Welcome to the Future: Sharon School District

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Professor & Head

Carnegie Mellon University

School of Architecture

Design Intelligence Scenarios: 2025

- The global population will soar to 8.35 billion people, the majority of whom will live in cities
- Standard operating procedure will be based sustainability sciences
- Construction sites will be dominated by construction robotics
- The Internet of Things (IoT) will become (is) ubiquitous & will drive change in buildings

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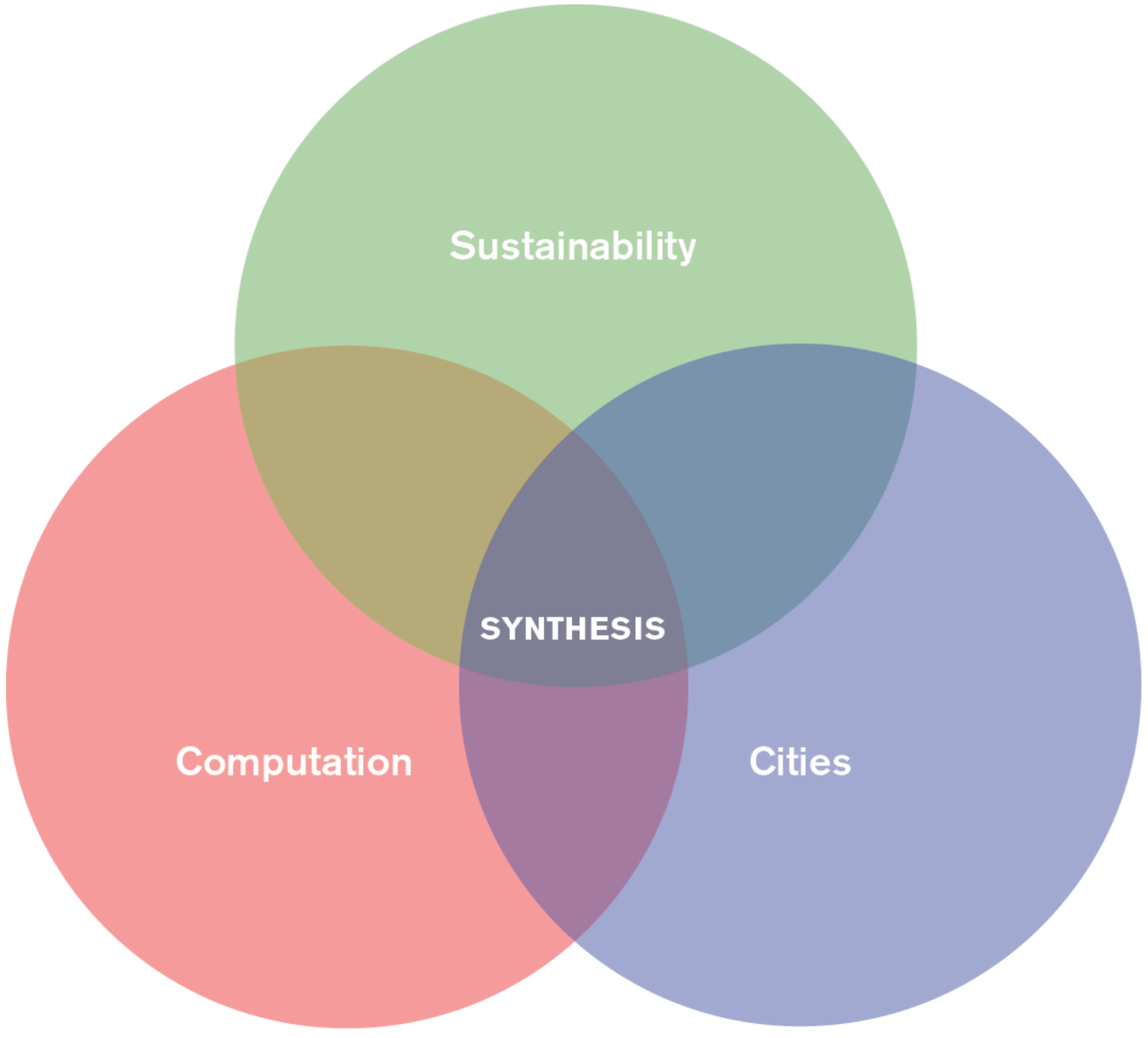
Integrating Three Themes



**In Teaching, Practice & Research,
the SoA Integrates Around Three Themes to
Synthesize Creative Solutions for the Built Environment**

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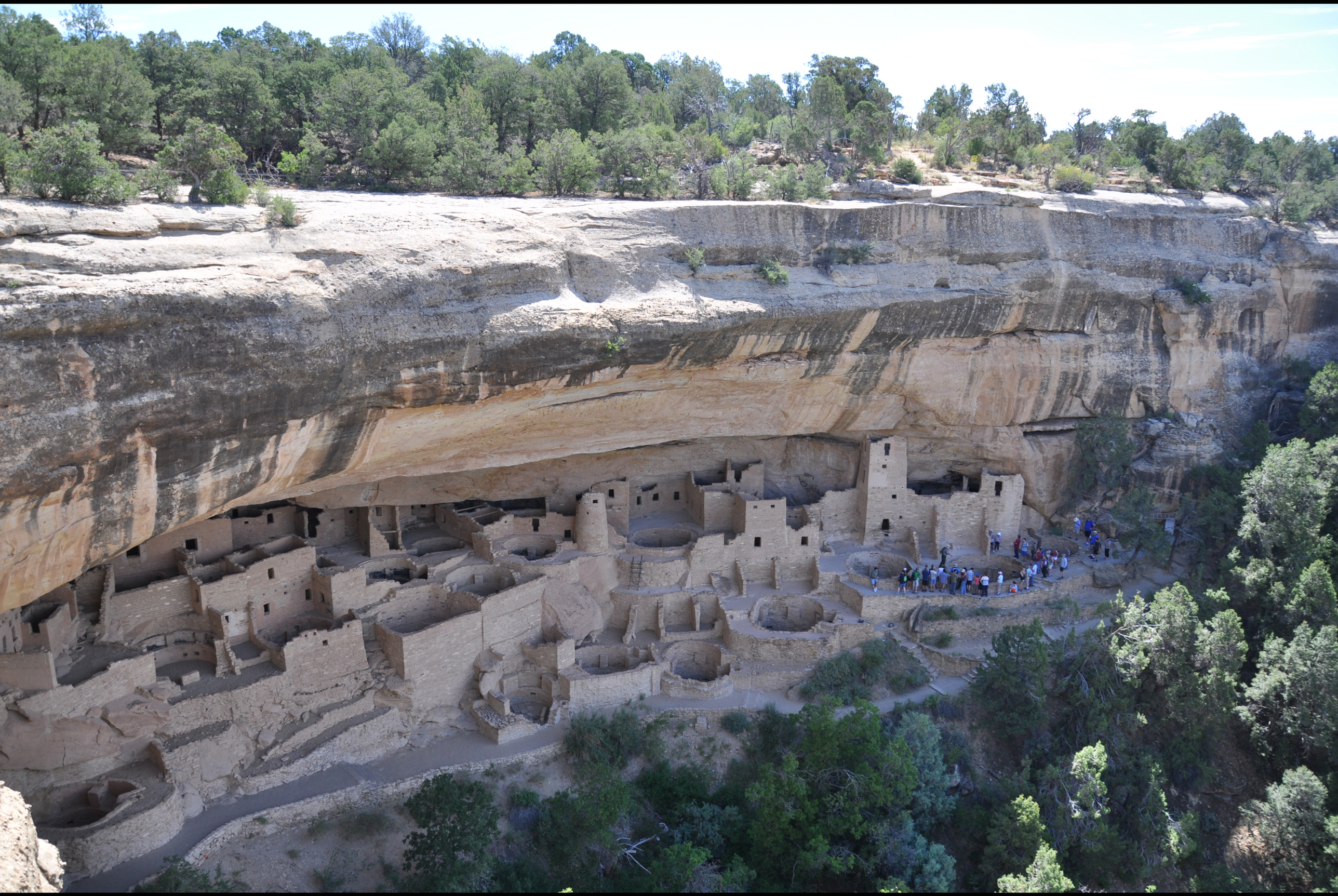
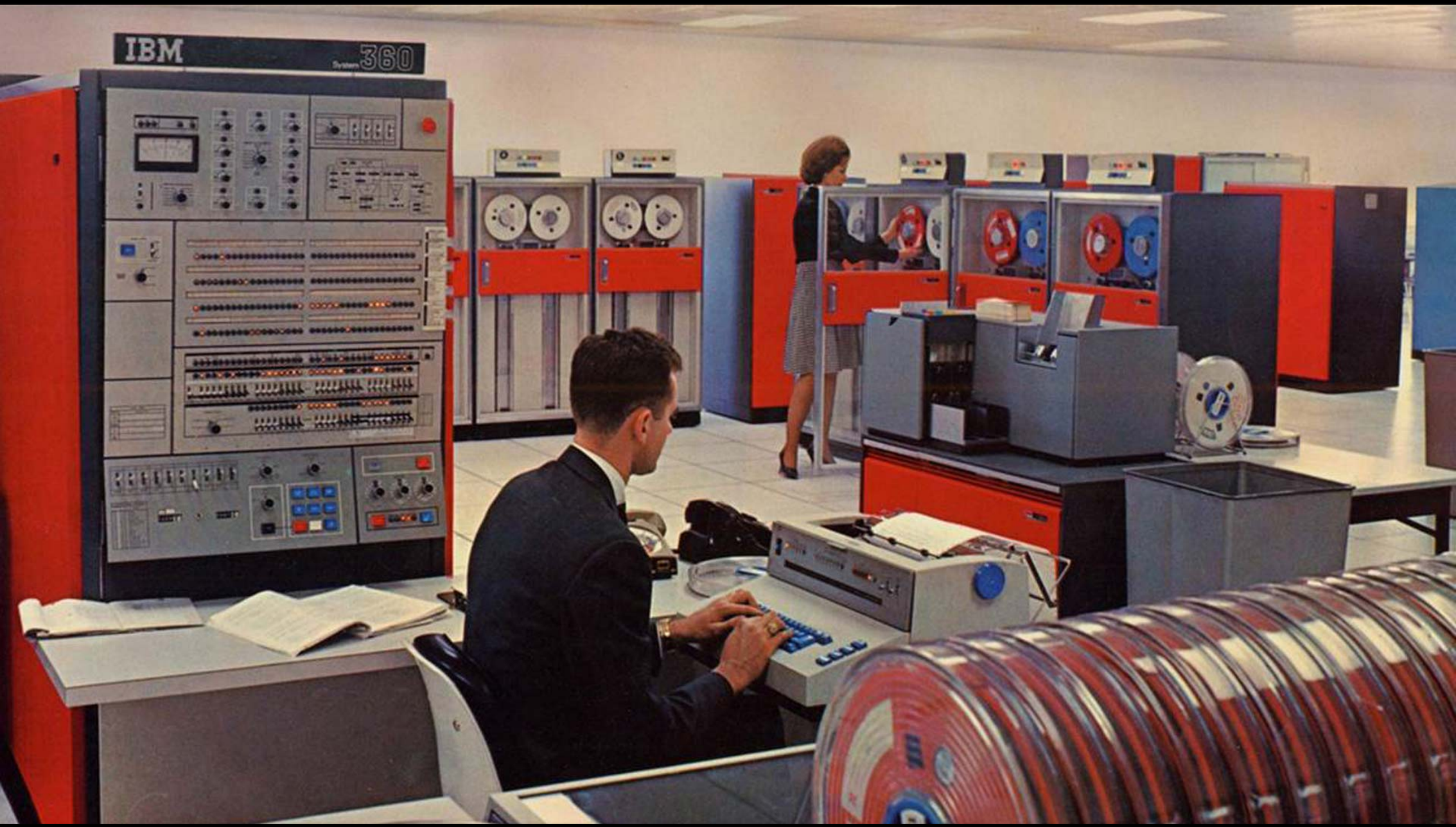
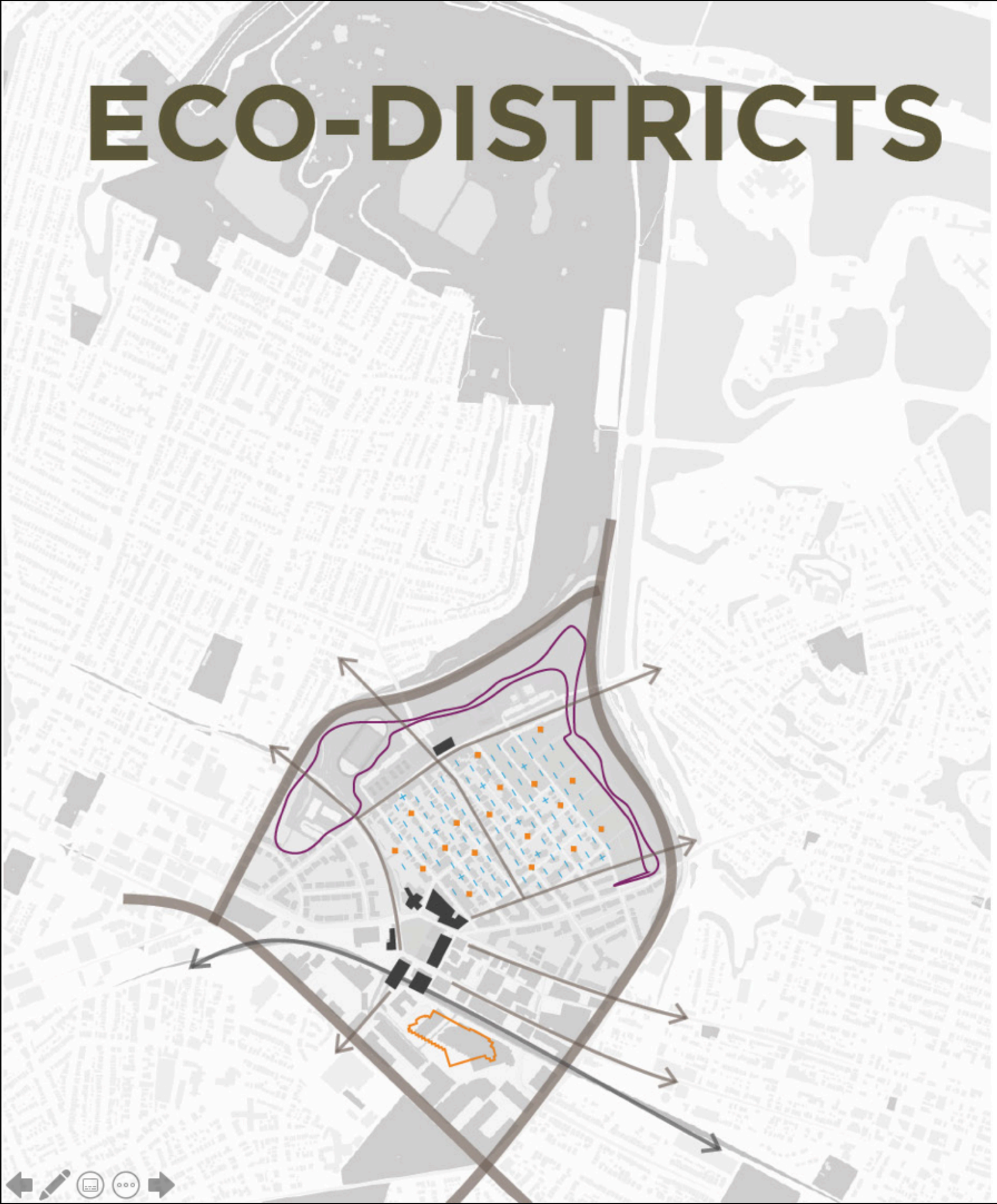



LUBIN & SMA
FLORI
WE TELEGRAPH
W. L.
DOUGLAS SHOES
RITZ


IBM
System 360

"Did management say you could go off the grid?"

ECO-DISTRICTS



Urban design goals typically include the creation of diverse, mixed use, walkable communities, the identification of economic drivers, and improved connectivity.

Ecodistrict planning quantifies system performance, assigns value to ecological processes and promotes social equity in scalar economies.

ENERGY
DIST. GENERATION & ENERGY COOPS
economic driver

WATER
WATER & SEWER DISTRICTS
economic driver

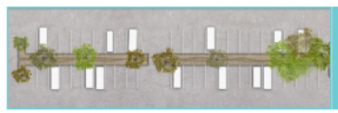
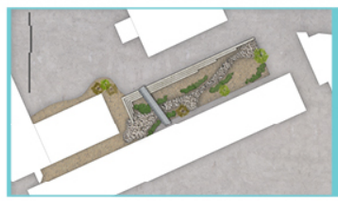
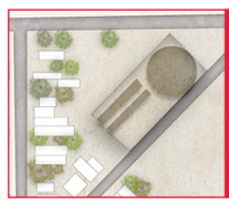
FOOD
URBAN AGRICULTURE
economic driver

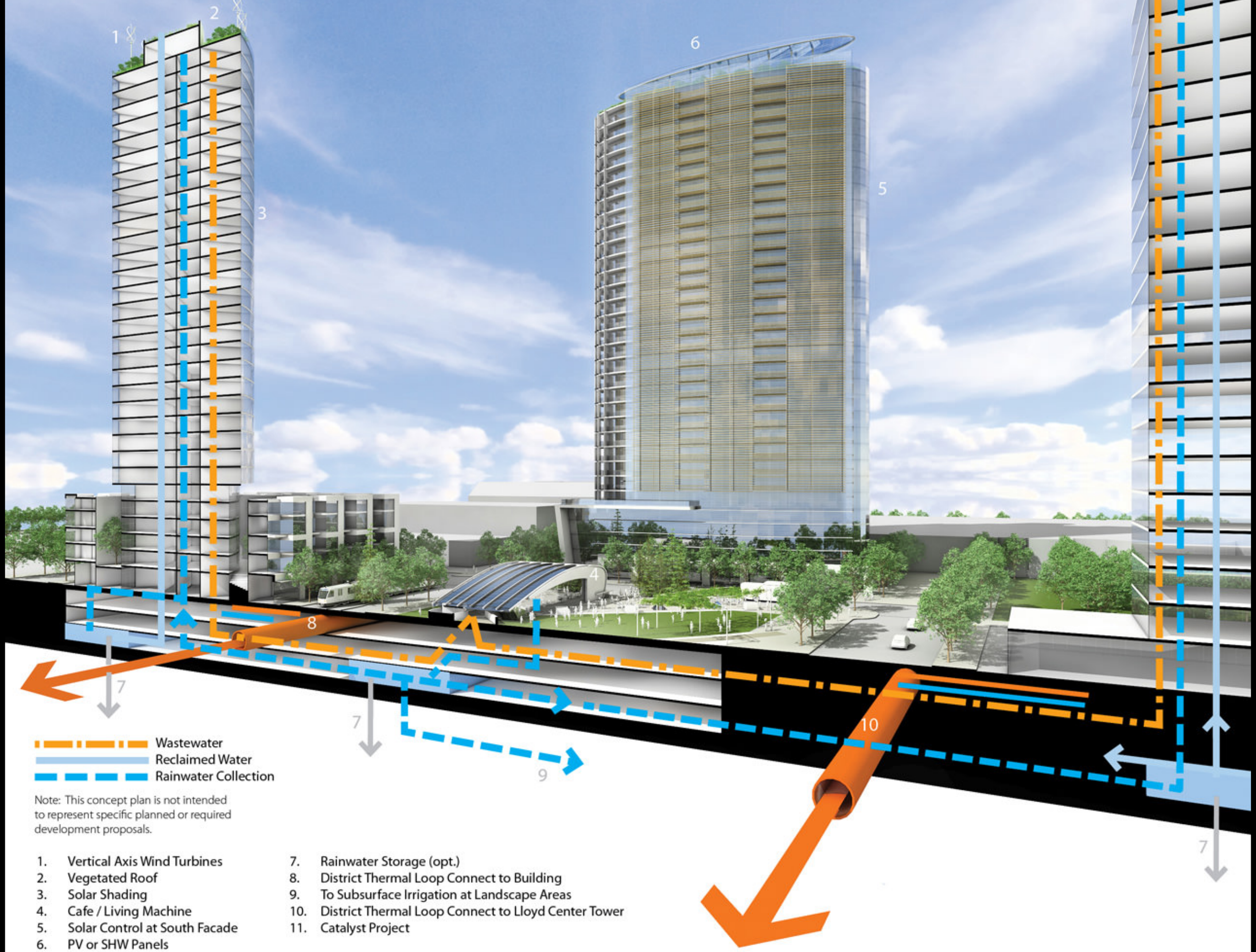
TOOLKIT FOR URBAN REGENERATIVE ENVIRONMENTS | ELENI KATRINI

MSC IN SUSTAINABLE DESIGN CARNEGIE MELLON UNIVERSITY

SUPERVISORS: VIVIAN LOFTNESS, AZIZAN AZIZ, ERICA COCHRAN

CASE STUDY MATRIX

	FOOD PRODUCTION	STORMWATER MANAGEMENT	WASTEWATER TREATMENT	ENERGY from WASTE
0 5 15 0-0.005 acres	 0.003 acres 320 plants	 0.005 acres 4 in/h		
0 10 30 0.02 - 0.1 acres	 0.140 acres 1.12 tons  0.036 acres 1680 plants	 0.300 acres 7 in/h	 0.020 acres 2,000 gpd  0.060 acres 100,000 gpd	
0 30 90 0.1- 1.0 acres	 0.850 acres 40 tons  1.000 acres 3 tons  0.850 acres 7 tons	 0.308 acres 7 in/h	 0.105 acres 30,000 gpd  0.140 acres 52,000 gpd	 0.310 acres annual waste treatment: 5,000 tons annual biogas: 5,860 mmBtu
0 100 300 1.0-10.0 acres	 4.000 acres 12 tons			 7.900 acres 550,000 tons  3.000 acres annual treatment: 600,000 tons biogas/yr: 235,438 mmBtu



Note: This concept plan is not intended to represent specific planned or required development proposals.

1. Vertical Axis Wind Turbines
2. Vegetated Roof
3. Solar Shading
4. Cafe / Living Machine
5. Solar Control at South Facade
6. PV or SHW Panels
7. Rainwater Storage (opt.)
8. District Thermal Loop Connect to Building
9. To Subsurface Irrigation at Landscape Areas
10. District Thermal Loop Connect to Lloyd Center Tower
11. Catalyst Project

COMMERZBANK HQ

TALLEST TOWER IN EVROPE
AT 53 STOREYS!

HIGH SPEED LIFTS

GREEN AGENDA...

4 STOREY GARDENS

VIEWS OUT OF BUILDING OVER FRANKFURT

VIEWS FROM, TO AND THROUGH THE BUILDING

OUT

VIEWS THRU' BUILDING

IN

PUBLIC SPACE & BASE

SOCIAL SPACE SERVES BANK & COMMUNITY

Eco-District Concept – Millvale

URBAN - FORM

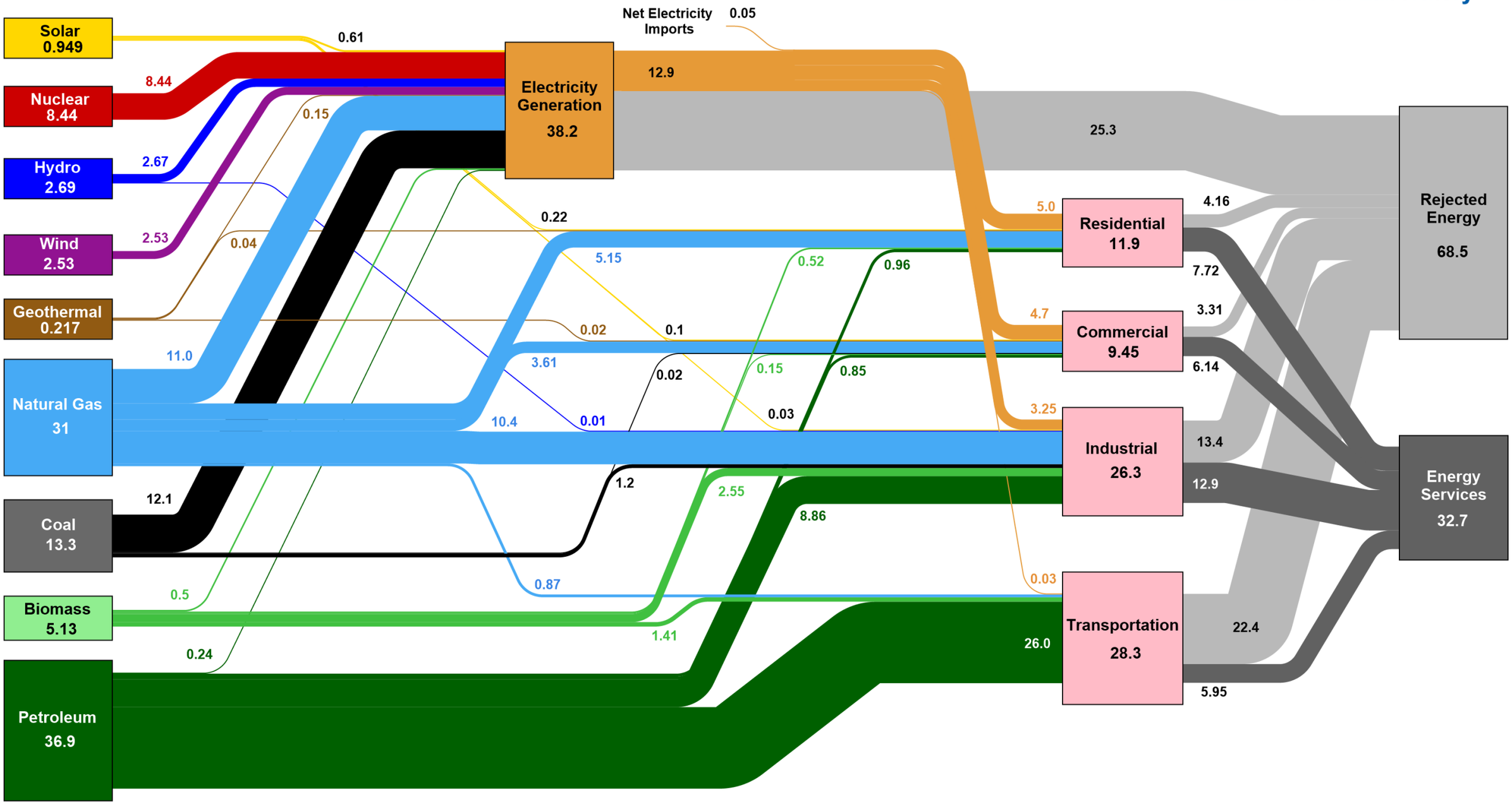
Understanding the Urban Fabric is crucial to analyze any urban environment. The physical relationship between the built up spaces and the open spaces, the connection of the buildings to the street are some to name a few. This would help reinforce the sense of the built environement

Urban Design/ Build Studio – Puriflume

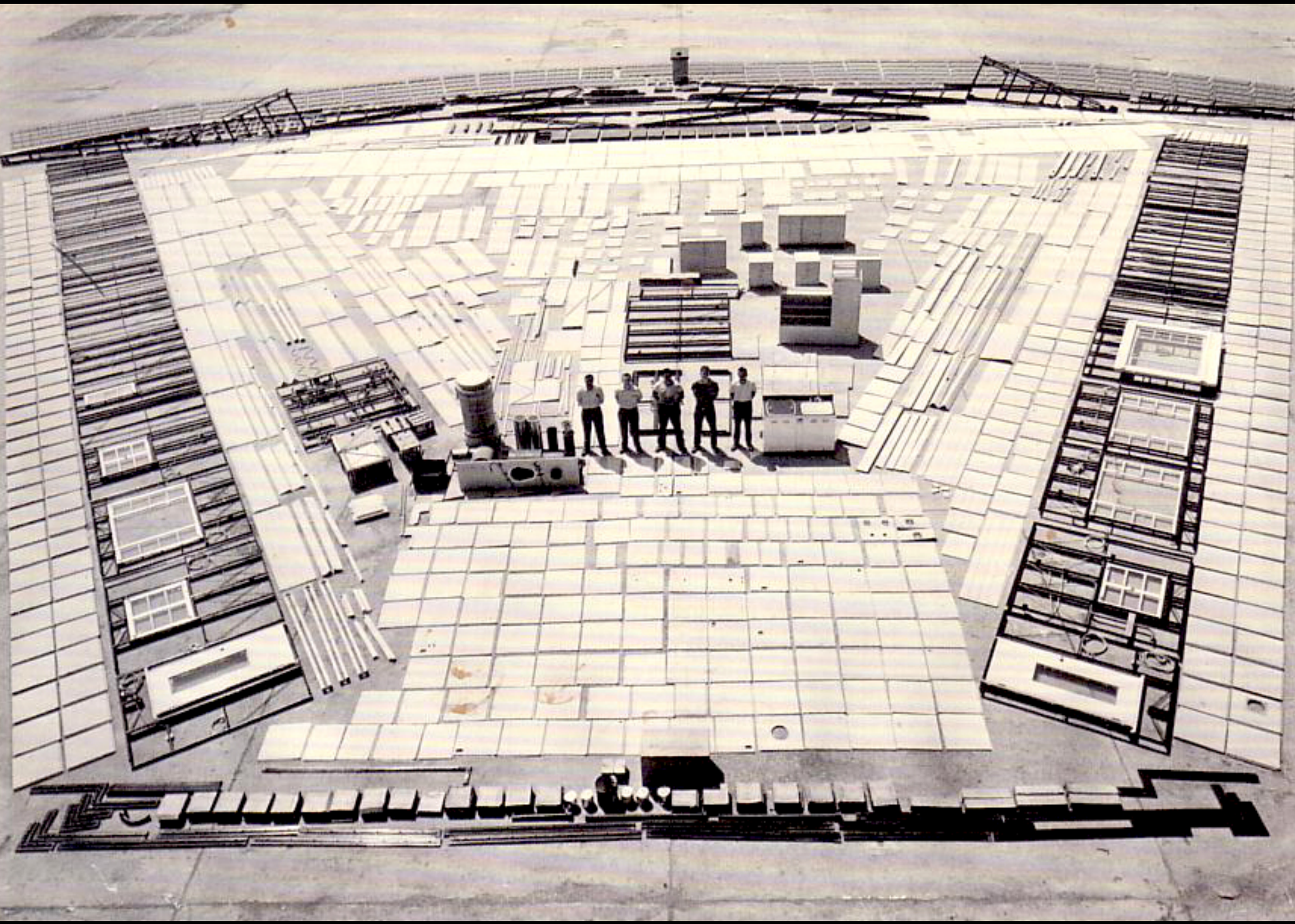
PuriFlume, Urban Design/ Build Studio, Carnegie Mellon SoA, Pittsburgh, PA, USA on Exhibit at the Hong Kong Bienalle

Estimated U.S. Energy Consumption in 2018: 101.2 Quads

Lawrence Livermore National Laboratory



Source: LLNL March, 2019. Data is based on DOE/EIA MER (2018). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 21% for the transportation sector and 49% for the industrial sector, which was updated in 2017 to reflect DOE's analysis of manufacturing. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527



Carnegie Mellon.
SOLAR DECATHLON

The National Mall, Washington, D.C.
October 12-20, 2007

triPOD

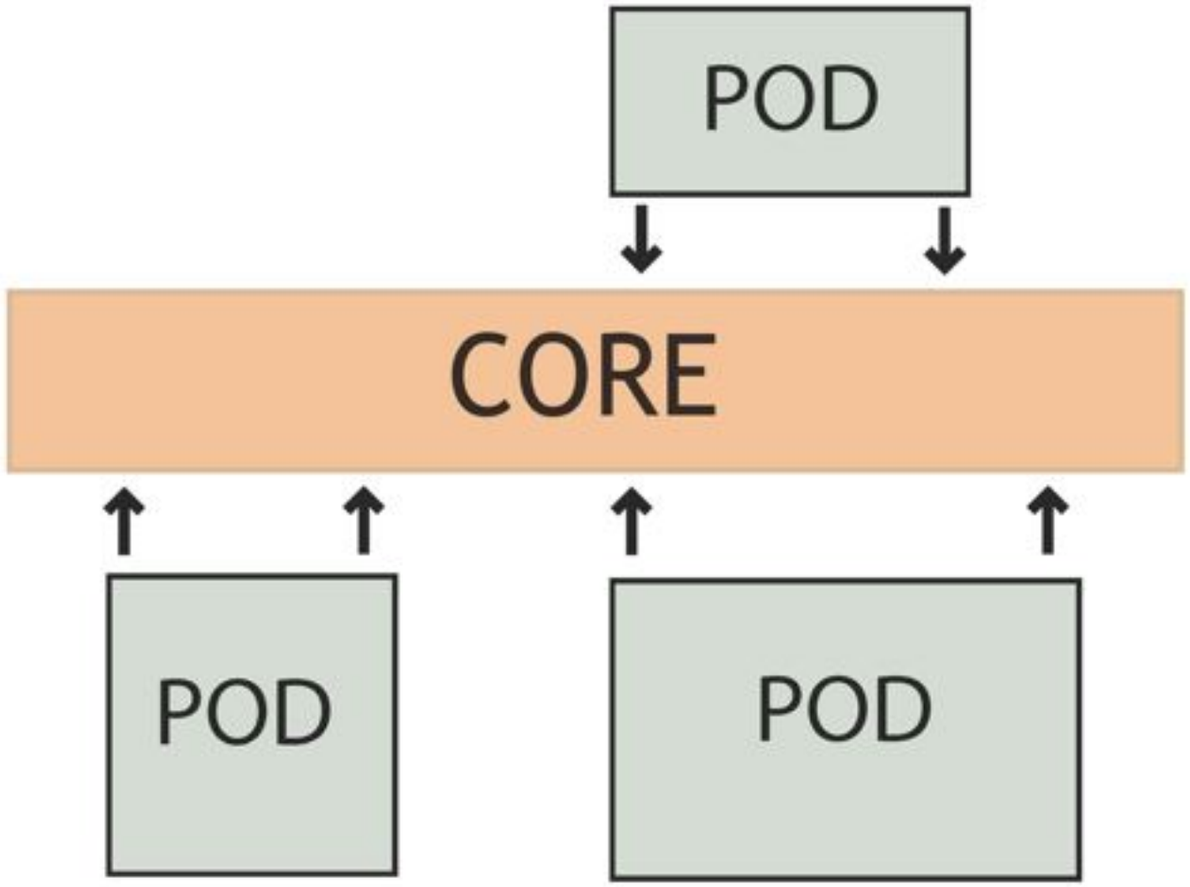
This year, the team will offer an innovative way of looking at sustainable solar design by creating a "Plug n' Play" housing product that employs modularity on a variety of scales, allowing the user to configure and re-configure their home as personal or family needs dictate. All mechanical systems are contained within a central Core which allows for the addition of living spaces or "Pods" to be added or exchanged with infinite possibility. A modular in-wall shelving system, combined with standardized wall, ceiling and floor panels allows the inhabitant to customize the interior.

For the competition, we have designed TriPOD, an 800 ft2 home for two. As the name indicates, this model has three Pods: Kitchen, Bedroom and Live/Work space. Meanwhile, the Core houses all the home's utilities, including a Bathroom and a laundry closet. Our design also seeks to blend indoor and outdoor spaces, showcasing a Greenscape to the north and a Courtyard to the south.

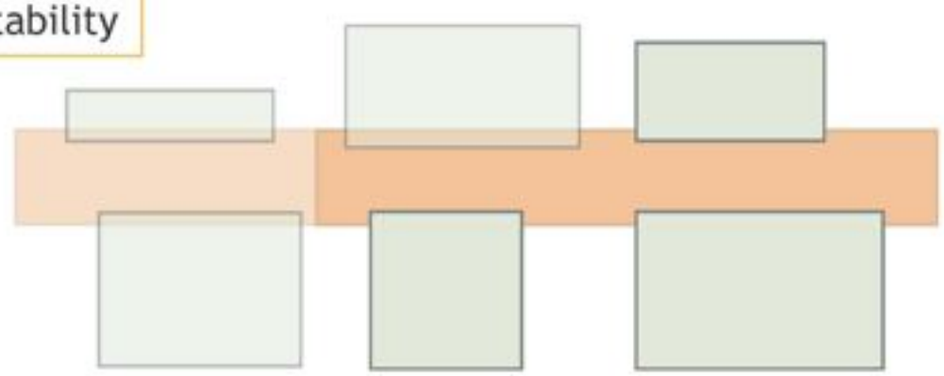
Solar Decathlon is a US Department of Energy sponsored competition that challenges collegiate teams to design and build a solar-powered house. In October of 2007 each of the twenty teams will bring their entry to Washington D.C. where they will compete in a week-long competition. As a third time entrant, we look forward to pushing the envelope even further with this year's "Plug n' Play" modular housing system.

Plug n' Play

- Modularity
- Flexibility
- Individual Adaptability



Future Adaptability

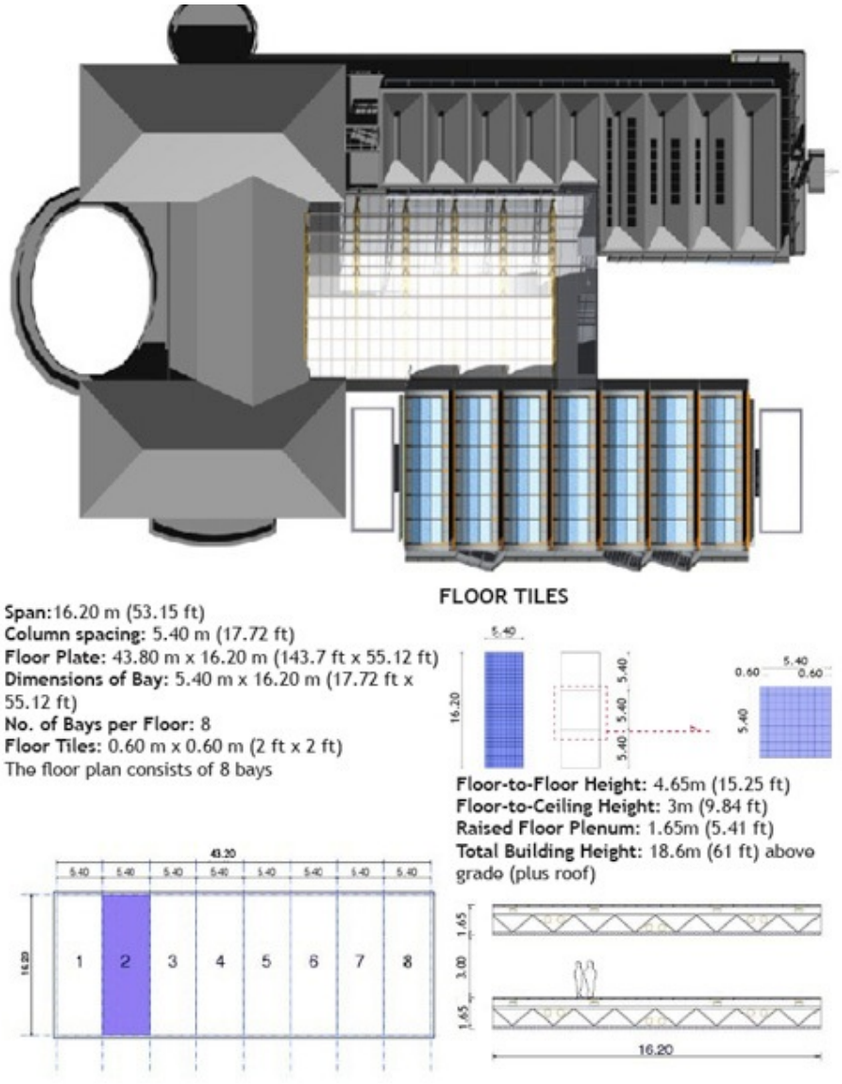


Carnegie Mellon SOLAR DECATHLON

Solar Decathlon 2007, SoA, Carnegie Mellon, Pittsburgh, PA, USA

Solar Decathlon 2005, SoA, Carnegie Mellon, Pittsburgh, PA, USA

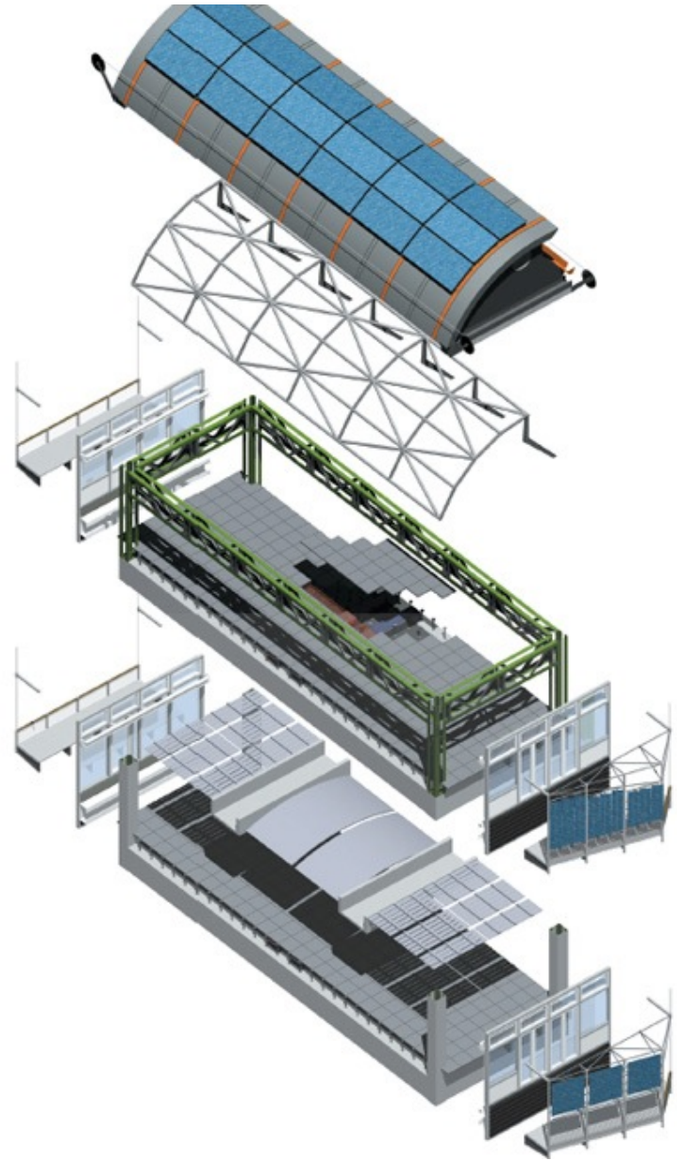
Systems Integration in the MMX



FLOOR TILES

Span: 16.20 m (53.15 ft)
Column spacing: 5.40 m (17.72 ft)
Floor Plate: 43.80 m x 16.20 m (143.7 ft x 55.12 ft)
Dimensions of Bay: 5.40 m x 16.20 m (17.72 ft x 55.12 ft)
No. of Bays per Floor: 8
Floor Tiles: 0.60 m x 0.60 m (2 ft x 2 ft)
The floor plan consists of 8 bays

Floor-to-Floor Height: 4.65m (15.25 ft)
Floor-to-Ceiling Height: 3m (9.84 ft)
Raised Floor Plenum: 1.65m (5.41 ft)
Total Building Height: 18.6m (61 ft) above grade (plus roof)

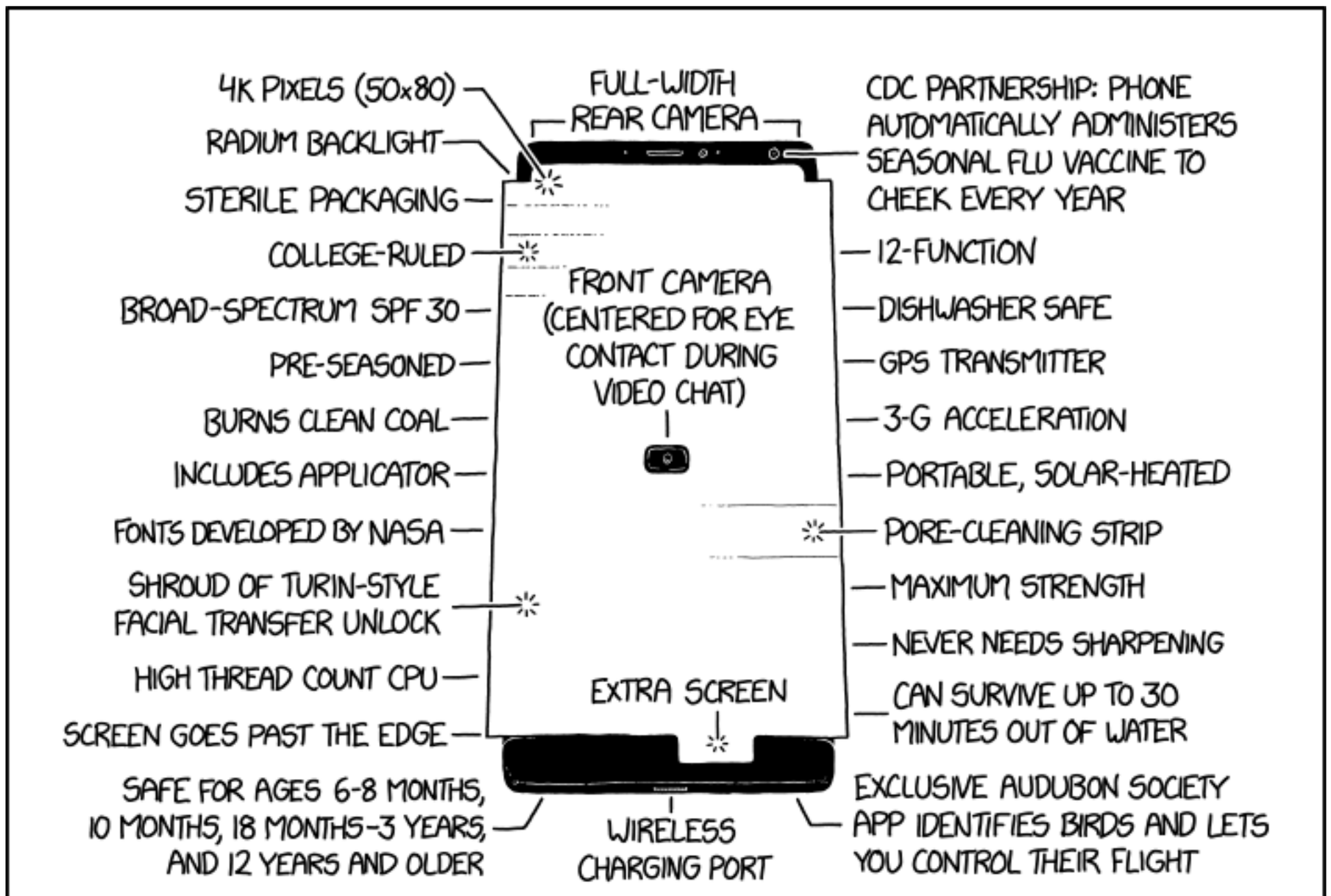


Carnegie Mellon University

Phipps Center for Sustainable Landscapes, Pittsburgh, PA, USA

Phipps Center for Sustainable Landscapes

Denmarsh Photography Inc.

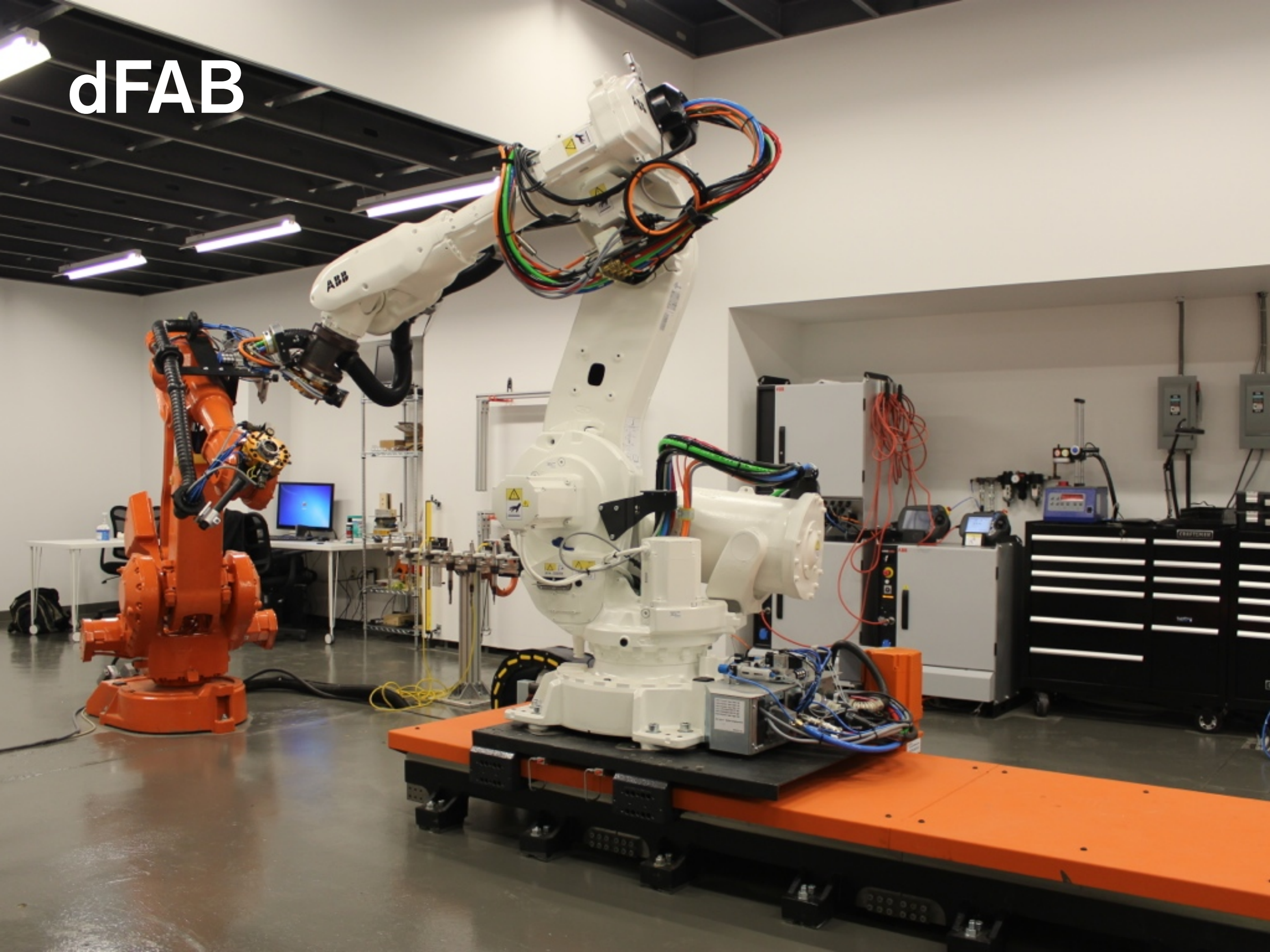


INTRODUCING

THE XKCD PHONE 6, VIII, 10, X, 26, AND 1876

WE DIDN'T START THIS NONCONSECUTIVE VERSION NUMBER WAR, BUT WE WILL NOT LOSE IT.™®©°

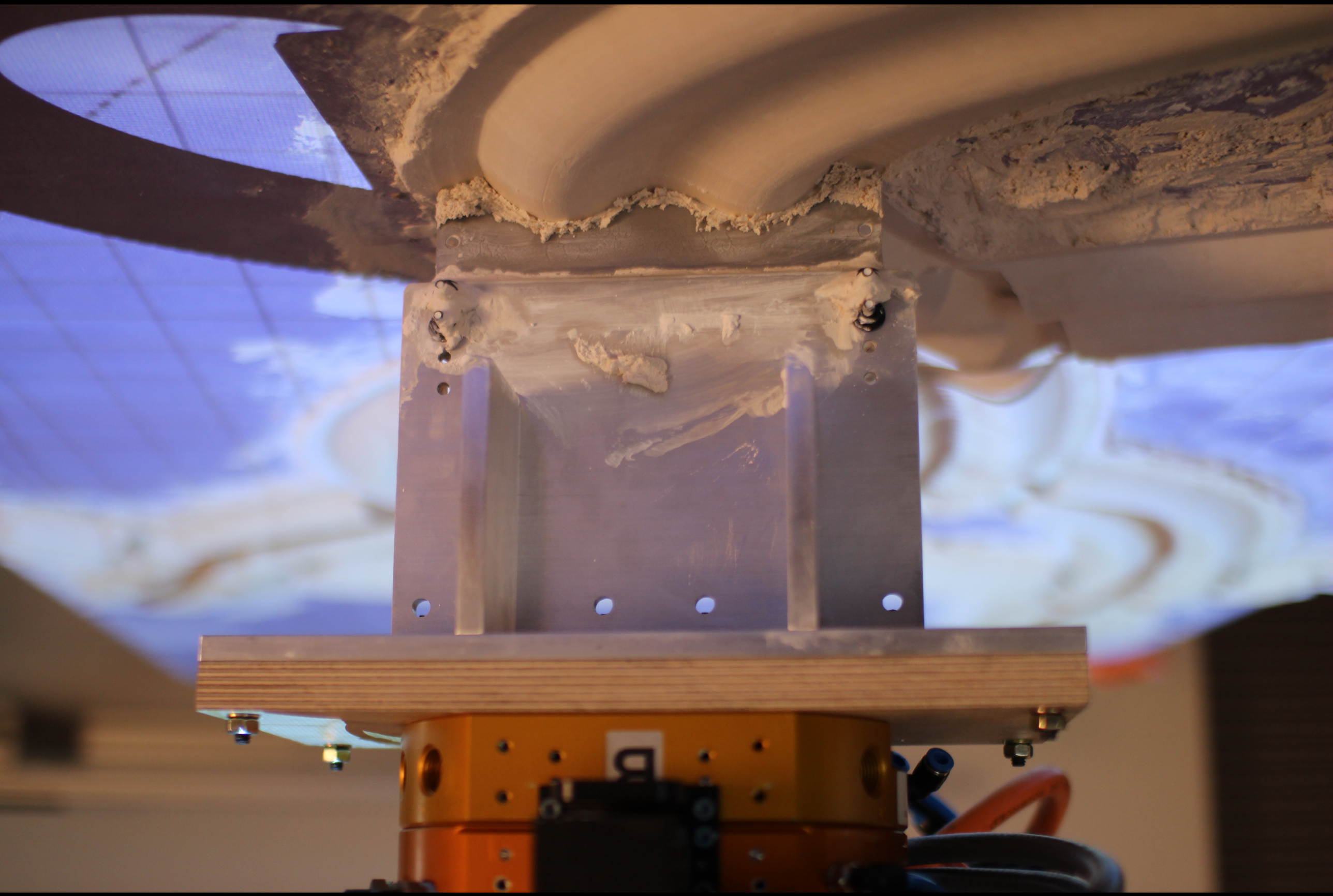
dFAB



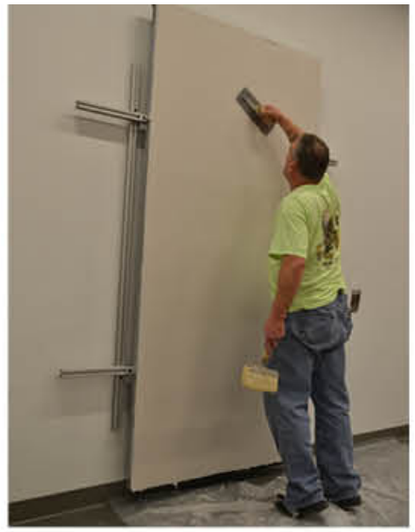
dFAB

the second in a series called HACLab
that invites you to take part in the
conversation, provide feedback, and
experiment with us as we explore the
significance of the Hall of Architecture
in the 21st century.

#cmoacopypaste














ROBOTIC PLASTERING

In the face of shrinking labor forces robots will function in on and off-site construction


EXIT
4X4
CHEVROLET
SILVERADO



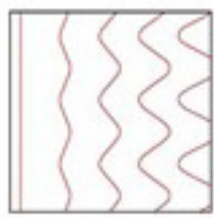


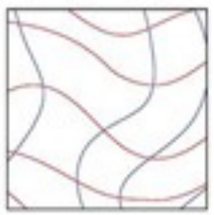






ABB



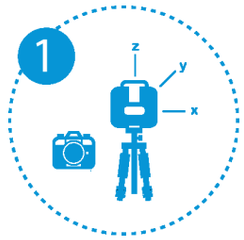


AUGUST WILSON HOUSE

CULTURAL CONSTRUCTION

REALITY COMPUTING

Reality Computing is an emerging field of technology concerned with the **translation of information between physical and digital environments**. Using capture technologies such as **photogrammetry** or **terrestrial/aerial LiDAR scanning**, objects in the physical world can be brought into digital workflows for manipulation/analysis via computational and/or modeling softwares. Experiential technologies including **virtual/augmented reality** and digital fabrication methods such as **3D-printing** and **CNC-milling** can then be used to deliver results back to the physical world. The CULTURAL CONSTRUCTION Studio utilized the August Wilson House as a test-case for developing **innovative applications of Reality Computing technologies for enhancing the efficacy of Historic Preservation**.



CAPTURE

Digitally capture the physical world.

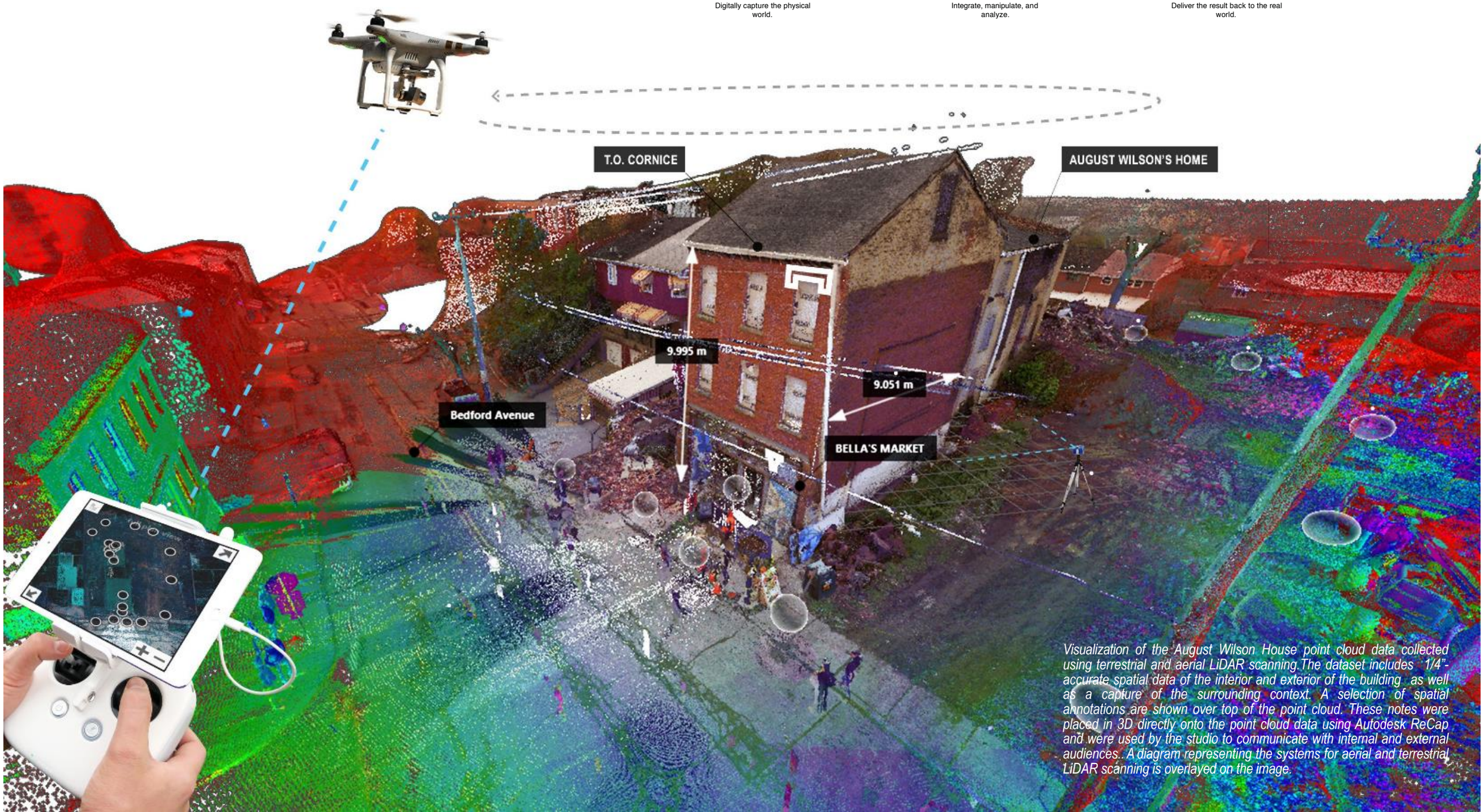
COMPUTE

Integrate, manipulate, and analyze.

CREATE

Deliver the result back to the real world.

Graphics and info courtesy ofAutodesk.



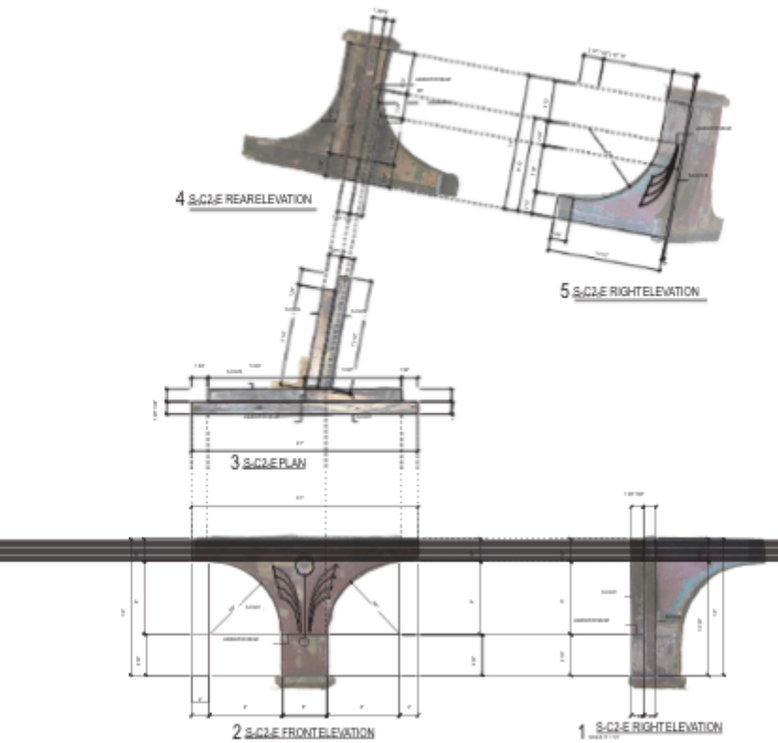
Visualization of the August Wilson House point cloud data collected using terrestrial and aerial LiDAR scanning.The dataset includes 1/4"-accurate spatial data of the interior and exterior of the building as well as a capture of the surrounding context. A selection of spatial annotations are shown over top of the point cloud. These notes were placed in 3D directly onto the point cloud data using Autodesk ReCap and were used by the studio to communicate with internal and external audiences.. A diagram representing the systems for aerial and terrestrial LiDAR scanning is overlayed on the image.

COMPUTE

Using **Photogrammetry** and reality computing software **Autodesk ReMake**, **3D meshes of existing artifacts** were generated and **analyzed digitally** to facilitate reproduction. Working over top of true orthographic views of the object allowed for precise geometric delineation and eliminated time and labor required to measure and record every facet of the object via traditional methods.

Front view of colonnette capital 3D-mesh

Rear view of colonnette capital 3D-mesh



(Left) The 3D mesh allowed for true orthographic views of the artifact to be taken from any angle. Analytical drawings were then executed over top of the orthographic views to reconstruct the precise geometry of the artifact.

3D-MESH

Detail image of colonnette capital 3D mesh generated using photogrammetry. The mesh model was analyzed digitally and used to facilitate reconstruction.


DEWALT

MODE 3: PRE-FABRICATION

Programs

- Bachelor of Arts in Architecture
- Bachelor of Architecture
- Minors for SoA Students:

  Architectural Design Fabrication, Architectural History, Architectural Representation & Visualization, Building Science Integrative Design, Arts, and Technology (IDeATe)

- Accelerated Masters Program (AMP)
- Studio–based Masters Programs (3)

  Advanced Architectural Design, Urban Design, M.Arch (F17)

Carnegie Mellon University

Programs

- Master of Science Programs (4)

  AECM, Building Performance & Diagnostics, Sustainable Design, Computational Design

- PhD Programs (3)

AECM,
Building Performance & Diagnostics,
Computational Design

Carnegie Mellon University

What traits will help make you be successful??

- From Slee (& Google):

Curiosity,
Emergent leadership,
Ownership &
Humility

Basic skills are assumed, but not “expertise”

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