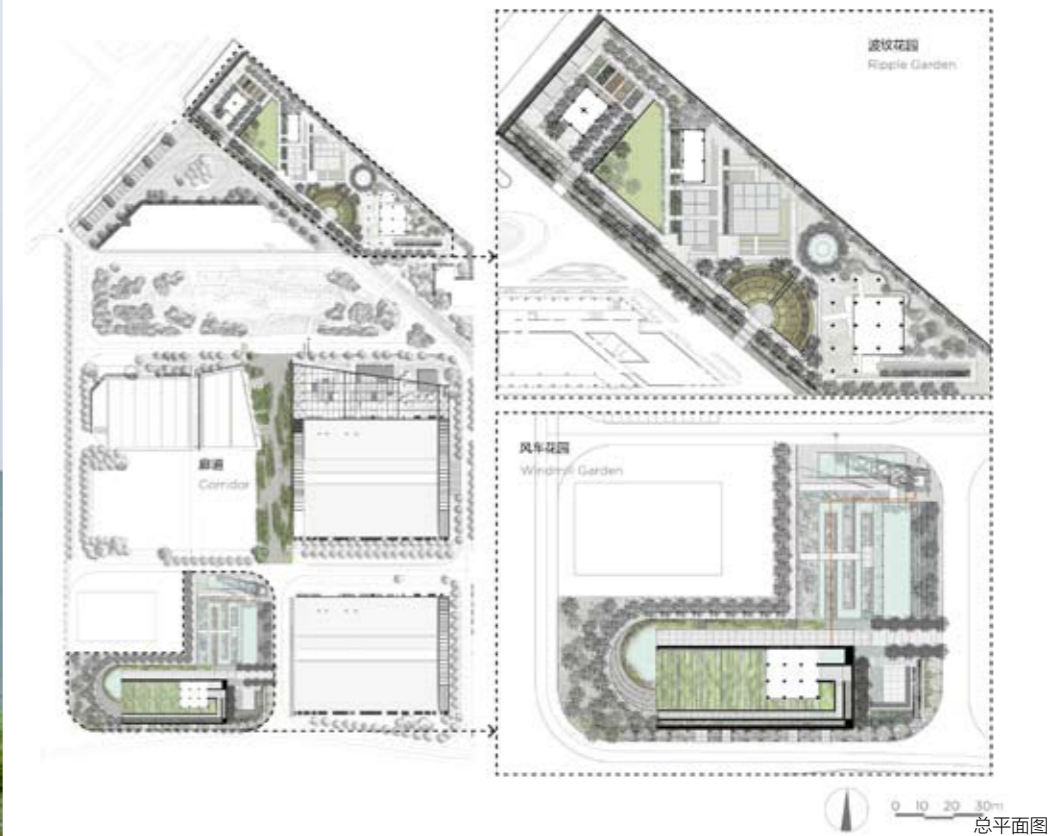


万科建研中心 Vanke Research Center

撰文/图片提供 张唐景观



雨水花园和远处的风车



总平面图



风车花园局部鸟瞰图



蓄水池和生态草沟

2014年ASLA评选委员会评语

设计者能创造出这样一座用于控制雨水质量的屋顶花园着实令人叹为观止，因为到处都覆有绿色屋顶和滤水系统。该项目的成功就是对项目设计与工程队通力合作的最好证明。

万科建研中心的研究重点在于住宅产业化研究，将成为主要研究建筑材料、低能耗设施，以及生态景观相关方面的研究中心。环保材料的开发运用是生态景观研究的核心内容，例如：如何将预制混凝土模块应用在将来的地产项目中、探索不同类型的透水材料，以及植物配植等。

为了设计出低维护的景观，设计师要解决两个主要问题：雨水的管理，以及低维护材料与植物的使用。

雨水流失量的控制

该项目中两个小三角形的场地被设计成“波纹花园”，其中一个三角形地块被用作植物配置的实验用地。相比于低矮的灌木和草坪，乔木可以更好地延缓雨

水落地的时间，所以是雨洪管理中最有效的元素。因此，在该地块中，设计师将乔木种植在三角形坡地的高点，与低矮植被形成对比和参照。此外，由于坡地草坪会使雨水迅速流走，因此设计师采用了波浪形的草坪，不仅从形式上提供了不一样的空间感受，而且在功能上也增加了雨水下渗的时间。草坪和波浪的坡度可以调整，从而能够达到最佳的渗透效果，并且不会引起积水或雨水流失过快的现象。在半环形的地块中，设计师对不同的硬质材料进行了考察。半环形的波浪之间使用了不同的渗水材料（树皮、陶粒、碎石和细沙等），波浪的边界采用溢水设计，可供观察和比较不同渗水材料的溢水量大小。

雨水质量的控制

在该项目的“风车花园”里有一个32 m高的风车，风车将风能转化为机械能，产生的动力可以将最初收集到的雨水提升到建筑的屋顶上，通过屋顶的雨水花园进行曝氧处理，直至跌落到地面的蓄水池中，实现雨水的初级净化；然后，雨水将流入一连串生态草沟中，此处设置有通道，可供人们参观或进行设施维护；二次净化后的雨水将通过一个检测阀，检测达到净化标准的水将流



生态草沟



波纹花园



波纹花园中的小路

入一个镜面水池，成为儿童嬉戏的场所，而未达到净化标准的水将会重新回到水循环系统中，再次进行净化。

以风能为动力，让雨季储存的雨水循环流动、不断净化，直至下一个雨季的到来。这样的雨水花园尊重地域特点，以节能为根本，同时也具备了教育、欣赏和娱乐的功能。

低维护材料

预制混凝土（precast concrete，以下简称PC）技术在欧美国家已经非常成熟，并且应用广泛。从外观上看，预制混凝土模块的尺寸、颜色和质感均与花岗岩相差无几。此外，预制混凝土也明显具备了低能耗的特点：首先，可以避免大面积矿石的开采；其次，中国大部分硬质景观的铺装几乎都需要采用混凝土垫层。因此，只要采用硬质铺装——无论是用于车道还是人行道——都无法实现雨水渗透。而PC的厚度很大，可以省去混凝土的垫层，从而加强了雨水向地面的渗透。此外，PC还可以进行异形加工，使得嵌草铺装成为可能，运用在停车场、消防车道这些规范所要求的大面积硬质铺装中，其视觉效果和生态意义都能得到提升。

除此之外，设计师还设计了多样的PC户外设施，比如座椅和自行车架等。借助模具，PC的形式可以更加多样，同时具有更强的耐久性，可在中国未来的居住区中普及。



波纹花园图解 2

Comment from 2014 ASLA Awards Jury

It's amazing that the designers were able to create a roof garden for stormwater quality control—every square inch has this green roof and on-site filtration running...The success of this project is a testament to the collaboration of the project's design and engineering team.

Vanke Architecture Research Center (VARC) focuses on housing industry related studies. It will become the research base of special architectural material, low-energy consumption methodology and eco-landscape study. Environmental friendly material development is the focus of eco-landscape study, such as the application of precast concrete modules in future real-estate projects, the exploration of different types of pervious materials and plant selection and arrangement etc.

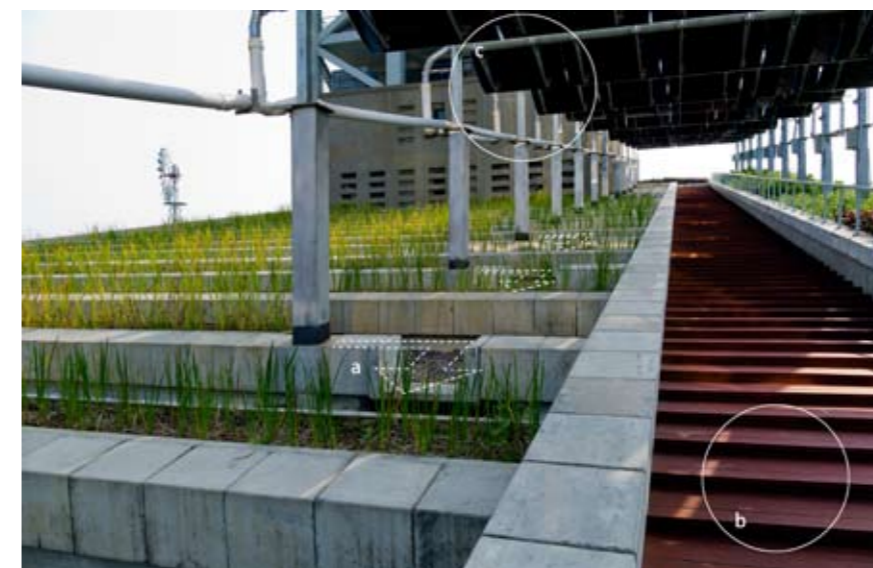
In order to achieve the goal of low maintenance overall in the campus, two major issues need to be addressed: a) stormwater management; b) low maintenance construction and planting material.

Run off Quantity Controlling

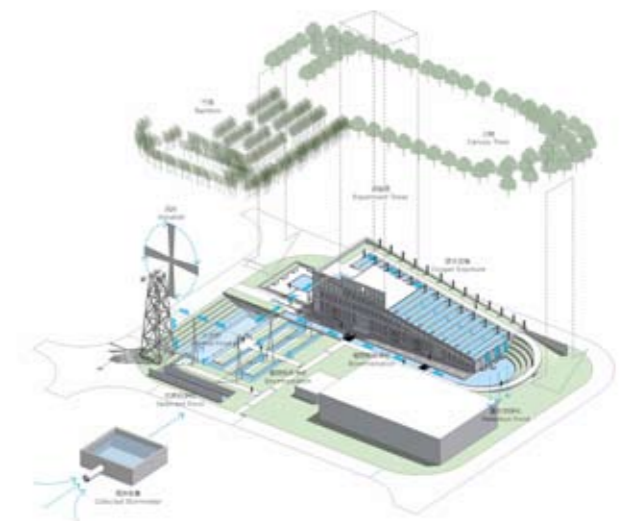
Two small triangular sites are designed as "Ripple Gardens". We conduct planting design experiment in a triangular parcel to compare short bushes with lawns. The canopy tree is the most efficient element in storm water management because of prolonged rainwater dripping period. The slope of the lawn and the wave can be adjusted to realize best infiltration effect without triggering water-logging or speedy flow. We examine different hardscape materials in a semi-circular parcel. The space between the waves adopts different pervious material (the bark, the ceramics, the gravel and sand etc.). The edge of the waves is designed to observe and compare the overflow amount of different materials.

Stormwater Quality Controlling

In the "Windmill Garden", a 32 m-tall windmill provides power for pumping the collected stormwater to the building roof for oxygen-exposure. The primary



a.收集的雨水沿着设计路径流经草根部，为雨水曝氧和根系净化提供了条件
b.跌水加氧台阶
c.太阳能板为抽水提供能源，同时具有遮阳的功能



场地净化系统图解



purification is not finished until the water falls down to the retention pool. Then, the stormwater passes a series of phytoremediation pools, incorporating the passage for sight-seeing and maintenance. The re-purified stormwater flows through an examination valve. The standardized purified water enters a reflection pool, serving as a child-playing space. The unqualified water returns to the cycling system for another round of purification.

Utilizing the energy from the windmill, water stored from the rainy season keeps cycling and being purified until the next rainy season. Such rain garden respects local characteristics and highlights energy-smart purpose. It enables the possibility of education, appreciation and entertainment.

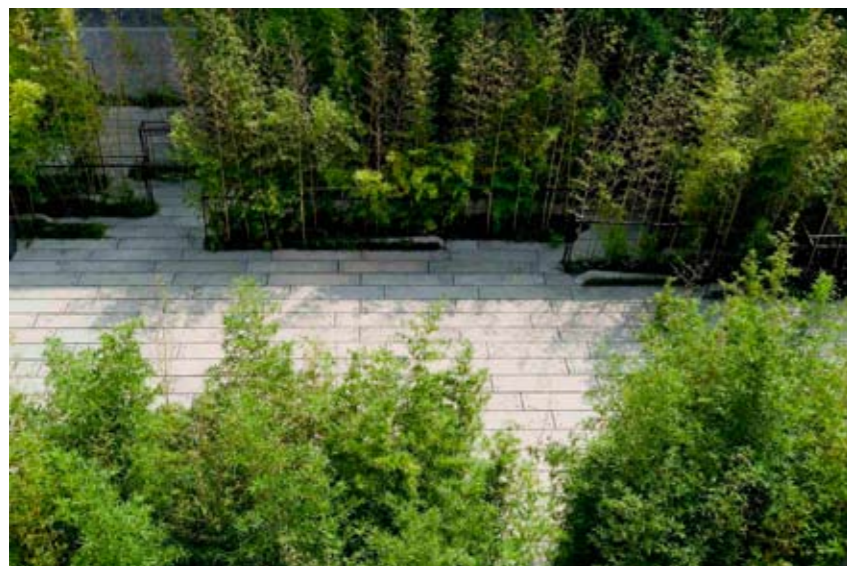
Low Maintenance Construction & Planting Materials

Precast concrete (PC) technique is well developed and widely used in US and EU countries. In terms of appearance, the size, color and texture of PC modules are hardly different from those of granite. Meanwhile, it has significant meaning of low-energy consumption. First, the replacement of PC over granite avoids extreme mining. Secondly, most paving areas employ concrete sub support slab in China. Therefore, the penetration of rain water cannot be realized anywhere there is pavement—both for vehicle or pedestrian passage. PC is so thick that the concrete slab can be defaulted, and the rain water penetration can be strengthened. Meanwhile, PC can be customized to enable grass-embedded pavement. It can improve the visual effects and eco-significance of large pavement area stipulated by regulations, such as the parking lot and the fire lane.

Besides, we also design various outdoor PC structures, such as benches and bike racks etc. With the help of mould, the appearance can be customized and the endurance can be improved to be used widely in future housing projects in China. **LD**

项目位置：中国广东省东莞市
景观设计：张唐景观
占地面积：18 500 m²
建成时间：2012年11月

Location: Dongguan, Guangdong Province, China
Landscape Design: Z+T Studio
Site Size: 18,500 m²
Completion Time: November, 2012



预制混凝土铺装与竹子结合



预制混凝土铺装与葱兰结合



预制混凝土材质的自行车架



预制混凝土铺装的台阶