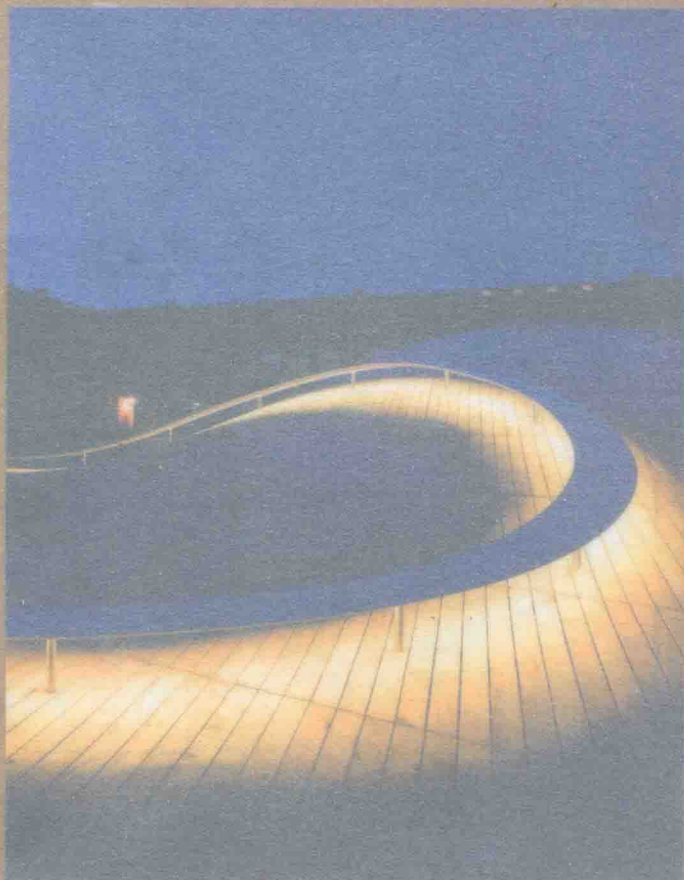


Mù Architecture

木 建 筑

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主编的话

Editor's notes

历史地看,人类社会的发展的确呈螺旋形上升的态势,木结构建筑在欧洲、北美的发展也正印证了这一点。中国曾是世界上最大的、也是历史最悠久的传统木结构建筑使用国,直至今日,在东北林区、西南和东南山区,还有数量不少的井干式、穿斗式等传统木构建筑遗存。甚至在西南苗、侗、瑶、土家等少数民族聚居地,穿斗式的传统木构建筑营造方式还在延续着。

时间已经将人类文明带入了二十一世纪,传统木构建筑的余晖虽然还在这个世界上的局部地区艰难地维系着,时过境迁,它的热度与光芒早已随着传统营造的整体没落而逐渐衰微,其影响力和意义或已微存。与之相反的情形是,现代木构建筑在欧洲、北美等地区经过近百年的技术发展、不断进步后横空出世,凭借木材自然优美的纹理、温馨淡雅的色彩、清新怡人的香气、优雅端庄的造型以及循环共生的理念再一次征服世人!在全球一体化的低碳经济时代,强调人和自然和谐共生的生态文明社会建设进程中,现代木构建筑克服了传统木构诸多弊端之后,一扫木构建筑在二十世纪下半叶以来发展的颓势,犹如凤凰涅槃般浴火重生!这不是传统木构建筑简单的历史回归,更准确地说应是社会生态文明与现代工业文明结合的新生事物,体现的是当代工业先进制造技术与绿色生态的营造理念。

一定有人会问,是什么样的力量能让现代木构在发达国家崛起?

是世界应对气候变化的策略,是材料制造和建造技术的进步,是人类健康建筑体系的需求,也是崭新的营造理念使然!首先,全球气候变暖已经迫使低碳经济时代提前来临,全世界负责任的国家已经团结起来共同面对环境恶化带来的生态危机,这是现代木结构建筑发展的时代需求与文化大背景;然后,是现代木材工业高端的新型复合材料制造技术带来的与传统木材相比脱胎换骨式的革命性材料的出现,为现代木构建筑奠定了基础;第三,新时期人们对建筑体系的健康和舒适性要求的进一步提升;最后,是由于现代建筑结构技术的理论与设计实践在木构体系上的高度契合,也是二十世纪后半叶延续到二十一世纪的新时期创意设计的必然要求!

历史的轮回即将让木构建筑再度回到世界营造舞台的中心。追溯木构建筑体系的兴衰历程,我们能体察到人类营造文明的进化史。这一点对曾经普遍使用传统木构建筑的中国乃至东亚地区而言,或更具意义。千年前,宋代的中國已经出现了木构营造的标准化、模数化和预制装配式施工方式,并且影响了东部亚洲几百年。明代以后的中国,随着木材资源日益减少而逐渐没落。1949年以后,木结构这一先前最主要的建筑结构形式更是一度被主流营造活动所遗弃。改革开放以来,尤其是中国重新回到世界贸易大家庭后,得益于全球木材资源的支持,中国木构建筑市场逐步复苏。二十世纪八十年代以来,新颖别致的欧美现代木构建筑技术随着木材贸易西风东渐,登陆神州大地,与古老中国的木构文化再度重逢。最近,新一届政府明确提出了中华文化复兴的宏伟目标。木构建筑——这一承载着中国数千年建筑文明的载体,在当下强大工业文明的支撑下,也一定会再度回归,或可成为一支不可忽视的新兴力量。

近年来,中国政府日益重视现代木结构建筑在中国的发展,住房和城乡建设部等相关部门组织行业专家和学者,相继完成了一系列木结构建筑工程或产品的国家标准的编制和再修编工作,初步建立起木结构建筑工程及相关产品标准体系,为现代木结构在中国的快速发展奠定良好的基础。2016年起,中国政府大力推广装配式建筑,发出“在具备条件的地方,倡导发展现代木结构建筑”(《中共中央国务院关于进一步加强城市规划建设管理工作的若干意见》2016年2月)的号召。旋即组织专家编制出台了《多高层木结构建筑技术标准》(GB/T 51226-2017,自2017年10月1日起实施)和《装配式木结构建筑技术标准》(GB/T 51233-2016,自2017年6月1日起实施)两部重要的技术标准,进一步完善了中国现代木结构建筑的技术标准体系,并解决了当前国内现代木结构建筑发展的技术瓶颈问题。至此,现代木结构建筑在中国的发展已经没有了技术层面的障碍。国内也因此掀起了发展现代木结构建筑的热潮,如位于中国东北地区的吉林省,结合自身资源与产业状况,提出将木结构建筑产业列为未来全省重点发展的支柱产业。内蒙古自治区、贵州省等省区的部分地区也纷纷结合自身情况,制定加快发展现代木结构建筑产业的计划和措施。

在这样的一个时代,热爱木构建筑的人们,或将做些什么?

他山之石，可以攻玉。经过数年的酝酿和筹备，由上海交通大学木结构建筑研究团队与欧洲木业协会合作主办的《木建筑》杂志第1辑终于问世并呈现在您的面前。它的诞生可以弥补中国乃至第三世界国家当代建筑设计中建筑师对世界各国优秀木结构建筑的认识不足，也可以让喜欢木结构的业主或潜在业主们看到建造的更多可能，更可以让那些正在可持续发展理念下成长的建筑与土木专业大学生们拓展视野与思维。在这样一本模样普通的文本中，蕴含着来自世界各地现代木结构建筑作品的优秀案例，也展示着世界各地区、各国建筑师的不同设计文化与格调。期待无论作为何种身份的您，都会在这个文本中找到知音或钟爱的案例。

让所有热爱中国木结构建筑文化的朋友们，都参与到这个重要的历史进程中，一起用自己的智慧与努力来见证中华文化复兴的壮举！

Looking at history, the development of the human society is indeed a spiral up trend. The development of timber structure in Europe and North America also confirms this point. China was once the World's largest nation with the longest history of using traditional timber architecture. Until today, there are still a number of preserved log home style, column and tie style and other types of traditional timber structures in China's northeast forest region, southwest and southeast mountain regions. Even in the southwest regions with numerous minor ethnic groups, column and tie style traditional timber architecture construction is still practiced today.

Time has brought human civilization into the 21st century, and the afterglow of the traditional timber architecture still struggles to remain in some parts of this world. Over time, its glory continue to gradually decline along with the system of traditional construction methods, with little influence and significance. But contrary, modern timber architecture in Europe and North America has had near a hundred years of technological development, continued to progress since its birth. The natural and beautiful texture, warm and elegant colors and fresh and pleasant aroma of wood materials, this elegant and dignified style of wood construction continues to conquer the world. In the era of low carbon global economy with emphasis on sustainable and civilized development, modern timber architecture has overcome many drawbacks of traditional timber architecture, giving great opportunities for further development. This is not only just the rebirth of traditional timber architecture, but more specifically the combination of sustainable and industrial civilization. This reflects the advancement of modern industrial manufacturing technologies and eco-friendly, sustainable construction concepts.

One might ask: what were the reasons that drove the rise of modern timber architecture in developed countries?

It's the strategy to adjust to global warming; It's the advancement of material manufacturing and construction technologies; It's the demand for healthy building systems; It's the establishment of new concepts! Firstly, global warming has forced the beginning of the low-carbon economy era and all the responsible nations are united to face this eco-crisis caused by environmental deterioration. This is the era of modern timber architecture development with the necessary cultural background and conditions. Secondly, the advancement of material manufacturing techniques has provided the necessary foundation for modern timber structure with revolutionary new construction materials. Thirdly, this generation has higher demand for health and comfort in the building systems. Lastly, the theories and designs of modern building structure technologies are very fitting in modern timber structure systems, and it is also the needs of innovation in architectural designs for the 21st century that drove the development of modern timber architecture.

The cycle in history will bring timber architecture back to the center stage of the international construction industry. In retrospect of the rise and fall of timber architecture, we can see the evolution of human civilization. This has much significance to China and East Asia where traditional timber architecture existed. A thousand year ago in Song Dynasty, there were already standardized, modular and prefabricated construction methods that had impacted East Asian countries for hundreds of years. From the Ming Dynasty, construction of timber architecture slowly declined due to the decrease in forest resources. Since 1949, timber architecture, once the mainstream of construction industry, had been abandoned. However, since China's reform and opening-

up policy was issued, especially since China joined WTO, the timber construction market had begun to recover, driven by the global timber trade. Since 1980s, novel timber structures from Europe and North America had emerged in China and met with the traditional timber structure culture. Lately, the new government has clearly proposed the goal of reviving Chinese culture. Timber architecture, the carrier of thousands of years of Chinese architectural civilization, will be revived with the strong support of industrialization, and become a force that cannot be ignored.

In recent years, the Chinese government strongly values the development of modern timber architecture in China. The Ministry of Housing and Urban-Rural Development and State Forestry Bureau gathered industry experts and academics to complete and revise a series of codes and standards for timber structure and products. The establishment of codes and standards provide the necessary foundation for the rapid development of modern timber architecture in China. Since 2016, the Chinese government strongly supported the development of prefabricated buildings and call the support to “encourage the development of timber structure in the suitable environments” (《中共中央国务院关于进一步加强城市规划建设管理工作的若干意见》2016年2月). The government immediately organized expert groups to compile two important technical standards, the《多高层木结构建筑技术标准》(GB/T 51226-2017, official implementation from 2017 October 1st) and the《装配式木结构建筑技术标准》(GB/T 51233-2016, official implementation from 2017 June 1st); a step closer to better complete the technical standards system for China's modern timber architecture. At the same time, this resolved the current main technical challenges for the development of modern timber architecture in China. Until now, the development of modern timber architecture in China is finally cleared of obstacles in technical levels. As a result, there is a fast growing trend for the development of modern timber architecture in various regions. For example, the government of Jilin Province, located in northern China, had stated strong support for the timber construction industry in its region. With the combined local resources and industries, timber construction will become one of the most important industries in the province. In the Inner Mongolia Province, Guizhou Province and other areas also announced support for more rapid development of modern timber architecture industry tailored to each situational conditions in each area.

In this century, the loves of timber architecture, what will they do?

他山之石，可以攻玉。Through numerous years of gathering funding and preparation, the first edition of “mù Architecture”, created in collaboration between the Timber Architecture Research Team from Shanghai Jiaotong University and the European Wood Association, is finally presented in front of you. The birth of this publishing can fill in the knowledge gap for timber architects in China and other developing nations with information of global and renowned timber architecture works. It also allows owners or developers, who have interest in timber architecture, to see the numerous possibilities of using timber structure. More so, it expands the perspectives and thinking of architects and civil engineering students who are growing in the generation of sustainable development. In this what appears to be a normal text, is stored the collection of excellent modern timber architecture works from around the world, while demonstrating the different design culture and style of these architects. I look forward that you, no matter your identity, may find a work from this publishing that you can admire and love.

For all the friends who have love and passion for Chinese timber architecture culture, lets participate in this important historical journey to witness the revival of Chinese culture with our knowledge and efforts.

上海交通大学中欧木建筑研究中心主任
建筑学系博士生导师
Director of Sino-European Wood Center
Doctoral Supervisor of architecture



2017年5月

院士寄语

National academician's remarks



木结构建筑曾是中国古代建筑中的主角，经过数千年的发展，其应用范围之广，建造工艺之精，艺术成就之高，均达到无与伦比的程度，代表了中华优秀传统文化的一个重要组成部分，且其国际影响遍及整个东亚地区。但自 19 世纪中叶以来，随着西方现代建筑技术及相应设计理念的传入，混凝土和钢材等新兴材料获得快速发展和应用，建筑行业经历了一个较大的变化过程。不仅传统的木结构建筑逐渐退出历史舞台，即使是基于“现代”技术的木结构建筑也没有获得快速发展，尤其是在一些大型的公共建筑领域。事实上，由于对森林资源的长期和过度开发，我国的木材资源逐渐匮乏，迄 20 世纪 60 年代后期，这一状况已相当严重，使木结构建筑基本上停止了发展。从那时起，全国大部分高校也相继停止开设木结构课程。相对于我国古代辉煌的木建筑文化，我们经历了一段悲惨暗淡的时期。

与此同一时期，欧洲、北美等地区的发达国家并没有停止木结构建筑的持续发展。丰富多样的材料品类和规格、富有时代性的设计理念、先进的建造技术，使各种新颖的现代木结构建筑获得广泛应用，展示了多彩的建筑形态，并充分体现了绿色生态建筑的一个重要发展方向。

随着改革开放的不断扩大和深入，这些先进的现代木结构建筑又逐渐传入我国，目前应用还不够多，业主、企业、设计人员等对它们的了解也还不够全面，说明它们在中国的发展仍处于初始阶段。但我国建筑业十分庞大，发展又非常快，而且目前正处于重要的转型升级阶段，通过不断创新向工业化、信息化、绿色化三位一体的现代化建筑业方向发展。这一宏观形势为现代木建筑的发展提供了巨大空间。（在这经济全球化的时代，原材料供应已不是问题，完全可以通过进口木材来解决我国的需求。）

在这一关键时刻，上海交通大学“中欧木结构建筑研究中心”联合国内外同行发起创办《木建筑》杂志，传播与交流国际上先进的木结构建筑信息，展示这类建筑体系在建筑美学、使用功能和绿色生态价值等方面的巨大优势，以期在中国大力推进这种先进建筑体系的发展，从而在新的技术与美学基础上复兴我们的木建筑文化传统，的确具有十分重要的意义。

这一杂志是国内乃至亚洲地区有关现代木建筑的第一本刊物，填补了这一领域的空白，的确办的正是时候，顺应了时代的需要。这体现了主编者的高瞻远瞩和巨大决心。我相信，这一杂志的成功创办必将为我国现代木建筑的健康快速发展起到重要的引领作用。我衷心祝愿《木建筑》杂志越办越好！

Timber structure was once the “main star” of ancient Chinese architecture. Over thousands of years of development, timber structure had reached an incomparable peak in terms of wide spread applications, delicate craftsmanship, and high levels of artistic achievement. It was a quintessential part of traditional Chinese culture, which also had strong influence on international regions such as the East Asia. With the introduction of modern western architectural techniques and related design theories since the 19th century, the applications of emerging building materials, such as concrete and steel, had spread rapidly and the construction industry transformed substantially. Not only was traditional timber structure disappearing gradually, but modern timber structure technologies also had not advanced, especially in the construction of large commercial and public buildings. In fact, the forest resource in China also became scarce due to long periods of over harvesting. In late 1960s, the depleting forest situation was so severe and the applications of timber construction essentially stopped due to limited resources. During this time, education on timber construction was removed in universities all over China. In comparison to the glorious development of timber structure of our Chinese heritage, this was a depressing period for the development of timber structures in China.

At the same time, advancements in timber structure continued in Europe and North America. With various types of products, dimensions and up-to-date design concepts, advanced construction techniques had been widely adopted in all types of modern timber structure. While demonstrating all types of architectural form, timber structure became an integral part of sustainable development and green buildings.

With the implementation of political reforms and open policies, modern timber structure had been introduced to China. However, the development of modern timber structure in China is still in the early stages since it has not been widely applied and recognized by clients, builders and designers. But, the large and fast-growing construction industry in China is entering a period of new advancements and upgrades with continuous innovations in industrialization, informatization, and modern green building technologies. This trend provides enormous opportunities for the development of modern timber structure. (In the age of globalization, raw material supply is no longer an obstacle. Global wood import is the solution to meet demands in China).

In this critical moment, the Sino-European Wood Center of Shanghai Jiao Tong University has taken the initiative to establish mù Architecture with domestic and overseas partners, aimed to spread the latest information on international timber structures and demonstrate the advantages of timber structure applications in terms of architectural aesthetics, functionalities, and green ecological values. This magazine holds significant value to promote the development of this kind of structural system in China and revive our traditional wood architecture heritage with advanced technologies and artistic foundations.

This magazine will be one of the first publishing on modern timber structures in China, filling a void in this industry. This is the right time to meet the demands of this generation. This publishing resembles the vision, ambition, and determination of the editor. I believe, this magazine will provide significant contributions to accelerate the development of modern timber structure in China.

沈世钊

2017年5月

沈世钊：哈尔滨工业大学教授、博士生导师，中国建筑学会木结构专业委员会顾问，中国工程院院士。

Shen Shizhao: Professor and Doctoral Supervisor at Harbin Institute of Technology, consultant of the timber structure committee of the Architectural Society of China, academician of Chinese Academy of Engineering (CAE) .

院士寄语

National academician's remarks



不能设想离开“土木”后中国的传统建筑会是什么样子，甚至还会有传统建筑吗？无论是半坡遗址的木骨泥墙，还是河姆渡遗址的干栏建筑，或者是历经千余年仍旧屹立的南禅寺、佛光寺与应县木塔，它们都在诉说着“土木”的故事与情怀。《考工记》中的“殷人重屋，茅茨土阶”也是对土木建筑形象而生动的记载。

《康熙字典》中收录的木字旁汉字有 1413 个，其中与建筑有关的多达 400 多个，诸如梁、柱、椽、檩、栋、楼等字；还有很多与生活密不可分的木字旁文字，诸如桌、椅、床、枕等，传统建筑中大木作的结构与小木作的装饰是基本法则，而且也是传统建筑的精华所在。植树为林，伐木为材，立柱架椽，广宇重栋，造屋筑园，这些老屋（可能并无精巧的艺术造型）不再仅仅是居住的房子，而是祖辈生命和血脉的传承，更是天人合一精神的践行与升华。

我国近代由于资源和技术的原因为，也由于受到西方建筑与文化的影响，在近代的我国，木结构房屋已繁华不在，甚至被弃之如敝屣。过去几十年，由于林业资源的匮乏和木材的短缺，政府对木材在建筑上的应用制定了严格的限制措施，提倡以钢代木、以塑代木，也使木结构房屋一直被排除在主流建筑之外。这与西方国家的情况形成了明显的对比，在木结构的研究和应用方面，近年来不仅应用原生态建筑较为广泛的北欧国家发展很快，而且美国、加拿大、日本等国也有长足发展，这些国家每年新建的住宅中有超过半数的房屋采用了木结构，并且有继续上升的趋势。同时，越来越多由木材构筑成的单一建筑、集合住宅和大型公共建设项目纷纷跃升到国际舞台，木建筑俨然成为二十一世纪的建筑新宠。

最新研究显示，木材不仅耐震抗压，利用新技术提高防火性能后，使得木材优点越发突出，而且木材属天然的再生材料，因此具有节能、环保、益于人体健康等优点，完全符合“绿色建筑”“生态建筑”的可持续发展的要求。因此，吸取国外的经验，加强对木材研究和开发，是一个值得我们特别重视的课题。

出于一种前瞻性，刘杰博士很早就关注木建筑的研究。五年前，在上海交大成立了“木建筑研究中心”，最近又倡导出版刊物——《木建筑》。这是一项极富开拓性的工作。特别是《木建筑》的出版，填补了我国在木建筑研究方向的空缺，它将能帮助我们深入吸取国外经验，进一步推动我国木建筑的研究、开发和应用。我衷心期望，通过刘杰博士的推动和《木建筑》的出版，使更多人关注“木建筑”在我国的发展，中国传统文化中的重要部分——木建筑，能够提升创新，重放光彩。

It is hard to imagine what traditional Chinese architecture will be without mud and wood, or if any traditional architecture will exist at all? Whether it is the wooden-stud mud walls of the Banpo Site, the stilt houses in the Hemudu Site, or the wooden structures that remained standing over a thousand years such as the Nanchang Temple, Foguang Temple and the Pagoda, they all tell a story about mud and wood. From the section on building of houses in the “Kao Gong Ji” (The Records of Examination of Craftsman), a classic work on science and technology in Ancient China written sometime during the late Spring and Autumn period (771 to 476 B.C.), is a powerful record to demonstrate the importance of wood and mud architecture.

The “Kangxi Dictionary” has 1413 Chinese characters that contain the wood character (木) as a component. Among these characters, there are over 400 characters associated with buildings such as beam (梁), column (柱), rafter (椽), purlin (檩), center purlin (栋), and floor (楼). There are also many characters associated with furniture and daily necessities products with the wood character (木) such as table (桌), chair (椅), bed (床), and pillow (枕). Whether it's large structural components or small decorative and furniture, it is fundamental to include the wood character (木) in all characters associated with traditional architecture. From harvesting to construction, the applications of wood were essential part of historical architecture. These old buildings are not only just shelter or art pieces, but also represent the blood, sweat, and tears of our ancestors and the essence of our cultural heritage.

Because of resources, technologies, and influences from western architecture and culture, the applications of timber structure gradually disappeared in our nation during recent periods. Over the past few decades, the government restricted applications of wood materials for building construction due to the nation's depleting forest resources. As a result, steel and plastics replaced wood entirely and timber structure was neglected from standards in the building industry. This situation was completely opposite to nations such as countries in Europe, the United States of America, Canada, Japan and etc, where construction of sustainable buildings became more and more popular. The research and applications of timber structures had continuous development with over half of all residential developments every year were built with wood in these countries. At the same time, more and more public buildings and commercial developments on the international stage also used wood as primary structural material. Timber structure has become the new favorite of the 21st century building industry.

Recent studies indicate that wood has high seismic and compressive strength performances. With new techniques to enhance the fire resistance of wood, applications with wood gained significant breakthrough. Not only is wood a natural and renewable resource, it also provides energy saving, eco-friendly, and health benefits when used as a building material. It completely meets the requirements of sustainable development and green buildings. Therefore, we must learn from foreign experiences and enhance the research and development of wood applications. This is a subject we must pay close attention to.

With a forward-looking perspective, Dr. Liu has put focus on the research of timber structure very early. Five years ago, the Sino-European Wood Center was established at Shanghai Jiao Tong University. And recently, the mù Architecture magazine will soon be published. This is a pioneering work to fill in the blanks of timber structure studies in our country. This magazine will help us learn more from overseas experience and push forward our country's research, development, and application of timber structure. Through Dr. Liu's efforts and the publication of mù Architecture, I sincerely hope that more people will pay attention to the development of timber structures in our country. As an essential part of traditional Chinese culture, timber structure can drive innovation and brilliance.



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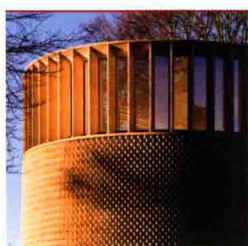
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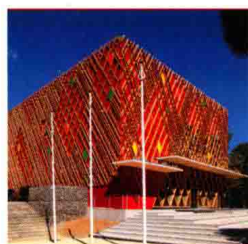
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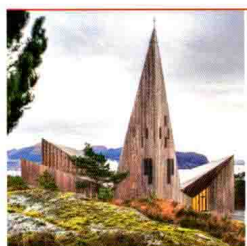
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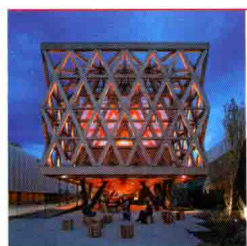
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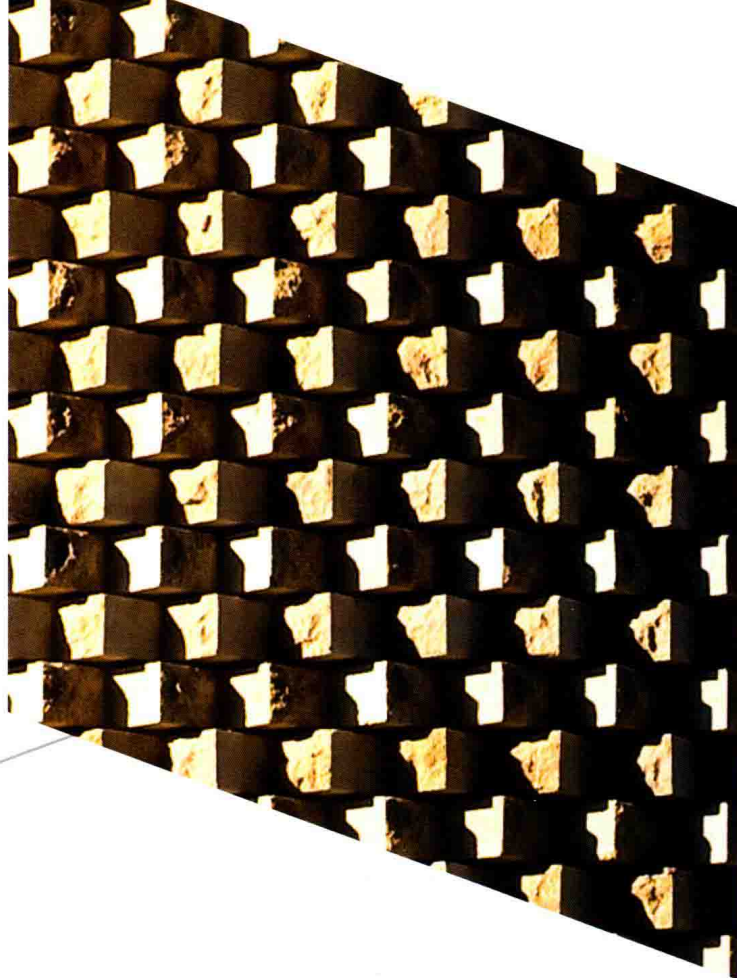
爱德华·金主教教堂

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HOW DO YOU make a brand new building spiritual?

When London-based Niall McLaughlin Architects were commissioned to design Bishop Edward King Chapel, near Oxford in England, they chose to give the building an elliptical form and blend soft and hard materials in light colours.

The interior boasts a treelike timber construction of prefabricated glulam that stretches from floor to ceiling. Its branches create a second ceiling in the form of cathedral vaulting. The posts rising up also define the space in what is otherwise a quite open-plan design. Larch and ash have been used for all the interior fittings, dominating the look of the chapel.

