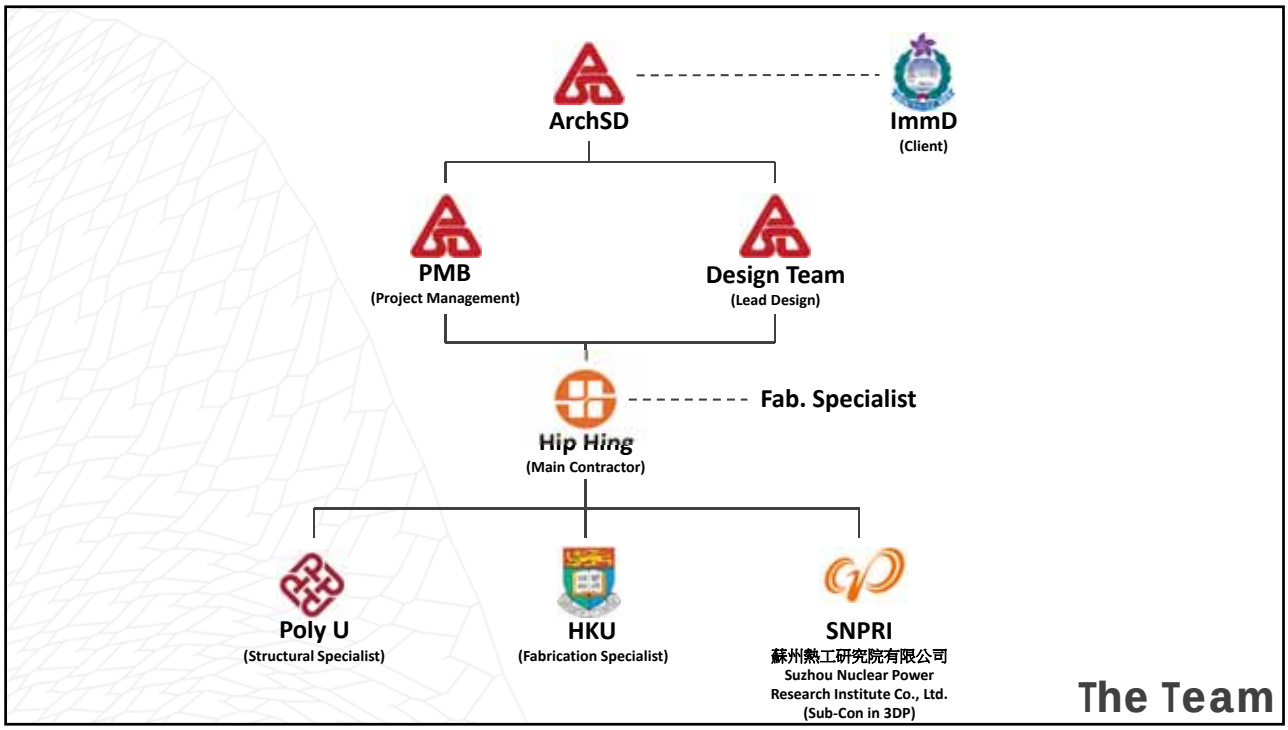
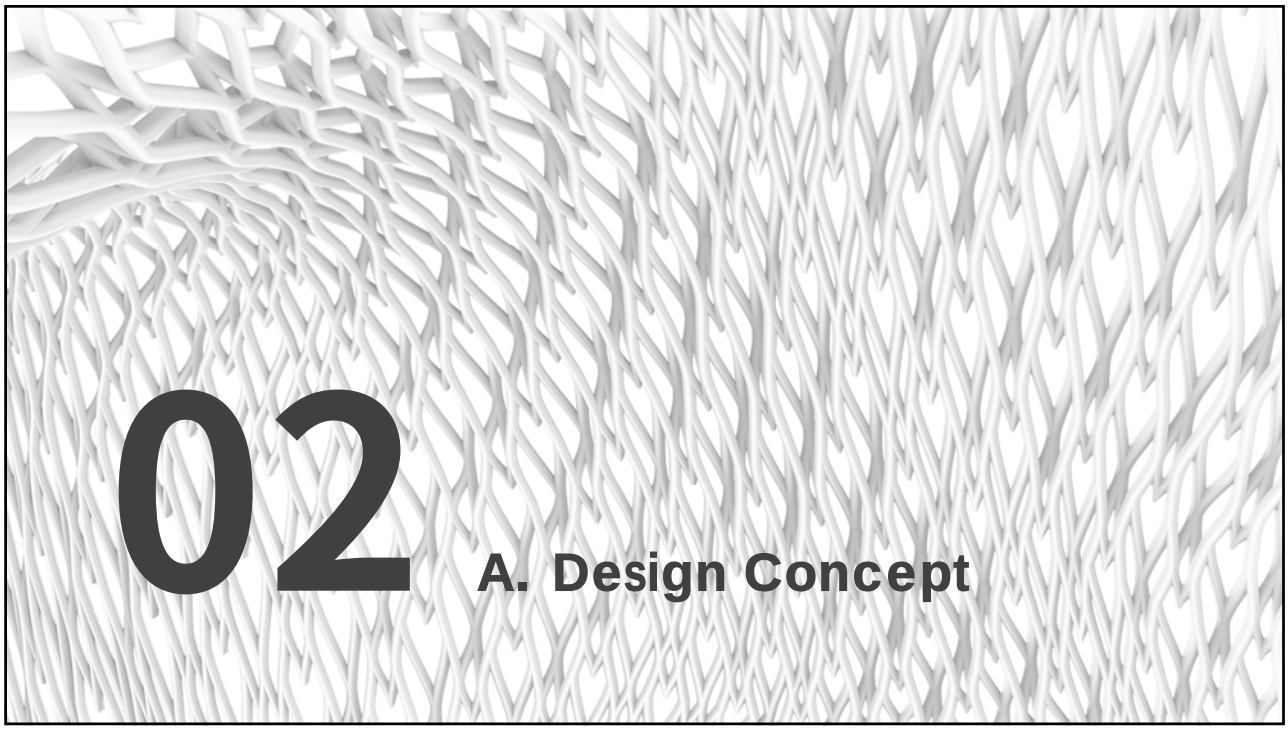
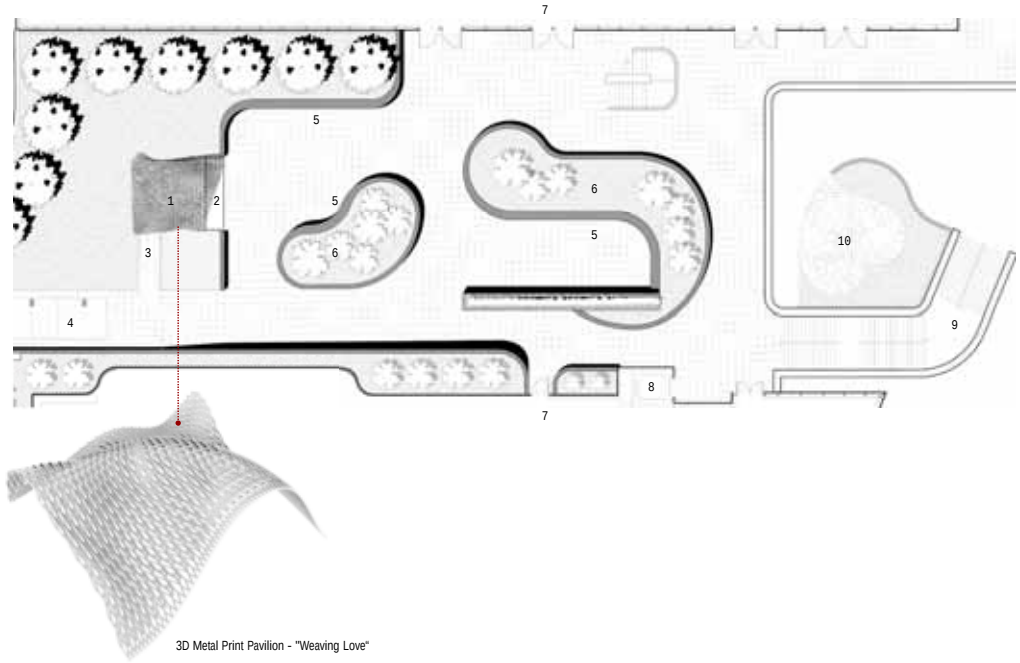
Contents

01 Introduction

Immigration Headquarters, TKO


ArchSD
ImmD
(Client)
PMB
(Project Management)
Design Team
(Lead Design)
Fab. Specialist
Hip Hing
(Main Contractor)
Poly U
(Structural Specialist)
HKU
(Fabrication Specialist)
SNPRI
蘇州熱工研究院有限公司
Suzhou Nuclear Power
Research Institute Co., Ltd.
(Sub-Con in 3DP)
The Team

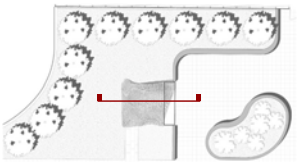

02
A. Design Concept

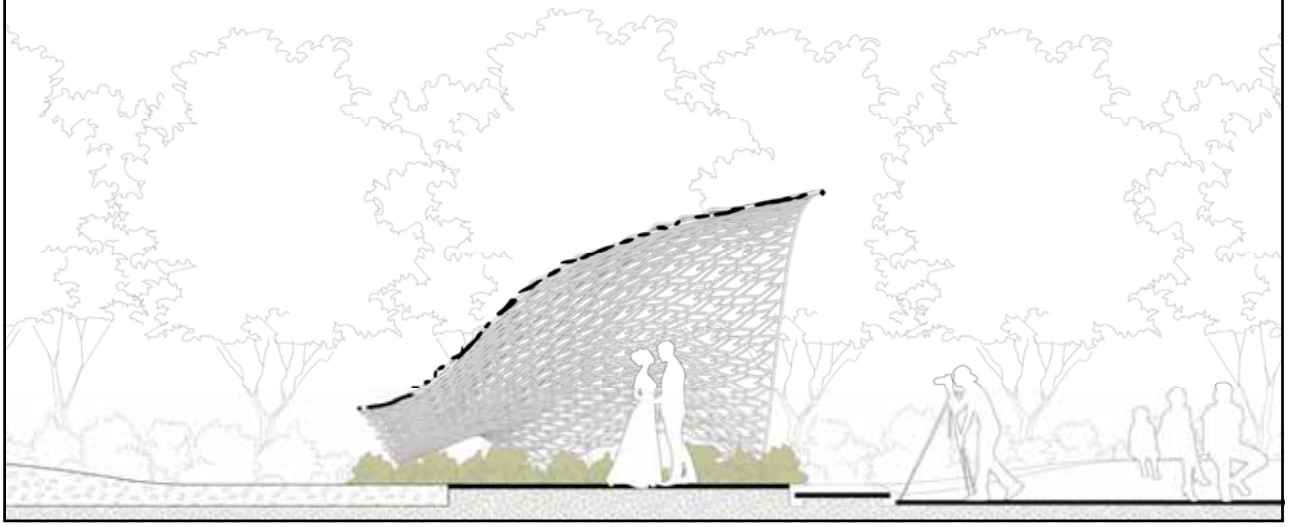


1. Weaving Love
2. Stepping Stone
3. March-in Path
4. Covered Walkway
5. Planter Curbs w/ Seating
6. Garden Landscape
7. Office Tower
8. Public Lift
9. Staircase to GF
10. 'Heart' Shape Garden on GF

3D Metal Print Pavilion - "Weaving Love"

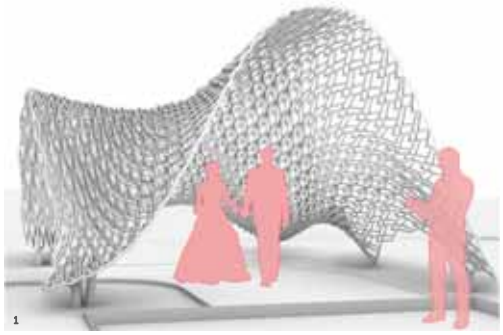
Modular patterns were transformed to 1312 unique heart-shaped forms, which symbolically conveyed a love message to the newlyweds.

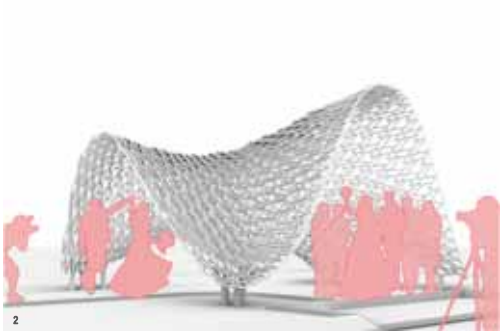


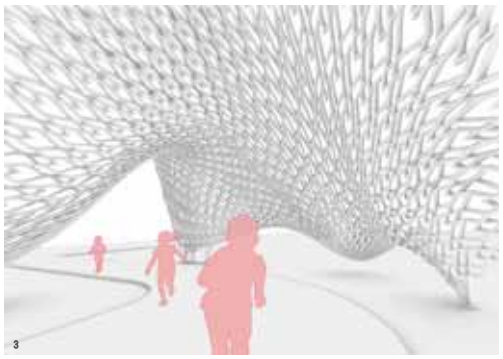


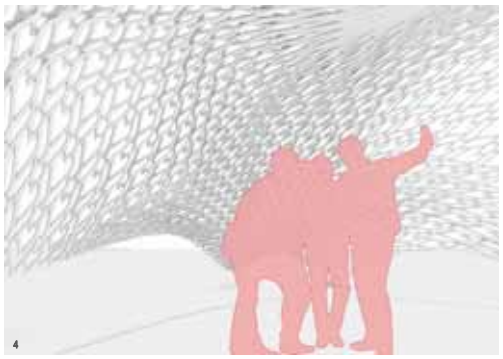
Design Concept – The Veil

The form of the pavilion draws inspiration from the graceful purity of a bridal veil, gently billowing in the breeze, resembling a delicate canopy.



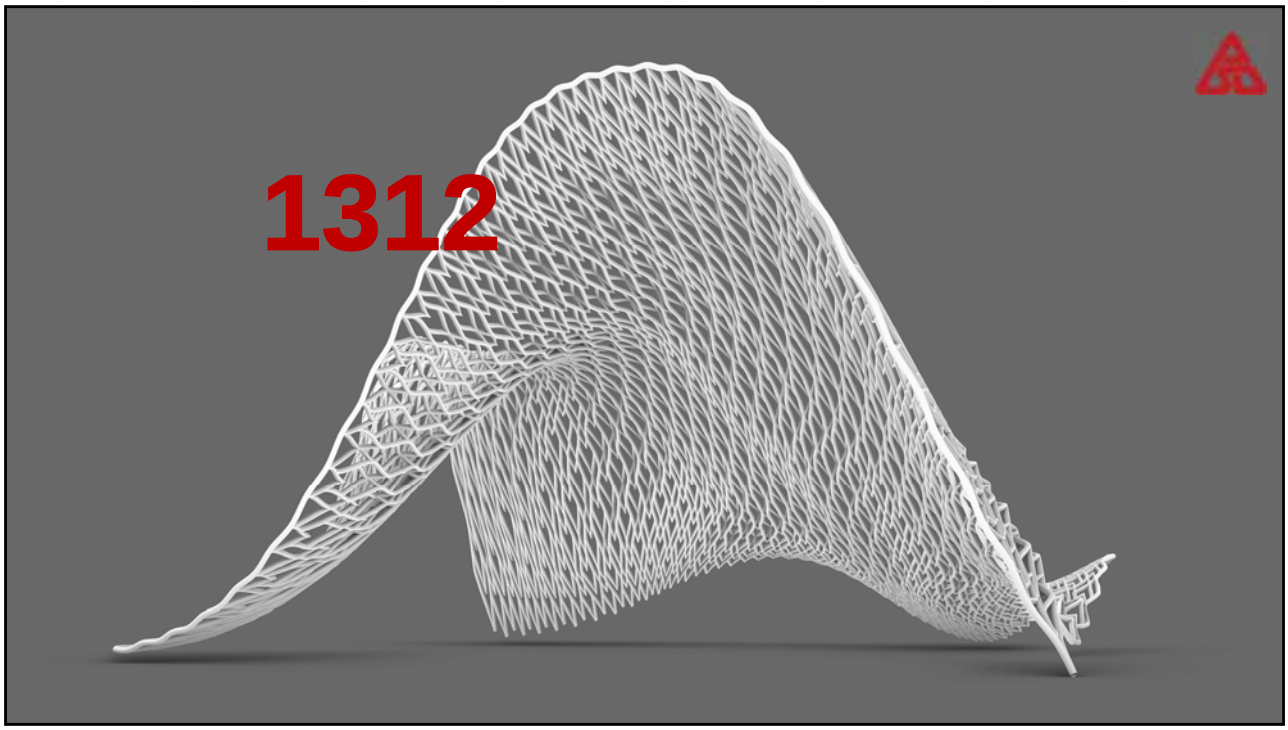






1. Captivating 'wedding path' for newlyweds
2. Dual shooting venues for different couples
3. Playful venue for kids
4. Immersive space giving an intimate experience

Pattern



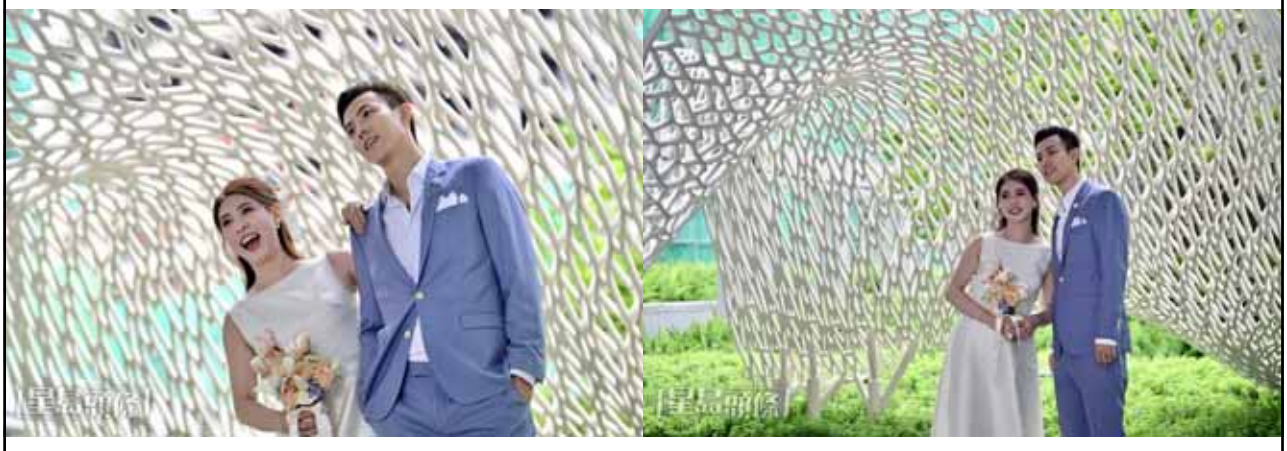
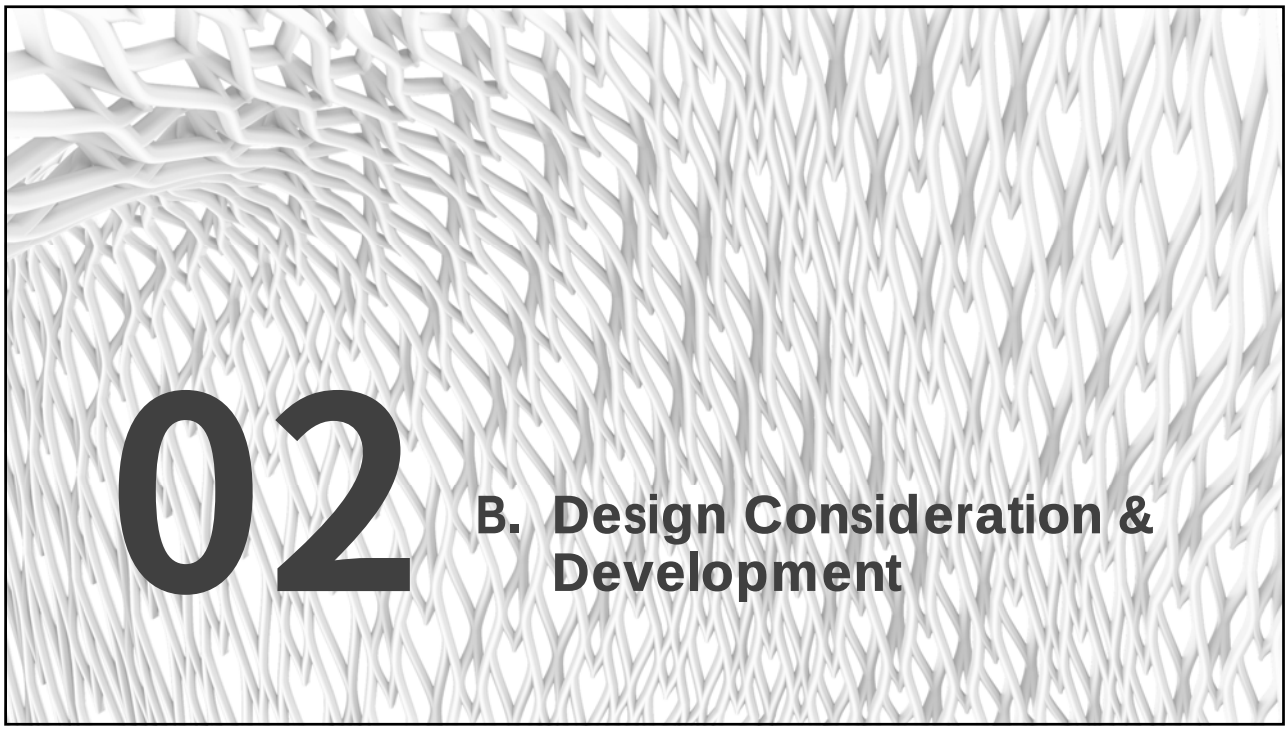
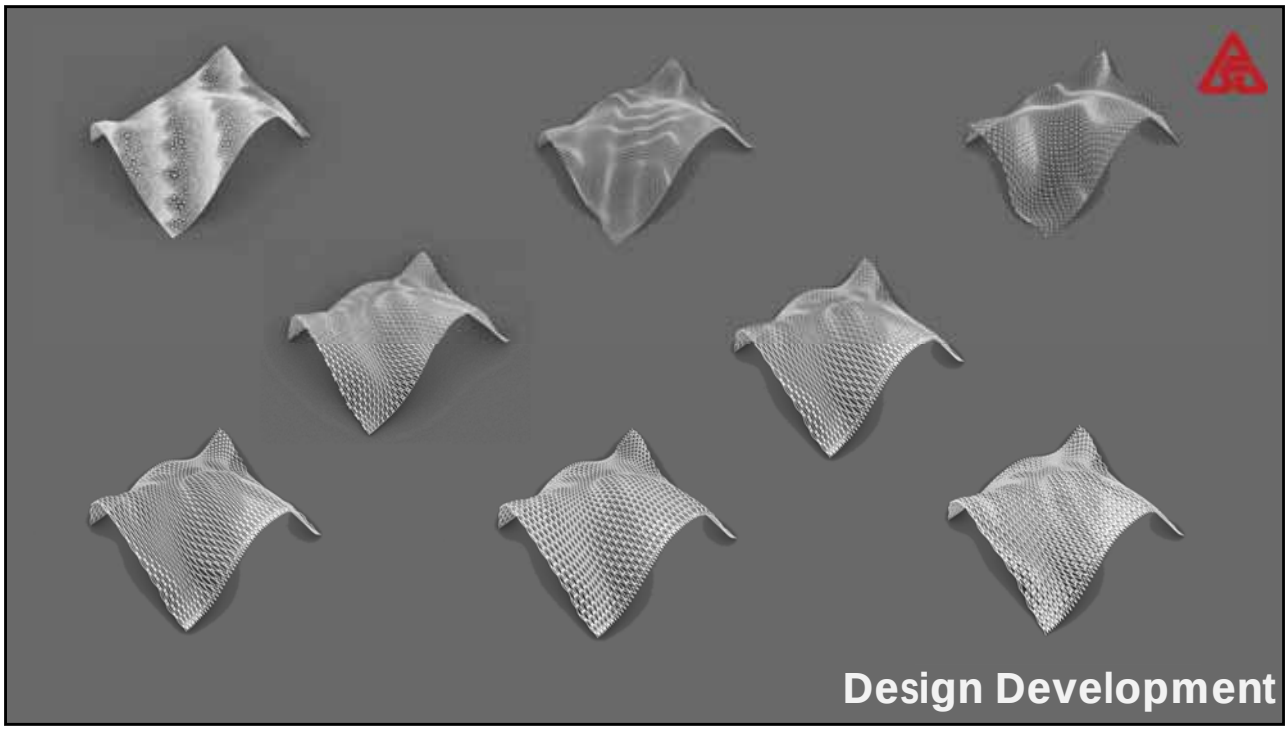


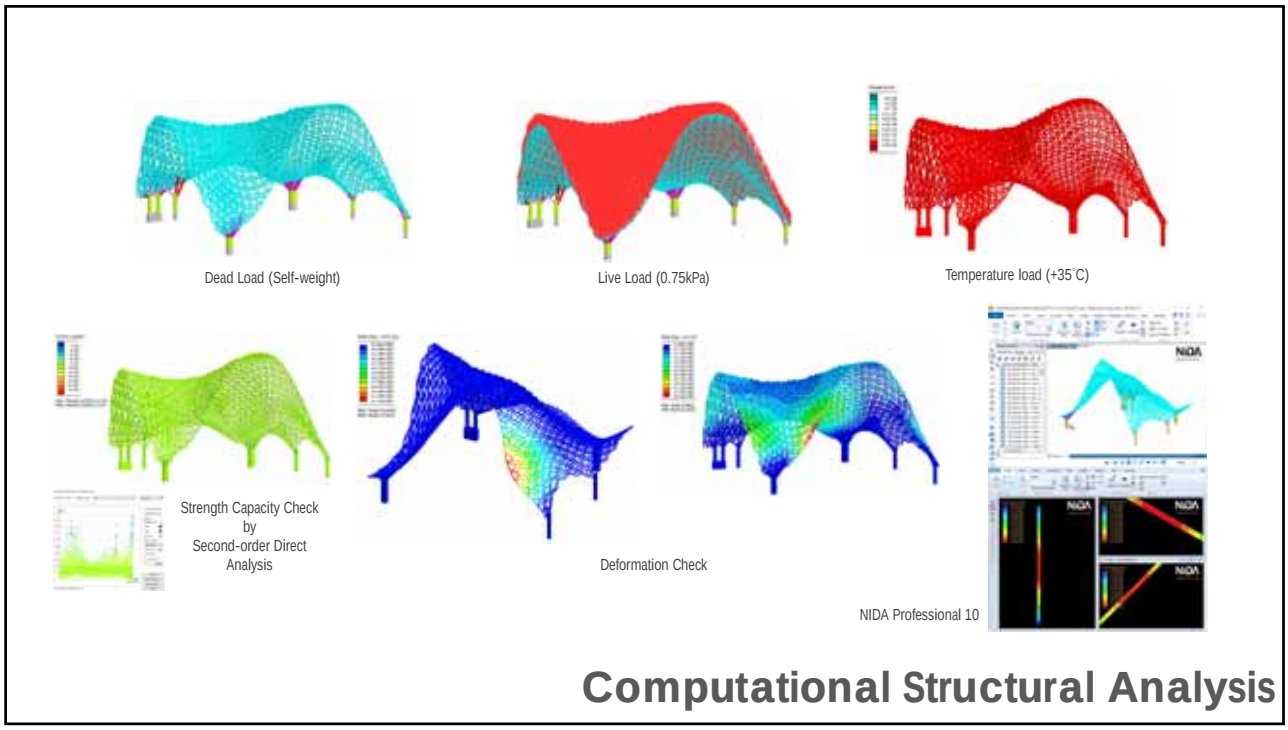
Photo credits: https://www.stheadline.com

Light & Shadow

02 B. Design Consideration & Development

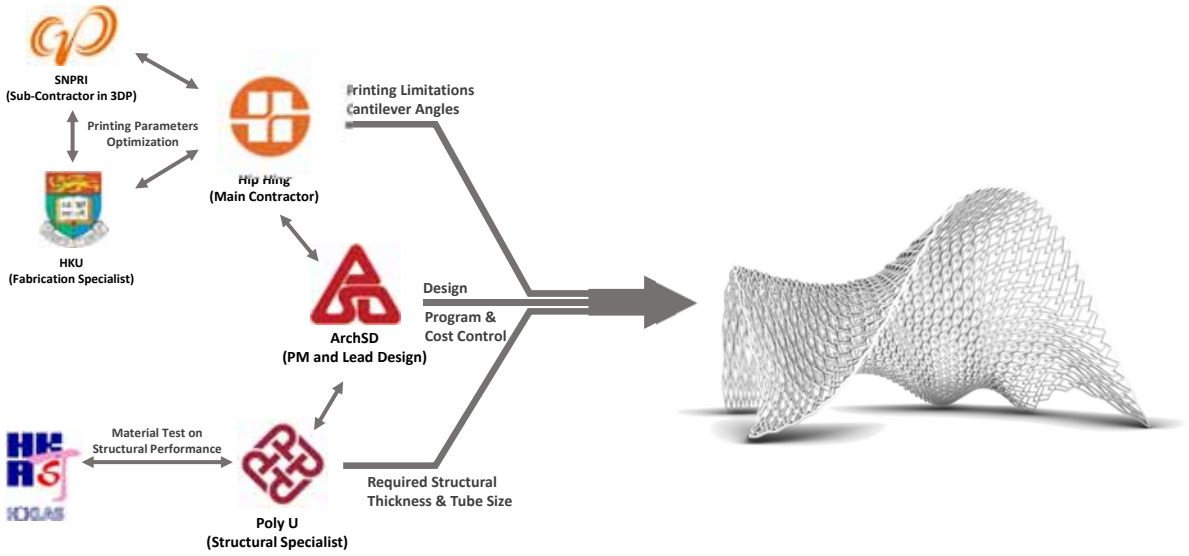


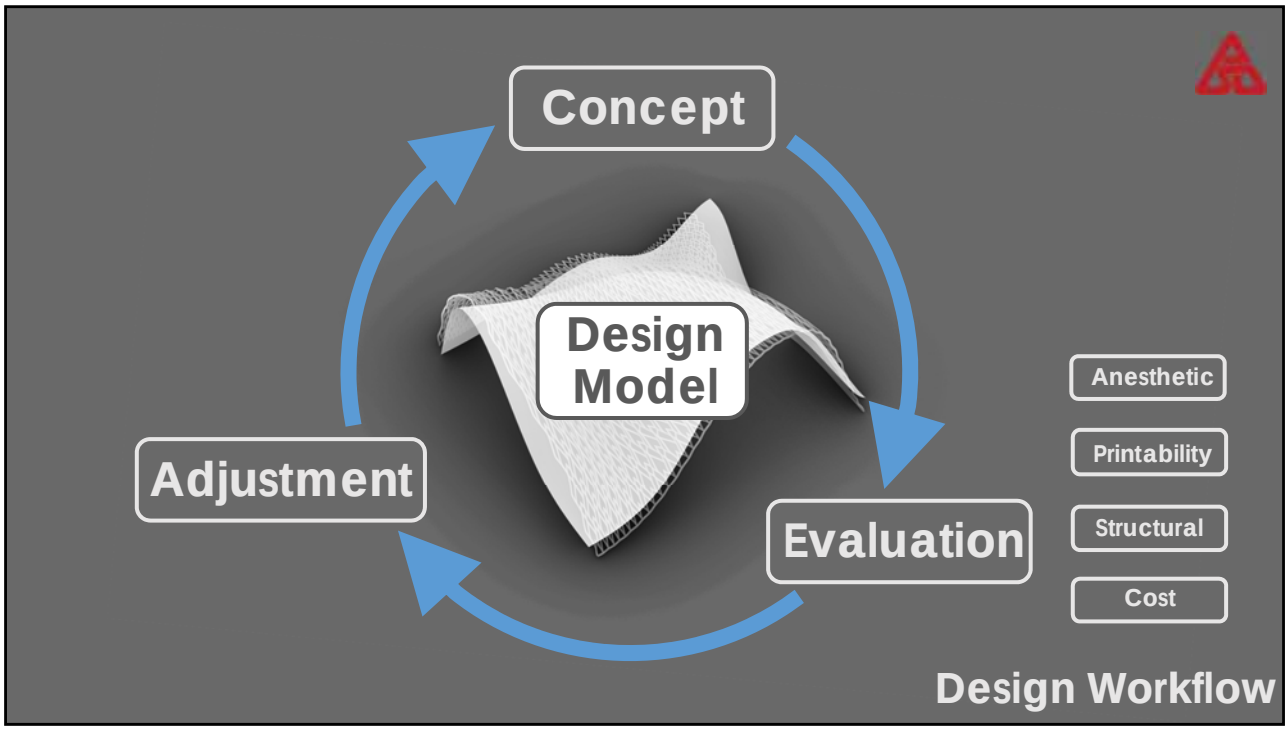

Design Development


Dead Load (Self-weight)
Live Load (0.75kPa)
Temperature load (+35°C)
Strength Capacity Check
by
Second-order Direct
Analysis
Deformation Check
NIDA Professional 10
Computational Structural Analysis

02 C. Design Methodology & Workflow

Parallel Project Execution Strategy




Concept
Design Model
Evaluation
Adjustment
Anesthetic
Printability
Structural
Cost
Design Workflow

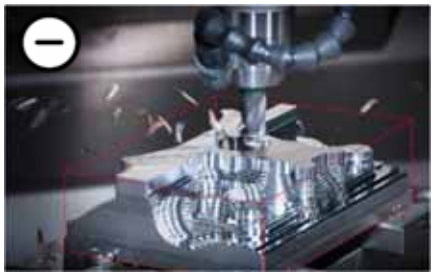
03 A. WAAM
Wire Arc Additive Manufacturing

Wire Arc Additive Manufacturing (WAAM)

WAAM is an additive manufacturing method, also known as 3D metal printing, is a process where objects are created by adding layer upon layer of material based on a digital design.

CNC (Computer Numerical Control) is a subtractive manufacturing method where computer-controlled machines carve out parts by removing material from a work piece.

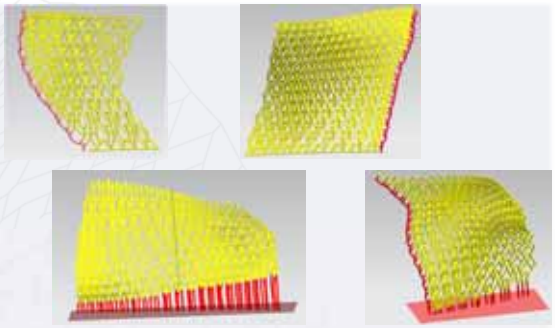
Sample of Additive manufacturing(3D-Printing)



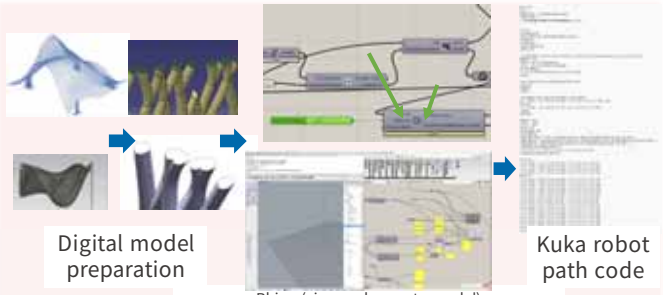
Sample of subtractive manufacturing(CNC)

03

B. Preparation & Printing



5. Automated print angle optimization



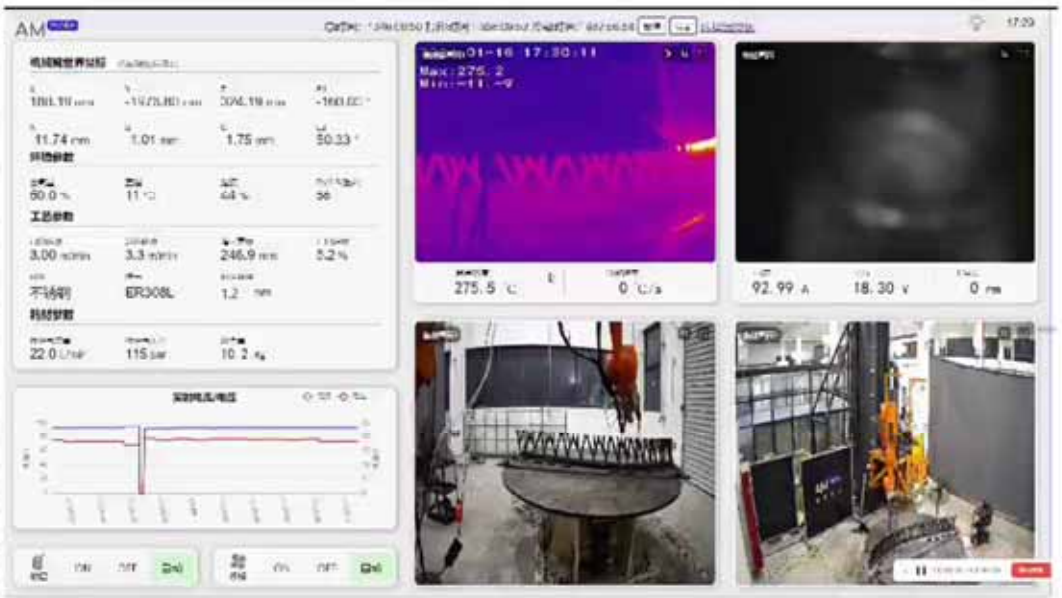
6. Automated print-path and layer generation

7. Print-path simulation

RS-R1 (6Axial + 2Axial Platform) RS-L1/L2 (6Axial + 2Axial Platform) Trial Print Sample

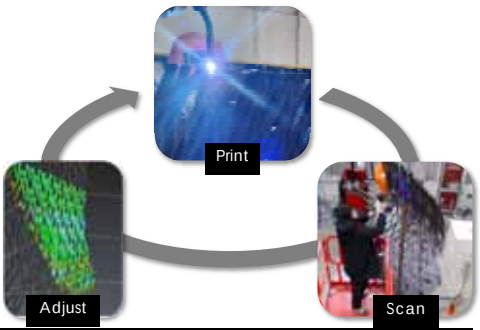
8. Pilot print verification

1. Voltage
2. Current
3. Feed Speed
4. Travel Speed
5. Contact Tip to Weld Distance (CTWD)
6. Temperature
7. Humidity
8. Protective Gas Flow
9. Tip Position
10. Deposition Rate
11. Dimensional Integrity



Print Parameters – real-time monitor & control

Operator Monitoring



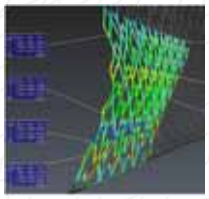
Quality & Dimensional Control

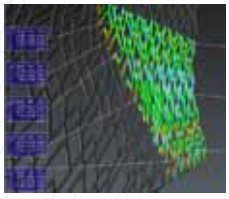
AI Monitoring & Machine Learning

03 C. Post-Printing Fabrication & Installation

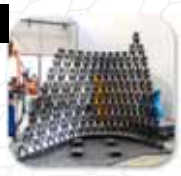
S4

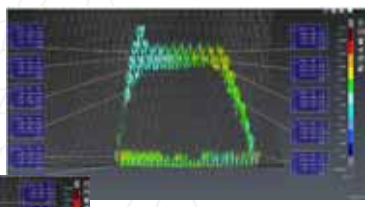
>97% of the as-built point cloud is within +-6mm deviation

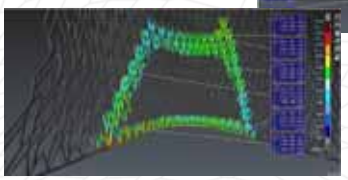




S3-1

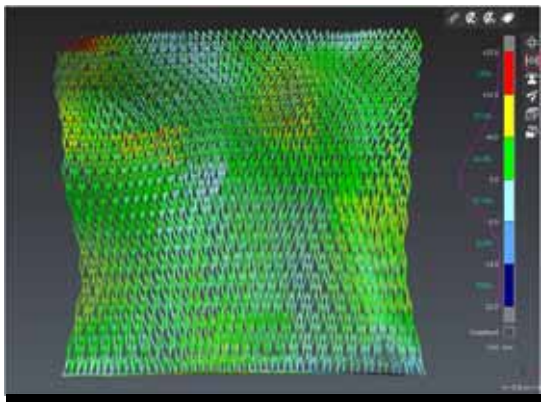






>96% of the as-built point cloud is within +-6 mm deviation

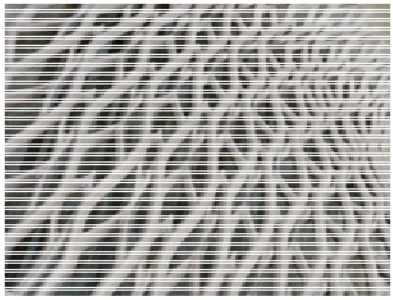
Segmental 3D Scan



Dimensional & Pre-assembly Verification

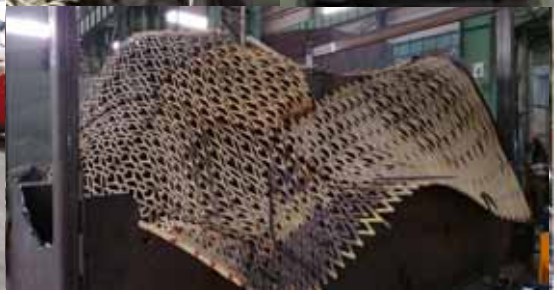
3D Scanning



Print Inspection & Defect Rectification



Assembly



MIG & TIG Welding, Plasma Cutting

Assembly

STRUCTURAL VALIDATION

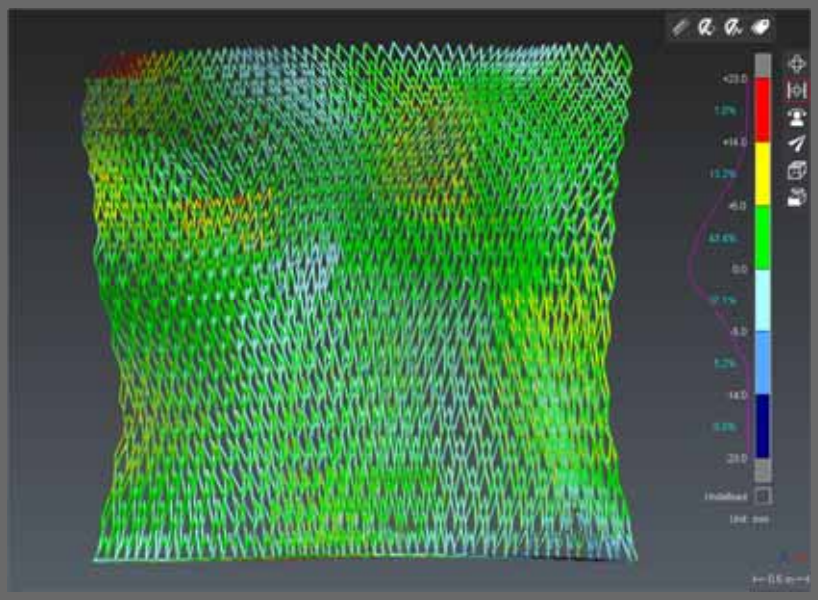
Test Preparation

Welding & Loading Test

Loading Test

Test Measurement Logging

Ex-factory 3D Scan



Based on the histogram, 98.9% of the as-built point cloud is within +-14mm deviation.

After noise removal, +-10mm

(Area portion-A lack of scan data, so that will be affect the result.)

3D Scan Result

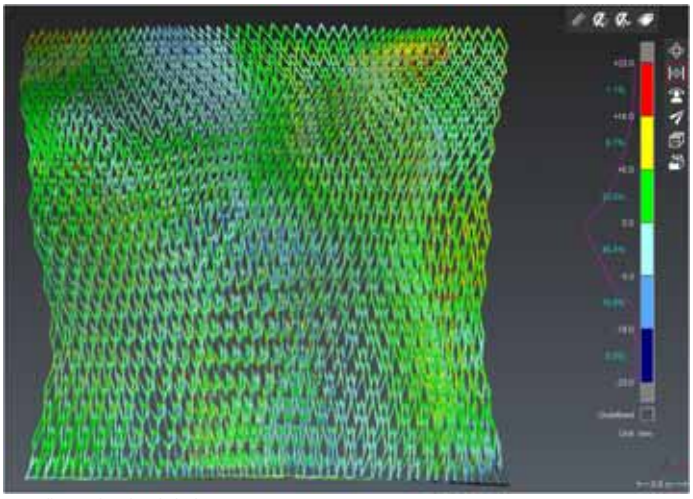
Package & Transportation

On-Site Installation

Based on the histogram, 98.9% of the as-built point cloud is within +-14mm deviation compare with design model.

After noise removal, +-10mm

'+'mean as-built point cloud outward the design model while '-' means inwards.



Overall Top View (Deviation)

Quality Assurance – 3D Scanning After Installation

04 Achievements

Project Achievements

Time & Cost Saving

Parametric modeling and 3D printing enable rapid iteration and decision-making, minimizing labor. **70% time and 50% cost savings** compared to conventional approach.

Design Flexibility

Parametric modeling enables free-form exploration, unbounded by rigid constraints. Integrated analysis tools provide **immediate feedback**, allowing the team to **rapidly iterate** and refine the design.

Environmental Friendly

3D printing and offsite construction offer environmental benefits. Precise manufacturing and optimized materials minimize wastes, **80% material reduction** compared to conventional approach.

Landmark for Wedding

The Pavilion's design creates a captivating **unique landmark** for weddings.

Quality Control & Safety

Computation and Digital Construction not only benefits to the design complexity and construction cost, but also **Quality Control** and **worker's safety**.

Way Forward

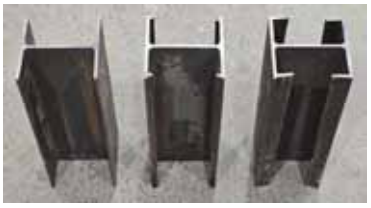
Application of WAAM showcases a new **promising technology** to the construction industry.

MX3D bridge in Amsterdam (2021 – 2023)

Weaving Love (2024 -)

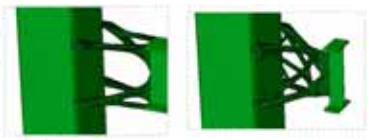
Potential applications:

Novel structure



Structure reinforcement

Automation construction



Seismic energy dissipation beam-column joint

Current research on WAAM:

Advantages of WAAM


Weaving Love
THANKS!