

Agenda

01

Polemics & Diagrams

02

**Why Buildings are Different
Case Study in Building Design**

03

**Robots Don't Have
Feelings (Yet)**

-OR-

**Our Clients Are Not
Robots (Yet)**

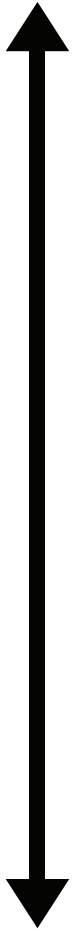
01

Polemics

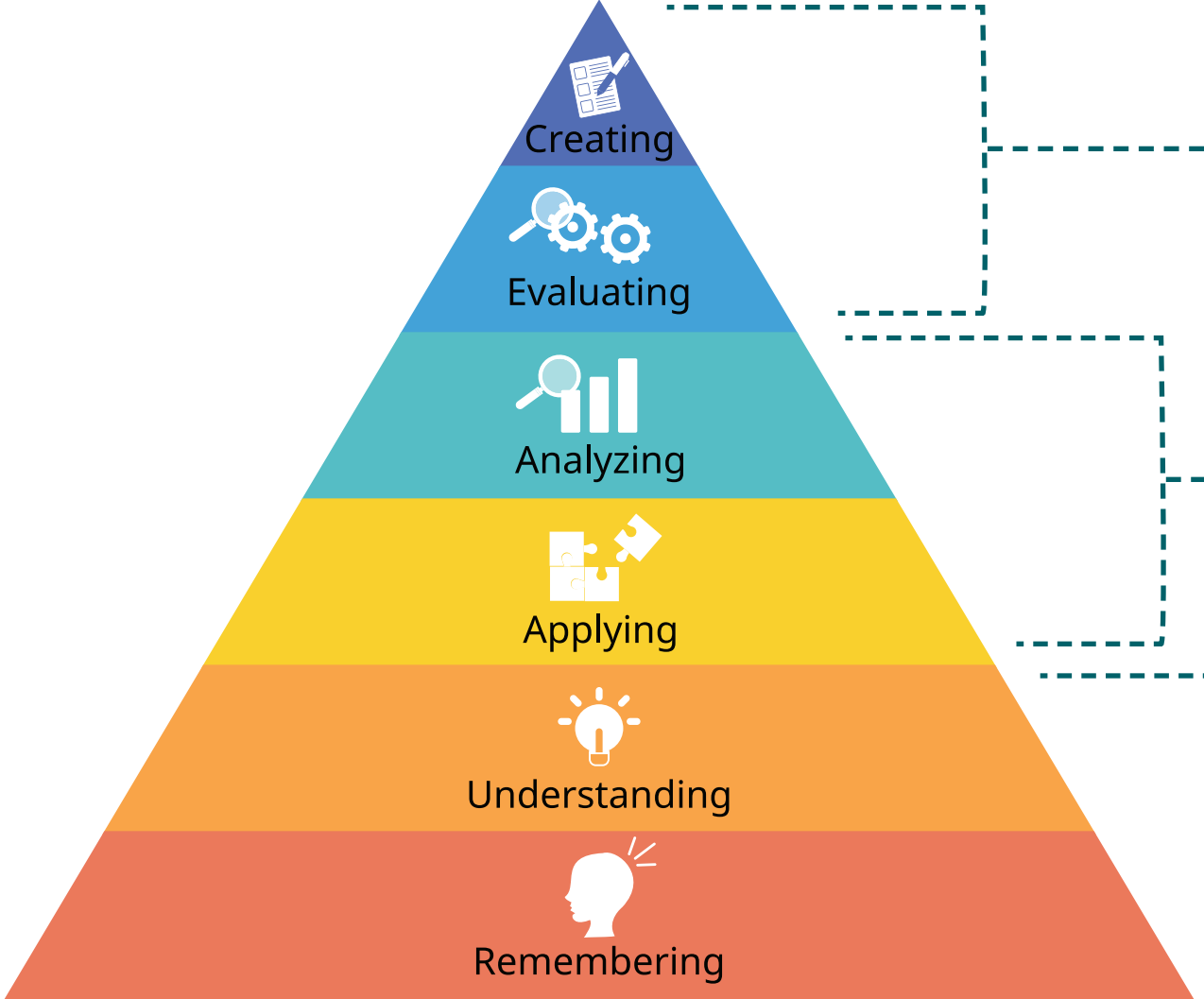
A Few Polemics About AI in Architecture and Engineering

Bloom's Taxonomy

Higher Order Thinking



Lower Order Thinking



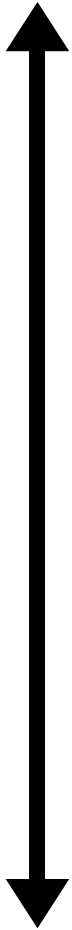
Create and Choose

Synthesize and Connect

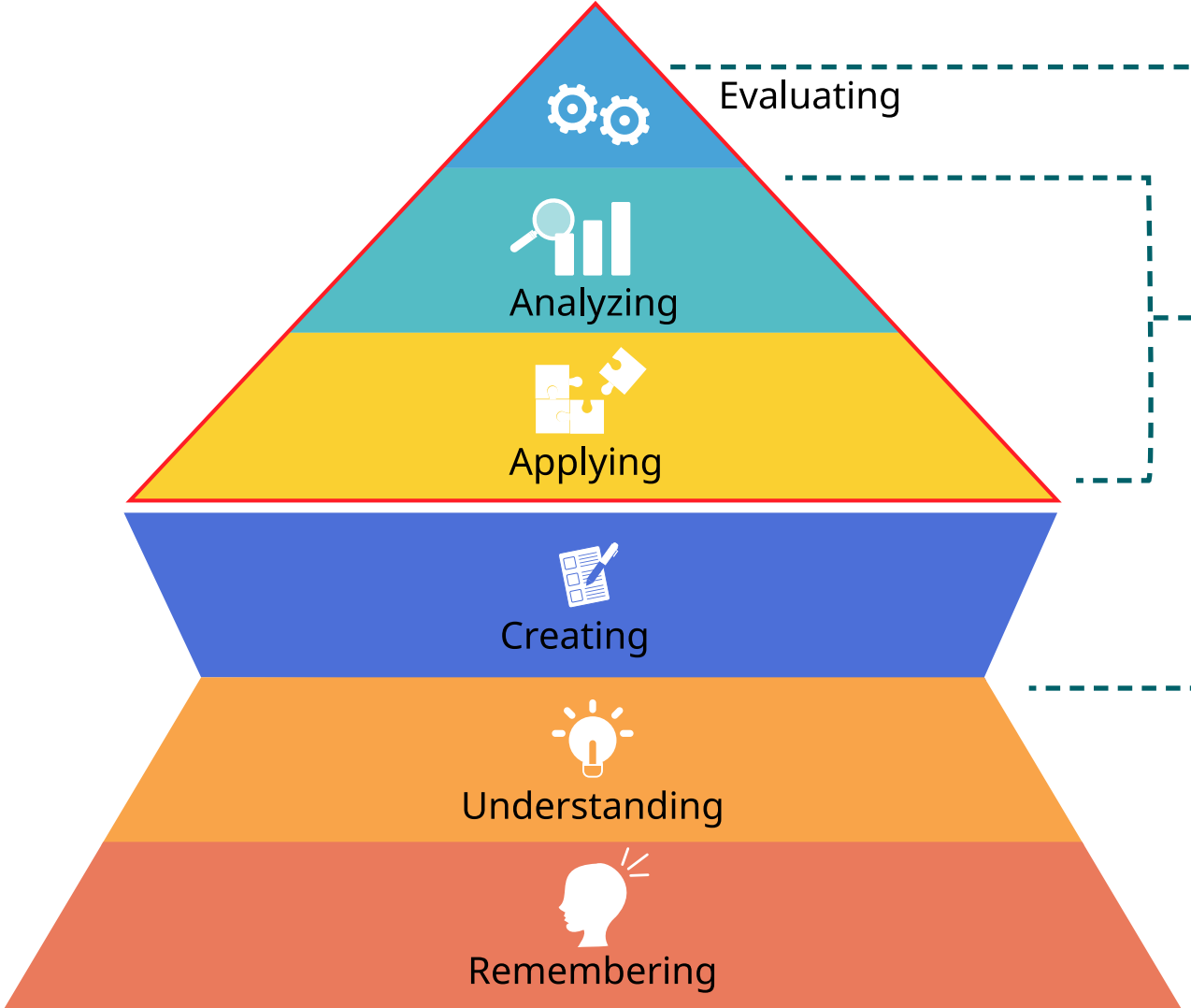
Recall and Explain

Early Design Automation and AI On the Market Now

Higher Order Thinking



Lower Order Thinking



Final Choice

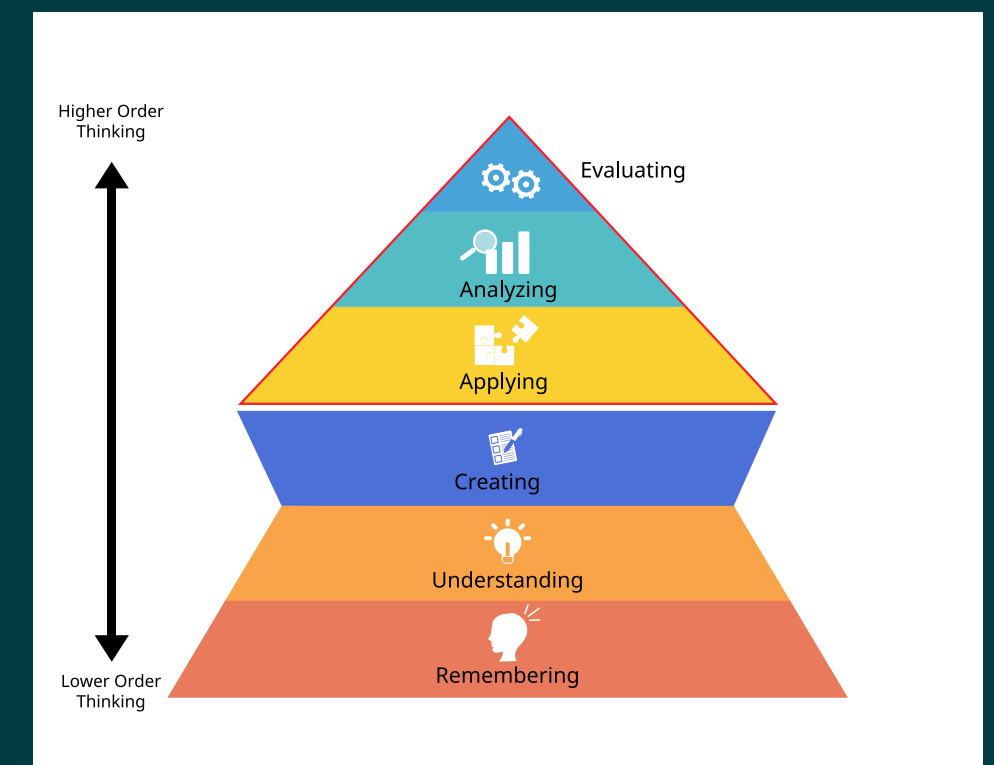
Synthesize and Connect

Create / Make

Recall and Explain



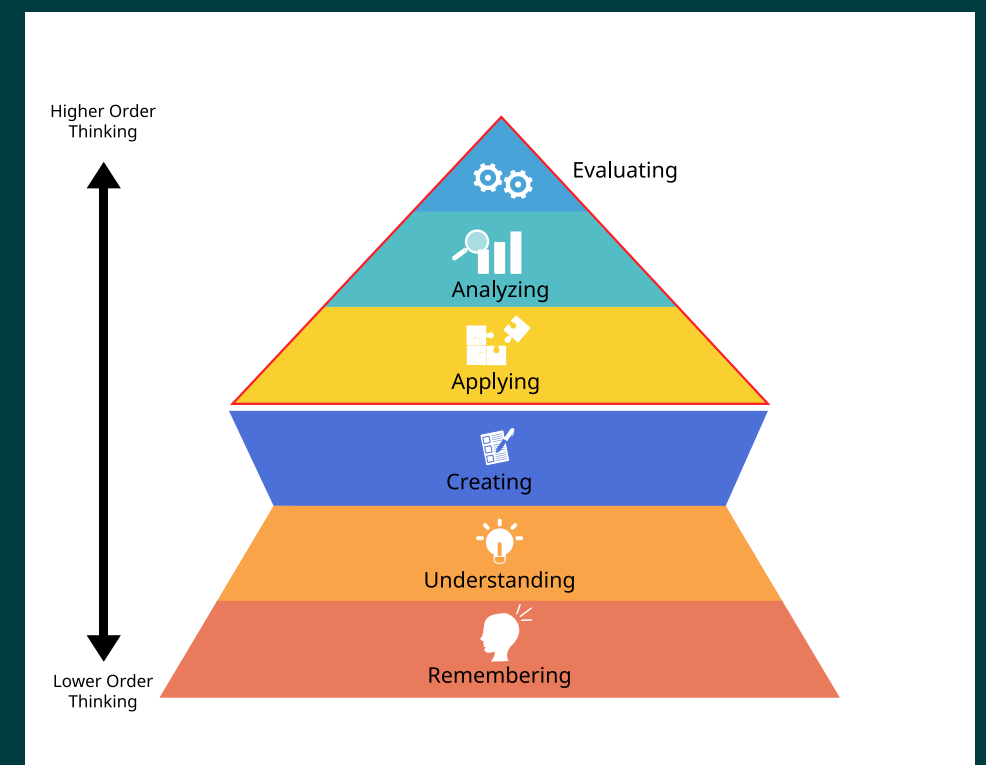
ACEC 12-2023
An old travel poster in a vintage style for Acadia National Park. The poster features classic elements like bold and stylized text reading Visit Acadia National Park

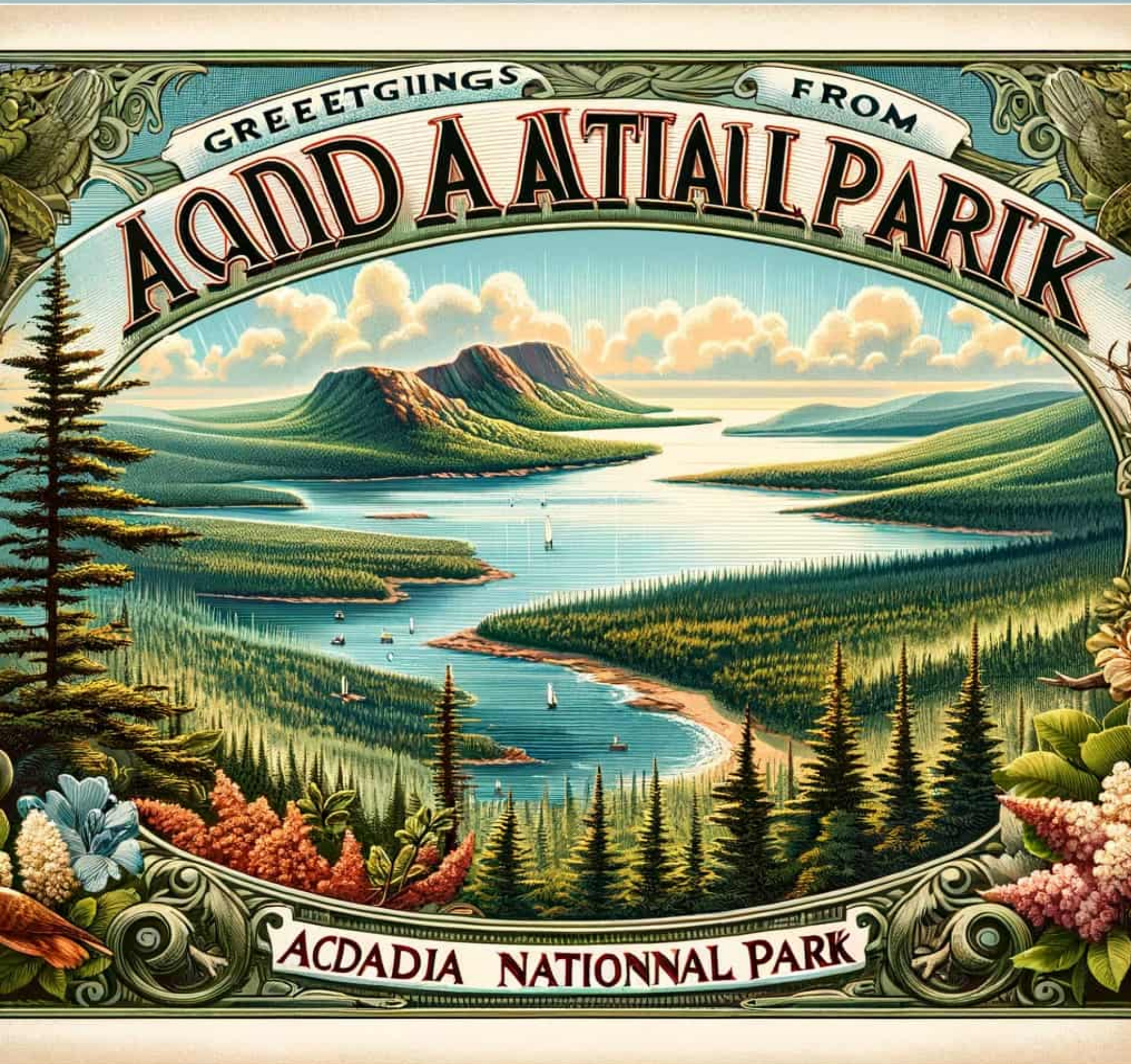




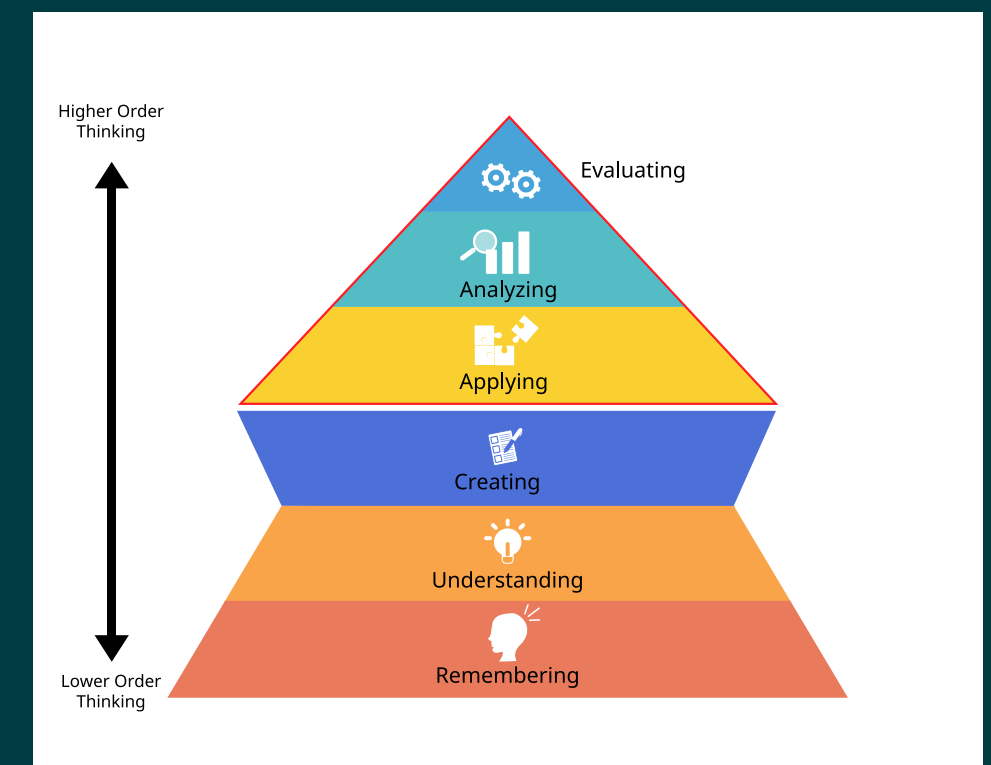
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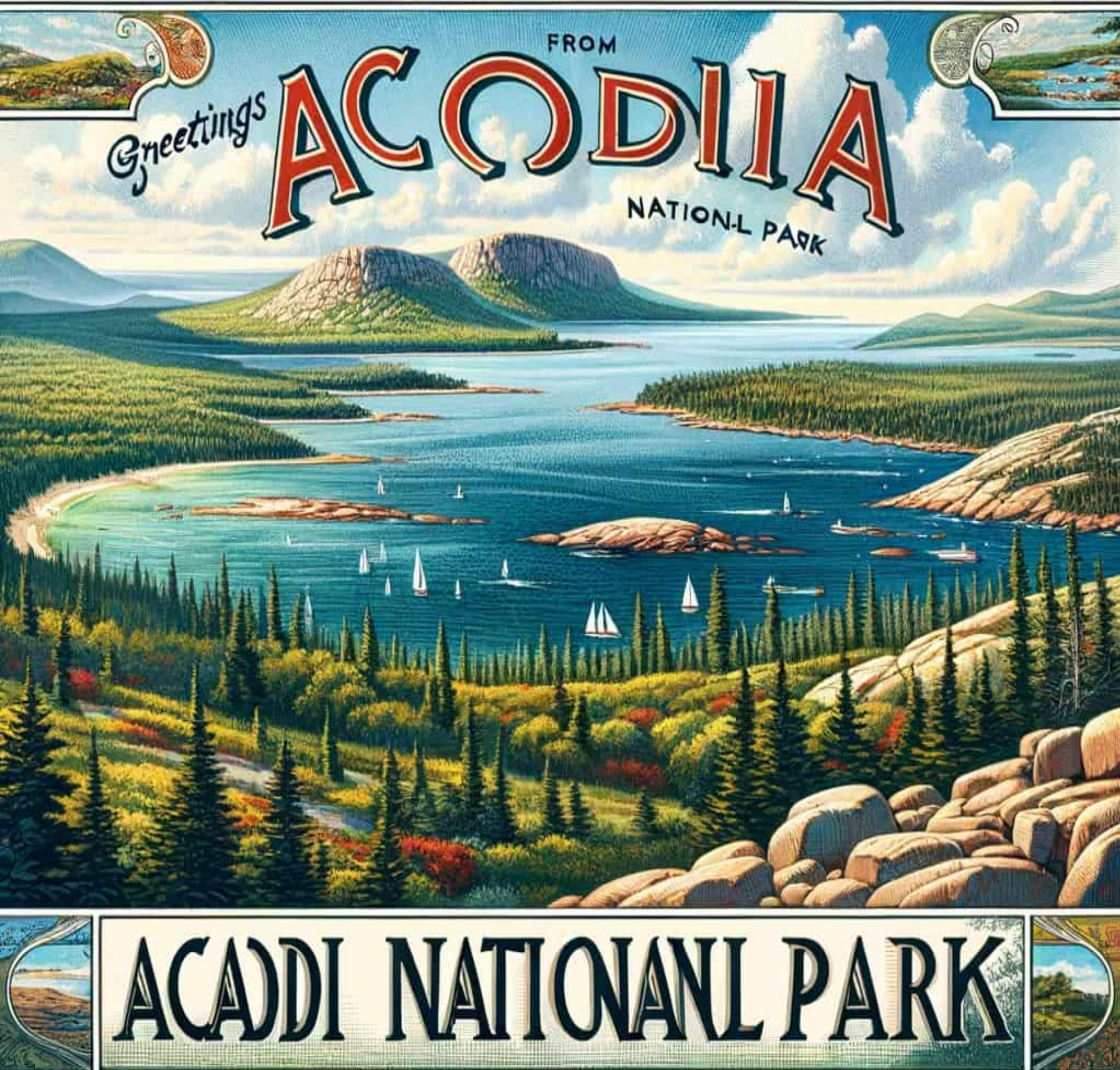
ACEC 12-2023



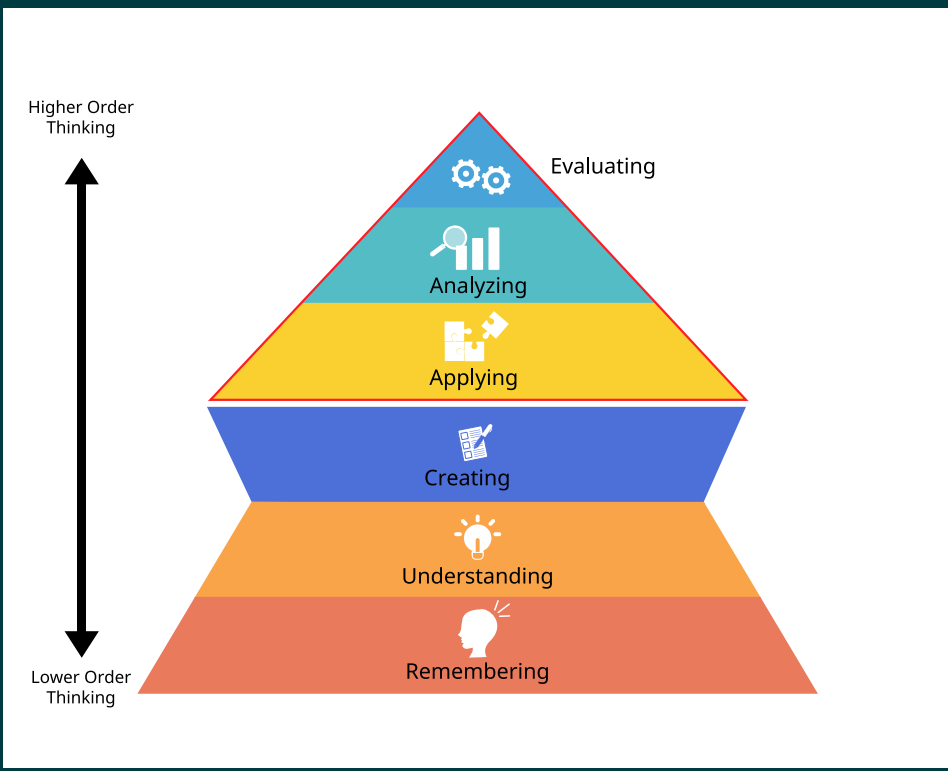


Create a full-sized postcard featuring Acadia National Park. The postcard should display a panoramic view of the park, combining elements like the iconic coastline with stylized text reading Greetings From Acadia National Park

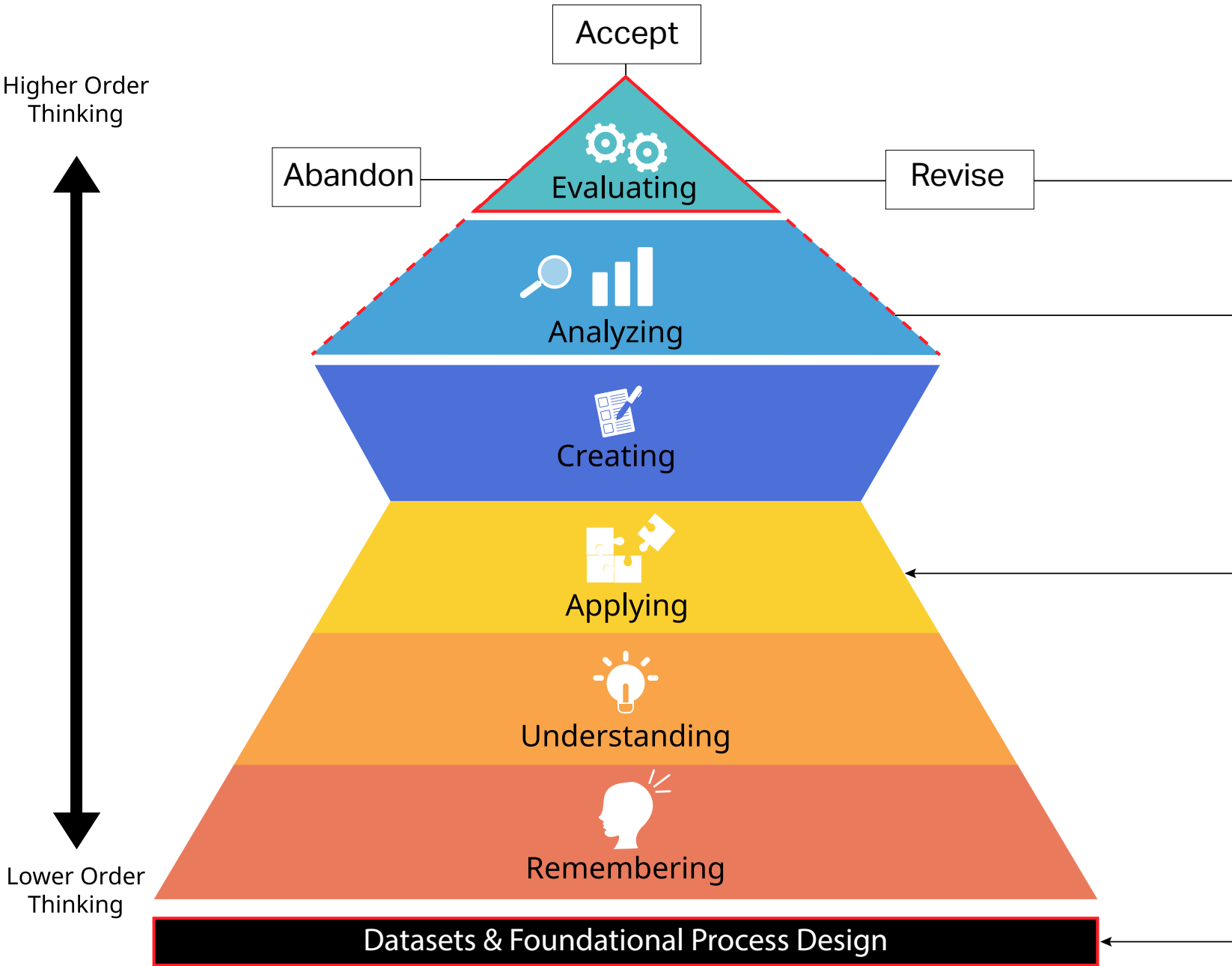




featuring Acadia National Park. The postcard should display a panoramic view of the park, combining elements like the iconic coastline with stylized text reading Greetings From Acadia National Park Correct Spelling



Current State of Automation and AI Bespoke Solutions 2022



Final Choice

Analyze

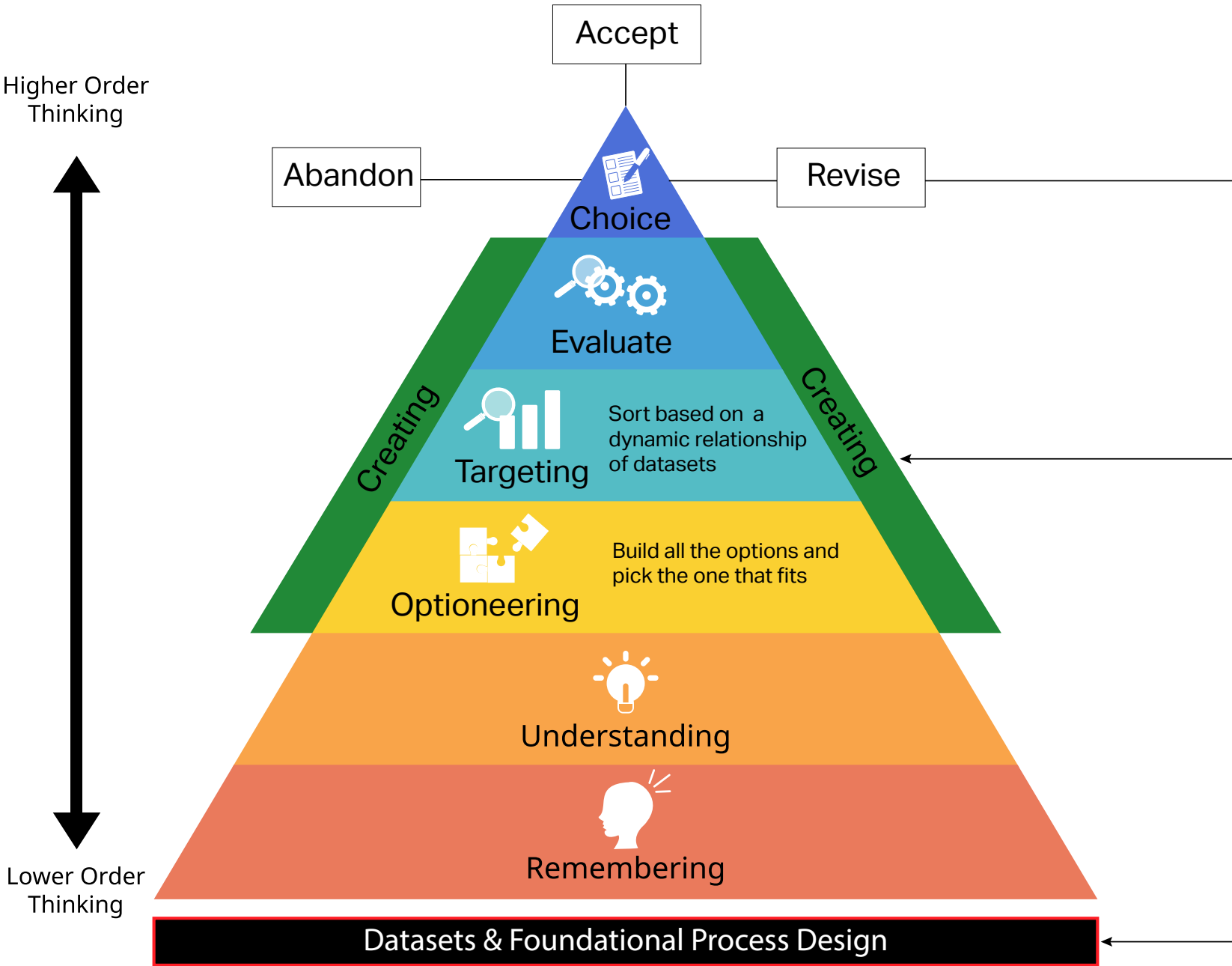
Create / Make

Synthesize and Connect

Recall and Explain

Well Designed Strategy

Current State of Automation and AI Bespoke Solutions 2023



Final Choice

Analyzing

Targeting

Optioneering

Recall and Explain

Well Designed Strategy

02

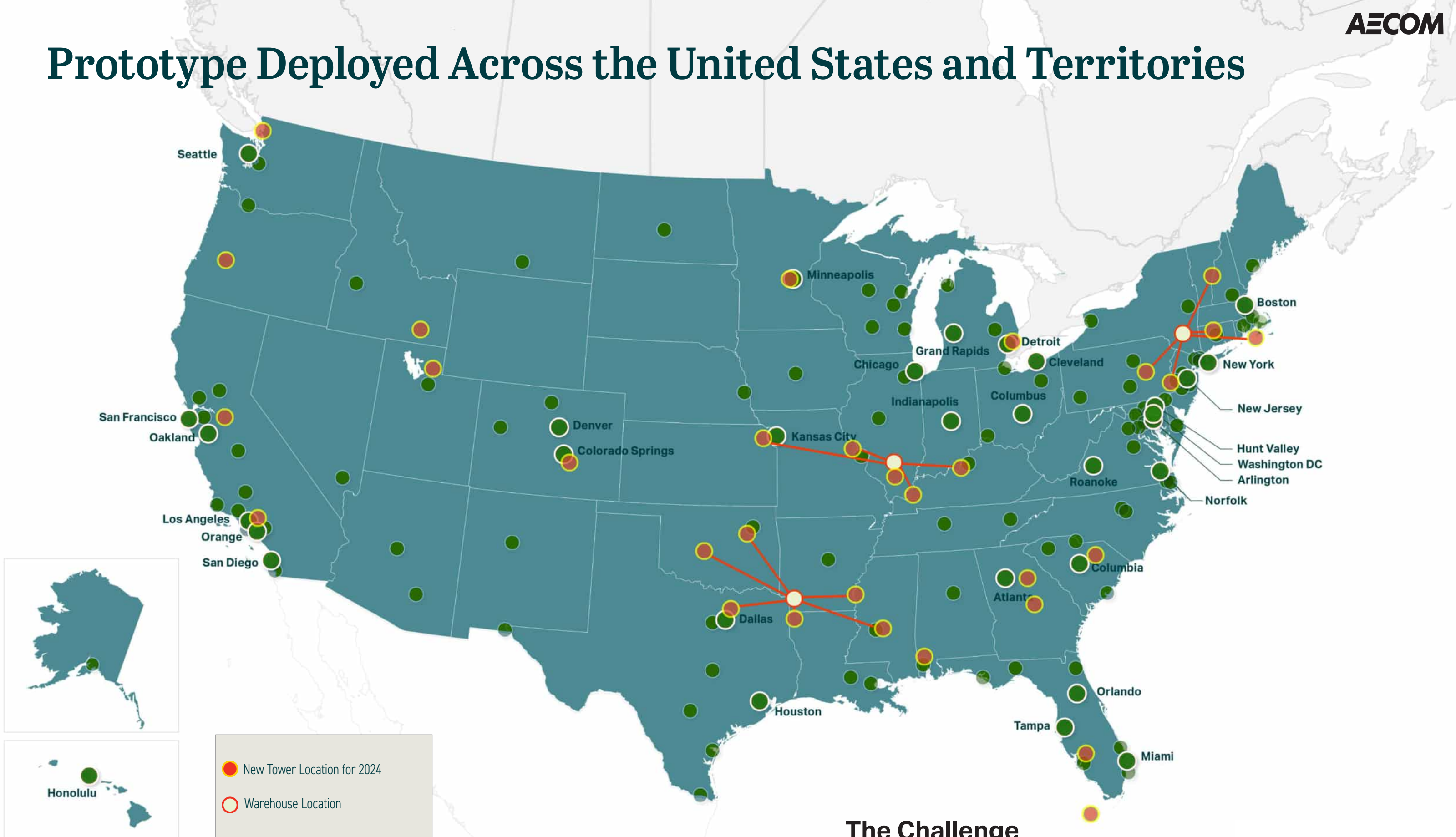
Case Study In Building Design

FAA TOWER OF THE FUTURE COMPETITION



**The Problem:
The FAA has more than 100
aging control towers that
need to be replaced**

Prototype Deployed Across the United States and Territories



The Challenge

Adaptable, Maintainable, Mass Produced, Sustainable

From Sea



To Shining Sea



**Postage Stamp Sites
Different Climates
Different Heights**

**One Tower,
Immense Variability**



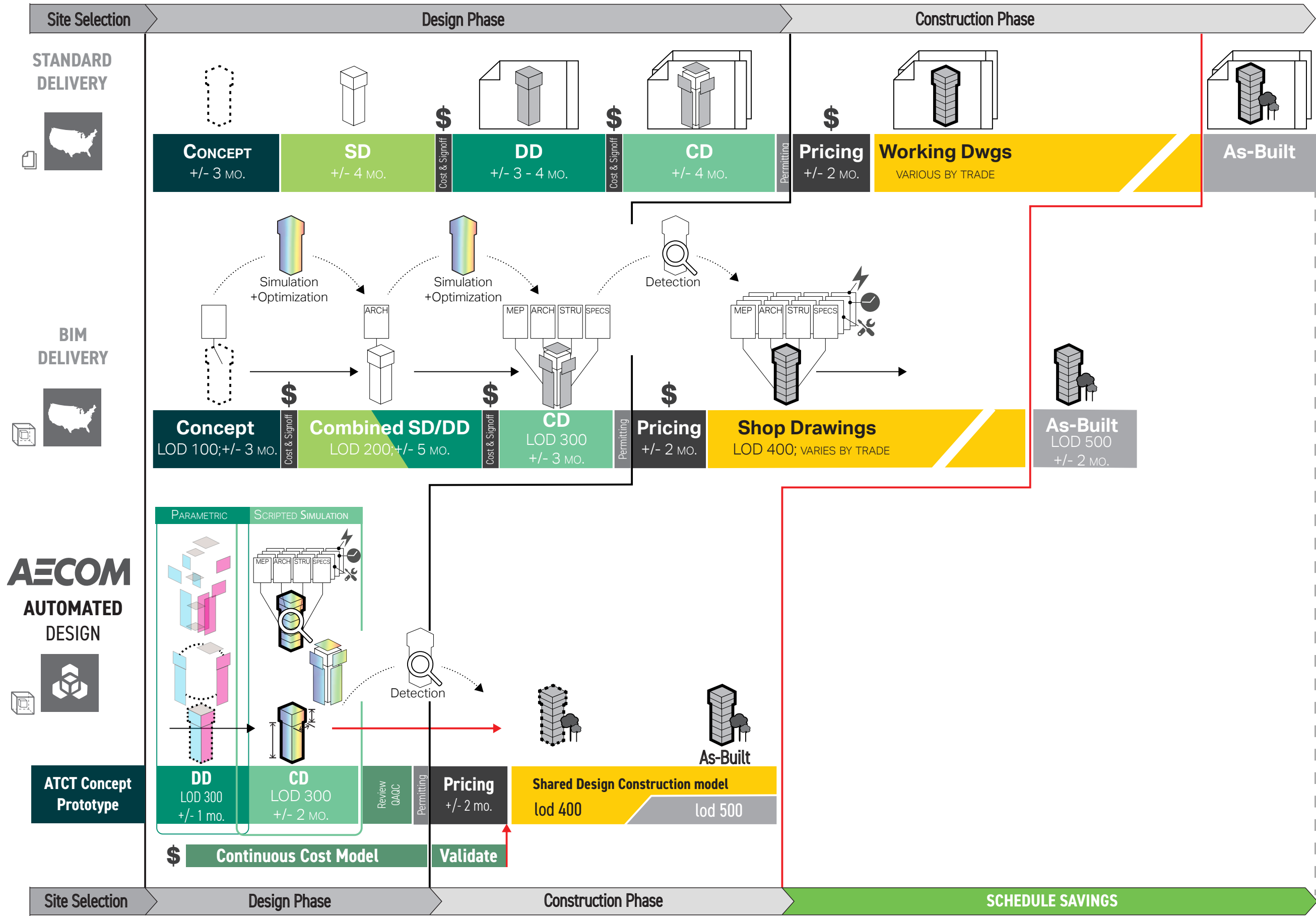
RETHINK DESIGN

Current Industry - Darwin Model

Design ONE tower, and adapt it

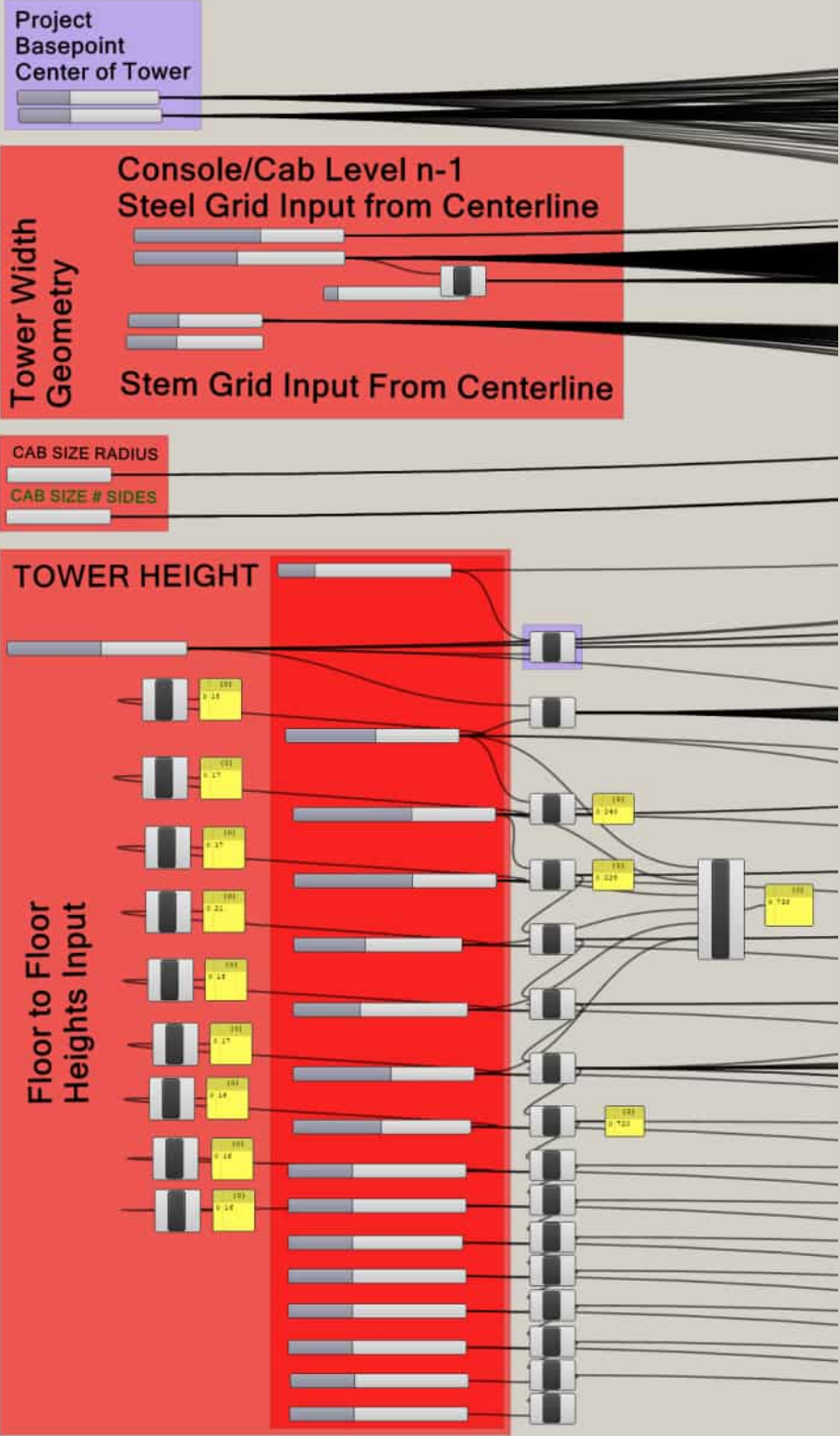
AECOM Strategy - Universe Model

Design ALL possible towers, and choose the
one you want

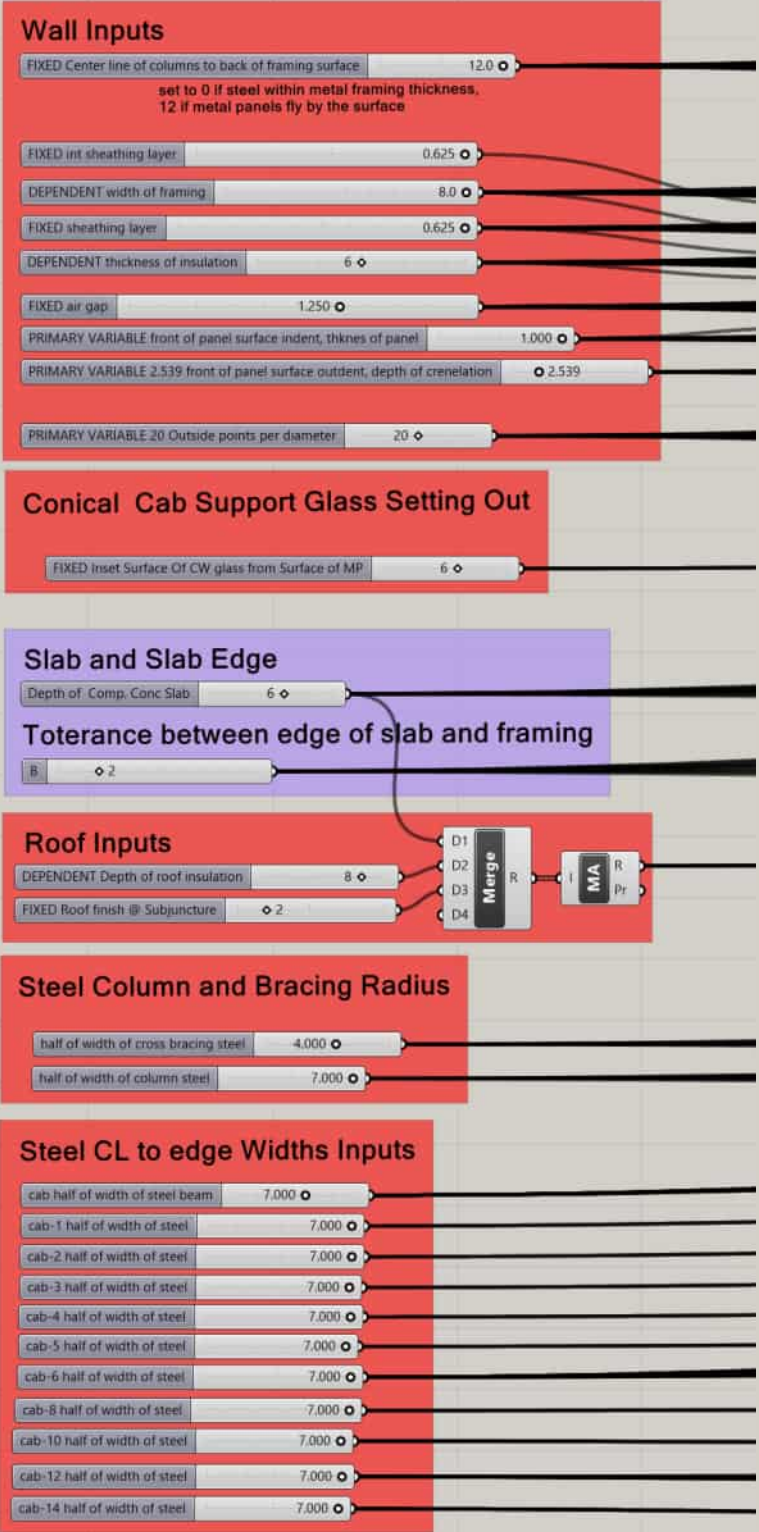


Comprehensive Building Foundation Script

Program and Geography Inputs



Building Performance Inputs



Comprehensive Building Foundation Script

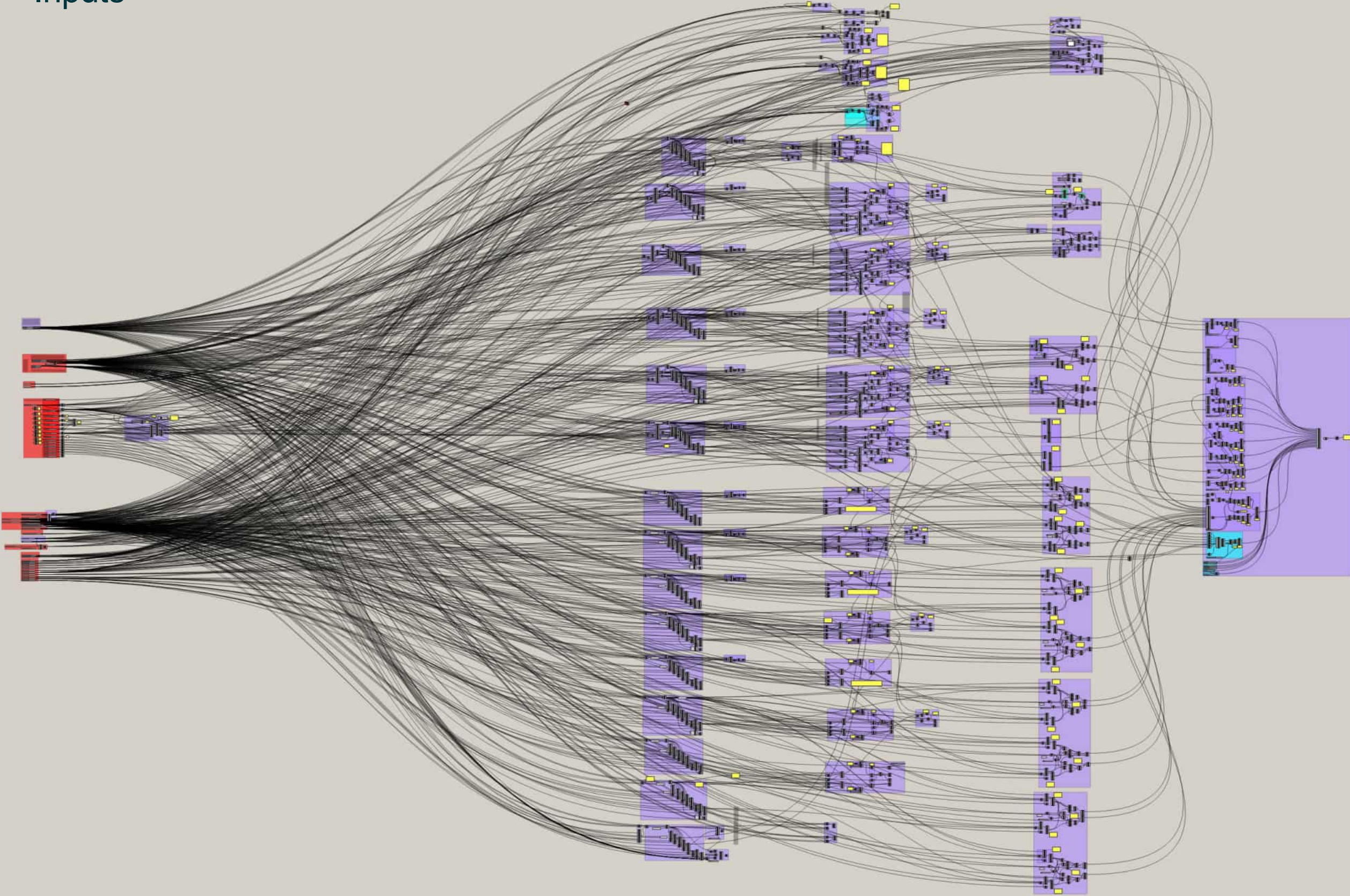
Site Specific
Inputs

Design
Surfaces

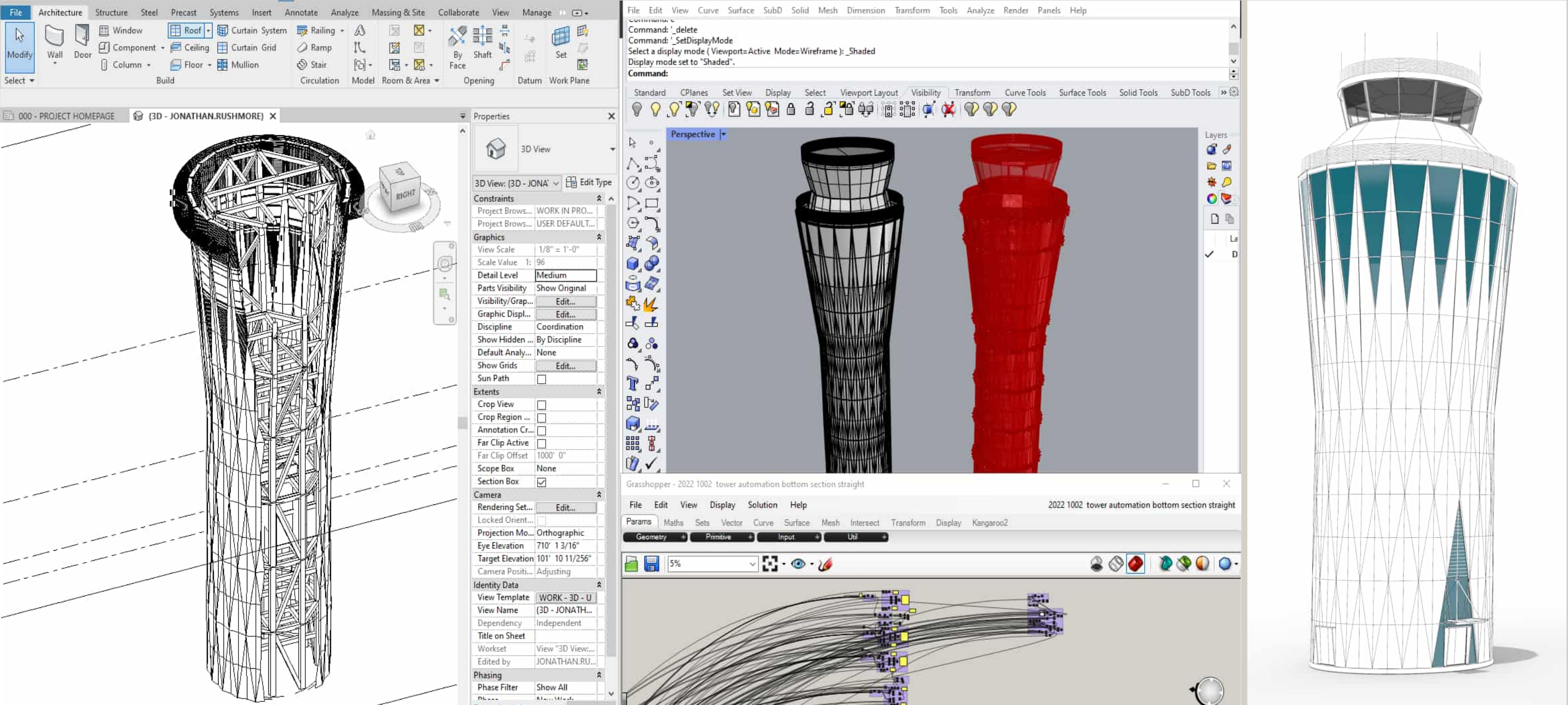
Structural

Architectural

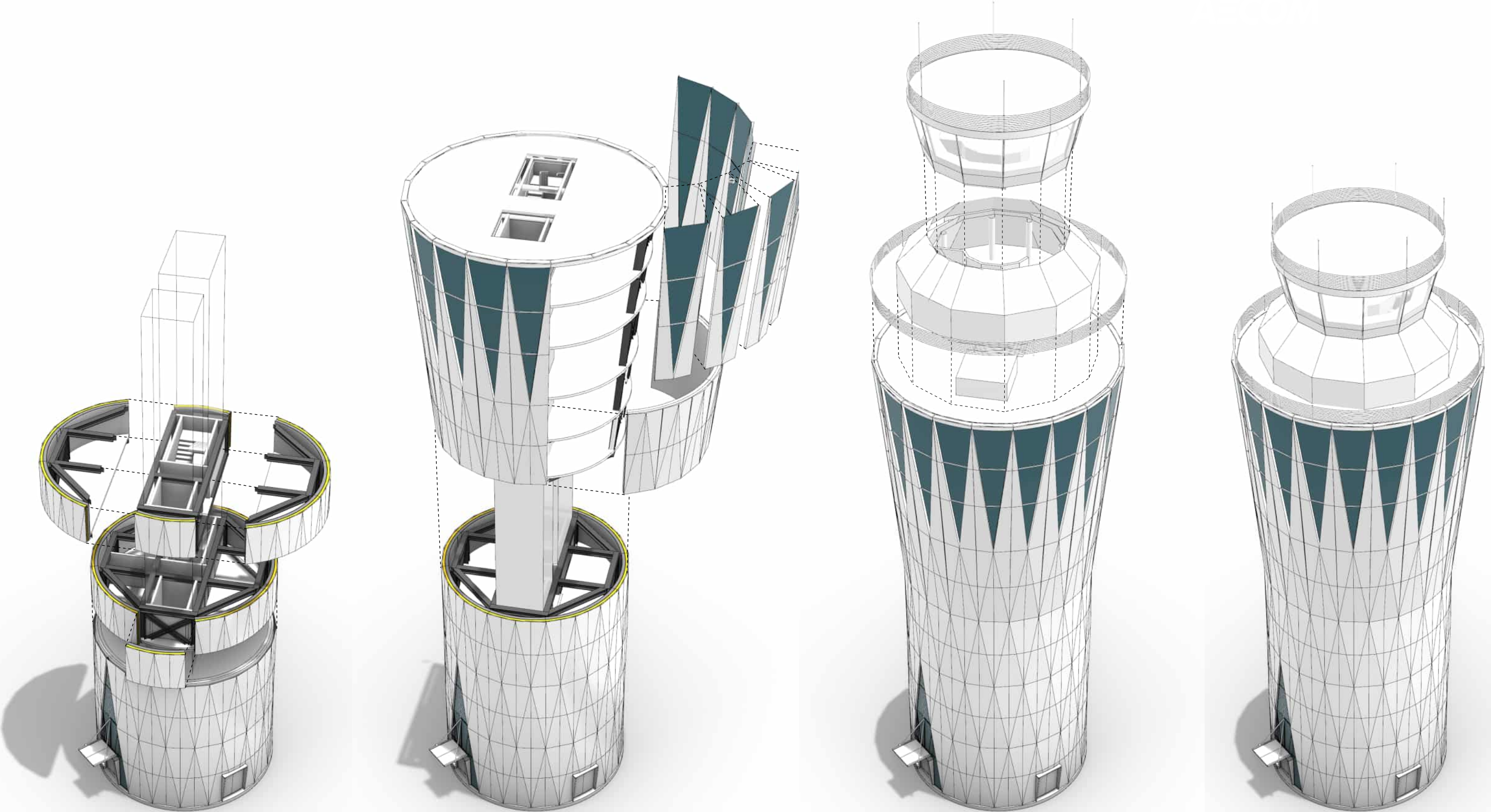
Cost



Understanding and Repackaging



Understanding and Repackaging



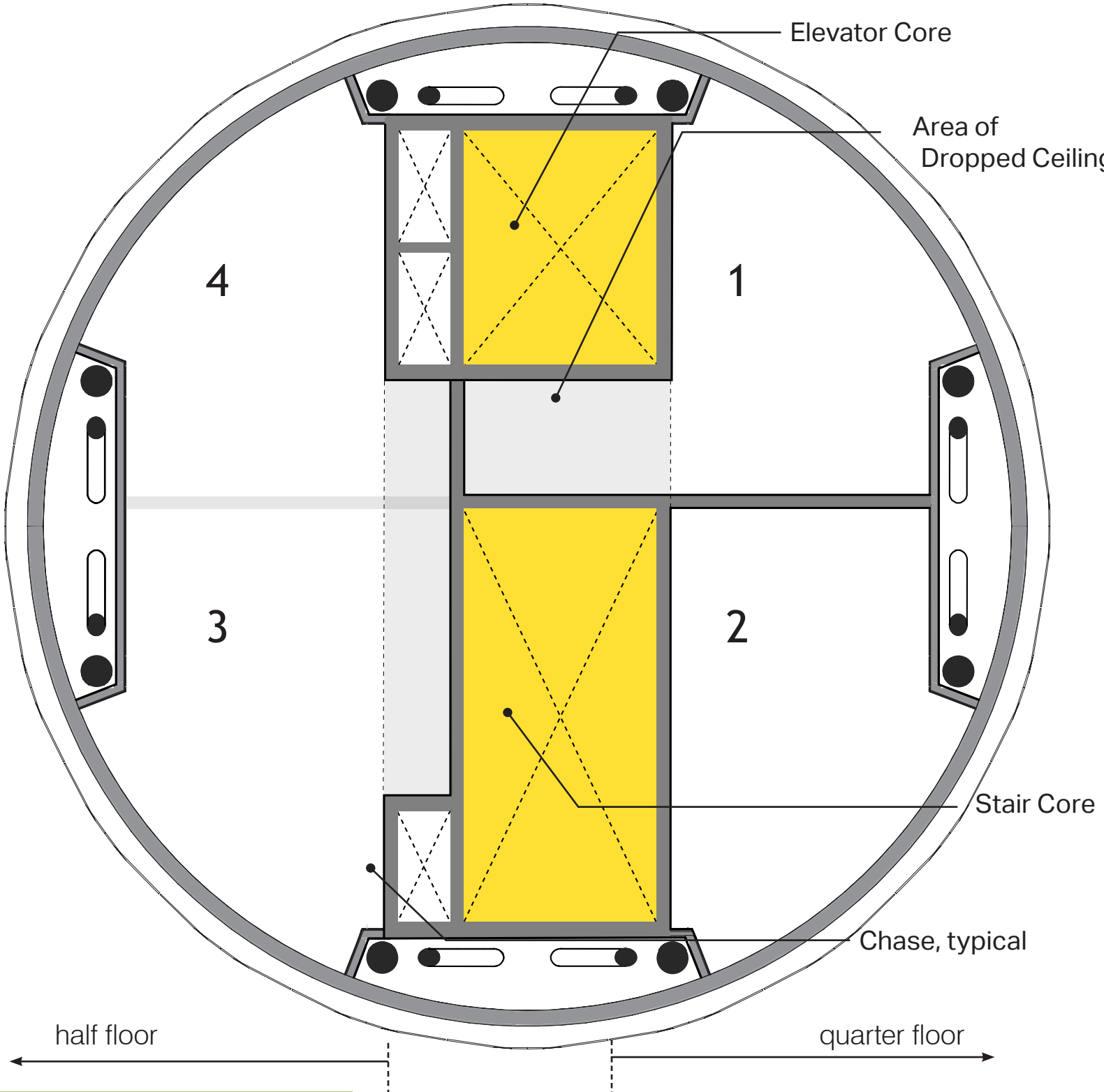
Stem Construction

Cab Support Construction

Cab and Console Access Construction

Assembled Tower

Architectural Plan Optioneering



Prototype Typical Architectural

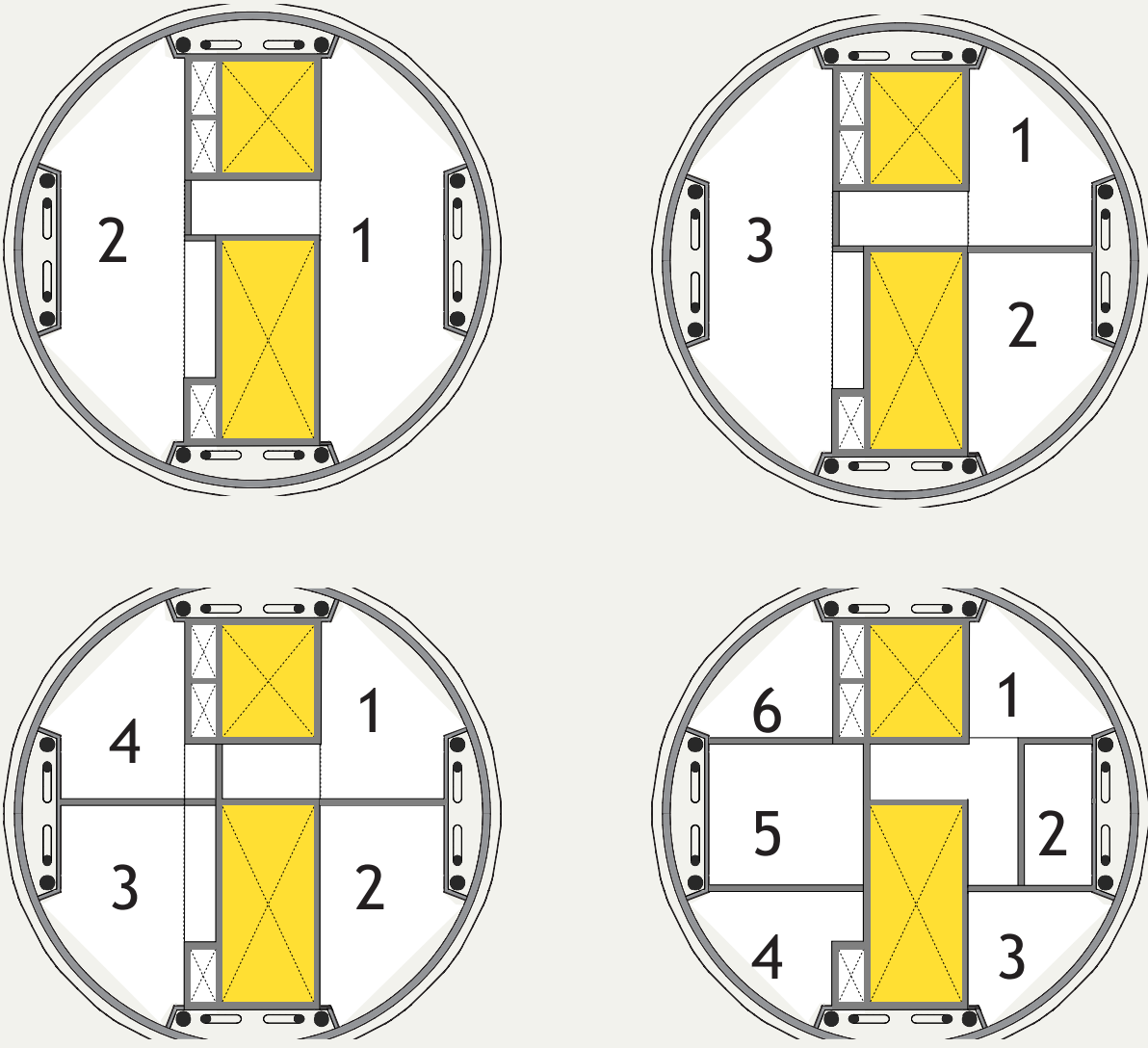


Highly Flexible and Modifiable Plan

Quadrant Plan Approach: can be combined for larger rooms or subdivided along common elements

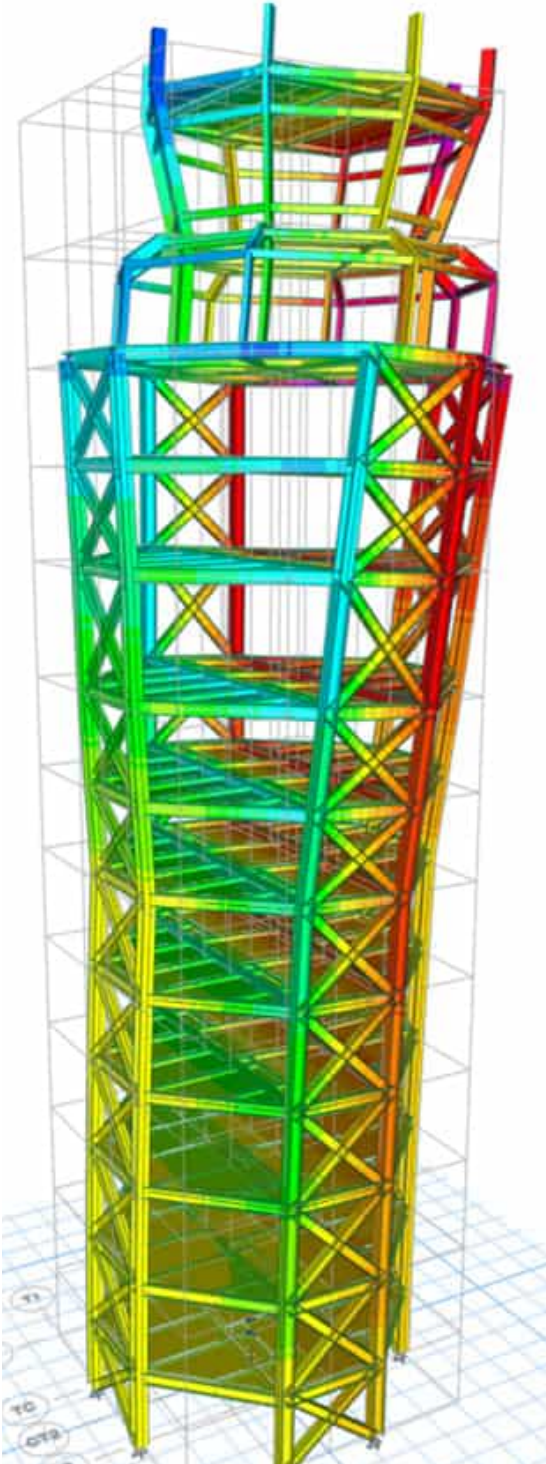
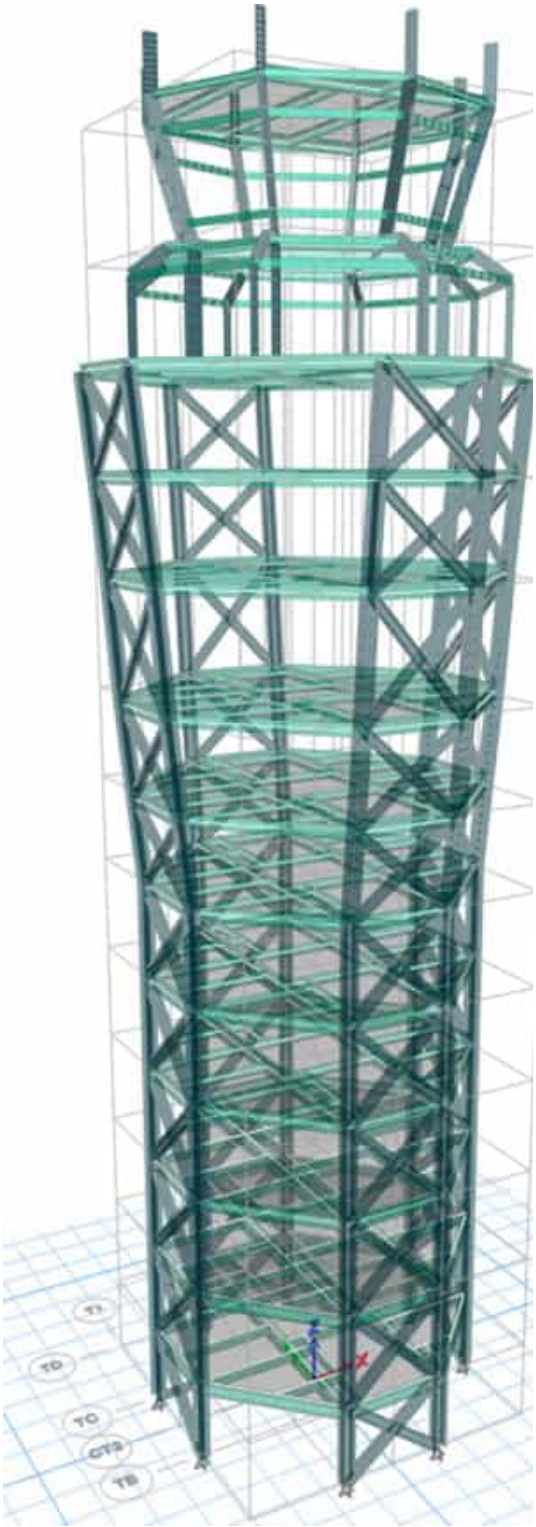
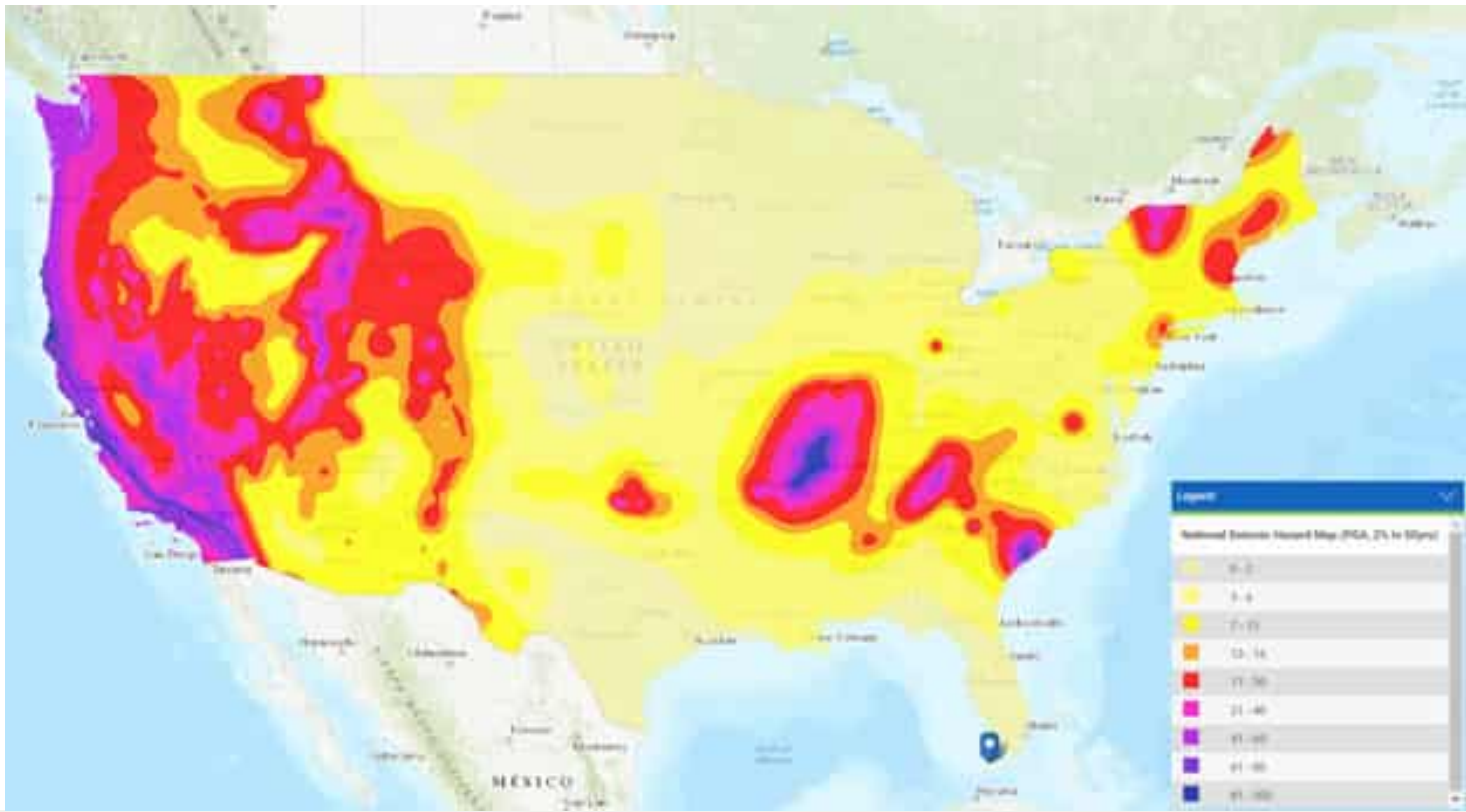
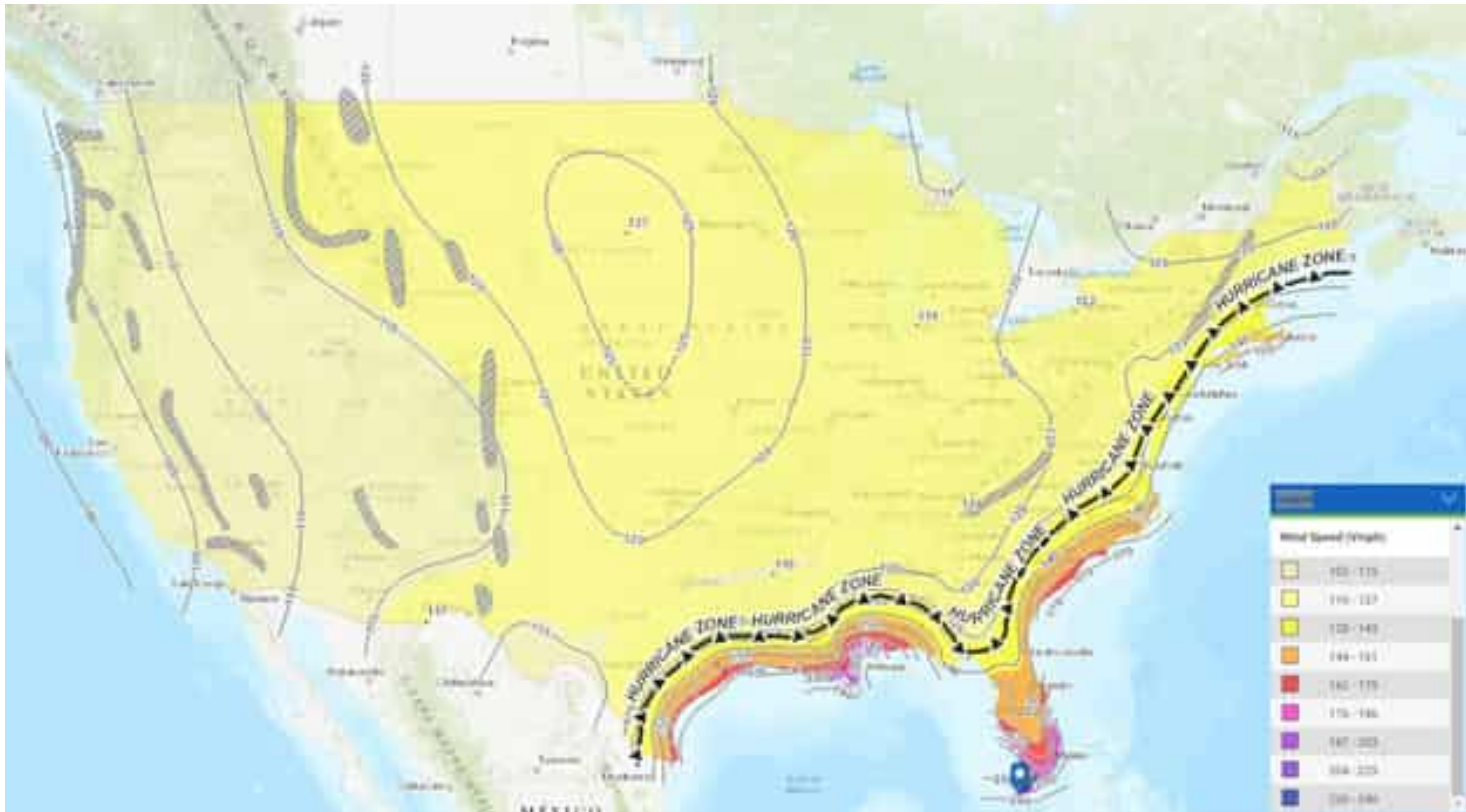
Perimeter Columns and bracing support plan and program modifications

MEP branch delivery in dropped ceilings adjacent to vertical circulation cores



Optioneering - Structural Systems

ASCE 7 HAZARD TOOL



Optioneering - MEP Systems

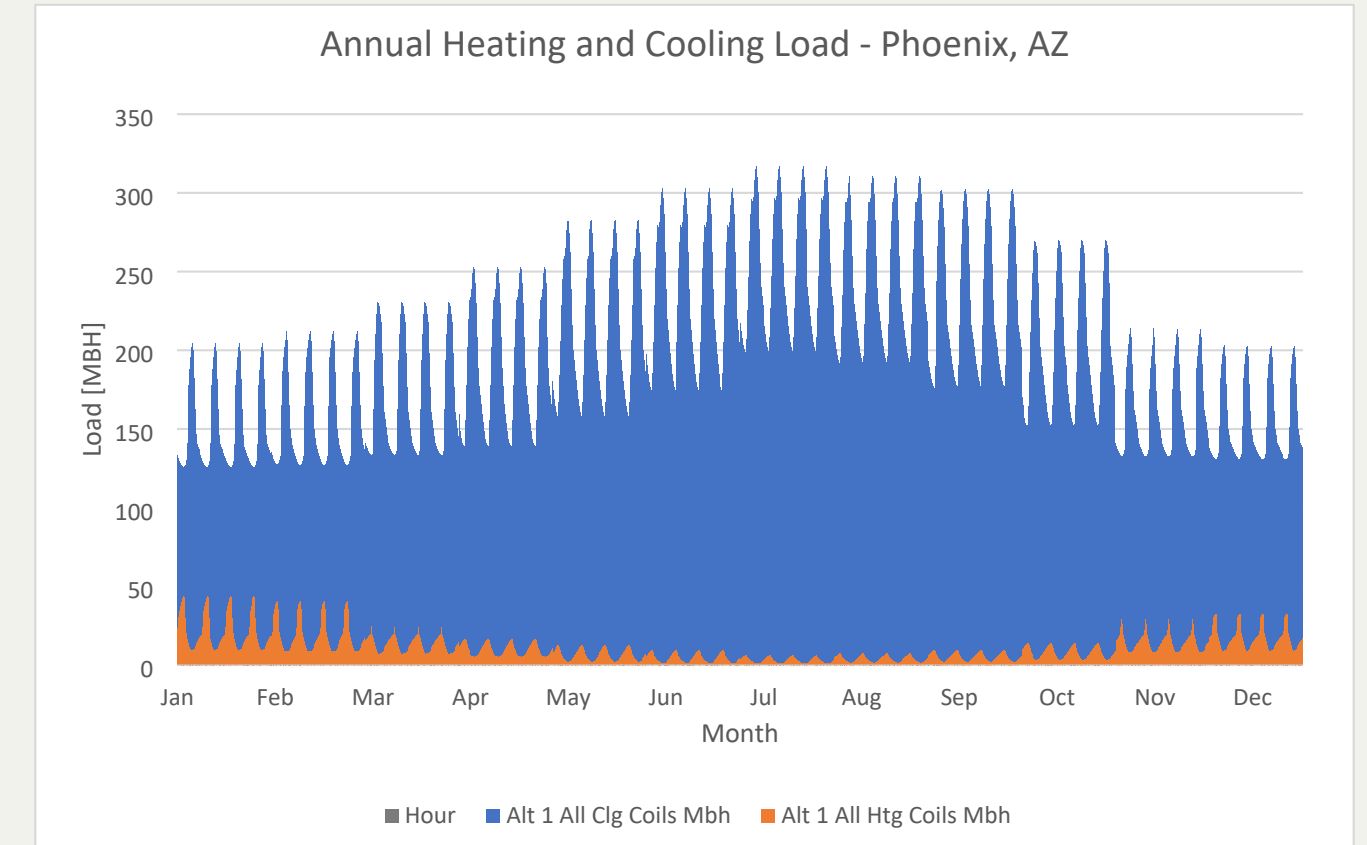
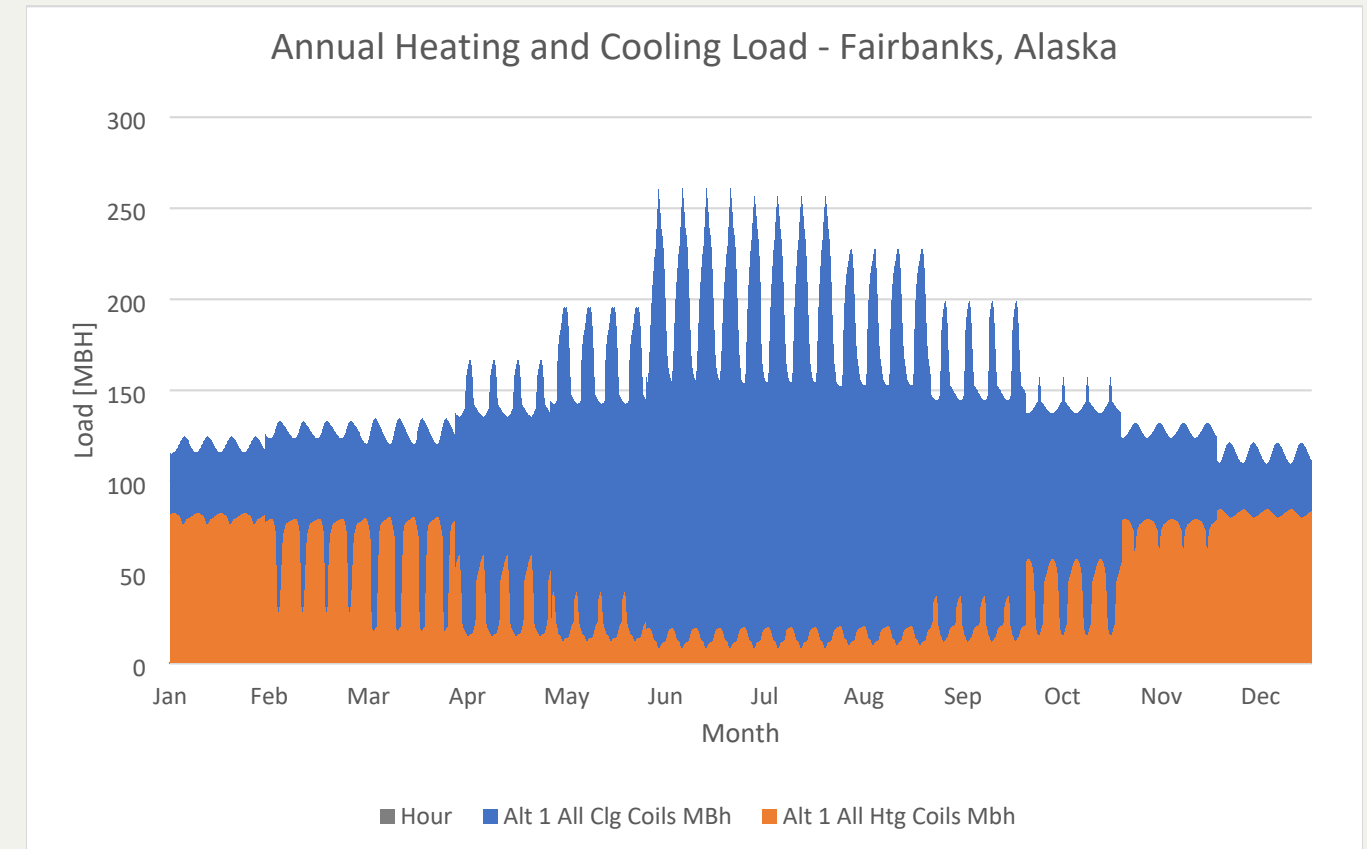
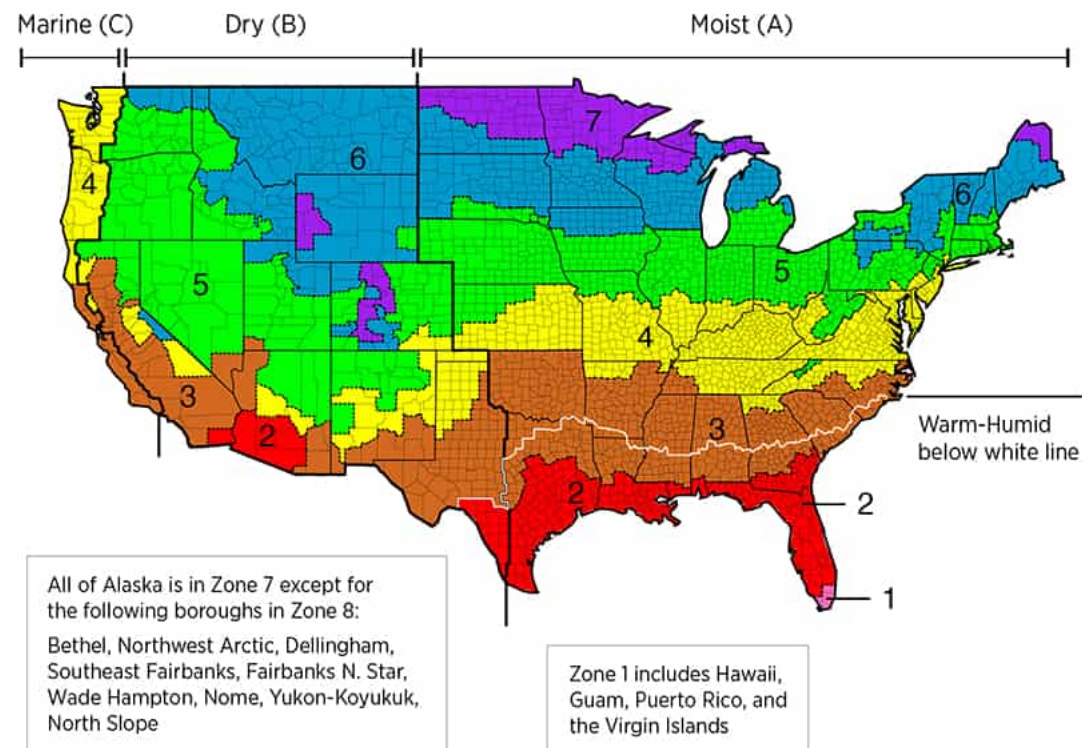
Equipment is sized for the most extreme situations

- Boiler/Heating baseline for Fairbanks Alaska (-37F DB)
- Chillers/Cooling baseline for Phoenix, Arizona (111F DB)

Energy Analysis based on southern Illinois (SIA)

- Best representation of US Climate on average to better represent energy savings in both cooling and heating seasons
- Electronic equipment generate large internal loads

Mechanical system will eliminate the need for boilers for 0+ degree temperatures



Lifecycle Cost Analysis

Alternative 1 – Code Compliant Chiller and Gas Fired Boiler

Alternative 2 – Heat Pump Chiller and Electric Boiler

Alternative 3 – Heat Recovery Chillers with FCUs and Electric Boilers (Basis of Design)

Alternative 4 – Heat Recovery w/ Chilled Beams and Electric Boilers

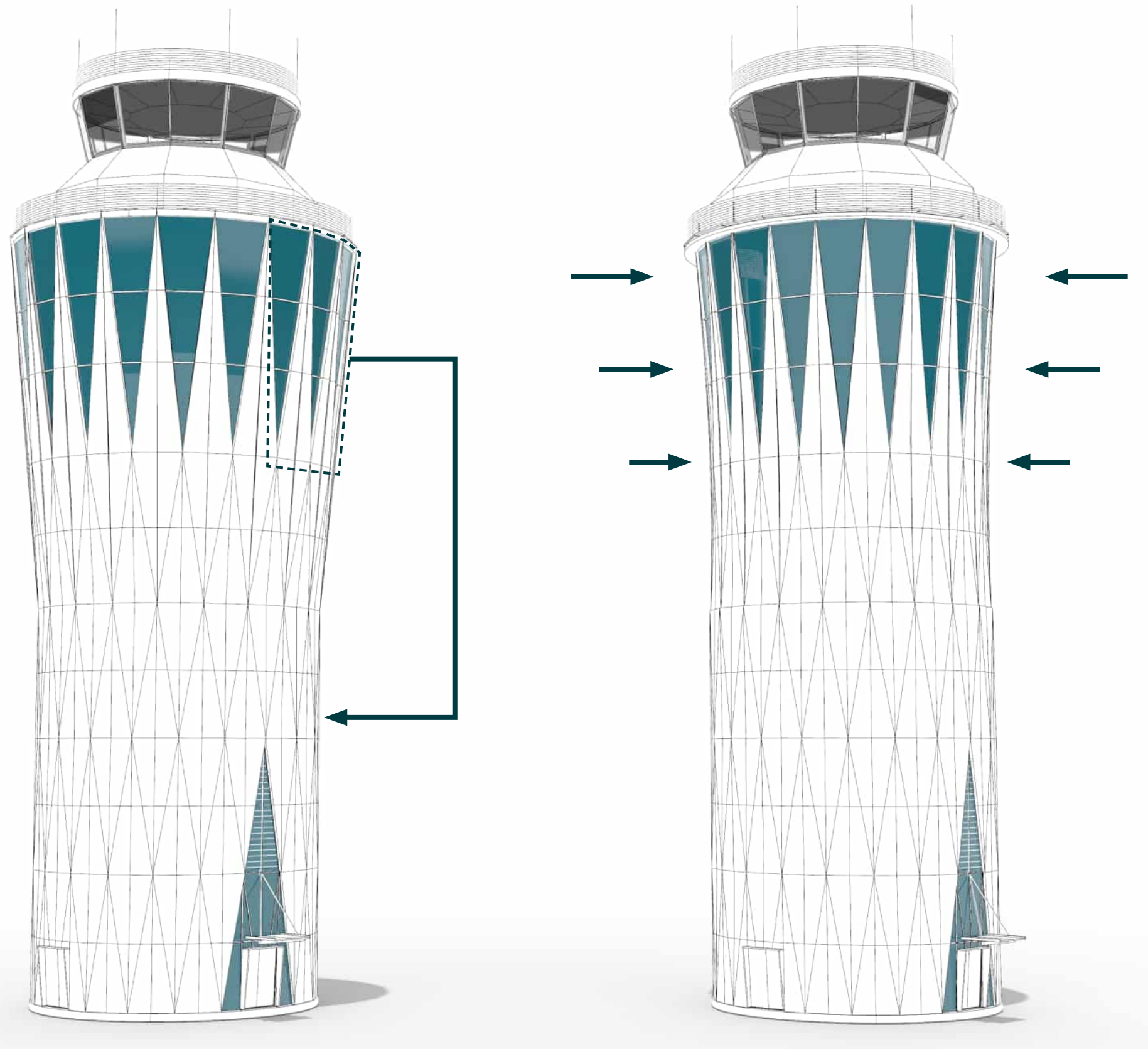
Lowest LC

Comparative Present-Value Costs of Alternatives

(Shown in Ascending Order of Initial Cost* = Lowest LCC)

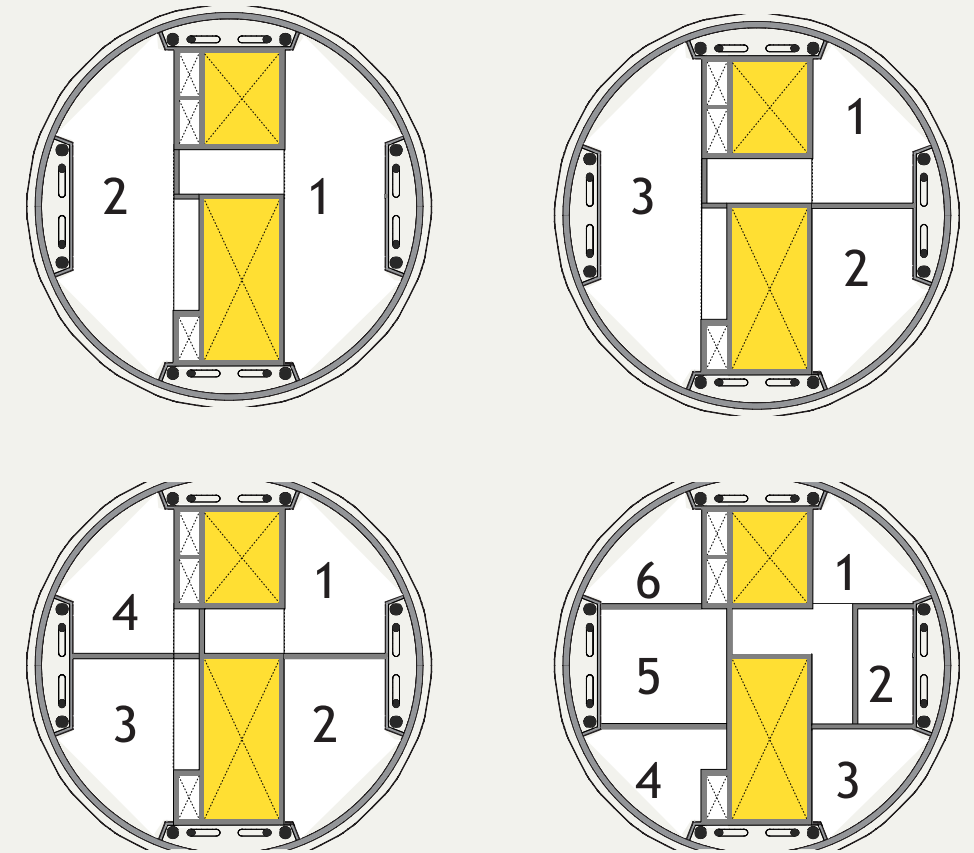
Alternative	Initial Cost (PV)	Life Cycle Cost (PV)
Alternative 2 - Heat Pump Chiller and Electric Boiler	\$1,723,000	\$3,307,696
Baseline - STD Air-Cooled Chiller w/ Gas Boiler	\$1,773,000	\$3,313,487
Alternative 3 - Heat Recovery Chiller and Electric Boiler	\$1,800,000	\$3,261,964
Alternative 4 - Heat Recovery Chiller and Electric Boiler and Chilled Beams	\$1,844,000	\$3,255,994 *

Formal and Cost Optioneering



An Alternate Prototype For Taller Towers

- Cost is most directly related to scope and square footage
- Heights cannot change
- Program can be reorganized







03

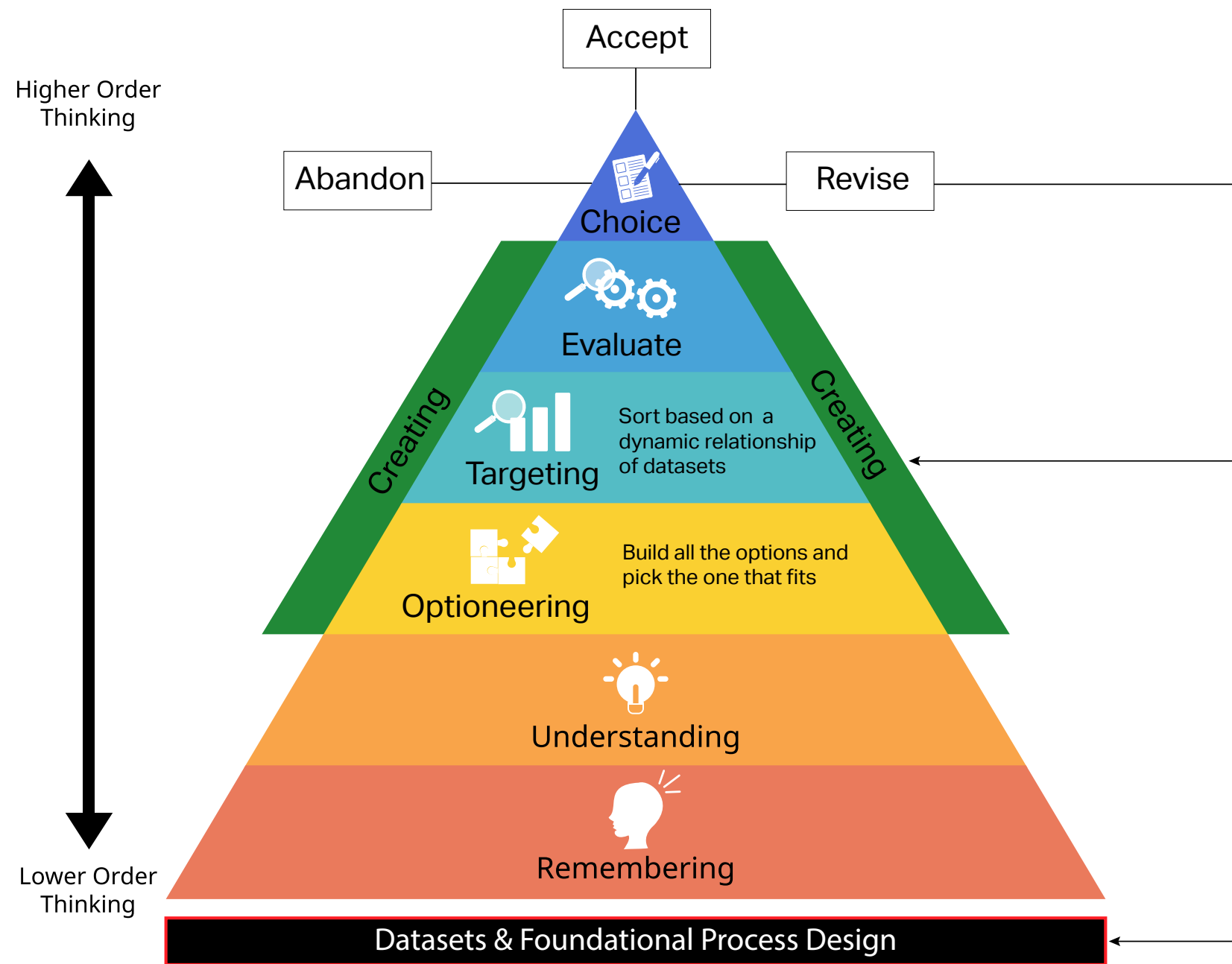
Hal 9000, PE, AIA 

Why Dave is Safe (for a while)

A black and white photograph of a vintage open-top automobile, likely a Ford Model T, parked on a paved road. The car is dark-colored and features a prominent front grille, round headlights, and spoked wheels. A driver wearing a flat cap and a dark jacket is seated in the front left seat, looking towards the camera. Two passengers are visible in the back seat. The license plate on the front of the car reads "HM 6150". The background shows a grassy area, trees, and a fence. The text "NOT A FASTER HORSE" is overlaid in large, bold, white capital letters across the middle of the car.

NOT A FASTER HORSE

Future Concepts in AI Design & How We Are Refining our Models



1. Sufficient Amount of Data
2. High Quality of Data
3. Lessons Learned
4. Why Things DON'T Work
5. Standard of Care
6. Our Clients are Primarily Humans

- Building Design is not the Compilation of Plans and Specs
- The End Results Do Not Fully Inform the Design Process
- Making is Part of Creating

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