Facade Tectonics FORUM SEATTLE

DIGITS, DATA AND BEYOND

Integrated Parametric Workflows in Advanced Facade Design and Execution

SPEAKERS

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Sustainable Design Leader
HOK

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Technical Principal
HOK

EMERGING STRATEGIES AND DESIGN PRACTICES

ENGINEERING TO ENABLE DESIGN TO CONSTRUCTION

FACADE TECTONICS SEATTLE
JULY 16TH 2019

Strategy: Interoperability

Design Tools in a Digital work platform

Rhino

- Geometric Freedom
- Parametric Modeling
- Sketching and Iteration
- Surface Modeling and Analysis
- Fabrication

Revit

- Information-rich Model
- Coordination
- Drawings
- Schedules

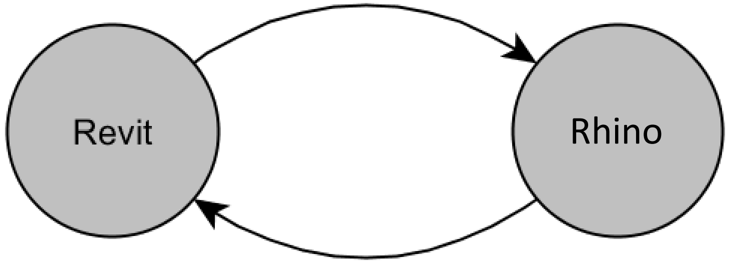
Interoperability - Transfer of digital data with high fidelity

- Allows the project to capture the **strengths** of each software and avoid the **weaknesses**

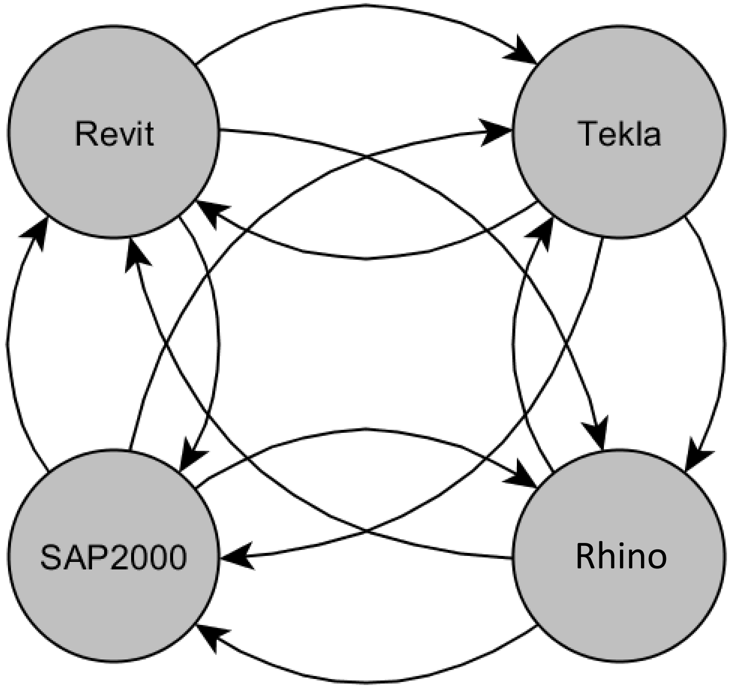
- Maintains **consistency** of data and avoids the extra work of building separate parallel models for each platform

- Develops an agnostic format that can apply to **any** software application

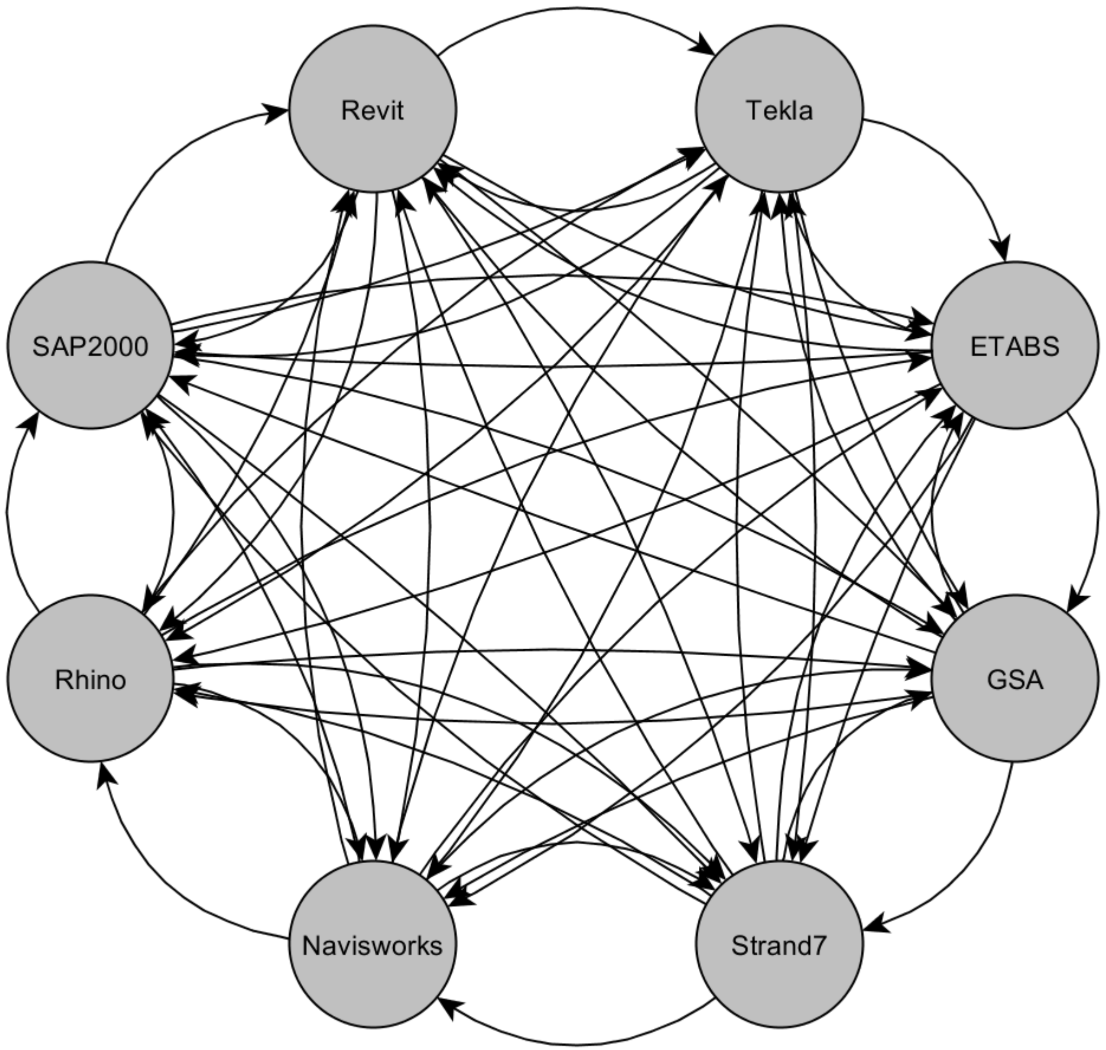
Transfer of data – single to single



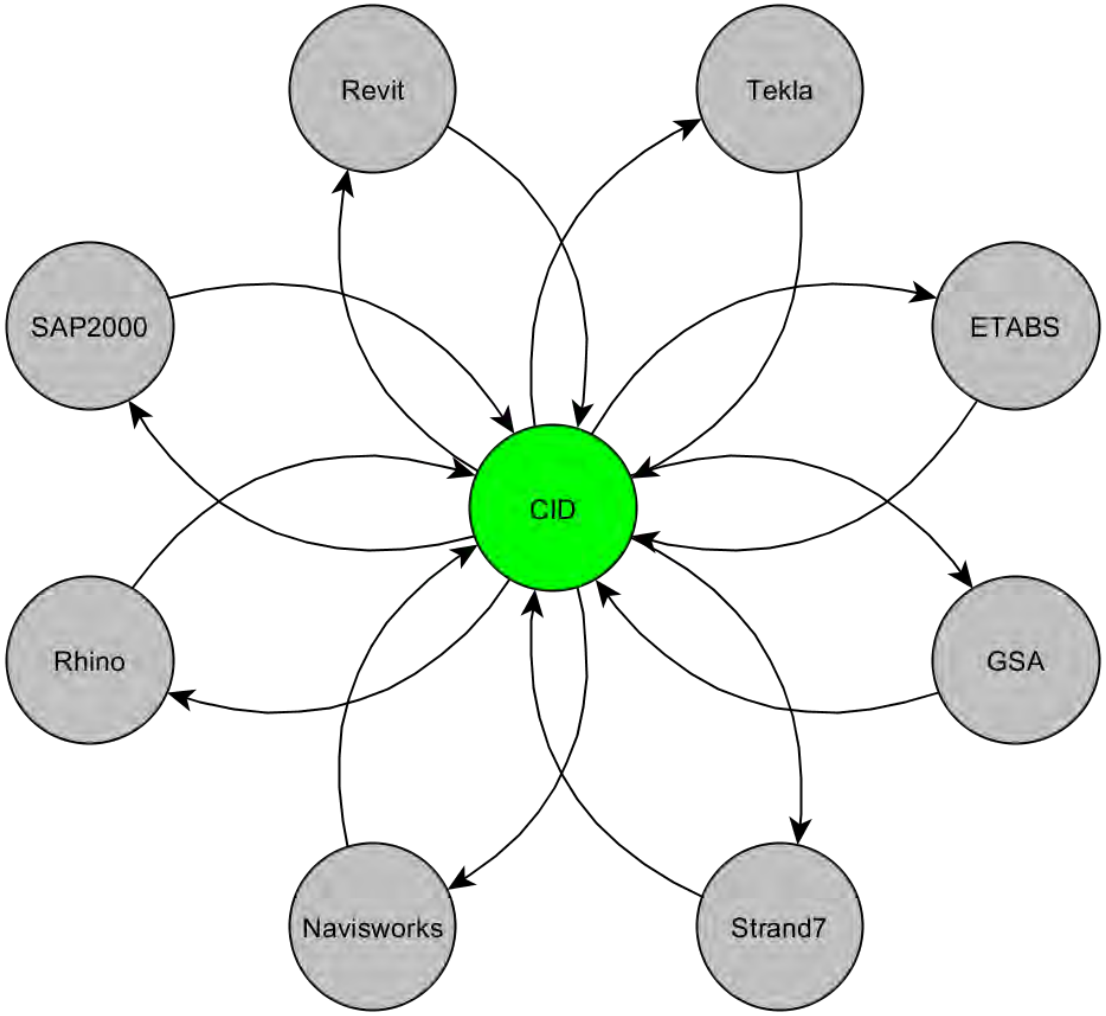
Transfer of data – multiple to multiple



Multiple complexity with multiple complexity



Using data for interoperability



The CID: Central Information Database

- CSV format
- User-friendly
- Readable by all software applications
- Data-rich
- Single source of truth
- Becomes an archive of previous versions of the design

<table>
<tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th><th>H</th><th>I</th><th>J</th><th>K</th><th>L</th><th>M</th><th>N</th><th>O</th><th>P</th><th>Q</th><th>R</th><th></th></tr>
<tr><td>1</td><td>WPMIndex</td><td>Site</td><td>Zone</td><td>Scope</td><td>Type</td><td>Location</td><td>Geometry</td><td>Vertex_1</td><td>Vertex_2</td><td>Vertex_3</td><td>Vert</td><td>Offset</td><td>Offse</td><td>IsVertica</td><td>SectionProfile</td><td>Material</td><td></td><td>ReferenceLocalAxes</td><td>Cr</td></tr>
<tr><td>2</td><td>LASED_VIP_S_PF1A_BEM_BC-0001_0</td><td>LASED</td><td>VIP</td><td>S</td><td>PF1A</td><td>BC-0001</td><td>Line</td><td>-5415.089|3976.275|2231.205</td><td>-5415.439|4636.098|2059.705</td><td>-5415.264|4306.187|2145.455</td><td>n/a</td><td>0|0|0</td><td>0|0|0</td><td>FALSE</td><td>SHS250x250x8.0</td><td>S335JR</td><td>5</td><td>-0.122563| -0.004003| 0.992453</td><td></td></tr>
<tr><td>3</td><td>LASED_VIP_S_PF1A_BEM_BC-0001_1</td><td>LASED</td><td>VIP</td><td>S</td><td>PF1A</td><td>BC-0001</td><td>Arc</td><td>-5415.439|4636.098|2059.705</td><td>-5538.181|3976.332|2214.928</td><td>-5479.037|4306.536|2136.920</td><td>n/a</td><td>0|0|0</td><td>0|0|0</td><td>FALSE</td><td>SHS250x250x8.0</td><td>S335JR</td><td>5</td><td>-0.134538| 0.250582| 0.958701</td><td></td></tr>
<tr><td>4</td><td>LASED_VIP_S_PF1A_BEM_BC-0001_2</td><td>LASED</td><td>VIP</td><td>S</td><td>PF1A</td><td>BC-0001</td><td>Line</td><td>-5538.181|3976.332|2214.928</td><td>-5415.089|3976.275|2231.205</td><td>-5476.635|3976.304|2223.066</td><td>n/a</td><td>0|0|0</td><td>0|0|0</td><td>FALSE</td><td>SHS250x250x8.0</td><td>S335JR</td><td>5</td><td>0.008458| 0.247108| 0.968951</td><td></td></tr>
<tr><td>5</td><td>LASED_VIP_S_PF1A_BEM_CD-0001_0</td><td>LASED</td><td>VIP</td><td>S</td><td>PF1A</td><td>CD-0001</td><td>Arc</td><td>-5542.517|3951.023|2220.314</td><td>-5650.214|3255.790|2354.545</td><td>-5599.445|3603.799|2286.995</td><td>n/a</td><td>0|0|0</td><td>0|0|0</td><td>FALSE</td><td>SHS250x250x8.0</td><td>S335JR</td><td>5</td><td>-0.110889| 0.204936| 0.972474</td><td></td></tr>
<tr><td>6</td><td>LASED_VIP_S_PF1A_BEM_CD-0001_1</td><td>LASED</td><td>VIP</td><td>S</td><td>PF1A</td><td>CD-0001</td><td>Line</td><td>-5650.214|3255.790|2354.545</td><td>-5415.045|3255.726|2378.209</td><td>-5532.630|3255.758|2366.377</td><td>n/a</td><td>0|0|0</td><td>0|0|0</td><td>FALSE</td><td>SHS250x250x8.0</td><td>S335JR</td><td>5</td><td>0.004179| 0.200366| 0.979712</td><td></td></tr>
<tr><td>7</td><td>LASED_VIP_S_PF1A_BEM_CD-0001_2</td><td>LASED</td><td>VIP</td><td>S</td><td>PF1A</td><td>CD-0001</td><td>Line</td><td>-5415.045|3255.726|2378.209</td><td>-5415.078|3950.940|2237.061</td><td>-5415.062|3603.333|2307.635</td><td>n/a</td><td>0|0|0</td><td>0|0|0</td><td>FALSE</td><td>SHS250x250x8.0</td><td>S335JR</td><td>5</td><td>-0.110477| -0.0025| 0.993876</td><td></td></tr>
<tr><td>8</td><td>LASED_VIP_S_PF1A_BEM_CD-0001_3</td><td>LASED</td><td>VIP</td><td>S</td><td>PF1A</td><td>CD-0001</td><td>Line</td><td>-5415.078|3950.940|2237.061</td><td>-5542.517|3951.023|2220.314</td><td>-5478.798|3950.982|2228.688</td><td>n/a</td><td>0|0|0</td><td>0|0|0</td><td>FALSE</td><td>SHS250x250x8.0</td><td>S335JR</td><td>5</td><td>0.005475| 0.199587| 0.979865</td><td></td></tr>
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<tr><td>10</td><td>LASED_VIP_S_PF1A_BEM_DE-0001_1</td><td>LASED</td><td>VIP</td><td>S</td><td>PF1A</td><td>DE-0001</td><td>Line</td><td>-5415.053|3110.877|2402.998</td><td>-5415.042|3230.162|2382.952</td><td>-5415.048|3170.519|2392.975</td><td>n/a</td><td>0|0|0</td><td>0|0|0</td><td>FALSE</td><td>SHS250x250x8.0</td><td>S335JR</td><td>5</td><td>-0.096874| -0.001576| 0.995295</td><td></td></tr>
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<tr><td>12</td><td>LASED_VIP_S_PF1A_BEM_DE-0001_3</td><td>LASED</td><td>VIP</td><td>S</td><td>PF1A</td><td>DE-0001</td><td>Line</td><td>-5653.661|3230.247|2359.047</td><td>-5669.349|3110.045|2377.685</td><td>-5661.505|3170.146|2368.366</td><td>n/a</td><td>0|0|0</td><td>0|0|0</td><td>FALSE</td><td>SHS250x250x8.0</td><td>S335JR</td><td>5</td><td>-0.116645| 0.013073| 0.993088</td><td></td></tr>
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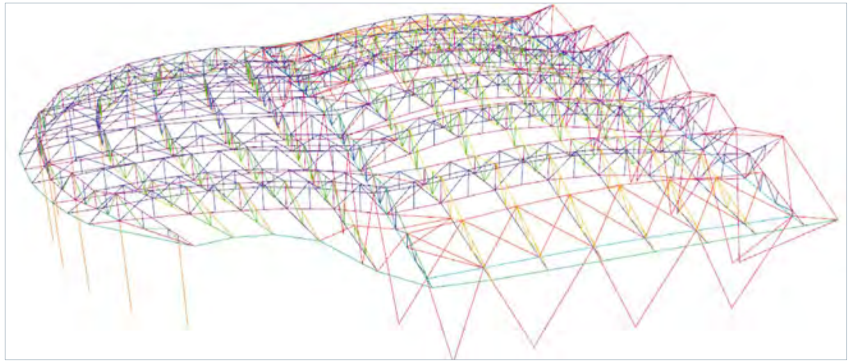
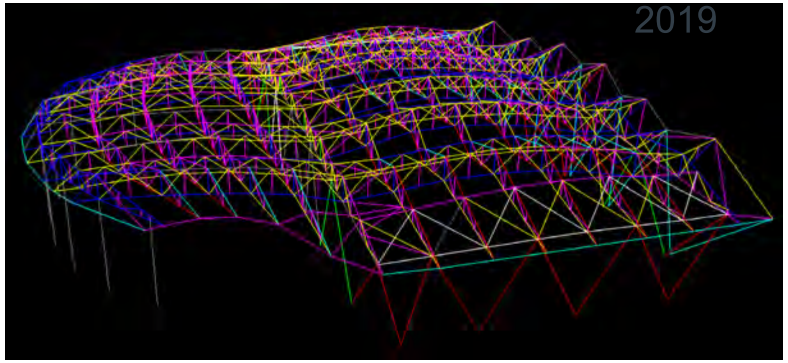
- Tectonics Seattle 2019



Rhino/Grasshopper



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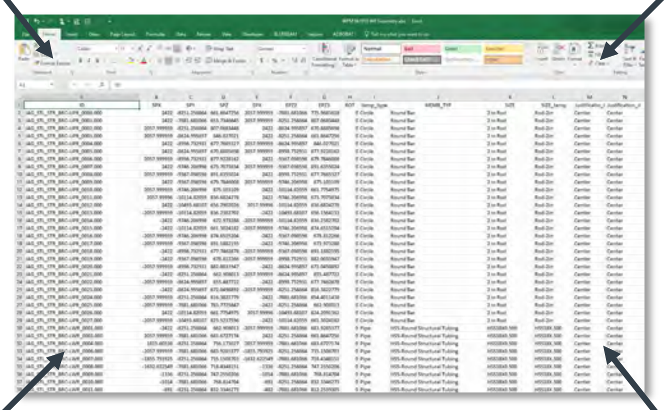
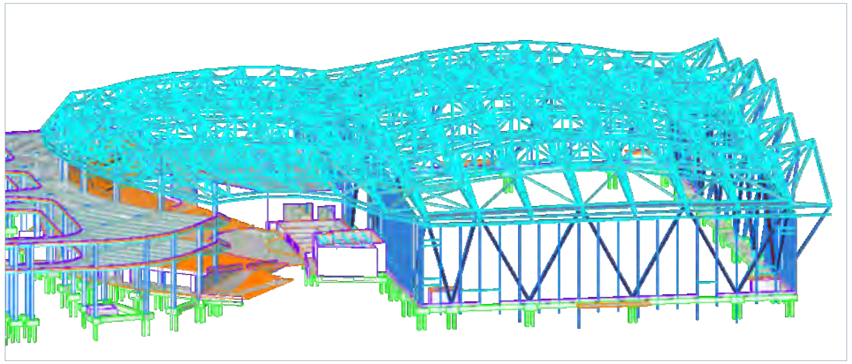
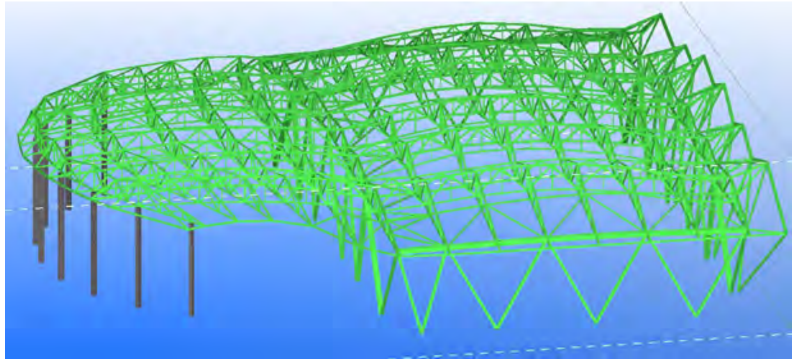


Revit/Dynamo



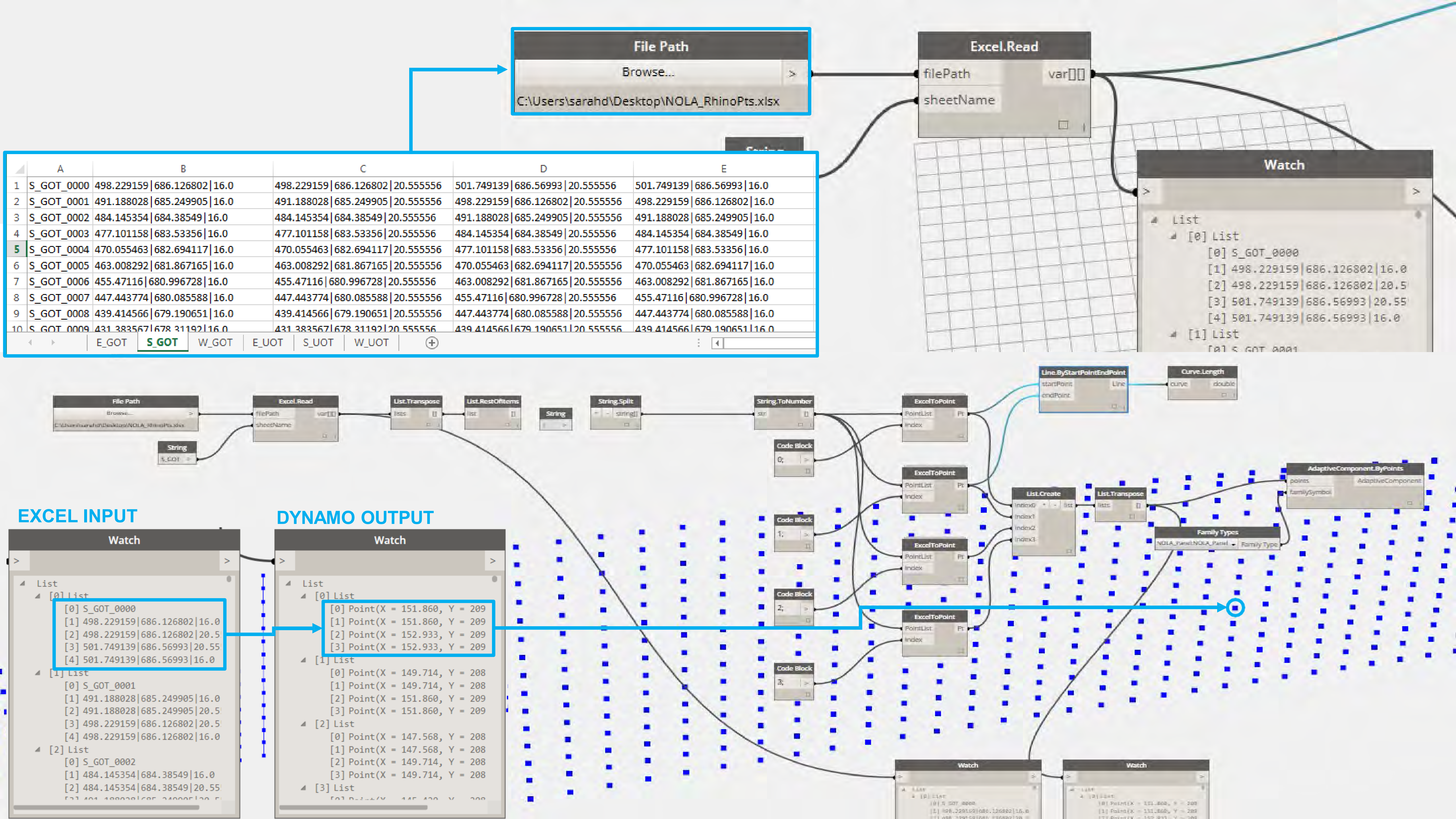
Tekla



Strategy: Designing Data for Fabrication

1D: Points

(X,Y,Z)



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5 S_GOT_0004 470.055463|682.694117|16.0 470.055463|682.694117|20.555556 477.101158|683.53356|20.555556 477.101158|683.53356|16.0
6 S_GOT_0005 463.008292|681.867165|16.0 463.008292|681.867165|20.555556 470.055463|682.694117|20.555556 470.055463|682.694117|16.0
7 S_GOT_0006 455.47116|680.996728|16.0 455.47116|680.996728|20.555556 463.008292|681.867165|20.555556 463.008292|681.867165|16.0
8 S_GOT_0007 447.443774|680.085588|16.0 447.443774|680.085588|20.555556 455.47116|680.996728|20.555556 455.47116|680.996728|16.0
9 S_GOT_0008 439.414566|679.190651|16.0 439.414566|679.190651|20.555556 447.443774|680.085588|20.555556 447.443774|680.085588|16.0
E_GOT
S_GOT
W_GOT
E_UOT
S_UOT
W_UOT
Line.ByStartPointEndPoint
Curve.Length
List.Transpose
List.RestOfItems
String
String.Split
String.ToNumber
ExcelToPoint
Code Block
List.Create
Family Types
AdaptiveComponent.ByPoints
EXCEL INPUT
DYNAMO OUTPUT
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NORTH TERMINAL
LOUIS ARMSTRONG
NEW ORLEANS
INTERNATIONAL
AIRPORT

CITY OF NEW ORLEANS
THE NEW ORLEANS AVIATION BOARD

CRESCENT CITY
AVIATION TEAM

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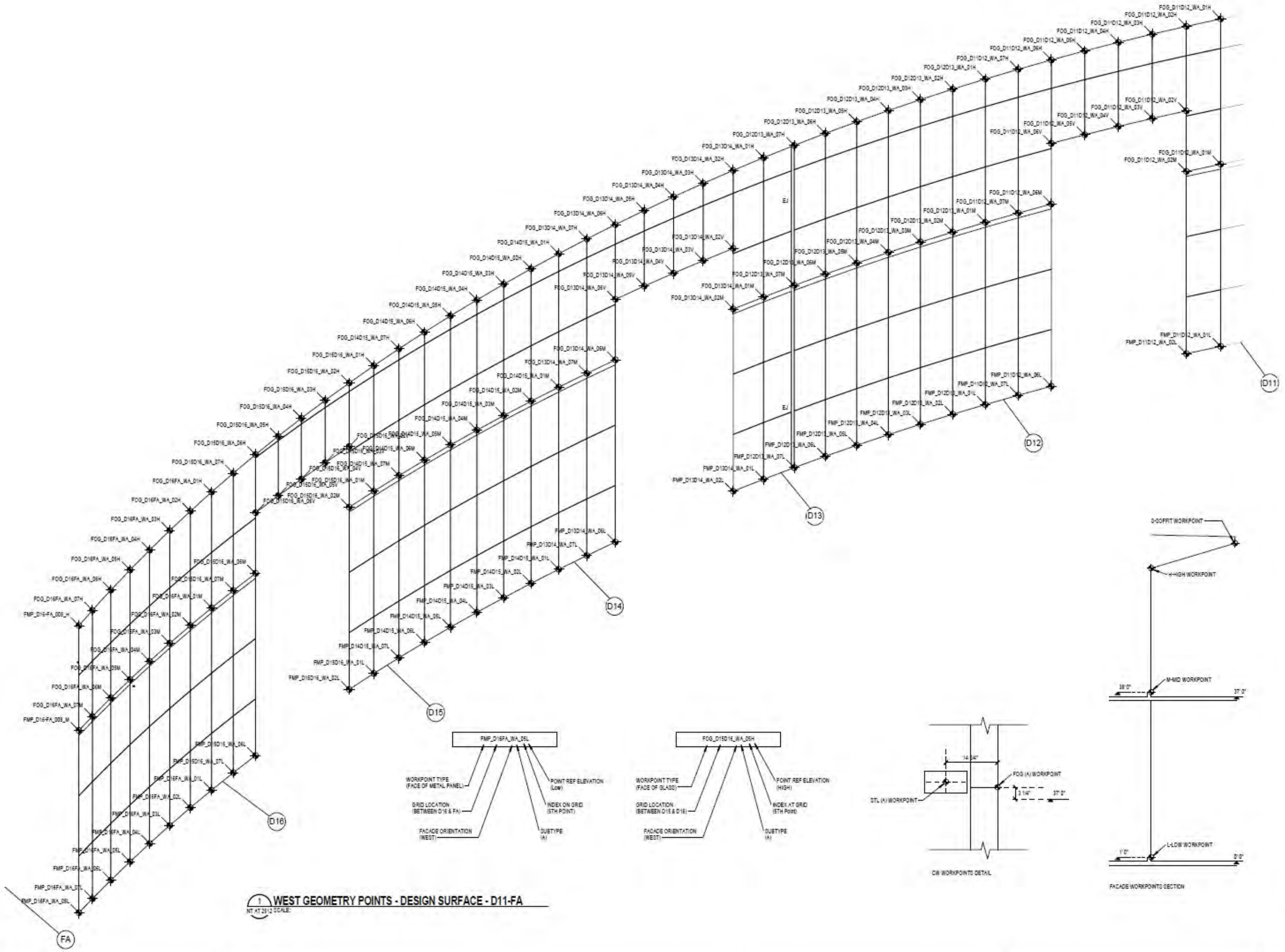
WALTER P MOORE

WALTER P. MOORE AND ASSOCIATES, INC.
11900 WEST OLYMPIC BOULEVARD, SUITE 750
LOS ANGELES, CALIFORNIA 90064.1059
PHONE: 310.254.1900 FAX: 310.254.1940

KEY PLAN

REVISIONS

FILE LOG



1 WEST GEOMETRY POINTS - DESIGN SURFACE - D11-FA
NT AT 2512 SCALE:

PRELIMINARY - NOT FOR CONSTRUCTION

SCALE : 3/8" = 1'-0"

95% CONSTRUCTION DOCUMENTS
PROJECT NO. 051-10250-000
03-13-2015

GEOMETRY WORKPOINTS_ WEST
D11-FA _ DESIGN SURFACE

VOLUME 3.2

NT AT 2512

WEST FACADE - FOG WORKPOINTS			
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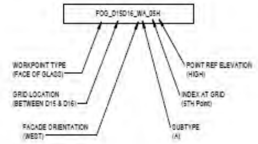
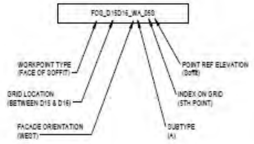
FOG_D14D15_WA_03M	-749.759161	13181.006849	459.25
FOG_D14D15_WA_04M	-746.538092	13255.936778	459.25
FOG_D14D15_WA_05M	-744.618363	13330.911335	459.25
FOG_D14D15_WA_06M	-744.000393	13405.907918	459.25
FOG_D14D15_WA_07M	-744.684621	13480.903926	459.25
FOG_D15D16_WA_01M	-746.670717	13555.876754	459.25
FOG_D15D16_WA_02M	-749.957798	13630.803813	459.25
FOG_D15D16_WA_03M	-754.545297	13705.662504	459.25
FOG_D15D16_WA_04M	-760.431777	13780.430268	459.25
FOG_D15D16_WA_05M	-767.615146	13855.084593	459.25
FOG_D15D16_WA_06M	-776.093589	13929.602947	459.25
FOG_D15D16_WA_07M	-785.864329	14003.962893	459.25
FOG_D16FA_WA_01M	-796.924521	14078.142013	459.25
FOG_D16FA_WA_02M	-809.270904	14152.117938	459.25
FOG_D16FA_WA_03M	-822.899614	14225.868386	459.25
FOG_D16FA_WA_04M	-837.806534	14299.371136	459.25
FOG_D16FA_WA_05M	-853.98728	14372.604009	459.25
FOG_D16FA_WA_06M	-871.437098	14445.544906	459.25
FOG_D16FA_WA_07M	-890.150276	14518.171949	459.25
FOG_D7D8_WA_02V	-2445.819759	9967.791009	608.0
FOG_D7D8_WA_03V	-2386.560833	10013.761114	608.0
FOG_D7D8_WA_04V	-2328.108995	10060.753176	608.0
FOG_D7D8_WA_05V	-2270.481599	10108.752702	608.0
FOG_D7D8_WA_06V	-2213.696224	10157.74548	608.0
FOG_D9D10_WA_02V	-1695.784208	10698.908065	608.0
FOG_D9D10_WA_03V	-1649.330708	10757.788819	608.0
FOG_D9D10_WA_04V	-1603.906378	10817.467133	608.0
FOG_D9D10_WA_05V	-1559.524934	10877.925038	608.0
FOG_D9D10_WA_06V	-1516.199779	10939.144332	608.0

WEST FACADE - FOG WORKPOINTS			
Point ID	X	Y	Z
FOG_D11D12_WA_03V	-1112.834904	11657.376305	608.0
FOG_D11D12_WA_04V	-1083.108432	11726.23273	608.0
FOG_D11D12_WA_05V	-1054.581894	11795.594869	608.0
FOG_D13D14_WA_03V	-808.611786	12659.640527	608.0
FOG_D13D14_WA_04V	-796.330642	12733.627306	608.0
FOG_D13D14_WA_05V	-785.33601	12807.816172	608.0
FOG_D15D16_WA_03V	-754.545297	13705.662504	608.0
FOG_D15D16_WA_04V	-760.431777	13780.430268	608.0
FOG_D15D16_WA_05V	-767.615146	13855.084593	608.0
FOG_D6D7_WA_007H	-2566.686887	9878.97137	781.420218
FOG_D7D8_WA_01H	-2505.867896	9922.856696	784.002581
FOG_D7D8_WA_02H	-2445.819759	9967.791009	786.490141
FOG_D7D8_WA_03H	-2386.560833	10013.761114	788.882085
FOG_D7D8_WA_04H	-2328.108995	10060.753176	791.17756
FOG_D7D8_WA_05H	-2270.481599	10108.752702	793.37582
FOG_D7D8_WA_06H	-2213.696224	10157.74548	795.476368
FOG_D7D8_WA_07H	-2157.769948	10207.716701	797.478591
FOG_D8D9_WA_01H	-2102.719565	10258.651232	799.381899
FOG_D8D9_WA_02H	-2048.561822	10310.533888	801.185665
FOG_D8D9_WA_03H	-1995.312889	10363.348871	802.88933
FOG_D8D9_WA_04H	-1942.98877	10417.080219	804.49241
FOG_D8D9_WA_05H	-1891.605454	10471.711949	805.994461
FOG_D8D9_WA_06H	-1841.178305	10527.227477	807.395063
FOG_D8D9_WA_07H	-1791.72244	10583.609998	808.6938
FOG_D9D10_WA_01H	-1743.252873	10640.842612	809.890213
FOG_D9D10_WA_02H	-1695.784208	10698.908065	810.98391
FOG_D9D10_WA_03H	-1649.330708	10757.788819	811.974654
FOG_D9D10_WA_04H	-1603.906378	10817.467133	812.862177
FOG_D9D10_WA_05H	-1559.524934	10877.925038	813.64618
FOG_D9D10_WA_06H	-1516.199779	10939.144332	814.326429
FOG_D9D10_WA_07H	-1473.943874	11001.106493	814.902688
FOG_D10D11_WA_01H	-1432.770004	11063.792881	815.374722
FOG_D10D11_WA_02H	-1392.6907	11127.184679	815.742513
FOG_D10D11_WA_03H	-1353.717873	11191.262674	816.006
FOG_D10D11_WA_04H	-1315.863298	11256.007572	816.165068
FOG_D10D11_WA_05H	-1279.138495	11321.399923	816.219615
FOG_D10D11_WA_06H	-1243.55435	11387.419914	816.169542
FOG_D10D11_WA_07H	-1209.121793	11454.047759	816.014918
FOG_D11D12_WA_01H	-1175.85103	11521.263285	815.755868
FOG_D11D12_WA_02H	-1143.752179	11589.046278	815.392523
FOG_D11D12_WA_03H	-1112.834904	11657.376305	814.924914
FOG_D11D12_WA_04H	-1083.108432	11726.23273	814.353103
FOG_D11D12_WA_05H	-1054.581894	11795.594869	813.677261
FOG_D11D12_WA_06H	-1027.263896	11865.441826	812.897674
FOG_D11D12_WA_07H	-1001.162367	11935.752433	812.01456
FOG_D12D13_WA_01H	-976.285411	12006.505576	811.028217
FOG_D12D13_WA_02H	-952.640711	12077.679999	809.938895
FOG_D12D13_WA_03H	-930.235047	12149.254132	808.746851
FOG_D12D13_WA_04H	-909.075153	12221.206401	807.452457
FOG_D12D13_WA_05H	-889.167755	12293.515228	806.056186
FOG_D12D13_WA_06H	-870.518729	12366.158769	804.558468
FOG_D12D13_WA_07H	-853.133385	12439.115053	802.959673
FOG_D13D14_WA_01H	-837.017231	12512.362166	801.260265
FOG_D13D14_WA_02H	-822.17534	12585.878071	799.460743
FOG_D13D14_WA_03H	-808.611786	12659.640527	797.561648
FOG_D13D14_WA_04H	-796.330642	12733.627306	795.563606
FOG_D13D14_WA_05H	-785.33601	12807.816172	793.467268
FOG_D13D14_WA_06H	-775.631029	12882.184736	791.273166
FOG_D13D14_WA_07H	-767.218331	12956.710547	788.981904
FOG_D14D15_WA_01H	-760.100769	13031.371179	786.594144
FOG_D14D15_WA_02H	-754.280537	13106.144131	784.110689
FOG_D14D15_WA_03H	-749.759161	13181.006849	781.532293
FOG_D14D15_WA_04H	-746.538092	13255.936778	778.859701
FOG_D14D15_WA_05H	-744.618363	13330.911335	776.093664
FOG_D14D15_WA_06H	-744.000393	13405.907918	773.234933
FOG_D14D15_WA_07H	-744.684621	13480.903926	770.284443
FOG_D15D16_WA_01H	-746.670717	13555.876754	767.243138
FOG_D15D16_WA_02H	-749.957798	13630.803813	764.111957
FOG_D15D16_WA_03H	-754.545297	13705.662504	760.891802
FOG_D15D16_WA_04H	-760.431777	13780.430268	757.583569
FOG_D15D16_WA_05H	-767.615146	13855.084593	754.188212
FOG_D15D16_WA_06H	-776.093589	13929.602947	750.70677
FOG_D15D16_WA_07H	-785.864329	14003.962893	747.140201
FOG_D16FA_WA_01H	-796.924521	14078.142013	743.489544
FOG_D16FA_WA_02H	-809.270904	14152.117938	739.755751
FOG_D16FA_WA_03H	-822.899614	14225.868386	735.940016
FOG_D16FA_WA_04H	-837.806534	14299.371136	732.043674
FOG_D16FA_WA_05H	-853.98728	14372.604009	728.068171
FOG_D16FA_WA_06H	-871.437098	14445.544906	724.014849
FOG_D16FA_WA_07H	-890.150276	14518.171949	719.884854

WEST FACADE - FOS WORKPOINTS			
Point ID	X	Y	Z
FOS_D1D2_WA_00S	-5533.50045	9351.103588	681.8335
FOS_D1D2_WA_01S	-5464.487006	9344.341823	686.964496
FOS_D1D2_WA_02S	-5390.04792	9337.048467	692.498876
FOS_D1D2_WA_03S	-5315.436138	9331.754933	697.967262
FOS_D1D2_WA_04S	-5240.736448	9327.829292	703.388392
FOS_D1D2_WA_05S	-5165.973772	9325.274475	708.7604
FOS_D1D2_WA_06S	-5091.173198	9324.090429	714.081538
FOS_D1D2_WA_07S	-5016.359753	9324.278103	719.350011
FOS_D2D3_WA_01S	-4969.527908	9325.093747	722.620715
FOS_D2D3_WA_02S	-4894.747079	9327.511952	727.799801
FOS_D2D3_WA_03S	-4820.019229	9331.301195	732.921634
FOS_D2D3_WA_04S	-4745.36944	9336.460583	737.984503
FOS_D2D3_WA_05S	-4670.82275	9342.988387	742.986712
FOS_D2D3_WA_06S	-4596.404268	9350.883347	747.926554
FOS_D2D3_WA_07S	-4522.138903	9360.14207	752.80242
FOS_D3D4_WA_01S	-4475.826704	9366.618131	755.815653
FOS_D3D4_WA_02S	-4401.863387	9378.086868	760.58407
FOS_D3D4_WA_03S	-4328.118696	9390.911535	765.284231
FOS_D3D4_WA_04S	-4254.617398	9405.087623	769.914581
FOS_D3D4_WA_05S	-4181.384276	9420.610762	774.473556
FOS_D3D4_WA_06S	-4108.444011	9437.475971	778.959622
FOS_D3D4_WA_07S	-4035.821188	9455.677756	783.371272
FOS_D4D5_WA_01S	-3990.801655	9467.676106	786.07827
FOS_D4D5_WA_02S	-3918.745907	9488.033577	790.36605
FOS_D4D5_WA_03S	-3847.071621	9509.711188	794.575578
FOS_D4D5_WA_04S	-3775.803036	9532.701946	798.705432
FOS_D4D5_WA_05S	-3704.964223	9556.998272	802.754224
FOS_D4D5_WA_06S	-3634.579196	9582.592374	806.720577
FOS_D4D5_WA_07S	-3564.671706	9609.475642	810.603165
FOS_D5D6_WA_01S	-3521.599822	9626.778535	812.966605
FOS_D5D6_WA_02S	-3452.516007	9655.731078	816.710738
FOS_D5D6_WA_03S	-3383.971473	9685.948868	820.367727
FOS_D5D6_WA_04S	-3315.989386	9717.421753	823.936339
FOS_D5D6_WA_05S	-3248.592797	9750.1393	827.415369
FOS_D5D6_WA_06S	-3181.804753	9784.091005	830.803613
FOS_D5D6_WA_07S	-3115.647709	9819.265159	834.099957
FOS_D6D7_WA_01S	-3075.135787	9841.582361	836.088322
FOS_D6D7_WA_02S	-3010.046738	9878.708696	839.233687
FOS_D6D7_WA_03S	-2945.647361	9917.026522	842.284251
FOS_D6D7_WA_04S	-2881.959388	9956.522758	845.239005
FOS_D6D7_WA_05S	-2819.00438	9997.184045	848.096959
FOS_D6D7_WA_06S	-2756.803794	10038.996847	850.857137
FOS_D6D7_WA_07S	-2695.378893	10081.947269	853.518596
FOS_D7D8_WA_01S	-2657.990422	10108.924884	855.106256
FOS_D7D8_WA_02S	-2597.862398	10153.68213	857.606373
FOS_D7D8_WA_03S	-2538.564067	10199.538353	860.005486
FOS_D7D8_WA_04S	-2480.115744	10246.478284	862.302771
FOS_D7D8_WA_05S	-2422.537292	10294.48606	864.497444
FOS_D7D8_WA_06S	-2365.848659	10343.545881	866.58875
FOS_D7D8_WA_07S	-2310.06864	10393.640604	868.576001
FOS_D8D9_WA_01S	-2276.315118	10424.870416	869.743053
FOS_D8D9_WA_02S	-2222.04144	10476.599557	871.560987
FOS_D8D9_WA_03S	-2168.726044	10529.319363	873.273148
FOS_D8D9_WA_04S	-2116.386634	10583.011524	874.878968
FOS_D8D9_WA_05S	-2065.041354	10637.658172	876.377883
FOS_D8D9_WA_06S	-2014.707585	10693.240687	877.76939
FOS_D8D9_WA_07S	-1965.402597	10749.740341	879.053014
FOS_D9D10_WA_01S	-1935.739944	10784.765553	879.785251
FOS_D9D10_WA_02S	-1888.128608	10842.703207	880.894052
FOS_D9D10_WA_03S	-1841.589276	10901.507386	881.893901
FOS_D9D10_WA_04S	-1796.137349	10961.157786	882.784495
FOS_D9D10_WA_05S	-1751.789483	11021.635036	883.565415
FOS_D9D10_WA_06S	-1708.559915	11082.917942	884.236503
FOS_D9D10_WA_07S	-1666.463243	11144.985614	884.797516
FOS_D10D11_WA_01S	-1641.291763	11183.308553	885.086169
FOS_D10D11_WA_02S	-1601.051538	11246.596922	885.469367
FOS_D10D11_WA_03S	-1561.980934	11310.614527	885.742062
FOS_D10D11_WA_04S	-1524.093454	11375.33974	885.904153
FOS_D10D11_WA_05S	-1487.402023	11440.750573	885.955578
FOS_D10D11_WA_06S	-1451.919198	11506.824821	885.896317
FOS_D10D11_WA_07S	-1417.656942	11573.53996	885.726393
FOS_D11D12_WA_01S	-1397.319846	11614.626292	885.568047
FOS_D11D12_WA_02S	-1365.048708	11682.326313	885.219962
FOS_D11D12_WA_03S	-1334.027292	11750.60737	884.761454
FOS_D11D12_WA_04S	-1304.266884	11819.446571	884.192654
FOS_D11D12_WA_05S	-1275.777361	11888.820388	883.513759
FOS_D11D12_WA_06S	-1248.56783	11958.705008	882.72504
FOS_D11D12_WA_07S	-1222.647869	12029.076801	881.826739
FOS_D12D13_WA_01S	-1207.429826	12072.359389	881.223276
FOS_D12D13_WA_02S	-1183.606491	12143.465892	880.149022
FOS_D12D13_WA_03S	-1161.094293	12214.996605	878.96608

WEST FACADE - FOS WORKPOINTS			
Point ID	X	Y	Z
FOS_D12D13_WA_04S	-1139.901412	12286.927369	877.674838
FOS_D12D13_WA_05S	-1120.034268	12359.233525	876.275749
FOS_D12D13_WA_06S	-1101.499947	12431.890602	874.769284
FOS_D12D13_WA_07S	-1084.30454	12504.873865	873.15596
FOS_D13D14_WA_01S	-1074.43014	12549.756179	872.114533
FOS_D13D14_WA_02S	-1059.405958	12623.213177	870.330033
FOS_D13D14_WA_03S	-1045.734921	12696.93137	868.440167
FOS_D13D14_WA_04S	-1033.420485	12770.885588	866.445614
FOS_D13D14_WA_05S	-1022.468616	12845.050847	864.347026
FOS_D13D14_WA_06S	-1012.880756	12919.401809	862.145149
FOS_D13D14_WA_07S	-1004.661313	12993.913362	859.840709
FOS_D14D15_WA_01S	-1000.290053	13039.772385	858.373982
FOS_D14D15_WA_02S	-994.284522	13114.489729	855.905626
FOS_D14D15_WA_03S	-989.65287	13189.30142	853.336833
FOS_D14D15_WA_04S	-986.396359	13264.182103	850.668487
FOS_D14D15_WA_05S	-984.516064	13339.106394	847.901481
FOS_D14D15_WA_06S	-984.012212	13414.048909	845.036773
FOS_D14D15_WA_07S	-984.885052	13488.984278	842.075314
FOS_D15D16_WA_01S	-986.108915	13535.175059	840.201506
FOS_D15D16_WA_02S	-989.206091	13610.045219	837.085776
FOS_D15D16_WA_03S	-993.677158	13684.841936	833.876026
FOS_D15D16_WA_04S	-999.520687	13759.539907	830.573327
FOS_D15D16_WA_05S	-1006.734617	13834.113883	827.178784
FOS_D15D16_WA_06S	-1015.31578	13908.538736	823.69358
FOS_D15D16_WA_07S	-1025.262153	13982.789203	820.118825
FOS_D16FA_WA_01S	-1032.08627	14028.55777	817.866423
FOS_D16FA_WA_02S	-1044.231819	14102.473343	814.149469
FOS_D16FA_WA_03S	-1057.731532	14176.14822	810.34624
FOS_D16FA_WA_04S	-1072.580771	14249.560553	806.458001
FOS_D16FA_WA_05S	-1088.773908	14322.686294	802.486094
FOS_D16FA_WA_06S	-1106.305517	14395.490993	798.43184
FOS_D16FA_WA_07S	-1125.169279	14467.96099	794.296616
FOS_D16FA_WA_08S	-1146.87574	14539.621993	789.991934
FOS_D16FA_WA_09S	-1168.5822	14611.282995	785.687251
FOS_D16FA_WA_10S	-1196.822442	14704.514413	780.086833
FOS_DA_WA_02S	-5590.081237	9268.721406	675.892529
FOS_DA-DB_WA_01S	-5632.871015	9206.419068	671.399611
FOS_DA-DB_WA_02S	-5675.660838	9144.116761	666.773768
FOS_DA-DB_WA_03S	-5718.450749	9081.814514	662.068103
FOS_DA-DB_WA_04S	-5761.240588	9019.512217	657.28274
FOS_DA-DB_WA_05S	-5804.030363	8957.209876	652.417327
FOS_DA-DB_WA_06S	-5846.820144	8894.90754	647.471755
FOS_DA-DB_WA_07S	-5889.609995	8832.605252	642.446205
FOS_DB-DC_WA_01S	-5932.399855	8770.30297	637.340967
FOS_DB-DC_WA_02S	-5975.189657	8708.000647	632.155741
FOS_DB-DC_WA_03S	-6017.979447	8645.698317	626.890265
FOS_DB-DC_WA_04S	-6060.769271	8583.39601	621.544574
FOS_DB-DC_WA_05S	-6103.559154	8521.093744	616.118943
FOS_DB-DC_WA_06S	-6146.348972	8458.791433	610.613352
FOS_DC_WA_01S	-6189.138803	8396.489131	604.911644
FOS_DC_WA_02S	-6231.928635	8334.186829	599.209937
FOS_DC_WA_03S	-6313.019497	8216.119406	588.404783





NORTH TERMINAL
LOUIS ARMSTRONG
NEW ORLEANS
INTERNATIONAL
AIRPORT

CITY OF NEW ORLEANS
THE NEW ORLEANS AVIATION BOARD

CRESCENT CITY
AVIATION TEAM
LEO A DALY / ATKINS
1 GALLERIA BOULEVARD #1516
METAIRIE, LA 70001
T (504) 303.7535 / F (504) 841.2229

WALTER P MOORE
WALTER P. MOORE AND ASSOCIATES, INC.
11600 WEST OLYMPIC BOULEVARD, SUITE 700
LOS ANGELES, CALIFORNIA 90064.1059
PHONE: 310.254.1900 FAX: 310.254.1940

KEY PLAN

REVISIONS

NO.	DESCRIPTION	DATE

FILE LOG

PRELIMINARY - NOT FOR CONSTRUCTION

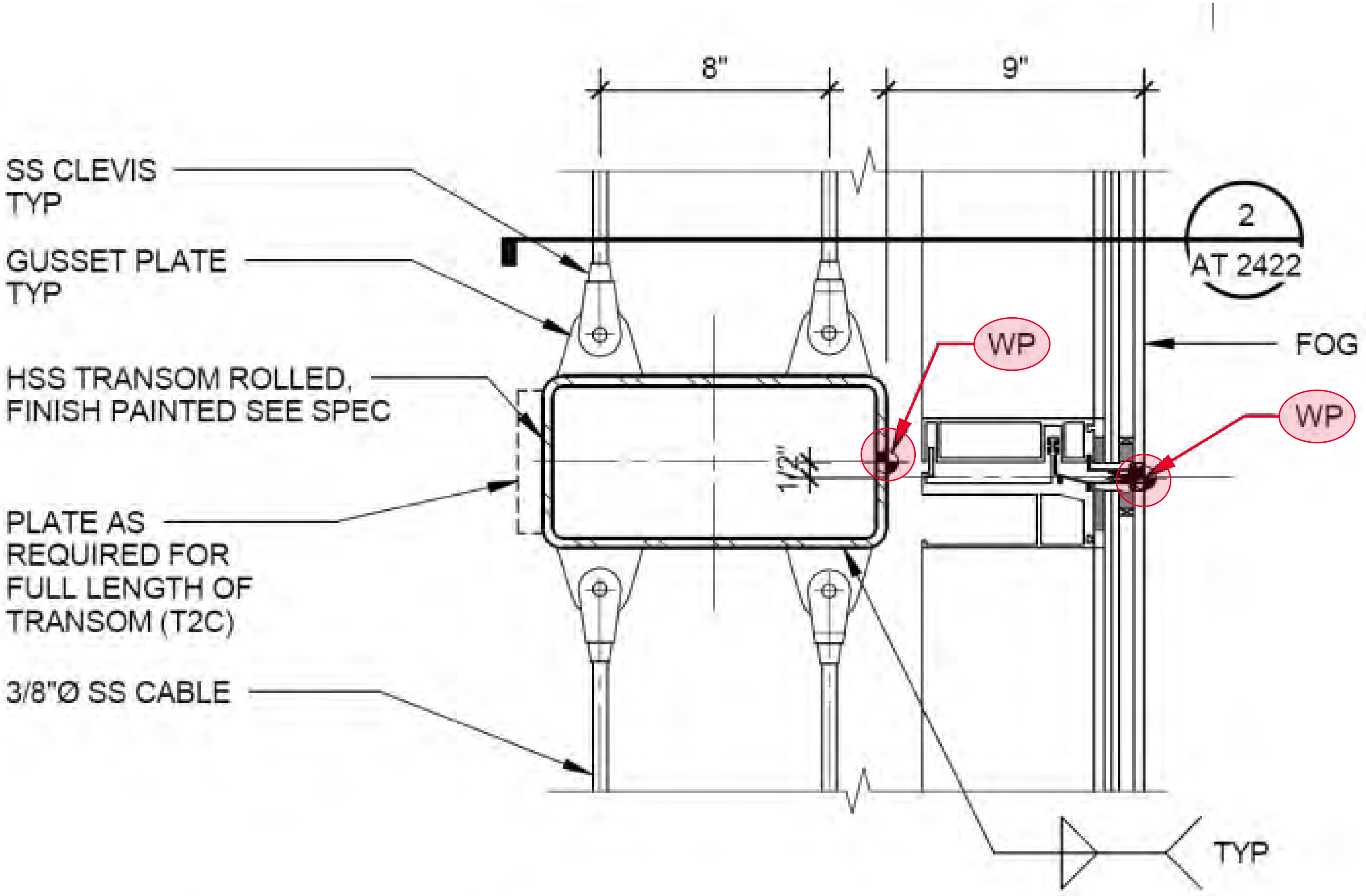
SCALE: 3/8" = 1'-0"

95% CONSTRUCTION DOCUMENTS
PROJECT NO. 051-10250-000
03-13-2015

GEOMETRY WORKPOINTS_WEST
WORKPOINTS SCHEDULE T

VOLUME 3.2

NT AT 2580

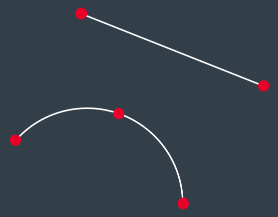


1

SECTION OF TYPICAL HANGER AND TRANSOM CONNECTION

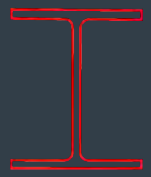
1 1/2" = 1'-0"

2D: Lines and Arcs



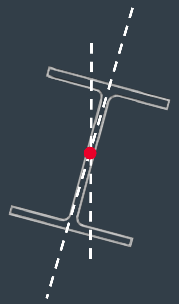
2-3 points

+



shape

+



orientation

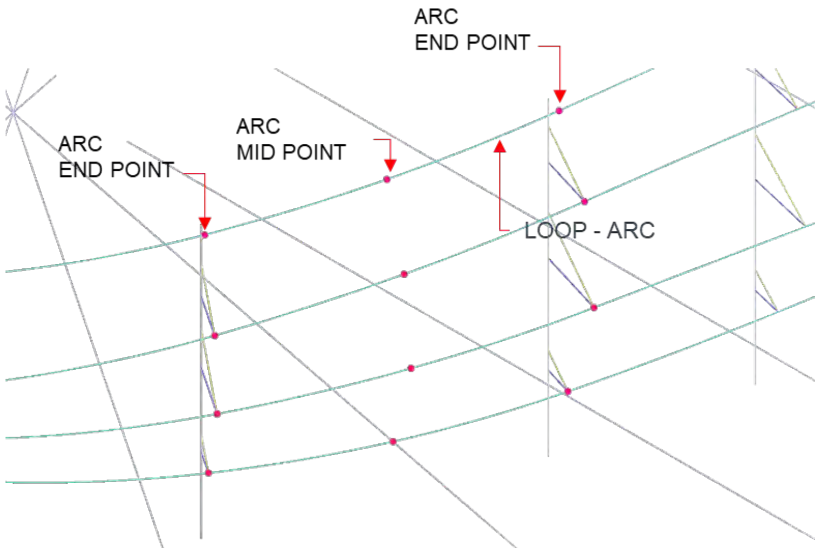
+

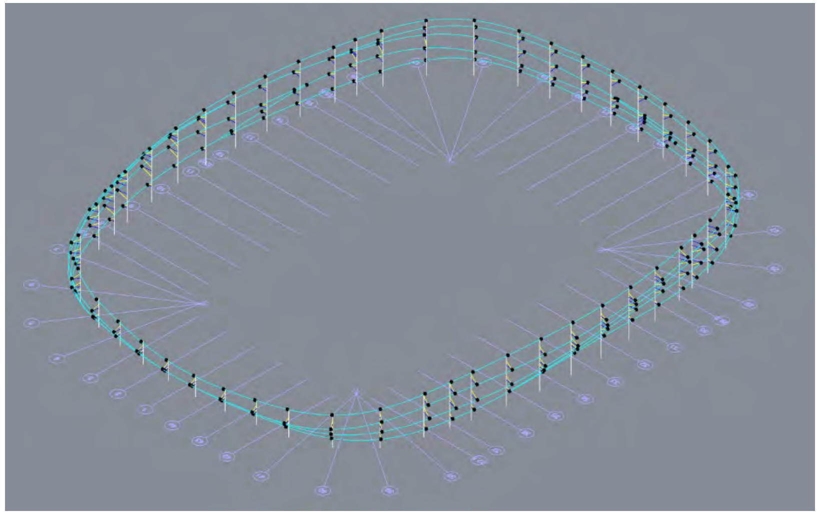
unique identifier
structural data
materials
finishes
software-specific data

data

2D: Lines and Arcs

1. Generate structural **wireframe** in Rhino

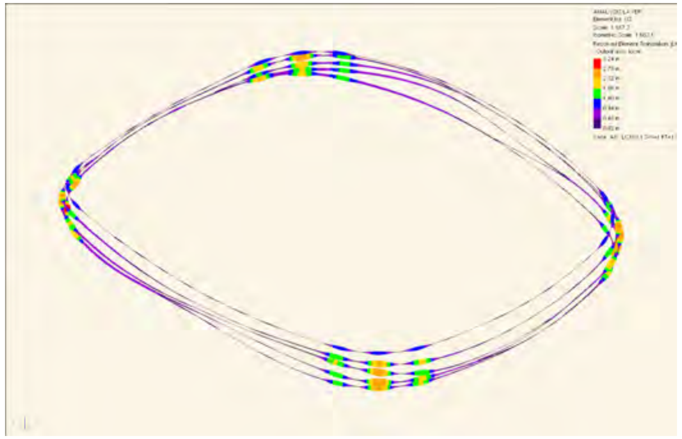


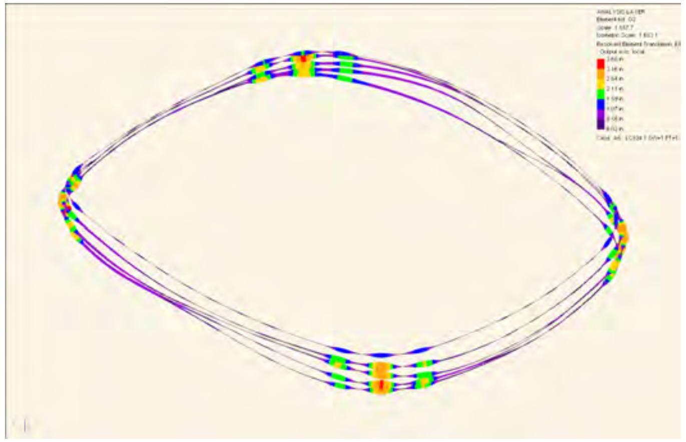


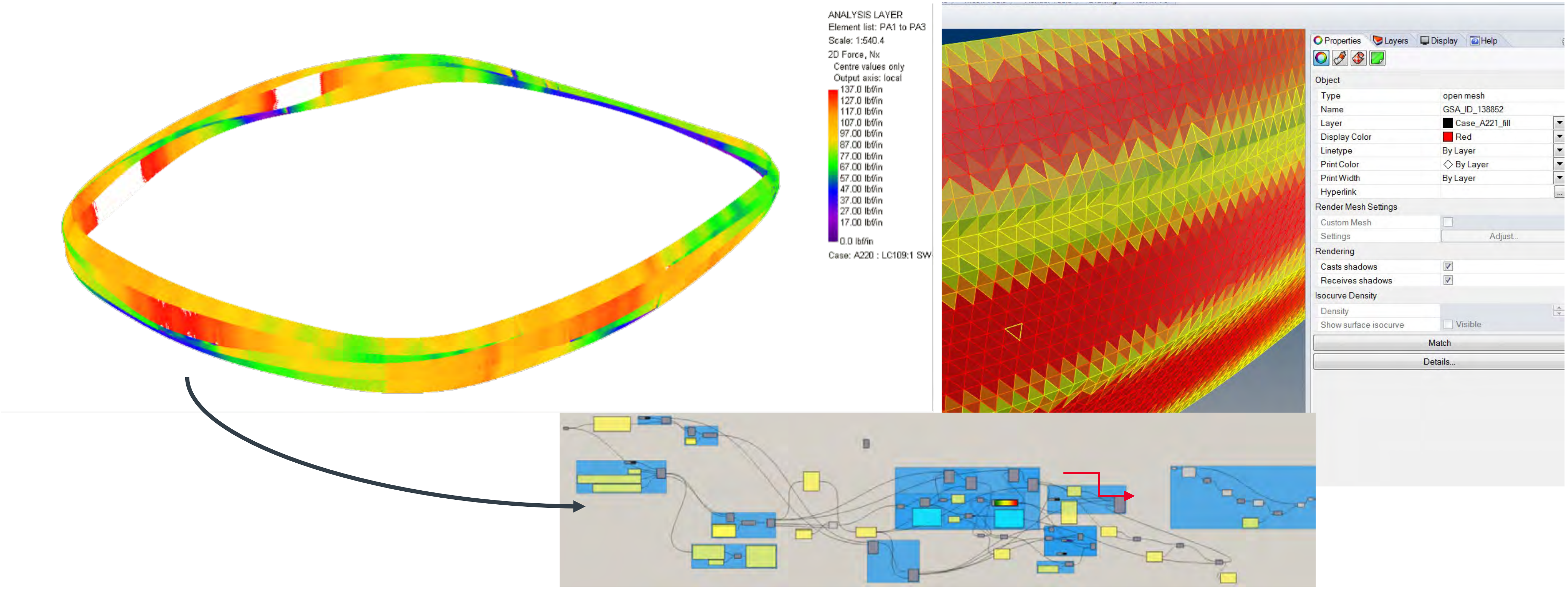
2D: Lines and Arcs

1. Generate structural **wireframe** in Rhino

2. Analyze wireframe in structural analysis software, add member **shapes**, **orientations**, and other **structural data**



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2D Force, Nx
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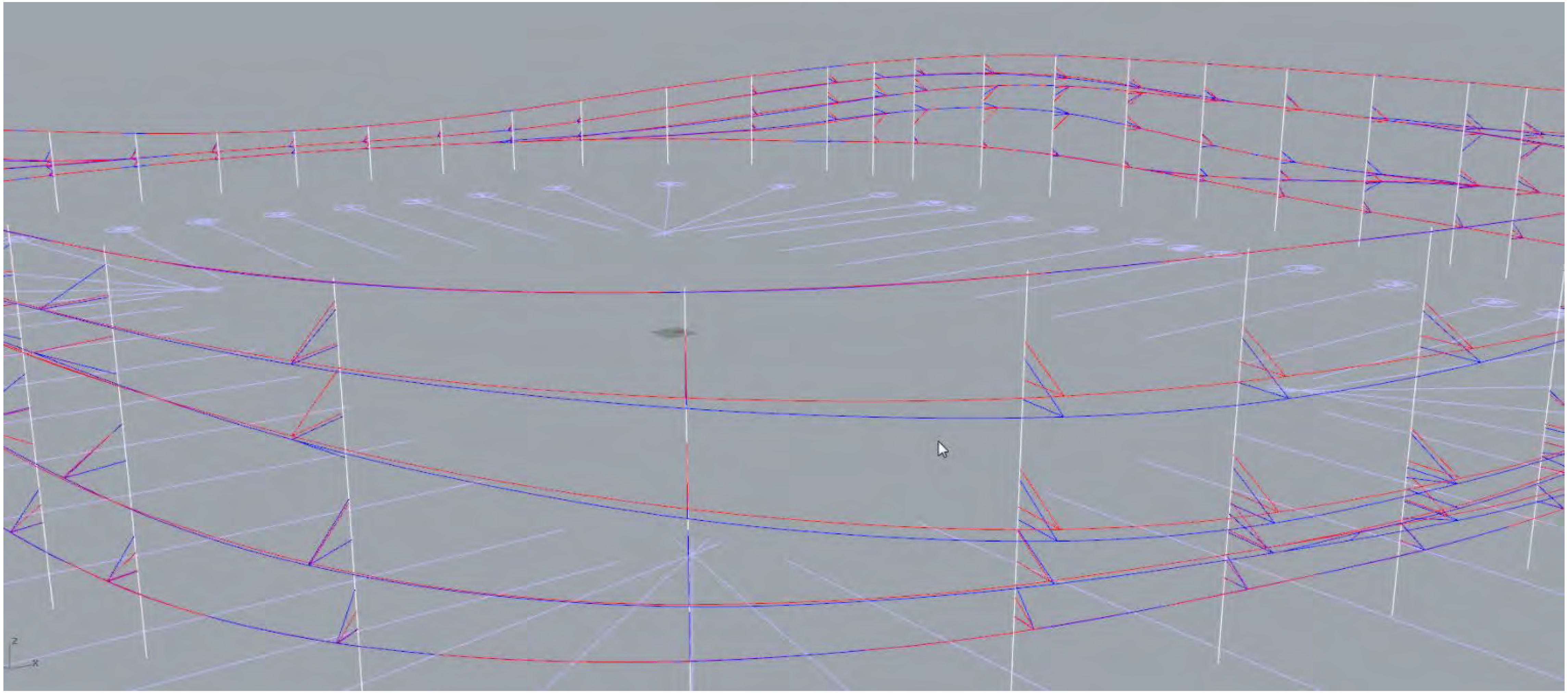
27.00 lbf/in
17.00 lbf/in
0.0 lbf/in
Case: A220 : LC109:1 SW
Properties
Layers
Display
Help
Object
Type
open mesh
Name
GSA_ID_138852
Layer
Case_A221_fill
Display Color
Red
Linetype
By Layer
Print Color
By Layer
Print Width
By Layer
Hyperlink
Render Mesh Settings
Custom Mesh
Settings
Adjust...
Rendering
Casts shadows
Receives shadows
Isocurve Density
Density
Show surface isocurve
Visible
Match
Details...

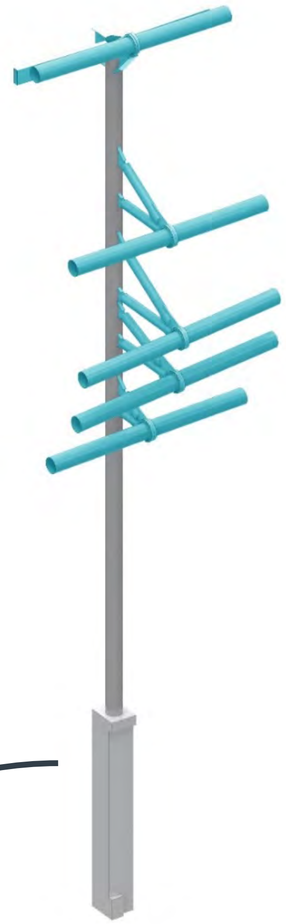


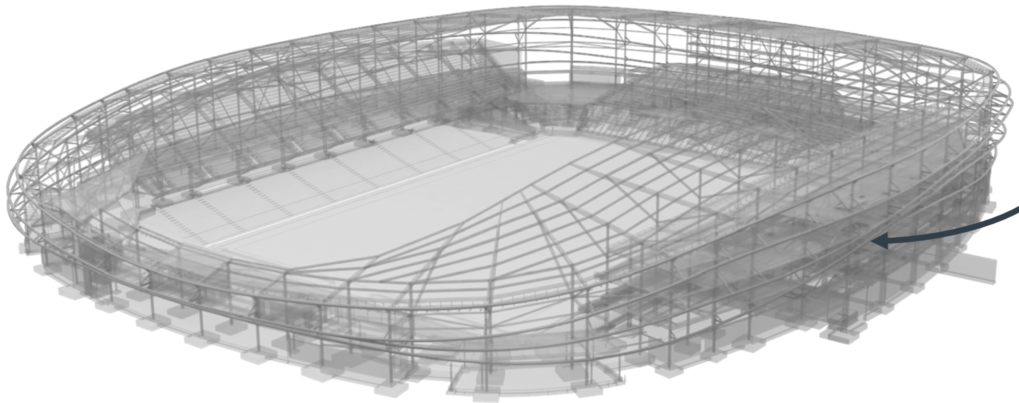
2D: Lines and Arcs

1. Generate structural **wireframe** in Rhino

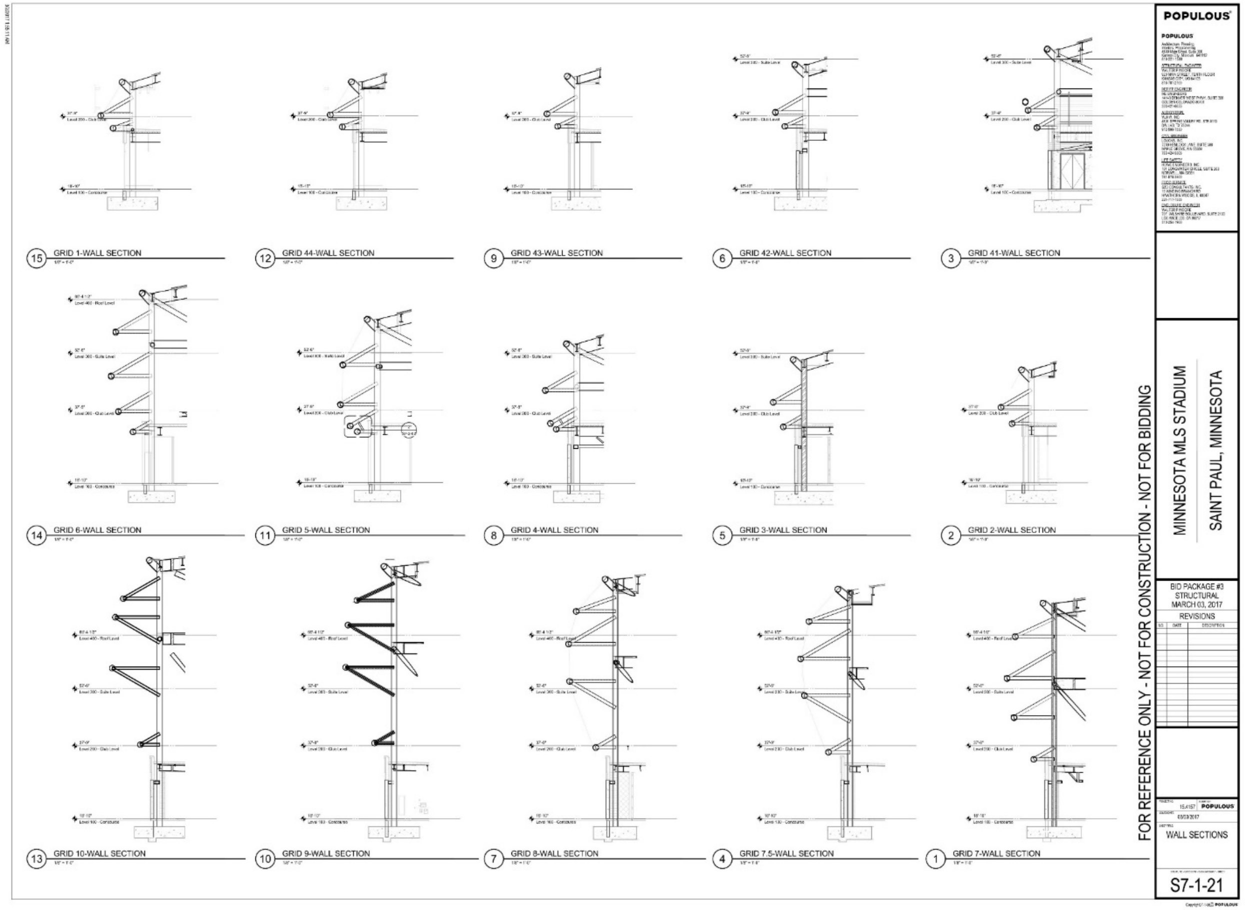
2. Analyze wireframe in structural analysis software, add member **shapes**, **sizes**, **orientations**, and other **structural data**

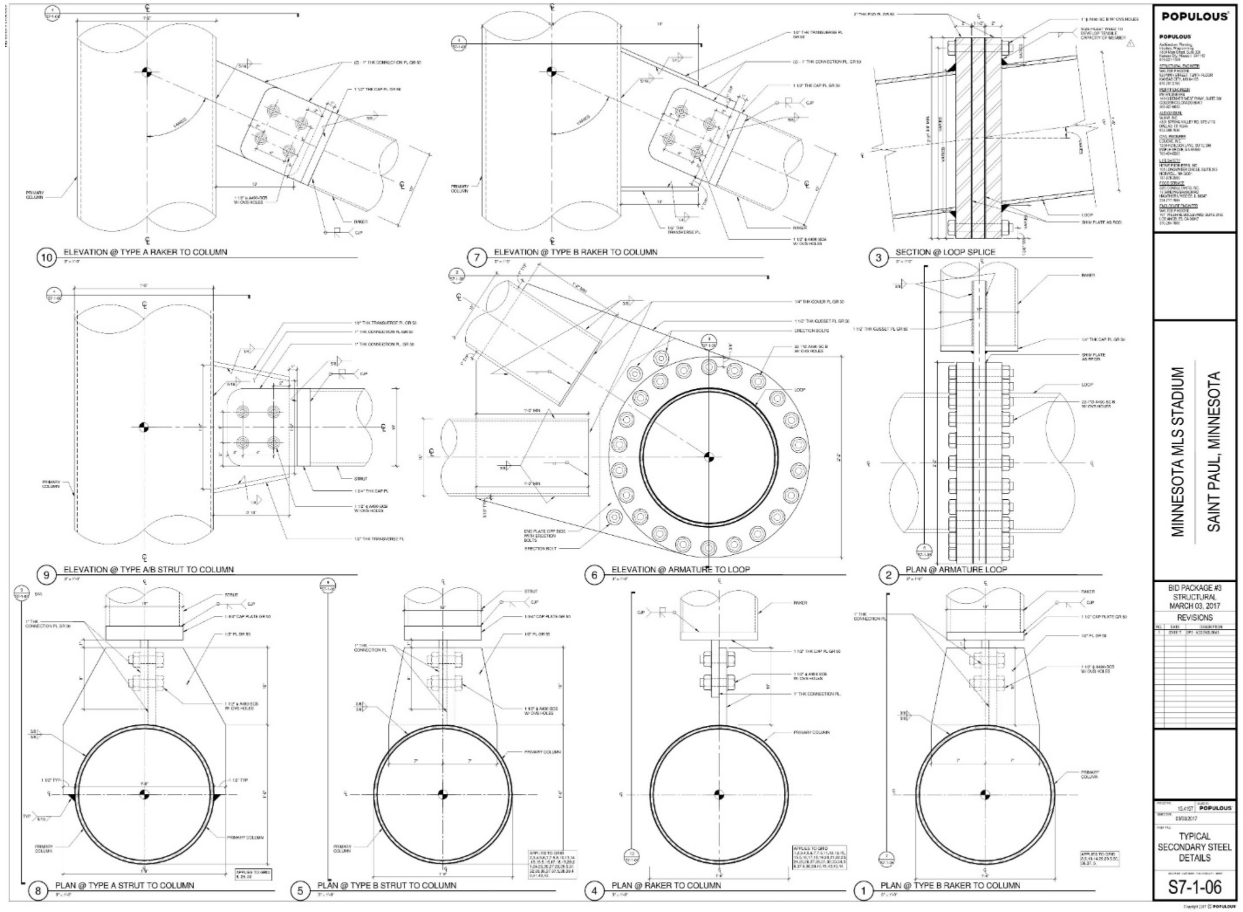
3. **Coordinate** and **Document** in Revit





- Tectonics Seattle 2019





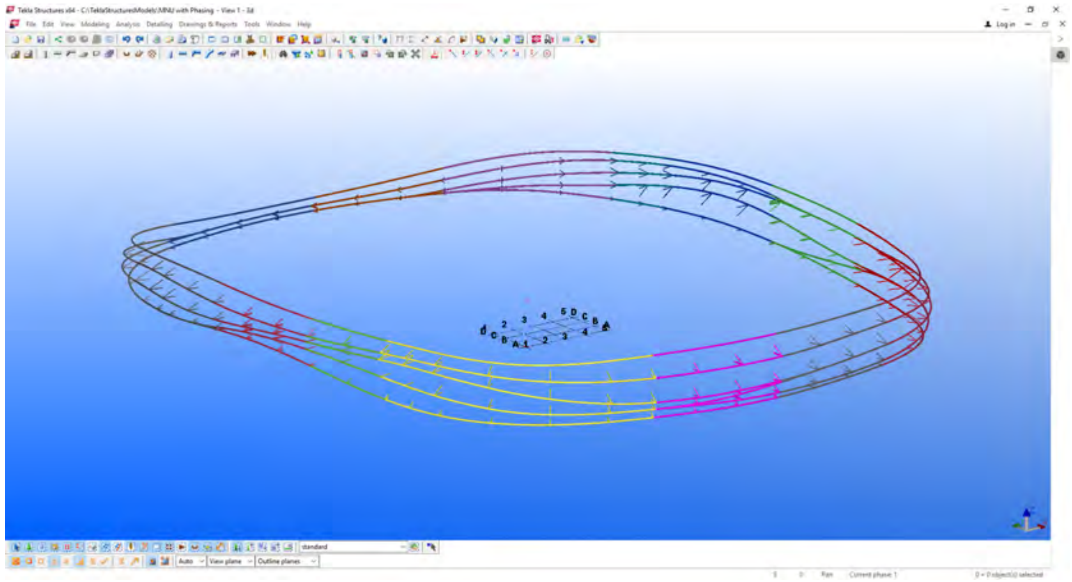
2D: Lines and Arcs

1. Generate structural **wireframe** in Rhino

2. Analyze wireframe in structural analysis software, add member **shapes**, **sizes**, **orientations**, and other **structural data**

3. **Coordinate** with surrounding building elements in Revit

4. Generate Tekla model for **Fabrication**

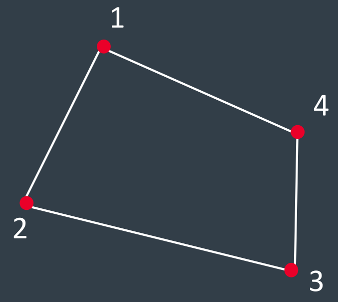


2D: Lines and Arcs

1. Generate structural **wireframe** in Rhino
2. Analyze wireframe in structural analysis software, add member **shapes**, **sizes**, **orientations**, and other **structural data**
3. **Coordinate** with surrounding building elements in Revit
4. Generate Tekla model for **Fabrication**
5. **Verify** locations of members on site


Allianz Field

3D: Simple Surfaces



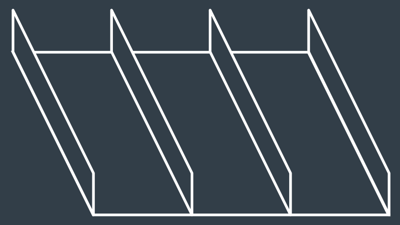
3-4 ordered points

+

NOLA_PNL_003_GLZ_S04

type data

+



component models

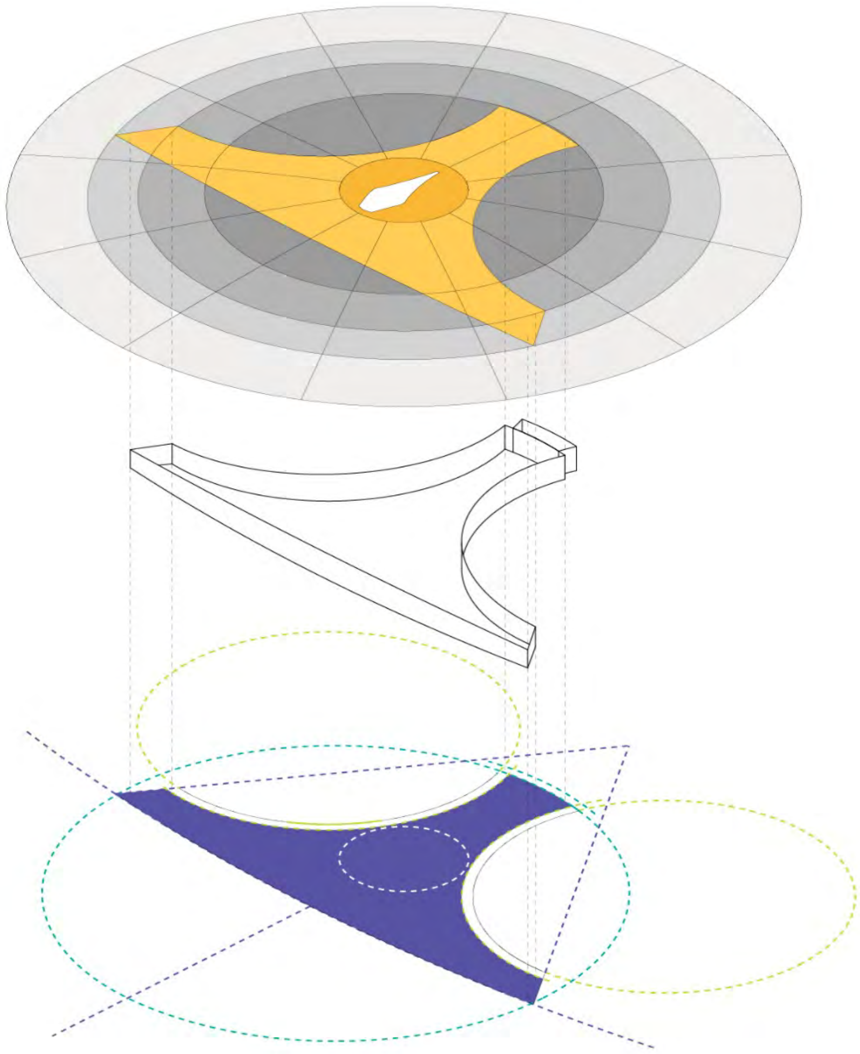
+

unique identifier
structural data
materials
finishes
software-specific data

data

3D: Simple Surfaces

1. Generate **driver surfaces** and **grids** in Rhino



Spherical Roof

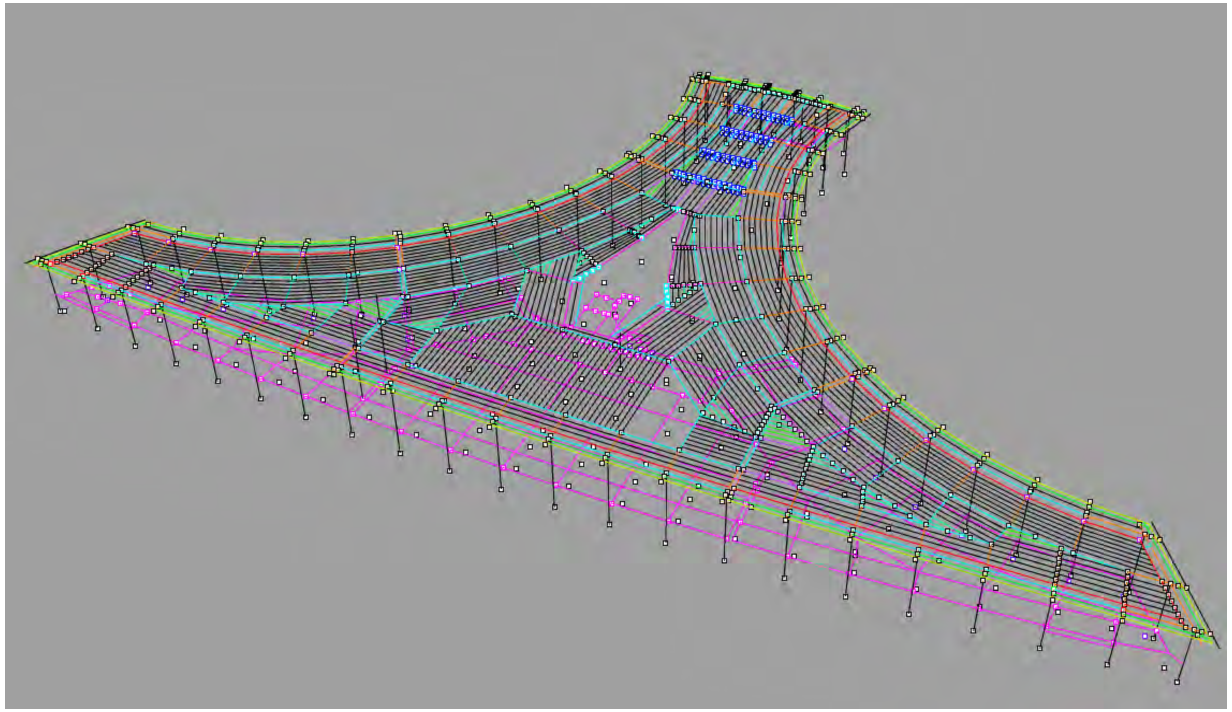
Vertical Facades

Radial Grids

3D: Simple Surfaces

1. Generate **driver surfaces** and **grids** in Rhino

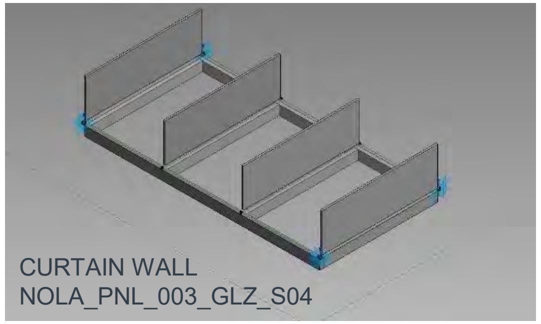
2. Use driver geometry to generate **workpoints** for locating panel elements

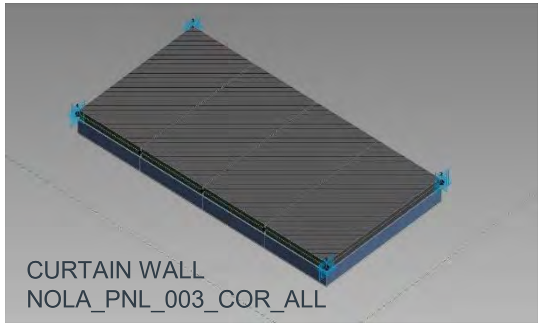


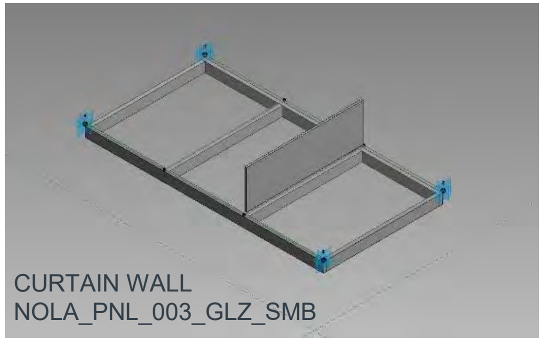
3D: Simple Surfaces

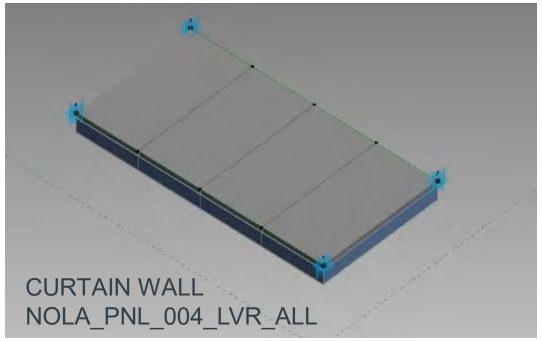
1. Generate **driver surfaces** and **grids** in Rhino
2. Use driver geometry to generate **workpoints** for locating panel elements
3. Generate **adaptive components** for each panel type

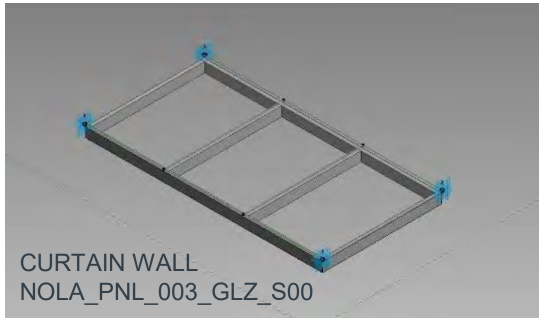
Panels Types – Adaptive Components

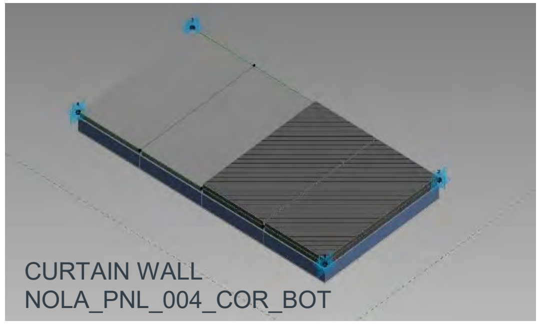












3D: Simple Surfaces

1. Generate **driver surfaces** and **grids** in Rhino

2. Use driver geometry to generate **workpoints** for locating panel elements

3. Generate **adaptive components** for each panel type

4. Use workpoint and panel type data to **instantiate** panels in Revit

3D: Simple Surfaces

1. Generate **driver surfaces** and **grids** in Rhino

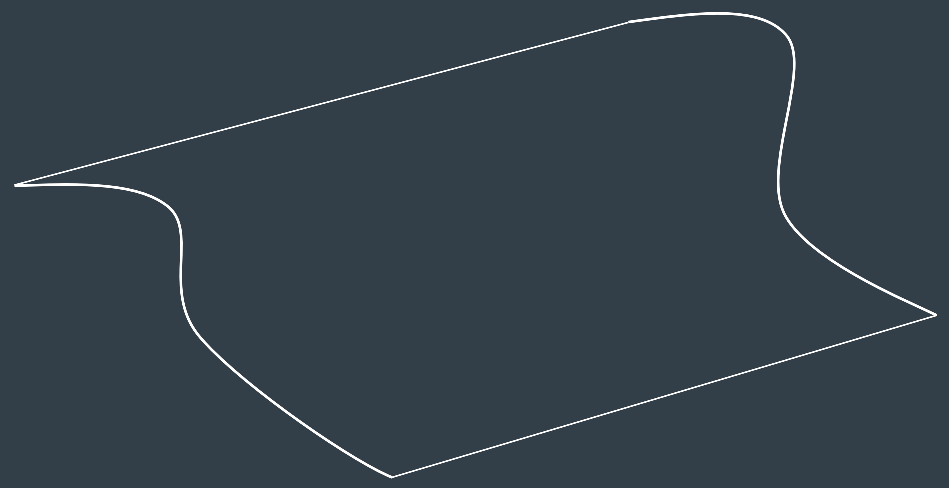
2. Use driver geometry to generate **workpoints** for locating panel elements

3. Generate **adaptive components** for each panel type

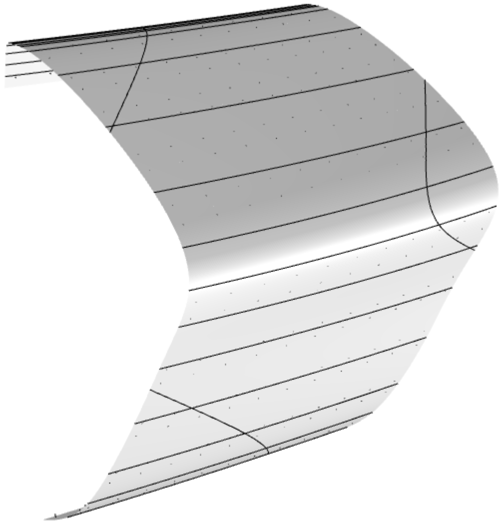
4. Use workpoint and panel type data to **instantiate** panels in Revit

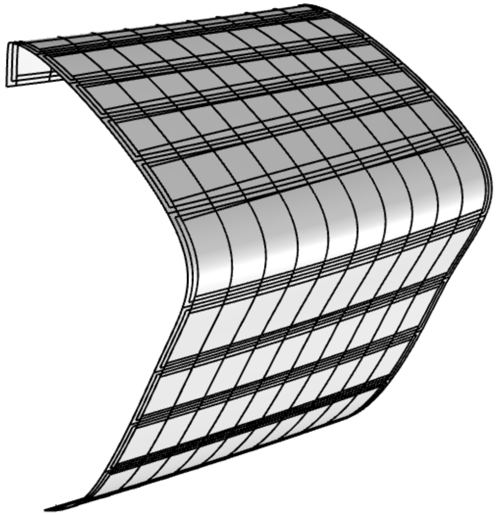
5. Use workpoints to **verify** location of panels on site

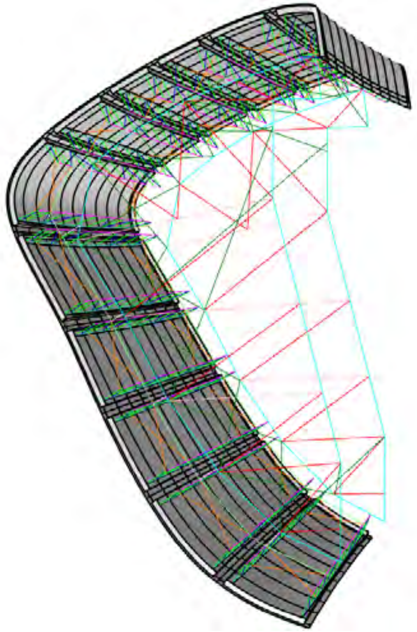
3D: Complex Curved Surfaces

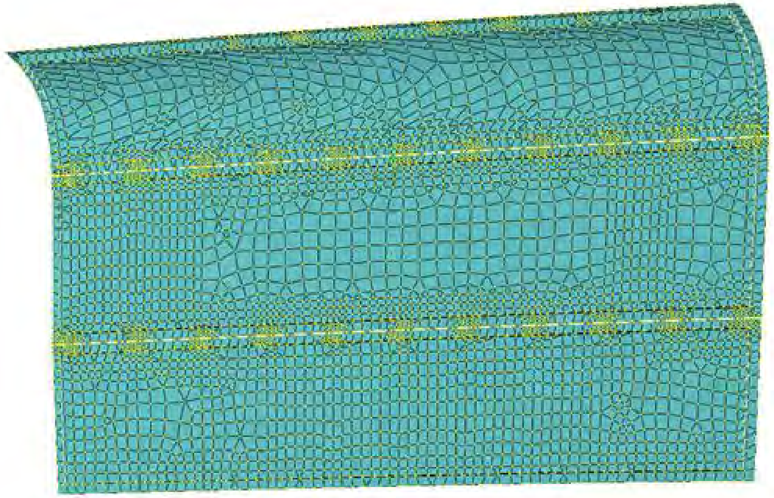


3D: Complex Curved Surfaces



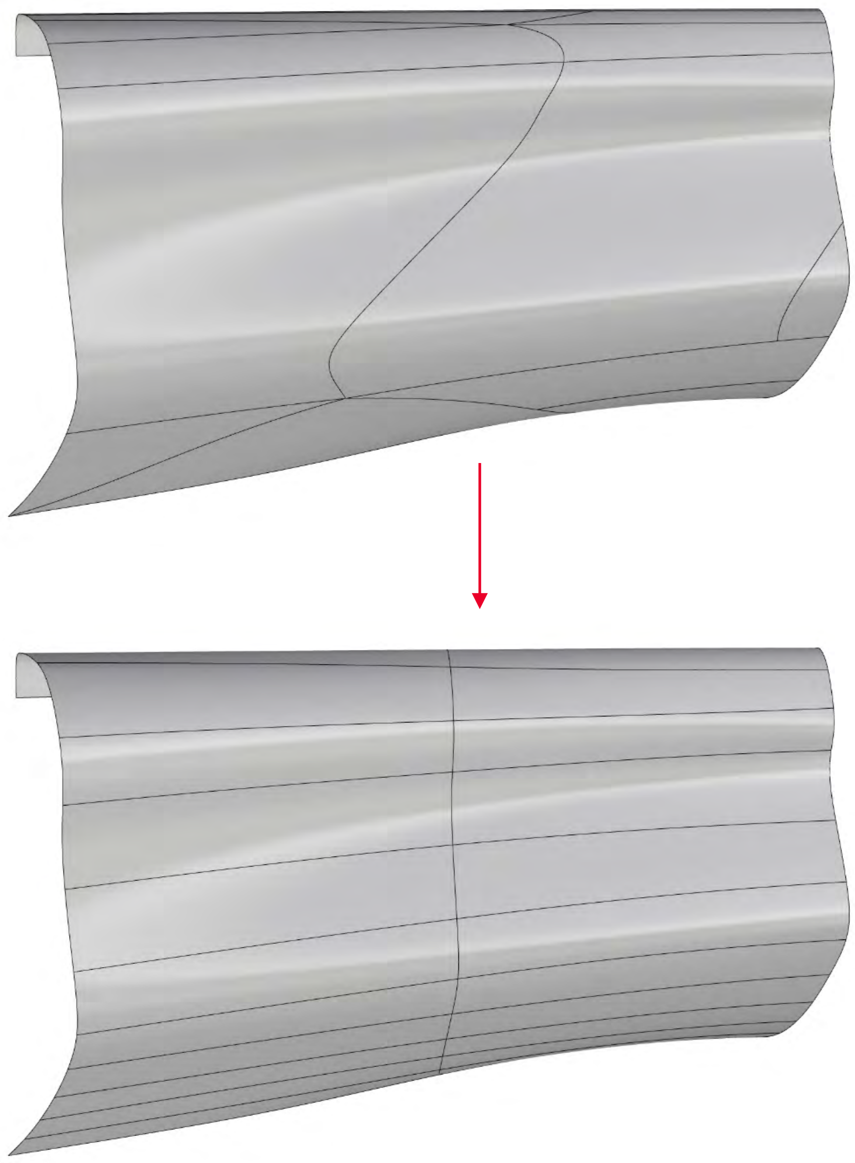






3D: Complex Curved Surfaces

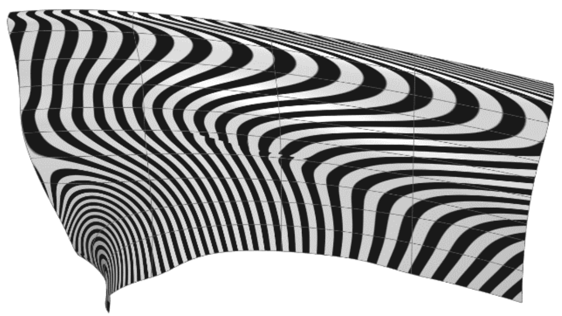
1. **Panelization** of design surface in Rhino

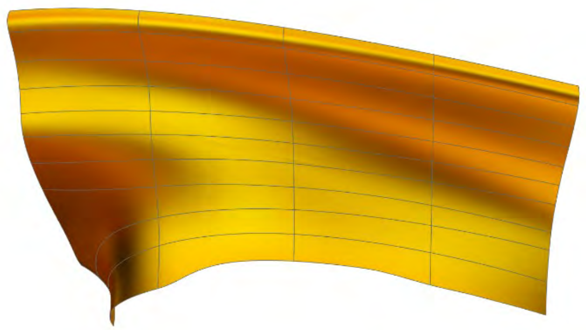


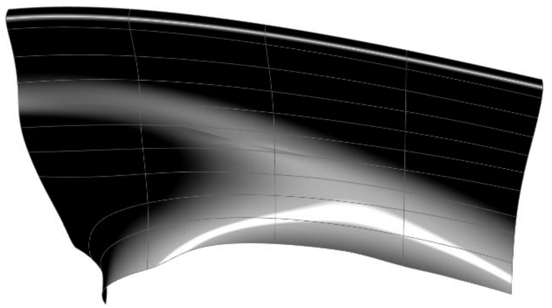
3D: Complex Curved Surfaces

1. **Panelization** of design surface in Rhino

2. **Surface analysis** in Rhino

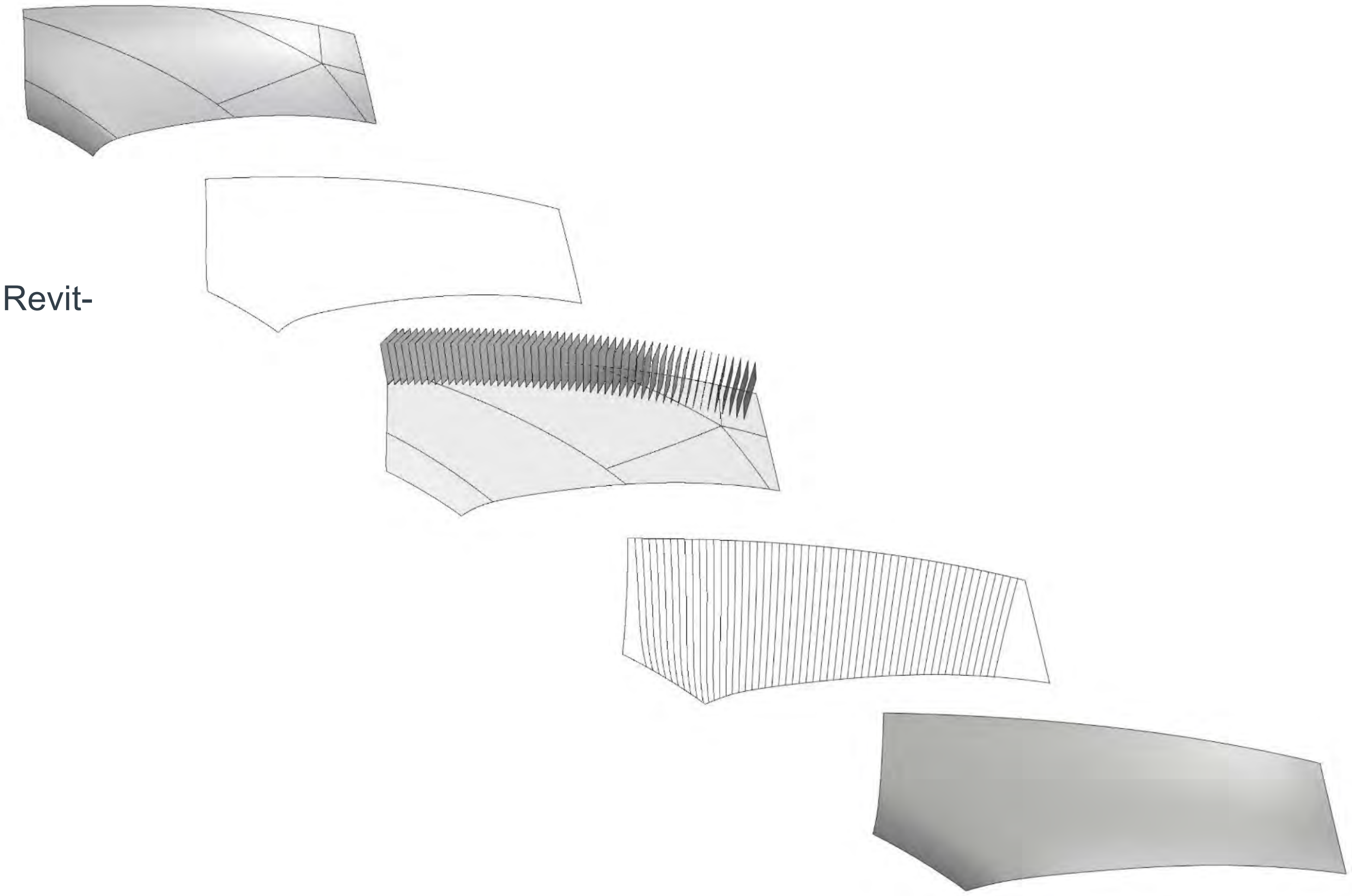






3D: Complex Curved Surfaces

1. **Panelization** of design surface in Rhino
2. **Surface analysis** in Rhino
3. **Clean up** and **rebuild** panels in Rhino to create Revit-friendly surfaces



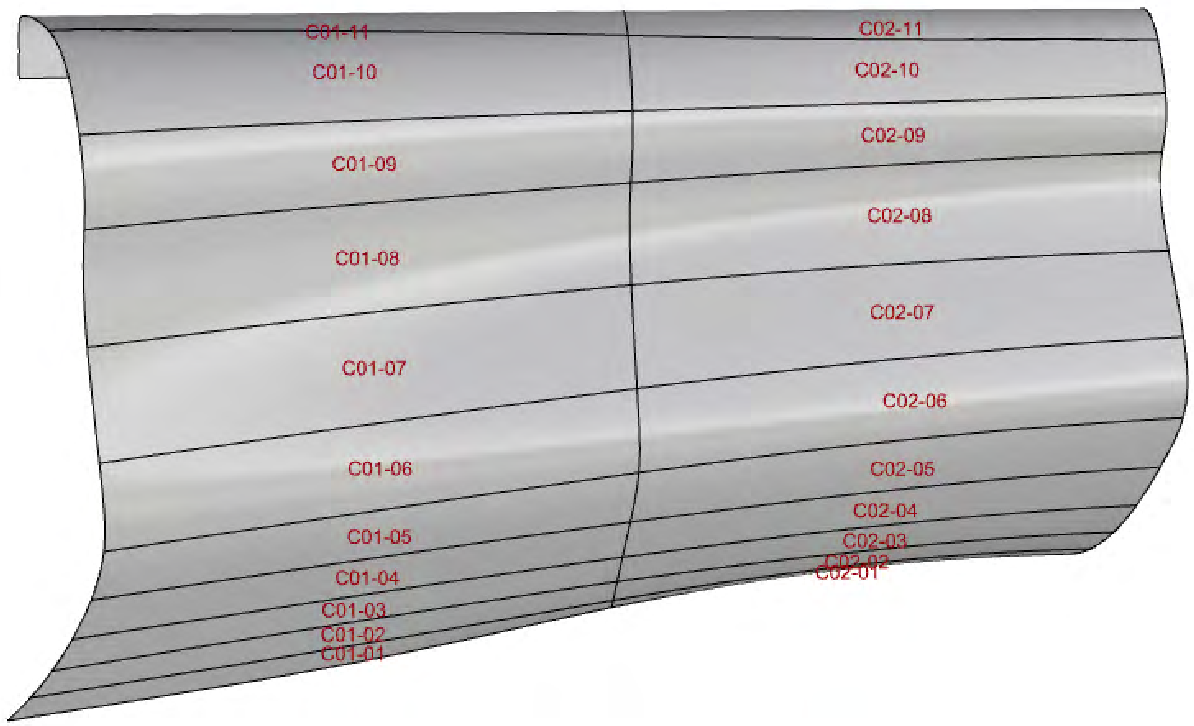
3D: Complex Curved Surfaces

1. **Panelization** of design surface in Rhino

2. **Surface analysis** in Rhino

3. **Clean up** and **rebuild** panels in Rhino to create Rev friendly surfaces

4. **Index** panels in Rhino



3D: Complex Curved Surfaces

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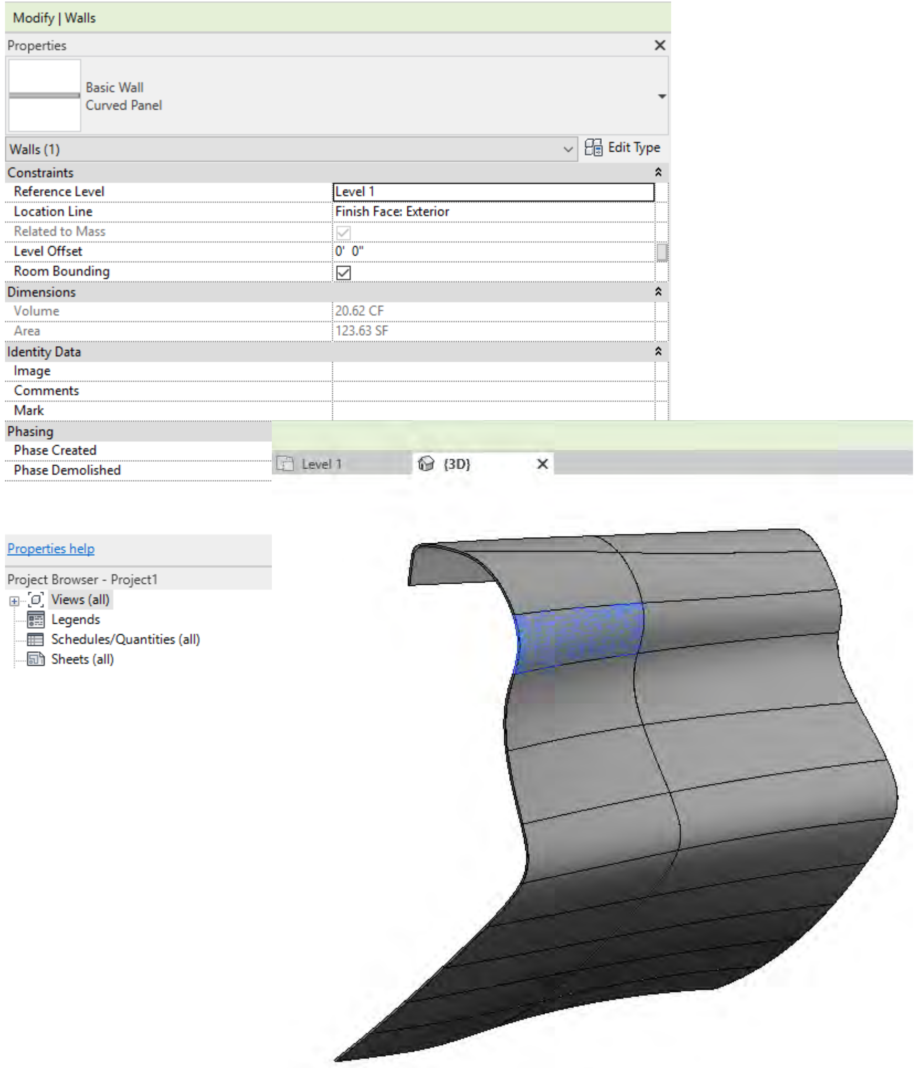
2. **Surface analysis** in Rhino

3. **Clean up** and **rebuild** panels in Rhino to create Revit-friendly surfaces

4. **Index** panels in Rhino

5. Import panel model to Revit as a **mass family**, build panels as **wall by face** geometry



3D: Complex Curved Surfaces

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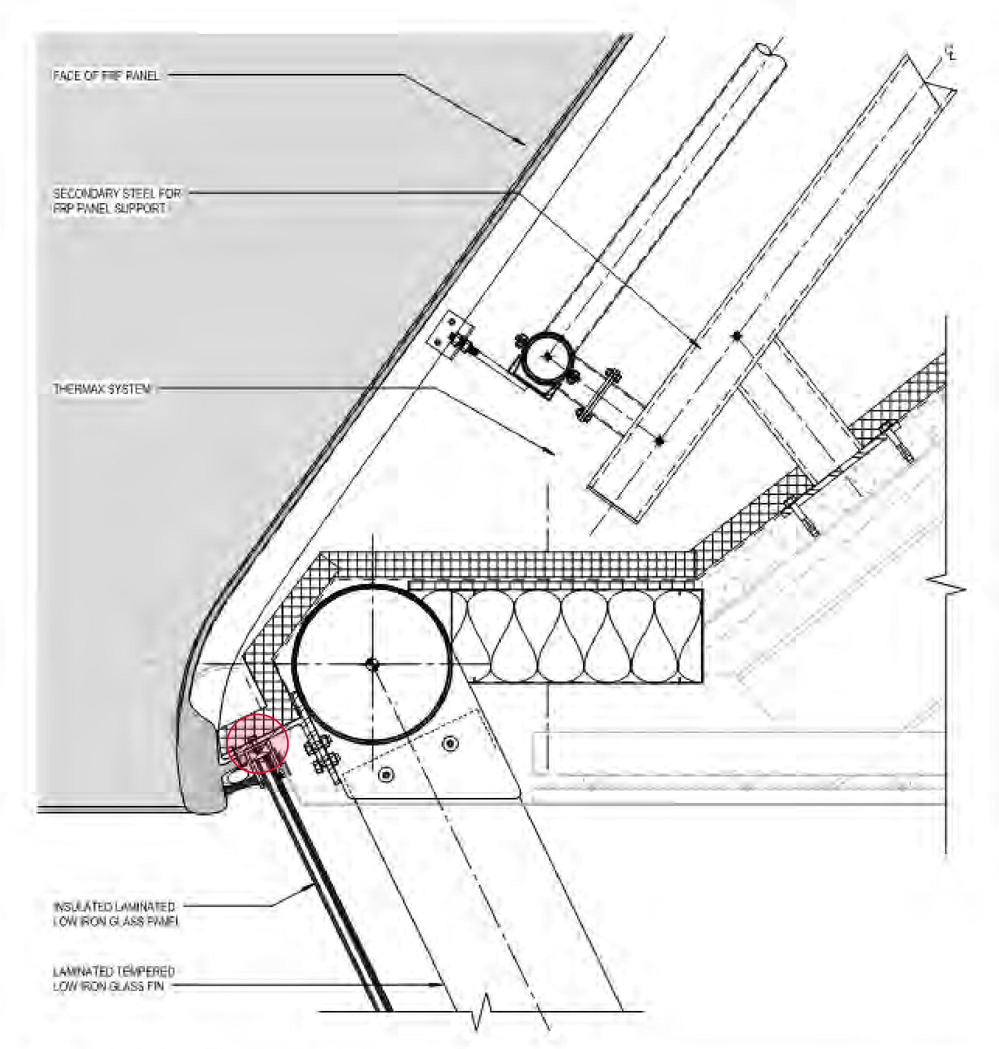
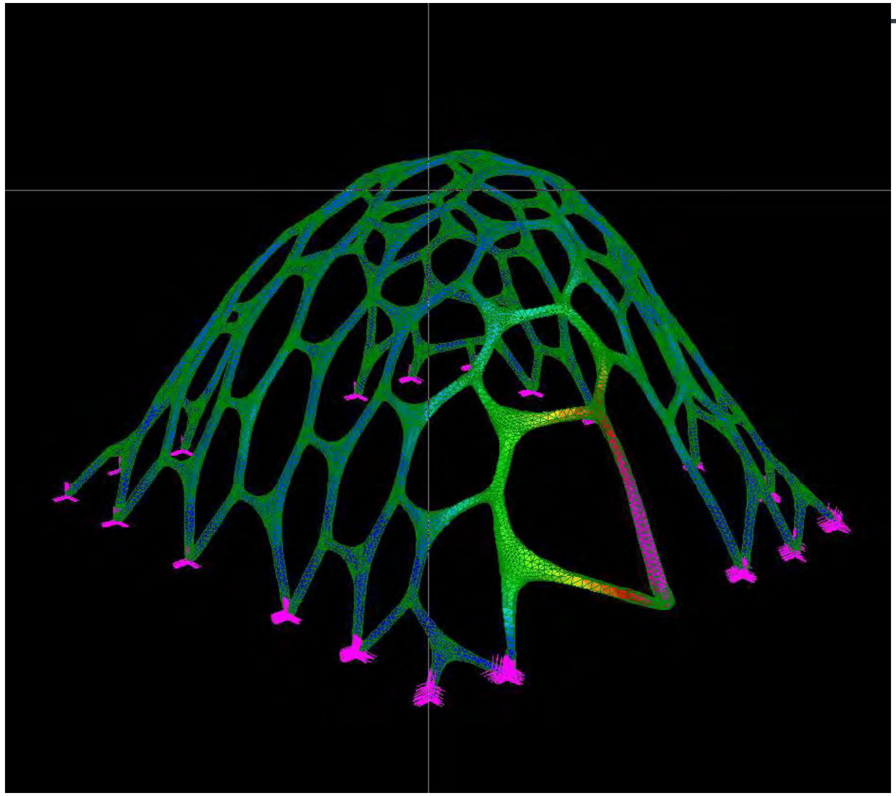
5. Import panel model to Revit as a **mass family**, build panels as **wall by face** geometry

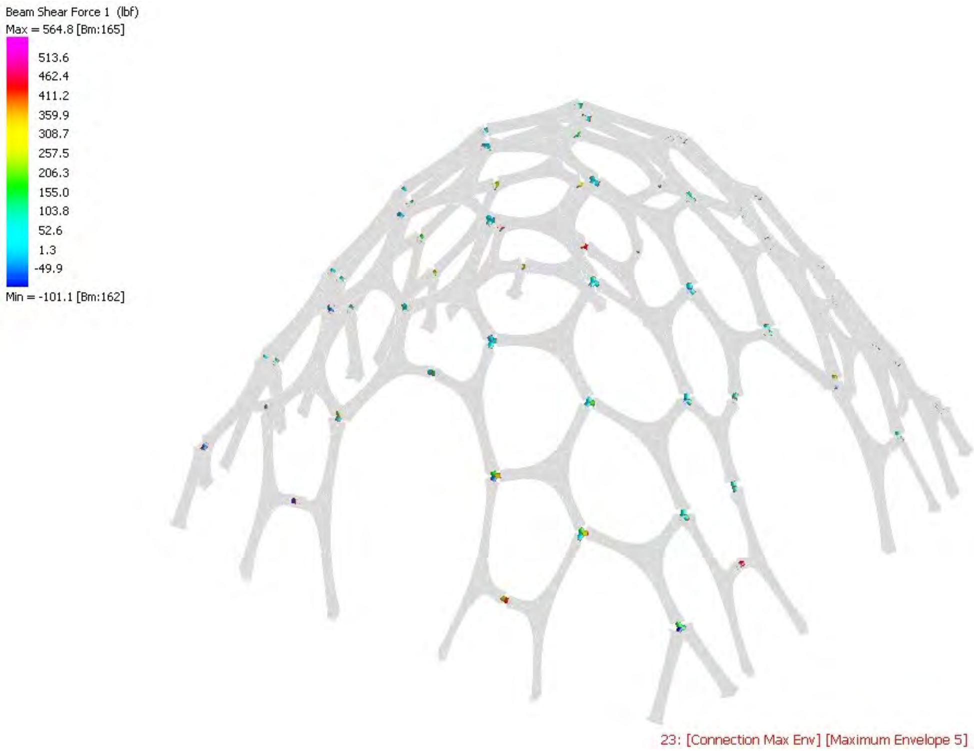
6. **Document** and **Coordinate** in Revit

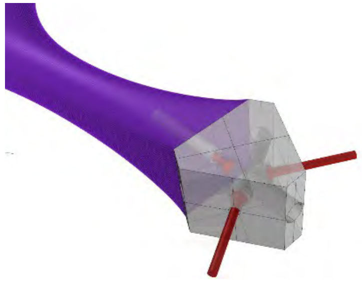


6 ATRIUM GLAZING WALL SECTION
1 1/2" = 1'-0"

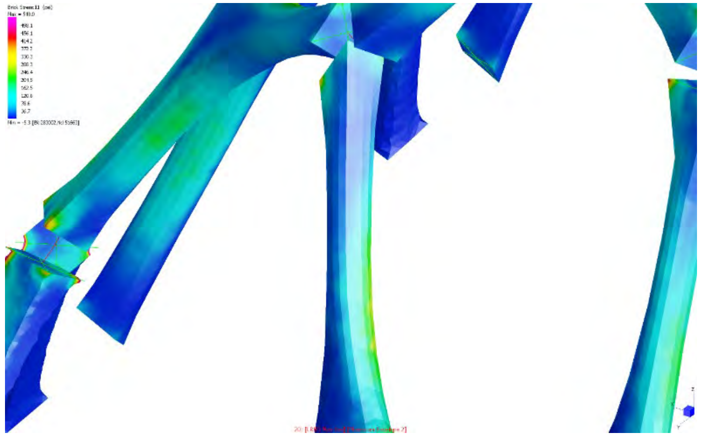
Industry Impact I S, M, L, XL







	Required Tensile Stress (psi)	ϕTn, Tensile Stress Capacity (psi)	Demand/Capacity Ratio	Required Compressive Stress (psi)	ϕPn, Compressive Stress Capacity (psi)	Demand/ Capacity Ratio
General Member (Global)	450 psi	540 psi	83%	1000 psi	8100 psi	**12%**



Emerging trends

- Collaborative Team of Teams
- Delivery Informed Process
- High quality models for a fluid design process across the whole design team (no need for rebuilding)
- Proprietary vs. Open
- Specialist Niche vs. Usable by Everyone
- Empower users and design teams to build their own tools
- Change the world

Thank You.

Sanjeev Tankha, AIA
Director I Walter P Moore Enclosure Practice

SAN FRANCISCO CONSERVATORY OF MUSIC

MARK CAVAGNERO ASSOCIATES

SAN FRANCISCO CONSERVATORY OF MUSIC

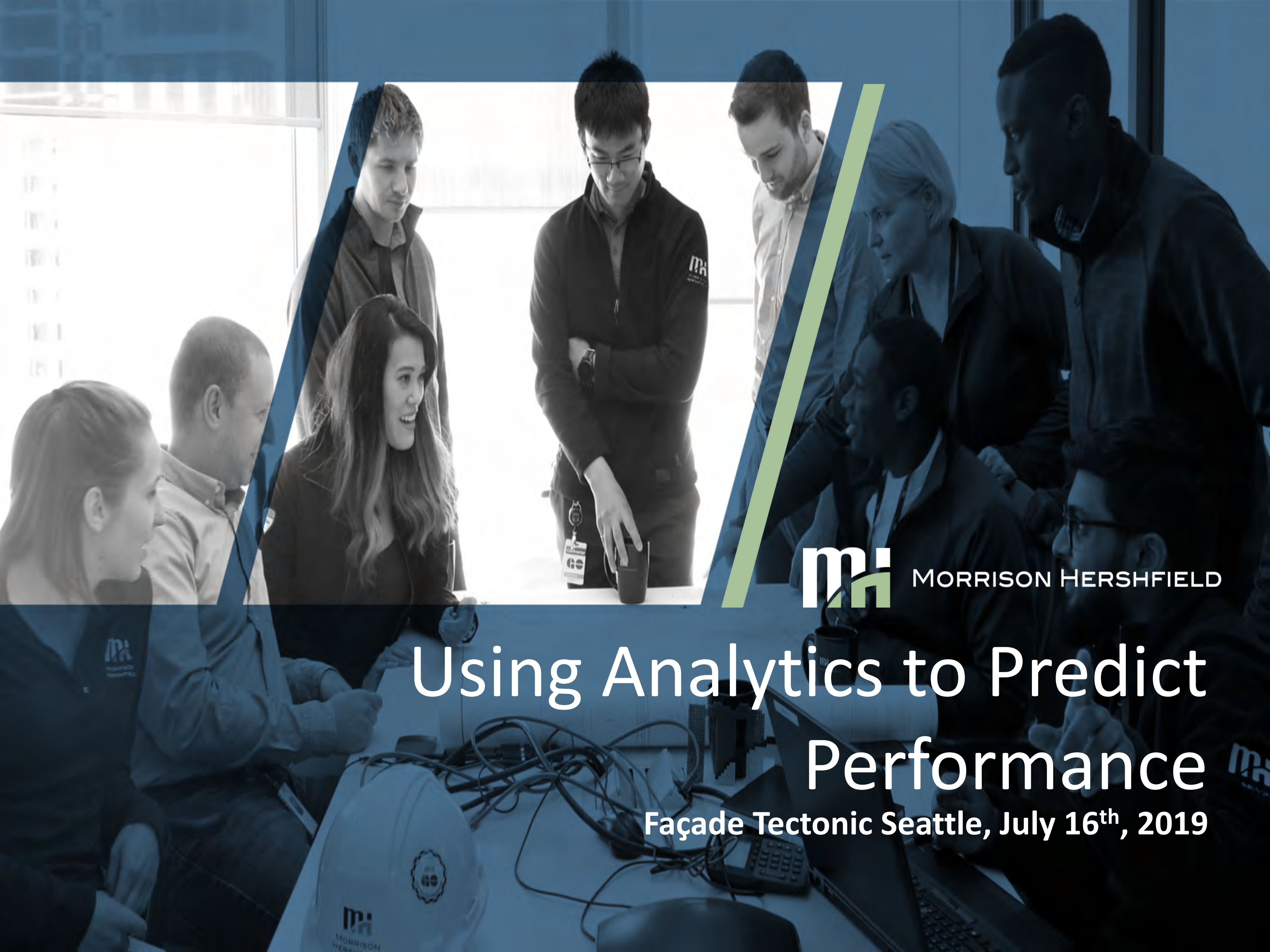
MARK CAVAGNERO ASSOCIATES

Façade Performance

- **TRANSPARENCY**
- Solar / Thermal control
- **ACOUSTIC** (fronts onto Hwy 101)
- Accessible / Maintainable
- **MAXIMIZE SEATING**
- Water-proof /-management
- Quick Transport + Installation
  (tight + restricted schedule)
- Risk/Continuity (back-up system)
- Loads (seismic movement) …

➢ **Unitized narrow-cavity system**

- Resolve acoustic control with unitized movement and drainage requirements
- Resolve access for cleaning (can be infrequent)
- Provide desiccant - capacity for 1-2years min before re-charge
  - ➢ **MH analysis**



Morrison Hershfield

Using Analytics to Predict Performance

Façade Tectonic Seattle, July 16th, 2019

Managing Uncertainty

Ideal –

statistical analysis where the probability of failure, loads and design parameters are stochastic variables, similar to limit state design for structural engineering

Gut Feeling and Experience –

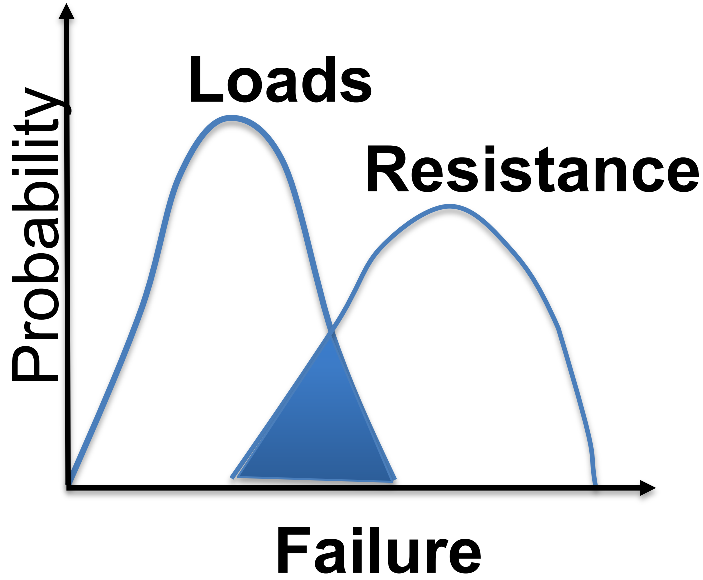
relying on your trusted advisor with grey hair to keep you out of trouble and to provide good advice based on what has and hasn't worked in the past

Managing Uncertainty

Ideal –

statistical analysis where the probability of failure, loads and design parameters are stochastic variables, similar to limit state design for structural engineering

Practical ?



Sufficient information is rarely available

Managing Uncertainty

Memory like an Elephant

Take the risk?

Gut Feeling and Experience –

relying on your trusted advisor with grey hair to keep you out of trouble and to provide good advice based on what has and hasn't worked in the past

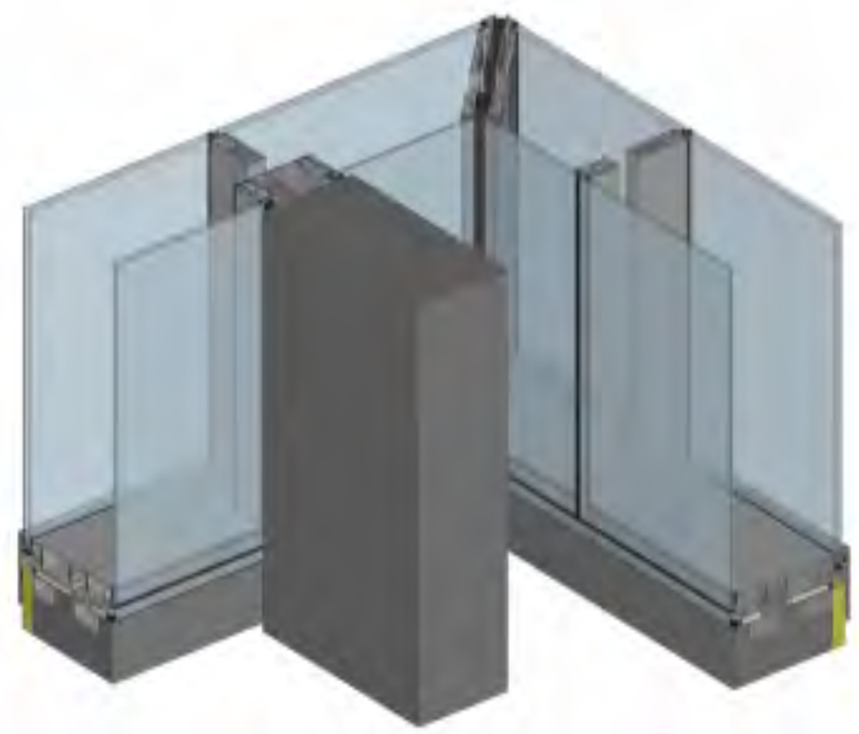
Finding Balance

Informed Design Decisions

- Best available information
- Professional judgement
- Assumptions that closely parallel reality
- Not too stringent or optimistic
- Experience

Case Study

- Sealed double skinned curtain wall proposed for an assembly occupancy in West Coast climate
- Double glazed with exterior IGU and interior IGU
- Exterior IGU with horizontally captured with thermal breaks and verticals structurally sealed
- Interior single light of glass four sided structurally glazed
- Concerns about potential for interstitial condensation during winter months



Outline of Performance Analysis

- Undertake 3D thermal simulations to assess thermal performance and determine condensation potential of key surfaces
- Determine required volume of desiccant to mitigate condensation risk based on air exchange and condensation potential
- Perform energy simulation to assess the impact on condensation risk of ventilating the curtain wall cavity with building HVAC system
- Revisit required volume of desiccant to mitigate condensation
- *Revisit energy simulation to assess the impact on condensation risk of ventilating the curtain wall cavity with dedicated HVAC system*
- *Perform Computational Fluid Dynamic simulations to assess impact of air flow on surface temperatures and condensation risk*

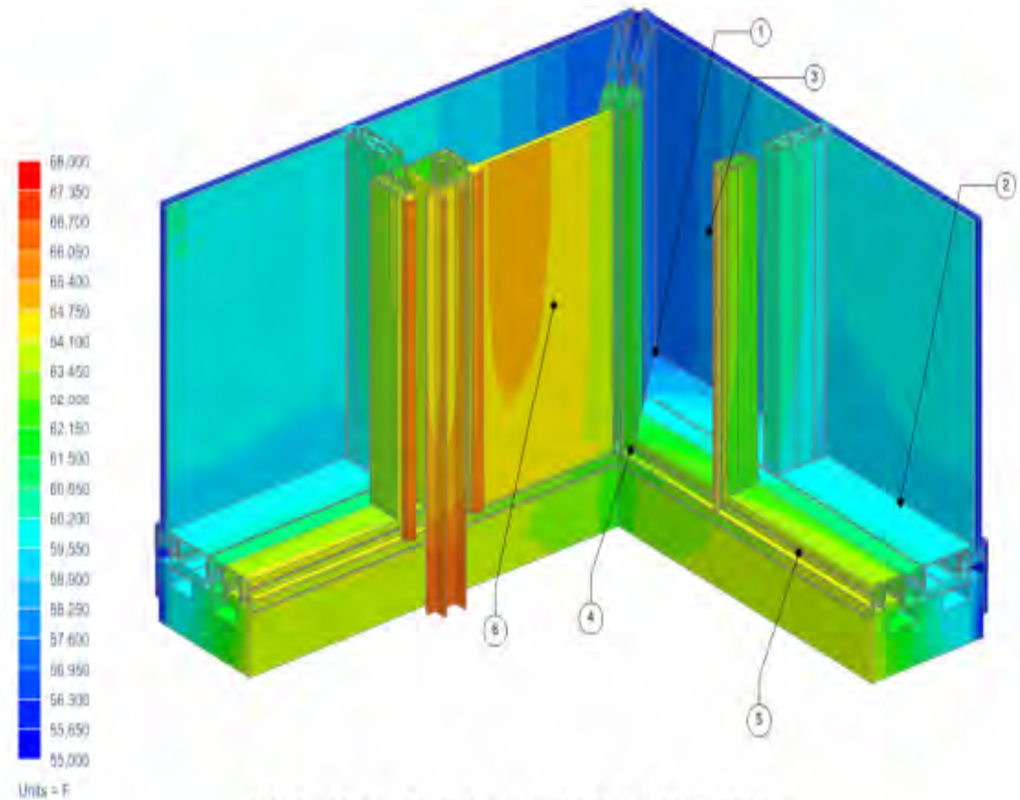
Thermal Analysis Methodology

Methodology

- Studied 3 conditions at head, sill and intermediate horizontal
- Thermal gradients modeled in 3D with Siemens Nx
  - Design Exterior temperature: 55F
  - Design Exterior temperature: 40F (99% Winter Design, ASHRAE)
  - Interior temperature: 68F
  - Exterior Wind: 15mph
  - Nighttime conditions (no effects of solar radiation)
- Established critical temperature index for each condition
- Determined Maximum allowed relative humidity
- Dew Point Analysis at Project Conditions

Thermal Analysis Results

Figure 1.3: Detail 3: WT-1 Sill (View from Int



Interior View with Column and Interior Glass Hidden

Figure 3.3: Thermal Profile for Exterior Typical Design Temperature for Detail 3: WT-1 Sill

Thermal Analysis Results

Table 3.3: Condensation Analysis Indices for Detail 3: WT-1 Sill

Critical Temperature Location		Exterior Typical Design Temperature 55°F (12.78°C)			Exterior ASHRAE Design Temperature 40°F (4.4°C)		
		Surface Temp °F (°C)	**Max RH%**	**Below Dewpoint (48.75°F) at 50% RH**	**Surface Temp** °F (°C)	**Max RH%**	**Below Dewpoint (48.75°F) at 50% RH**
1	Exterior Frame - Corner	57.2 (14.0)	**68%**	**NO**	44.8 (7.1)	**43%**	**YES**
2	Exterior Frame	59.1 (15.1)	**73%**	**NO**	48.9 (9.4)	**50%**	**NO**
3	Exterior Centre of Glass	58.1 (14.5)	**71%**	**NO**	46.8 (8.2)	**47%**	**YES**
4	Interior Frame - Corner	62.1 (16.7)	**81%**	**NO**	55.3 (13.0)	**64%**	**NO**
5	Interior Frame	64.5 (18.1)	**89%**	**NO**	60.0 (15.5)	**75%**	**NO**
6	Interior Centre of Glass	64.4 (18.0)	**88%**	**NO**	60.5 (15.8)	**77%**	**NO**

Estimating Desiccant Volume Methodology

- Assumed air leakage from the interior space will bring moisture into the sealed cavity
- Assumed the air leakage rate into the cavity followed the ideal gas law of PV=nRT
- Difference in volume was assumed to be the amount of air displaced from the cavity and the interior space
- amount of moisture brought into cavity calculated based on the overall moisture load of the interior space and and was varied weekly to account for different event schedules

Estimating Desiccant Volume

Table 2: Volume per Linear Foot of Desiccant Required Annually for Various Occupancy

Number of Concerts per Week	Desiccant Type	
	Silica Gel $ft^3_{Silica}/ft_{Linear}$ (m^3_{Silica}/m_{Linear})	Molecular Sieve ft^3_{MS}/ft_{Linear} (m^3_{MS}/m_{Linear})
Daily	0.340 (0.032)	0.102 (0.009)
6	0.336 (0.031)	0.101 (0.009)
5	0.333 (0.031)	0.100 (0.009)
4	0.330 (0.031)	0.099 (0.009)
3	0.326 (0.030)	0.098 (0.009)
2	0.323 (0.030)	0.097 (0.009)
1	0.320 (0.030)	0.096 (0.009)

Analyzing Cavity Ventilation Methodology

- Effective 3D U-values and Temperature Index used in Energy simulations
- Dynamic building energy model created using EnergyPlus software using exterior weather data
- An airflow network used to model bulk air movements between thermal zones including the curtain wall cavity
- air leakage through the curtain wall assumed to match NAFS requiement for curtain walls
- ventilating air for curtain wall cavity coupled with the HVAC operation for the main assembly space with and without economizer
- With hourly curtain wall cavity air dew point temperatures and temperature index hourly surface temperature compared to the air dew point temperature within the curtain wall cavity.
- The annual number of hours with a risk a condensation determined by summing up hours when the surface temperature was lower than the cavity air dew point temperature

Analyzing Cavity Ventilation Results

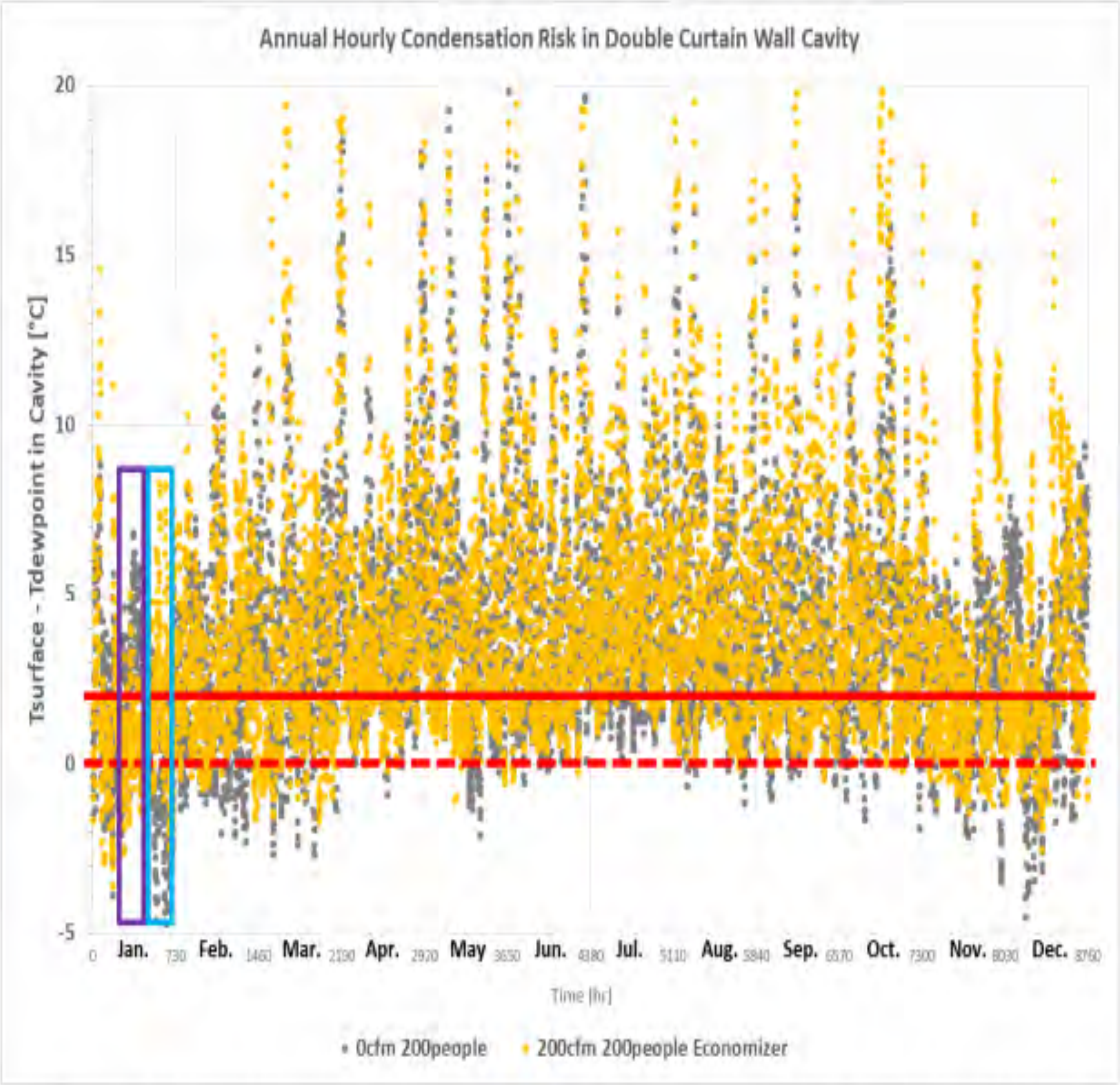


Figure 1: Annual Hourly Condensation Risk in Double Curtain Wall Cavity for Additional Scenario with Economizer, Occupancy of 200 People, and 200 cfm Supplied

Analyzing Cavity Ventilation Results

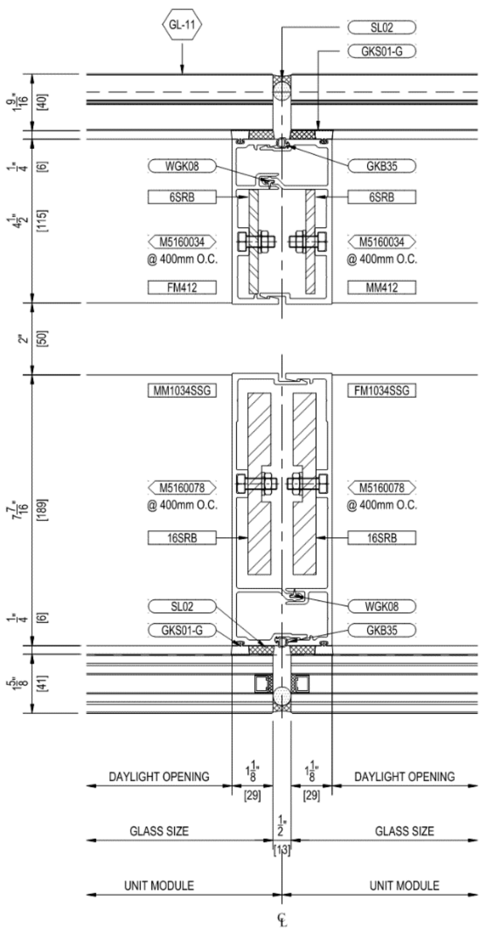
- For the whole year, the total number of hours with a risk of condensation was determined to be 549 hours for the ventilated scenario.
- Allowing to a margin of safety of 2°C (3.5°F) above the condensation threshold, the ventilated scenario results in 3027 hours at risk, while the unventilated scenario yields 2769 hours at risk.
- ventilating the double curtain wall façade cavity with conditioned air from the does not help to reduce the risk of condensation
- Providing a dedicated system supplying dry heated air for the cavity alone could potentially alleviate the issue.

SAN FRANCISCO CONSERVATORY OF MUSIC

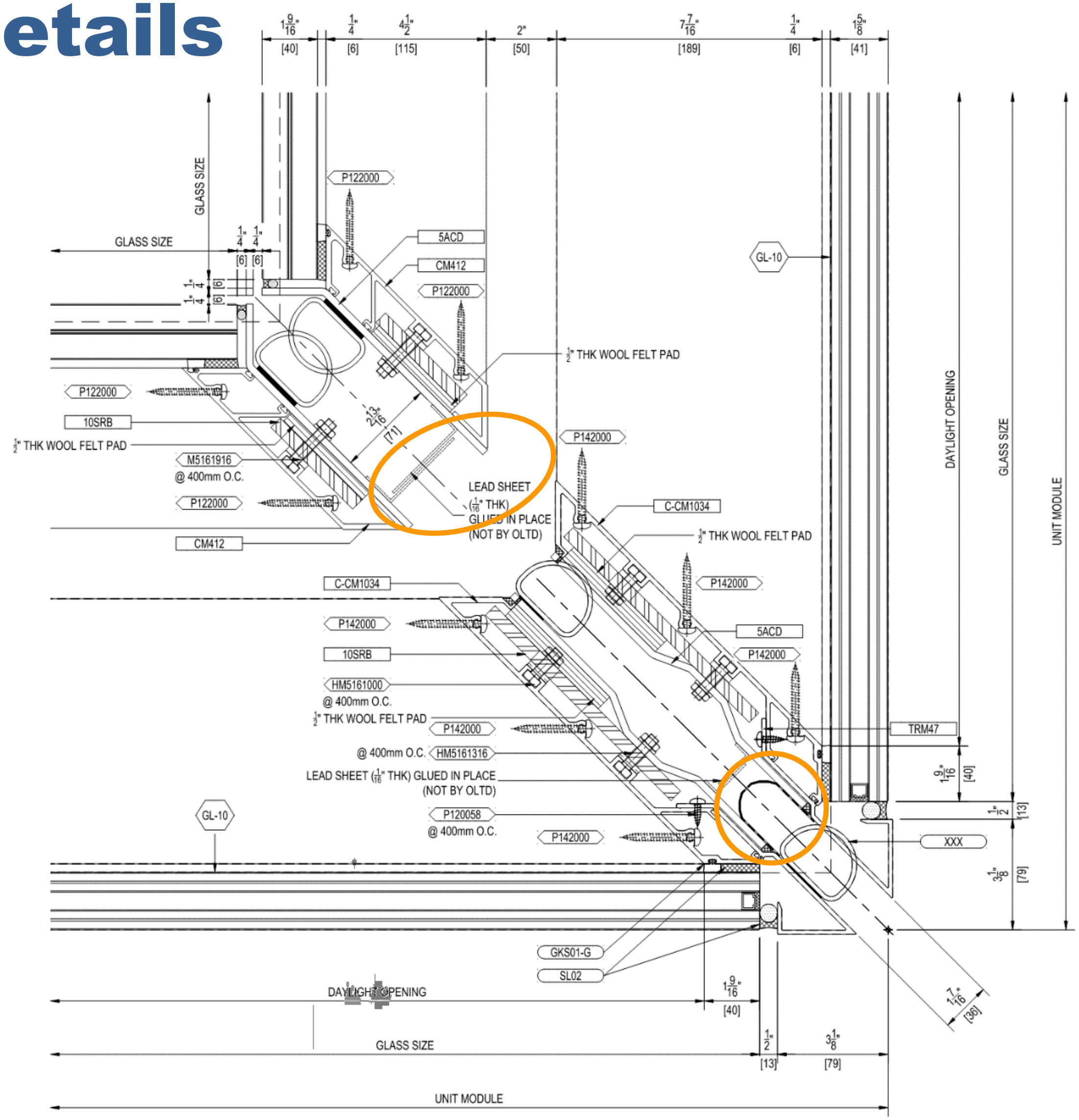
MARK CAVAGNERO ASSOCIATES

Façade System Details

(CS Erectors)



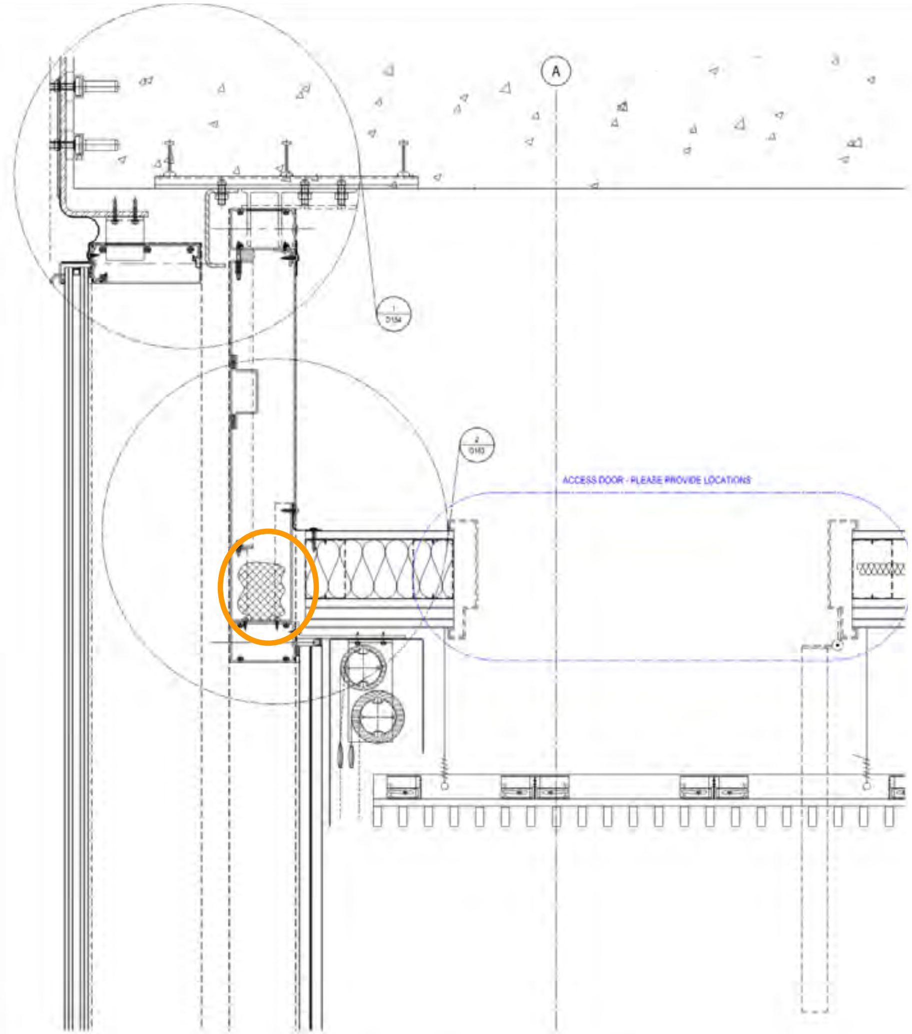
1 D102 WT1 GLASS AT JOINT
ARCH'L REF: 5/A5.01.1 SCALE: 6" = 1'-0"



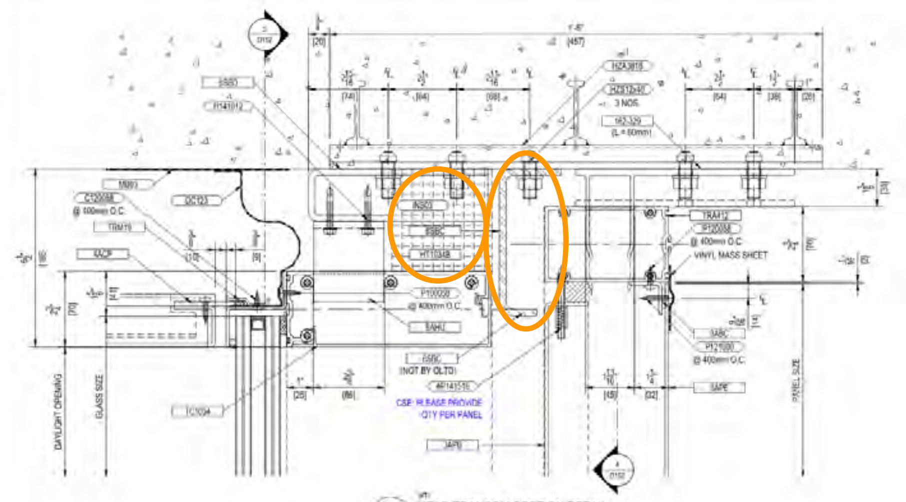
2 D102 WT1 GLASS AT CORNER
ARCH'L REF: 4/A5.01.1 SCALE: 6" = 1'-0"

Façade System Details

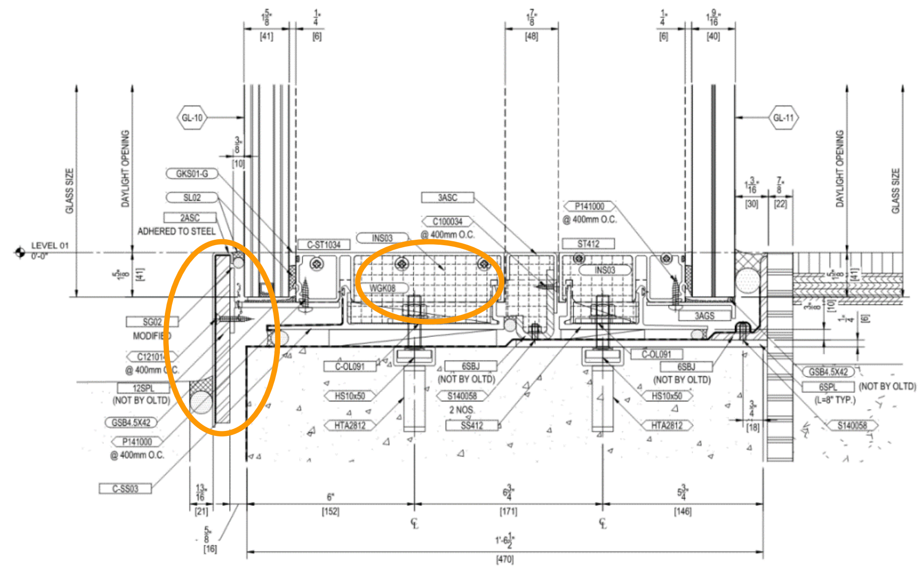
(CS Erectors)



1 D153 GLASS AND PANEL AT JOINT
ARCH'L REF: 2/A5.01.3 SCALE: 6" = 1'-0"



1 D152 HEAD TRANSOM SECTION DETAIL
SCALE: 6" = 1'-0"



1 D151 GLASS AT SILL
ARCH'L REF: 1/A5.00.4 SCALE: 6" = 1'-0"

Façade Maintenance Access Mockup

Façade Performance

- **TRANSPARENCY**
- Solar / Thermal control
- **ACOUSTIC** (fronts onto Hwy 101)
- Accessible / Maintainable
- **MAXIMIZE SEATING**
- Water-proof /-management
- Quick Transport + Installation (tight + restricted schedule)
- Risk/Continuity (back-up system)
- Loads (seismic movement) …

➢ **Unitized narrow-cavity system**

- Resolve acoustic control with unitized movement and drainage requirements
- Resolve access for cleaning (can be infrequent)
- Provide small back-up conditioned, de-humidified, dedicated air supply system

SAN FRANCISCO CONSERVATORY OF MUSIC

MARK CAVAGNERO ASSOCIATES

Art of Simulation & Biology in Façade Design

Sean Quinn
HOK Performance Design Leader
16 July, 2019

Facade Tectonics
Material Matters
2019 Facade Tectonics Forum: SEATTLE
July 16th | University of Washington

hok


POLLINATORS
TEMPERATURE
REGULATION
CARBON
SEQUESTERS
FILTERS
EROSION
CONTROL

BIOLOGIST AT THE DESIGN TABLE

Biomimicry in Building Design

Adept at studying nature's R&D labs and translating into solutions that effectively meet design challenges.

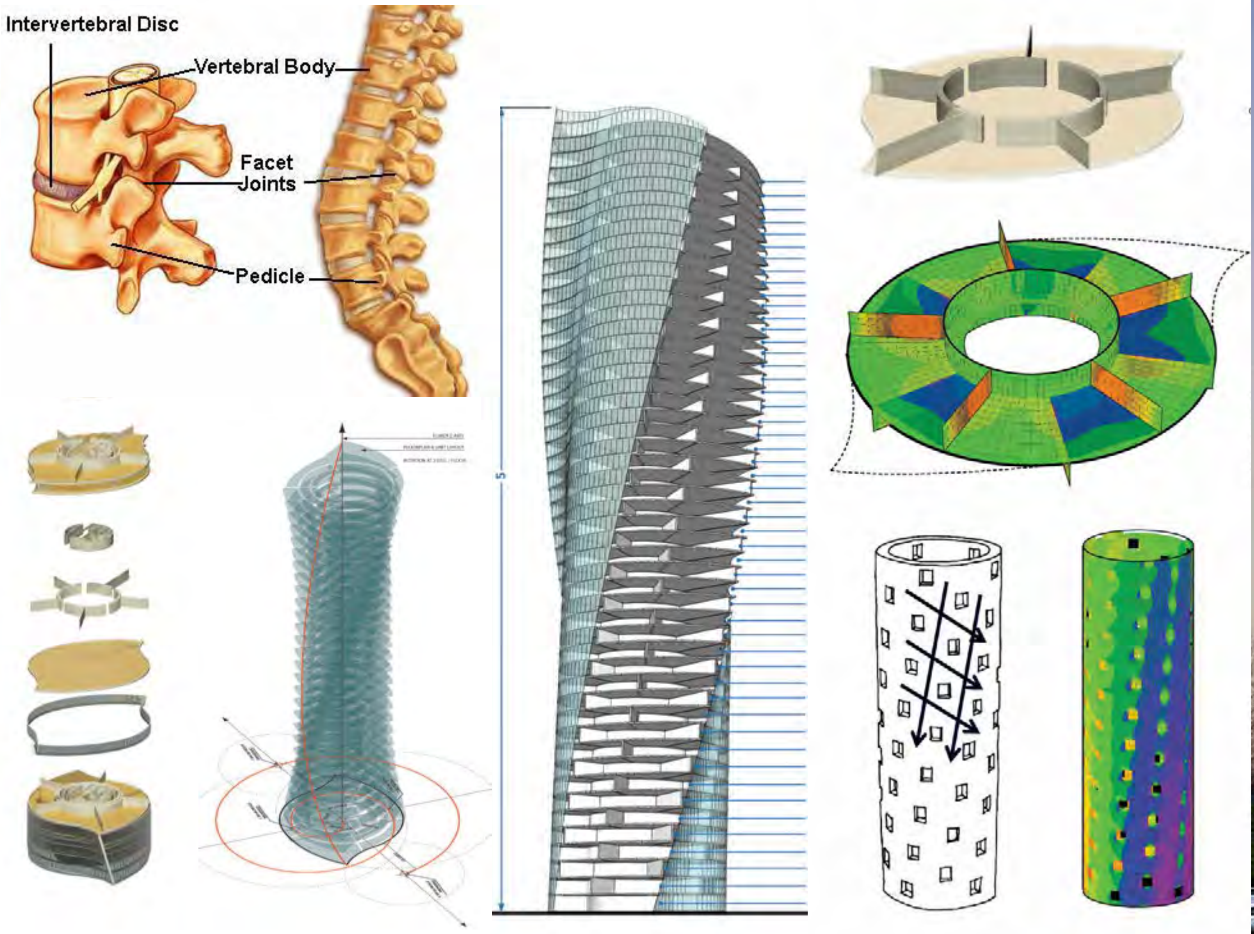
Trained in the biomimicry design methodology systems.

Help companies find, vet, understand and emulate these effective strategies.

Advance concepts to prototypes.

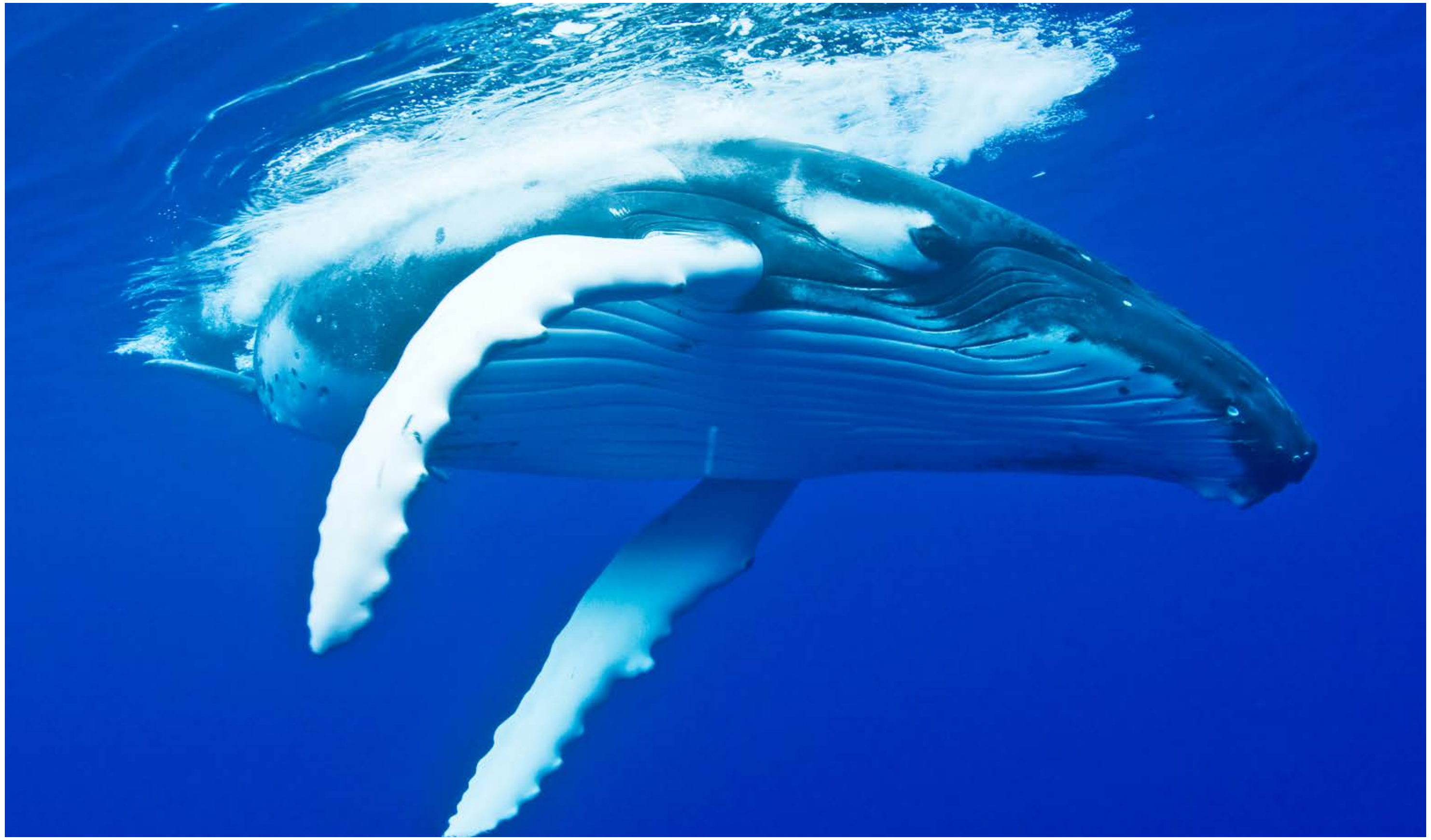
NEW SONGDO CITY

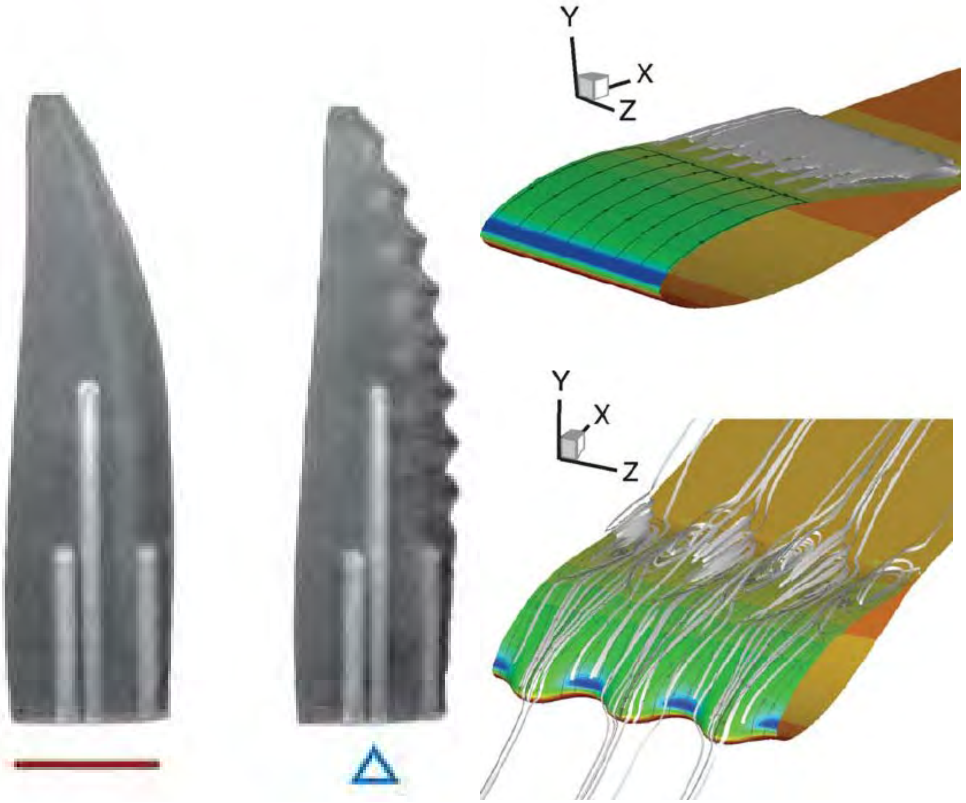
Spinal Structure & Honeycomb



NEW SONGDO CITY

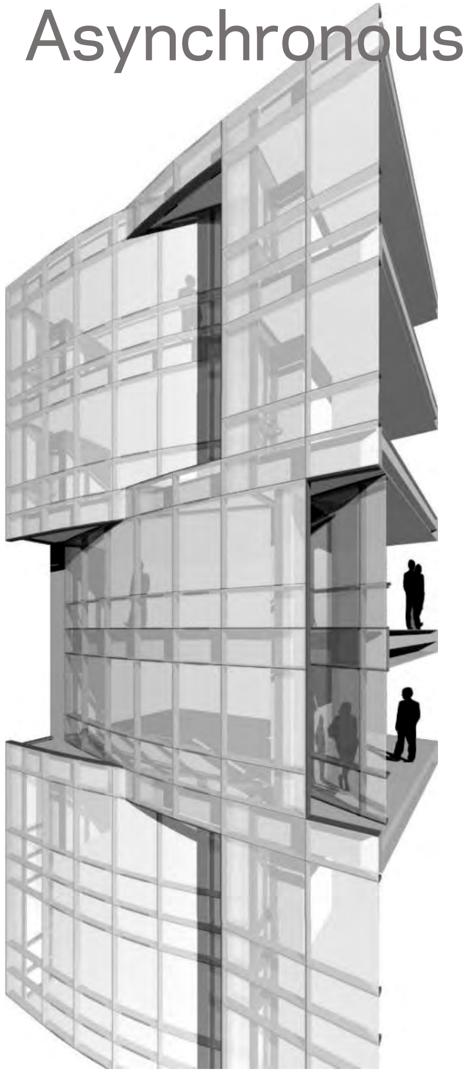
Humpback Whale Fin

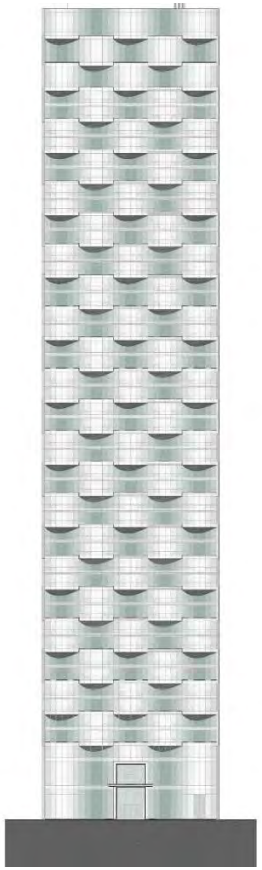


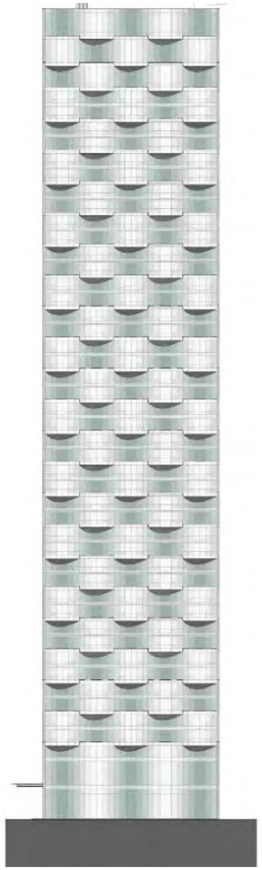


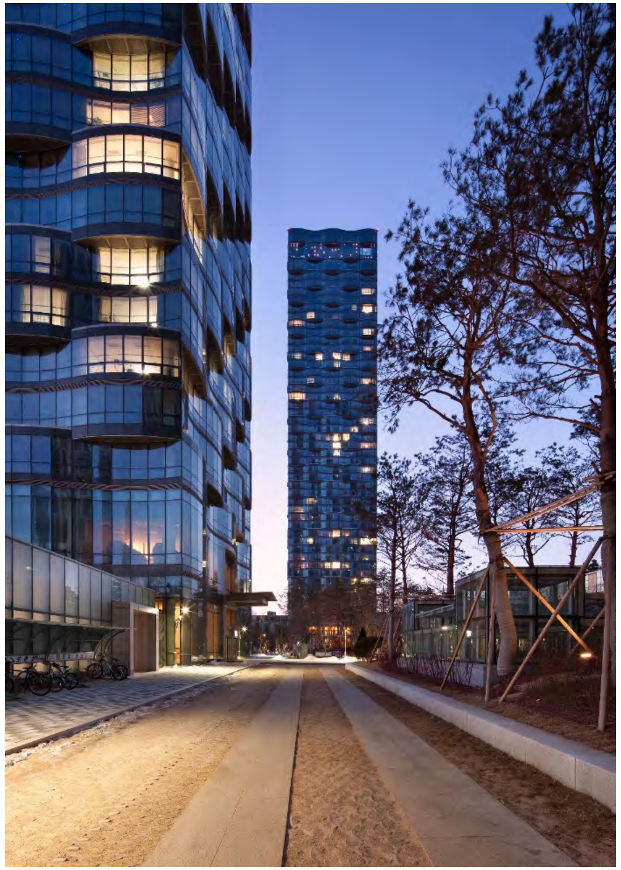
NEW SONGDO CITY

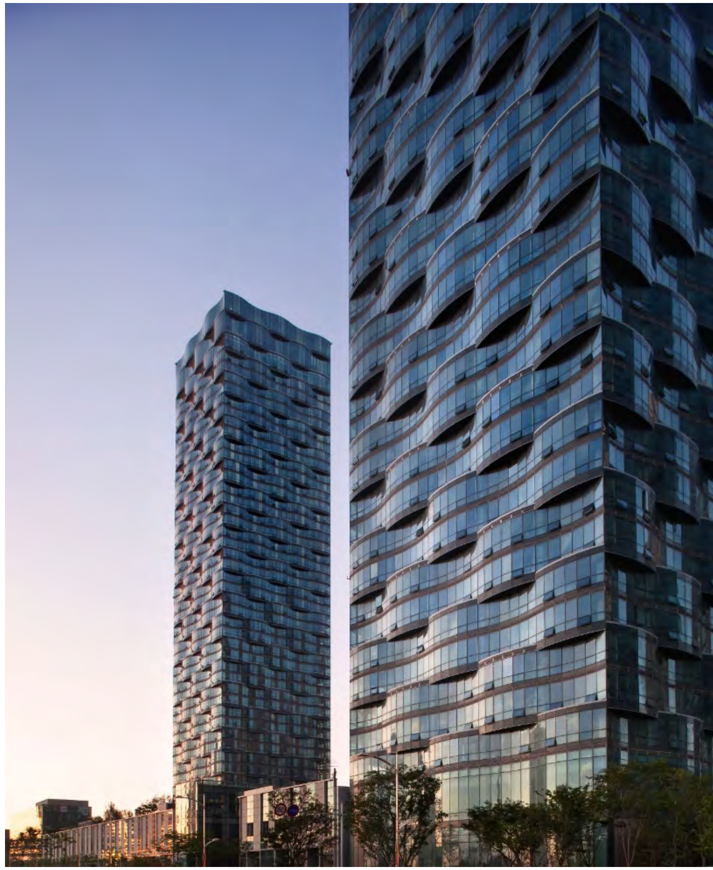
Asynchronous Forms to Reduce Drag & Shear





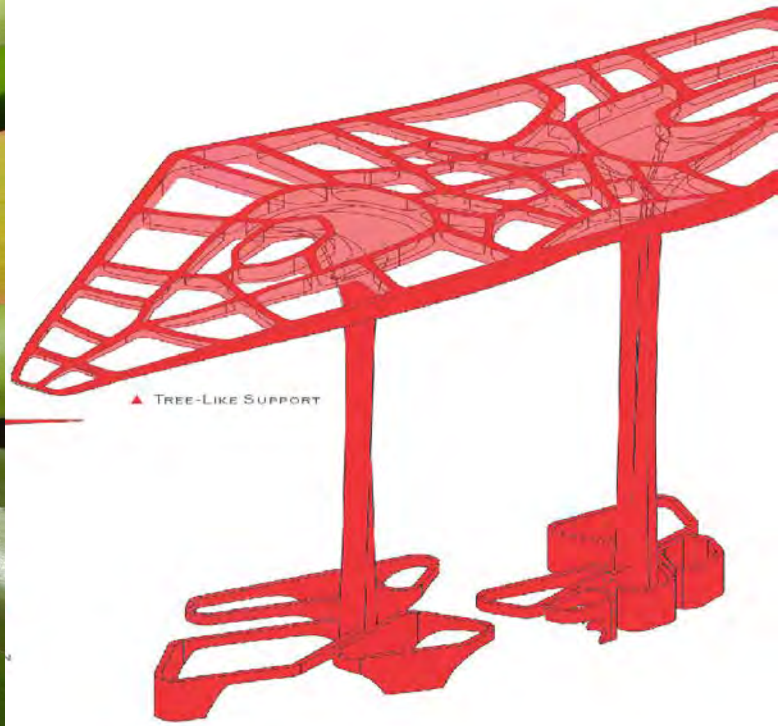






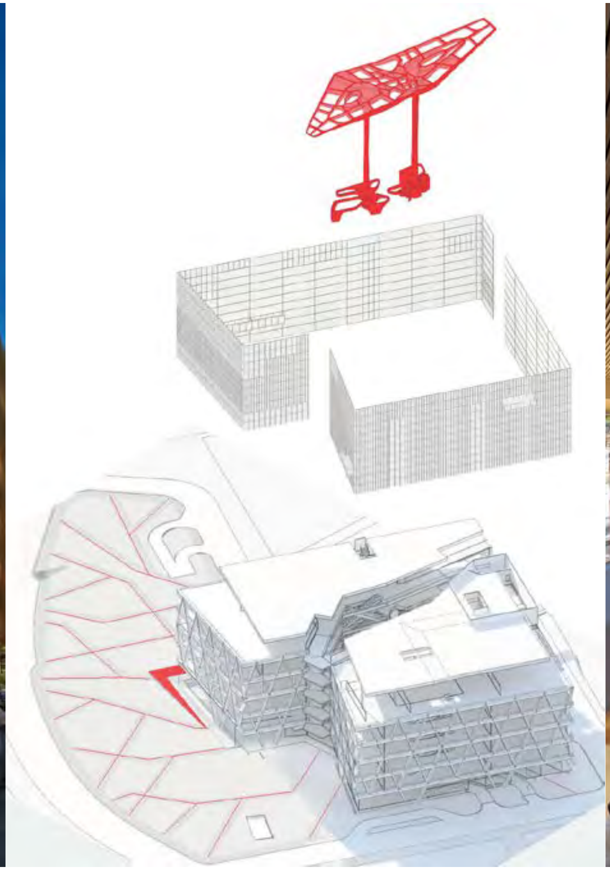
LARGO DE BATATA

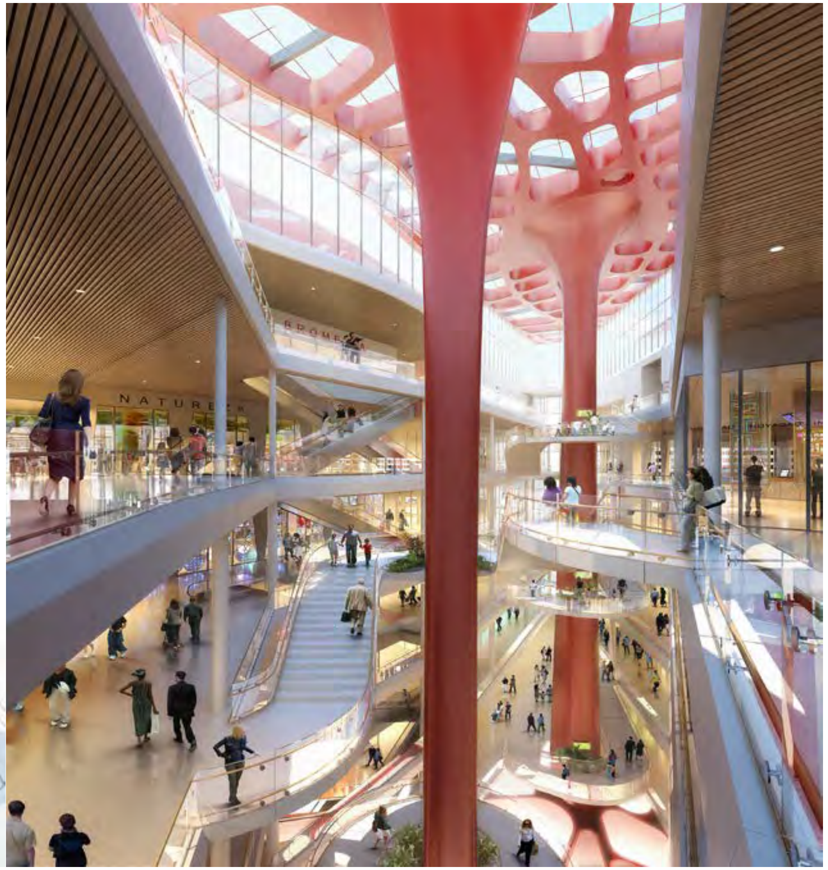
Sao Paulo, Brazil



LARGO DE BATATA

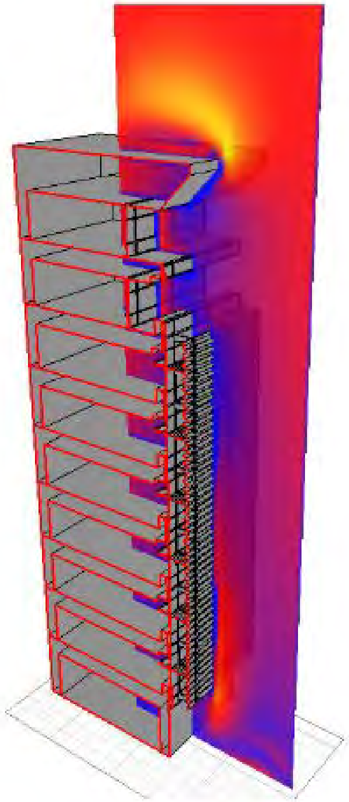
Stormwater Management & Treatment

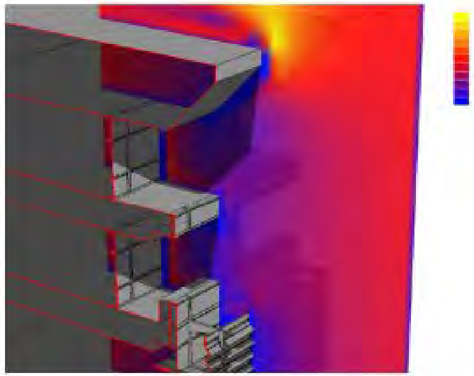


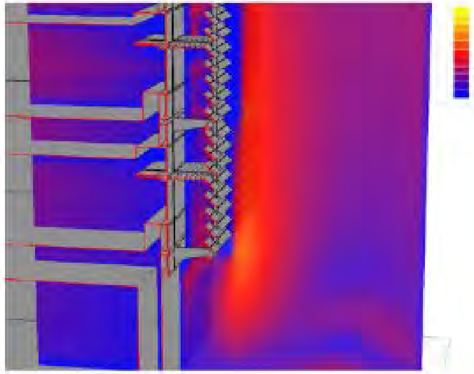


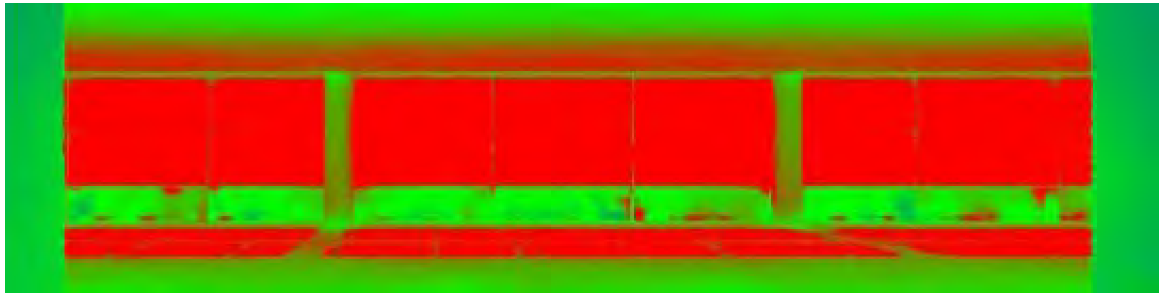
DC CONSOLIDATED FORENSICS LAB

Kinetic Facades



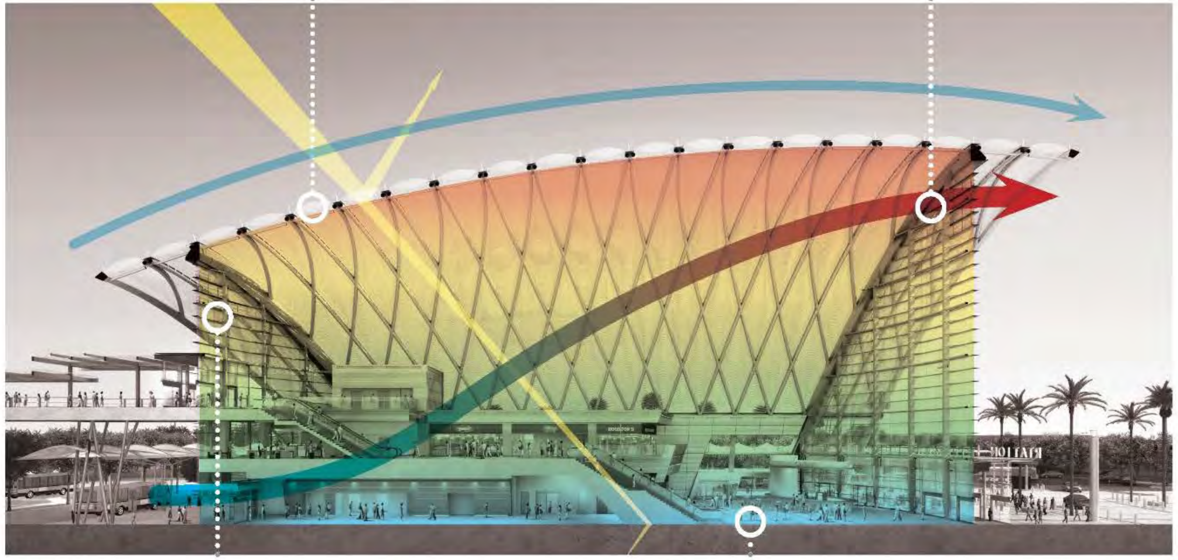


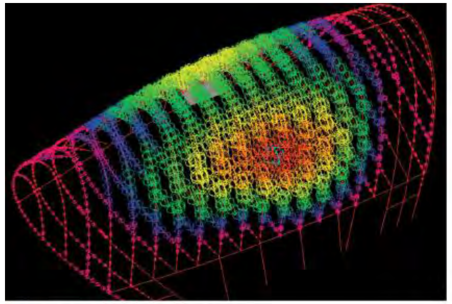




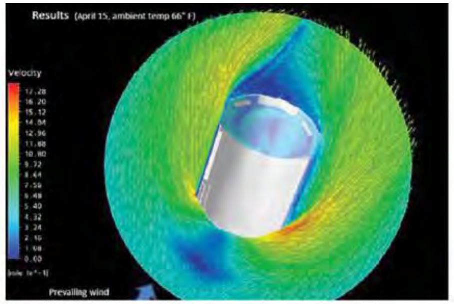
ARTIC

Adaptive Facades

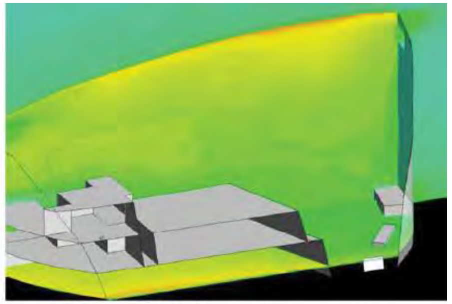




1. STRUCTURAL DESIGN OF ETFE ROOF REDUCES STEEL TONNAGE

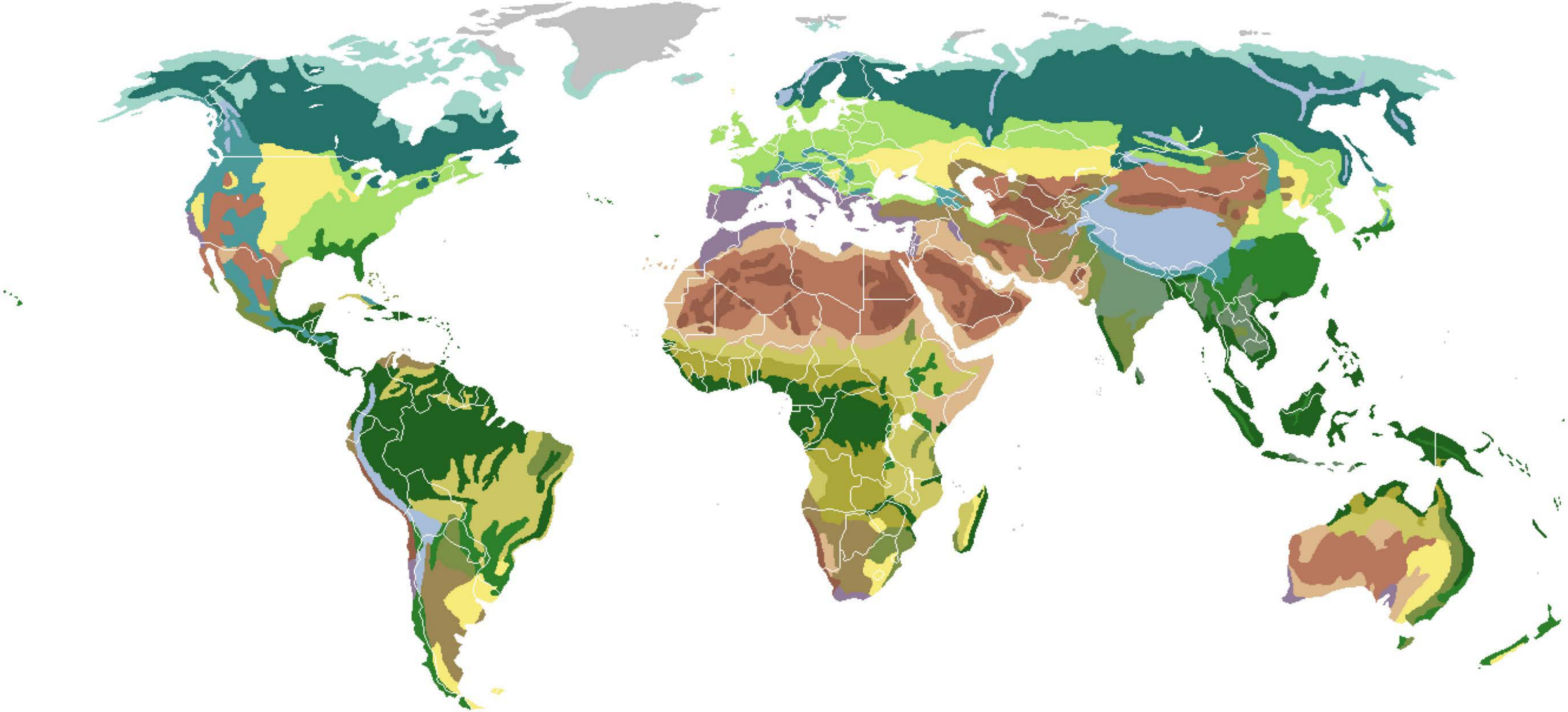


2. AERODYNAMIC FORM INDUCES NATURAL VENTILATION



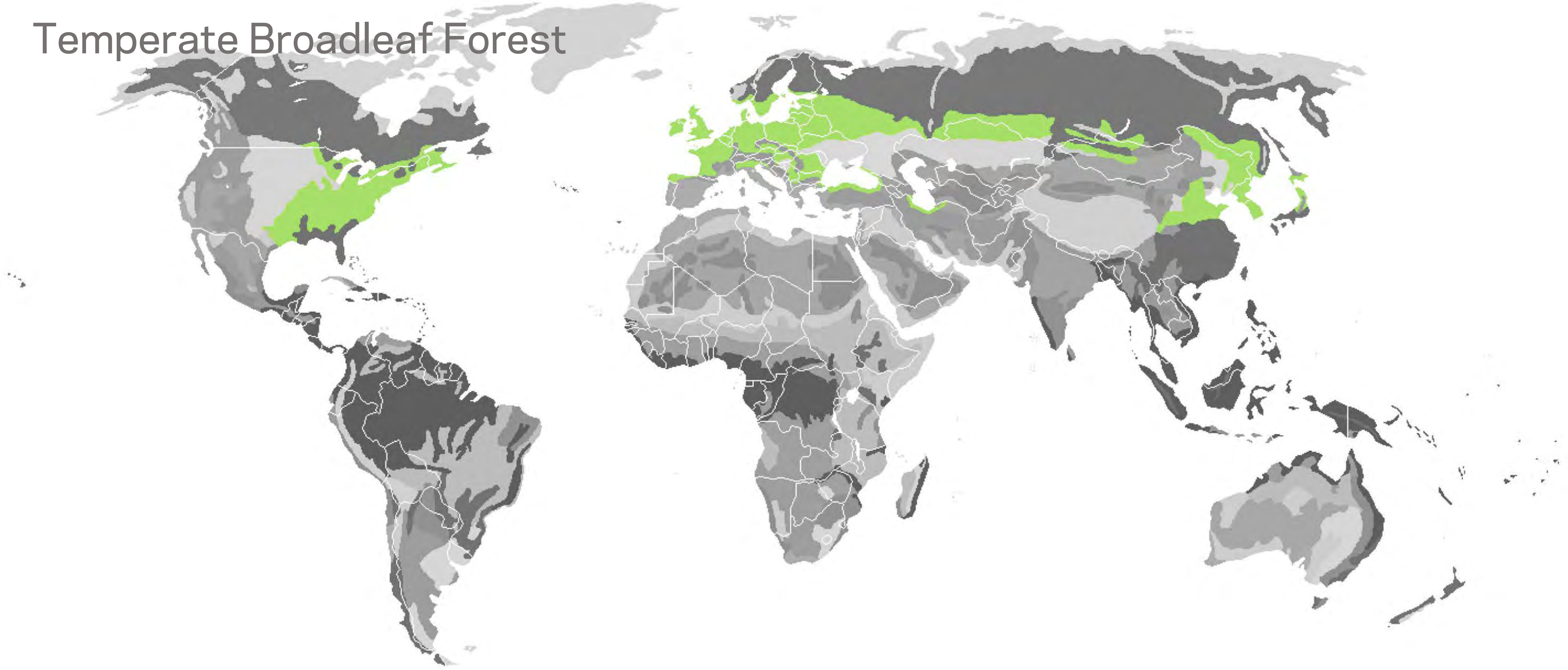
3. GFD DEMONSTRATES AIR STRATIFICATION WITHIN CENTRAL HALL

WORLD BIOMES



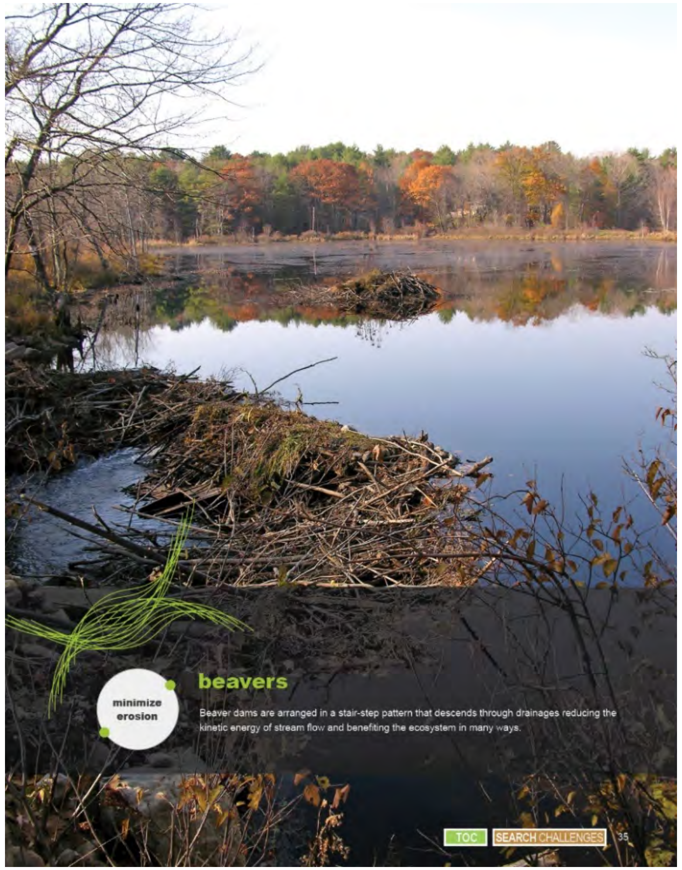
GENIUS OF BIOME

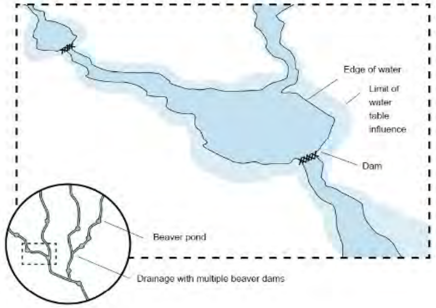
Temperate Broadleaf Forest



GENIUS OF BIOME

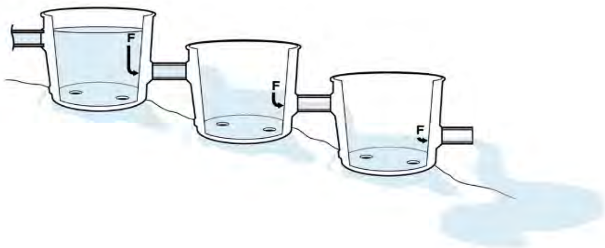
Beavers: Ecosystem Engineers





nature's design

series of upstream barriers slow water



design principle

series of upstream barriers slow water

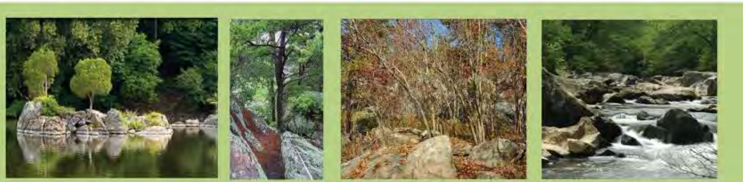
GENIUS OF BIOME

Series of Upstream Barriers

BLUE RIDGE + NORTHERN PIEDMONT
Trap Rock + Conglomerate Uplands

NORTHERN PIEDMONT
Piedmont Uplands + Foothills

NORTHERN PIEDMONT
Lowlands + Outer Piedmont



SOUTH-EASTERN PLAINS
Chesapeake Rolling Coastal Plain

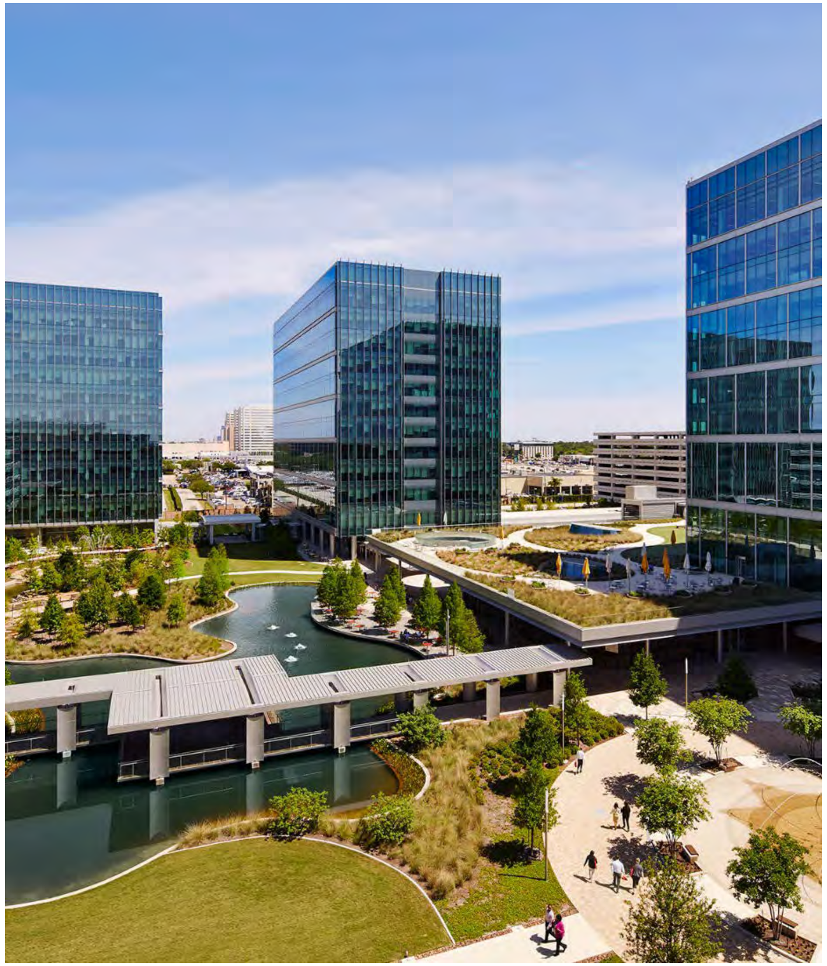
MIDDLE ATLANTIC COASTAL PLAIN
Chesapeake-Albemarle Silty Lowlands + Tidal Marshes

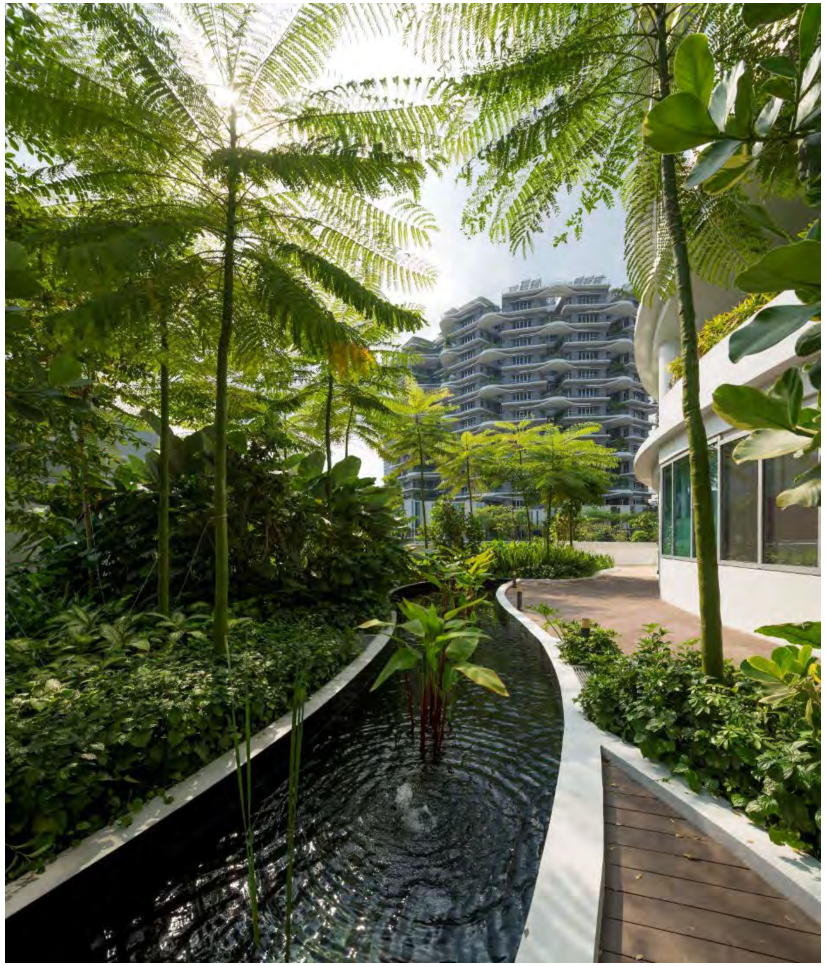
GENIUS OF BIOME

U.S. Coast Guard Headquarters

GENIUS OF BIOME

Replication at Scale



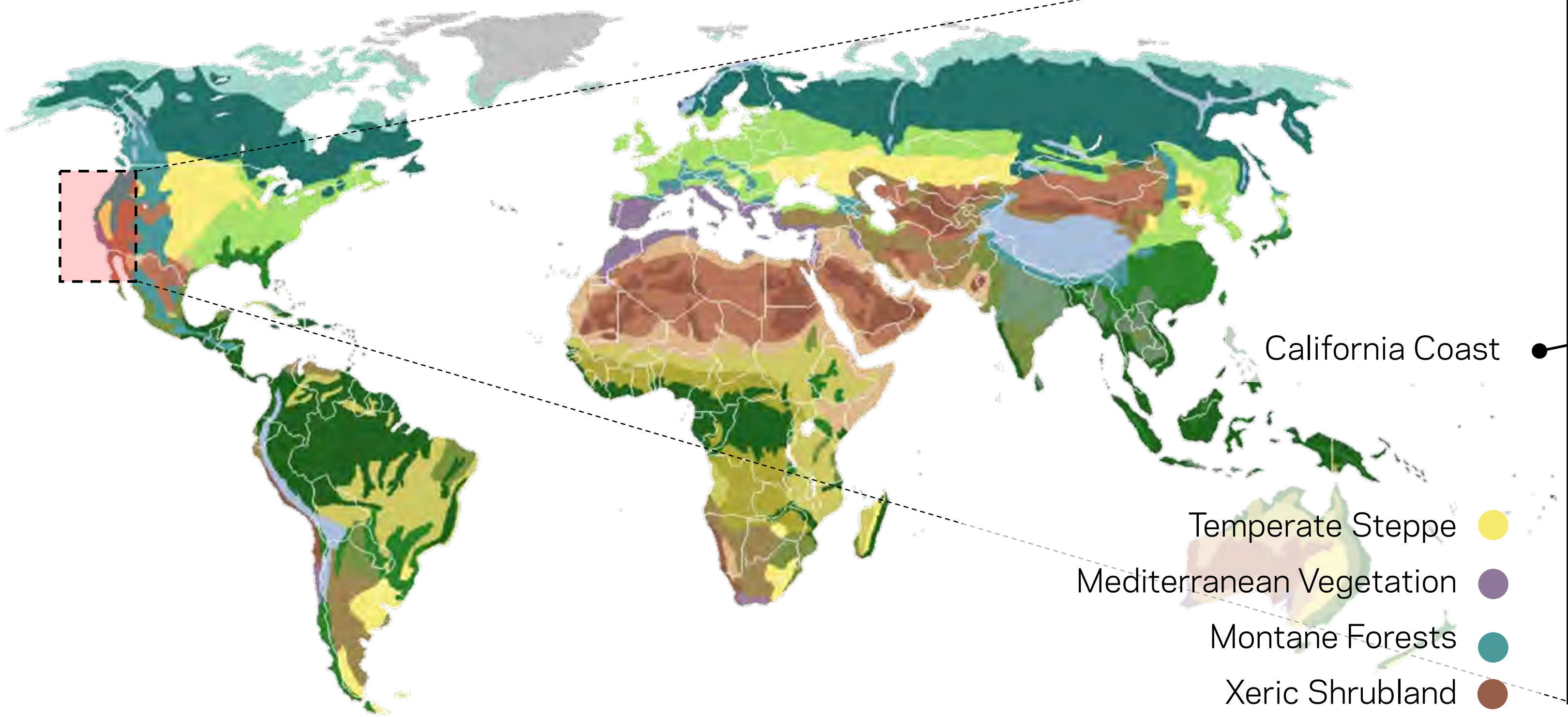


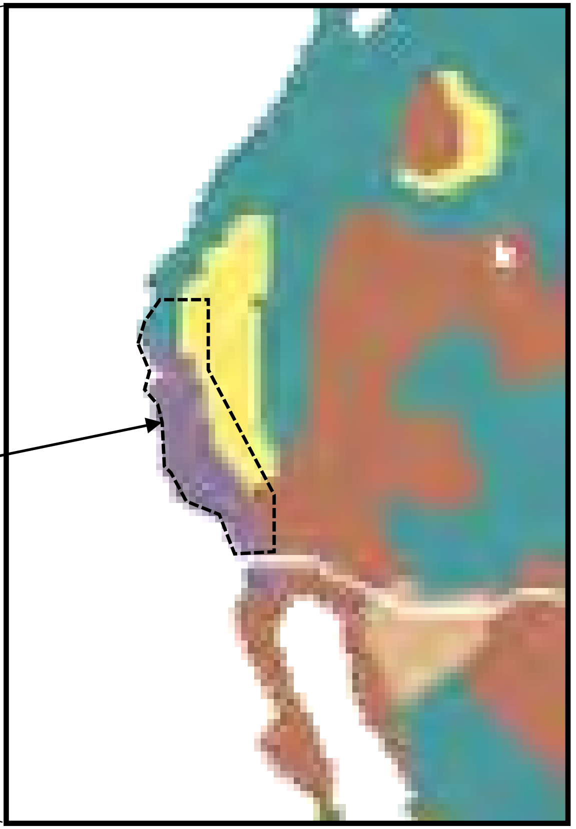
GENIUS OF BIOME

CALIFORNIA COAST

CALIFORNIA COAST

Ecotone Systems

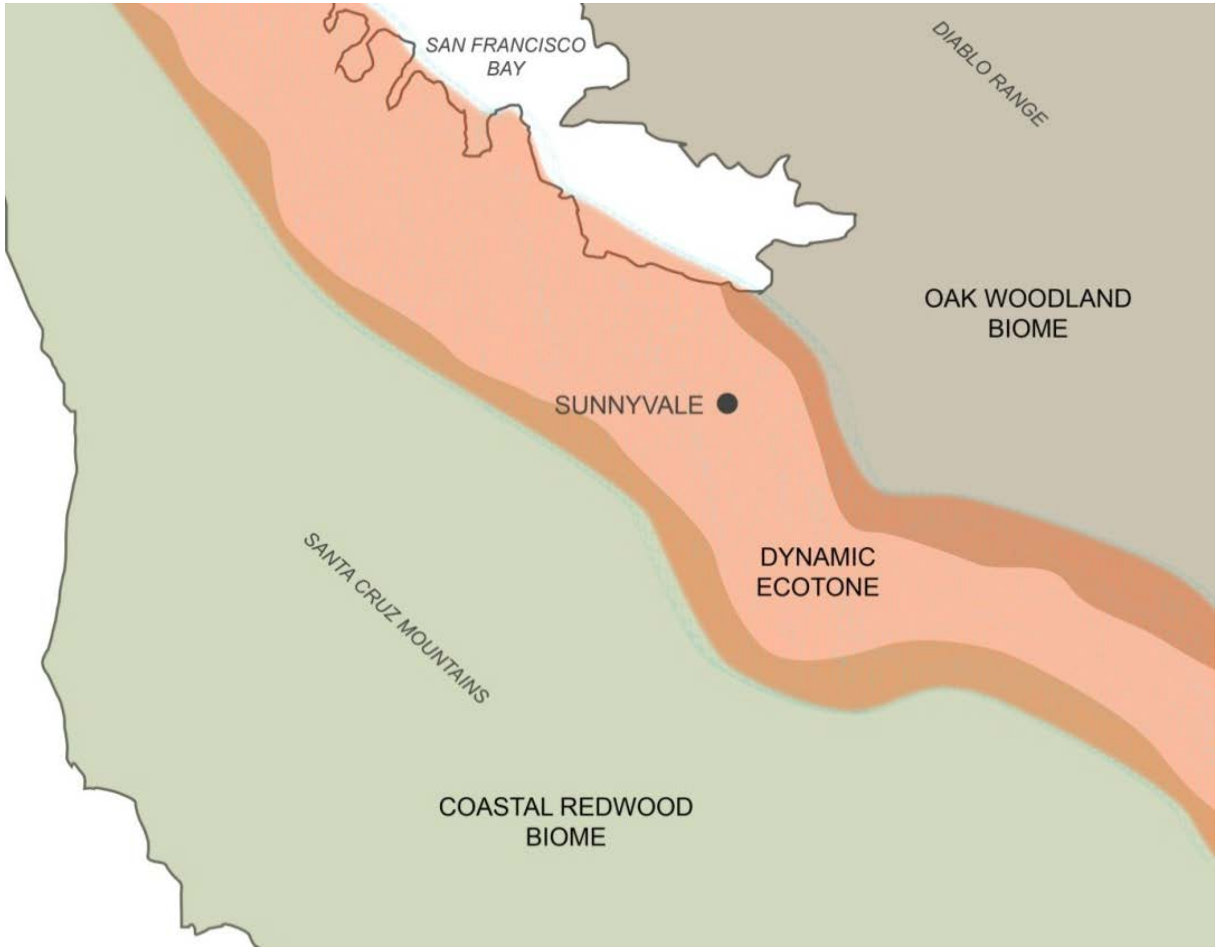


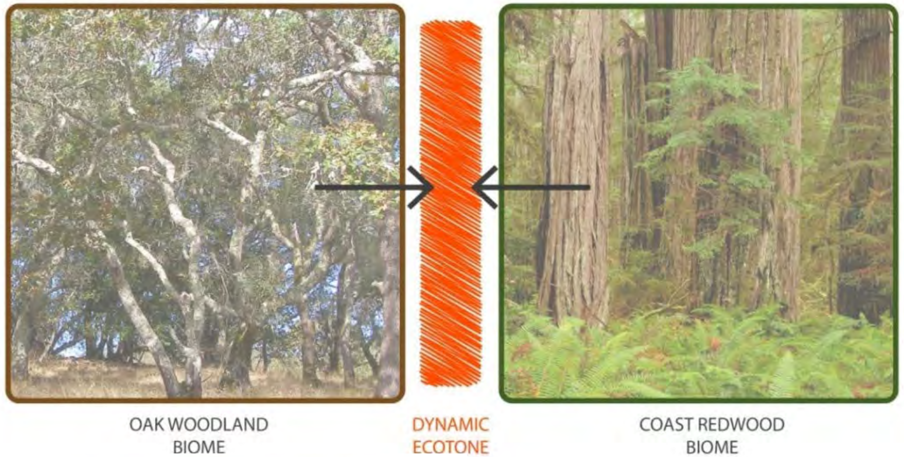


"California Biome"

CALIFORNIA COAST

Dynamic Ecotones: Oak Woodland & Coast Redwood



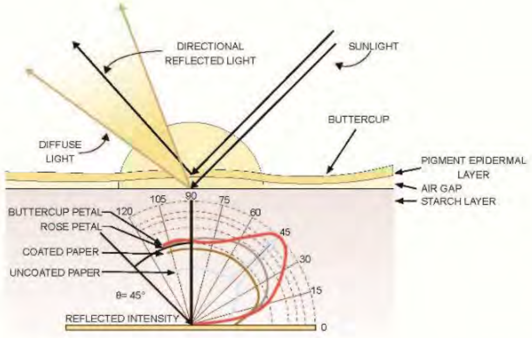


CALIFORNIA COAST

Buttercup: Color & Light Distribution

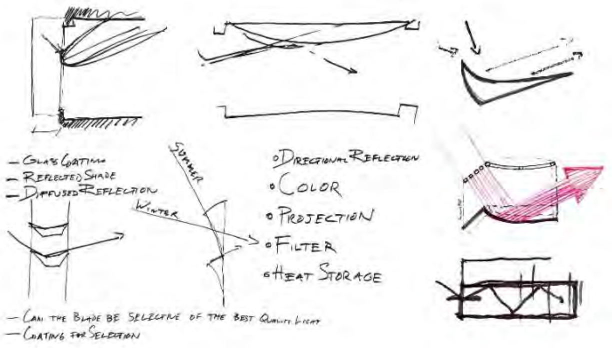
Nature's Design

layered petal and air gap creates multiple lighting effects



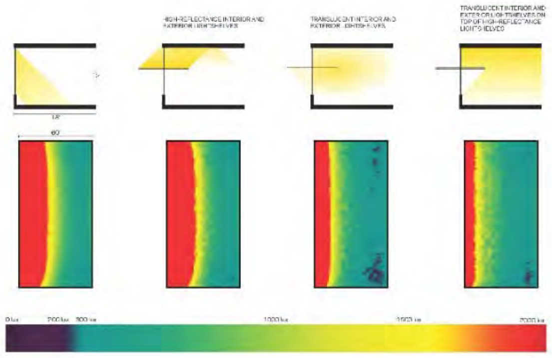
Design Principle

multi layered structure produces optimal lighting



BaDT Brainstorm

architecture & engineering challenge

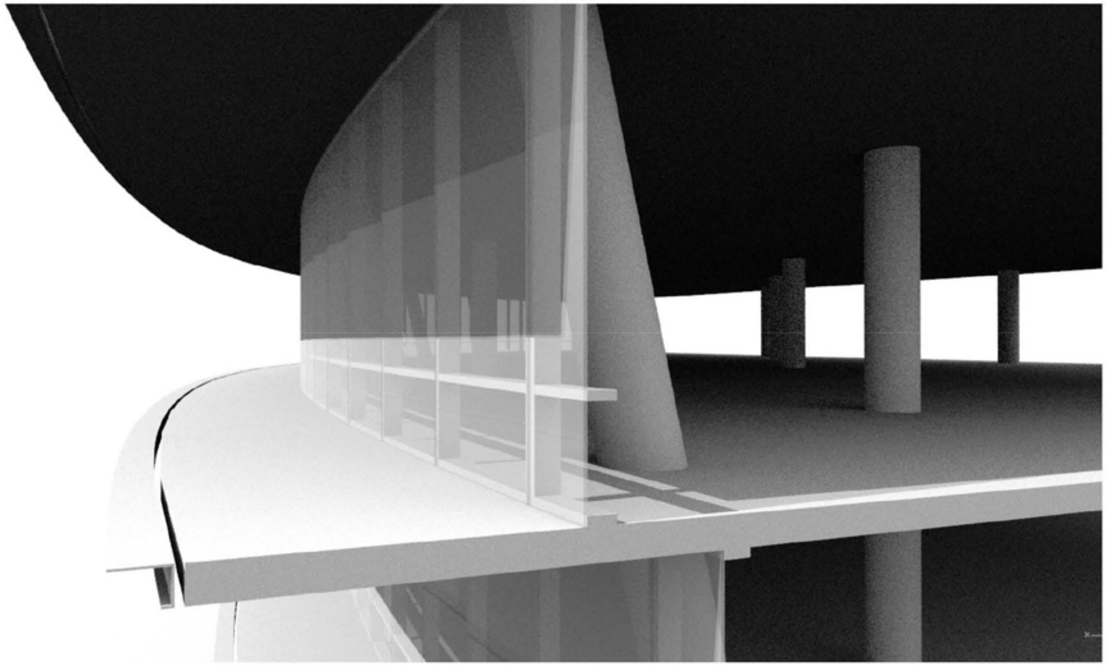


Design Application

sustainable design strategy

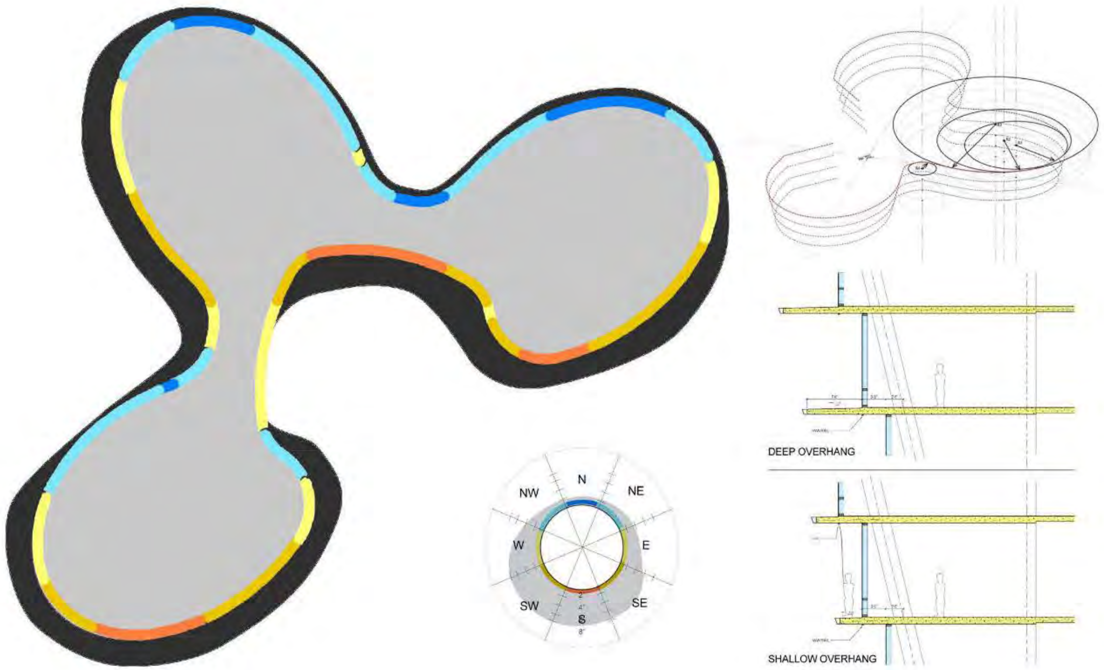
CENTRAL & WOLFE

Design Application



Vision

diffused natural daylight tuned for circadian response

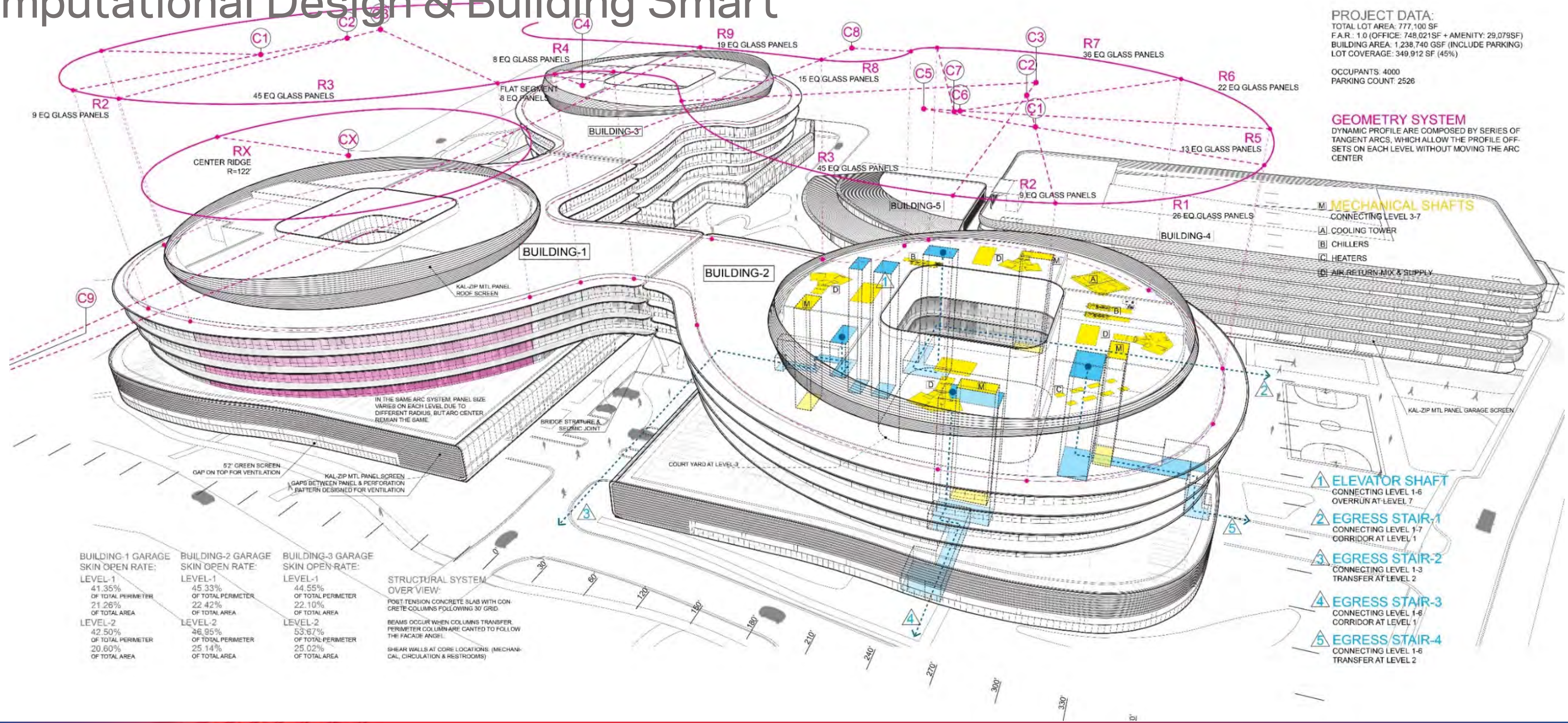


Vision

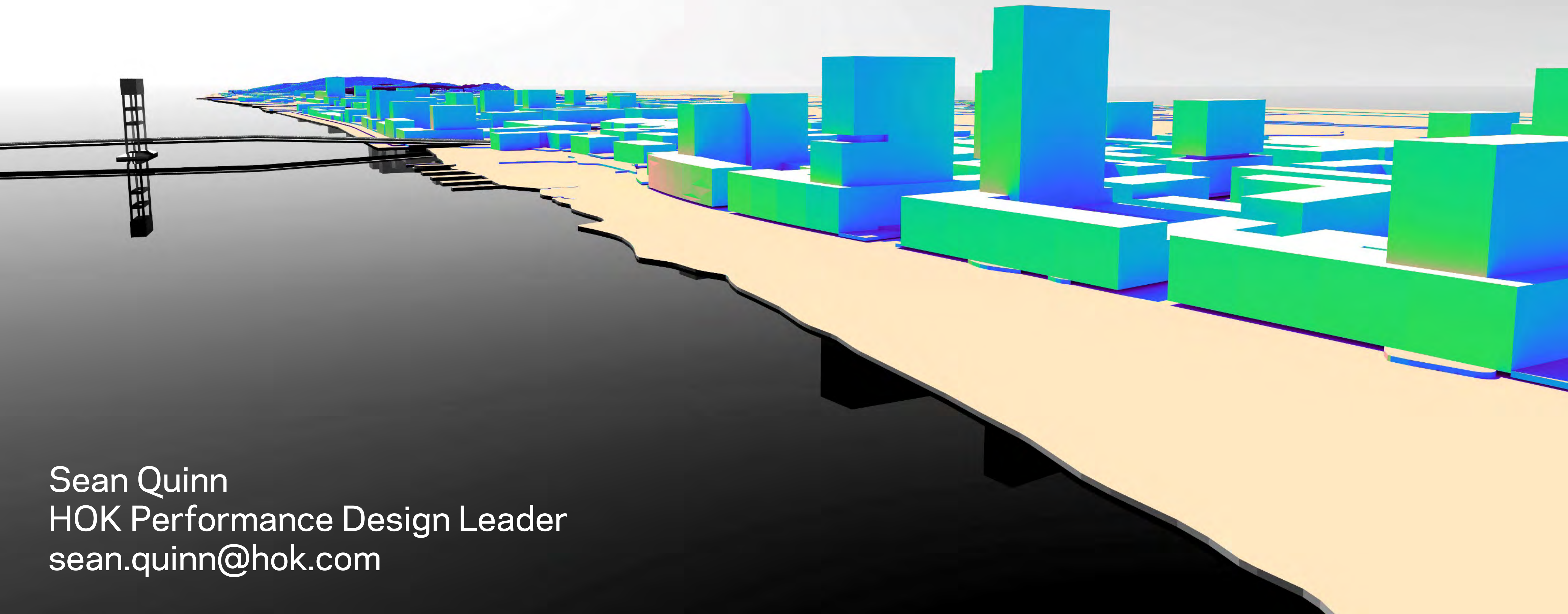
solar responsive floorplan and facade

CENTRAL & WOLFE

Computational Design & Building Smart



Data Drivers for Smart Cities, Buildings & Facades



Sean Quinn
HOK Performance Design Leader
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Facade Tectonics FORUM SEATTLE

DIGITS, DATA AND BEYOND

Integrated Parametric Workflows in Advanced Facade Design and Execution

SPEAKERS

Sanjeev Tankha, AIA
Principal
Walter P Moore

Maurya McClintock
McClintock Facade Consulting

Stéphane Hoffman, M. Arch, M. Eng.
Vice President Facade Engineering
Morrison Hershfield

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