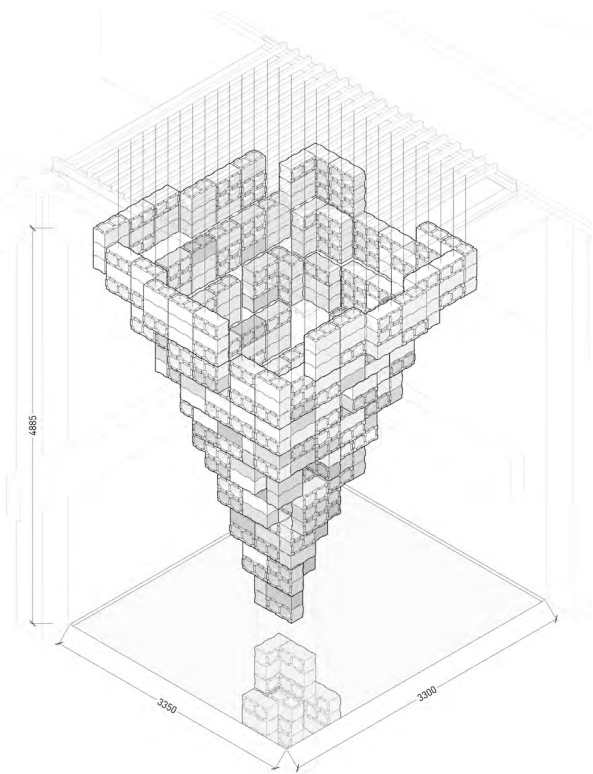


## 反方向的构筑：蘑菇砖金字塔

### INVERTED ARCHITECTURE: MUSHROOM BRICK PYRAMID

在 2022 年深港城市建筑双城双年展 “城市生息” 的主题下，于深双主会场 “物灵之旅” 板块，建筑师以生长的蘑菇砖为材料，设计了生态装置 “反方向的构筑”，旨在为建筑提供 “生长” 的赋能，打造出一个区别于传统人为建造方式的生态环境，重新审视思考自然、城市的关系。

'More than Human Adventure' is the theme of our Exhibition for the 2022 Shenzhen Biennale, titled Urban Cosmologies. In response to the theme the designer proposes to explore the intersection between living organisms and architecture.



轴侧图  
AXON DRAWING





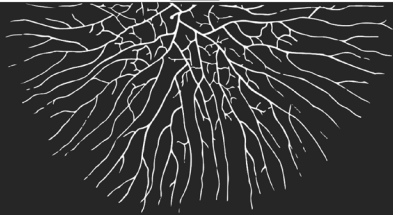
## I. “菌丝体” MYCELIUM

菌丝体（蘑菇）是一种活的根状结构，有时可以覆盖数千英亩。它具有强大的生存能力和适应各种环境及其需求的能力。

Mycelium (mushroom) is a living root-like structure that can sometimes cover thousands of acres. It has tremendous abilities to survive and adapt to various environment and its demands.

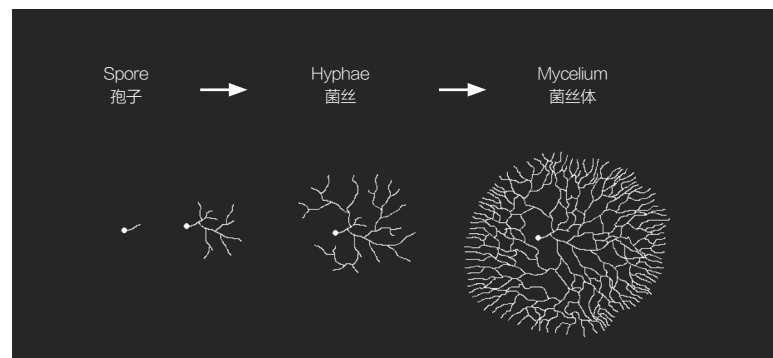


Mushroom  
蘑菇



Mycelium  
菌丝体

菌丝体示意图  
MYCELIUM DIAGRAM



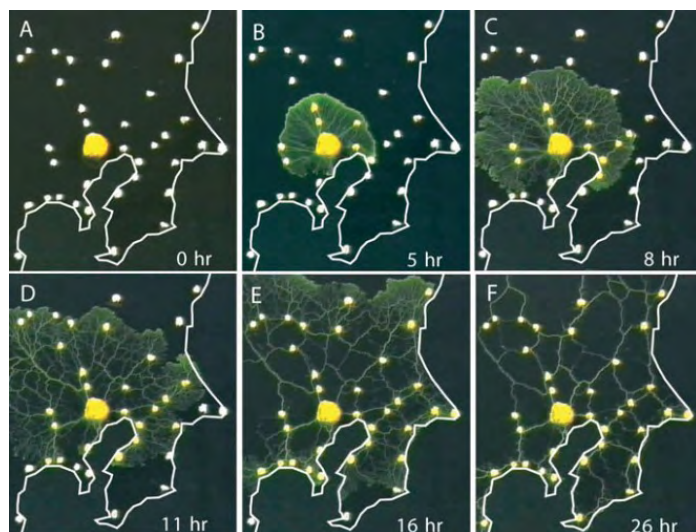
菌丝体生长过程  
MYCELIUM GROWING PROCESS







日本东京铁路图  
TYKYO RAILWAY SYSTEM



黏菌生长示意图  
SMILE MOLD GROWING NETWORK DIAGRAM

曾有学者做了一组有趣的实验：当在以东京周边的日本城市的形状排列燕麦薄片时，这些没有大脑的单细胞黏菌构建了营养通道网络，其结构与日本的铁路网络非常相似。

在这个装置中，我们通过研究、学习这种生物组织的生长方式，将其应用于建造，创造出适应未来建筑技术。

A group of researchers conducted an interesting experiment where brainless, single-celled slime molds were presented with oat flakes arranged in the pattern of Japanese cities around Tokyo. The slime molds then constructed networks of nutrient-channeling tubes that were strikingly similar in structure to Japan's rail system, which was designed by talented and dedicated engineers to be one of the world's most efficient.

In this installation we aim to reflect, visualize and learn from such organisms, adapting the languages and techniques of architecture towards the future.



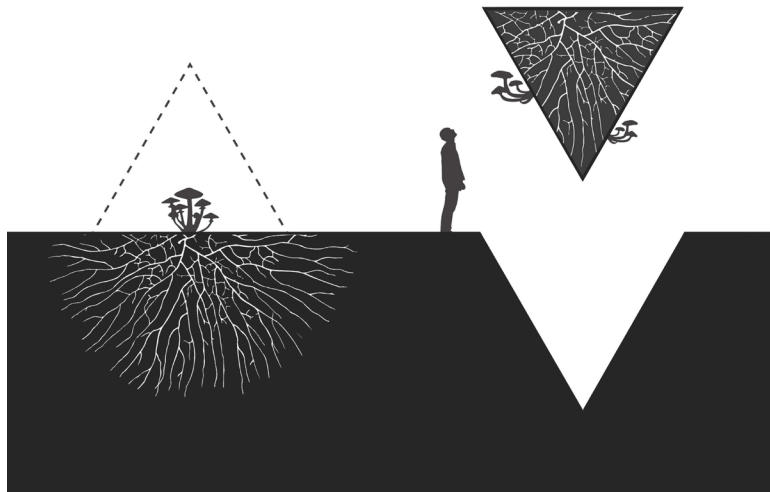
## II. “颠倒的”金字塔 “INVERTED” PYRAMID

这个装置探索了人类建造与隐藏的自然生态系统之间的潜在关系，试图消除两个领域之间的传统分离，以承认并创造一种有意的共生合作。金字塔通常是人类表达伟大的标志物，表达人类与自然抗衡的力量。作品“反方向的构筑”是悬挂着的蘑菇砖所组成的装置，其倒金字塔形的多孔结构是对以人为中心的传统构筑物的颠覆，表达一种反标志性的态度的同时，在功能上可以最大限度地在其顶部收集雨水，并在下方提供充足的遮阴面。



Pyramid  
金字塔

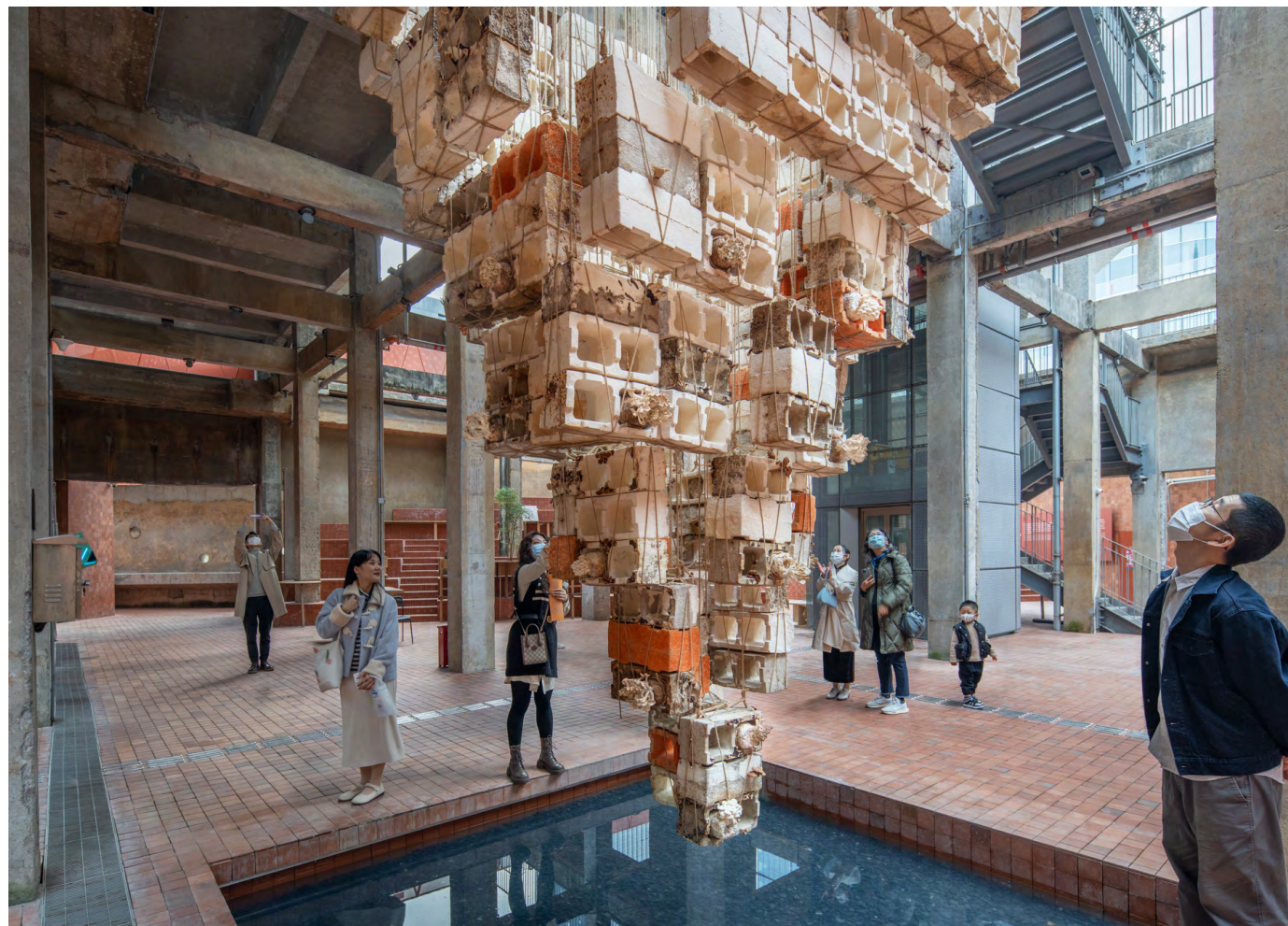
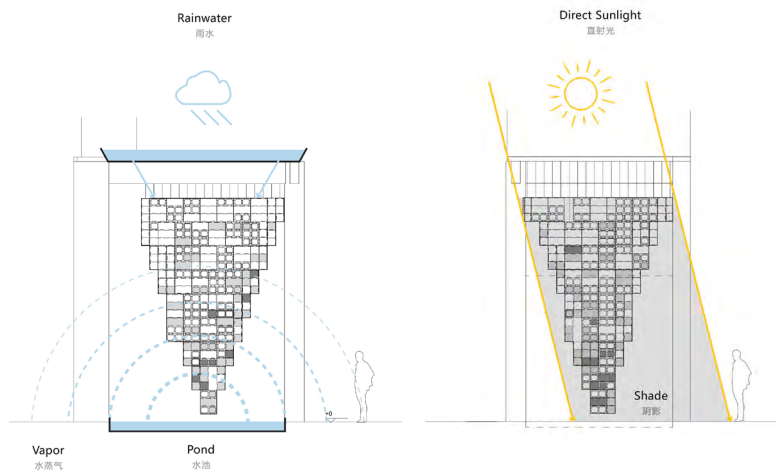
Inverted Pyramid  
倒置金字塔



概念示意图  
CONCEPT DIAGRAM

Using the language of construction, this installation explores relationships between architecture and an ecosystem that is mostly unknown. The aim is to dissolve boundary and create a symbiosis, a collaboration between both realms. The inverted-pyramid shape flips traditional views on its head, illustrating the existence of second natures, double functionality, duplicate purposes, man-made and nature, present and future, and finally growth and decay. A symbol that is also an anti-symbol.

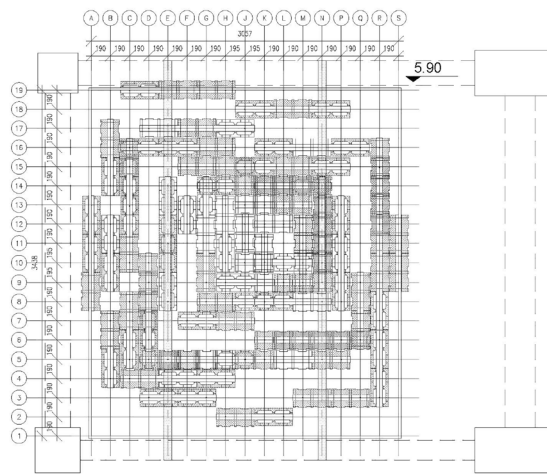




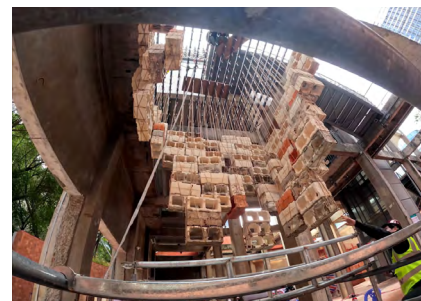
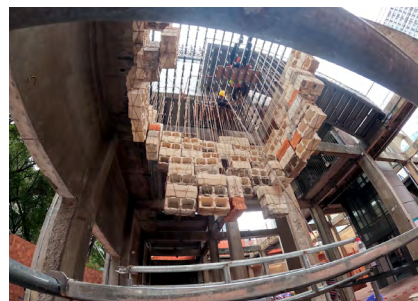
我们在深圳多年的在地实践经验建立了我们对深圳气候和生态的认知体系，展览场地位于由旧啤酒厂改造的半室外空间，悬挂于裸露的混凝土框架结构之下。半室外空间为蘑菇砖吸收空气中的水分提供了理想场所，装置最主要的材料是蘑菇砖，带有吸收空气中潮湿的材料性能，利用材料自身特性给蘑菇创造必要的生长环境。装置下方设有水池，可以产生湿润的微气候，为装置的“生长”提供更充足的条件。

The exhibition takes place in a converted old brewery, with gallery spaces between continuous concrete frame. The indoor-outdoor space provides an ideal place for mushroom bricks to absorb moisture from the air. In addition, a pool is created under the installation to provide a moist micro-climate.





总平面图  
SITE PLAN



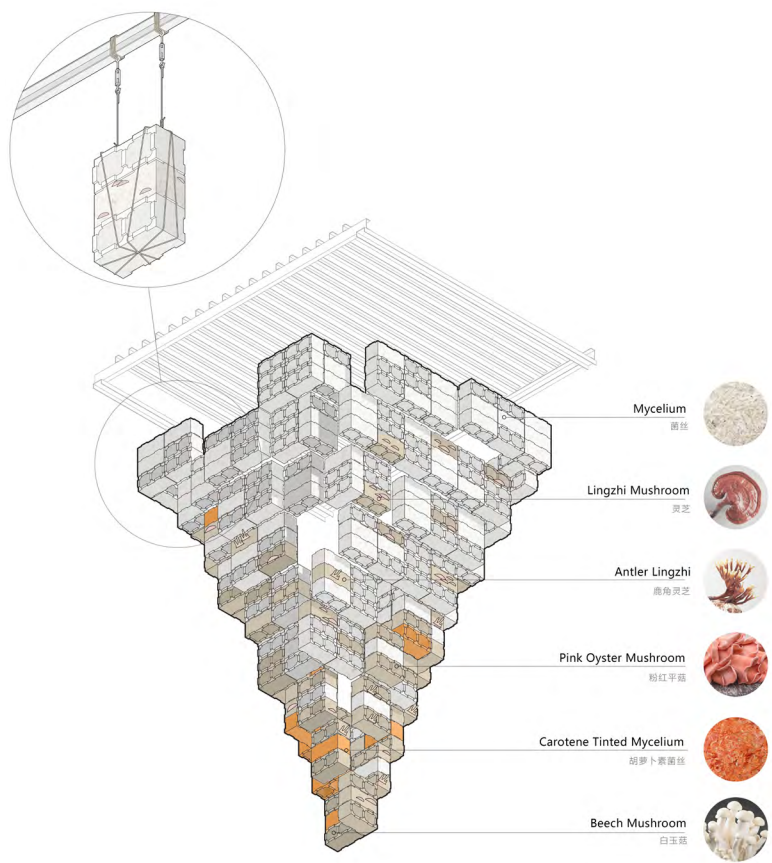


### III. “生长的”材料：蘑菇砖

#### "LIVING" MATERIAL: MUSHROOM BRICK

装置由 400 块悬挂的蘑菇砖组成，是一种可降解、再生的新型生态材料。

The installation consists of 400 hanging mushroom bricks, a renewable and bio-degradable material.



吊挂节点与菌丝品种示意图  
DETAILS OF THE INSTALLATION





Mycelium Brick  
菌丝砖

Carotene Tinted  
Mycelium Brick  
胡萝卜素菌丝砖

菌丝砖采用农作物废料( 秸秆、甘蔗渣、麸皮等 )作为培养基, 加入特定菌丝, 让其自然生长并将所有原材料结合固化在一起, 形成具有结构强度的轻质材料。

Bricks are grown rather than manufactured. Using agricultural waste straw, bagasse, wheat bran as substrate, mycelium grows naturally and in time solidifies.

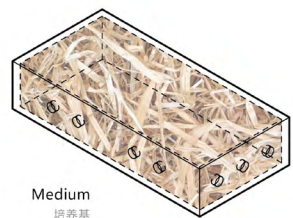
Mycelium Brick Manufacturing Process  
菌丝砖出菇过程



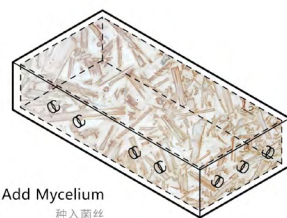


这种材料有很强的可塑性，在适合的温度与湿度下，可以根据模具“长”成任何形状，不同于传统建筑材料对于精度的要求。

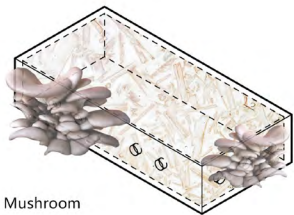
The end result is a material with enough structural strength and plasticity that, under the right temperature and humidity, can grow into any shape.



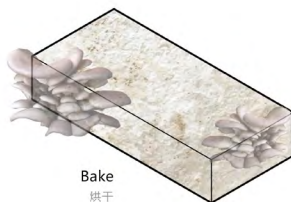
Medium  
培养基



Add Mycelium  
种入菌丝



Grow Mushroom  
出菇



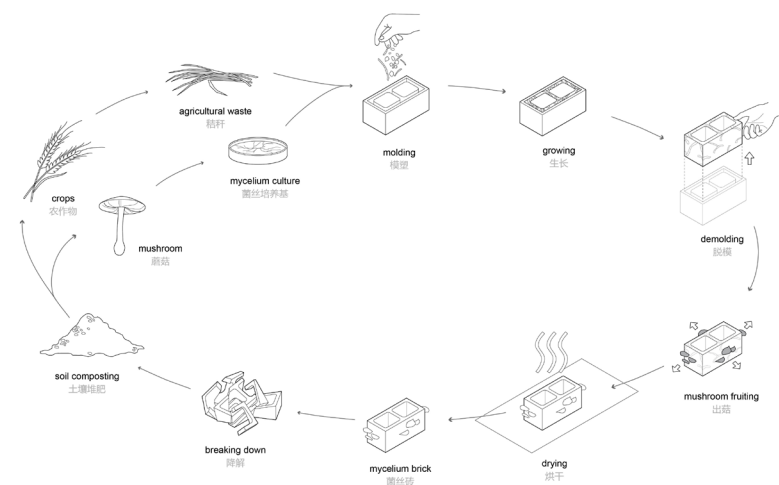
Bake  
烘干





这种材料具备可持续可循环的特性，废弃后，打碎置于土壤之中几个月内可完成降解，不会为环境带来生态负担。这也是未来我们想要在建筑领域深入去研究和实践的方向。当展览结束，这个培育基块将会被重新加工并利用作为自然形成的建筑材料。

Once its life as construction material ends, several months in the soil will see complete degradation of the mushroom brick. There is no burden to the environment.



蘑菇砖的生命周期  
LIFECYCLE OF MUSHROOM BRICK



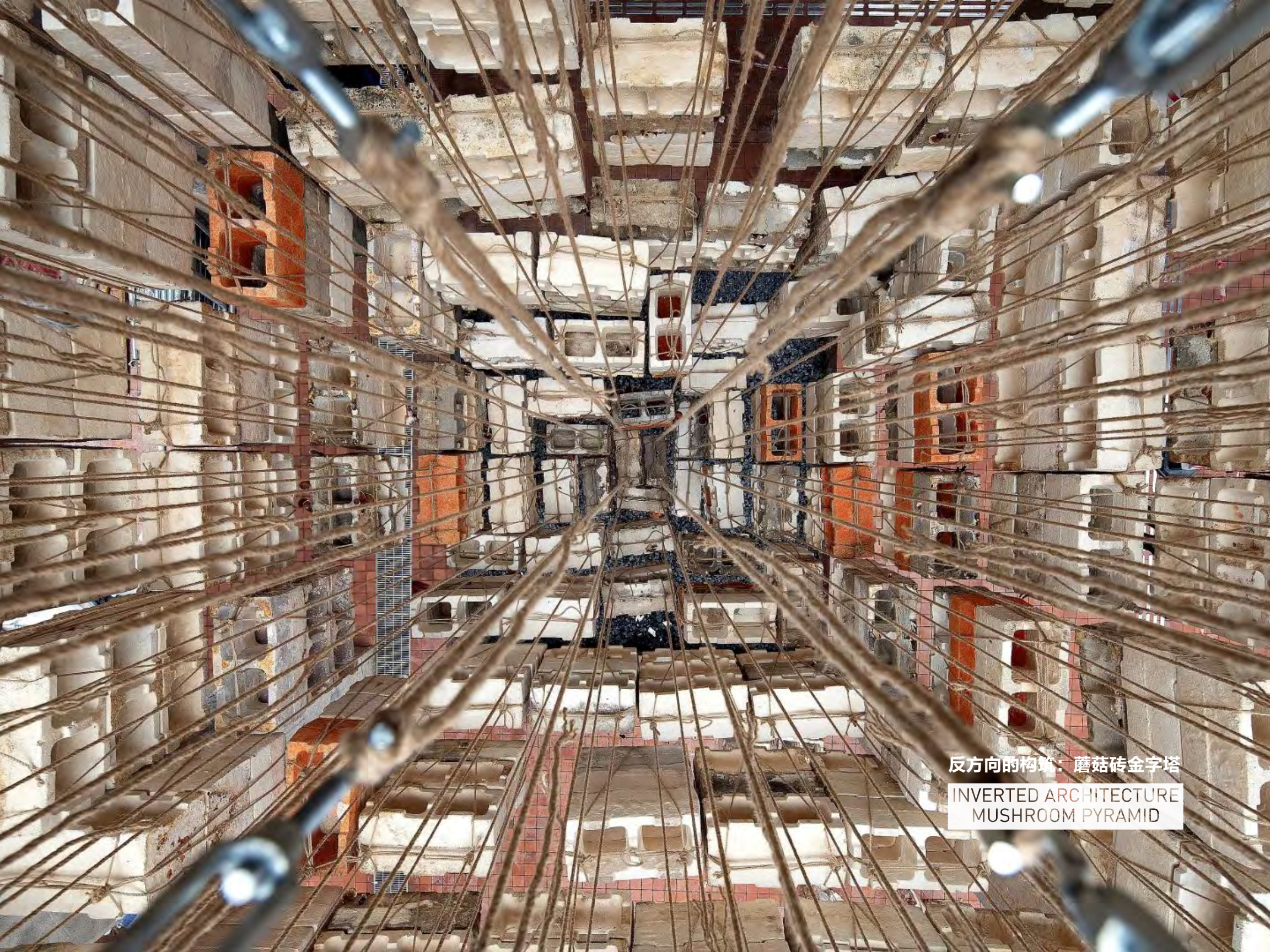


普通蘑菇砖的制作过程中要将菌丝灭活，我们选择性的将部分菌丝继续培养，生长出新鲜的蘑菇，让装置在可持续、可降解的全生态周期中更有生命性，从而变成一个非人为、可以自由生长的装置。这个过程将展示自然作物如何繁茂生长并取代原有培育结构形成新的自然结构，增加装置的趣味和互动性。这是建筑材料与生态结合的全新尝试，也更能呼应板块的主题“物灵之旅”。



The mycelium will be deactivated in the manufacturing process. To compensate we selected some bricks to grow fresh mushrooms within after assembly. The hope is to make this installation part of the sustainable ecological cycle, a man-made device that grows and evolves as a living organism.





反方向的构筑：蘑菇砖金字塔

INVERTED ARCHITECTURE  
MUSHROOM PYRAMID