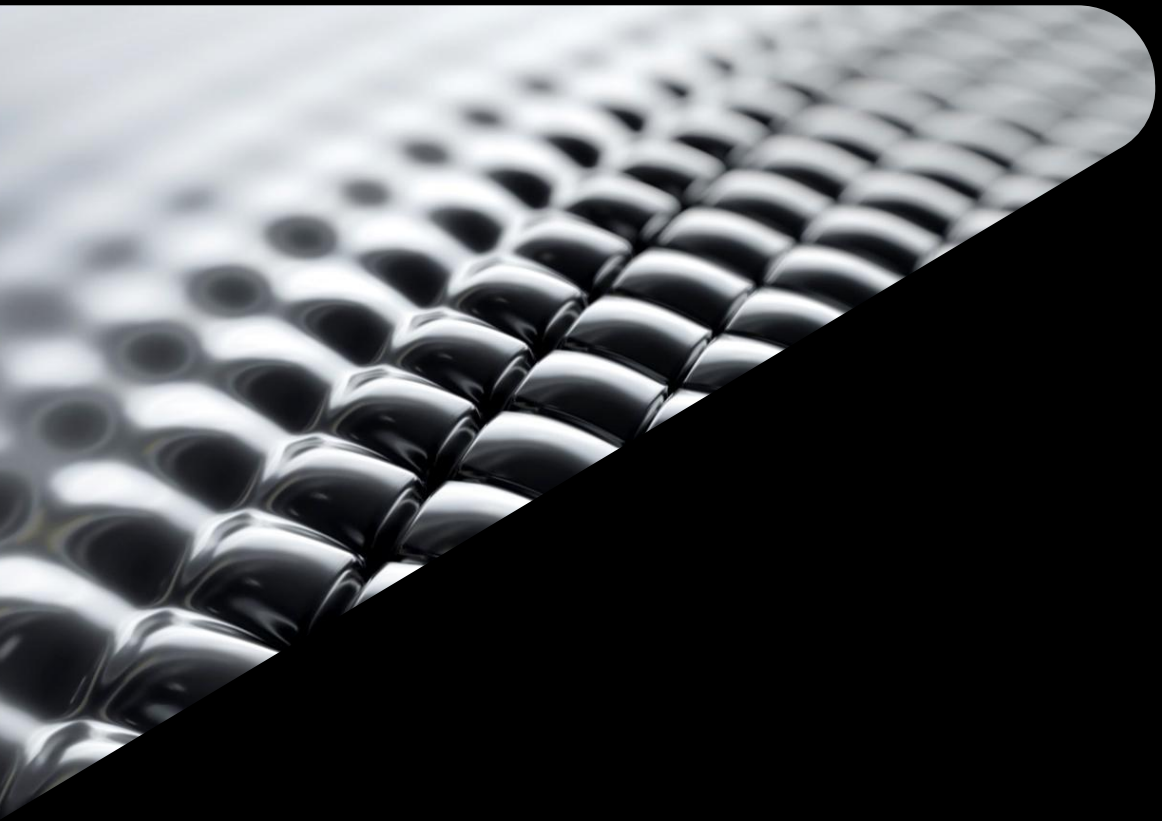
AUTODESK UNIVERSITY

Autodesk Fusion 360 for Architects & Designers

Jeffrey McGrew
Architect & Co-Founder | becausewecan.design

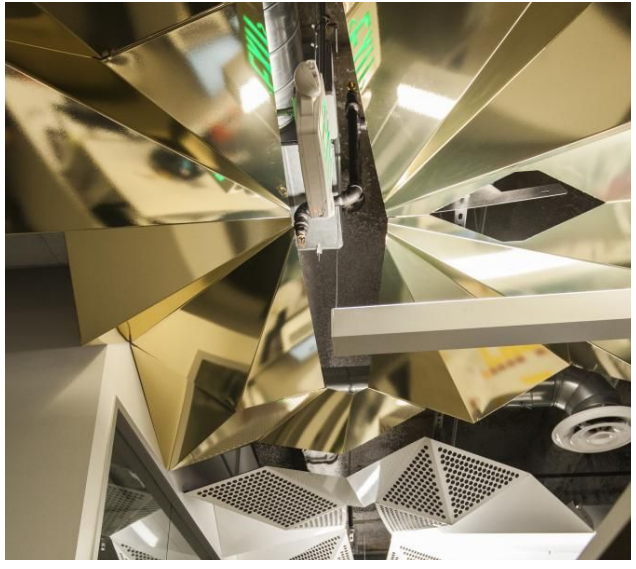


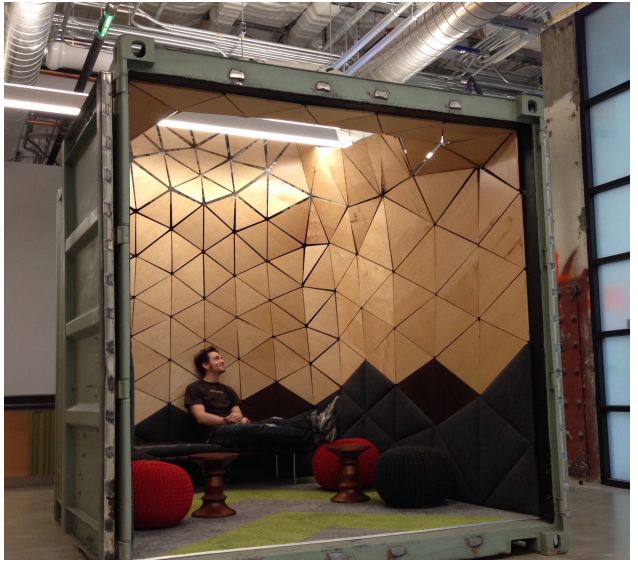
Intro

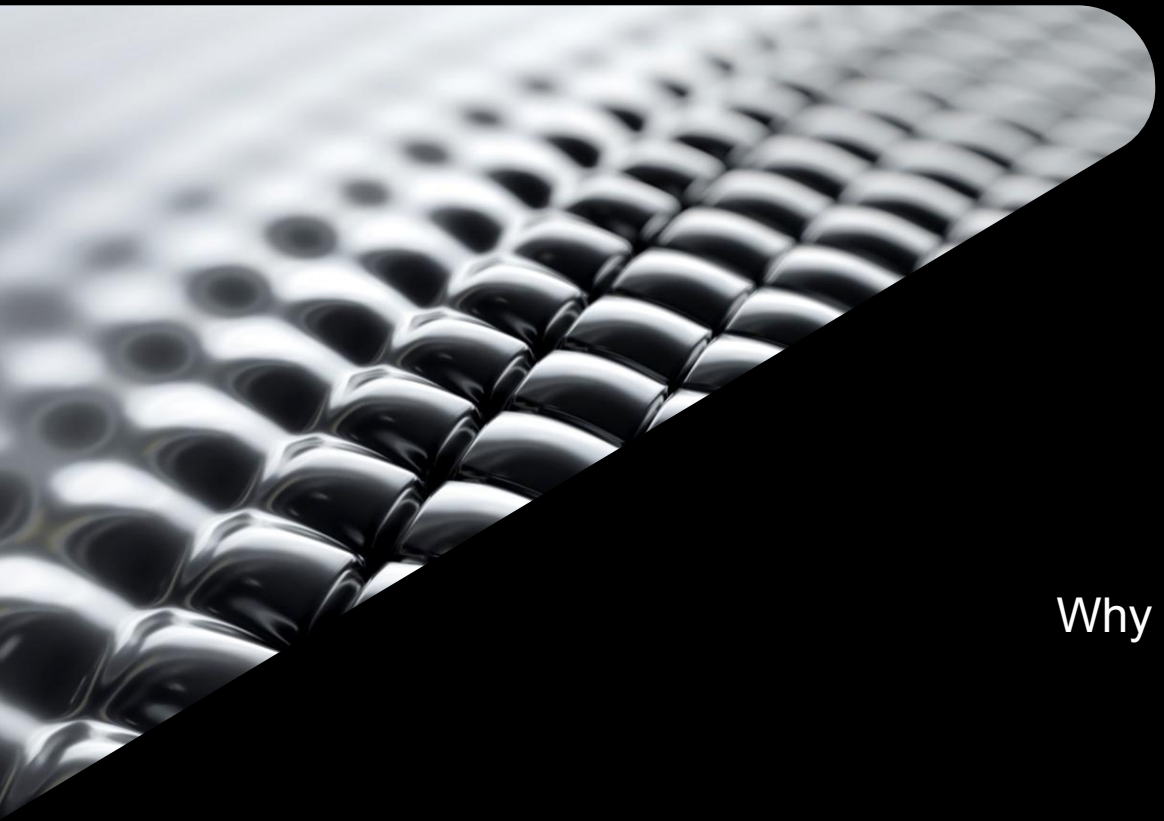
Jeffrey McGrew

- Licenced Architect in California, fabricator, and entrepreneur
- Co-founder of becausewecan.design, a design-build architecture studio.
- Co-founder of model-no.com, a 3D printed sustainable furniture start-up.




BECAUSE
WE
CAN

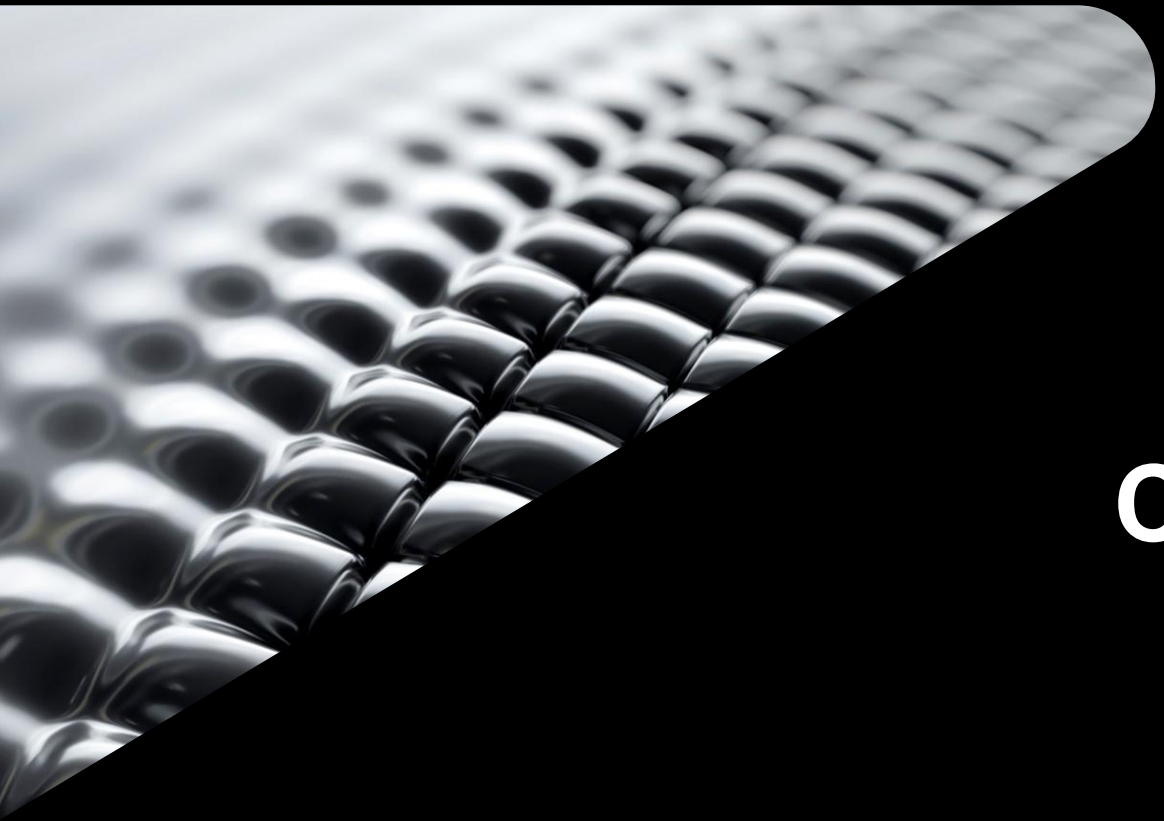


Fusion 360

Why it’s a great addition to your tools

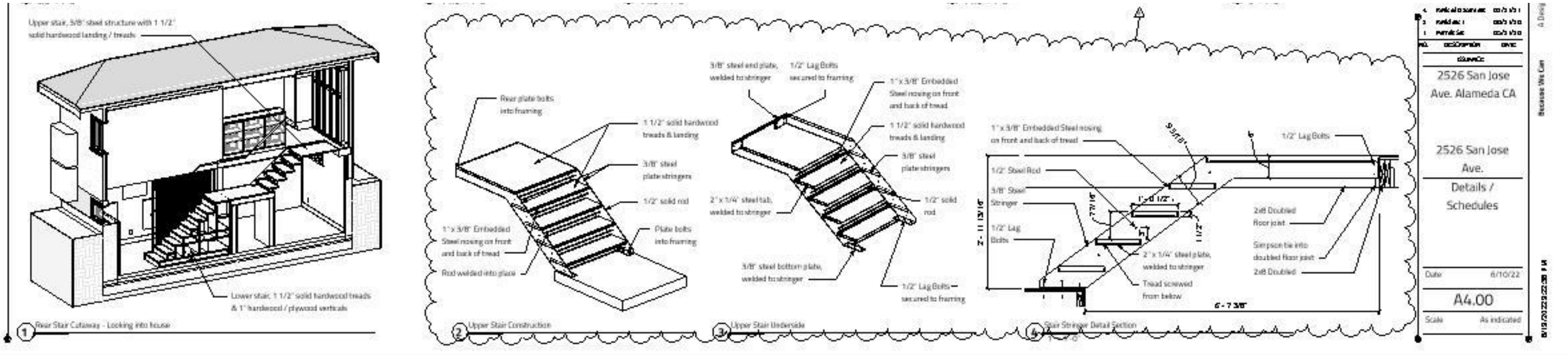
Why Fusion is a great tool to add to your work

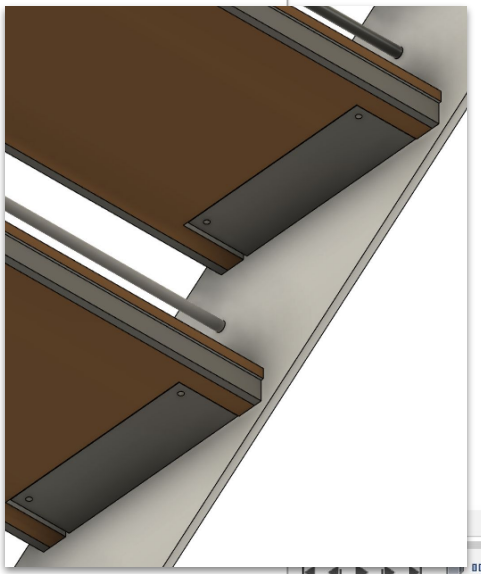
- Because you can do things with it you can’t do in Revit or AutoCAD
- It’s easy to learn, easy to use, and really affordable
- It’s much more supportive of design work than other MCAD platforms
- It works with Revit and AutoCAD (kinda)



Case Study #1

An easy way to use FEA


Upper stair, 3/8" steel structure with 1 1/2" solid hardwood landing / treads
Lower stair, 1 1/2" solid hardwood treads & 1" hardwood / plywood verticals
1 Rear Stair Cutaway - Looking into house
Rear plate bolts into framing
1 1/2" solid hardwood treads & landing
3/8" steel plate stringers
1/2" solid rod
Plate bolts into framing
1" x 3/8" Embedded Steel nosing on front and back of tread
Rod welded into place
2 Upper Stair Construction
3/8" steel end plate, welded to stringer
1/2" Lag Bolts secured to framing
1" x 3/8" Embedded Steel nosing on front and back of tread
1 1/2" solid hardwood treads & landing
3/8" steel plate stringers
2" x 1/4" steel tab, welded to stringer
1/2" solid rod
3/8" steel bottom plate, welded to stringer
1/2" Lag Bolts secured to framing
3 Upper Stair Underside
1" x 3/8" Embedded Steel nosing on front and back of tread
1/2" Lag Bolts
1/2" Steel Rod
3/8" Steel Stringer
1/2" Lag Bolts
1' - 0 1/2"
2x8 Doubled Floor joist
Simpson tie into doubled floor joist
2x8 Doubled
2" x 1/4" steel plate, welded to stringer
Tread screwed from below
6' - 7 3/8"
2' - 11 13/16"
4 Stair Stringer Detail Section
2526 San Jose Ave. Alameda CA
2526 San Jose Ave.
Details / Schedules
Date 6/10/22
A4.00
Scale As indicated
Because We Can



053022-export 3/8" Variant v4*

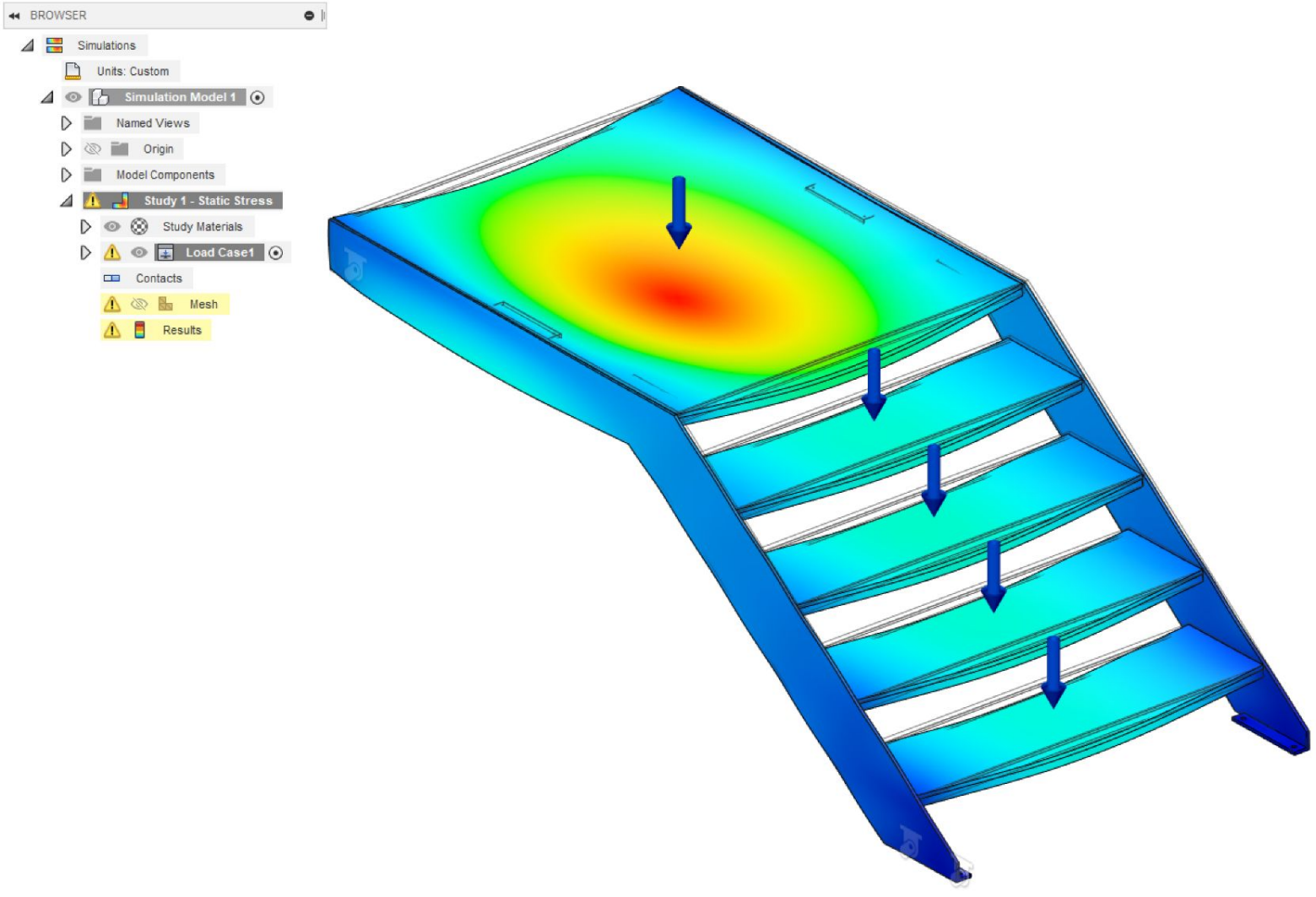
DESIGN

SOLID | SURFACE | MESH | SHEET METAL | PLASTIC | UTILITIES | MANAGE

CREATE | AUTOMATE | MODIFY | ASSEMBLE | CONSTRUCT | INSPECT | INSERT | SELECT

BROWSER

- 053022-export 3/8" Varian...
  - Document Settings
  - Named Views
  - Origin
  - Sketches
  - Left Side:1
  - Right Side:1
  - Treads:1
  - Landing:1
  - Rods:1



Study Report

Analyzed File	053022-export v14
Version	Autodesk Fusion 360 (2.0.13158)
Creation Date	2022-05-30, 17:41:15
Author	jeffr

Project Properties

Title	Studies
Author	jeffr

Simulation Model 1:1

Study 1 - Static Stress

Study Properties

Study Type	Static Stress
Last Modification Date	2022-05-30, 17:40:19

Settings

General

Contact Tolerance	0.003937 in
Remove Rigid Body Modes	No

Damping

Mesh

Average Element Size (% of model size)	
Solids	10
Scale Mesh Size Per Part	No
Average Element Size (absolute value)	-
Element Order	Parabolic
Create Curved Mesh Elements	Yes
Max. Turn Angle on Curves (Deg.)	60
Max. Adjacent Mesh Size Ratio	1.5
Max. Aspect Ratio	10
Minimum Element Size (% of average size)	20

Adaptive Mesh Refinement

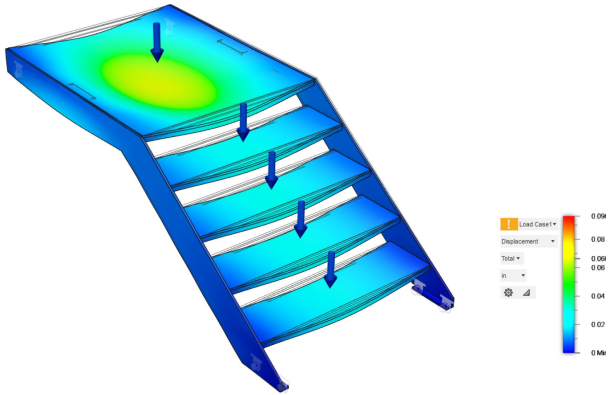
Number of Refinement Steps	0
Results Convergence Tolerance (%)	20
Portion of Elements to Refine (%)	10
Results for Baseline Accuracy	Von Mises Stress

Materials

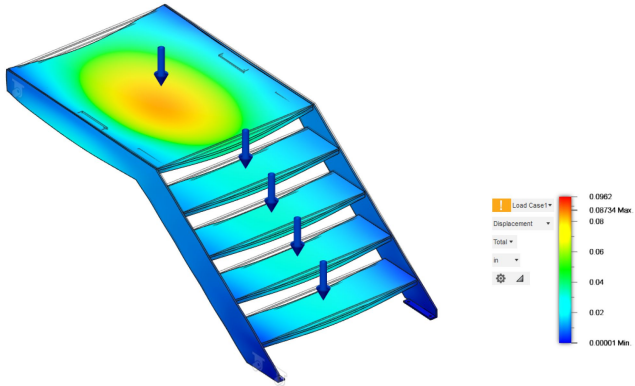
Component	Material	Safety Factor
Left Side:1	Steel	Yield Strength
Right Side:1	Steel	Yield Strength
Treads:1/Tread:1/Body6	Steel	Yield Strength
Treads:1/Tread:1/Body5	Steel	Yield Strength
Treads:1/Tread:1/Body1	MDF Medium Density Fiberboard	Yield Strength
Treads:1/Tread:2/Body6	Steel	Yield Strength
Treads:1/Tread:2/Body5	Steel	Yield Strength
Treads:1/Tread:2/Body1	MDF Medium Density Fiberboard	Yield Strength
Treads:1/Tread:3/Body6	Steel	Yield Strength
Treads:1/Tread:3/Body5	Steel	Yield Strength
Treads:1/Tread:3/Body1	MDF Medium Density Fiberboard	Yield Strength
Treads:1/Tread:4/Body6	Steel	Yield Strength
Treads:1/Tread:4/Body5	Steel	Yield Strength
Treads:1/Tread:4/Body1	MDF Medium Density Fiberboard	Yield Strength
Landing:1/Body3	Steel	Yield Strength
Landing:1/Body2	Steel	Yield Strength
Landing:1/Body1	MDF Medium Density Fiberboard	Yield Strength

Steel

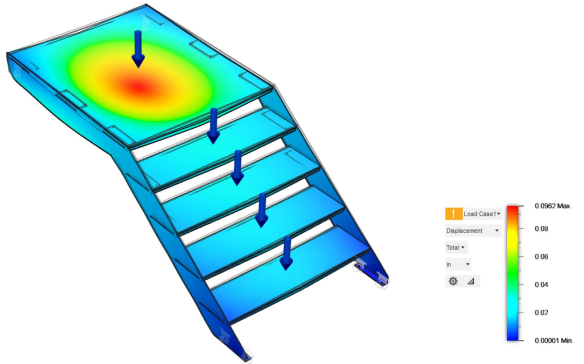
Density	0.1286 kg / in^3
Young's Modulus	210000 MPa
Poisson's Ratio	0.3
Yield Strength	207 MPa
Ultimate Tensile Strength	345 MPa
Thermal Conductivity	1.422 W / (in C)
Thermal Expansion Coefficient	1.2E-05 / C
Specific Heat	480 J / (kg C)



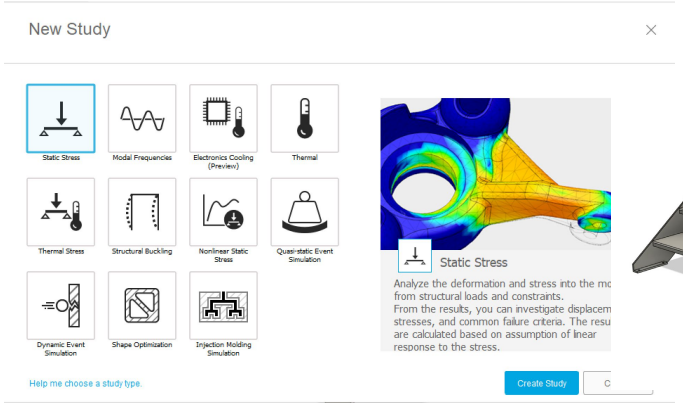
½” Stringers



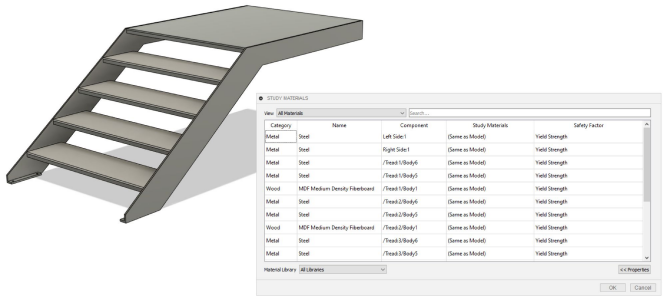
⅜” Stringers



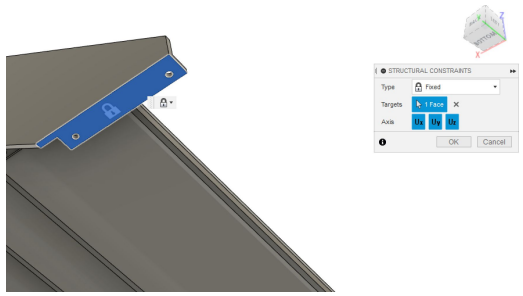
¼” Stringers



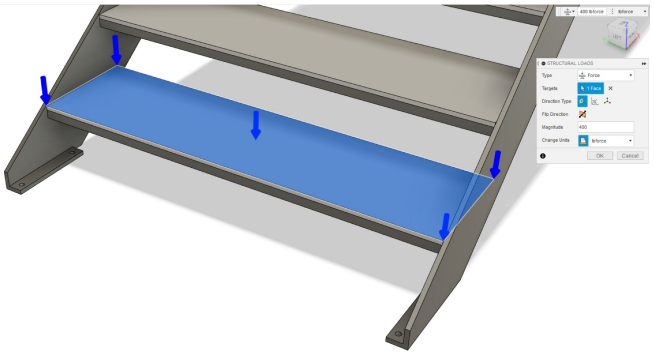
1. Create a New Study, and use Static Stress



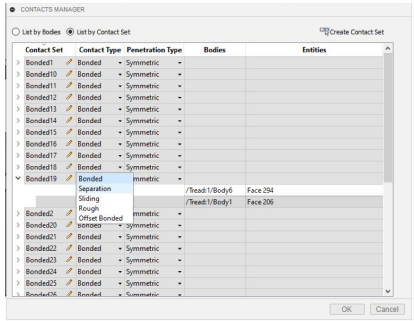
2. Set Materials



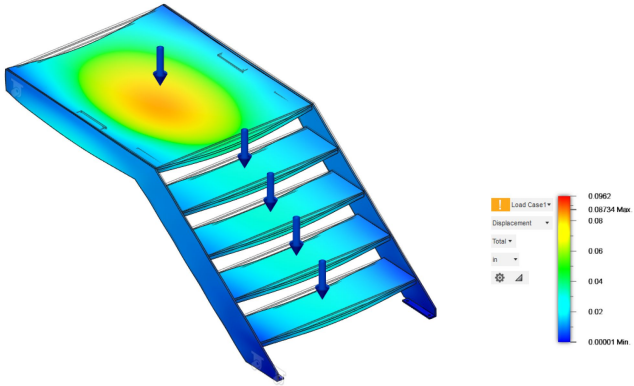
3. Set Constraints



4. Set Loads



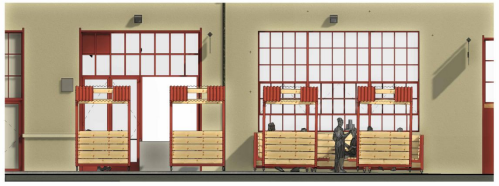
5. Set Contacts (be careful of Automatic Contacts!)



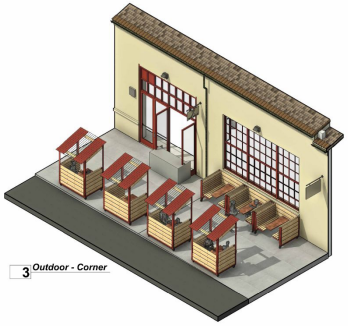
6. Run!

1 Outdoor Front Area
3/16" = 1'-0"

2
OD-1



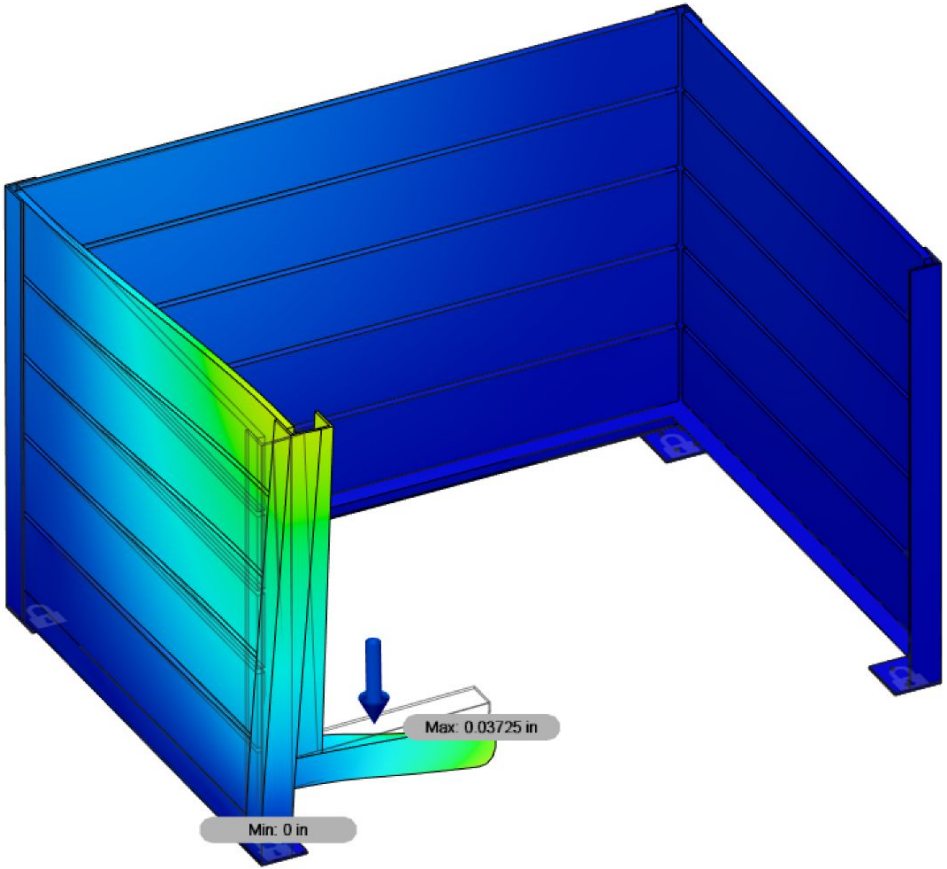
2 Outdoor Front Area Elevation
3/16" = 1'-0"

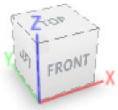


3 Outdoor - Corner

08/01/22 | LongNow | Outdoor Area | 3/16" = 1'-0" | OD-1

a design-build studio | 2500 Kirkham Street | 510-545-9275 | www.becausewecan.design





RESULTS DETAILS

Actual Minimum Safety Factor 4.70

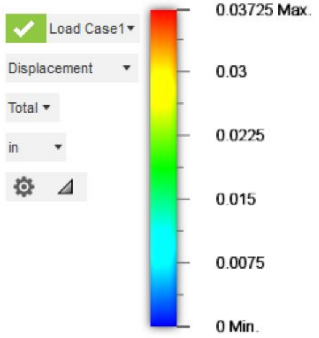
The design is not expected to bend or break with the current analysis criteria. It's a good idea to validate the analysis criteria and also ensure the Safety Factor Targets meet the standards of your company, application and industry.

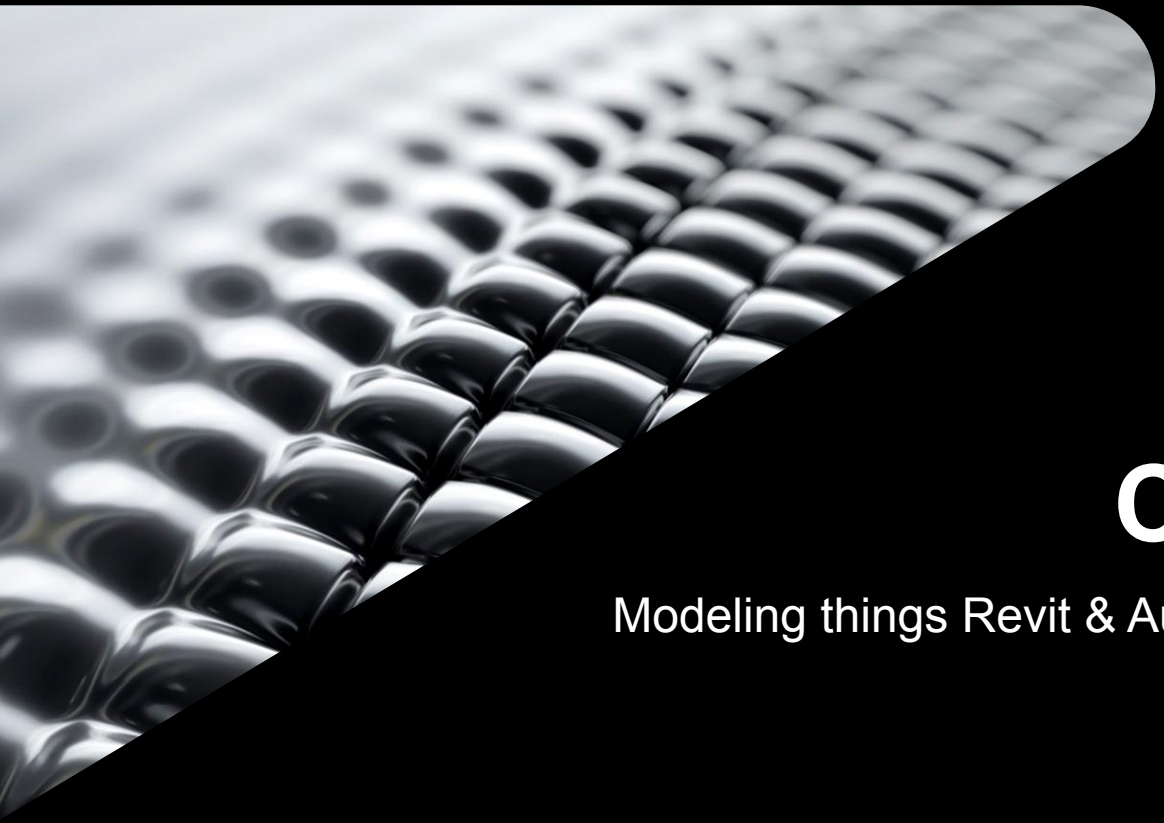
Safety Factor Targets

Deformation Scale: Adjusted

Don't show this automatically

Close

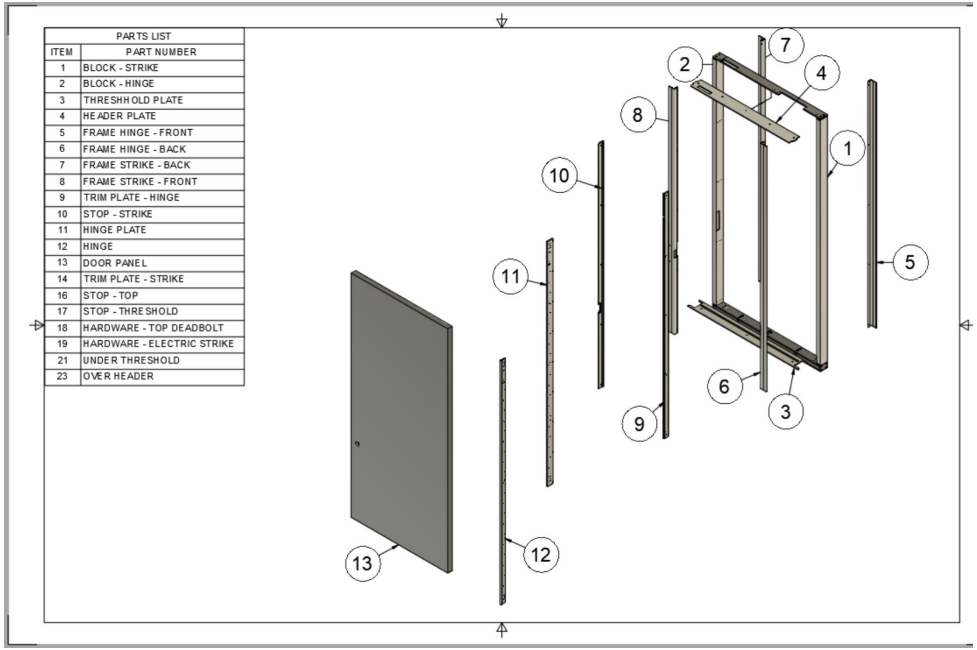




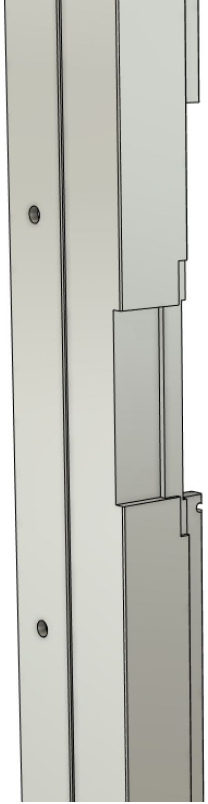
Case Study #2

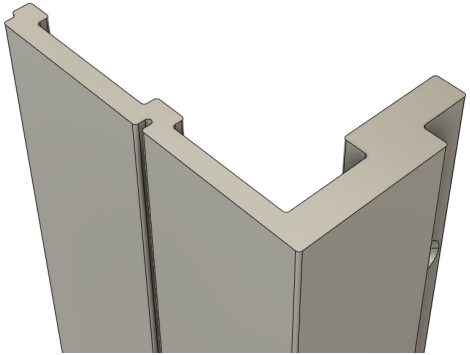
Modeling things Revit & AutoCAD aren’t good at modeling

DESK UNIVERSITY

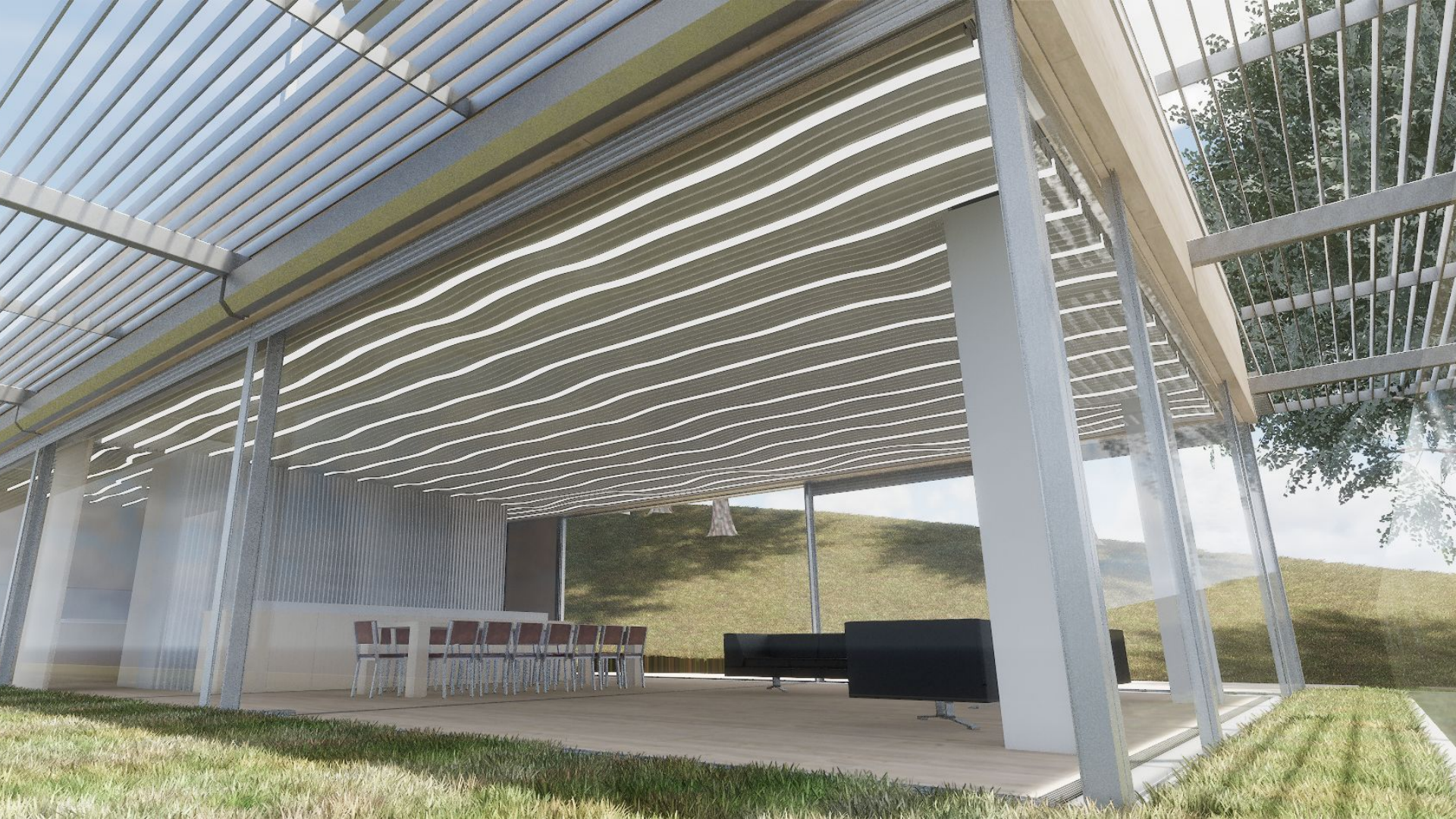


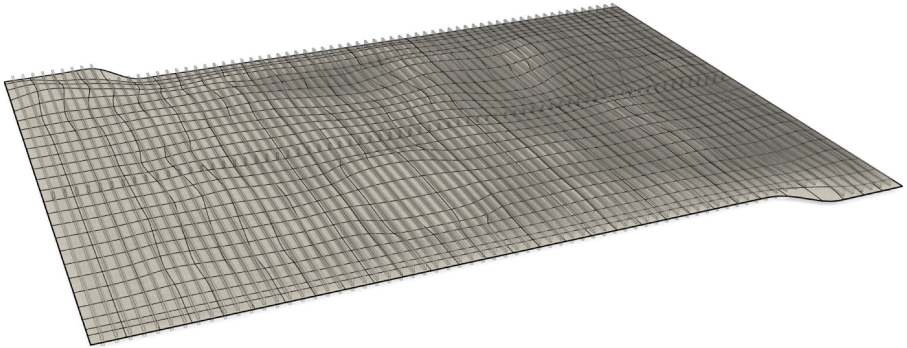
PARTS LIST	
ITEM	PART NUMBER
1	BLOCK - STRIKE
2	BLOCK - HINGE
3	THRESHHOLD PLATE
4	HEADER PLATE
5	FRAME HINGE - FRONT
6	FRAME HINGE - BACK
7	FRAME STRIKE - BACK
8	FRAME STRIKE - FRONT
9	TRIM PLATE - HINGE
10	STOP - STRIKE
11	HINGE PLATE
12	HINGE
13	DOOR PANEL
14	TRIM PLATE - STRIKE
16	STOP - TOP
17	STOP - THRESHOLD
18	HARDWARE - TOP DEADBOLT
19	HARDWARE - ELECTRIC STRIKE
21	UNDER THRESHOLD
23	OVER HEADER

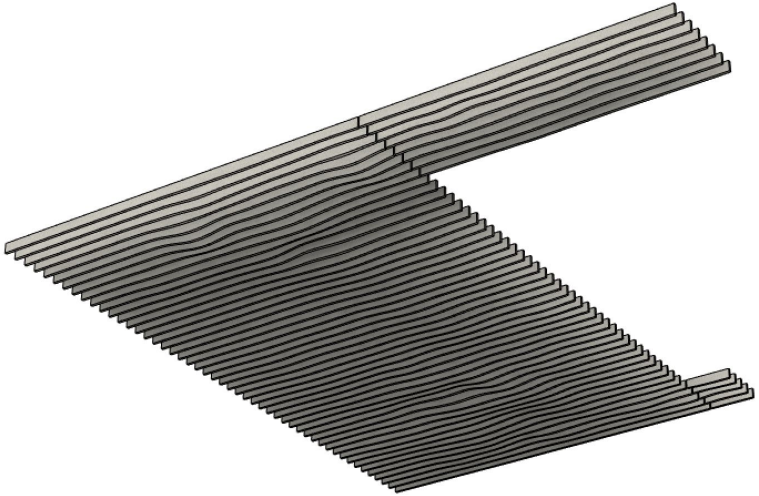


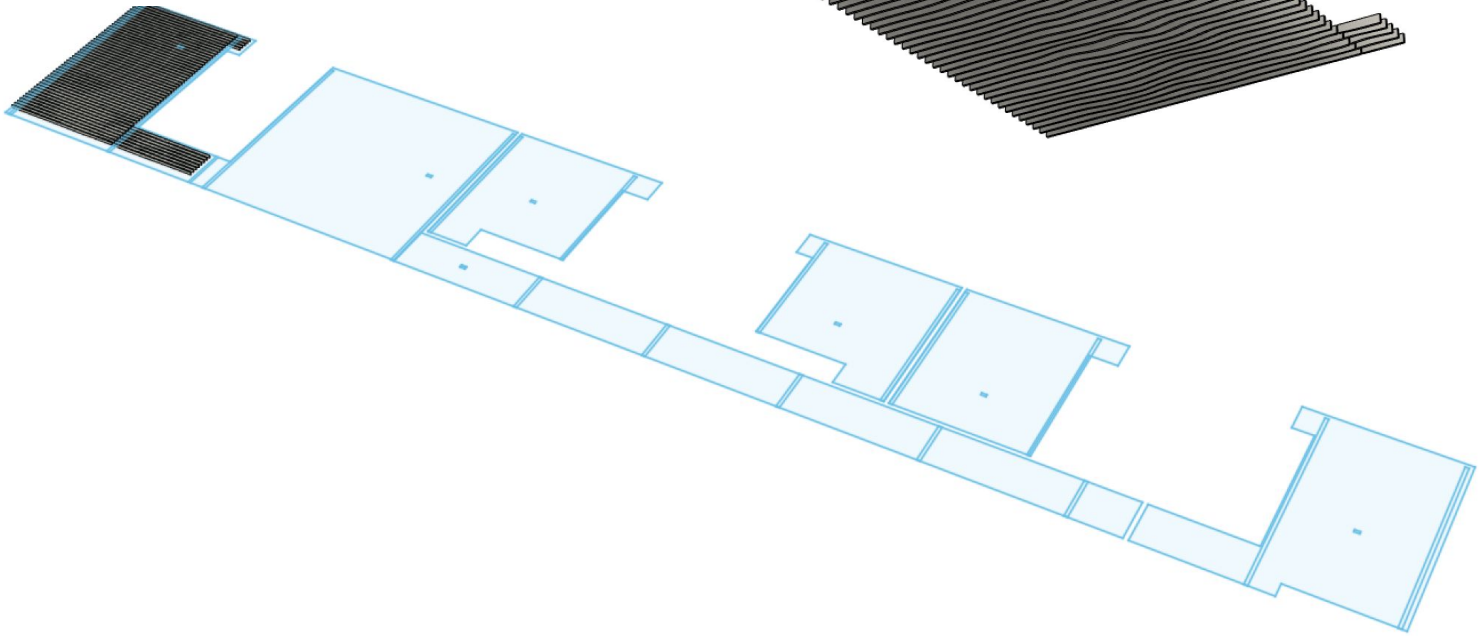


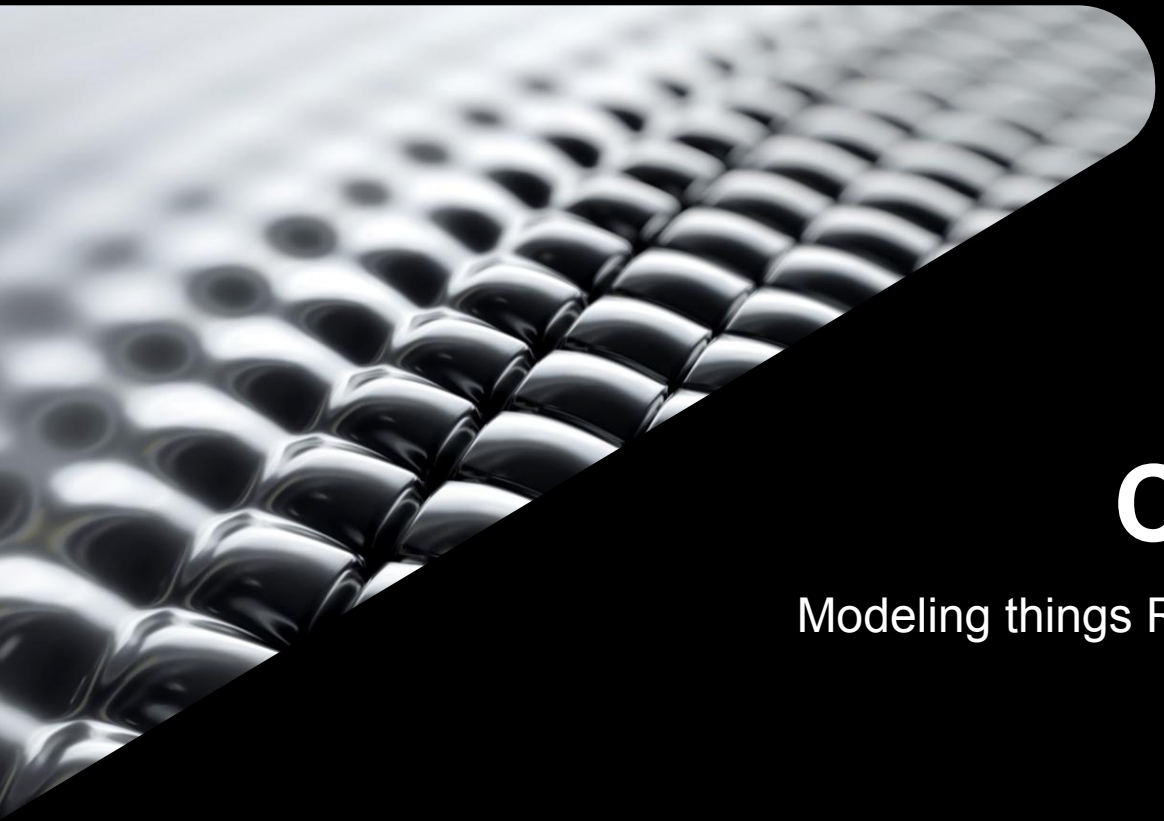
Complex Assemblies with small details





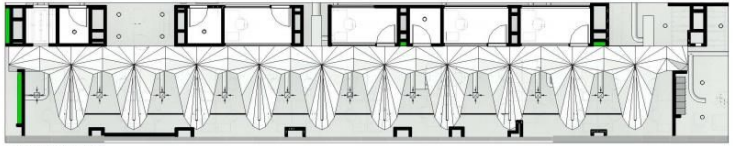






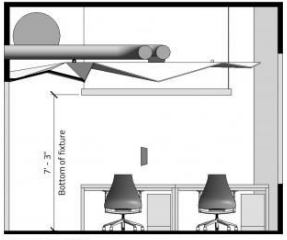
Case Study #3

Modeling things Revit & AutoCAD don’t automate

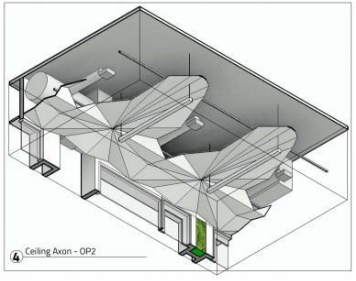


1 Level 3 - Ceiling - OP2
1/8" = 1'-0"

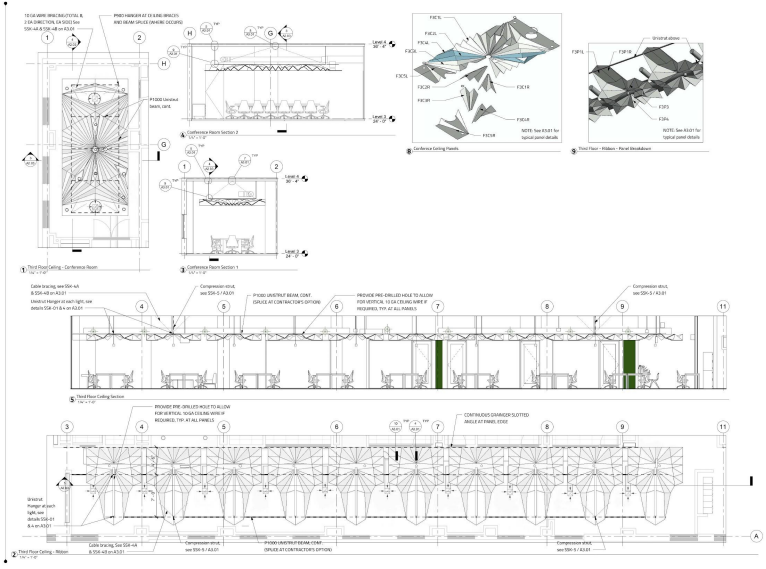
3 Ceiling Section - OP2
1/8" = 1'-0"

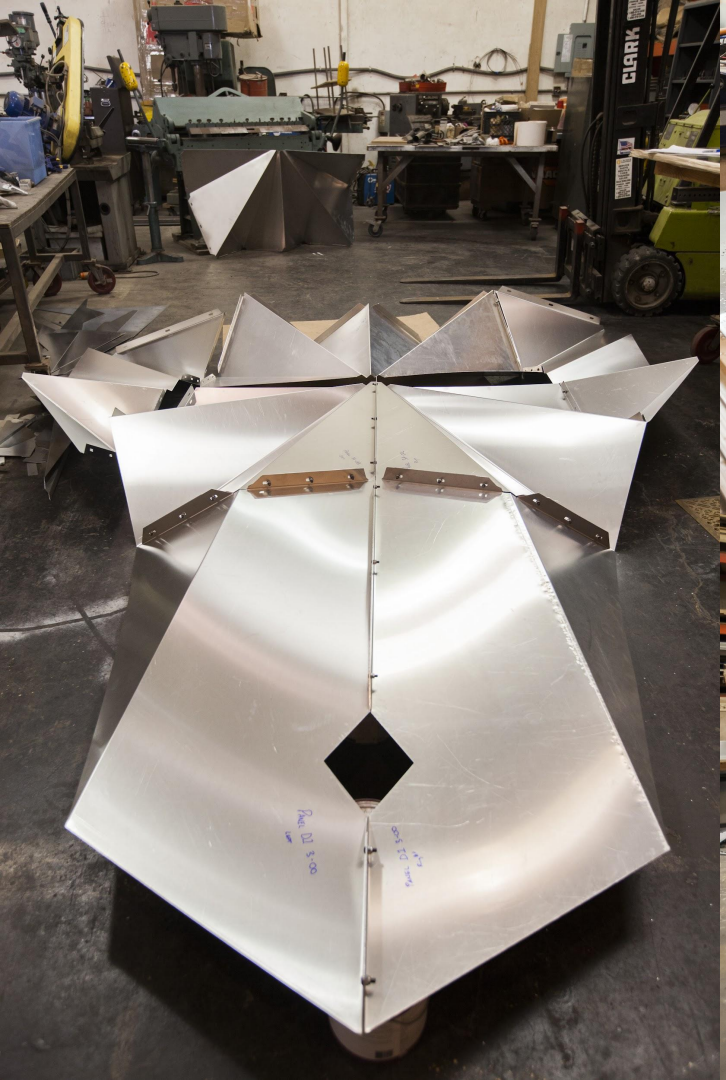


2 Ceiling Cross Section - OP2
3/8" = 1'-0"

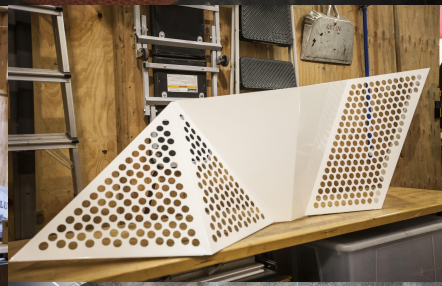


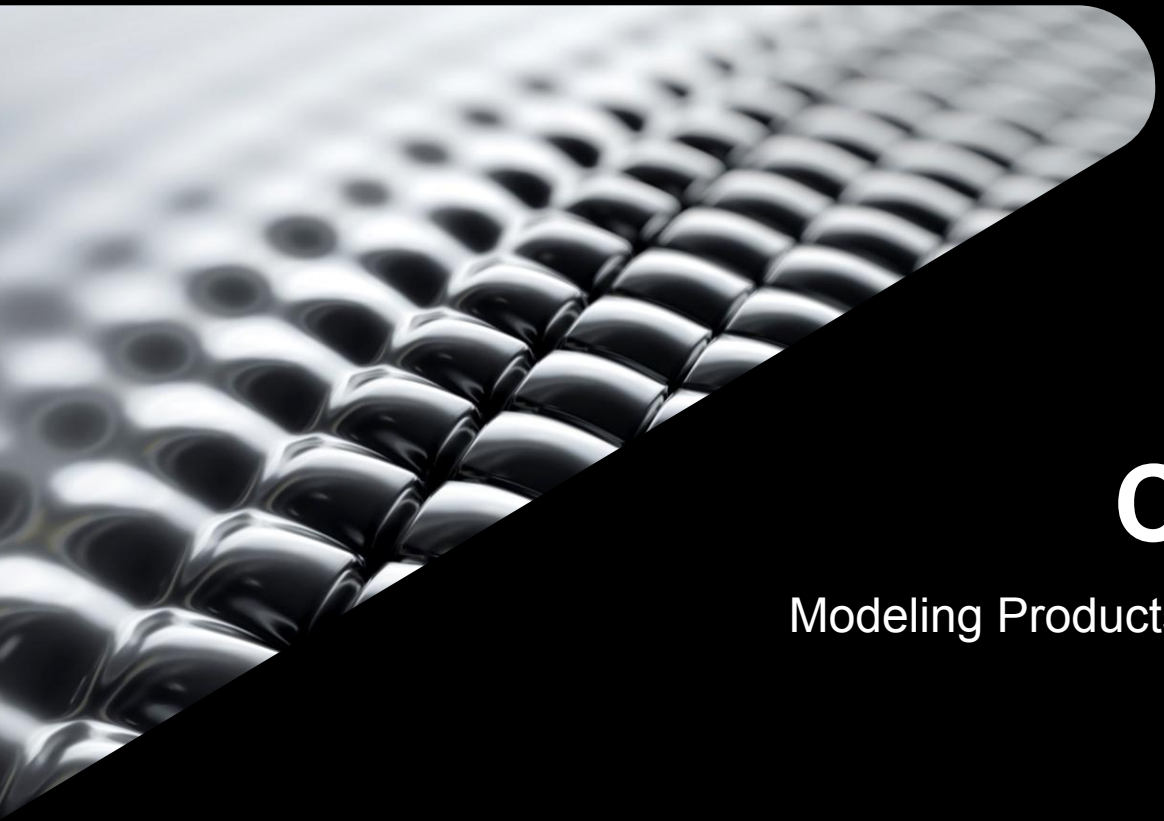
4 Ceiling Axon - OP2




CLARK

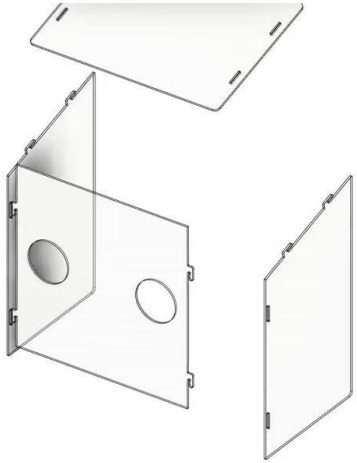

PANEL 0C-00L

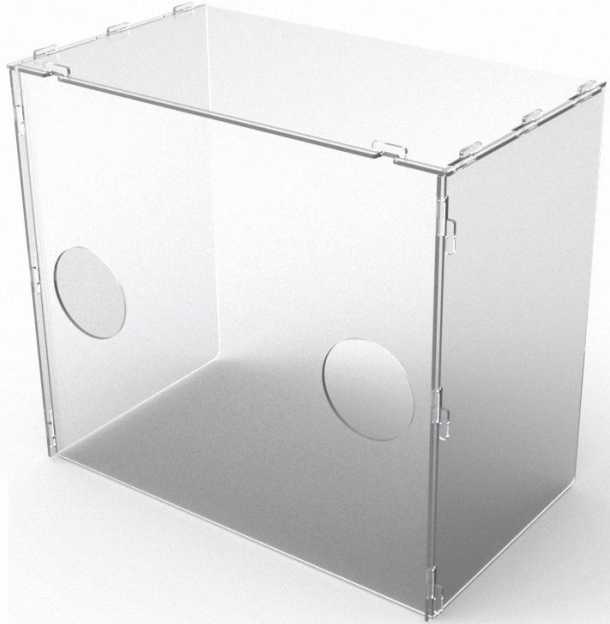


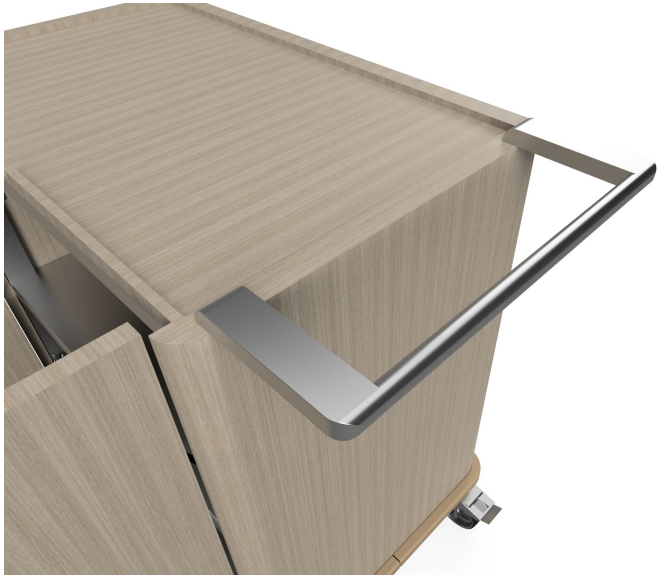


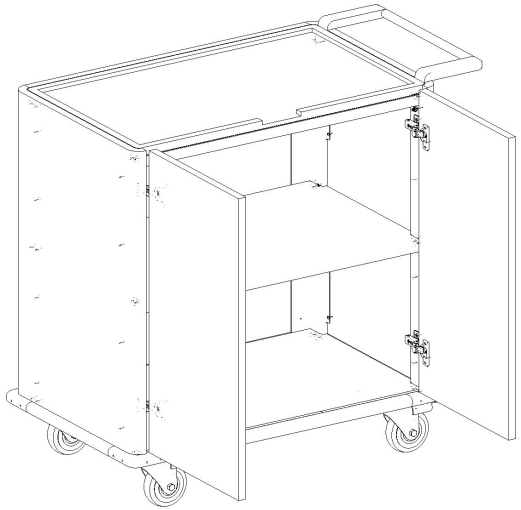
Case Study #4

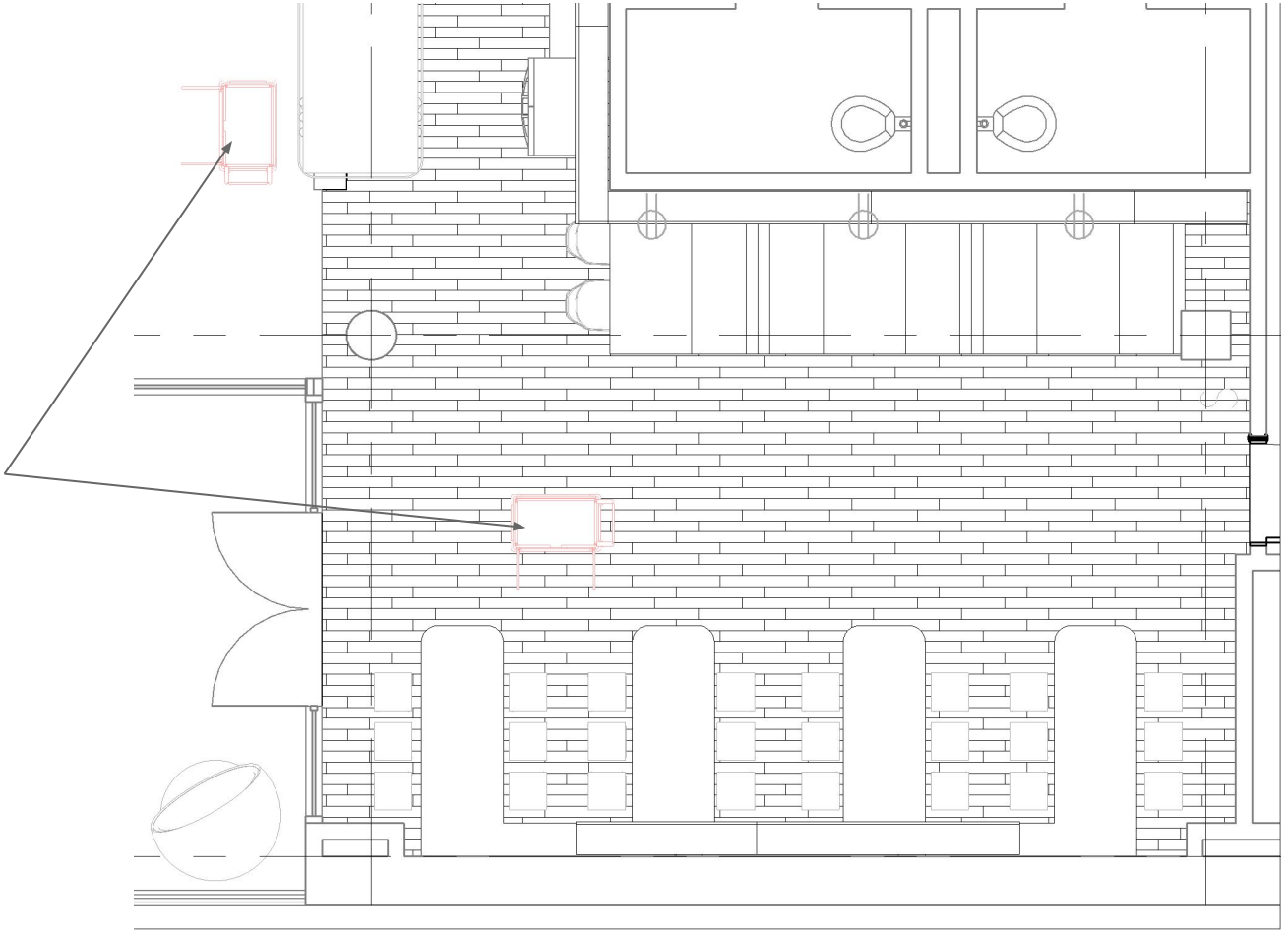
Modeling Products (that can be used as Families)

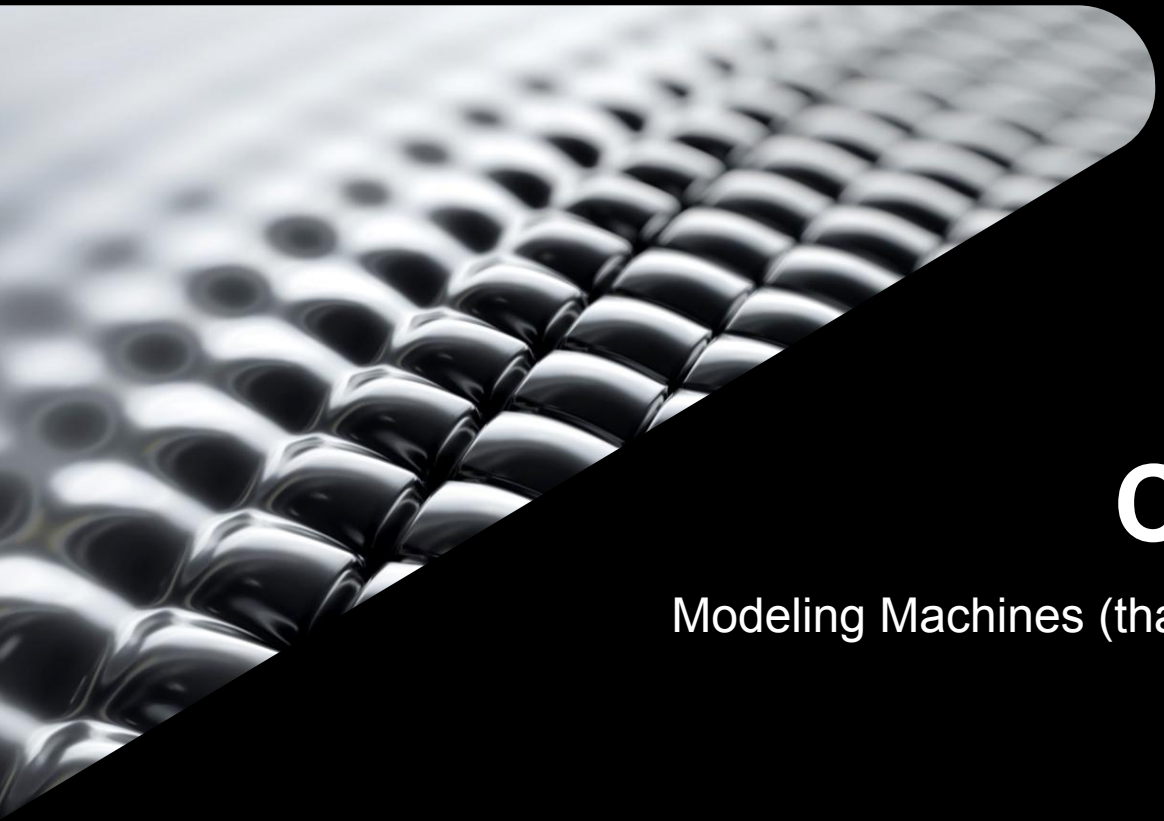






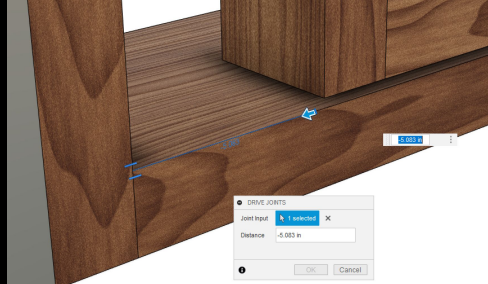


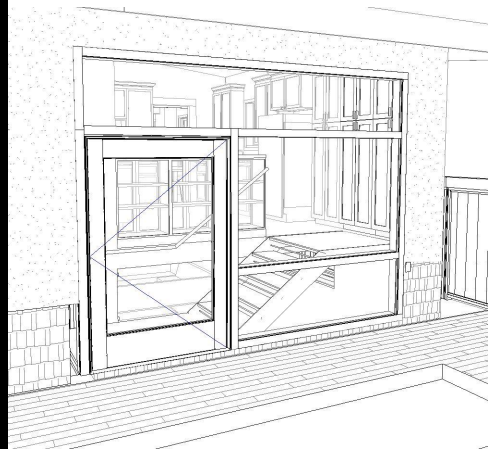


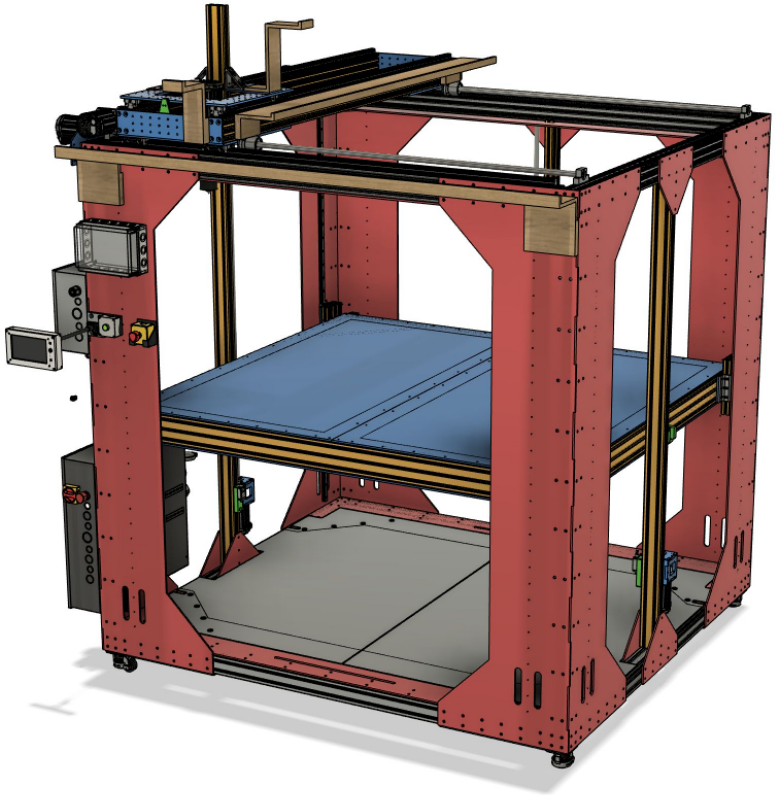


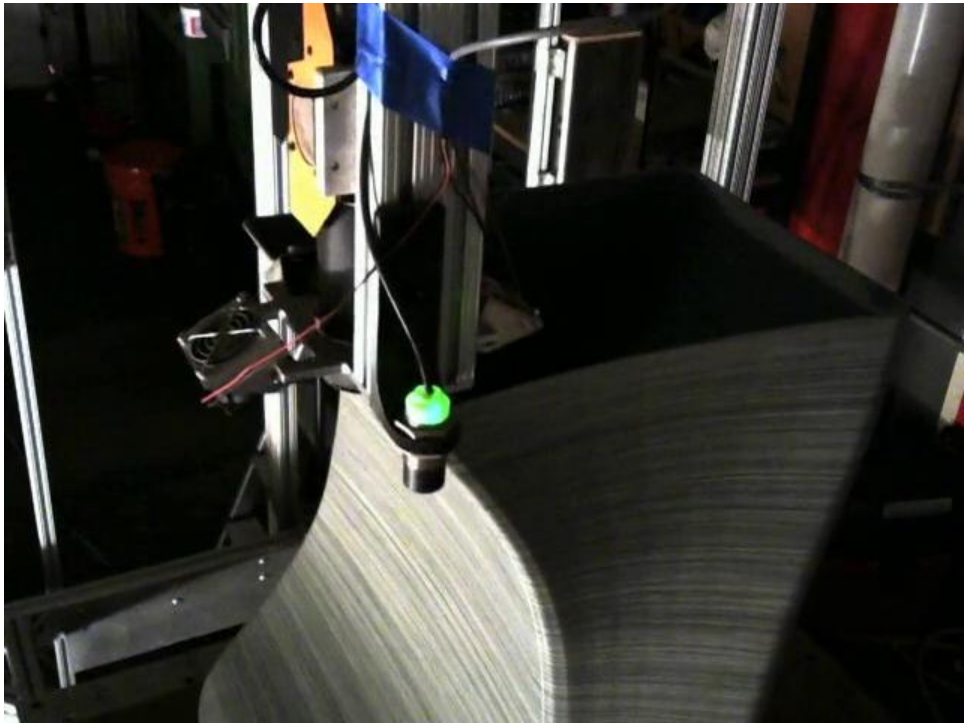
Case Study #5

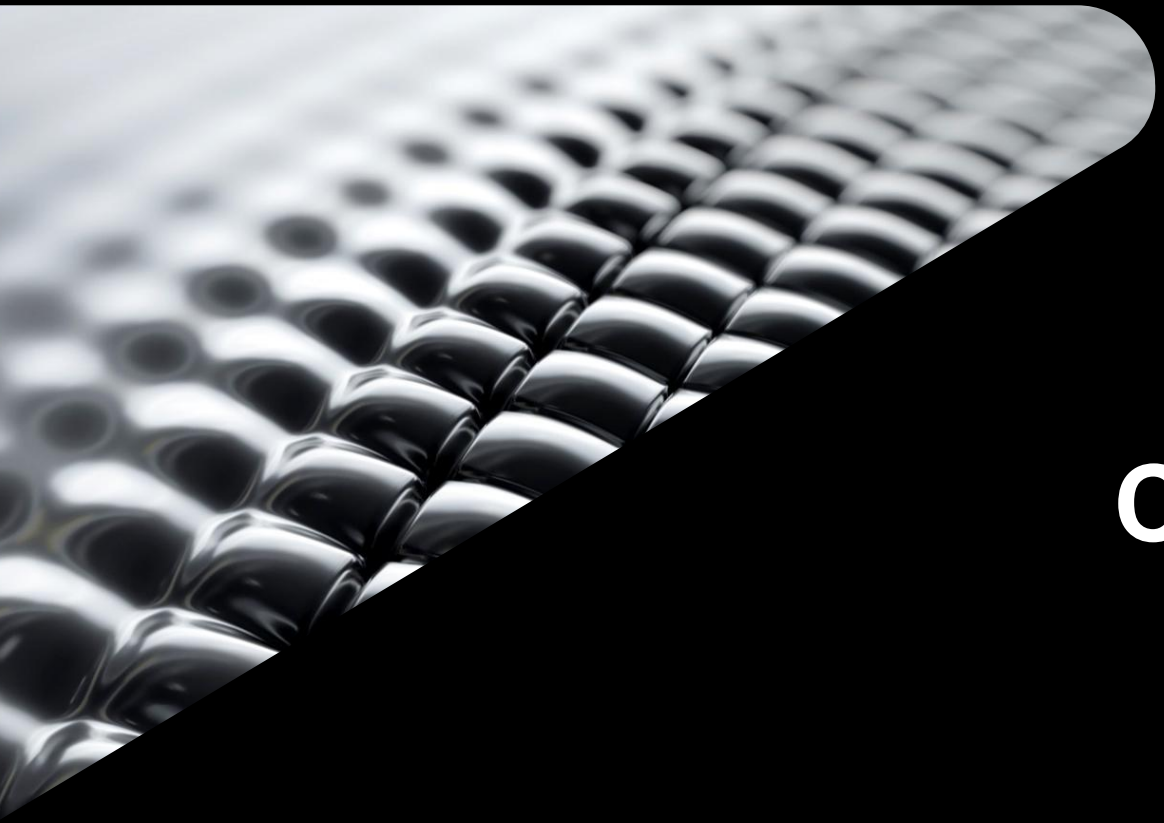
Modeling Machines (that can also be used as Families)


-5.083 in
DRIVE JOINTS
Joint Input
1 selected
Distance
-5.083 in
OK
Cancel



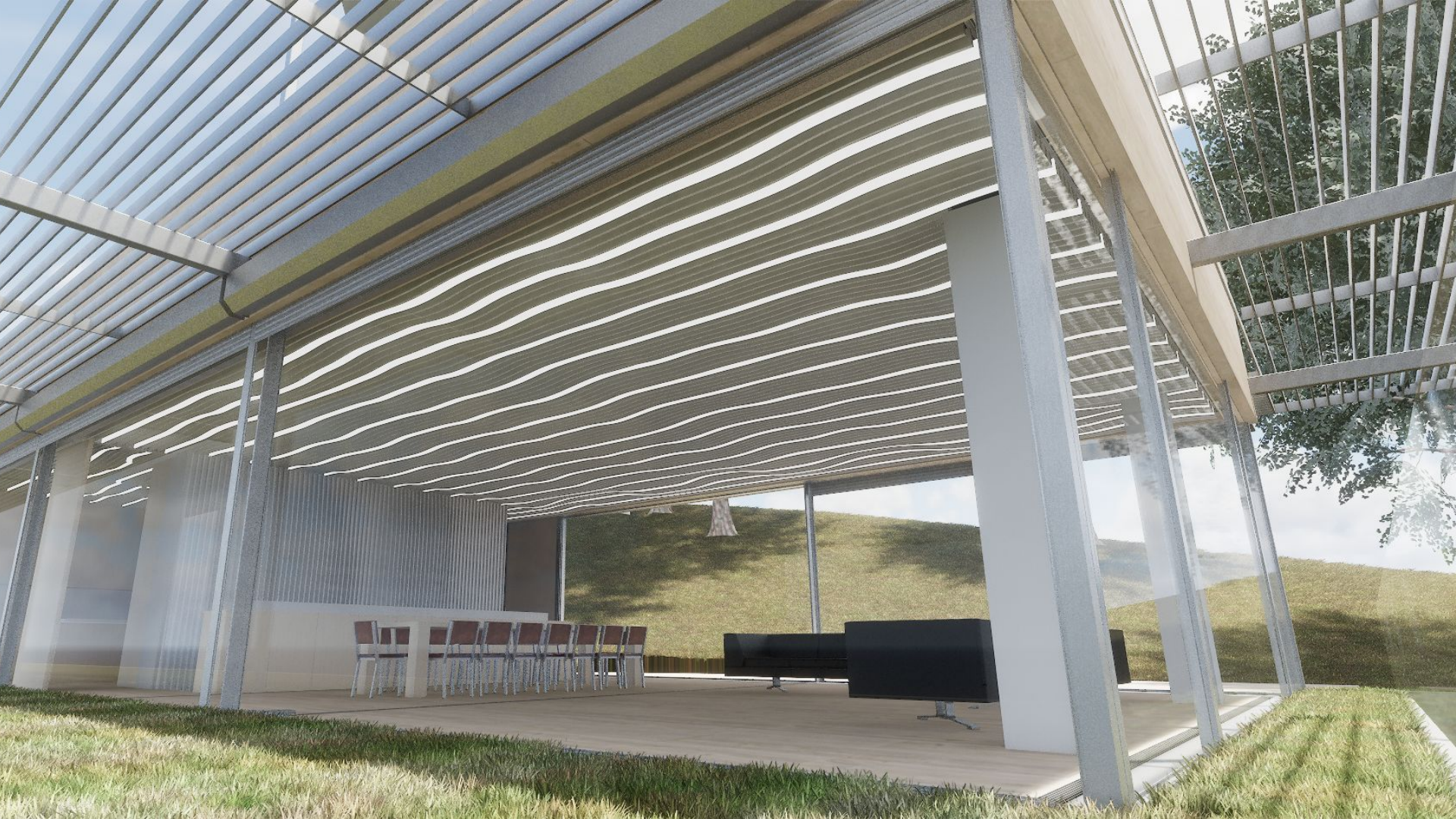


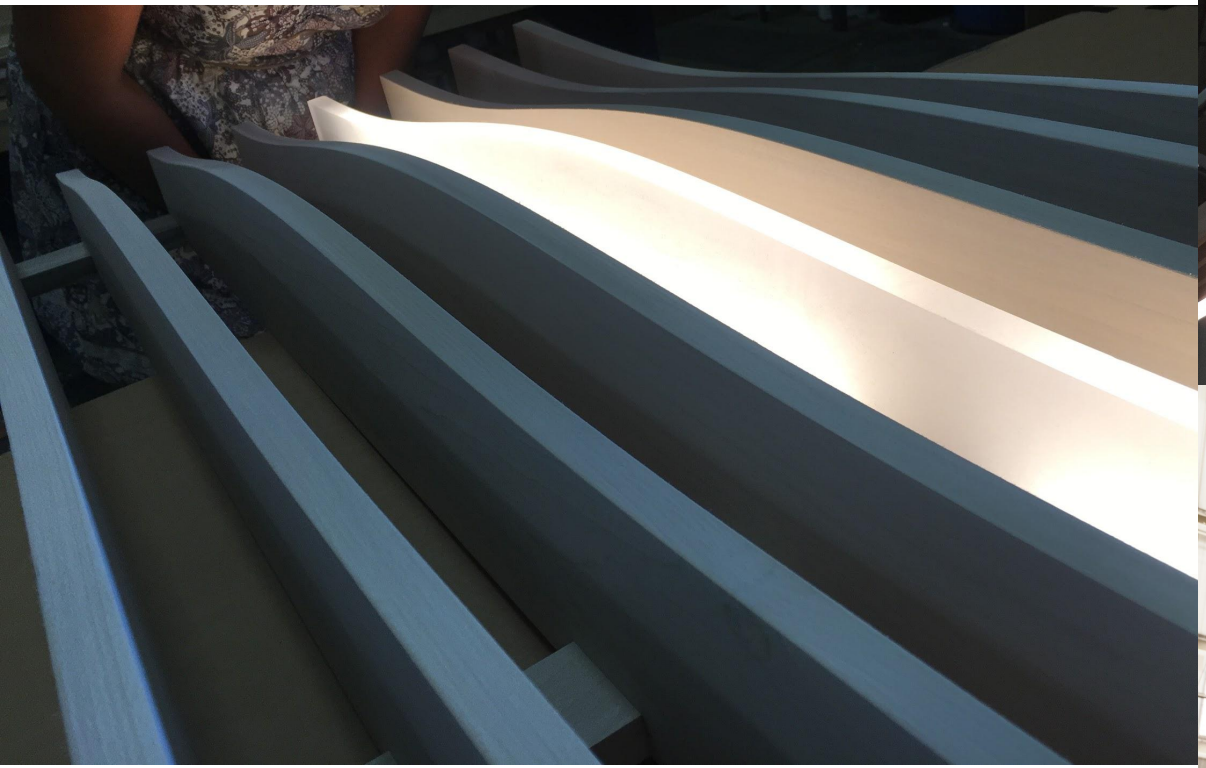


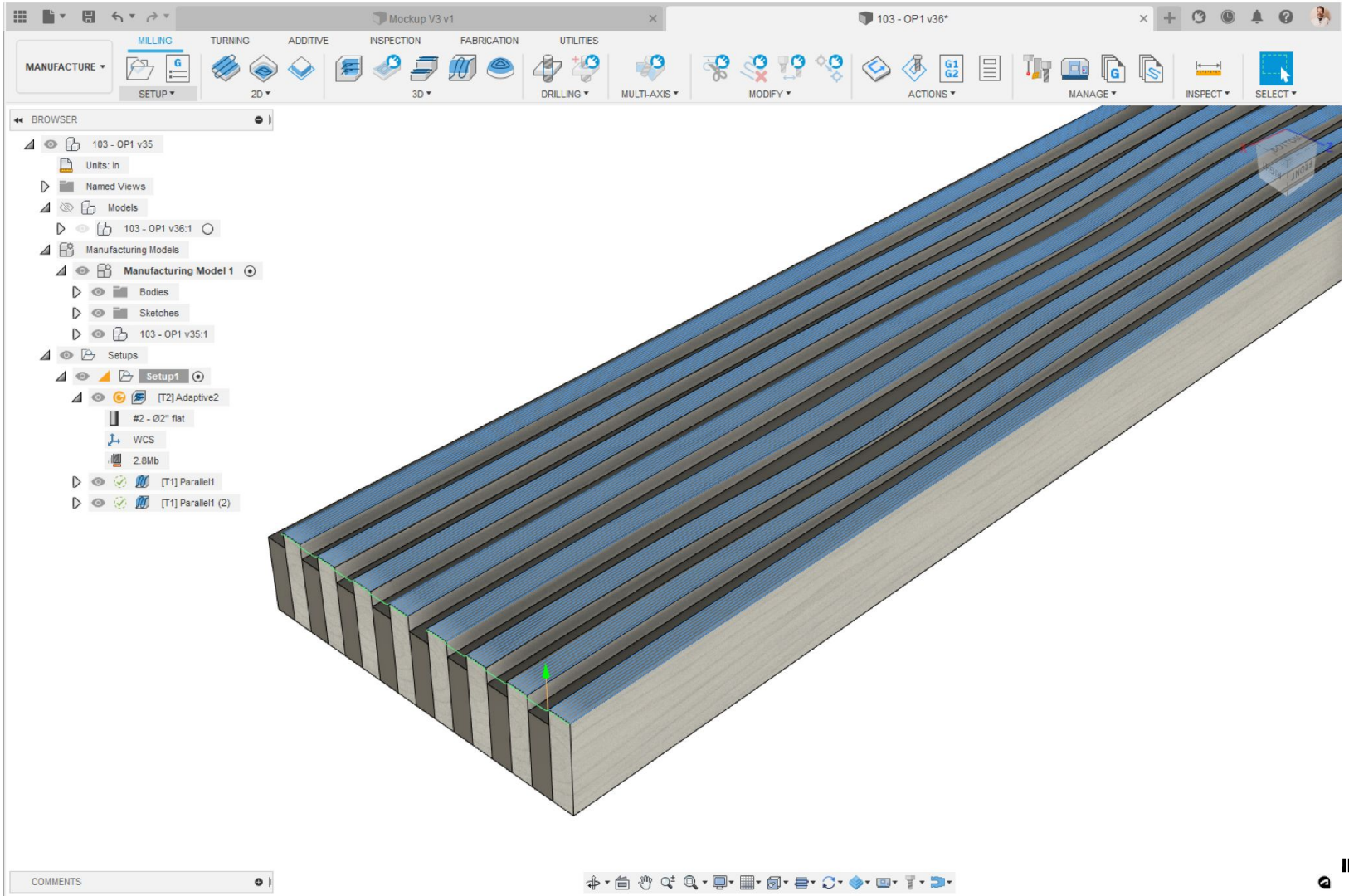


Case Study #6

Modeling for Fabrication

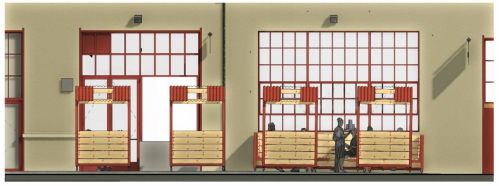




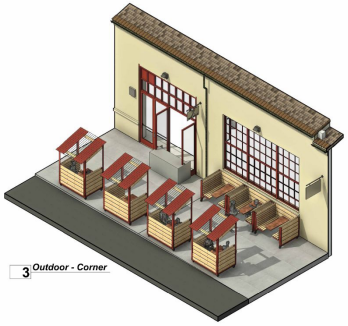

Mockup V3 v1
103 - OP1 v36*
MANUFACTURE
MILLING
TURNING
ADDITIVE
INSPECTION
FABRICATION
UTILITIES
SETUP
2D
3D
DRILLING
MULTI-AXIS
MODIFY
ACTIONS
MANAGE
INSPECT
SELECT
BROWSER
103 - OP1 v35
Units: in
Named Views
Models
103 - OP1 v36:1
Manufacturing Models
Manufacturing Model 1
Bodies
Sketches
103 - OP1 v35:1
Setups
Setup1
[T2] Adaptive2
#2 - Ø2" flat
WCS
2.8Mb
[T1] Parallel1
[T1] Parallel1 (2)
COMMENTS

1 Outdoor Front Area
3/16" = 1'-0"

2
OD-1



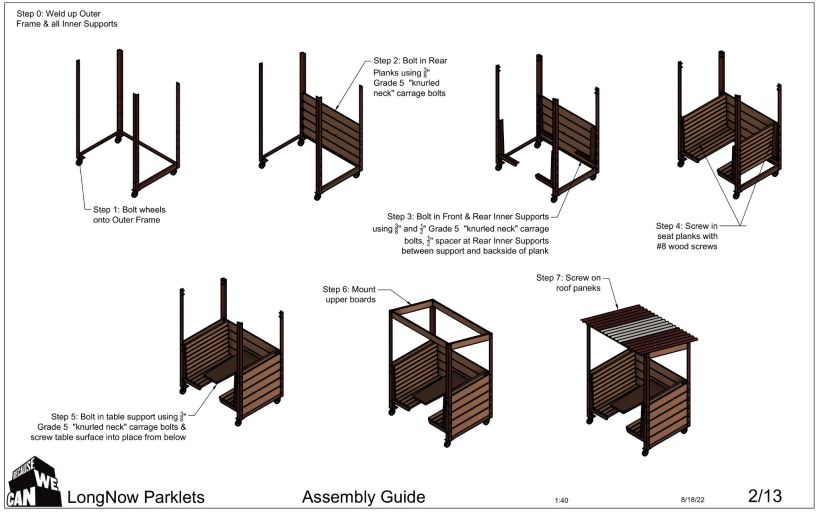
2 Outdoor Front Area Elevation
3/16" = 1'-0"

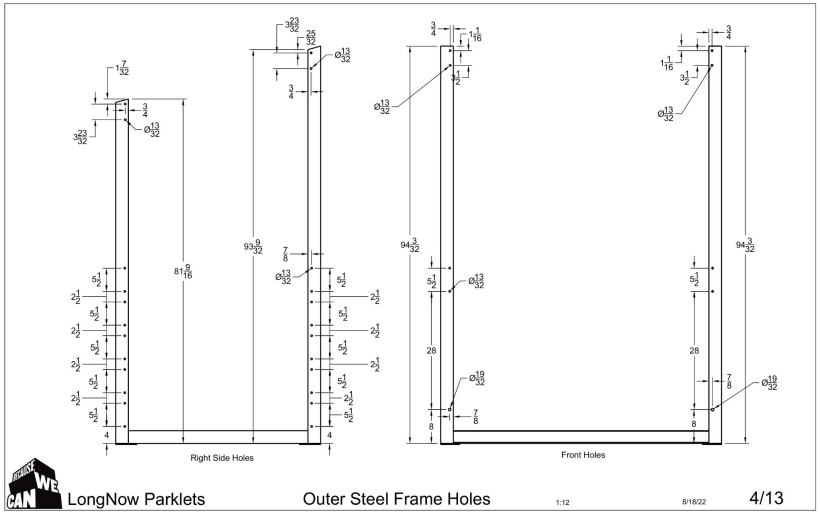


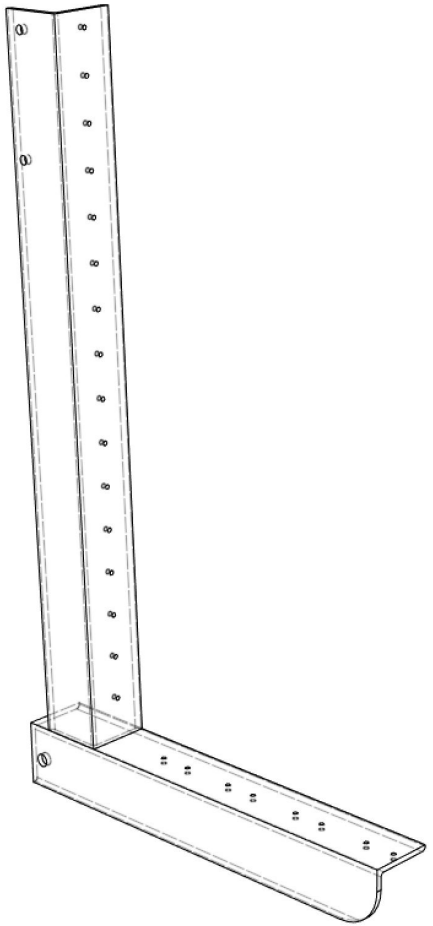
3 Outdoor - Corner

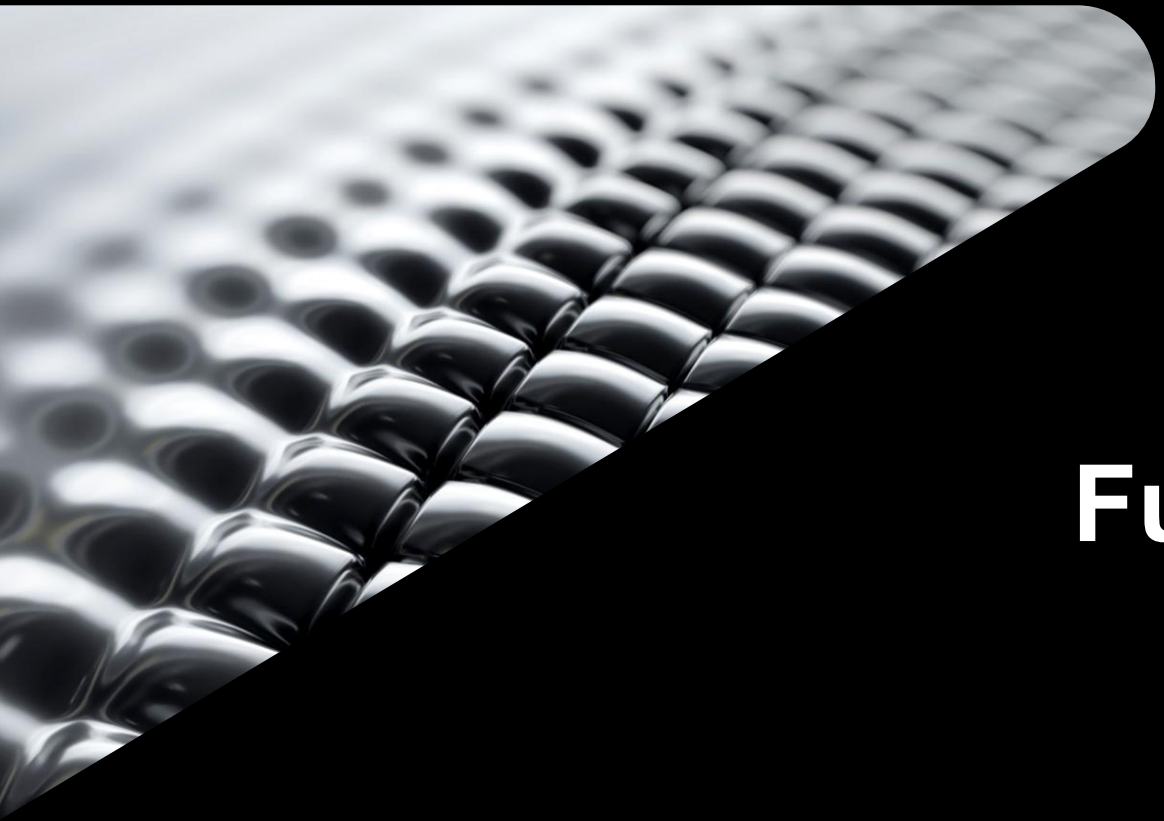
08/01/22 | LongNow | Outdoor Area | 3/16" = 1'-0" | OD-1

a design-build studio | 2500 Kirkham Street | 510-545-9275 | www.becausewecan.design







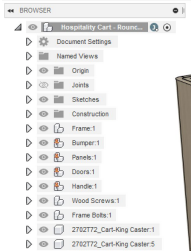


Fusion to Revit

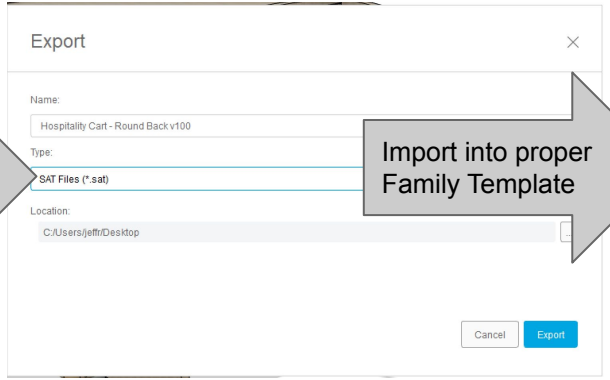
Modeling for Fabrication

Going from Fusion to Revit

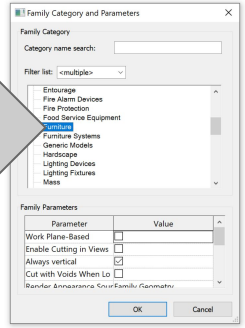
- Set your Materials in Fusion & name your Bodies / Components
- Export to .SAT
- Insert into a Family Template of the right category
- Snap into position & rename materials

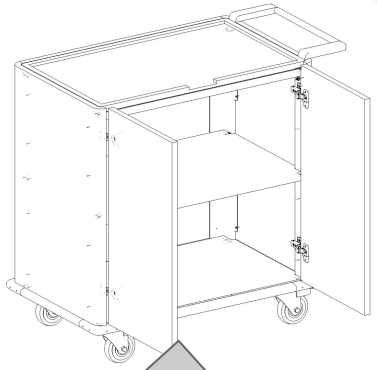


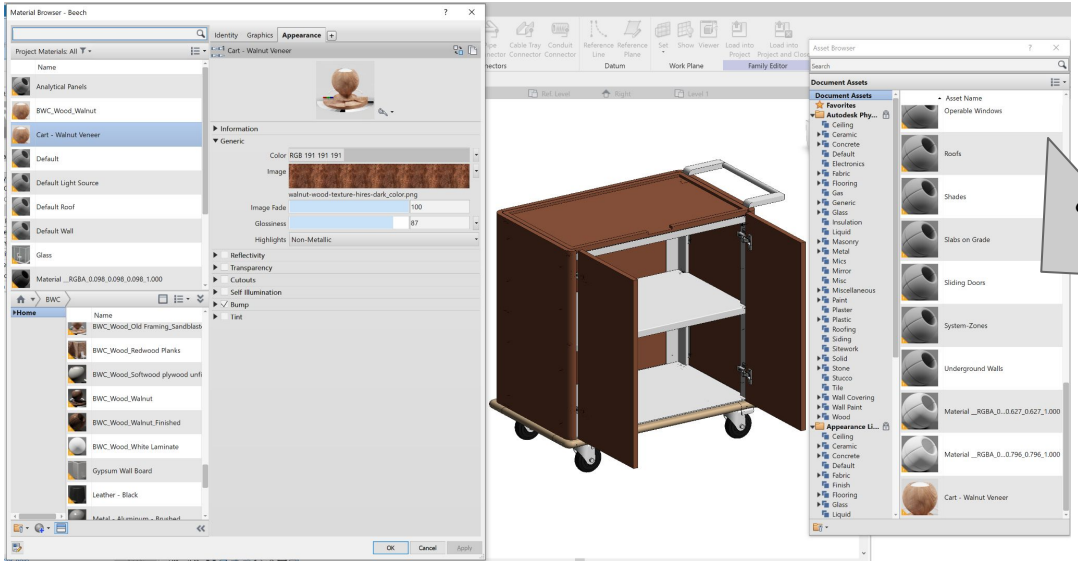
Apply Materials & Export to SAT



Import into proper Family Template



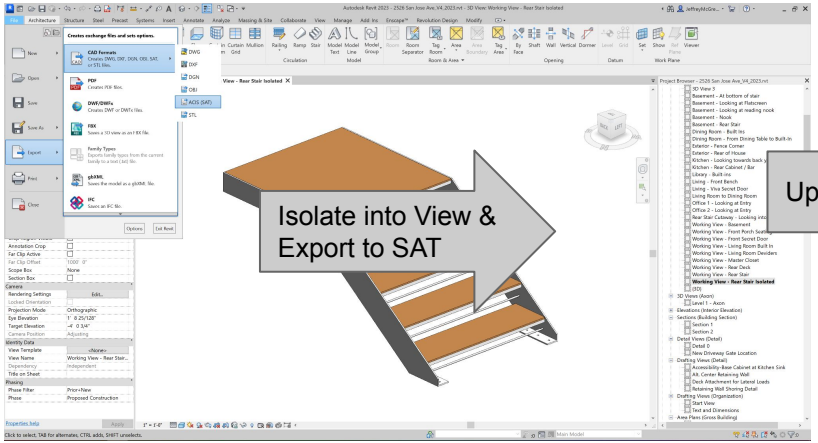




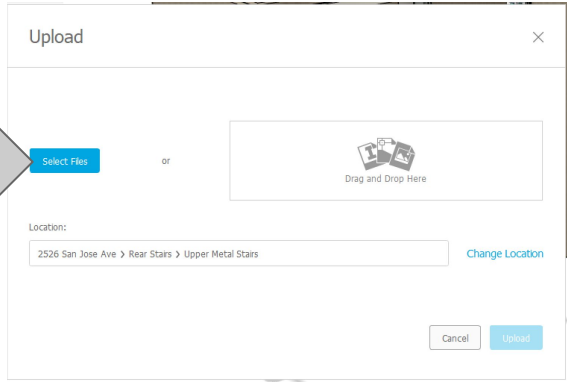
Set Materials & Reference Planes

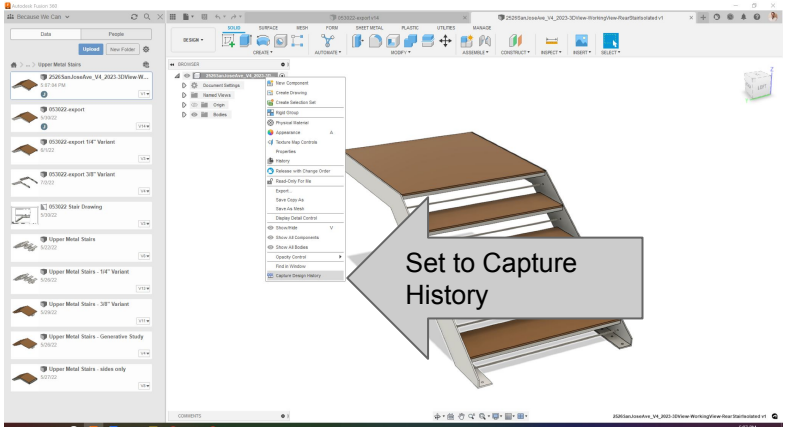
Going from Revit to Fusion

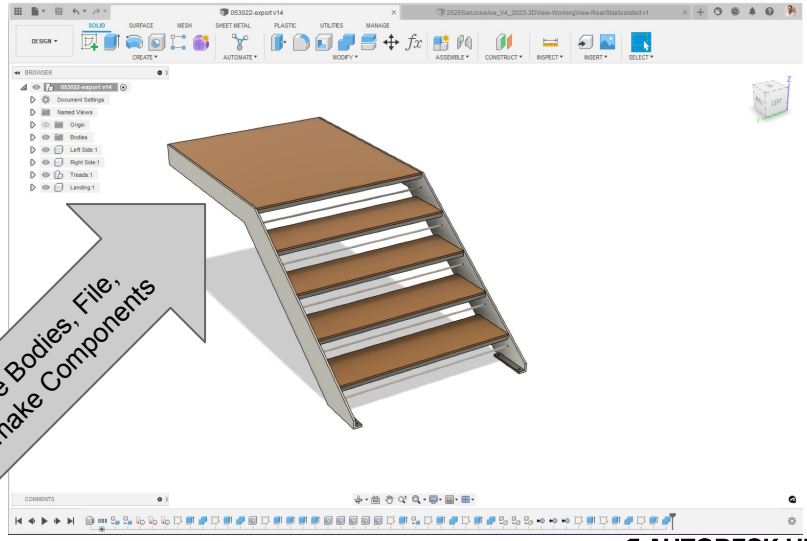
- Isolate your Revit content into a single view (what you see is what you export)
- Export to a .SAT file
- Upload to your Fusion project folder
- Open in Fusion & set it to ‘Capture History’

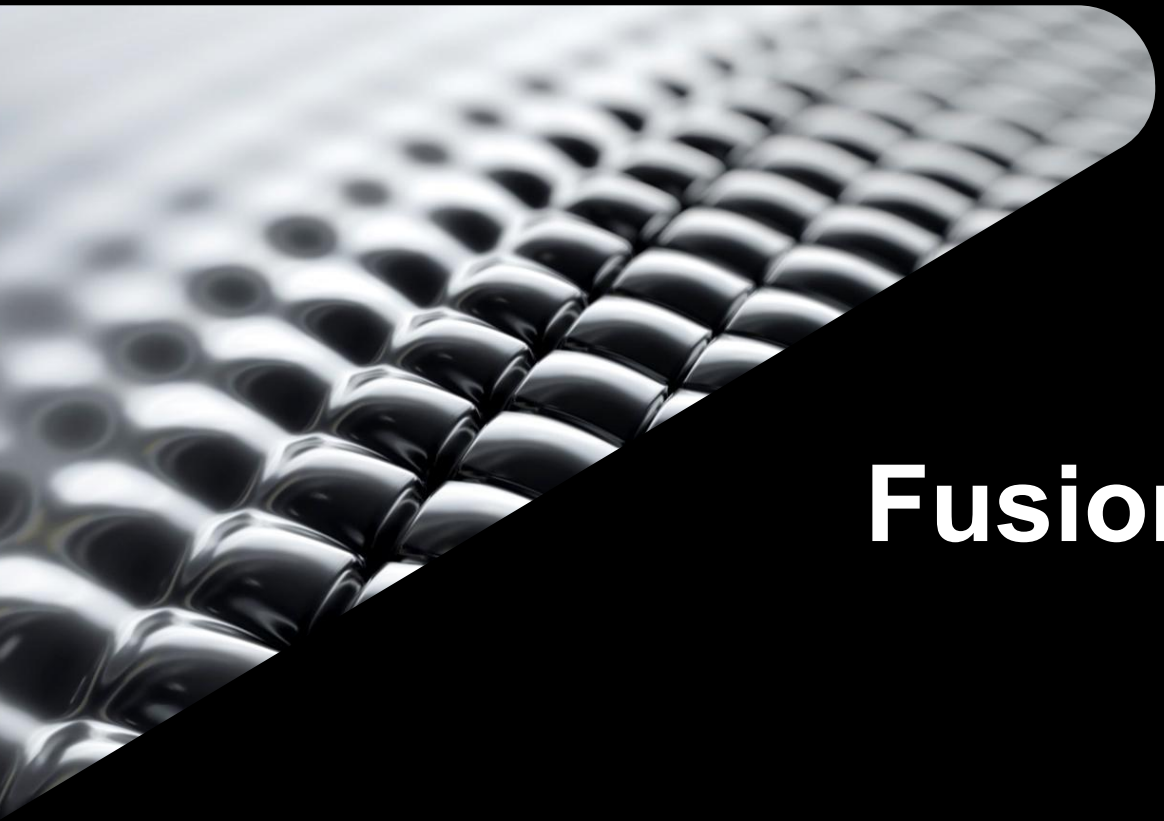


Upload to Fusion









Fusion vs. Inventor

Which to use?

Fusion vs. Inventor

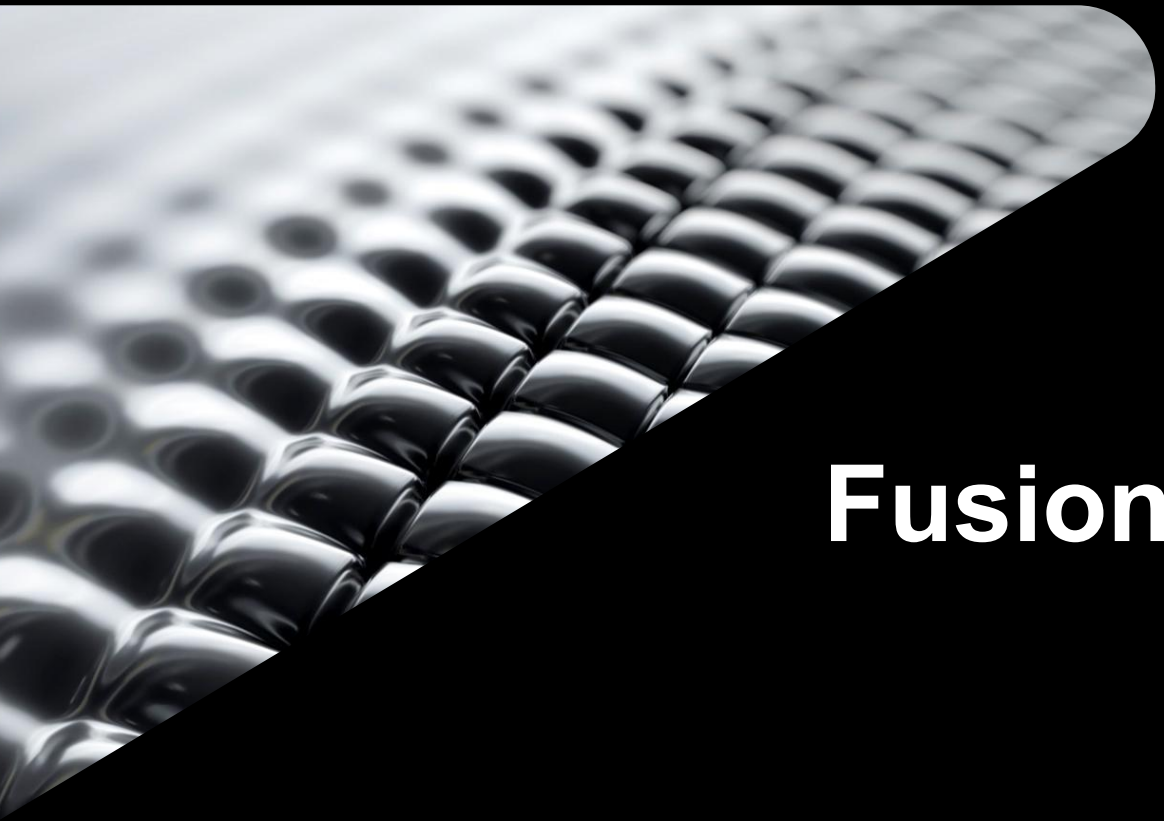
Which to use?

Fusion

- Really affordable
- Easy to learn and simple to use
- Great for design work & really forgiving of big later changes
- Have to manually import / export
- Great for teams under five people
- Not great at shop drawings

Inventor

- Costs as much (or more!) than Revit
- More effort to learn & more complex
- Harder for design work & less forgiving of big later changes
- Syncs with Revit & AutoCAD nicely
- Works well for larger teams
- Way better at shop drawings (but Revit is still way better!)



Fusion Pros & Cons

What’s the Catch?

Fusion Pros & Cons

What's the Catch?

Pros

- Easy
- Affordable
- Runs on Windows or OS X the same
- Cloud saves / Cloud Services
- Full modeling package with CAM

Cons

- Can be slow
- More and more features that were included you now have to pay extra for
- Can be really slow sometimes (when compared to Inventor / Revit / AutoCAD)
- Cloud Saves / Cloud Services
- Terrible drawing module…