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清代广州外销画
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Export Painting of Canton
(today’ s Guangzhou) in
the Qing Dynasty

葡语翻译:
李雨萌
Portugese Translation:
LI Yumeng

校对:
黄迪崎
杨妍荟
Proofread:
HUANG Diqi
YANG Qianhui

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学“一带一路”联合实验室
《遗产研究国际动态》编辑委
员会

审定:
吴永发

主编:
吴尧

编辑:
徐粤

编辑助理:
李雨萌
吴宇杰

编辑部地址:
江苏省苏州市吴中区斜塘街道
仁爱路 199 号苏州大学独墅湖
校区南区金螳螂建筑学院

编辑部联系方式:
jlbri@suda.edu.cn

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Chief Supervisor:
WU Yongfa

Chief Editor:
WU Yao

Editor:
XU Yue

Editing Assistant:
LI Yumeng
WU Yujie

Address:
School of Architecture, Soochow University
No. 199 Ren'ai Road, Wuzhong District, Suzhou, Jiangsu
Province, P.R.China

Contact:
jlbri@suda.edu.cn

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前沿研究 Research Fronts

东西方文化影响下粤系风土建筑分类与基质研究

Classification and Characteristics of Cantonese Vernacular Architecture under the Influence of Eastern and Western Cultures

徐粤ⁱ

XU Yueⁱ

ⁱ 苏州大学建筑学院历史建筑保护工程专业讲师; 同济大学博士
Lecturer of Conservation of Historic Architecture, School of Architecture, Soochow University (China); Ph.D. from the Tongji University

粤语方言区横亘广东广西两省, 可分为广府、四邑、高阳、勾漏、吴化、邕潯、钦廉7个片。在范围上, 广东省内方言复杂, 主要的就有粤语, 潮汕话, 客家话三种, 广西的东南部也以粤语作为主要方言, 因此风土谱系的研究应该跨越行政区域的限制, 进行更合理的划分。在内容上, 目前的研究偏重于依靠民系进行分类, 关注区域内的研究和实例的剖析, 而较少关照到将整个谱系作为一个系统的研究以及谱系间的关系。因此对整个粤语方言区的风土建筑进行系统性的谱系研究非常重要(图1)。

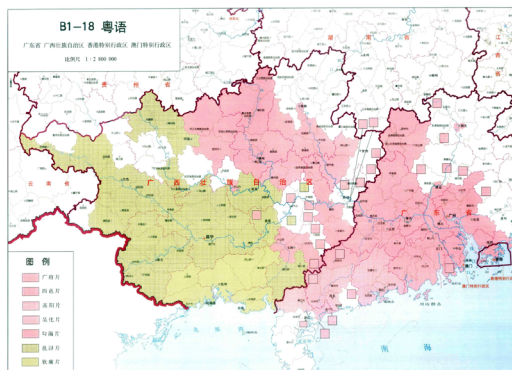


图1: 粤语方言区分布及小片划分
Figure 1. Regional distribution and subdivision of Cantonese dialect area

中山大学刘志伟教授提出“环南中国海”的概念, 即以广东南部南中国海域为中心, 包括沿线的中国东南沿海及东南亚等区域, 将

The Cantonese dialect area, which spreads across Guangdong and Guangxi provinces, can be divided into seven dialect sub-areas: Guangfu (Khanfu), Siyi (Sze-yap), Gaoyang, Goulou, Wuhua, Yongxun and Qinlian. Many different dialects are spoken in Guangdong Province, including Cantonese, Teochew and Hakka. Cantonese is also the dominant dialect in south-eastern Guangxi Province. Therefore, research into vernacular architectural pedigrees should break the limitations of administrative boundaries to achieve a more appropriate classification. Current studies tend to base their classifications on sub-ethnic groups and are generally focused on target areas and analyses of examples, while the broader picture of the whole pedigree and the relationships between different architectural pedigrees are seldom noticed. Therefore, it is important to perform systematic research on the vernacular architectural pedigree in the whole Cantonese dialect area (Fig. 1).

Liu Zhiwei, the professor at Sun Yat-sen University, proposed the concept of the South China Sea rim, which considers the whole region as one cultural circle where the South China Sea to the south of Guangdong Province serves as the centre, with an extension along the south-eastern Chinese coastline and relative regions of south-east Asia. Compared

整个区域放在一个文化圈内看待; 相较五岭以北的文化, 这个区域内的文化也和闽粤文化更加相近更加融合。整个区域内的工匠和技艺也会相互流动和影响。在环南中国海大区域背景下, 基于语言及地理历史、文化形态, 位于我国的岭南区域也可以划分为两个大的文化圈: 一个是珠三角、粤西及广西东南部的粤系文化圈; 另一个是粤北、粤东及相邻闽赣区域, 加上福佬系沿海所迁徙至的雷州半岛(更远可包括到海南岛), 甚至是除珠三角以外的广东其他沿海区域, 所共同组成的福佬、客家文化圈(图2)。

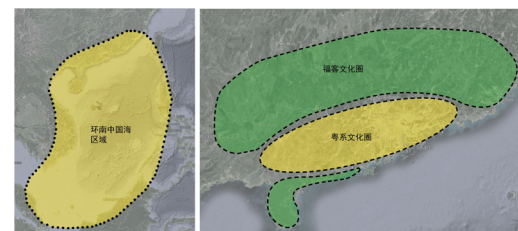


图2: 环南中国海区域及两个文化圈
Figure 2. South China Sea rim and two cultural circles

以方言分区作为参考, 结合各区域的基质特征, 综合文化和地理的影响, 可以将整个粤语方言区划分为以下几片:

广府片以梳式布局为主, 祠堂位于中心或村面。祠堂为多进院落式, 一般为门-堂-寝三部分, 也有两堂的情况; 采用明间插梁式木构架, 山墙面硬山搁檩; 基础部分常设塾台, 山墙华丽, 正脊独立。民居以三间两廊为主, 局部有夹层; 主要是墙承檩结构, 部分山墙和正脊比较华丽。

四邑片以棋盘式布局为主, 祠堂多位于村口位置, 对民居建筑的布局不起统领作用; 公建和广府片类似, 结构和装饰受到西洋影响, 结合岭南传统工艺做法, 表现出中西合璧的特点。民居以三间两廊为主, 一般为二层, 两廊多用平顶; 主要是墙承檩结构; 民居装饰较少, 装饰主要集中在入口处。庐居和碉楼受西洋影响较

with the cultures to the north of the Wuling mountains (the Five Ridges), the cultures in this region are closer to the Min and Cantonese cultures. Internal communications and mutual influences of craftsmanship and artistry were spread throughout the whole region. Against the background of the South China Sea rim, Lingnan region can be divided into two major cultural circles based on their languages, geographical history and cultural morphology. The first circle is the Cantonese cultural circle, including the Pearl River Delta, western Guangdong and south-eastern Guangxi provinces, while the second circle is the Hoklo-Hakka cultural circle, including northern and eastern Guangdong Province with adjacent regions in Fujian and Jiangxi provinces, Leizhou Peninsula (and even Hainan Island), which are predominantly influenced by the Hoklo culture, and all coastal areas in Guangdong Province, except for the Pearl River Delta (Fig. 2).

Using the classification of dialect sub-areas as a reference and combining related factors such as cultural geography, historical administrative boundaries and basic architectural characteristics, the whole Cantonese dialect area can be roughly divided into four vernacular architectural sub-areas:

The Guangfu sub-area features a comb-like layout of the traditional settlements where the ancestral hall is either in the centre or at the front of a village. The ancestral halls have a sequence of courtyards, which is characterised by a serial courtyard-halls along the building's axis. These buildings are usually divided into three parts: i.e., the gate, the sacrificial hall and the tablet chamber. Most of the residential buildings are characterised by the three-bay-two-wing (*sanjian-lianglang*) layout with partial mezzanines. As for the buildings' structure, a *chaliang* framework (a combination of column-and-beam and column-

大, 其装饰融合了西方古典柱式和巴洛克等装饰风格。

高阳 - 吴化片以梳式和棋盘式布局为主, 而钦廉片以梳式和密集式布局为主。祠堂有多进院落式也有祠宅合一的形式; 多进院落式采用明间木构架, 山墙面硬山搁檩; 祠宅合一式大部分为墙承檩结构。民居有三间两廊也有多进天井式, 主要是墙承檩结构。公建筑装饰和广府片类似; 民居装饰较少, 装饰主要集中在入口处。

邕潯 - 勾漏片以梳式和自由式布局为主; 建筑有祠宅合一式, 三间两廊, 三间一幢几种类型; 建筑主要都是墙承檩结构, 部分祠堂中堂有木梁架; 装饰较少, 较为朴素, 最主要的装饰都集中在祠宅合一式民居的中堂。

and-tie structures) is applied at the central bay, and purlins are directly supported by flush gable walls on both sides. A platform is usually placed on the foundation at the front. The gables are usually richly decorated with an independent main ridge.

The Siyi (Sze-yap) sub-area features chessboard layouts in traditional settlements, where the ancestral halls are at the main entrances and have no dominance over the layouts of residential buildings. The public buildings are like those in Guangfu (Khanfu) sub-area, but the structures and decorations combine obvious Western structural and decorative forms and traditional Lingnan artistry. The residential buildings are also characterised by the three-bay-two-wing

以方言分区作为参考, 结合各区域的基质特征, 综合文化和地理的影响, 可以勾勒出整个粤语方言区的大致分区: 南部沿海受福佬系影响的区域 (高阳 - 吴化 - 钦廉片), 中部沿珠江水系和相通水系受粤系影响的区域 (广府片), 和北部位于山区受客家系影响的区域 (邕潯 - 勾漏片)。这个分区仅仅是一个粗略的划分, 各区域内不可避免会出现很多特例, 但是大体的趋势应该是可以确定的 (图3)。

(徐粤编译)

layout, while most of them have two storeys and flat roofs for the wing houses. The purlins are mainly supported by walls, while residential buildings have fewer decorations which are concentrated mainly at the entrance. Lu villas and *diaolou* (multi-storied defensive village houses) were deeply influenced by Western cultures, as their decorations combine multiple Western classic styles, such as the Baroque style.

The Gaoyang-Wuhua sub-area features both comb-like and chessboard layouts of traditional settlements, while comb-like and intensive layouts dominate the Qinlian sub-area. The ancestral halls have two types of layouts: i.e., the courtyard-sequence layout and the ancestral-hall-residence complex. In the courtyard-sequence layout, wooden structures are applied to the central bay and purlins are supported by the flush gable walls on both sides. In an ancestral-hall-residence complex, the purlins are directly supported by walls in most cases. Residential buildings also show two types of layouts: i.e., courtyard-sequence and single-courtyard layouts, which are both based on the three-bay-two-wing unit. Their purlins are mainly supported by walls. The public buildings in this area are similar to those in the Guangfu (Khanfu) sub-area; however, the residential buildings have fewer decorations, which are concentrated at their entrances.

The Yongxun-Goulou sub-area features both comb-like and freestyle layouts. Three types of building layouts can be observed: i.e., ancestral-hall-residence complex, and the three-baytwo-wing and three-bay-single-building layouts. In most cases, the purlins are supported by walls, while wooden frames are only used in some of the ancestral halls. The buildings have fewer and plain decorations, while only the central bay of the main hall in an ancestral-hall-residence was magnificently

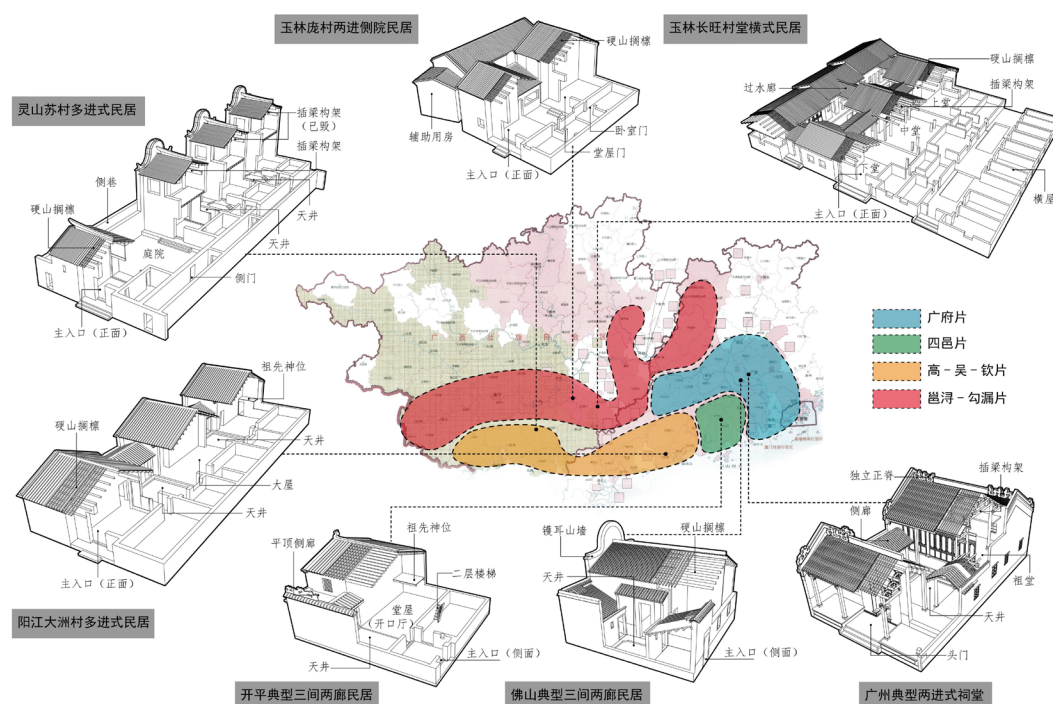


图3: 粤语方言区谱系划分及宅院特征

Figure 3. The pedigree division and house characteristics of Cantonese dialect area

decorated.

In conclusion, a general classification of the vernacular architecture pedigree of the whole Cantonese dialectal area can be outlined as follows: the southern coastal area (including Gaoyang, Wuhua and Qinlian dialect sub-areas) is influenced by Hoklo culture, the central area (primarily Guangfu dialect sub-area) along the Pearl River Delta system and other connected river systems is influenced by Cantonese culture, the northern mountainous area (including Yongxun and Goulou dialect sub-areas) is influenced by Hakka culture, and the Siyi (Sze-yap) area is influenced by overseas Chinese culture. The demarcation of these areas is merely a rough division because there are inevitably many exceptions in each area, but the general trend is quite clear (Fig. 3).

(translated and edited by
XU Yue)



阿莫斯·拉普卜特 Amos Rapoport

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<https://www.re-thinkingthefuture.com/rtf-architectural-reviews/a4568-book-in-focus-house-form-and-culture-by-amos-rapoport/>

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Interview with Amos Rapoport Arch. & Behav., Vol. 8, no. 1, p. 93-102 (1992)

阿莫斯·拉普卜特 1929 年 3 月 28 日出生于在波兰华沙。1939 年，他和他的父母逃离了华沙，在穿越苏联后，他们在上海找到了避难所，在日本人控制的犹太区度过了战争时期。阿莫斯在上海犹太学校上学。日本投降后，他移民到澳大利亚，并在墨尔本定居。1955 年，阿莫斯从墨尔本大学毕业，获得了建筑学学士学位。1957 年，阿莫斯从莱斯大学毕业，获得硕士学位。1966 年，他从墨尔本大学获得了城市和区域规划的硕士文凭。

阿莫斯·拉普卜特是澳大利亚的注册建筑师，也是英国皇家建筑师协会的会员。他是《城市生态学》杂志的主编，同时还是很多国际级刊物的编委会成员和国际组织的委员会委员。他是环境与行为研究（EBS）的创始人之一。他在此领域发表了 200 多篇学术论文，其中包括已被翻译成外文的书。最著名的书籍有《宅形与文化》（1969 年出版）、《城市形态的人文方面》（1975 年出版）、《建筑环境的意义》（1990 年出版）和《文化、建筑与设计》（2005 年出版）。阿莫斯·拉普卜特曾在全球许多大学担任荣誉顾问，并在阿根廷、澳大利亚、巴西、加拿大、以色列、墨西哥、波多黎各、印度、瑞士、土耳其和英国等地举行讲座大会。

代表著作《宅形与文化》

“《宅形与文化》讲述我们不能只看建筑师做什么，我们必须关注例如乡土设计、自发形成

Amos Rapoport was born on 28 March 1929 in Warsaw, Poland. In 1939, he and his parents fled Warsaw and after crossing the USSR, they found refuge in Shanghai, where they spent the war in the Japanese-controlled ghetto. Amos attended the Shanghai Jewish School. Following the Japanese surrender, he emigrated to Australia, where the family settled in Melbourne. In 1955 he graduated with a Bachelor of Architecture degree from the University of Melbourne. In 1957 he graduated with an MA from Rice University. In 1966 he got a Postgraduate Diploma in Town and Regional Planning from the University of Melbourne.

Amos Rapoport is a registered architect in Australia and an associate of RIBA. He is editor-in-chief of the journal *Urban Ecology* and is a member of the editorial boards of many international journals and a committee member of international organizations. He is also one of the founders of Environment-Behavior Studies (EBS). He is the author of over 200 academic publications in this field, including books that have been translated into foreign languages. Most notable work are *House Form and Culture* (1969), *Human Aspects of Urban Form* (1975), *The Meaning of the Built Environment* (1990) and *Culture*,



阿莫斯·拉普卜特
Amos Rapoport

的定居等一系列的问题。”——阿莫斯·拉普卜特。

阿莫斯·拉普卜特于1969年撰写了《宅形与文化》一书（图1）。这位波兰裔美国建筑师对环境行为研究有着浓厚的兴趣，并试图通过这本分为六章的162页读物来强调某些方面。他认为对房屋和形式的研究，涉及建筑、文化、地理、历史、城市规划、人类学、人种学、跨文化研究和行为科学等多种领域。

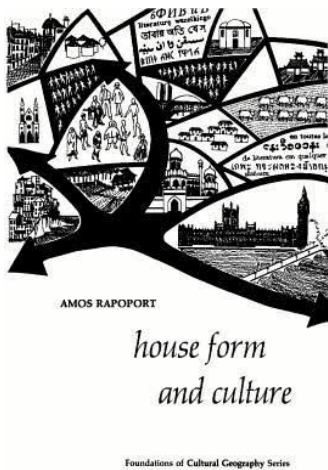


图1：《宅形与文化》
Figure 1. House Form and Culture

本书内容

在第一章中，他将建筑划分为“重要的”（如

Architecture, and Design (2005). He has held honorable and visiting positions in many universities around the globe, and has also held visiting appointments in Argentina, Australia, Brazil, Canada, Israel, Mexico, Puerto Rico, India, Switzerland, Turkey and the U.K., among other places.

House Form and Culture

“House Form and Culture essentially said that we can not just look at what architects do, we must look, for instance, at vernacular design, spontaneous settlements and so on.” — Amos Rapoport.

Amos Rapoport authored the book *House Form and Culture* in 1969 (Fig. 1). The Polish-American architect had a keen interest in Environment Behavioral Studies and tried to highlight certain aspects of the same through the 162-page read, divided into six chapters. He thinks that the study of house and form is multi-disciplinary and involves fields of architecture, culture, geography, history, city planning, anthropology, ethnography, cross-cultural studies, and behavioral sciences.

Contents of the Book

In the first chapter, he segregates buildings as ‘important’ like monuments or ‘unimportant’ like houses and streets. He then goes on to define a building as ‘primitive’, ‘vernacular’ or ‘traditional’. The second chapter discusses in detail the influence of climate, materials and technology available. It also takes into consideration the aspects of economics, religion, site and defence.

The third chapter focuses on establishing a relationship between the factors: house, form, and culture. A house is seen in the light of choice of site, relation to its settlement, and socio-cultural forces while ensuring that basic needs are met (Fig. 2). Climate is discussed as a major modifying factor in the fourth chapter. Various instances, from extreme hot to cold

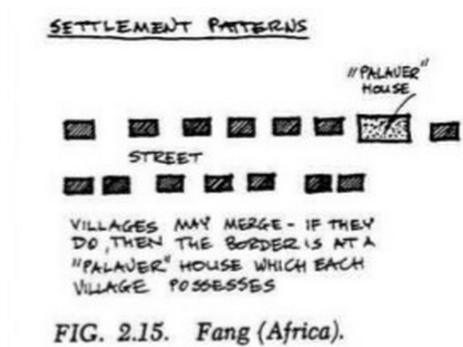


FIG. 2.15. Fang (Africa).

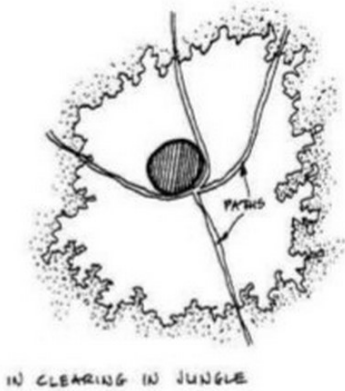


图2：集聚模式
Figure 2. Settlement Patterns

纪念碑）或“不重要”（如房屋和街道）。之后他将建筑定义为“原始”、“乡土”或“传统”。第二章详细讨论了气候、材料和现有技术对建筑的影响。此外，还考虑到了经济、宗教、场地和防御等方面的问题。

第三章的重点在于探讨房屋、形式、文化三者之间的关系。在确保基本需求得到满足的情况下，根据场地的选择、与所在地的关系以及社会文化力量来看待房屋本身（图2）。在第四章中，气候被作为一个主要的改变因素来讨论。为了更好地理解气候变量对建筑房屋的影响，作者给出了从极端炎热到寒冷环境的各种实例。拉普卜特在第五章中解释说，人们的生活方式、共同的群体价值观和理想的环境条件决定了房屋的建造方式。

在深入讨论了原始和乡土建筑之后，拉普卜特在最后一章中谈及，由于工业化和现代生活的迅猛发展，乡土建筑正逐步淡出人们的视野。他从发展中国家与自身的文化变化的角度讨

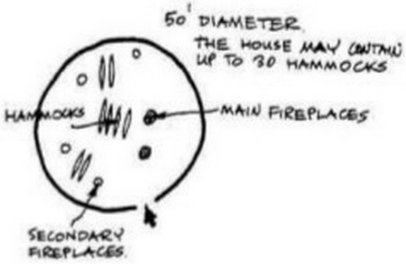
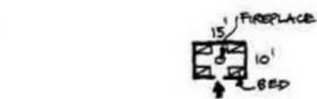


FIG. 2.16. Piara (South America).

environments, are given for a better understanding of the climatic variables. This is followed by suitable responses to the same suggested by the author. Rapoport explains that how a house is built depends on the way of life, shared group values and ideal environmental conditions in the fifth chapter.

Having discussed in-depth primitive and vernacular buildings, in the last chapter, Rapoport talks about the decreasing popularity of the same due to industrialization and the specialization of modern life. He concludes by discussing the scenario in the light of developing countries and the changes in our own culture.

A primitive building is one that anyone can build based on their requirements and the problems that are to be dealt with. Vernacular is an extension to primitive, describing how a building is designed and built. It talks about

论了这种情况发生的原因。

原始建筑是任何人都可以根据自己的需求和需要处理的问题来建造的建筑。乡土建筑则为原始建筑的延伸，展现出建筑的设计和建造方式。乡土建筑的模式和调整比原始建筑更具有个体差异性。传统模式是几代人之间以及建筑设计者和使用者之间合作的结果。然而，由于设计者和使用者的意见不同，近代传统正逐步被人们遗忘。

乡土建筑并不涉及专人营造。相反，外行人只要掌握基本的知识和解决问题的能力，也能建造一个住所。拉普卜特认为现代设计的关键在于乡土建筑的成功解决方案。

首要因素在于气候。他引用了佛罗里达州塞米诺尔房屋的例子，房屋建在支撑物上，以保护其免受潮湿、昆虫和动物的侵害，为了通风没有设置墙壁。如今这类吊脚楼建筑在洪泛区也很常见，如印度东北部的雅鲁藏布江沿岸。在乡土建筑中，用于建筑的材料是当地可用的，并且适合气候。

在热带和亚热带地区，砖砌建筑很常见，而在温带地区，玻璃建筑很受欢迎。场地的选择在很大程度上取决于社会文化价值。在喀麦隆，房屋的建造取决于家庭的类型。这与今天的家庭结构形式有关——核心家庭或联合家庭。

随着隐私观念的转变，浴室的数量也成为一个重要因素。房屋周围的围栏则为现代防护理念的产物，同时也暗示着个人隐私（图3）。不变的是宗教观念的影响，像风水和瓦斯图卡拉的概念在

models and adjustments with more individual variability than primitive. A traditional model is a result of the collaboration between people over generations and between the designer and the user of the building. However, a loss of tradition has been observed in recent times owing to the difference in opinion of the designers and users.

Vernacular architecture does not involve specialized people for building houses. However, the layman manages to build not only a shelter through basic knowledge and problem-solving skills. Rapoport believes that the key to modern design lies in the successful solutions from vernacular architecture.

The very first factor in the discussion is climate. He quotes the example of the Seminole House of Florida which is built on supports to protect it from moisture, insects and animals and the absence of walls is for ventilation. Stilt houses are prominent even today in flood plains such as in North East India along the Brahmaputra. The material used for construction in the case of vernacular architecture was the one locally available and suited the climate.

In tropical and subtropical areas, brick masonry is common, and in temperate zones, glass buildings are popular. Choice of the site largely depends on socio-cultural values. In Cameroon, houses were constructed depending on the type of family. It is relevant in the form

FIG. 3.5. Comparison of Cameroon houses, both drawn to the same scale. (Adapted from Beguin, Kalt et al., L'habitat au Cameroun, pp. 19, 52.)

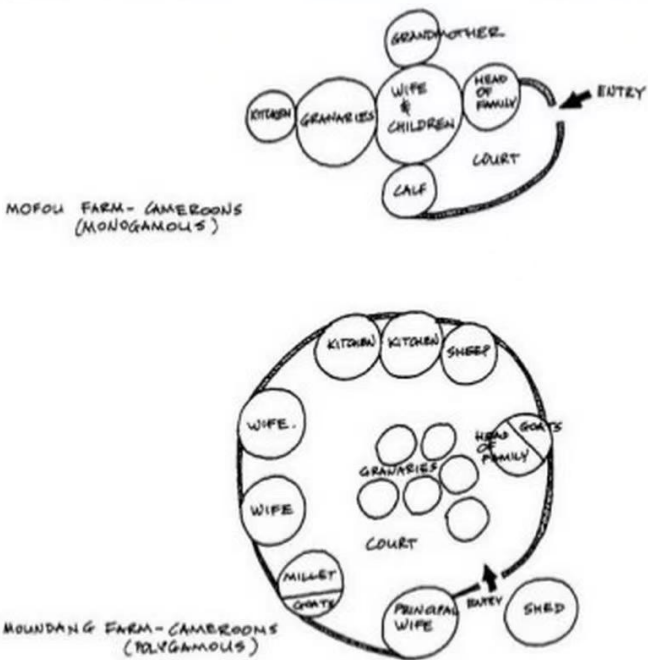


图4：影响房屋规划的社会文化因素
Figure 4. Socio-cultural factors affecting house plan

今天占主导地位。房屋的形式不是简单的自然因素或任何单一因素的结果，而是整个社会文化因素的结果。除了提供住所，房屋的功能是创造一个最适合人们生活方式的环境，一个社会空间单位。今天，即使人们不是自己建造房屋，他们的房屋也是他们思想、信仰和文化的反映（图4）。

论文化与环境的关系（图5）

文化与环境的关系一直是环境行为研究（EBS）中最具创新性和令人兴奋的领域之一。这些问题经常在环境设计研究协会的会议（EDRA）上讨论。阿莫斯·拉普卜特认为，其他领域也是同样的情况，这说明以前被忽视低估的文化的功能和后果已经逐渐得到了重视。

文化和文化概念也被应用于组织工作中。拉普卜特将这类进步归功于文化在人类行为、认知、情感、偏好和意义等所有领域不可分割的重要参与。无论它重要与否，这种影响的广度和深度是显而易见的。

of the family structure today- nuclear or joint.

With a shift in the idea of privacy, the number of bathrooms in a house is an important factor. In the USA, advertising agencies report more bathrooms than bedrooms. Fencing around the house is the modern idea of defence, hinting at privacy at the same time (Fig. 3). A change in eating habits has paved the way for the need for a formal dining table or a backyard for barbeque. What remains unchanged is the religious influence and orientation with concepts like Feng Shui and Vaastu Kala predominant today.

House form is not simply the result of physical forces or any single causal factor but is the consequence of a whole range of socio-cultural factors. Apart from the provision of shelter, the function of the house is to create an environment best suited to the way of life of the people, a social unit of space. Today, even

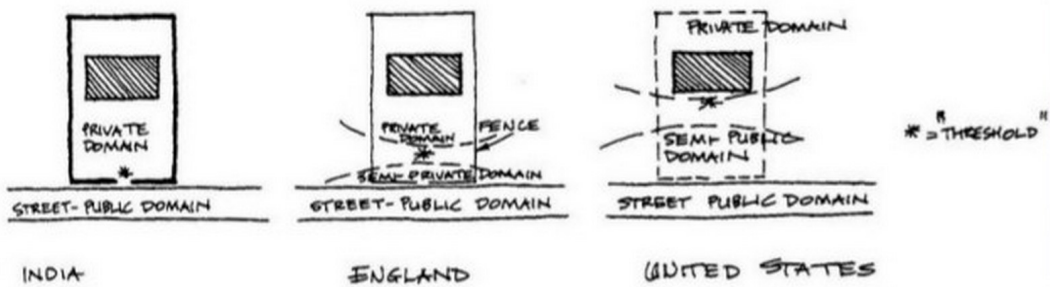


FIG. 3.15. Approximate location of "threshold" in three cultures.

图3：隐私程度
Figure 3. Degree of privacy



图 5: 阿莫斯·拉普卜特论文化与环境的关系
Figure 5. Amos Rapoport on culture & environment

阿莫斯·拉普卜特认为,文化的首要地位带来了一个明显的悖论。文化通常被看作是人类的显著特征,定义了智慧物种。文化是任何人类现象中不可分割的一部分,包括个人如何形成、行为和与周围环境互动。

群体的变异性是人们的一个重要属性,对于理解环境行为关系(EBR)和正确开发设计至关重要。文化是区分这些群体的原因。

其他关键的设计结果包括:各种用户群体,而他们每个人都有自己的不同的需求。这包括他们对环境方面和偏好的解释以及对环境质量、理想和模式的理解。此外,它适用于所有的用户,而非设计者,设计者是一个非常具体的、高度特异的群体,与大多数用户没有什么共同之处。

对于儿童、老人、第三世界国家的城市贫民、残疾人、单亲家庭和文学作品中遇到的其他特殊用户群体来说,在某些方面,“文化”更有意义,它贯穿了这些群体的特征。

阿莫斯·拉普卜特讨论了各种环境,以及活动系统及其周围环境之间的关系。他谈到了与建筑环境有关的生活方式的几个方面。拉普卜特提出了一种关于“文化”和“环境”的新的思考方式,以及使这些概念具有可操作性并因此可用的策略。

(倪伊阳、徐粤编译)

though people do not build their homes on their own, their homes are a reflection of their ideas, beliefs and culture (Fig. 4).

On the relation between Culture and Environment (Fig. 5)

Culture-environment relations have been one of the most innovative and exciting areas of environmental behaviour research (EBS). These issues are frequently discussed at the Environmental Design Research Association's meetings (EDRA). According to Amos Rapoport, this is the situation in other fields where the function and consequences of culture, which were previously unrecognized, overlooked or underestimated, have gained traction.

Culture and cultural concepts are also applied in organizations. Rapoport also believes that these advancements are attributable to the importance of culture's inextricable and vital involvement in all areas of human behaviour, cognition, affect, preference, and meaning. The breadth and depth of that impact are observational questions, regardless of how central it is.

According to Rapoport, the primacy of culture entails an apparent paradox. Culture is often viewed as the distinguishing characteristic of humans, defining the Homo Sapiens Sapiens. Culture is an inextricable part of any human phenomena, including how individuals form, use, and interact with their surroundings.

Rapoport argues that group variability is an important property of people and is crucial to understanding EBR and correctly developed design. Culture is what distinguishes these groups.

Other key design consequences include the fact that this involves a variety of user groups, each with its own set of desires. This includes their interpretations of environmental aspects and preferences and conceptions of environmental quality, ideals, and schemata. Furthermore, it applies to all users, as opposed

to designers, who are a very specific, highly idiosyncratic group with little in common with the majority of users.

Amos Rapoport argues that children, the elderly, the urban poor in third world countries, the disabled, single parents and other special user groups encountered in literature may not be useful or appropriate. In some ways 'culture' is more relevant, cross-cutting the characteristics of such groups.

Rapoport discusses the variety of settings, as well as the relationship between activity systems and their surroundings. He talks about a few areas of lifestyle that have to do with the built environment. Rapoport proposes a new way of thinking about 'culture' and 'environment', as well as strategies to make these notions operational and hence usable.

(translated and edited by
NI Yiyang, XU Yue)

实践案例 Case Study

“新旧孪生”——上海杨浦滨江永安栈房旧址修缮工程

A Tale of the New and the Old: Renovation of Yong'an Warehouse at Yangpu Waterfront, Shanghai

资料来源 Source:

<https://built-heritage.springeropen.com/articles/10.1186/s43238-021-00027-9>

项目背景

城市结构布局的调整、城市功能的转换及空间质量的提升导致大量原有的城市工业用地面临更新改造。上海近现代的工业建筑在一定程度上记录了近代中国工业建筑发展的过程,体现着工业建筑的空间特征,是上海城市化进程重要的组成部分。《上海文化发展报告(2018)》的调研显示,从1989年上海市公布第一批优秀近代建筑至今,上海对工业建筑遗产的研究和再利用成效显著,但仍然存在保护不足和利用效率低等问题,如何更好地保护和改造工业建筑遗产依旧需要一些有效的解决方法。

随着2015年黄浦江沿岸城市开发的进展,杨浦区政府批准购买永安仓库,该仓库被列入由张青教授及其团队制定的监管规划和保护清单。双子仓库在经历了一个世纪的风雨历程后重新进入公众视野(图1)。随着杨浦滨水区城市发展的推进,永安仓库的潜在转型方式有待探索。为了保护和翻新这样的遗产结构,建筑师需要足够的历史背景知识,并能够通过传达历史专家和地方长官的具体成就来重新诠释上海的城市化(图2)。

1 永安栈房历史背景

永安(也称“Wing On”)栈房位于黄浦江沿岸的老杨浦工业区。它最初是永安纺织股份有限公司第一厂的仓储货栈。永安栈房设计并建造于1922年,规模仅次于申新纺织公司,随着规模和管理效率的提高,永安纺织股份有限公司先后开设五座厂区和印染厂,并吸收永安公司第一厂与永安公司印染厂合并,取名永安棉纺织印染厂,当时每天在该设施中生产和仓储数以千计的棉花制品。永安栈房于1937年被日本人占领,在1949年后

Background

Changes to urban infrastructure and urban functions and improvements in spatial quality continue to redefine massive urban industrial areas. Considered an essential part of Shanghai's urban development, the industrial architecture reflects not only typological characteristics but also the progression of contemporary industrialisation in China. As shown in Shanghai Cultural Development's Annual Report of 2018, the research on and renovation of industrial heritages has made significant progress since the first few representatives of modern architectural projects were announced in 1989. However, because of the limited reach and slow process of conservation, valid solutions are still needed to better renovate the city's heritage.

As urban development along the Huangpu River progressed in 2015, the Yangpu government approved the purchase of Yong'an Warehouse, which was included on a regulatory plan and conservation list devised by Professor Qing Chang and his team. The twin warehouses reentered the public consciousness after a century of trials and hardship (Fig. 1). As the urban development of the Yangpu waterfront proceeded, the potential transformation way of Yong'an Warehouse awaited exploration. To conserve and renovate such a heritage structure, the architect would need adequate historical background knowledge and be able to reinterpret Shanghai's urbanisation by communicating the specific fulfilments from groups of historical experts and local governors (Fig. 2).

1 History of Yong'an Warehouse

Yong'an (also known as Wing On) Warehouse is located in the old Yangpu industrial district along the banks of the



图1: 杨浦区滨江景观: 永安栈房 (图片来源: 田方方摄影)
Figure 1. View from the Yangpu waterfront: Yong'an Warehouse (Source: TIAN Fangfang)

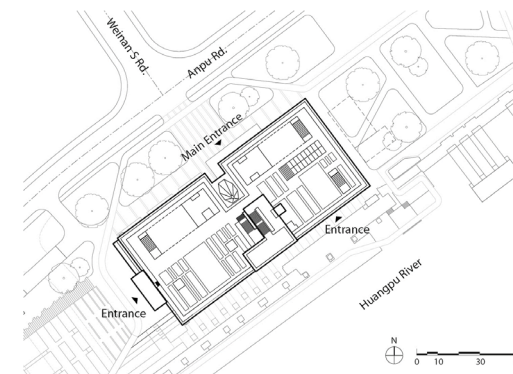


图2: 永安栈房总平面图 (图片来源: 上海创盟国际建筑设计有限公司提供)

Figure 2. Yong'an Warehouse Masterplan (Source: Archi-Union Architects)

被上海第二十九棉纺织厂接管。1961年,该建筑的一部分成为上海化工厂的原材料仓库,之后便逐渐走向了衰败。时至今日,与永安栈房同期建造的其他厂房建筑都已无存,仅永安栈房一处保留了下来,并成为了上海近现代工业遗产一个罕见的实例。

永安栈房主要由东西两栋对称的4层高建筑体量构成,它们在面向黄浦江沿岸的南北轴线上相对。栈房以折衷的现代风格建造,线条简单干净。建筑平面均为正方形,每层建筑面积约2400m²,总建筑面积共计约20000m²(图3)。从历史资料 and 老照片可知,建筑为钢筋混凝土框架结构,立面构图整齐,内部空间采用了八角形棱柱支起棱角斗状柱帽天花板的无梁楼盖结构体系,极有特色(图4)。

建成后的永安栈房在使用过程中频繁易主,

Huangpu River. It was originally a storage facility for the first factory of the Wing On Textile Co., Ltd. Designed and built in 1922, the Yong'an Warehouse was second only to that of the Shenxin Textile Company. As it grew in scale and management efficiency, the Yong'an Textile Company established five factories and a mill, which absorbed the first factory to become Yong'an Textile Mill. Thousands of cotton goods were manufactured and stored in the facility each day. The Yong'an Warehouse was occupied by the Japanese in 1937 and then was taken over by Shanghai No. 29 Cotton Mill after 1949. In 1961, part of the building was assigned to the Shanghai Chemical Plant, which used it to store raw material. The building gradually fell into decay. It is currently the only facility of its kind remaining and a rare example of Shanghai's industrial heritage.

The warehouse consists of two 4-storey buildings opposing each other on a north-south axis facing the Huangpu waterfront. They were built in an eclectic modern style with simple, clean lines. Each square-shaped floor is 2400 m², for a total of 20,000 m² (Fig. 3). According to historical records and photos, the warehouse was built with a reinforced concrete frame structure and a well-preserved façade. A beamless superstructure system, octagonal prismatic columns and angled bucket caps brought out the unique characteristics of the interiors. (Fig. 4).

Frequent takeovers and two consecutive wars resulted in substantial damage to the warehouse's structure. In the 1990s, due to the development of the market economy and land exchange, the east building was converted into the storage unit in Shanghai's New Organic Material Industrial Complex and later into an office building in the Yangpu Jingyuan Cultural Creative Garden. To allow the building to fulfil its new functions, several columns were removed and replaced by a staircase, the interior space was covered in white paint, and most of the exterior walls were demolished and replaced with glass windows during the renovation process. These changes caused irreversible damage to the original appearance of the historic warehouse. However, they offered new opportunities for the rebirth of Yong'an Warehouse during the urban development of the Yangpu Waterfront.

2 Research and renovation strategies

期间经历抗日战争和解放战争, 遭受了不同程度的破坏。20 世纪 90 年代, 由于市场经济的发展, 永安栈房的东侧仓库当时因土地置换而成为上海有机新材料工业园的材料成品仓库, 后又改建为办公楼, 对外租赁, 成为杨浦景源文化创意园。为了使栈房能够实现其新功能, 改建为创意园办公楼时, 栈房东楼室内个别八角形棱柱被打掉并加建了楼梯间, 室内空间表面全部覆盖了白色涂料; 大部分外墙面被改建粉刷, 并大面积替换为方形玻璃窗, 对栈房原貌造成了不可逆的破坏。如今杨浦滨江空间的功能转型, 为永安栈房开启新的篇章创造了契机。

2 对永安栈房现状及保护措施的研究

一方面, 栈房年久失修, 结构构件及墙体有老化脱落现象, 多处涂层剥落, 钢筋外露, 门窗玻璃有破损, 内部被多次刷白和涂鸦。经过多次功能改造后, 东侧栈房楼体立面已经面目全非, 内部空间也存在改动。1999 年又加建了西侧耳房, 2011 年拆除了屋顶水箱, 这些都对栈房原始风貌造成了破坏。

另一方面, 楼板因当年生产荷载过重而形成了贯通裂缝, 立柱也存在变形情况。经过整体结构强度的评估, 发现楼板强度已达不到商业使用要求。此外, 结构横向的抗剪能力十分薄弱, 不符合抗震要求, 需要进行加固。内部空间同样存在诸多功能问题: 建筑立面多为实体墙, 视野受限, 采光严重不足, 加之进深过大, 无法形成有效



图 3: 1979 年永安栈房卫星地图 (图片来源: <https://www.shanghai-map.net/shtdt/multi-images/index.html>)

Figure 3. Aerial view of the historical Yong'an Warehouse in 1979 (Source: <https://www.shanghai-map.net/shtdt/multi-images/index.html>)

First, the warehouse's structures were in poor condition, with the structural components, interior and exterior walls, apertures and steel frames showing different degrees of damage. Traces of graffiti and several repaints were visible in the warehouse. After a number of functional transformations, the east wing building's elevation and interior space bore no resemblance to the original. A new room had been added on the west side in 1999. Later, in 2011, the original water tank on the rooftop was removed. Each step taken was another heavy blow dealt with the warehouse's original appearance.

In addition, overloading during industrial production had resulted in fractures and deformations of the columns. The evaluations indicated that the structural integrity was not sufficient for the warehouse to be used for commercial purposes. Additionally, the shear strength of the horizontal beams had to be reinforced to meet seismic code requirements. The interior walls were generally solid but blocked the view and natural light. Air circulation was impaired by the overwhelming depth of the interior space. The original entrance to the building was not distinguishable and could thus not be used for orientation. The lack of internal connection within the building made it impossible to satisfy the fire codes. Additionally, the means for thermal insulation within the building were not sufficient to meet the sustainable building codes and standards.

Yong'an Warehouse was listed among the permanent cultural heritage in Yangpu District because it witnessed the industrial development of China. Not only is the warehouse one of the only remaining examples of the traditional industrial facilities of 1920s Shanghai, but also its beamless superstructure system was state-of-the-art in its time. Its artistic and scientific characteristics are thus invaluable to research. Further, the open site of the Yangpu waterfront has potential for space reuse and redevelopment. The value of the warehouse throughout its history needed to be balanced with its cultural value, although the previous renovation and existed damage was not seriously impacting the heritage conservation.

Based on the existing design problems and renovation goals, the architects specified the following design strategies:

的空气对流; 原建筑入口辨识性弱, 缺乏秩序性和引导性; 内部交通联系弱, 导致内部空间太过封闭, 且不符合消防规范; 缺乏保温隔热措施, 热工性能差, 不符合现代建筑的节能要求。

永安栈房于 2016 年被列为杨浦区不可移动文物保护点之一, 它的意义首先在于其整体的历史价值和纪念价值, 它见证了中国近现代工业发展的风云动荡, 承载了上海城市工业和民族企业的记忆。其次, 永安栈房的建筑式样代表着 20 世纪 20 年代上海经典的厂房式样, 它是上海存留至今为数不多的案例之一, 所使用的无梁楼盖结构体系在当时是最先进的, 因此具有很高的艺术价值和科学价值。另外, 由于它的滨江区位和周边空间的开敞性, 它具有较好的发展潜力和使用价值。相较而言, 过去的破坏性改建不具备太多保护价值, 而岁月形成的时间痕迹应当和文化艺术价值进行权衡。



图 4: 永安栈房历史照片 (图片来源: 常青院士团队 2016 年 8 月《“杨浦南段滨江”工业遗产特征要素及其保护策略研究》)

Figure 4. Historical photos of Yong'an Warehouse (Source: *Research on Spatial Characteristics of Industrial Heritages and Protection Strategies at Yangpu Waterfront*, Professor Qing Chang's team, August 2016)

基于对存在问题、保护目标和价值分析的研究, 建筑师提出了具有针对性的保护措施:

(1) 对留存的原貌 (如建筑立面、结构体系、空间格局) 进行谨慎的修复保护, 保证重要历史信息 and 艺术价值的传达, 对历史痕迹适当保留;

(2) 采用新技术补全风貌被破坏的部分, 使补全的部分既能反映建筑历史形制, 又具有可识别性, 呈现双子栈房完整的建筑历程和记忆;

(3) 通过其他最小干预的改造措施, 达到提升栈房当代使用价值的目的。

3 技术介入的保护与改造

在对栈房的保护过程中, 建筑师主要根据建筑的具体情况进行不同方式的清理、修复和加

(1) Preserving the existing façades, structural systems, and spatial composition to preserve the building's essential historical record and artistic features;

(2) Implementing new technologies to repair the destroyed components with the goal of reflecting the past and presenting the comprehensive history of the twin warehouses;

(3) Minimal intervening to ensure the building fulfils contemporary design standards and functional requirements.

3 Technological intervention and renovation-redux of the original

During the various phases of the design process, the architects adopted different methods to clean, repair and reinforce the building consistent with its spatial composition and functions. Based on heritage values, they determined which historical information had to be retained. Even though the materials for the renovation could not be the same as those used in the past, the architect asked that the craftsmanship be as close as possible to the original, therefore maximising the expression of artistic value. Eventually, the interior structures, as well as the western façade, were successfully preserved in a way that resembled the original.

3.1 Reinforcing the beamless superstructure system

Yong'an Warehouse represents one of the first implementations of a beamless superstructure system in China. The structural systems within the twin buildings were fully retained, but the interior walls had been repeatedly repainted. Thus, the design team used a high-pressure water gun to clean the entire structure of the remaining paint and carefully restored the reinforced concrete frame structures to their original state.

The architects analysed the building structure and frequently met with the local Cultural Heritage Department to discuss the seismic requirements. They came up with a solution to insert eight reinforced concrete core tubes, strengthen the horizontal supports and provide for emergency evacuation routes and equipment installation without the removal of any of the octagonal prismatic columns (Fig. 5). To address the rooftop's loading standards, they decided to insert steel interlayers into the top floor and rooftop structures, which invisibly increased the load capacity for the equipment.

固，依据历史价值和使用情况尽可能保留历史信息。即使不得已用新材料修补，在做法上也尽可能贴近原工艺，使建筑原有的艺术价值的传达最大化。最终使栈房整体的内部结构和西侧栈房的建筑立面修旧如旧，得以重现昔日风貌。

3.1 无梁楼盖结构体系的保护与加固

永安栈房是中国将无梁楼盖应用于现代建筑中的第一批实践作品。栈房东、西两栋楼内部的结构体系保存相对完整，但内部墙壁被反复涂刷。设计团队首先用高压水枪对墙面和结构进行多次彻底的冲洗，继而小心地修平、补色，呈现出钢筋混凝土结构的素裸状态。

为了满足抗震需求，通过结构检测以及与文保部门的反复讨论，建筑师在结构体系中避开八角形棱柱，插入了 8 个钢筋混凝土核心筒，既加强结构的侧向支撑，又满足了消防疏散和设备安装的需要（图 5）。原建筑顶层的梁板式楼盖结构可承受荷载有限，为保护它并解决屋面设备荷载的需求，建筑师在原顶层结构和屋面之间加入了钢结构夹层，这种做法同时也将屋面上的大量设备隐藏在结构夹层中。

建筑师保留了该建筑历史上曾使用钢板、型钢加固室内的修葺改造痕迹，新的加固部分使用与原建筑材料明显区别的钢模混凝土，保证结构体系及室内空间改造真实信息的充分体现。

3.2 外围护构件的修复

永安栈房体现出较为强烈的现代主义的建筑语言，韵律感强。而保存较好的西侧仓库还能看出较为完整的立面形制，将涂料层剥落，里面水泥拉毛的立面效果清晰可见。由于墙体破损严重、墙体表皮也有大量脱落，出于安全考虑，有将近 80% 的墙体必须进行修缮，难以保留墙面的古锈痕迹，因此决定将墙面按照原始样貌进行恢复。

建筑师专门与传统营造技艺专家研究了原建筑立面的材料和工艺，试验出水泥压毛工艺来再现原有外观，并对外墙进行加厚、加固及内保温设计。对于老旧的门窗构件，则请老手工匠人按照原有式样进行修复。

平衡处理“新”与“旧”的关系，以及最小干预原则一直是在历史建筑改造中的关键所在。在永安栈房修缮项目中，建筑师将改造操作主要

Furthermore, the reinforced steel panels and frames in the original building were retained, and reinforced concrete was applied for renovation. The change in materials also reflected the transformation of the building structure as well as its interior space.

3.2 Renovating the peripheral compartments

Yong'an Warehouse was built in a modern style with a clear sense of architectural rhythm. The building's west wing most clearly retained the appearance of the original façade. After the outer layer of paint was removed, the stuccoed texture of the concrete was clear to the eye. As the structural integrity of the interior walls was largely compromised due to repeated damage, for safety reasons, the design team decided that 80% of the walls needed to be renovated. Because of the difficulty of preserving the traces of erosion while making the structure stable, the team decided to restore the walls to their original state.

The architects collaborated with a group of experts to experiment with and test the concrete stuccoed technique to replicate the original appearance of the exterior walls. They also invited craftsmen equipped with traditional skills to repair the old aperture compartments.

Balancing the new and the old through an understanding of their relationship, minimal intervention has always been the key to renovations of historic architecture. For Yong'an Warehouse, a design process following the symbiotic twin strategy was used for the east wing building, which had less preservation value, to honour its historical origin and maintain the project's underlying coherence. Overall, characteristics such as the building's footage and the general silhouette were generally retained since the design details could distinguish the new from the old.

3.3 Renovating the twin Façades

The fact that the east wing building had gone through several severe reconstructions enabled the architects to move beyond an exact replication and to instead apply novel technologies to revive the rhythm and imagery of the original façade. For instance, they used screen printing to reproduce the stuccoed texture on glass panels. The printed images were taken from the restored west building and transferred at an exact 1:1 ratio onto the glass panels (Fig. 6). After careful calibration, the panels, once installed, made

集中在保护价值较小的东侧栈房，基于对历史原貌的尊重，通过“孪生”的策略处理加建与改建部分，从而实现“新”与“旧”的潜在一体性。总建筑面积、建筑外轮廓、建筑高度在修缮改造前后基本保持不变，远观以呈现历史风貌为主，走近或进入建筑内部，设计细节使“新”“旧”部分具有明确的辨识度。

3.3 丝网印刷玻璃与历史风貌立面的“孪生”关系

对于曾被拆除大部分墙面的东侧栈房，建筑师忠实尊重“已被破坏”这一历史事实，没有按照原貌复原或简单模仿，而是通过新技术——玻璃丝网印刷水泥压毛效果形成的图案——在立面上重新呈现原建筑立面的材料意象与节奏韵律。这一图案是在西侧栈房修复完毕后，对立面进行高清拍照，并按照 1:1 的比例进行印刷的（图 6）。建筑师反复制作玻璃样品拿到现场与西侧栈房的建筑立面进行比对，以确认形式和颜色。经过不断修改后，终于达成这样的效果：东西两栋楼远观效果几乎一致，而近看却截然不同。通过这样的方式，将这座建筑体现历史风貌的立面、改造痕迹、丝网印刷玻璃立面所代表的三段历程，压缩并置在同一侧立面上。到了夜晚，永安栈房的双子楼一明一暗，象征历史与未来的“孪生”关系跃然眼前。

为了达到绿色建筑标准，丝网印刷玻璃由三玻两腔玻璃组成，每一跨由两块玻璃拼合而成。栈房西面的货道与耳房的立面也采取了与此类似的处理方式。对与栈房同期建设的货道，按原貌进行修复；而对 1990 年加建的耳房则仅保留主体结构，立面材料同样替换为丝网印刷玻璃，作为次入口使用。

3.4 屋顶观景厅与历史水箱的“孪生”关系

2011 年，原有的水箱间被拆除，此举将两个建筑体量分隔开来，并破坏了架空结构所体现的工业建筑的风貌特征。建筑师从重现栈房原天际轮廓的角度考虑，决定按历史资料对该部分进行恢复。但并不是原样复原已无实际功能的水箱，而是按照原水箱体块的结构和形体比例重新设计、置入一座屋顶观景厅，使用钢结构替代原钢混结构，并在一定程度上呼应原来的结构形式。观景厅的立面采用丝网印刷玻璃，并将它与连接体中的公共

the two buildings almost identical from a distance but distinctively different up close. In this way, the warehouse's three life phases, as represented by its historical façade, the marks of previous renovations and the new façade of screen-printed glass, were all shown in a single view. The high and low light of the twin buildings at night indicated the symbiotic twin relationship connecting the past and the future.

To meet the green building standards, the screen-printed glass became part of a triple-layered glass window system with insulating air between the layers. Each opening is composed of two of these glass panels. Similar techniques were applied to the loading dock on the west side and to the façade of the side building. The loading dock was maintained in its original form. However, the side room built in 1990 was preserved only with its mainframe structure. The entrance was replaced with screen-printed glass panels as well.

3.4 Rebuilding the historical water tank

In 2011, the original water tank was removed, which separated the two building volumes and destroyed the unique quality of the industrial structure in terms of the overall composition. To recreate the rhythmic silhouette, the architects decided to reuse the original water tank as a formal guideline for an observatory on the rooftop with a complete steel structure instead of a steel and concrete structure. The new form corresponds with that of the historic water tank, uses screen-printed glass for the façades, and connects the two opposing building volumes with a public staircase. The upward sightseeing route provides grand views for visitors of the Yangpu waterfront (Figs. 5 and 7).

3.5 Spatial reordering

The architects reemphasised the entrance by using steel plates and modernist design language to direct the public path into the twin buildings. New gigantic columns and staircases were added, which expanded the square footage of the second floor, created new circulation and the observatory, and provided shade for the middle pathway. The gigantic columns took their forms from the original octagonal prismatic columns' deconstructed curves, which constituted the rainwater drainage systems. The exaggerated forms overturned the stereotypical static impression of the warehouses and corresponded to the internal structures,

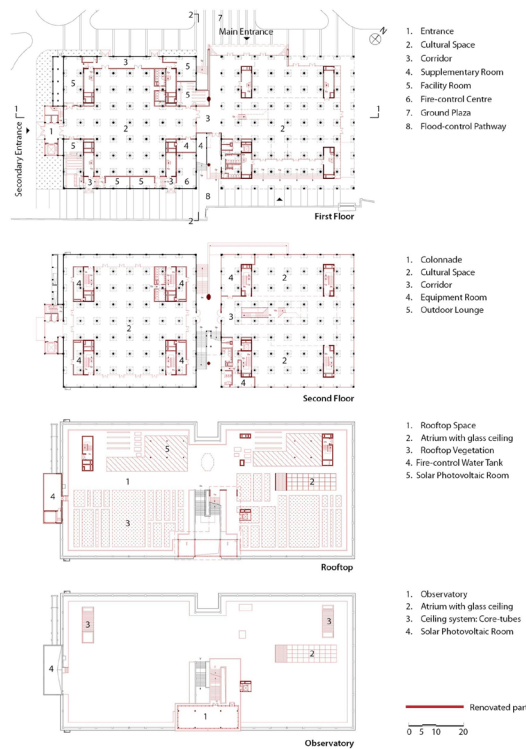


图 5：修复改造后永安栈房各层平面图（图片来源：上海创盟国际建筑设计有限公司提供）

Figure 5. Plans of the Yong'an Warehouse renovation (Source: Archi-Union Architects)

楼梯相连，形成从地面至屋顶连续上升的观景流线，成为滨江观景的一个好去处（图 5 和 7）。

3.5 空间秩序再造

建筑师使用钢板这一材料并结合现代设计手法重新强调了入口空间，引导人群分散进入两栋建筑。为了解决两个体量间的联通问题，在保持原有连接体不变的情况下增加了新的巨柱及楼梯，扩展二层平台范围，在二层联通东西两侧的建筑空间，形成新的交通枢纽及观景平台，还可为下方交通空间提供遮蔽。新建巨柱的形式来自对室内柱子形态的分析，将原有八角形棱柱的形式分解后得到的曲线形进行融合，并在柱子内部设计了雨水收集通道。这种内部结构形式使新建部分与历史建筑的内部结构特征发生了一定的呼应，但以夸张的尺度破开原有的固定印象，并与原结构形式形成差别，使这个空间成为建筑中心的吸引点和记忆符号。新置入的建造部分均保持独立，以保证对栈房操作的可逆性（图 8）。

建筑内部为解决采光和上下联通的不足，在

making the middle pathway the building's focal point. The new parts were built separately from the original structure to ensure the reversibility of the operation (Fig. 8).

Through an atrium and a public staircase in the east wing and the staggered arrangement of its sections, the additions were able to direct the natural light and make Yangpu Bridge's frame structure visible through the skylight, inviting visitors to ascend.

3.6 Integrating into the urban environment

The architects indented the exterior walls one column span inwards to expose the original first-floor columns on the south, east and north sides, creating a 6 m wide transitional lounge. This not only showcased the beauty of the historic architecture to the city but also facilitated a pedestrian passage. The design raised the interior floor level to match the existing flood-control walls, creating a linear spatial experience between the interior, the colonnade, and the riverside recreational spaces.

4 Implementation of ecological technologies into historic architecture

Yong'an Warehouse's architectural performance was already outdated by modern standards. To improve its effectiveness and extend the building's life cycle, the architects implemented 10 green ecological technologies following the principle of minimal intervention and in accordance with the building's spatial characteristics (Fig. 9).

In the original warehouse, there was no capacity for thermal storage even though the interior space was highly flexible. When reorganising the interior space, the architects turned the colonnade into a transitional space that adjusts the indoor and outdoor environment. This was done by regulating the interior environment through an architectural spatial strategy. The colonnade's natural ventilation during summer and heat emission during the winter can reduce the energy consumption by 30%, providing a supplementary space for various events and activities. The phase-change material used in the new walls can also store heat using night-time electricity at lower costs to prepare for daytime consumption.

The original warehouse primarily used low-efficiency heating and electricity.



图 6：丝网印刷玻璃透光效果及细节（图片来源：左、右由田方方摄影；中由扬天周摄影）

Figure 6. Internal view of the façades made of screen-printed glass and details of the screen-printed glass panels (Sources: left and right by TIAN Fangfang ; middle by YANG Tianzhou)

东侧仓库中部开设一采光中庭，置入直跑公共楼梯，并错动梯段以引入光线，透过楼梯上部天窗可以看到杨浦大桥的桥架，壮丽的对景吸引人群拾级而上。

3.6 城市环境衔接

建筑师将建筑首层南侧、东侧及北侧部分外墙向内缩进一跨柱距，暴露原有八角形棱柱结构体系，并形成宽 6m 的柱廊作为过渡空间，既可向城市直观展示历史建筑的独特结构魅力，也便于行人通行。由于现有防汛墙高于建筑首层标高，设计中特地抬高室内地坪，形成了室内空间到八角形棱柱廊再到城市滨江休闲广场的连贯空间体验。

4 历史建筑中的绿色生态技术应用

永安栈房的建筑性能已不符合当代需求。为了对其进行性能提升，有效延展建筑生命，建筑师们在最小干预原则下，根据永安栈房自身空间特点，运用了 10 项绿色生态技术（图 9）。

原栈房没有蓄热空间，但厂房空间开敞灵活。建筑师利用改造时对内部重新划分的机会，设计了介于封闭空调环境和室外环境之间的环廊作为缓冲带，以建筑空间策略调适室内环境。夏季环廊内拥有自然通风，冬季则利用空调区的热量，形成辅助活动空间，经测算能够减少约 30% 的室内能耗。而围合环廊的新墙体则使用相变材料，可用夜间低价电来蓄热，供次日白天作辅助热源。

原栈房能源利用效率低且多为非自然能源。建筑师注意到栈房面积开阔的平屋面，利用屋面布置了诸如风力发电、光伏发电、储能设施等清洁能源发电技术，进行风光互补发电。屋顶还



Therefore, the design team installed wind and photovoltaic power generators and storage facilities on the rooftop to provide clean energy through complementary production between the two sources. The rooftop can also collect rainwater through the drainage system embedded in the gigantic columns. The rainwater eventually reaches a processing facility and is reused.

In addition, the architects utilised the atrium and open area to improve the ecological environment of the historic building. The combination of rooftop and vertical vegetation, as well as active light guiding and rainwater processing, ensure the closed internal recycling of the energy and water. There is a 1000 m² area for vegetation on the roof. A ground-source ventilation system was also installed separate from the buildings in the adjacent open square to provide fresh air and thermal regulation through the exterior – underground – interior – rooftop – exterior underground piping and interior ventilation loop.

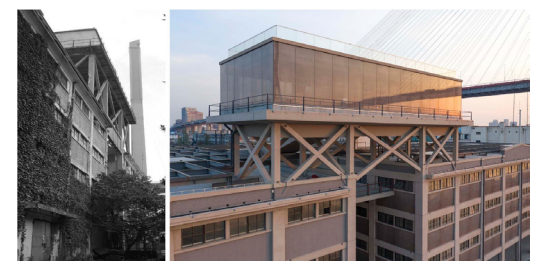


图 7：屋顶原有水箱和观景厅体量前后对比（图片来源：田方方摄影）

Figure 7. Historical water tank vs. renovated observatory (Source: TIAN Fangfang)

Further, the design team preserved most of the structural compartments as a foundation for future renovation and selected environmentally friendly materials with low energy costs. Implementation of Building

提供了雨水回收的可能性,雨水经屋面收集后集中于巨柱内部雨水管,最终流入雨水处理机房。

此外,为优化旧建筑的生态环境,建筑师进一步利用屋面空间和中庭外墙,使用了生态屋顶绿化技术及生态垂直绿植技术,结合主动式导光系统和雨水回收中水处理系统,实现建筑内部的生态资源循环。1000m²的屋顶绿化面积能有效改善建筑生态。在相邻的开放广场上,还安装了与建筑物分离的地源新风系统,以通过“外部——地下——内部——屋顶——外部”的路线(通过在地下埋设风道,将室外空气吸入地道内进行热交换再进入室内环境,由屋顶拔风口将室内空气拔出),不仅更新室内空气,同时完成热力学调适。

另外,建筑师在改造过程中保留了大部分结构构件作为日后改建基础,并选择使用能源资源消耗小和环境效益显著的绿色建材。能源监测可视技术则建立了一个集成的管理平台,实现项目对环境监测的需要,全程 BIM 技术的应用有效地辅助了设计与建造。

(戈之灵、徐粤编译)

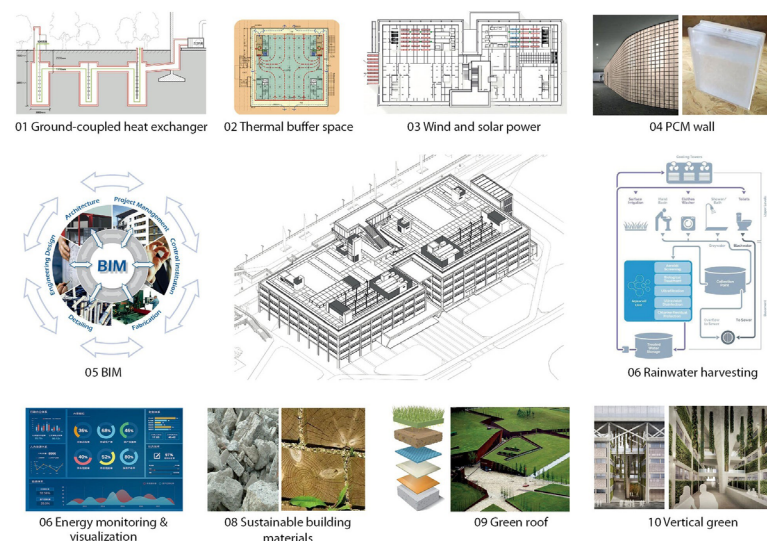


图 9: 永安栈房设计中的十大绿色生态技术 (图片来源: 上海创盟国际建筑设计有限公司提供)

Figure 9. Schematic proposal for the Yong'an Warehouse renovation (Source: Archi-Union Architects)

Information Modelling (BIM) technology facilitated the design, construction and real-time monitoring of the environment, allowing visualisation of the energy cost via an integrated platform.

(translated and edited by
GE Zhijiong, XU Yue)

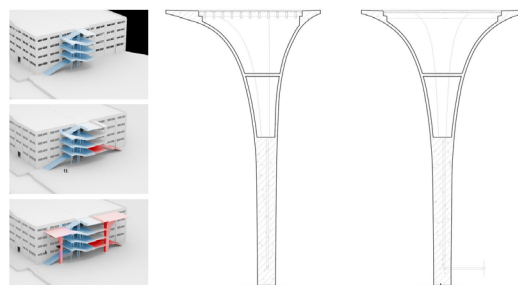


图 8: 巨柱设计与内部的雨水收集系统 (图片来源: 上海创盟国际建筑设计有限公司提供)

Figure 8. Gigantic columns with built-in rainwater drainage system (Source: Archi-Union Architects)

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图 1: 会议海报

会议背景

我国地域辽阔,历史悠久,有大量珍贵的建筑文化遗产。建筑遗产又是文化遗产的重要组成部分,从中国到世界各国对建筑遗产保护一直比较重视。习近平总书记多次视察文物建筑遗产建筑,发表关于文化遗产的重要讲话,在国内引发了全国人民对文化遗产的认识与重视。加强对建筑文化遗产的保护是一项任重道远的工作,需

Background

China is a country with a vast territory and a long history. It has a rich number of precious architectural cultural heritage (hereinafter referred to as ACH). Architectural heritage is an important part of cultural heritage, the protection of which the world has always attached great importance to. General Secretary Xi Jinping has inspected cultural relics and heritage buildings many times and delivered important speeches on cultural heritage, which has aroused awareness and attention to cultural heritage in China. But the protection of ACH still has a long way to go, which requires the joint and concerted efforts of many parties.

However, these historical buildings are facing an unprecedented survival dilemma in the renovation and construction of modern cities, and there is urgent need for effective methods to develop, utilize and protect them rationally. With the advancement of the new generation information technology in breadth and depth, the current domestic multi-dimensional building surveying and mapping technology, non-destructive testing analysis, new material technology research and development in the field of architectural heritage protection is still in its infancy, lacking systematic and in-depth research, and a certain gap with developed countries still exists. These modern technologies are a technical means to promote the combination of tradition and modernity, which need to be continuously improved and explored to meet modern life and spiritual needs, thereby enhancing the use value, economic value, and social value. Through the International Conference on "Innovative Technology and Application of Architectural Cultural Heritage Protection", a dialogue platform for the protection and utilization of new technologies for ACH can be established at home and abroad, providing new

要多方共同努力，齐心协力，方能推动文物建筑的保护工作。

然而这些历史建筑在现代城市的更新建设中，正面临着前所未有的生存困境，迫切需要结合有效的方式进行合理的开发利用与保护。随着新一代信息技术向广度、深度的推进，目前国内多元建筑测绘技术、无损检测分析、新型建筑材料研发与工艺技术在建筑遗产保护领域的研究还处于初级阶段，缺乏系统和较为深入的研究，与发达国家存在一定的差距。这些现代化保护技术是促进传统与现代结合的一种技术手段，还需要持续完善和探索，以满足人们现代生活和精神上的需求，进而提升建筑文化遗产的使用价值、经济价值和社会价值。希望通过“建筑文化遗产保护创新技术与应用”国际会议，搭建一个国内外针对建筑文化遗产保护和利用新技术的对话平台，为建筑文化遗产保护创新技术提供新的视角和方法体系，提高文化遗产研究和保护水平，服务国家传统文化对外传播，推动文化的大发展大繁荣。

2022 年 11 月 15 日，全球视野下的建筑文化遗产保护创新技术与应用国际研讨会将邀请国内外相关领域的 13 名学者围绕会议主题，发表内部演讲并展开讨论。

会议主题及议题

通过搭建国内外针对建筑文化遗产保护和利用新技术的对话平台，探索对建筑文化遗产保护创新技术的新视角和方法体系，以实现我国对建筑文化遗产信息记录和保存的真实性、完整性、连续性、易用性及规范化。通过讨论建筑文化遗产修复与保护技术，以期在无损检测分析、新型纳米保护材料与工艺研发、保护加固等技术领域解决传统保护材料的系列问题。通过分享建筑文化遗产中的建造技术，挖掘传统建筑建造智慧，促进传统建造技术与现代化建造技术的融合发展，探索建筑现代化发展技术，构建我国的建筑文化遗产保护、传承与发展之路。

会议主要分为三个内容，一是讨论多手段空间信息技术的运用在建筑文化遗产测绘和数字保存中的工作。利用虚拟仿真技术为桥梁，结合多媒体、计算机图形图像处理、遥感扫描等科学技术，对建筑遗产展开准确、精密的测量，构筑三维模型，并搭建数据库，为历史建筑文化遗产的研究、保护、修复提供新的思路与技术创新平台。二是探索

perspectives and method systems for innovative technologies in ACH protection, improving the level of research and protection, serving the foreign dissemination of traditional culture, and promoting the great development and prosperity.

On November 15th, 2022, the Innovative Technology and Application of Architectural Cultural Heritage Protection Webinar (ITAACHP) will invite 13 scholars from related fields at home and abroad to give internal speeches and discuss the themes and topics of the conference.

Themes and Topics

By establishing a dialogue platform at home and abroad for the utilization of new technologies and exploration innovative perspective and methodology in the protection of ACH, it is aimed to achieve the authenticity, integrity, continuity, usability and normativity. Through discussing the restoration and protection technology, it is expected to solve series of problems in the fields of non-destructive testing and analysis, new nano-protection materials and processes, and reinforcement technology. Through sharing the construction technology, excavating the wisdom of traditional construction, we can promote the integrated development of traditional and modern construction technology, explore building modernization development technology, and ultimately build the road of protection, inheritance, and development of ACH.

The webinar consists of three components:

First, discuss the application of multi-means spatial information technology in the mapping and digital preservation. Using virtual simulation technology as a bridge, combined with multimedia, computer graphics and image processing, remote sensing scanning and more, to realize accurate and precise measurement, construction of three-dimensional models, and database establishment, and thus provide new perspective and innovation platforms for the ACH research, protection, and restoration. Second, explore modern new materials and processing techniques to provide stronger and more durable possibilities for the protection and reinforcement of architectural heritage. Third, use ultrasonic non-destructive testing to evaluate the internal structure of architectural heritage, as well as weathering, cracks and other engineering

现代新型材料和加工工艺，为建筑遗产的保护与加固提供更坚固耐久的可能性；三是利用超声波无损检测对建筑遗产内部结构，风化、裂隙等工程病害进行评价，进而采取及时有效的加固和预防性保护方案。综上，此次国际会议主要分为五个议题，如下：

- 1) 全球视野下建筑文化遗产保护创新理念
- 2) 全球视野下建筑文化遗产保护创新实践
- 3) 空间信息技术与建筑文化遗产数字化保护
- 4) 建筑文化遗产的预防性保护国际研究前沿
- 5) 超声波无损检测在建筑文化遗产评价中应

用的国际经验

遗产保护与可持续发展国际会议暨国际建成遗产保护联合体成立大会 International Conference on Heritage Conservation and Sustainable Development and Founding Conference of International Consortium for Conservation of Built Heritage

资料来源 Source: http://jl bri.suda.edu.cn/jlbri_en/d7/6f/c27108a513903/page.htm

由苏州大学中国—葡萄牙文化遗产保护科学“一带一路”联合实验室发起，苏州大学金螳螂建筑学院、国际合作交流处、研究生院承办的遗产保护与可持续发展国际会议暨国际建成遗产保护联合体成立大会将于 2022 年 12 月 3-4 日在苏州大学金螳螂建筑学院·学术交流中心举办。

可持续发展概念最早追溯于 20 世纪 80 年代，它是指既能满足当代人的需求，又不对未来的可能性产生影响的发展，涵盖社会、经济、自然等多方面内容。遗产作为文化传播的载体具有较强的多元延续力，能够促进全球文化交流融合。面临遗产资源濒临消亡，在保护的前提下需要合理可持续利用，从而带动文化、经济和旅游的可持续发展。对于遗产保护相关研究已从静态保护修复延伸至活态保护、积极保护、创造性转化等多个领域，其中也不乏合理规划、旅游开发、数字技术等学科介入。目前，遗产保护领域的可持续发展需要平衡遗产保护、有效开发、环境提升来保证遗产的存续、传承与发展，让遗产成为真正可持续性的社会活动。

此次会议将主要包含三个部分，一是举办以“建筑遗产保护与可持续发展”为主题的研究生

diseases, and then take timely and effective reinforcement and preventive protection plans. The webinar has 5 topics, as follows:

- 1) Innovative concepts of ACH protection from a global perspective
- 2) Innovative practice of ACH protection from a global perspective
- 3) Spatial information technology and digital Protection of ACH
- 4) Frontiers of international research on preventive protection of ACH
- 5) International experience in the application of ultrasonic nondestructive testing in the evaluation of ACH

Initiated by the China-Portugal Belt and Road Joint Laboratory of Cultural Heritage Conservation Science, Soochow University, the International Conference on Heritage Protection and Sustainable Development and the Founding Conference of the International Consortium for Conservation of Built Heritage will be held in the Academic Exchange Center of the Golden Mantis School of Architecture, Soochow University on December 3-4, 2022. The conference will be organized by the Architecture School, International office and Graduate school of Soochow University.

The concept of sustainable development, which could be traced back to the 1980s, refers to the development that meets the needs of the present without compromising future possibilities, covering society, economy, nature and other aspects. As a carrier of cultural dissemination, heritage has a strong multicultural continuity, which may contribute to global cultural exchanges and integration. Faced with the gradual demise of heritage resources, it is necessary to rationally use them under the premise of conservation and sustainability, so as to promote the sustainable development of culture, economy and tourism. The research related to heritage conservation has been extended from static

国际学术创新论坛，为全国各高校优秀研究生提供交流、分享与学习建筑遗产保护与可持续发展方面研究成果的平台；二是将于大会上启动国际建成遗产保护联合体成立大会；三是举办遗产保护与可持续发展国际会议，会议将分为主报告场及三个平行分论坛。分论坛将分别以遗产保护与可持续发展、文化景观保护与城乡可持续发展、城市碳中和及零碳建筑为议题展开讨论与交流。本次会议旨在为专家、学者们提供面对面交流与学习的机会，重点研讨遗产保护与可持续发展领域的最新研究成果，鼓励作者展示相关的杰出研究论文，包括理论方法和实践案例综述。

(徐粤编译)



图 2：会议海报
Figure 2. Conference poster

protection and restoration to live conservation, active conservation, creative transformation and other fields. Disciplines such as rational planning, tourism development, and digital technology are also involved. At present, it requires to balance heritage conservation, effective development and environmental improvement to ensure the subsistence, inheritance and development of heritage, so that heritage can become a truly sustainable social activity.

The conference will mainly consist of three parts. One is to hold an international academic innovation forum for graduate students with the theme of ‘Architectural Heritage Protection and Sustainable Development’, which will provide a platform for outstanding graduate students from universities across the country to exchange, share and learn research results on architectural heritage protection and sustainable development. Secondly, the founding conference of the International Consortium for Conservation of Built Heritage will be launched. Thirdly, the International Conference on Heritage Conservation and Sustainable Development will be held. The conference will be divided into a main venue and three parallel sub-forums. The sub-forums will discuss and exchange topics on heritage protection and sustainable development, cultural landscape protection and sustainable development of urban and rural areas, and carbon neutral and zero carbon buildings in cities. The conference aims to provide face-to-face communication and learning opportunities for experts and scholars, focusing on the latest research results in the field of heritage conservation and sustainable development. Authors are encouraged to present outstanding research papers, including theoretical methods and practical case reviews.

(translated and edited by
XU Yue)

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