PREFABRICATION WITH SOUL

190914 at HKIA
朱竞翔

香港中文大學建築學院 副教授
香港元遠建築科技發展有限責任公司 創辦人

ZHU Jingxiang

Associate Professor, School of Architecture of the Chinese University of Hong Kong
Founder, Hong Kong Unitinno Architectural Technology Development Co., Ltd.

http://unitinno.com

zhujx@cuhk.edu.hk
"The southern China metropolis, only vaguely perceived in most of the world at this time, is likely to become the most representative urban face of the twenty-first century."

OBSERVATION ACTION

UNIFORMITY DIVERSITY

HEAVY MATERIAL LIGHTWEIGHT MATERIALS

SLOW EXECUTION RAPID CONSTRUCTION

GREAT NUMBER SYSTEM PROTOTYPE
FORCE - STRUCTURE
A Composite Structure System (Newbud)
Light gauge steel frame infilled and covered by rigid wood composite panels.
Two parts work together to resist gravity and seismic forces.
Panels bring good thermal performance.
Remote prefabrication and on-site simple assembly.
1 - Light gauge steel frame
   Take Vertical loads mainly

2 - Infill panel and bonding panel
   Take Horizontal loads mainly
   Thermal Protection

3 - Opening
   Remain force path
   Daylight proper use

4 - Outer skin
   Additional Bond
   Anti-weathering
四川廣元下寺小學重建
Sichuan Xiasi Primary School Reconstruction 2009
Sichuan Anzihe Nature Reserve Work Station 2011
A TWIST STAIR GENERATING SPACES
TAILOR-MADE ENVELOPE AND OPENINGS: A GUARANTEE OF THERMAL COMFORT FOR COLD REGION

bay window design
ENERGY - ENVELOPE
Five climatic zones in China
外层／耐候
weather

中层／保暖
thermal

里层／排汗
Touch
breath

外层
Sichuan Dazu Study Hall, 2010
四川省栗子坪保护区大熊猫放归监测基站

Sichuan Liziping Eco Base, 2012
global slums resulted from rapid urbanization
Mceda school extension in Mathare valley slum of Nairobi Kenya 2014
sun shading components as security fence
Going the prefab way

In a market dominated by the traditional bricks and mortar, it will take a lot to offset a shift to prefabricated structures. But the transition is starting, and the results do not look that bad.
USE - PROGRAMME
谁来陪伴他／她？

Who will accompany him / her?
kid playroom for Gansu Huining Chequ village, 2015
Is it possible to attract children to play in a room without toys?
Since most of countryside villages in China are affected by rapid urbanization and losing their young working people, counter measures have been conceived and realized as follows: the product is manufactured by an emerging factory first but the knowhow can be transferred to near-site carpentry workshop. Simple foundation of galvanized steel elevates the building above the freezing ground. The assembly process is close to that of a giant furniture. It is easy to be moved or reshaped. Step by step instructions and training helped the local workers and the NGO staff to complete the assembly and maintenance by themselves.
空间将怎样与教学互动?

Can program be inspired by space?
香港黄大仙天虹小学室内游乐空间
BAPTIST RAINBOW PRIMARY SCHOOL PLAYROOM, HONGKONG
BIENNALE ARCHITETTURA 2016

REPORTING FROM THE FRONT

28.5–27.11
VENEZIA

15th Intl. Architecture Exhibition 2016 (La Biennale di Venezia)
Chinese Pavilion Theme: Back to the Ignored Front - Daily Design, Daily Tao
“Dou Pavilion” Rendering for 2016 Venice Biennale Chinese Pavilion
The Venice pavilion uses more surface gaps and openings to adapt to warm summer climate.
Dou: from conflict to fun
Facade with a sense of ritual
It is assembled by five workers.
MOUNTAIN - ANCHOR
云南美水小学

Yunnan Meishui School, 2010
四川西昌美姑大桥镇民生银行红丝带爱心小学
WATER - FRONT
Ecologically sensitive area
Dry season
High water season
南昌鄱阳湖南矶湿地保护区环保工作站
海堤上的“沪”

waterfront fisherman house in Shanghai
FULL SCENE
Heavy weight construction takes 1 year, how long a lightweight would?
河南西平
Henan Xiping

青岛港
Qingdao Port

菲律宾
Philippines

卡加延港
Cagayan Port

苏里高港
Surigao Port

中国
China
Main entrance
Main entrance
INDOOR - SPACE
Qinghai Yushu Lawuga School Reconstruction 2015
New Lawaga School of Yushu, 2015, 4000 meters above sea level
In such an extreme weather condition, what is the solution?
The two "wings" at the long edges entrust the spatial defining panels with the structural possibilities. In the transportation and construction process, the wings help prevent the falling parts from damage. In the building system, if the panel is placed horizontally as a wall panel, the wings would help to resist the lateral force. Besides, Z-shaped panel has a high stability in construction for storage. This is important especially in the case of prefabrication when a large portion of the budget logistic takes up. And when two Z-shaped panels are connected, overlapping the "wings" is an easy connection which gives strong structural performance, and provides excellent air-tightness.

In the later stage, panels with C-shaped and L-shaped sections are also developed. The thickness, width and length of each panel is an integrated result responding to multiple disciplines of manufacturing, transportation, construction, structural requirement, thermal performance, and the spatial requirement. For example, the peripheral wall panels (Thickness = 150mm) is thicker than the suspended floor panel (T = 900mm) to withstand the exterior environment; the width of the panels are defined by their width (1220mm); the length of all panels are limited by 9m for lorry transportation, etc. Z-Shaped Panel
FUND - FLOW
Jiangsu Lukou Grameen village bank 2014
EFFICIENCY: CONSTRUCTION AND ITS MANAGEMENT
COMMUNITY PARTICIPATION:
LOCAL WORKERS
家具制作
Furniture Making

水电工人
Utility Works

内地装饰
Paintings

场地布置
Pavement
EXPENDITURE RATIO

Estimation of the expenditure ratio based on early cash flow

- Lukou Village expenditure
- Xuzhou expenditure (excluding Lukou Village)
- Jiangsu province expenditure (excluding Xuzhou)
- Expenditure from outside of Jiangsu province
KNOWHOW - TRANSFER
Mass production in factory
Tea house for Shanghai Pudong Dishui Lake 2015
欧松板

欧松板全部采用高级环保胶粘剂，符合欧洲最高环境标准EN300标准，其甲醛释放量几乎为零，可以与天然木材相比，远远低于其它板材，是真正绿色环保建材，完全满足现在及将来人们对环保和健康生活的要求。

原料主要为软针、阔叶树木的小径木、速生间伐材等，如桉木、杉木、杨木间伐材等，来源比较广泛。其制造工艺主要是将一定几何形状的刨片经干燥、施胶、定向铺装和热压成型。
国质（北京）建设工程检测鉴定中心

是依法设立的第三方检测/检查机构，2008年11月通过工商注册，能够承担相应的法律责任，保证客观、公正和独立地从事检测/检查活动。通过北京市质量技术监督局的计量认证和中国合格评定国家认可委员会（CNAS）的实验室认可，具有建筑工程主体结构（混凝土工程、砌体工程、钢结构工程、木结构工程）检测能力；通过了中国合格评定国家认可委员会（CNAS）建筑结构检查领域的检查机构认可，具有工程结构质量评价、结构设计质量评价、房屋安全性与可靠性评价、房屋结构抗震性能评价等能力。
Over 120 Checkered Playroom has built

cover 13 provinces and 14 counties in China,
1 Special Administrative Region;
include 5 climatic zones (China);
furthest service distant up to 3,900km (China);
3 world major companies (top 500 ranking)
participate in construction process;
3 times of participation in international exhibitions;
1 participation in national programme;
12 times of social team building services;
20,970 students and 350 teachers are benefitted directly;
40,000 total beneficiaries;
over 20 times media exposure;
Using environmentally sustainable, reusable lightweight architectural product to activate sporadic land resource in the neighbourhood
Indoor lighting and service
On-site assembly procedure
超强台风“山竹”是1983年“爱伦”台风之后影响深圳最强的台风。
- 2名人员受伤。
- 大鹏和盐田发生海水倒灌事件。大鹏新区葵涌下洞河等11个社区多处区域出现海水倒灌，紧急转移约1500多人。
- 多处供电线路中断。
- 全市接报内涝积水80余处。
- 部分市政设施和车辆受损。其中，公共场馆受损104个，公共交通标识受损97个，户外广告牌受损122个，路灯损毁68个，车辆损毁94辆，树木倒伏8074棵。
- 共发生次生灾害13起。
Leading research and design enabling integration of production and construction
Digitalised processing
SYSTEM - EVOLUTION
earl bamboo theatre in South China
2010 - Hong Kong Causeway Bay Bamboo Theatre
Basic Building Systems

框架式
Frame

板式
Panel

箱式
Box
Spatial Panel

Newbud
4000 m above sea level
Yushu Lavug School, Qinghai, China, 2015

5 m Varied water level
Poyang Lake Eco-Station, Jiangxi, China, 2015

9000 km from Shenzhen
MECEDO School, Shenzhen, China, 2014

60 days from design to completion
Gammel China Ljudbank, Xitou, China, 2014
emerging activities
construction timeframe: lightweight vs heavyweight

light-weight construction
重型结构

light-weight construction
重型结构

6 10 10 4 6 2

6 18 24

construction
design
drawing
construction
planning
bidding and purchasing
manufacturing and QC
assembly

施工图设计
施工图设计
施工图设计

施工方案确定
施工方案确定

施工方案确定
Metaphor of Babel Tower: Conflicts of Languages
From a little spark may burst a flame.

Dante Alighieri
THE END