

BRIDGE 橋梁

2012年 第4期 8月31日出版 總第48期

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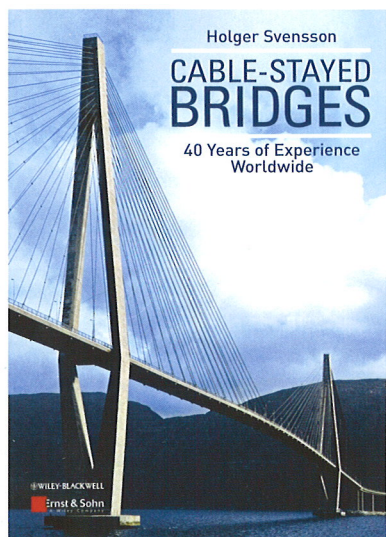
ISSN 1819-642X



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推介Svensson教授 《斜拉桥》

文/项海帆 葛耀君



《斜拉桥》封面



《斜拉桥》封底

20世纪70年代初, Svensson先生受德国著名的Leonhardt and Andra Partner (LAP) 设计事务所委派负责美国华盛顿州P-K桥的建设, 将斜拉桥传入美洲大陆, 后又建成了东部的East Huntington桥, 参与Sunshine Skyway桥的方案竞赛和Houston的Baytown桥的建设。80年代, 他在北欧的挪威和瑞典以及英国又建造了一系列斜拉桥。90年代初, 他接受亚洲开发银行 (ADB) 邀请来中国上海主持对当时602米世界纪录跨度的杨浦大桥的设计审核工作。可以说Svensson先生一直奔走世界各地, 为斜拉桥的发展和推广贡献了毕生的心血。

Svensson先生在2003年当选为国际桥协 (IABSE) 副主席, 我们俩和他在执委会一起共事多年。由于他的导师Leonhardt教授是同济大学已故李国豪教授的同门师兄, 我们作为李教授的学生、同济大学又是德国医生宝隆博士于1907年创立的学校, 相互之间就多了一份亲切感和友情。

《斜拉桥》一书是Svensson教授在德国Dresden大学所用的教材, 共七章30讲。第一章为引言 (Introduction), 第二至第五章为正文; 包括四个方面的内容: 历史发展 (Historical development)、结构细节 (Structural details)、初步设计 (Preliminary Design) 和施工安装 (Erection); 第六章介绍典型斜拉桥实例; 第七章为未来发展 (Future Development)。全书共458页, 约1300幅精美的图, 可谓一部浩卷巨篇之力作。

第一章引言中, Svensson教授提出了独具匠心的十条美学指南, 这是结构工程师的桥梁美学观, 也是将结构和艺术高度融合的结晶, 具有重要的启示意义。在第二章斜拉桥的发展中, 他回顾了斜拉桥从16世纪最初的启蒙, 17-18世纪的最初实践, 工业革命后斜拉桥在重载下的失败而退出, 但仍作为提高悬索桥刚度的辅助措施发挥作用, 直至20世纪50年代复兴的全部历史过程。第二章中还分节介绍了钢斜拉桥、混凝土斜拉桥、结合梁斜拉桥以及特殊体系的特点和典型实例。本书介绍了为斜拉桥的发展作出重要贡献的知名学者和工程师, 是迄今为止看到的最丰富、详尽的斜拉桥发展史料, 弥足珍贵。

第四章初步设计是本书的核心内容, 其中4.1和4.2两节透彻分析了斜拉桥的力学性能和几何尺寸的合理布局; 4.3节桥梁动力学中, 特别强调了A形桥塔和桥面风嘴对抑制风振的重要作用, 涡振和拉索风雨

振动的控制以及TMD在施工阶段的有效应用,还简要介绍了斜拉桥的抗震分析。4.4节则详细介绍了桥墩防撞的分析方法和各种措施。4.5节中介绍了初步设计中使用的近似计算和参数调整方法,对于学生掌握概念设计的技能是十分重要的。本书把斜拉桥的构造细节放在初步设计前面的第三章,是很有特色的安排,他让学生先了解斜拉桥各部分的构造特点后,再进入设计构思阶段,可能会使初步设计更加具体和切合实际。

在第六章中,作者着重介绍了他本人和LAP公司参与的一些斜拉桥、一些具有创新构造的桥以及创纪录跨度的桥。现代斜拉桥由德国Dishinger教授所首创,战后50—70年代首先在德国得到发展和推广。许多创新的构造细节和第五章中介绍的各种施工工法也大都都是德国学者所创造,在计算理论上的建树也最多。

在最后的第七章未来发展(Future development)中,Svensson先生特意介绍了1982年Leonhardt教授在意大利Messina海峡大桥方案竞赛中所建议的1800米跨度斜拉桥方案。Svensson先生当年也可能参与过这一举世瞩目的盛事。尽

管最后由3300米跨度的悬索桥方案获准成为实施方案,但他在未来发展一章中重提此事一定是坚信斜拉桥尚有发展潜力。他指出,要注意超大跨度斜拉桥的气动稳定性,并通过设置MR阻尼器或主动控制翼扇解决长拉索和柔性主梁的风致振动问题。如果能克服斜拉桥桥面受压的稳定性和长拉索因垂度引起的弱化问题,满足通航要求的1800米斜拉桥将会比因锚碇必须退至岸上而被迫加大跨径的3300米悬索桥更为经济。我们相信这也是Svensson先生心中的信念。

纵观全书, Svensson教授用他40年丰富的成功经验,给我们记述了斜拉桥的精彩发展历程,诠释了现代斜拉桥设计和施工的精髓,是继1976年美国Podolny和Scalzi合著的《斜拉桥设计与施工》一书出版25年后的又一本斜拉桥的优秀学术著作。我们慎重地向世界各国推荐此书,特别向中国大学和桥梁界的同行介绍此书,相信它一定能在培育未来的桥梁工程师中和未来的斜拉桥建设中发挥重要作用。📖

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(编辑:樊灿)

Book Recommendation

《Cable-Stayed Bridges》 by Prof. H. Svensson

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In the early of 1970's, commissioned by Leonhardt and Andra Partner (LAP), Mr. Svensson was in charge of the design of P-K Bridge in Washington State, USA, and he introduced cable-stayed bridges into America. He also involved in the design of East Huntington Bridge and Baytown Bridge in Huston, and the scheme competition for Sunshine Skyway Bridge. Entering into 1980's, he designed a series of cable-stayed bridges in Norway, Sweden and England. In the early of 1990's, invited by Asian Development Bank, he was in charge of design checking of 602m spanned Yangpu Bridge in Shanghai, China, with the record-breaking span length of cable-stayed bridge. He travelled a lot all over the world to develop and spread cable-stayed bridges for his whole life.

Mr. Svensson was elected as Vice President of International Association for Bridge and Structural Engineering (IABSE), and both of us have worked together with him for several years. Because his PhD supervisor, Prof. Leonhardt, and Prof. Guohao Li got their PhD degree from the same professor in Germany, and Tongji University was created by a German doctor in 1907, we feel great special friendship and sentiments.

This book was written by Prof. H. Svensson with seven chapters for thirty lectures as a textbook in Dresden University in Germany. Chapter One is Introduction, and the Chapters Two to Five are main contents, including historical development, structural details, preliminary design and erection. Chapter Six introduced typical examples of cable-stayed bridges, and Chapter Seven showed future development. With total 458 pages and over 1300 delicate photos or drawings, this is a versatile and great work in bridge engineering.

In Chapter One, Introduction, Prof. Svensson uniquely proposed ten aesthetic guidelines for bridge design. These guidelines are of bridge aesthetic point of view of structural engineers and the crystallization of close harmonization of structure and art, which have very important inspiration for bridge engineering. In Chapter Two, the author recalled the development history of cable-stayed bridges from period of enlightenment in the sixteenth century, initial practice in the seventeenth and eighteenth centuries, failure and withdraw under heavy loads but still used as stiffening measures for suspension bridges after industrial revolution, and approaching modern form in 1950's. Chapter Two described characteristics and typical examples of steel, concrete, composite cable-stayed bridges and their special systems, and also listed famous experts and engineers who made great contribution to cable-stayed bridge development, which are the most plentiful and exhaustive historical documents with great values.

Chapter Four, Preliminary Design of Cable-Stayed Bridges, is the core of this book. Sections 4.1 and 4.2 incisively analyzed rational arrangement of mechanical characteristics and geometrical sizes of cable-stayed bridges. Section 4.3 Bridge Dynamics emphasized the importance of A-shaped pylons and girder wind noses against wind induced vibration, and mentioned prevention of vortex-induced vibration and wind/rain induced vibration of stay cables, effective application of TMD system in construction stages, and seismic analysis in brief. Section 4.4 explicitly provided analysis methods and prevention measures of anti-collision for piers. Section 4.5 proposed approximate calculation and parameter modulation for preliminary design, which is very important for students to study conceptual design. It is very special in the book to arrange structural details in Chapter Three prior to preliminary design content. With this arrangement, students can learn structural characteristics of cable-stayed bridges first, and may begin with preliminary design practice in more reality and concrete.

In Chapter Six, the author emphatically presented some cable-stayed bridges involved by himself and LAP Co., and the others with innovative structures or span-length records. Modern cable-stayed bridges were created by German Prof. Dishinger, and were firstly developed and popularized in Germany from 1950's to 1970's. Many innovative structural details and various erection methods mentioned in Chapter Five were almost proposed by Germany experts, who also made the greatest contribution to calculation theory.

In the last Chapter, Chapter Seven Future Development, Prof. Svensson particularly introduced 1800m cable-stayed bridge scheme, proposed by Prof. Leonhardt in the bridge competition in 1982 for Messina Bridge in Italy, and he also involved in this scheme. Although the final scheme for Messina is 3300m suspension bridge, he mentioned this cable-stayed bridge scheme for showing his belief that cable-stayed bridge is still under development in its span length. He pointed out that we must take care of aerodynamic stability of super long span cable-stayed bridges, and adopt MR damper or active control wing to solve wind-induced vibration in stay cables and girder. If compressive girder stability and long stay cable sag can be overcome, the 1800m cable-stayed bridge scheme will be more economic than the 3300m suspension bridge scheme for putting two anchors on bank. We believe this is the conviction from the heart.

In conclusion, Prof. Svensson, with his 40 years productive and successful experiences, contributed to us the colorful development process of cable-stayed bridges, and annotated the quintessence of design and construction of modern cable-stayed bridges in his book. This great work has been the best academic book in cable-stayed bridges since *Construction and Design of Cable-stayed Bridges* authored by W. Podolny and J.B. Scalzi published in 1976. We wholeheartedly recommend this book all over the world, in particular to our colleagues in Chinese universities and bridge community. We believe this book will play an important role in educating future bridge engineers and future cable-stayed bridge development.