THE ZEB-CHINA PROJECT - ZERO-EMISSION BUILDING
中瑞零碳建筑合作项目

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中国建筑节能协会

中瑞零碳建筑系列研讨会
ZEB TALKS

PROF. ADRIAN ALTENBURGER, HSLU
SWITZERLAND
24th of May 2022

卢塞恩应用科学与艺术大学（HSLU）
Adrian Altenburger教授
2022年5月24日

综合规划助力零碳建筑

Integrated planning methods for Zero Emission Building Projects

瑞士零碳建筑规划方法—经验与成果

Swiss ZEB planning methods – experiences and results

2015年以来，Adrian Altenburger教授为卢塞恩应用科学与艺术大学（HSLU）建筑技术和能源研究所的负责人。2009-2022年，担任瑞士工程师和建筑师协会（SIA）的副主席，负责国家层面建筑标准的制定。他拥有建筑技术工程学士学位（HSLU）和建筑学硕士学位（ETH）。

Since 2015 Prof. Adrian Altenburger is Head of the Institute of Building Technologies and Energy at Lucerne University of Applied Sciences (HSLU), from 2009-2022 he was Vice President at the Swiss Society of Engineers and Architects (SIA) and responsible for all national construction standards. He holds a Bachelor's Degree in Building Technology Engineering (HSLU) and a Master's Degree in Architecture (ETH).

专业及经验重点

- 建筑复合体的综合工程规划及建筑设计
- 浅层地热能应用于供暖和制冷（如地埋管热交换器、能源桩、地下水、河流和湖水等）
- 数据中心能效提升（作为瑞士联邦能源办公室咨询顾问）

Key-Topic of Expertise or Experience

- Integrated Engineering and Architecture for complex buildings
- Shallow geothermal applications for heating and cooling (e.g. borehole heat exchangers, energy piles, groundwater, river and lake water).
- Data Center Energy Efficiency (Consultant for the Swiss Federal Office of Energy)

Adrian Altenburger教授
经验/专业背景

Prof. Adrian Altenburger
Experience / Expertise

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综合规划助力零碳建筑

综合规划 – 基本原理及先决条件

Integral planning - fundamentals and prerequisites

团队 TEAM **1**

团队：基于任务和能力组建团队，包括资深建筑师、土木工程师、建筑服务工程师以及建筑物理、幕墙规划等领域的专家。

Team Composition: Depending on task and competences (core disciplines architecture, civil engineer, building services engineer and specialists such as building physicists, facade planners, etc.)

要求 PREMISES **2**

要求： 必须为所有人所知，并如实声明。要求必须全面合理（也针对客户）。

Premises: Must be known to all and declared as such. No premises without comprehensible justification (also vis-à-vis the customer).

规则 RULES **3**

规则：必须明确能力和责任。最佳的解决方案需要过程中的灵活性（反复寻找最优解决方案）。

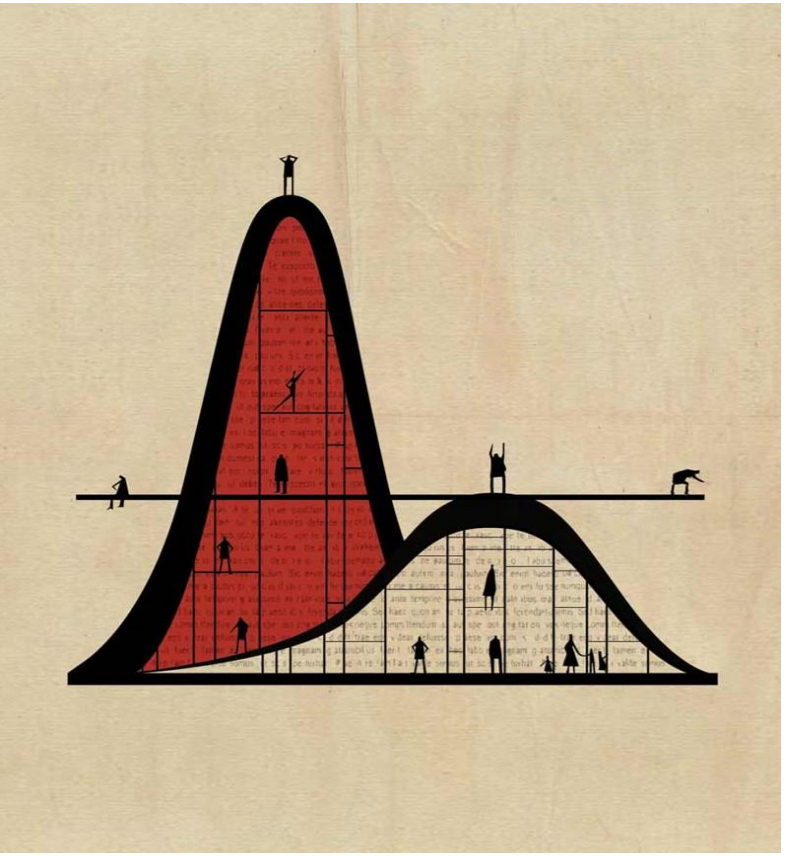
Rules: Competencies and responsibilities must be clear. Optimal solutions require flexibility in the process (iterative solution finding).

基于专业学科能力的跨学科解决方案

Interdisciplinary solutions are based on disciplinary competences

1 团队构成

TEAM COMPOSITION



零碳建筑涉及到以下任务

INVOLVEMENT FOLLOWS TASKS FOR ZEB

建筑 – 基于零碳理念的建筑设计和建材选用

Architecture – ZEB mainly related to design and materials

结构工程 – 基于零碳理念的材料和结构

Structural Engineering – ZEB mainly related to materials and structure

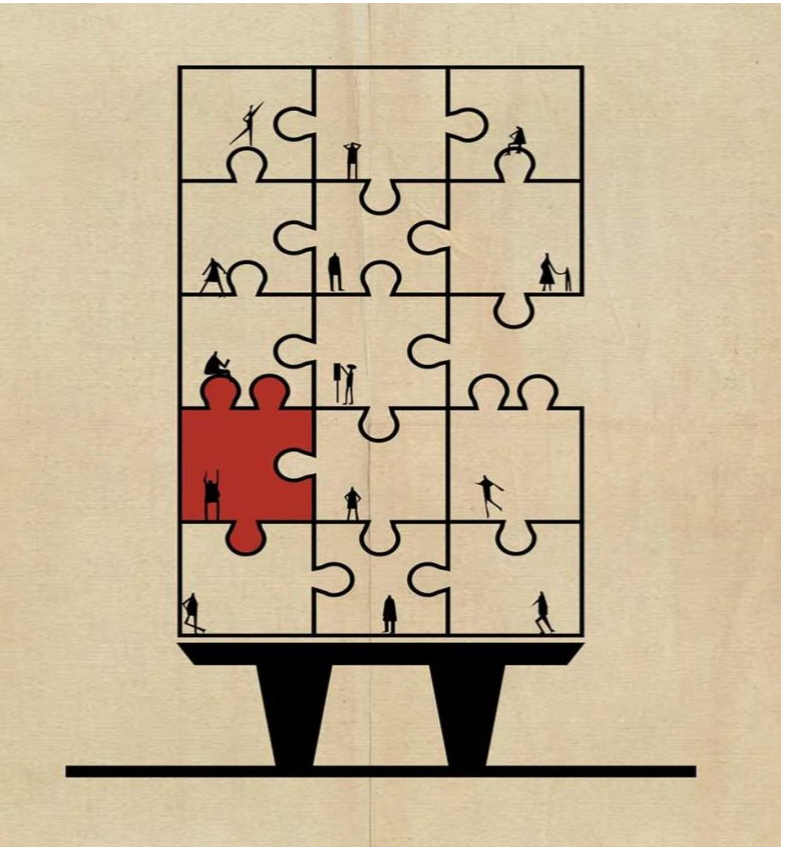
建筑技术工程 – 基于零碳理念的能量来源和系统效率

Building Technology Engineering (MEP) – ZEB mainly related to energy sources and efficiency of systems needed

团队构成 - 合作文化

TEAM COMPOSITION – CULTURE OF COOPERATION

2 要求 PREMISES



明确并符合零碳建筑目标 – 责任手册

CLEAR AND IN LINE WITH ZEB OBJECTIVES – DUTY BOOK

零碳建筑设计阶段 – 比如能源效率、舒适度参数、自给自足程度等目标值

ZEB design phase - e.g. target values for energy efficiency, comfort parameters, degree of self-sufficiency, etc.

零碳建筑施工阶段 – 比如材料和部件再利用百分比的目标值，预制和现场施工的质量控制等

ZEB construction phase - e.g. target values for percentage of re use for materials and components, ongoing quality controls in prefabrication and on site etc.

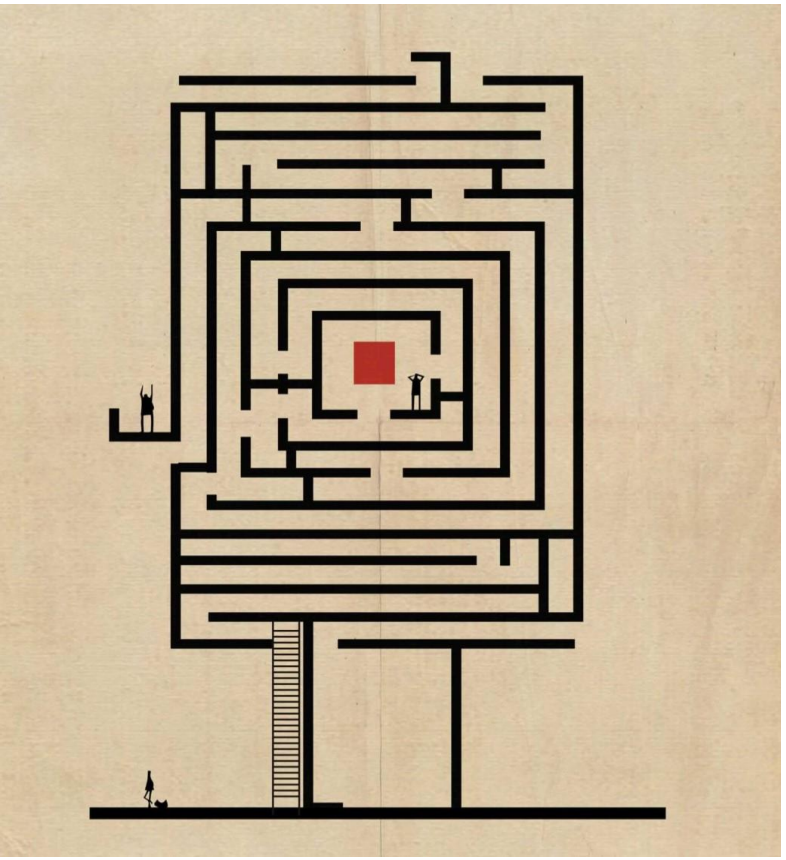
零碳建筑运行阶段 – 比如与规划、监测数据和优化阶段相比的允许偏差等

ZEB operational phase - e.g. tolerance values compared to planning, monitoring data, periodicity of optimizations, etc.

要求 – 少即是多

PREMISES – LESS IS MORE

3 规则 RULES



规则服务于流程效率

RULES SERVE PROCESS EFFICIENCY

第一步：规范规则，背景分析，团队确认

Step 1: Disciplinary order and context analysis and confirmation in the team

第二步：定义零碳建筑目标及权重（责任手册）

Step 2: Definition of ZEB objectives and their weighting (Duty Book)

第三步：定义可能变量，并进行效用分析，包括敏感性分析，如能源价格、资本利息等

Step 3: Definition of possible variants and utility analysis including sensitivity analysis (e.g. energy prices, capital interest, etc.)

规则 - 基于协定的信息作出的决定

RULES – DECISIONS BASED ON AGREED INFORMATION

卢塞恩模式 – 四项原则

THE LUCERNE MODEL – 4 PRINCIPLES

1 团队自主性原则

1 AUTORSHIP IN THE TEAM

团队中的自主性原则必须适用于所有的方案决策，这需要一个广泛的类比性框架，利用协同效应可以实现最佳的建设效果。为了能获得跨学科的发现，相关人员必须必备高层次的跨学科知识。

The principle of authorship in the team must be applied to all conceptual decisions, which requires a largely analogous discourse that uses synergies to achieve an optimum for the construction.
In order to arrive at interdisciplinary findings, a high level of disciplinary knowledge is therefore indispensable among those involved.

2 协同效应

2 SYNERGETIC EFFECTS

与建造相关的跨学科规划方法是以协同效应为导向的，因此可以产生巨大的附加值。当每个子学科都以一种开放的、对潜在的协同效应进行推测的心态运作时，这就成功了。相反，如果其中一个学科认为它能单独找到正确的解决方案，那么过程就会受到阻碍。总的来说，每一个规划步骤产生的不是一个正确的解决方案，而是一个合理的解决方案。这就确保了后续步骤有足够的回旋余地。

A construction related interdisciplinary planning methodology is geared towards synergetic effect and can thus generate significant added value.
This succeeds when each subdiscipline operates in a mindset that is open ended and speculative about potential synergies.
If one of the disciplines postulates that it alone will find the right solution, this process is blocked.
Overall, each planning step produces not the one right solution, but a plausible one.
This ensures that there is sufficient room for maneuver for the further steps.

卢塞恩模式 – 四项原则

THE LUCERNE MODEL – 4 PRINCIPLES

3 建筑即服务

BUILDING AS A SERVICE

出发点是共同商讨一个建筑应该实现什么。
这涉及到用户的观点和现有的环境，以及由此对建筑环境的设计可以产生什么影响的问题。
这种对建筑服务的定义是假定它必须在整个使用期限内完成“服务”意义上的任务，并以有意义的方式支持建筑文化中可持续部分的行动。

The starting point is the joint negotiation of what a building should achieve.
This involves the user's perspective and the existing context, as well as the question of what effects can be expected from this on the design of the built environment.
This definition of a building's services assumes that it must fulfill tasks in the sense of "services" over its entire useful life and support actions in a meaningful way for a sustainable part of building culture.

4 开放式发展

OPEN ENDED DEVELOPMENT

“卢塞恩模式”要求所有团队成员都愿意参与到一个共同的过程中，并以一种开放的方式合作和寻找解决方案。
这仅仅适用于无等级化的团队以及话语秩序，并需要对要使用的手法进行跨学科的协商（例如要采用的技术手法的范围和类型）。
与用户和客户一起（由团队）制定一个适当的目标，是保障合作的重要前提条件。

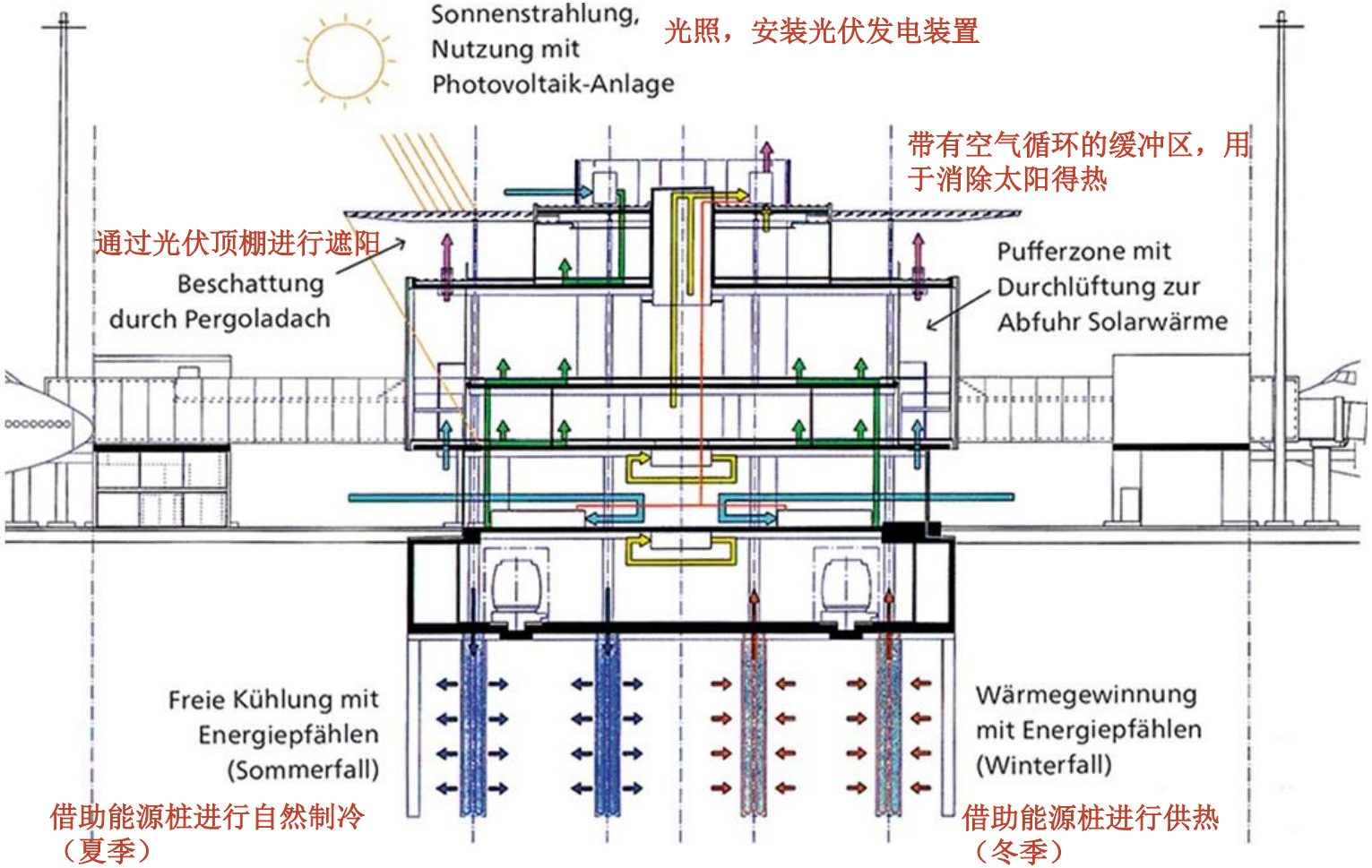
The "Lucerne Model" requires the willingness of all team members to engage in a joint process and to collaborate in finding solutions in an open-ended manner.
This only works in non-hierarchical teams as well as in discursive logic and requires an interdisciplinary negotiation of the means to be used (e.g. scope and type of technical means to be employed).
The formulation (by the team) of an appropriate objective with the users and the client, is an important prerequisite for a promising collaboration.

卢塞恩模式 – 四项原则

THE LUCERNE MODEL – 4 PRINCIPLES

案例：苏黎世机场 – 新的航站楼E

EXAMPLE – ZURICH AIRPORT
NEW DOCK E TERMINAL



规划/建设周期：1996-2003
成本：3.5亿瑞士法郎
建筑面积：8万平方米（500米长）

Planing/Construction Period: 1996-2003
Cost: 350 Mio. CHF
Floor Area: 80'000 m2 (500 m long)

能量来源：300个能源桩用于供暖和制冷，屋顶集成了300kWp的光伏发电系统

Energy Sources: 300 Energy Piles for heating and cooling, 300 kWp PV with integrated pergola roof

协同效应：登机通道的幕墙缓冲区，结构桩，光伏遮阳，家居一体化的新风供应

Synergies: Façade Buffer for boarding ramps, Structural Piling, Shading with PV, supply air integrated in the furniture

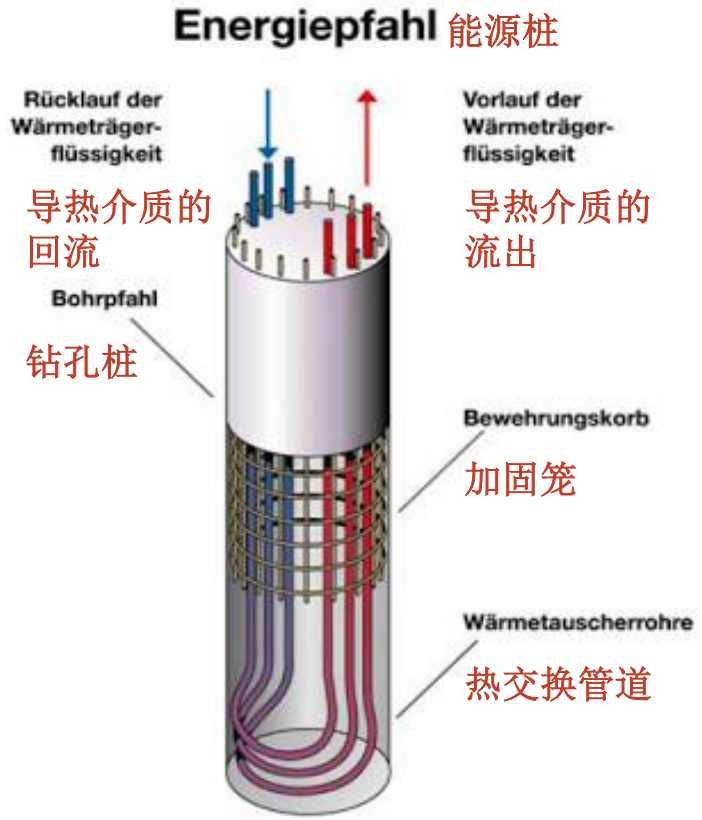
建筑技术工程 – 基于零碳理念的能源来源和系统效率

Building Technology Engineering (MEP) – ZEB mainly related to energy sources and efficiency of systems needed

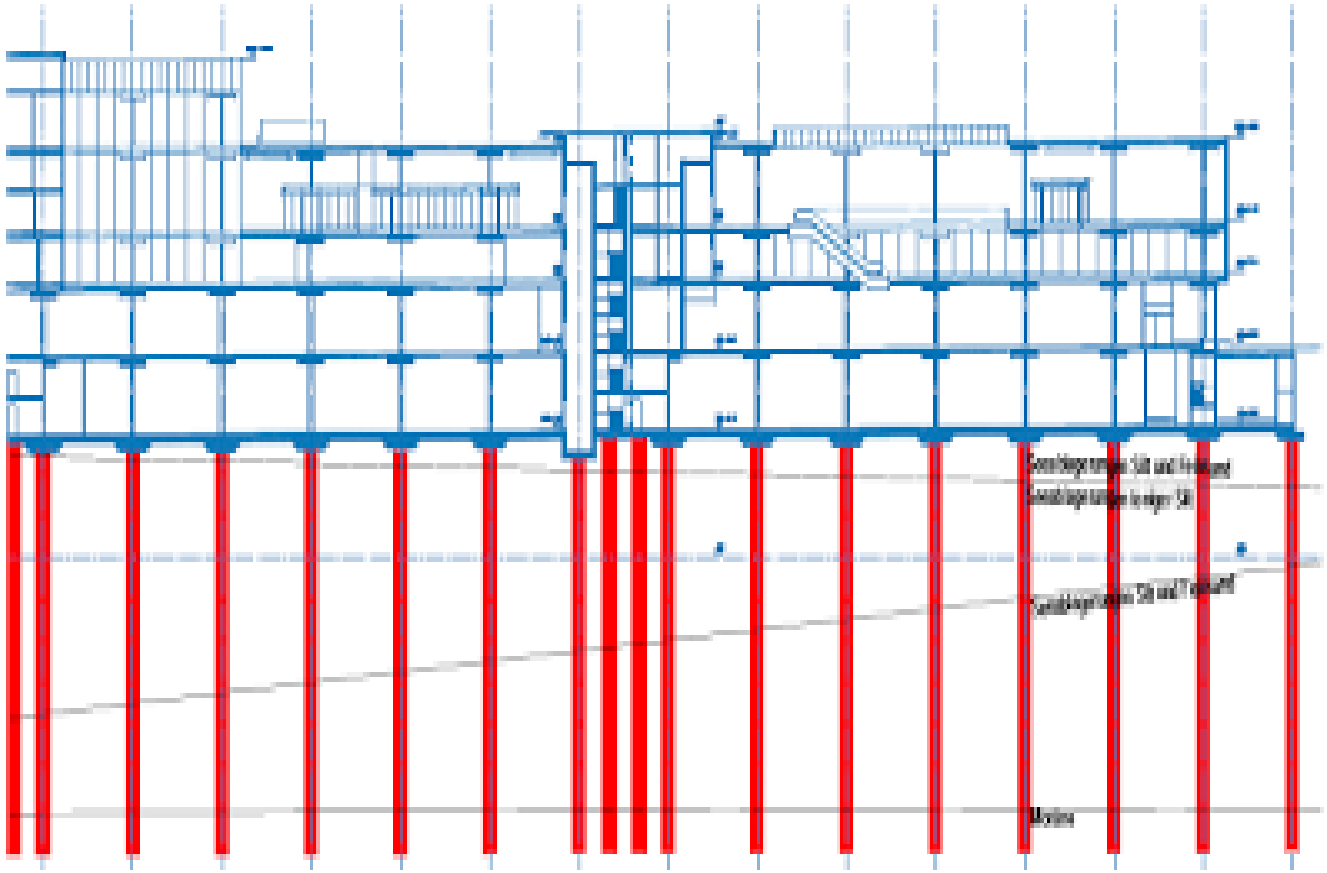
案例：苏黎世机场 - 新的航站楼E

EXAMPLE – ZURICH AIRPORT
NEW DOCK E TERMINAL

能源桩（40米长，带集成管道）
Energy Piles (40 m length with integrated piping)



建筑剖面：300根能源桩（红色）
Building Section with 300 Energy Piles (red)

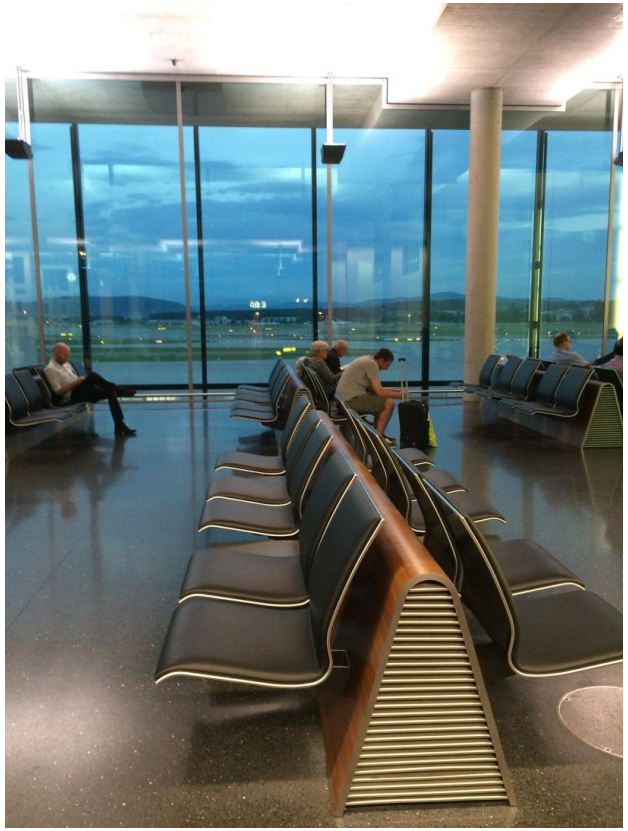


案例：苏黎世机场 – 新的航站楼E

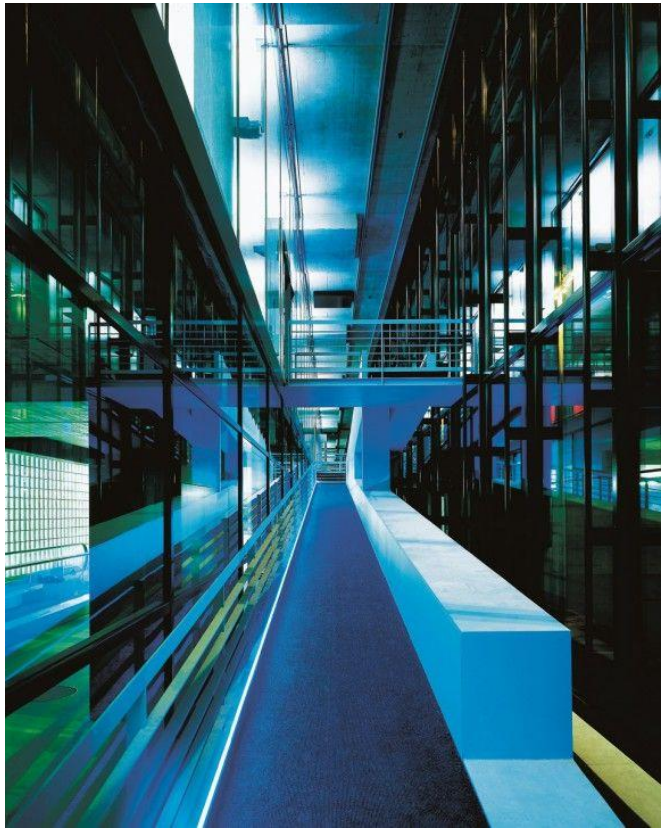
EXAMPLE – ZURICH AIRPORT
NEW DOCK E TERMINAL

光伏屋顶（300kWp，集成遮阳）
PV Roof (300 kWp, integrated shading)

家居一体化的新风供应
Supply Air integrated furniture



集成登机通道的双层幕墙
（气候缓冲区）
Double facade (climate buffer)
with integrated boarding ramps



案例：苏黎世机场 – 新的航站楼E

EXAMPLE – ZURICH AIRPORT
NEW DOCK E TERMINAL

方法来源于挑战 – 综合规划助力零碳建筑及可持续解决方案

THE METHOD FOLLOWS THE CHALLENGE – INTEGRATED PLANNING FOR ZEB AND SUSTAINABLE SOLUTIONS

“电灯并不是来自于对蜡烛的不断改进”
奥伦 • 哈拉里（1949–2010）

"The electric light did not come from the continuous improvement of candles“

Oren Harari (1949-2010)

创新&可持续 – 零碳建筑需要新的方法

INNOVATION & SUSTAINABILITY – NEW METHODS NEEDED FOR ZEB

感 谢 您 的 聆听

THANK YOU FOR YOUR ATTENTION

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ZEB TALKS

3rd Oct 2019
Luzern.

INTEP/SKAT/HSLU
SWITZERLAND
24th May 2022

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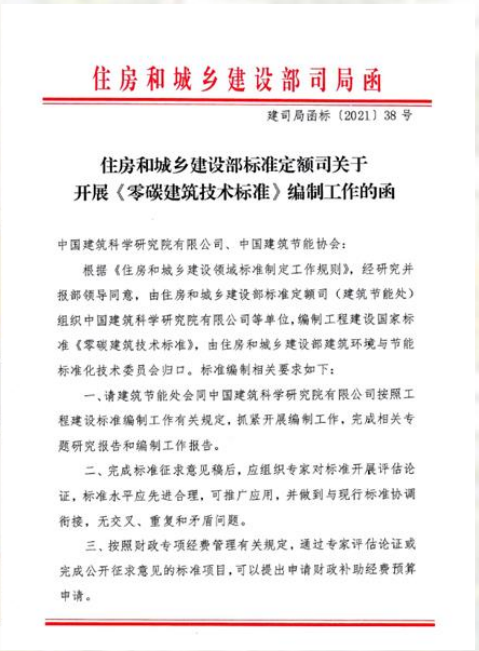

住房和城乡建设部司局函

建司局函标〔2021〕38号

住房和城乡建设部标准定额司关于
开展《零碳建筑技术标准》编制工作的函

中国建筑科学研究院有限公司、中国建筑节能协会：

根据《住房和城乡建设领域标准制定工作规则》，经研究并报部领导同意，由住房和城乡建设部标准定额司（建筑节能处）组织中国建筑科学研究院有限公司等单位，编制工程建设国家标准《零碳建筑技术标准》，由住房和城乡建设部建筑环境与节能标准化技术委员会归口。标准编制相关要求如下：

一、请建筑节能处会同中国建筑科学研究院有限公司按照工程建设标准编制工作有关规定，抓紧开展编制工作，完成相关专题研究报告和编制工作报告。

二、完成标准征求意见稿后，应组织专家对标准开展评估论证，标准水平应先进合理，可推广应用，并做到与现行标准协调衔接，无交叉、重复和矛盾问题。

三、按照财政专项经费管理有关规定，通过专家评估论证或完成公开征求意见的标准项目，可以提出申请财政补助经费预算申请。

Technical standard for Zero carbon building

- ✓ The compilation team consists of 30 editorial members from 20 research, design, construction and carbon trading units in the field of building energy efficiency and carbon reduction.
- ✓ The standard will stipulate the relationship between zero carbon building and near zero energy building standard system.

- Ultra low/nearly zero energy buildings are a manifestation of low-carbon/nearly zero carbon buildings, but low carbon/nearly zero carbon buildings pay more attention to the application of local renewable energy.
- Local policies generally do not clearly distinguish between zero-energy buildings and zero-carbon buildings, so it is necessary to establish a zero carbon building standard system in China.

In April 2021

"Zero Carbon Building Technical Standards" launch meeting

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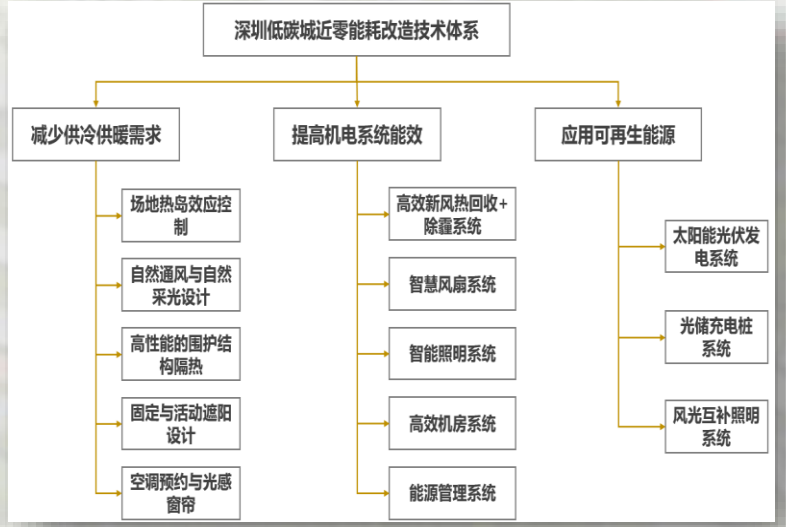
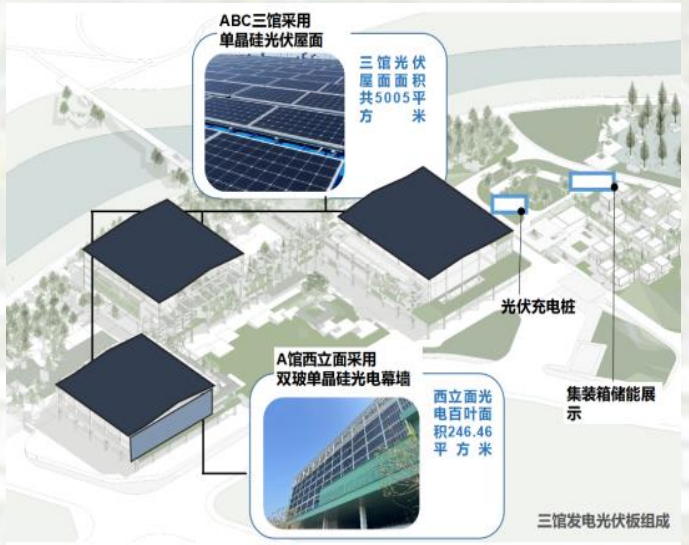
综合规划助力零碳建筑

深圳低碳城会展中心 A/B/C馆项目





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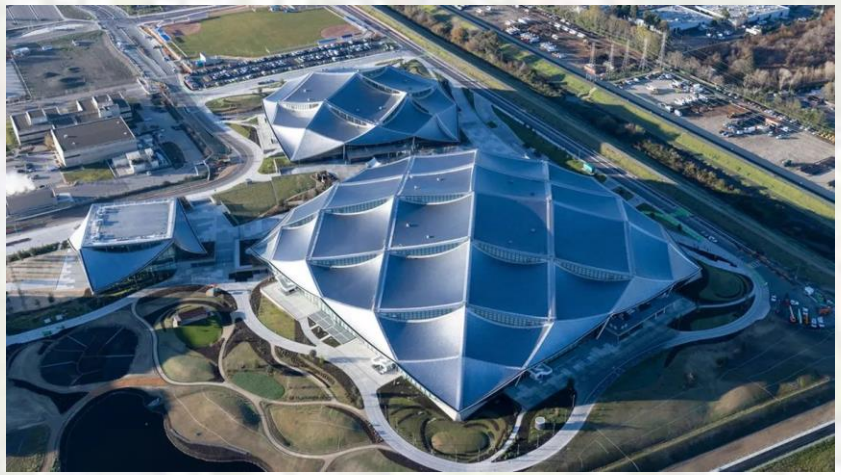
自2021年国家标准《零碳建筑技术标准》启动编制以来，已对接了24个项目，总建筑面积约97.3万平米。

问题与思考

（1）对零碳方向的理解与认可

（2）对低碳、近零碳、零碳级别的共识与坚持



（3）技术路线的选择

（4）增量成本的可承受控制预判

（5）工作周期的影响预判

（6）标准化的对接文件（方案、建筑技术、能源、暖通、零碳）

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- 01 零碳建筑与园区 技术交流20220222
- 02【零碳建筑路线图】
- 03【工作计划、零碳及近零碳差异及实施难度】
- 04【零碳建筑专项初步方案分析】
- 05【建筑能耗模拟分析报告】
- 06【建筑碳排放模拟分析报告】
- 07【零碳建筑可行性研究分析报告】
- 08【零碳技术增量成本分析】
- 09【零碳建筑技术培训资料】
- 10【零碳建筑可行性研究分析报告】
- 11【零碳建筑技术方案】
- 12【生活热水热源方案对碳排放影响分析】
- 13【零碳建筑技术方案】
- 14【增量成本测算】