Atlantic team

Spring presentation 7th may 2010

Martin
Engineer

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Construction
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Architect

Lena
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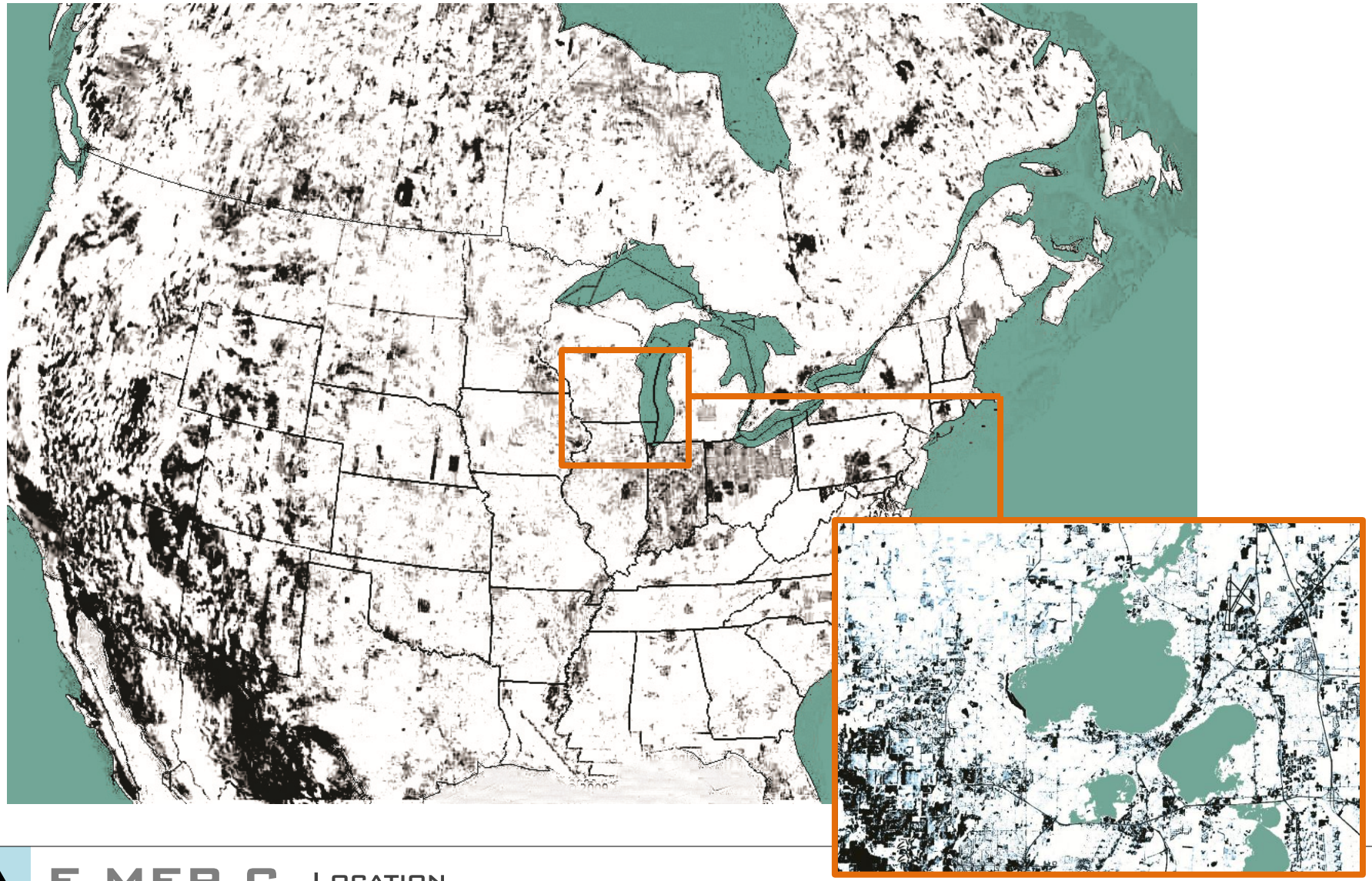
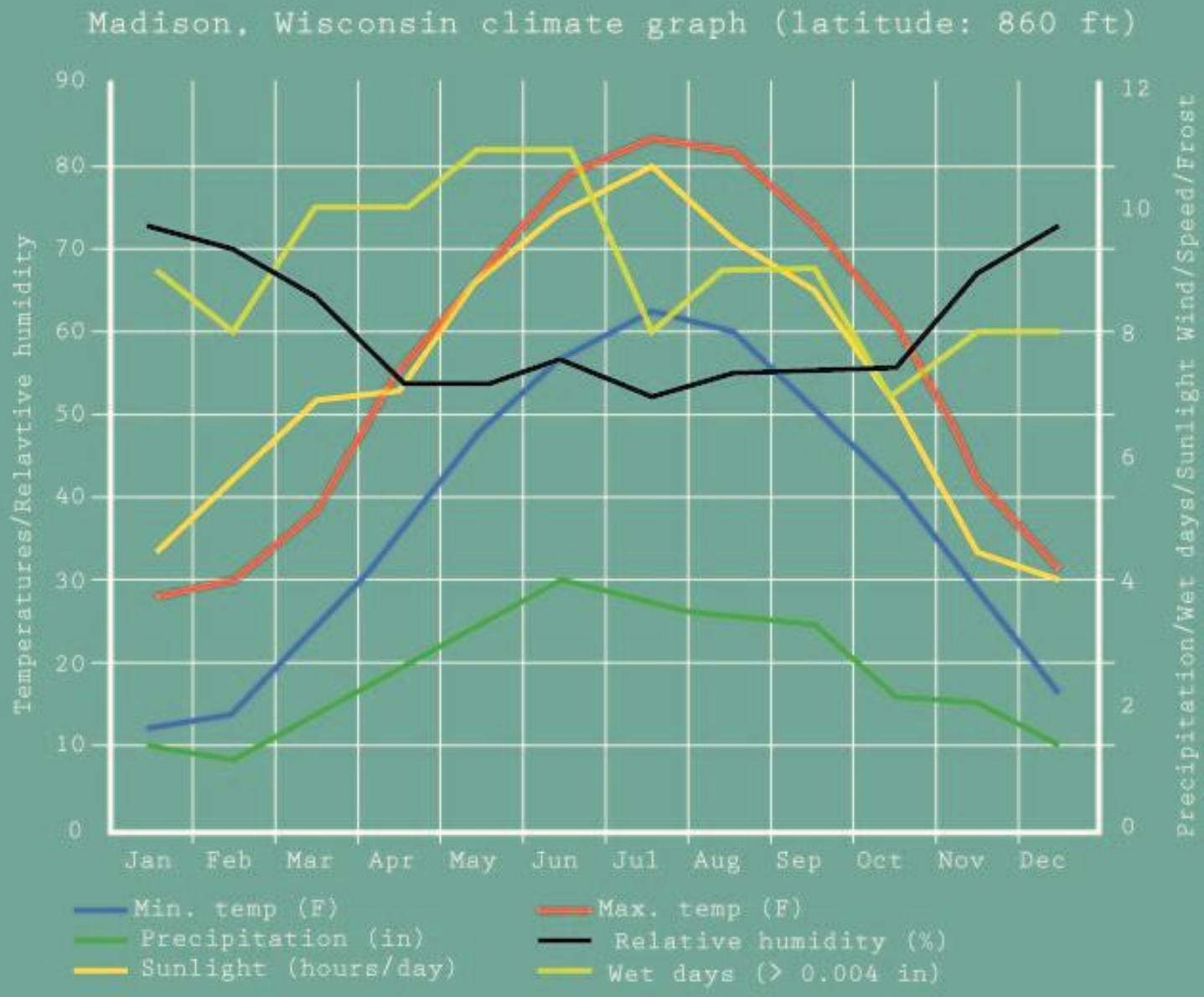
Manager

Architecture
Engineering
MEP
Construction
Integrated Project Delivery

University of Wisconsin, Madison, USA

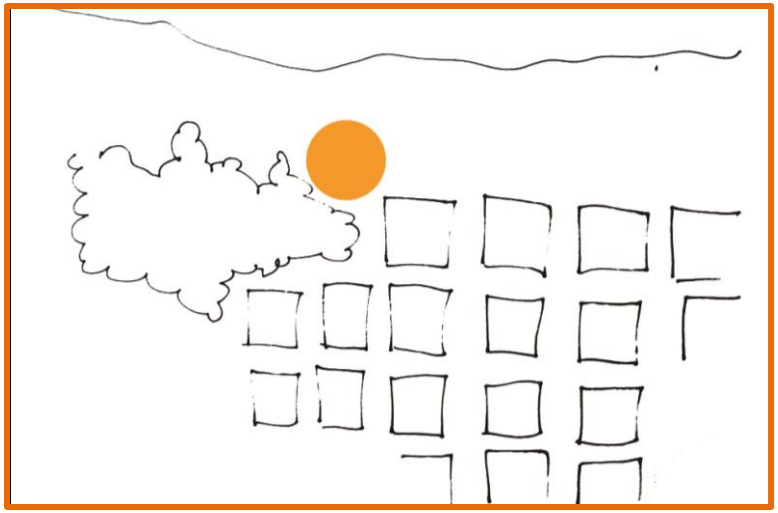



Madison, Wisconsin climate graph (latitude: 860 ft)
Temperatures/Relavtive humidity
Precipitation/Wet days/Sunlight Wind/Speed/Frost
90
80
70
60
50
40
30
20
10
0
12
10
8
6
4
2
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Min. temp (F)
Max. temp (F)
Precipitation (in)
Relative humidity (%)
Sunlight (hours/day)
Wet days (> 0.004 in)

Site is in the middle of:

- Rigid building grid
- Wood
- Lake

Building is a drop in between



A → E

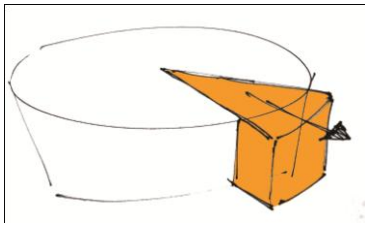



	The Link (Concrete)	The Link (Steel)	Corn Silos (Concrete)	Water Rings (Steel)
Flexibilty	2	2	4	4
Simplicity of Structural Design	1	1	4	4
Aesthetics	2	2	3	3
Sustainability	2	2	4	3
Site Disturbance	1	1	4	2
Costs	2	1	4	3
Symmetry	2	2	4	1
Length of Schedule	1	4	3	3
IPD	3	3	2	2
Feeling	2	1	3	3
Owners Preference	2	2	3	4
TOTAL	**20**	**21**	**38**	**32**

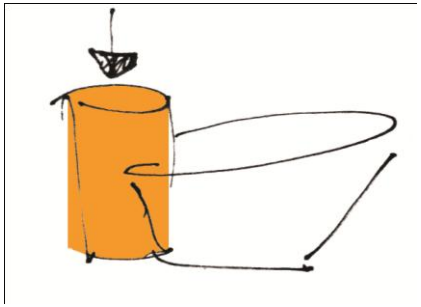
A drop in water

Water Science and Engineering lab

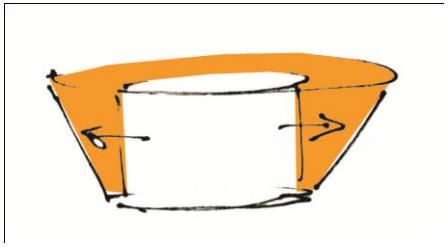
Grand view towards lake



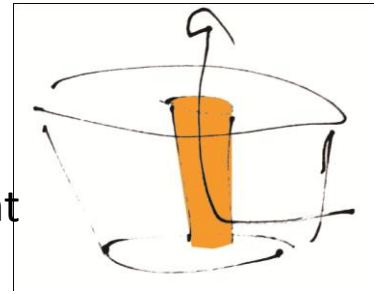
Access tower



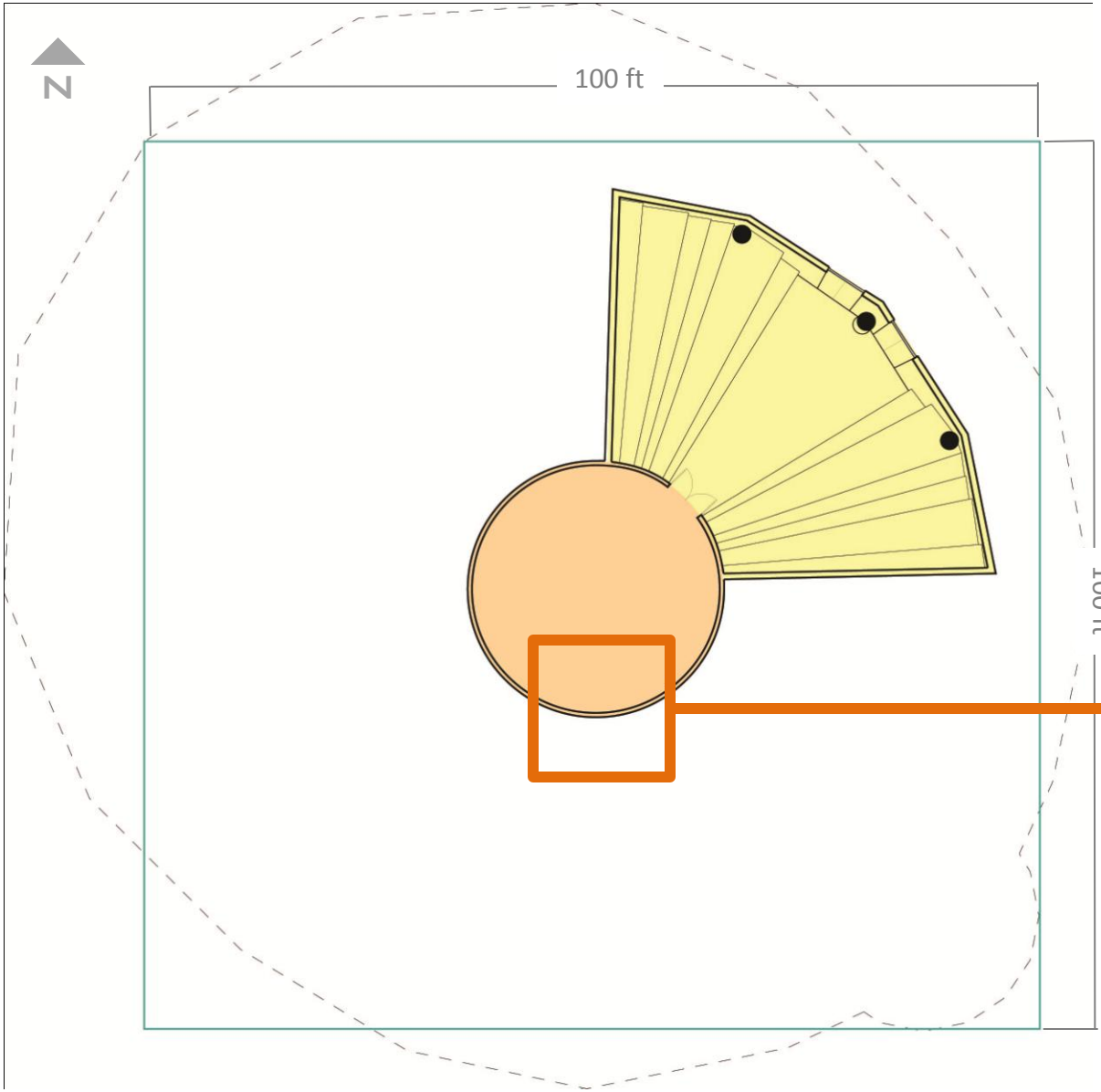
Slanted facades
Increase SqFt



Atrium
Ventilation and light



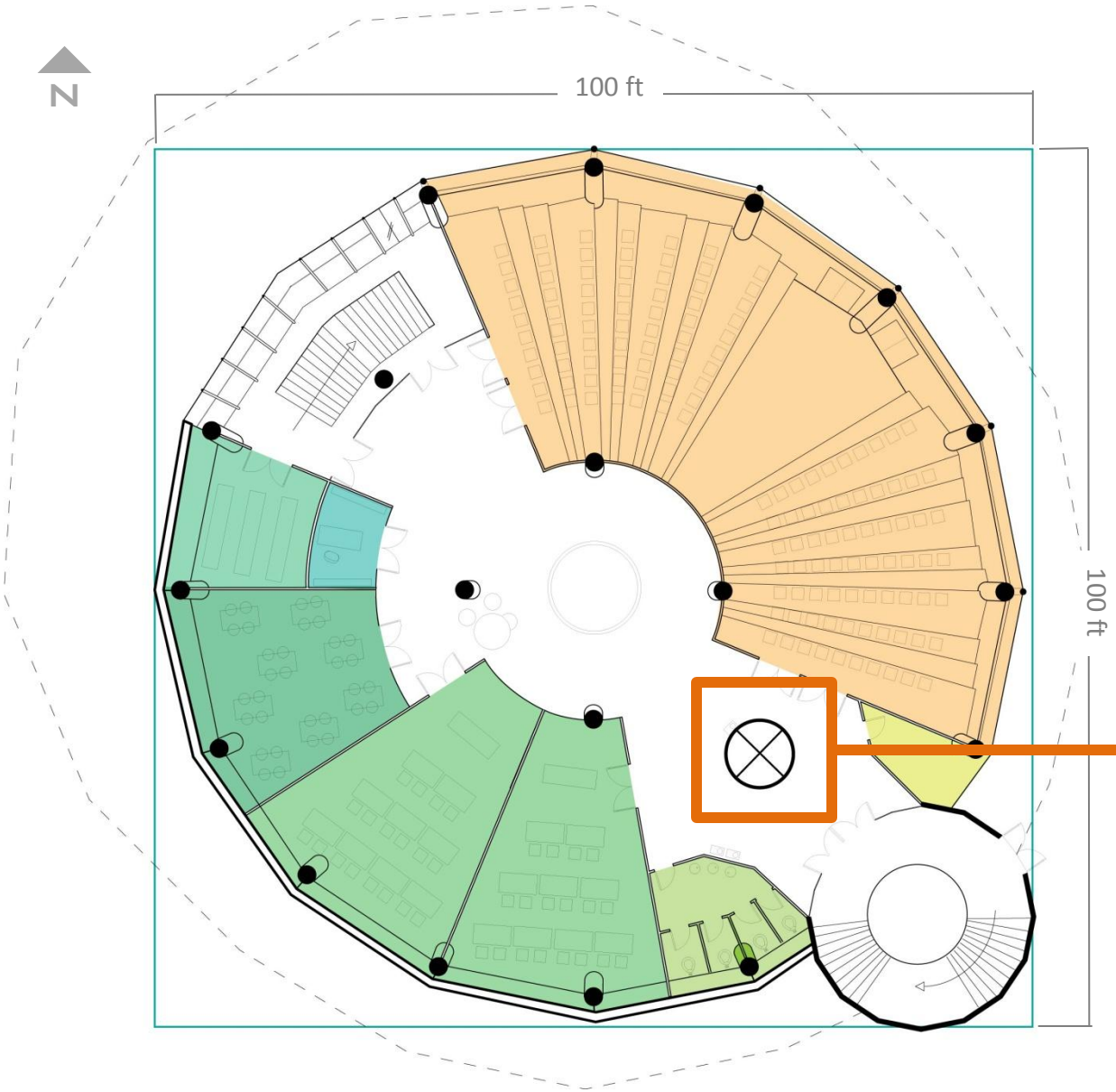
SITE PLAN



Storage 500/530SqFt
Auditorium 2000/1870SqFt

A → MEP

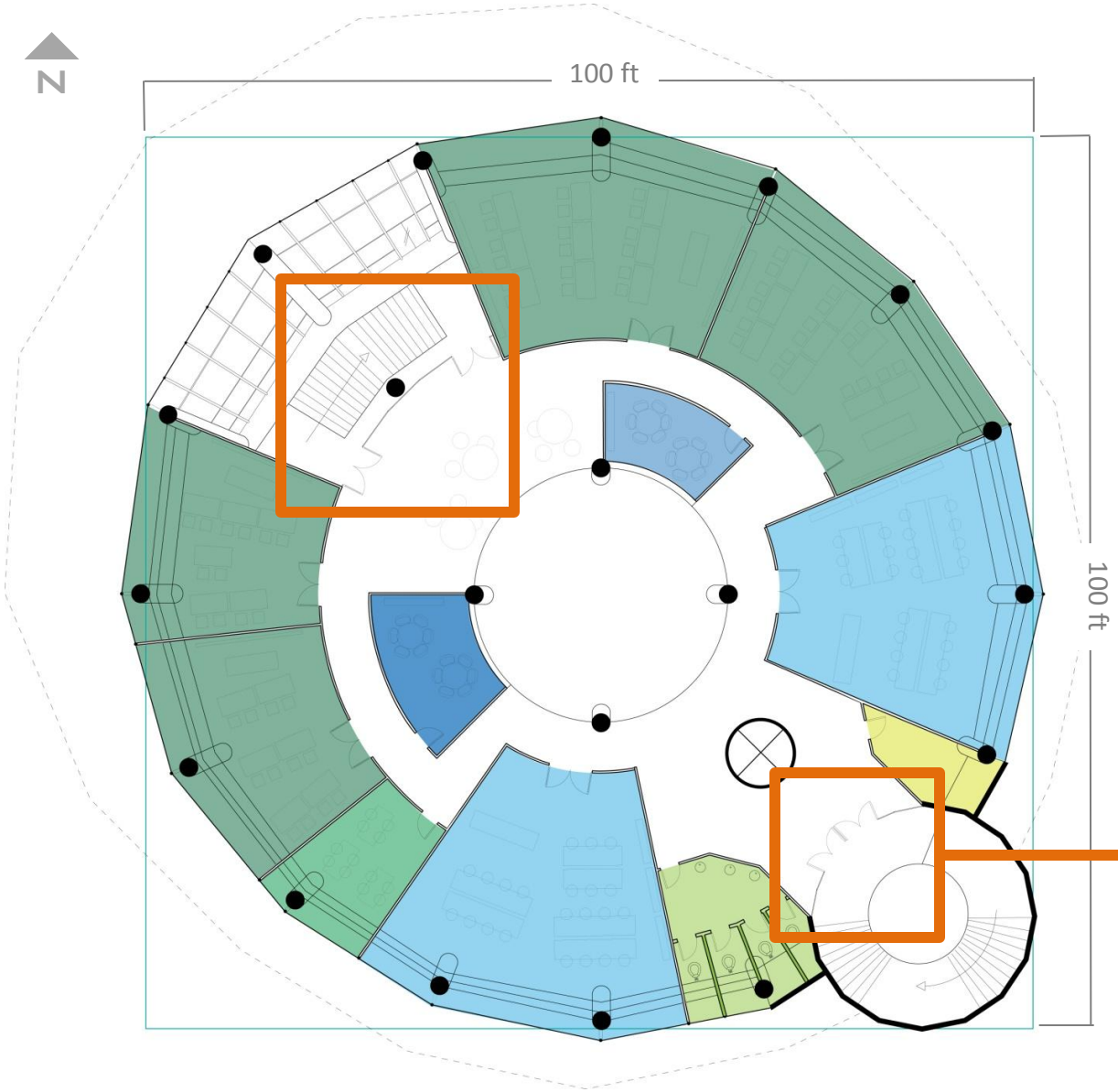
Economic efficiency



- Auditorioum 2000/1870SqFt
- MEP 0/60SqFt
- Restrooms 0/150SqFt
- Large classroom 800/600SqFt
- Student offices 1200/1300SqFt (300 shared space)
- Server room 800/160SqFt
- Technical support 100/80SqFt

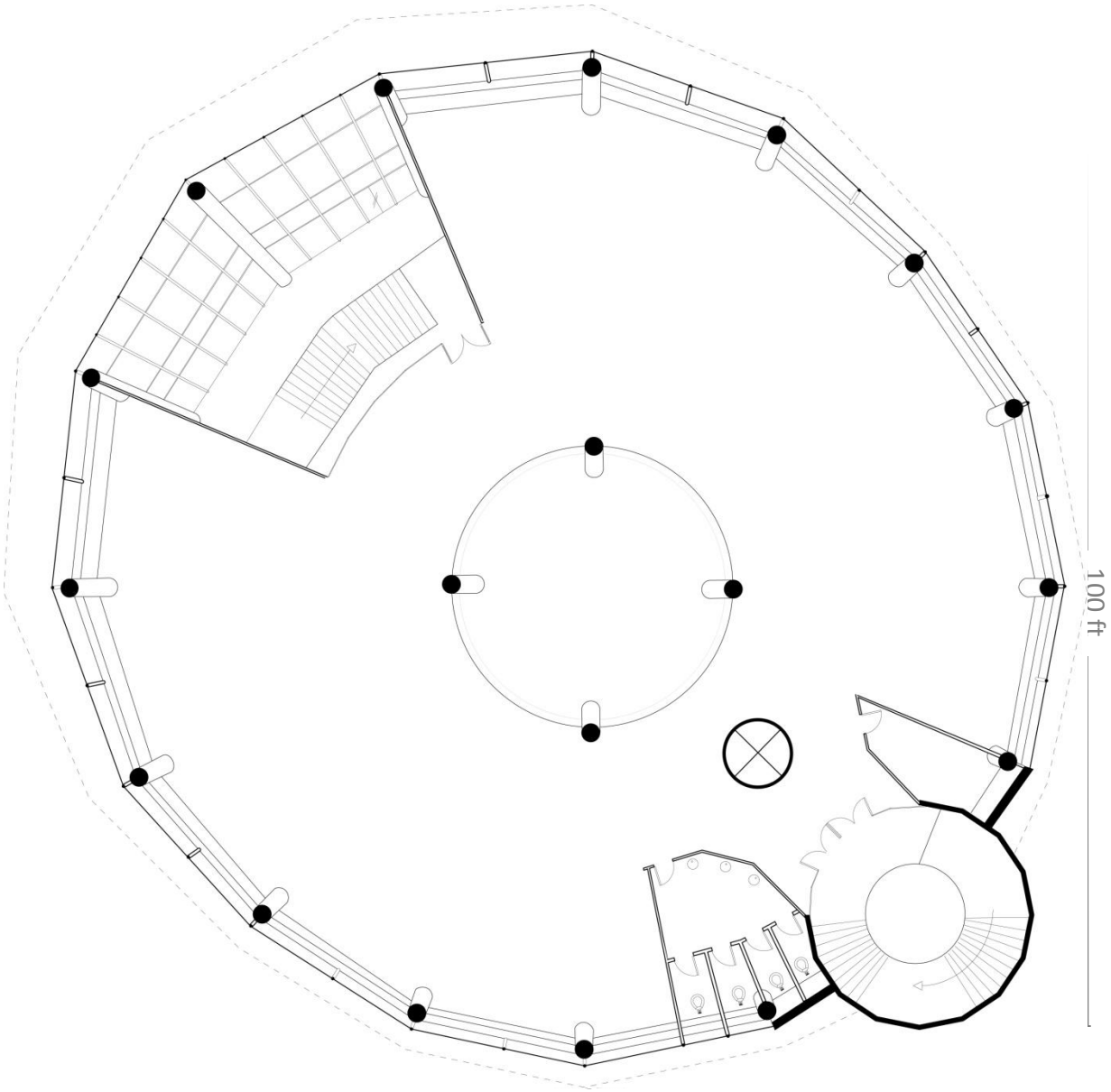
C → A

Sustainable reuse



- MEP 0/70SqFt
- Restrooms 0/160SqFt
- Instructional lab 2000/1400SqFt
- Student offices 1200/1300SqFt (300 shared space)
- Small classroom 2000/1700SqFt
- Seminar rooms 200/150SqFt

Economic efficiency
Sustainable performance

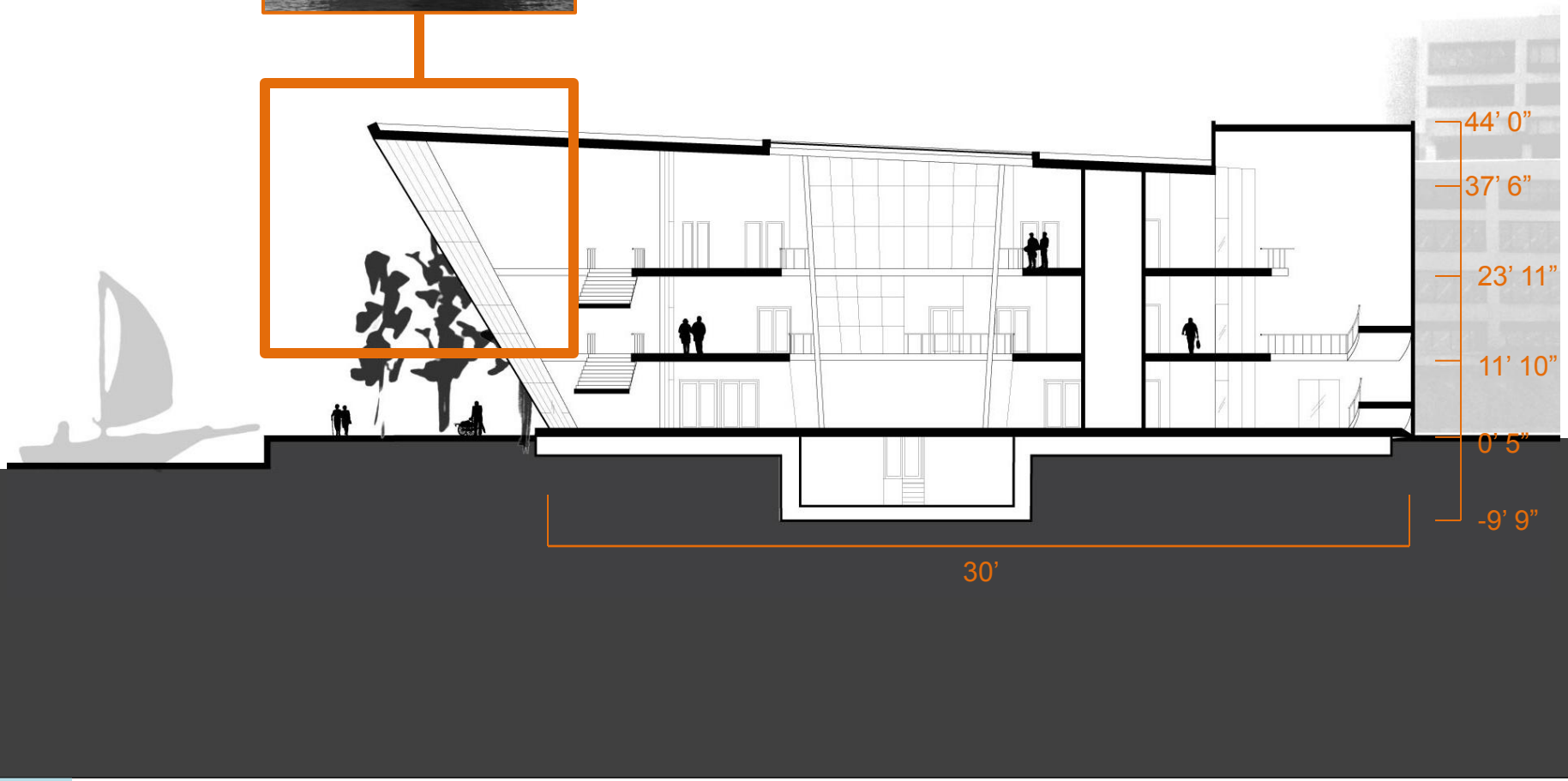


- MEP 0/75SqFt
- Restrooms 0/210SqFt
- Faculty offices 3600/3000SqFt
- Head chair office 300/350SqFt
- Senior adm. Offices 300/150SqFt
- Adm. Assistants 75/70SqFt
- Faculty lounge 1000/2300SqFt

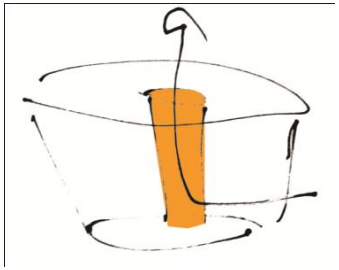
E → A

Efficient use of space
Sustainable performance

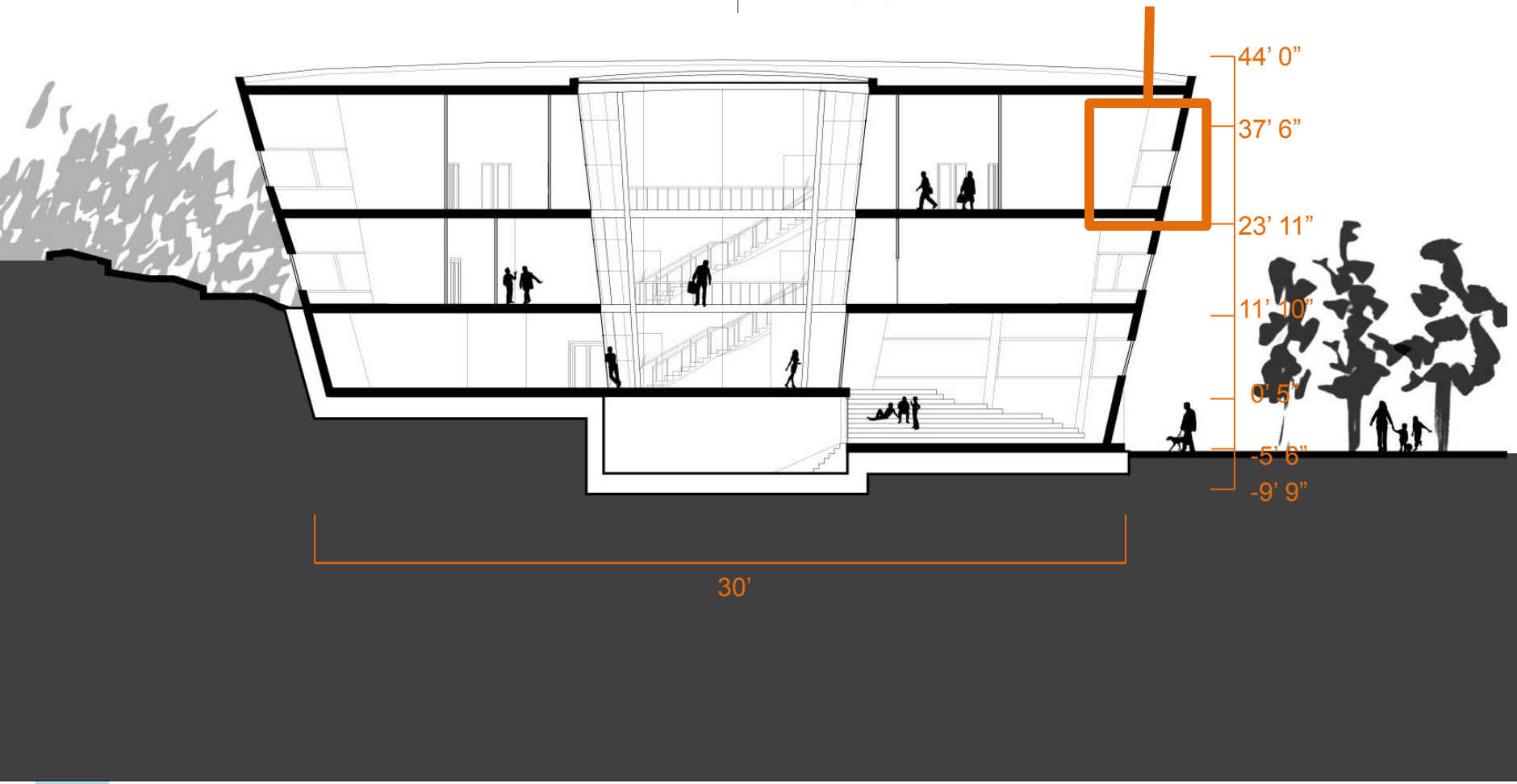
Foster nearby environment



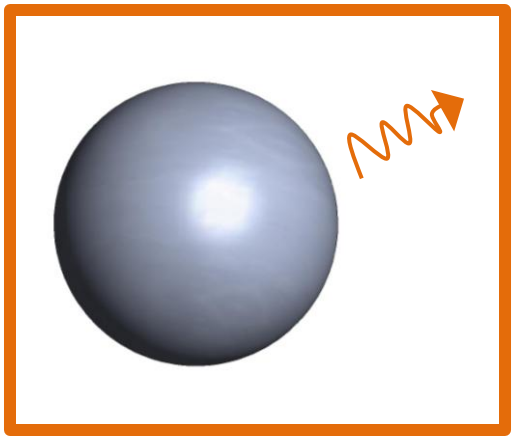
MEP → A



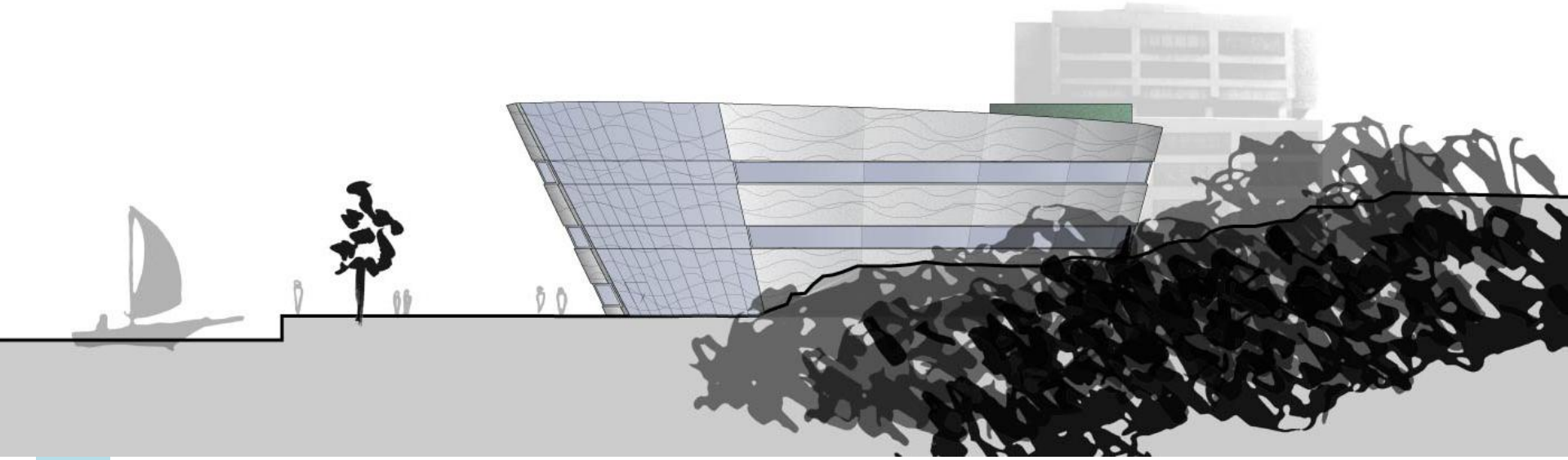
Economic efficiency



Sustainable interaction

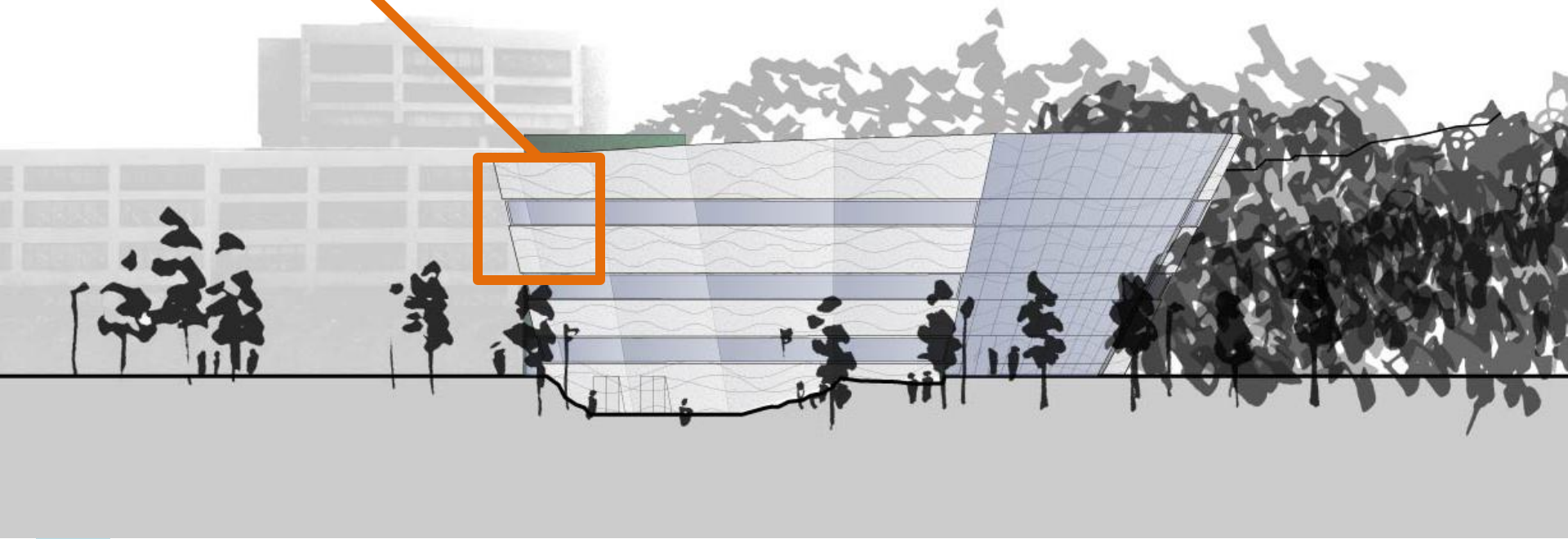


Economic efficiency

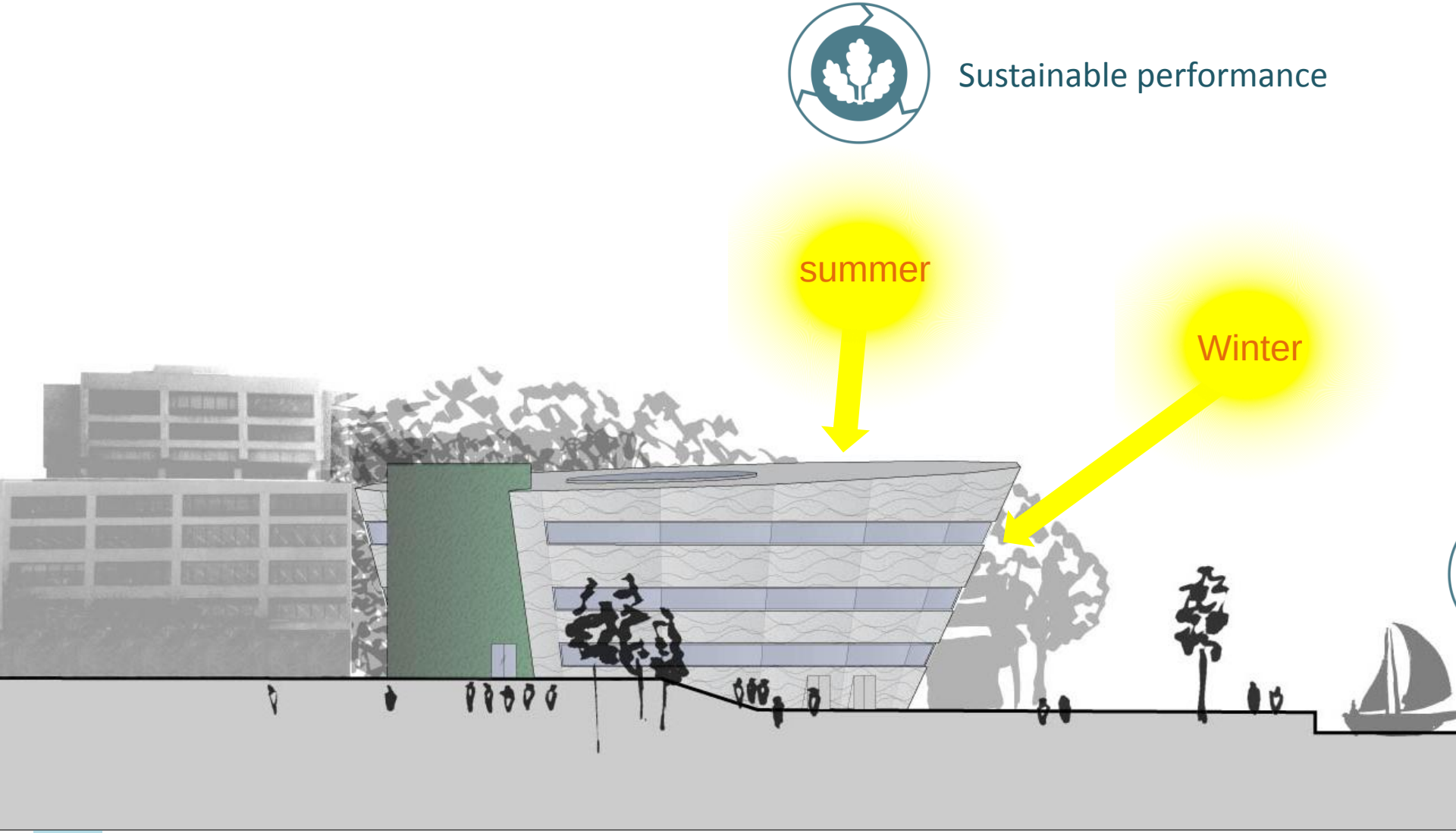


C → A

Economic efficiency
Sustainable performance



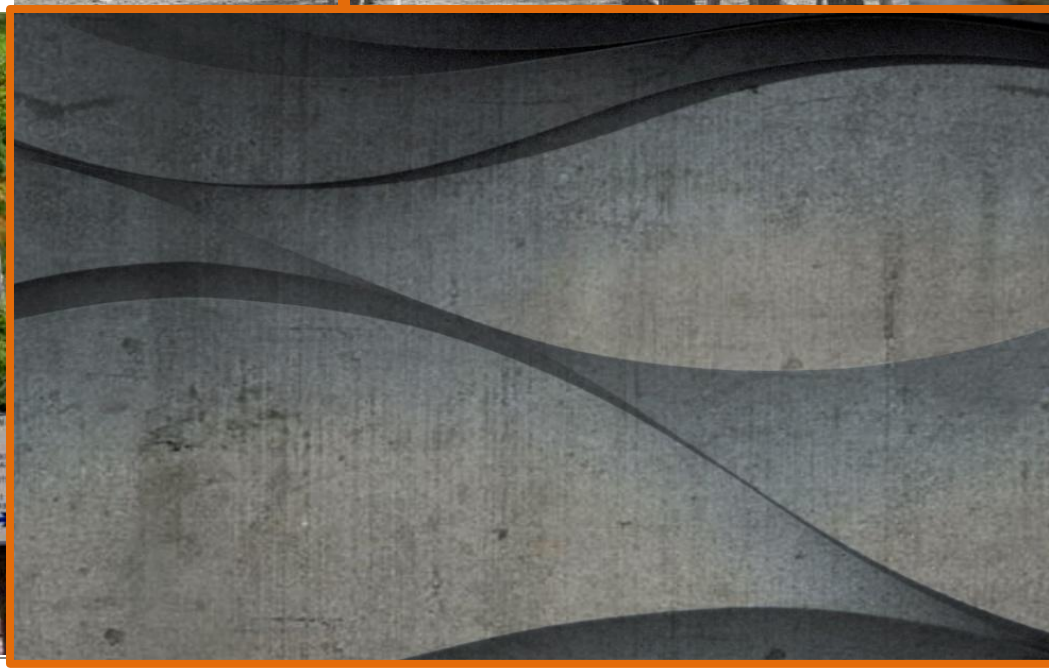
Sustainable performance



ELEVATION EAST

Concrete with wave pattern

Green wall with local plants



Architecture

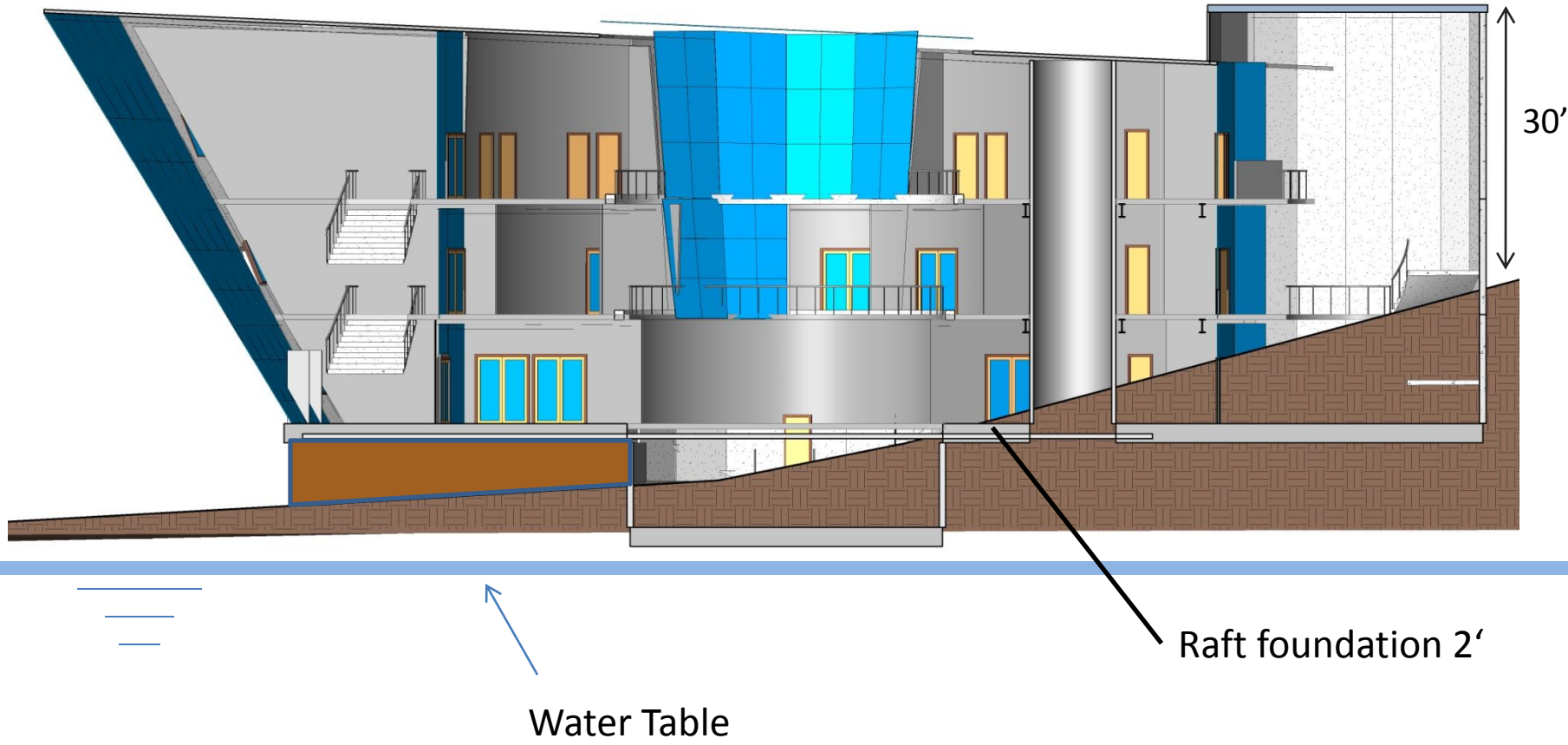
Engineering

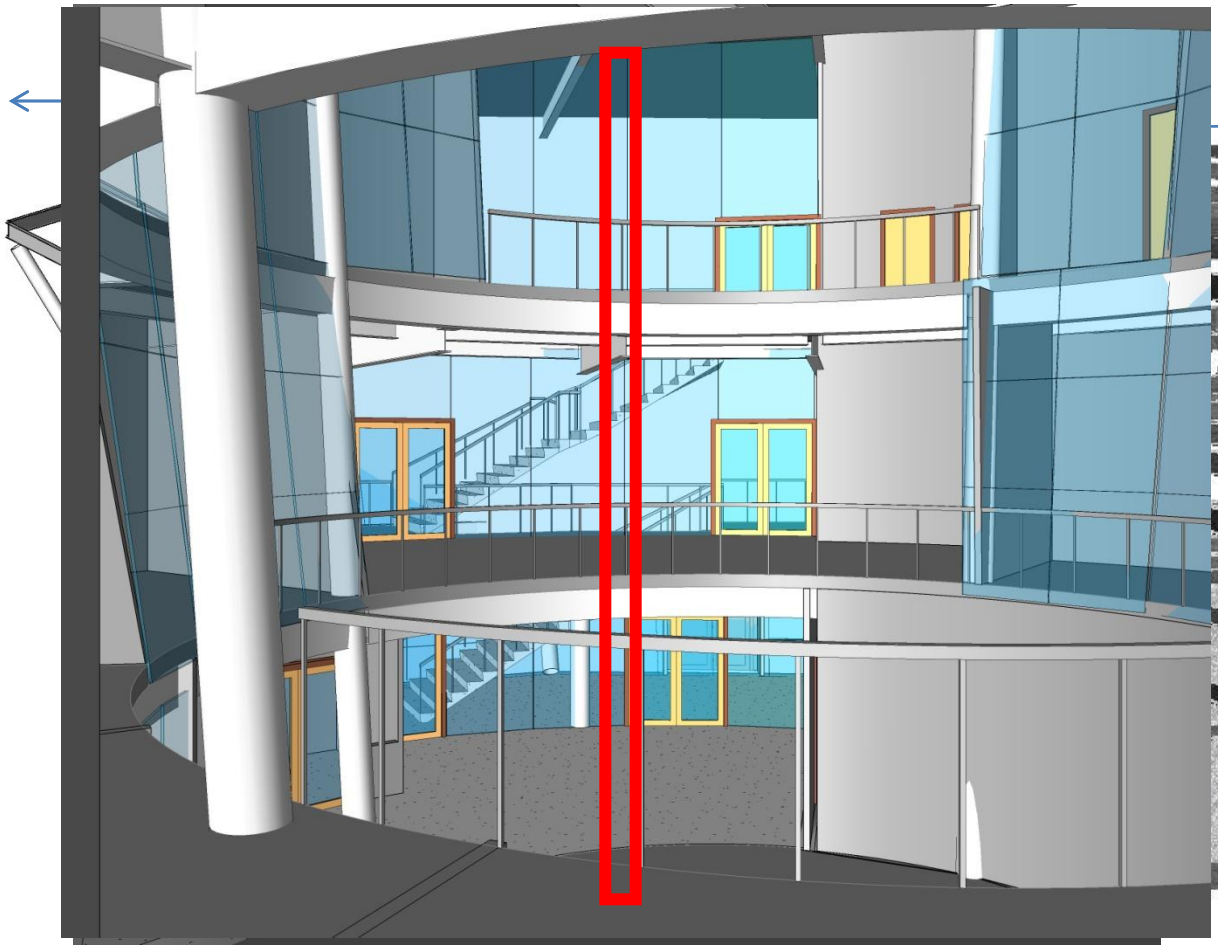
MEP

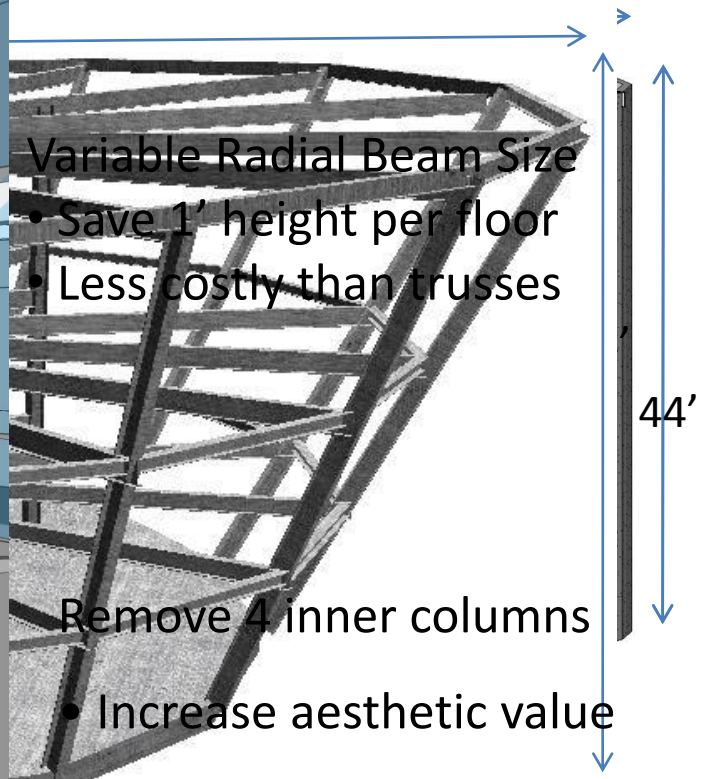
Construction

Integrated Project Delivery

- Dead Loads
  - Composite Slab → 45 psf
  - roof → 15 psf
  - MEP, ceiling, cladding → 30 psf
  - façade elements → 55 psf
- Live Load
  - 100 psf
- Snow Load
  - 20 psf
- Wind Load
  - 26 psf
- Earth pressure


30’
Raft foundation 2‘
Water Table





Variable Radial Beam Size
- Save 1’ height per floor
- Less costly than trusses

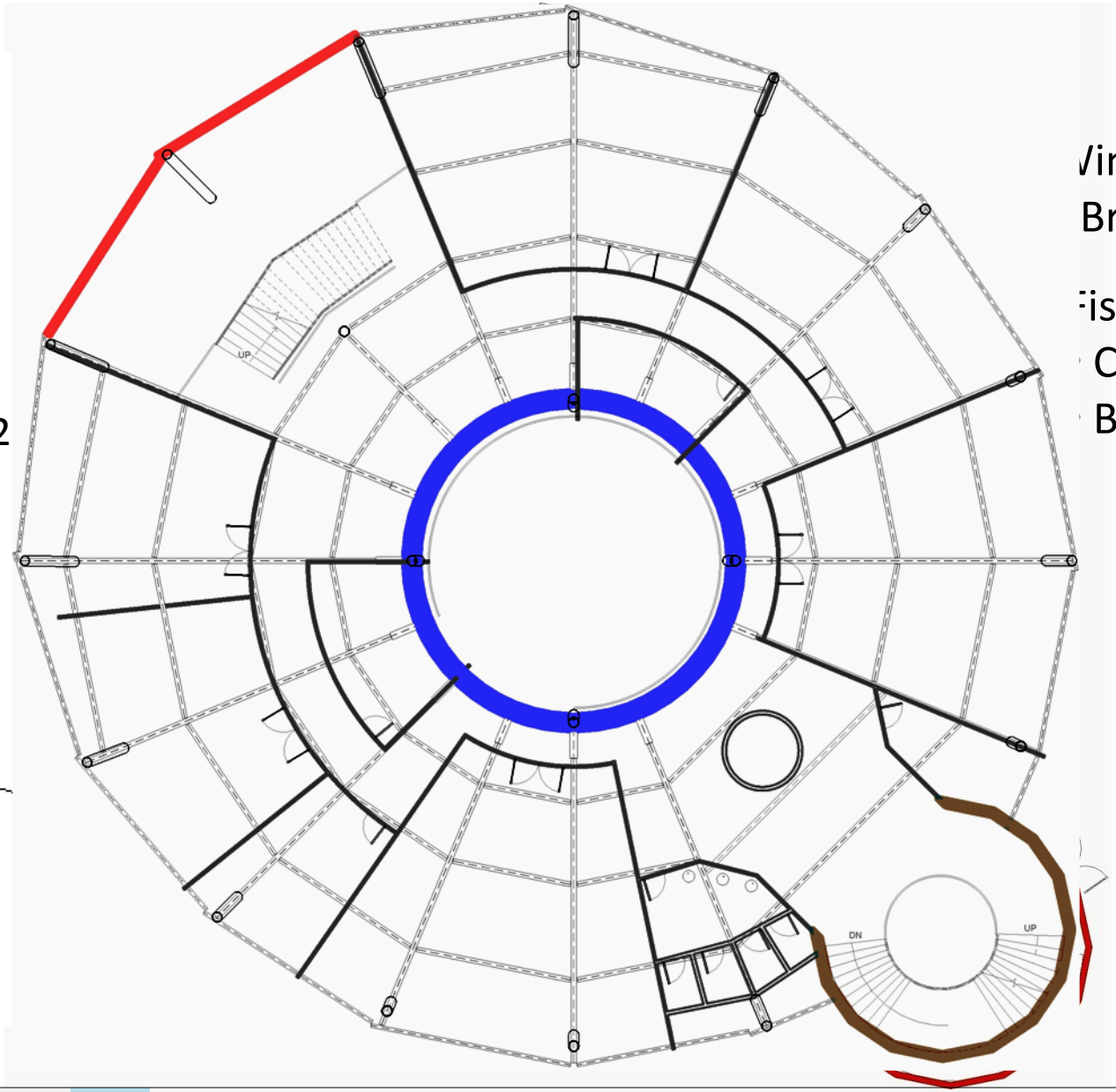
Remove 4 inner columns
- Increase aesthetic value
- Improve circulation

MEP → E
CM → E

A → E

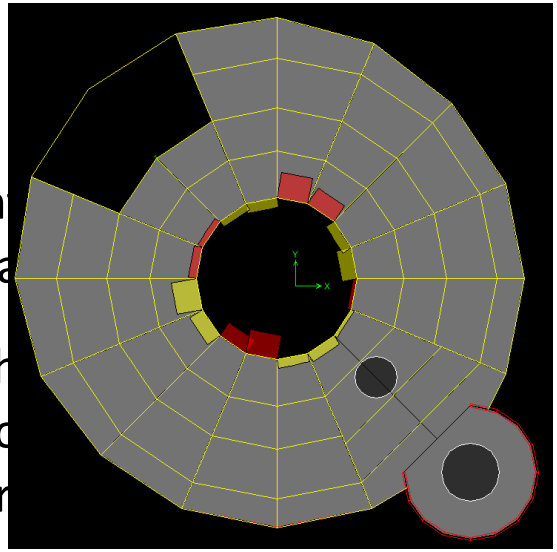
- Slanted Exterior Columns
- No Cantilevers

Create mix uses



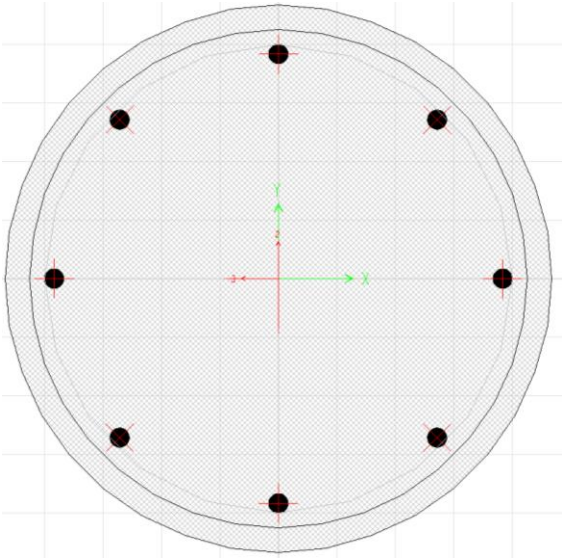
22

Vin
Bra
Fish
Co
Br

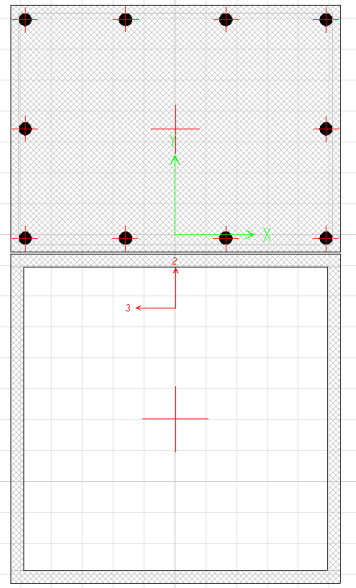


- Concrete Shear Wall
- Moment Frames: Inner Ring Beams & Outer Ring Beams
- Concrete Shear Wall
- Moment Frames: Inner Ring Beams

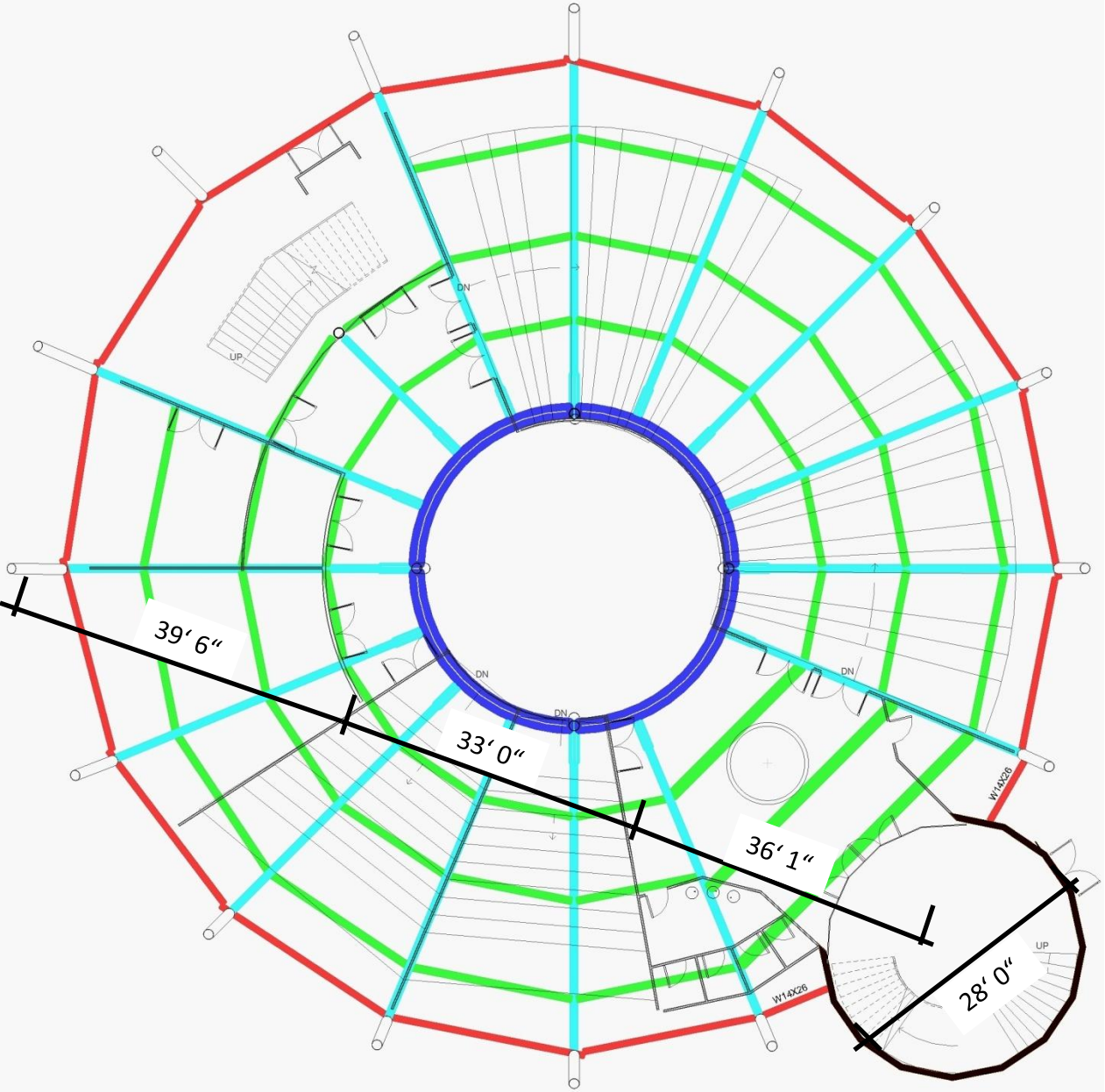
Create Mix Uses



Composite Columns
→ HSS 14x0.625



Inner ring beams
→ HSS16x12x5/8
→ 12”x12” Concrete



Composite columns
→HSS14x0.625

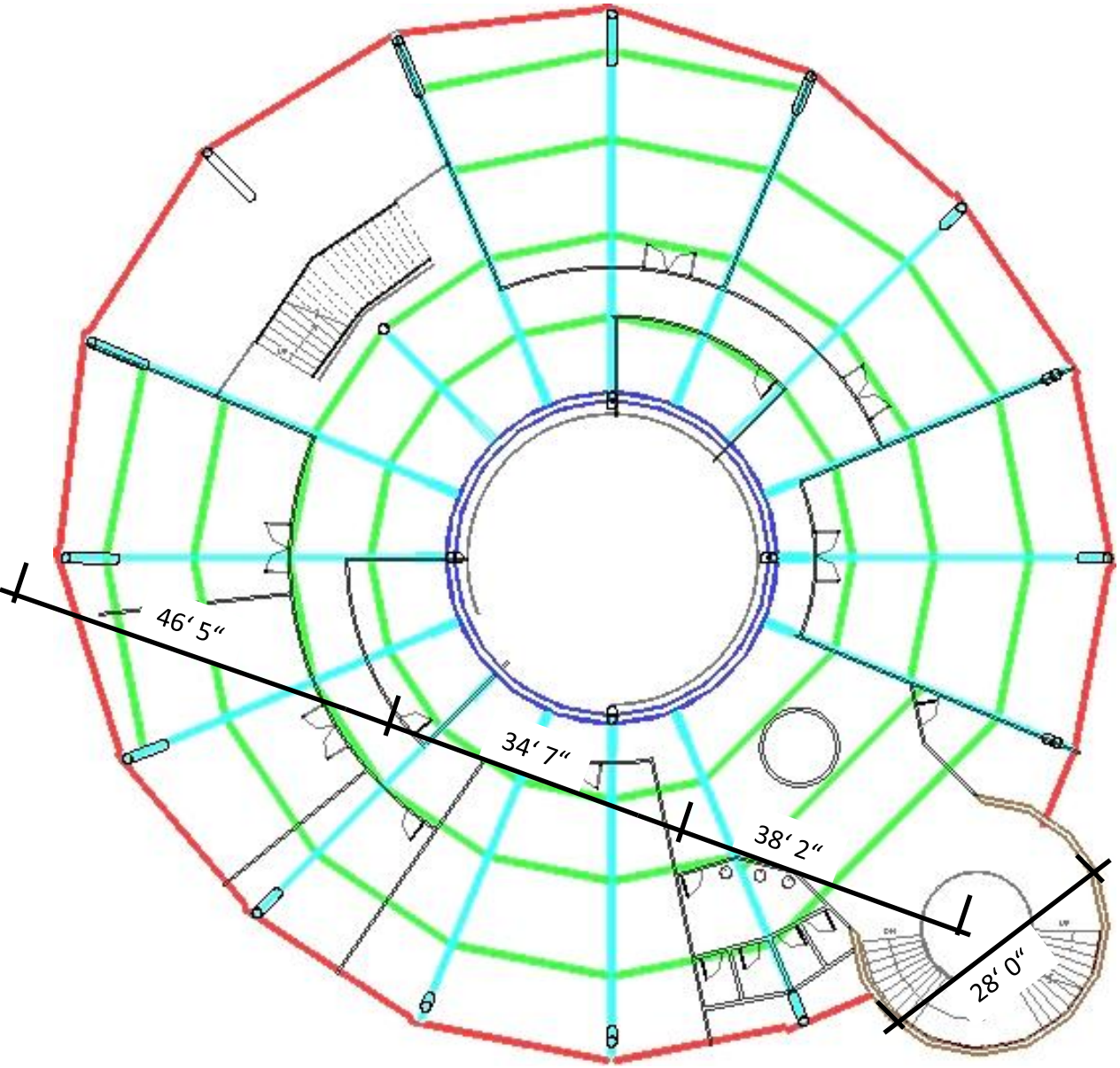
Radial beams
→ W24x55/ W12x58

Inner ring
→HSS16x12x5/8
→12”x12” Concrete

Outer ring
→ W14x26

Filler beams
→W12x26/ W16x36

Shear walls
→ 8”



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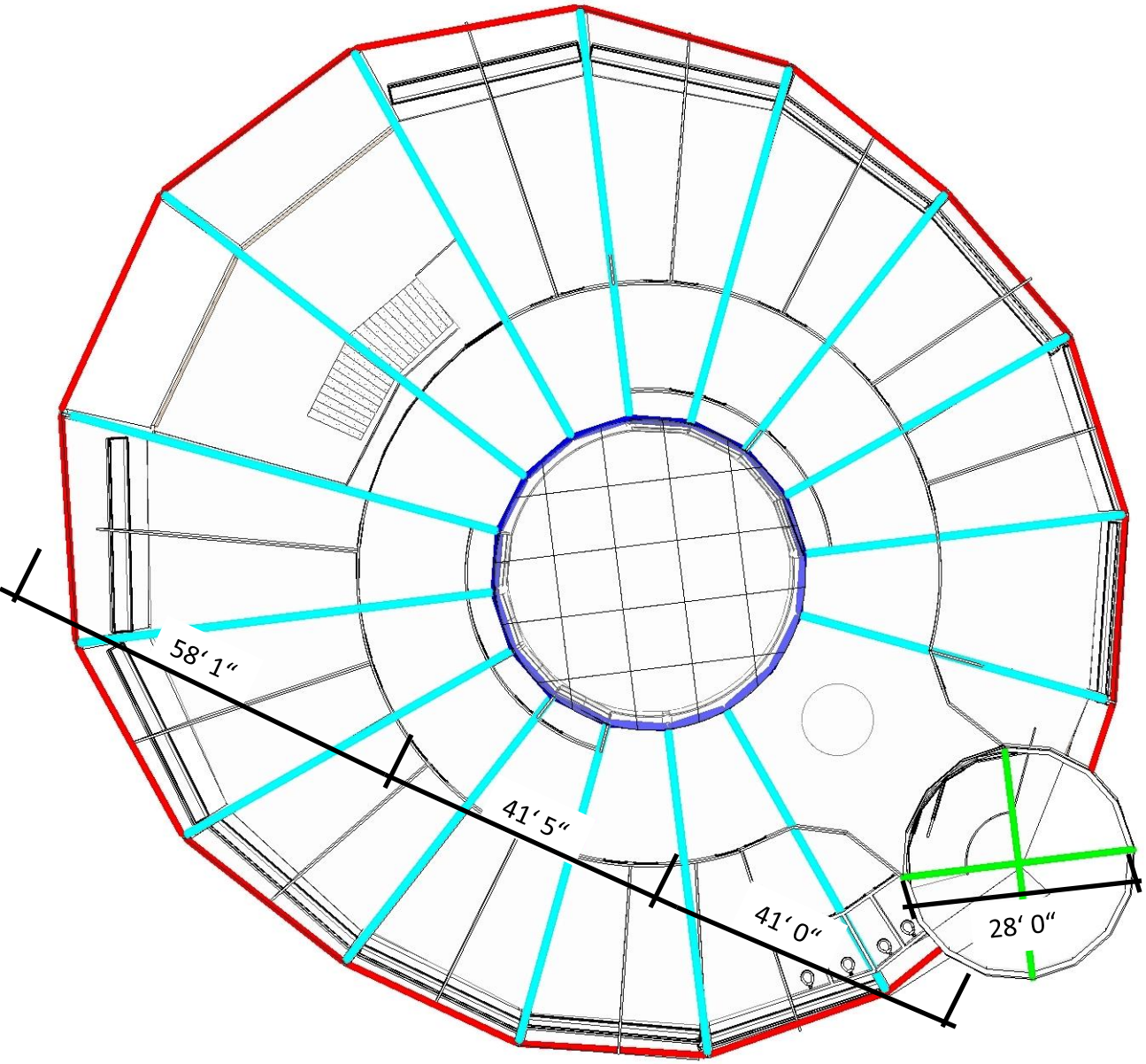

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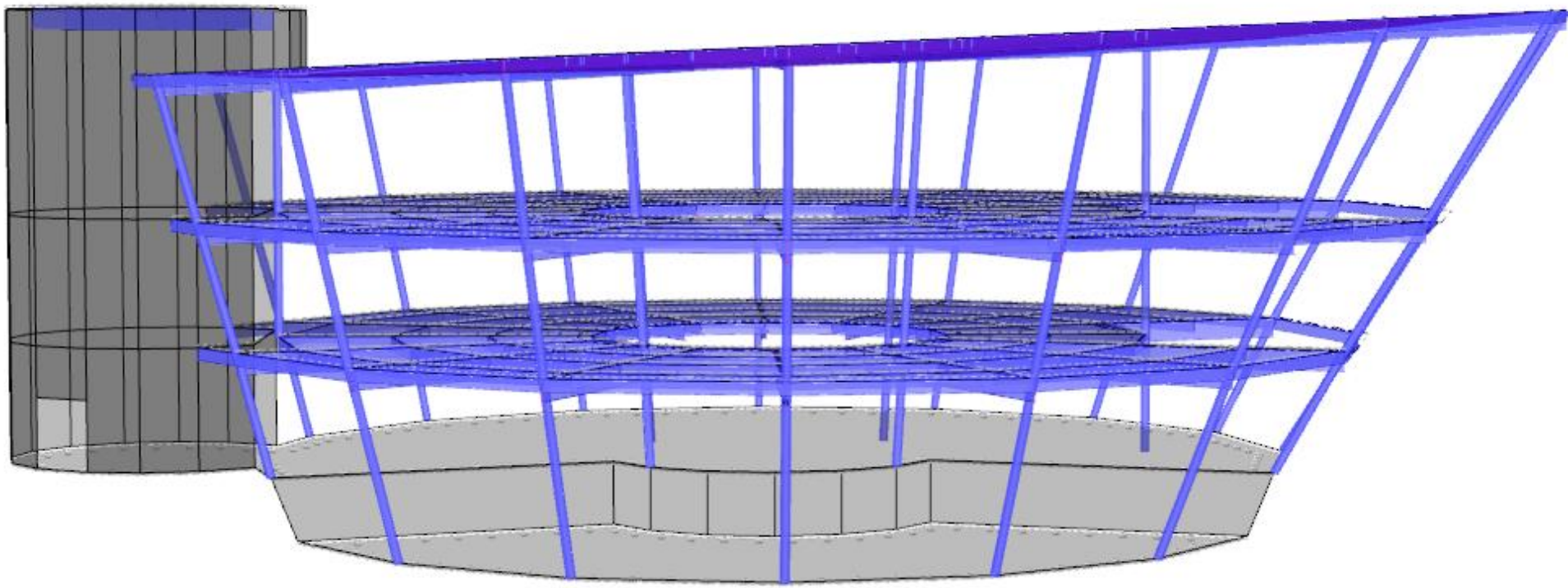
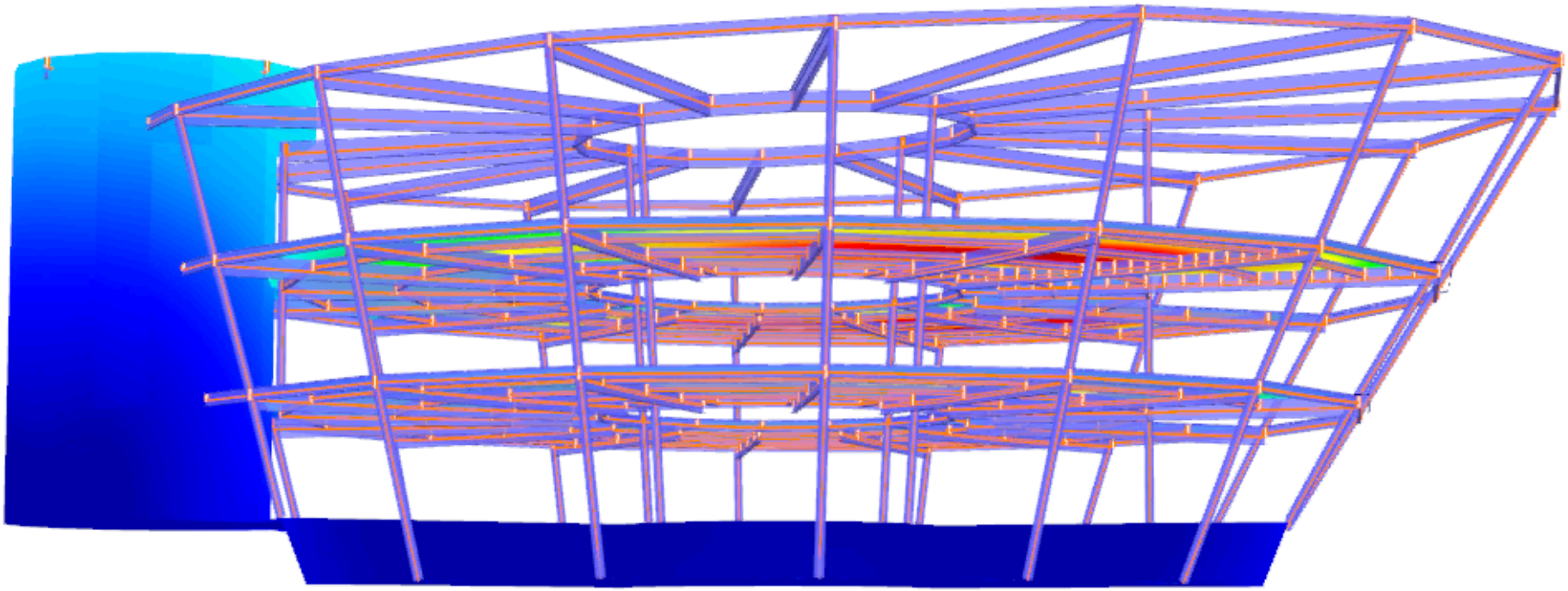
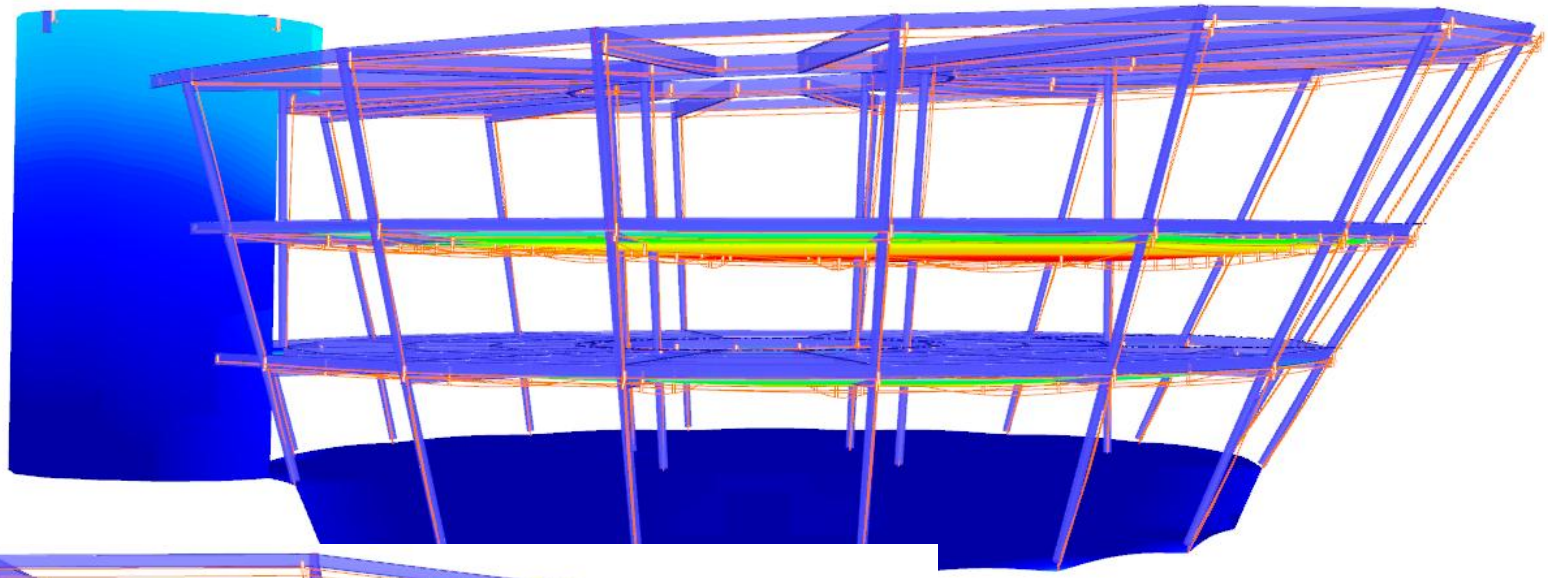
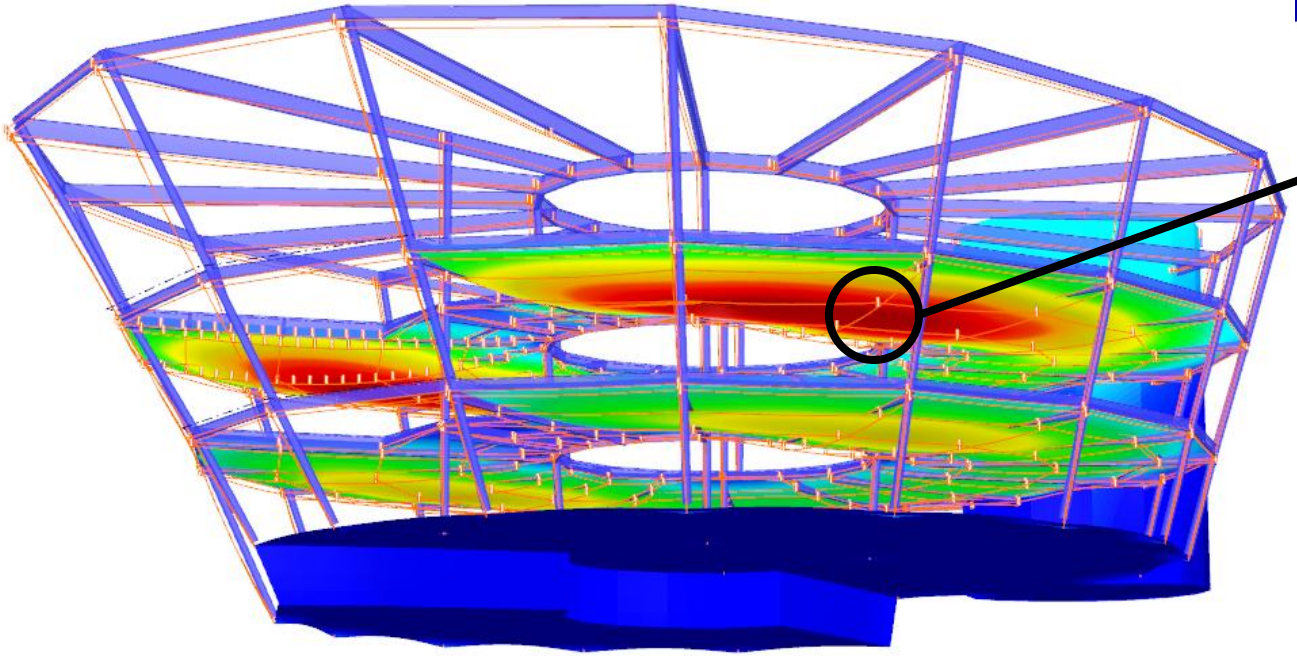


- Maximum deflection for the radial beams: L/240 ≈ 2.1”
- Maximum deflection for the columns: 0.02h ≈ 12”



Deflection under full load

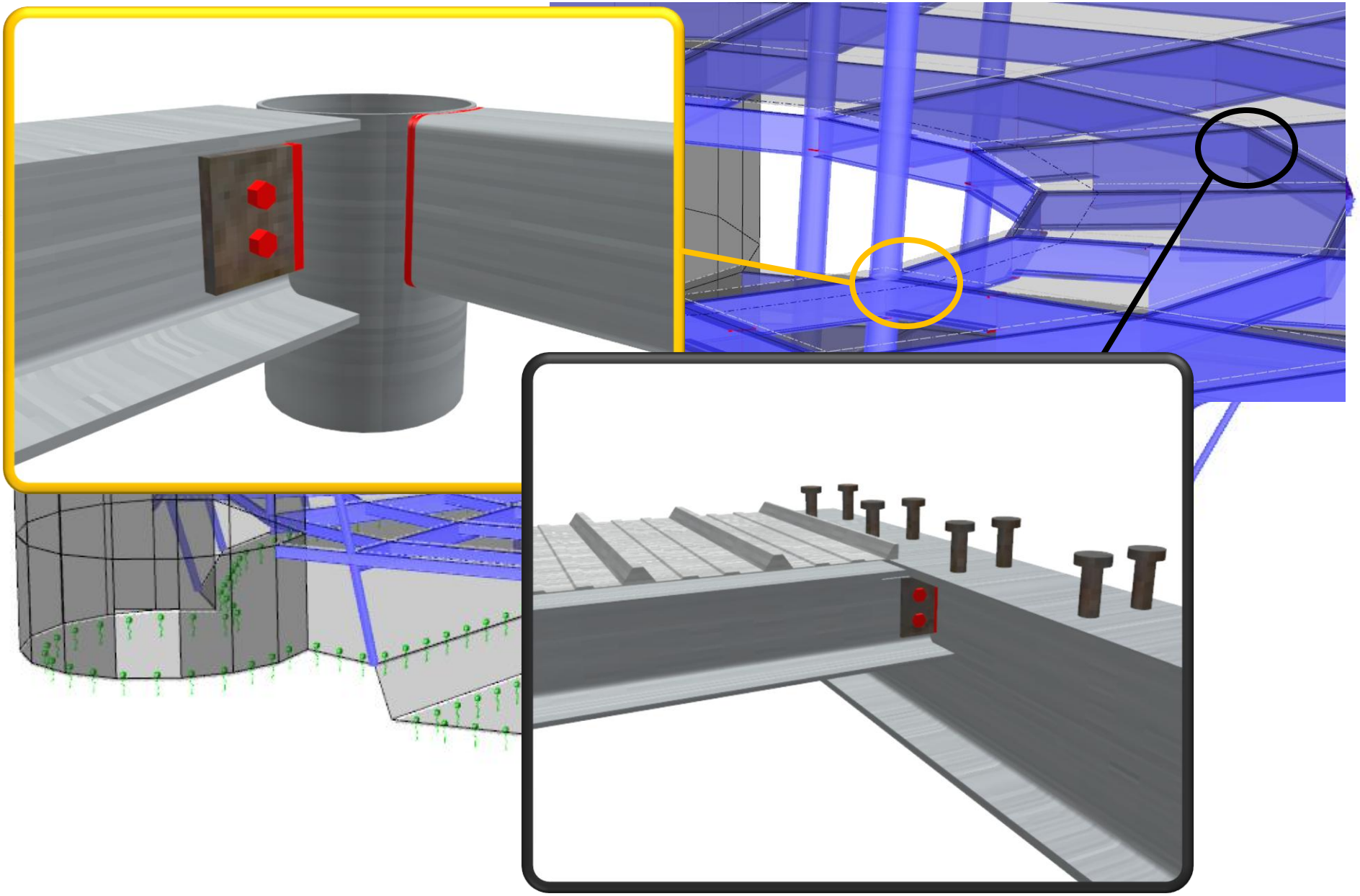


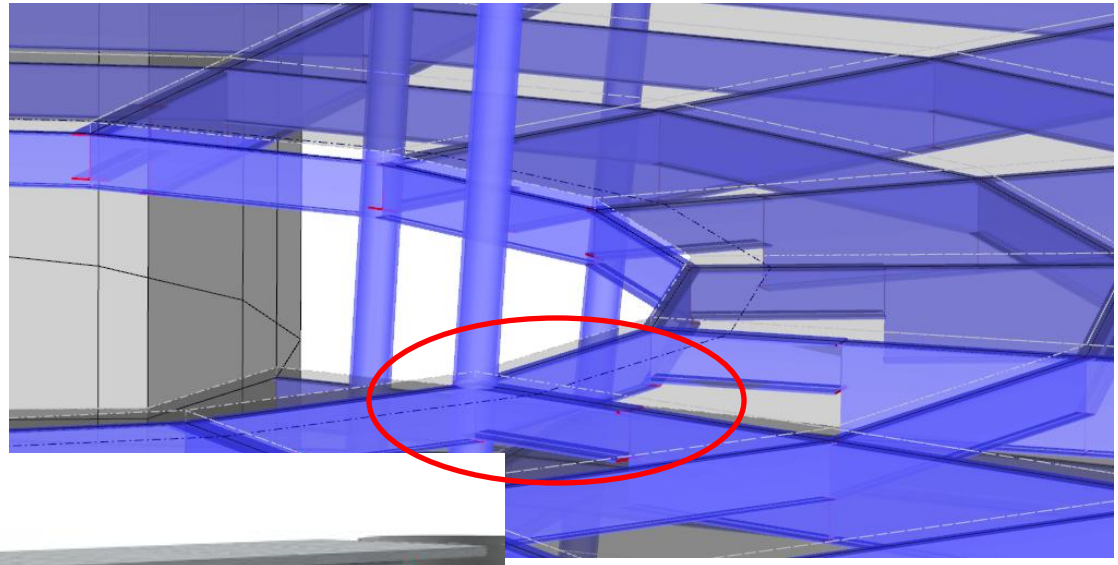


Maximum deflection
of 2.3” > 2.1”

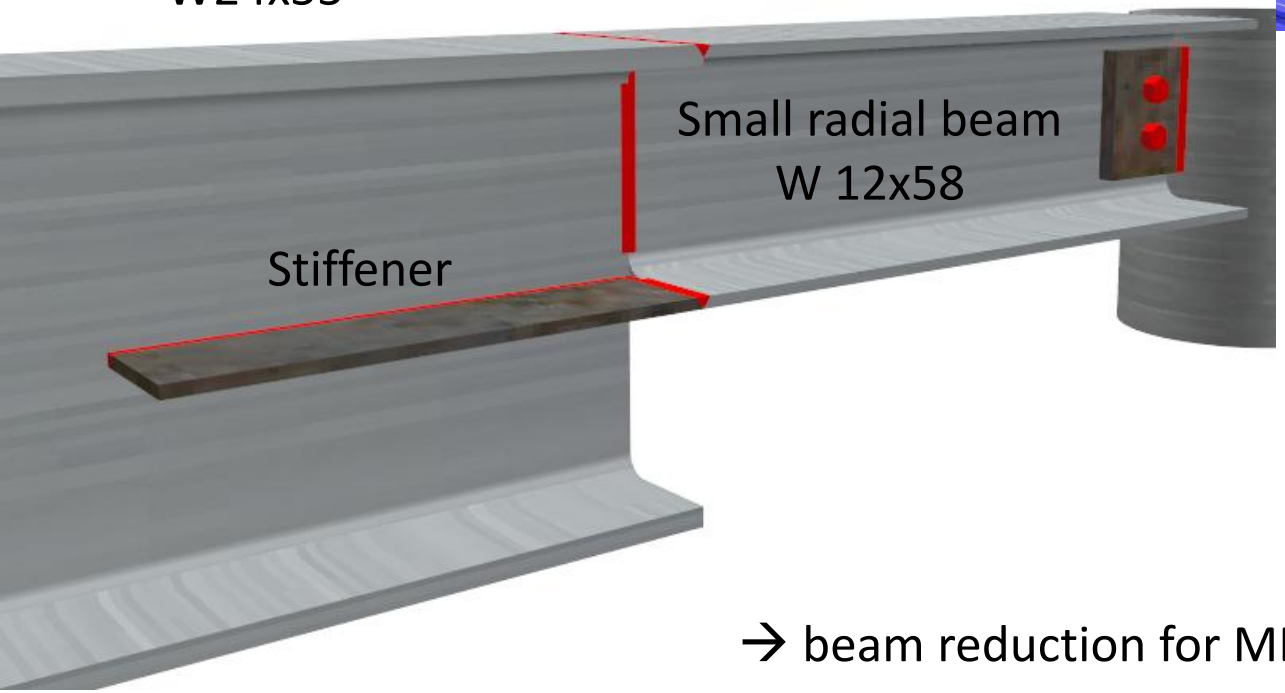
→ 1.5“ cambering

Economic Efficiency
Effective use of resources





Radial beam
W24x55



Composite column
HSS14x0.625

Economic Efficiency
Effective use of space

→ beam reduction for MEP

ARCHITECTURE

ENGINEERING

MEP

CONSTRUCTION

INTEGRATED PROJECT DELIVERY

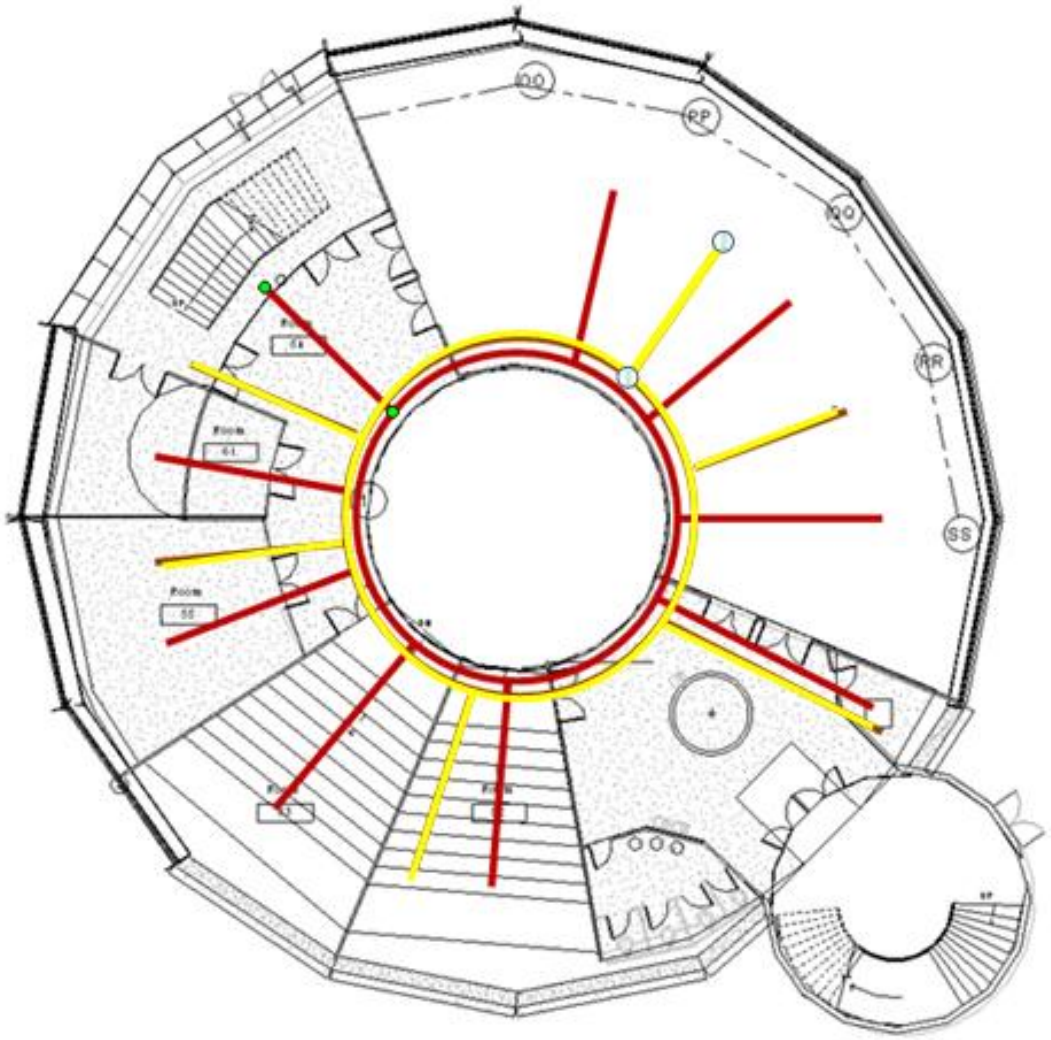
Control Variable Air Volume System (VAV):

- Controllable room temperature.
- Energy efficient: could be turned off in any room, when not in used.

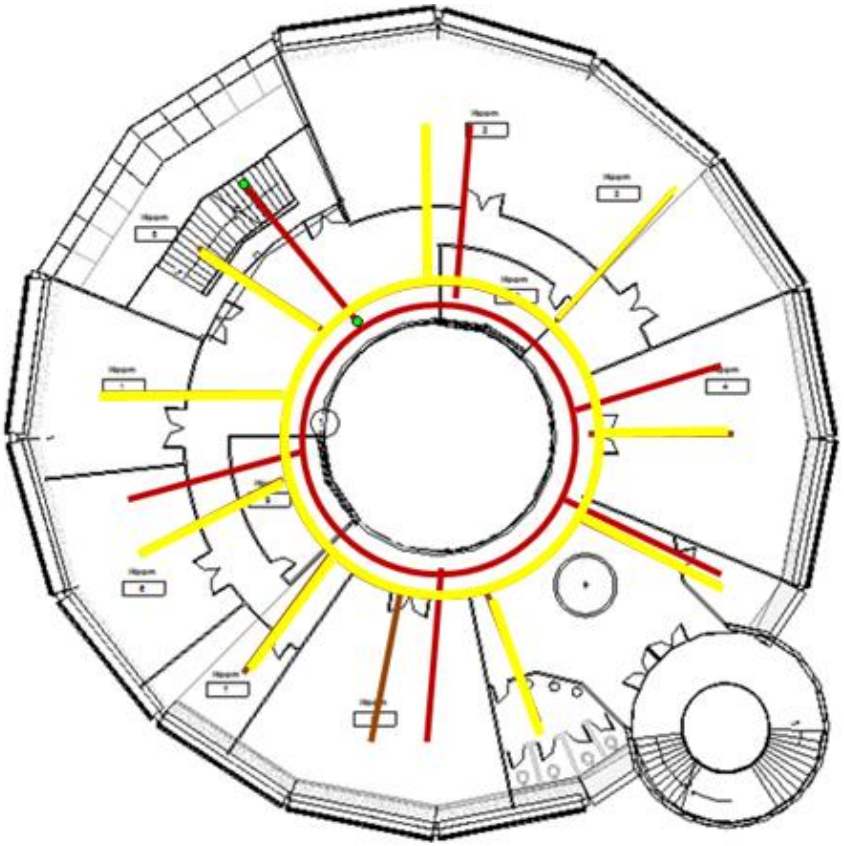
Heating and Cooling Facility:

- West Campus Cogeneration Facility.
- University Central Heating and Cooling System.

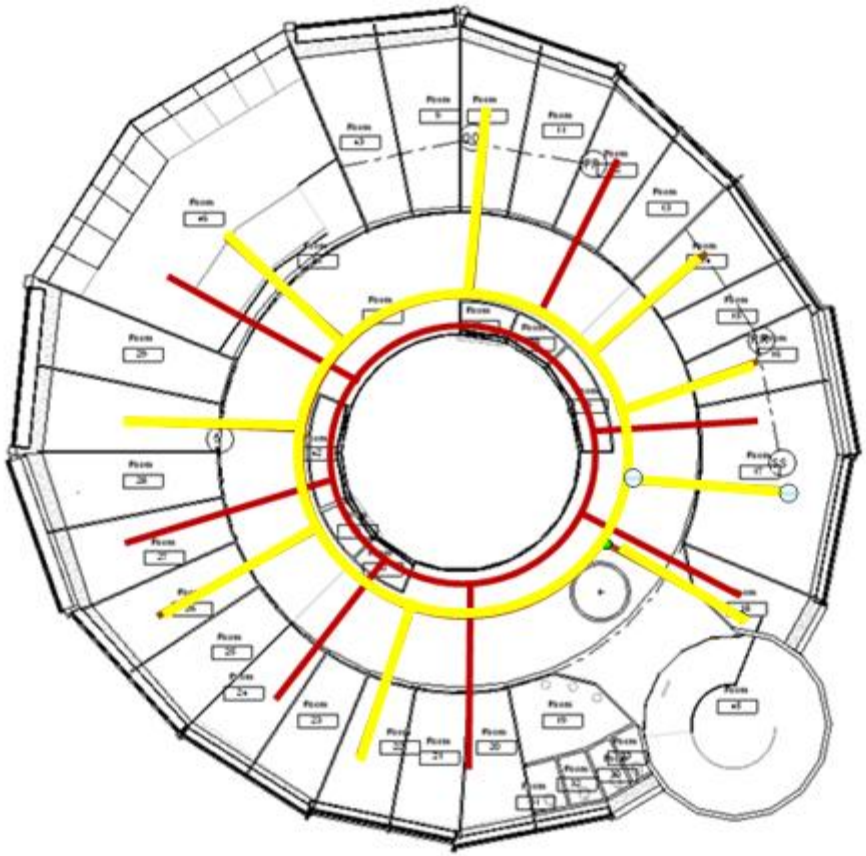
VAV Box



First Floor



Second Floor

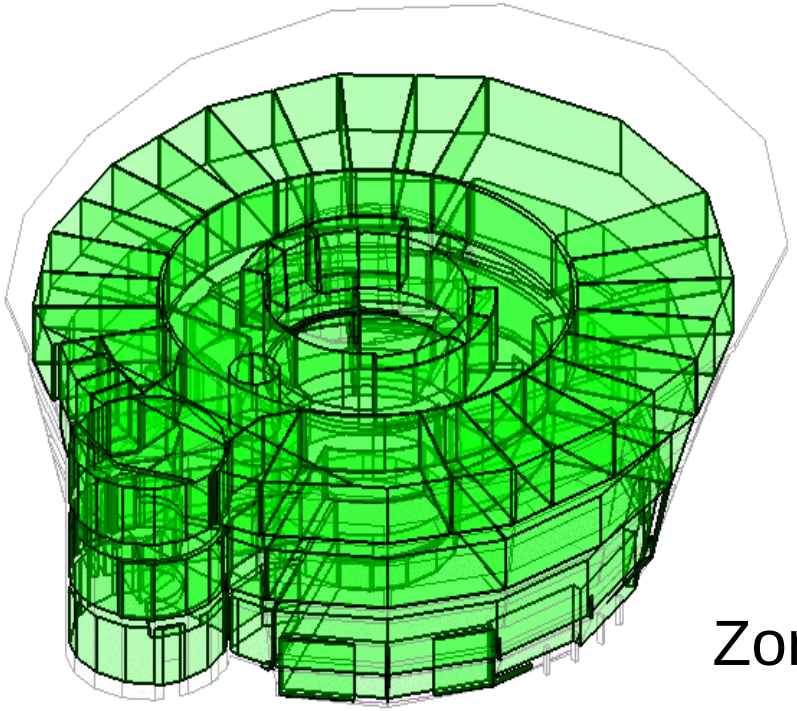


Third Floor

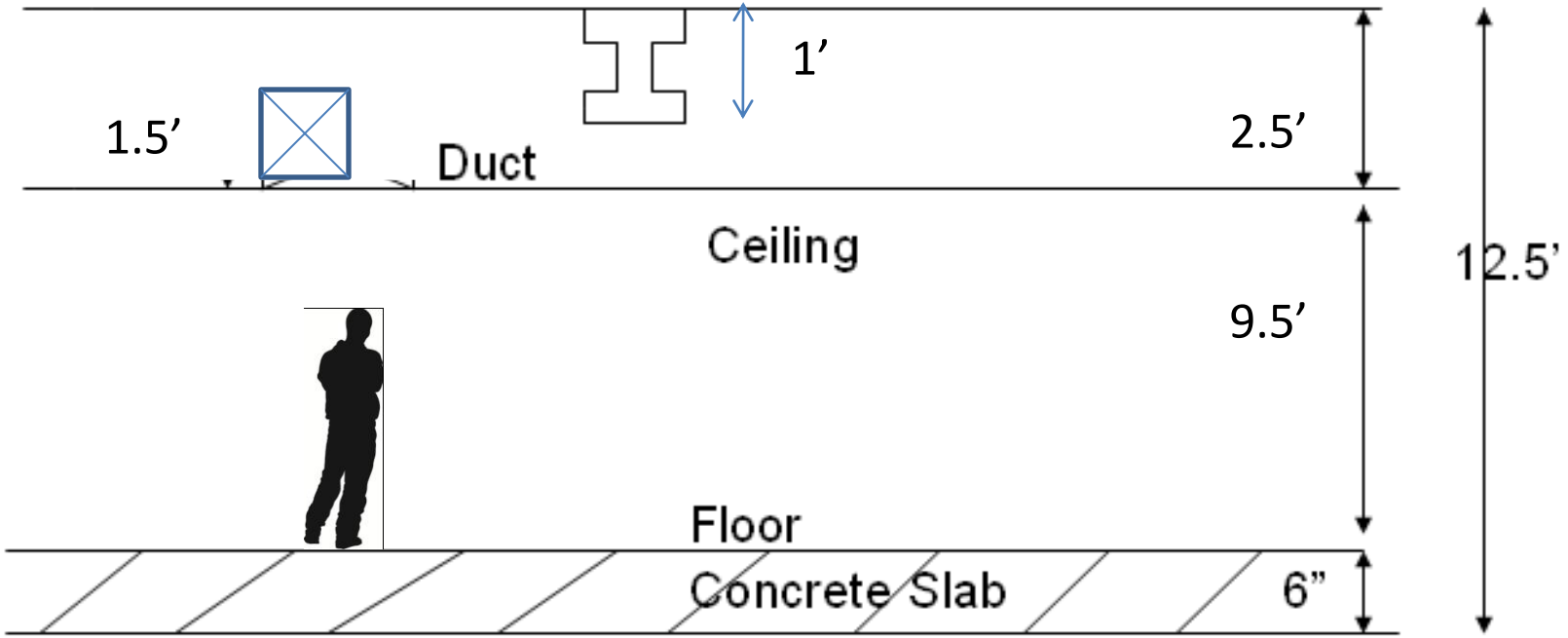
- Total Cooling Air Flow: 19,000 CFM
- Largest Ducts:

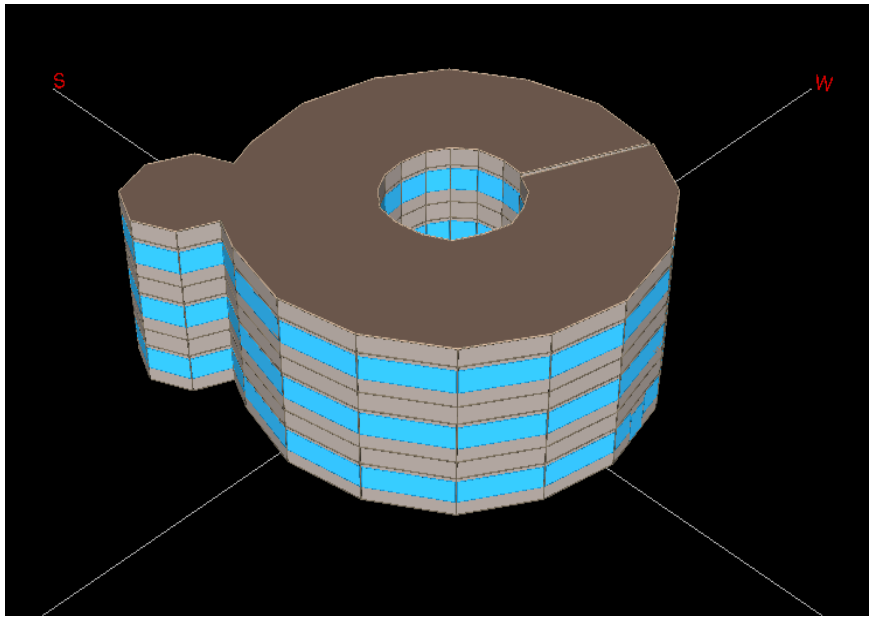
 - 1.5’ x 1.5’ (First Floor)

 - 19” Diameter (Second and Third Floor)



Zone Study


1’
1.5’
Duct
2.5’
Ceiling
12.5’
9.5’
Floor
Concrete Slab
6”



eQuest Building Model

Wall/Window Recommendation:

- Heavy Concrete 6” (2%)
- U21 3 Piece Glass with Argon(22%)

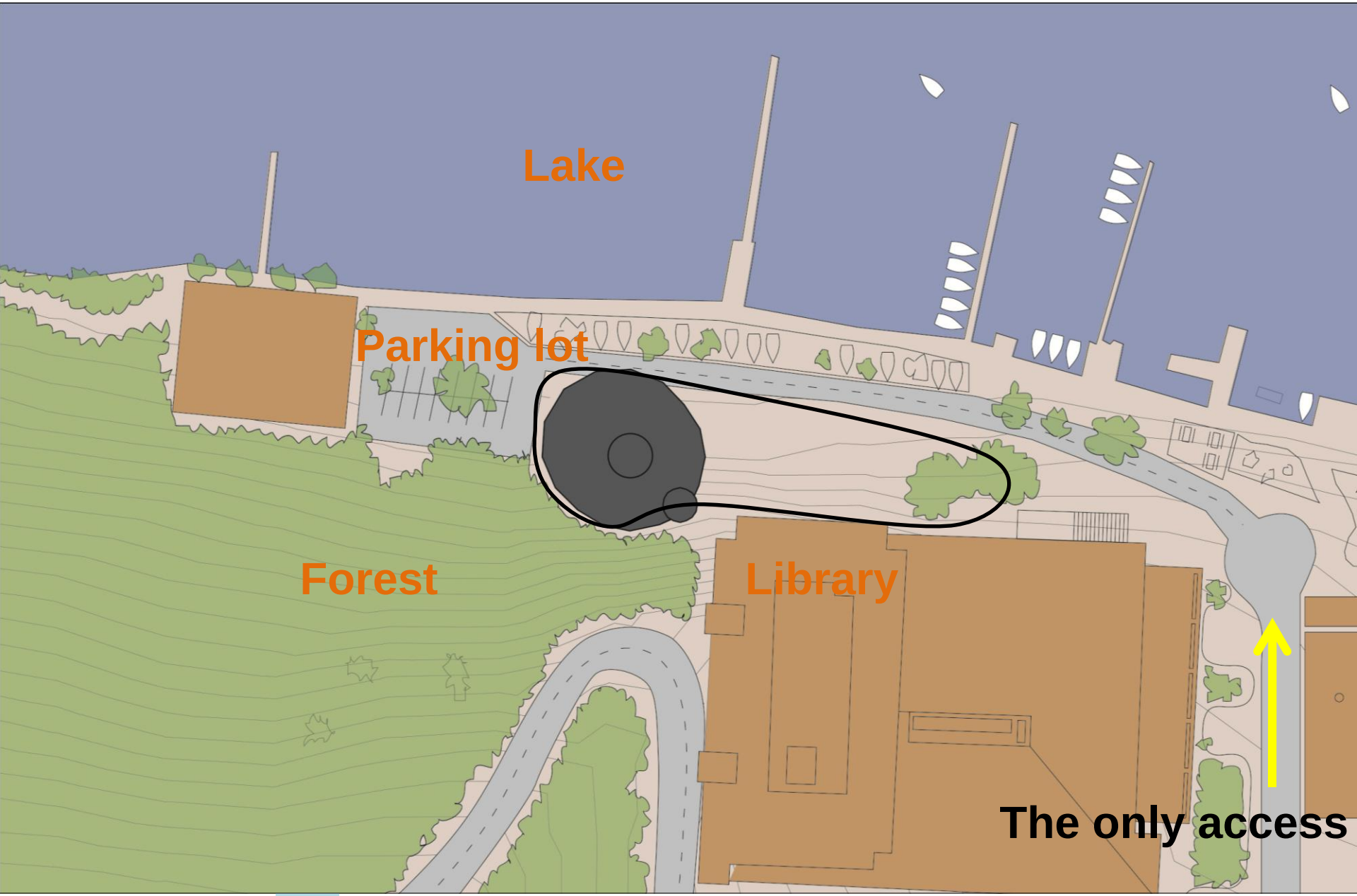
Architecture

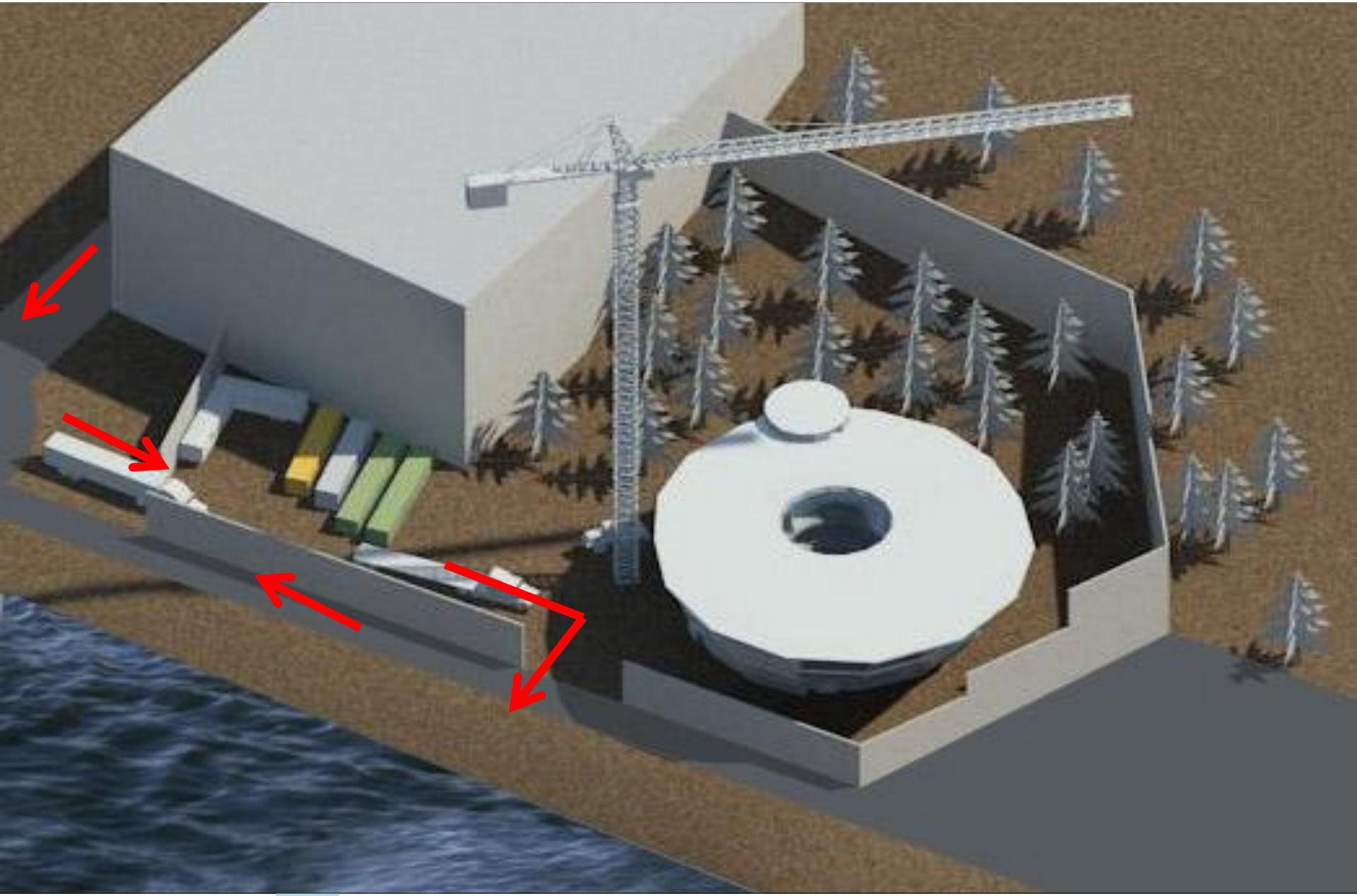
Engineering

MEP

Construction

Integrated Project Delivery

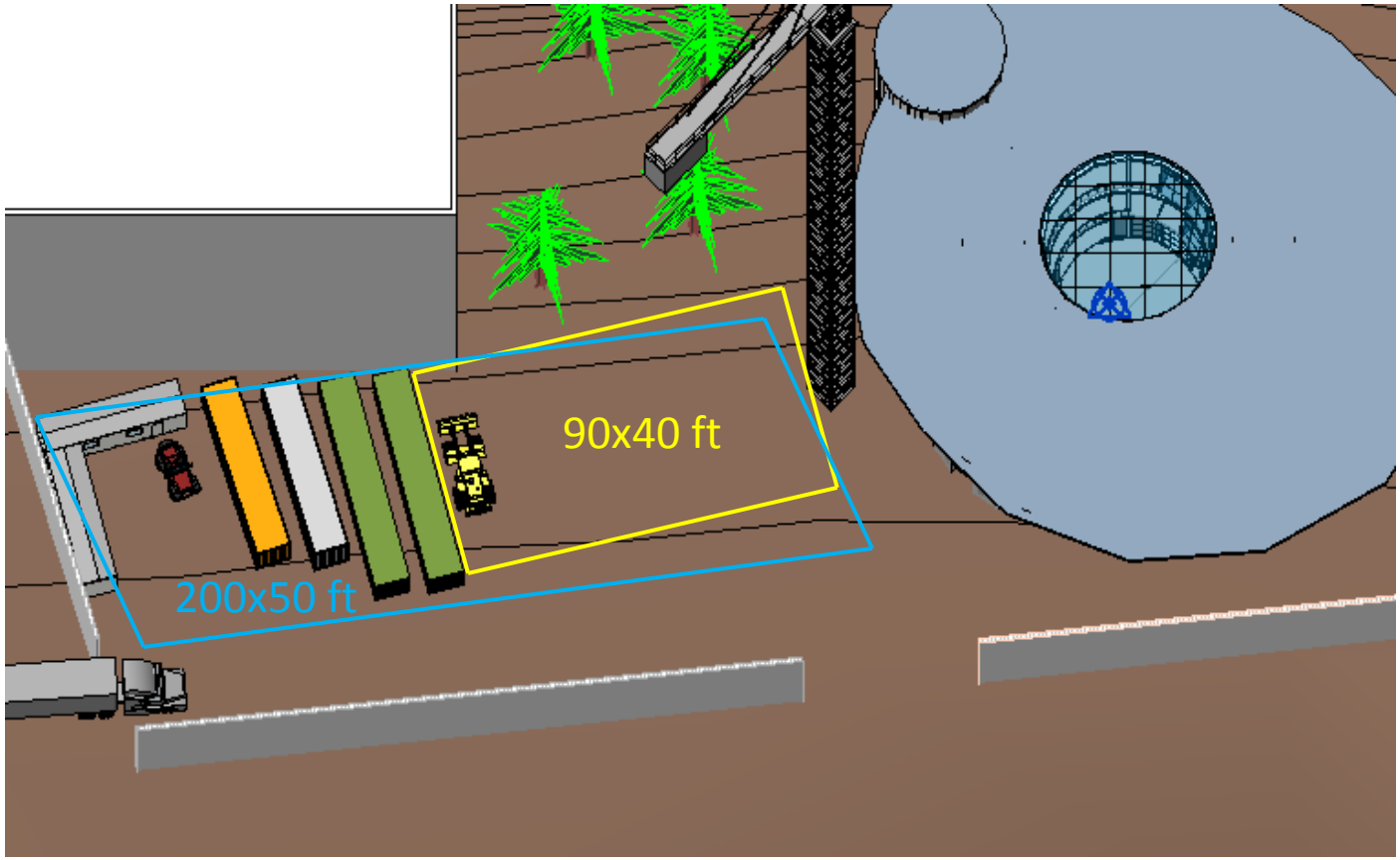

Lake
Parking lot
Forest
Library
The only access



Reduced Site Disturbance and Material Waste

Just-in-Time Delivery

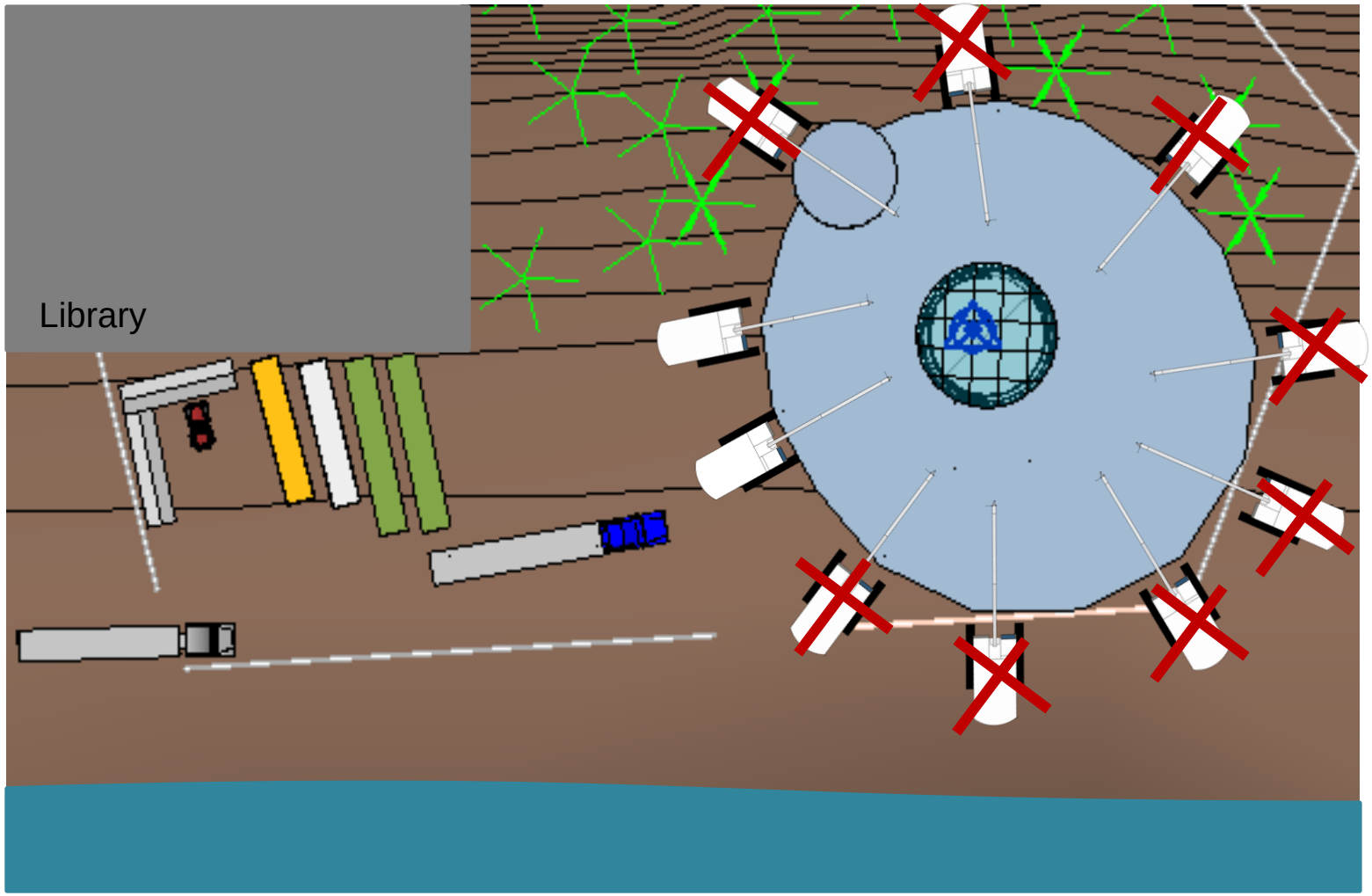
- Optimized scheduling of material delivery
- Reduced on-site storage space



Mobile vs. Tower Crane

- Small site forces use of tower crane

Reduced Site Disturbance



Minimal Transportation

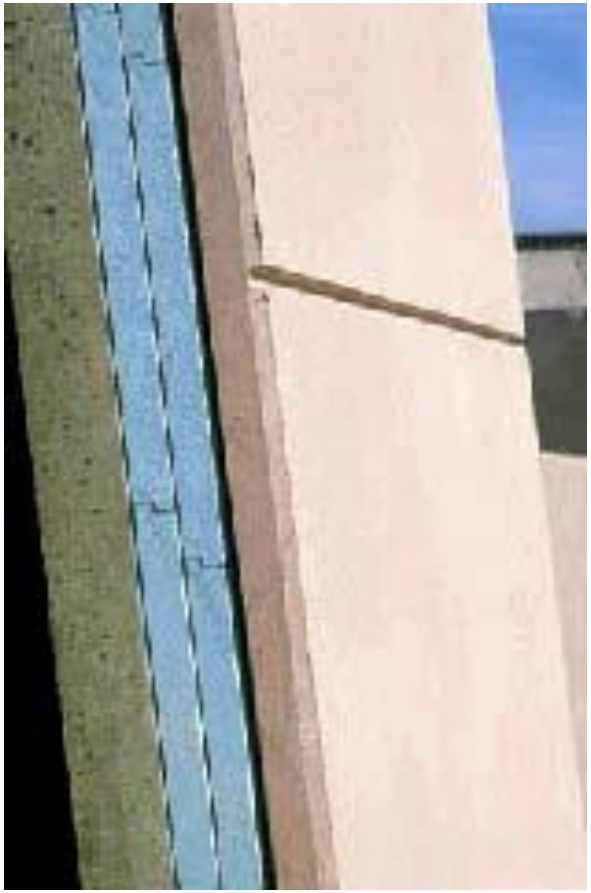
Steel	8 miles	17 min
Ready Mix Concrete	7 miles	17 min
Precast Concrete	62 miles	1 h 13 min
Doors	81 miles	1 h 34 min
Windows	89 miles	1 h 43 min

Improved Insulation

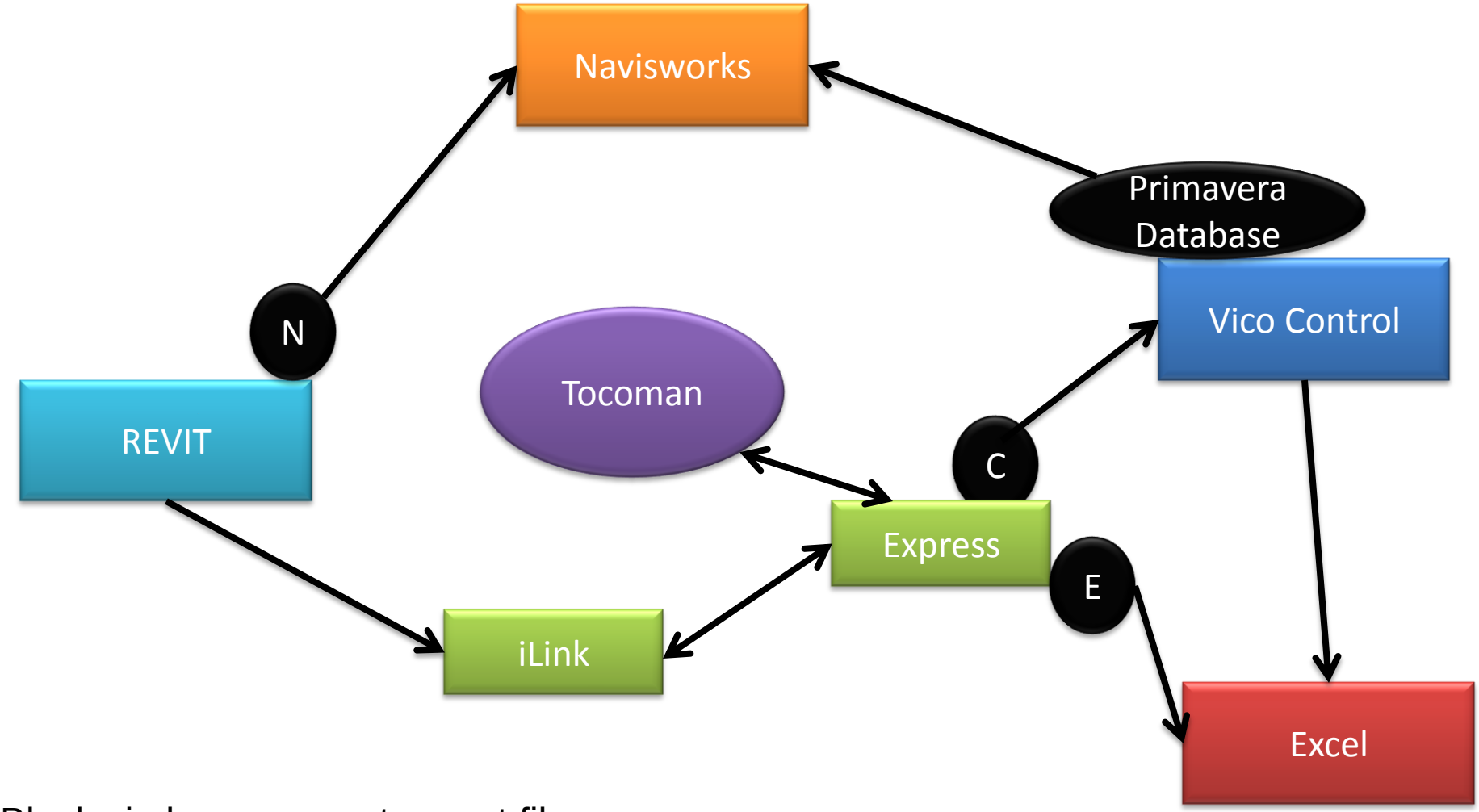
Prefabricated Wall Panels

- Double layered wall construction with insulation
- Reduced on-site construction time
- Reduced site congestion

Local Precast Manufacturer strongly recommended against pre-installing the windows in the panels – too **difficult to safely transport**

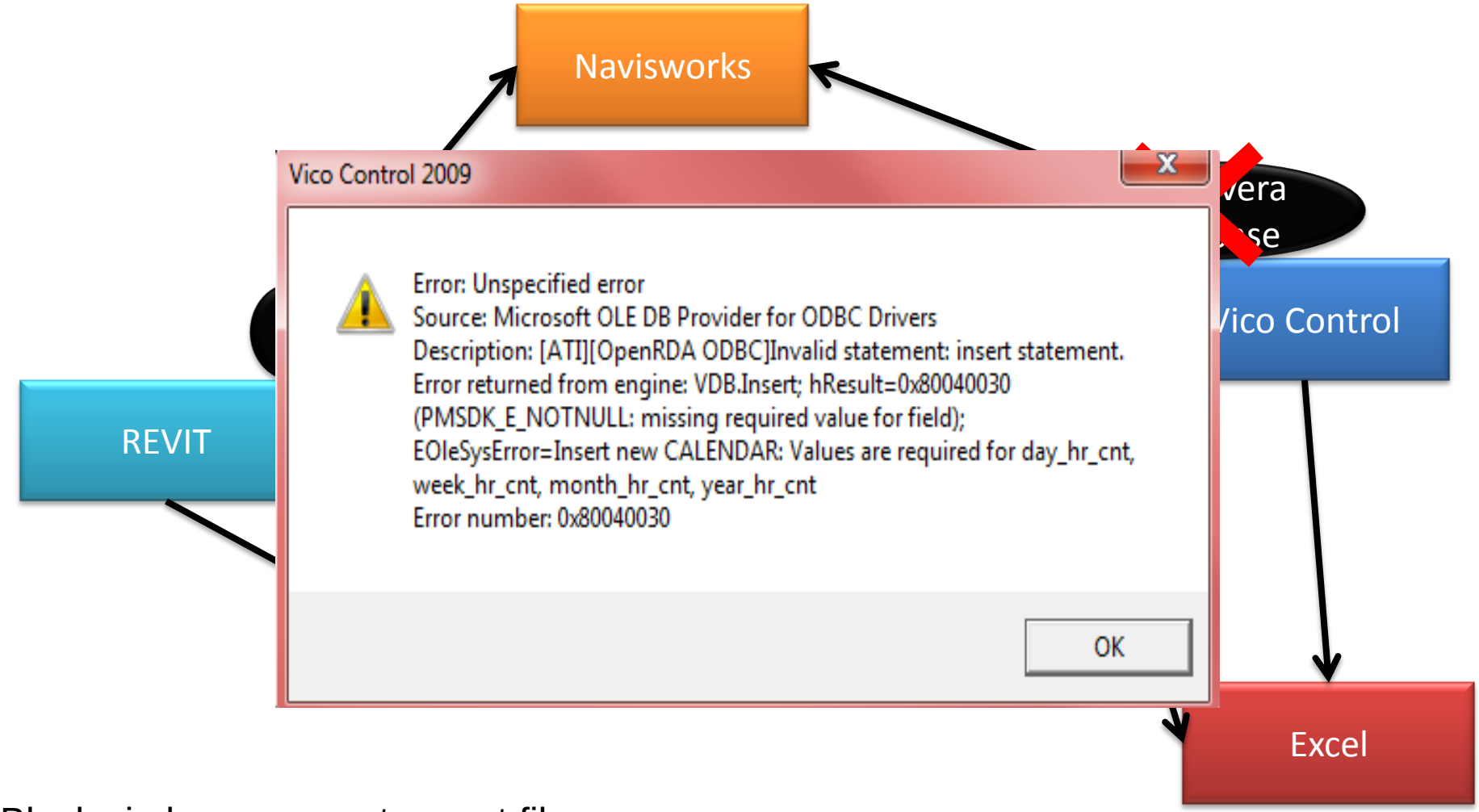


ORIGINAL



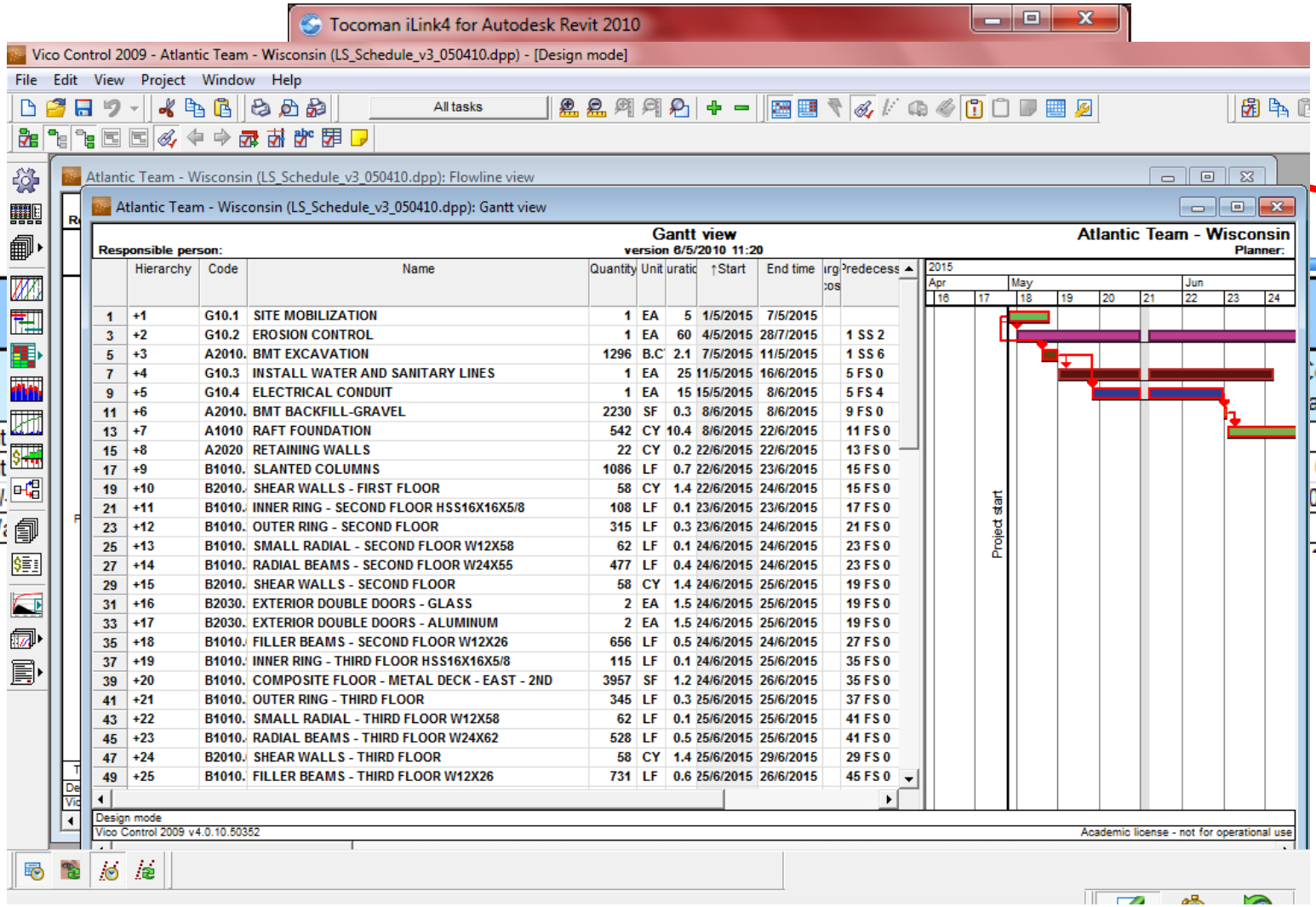
Black circles represent export files

MODIFICATION

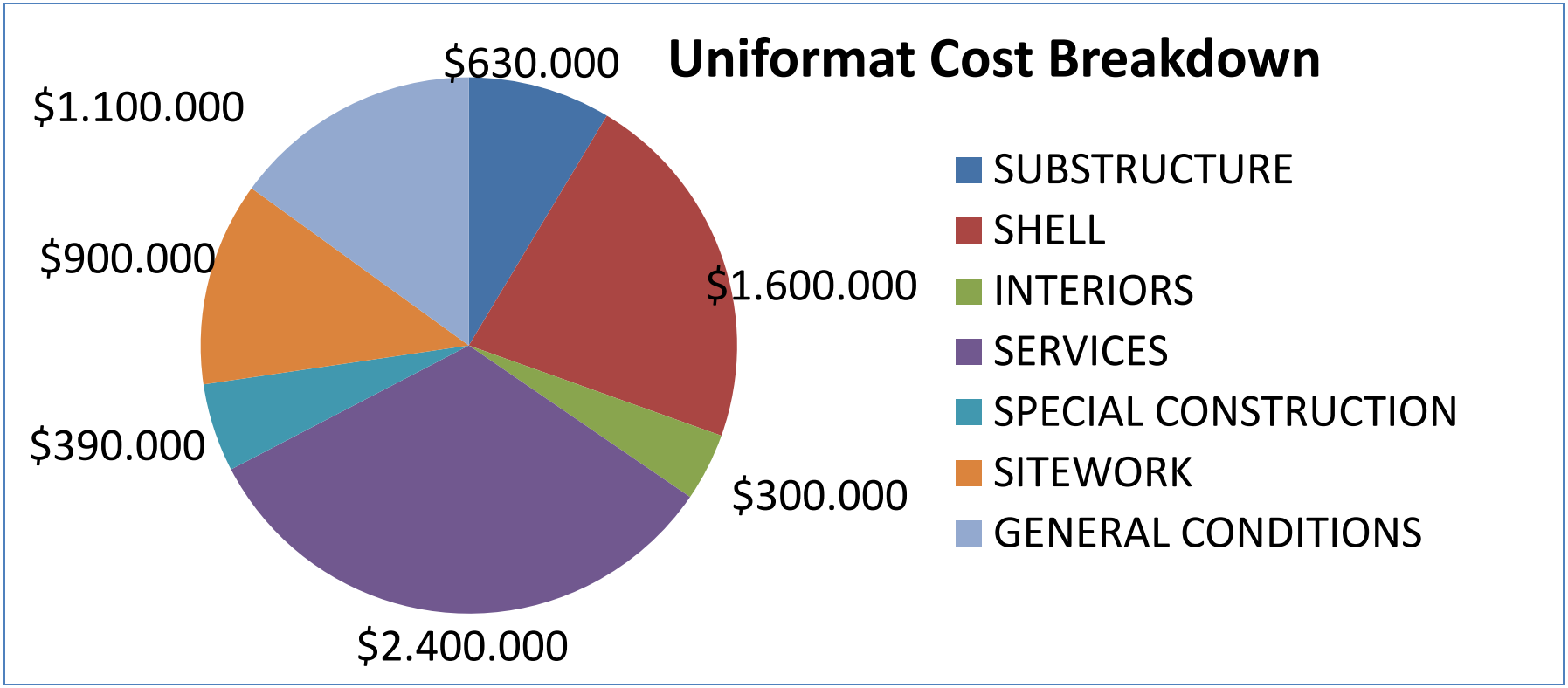


Black circles represent export files

FINAL


Tocoman iLink4 for Autodesk Revit 2010
Vico Control 2009 - Atlantic Team - Wisconsin (LS_Schedule_v3_050410.dpp) - [Design mode]
File Edit View Project Window Help
All tasks
Atlantic Team - Wisconsin (LS_Schedule_v3_050410.dpp): Flowline view
Atlantic Team - Wisconsin (LS_Schedule_v3_050410.dpp): Gantt view
Gantt view
version 6/5/2010 11:20
Responsible person:
Atlantic Team - Wisconsin
Planner:
Hierarchy Code Name Quantity Unit Duration Start End time Predecessors
1 +1 G10.1 SITE MOBILIZATION 1 EA 5 1/5/2015 7/5/2015
3 +2 G10.2 EROSION CONTROL 1 EA 60 4/5/2015 28/7/2015 1 SS 2
5 +3 A2010. BMT EXCAVATION 1296 B.C 2.1 7/5/2015 11/5/2015 1 SS 6
7 +4 G10.3 INSTALL WATER AND SANITARY LINES 1 EA 25 11/5/2015 16/6/2015 5 FS 0
9 +5 G10.4 ELECTRICAL CONDUIT 1 EA 15 15/5/2015 8/6/2015 5 FS 4
11 +6 A2010. BMT BACKFILL-GRAVEL 2230 SF 0.3 8/6/2015 8/6/2015 9 FS 0
13 +7 A1010 RAFT FOUNDATION 542 CY 10.4 8/6/2015 22/6/2015 11 FS 0
15 +8 A2020 RETAINING WALLS 22 CY 0.2 22/6/2015 22/6/2015 13 FS 0
17 +9 B1010. SLANTED COLUMNS 1086 LF 0.7 22/6/2015 23/6/2015 15 FS 0
19 +10 B2010. SHEAR WALLS - FIRST FLOOR 58 CY 1.4 22/6/2015 24/6/2015 15 FS 0
21 +11 B1010. INNER RING - SECOND FLOOR HSS16X16X5/8 108 LF 0.1 23/6/2015 23/6/2015 17 FS 0
23 +12 B1010. OUTER RING - SECOND FLOOR 315 LF 0.3 23/6/2015 24/6/2015 21 FS 0
25 +13 B1010. SMALL RADIAL - SECOND FLOOR W12X58 62 LF 0.1 24/6/2015 24/6/2015 23 FS 0
27 +14 B1010. RADIAL BEAMS - SECOND FLOOR W24X55 477 LF 0.4 24/6/2015 24/6/2015 23 FS 0
29 +15 B2010. SHEAR WALLS - SECOND FLOOR 58 CY 1.4 24/6/2015 25/6/2015 19 FS 0
31 +16 B2030. EXTERIOR DOUBLE DOORS - GLASS 2 EA 1.5 24/6/2015 25/6/2015 19 FS 0
33 +17 B2030. EXTERIOR DOUBLE DOORS - ALUMINUM 2 EA 1.5 24/6/2015 25/6/2015 19 FS 0
35 +18 B1010. FILLER BEAMS - SECOND FLOOR W12X26 656 LF 0.5 24/6/2015 24/6/2015 27 FS 0
37 +19 B1010. INNER RING - THIRD FLOOR HSS16X16X5/8 115 LF 0.1 24/6/2015 25/6/2015 35 FS 0
39 +20 B1010. COMPOSITE FLOOR - METAL DECK - EAST - 2ND 3957 SF 1.2 24/6/2015 26/6/2015 35 FS 0
41 +21 B1010. OUTER RING - THIRD FLOOR 345 LF 0.3 25/6/2015 25/6/2015 37 FS 0
43 +22 B1010. SMALL RADIAL - THIRD FLOOR W12X58 62 LF 0.1 25/6/2015 25/6/2015 41 FS 0
45 +23 B1010. RADIAL BEAMS - THIRD FLOOR W24X62 528 LF 0.5 25/6/2015 25/6/2015 41 FS 0
47 +24 B2010. SHEAR WALLS - THIRD FLOOR 58 CY 1.4 25/6/2015 29/6/2015 29 FS 0
49 +25 B1010. FILLER BEAMS - THIRD FLOOR W12X26 731 LF 0.6 25/6/2015 26/6/2015 45 FS 0
2015
Apr May Jun
16 17 18 19 20 21 22 23 24
Project start
Design mode
Vico Control 2009 v4.0.10.50352
Academic license - not for operational use

TOTAL COST: $7.3 Million



High Cost Items:

* **Structural System - $430,000**
* **Curtainwall - $360,000**
* **Precast Wall Panels -$270,000**
* **Windows - $141,000**

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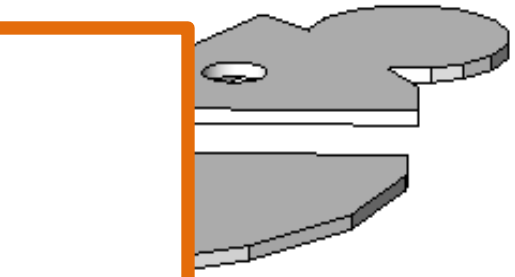
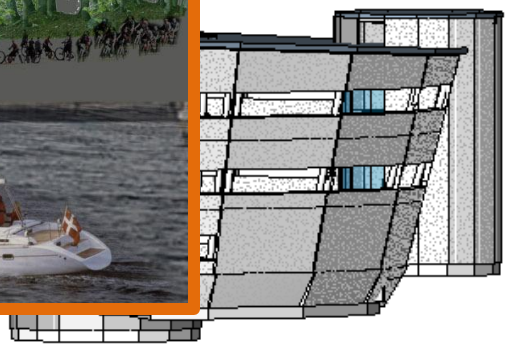
Total Duration:

10.5 months

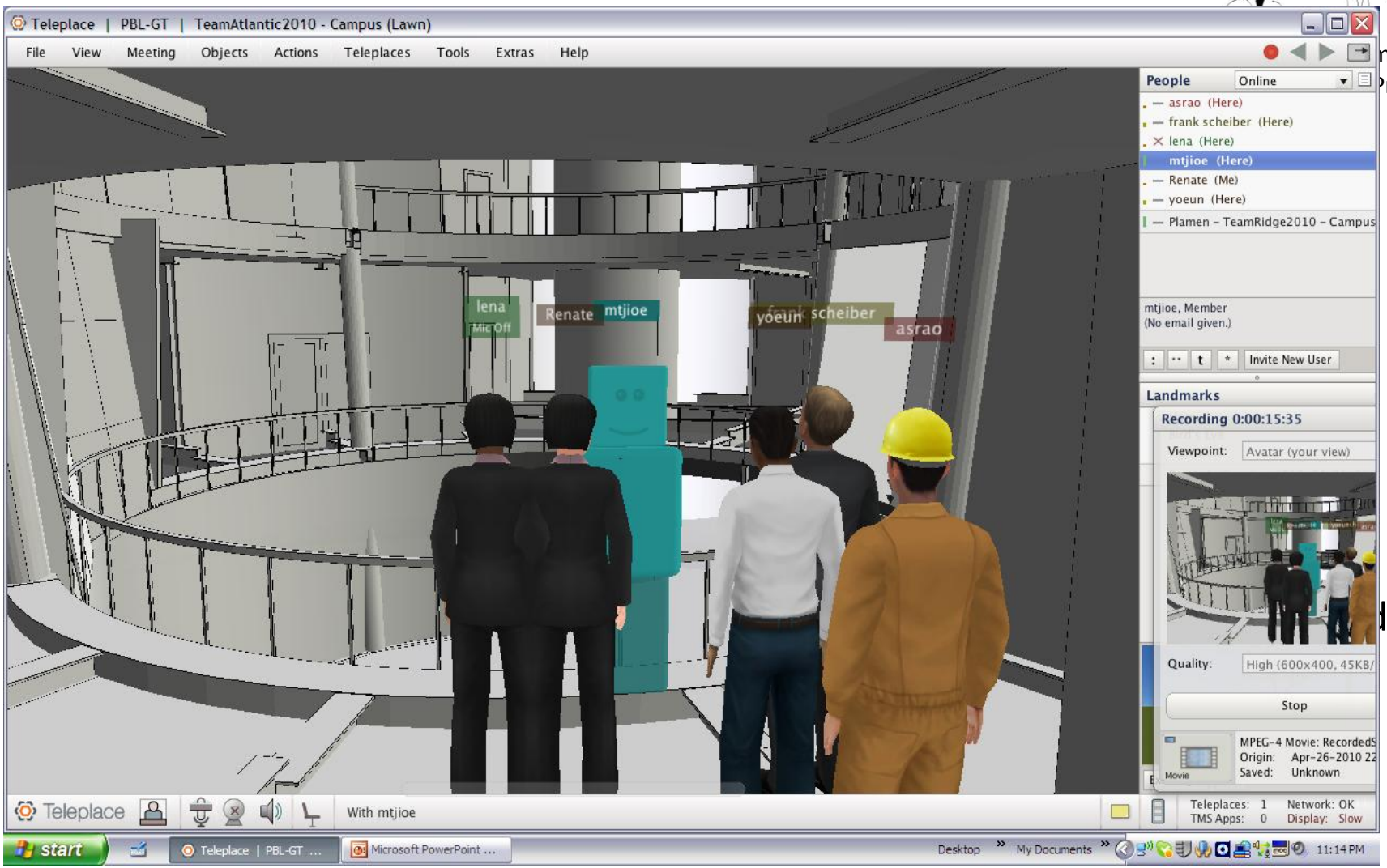
(05/01/15 to 03/11/16)





Architecture
Engineering
MEP
Construction
Integrated Project Delivery

Team Communications



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Maximum Team Efficiency

OUR APPROACH

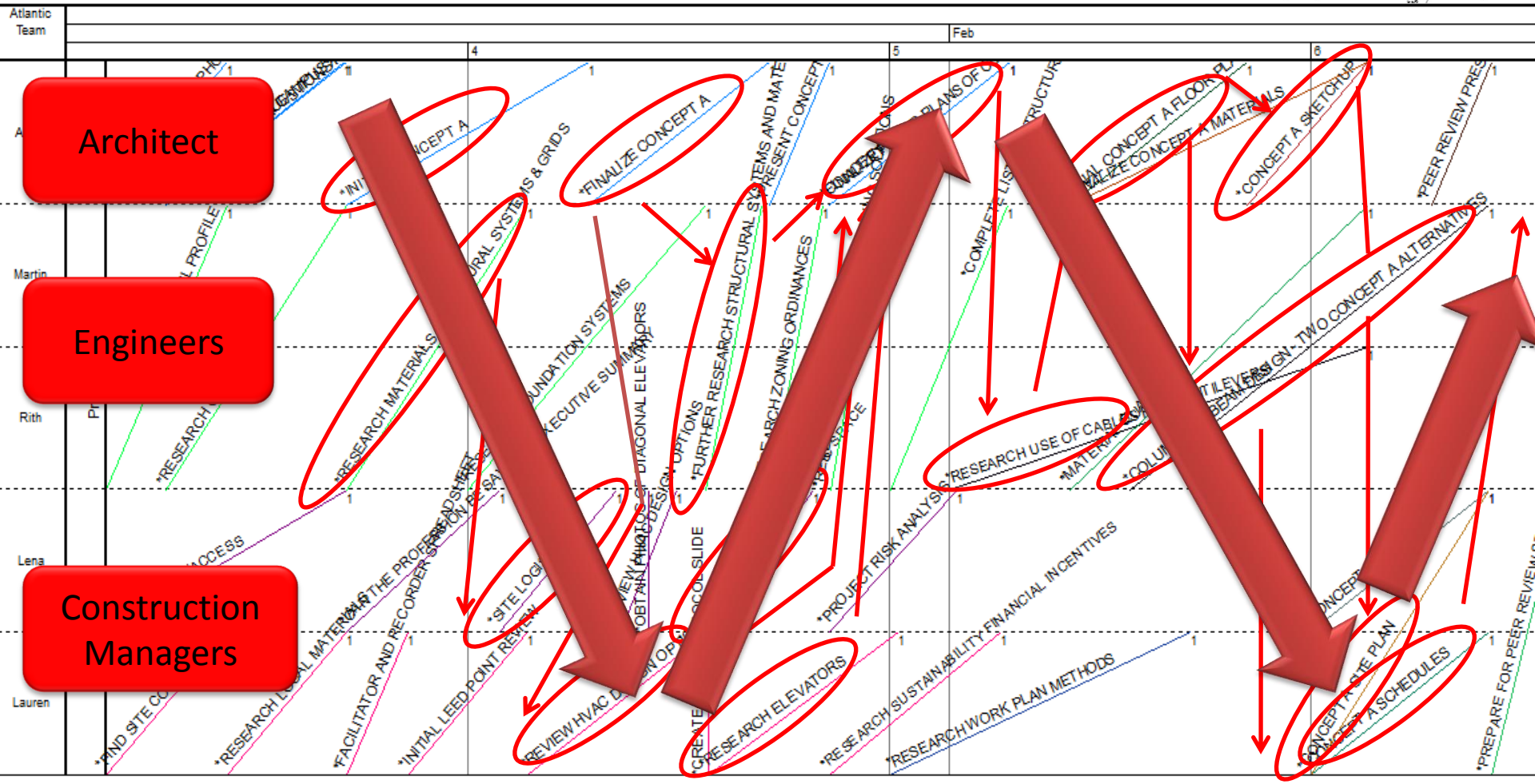
- Track Progress
- Transparency of Task Completion
- Successful Completion of Project Requirements
- Optimized Colloborative Scheduling

WINTER QUARTER Vico Control Experiment

Architect

Engineers

Construction Managers



Circular Flow of Activities

Continuous Process

SPRING QUARTER

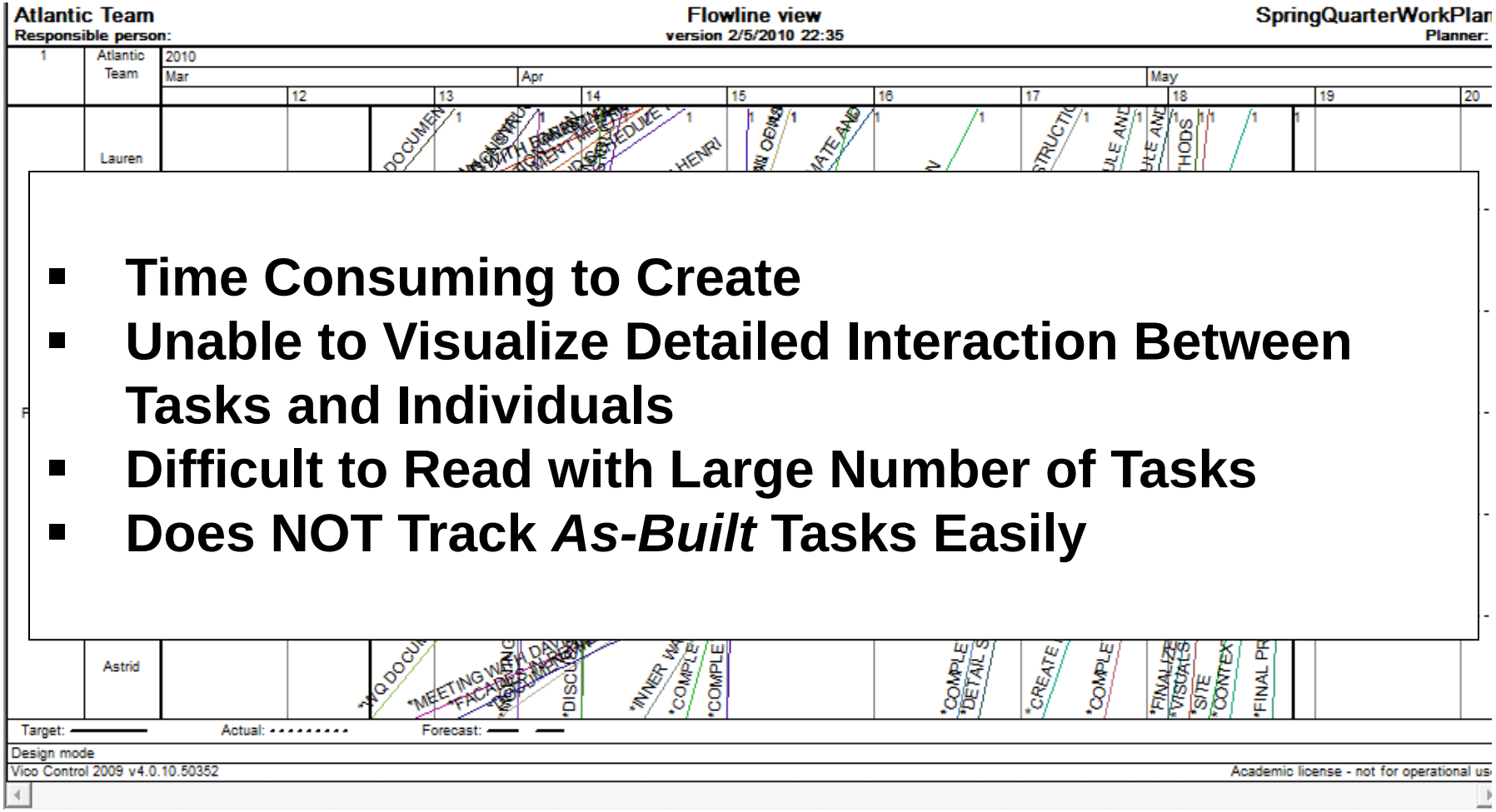
1. EXCEL Checklist

Activity	By Whom	Estimated Finish Date	Actual Finish Date	Estimated Hours to Complete	Actual Hours to Complete	Hours Accuracy	Reason for Delay?	Completed
Facades in Revit	Astrid	07-Apr-10	15-Apr-10	3.0 hours	45.0 hours	Under Estimated	Revit, had to learn the programme, and it's very	YES
Preliminary Estimate &	L & L	08-Apr-10	30-Apr-10	10.0 hours	45.0 hours	Under Estimated	Learning Programs, Software Glitches	YES
Inner walls, stairs etc in Revit	Astrid	09-Apr-10	14-Apr-10	5.0 hours	16.0 hours	Under Estimated	Actually went a bit faster than expected, but had to change	YES
Run Energy Simulation	Rith	10-Apr-10						NO
Detailed Sizing of Gravity System	Frank & Martin	11-Apr-10		5.0 hours			We are still working on this. Hopfully we finish on April 30	NO
Detailed Sizing of LL Resisting System	Frank & Martin	11-Apr-10		5.0 hours			We are still working on this. Hopfully we finish on April 30	NO

Transparency of tasks
Inadequately shows team interactions

SPRING QUARTER

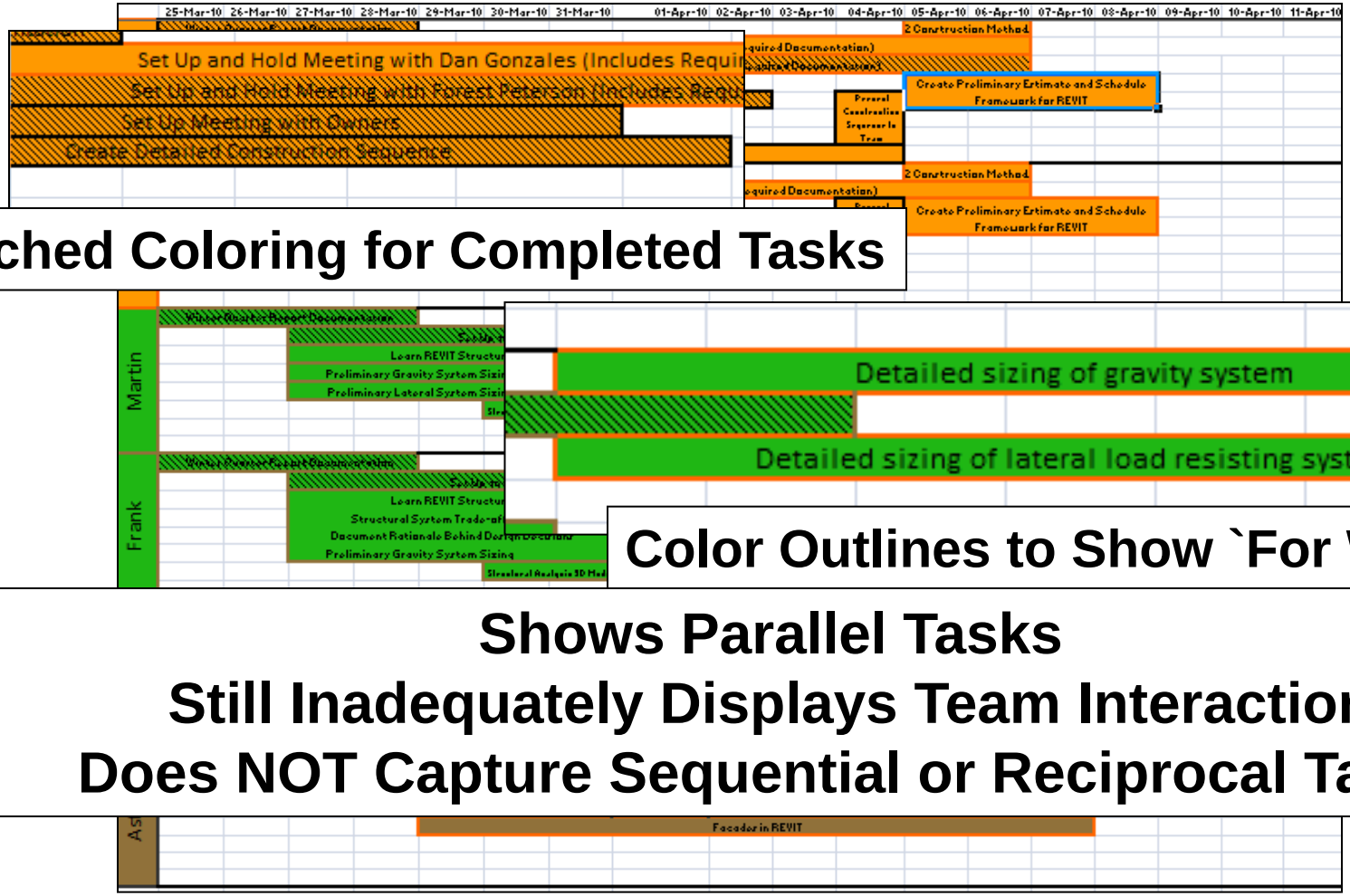
2. Re-Tried Vico Control



- **Time Consuming to Create**
- **Unable to Visualize Detailed Interaction Between Tasks and Individuals**
- **Difficult to Read with Large Number of Tasks**
- **Does NOT Track *As-Built* Tasks Easily**

SPRING QUARTER

3. EXCEL Chart



Hatched Coloring for Completed Tasks

Color Outlines to Show `For Whom`

Shows Parallel Tasks
Still Inadequately Displays Team Interaction
Does NOT Capture Sequential or Reciprocal Tasks

SPRING QUARTER

4. VISIO Flow Chart

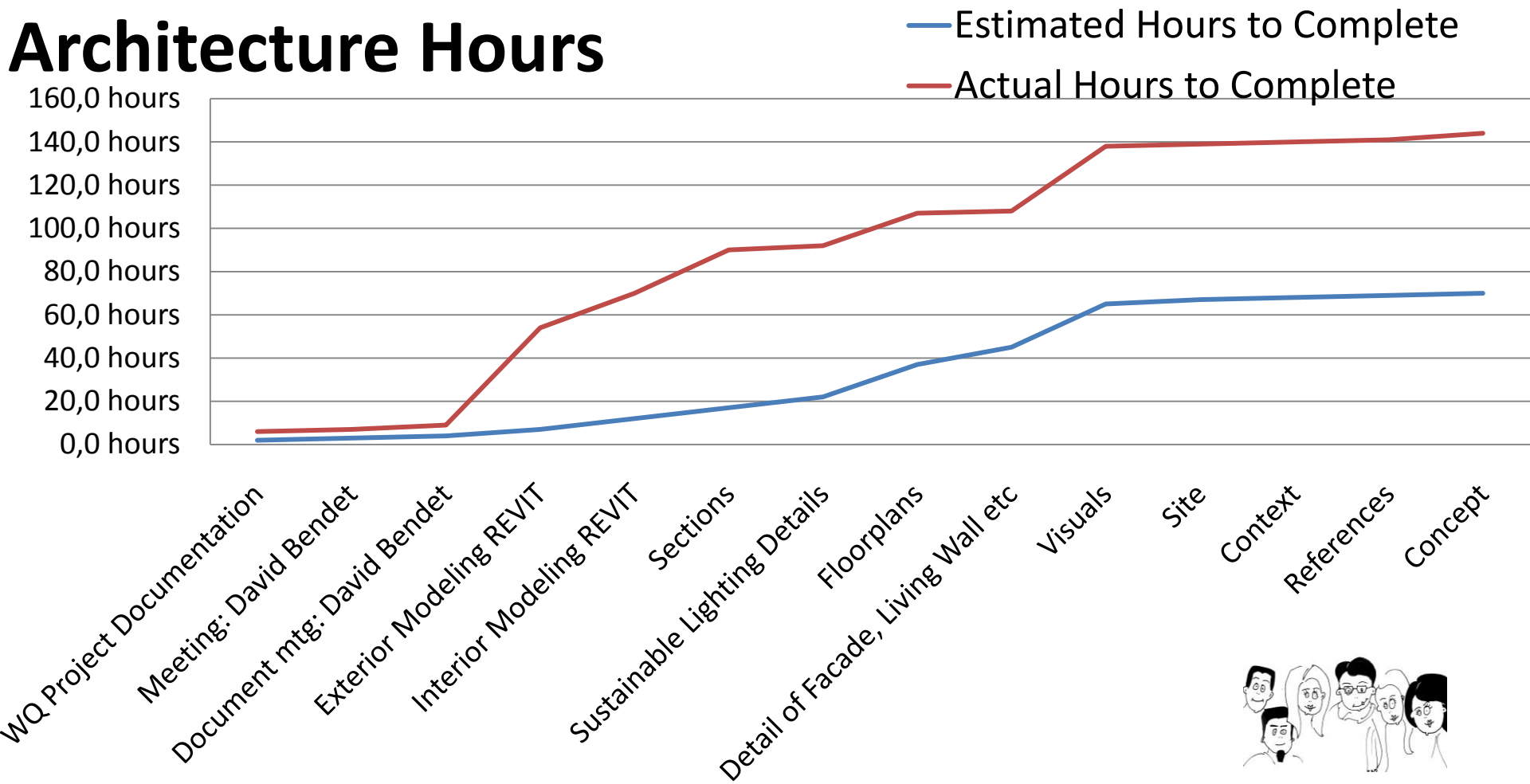
Diamond for Intermediary, Discipline Specific Milestone

Thick Border for Completed Tasks

Red Lines For Potential Reciprocal Tasks

SPRING QUARTER

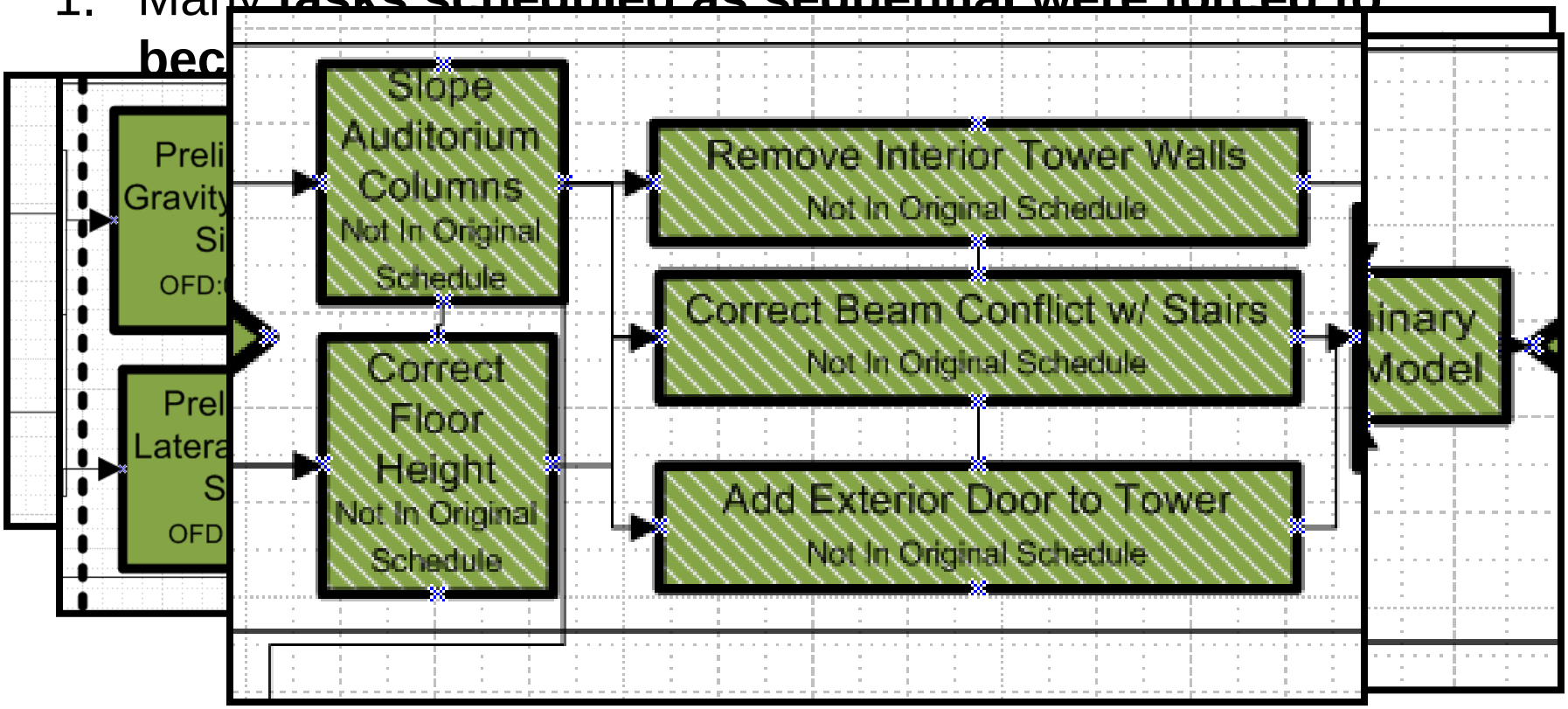
Architecture Hours



SPRING QUARTER

Trends Discovered:

1. Many **tasks scheduled as sequential were forced to bec**



SPRING QUARTER

IPD Lessons Learned:

- Establishing an extensive TO-DO list at the beginning helps to reinforce and clarify project requirements

- Nothing goes as originally planned – instead, it is important to always know what *still* needs to be finished and to constantly replan**...and then replan again**

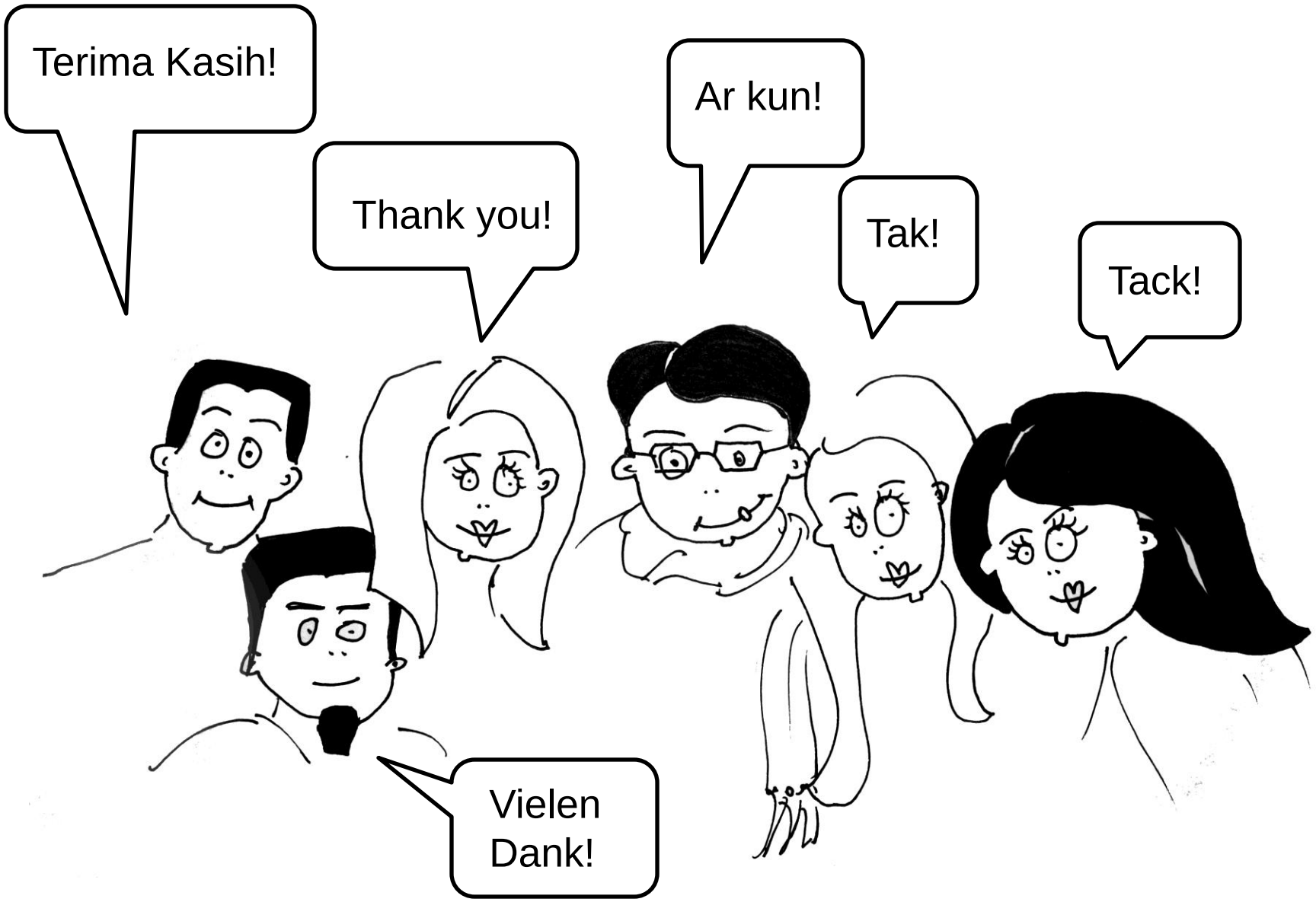
- Planning estimated finish dates should incorporate many iterations of design

IMPROVEMENTS FROM WINTER QUARTER

- Level of communication
- Greater bonding
- Communicated in shorter intervals
- Greater interaction with mentors

LESSONS LEARNED

- Just-in-time sequencing of tasks.
- Direct communication makes everything clearer.
- Be more understanding and open-minded to new ideas.
- Communicating across disciplines with a common language.



THANKS TO EVERYONE WHO HAS SUPPORTED US DURING THIS JOURNEY