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GERÜSTE UND HILFS- KONSTRUKTIONEN IM HISTORISCHEN BAUBETRIEB GEHEIMNISSE DER BAUTECHNIKGESCHICHTE

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This book deals with an aspect of architecture that is crucial to the act of building, yet is rarely the subject of study: scaffolding and auxiliary structures. These often ingenious constructions form the negative imprint of a building, but once the work is finished they are removed and only a few traces remain to remind one of the builder's sometimes adventurous and dangerous efforts. The subject has received some attention in the Dutch-speaking world in the past. Herman Janse's 1965 book on construction, *Bouwers en bouwen in het verleden*, contains a modest number of pages devoted to scaffolding, shoring, cranes and other lifting devices. But the work that can best be compared with Holzer's book is Frieda van Tyghem's 1966 study, *Op en om de middeleeuwse bouwwerf. De gereedschappen en toestellen gebruikt bij het bouwen van de vroege middeleeuwen tot omstreeks 1600*, which offered a systematic overview of the subject.

The main sources for the study of scaffolding and related construction aids – apart from the scant traces on buildings themselves – are mainly to be found in drawings, miniatures, prints, paintings and building sculpture. In the fifteenth century, these sources were supplemented by architectural models and architectural treatises but, with a few exceptions, texts devoted specifically to the construction of scaffolding did not appear until the nineteenth century. Nor is there much mention of scaffolding and other aids in historical builder's specifications. Some building accounts

– such as those for Utrecht Cathedral – contain more extensive entries relating to the purchase of material for scaffolding, but apart from the information that old ship's timbers were sometimes used, these sources do not reveal how scaffolding was put together.

By systematically collecting material over many years and researching the history of the construction process, Stefan Holzer has produced a comprehensive standard work on scaffolding, published as part of the *Bautechnikgeschichte/ Construction History* series under the editorial direction of Karl-Eugen Kurrer and Werner Lorenz. The ambition of *Gerüste und Hilfskonstruktionen* extends far beyond a mere inventory. It aims to provide insight into the knowledge about scaffolding construction and to indicate milestones of importance in the further history of construction. The time span of the book runs from Antiquity to the First World War. And although the focus is clearly on Germany, France, Switzerland, Austria and Italy, there are examples from other countries as well.

The book is divided into six chapters. After the first, introductory chapter, the second deals with scaffolding on which to work: trestle platforms, flying scaffolds, with and without a vertical post from the ground. This chapter also deals with scaffolding for repairs at great heights. The third chapter is devoted to vault construction. Apart from wooden centring – built from the ground up or suspended far above the ground – a number of surprising formwork techniques

and materials are reviewed: the use of reeds, of ceramic tiles and of huge piles of packed earth shows that vault construction has a long and varied history. After chapter four, which deals with the construction of domes and is therefore a logical continuation of the previous one, chapter five deals with an entirely different subject: the history and development of the crane, especially from the fifteenth century onwards. Of particular interest are the reflections on the construction of large masts, which were assembled from separate pieces of wood when requirements exceeded the maximum available lengths. Not only cranes for building, but also for erecting masts on large ships and equestrian statues are discussed, as well as the way heavy loads were lifted (dowels, stone tongs, Lewis pin). The horizontal transport of such loads also receives attention, culminating in the erection of obelisks and the relocation of entire buildings, on which subject, incidentally, the comprehensive article 'Die mobile Immobile. Zum traditionellen Wandern von Holzbauten in Europa und Nord-Amerika im 1. und 2. Jahrtausend n. Chr.' by W.H. Zimmermann (2007) is missing from the bibliography. The last chapter focuses on the 'king of disciplines' in scaffolding: scaffolding and falsework for bridges, after which the text ends almost without concluding remarks.

This review is unable to do justice to the frankly spectacular pictorial material, although it must be said that the captions are rather sketchy. Another attractive aspect of the book is that the material is chronologically arranged by sub-theme, resulting in an orderly whole that is easy for readers to navigate. Nevertheless, it is sometimes difficult to locate a particular topic unless one has bookmarked it while reading. On pages 58-59, for example, we learn that it sometimes happened – as with the construction of the Halle aux Blés in Paris in 1784 – that more wood was used in the construction of a scaffolding for the dome than in the actual dome itself. Section 2.3 also contains interesting passages on timber use and costs, while the cost of scaffolding crops up again in section 6.8. This is just one example of a side issue being touched on here and there in the text rather than being dealt with sepa-

ately. The emphasis of this book is too much on the history of the construction of scaffolding for a separate treatment of such side issues.

One of the conclusions reached by the author is that there were hardly any developments or innovations in this vital but often overlooked aspect of architecture. Only in the early modern era and with the advent of iron in the nineteenth century did scaffolding construction change. As the author emphasizes on the last page, it was not his intention to be exhaustive; many interesting points had to be omitted and more could have been written about each sub-theme (p. 442). While it is understandable that the author did not strive for completeness, it is his very enthusiasm for the subject that leads the reader to expect nothing less. A few examples: although lifting equipment is inextricably linked to the subject of this book and quite rightly receives a lot of attention in chapter five, it is not clear why other construction machinery is given such scant attention. Pile driving, sheet piling, the use of barges as scaffolding and work platforms, and things like pumps and construction screws are also directly related to the subject of this study. It would have been helpful to pay at least some attention to them, especially with regard to the foundations of heavy scaffolding. The chapter on bridges explains how, in the course of the eighteenth century, self-supporting formwork was replaced by formwork supported by uprights, resting on a riverbed foundation. But how these load-bearing elements were built and – not unimportant for shipping – how they were removed again after the bridge was completed, receives virtually no attention. And this while copious information is given on the removal of the formwork itself.

None of this detracts greatly from the enormous value of this book. For a literally 'weighty' scholarly study in the German language, it is remarkably accessible. Holzer constantly attempts to link the visual sources, the written texts and the buildings themselves, creating an excellent mix that shows why it is important for humanities scholars of architectural history to embrace construction history as well.

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