interest and character. Surfaces take on a degree of interest and 'spaces become places'. Additional architectural enrichment flows from structure's interaction with light, or by offering meaning to viewers through its representational and symbolic qualities.

Structure is not a neutral architectural element. It influences the space around it, and its very presence invites architectural analysis or readings. This book encourages architects to develop a strong proactive stance towards structure, rather than resigning themselves to perceiving structure as purely utilitarian. Architects should allow their design ideas to drive the structural design. They should make the most of structure as an architectural element, beginning with its form and layout, and further enliven their designs through structural detailing. The architectural success of any structure should be assessed by the extent to which it realizes a design concept, or in other words, enriches a design.

This perception of structure creates opportunities rather than constraints. Such a positive attitude releases structure from the shackles of conventional practice and its two masters of constructability and economy, and frees it to play more substantial functional and aesthetic roles in architecture. Just as a structural overlay upon an architectural plan or section bestows an additional sense of constructional reality to an otherwise diagrammatic representation, exposed structure transforms surfaces, spaces and viewers' experiences of built architecture.

STRUCTURAL DIVERSITY

There are a surprisingly large number of modes by which structure enriches architecture – the most important being to assist the realization of the design concept. In order to achieve this goal, exposed structure will be prominent in one or more of the areas of architecture discussed in the previous chapters, such as in intensifying or contrasting with architectural form, or modifying the visual appearance of the exterior or interior of a building. Structure, in all likelihood, will also be

carefully integrated with building function, for example, by articulating spaces for circulation. It will often play a role in introducing daylight into a space and modifying some of the qualities of light. Success with the big picture is achieved where structure relates to all aspects of the design, down to the smallest structural detail.

Within each area of architecture the contribution of structure can take one of many possible forms. Consider the large number of examples illustrating different structural details or ways that structure interacts with daylight. Diversity also abounds given the number of structural systems available. For example, designers can choose between three-dimensional surface-structures such as at the Saint Massimiliano Church, Varese (see Fig. 6.10), spatial frameworks like those at the Portland Building, Portsmouth (see Fig. 6.16), and essentially two-dimensional systems like structural walls. As well as a choice of structural materiality, designers also have a huge diversity of structural scale at their disposal – members that vary in size from 10 mm diameter cables to trusses over 5 m deep.

Given the huge number of structural possibilities, designers have considerable freedom of choice. This sets the scene for innovative and creative structural designs. But because of the goal that structure should actively reinforce the design concept, each structural decision requires to be thought through strategically. Future technological advances in structural materials and in analysis and design techniques will inevitably continue to increase both the diversity of structural options and their architectural implications.

The impacts of structure upon those who experience it are also diverse. One structure, exuding a sense of tranquility, soothes emotions. Another sets nerves on edge. A raw and inhospitable structure contrasts with one that welcomes and expresses a sense of protection. As outlined in Chapter 9 especially, structures are also capable of conveying an enormous range of meanings to passers-by and building occupants.

IMPLICATIONS FOR THE ARCHITECTURAL AND STRUCTURAL ENGINEERING PROFESSIONS

With its emphasis upon structure as an architectural element this book encourages a broad, creative and critical stance towards structure. It presents an alternative approach to some current practice where the most expedient structural engineering solution is adopted unless its impact upon the architectural concept is considered to be disastrous. For structure's potential as an enlivening architectural element to be

realized, collaboration between the architect and the structural engineer needs to be extensive and intensive.

Architects need to take an active role in all stages of structural design, working with the structural engineer in order to achieve mutually acceptable outcomes. Beginning with preliminary structural layouts through to detailed design at working drawing stage, both groups of professionals together need to wrestle with the various options. Structure is owned by both professions and it must satisfy simultaneously the requirements of both – load-bearing as well as architectural expression.

This book will help bridge the gap between both professions. Through it, architects will become more aware of how structure can enrich their designs. This will lead them to request structural engineers to explore how less conventional structural responses might integrate better with their design concepts. Through such a process, structural engineers will grow in their awareness that the systems and members they design and detail for strength and stiffness possess considerable architectural value and represent far more to architects and the general public than just a means of load-bearing. Architecturally enriching structure is likely to require greater analytical and design skills. It challenges designers' reliance upon a formulaic approach to structural design where the most construction-friendly and economic design is adopted. Finally, an increased appreciation of how exposed structure plays important architectural roles will increase a sense of pride among structural engineers and strengthen the sense partnership between the two professions.

A further implication of the fact that structure is of vital importance to both professions suggests the need for on-going reflection upon how 'Structures', that subject within schools of architecture curricula, is taught. In most schools, engineers teach the subject within the architectural technologies section of the programme. Little mention is made of structure's architectural roles. By increasing the level of integration of 'Structures' with architectural design, students' interest in structures and their awareness of its relevance to their designs will be enhanced – along with the quality of their architecture.