Thornton Tomasetti

Advanced Project Delivery (Beyond conventional CD's)

Robert Otani, PE LEED AP Principal | CORE studio

Practices



Reach

Our Locations 5 Continents Albuquerque, New Mexico Austin, Texas Boston, Massachusetts Chicago, Illinois Dallas, Texas Denver, Colorado Ft. Lauderdale, Florida Irvine, California Kansas City, Missouri Los Angeles, California Marina del Rey, California Mountain Lakes, New Jersey Mountain View, California New York, New York (2) Newark, New Jersey Philadelphia, Pennsylvania Portland, Maine San Diego, California San Francisco, California Seattle, Washington Washington, D.C. West Hartford, Connecticut

São Paulo, Brazíl

1200 Engineers, Projects in Architects and Professionals **36** Offices

Countries

Dalgety Bay, Scotland* Glasgow, Scotland

London, UK (Head Office) London, UK (PLC City Office) Moscow, Russia Beijing, China Hong Kong, China Shanghai, China Mumbai, India UAE Ho Chi Minh City, Vietnam Christchurch, New Zealand

Weidlinger locations Shared Locations **Thornton Tomasetti Locations** *Additional offices in Bristol, U.K.

CORE studio | Thornton Tomasetti









Rob Otani Nick Mundell Ben Howes Kenny Tam

Elcin Ertugrul Daniel Segraves Hiram Rodriguez Michael Kero

Dan Reynolds Serena Li Margaret Wang Emil Poulsen

Shannon McMullan Mark Tam Leland Jobson **Richard Schmitt**

> David Mans Hanshen Sun

KONSTRU



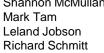
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Our Mission

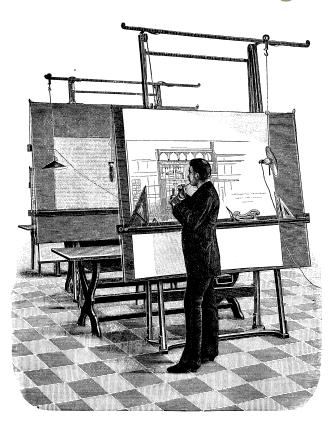
CORE studio is a firm-wide idea incubator.

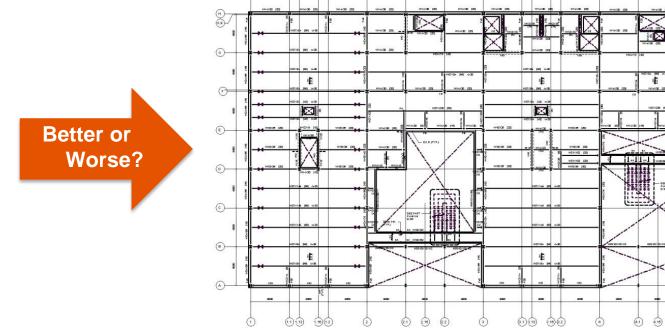
Our mission is to increase the value we bring to clients through innovation.

The studio conducts research, develops custom software applications, designs workflows to optimize project realization, and develops interactive computational models.

Evolution of BIM

Manual Drafting





2-D CAD

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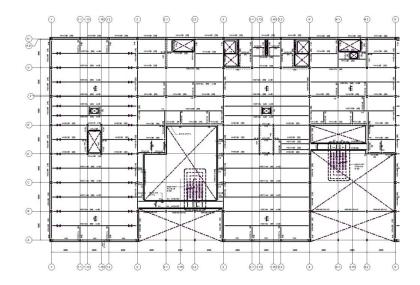


One Liberty Place The New York Times 60 drawings 1 2 1 1 1 11 11 11 10 HI III III II 11 11 11 140 drawings 2007 1987

60 Drawings vs. 140 Drawings

- Production Better or Worse?
- Dimensional Information Better or Worse?
- Clarity of Intent Better or Worse?
- Coordination Better or Worse?
- RFIs/Extras/Claims/ Better or Worse?
- Do changes in design occur more or less?

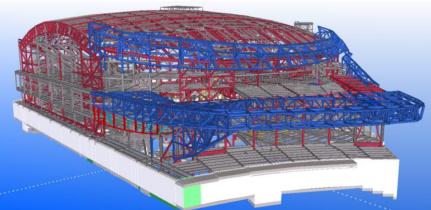
PROGRESS!!



2-D or 3-D CAD

BARCLAYS CENTER





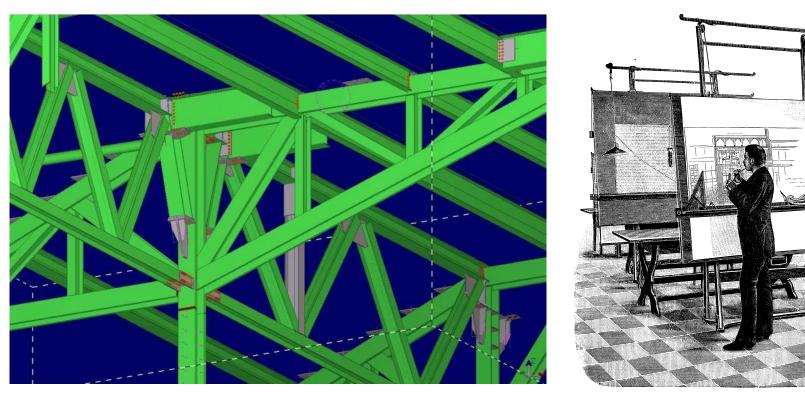
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BIM

...not if the Model is not the Deliverable

This might as well be ...





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CASE STUDY – ONE VANDERBILT

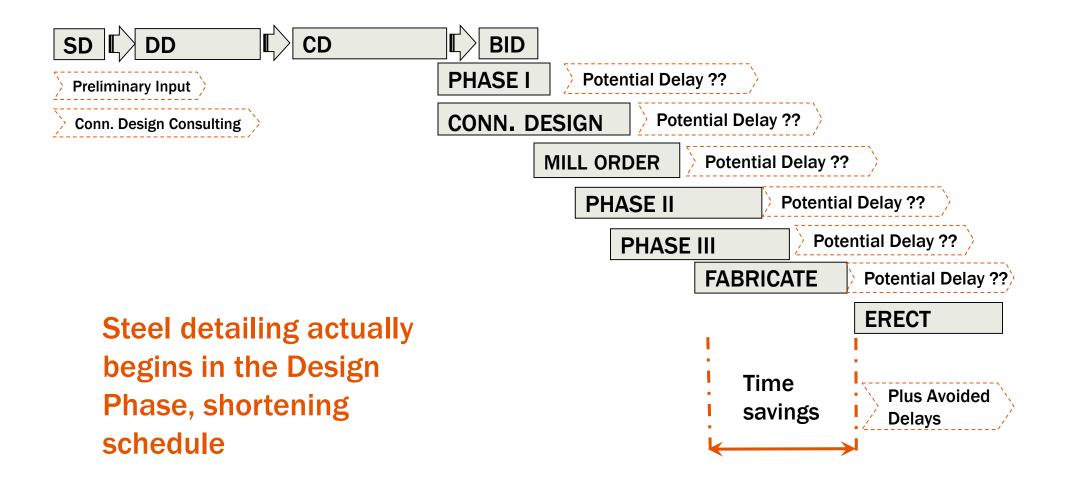
- Engineer of Record is Severud
- Thornton Tomasetti Construction Engineering team hired directly by Hines
- Early involvement in design to understand both the design intent and the Steel Fabricators needs and preferences
- Early release of structural information and advancement of shop/fabrications drawings saved time and money
- Early completion (Min. 7 months)
- Happy Client!



Architect: KPF Structural Engineer of Record: Severud Fabrication/Connection Engineer: Thornton Tomasetti

Schedule Savings

Tradition of the second termination of the second s



Benefits to a Project with APD (Advanced Project Delivery)

- More complete and detailed coordinated information earlier which results in an improved project schedule and better cost certainty
- When concrete and steel interact, better coordination can occur between these two trades early
- Schedule savings
- Delivering a model to the fabricators in a format and manner that they can rely on and use (shop drawings creation, drive CNC equipment)
- Tekla model can be converted into almost any format for coordination and early clash detection
- Cost Certainty Progress model can be issued with bid documents to show complexity and sample connections
- Reduction in RFIs connection engineering, drawing related issues discovered and addressed during model development before released to fabricator
- Reduced or Validating Change Orders by producing a Tekla model, quantities and complexity identified as design progresses. Since all information is shared, utilizing a collaborative design/construction approach, potential change orders are identified earlier in the process.
- REDUCED SHOP DRAWING REVIEW (95% FIRST TIME APPROVALS)

ALL DESIGN DATA SHOULD BE PORTED TO THE SUBCONTRACTORS

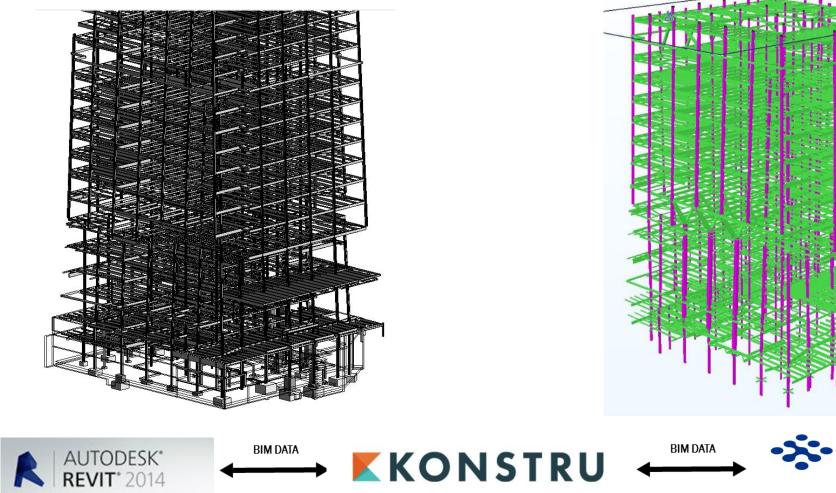
- Schedule Accelerate Contractors understanding of the design
- Risk Management Avoid <u>Mis</u>interpretations of the 2D Drawings
- Collaboration Demonstrate coordination has been completed with <u>all</u> disciplines
- Expedite Construction Allows subcontractors a head start in understanding the design intent and creating shop drawings

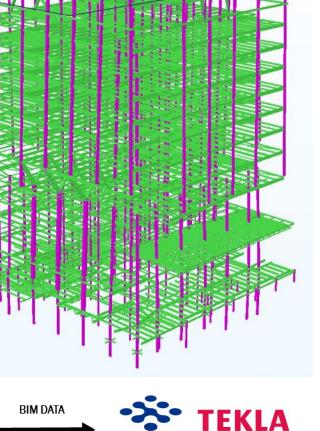


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BIM Model to Fabrication Model

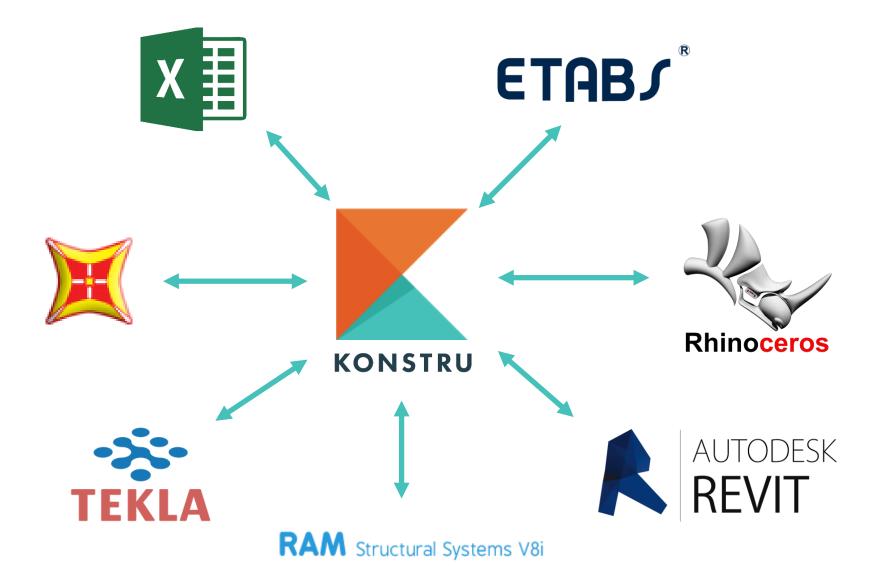
Create A Tekla Model Using The Existing Revit Model as a Starting Point



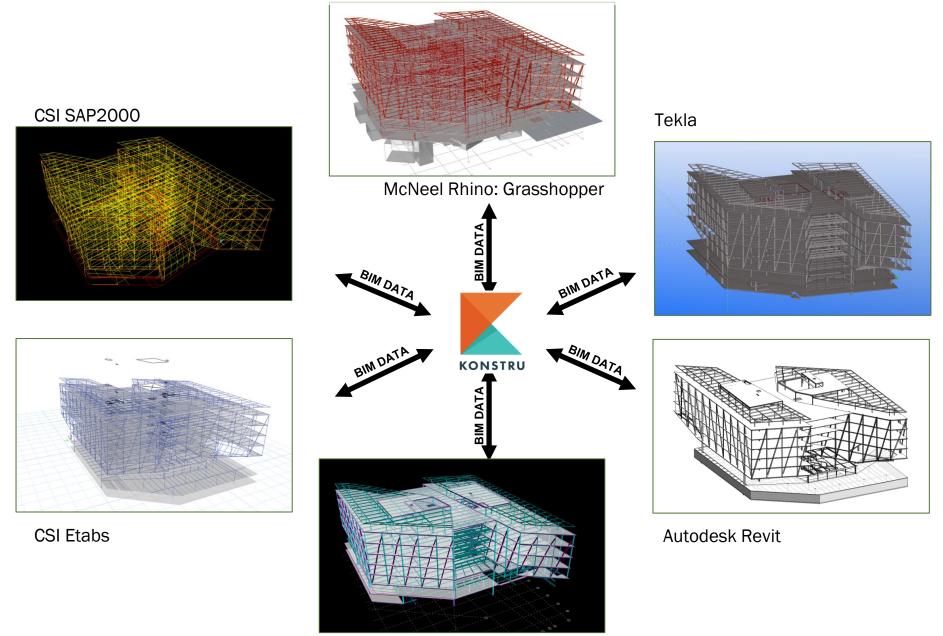


Structures

Interoperability, Cloud and Web Platform - KONSTRU

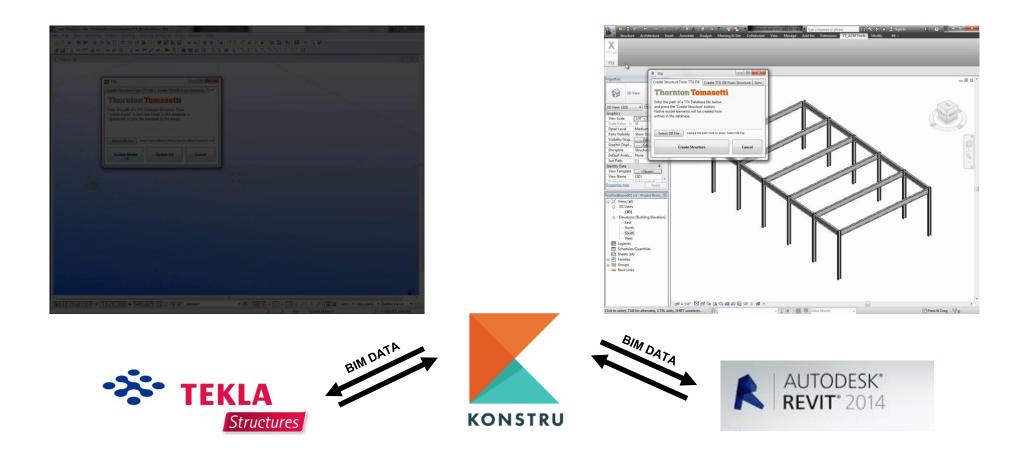


Interoperability, Cloud and Web Platform - KONSTRU



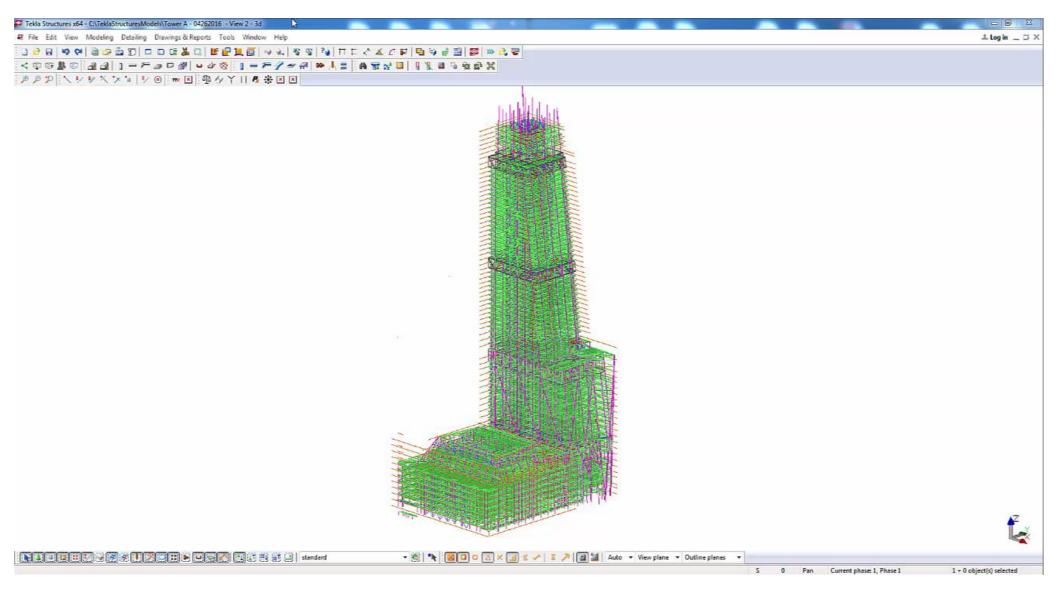
Bentley RAM Structural System

BIM DATA INTEROPERABILITY (AUTOMATION) USING KONSTRU

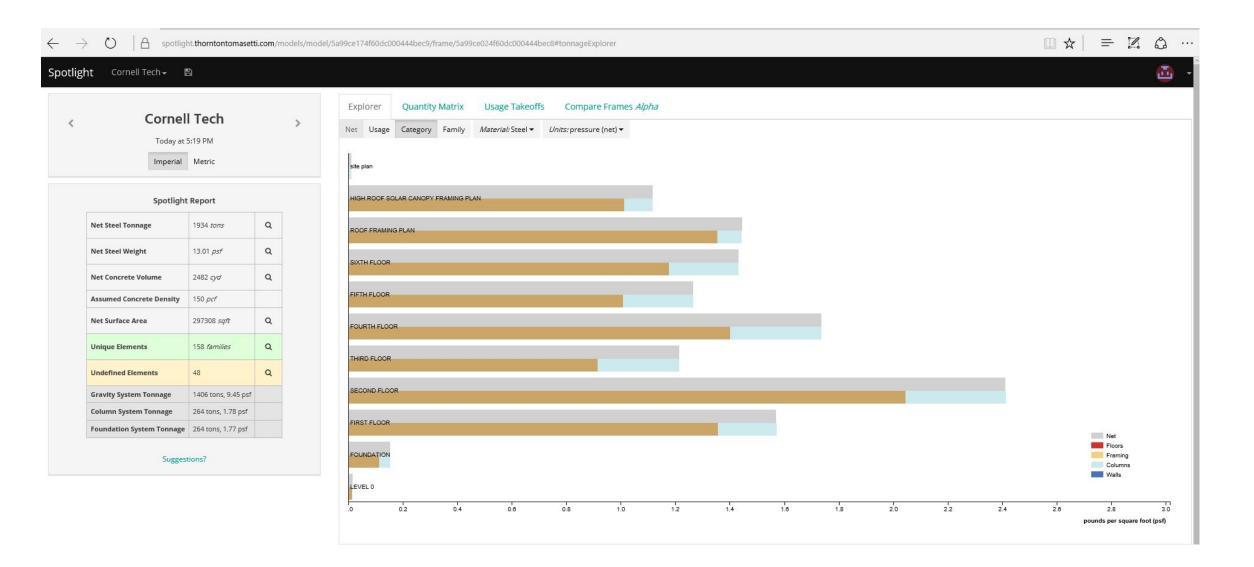


BIM Model to Fabrication Model

CORE studio Automation Tools



Spotlight – Automated Quantity Take Off and Visualization



Spotlight – Automated Quantity Take Off and Visualization

()A spotlight.thorntontomasetti.com/models/model/5a99ce174f60dc000444bec9/frame/5a99ce024f60dc000444bec8#quantityMatrix \leftarrow 凸 Spotlight Cornell Tech 🗸 🛛 🖺 Quantity Matrix Usage Takeoffs Compare Frames Alpha Explorer Cornell Tech < > 🛓 Download Full Takeoff Today at 5:19 PM Name Count NetWeight(lbs) NetVolume(cyd) StructuralMaterial StructuralType NetLength(ft) Imperial Metric 12" Concrete 80 7274477 1796 0 Concrete Floors 4 1/2" NW Concrete on 2" Metal Deck 10 48850 1810 0 Unknown Floors Spotlight Report 3-1/4" LWC over 2" Verco W2 33 87505 3242 0 Unknown Floors 3-1/4" LWC over 1-1/2" Verco B 4 3789 140 0 Unknown Floors Q Net Steel Tonnage 1934 tons 0 6" Concrete 1 134388 33 Concrete Floors Net Steel Weight 13.01 psf Q 14" Concrete 2 172168 42 0 Concrete Floors 3" Roof Deck 1 206 8 0 Unknown Floors 2482 cyd Net Concrete Volume Q 8" Concrete 1 104921 26 0 Concrete Floors Assumed Concrete Density 150 pcf W14X68 63 54800 0 874 Framing Steel Net Surface Area 297308 sqft Q W18X40 55 71865 0 1866 Steel Framing W14X99 56 80017 0 824 Stee Framing 158 families Q **Unique Elements** W14X22 419 112039 0 5497 Steel Framing 1419 W24X55 33 75405 0 Steel Framing **Undefined Elements** 48 Q W14X48 37 22495 0 492 Steel Framing Gravity System Tonnage 1406 tons, 9.45 psf W12X14 302 0 33121 2612 Steel Framing Column System Tonnage 264 tons, 1.78 psf W14X82 99 90911 0 1183 Steel Framing Foundation System Tonnage 264 tons, 1.77 psf W21X44 99 127322 0 3025 Stee Framing 125 0 W14X61 90302 1604 Steel Framing Suggestions? W18X35 201 0 5548 185261 Steel Framing W21X55 8 13688 0 261 Steel Framing W24X117 14 61857 0 548 Steel Framing W16X36 63 29405 0 885 Steel Framing W14X43 121 58308 0 1456 Steel Framing W14X120 48 72646 0 622 Steel Framing W14X90 124 181522 0 2151 Steel Framing

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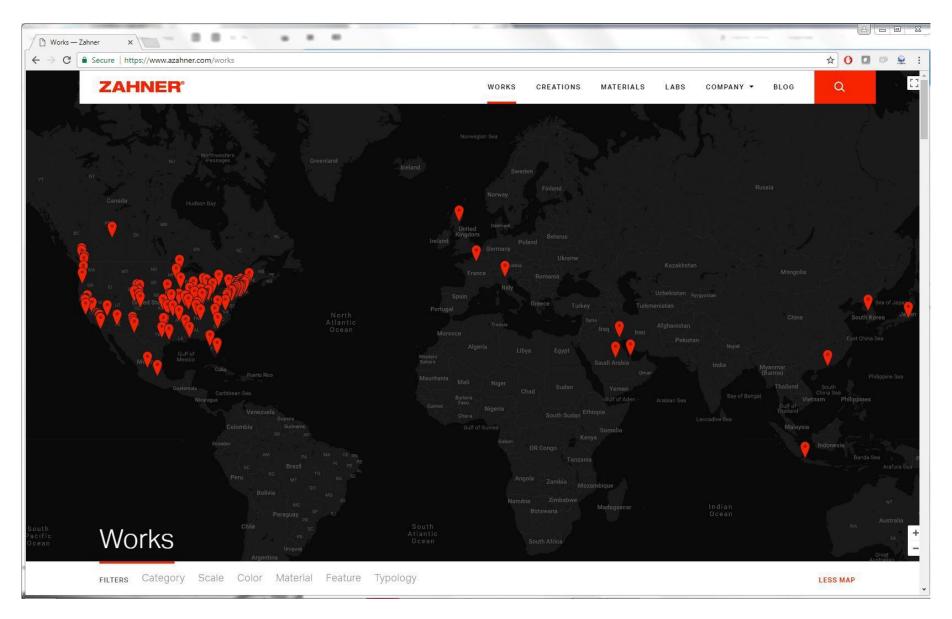
W24X131

Thornton Tomasetti CORE studio

CORE.ThorntonTomasetti.com @TT_CORE







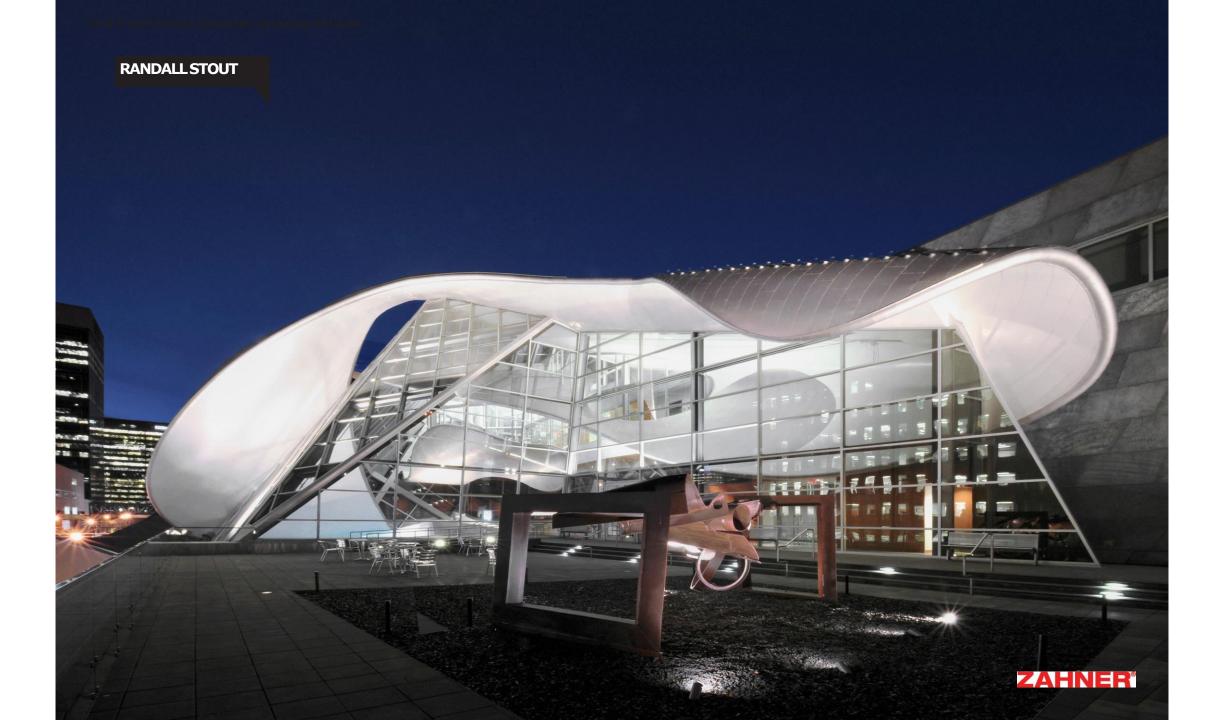


Delivery Symposium: Delivering the Future

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2018 Project Delivery Symposium: Delivering the Future

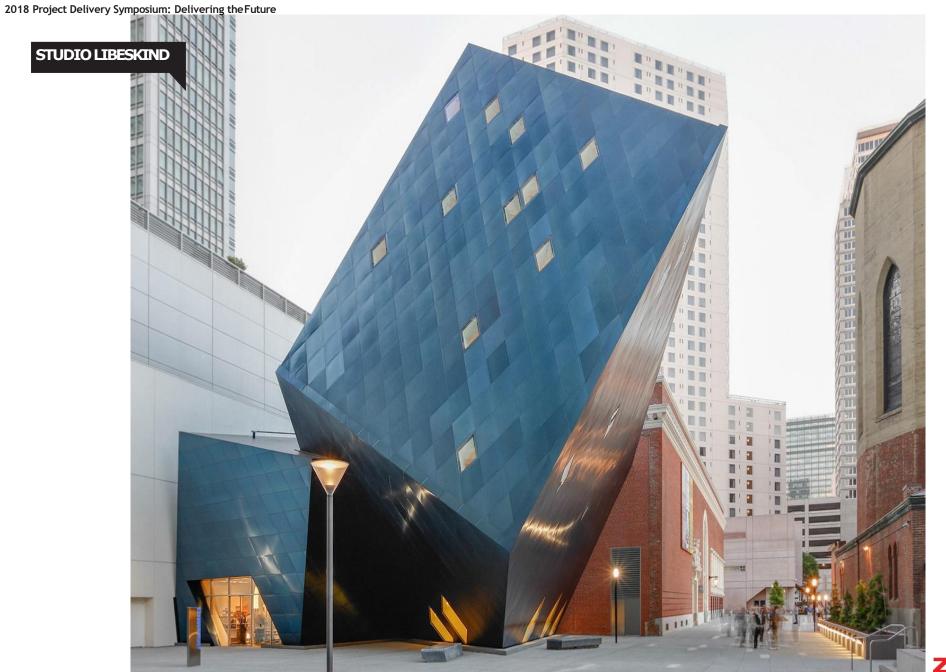
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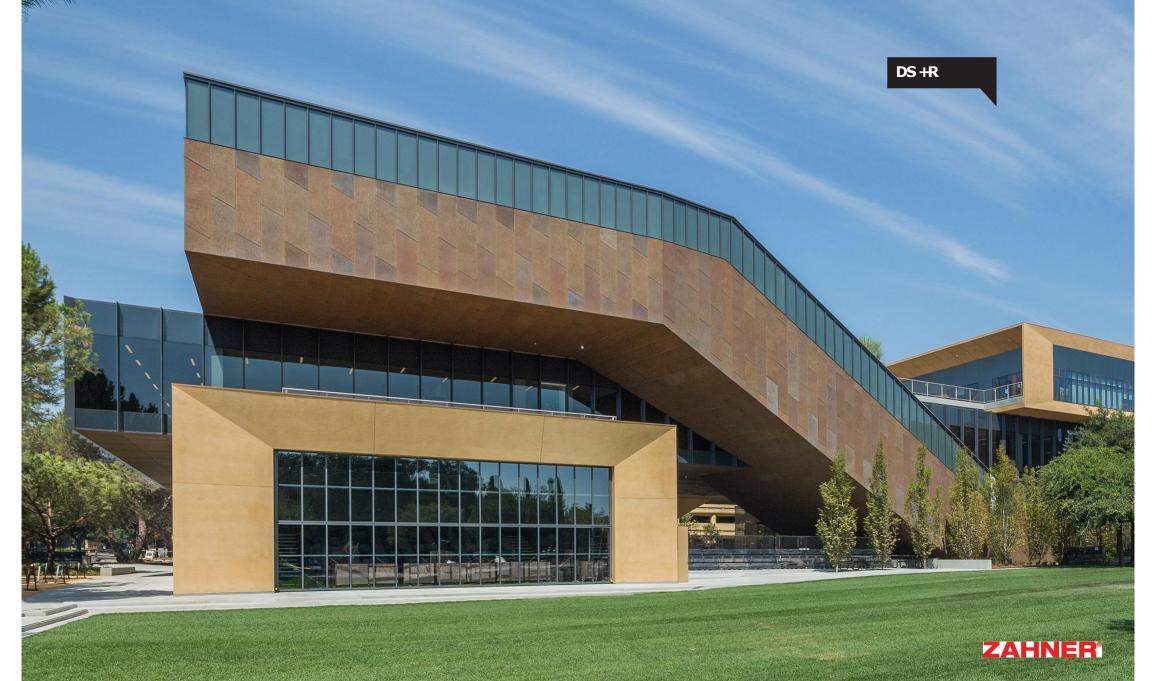


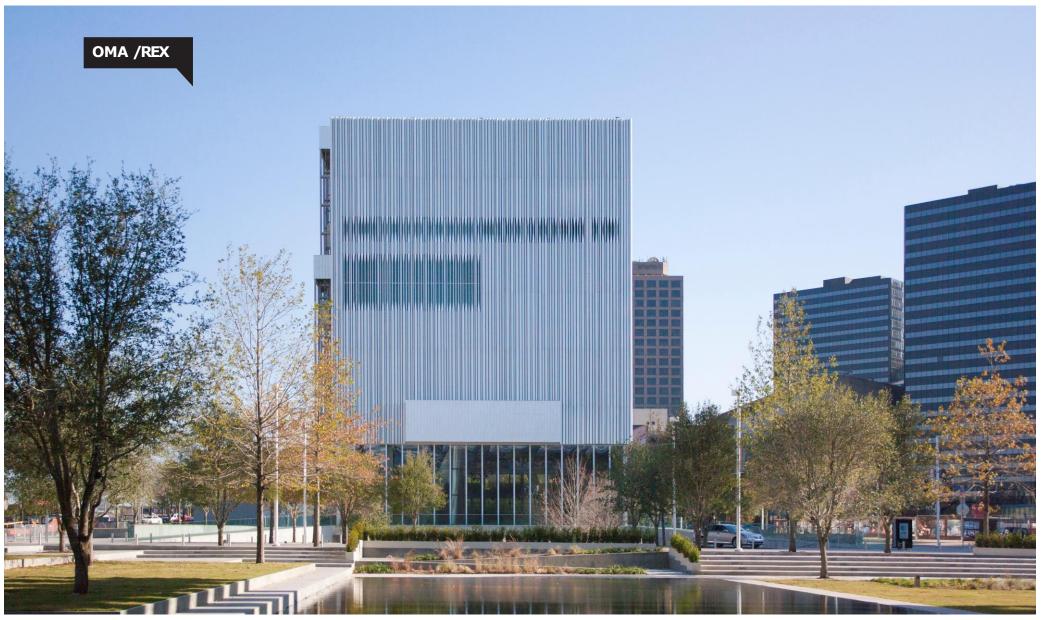


2018 Project Delivery Symposium: Delivering the Future

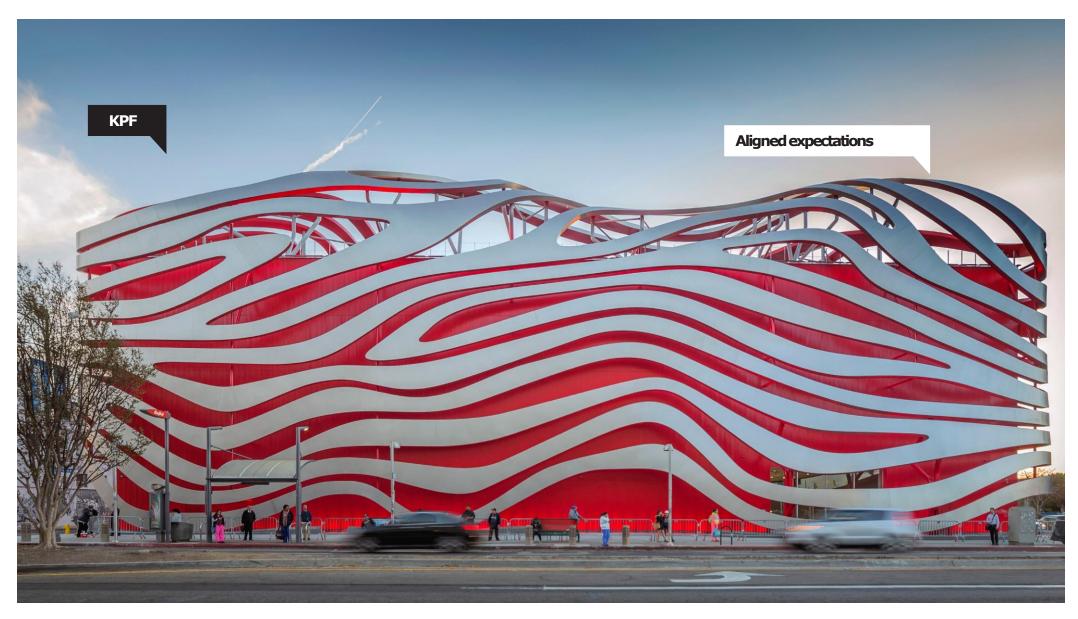




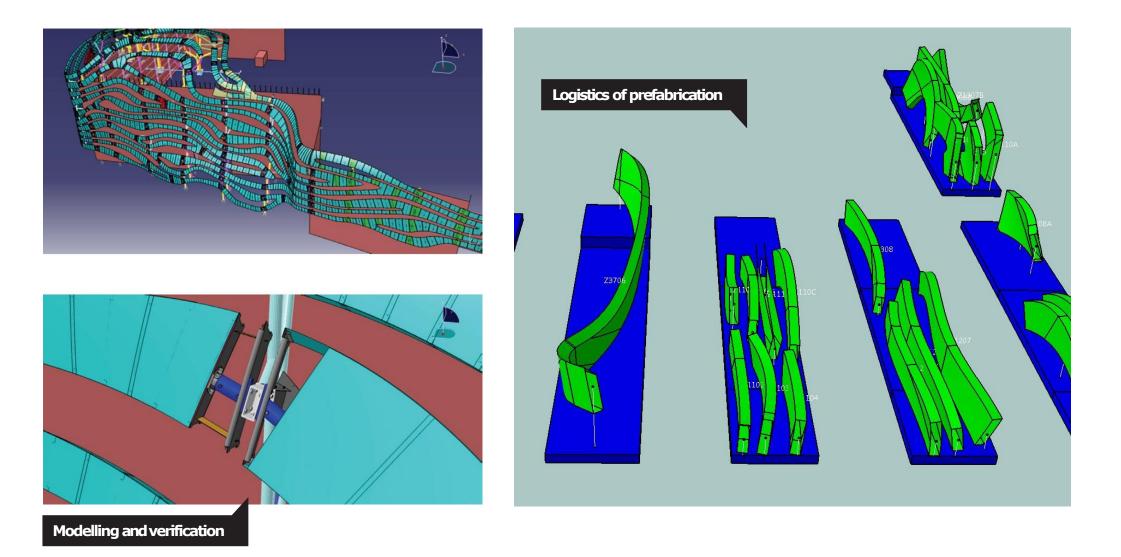






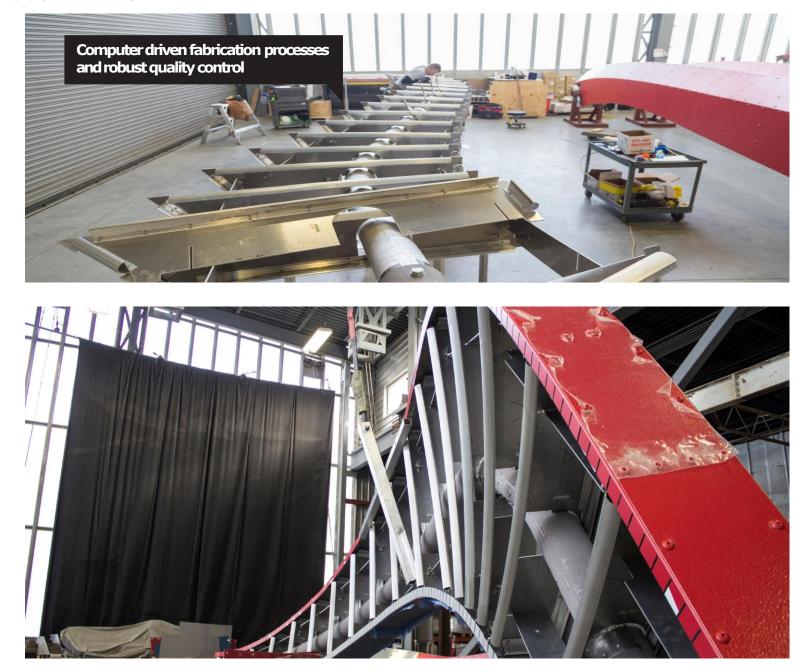








2018 Project Delivery Symposium: Delivering the Future











DELIVERING THE FUTURE

AIA PROJECT DELIVERY SYMPOSIUM

HKS

SETTING THE CONTEXT

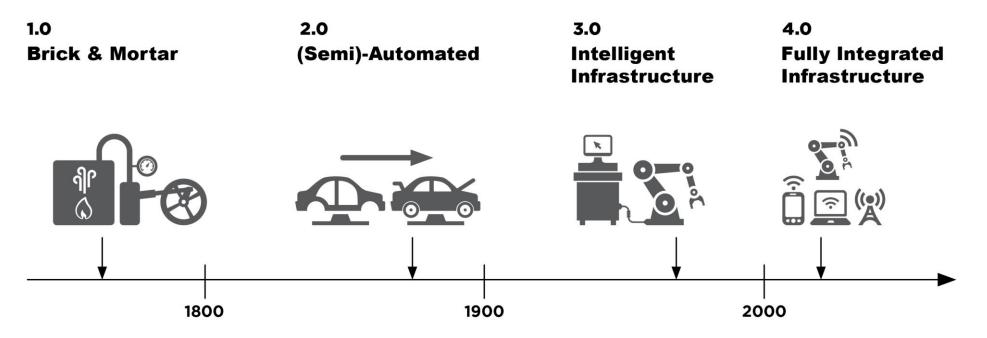
SETTING THE CONTEXT

FROM AN ARCHITECT'S PERSPECTIVE

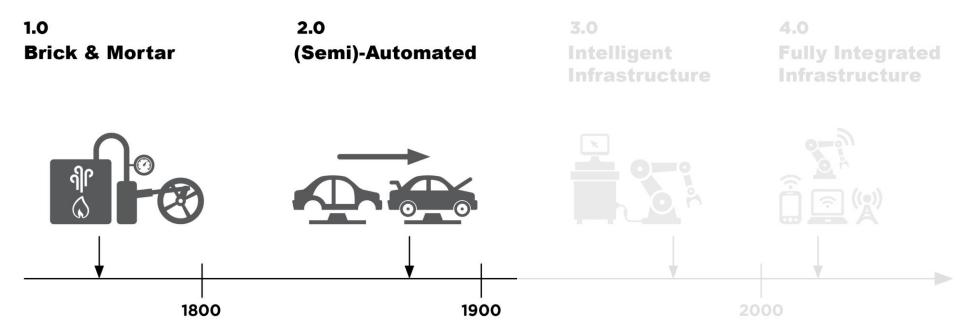
INDUSTRIAL REVOLUTIONS HOW DO WE MATCH UP

200

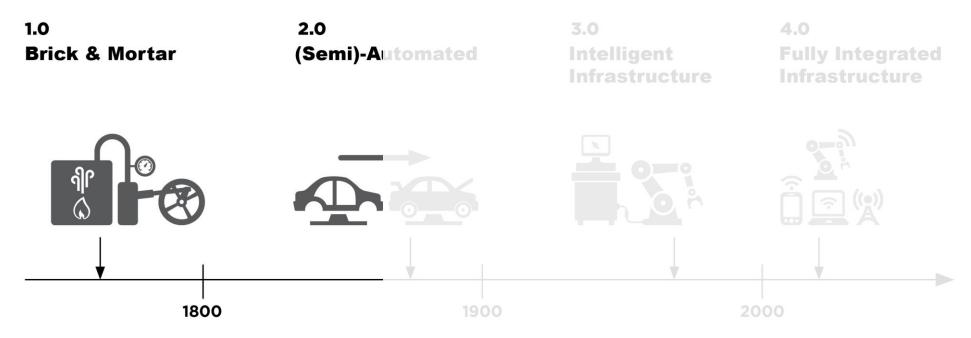
FROM INDUSTRY 1.0 TO INDUSTRY 4.0



FROM INDUSTRY 1.0 TO INDUSTRY 4.0



FROM INDUSTRY 1.0 TO INDUSTRY 4.0



THE PROCESS

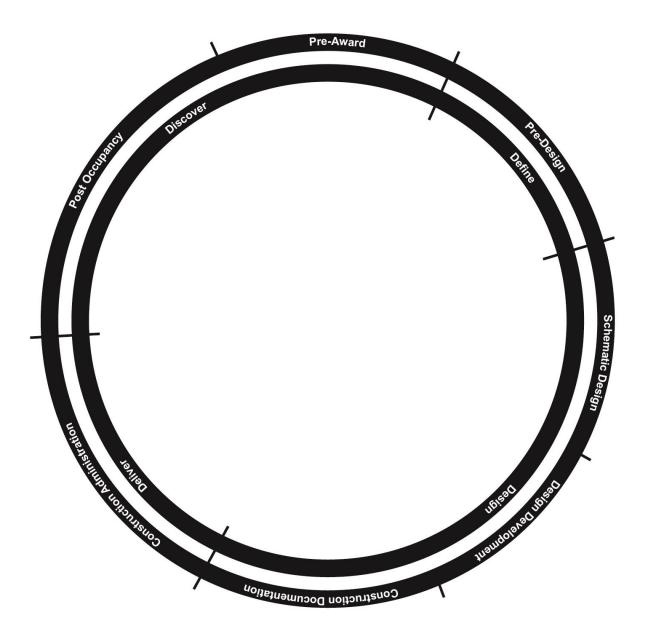
A PROCESS THAT IS FUNDAMENTALLY BROKEN

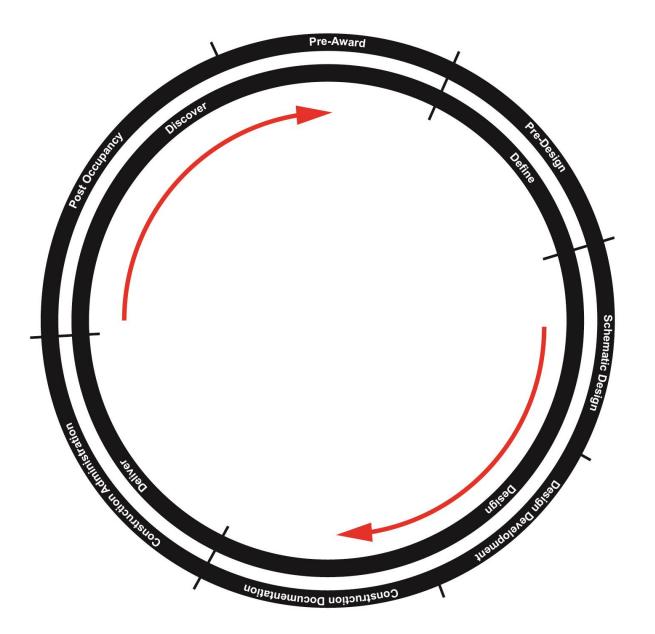
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Pre-Design	Schematic Design	Design Development	Construction Documentation	Construction Administration
Define		Design		Deliver

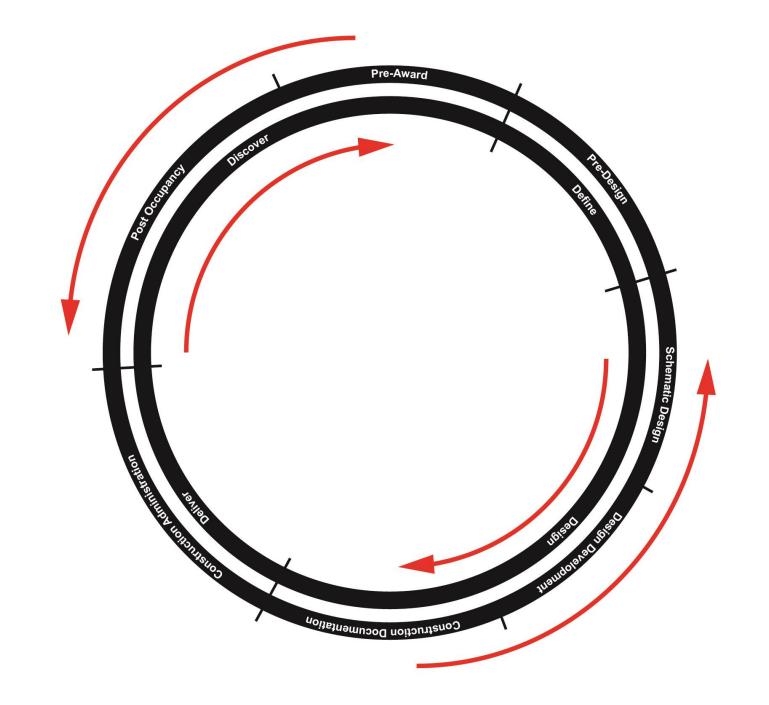
Pre-Award				Post Occupancy
Discover	Define			Observe

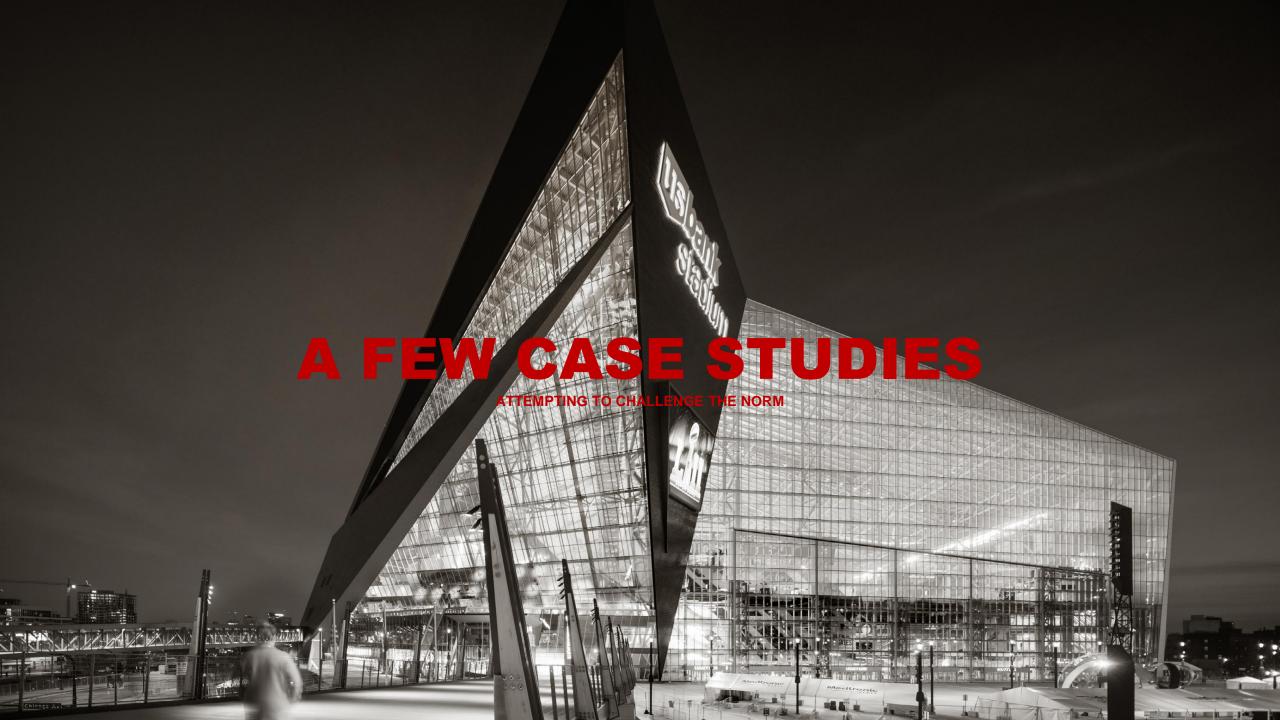
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Pre-Award	Pre-Design	Schematic Design	Design Development	Construction Documentation	Construction Administration	Post Occupancy
Discover	Define	Design		Deliver	Observe	

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Pre-Award	Pre-Design	Schematic Design	Design Development	Construction Documentation	Construction Administration	Post Occupancy
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Discover	Define		Design		Deliver	Observe
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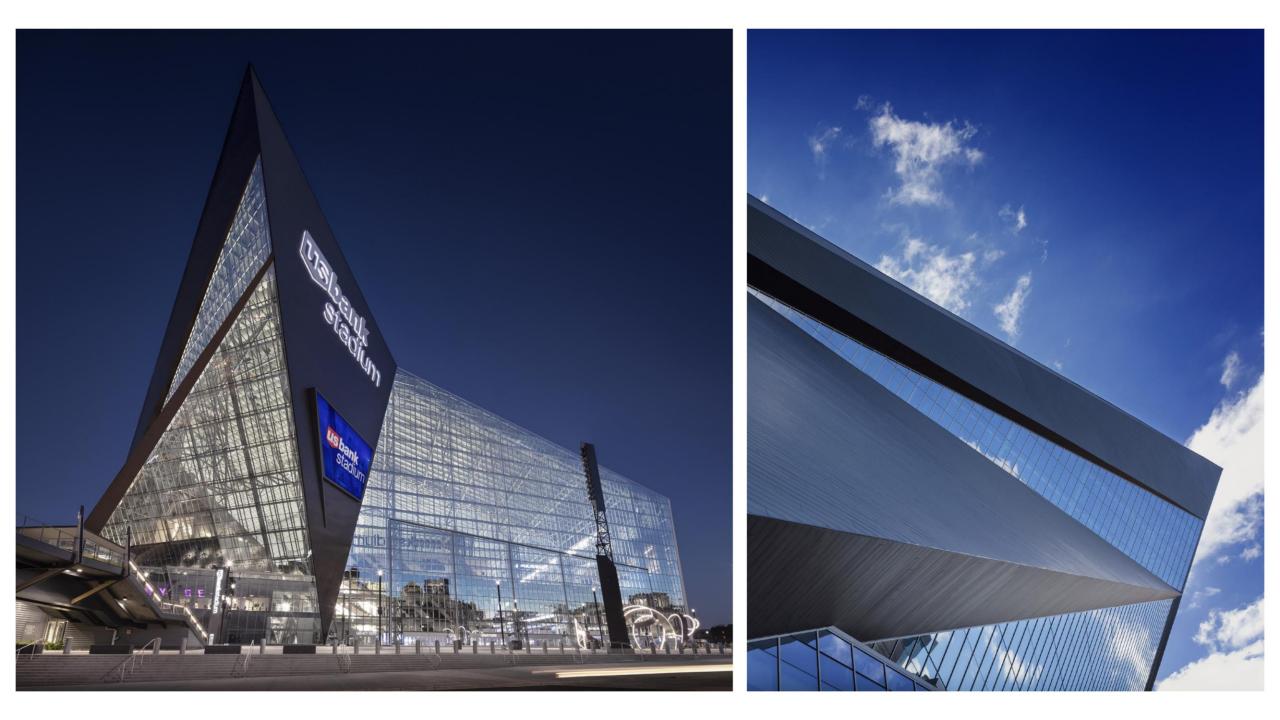












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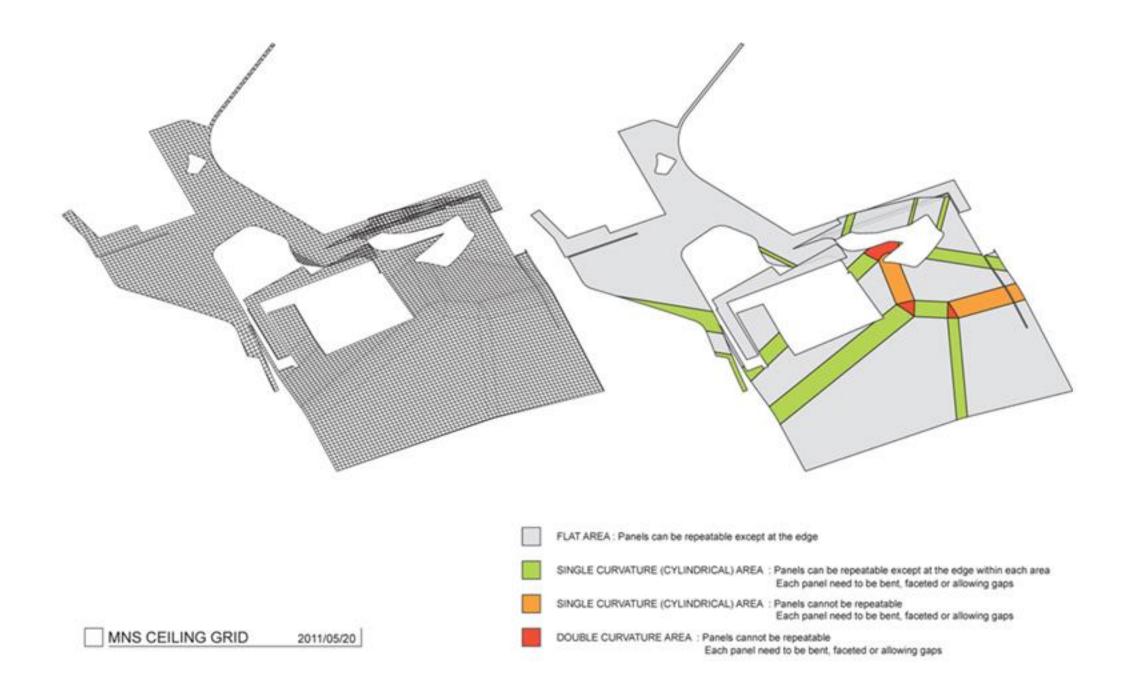
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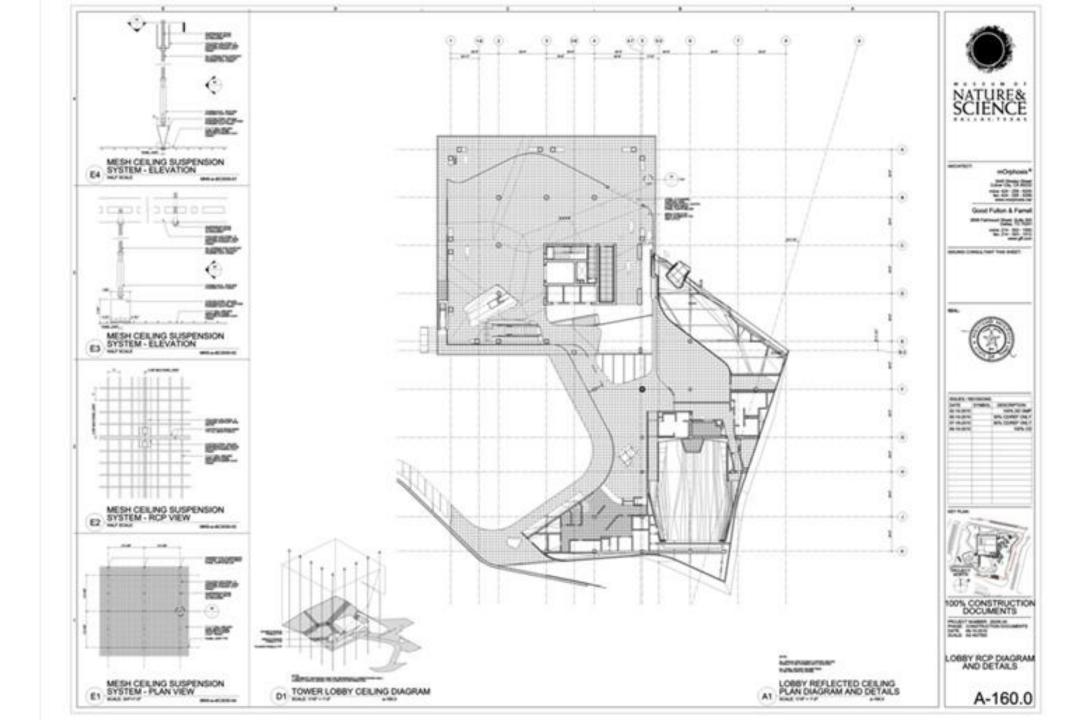
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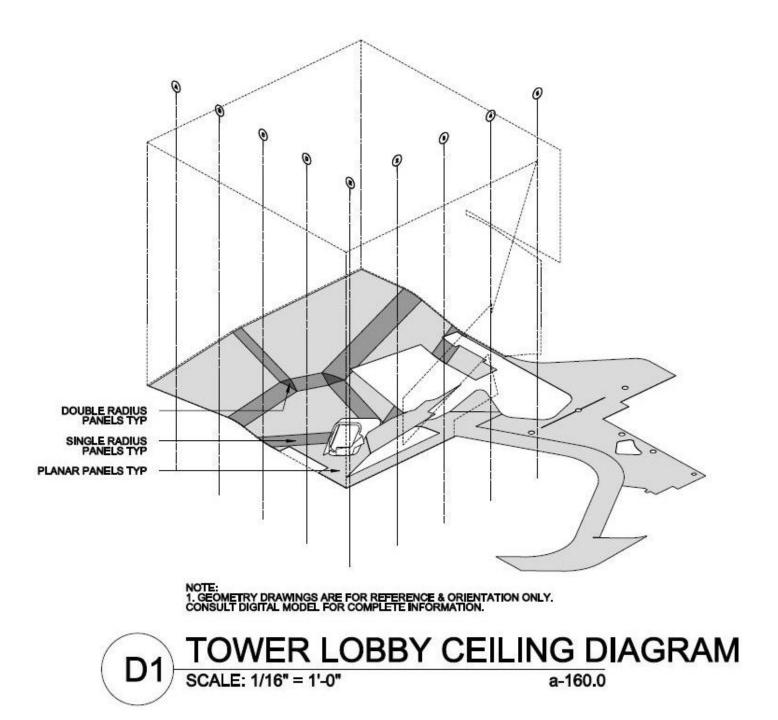
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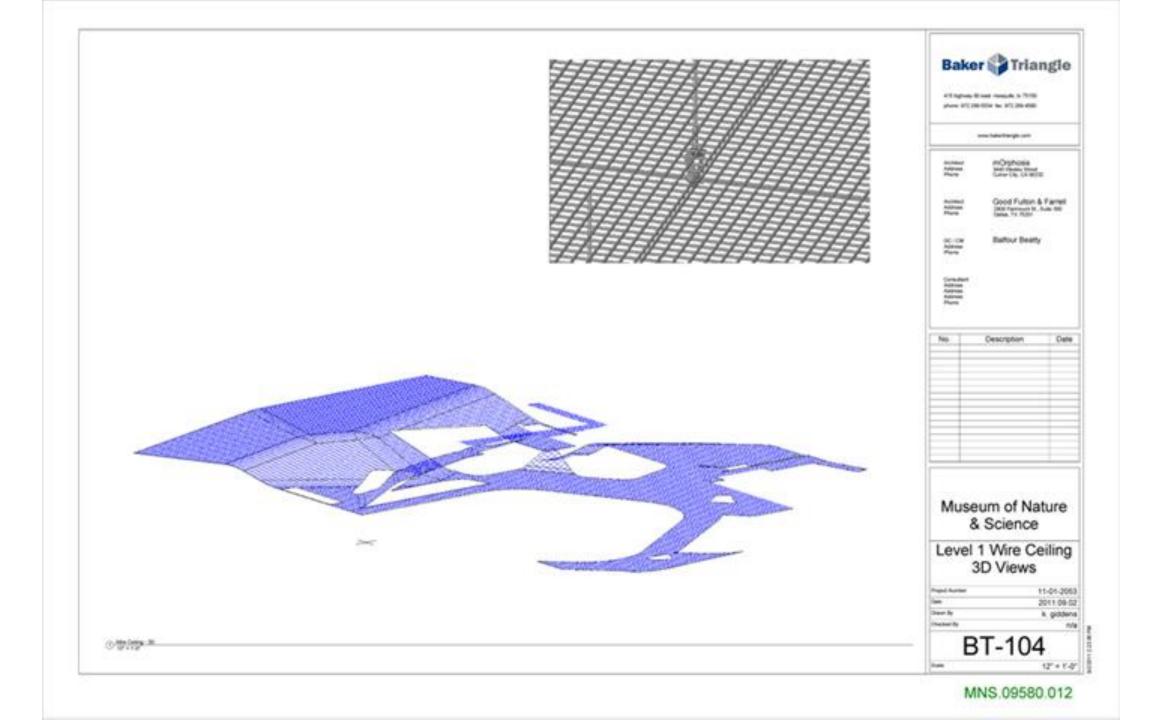
Addition

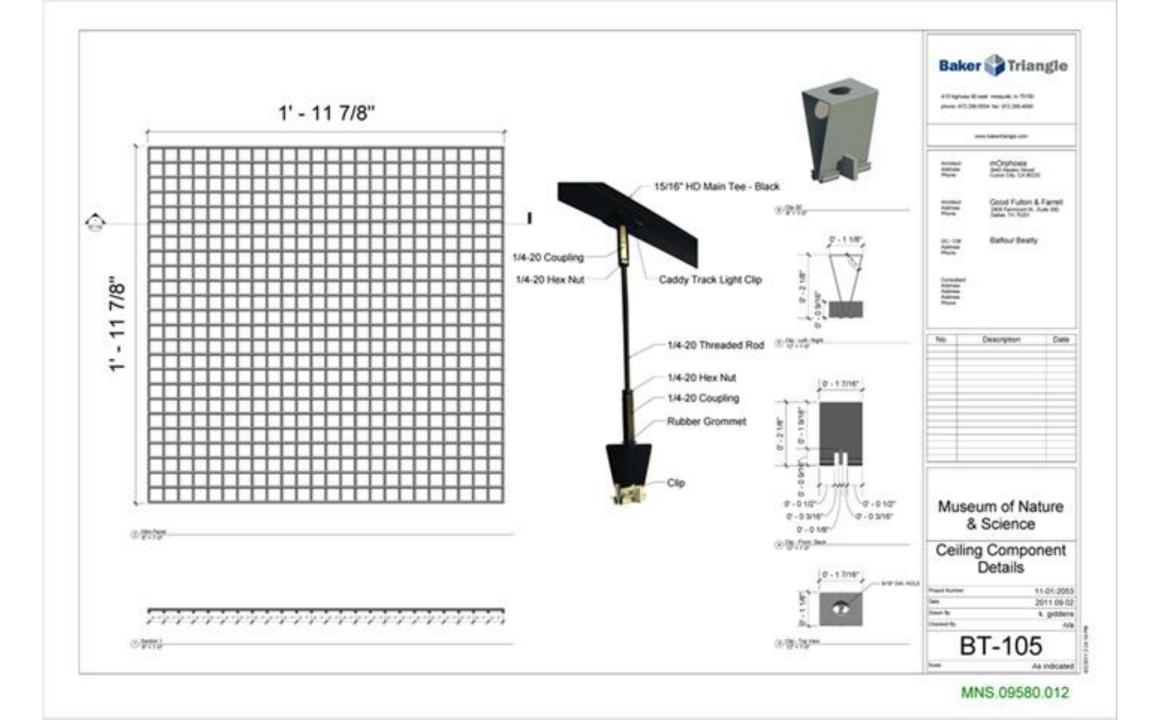
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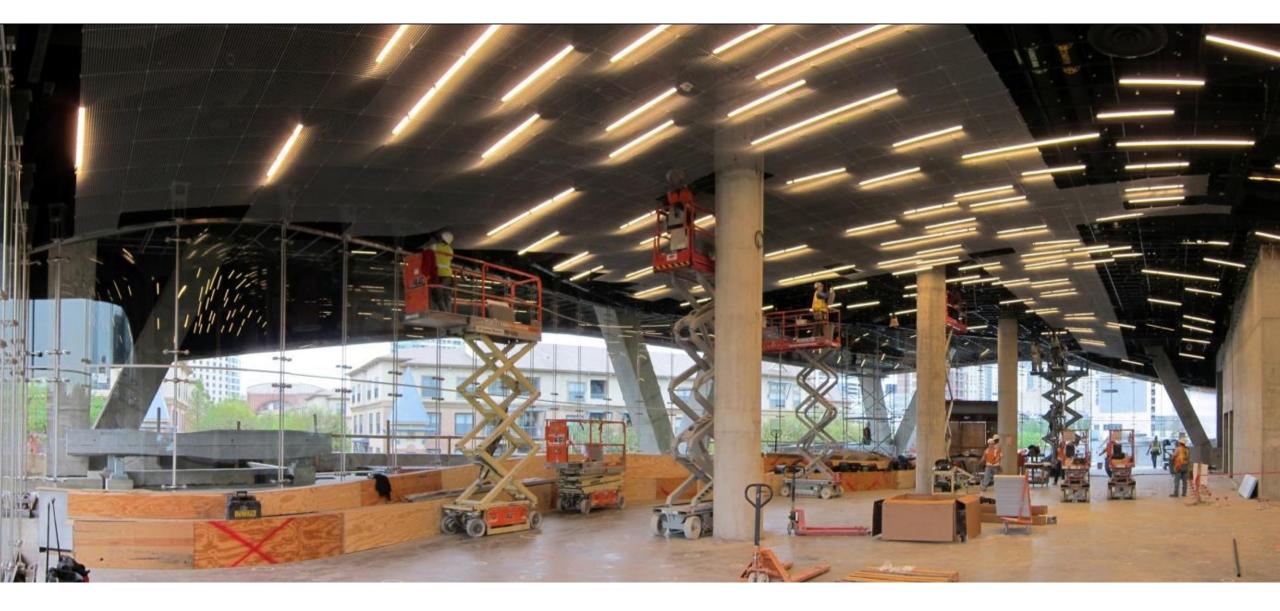
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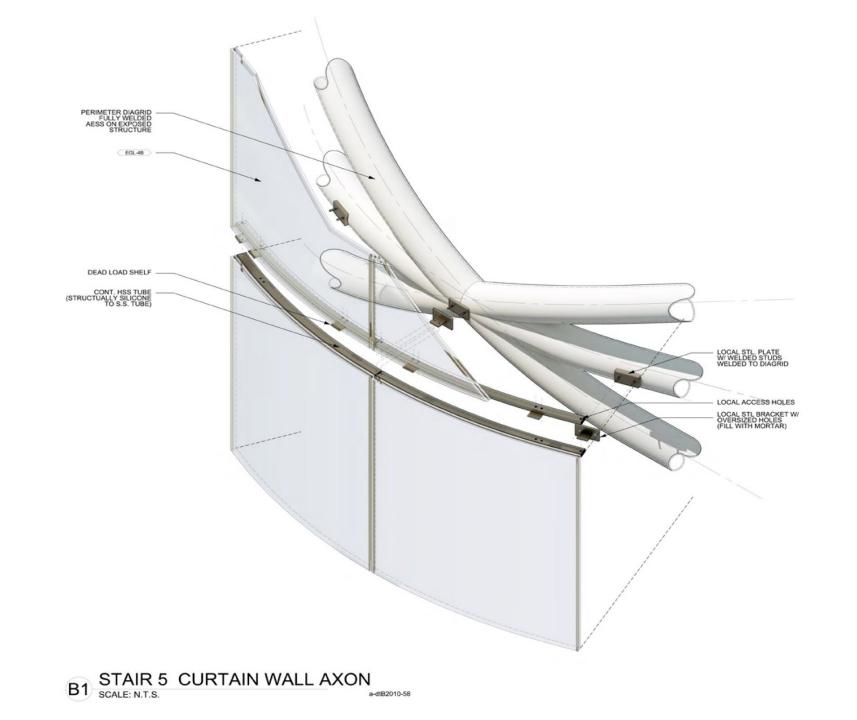
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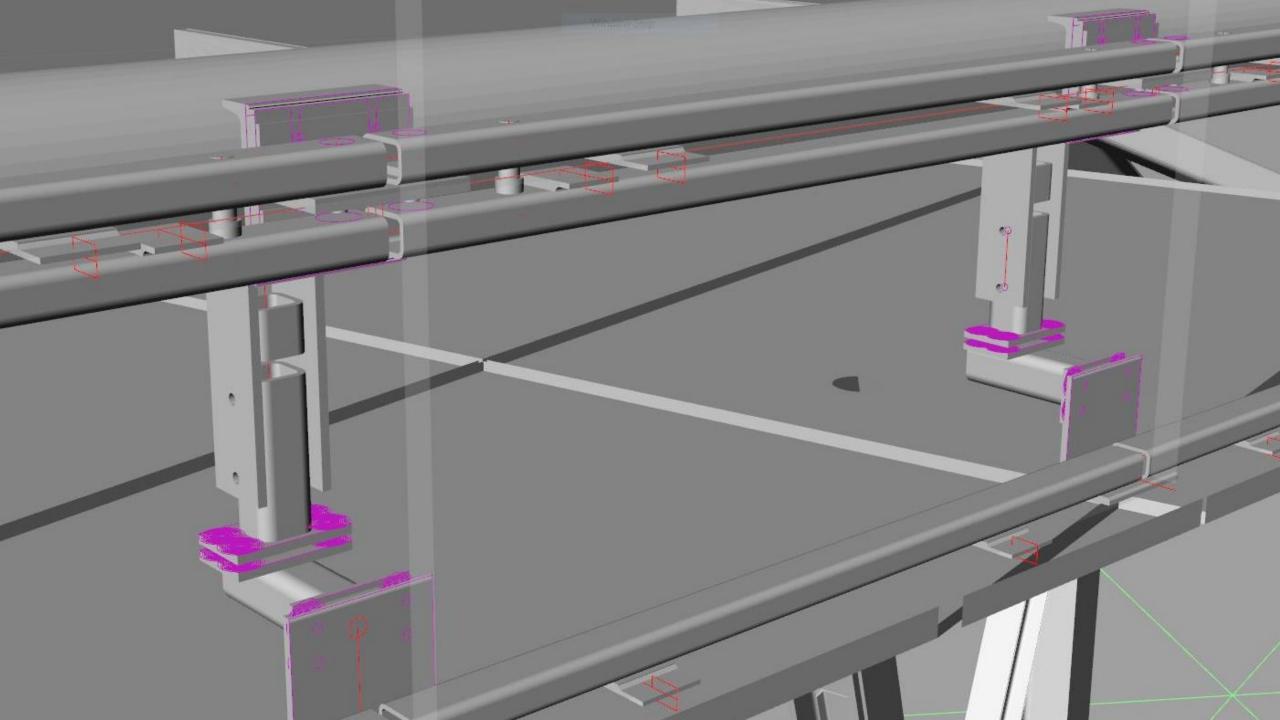
Sea

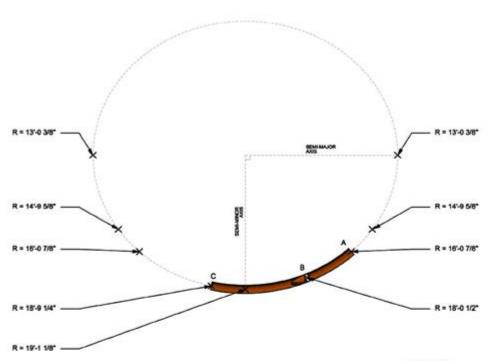
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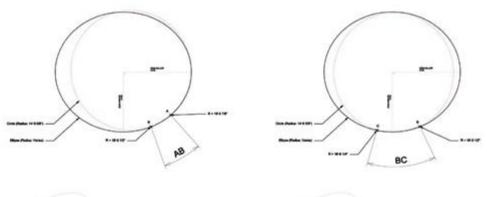






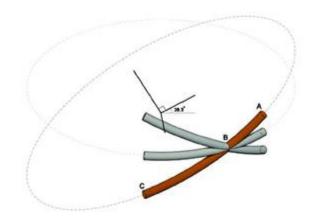


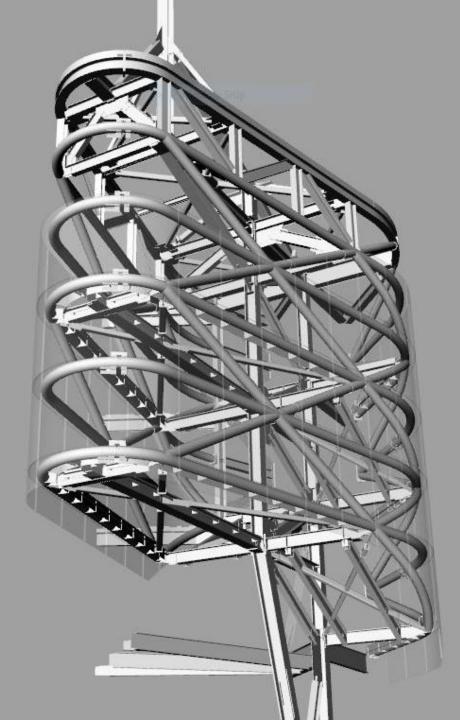




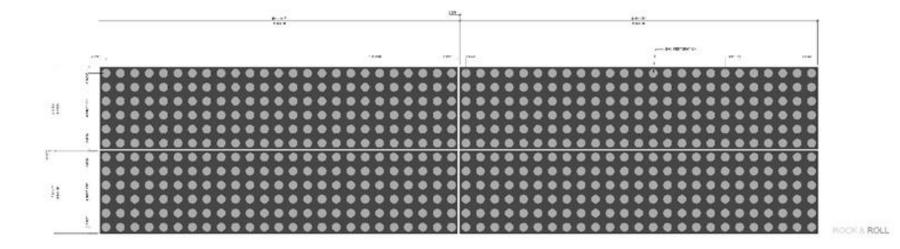


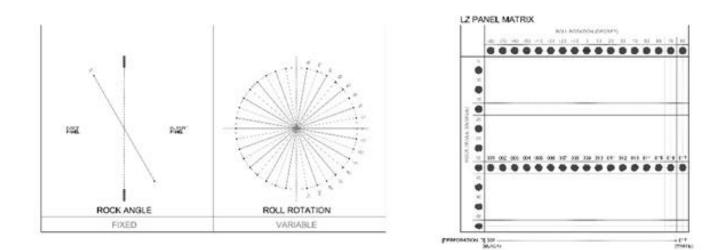
Plan - Ellipse





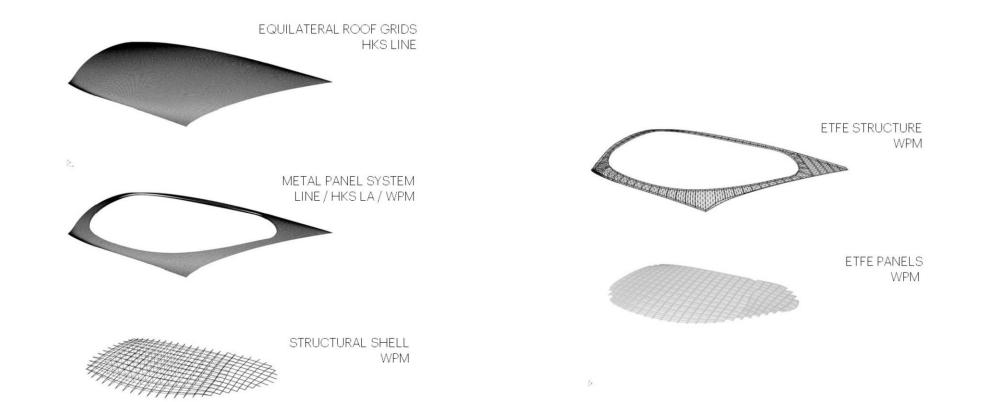


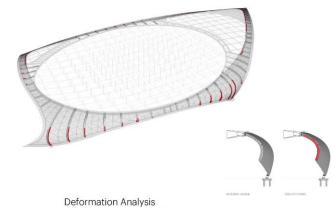




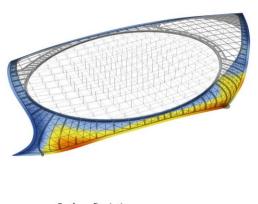
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N O D E . A S S E M B L Y

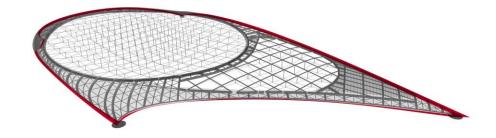




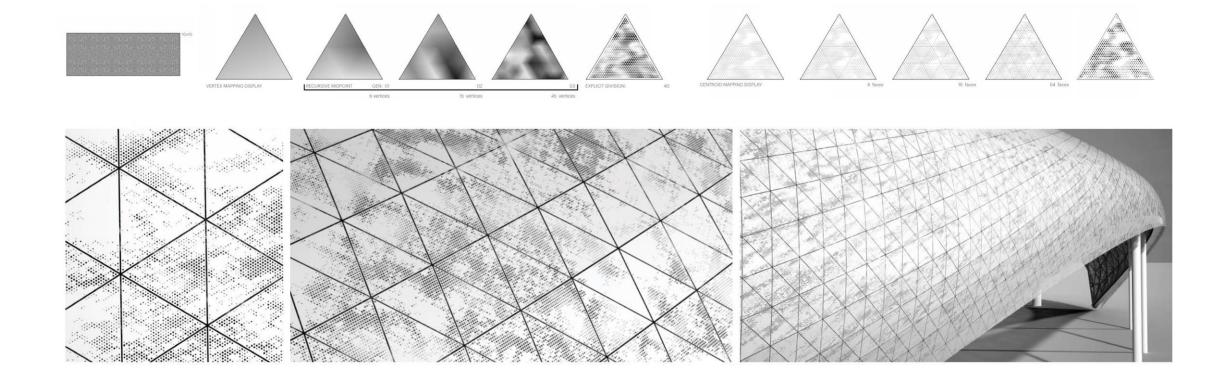
Analysis demonstrates non-conforming clearances between deflected primary steel girders and desired design surface.

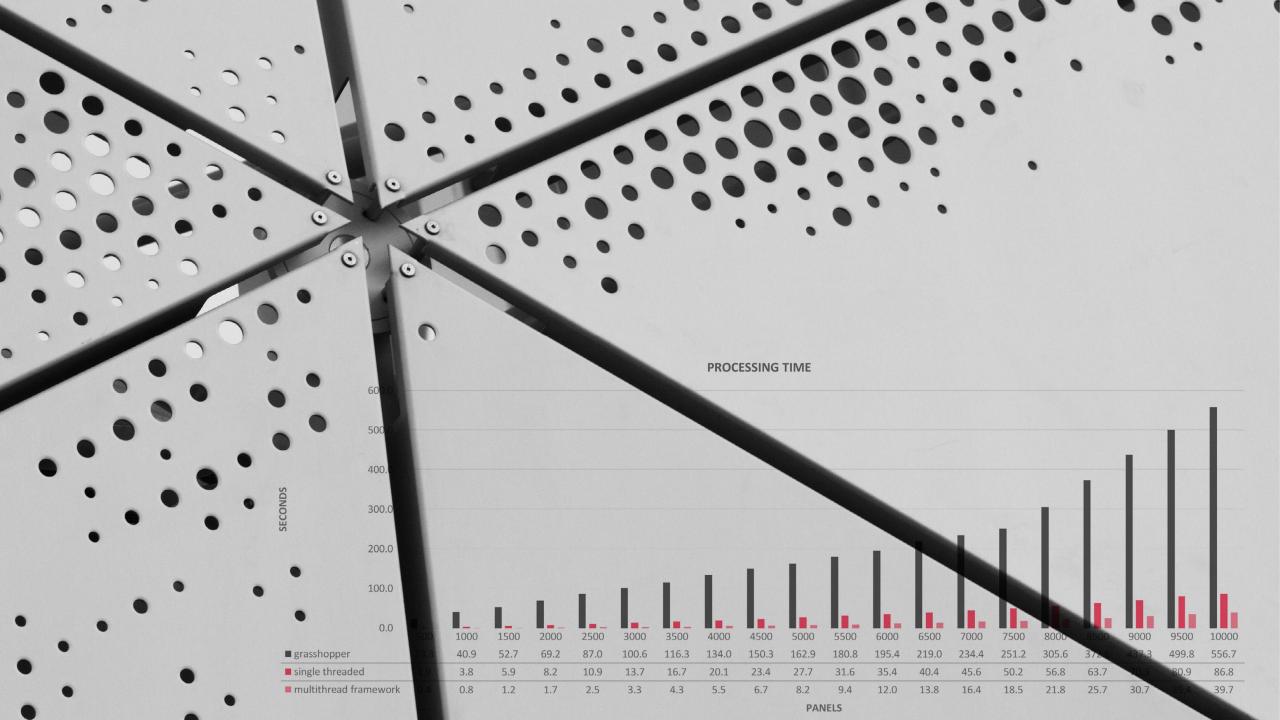


Surface Deviation Visualization of surface modifications required for adequate clearance between deformed primary structure and prefabricated skin. SURVER MORE CATION



Fascia Modifications Surface area increases resulting from skin modification was partially offset by refinements to fascia and soffit conditions.





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		Julion Four Automatics Four All Control All States and All States	Ф.,00029.54 СР,00030.54	CP_00077.5d	OP_00125.bet	CP_0017314	CP_00221.54	CP_002770.54	CP,00317.5e		P051 (12 P051 (13 P051 (14	.55785942, 54048184, 646808428, 41152763,	1.86246487, 1.86246487, 1.86246487, 1.86246487,	#3 #5 #2 #2	0GA1 5,125 0GA1 5,125 0GA1 5,125 0GA1 5,125
Extract Panel Da	ata	11 Finit-Letter, Same (Pert), - Kell, P. (Third Mer, A. (Par), - Nethering, Note:	СР,00031.54 СР,00032.54 СР,00033.54	CP_000079.txt	CP_00127.54 CP_00128.54 CP_00128.54	CF_00175.bt	CP_0023154	CP (00271.54)	CP,0031554	CP_DUBLIN 14	#05: C 22	W.9627499, 5.16397247, 7.26559394, 6,23646738,	1.86346487, 1.86246487, 1.86346487, 1.86346487,	40 40 40	05A1 0.875 05A1 0.75 05A1 0.75 05A1 0.625
TIN/2/ TIN/2/	7	State and State	CP_00034.54	00,00002.5d	CP.00130.5d	CP_00178.5et	00 00225.ht	CP_00274.5d	CP_0032234	CP-0117064	P051 (18	,16763679, CT1886275, A7908362,	1,86346487, 1/86346487, 1,86346487,		00A1 0.375 00A1 0.75 00A1 1.125

OP_00003.dwg	1.dwg		0147.dwg		OP_00243.my	OP_00291.dwg					
	2.dwg		00.00148.dwg		OP_00244.4wg	OP_00292.dwg					
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0P_00006.dwg	4.dwg	OP_00102.dwg	OP_00150.c vg	OP_00198.dwg	CP_00246.	OP_00294.dwg					
OP_00007.dwg	5.dwg	OP_00103.dwg	OP_00151.d vg	OP_00199.dwg	CP_00247.4wg	CP_00295.dwg		OP_00391.dwg			
OP_00008.dwg	M OP_00056.dwg	M OP_00104.dwg	OP_00152.dwg	OP_00200.dwg	CP 05248	OP_00296.dwg		P_00392.dwg			
OP_00009.dwg	M OP_00057.dwg	OP_00105.dwg	M OP_00153.d vg	M OP_00201.dwg	DWC	OP_00297.dwg	OP_00345.dwg	00393.dwg			
M OP_00010.dwg	OP 00058.dwg	OP 00106.dwg	OP_00154.dwg	OP 00202.dwg	CP_00250.0wg	OP_00298.dwg	OP_00346.dwg	08.0394.dwg			
M OP_00011.dwg	9.c	0107.dwg	OP_155.dwg	9	🔟 CP_00251.dwg	M OP_00299.dwg	OP_00347.dw	0 0 Sidwg			
M OP_00012.dwg	p.c	0100.4	TXT De 15		P_00252.dwg	M OP_00300.dwg	OP_00348.d/vg	000			
OP_00013.dwg	1.0	0109.dwg	OP_00157.dwg		M OP_00253.dwg	🔟 OP_00301.dwg	OP_00349 dwg	000			
OP_00014.dwg	2.0	0110.dwg	M OP_00158.dwg	9	M OP_00254.dwg	OP_00302.dwg	OP_00350.dwg	o 0900398.dwg			
OP_00015.dwg	OP_00063.dwg	OP_00111.dwg	M OP_00159.dwg	CP_00207.dwg	M OP_00255.dwg	M OP_00303.dwg	OP_00751.dwg	◦ O C6_00399.dvo ∖	OP_00447.dwg		
M OP_00016.dwg	M OP_00064.dwg	M OP_00112.dwg	M OP_00160.dwg	M OP_00208.dwg	M OP_00256.dwg	OP_00304.dwg	-	0 0 0 0 00 00 0	OP_00448.dwg		
M OP_00017.dwg	M OP_00065.dwg	M OP_00113.dwg	M OP_00161.dwg	OP_00209.dwg	M OP_00257.dwg	M OP_00305.dwg	OP 00353.dwgO	0 0 0 0 0 0 0	OP_00449.dwg		
M OP_00018.dwg	M OP_00066.dwg	M OP_00114.dwg	M OP_00162.dwg	MOP_00210.dwg	M OP_00258.dwg	🔤 OP_00306.dwg	0/_00354.dvO		O P_00450.dwg		
M OP_00019.dwg	M OP 00067.dwg	OP 00115.dwg	OP 00163.dwg	0P 00211.dwg	M OP_00259.dwg	00307.dwg		000000			
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M OP_00023.dwg	M OP_00071.dwg	M OP_00119.dwg	M OP_00167.dwg	M OP_00215.dwg	M OP_00263.dwg	M OP_00311.dwg		000000			
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M OP_00025.dwg	M OP_00073.dwg	M OP_00121.dwg	M OP_00169.dwg	M OP_00217.dwg	M OP_00265.dwg	OP_00313.dwg	UNI OF OUDUILUNG	000000	or overstang	OP_00505.dwg	
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M OP_00027.dwg	M OP_00075.dwg	M OP_00123.dwg	M OP_00171.dwg	M OP_00219.dwg	M OP_00267.dwg	OP_00315.gwg		00000000		OP_00507.dwg	
M OP_00028.dwg	M OP_00076.dwg	M OP_00124.dwg	M OP_00172.dwg	M OP_00220.dwg	M OP_00268.dwg	OP_00319.dwg	CP_00364.8Wg	0000000		P_00508.dwg	
OP_00029.dwg	M OP_00077.dwg	M OP_00125.dwg	OP_00173.dwg	M OP_00221.dwg	M OP_00269.dwg	M OP_00317.dwg				00509.dwg	
OP_00030.dwg	M OP_00078.dwg	M OP_00126.dwg	M OP_00174.dwg	M OP_00222.dwg	OP_00270.dwg	OP_00318.dwg		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		OP_0510.dwg	
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OP_00032.dwg	OP_00080.dwg	M OP_00128.dwg	OP_00176.dwg	OP_00224.dwg	M OP_00272.dwg	M OP_00320.dwg	• OP 00368 dwg	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	O OP 00464.dwg	OP_00512 dwg	
M OP_00033.dwg	M OP_00081.dwg	M OP_00129.dwg	OP_00177.dwg	M OP_00225.dwg	OP_00273.dwg	P_00321.dwg c	o ⁰⁰ 0 ⁰ 0 ^{369.dvg} o	0 000017 dwD (O O OP_00465.dwg	OP_00513.dvg	OP_00561.dwg
OP_00034.dwg	M OP_00082.dwg	M OP_00130.dwg	OP_00178.dwg	OP_00226.dwg	OP_00274.dwg	OP_00322.dwg	0 00-00-70dwg	o 0 0 - 00418 do 0	OP_00466.dwg	• OP_00514.dwg	OP_00562.dwg
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OP_00037.dwg	M OP_00085.dwg	M OP_00133.dwg	OP_00181.dwg	OP_00229.dwg	M OP_00277.dwg		o o Ø_037∂dvø o			• OP_00517.dwg c	
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OP_00041.dwg	All OP_00089.dwg	OP_00137.dwg	M OP_00185.dwg	OP_00233.dwg	OP_00281.d \//g	OP_00329.dwg	OP_00377.dwg	OP_00425.dwg	OP_00473.dwg	OP_00521.dwg	OP_00369.dwg
OP_00042.dwg	OP_00090.dwg	OP_00138.dwg	OP_00186.dwg	OP_00234.dwg	OP_00282.dwg	OP_00330.dwg	M OP_00378.dwg	OP_00426.dwg	M OP_00474.dwg	OP_00522.dwg	OP_00570.dwg
OP_00043.dwg	M OP_00091.dwg	M OP_00139.dwg	M OP_00187.dwg	OP_00235.dwg	OP_00283.dwg	OP_00331.dwg	OP_00379.dwg	OP_00427.dwg	OP_00475.dwg	OP_00523.dwg	OP_00571.dwg
M OD 00044 dura	M OD 00000 dura	M OD 00140 dura	M OD 00100 dava	היייב אייים	00 00101 dura	00 00000 dura	run nhann street	THE DEPART OF THE	CHI INTATE dure	and this this 34 dates	(ALL THE C.) shows

HKS LINE

OP_00000.txt	OP_00048.txt	OP_00096.txt	OP_00144.txt	OP_00192.txt	OP_00240.txt	OP_00288.txt	OP_00336.20 2 OP_00337.55 3	// 00603.000:: OV // PANEL PARAMETE	IS STADIUM RS UNITS [INCHE 2016:1:19 TIME: 8		in conjugation de president	
							OP_00338.bd 5	// OVIS PANEL_000	OP 00434.54			
						COP_0291.txt	OP_00339.bd 7	// NODE POSITIONS	: OP_00435.txt			
OP_00004.txt	A SECTION		CO. 00148 kt		OP_00244.bt	OP 00292.bt	OP_00340.bt 8	// [WORLD COORDI	NATES] X,	Y,	Z)	
OP_00005.txt		0F_00101.00	JPG -	OP_00197.txt	OP_00245.pt	JPG 193.txt	OP_00341.bt 10		7025.731445, 7088.620605,	-2980.814697, -2960.644043,	1302.910156) 1326.833374)	
DP_00006.txt	2 2 - 2 2 2 1 1		📕 O P_00150. td	OP_00198.bd	OP_00246.pt	94.txt	OP_00342.pt 11		7064.873535,	-2943.861816,	1253.605225)	
🔜 OP_00007.txt	tot	🧾 OP_00103.txt		OP_00199.txt	MOP_00247.pxt	0P_0295.txt	OP_00343.btt 13	// PANEL ORIENTAT	TON VECTOR:			
OP_00008.txt	OP_00056.txt	OP_00104.txt		OP_00200.bt	OP_00248 xt	00.00296.txt	OP_00344.bxt 15	// OPVEC: 9(bd	-0.39886255,	-0.85718581,	-0.32579310)	
OP_00009.txt	DP_00057.txt	OP_00105.txt	P_00153.txt	OP_00201.txt	OP_00249.pxt	DWG): 97.txt	OP_00345.pt 16		0.03967894,	0.99998828,	0.00000000)	
OP_00010.txt	OP 00058.txt	OP 00106.txt	OP_00154.txt	OP_00202.txt	OP_00250.pxt	OP_00298.txt	OP_00346.txt 18		354.503906 104.919096	[SQ.INCH] [SQ.INCH]		
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OP_00013.txt	Jos prt	9.txt	🔲 CP_00157.tkt	🔤 OP_0	OP_00253.txt	1= OF_00301.bd	OP_00349.bt 25	ILL C POUSSY DA	8.3179 2.00445.6xt	[DEGREES]		
OP_00014.txt	xt	0.txt	OP_00158.txt	0P_0	OP_00254.txt	OP_00302.txt	OP_00350.txt 25	// O SUM: 398.bd	80 OP_00446.txt	OP_00494.txt		
OP_00015.txt	OP_00063.txt	OP_00111.txt	DP_00159.txt	OP_00207.txt	OP_00255.txt	P_00303.txt	OP_00351.txt 26	1 11111111111111111111111111111111111	mannin	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
OP_00016.txt	OP_00064.txt	OP_00112.txt	OP_00160.txt	📃 OP_00208.txt	P_00256.txt	DP_00304.txt	OP_00352.txt 28		: OP 00448.txt			
OP_00017.txt	📓 OP_00065.txt	🧾 OP_00113.txt	OP_00161.txt	DP_00209.txt	💹 OP_00257.txt	DP_00305.txt	OP_00353.txt 30	10P_0040(.txt	OP_0(x ,49.txt	OP_09497.txt	OP_2545.txt	
OP_00018.txt	OP_00066.txt	🧾 OP_00114.txt	DP_00162.txt	DP_00210.txt	🧾 OP_00258.txt	DP_00306.txt	OP_00354.txt 31	POS: (.txt	70.24401093,	OP_00498.txt	OP_(0) 46.txt	
OP_00019.txt	OP 00067.txt	OP_00115.txt	OP_00163.txt	OP 00211.txt	OP 00259.txt	OP_00307.txt	OP_00355.txt 33	OPPOS:0(.txt	28.8628788,51.bd	67.04870605,99.btt	OP (0) 47.txt	
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OP_00021.txt	P_ 0069. t	LOP_01 to	DP_(<u>165</u> .txt	📗 DR 00 13 t	C002€tx	OP 02 .txt	OP_00357.txt 36	OP VEC: 06.txt	OP_00%53.txt	OP_00.01.bt	OP_01)549.txt	
OP_00022.txt	🗾 OP_00070.txt	🧾 OP_00118.txt	DP_00166.txt	📓 OP_00214.txt	DP_00262.txt	P_00310.txt	OP_00358.txt 38		NS: OP_0045 (POS:	OP_0§502.txt		
OP_00023.txt	🗾 OP_00071.txt	🗾 OP_00119.txt	P_00167.txt	DP_00215.txt	DP_00263.txt	P_00311.txt	OP_00359.txt 40	TASTENER POSIT	IONS: OP 0045 (POS:	DIAMETER: 3503.txt		
OP_00024.txt	OP_00072.txt	OP_00120.txt	DP_00168.txt	OP_00216.txt	DP_00264.txt	DP_00312.txt	OP_00360.txt 41	OP 00408.txt	OP_00456.txt	OP 00504.txt DIAMETER: }		
OP_00025.txt	OP_00073.txt	OP_00121.txt	DP_00169.txt	P_00217.txt	OP_00265.txt	OP_00313.txt	DP_00361.bxt 43	// PERFORATION CO		OP_00505.txt		
OP_00026.txt	OP_00074.txt	OP_00122.txt	DP_00170.txt	OP_00218.txt	P_00266.txt	OP_00314.txt	OP_00362.txt 44	POS: OP POS: OC txt	2.752969265,	1.86246407,	OP_00554.txt	DIA: 0 P 00602 txt
OP_00027.txt	📓 OP_00075.txt	OP_00123.txt	DP_00171.txt	📓 OP_00219.txt	📓 OP_00267.txt	P_00315.txt	OP_00363.txt 46	POS: (4.704191685,9.txt	1.86246407,7 bt	OP_0(8)55.txt	DIA: 0.75
OP_00028.txt	November 2007 [2017] [2	OP_00124.txt	DP_00172.txt	🔤 OP_00220.txt	P_00268.txt	P_00316.txt	OP_00364.txt 48	OP POS 12 (xt	8.606637001,0.txt	1.86246407, 8.b.t	OP_0(0)56.txt	DIA: 100604.bt
OP_00029.txt	OP_00077.txt	OP_00125.txt	DP_00173.txt	OP_00221.txt	OP_00269.txt	OP_00317.txt	OP_00365.txt 49	OP POS: 13 (Dat	10.55785942, tot 12.50908184,	1.86246407, 9.bd	OP_0(0)57.txt	DIA: 1.125 DIA: 1.125
OP_00030.txt	OP_00078.txt	OP_00126.txt	OP_00174.txt	OP_00222.txt	OP_00270.txt	OP_00318.txt	OP_00366.txt 51	DOC: /	14.46030426,2 bd	1.86246407, 0.bd	OP_0(0)58.txt	DIA: 1.125
OP_00031.txt	OP_00079.txt	OP_00127.txt	DP_00175.txt	P_00223.txt	OP_00271.txt	P_00319.txt	P_00367.txt 53	OPpost15 oxt	18.3627491,3.txt	1.86246407, 1.txt	OP_0659.txt	DIA: 0.875 607 bd
OP_00032.txt	OP_00080.txt	OP_00128.txt	DP_00176.txt	DP_00224.txt	P_00272.txt	P_00320.txt	OP_00368.txt 54	FUS. (20.31397247.4.txt	1.86246407, 2.bd	OP_0(⁰⁾ 50.txt	DIA: 0.75 DIA: 0.75
OP_00033.txt	OP_00081.txt	OP_00129.txt	DP_00177.txt	OP_00225.txt	OP_00273.txt	P_00321.txt	OP_00369.txt 56	005. (24.21641731,5.bd	1.86246407, 3.bd 1.86246407,	OP_0(0)61.txt	DIA: 0.6250609.bd DIA: 0.375
OP_00034.txt	OP_00082.txt	OP_00130.txt	OP_00178.txt	OP_00226.txt	OP_00274.txt	OP_00322.txt	OP_00370.txt 58	POS: 18 (xt	28.11886215,6.txt	1.86246407, 4.txt	OP_0(0)62.txt	DIA: 0.7500610.bd
OP_00035.txt	OP_00083.txt	OP_00131.txt	OP_00179.txt	OP_00227.txt	OP_00275.txt	OP_00323.txt	OP_00371.txt 59 60	PUS: (30.07008362,7.txt 32.0213089,	1.86246407, 5.bxt 1.86246407,	OP_0(⁰)63.txt	DIA: 1.125 DIA: 1.25
OP_00036.txt	OP_00084.txt	OP_00132.txt	OP_00180.txt	OP_00228.txt	OP_00276.txt	OP_00324.txt	OP_00372.txt 61		33.97253036,8.txt 35.92375183,	1.86246407, 6.bd	OP_0(0)64.txt	DIA: 0.7500612.bd
OP_00037.txt	OP_00085.txt	OP_00133.txt	OP_00181.txt	OP_00229.txt	OP_00277.txt	OP_00325.txt	G3 0P_00373.0Xt 63	POS:21(XL	37.8749733,	1.86246407, txt	OP_0(0)65.txt	DIA: 0100613.00
OP_00038.txt	OP_00086.txt	OP_00134.txt	DP_00182.txt	OP_00230.txt	OP_00278.txt	OP_00326.txt	OP_00374.txt 64 65	POS: (39.82619858 O.t.t.	1.86246407, 8.bd 1.86246407,	OP_0(2)66.bxt	DIA: 0.00614.bt
OP_00039.txt	OP_00087.txt	OP_00135.txt	OP_00183.txt	OP_00231.txt	OP_00279.txt	OP_00327.txt	P_00375.txt 66	OPpost23 (xt	43.72864151,1.txt	1.86246407,9.txt	OP_00067.txt	DIA: 0.8750615.bd
OP_00040.txt	OP_00088.txt	OP_00136.txt	OP_00184.txt	OP_00232.txt	OP_00280.txt	OP_00328.txt	OP_00376.txt 68		45.67986298,2.txt 47.63108826,	1.86246407, 0.txt	OP_0(2)68.txt	DIA: 1.125 DIA: 0.875
OP_00041.txt	OP_00089.txt	OP_00137.txt	OP_00185.txt	OP_00233.txt	OP_00281.txt	OP_00329.txt	OP_00377.txt 69	POS: (49.58230972,3.txt 51.53353119,	1.86246407, 1.bd 1.86246407,	OP_0(8)69.txt	DIA: 00P_00617.bd
OP_00042.txt	OP_00090.txt	OP_00138.txt	OP_00186.txt	OP_00234.txt	DP_00282.txt	OP_00330.txt	OP_00378.txt 71	OP pos426 txt	53.48475647.4.txt	1.86246407,2.txt	OP_00070.txt	DIA: 00P 00618.bd
OP_00043.txt	NP_00091.txt	OP_00139.txt	OP_00187.txt	DP_00235.txt	MOP_00283.txt	DP_00331.txt	OP_00379.txt 72		55.43597794,5.txt 57.3871994,	1.86246407, 3.txt 1.86246407,	OP_0(⁰)71.txt	DIA: 0 P_00619.txt
D 00044+++	CD 00000 54	D 00140 54		M OD 00006 +++	CD 00204 +++	M 00 00333 ++	CD 00000 ++ 74	CODDOC 1064	C0 22042007/C +.+	1 0C7ACA07 1 4 44	00 0/0171 +++	DTA- 019750500 44

HKS LINE

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