Good design

makes a difference ™

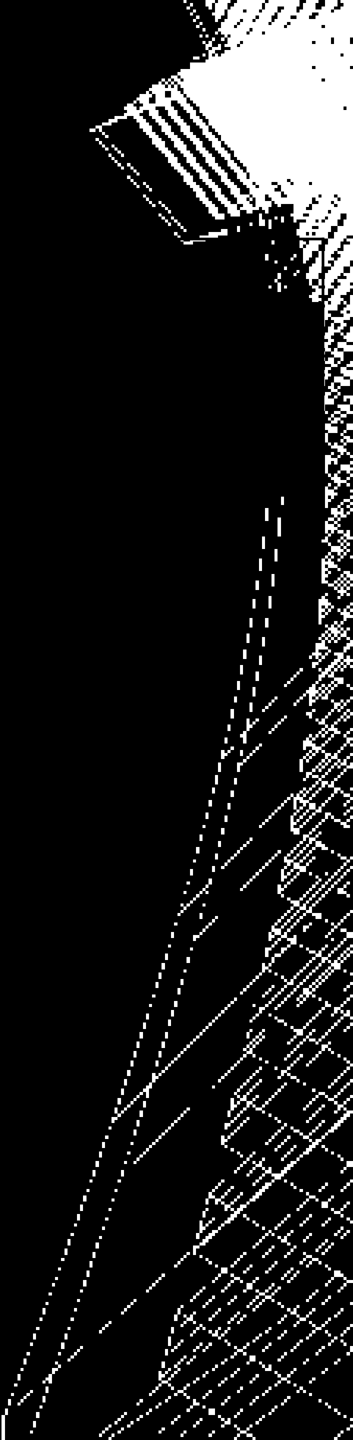
AIA

Award Winning BIM

Stephen Hagan FAIA

Award Winning BIM

Stephen Hagan FAIA



BIM Awards Committee

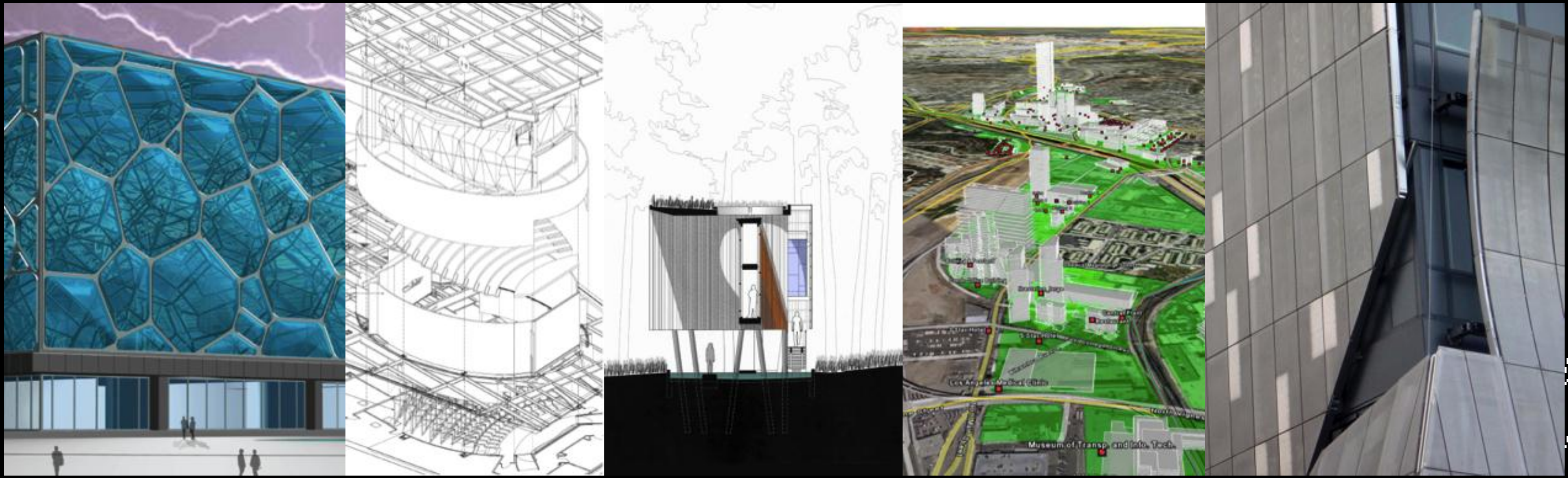
Mission & Goals

- **Support the Annual the BIM Awards Program**
- **Develop the BIM Awards Program with evolving metrics**
- **Assist BIM Awards Reception**
- **Case studies | publications | tools for BIM information distribution**
- **Webinars!**

BIM Awards Committee

Timeline

- **7 years of AIA BIM Awards**
  Archives at AIA Technology in Practice:
  http://www.aia.org/about/initiatives/AIAS078440



BIM Awards 2005-2011

AIA TECHNOLOGY IN ARCHITECTURAL PRACTICE 7TH ANNUAL BUILDING INFORMATION MODELING (BIM) AWARDS 2011

2011 BIM Awards

7th Annual

The AIA Technology in Architectural Practice (TAP) presents its 7th Annual Building Information Modeling (BIM) Awards honoring projects that have used technology as a mechanism to bridge the gap between people and processes.

The 2011 Awards reveal how BIM is advancing from a pure tool

2005, 2006, 2007, . . .

What's in a name?

A lot, actually.

If we didn't have BIM, we wouldn't have a National BIM Standards Committee - an important component in the

TECHNOLOGY IN ARCHITECTURAL PRACTICE

2007 BIM Awards

3rd Annual

AIA Technology in Architectural Practice (TAP) presents its 3rd Annual Building Information Model (BIM) awards honoring projects that have used integrated and

Education Thrives, Process Arrives, Design Survives

BIM Comes Alive

The 4th Annual AIA TAP BIM Awards reveal the liveliness BIM demonstrated in 2007 - a year called a tipping point for this advanced technology tool set.

The fear that institutions of higher education were not hitting their groove with BIM is allayed with four awards in the academic category. One award went to a graduate studio that convincin... modular housing ca... BIM.

TECHNOLOGY IN ARCHITECTURAL PRACTICE

2009 BIM Awards

5th Annual

AIA Technology in Architectural Practice (TAP) presents its 5th Annual Building Information Model Awards honoring projects that have used integrated modeling processes, advanced data exchange techniques and a high level of interdisciplinary collaboration.

The 2009 Awards reveal that what was award-winning five years ago is becoming common practice today. The use of BIM processes alone is no longer worth heralding. We are able to look into process details and recognize subtle refinements and artful applications. See www.aia.org/tap for more of the Art of BIM as embodied by this year's award recipients and compare them to winners from previous years. The comparison is revealing.

TECHNOLOGY IN ARCHITECTURAL PRACTICE

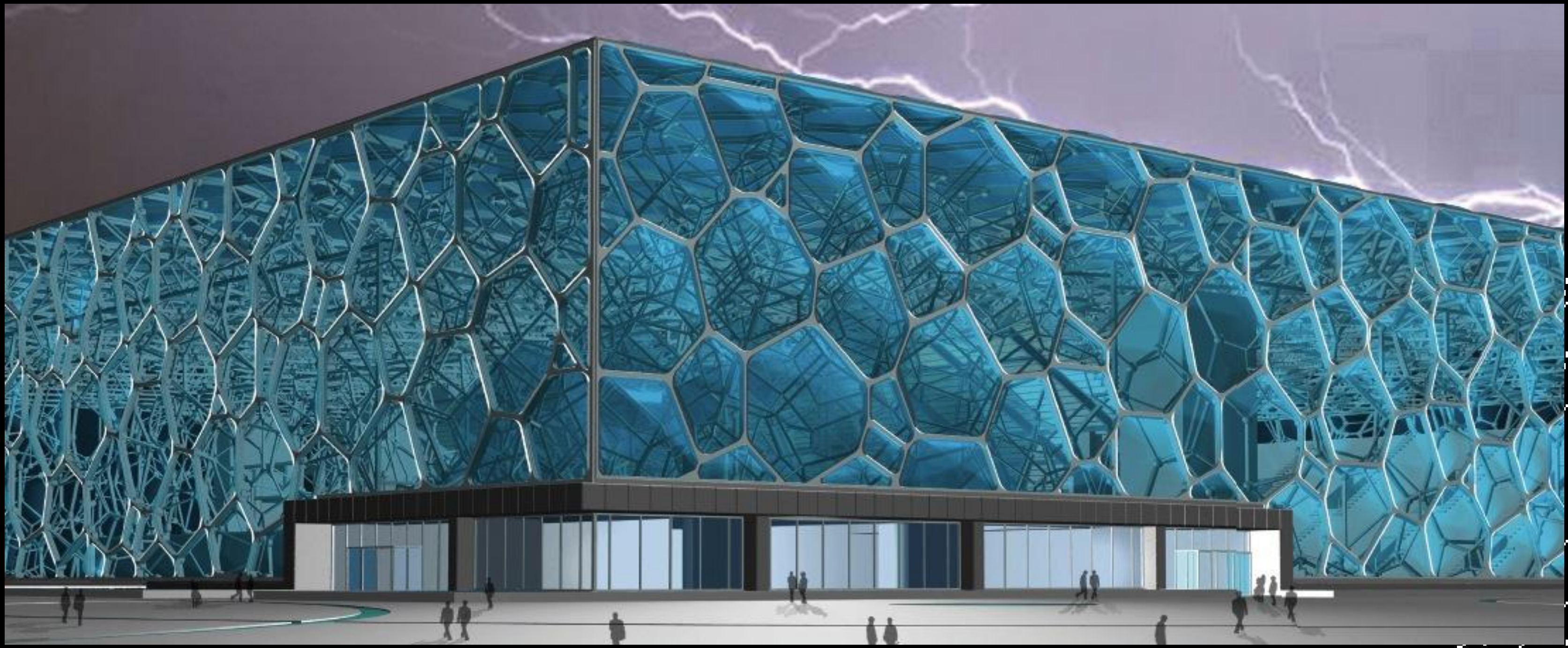
2010 BIM Awards

6th Annual

AIA Technology in Architectural Practice (TAP) presents its 6th Annual Building Information Model Awards honoring projects that have used integrated modeling processes, advanced data exchange techniques and a high level of interdisciplinary collaboration.

The 2010 Awards reveal that what was award-winning five years ago is becoming standard practice today. The use

Creating Stellar Architecture **Using BIM**



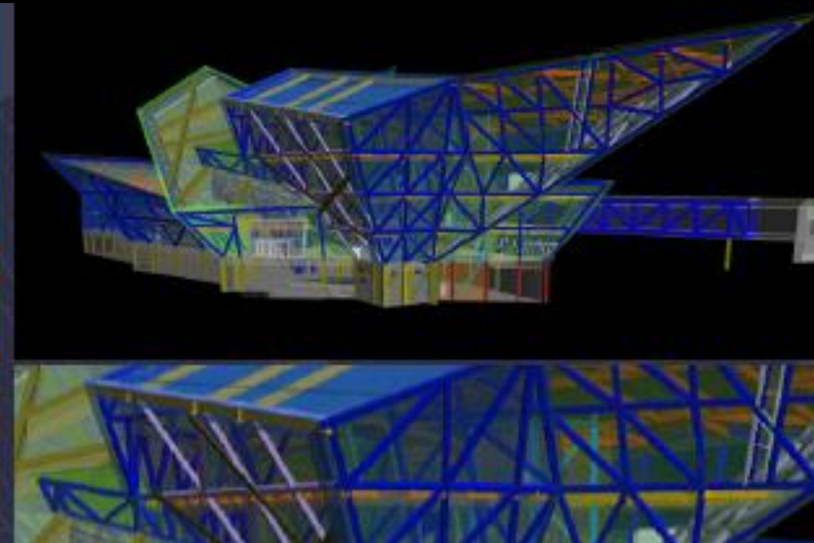
Technology in
Architectural Practice
http://www.aia.org/TAP

twitter #AIATAP

Email: tap@aia.org

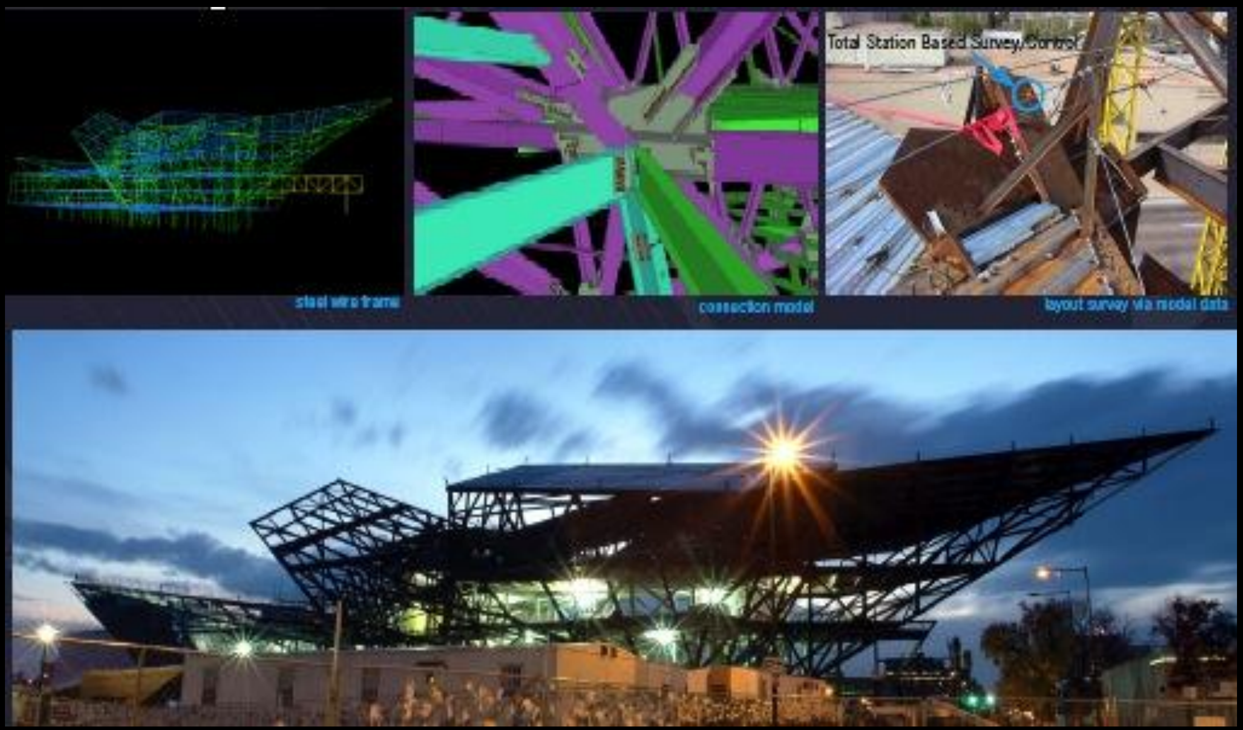
Creating Stellar Architecture **Using BIM**

Fredric C Hamilton Building
Denver Art Museum



M.A. Mortenson Company

Creating Stellar Architecture **Using BIM**



Fredric C Hamilton Building
Denver Art Museum

M.A. Mortenson Company

Creating Stellar Architecture **Using BIM**

Technology in
Architectural Practice
http://www.aia.org/TAP

twitter #AIATAP

Email: tap@aia.org

Creating Stellar Architecture **Using BIM**

Technology in
Architectural Practice
http://www.aia.org/TAP

twitter #AIATAP Email: tap@aia.org

CATEGORY A : BIM EXCELLENCE

- JURY ASSESSMENT OF ARCHITECTURAL QUALITY
- CLEAR USE OF MULTIPLE APPLICATIONS INTEROPERATING TO REALIZE OUTSTANDING DESIGN
- ARCHITECTURAL EXPRESSION THAT COULD NOT HAVE BEEN REALIZED IN OTHER WAYS

BIM EXCELLENCE

BIM AWARD CITATION

DC Consolidated Forensic Lab

District of Columbia

HOK



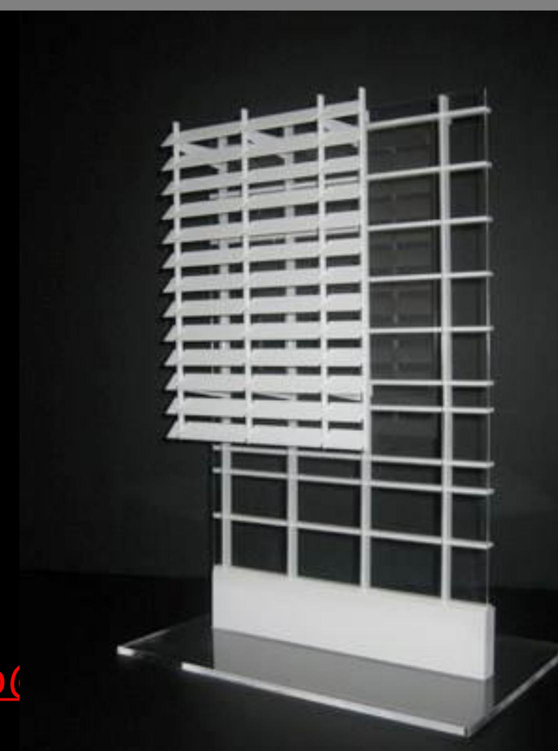


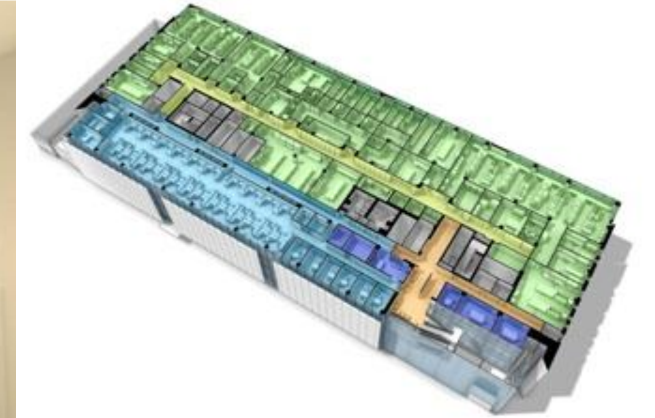



FACADE DESIGN AND INTEGRATION

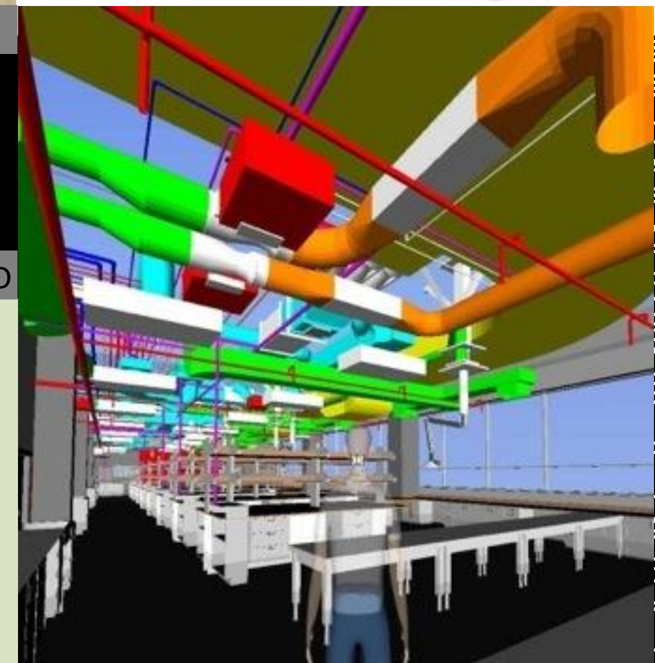
ice
g/TAP

ail: tap(

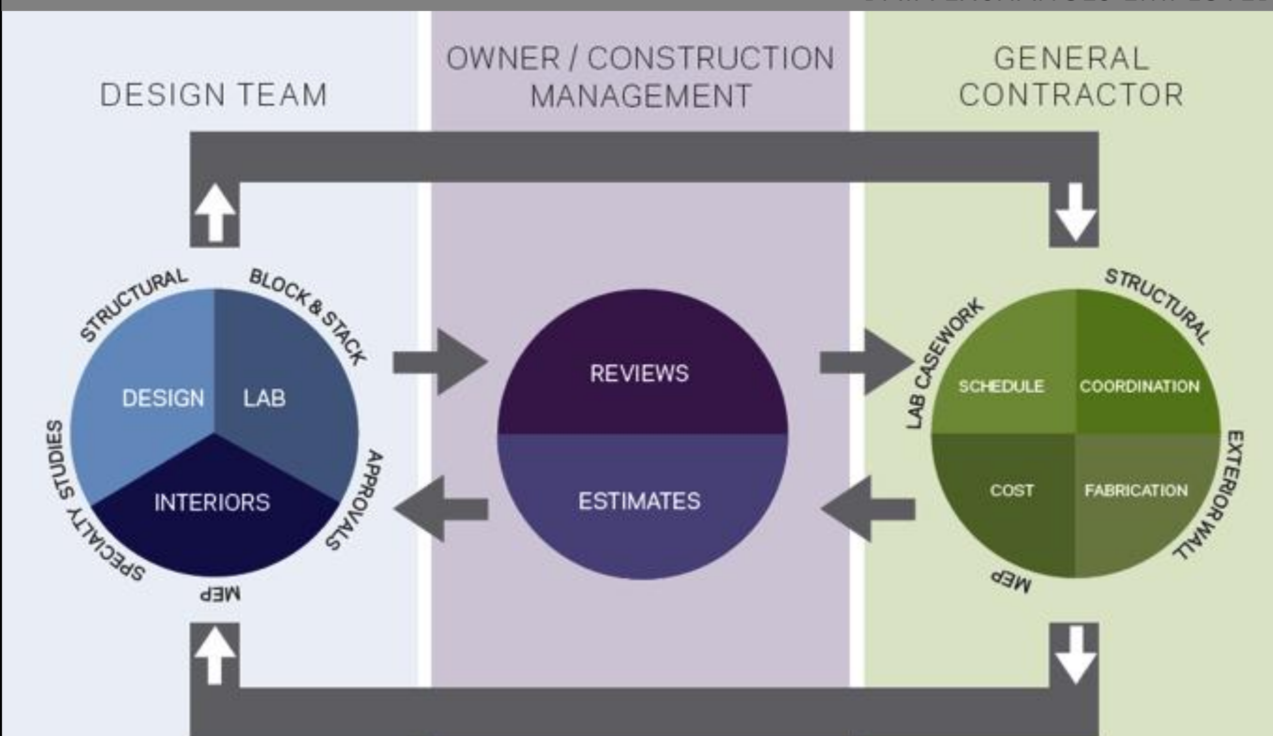


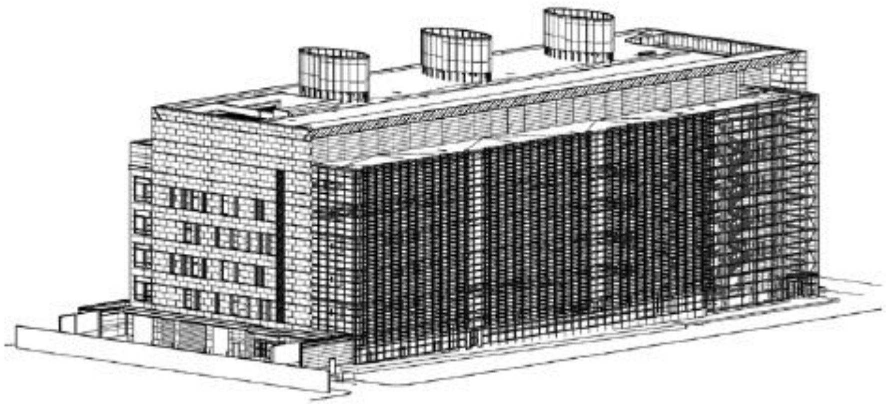


LAB PLANNING AND CONSTRUCTABILITY

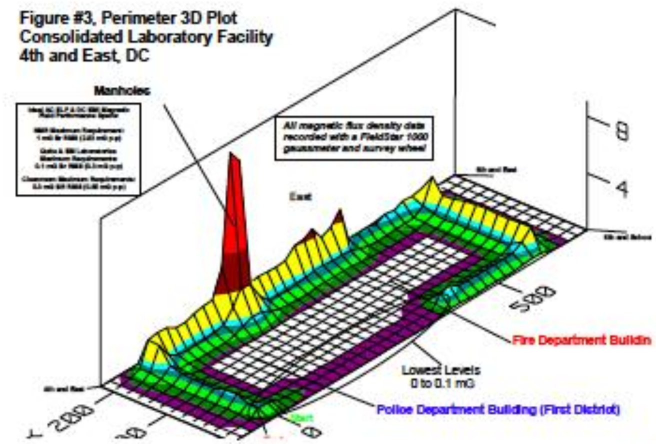


DATA EXCHANGES EMPLOYED

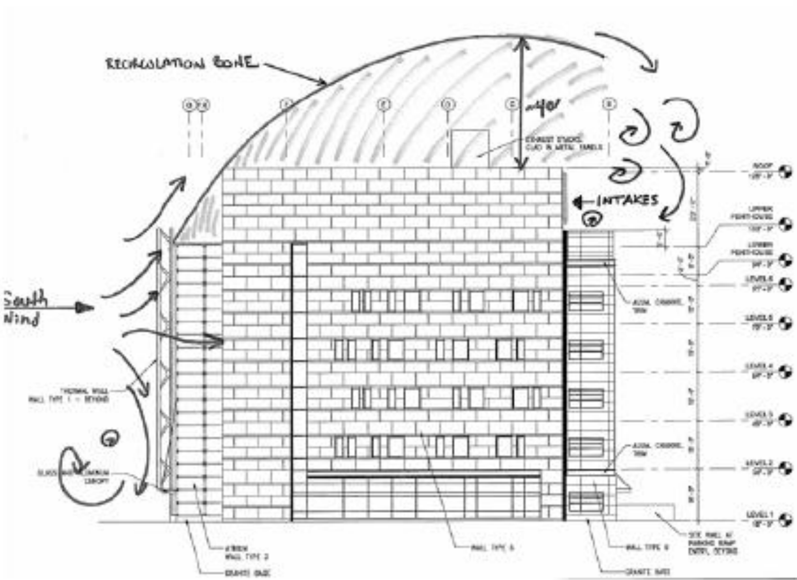




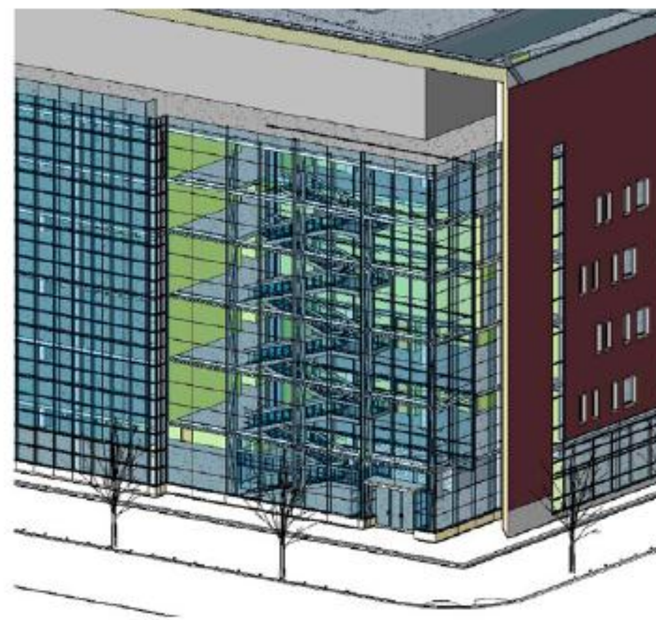
MODEL LOOKING NORTHWEST



EMI/RFI



EAST ELEVATION- WIND WAKE



ATRIUM EXHAUST MODEL

BIM Awards Committee

Participants

- **Stephen Hagan, Co-Chair**
- **Marty Doscher, Co-Chair**

BIM Awards Committee

- **In 2012 Expand BIM Awards: AGC BIMForum and COAA**

- **For the 2012 Building Information Modeling (BIM) Awards competition, the AIA TAP Knowledge Community seeks projects that have used integrated and interoperable BIM.**
- **Category A: BIM Excellence**
  Category B: Delivery Process Innovation (in association with BIMForum, Professional's Choice Award—Owners Choice and COAA added for 2012
  Category C: Outstanding Sustainable Design
  Category D: Academic Program / Curriculum Development
  Category E: Exemplary use of BIM in a Small Firm

- **WEBINARS!!!**

BIM Awards Committee

2011 Jury

Joseph G. Burns, FAIA - Thornton-Tomasetti Group – Chicago, IL

Luciana Burdi, Ph.D. - State of Massachusetts Office of Planning, Design and Construction Division of Capital Asset Management – Boston, MA

Rodd Merchant, P.E. - JE Dunn Construction – Denver, CO

Kimon Onuma, FAIA - Onuma, Inc. – Pasadena, CA

Marty Doscher, AIA Co-Chair of TAP BIM Awards Committee

BIM Awards 2005-2011

Award Winning BIM

stephen.hagan@gmail.com
Founder of AIA TAP BIM Awards
Director, Project Knowledge and Innovation
GSA Public Buildings Service, GSA

Good design
makes a difference ™

AIA

Generative Design and Parametric Structures

Jonatan Schumacher

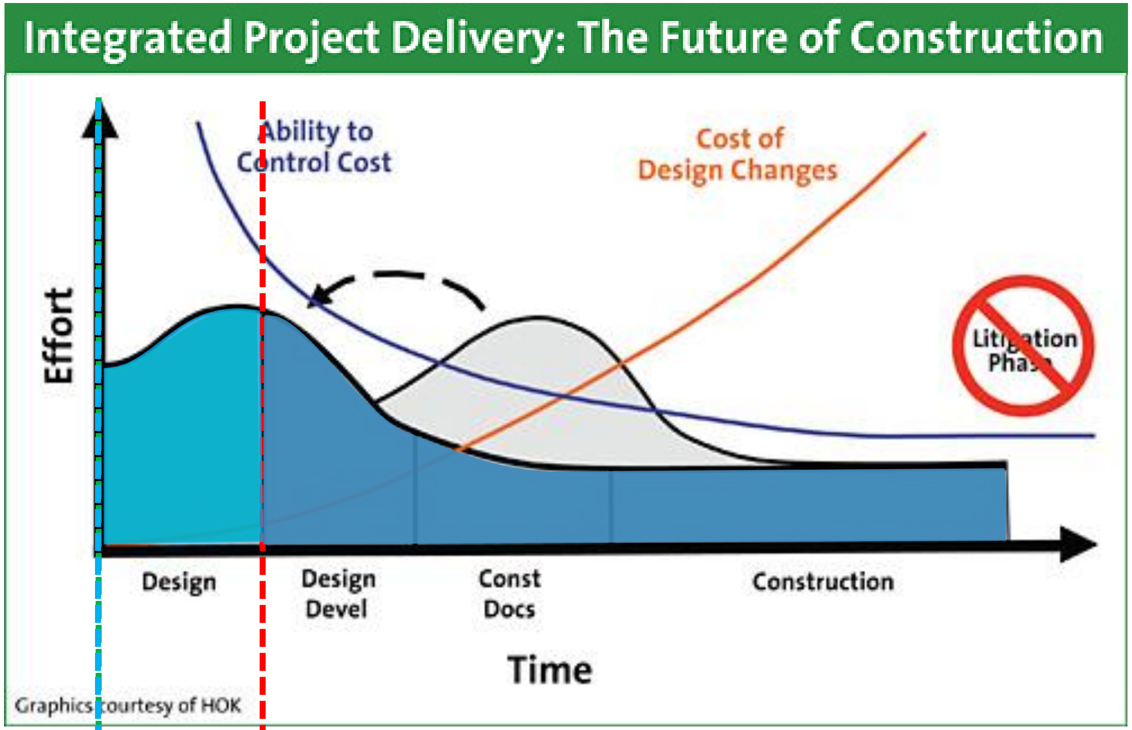
Generative Design and Parametric Structures

- Integrated Design Exploration utilizing advanced ‘digital engines’.
- Integrated form finding approach for freeform structures using custom automation tools.
- Interlinked architectural and engineering models for advanced analysis.
- Illustration of digital fabrication approach from early design concept design.

Generative Design and Parametric Structures

Jonatan Schumacher
jschumacher@thorntontomasetti.com

Generative Modeling



GENERATIVE MODELING +

BIM (Tekla, Revit, CATIA,…)

BIM

CONCEPT(?)

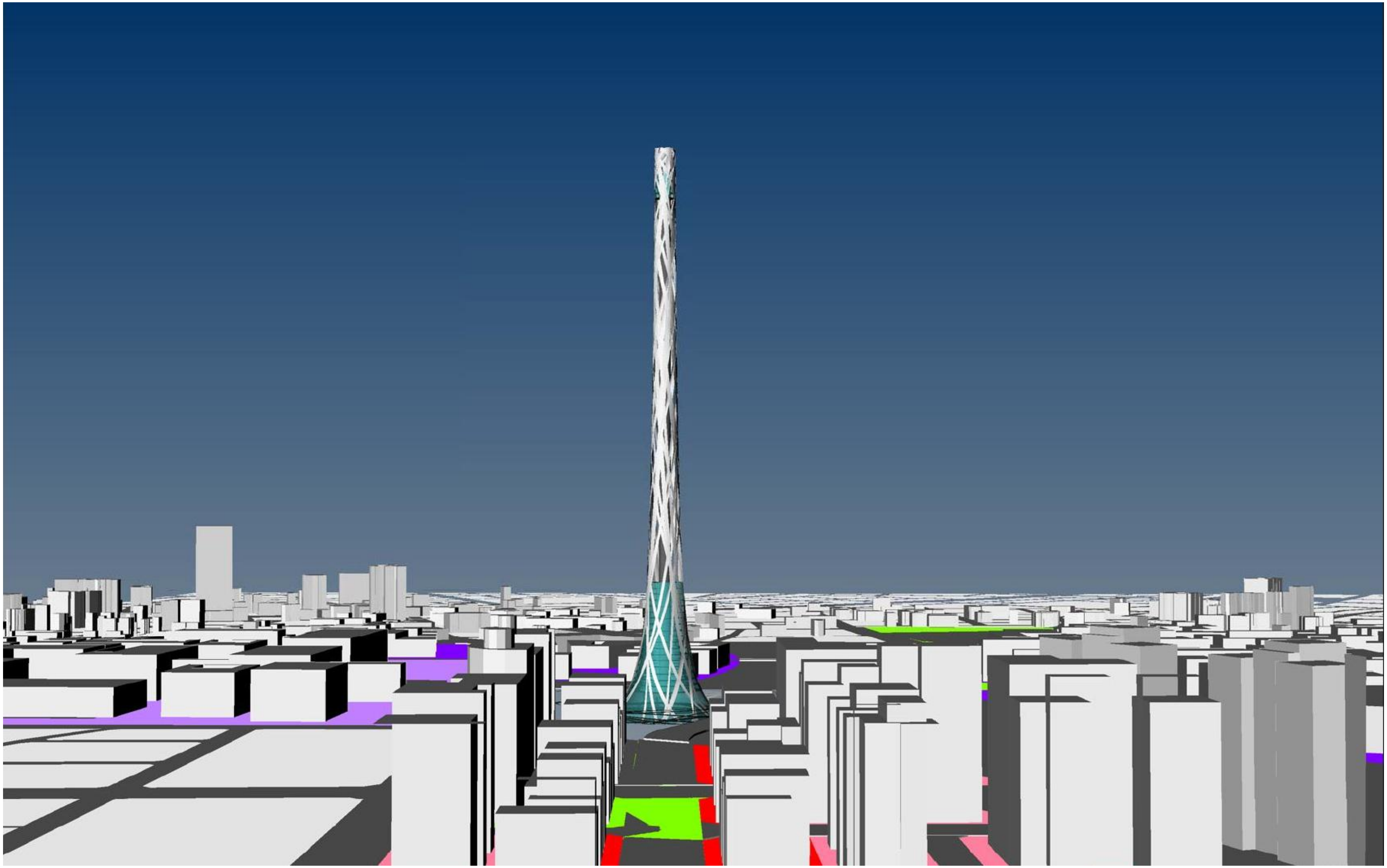
collaborative
modeling

Taiwan Tower

Rendering by AEDAS London

Taiwan Tower

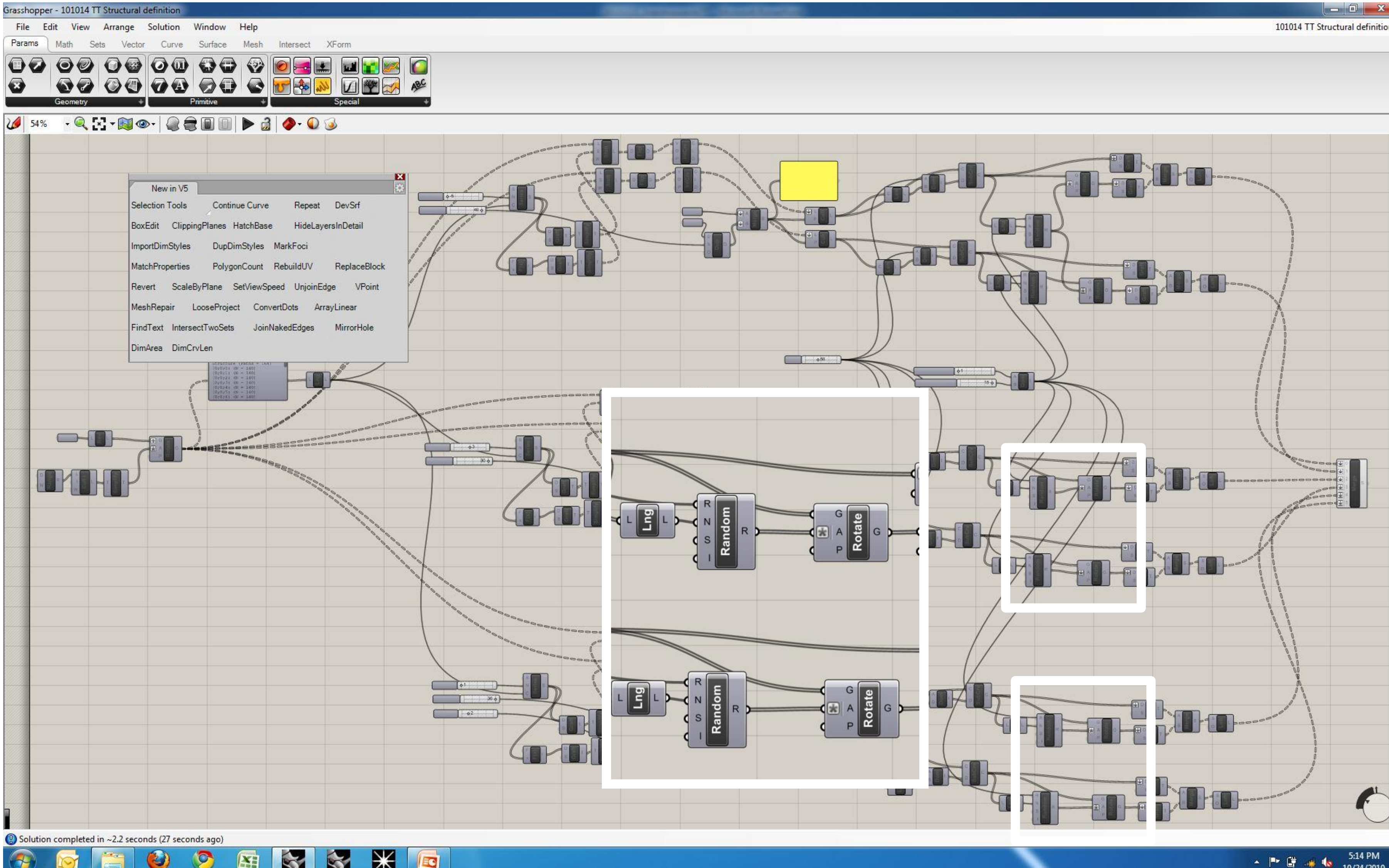
Competition with AEDAS London



Architect's conceptual Rhino model

Taiwan Tower

Competition with AEDAS London

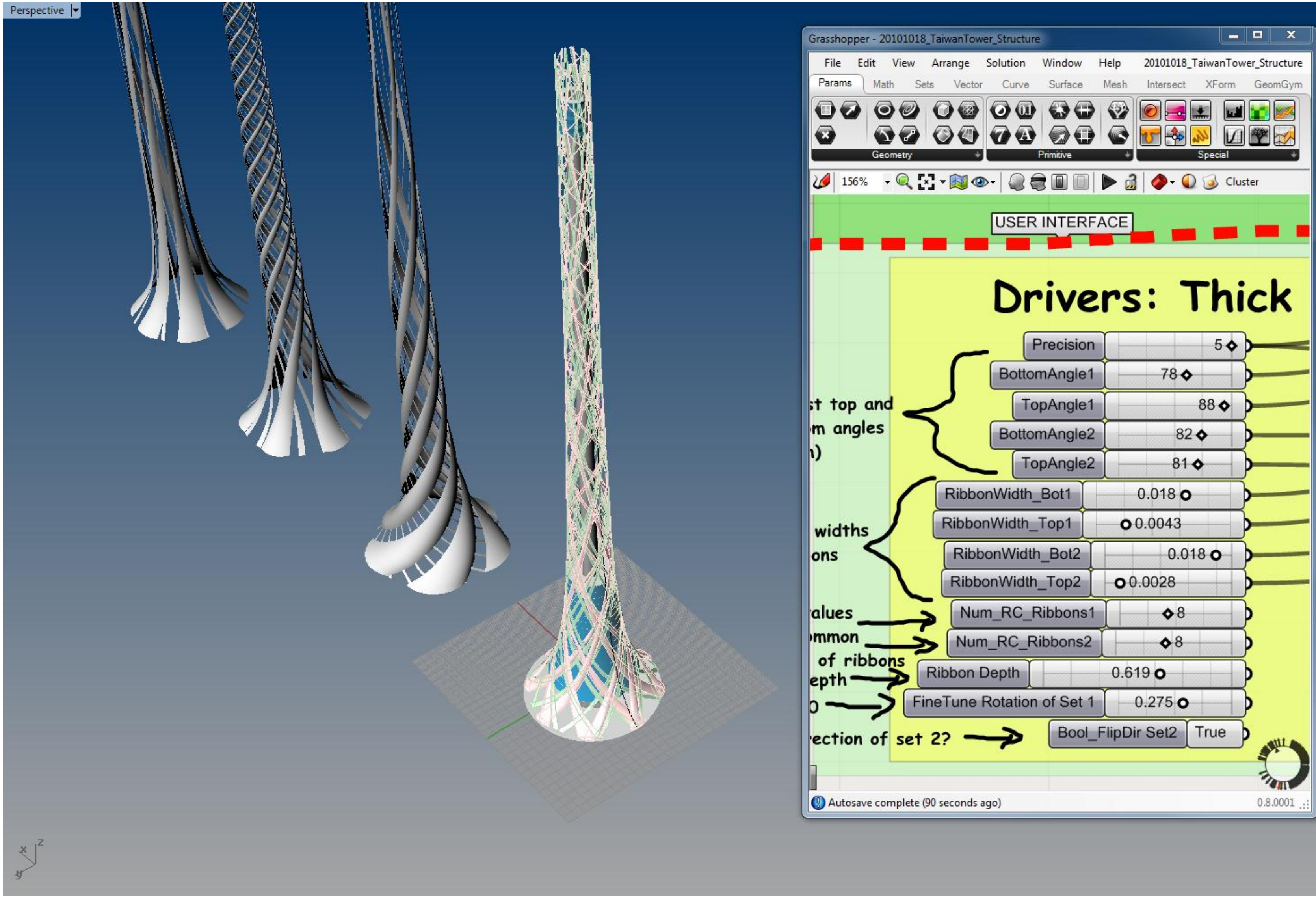


Architects' Grasshopper definition

AIA

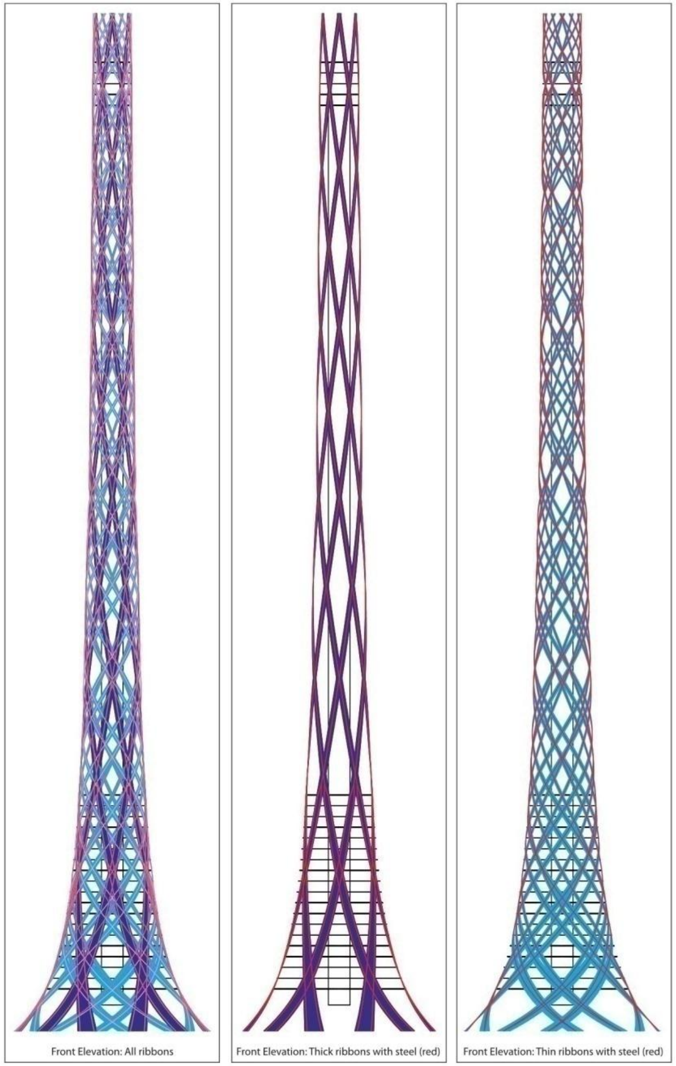
Taiwan Tower

Competition with AEDAS London

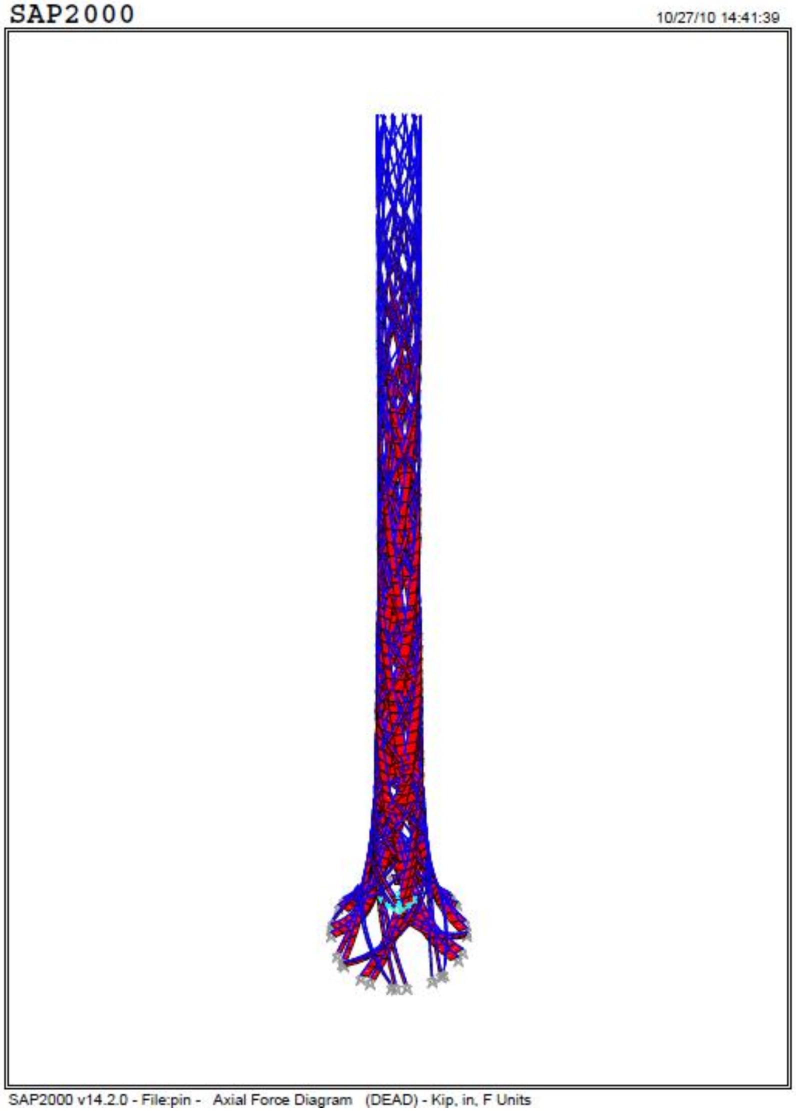


Thornton Tomasetti's Grasshopper definition - VIDEO

Taiwan Tower



Structural concept



automated

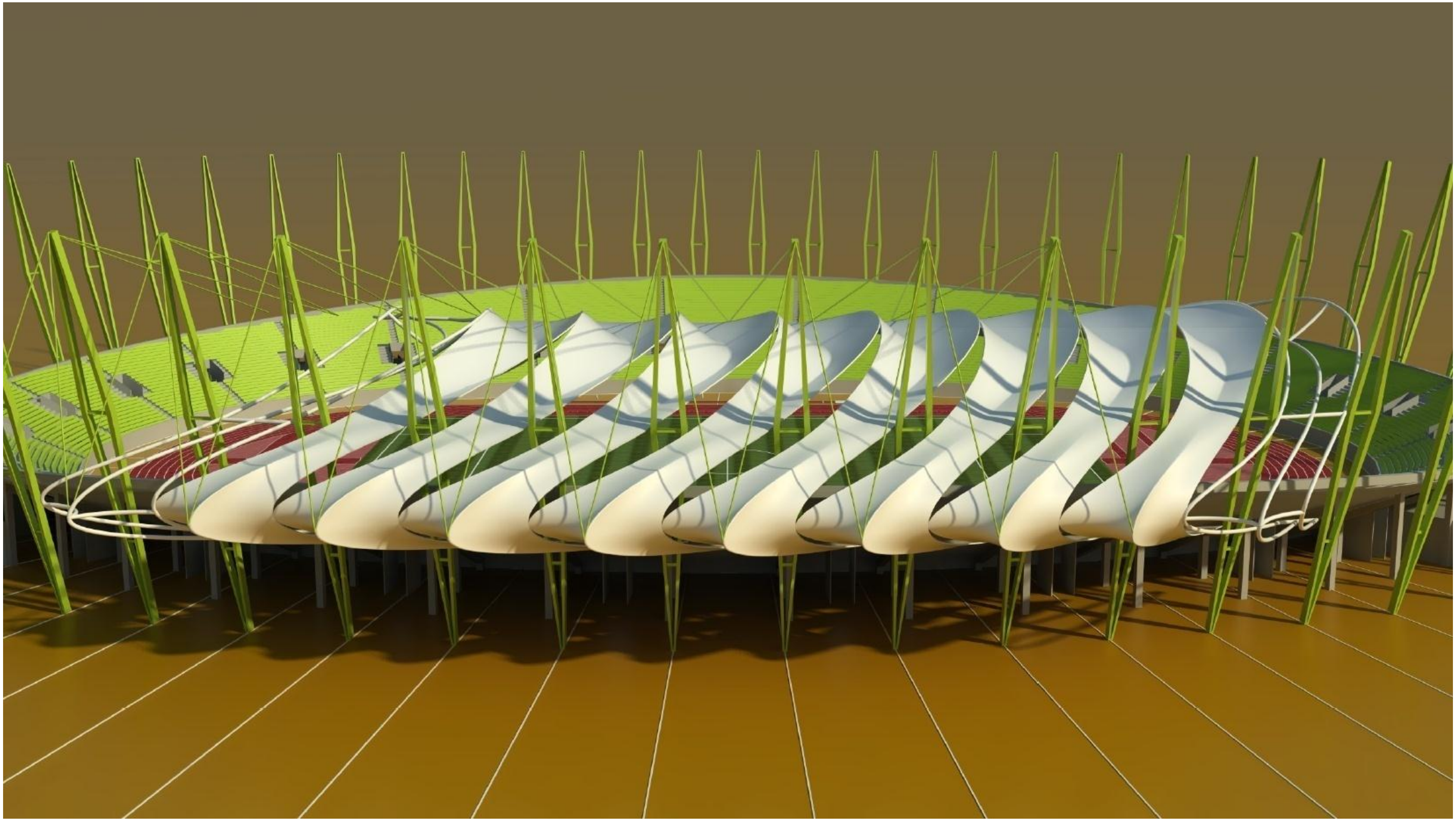
information

exchange

Al Menaa 30K Stadium

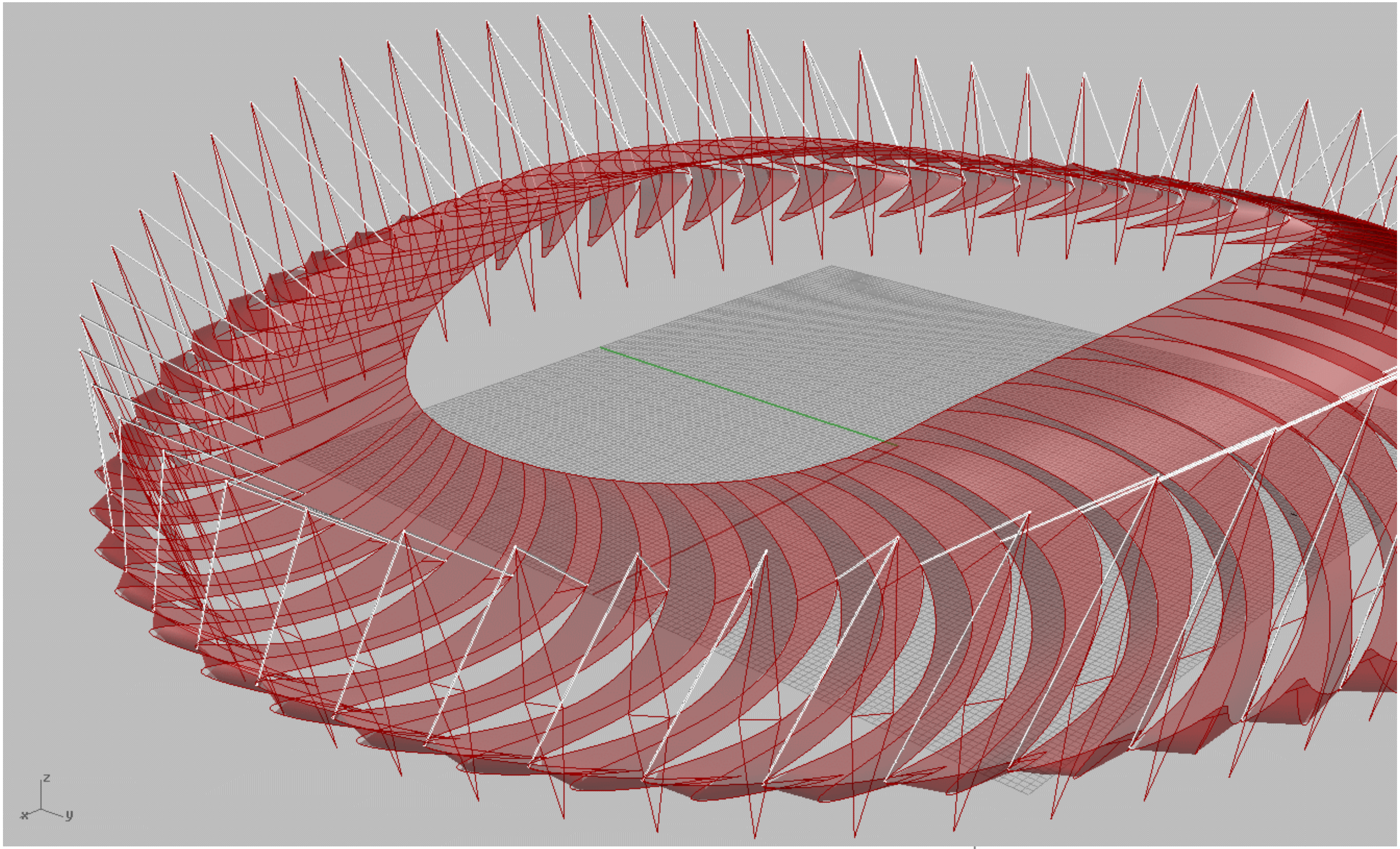
Rendering by 360 Architects

Al Menaa 30K Stadium

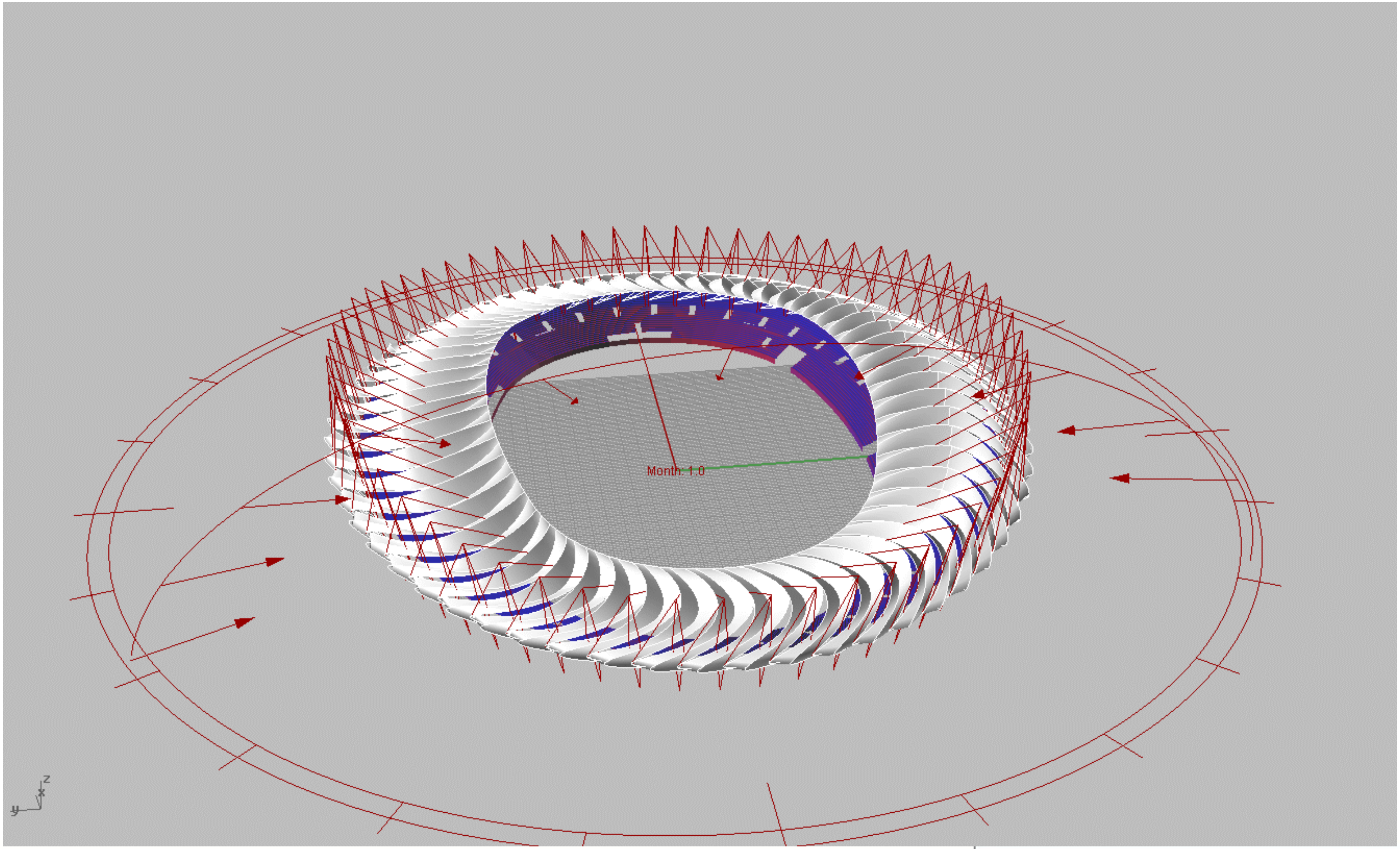


Architect's 3DSmax model

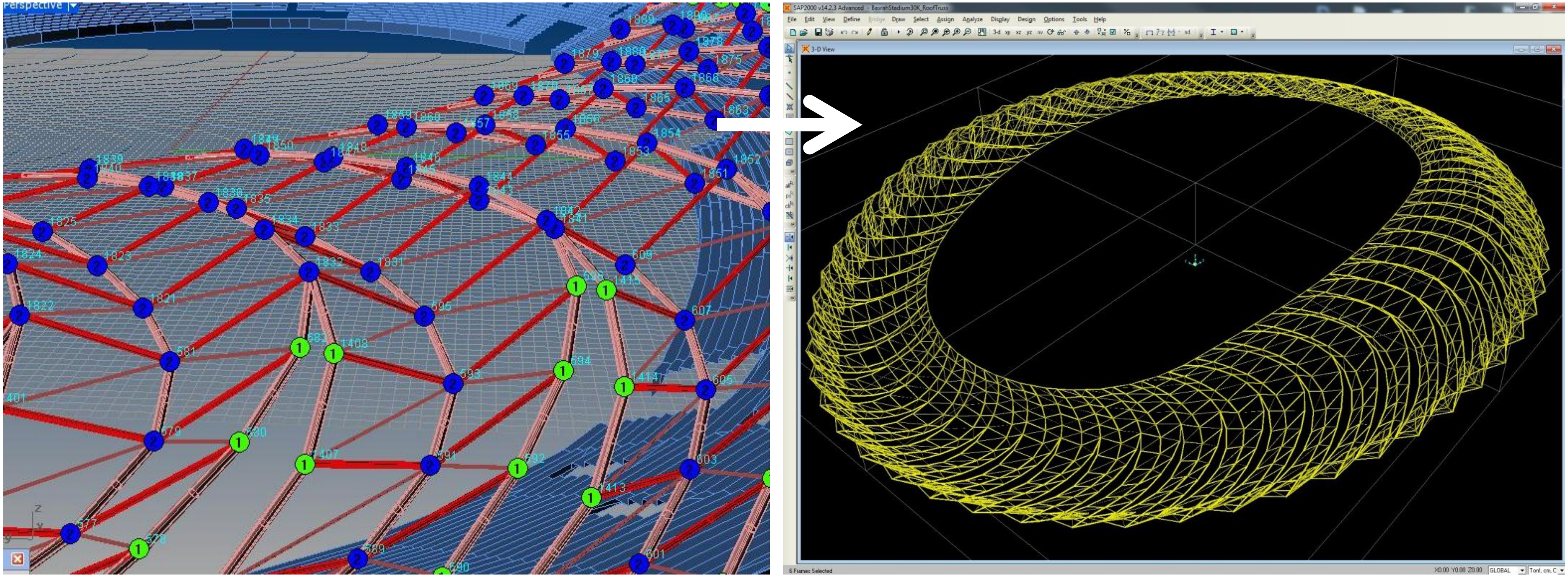
Grasshopper model demo



Grasshopper model demo

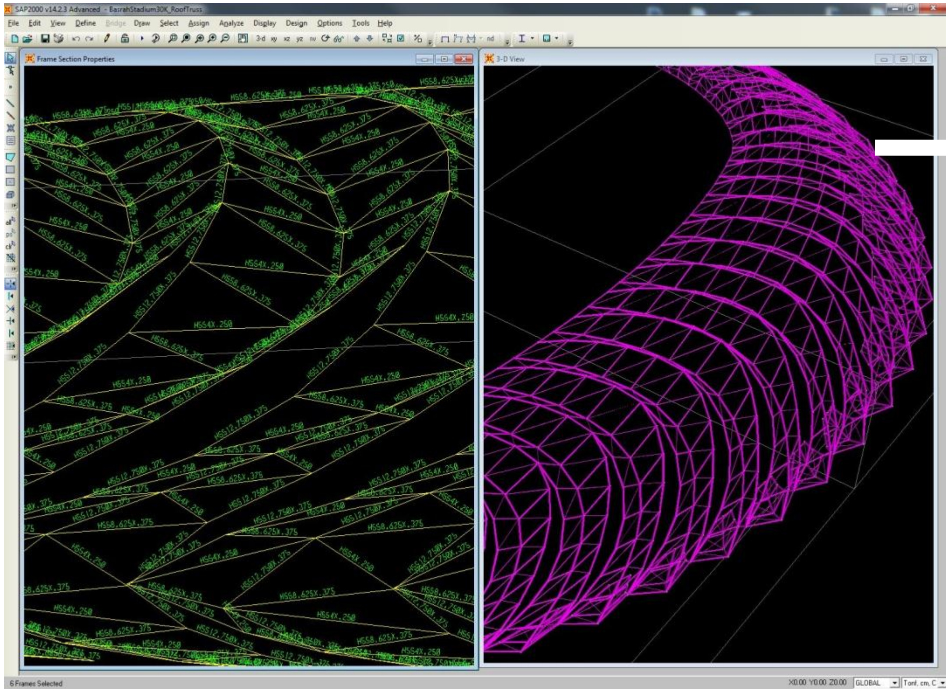


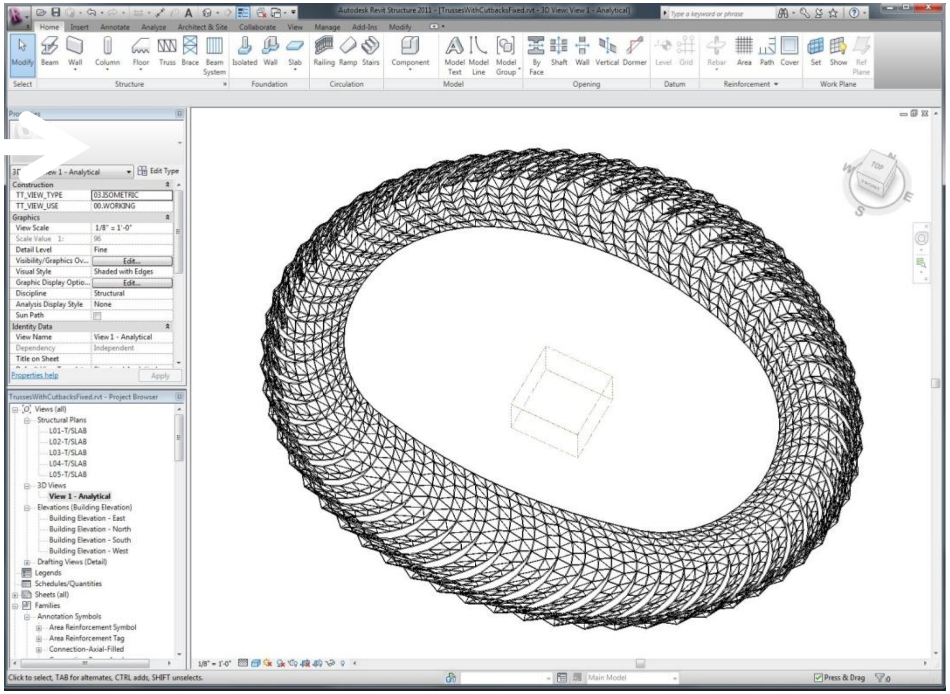
Structural Analysis model



Automated Rhino to SAP translation

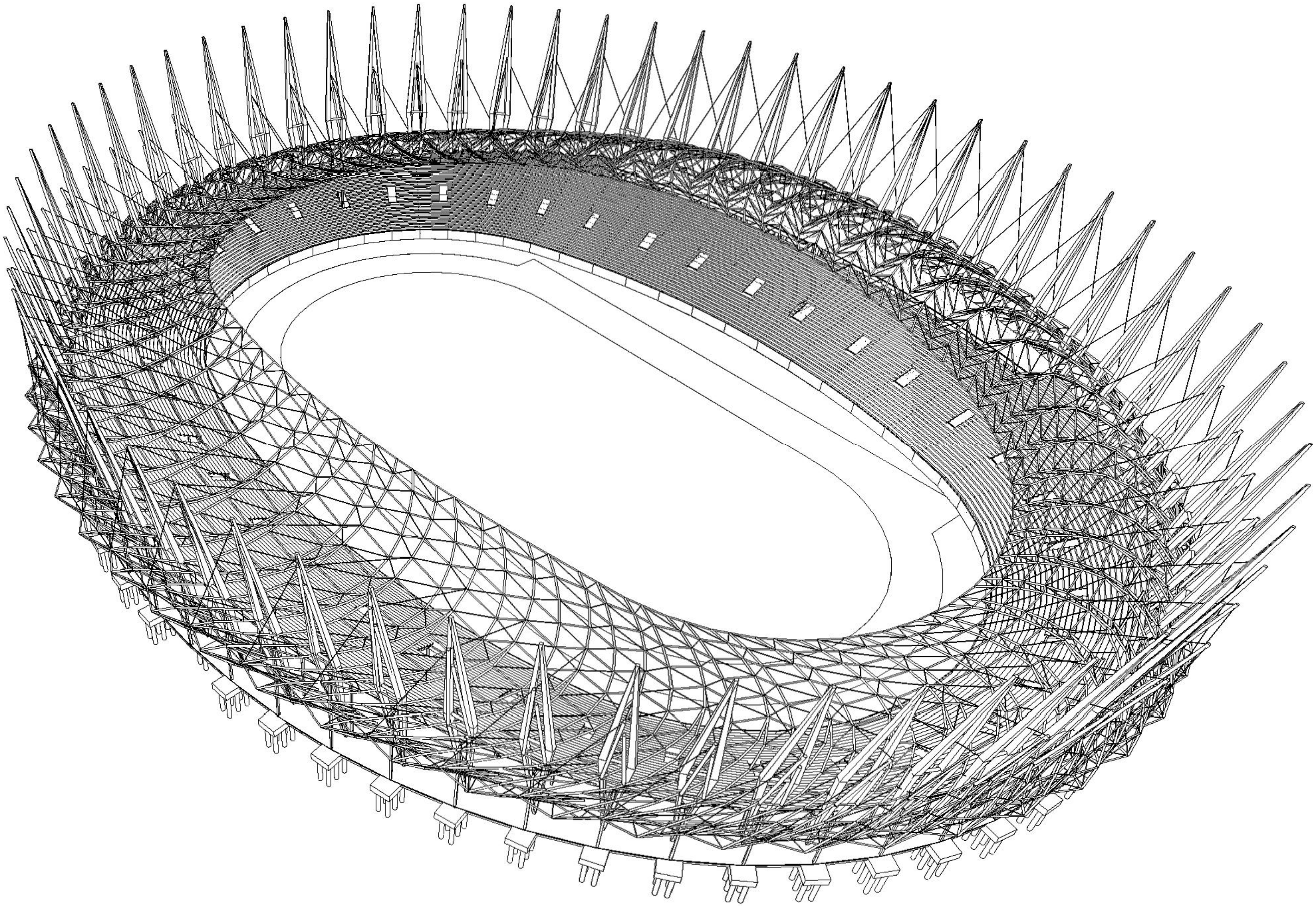
REVIT Documentation model



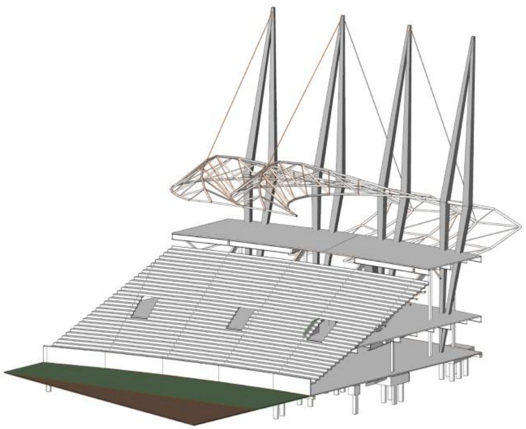


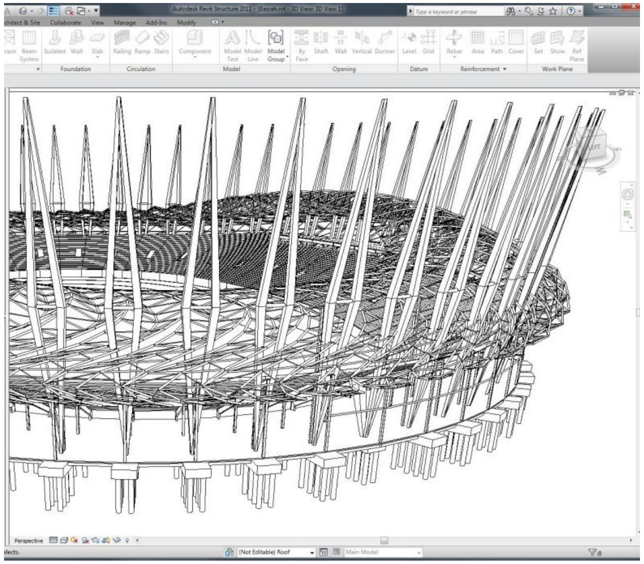
Automated SAP to REVIT translation

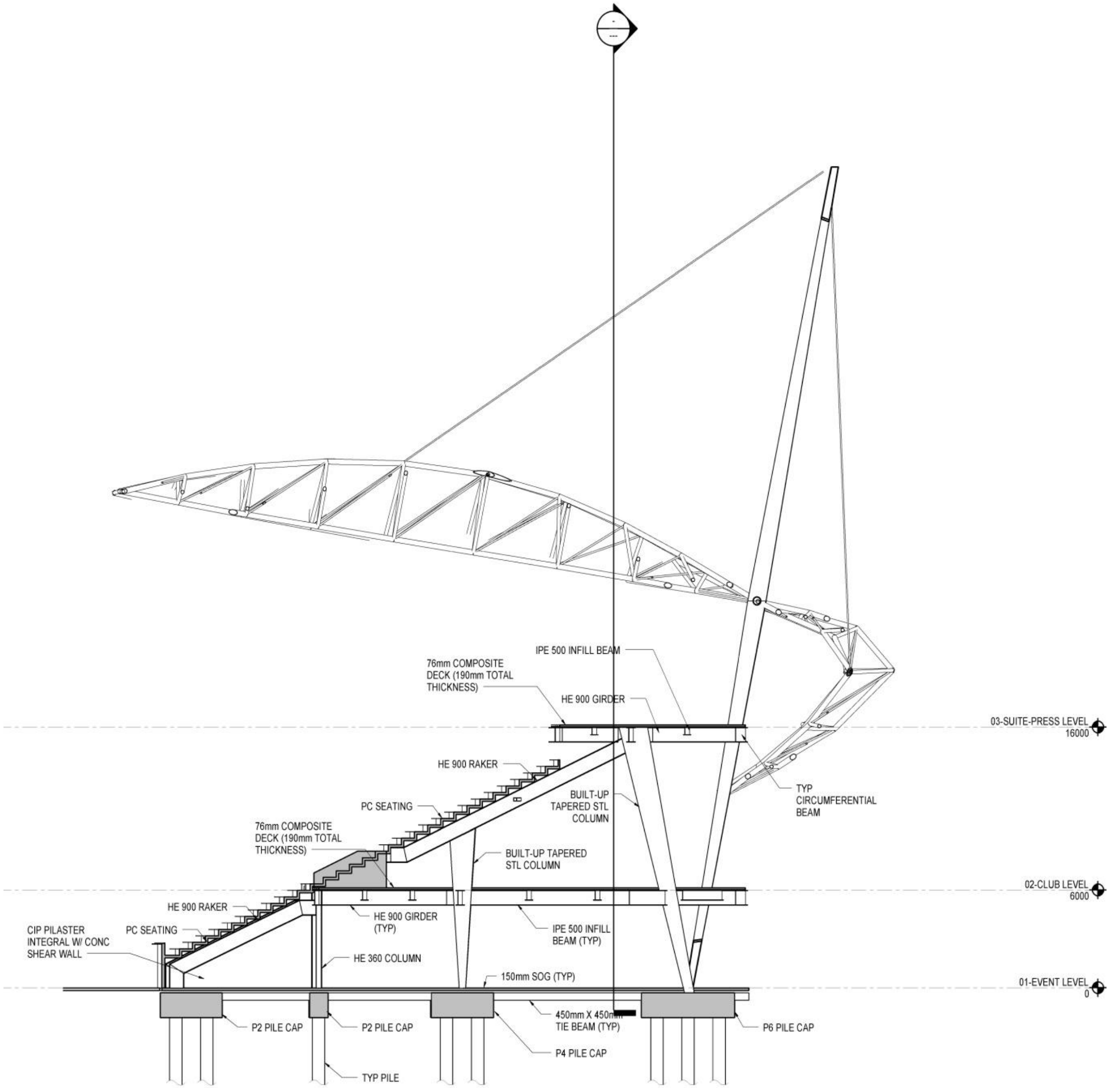
REVIT Model



REVIT Model





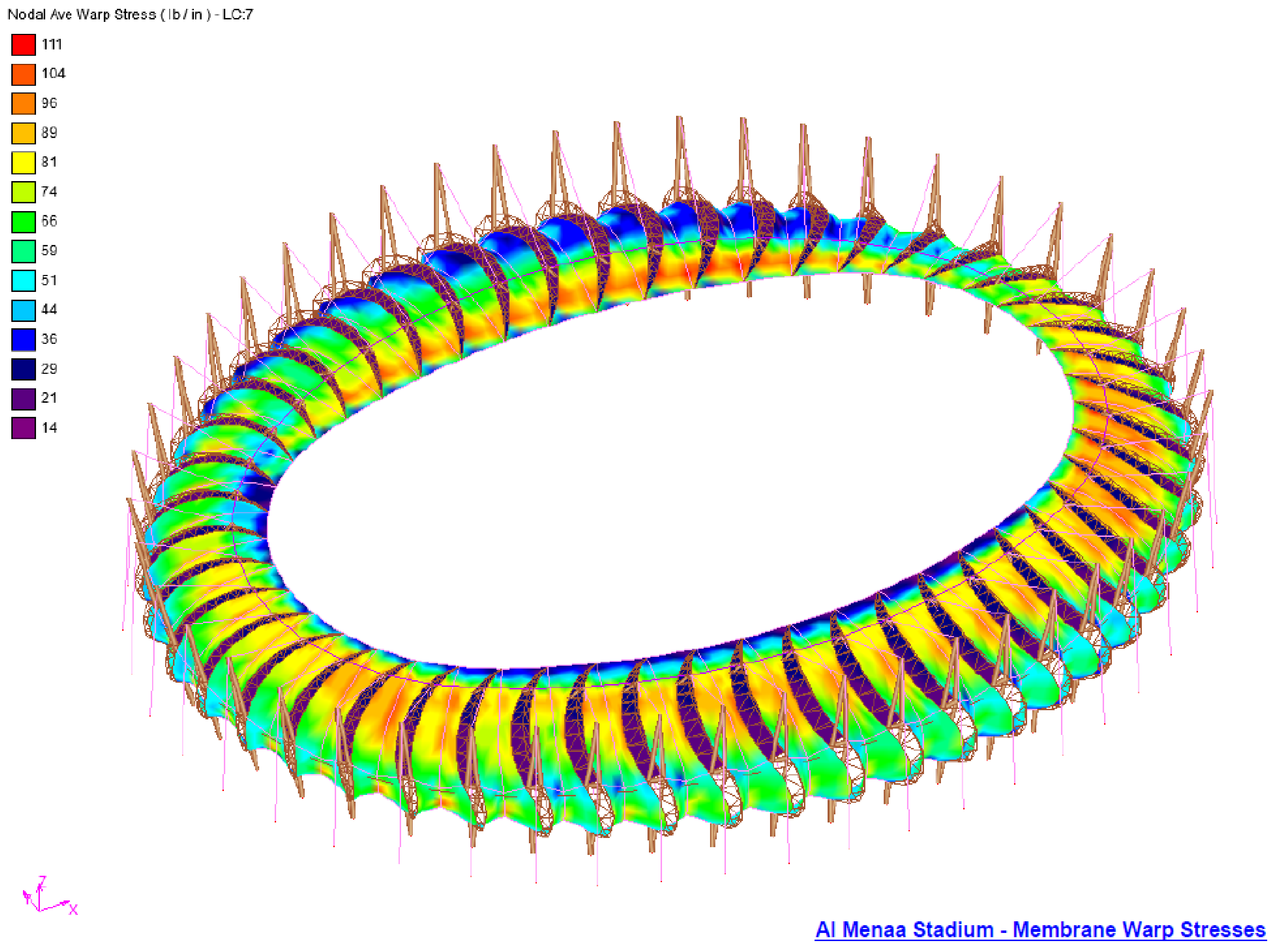

IPE 500 INFILL BEAM
76mm COMPOSITE DECK (190mm TOTAL THICKNESS)
HE 900 GIRDER
03-SUITE-PRESS LEVEL 16000
HE 900 RAKER
PC SEATING
BUILT-UP TAPERED STL COLUMN
TYP CIRCUMFERENTIAL BEAM
76mm COMPOSITE DECK (190mm TOTAL THICKNESS)
BUILT-UP TAPERED STL COLUMN
02-CLUB LEVEL 6000
HE 900 RAKER
CIP PILASTER INTEGRAL W/ CONC SHEAR WALL
PC SEATING
HE 900 GIRDER (TYP)
IPE 500 INFILL BEAM (TYP)
HE 360 COLUMN
150mm SOG (TYP)
01-EVENT LEVEL 0
450mm X 450mm TIE BEAM (TYP)
P2 PILE CAP
P2 PILE CAP
P6 PILE CAP
P4 PILE CAP
TYP PILE

Basrah 30K Stadium

Rendering by 360 Architects

Basrah 30K Stadium

Rendering by 360 Architects


Nodal Ave Warp Stress (lb / in) - LC:7
111
104
96
89
81
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59
51
44
36
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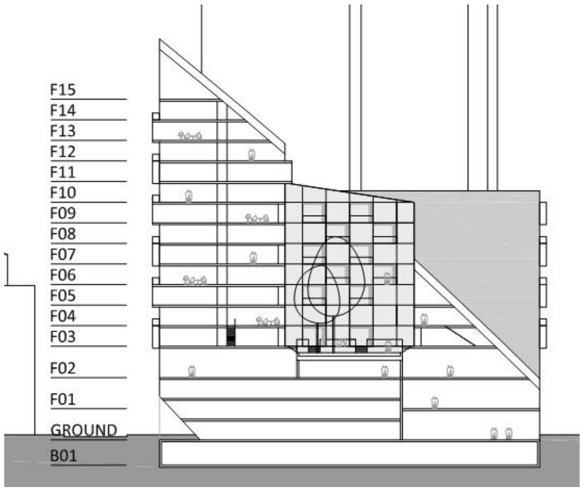
21
14
Z
X
Al Menaa Stadium - Membrane Warp Stresses

W57th St

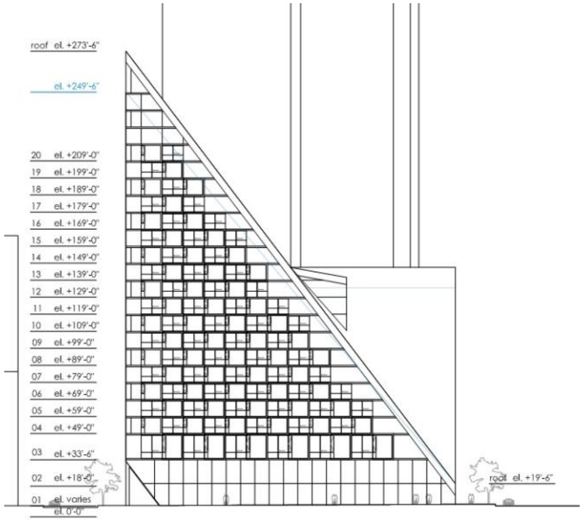
Rendering by BIG (Denmark)

W57th St

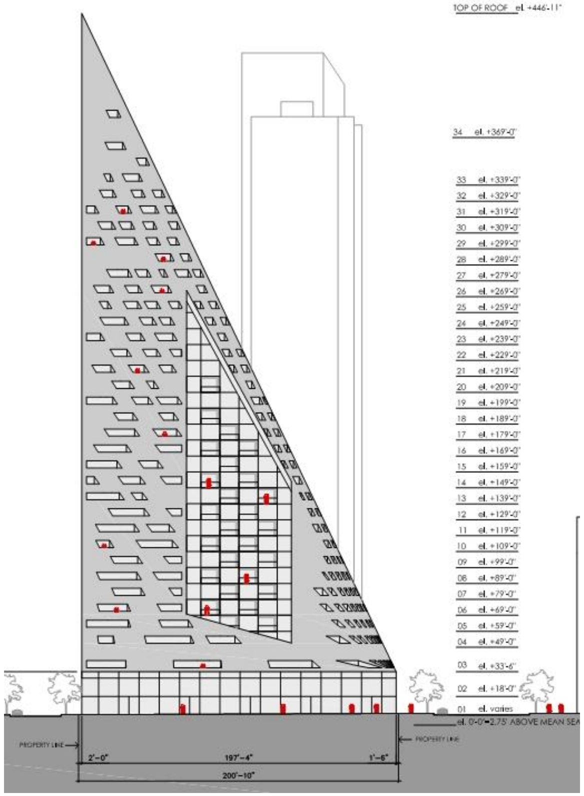
Scheme Development



Scheme 1: June 15th
15 Floors

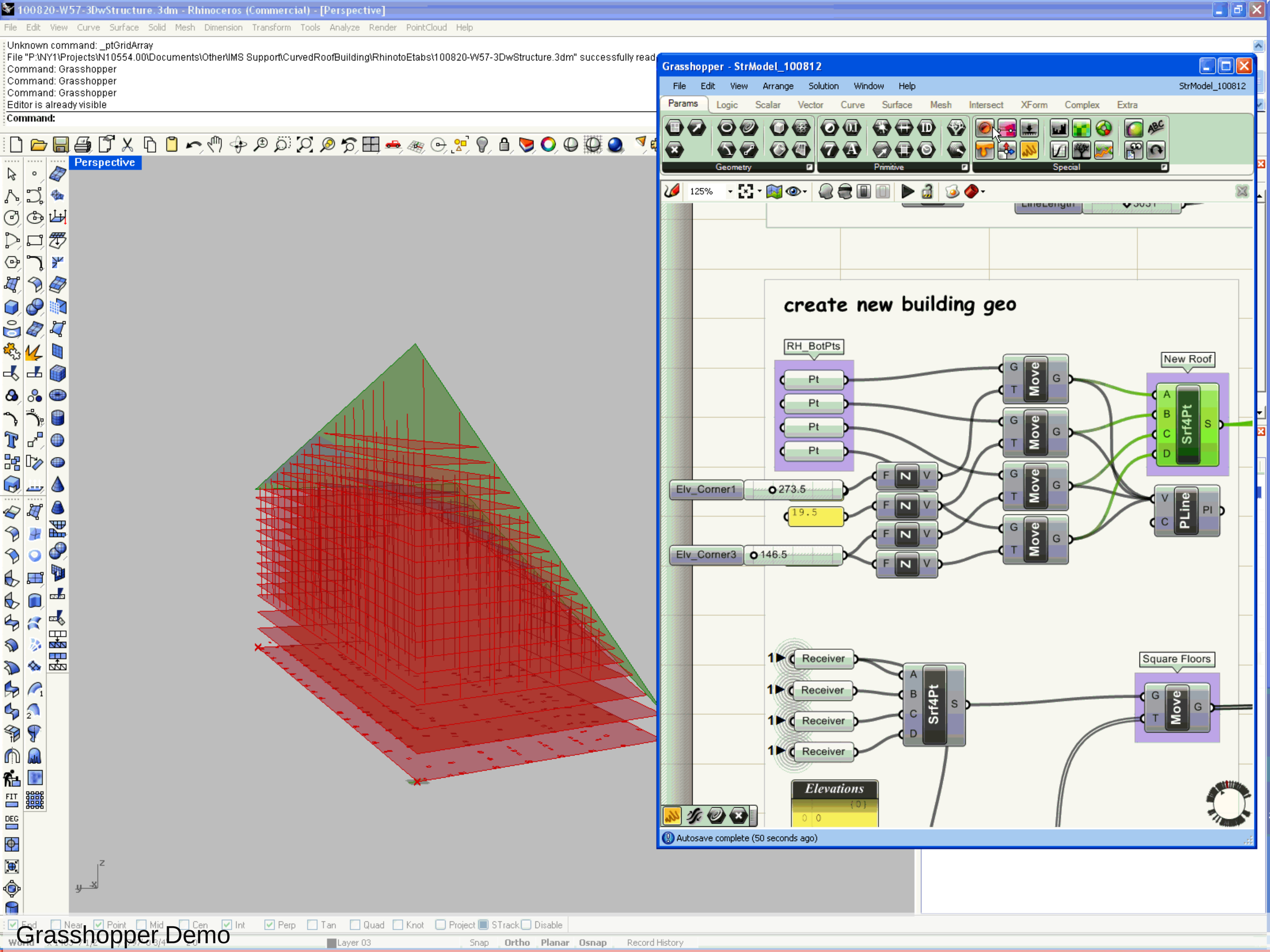


Scheme 2: Aug 12th
20 Floors



Scheme 3: Aug 23th
34 Floors

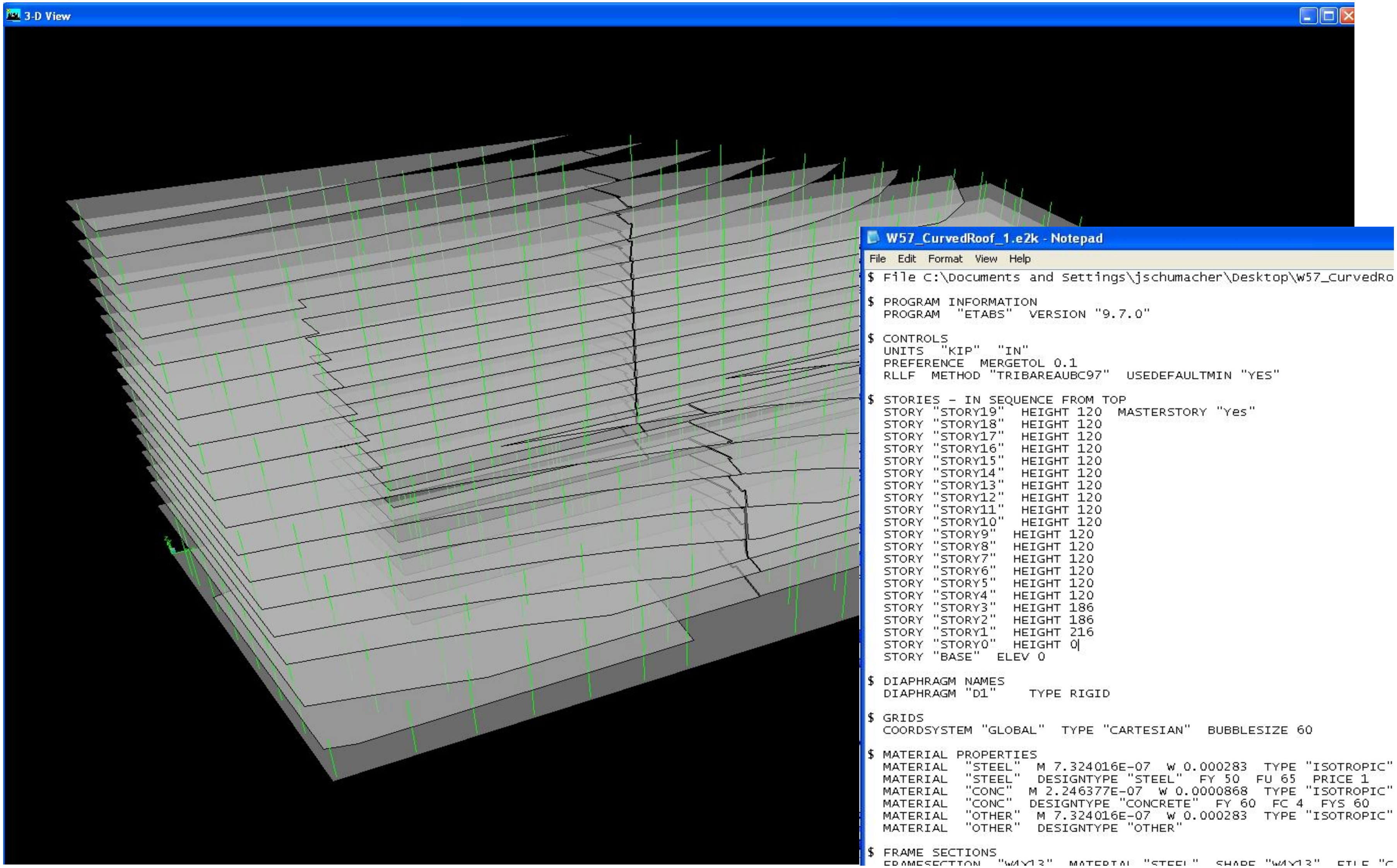
AIA



Grasshopper Demo

Structural geometry translator

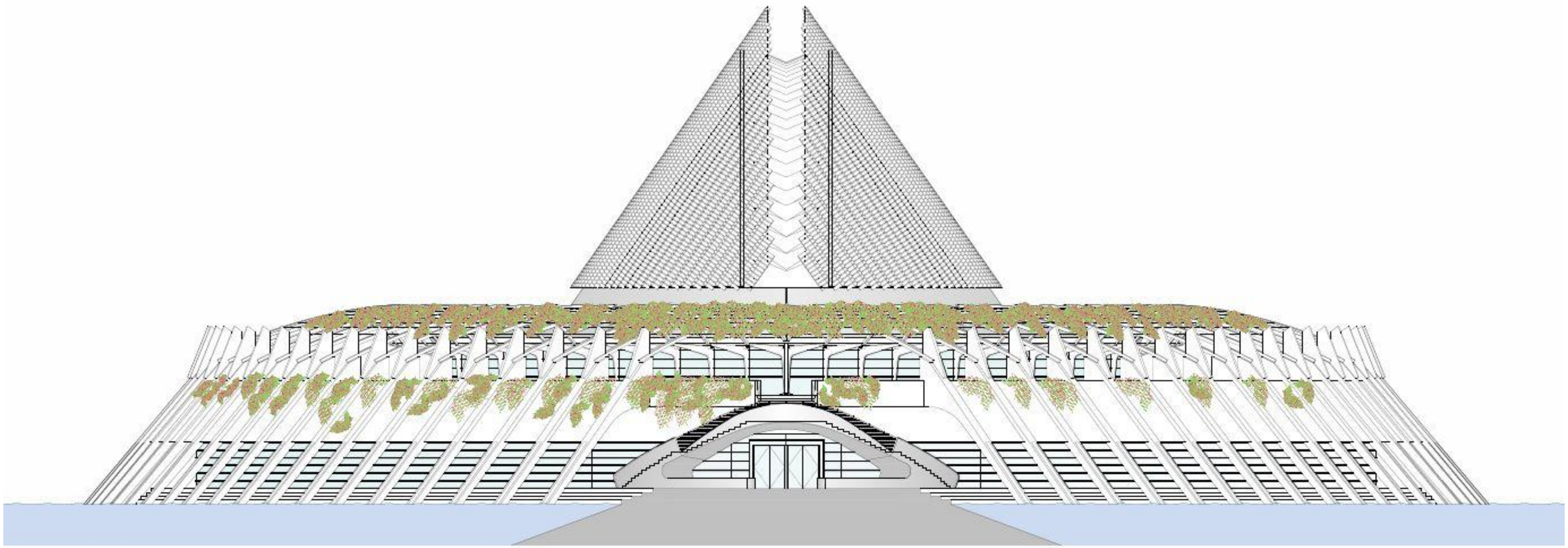
Grasshopper to ETABS



TT in-house E2K text file creation

TT Grasshopper to Etabs Translator

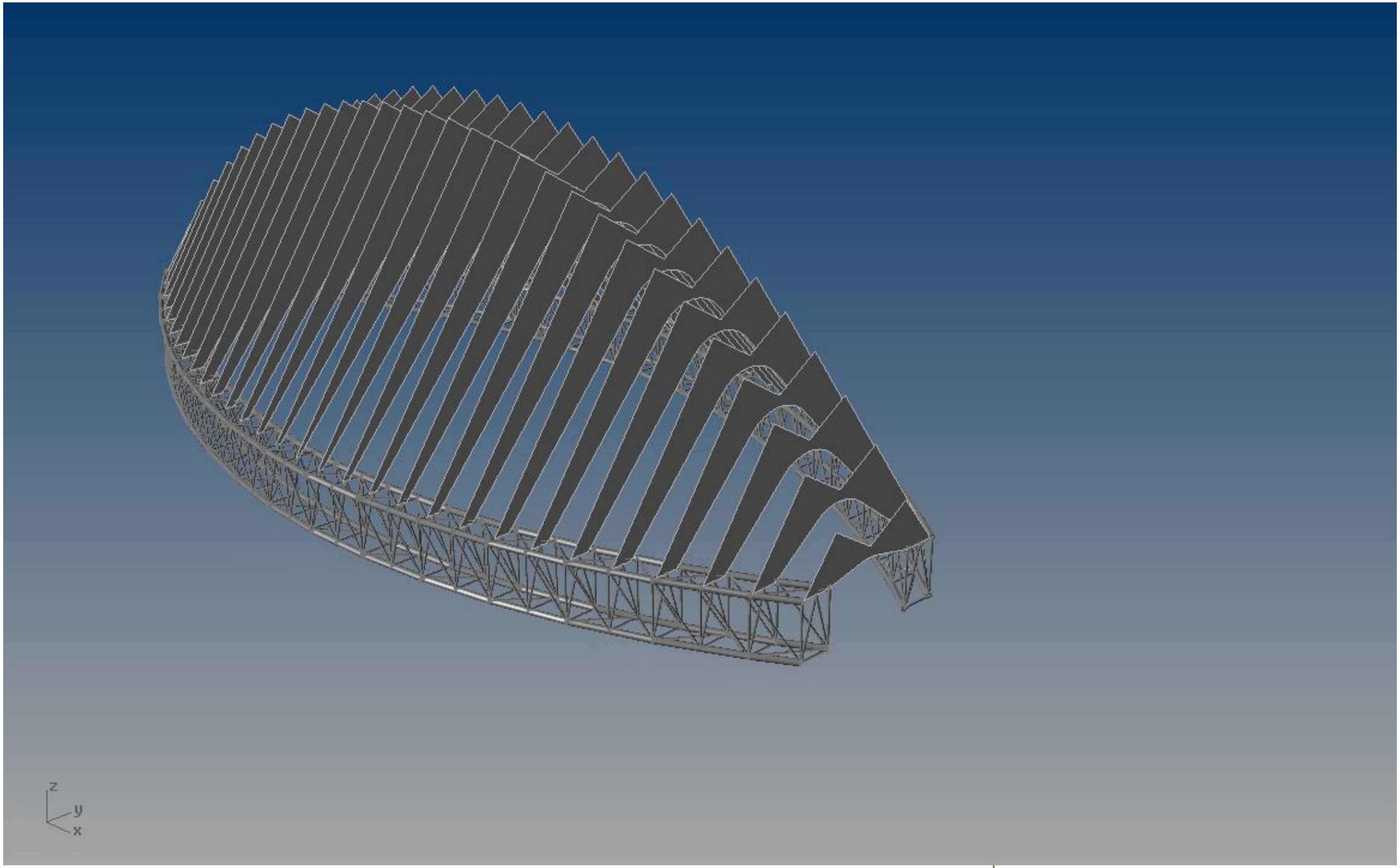
Roof



Roof model by Calatrava

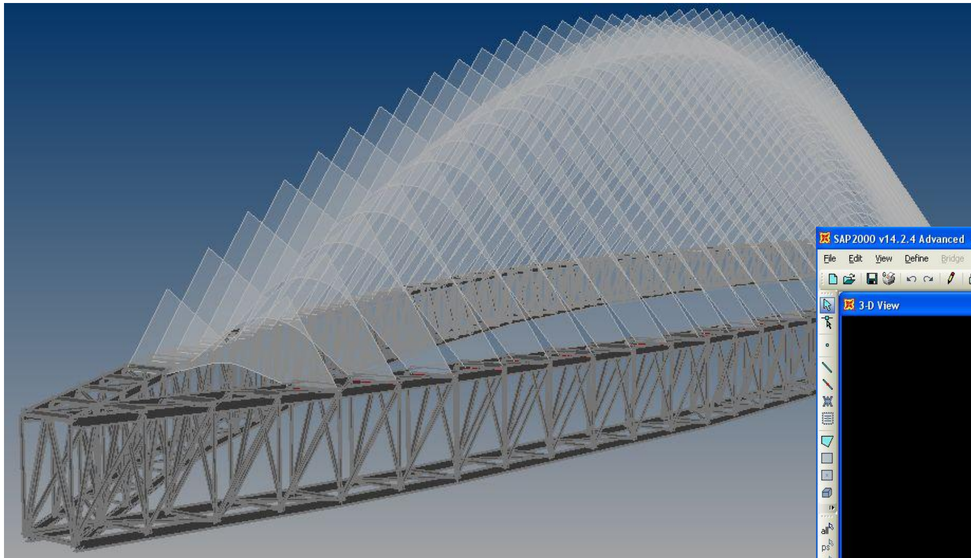
Roof

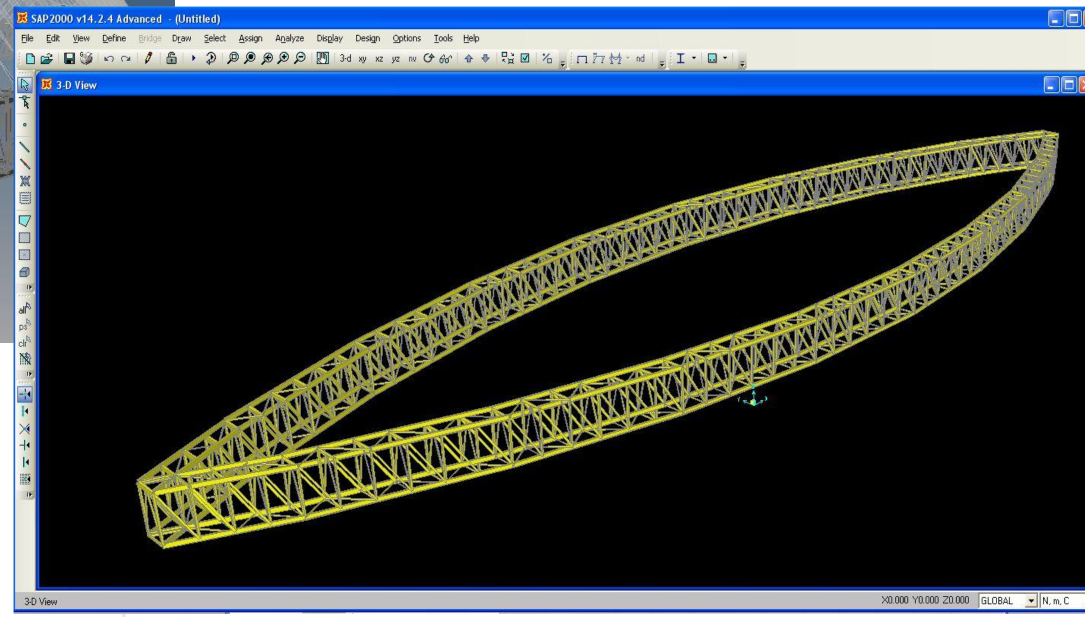
Structural Model

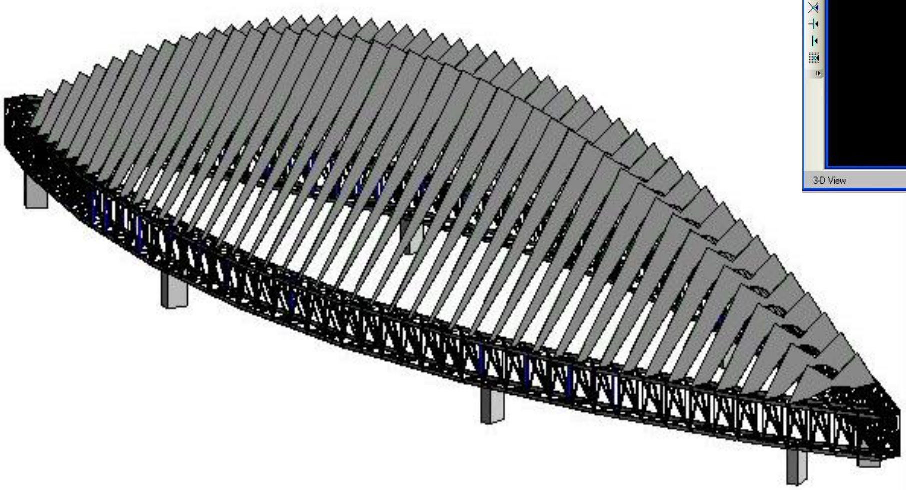


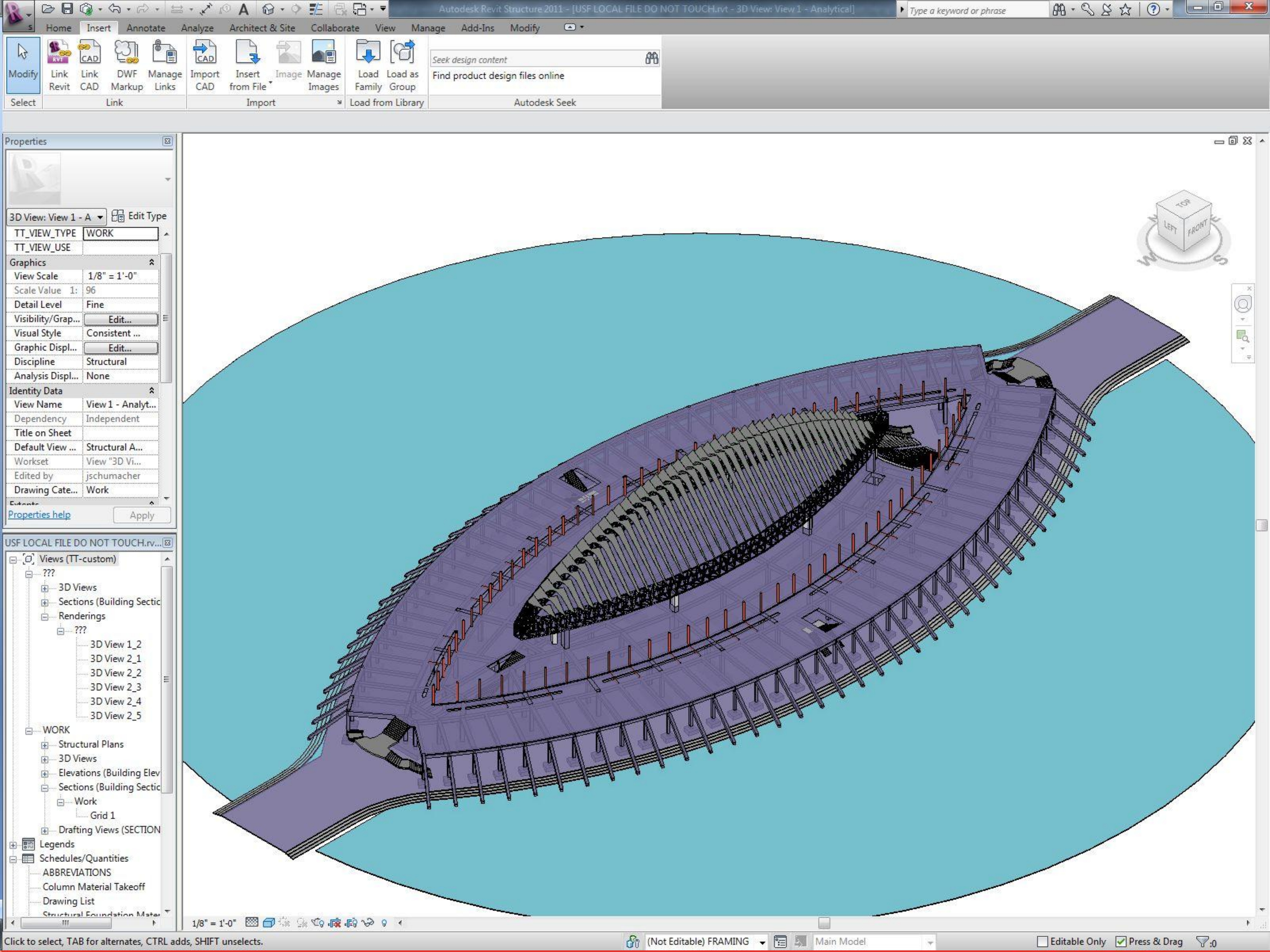
Roof

Structural Model








Autodesk Revit Structure 2011 - [USF LOCAL FILE DO NOT TOUCH.rvt - 3D View: View 1 - Analytical]
Type a keyword or phrase
Home Insert Annotate Analyze Architect & Site Collaborate View Manage Add-Ins Modify
Modify
Link Revit
Link CAD
DWF Markup
Manage Links
Import CAD
Insert from File
Image
Manage Images
Load Family
Load as Group
Seek design content
Find product design files online
Select
Link
Import
Load from Library
Autodesk Seek
Properties
3D View: View 1 - A
Edit Type
TT_VIEW_TYPE WORK
TT_VIEW_USE
Graphics
View Scale 1/8" = 1'-0"
Scale Value 1: 96
Detail Level Fine
Visibility/Grap... Edit...
Visual Style Consistent ...
Graphic Displ... Edit...
Discipline Structural
Analysis Displ... None
Identity Data
View Name View 1 - Analyt...
Dependency Independent
Title on Sheet
Default View ... Structural A...
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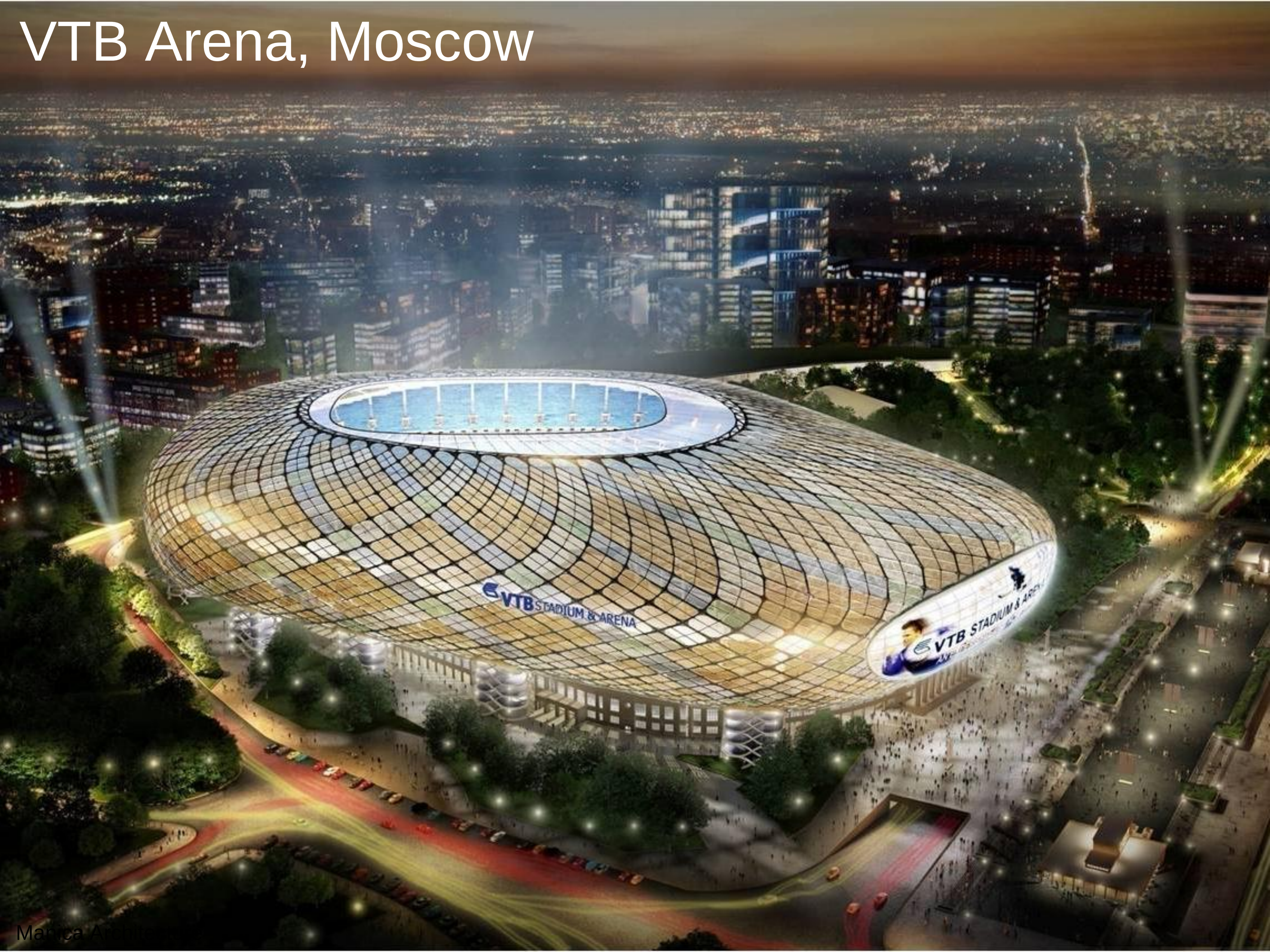
Edited by jschumacher
Drawing Cate... Work
Properties help
Apply
USF LOCAL FILE DO NOT TOUCH.rv...
Views (TT-custom)
???
3D Views
Sections (Building Sectic
Renderings
???
3D View 1_2
3D View 2_1
3D View 2_2
3D View 2_3
3D View 2_4
3D View 2_5
WORK
Structural Plans
3D Views
Elevations (Building Elev
Sections (Building Sectic
Work
Grid 1
Drafting Views (SECTION
Legends
Schedules/Quantities
ABBREVIATIONS
Column Material Takeoff
Drawing List
TOP
LEFT
FRONT
1/8" = 1'-0"
Click to select, TAB for alternates, CTRL adds, SHIFT unselects.
(Not Editable) FRAMING
Main Model
Editable Only
Press & Drag
:0

integrated

analysis

VTB Arena, Moscow



Manica Archite

VTB Arena, Moscow

Data Mining

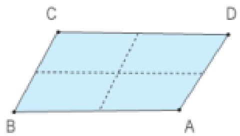
	Length Axis 1(mm)	Length Axis 2 (mm)	Area (mm2)	round a1	round a2	range a1	count a1	range a2	count a2		Axis 1	Axis 2
0	10992.00	7238.41	37226000.00	11000.00	7000.00	9000.00	2.00	5500.00	2.00	min	9183.83	5729.17
1	11586.00	7604.86	40617000.00	11500.00	7500.00	9500.00	12.00	6000.00	1256.00	max	20748.00	14380.00
2	12212.00	7909.85	44164000.00	12000.00	8000.00	10000.00	18.00	6500.00	187.00			
3	12794.00	8077.95	47266000.00	13000.00	8000.00	10500.00	41.00	7000.00	120.00			
4	13335.00	8033.73	49528000.00	13500.00	8000.00	11000.00	51.00	7500.00	77.00			
5	13868.00	7917.84	51462000.00	14000.00	8000.00	11500.00	63.00	8000.00	57.00			
6	14388.00	7750.29	52956000.00	14500.00	8000.00	12000.00	61.00	8500.00	29.00			
7	14897.00	7544.69	54001000.00	15000.00	7500.00	12500.00	59.00	9000.00	35.00			
8	15400.00	7315.29	54641000.00	15500.00	7500.00	13000.00	58.00	9500.00	23.00			
9	15887.00	7131.91	55258000.00	16000.00	7000.00	13500.00	81.00	10000.00	31.00			
10	16339.00	6885.61	54882000.00	16500.00	7000.00	14000.00	75.00	10500.00	20.00			

	Angle A	Angle B	Angle A / Angle B	Angle Sum	Max Deviation Dist (eval srf)
0	116.212661	113.173502	1.02685398	360	5.336134
1	117.61059	112.826751	1.042399865	360	0.871038
2	118.691855	113.594831	1.044870211	360	1.130024
3	120.75759	114.371515	1.055836237	360	9.984354
4	123.56208	116.109558	1.064185259	360	14.836463
5	126.267276	118.296062	1.067383596	360	19.303195
6	128.966301	120.701635	1.068471865	360	23.444554
7	131.723265	123.194604	1.069229177	360	27.788725
8	134.365394	125.864944	1.067536279	360	31.773613
9	136.036988	128.778648	1.056362915	360	10.296549
10	135.124833	135.064414	1.000447335	360	302.36649

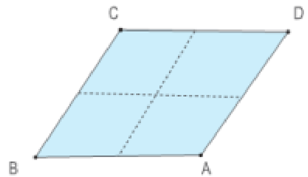
VTB Arena, Moscow

Panel Callouts

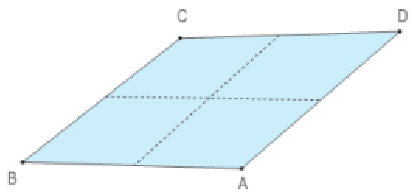
PANEL 1707
SMALLEST PANEL
A [-124.46, -46.48, 13.7]
B [-129.9, -50.77, 13.7]
C [-129.6, -54.56, 13.7]
D [-123.85, -50.27, 13.7]
AREA : 23.1 m²



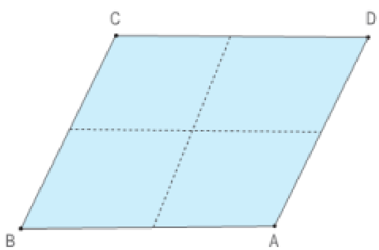
PANEL 115
SMALL - AVG PANEL
A [69.5, -3.3, 60.92]
B [66.4, 2.92, 61.25]
C [69.3, 8.55, 60.91]
D [72.59, 2.33, 60.55]
AREA: 36.8 m²



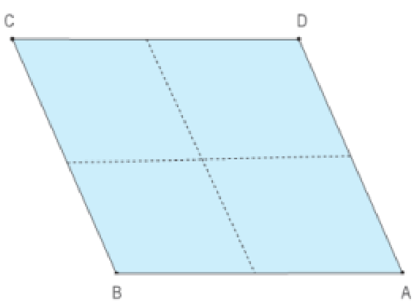
PANEL 1847
AVERAGE SIZE PANEL
A [-120.02, -167.12, 16.75]
B [-113.03, -172.7, 18.98]
C [-104.72, -173.95, 16.38]
D [-111.75, -168.06, 15.33]
AREA: 50.5 m²

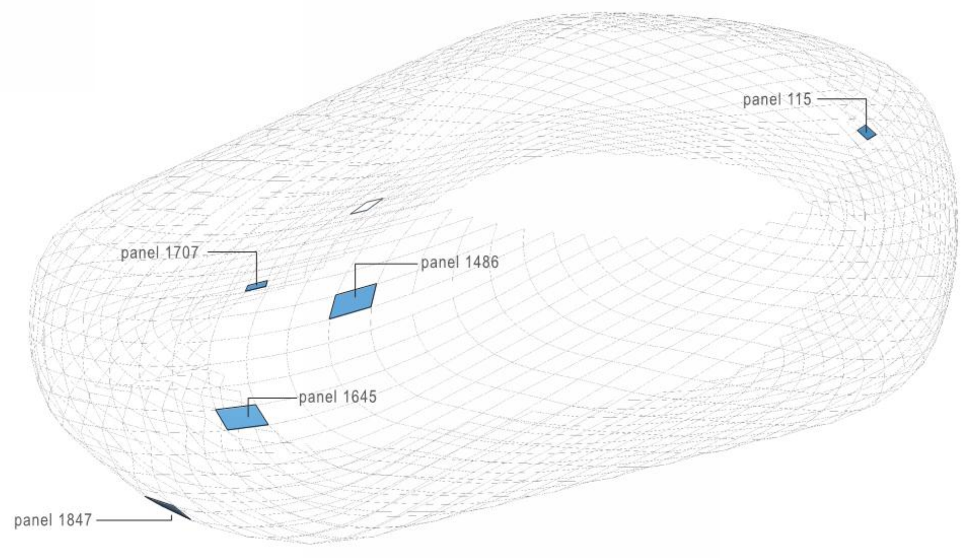


PANEL 1645
AVG - LARGE PANEL
A [-97.94, -165.33, 46.16]
B [-87.77, -163.41, 47.57]
C [-82.35, -170.15, 46.77]
D [-92.46, -172.25, 45.42]
AREA: 82.0 m²



PANEL 1486
LARGEST PANEL
A [-78.25, -119.51, 55.3]
B [-67.98, -113.93, 56.78]
C [-67.03, -124.31, 55.51]
D [-77.3, -129.93, 53.97]
AREA: 113.5 m²





WIND LOADS

Until results of the wind tunnel test are available, cladding is to be designed to withstand wind loading calculated in accordance with SNIP 2.01.07-85 Section 6 with the following parameters:

W_0 0.23 kPa
Locality type C

z (m)	W_{net} - suction (kPa)	W_{net} - pressure (kPa)
10	-1.43	0.72
20	-1.62	0.81
40	-2.05	1.03
60	-2.05	1.03
80	-2.29	1.15
100	-2.43	1.22

SNOW LOADS

The cladding is to be designed to withstand snow loading calculated in accordance with SNIP 2.01.07-85 Section 5 with the following parameters:

S_g 1.8 kPa

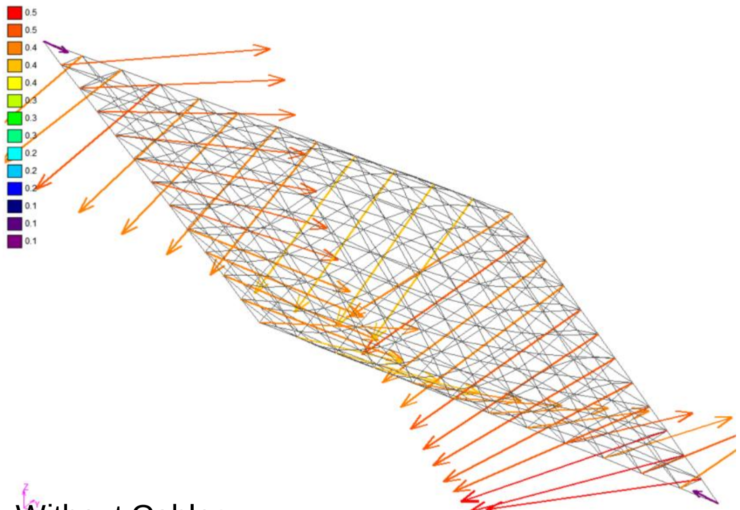
The coefficient m for snow accumulation and drift is to be determined depending on the final cladding shape. It should be noted that μ can be as high as 2.0 locally and needs to be considered for cladding design.

$S = S_g m\mu =$ 3.6 kPa

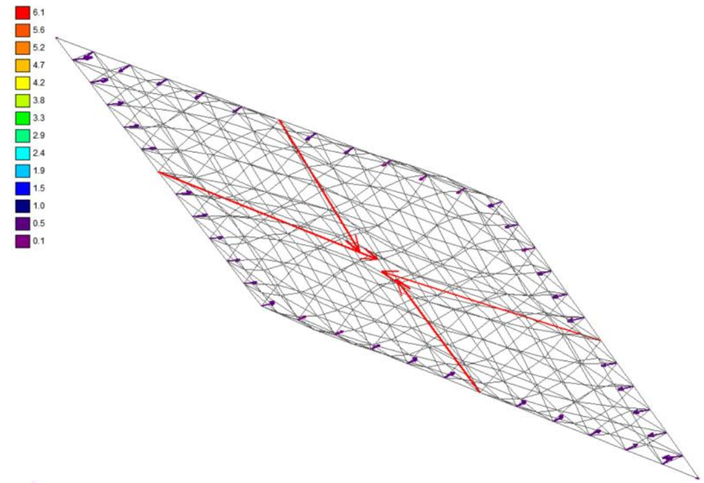
VTB Arena, Moscow

ETFE modeling and analysis

Reaction Forces

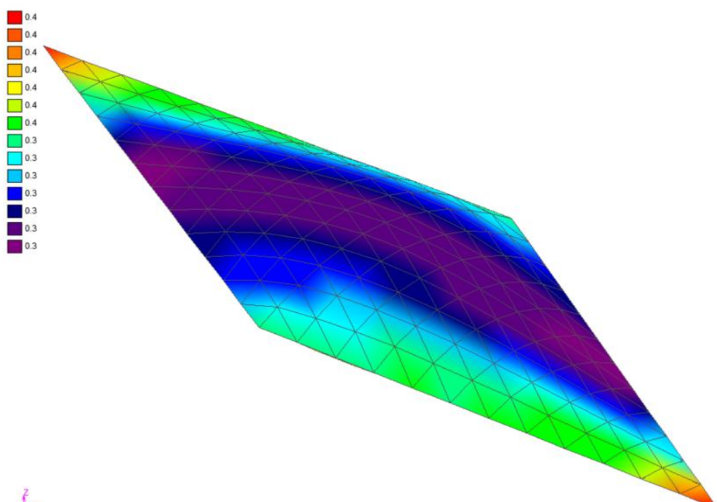


Without Cables

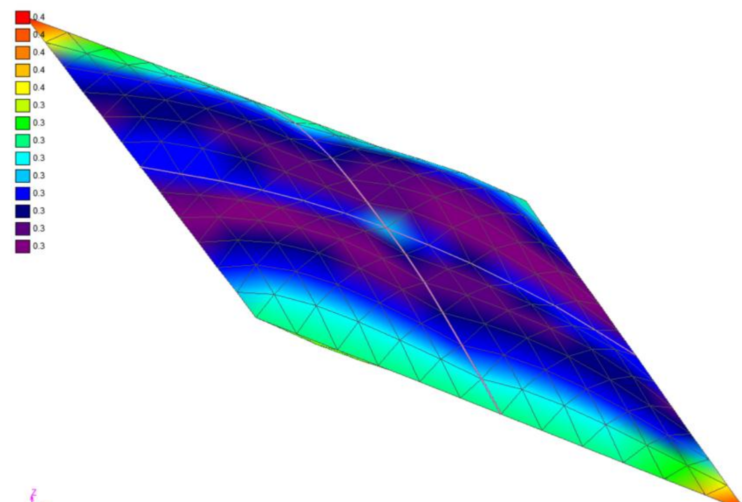


With Cables

Warp Stress – Prestress



Without Cables

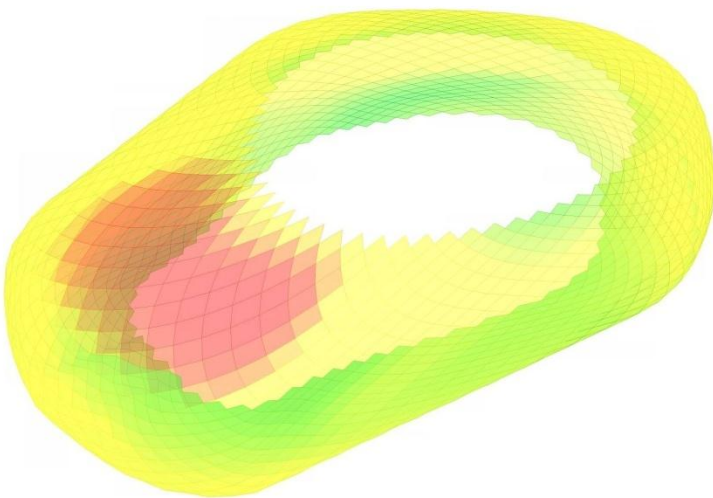


With Cables

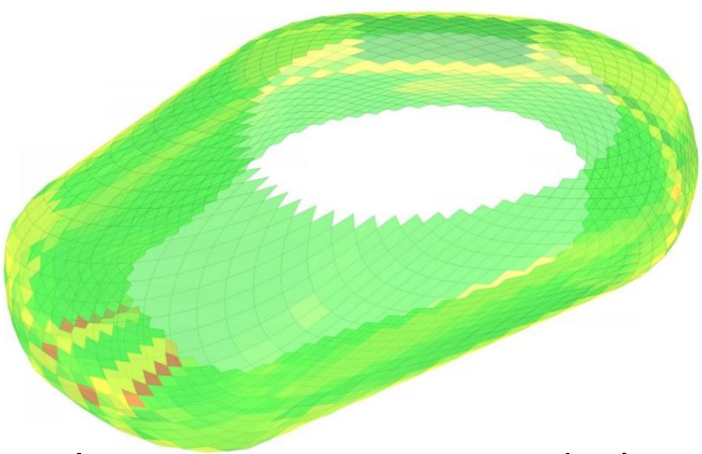
VTB Arena, Moscow

Data Mining and visualization

BEFORE

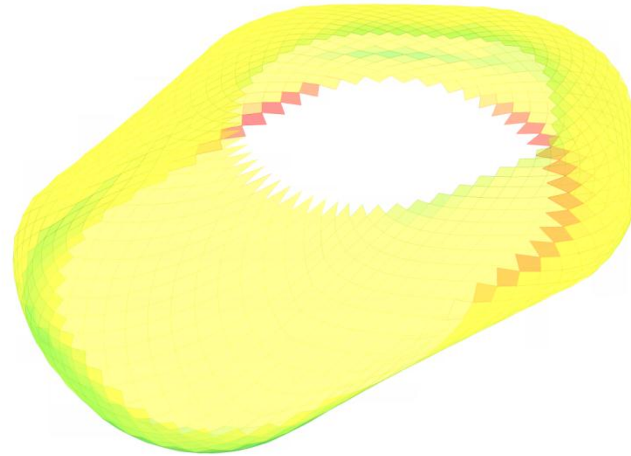


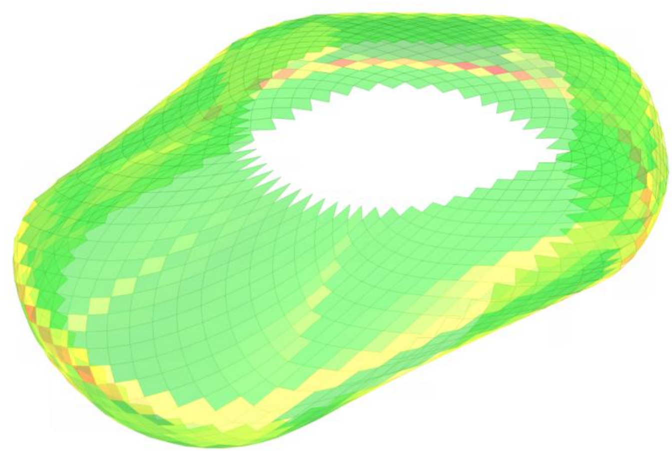
Panel Size: Max: 115.5 m^2 | Min: 23.1 m^2



Panel Curvature: Max: 22.7 % | Min: 0 %

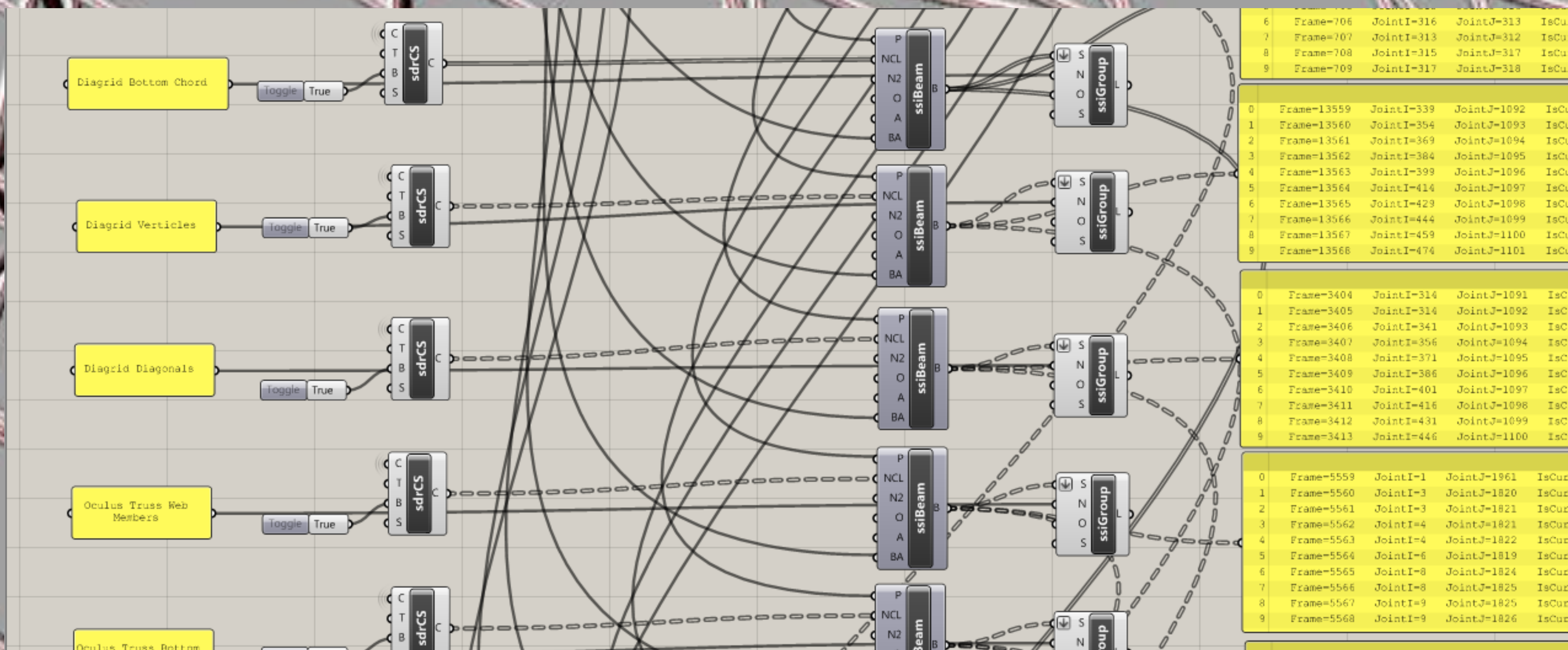
AFTER





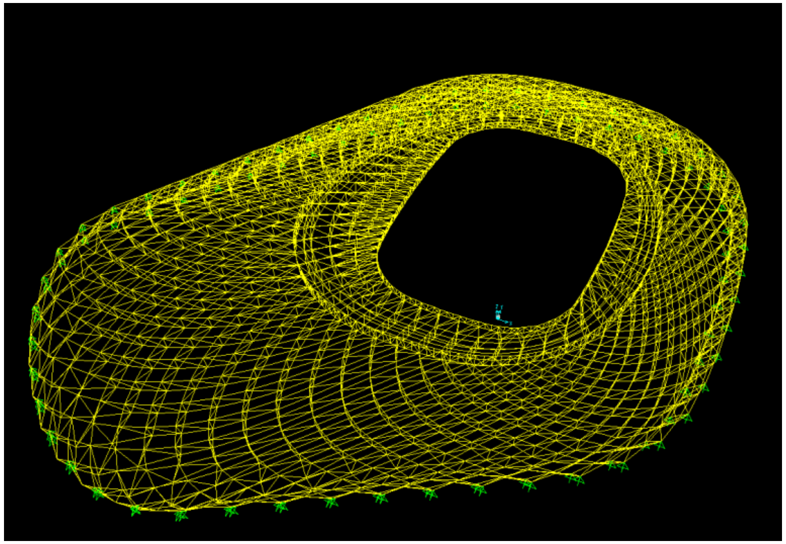
VTB Arena, Moscow

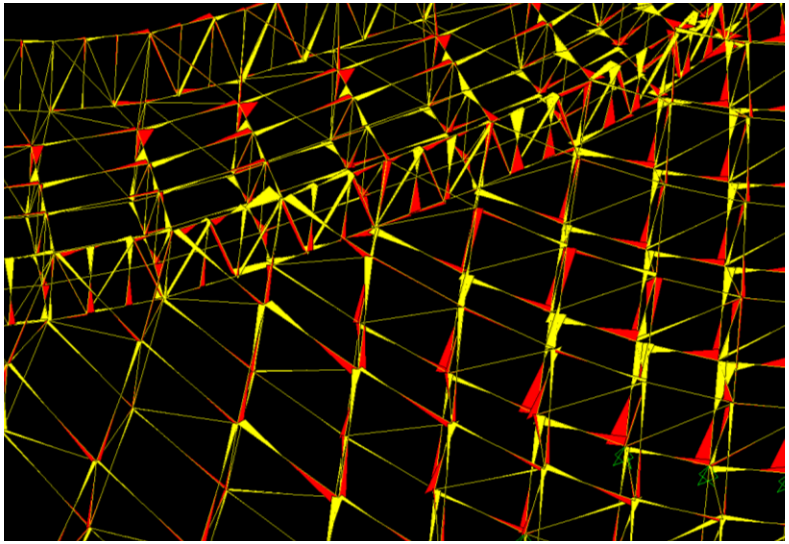
Structural model defined in Grasshopper

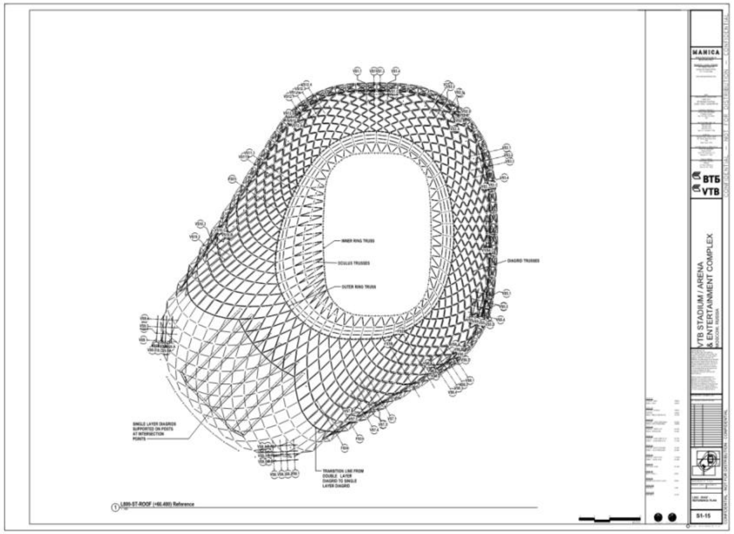


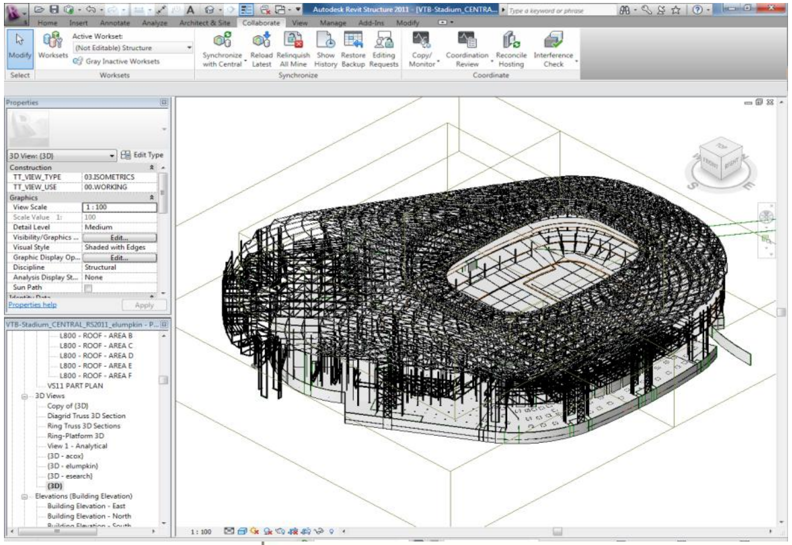
VTB Arena, Moscow

Structural model defined in Grasshopper









Glass façade panelization

Genetic Algorithm

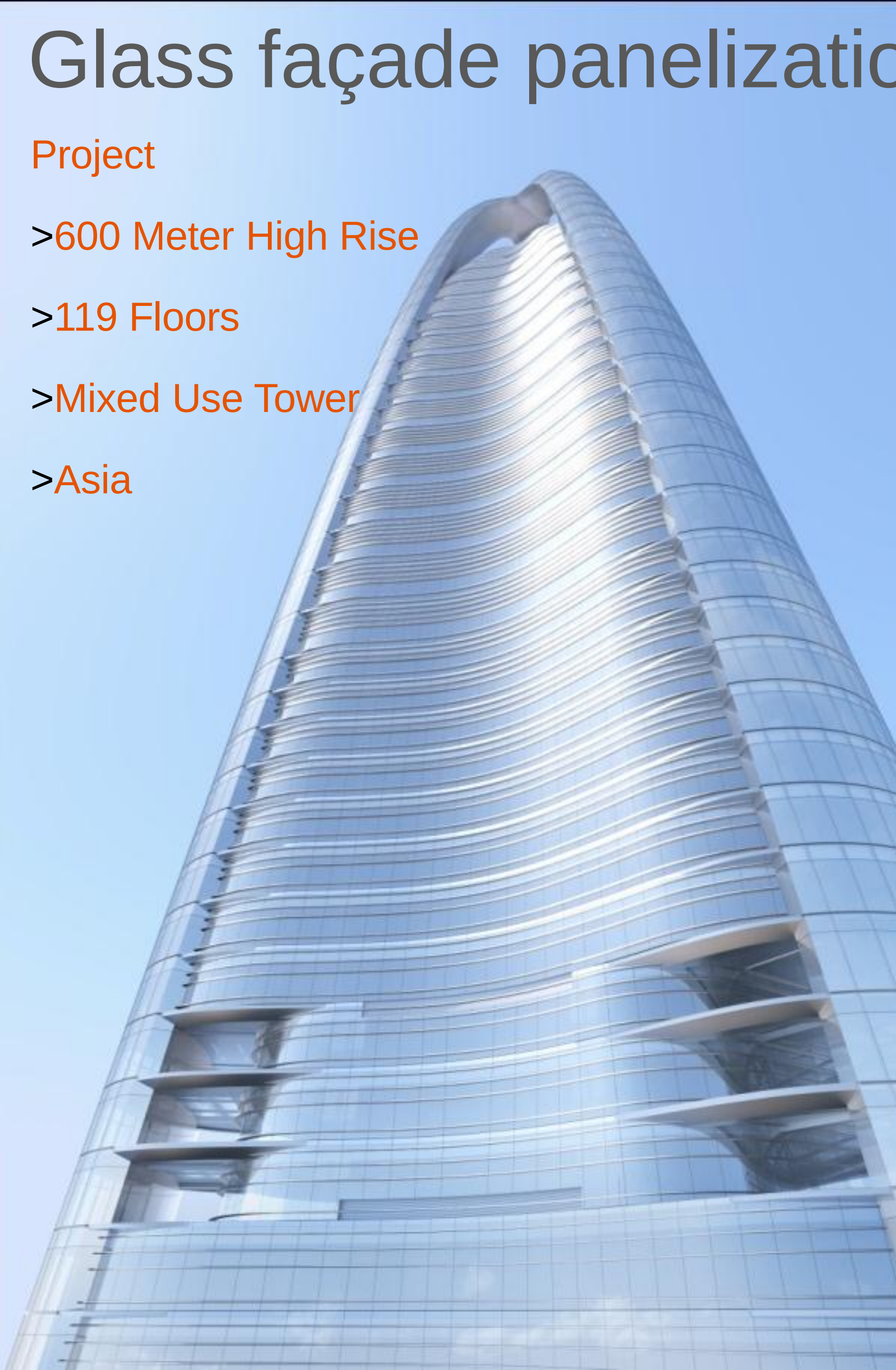
Project

>600 Meter High Rise

>119 Floors

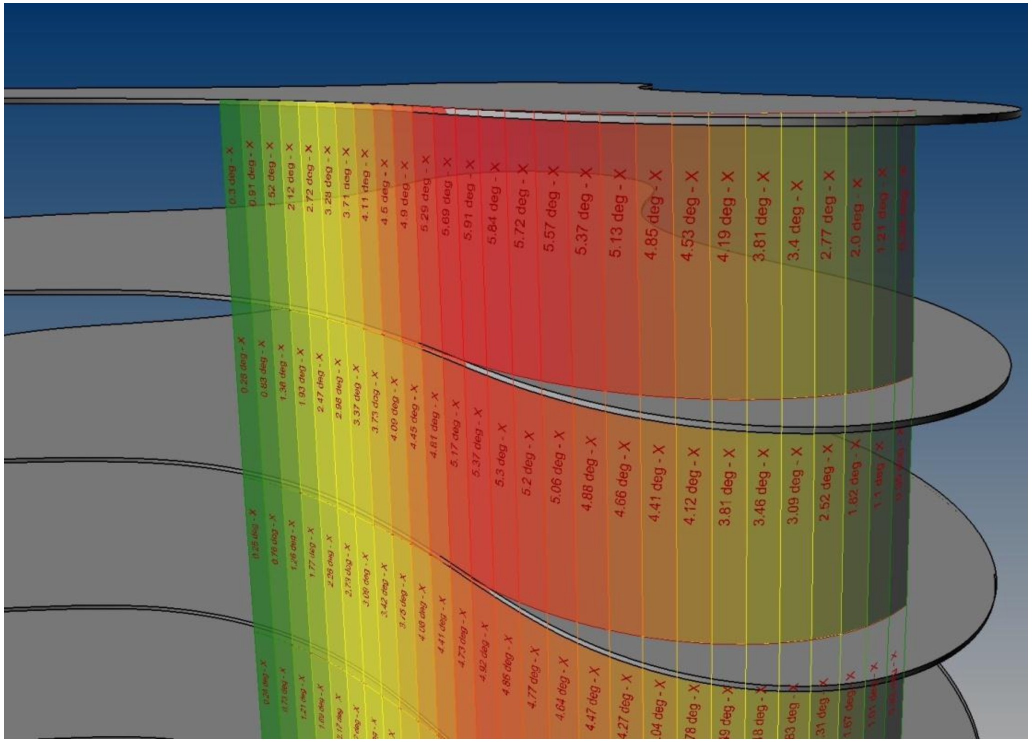
>Mixed Use Tower

>Asia



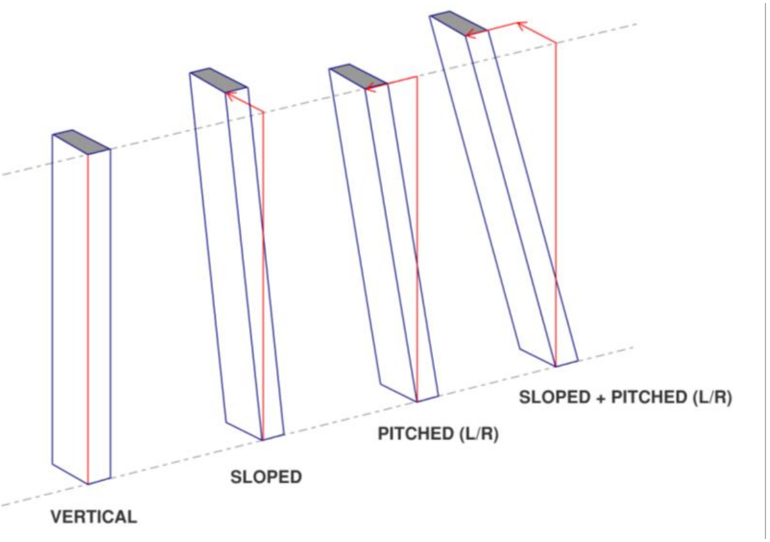
Glass façade panelization

Pitched Mullion Analysis in X Axis



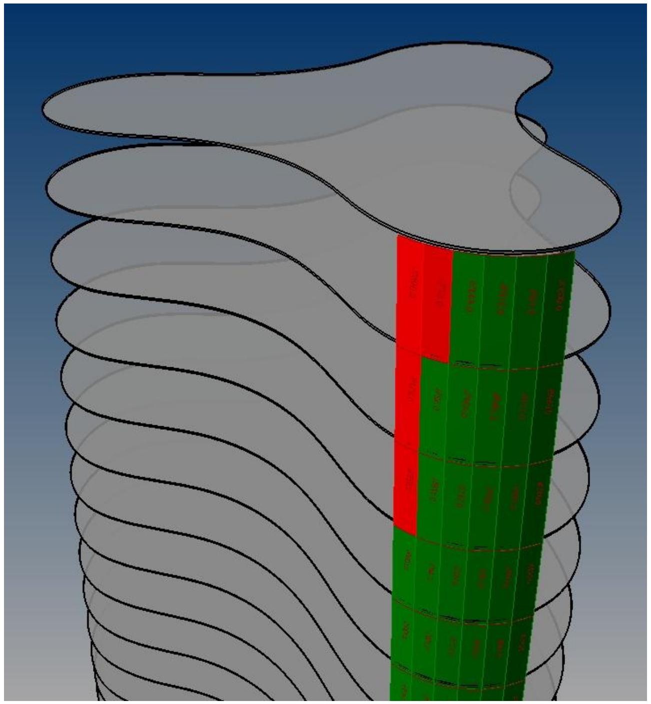
Tower Façade Optimization

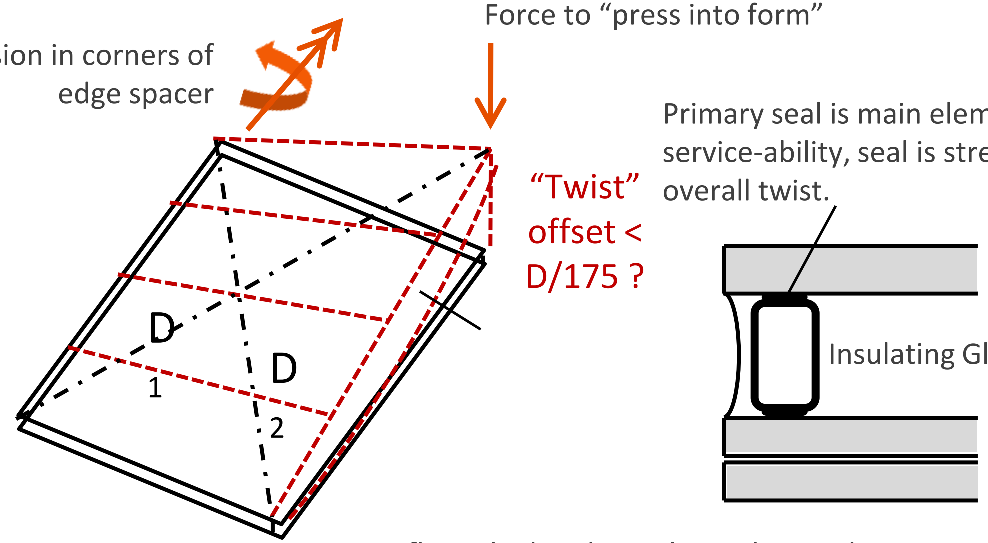
Study to evaluate warpage, slope and pitch of the current configuration of façade panels, and to optimize for constructability and cost efficiency.



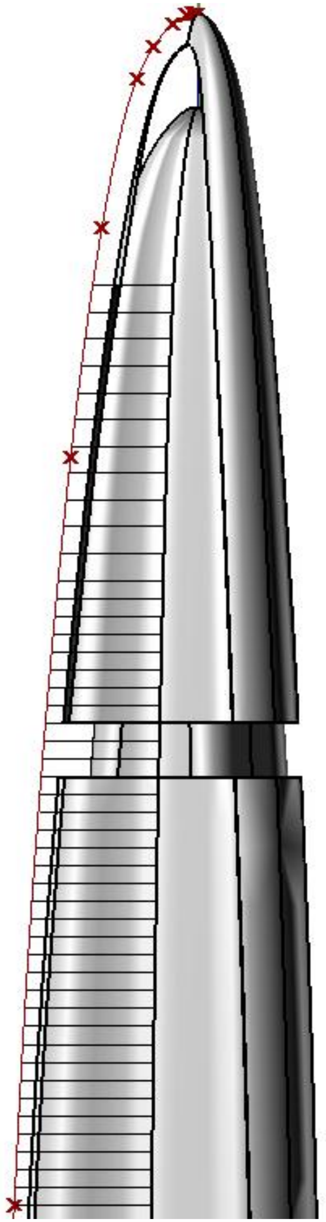
Glass façade panelization

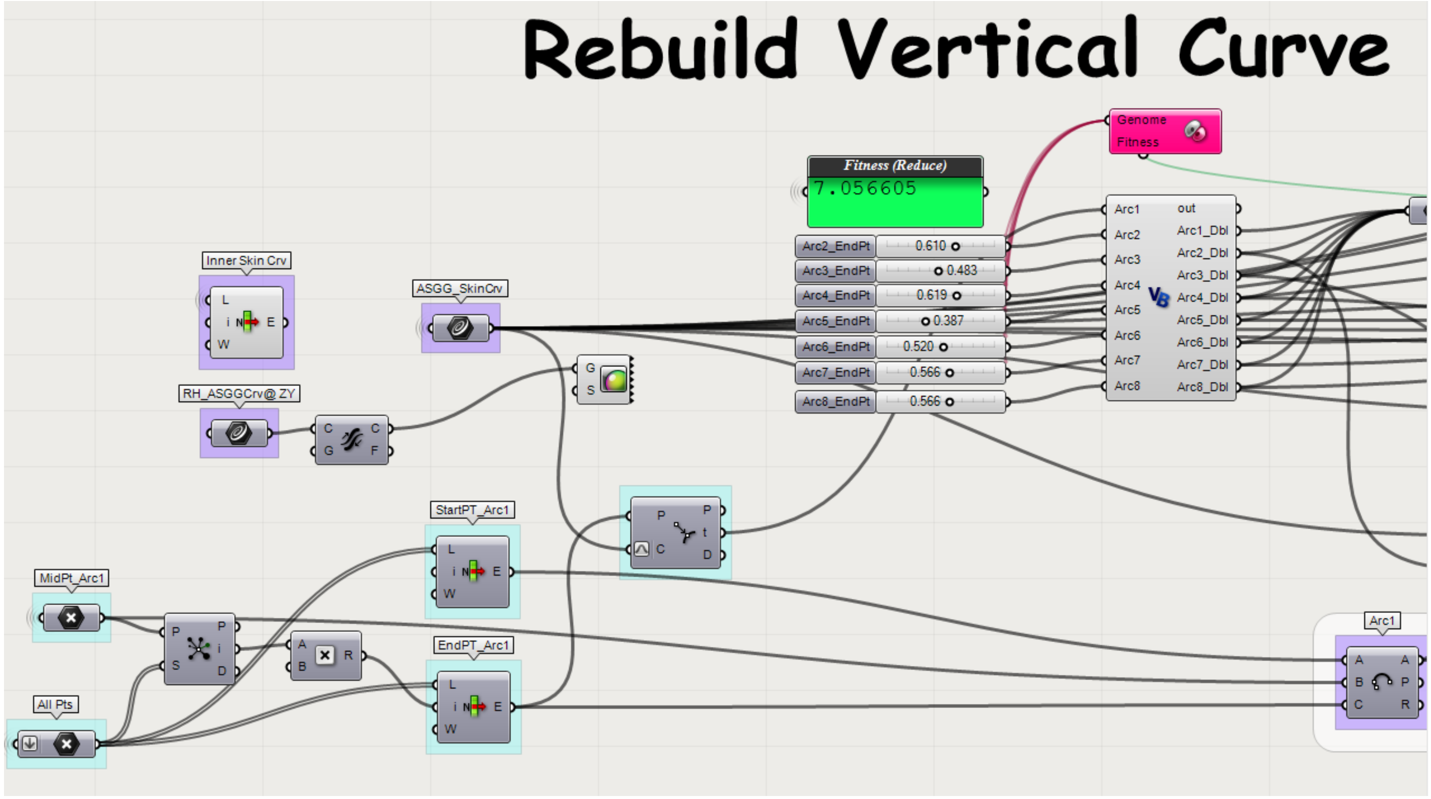
Panel Warpage Analysis



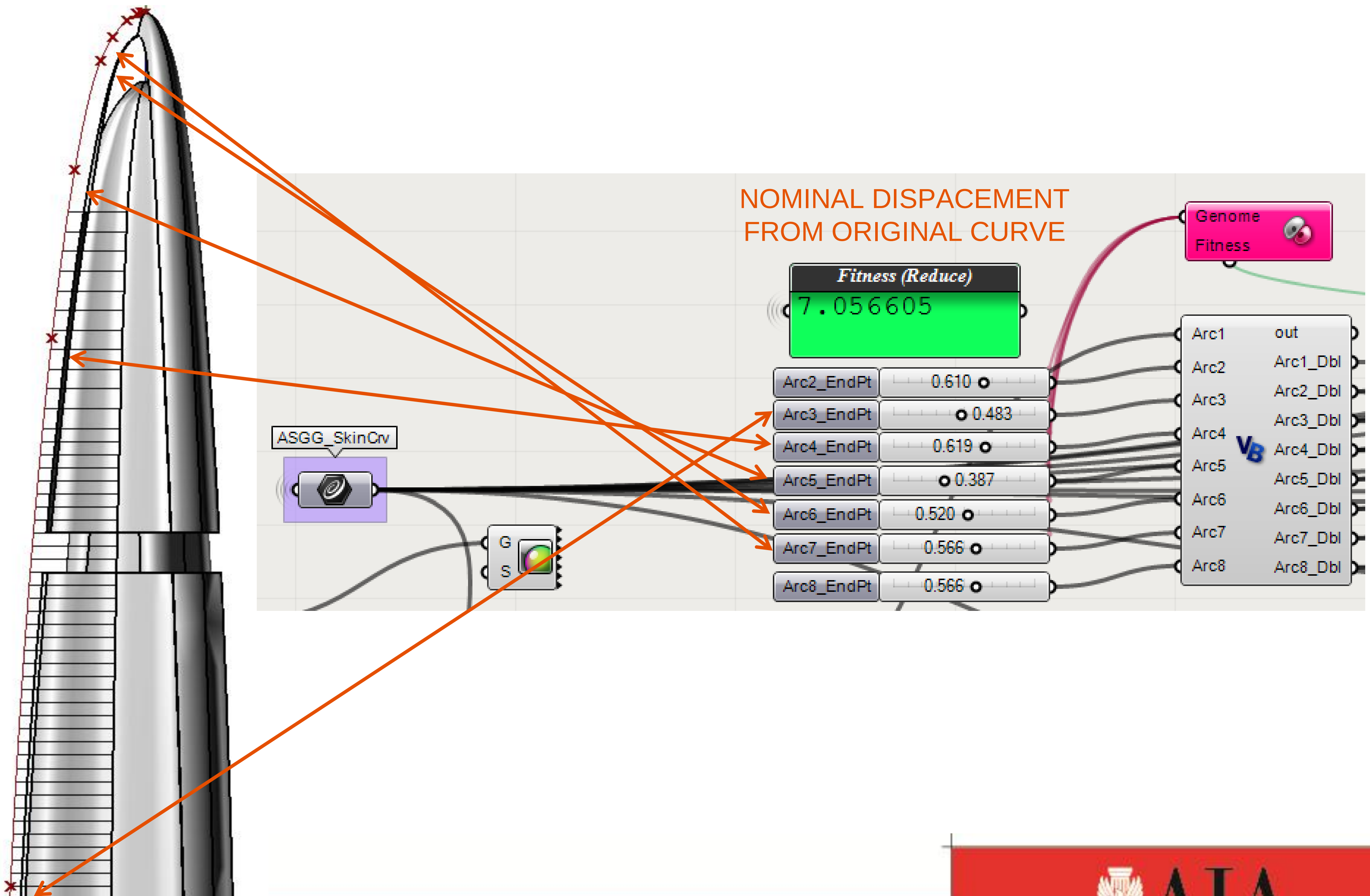


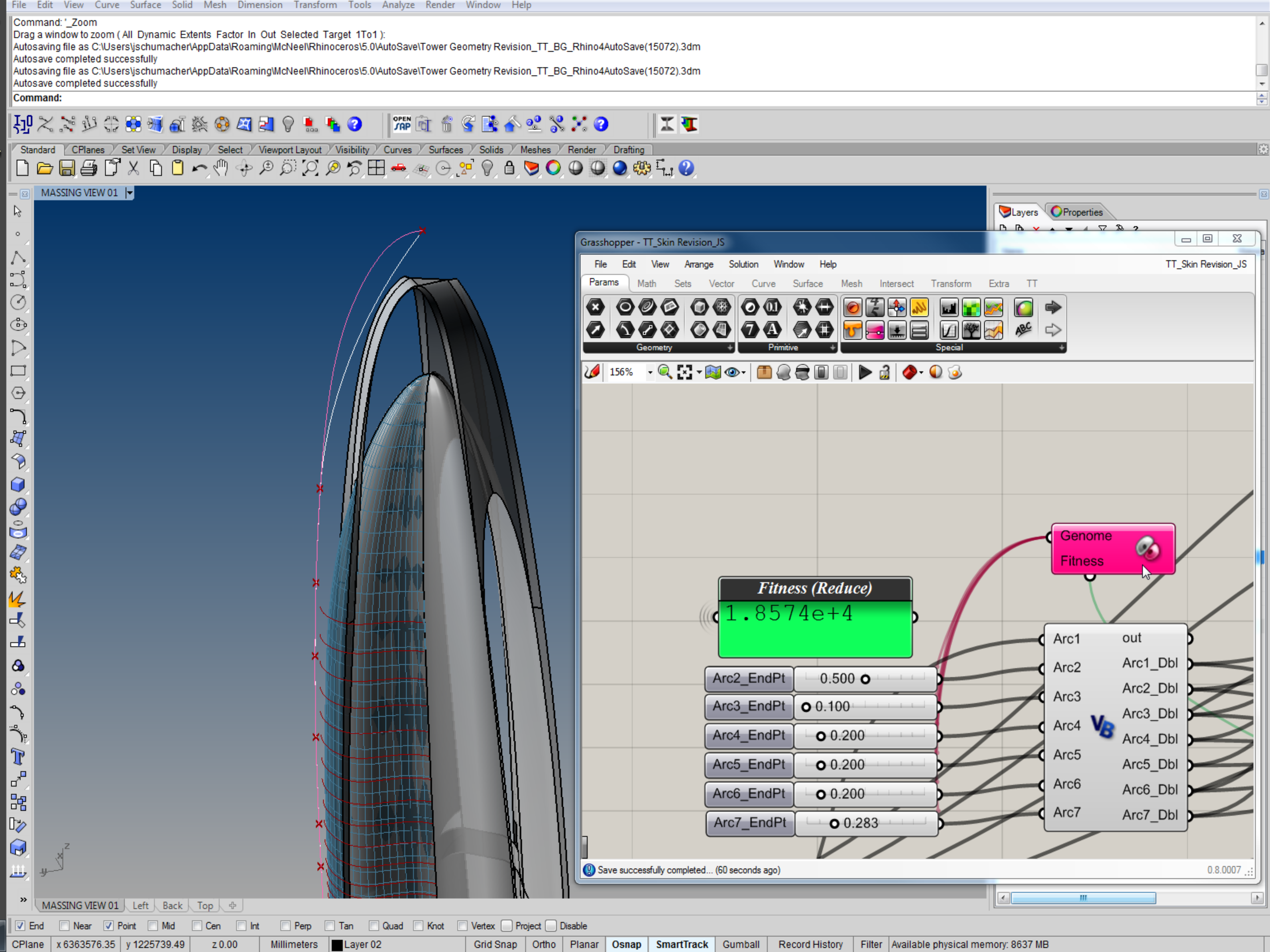
Rationalizing the building geometry





Rationalizing the building geometry




File Edit View Curve Surface Solid Mesh Dimension Transform Tools Analyze Render Window Help
Command: '_Zoom
Drag a window to zoom (All Dynamic Extents Factor In Out Selected Target 1To1):
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Autosave completed successfully
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Autosave completed successfully
Command:
Standard CPlanes Set View Display Select Viewport Layout Visibility Curves Surfaces Solids Meshes Render Drafting
MASSING VIEW 01
Layers Properties
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File Edit View Arrange Solution Window Help TT_Skin Revision_JS
Params Math Sets Vector Curve Surface Mesh Intersect Transform Extra TT
Geometry Primitive Special
156%
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Fitness (Reduce)
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Arc3_EndPt 0.100
Arc4_EndPt 0.200
Arc5_EndPt 0.200
Arc6_EndPt 0.200
Arc7_EndPt 0.283
Arc1 Arc2 Arc3 Arc4 Arc5 Arc6 Arc7
out Arc1_Dbl Arc2_Dbl Arc3_Dbl Arc4_Dbl Arc5_Dbl Arc6_Dbl Arc7_Dbl
Save successfully completed... (60 seconds ago)
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MASSING VIEW 01 Left Back Top
End Near Point Mid Cen Int Perp Tan Quad Knot Vertex Project Disable
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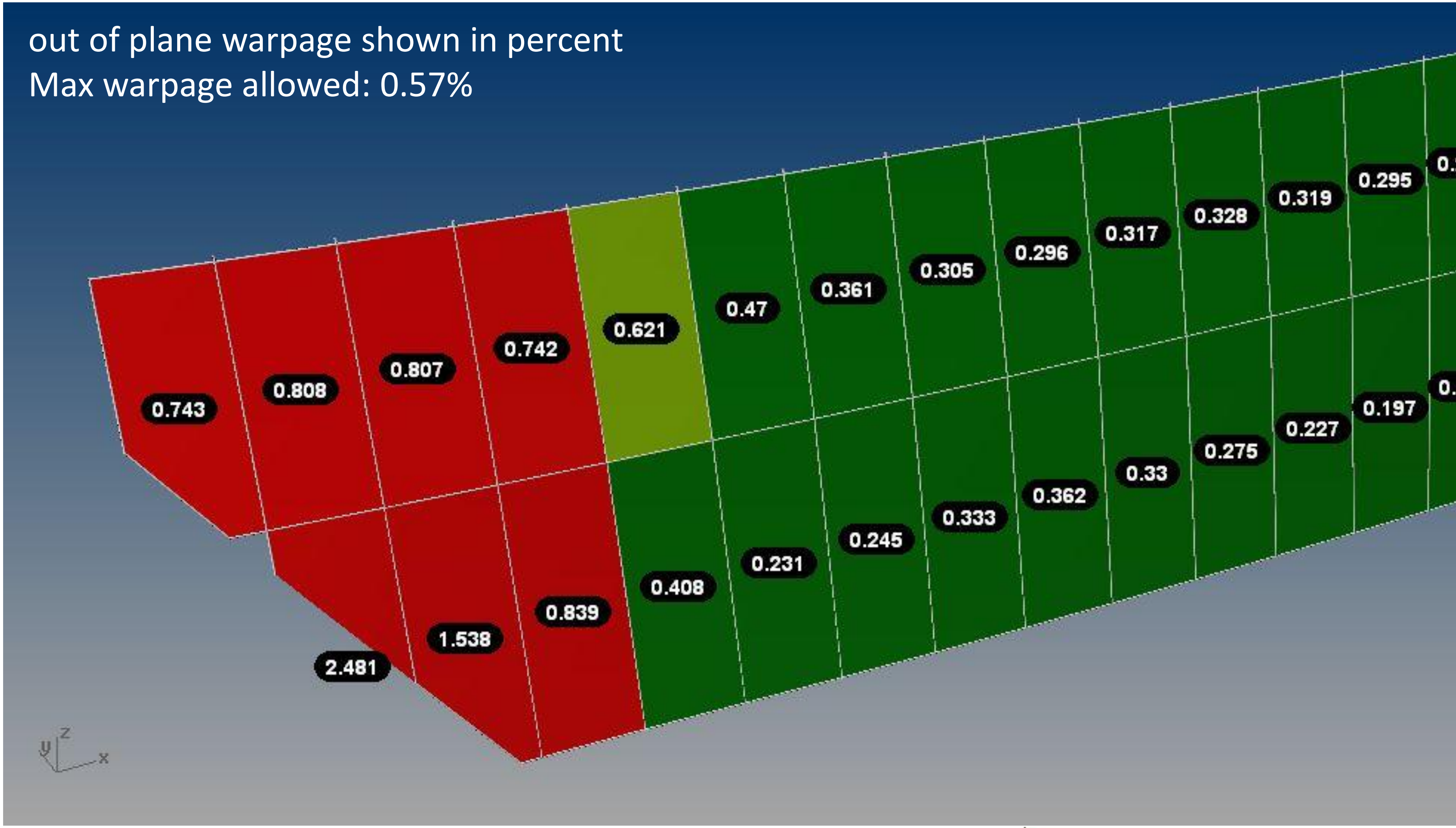
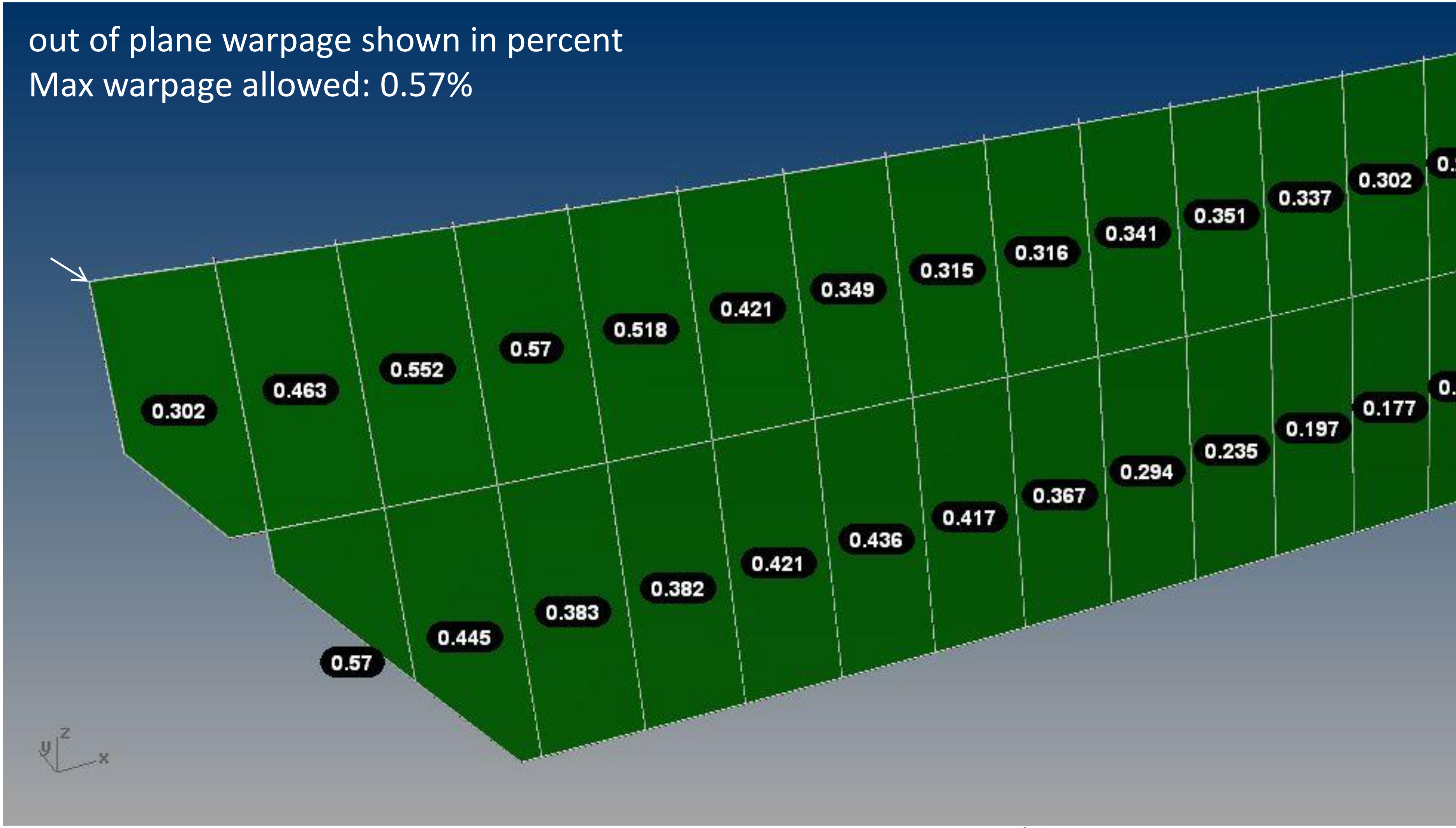
Glass façade panelization

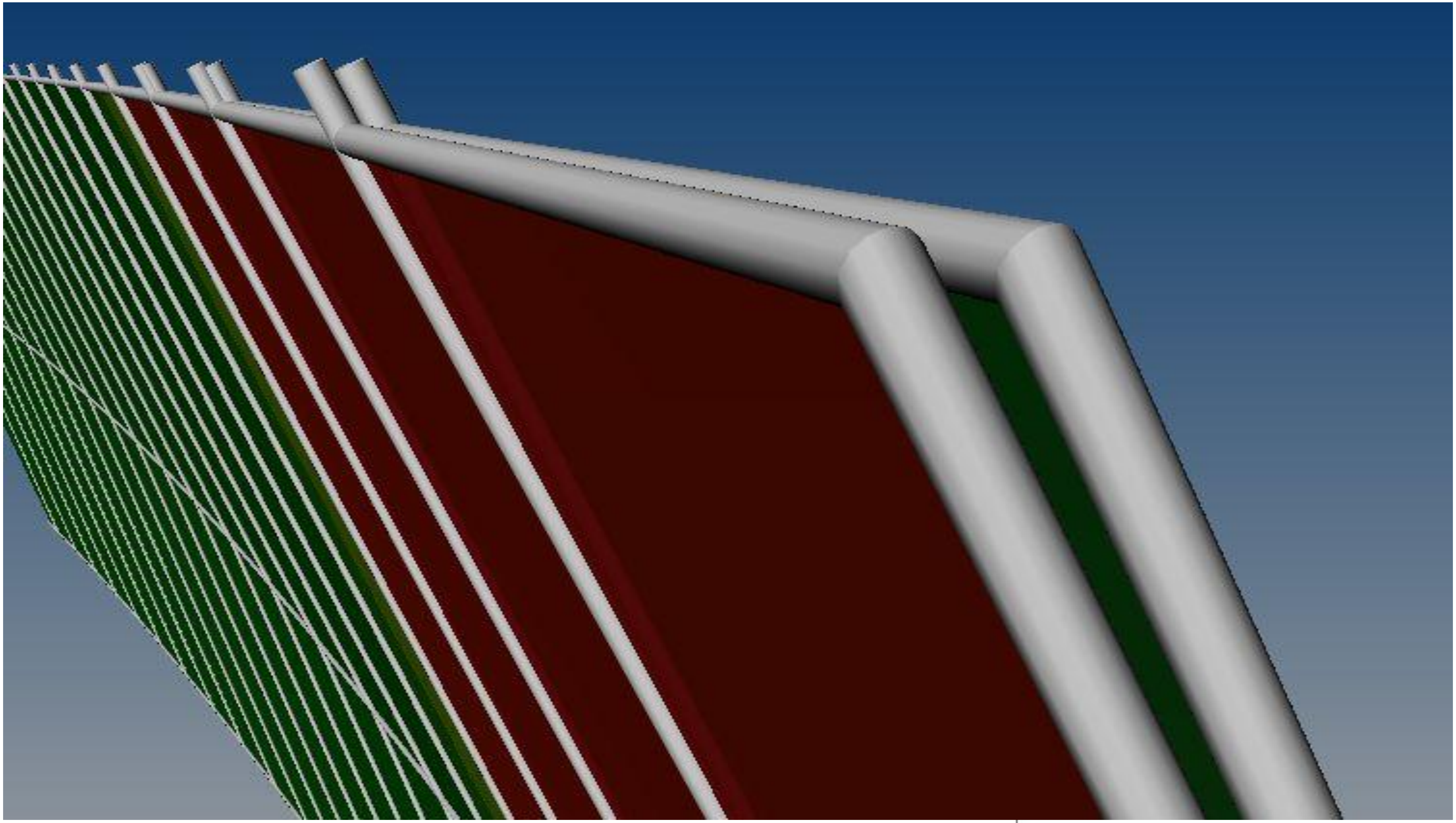


AIA

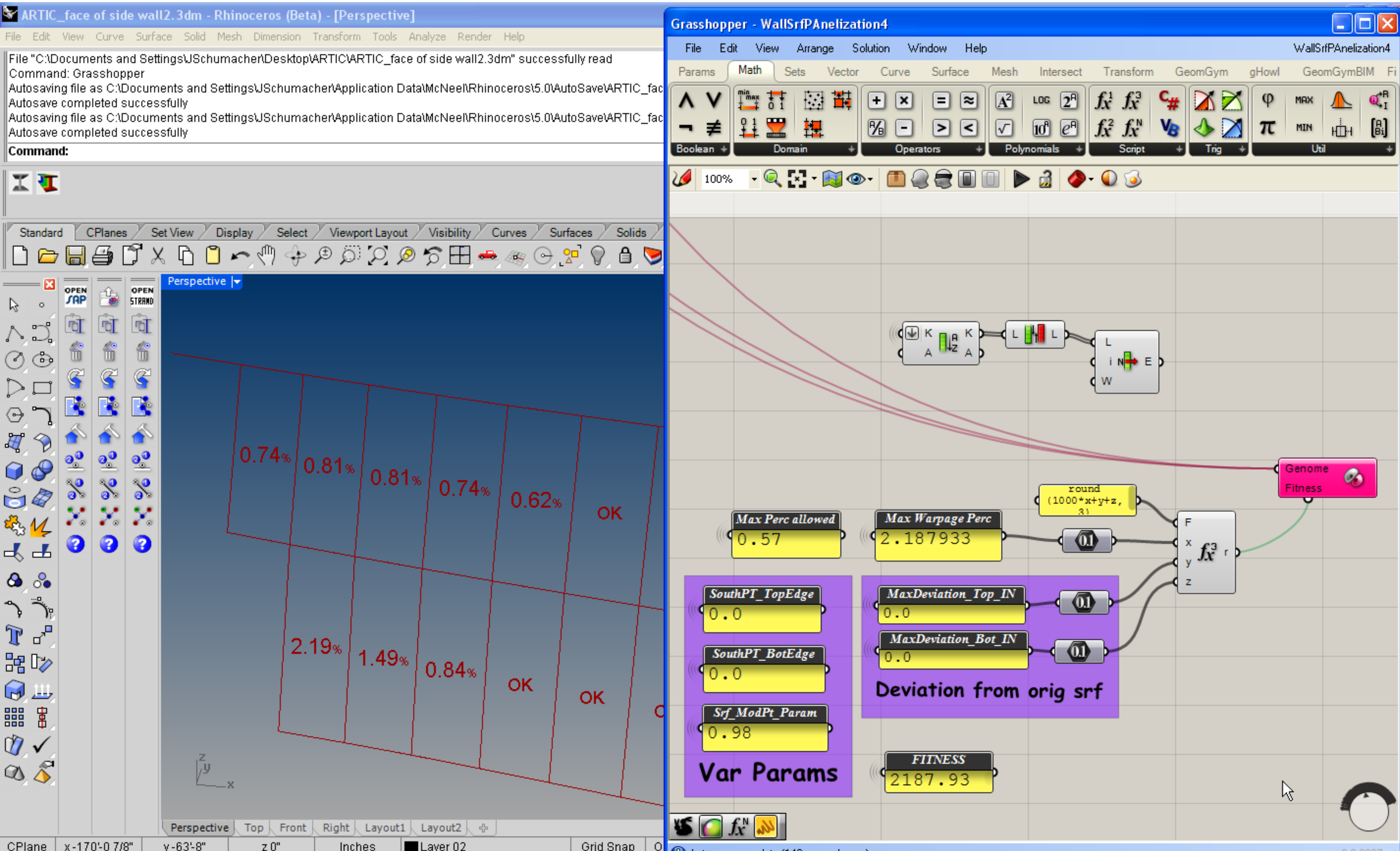
Glass façade panelization



Glass façade panelization



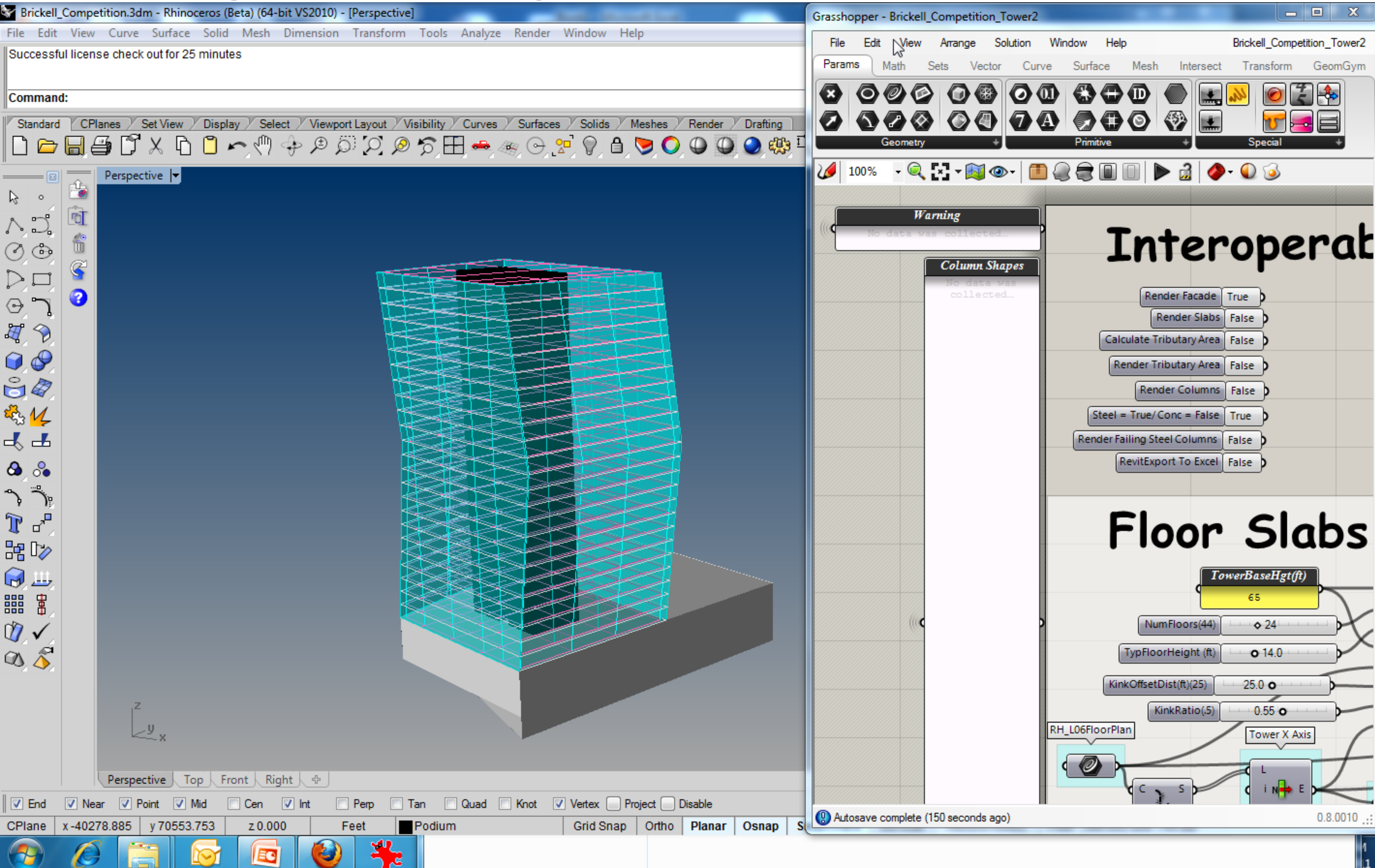
Glass façade panelization



custom

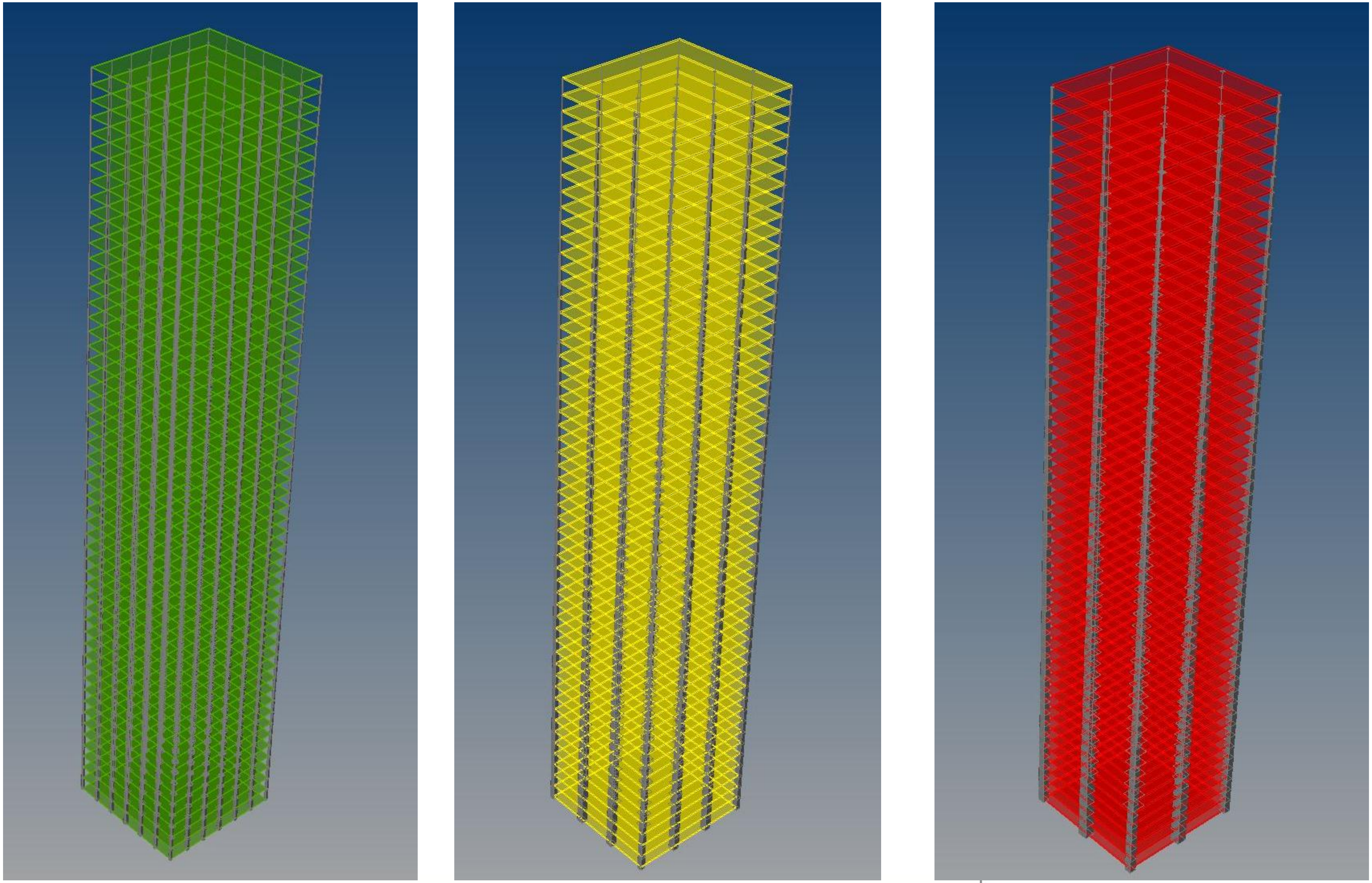
software

TT Integrated Analysis

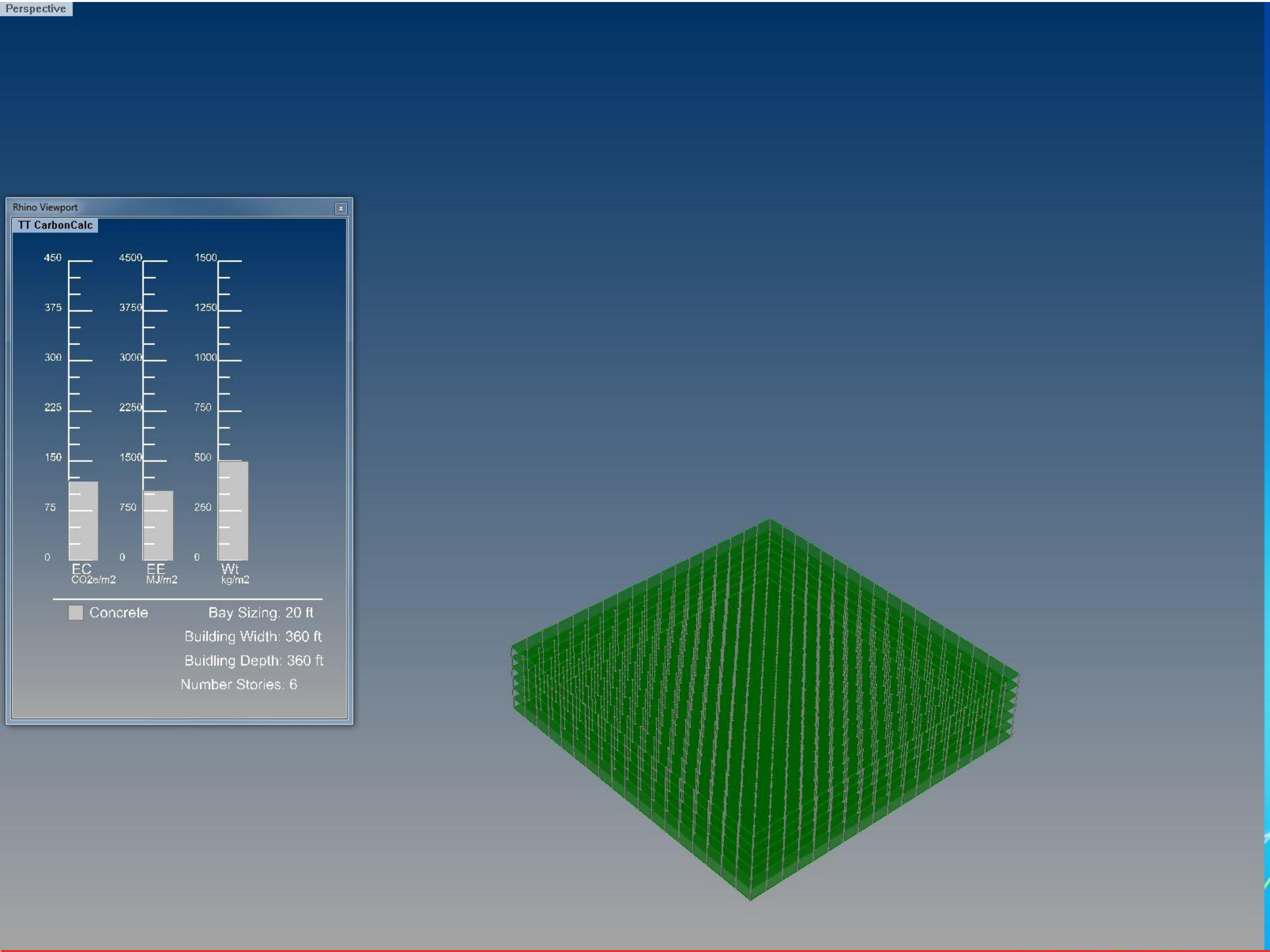


TT Integrated Analysis

Embodied carbon calculator



embodied energy &
carbon efficiency
optimization tool



Perspective
Rhino Viewport
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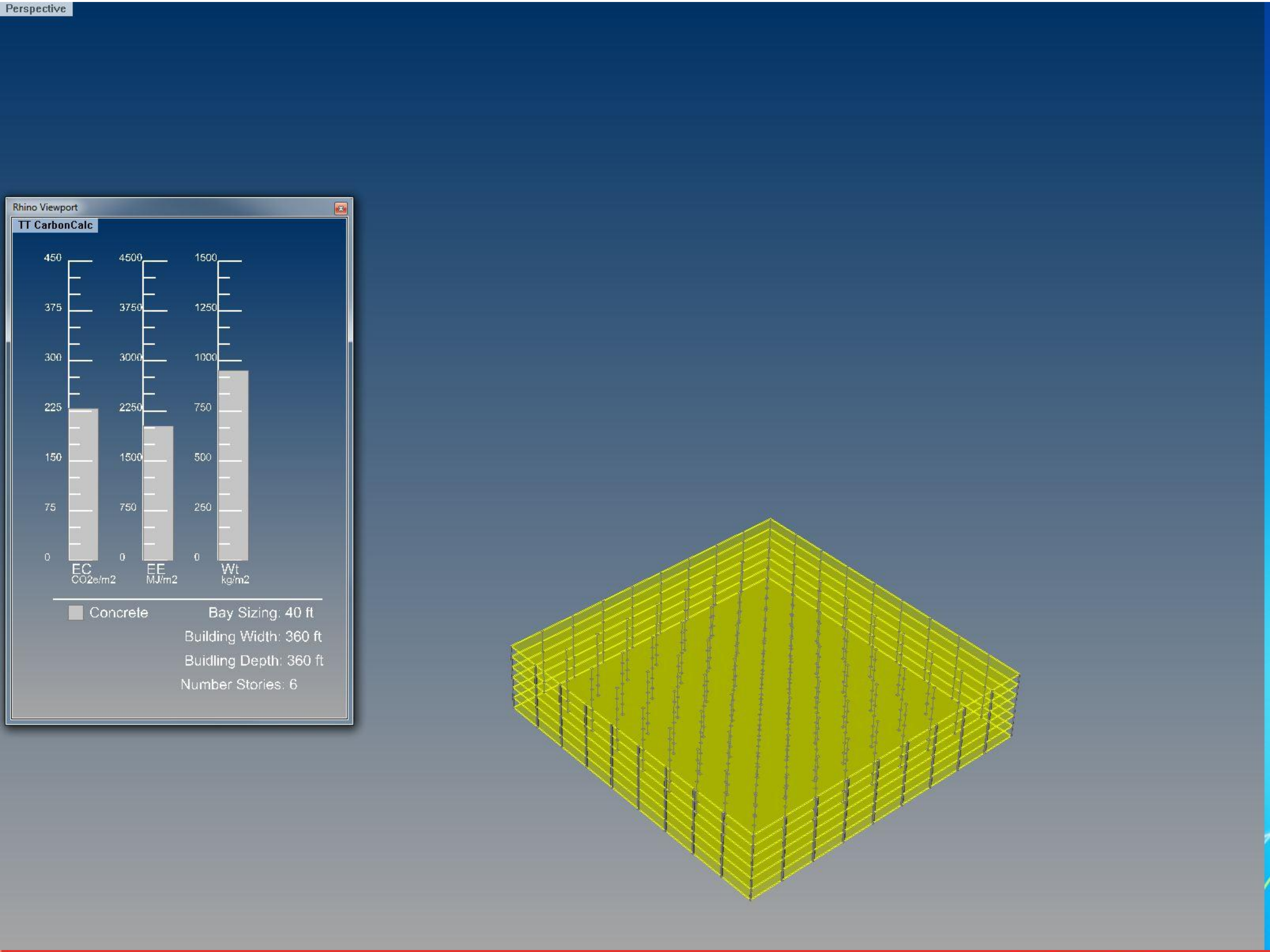
Buidling Depth: 360 ft
Number Stories: 6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Building Width: 360 ft
Buidling Depth: 360 ft
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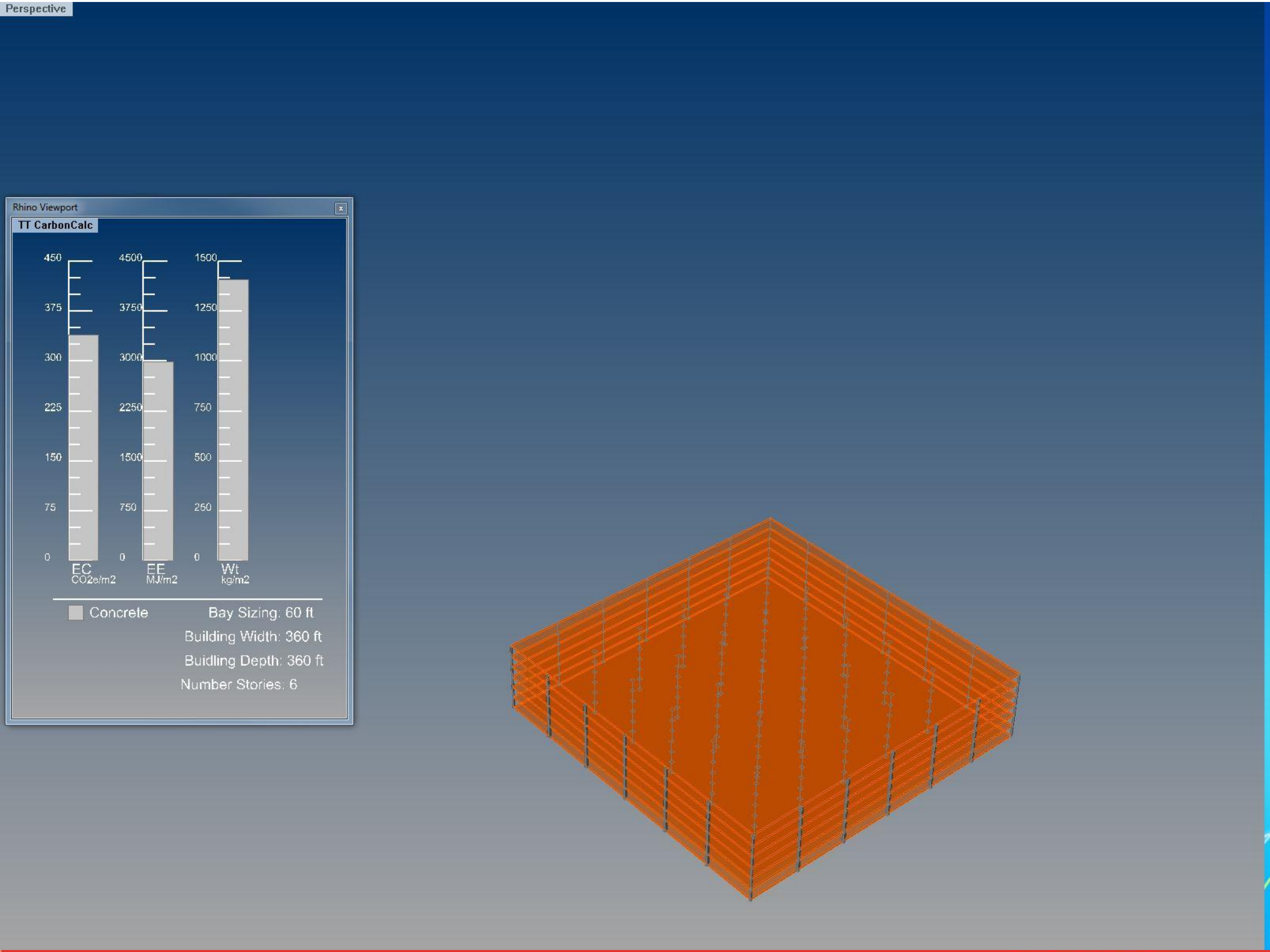
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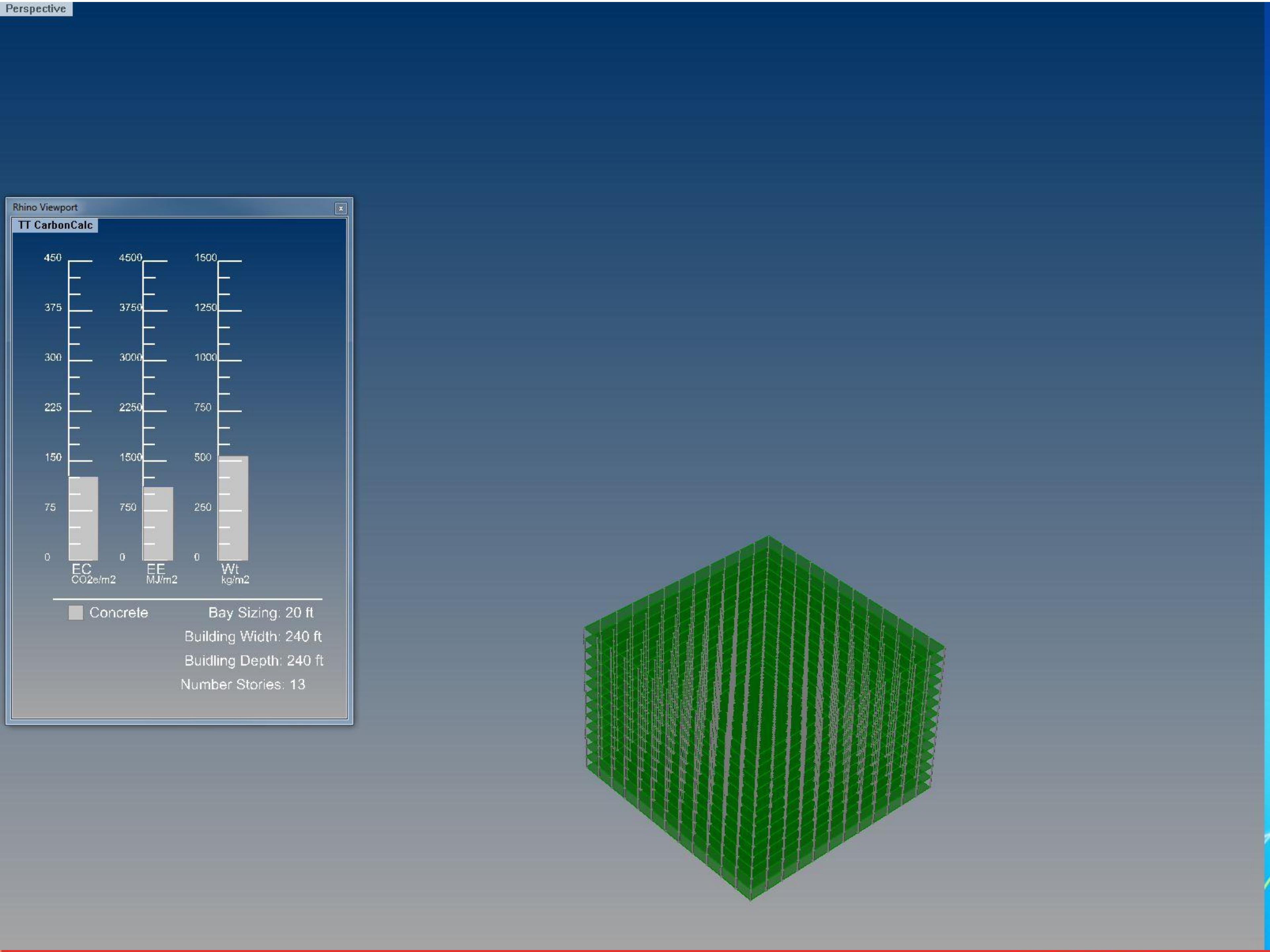
Number Stories: 6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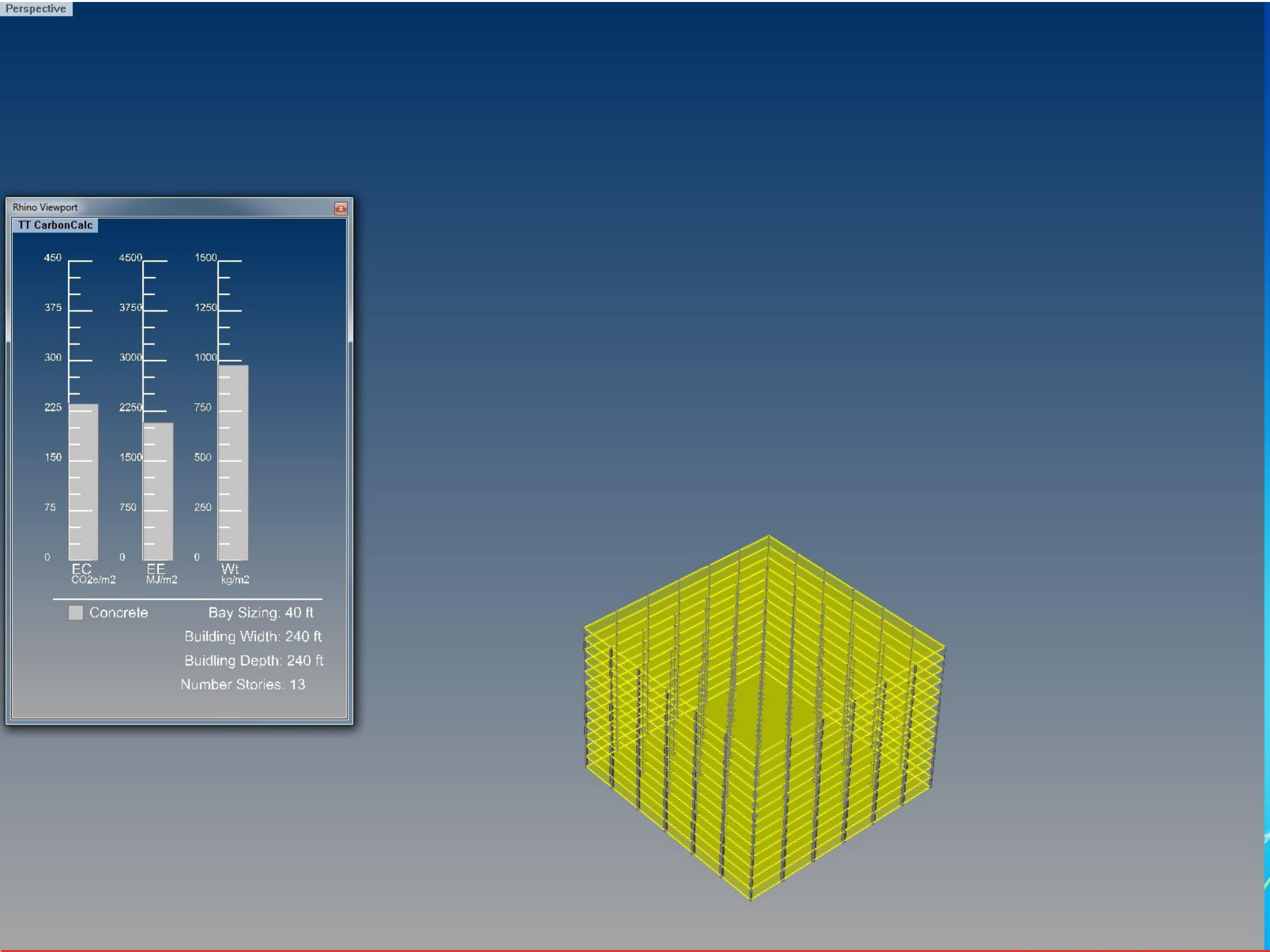
Number Stories: 13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MJ/m2
Wt
kg/m2
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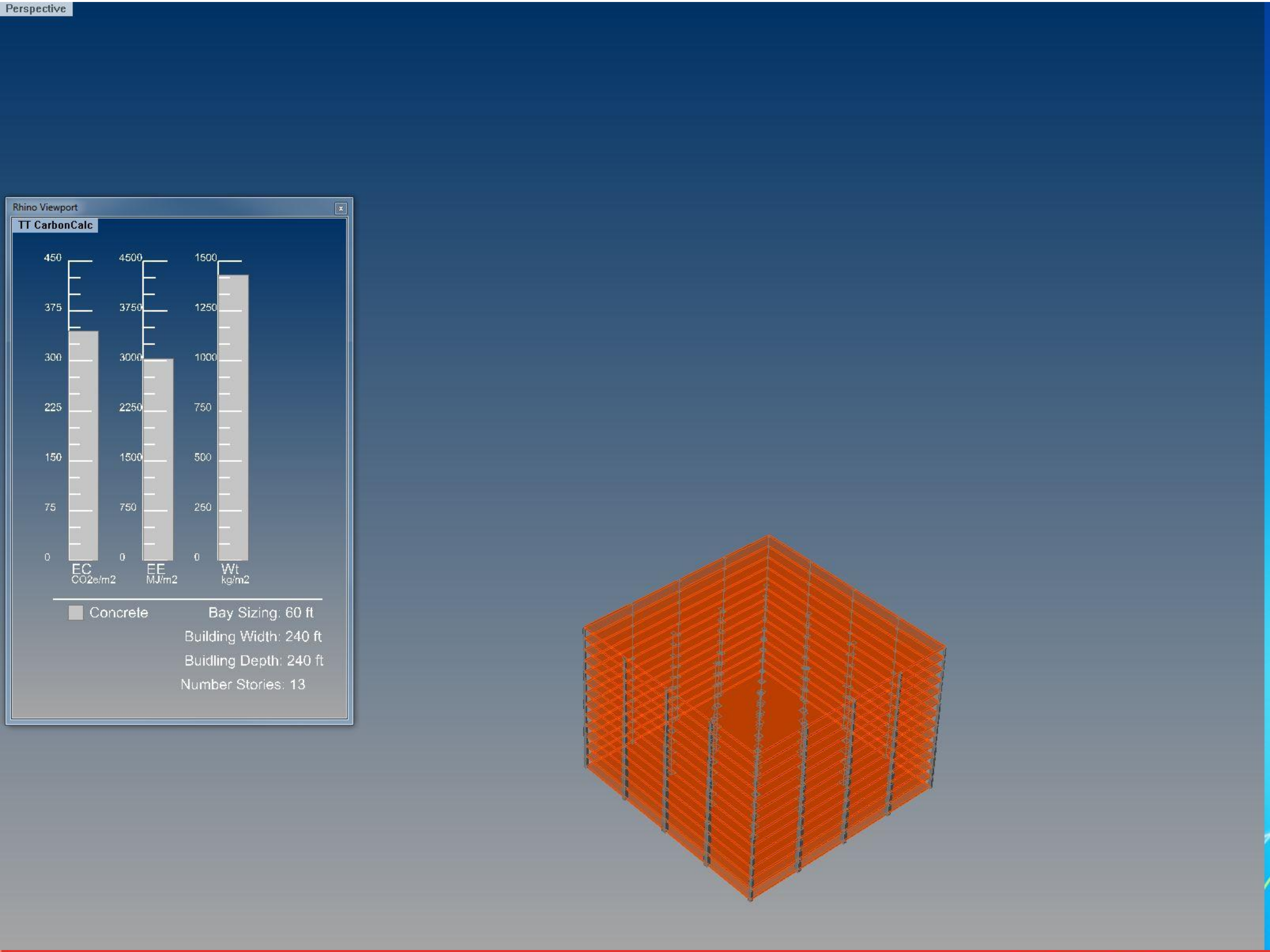
Number Stories: 13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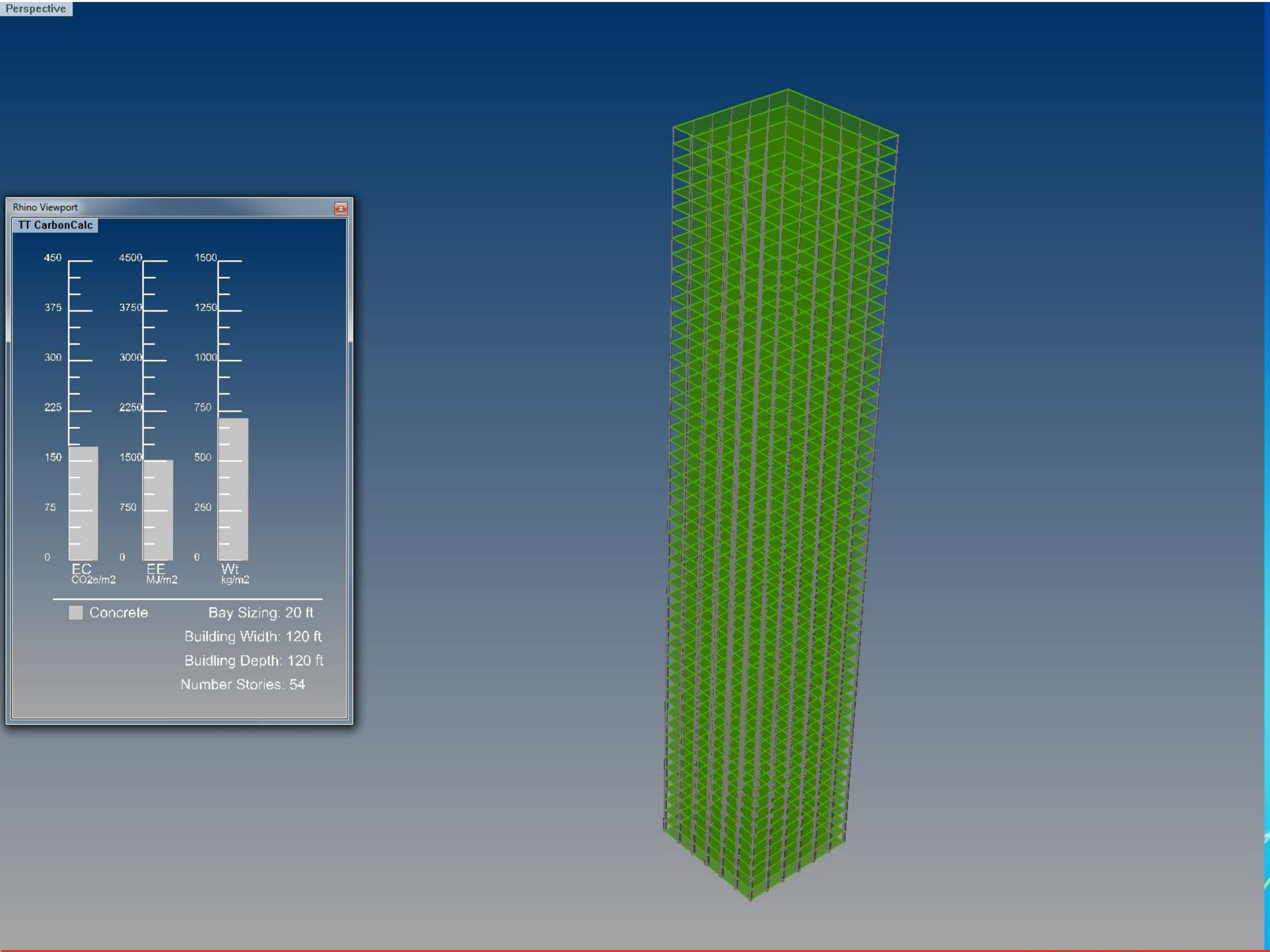
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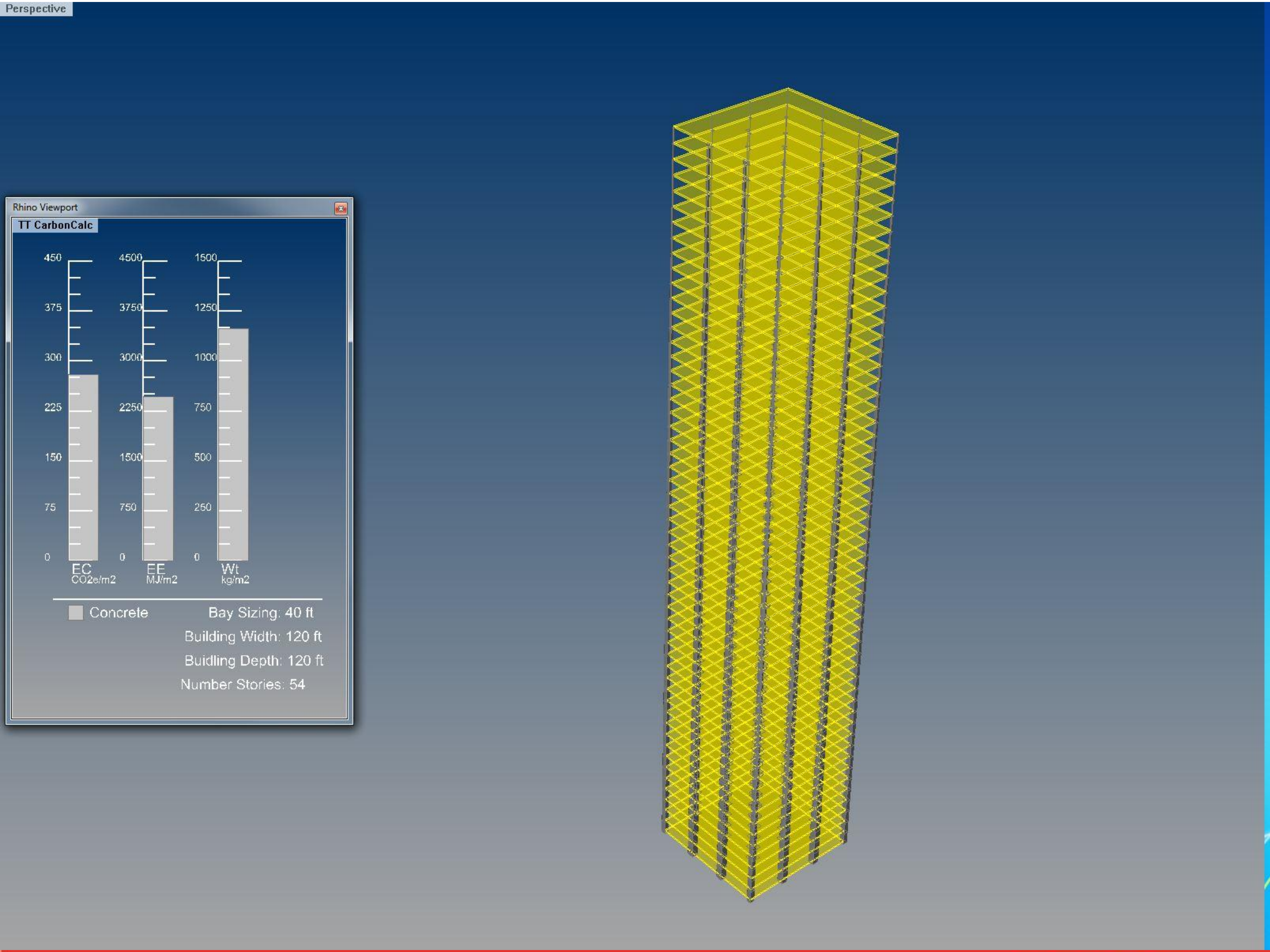

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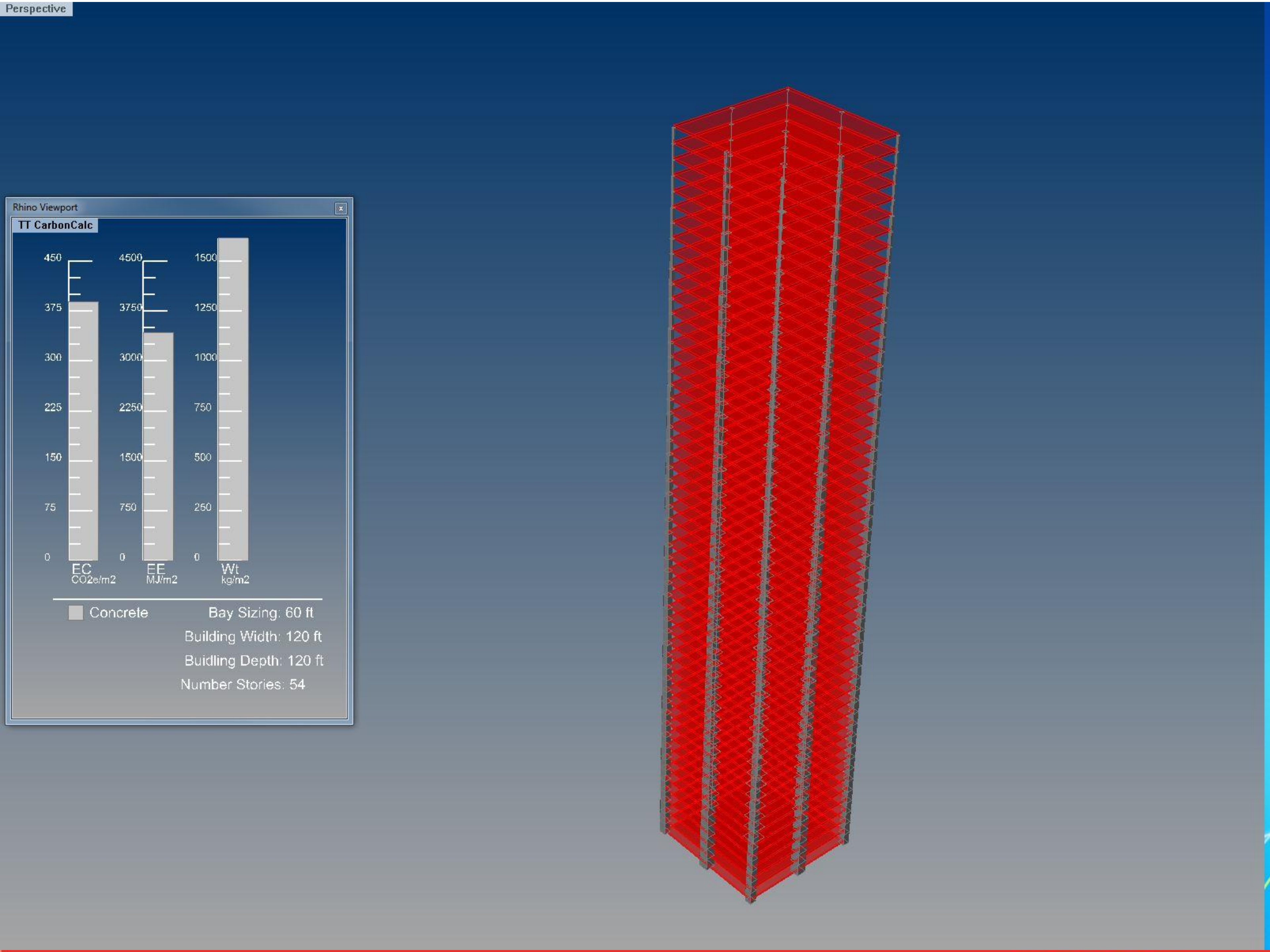
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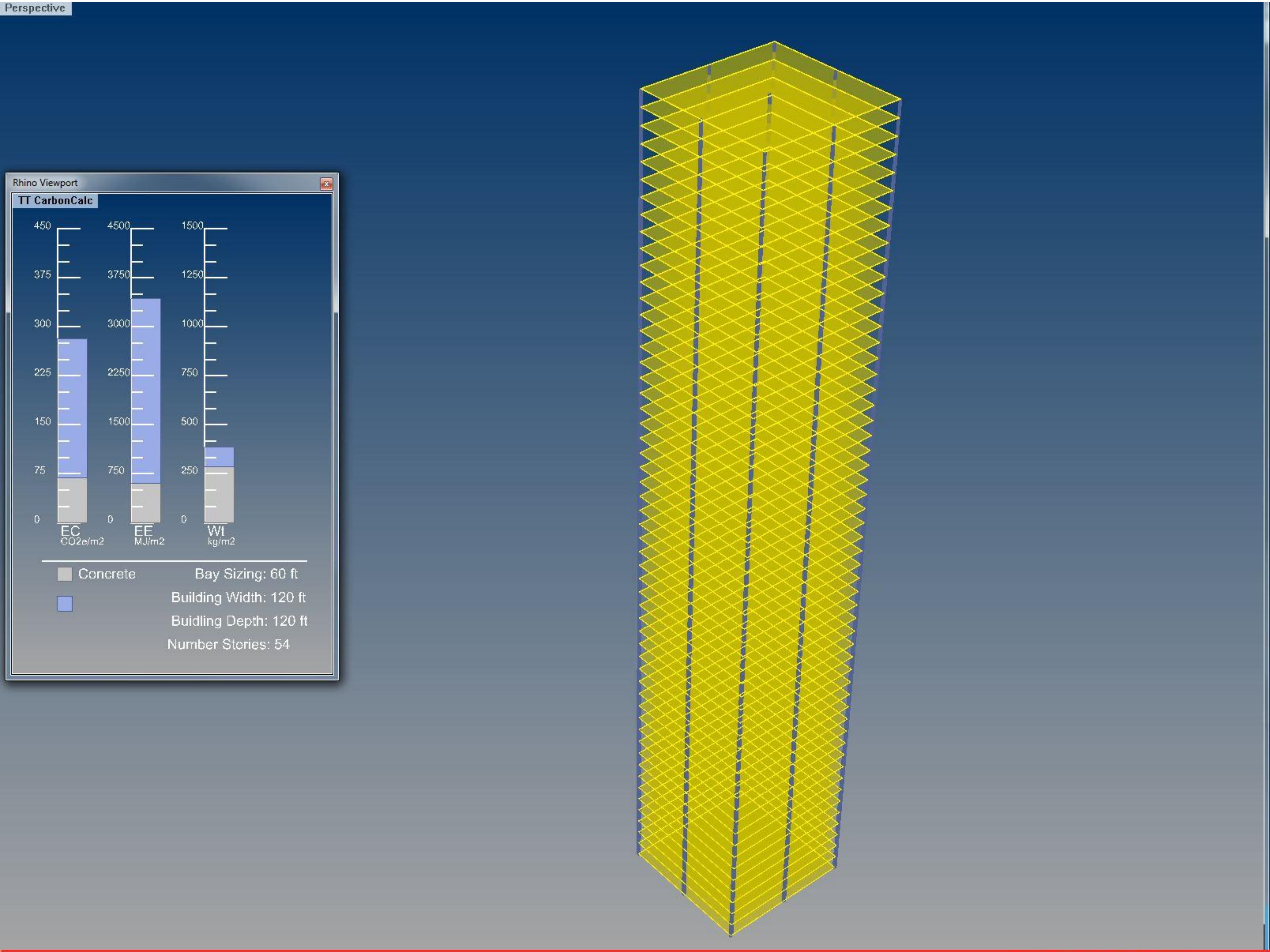
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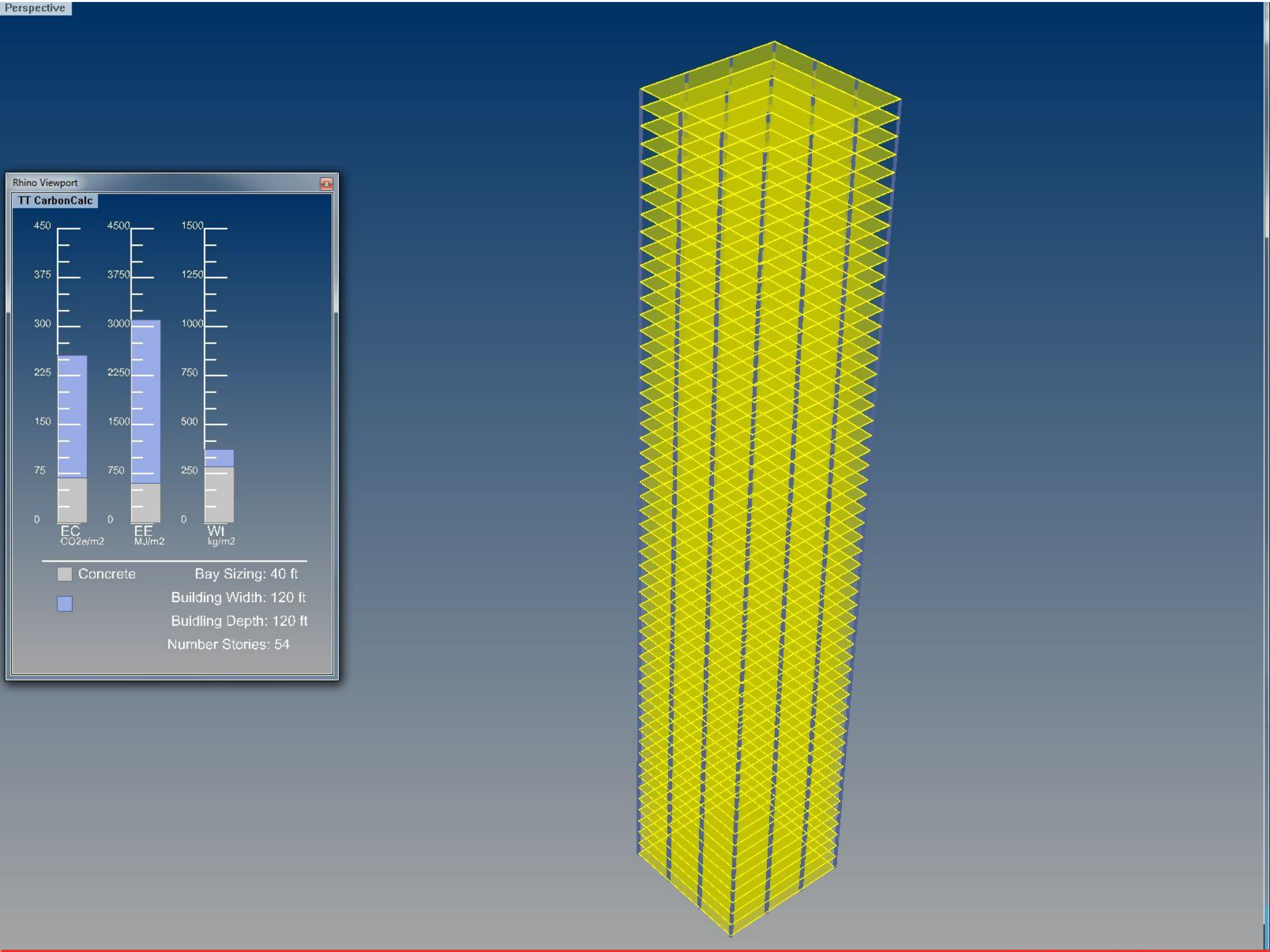
Number Stories: 54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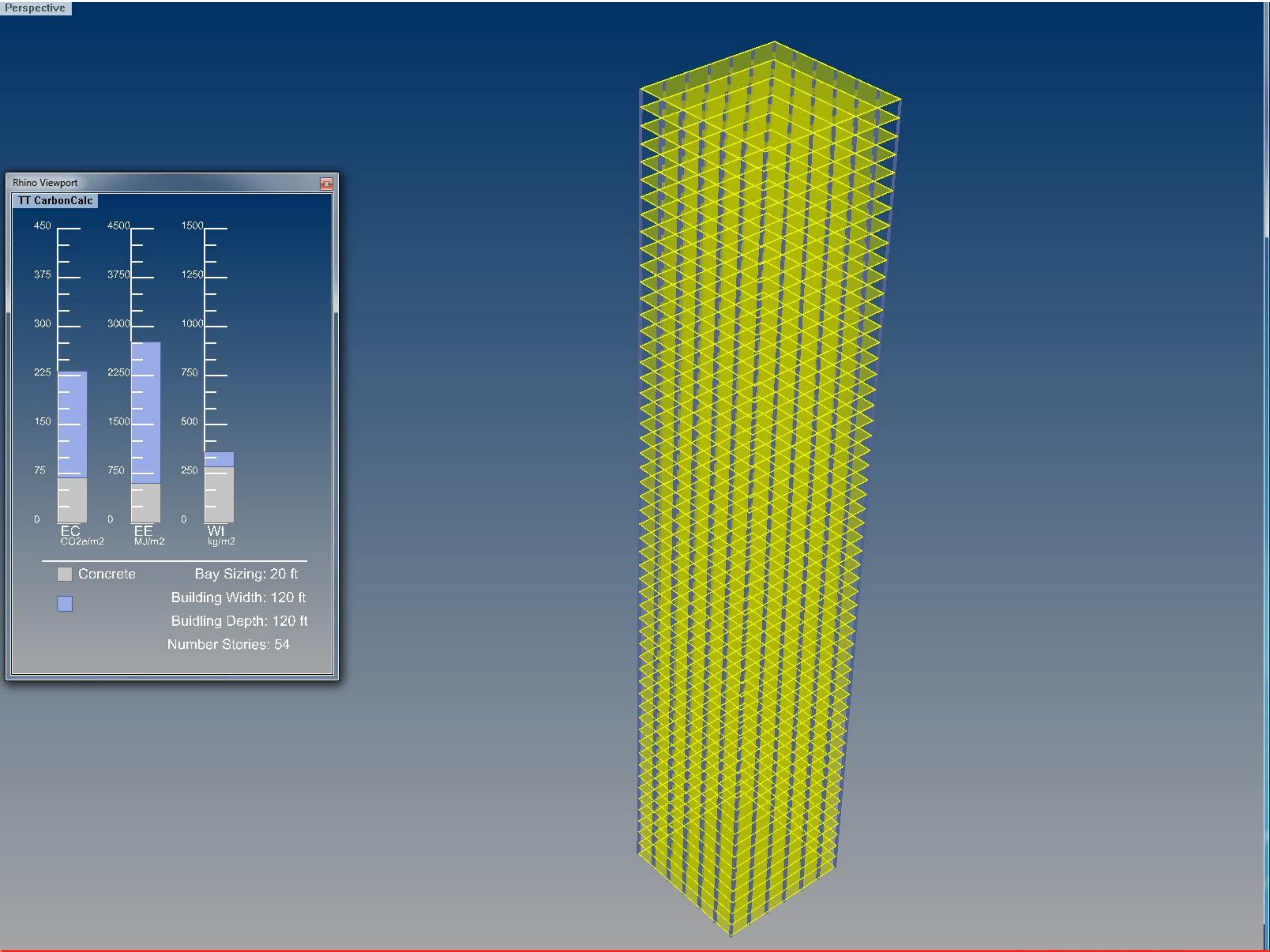
MJ/m2
Wt
kg/m2
Concrete
Bay Sizing: 40 ft
Building Width: 120 ft
Buidling Depth: 120 ft
Number Stories: 54



Perspective
Rhino Viewport
TT CarbonCalc
450
375
300
225
150
75
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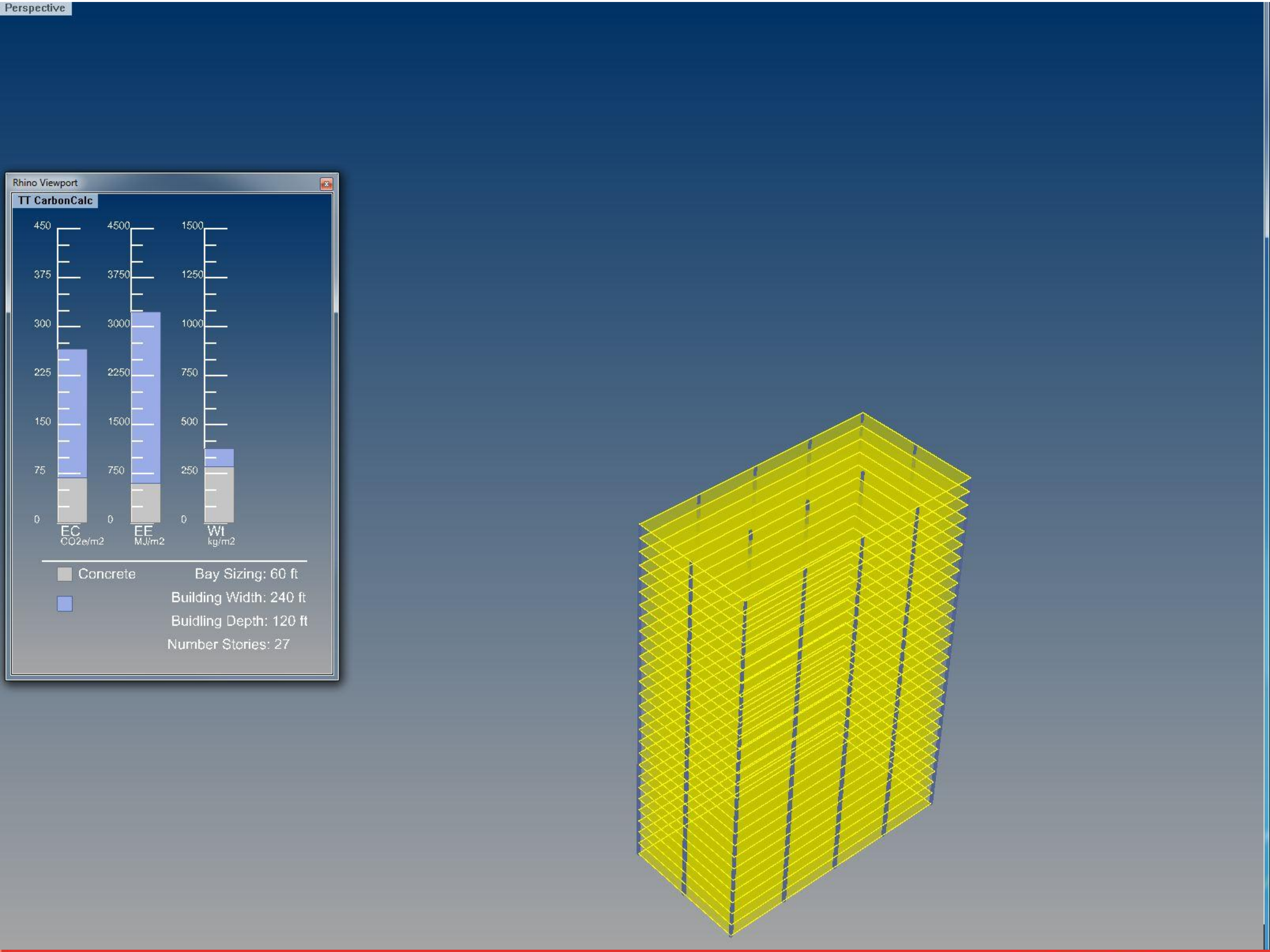
4500
3750
3000
2250
1500
750
0
1500
1250
1000
750
500
250
0
EC
CO2e/m2
EE
MJ/m2
Wt
kg/m2
Concrete
Bay Sizing: 20 ft
Building Width: 120 ft
Buidling Depth: 120 ft
Number Stories: 54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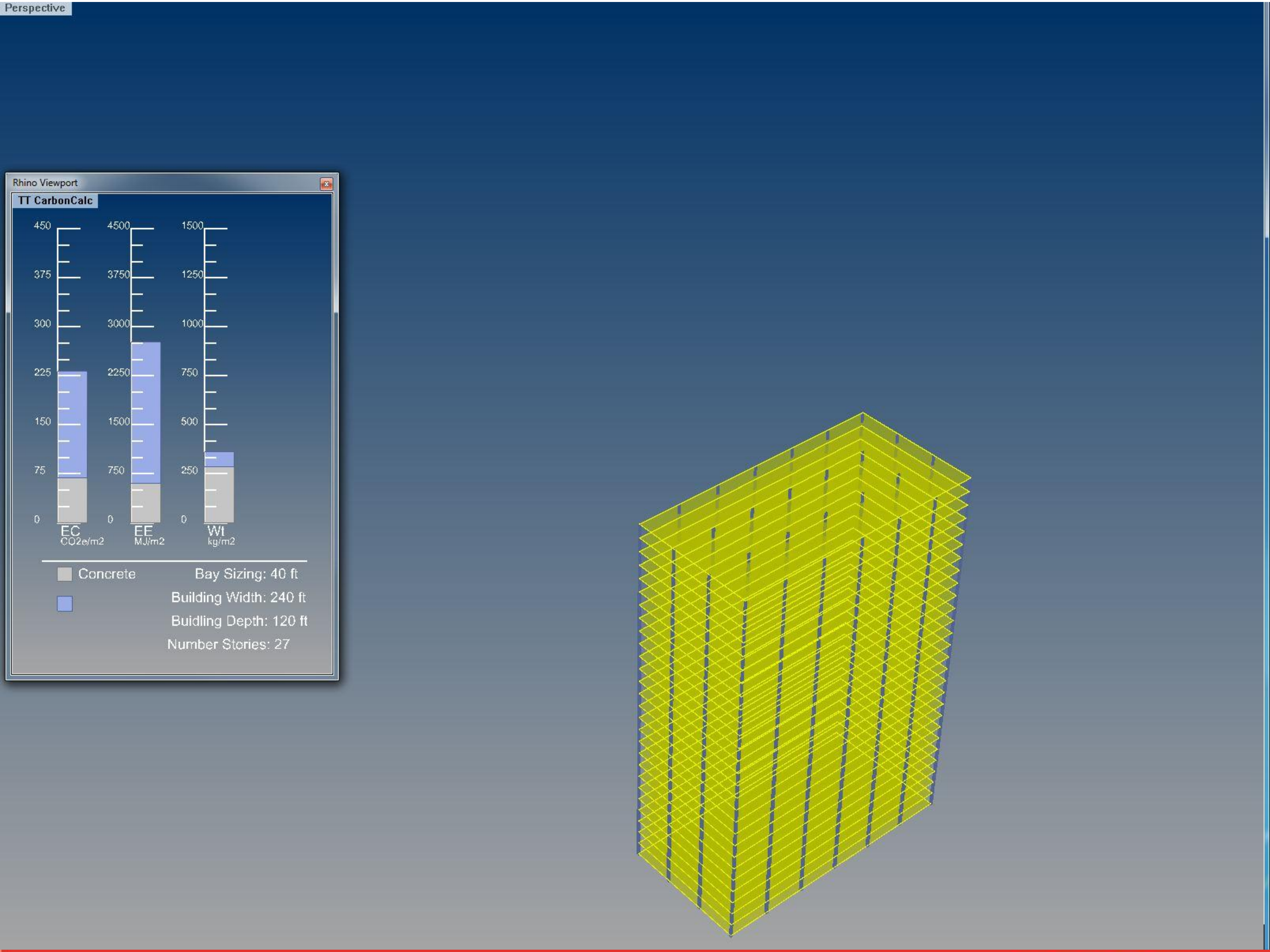
1500
1250
1000
750
500
250
0
EC
CO2e/m2
EE
MJ/m2
Wt
kg/m2
Concrete
Bay Sizing: 60 ft
Building Width: 240 ft
Buidling Depth: 120 ft
Number Stories: 27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1500
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0
EE
MJ/m2
1500
1250
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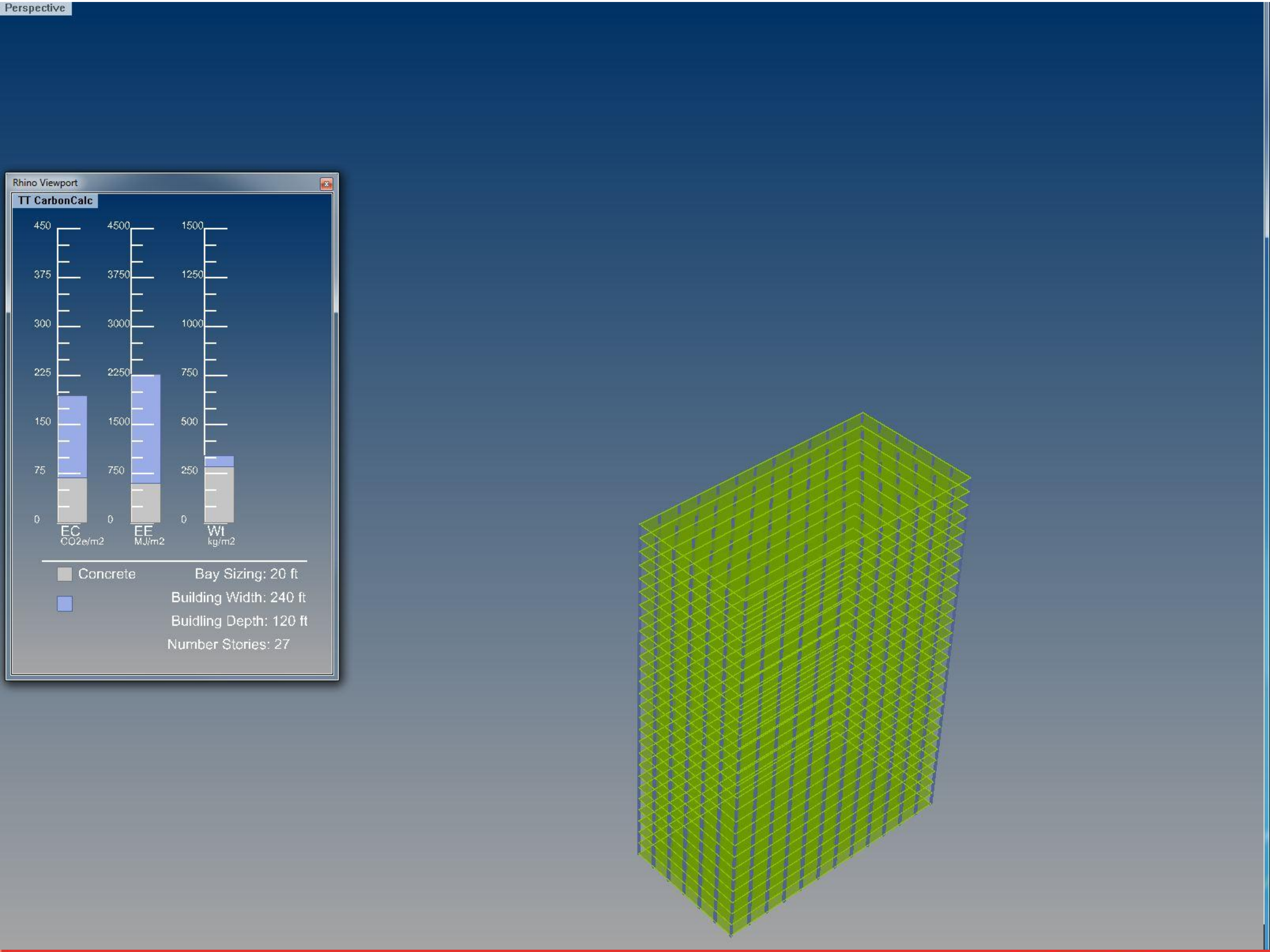
Wt
kg/m2
Concrete
Bay Sizing: 40 ft
Building Width: 240 ft
Buidling Depth: 120 ft
Number Stories: 27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1250
1000
750
500
250
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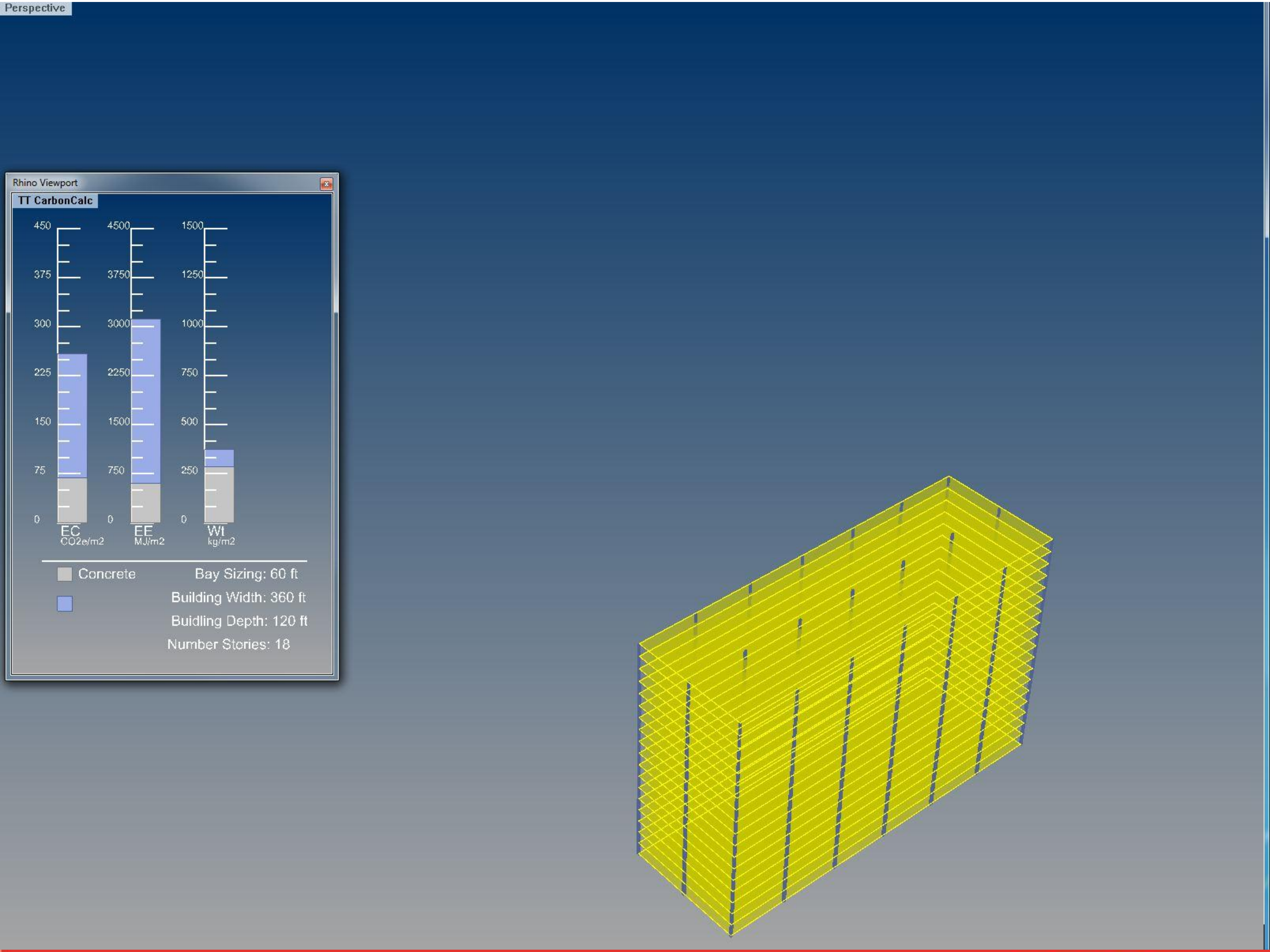
EC
CO2e/m2
EE
MJ/m2
Wt
kg/m2
Concrete
Bay Sizing: 20 ft
Building Width: 240 ft
Buidling Depth: 120 ft
Number Stories: 27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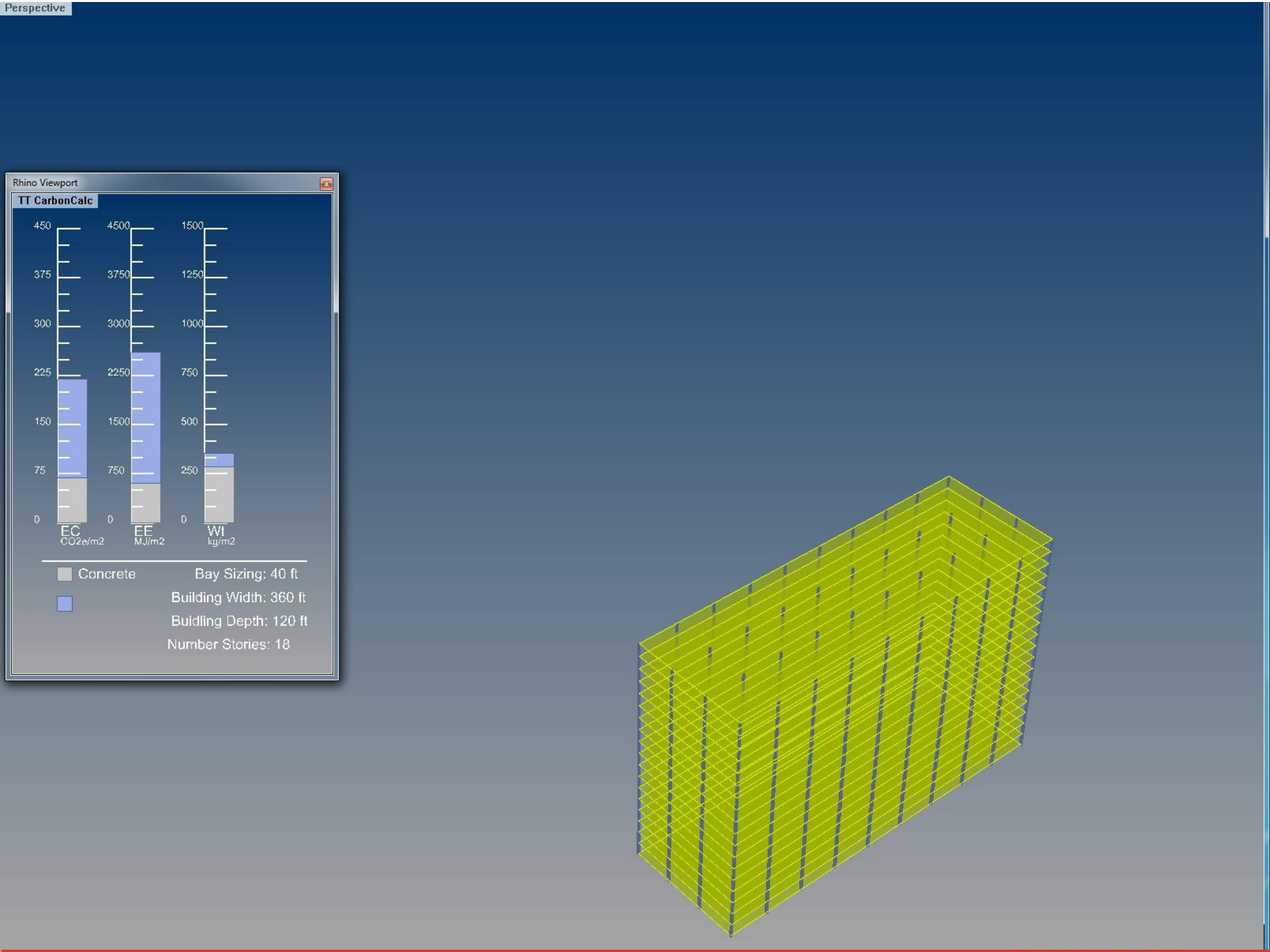
1250
1000
750
500
250
0
EC
CO2e/m2
EE
MJ/m2
Wt
kg/m2
Concrete
Bay Sizing: 60 ft
Building Width: 360 ft
Buidling Depth: 120 ft
Number Stories: 18



Perspective
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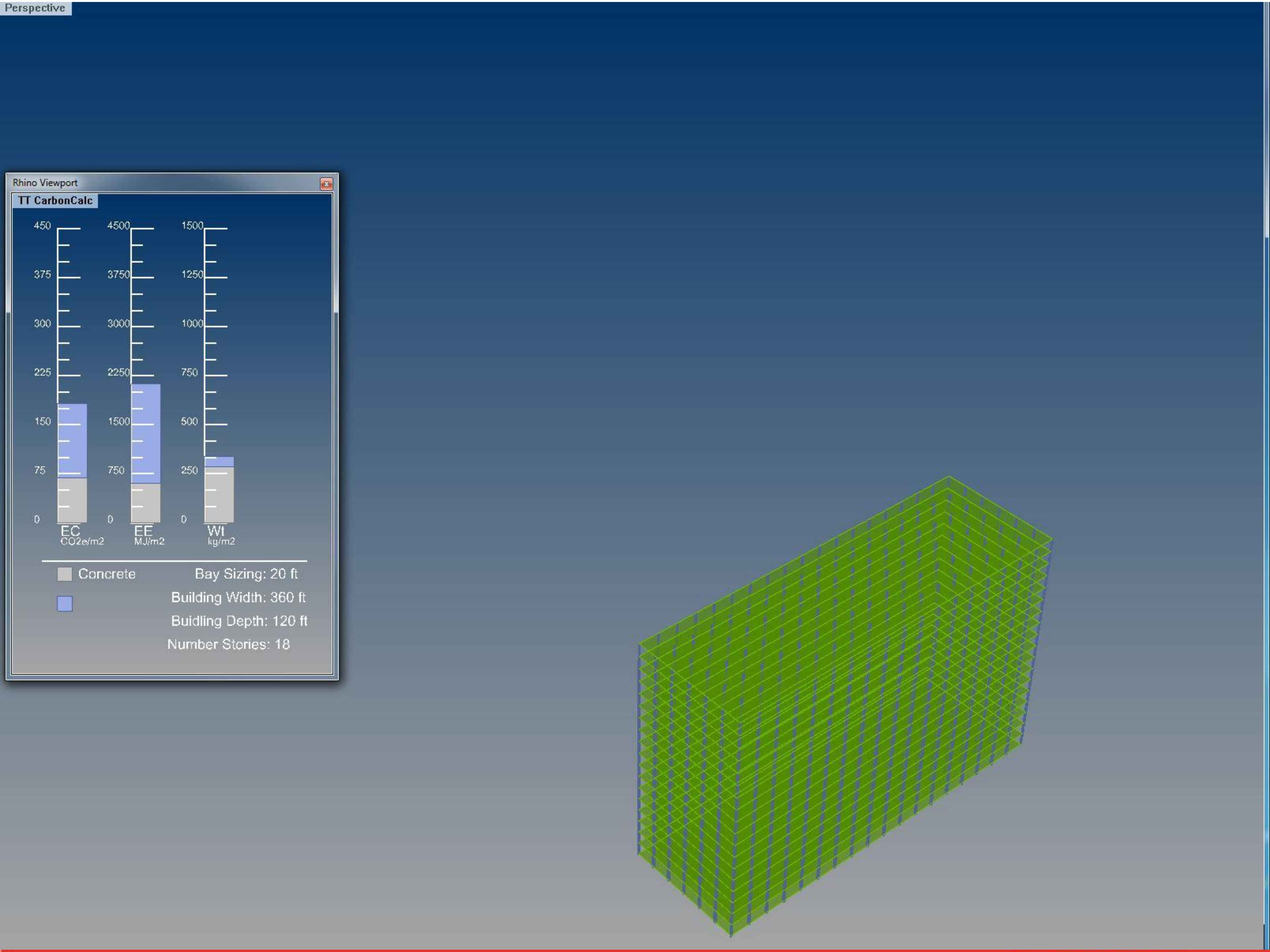
1250
1000
750
500
250
0
EC
CO2e/m2
EE
MJ/m2
Wt
kg/m2
Concrete
Bay Sizing: 40 ft
Building Width: 360 ft
Buidling Depth: 120 ft
Number Stories: 18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1250
1000
750
500
250
0
EC
CO2e/m2
EE
MJ/m2
Wt
kg/m2
Concrete
Bay Sizing: 20 ft
Building Width: 360 ft
Buidling Depth: 120 ft
Number Stories: 18

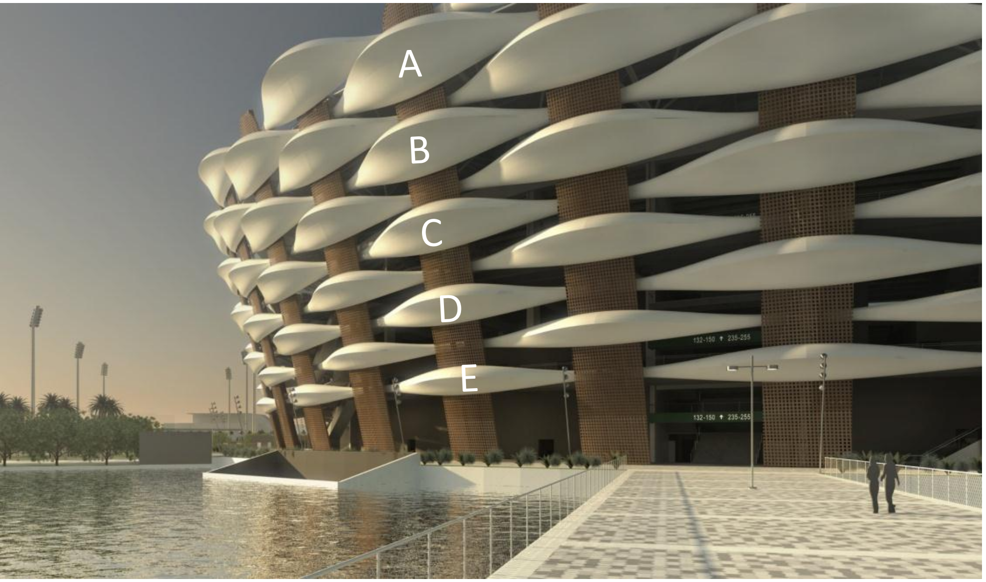
bringing it all

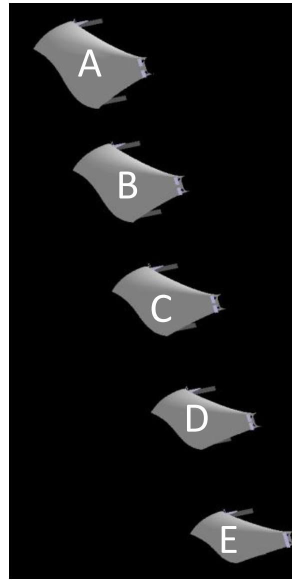
together

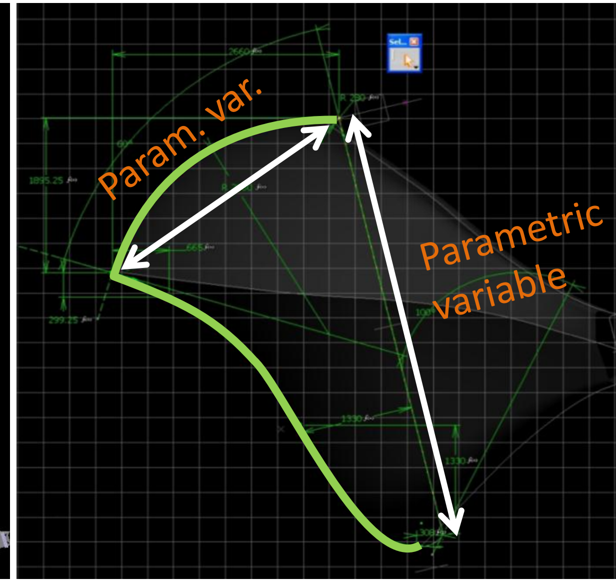
Basrah 65K Soccer Stadium

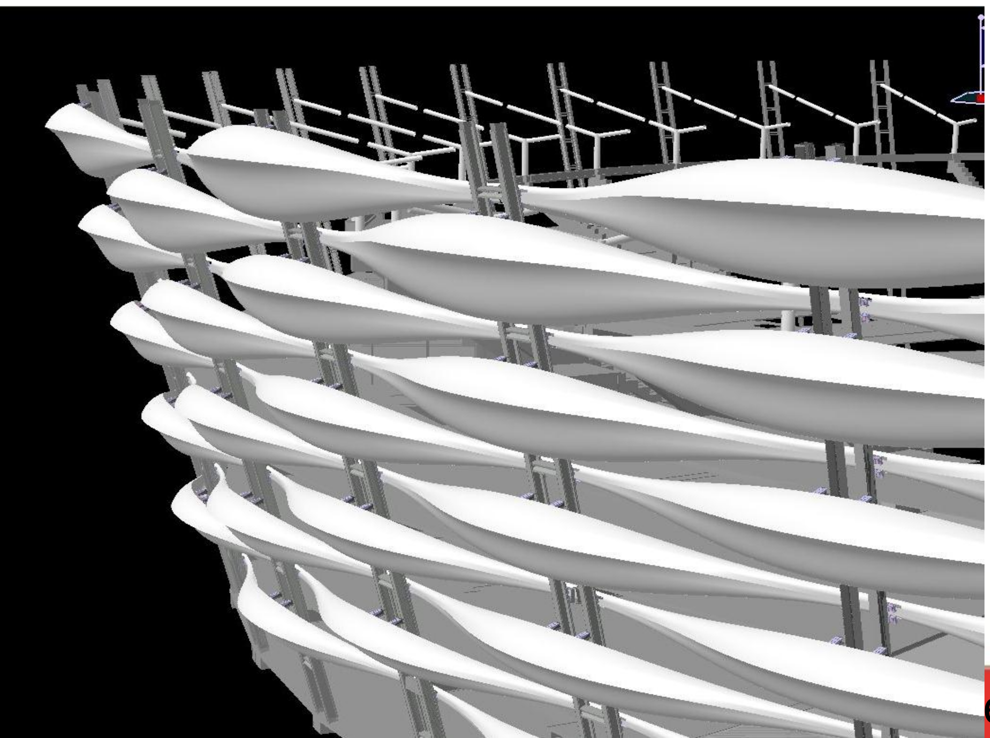
Rendering by 360 Architecture Kansas City

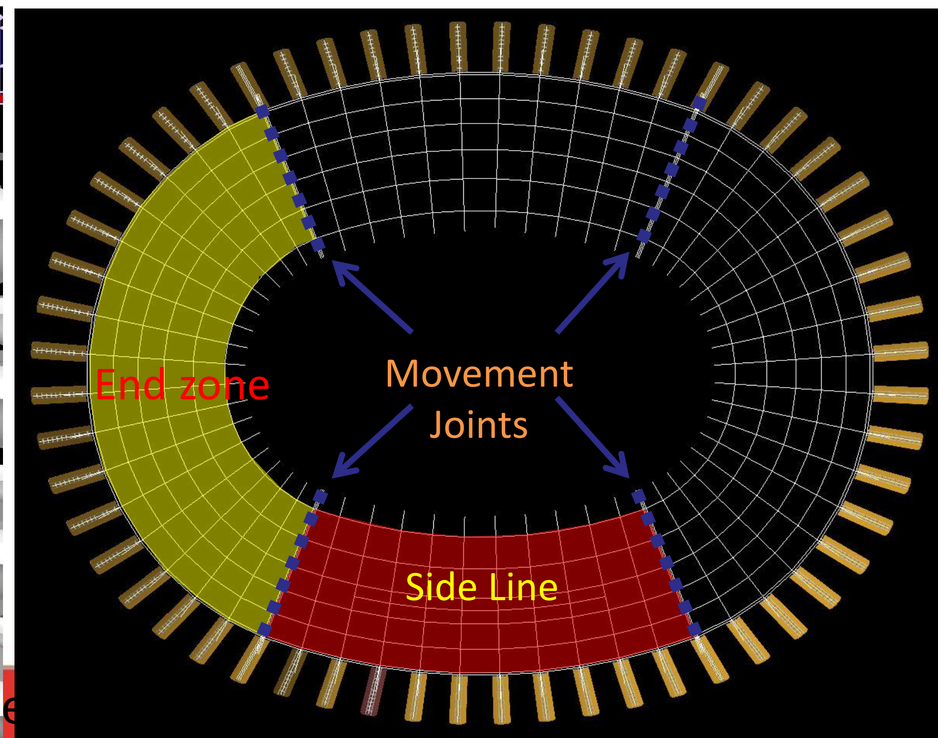
Basrah Skin Design



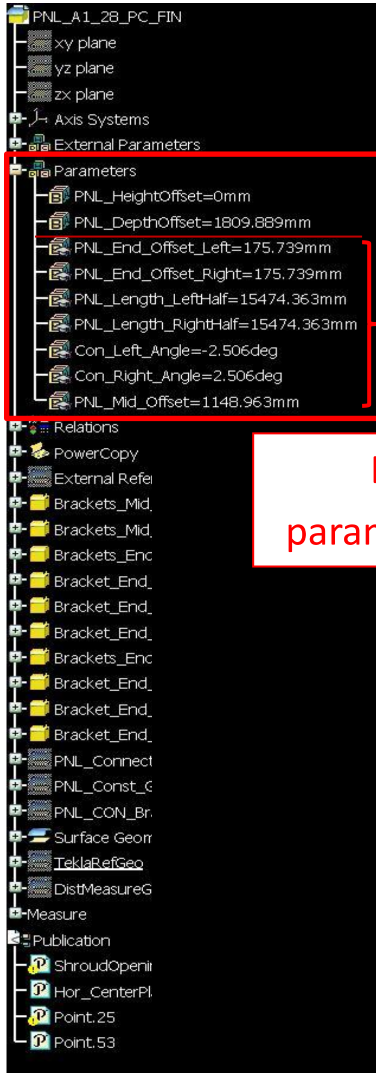








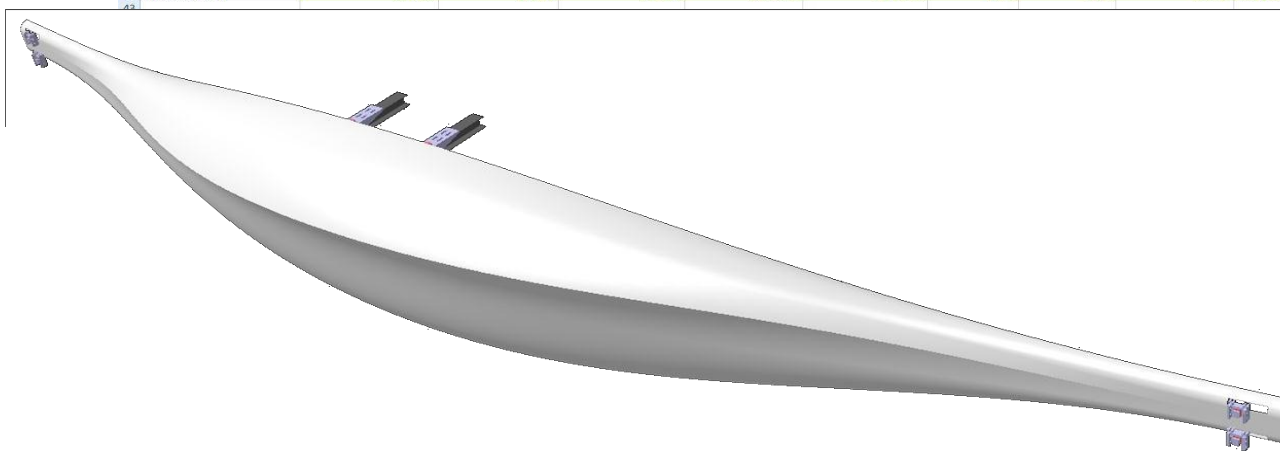
Parametric Panel Informs Connection Brackets



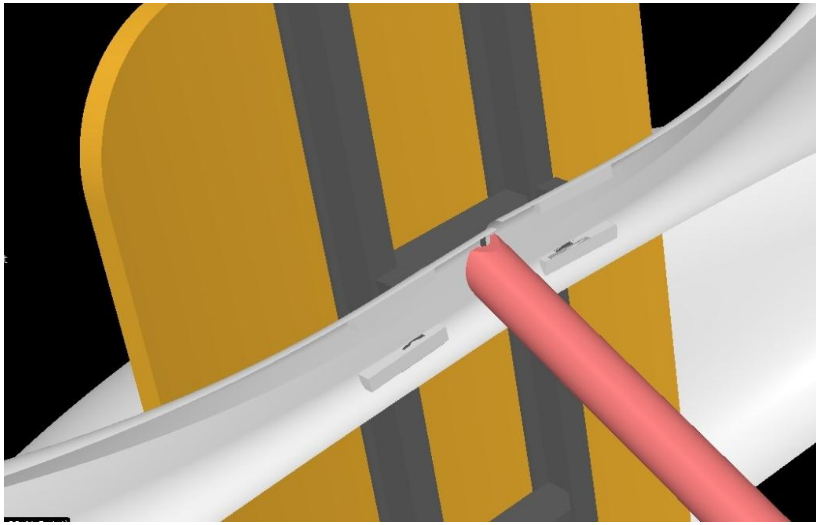
Driven parameters

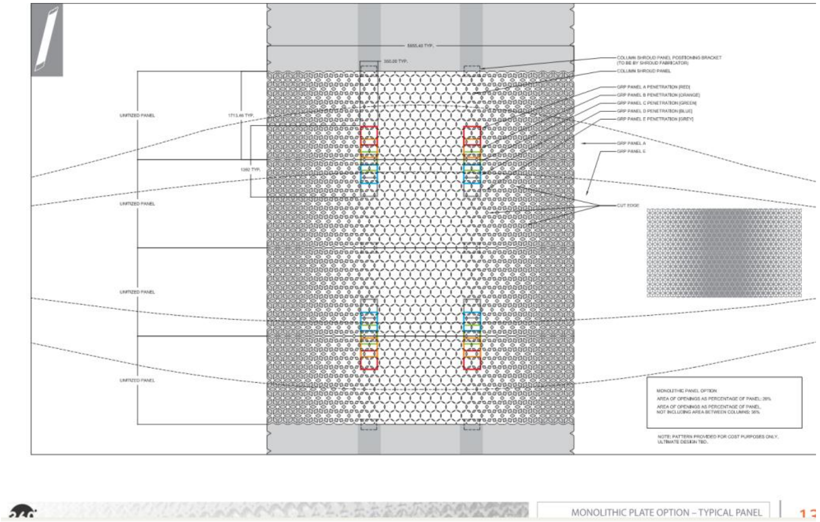
	A	B	C	D	E	F	G	H	I	J
1	Panel Name	PNL_DepthOffset to F-Col	PNL_End_Offset_Left	PNL_End_Offset_Right	PNL_Length_LeftHalf	PNL_Length_RightHalf	Con_Left_Angle	Con_Right_Angle	PNL_Mid Arm Length	
2		mm	mm	mm	mm	mm	deg	deg	mm	
3	PNL_A1_28_PC_FIN	1809.889	175.739	175.739	15474.363	15474.363	-2.506	2.506	1148.963	Sideline
4	PNL_A1_30_FIN	1242.425	199.717	175.749	15581.838	15581.838	-1.764	0.371	614.711	Seismic Joint
5	PNL_A1_33_FIN	1268.024	175.745	175.745	15719.756	15719.756	-1.764	1.764	638.811	End Zone
6	PNL_A1_35_FIN	1268.024	175.744	175.744	15719.756	15719.756	-1.764	1.764	638.811	End Zone
7	PNL_A2_27_FIN	1794.042	174.225	174.225	15695.987	15695.987	-2.506	2.506	1133.12	Sideline
8	PNL_A2_29_FIN	1794.037	202.485	174.22	15695.987	15695.987	-0.371	2.506	1133.115	Seismic Joint
9	PNL_A2_32_FIN	1251.737	174.215	174.215	15878.116	15878.116	-1.764	1.764	622.554	End Zone
10	PNL_A2_34_FIN	1251.737	174.215	174.215	15878.116	15878.116	-1.764	1.764	622.554	End Zone
11	PNL_B1_28_FIN	1807.096	174.203	174.203	15643.79	15643.79	-2.506	2.506	1145.409	Sideline
12	PNL_B1_30_FIN	1238.067	196.918	172.177	15687.802	15687.802	-1.764	0.371	609.565	Seismic Joint
13	PNL_B1_33_FIN	1264.351	174.186	174.186	15762.585	15762.585	-1.764	1.764	634.428	End Zone
14	PNL_B1_35_FIN	1264.351	174.185	174.185	15762.586	15762.586	-1.764	1.764	634.428	End Zone
15	PNL_B2_27_FIN	1802.97	174.191	174.191	15591.786	15591.786	-2.506	2.506	1141.524	Sideline
16	PNL_B2_29_FIN	1802.97	200.85	174.191	15591.786	15591.786	-0.371	2.506	1141.524	Seismic Joint
17	PNL_B2_32_FIN	1259.781	174.185	174.185	15647.441	15647.441	-1.764	1.764	630.125	End Zone
18	PNL_B2_34_FIN	1259.78	174.197	174.197	15647.44	15647.44	-1.764	1.764	630.125	End Zone
19	PNL_C1_28_FIN	1816.03	174.161	174.161	15539.603	15539.603	-2.506	2.506	1153.818	Sideline
20	PNL_C1_30_FIN	1258.478	4.575	-20.848	15540.285	15540.285	-1.764	0.371	617.484	Seismic Joint
21	PNL_C1_33_FIN	1272.396	174.156	174.156	15531.912	15531.912	-1.764	1.764	642	End Zone
				174.156	15531.912	15531.912	-1.764	1.764	642	End Zone
				174.161	15487.594	15487.594	-2.506	2.506	1149.932	Sideline
				174.161	15487.594	15487.594	-0.371	2.506	1149.932	Seismic Joint
				174.156	15416.767	15416.767	-1.764	1.764	637.699	End Zone
				174.156	15416.767	15416.767	-1.764	1.764	637.698	End Zone
				174.132	15236.557	15236.557	-2.506	2.506	1162.237	Sideline
				166.258	15154.686	15154.686	-1.764	0.371	623.195	Seismic Joint
				174.126	15102.713	15102.713	-1.764	1.764	649.582	End Zone
				174.126	15102.713	15102.713	-1.764	1.764	649.582	End Zone
				174.132	15383.413	15383.413	-2.506	2.506	1158.351	Sideline
				174.132	15383.413	15383.413	-0.371	2.506	1158.351	Seismic Joint
				174.126	15186.094	15186.094	-1.764	1.764	645.28	End Zone
				174.126	15186.094	15186.094	-1.764	1.764	645.28	End Zone
				174.103	15331.258	15331.258	-2.506	2.506	1170.637	Sideline
				173.314	15184.922	15184.922	-1.764	0.371	629.94	Seismic Joint
				174.097	15070.565	15070.565	-1.764	1.764	657.147	End Zone
				174.097	15070.565	15070.565	-1.764	1.764	657.147	End Zone
				174.103	15080.363	15080.363	-2.506	2.506	1166.752	Sideline
				174.103	15080.363	15080.363	-0.371	2.506	1166.752	Seismic Joint
41	PNL_E2_32_FIN	1283.919	174.097	174.097	14756.921	14756.921	-1.764	1.764	652.845	End Zone
42	PNL_E2_34_FIN	1283.919	174.097	174.097	14756.921	14756.921	-1.764	1.764	652.845	End Zone

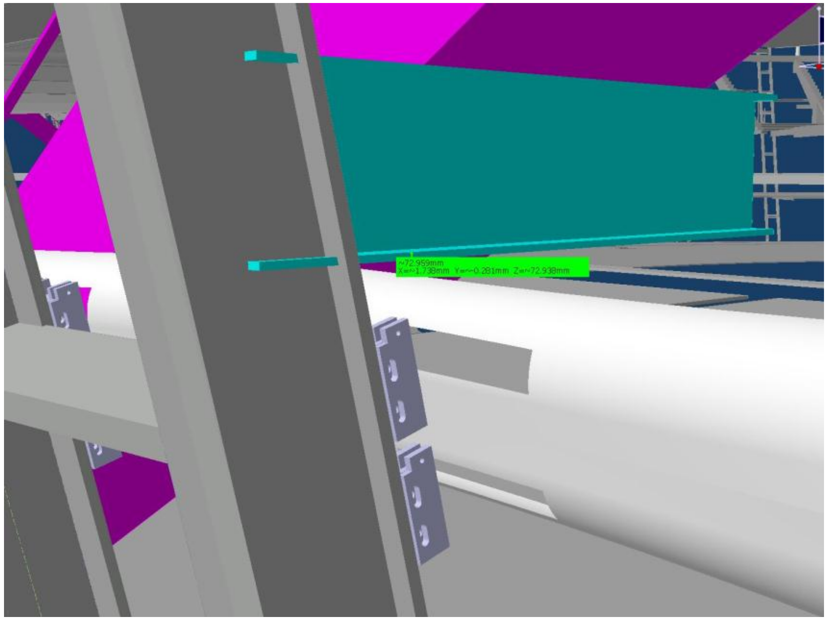
Geometry data output to Excel for bracket design coordination and cost estimation of GRP panel

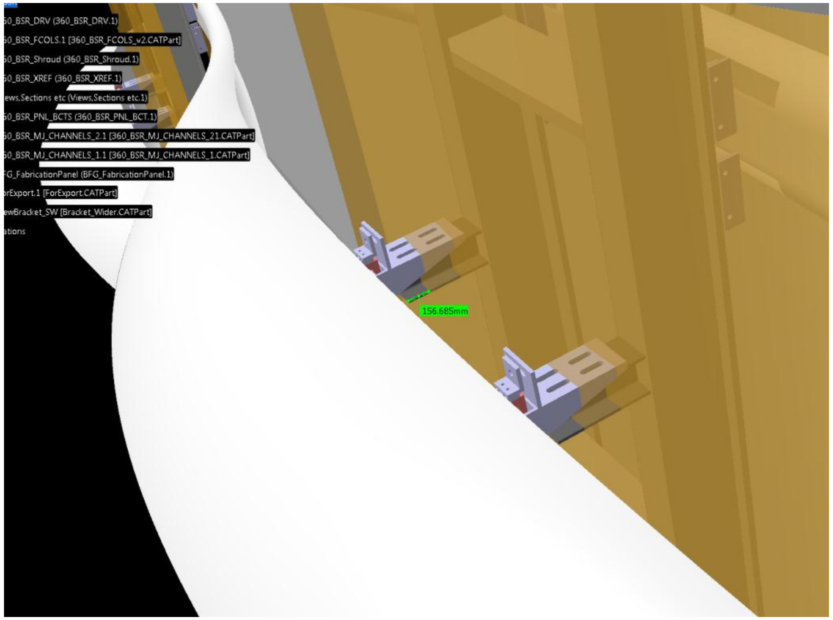


Coordination model

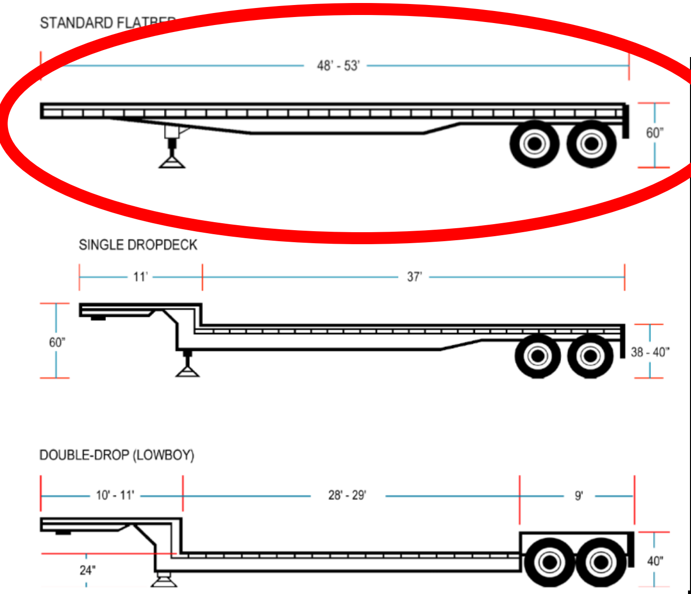


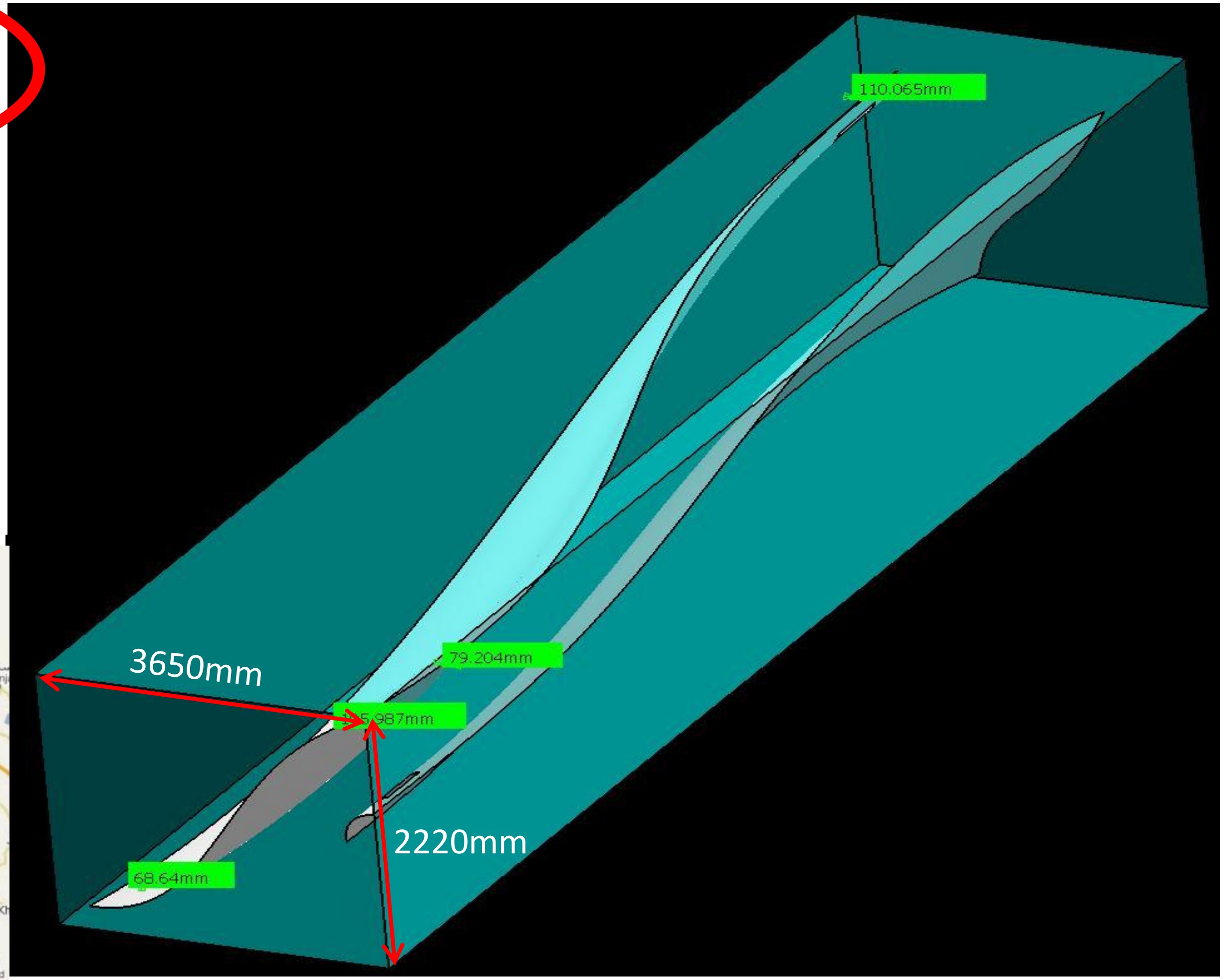




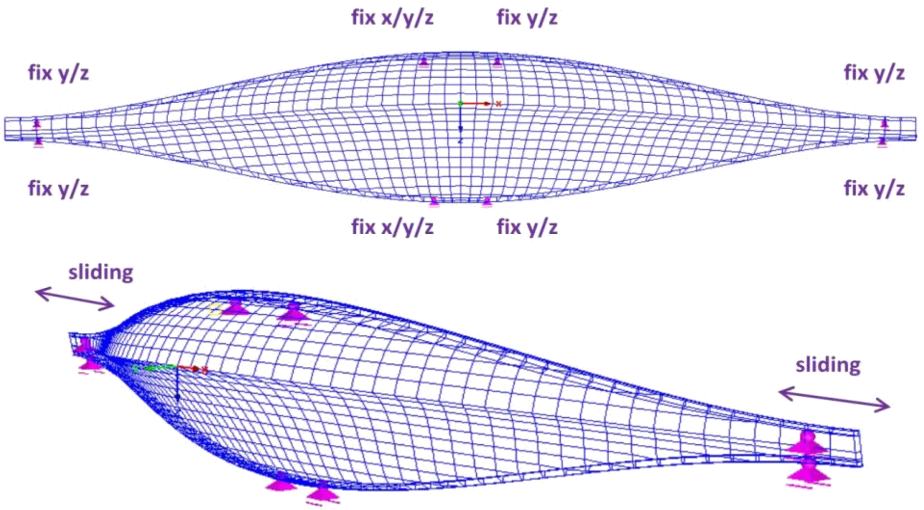


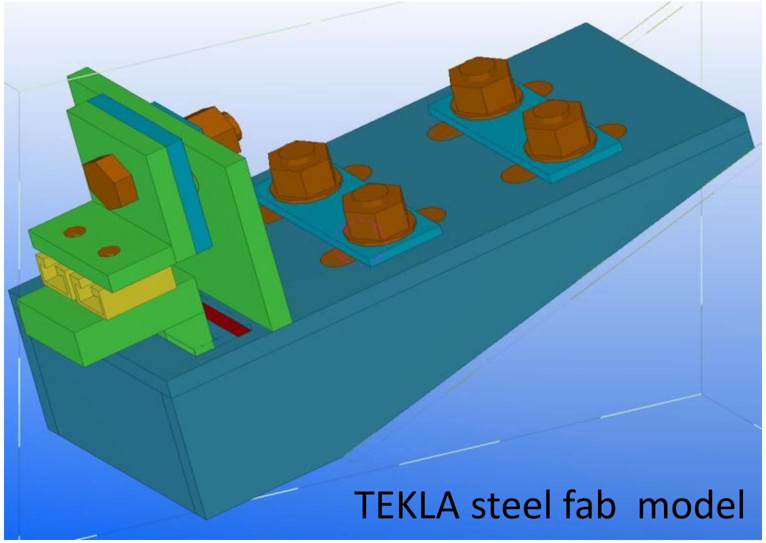
Transportation planning

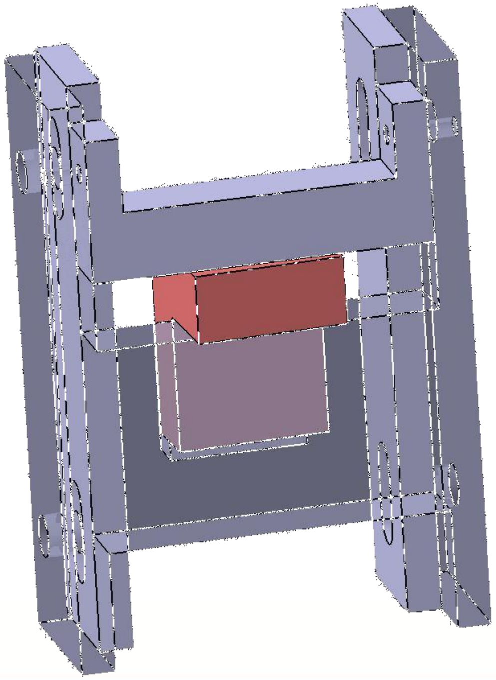


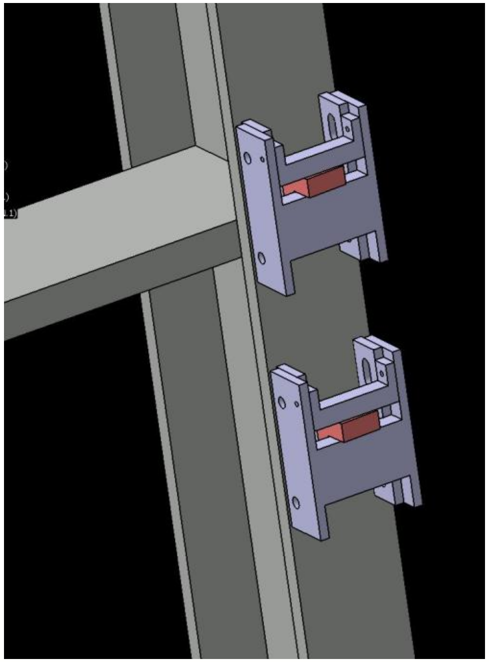


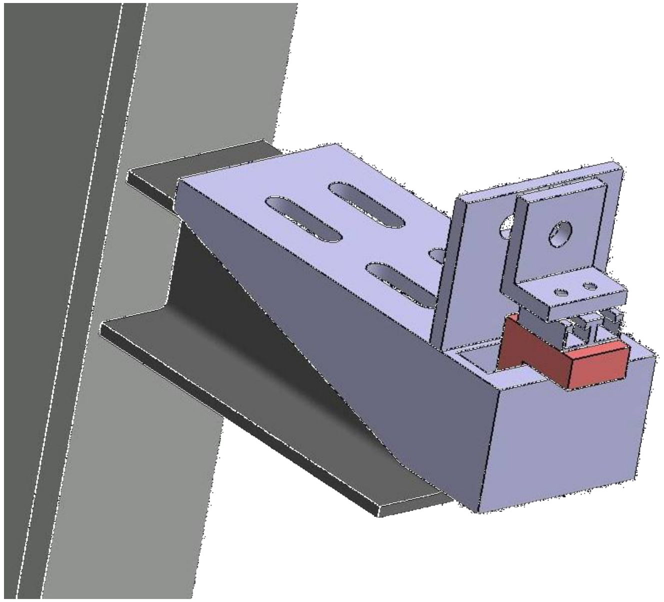
Bracket design



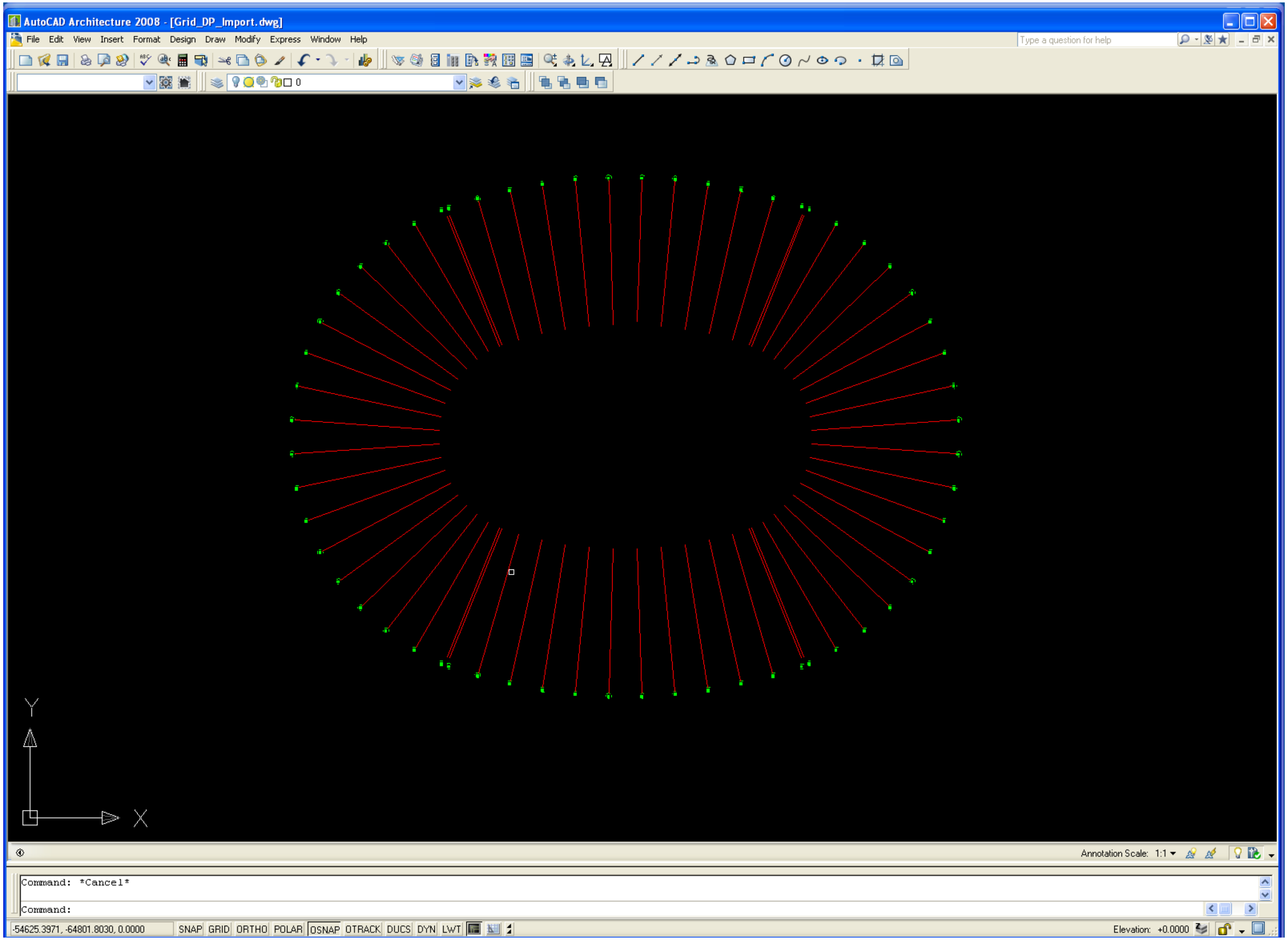


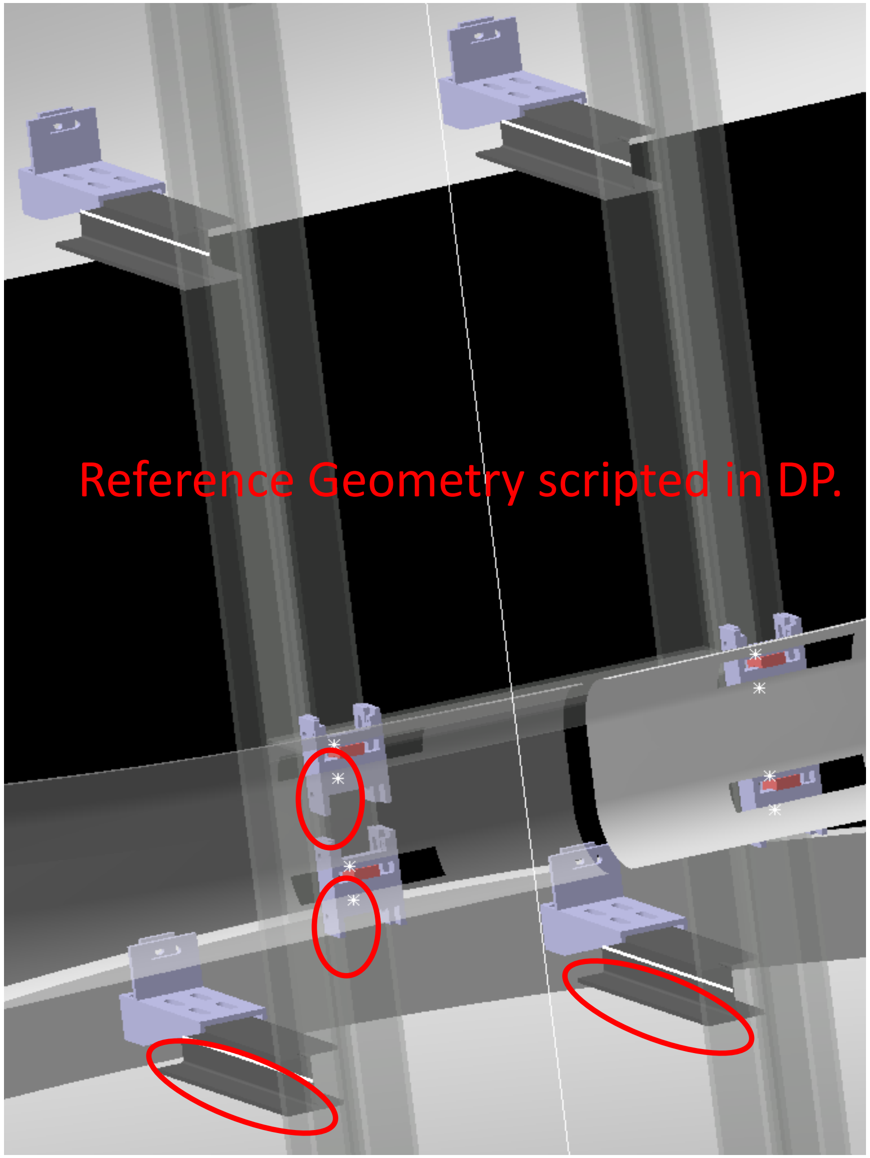


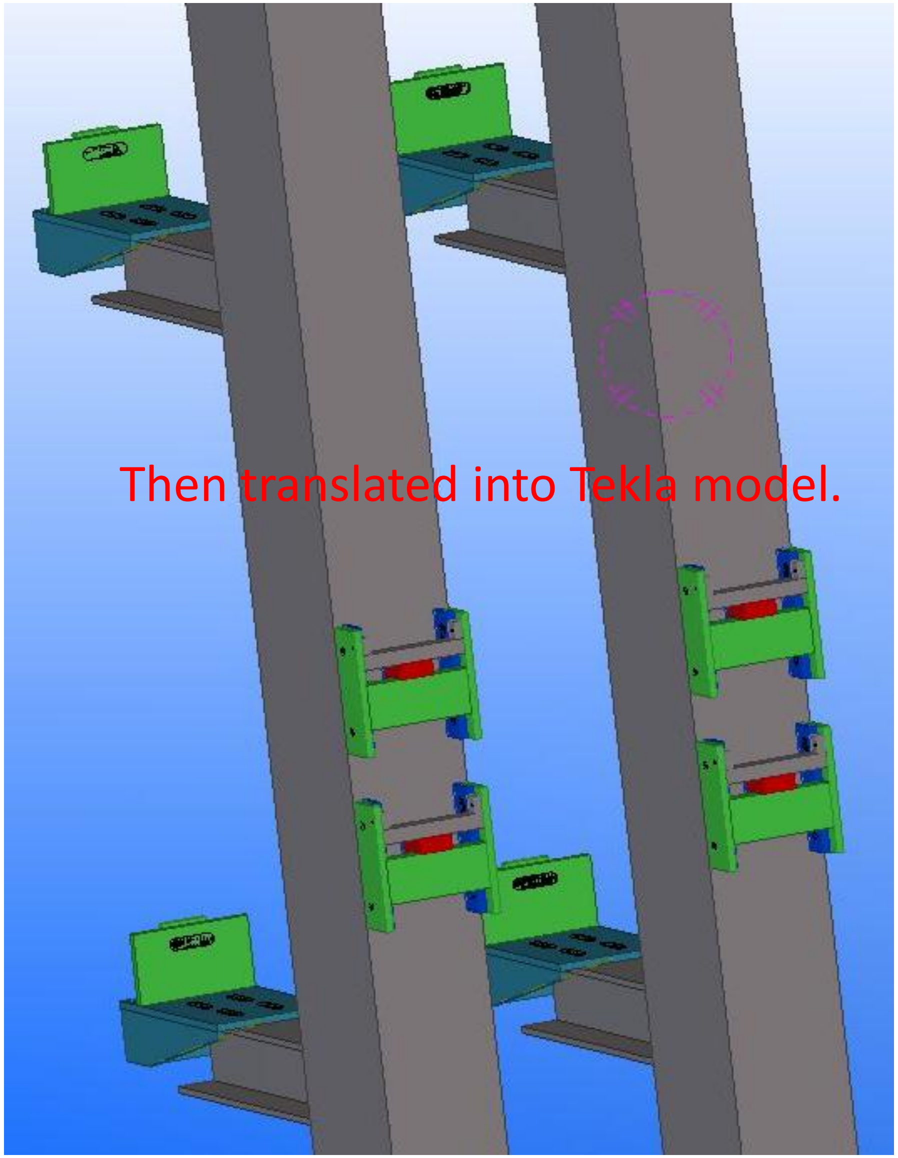




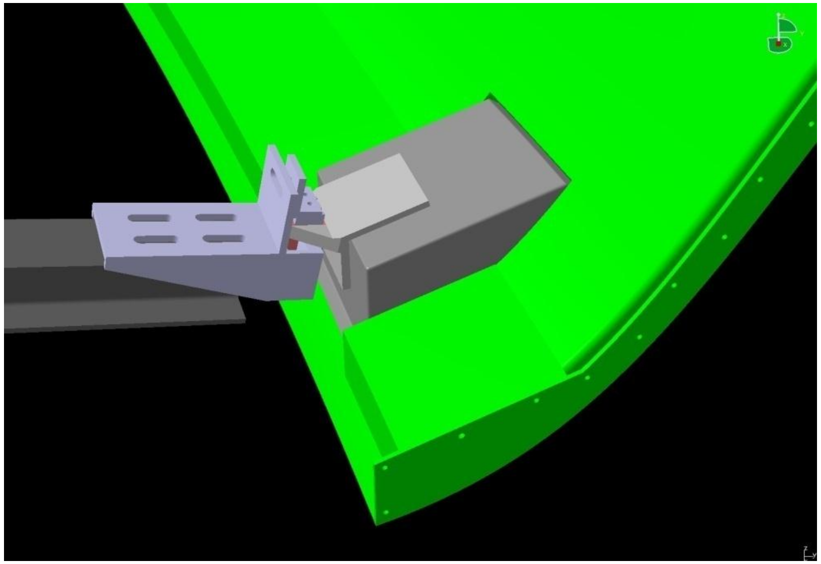
Automated model generation

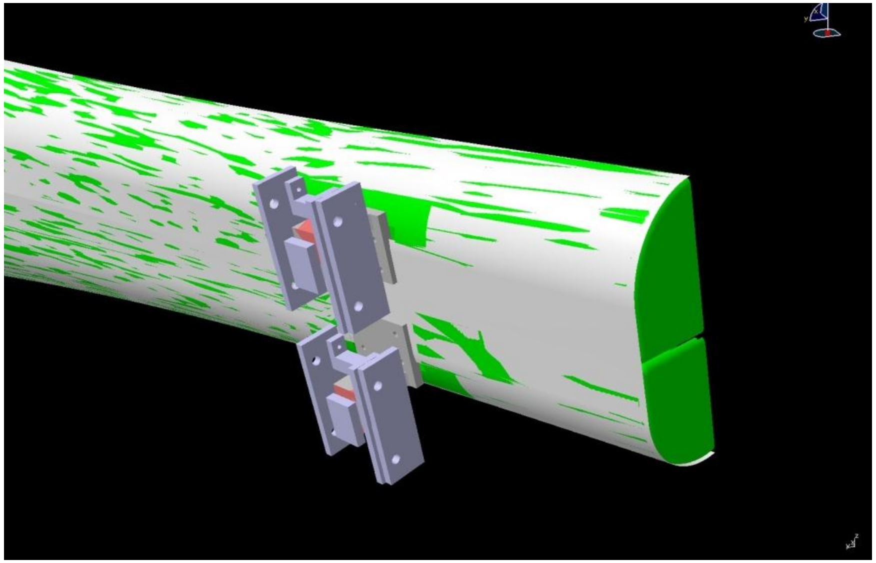


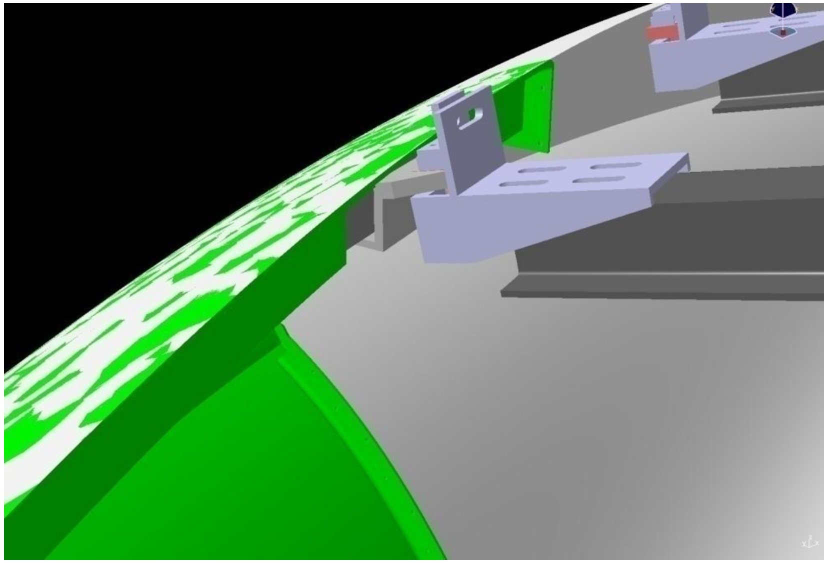

Reference Geometry scripted in DP.


Then translated into Tekla model.

Digital to Physical Modeling





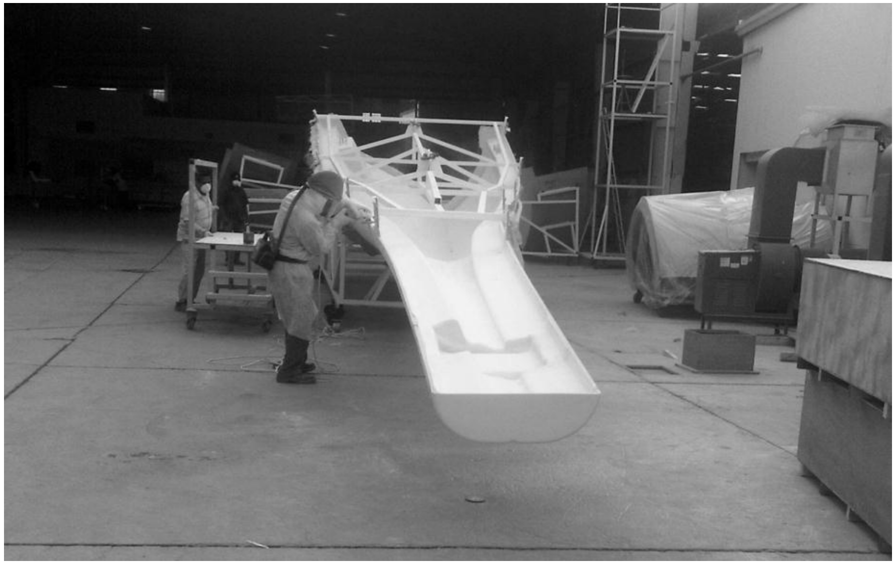


GFRP Panel mold created from CATIA model

Digital to Physical Modeling

GFRP Panel mold created from CATIA model

Digital to Physical Modeling



First Type E Panel (Feb 2011)

Digital to Physical Modeling


Questions?

Thank you!

Jonatan Schumacher
JSchumacher@ThorntonTomasetti.com

Thank you!

Jonatan Schumacher
JSchumacher@ThorntonTomasetti.com

Good design
makes a difference ™

AIA