

3Xn
Architecture

GXn
Innovation



COPENHAGEN - HQ

3XN COPENHAGEN A/S
KANONBRØDSVEJ 8
1437 COPENHAGEN K
DENMARK

STOCKHOLM

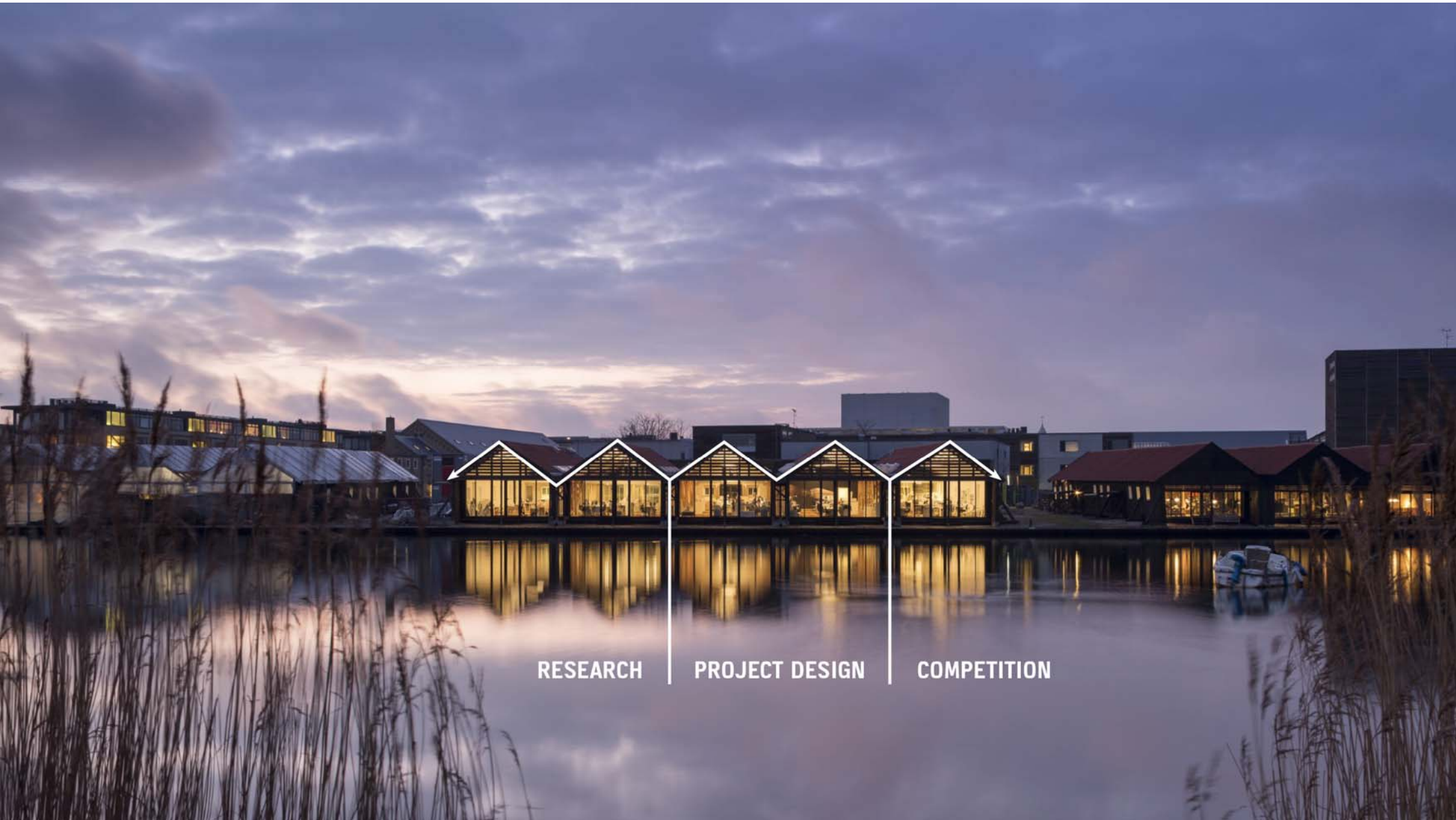
3XN STOCKHOLM AB
KAMMARKARGATAN 48
11160 STOCKHOLM
SWEDEN

NEW YORK

3XN NEW YORK LLC
101 BROADWAY, NO. 408
BROOKLYN, NY 11249
NEW YORK
USA

SYDNEY

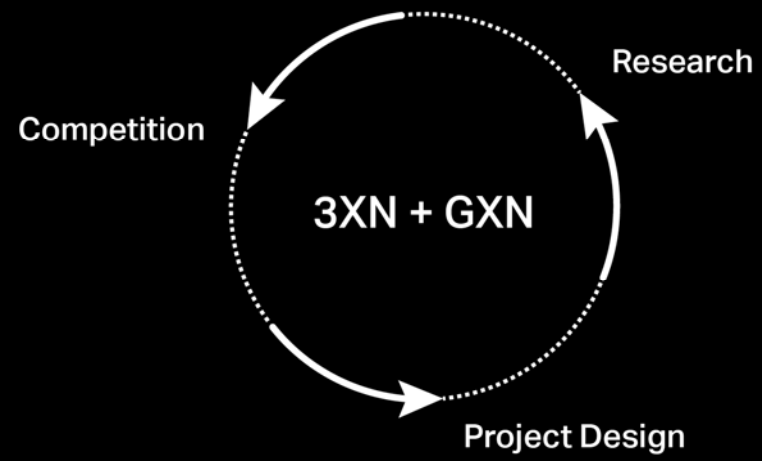
3XN SYDNEY PTY. LTD.
LEVEL 1, 225 GEORGE STREET
SYDNEY, NSW 2000
AUSTRALIA

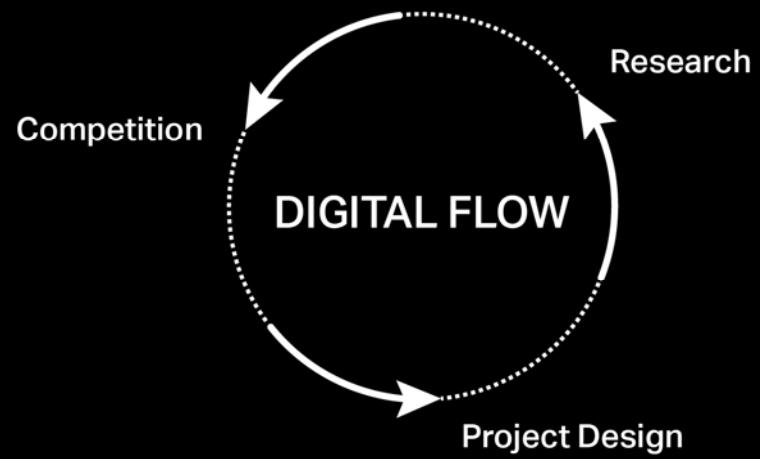


RESEARCH

PROJECT DESIGN

COMPETITION





A detailed architectural line drawing of a building's structural frame. The drawing shows multiple levels of a building with a complex network of vertical and horizontal beams, columns, and diagonal bracing. The perspective is from a low angle, looking up at the structure. The lines are clean and precise, typical of architectural blueprints. The text "DATA IN BUILDINGS" is overlaid in the center of the image.

DATA IN BUILDINGS

```
import rhinoscriptsyntax as rs
import Rhino
import os
import shutil
import errno
import glob
```

```
#Data Locations
locUser = os.path.expanduser("~/")
strToolBarName = "3XNFLOW"
strPathTempFolder = "V:\\RHINO5\\Templates\\Rhino_Standards\\"
locScriptsLocal = locUser + "\\AppData\\Roaming\\McNeel\\Rhinoce-
os\\5.0\\scripts"
LocToolbarsLocal = locUser + "\\AppData\\Roaming\\McNeel\\Rhinoce-
os\\5.0\\UI"
locServerScripts = "V:\\RHINO5\\Tools\\Tools_Rhino"
LocServerToolBar = "V:\\RHINO5\\3XN_Tools\\Toolbars\\" + "\\\" + strTool-
BarName + ".rui"
```

```
def DeleteToolbars(strToolBarName):
```

```
#01a - Find Default Local Folder
strUserName = os.path.expanduser("~/")
strUserObjFolder = strUserName + "\\AppData\\Roaming\\McNeel\\Rhino-
ceros\\5.0\\UI\\"
LoadToolBarLocal = strUserObjFolder + strToolBarName + ".rui"
```

```
#01b - Close Toolbar-collection
test = Rhino.RhinoApp.ToolbarFiles.FindByPath(LoadToolBarLocal)
```

```
rs.AddAlias("2D_Blocks_3XN", "! _-RunPythonScript 2D_Blocks_FLOW")
rs.AddAlias("3D_Blocks_3XN", "! _-RunPythonScript 3D_Blocks_FLOW")
rs.AddAlias("MoveAllBlocksToLayer_3XN", "! _-RunPythonScript MoveAllBlock-
sToLayer_FLOW")
```

```
#Workflow
rs.AddAlias("AddSheet_3XN", "! _-Loadscript AddSheet_FLOW.rvb")
rs.AddAlias("BatchRender_3XN", "! _-Loadscript BatchRender_FLOW.rvb")
rs.AddAlias("IntColorsBySelection_3XN", "! _-Loadscript InterpolatedColors-
BySelection_FLOW.rvb")
```

```
rs.AddAlias("ClosedCurvesOffset_3XN", "! _-Loadscript ClosedCurvesOffset_
FLOW.rvb")
rs.AddAlias("ClosedCurveMultipleOffset_3XN", "! _-Loadscript ClosedCurve-
MultipleOffset_FLOW.rvb")
rs.AddAlias("OffsetPointsAlongCurve_3XN", "! _-Loadscript OffsetPointsA-
longCurve_FLOW.rvb")
rs.AddAlias("PlanarizeCurve_3XN", "! _-Loadscript PlanarizeCurve_FLOW.rvb")
rs.AddAlias("FilletNonPlanar_3XN", "! _-Loadscript FilletNonPlanar_FLOW.
rvb")
rs.AddAlias("RebuildCurvesByLength_3XN", "! _-Loadscript RebuildCurvesBy-
Length_FLOW.rvb")
rs.AddAlias("DivideCurvesByLength_3XN", "! _-Loadscript DivideCurvesBy-
Length_FLOW.rvb")
rs.AddAlias("MultipleCurvesBooleanOffset_3XN", "! _-Loadscript MultipleCur-
vesBooleanOffset_FLOW.rvb")
rs.AddAlias("VectorfieldMovements_3XN", "! _-RunPythonScript Vectorfield-
Movements_FLOW")
rs.AddAlias("CirclesRandomGrowth_3XN", "! _-RunPythonScript CirclesRand-
omGrowth_FLOW")
rs.AddAlias("CirclesRecursive_3XN", "! _-RunPythonScript CirclesRecursive_
```

```
rs.AddAlias("SelectByRadiusSelected_3XN", "! _-RunPythonScript SelectByRa-
diusSelected_FLOW")
rs.AddAlias("SelectCurvesByLength_3XN", "! _-RunPythonScript SelectCurves-
ByLength_FLOW")
rs.AddAlias("SelectCurvesByArea_3XN", "! _-RunPythonScript SelectCurvesBy-
Area_FLOW")
rs.AddAlias("SelectSurfacesByArea_3XN", "! _-RunPythonScript SelectSur-
facesByArea_FLOW")
rs.AddAlias("SelectCurvesByZLevel_3XN", "! _-Loadscript SelectCurvesByZ-
Level_FLOW.rvb")
rs.AddAlias("RandomSelection_3XN", "! _-RunPythonScript RandomSelection_
FLOW")
```

```
#Distribute
rs.AddAlias("ArrayLinearDistribution_3XN", "! _-Loadscript ArrayLinearDistri-
bution_FLOW.rvb")
rs.AddAlias("CopyObjectToPoints_3XN", "! _-Loadscript CopyObjectToPoints_
FLOW.rvb")
rs.AddAlias("DistributeObjects_Sprinkler_3XN", "! _-Loadscript DistributeOb-
jects_Sprinkler_FLOW.rvb")
```

```
print " - 3XNFLOW Alias mode installed"
```

```
# - AddSearchPath script location to the standard Python location. We import
both Rhinoscript(VB) and Python scripts in that folder
# - (I need this for easy macro commands and aliases)
strSPRhino = rs.AddSearchPath(locScriptsLocal)
```

```
def CopyFiles(locScriptsLocal,locServerScripts,folderName):
    ServerTools = locServerScripts + "\\\" + folderName
    for filename in os.listdir(ServerTools):
```

```
rs.OpenToolBarCollection(LocToolbarsLocal + "\\\" + strToolBarName + ".rui")
```

```
def InstallingGrasshopperTools():
```

```
#DIRECTORIES
strUserName = os.path.expanduser("~/") #Find user path
strPathUserOrigin = "V:\\RHINO5\\Tools\\Grasshopper\\Installation -
User Components\\" #Directory origin user components (installation)
strPathPluginOrigin = "V:\\RHINO5\\Tools\\Grasshopper\\Installation -
Plugins\\Files\\" #Directory origin plugins (installation)
```

```
nameUserFolders = "3XN_Tools" #Naming (Local installation User-folders)
nameLibFolder = "3XN_Selected_Lib" #Naming (Local installation Lib-folders)
strUserObjFolder = strUserName + "\\AppData\\Roaming\\Grasshopper\\"
UserObjects\\" + nameUserFolders + "\\\" #UserObjectsFolder
strLibrariesFolder = strUserName + "\\AppData\\Roaming\\Grasshopper\\
Libraries\\" + nameLibFolder + "\\\" #LibrariesFolder
```

```
#READ-ONLY DIRECTORIES
KangarooName = "Kangaroo 2.2.1"
TTToolboxName = "TT Toolbox 1.8"
LunchboxName = "LunchBox"
```

```
Kangaroo = "V:\\RHINO5\\Tools\\Grasshopper\\Installation - Plugins\\
Folders(Read_Only)\\\" + KangarooName + "\\\" #Name on server (Version
2.2.1)
KangarooLocal = strLibrariesFolder + KangarooName + "\\\"
TTToolbox = "V:\\RHINO5\\Tools\\Grasshopper\\Installation - Plugins\\
Folders(Read_Only)\\\" + TTToolboxName + "\\\" #Name on server (Version 1.8)
```

```
TTToolboxLocal = strLibrariesFolder + TTToolboxName + "\\\"
Lunchbox = "V:\\RHINO5\\Tools\\Grasshopper\\Installation - Plugins\\
Folders(Read_Only)\\\" + LunchboxName + "\\\" #Name on server (Version ?)
LunchboxLocal = strLibrariesFolder + LunchboxName + "\\\"
#print KangarooLocal, TTToolboxLocal
```

```
#DELETE FILES
def deleteFilesLocal():
```

```
#FILES TO DELETE
DeleteName_ghPython = "GHPYTHON"
DeleteName_Heliotrope = "HELIOTROPE"
DeleteName_Human = "HUMAN"
DeleteName_TPGNM_Lunchbox = "TPGNM"
DeleteName_Lunchbox = "Lunch"
DeleteName_TreeFrog = "TREEFROG"
DeleteName_Treesloth = "TREESLOTH"
DeleteName_Wombat = "WOMBATGH"
DeleteName_Kangaroo = "KAN"
DeleteName_TTToolbox = "TT"
DeleteName_LunchBox = "LUNCHBOX"
DeleteName_UserObjects = "3XN"
```

```
DeleteLocationLibraries = strUserName + "\\AppData\\Roaming\\Grass-
hopper\\Libraries\\"
DeleteLocationUser = strUserName + "\\AppData\\Roaming\\Grasshop-
per\\UserObjects\\"
```

```
#DELETE FILES
def deleteIfExist(Location, DeleteName):
    try:
```

```
deleteIfExist(DeleteLocationLibraries, DeleteName_Human)
deleteIfExist(DeleteLocationLibraries, DeleteName_TPGNM_Lunchbox)
deleteIfExist(DeleteLocationLibraries, DeleteName_TreeFrog)
deleteIfExist(DeleteLocationLibraries, DeleteName_Treesloth)
deleteIfExist(DeleteLocationLibraries, DeleteName_Wombat)
deleteIfExist(DeleteLocationLibraries, DeleteName_Kangaroo)
deleteIfExist(DeleteLocationLibraries, DeleteName_TTToolbox)
deleteIfExist(DeleteLocationLibraries, DeleteName_Lunchbox)
deleteFilesLocal()
```

```
#CREATE DIRECTORIES (IF EXISTS)
def createDirectories():
    if not os.path.exists(strUserObjFolder): #Creating UserObjectsFolde
os.makedirs(strUserObjFolder)
```

```
if not os.path.exists(strLibrariesFolder): #Creating LibrariesFolder
os.makedirs(strLibrariesFolder)
```

```
if not os.path.exists(KangarooLocal): #Creating Kangaroo Folder
os.makedirs(KangarooLocal)
```

```
if not os.path.exists(TTToolboxLocal): #Creating TTToolbox Folder
os.makedirs(TTToolboxLocal)
```

```
if not os.path.exists(LunchboxLocal): #Creating TTToolbox Folder
os.makedirs(LunchboxLocal)
createDirectories()
```

```
#COPY FILES TO LOCAL DRIVE
```

DIGITAL AND COMPUTATIONAL PROCESS

```
pass

DeleteToolbars("3XN - Toolbar")
DeleteToolbars(strToolBarName)

def Load_TemplateFolder(strPathTempFolder):
    rs.TemplateFolder(strPathTempFolder)
    print " - 3XNFLOW Template folder installed"

def InstallAlias_Flow():

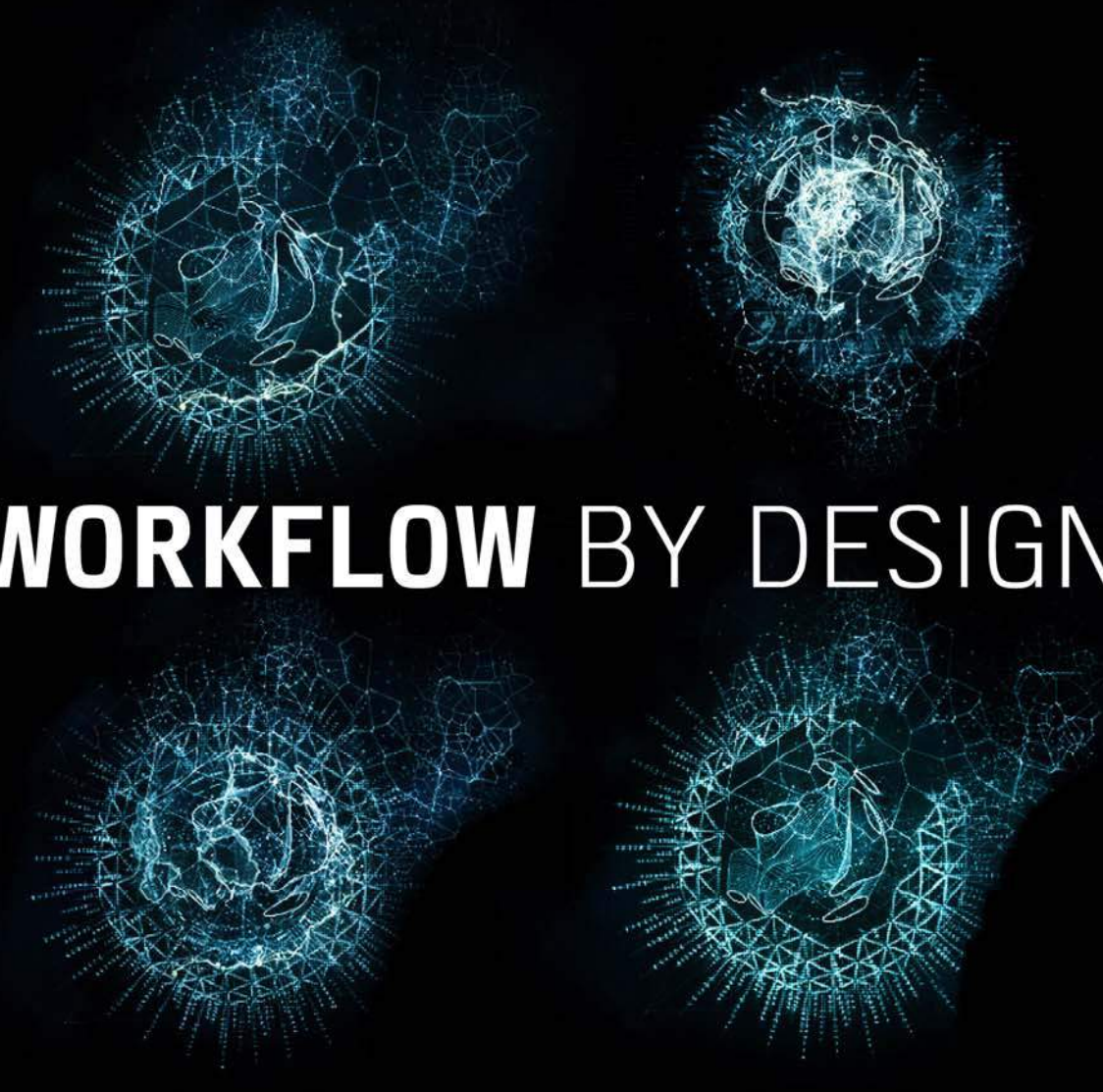
    #Root
    rs.AddAlias("DrawingStandards_3XN", "! _-RunPythonScript 3XN_Drawing-
Standards_FLOW")
    rs.AddAlias("StandardLayers_3XN", "! _-Loadscript 3XN_StandardLayers_
FLOW.rvb")

    #Layers
    rs.AddAlias("AddLayerRandomColor_3XN", "! _-RunPythonScript AddLayerRand-
omColor_FLOW")
    rs.AddAlias("RandomLayerColors_3XN", "! _-Loadscript RandomLayerColors_
FLOW.rvb")
    rs.AddAlias("InterpolatedLayerColors_3XN", "! _-Loadscript InterpolatedLay-
erColors_FLOW.rvb")
    rs.AddAlias("LayerStandardPrintWidth_3XN", "! _-RunPythonScript LayerStan-
dardPrintWidth_FLOW")
    rs.AddAlias("IsolateByLayer_3XN", "! _-Loadscript IsolateByLayer_FLOW.rvb")
    rs.AddAlias("LayerBySelection_3XN", "! _-Loadscript LayerBySelection_FLOW.
rvb")

    #Blocks
```

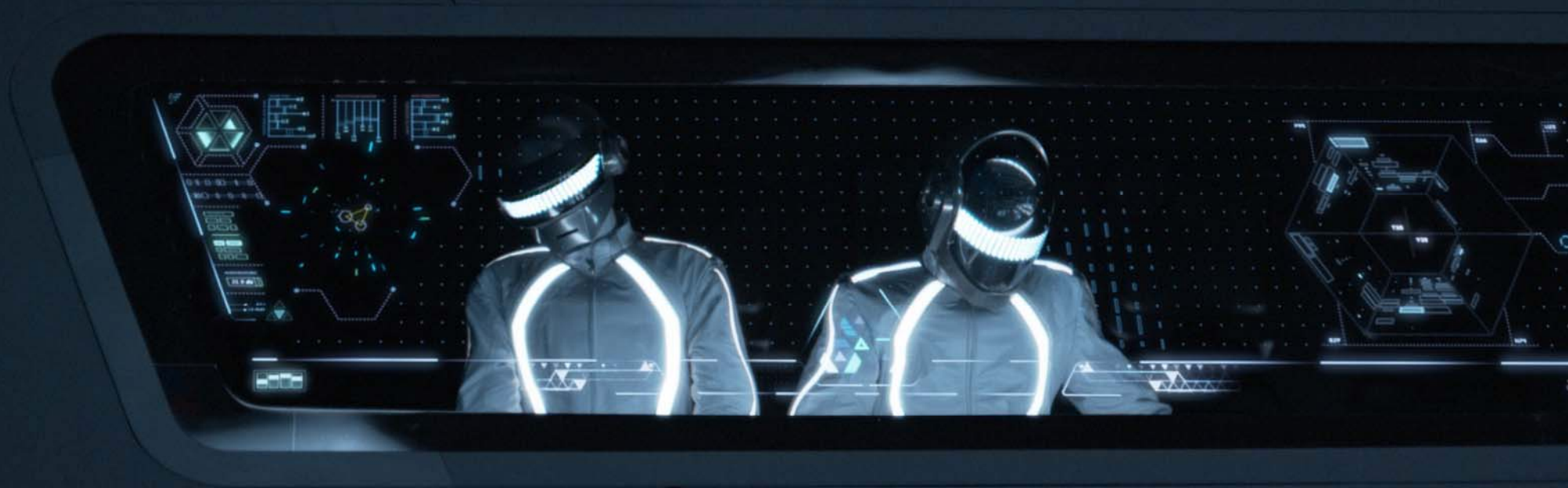
```
#Geometry
#rs.AddAlias("AlignGeometriesToSurface_FLOW.rvb","")
rs.AddAlias("RotateSurfaceFromNormal_3XN", "! _-Loadscript RotateSurface-
FromNormal_FLOW.rvb")
rs.AddAlias("RotateOnNormal_3XN", "! _-Loadscript RotateOnNormal_FLOW.
rvb")
rs.AddAlias("SurfaceToRectangularLights_3XN", "! _-RunPythonScript Surface-
ToRectangularLights_FLOW")
rs.AddAlias("ClosestDistanceBetweenObjects_3XN", "! _-Loadscript Closest-
DistanceBetweenObjects_FLOW.rvb")
rs.AddAlias("RandomScaleObjects_3XN", "! _-Loadscript RandomScaleOb-
jects_FLOW.rvb")
rs.AddAlias("RandomRotateObjects_3XN", "! _-Loadscript RandomRotateOb-
jects_FLOW.rvb")
rs.AddAlias("ClippingModel_3XN", "! _-Loadscript ClippingModel_FLOW.rvb")
rs.AddAlias("ClippingPlaneCurves_3XN", "! _-Loadscript ClippingPlaneCurves_
FLOW.rvb")
rs.AddAlias("SurfaceDivide_3XN", "! _-RunPythonScript SurfaceDivide_FLOW")
rs.AddAlias("SphereRandomGrowth_3XN", "! _-RunPythonScript SphereRand-
omGrowth_FLOW")
rs.AddAlias("RecursiveScale_3XN", "! _-RunPythonScript RecursiveScale_
FLOW")
```

```
#Selection
rs.AddAlias("SelectArc_3XN", "! _-RunPythonScript SelectArc_FLOW")
rs.AddAlias("SelectPlanarCurves_3XN", "! _-RunPythonScript SelectPlanar-
Curves_FLOW")
rs.AddAlias("SelectPlanarSurfaces_3XN", "! _-RunPythonScript SelectPlanar-
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rs.AddAlias("SelectByRadiusNumber_3XN", "! _-RunPythonScript SelectByRa-
diusNumber_FLOW")
```

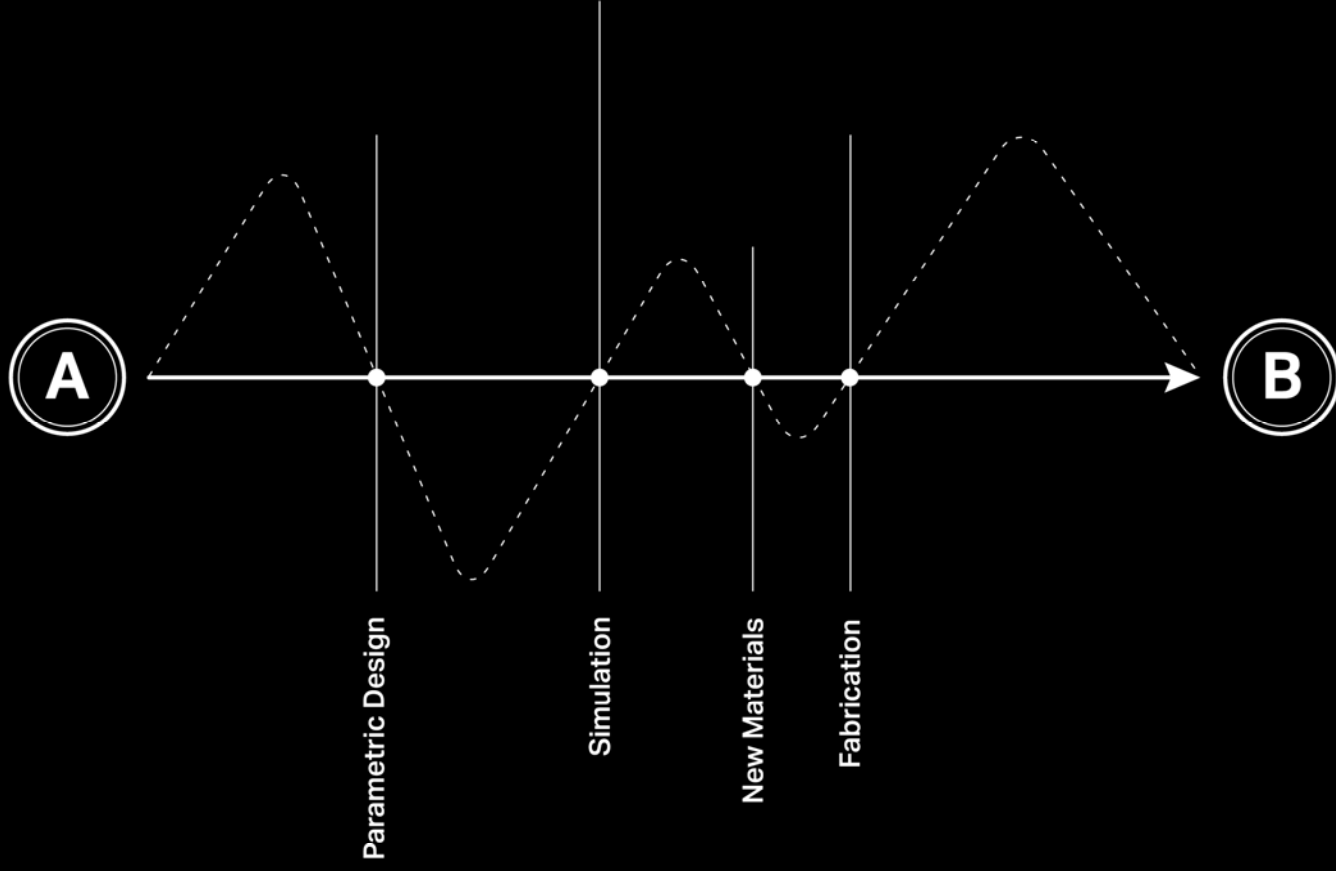


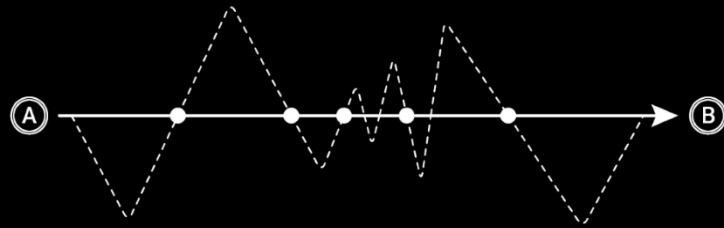
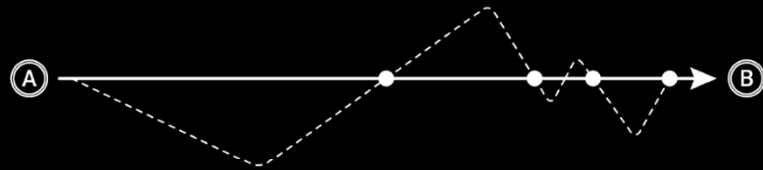
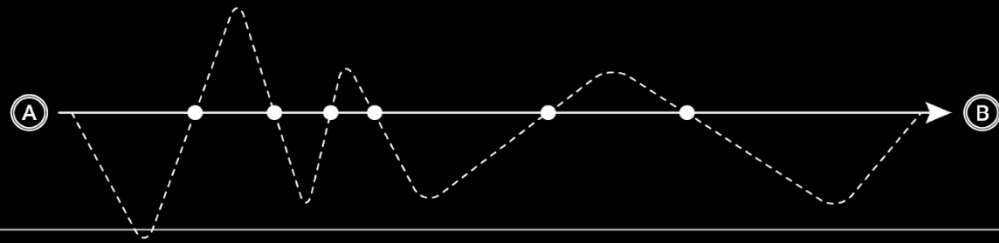
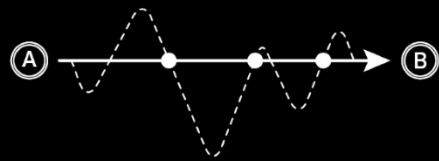
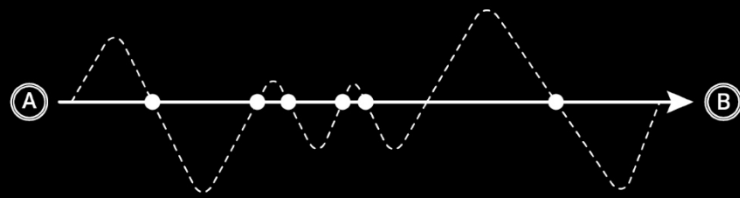
WORKFLOW BY DESIGN

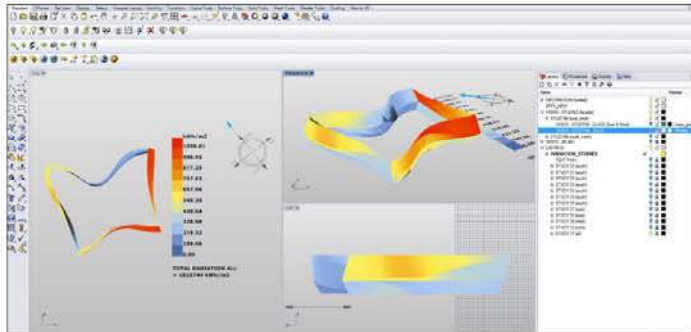
FROM THE MOVIE, TRON LEGACY



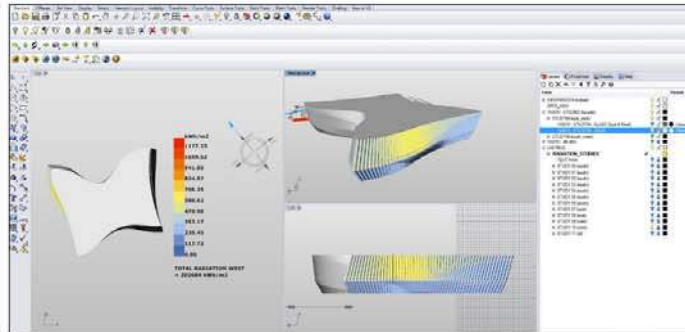
FROM THE MOVIE, TRON LEGACY



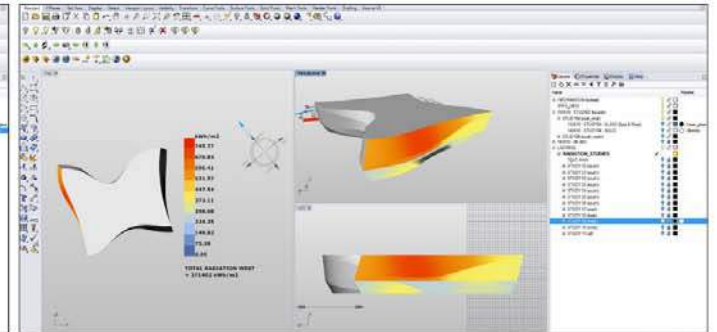




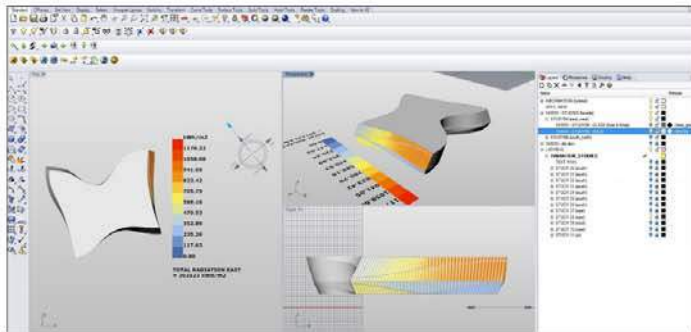
STUDY 01



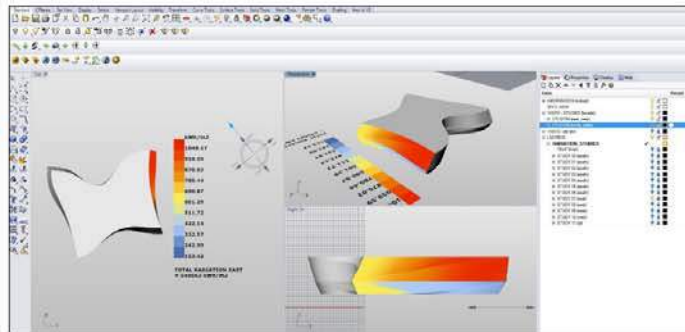
STUDY 04



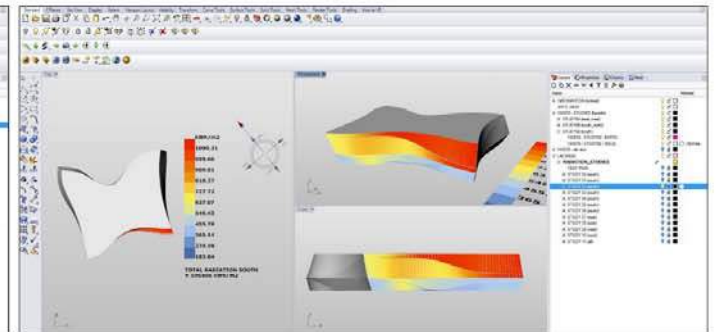
STUDY 08



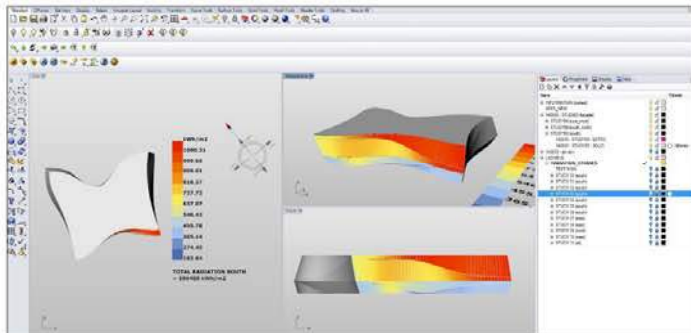
STUDY 09



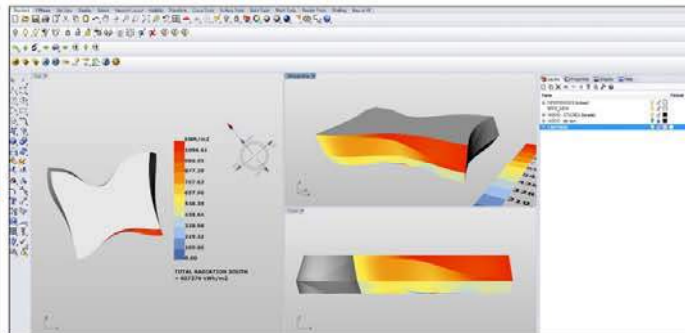
STUDY 13



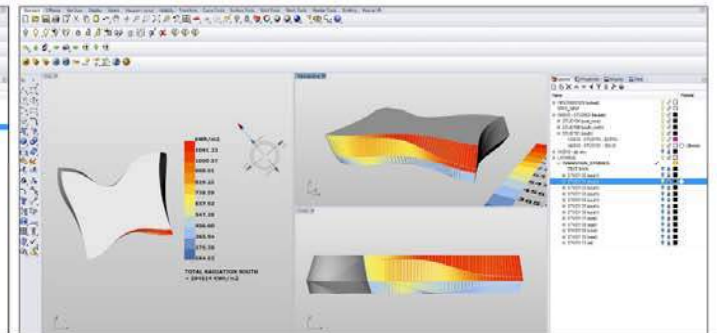
STUDY 19



STUDY 21

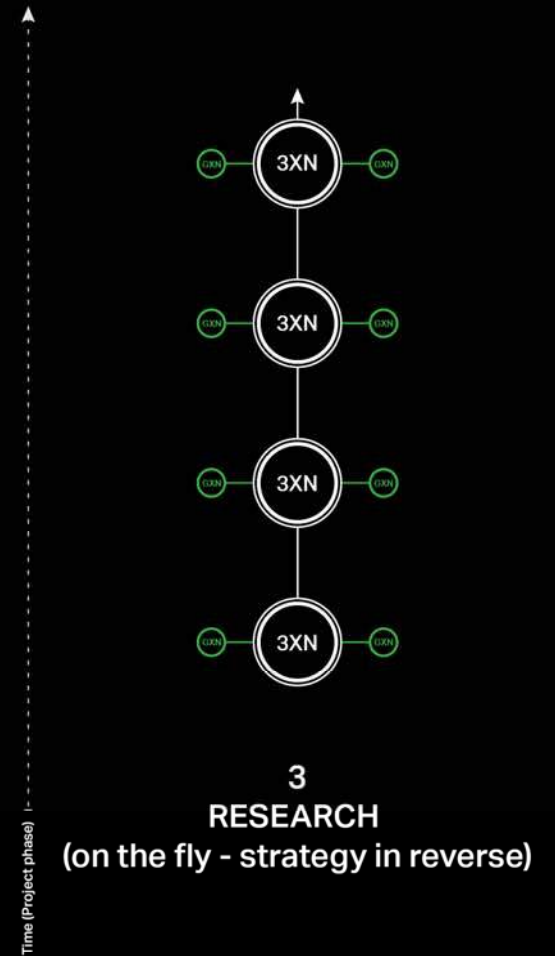
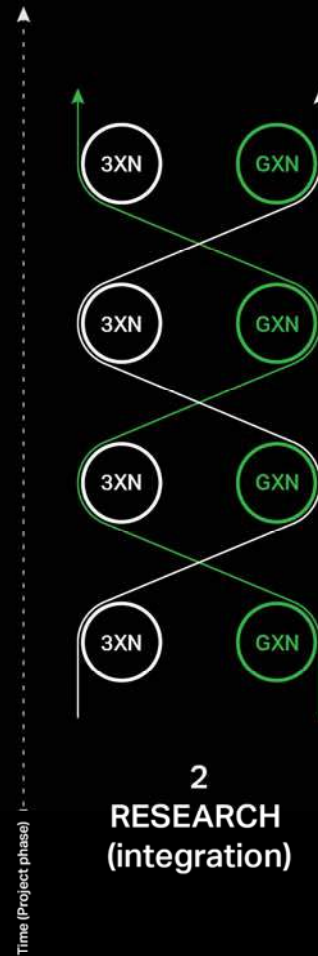


STUDY 22

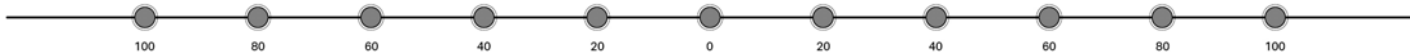


STUDY 23

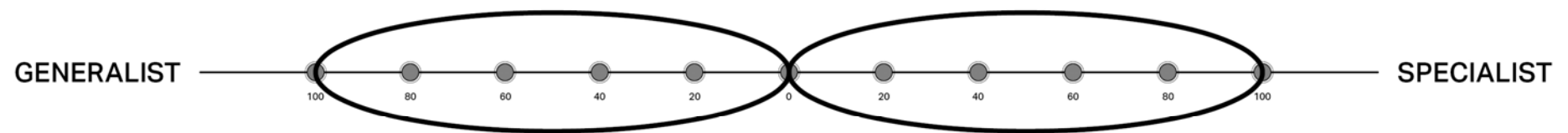


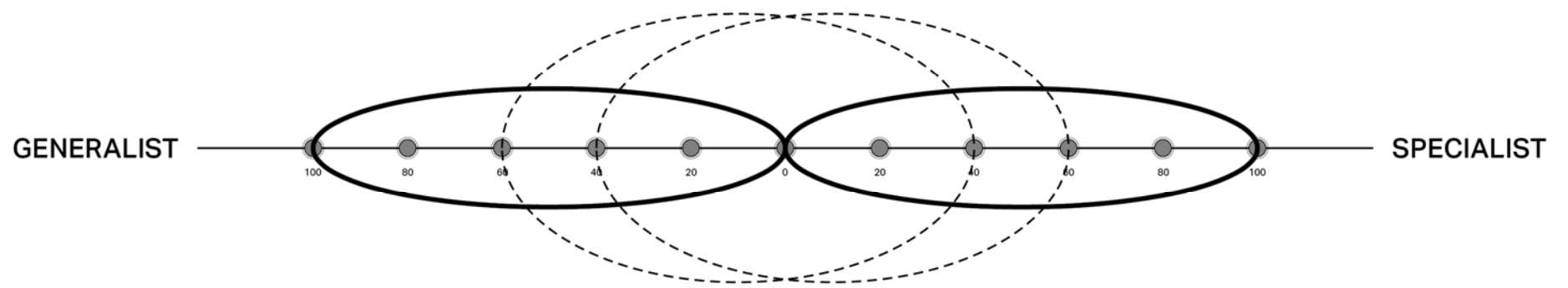


GENERALIST



SPECIALIST

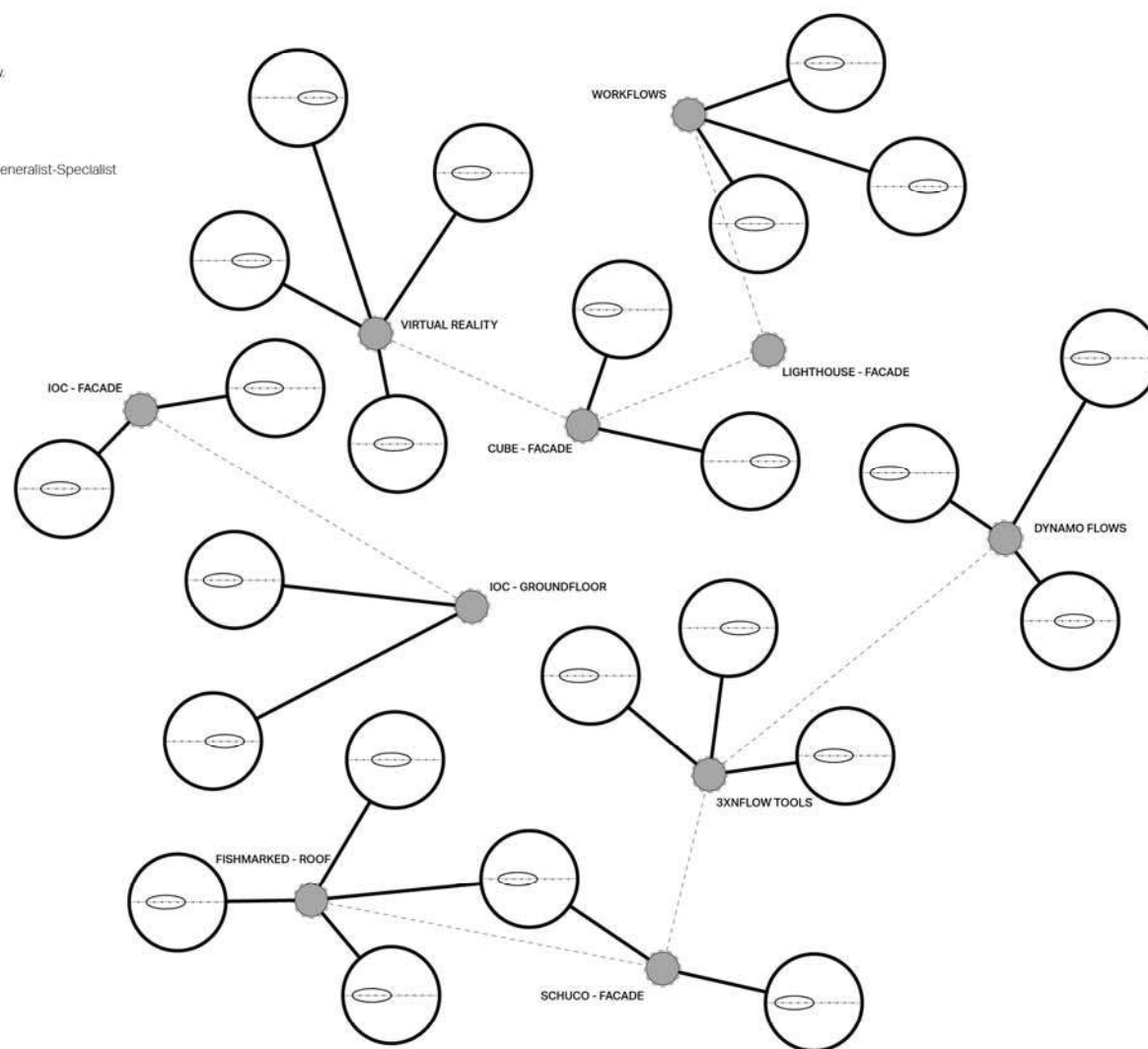






PROJECTS key projects in the workflow.

PEOPLE Specialist-Generalist and Generalist-Specialist





BIM IS DEAD

BIM IS DEAD

Or has it just become obsolete?

BIM IS DEAD

Or has it just become obsolete?

WE THINK THE ANSWER IS YES



Sketchpad - Ivan Sutherland - 1963



ISO-10303-21;
HEADER;

```

/*****
* STEP Physical File produced by: The EXPRESS Data Manager Version 5.02.0100.07 : 28 Aug 2013
* Module: EDMstepFileFactory/EDMstandAlone
* Creation date: Sun Mar 05 21:33:11 2017
* Host: I02984
* Database: c:\temp\{037D72F9-C01A-41DC-844A-33C9C39618E9}\ifc
* Database version: S507
* Database creation date: Sun Mar 05 21:33:10 2017
* Schema: IFC2X3
* Model: DataRepository.ifc
* Model creation date: Sun Mar 05 21:33:11 2017
* Header model: DataRepository.ifc_HeaderModel
* Header model creation date: Sun Mar 05 21:33:11 2017
* EDMuser: sdai-user
* EDMgroup: sdai-group
* License ID and type: 5605 : Permanent license. Expiry date:
* EDMstepFileFactory options: 020000
*****/
FILE_DESCRIPTION(('ViewDefinition [CoordinationView_V2.0, QuantityTakeOffAddonView]'),'2;1');
FILE_NAME('Project Number','2017-03-05T21:33:11',('Merlijn van Leeuwen'),('Bartels'),'The EXPRESS Data Manager
Version 5.02.0100.07 : 28 Aug 2013','20161117_1200(x64) - Exporter 17.2.0.0 - Alternate UI 17.2.0.0','');
FILE_SCHEMA(('IFC2X3'));
ENDSEC;

```

DATA;

```

#1= IFCORGANIZATION($,'Autodesk Revit 2017 (ENU)',$, $, $);
#5= IFCAPPLICATION(#1,'2017','Autodesk Revit 2017 (ENU)', 'Revit');
#6= IFCCARTESIANPOINT((0.,0.,0.));

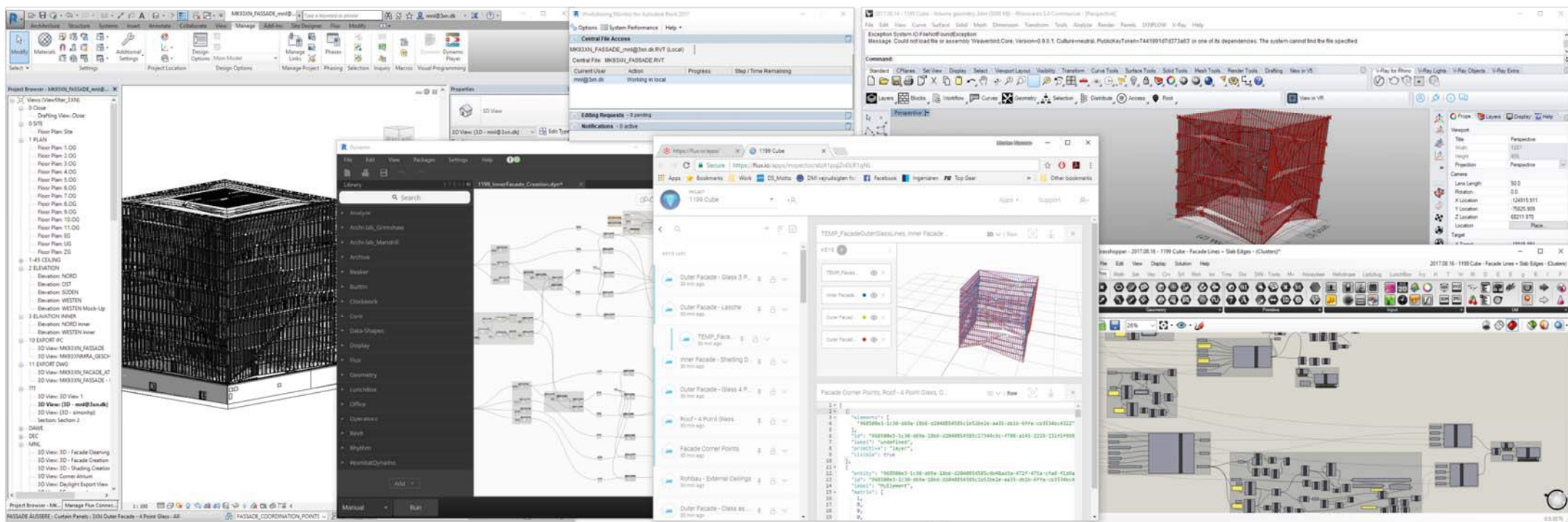
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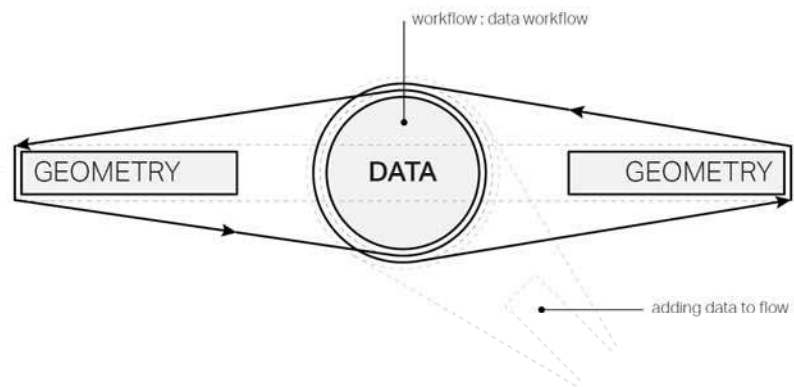
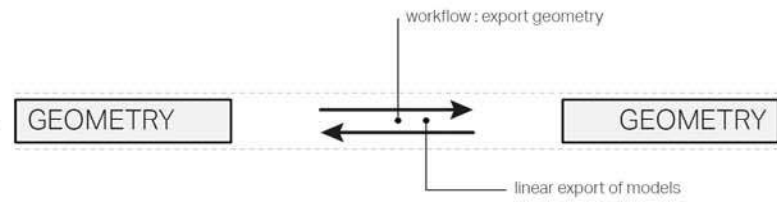






WORKFLOW AND DATA



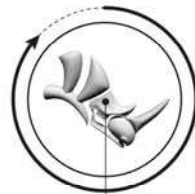


Geometry as representation in BIM

Geometry shows correctly in BIM and on drawings
Data stored elsewhere

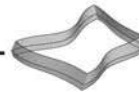
Computational Data Model

Computational design Model (Specialist):
- Design exploration
- Analysis
- Optimization
- ...



RHINO
+ Grasshopper

Geometry



REVIT
+ Dynamo

BIM Documentation Model

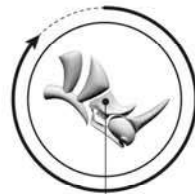
Documentation Model (Full Team):
- Plan, Sections, Elevations
- Types / Families
- Details
- ...

Data based representation in BIM

Data flow in one direction
Over time BIM model becomes primary data model

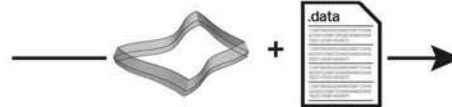
Computational Data Model

Computational design Model (Specialist):
- Design exploration
- Analysis
- Optimization
- ...



RHINO
+ Grasshopper

Geometry + Data



REVIT
+ Dynamo

BIM Documentation Model

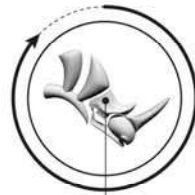
Documentation Model (Full Team):
- Plan, Sections, Elevations
- Types / Families
- Details
- ...

Bitchin' BIM

Bidirection data flow
Full dataset stored in both models

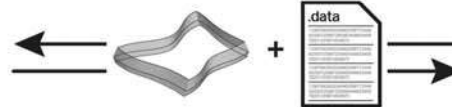
Computational Data Model

Computational design Model (Specialist):
- Design exploration
- Analysis
- Optimization
- ...



RHINO
+ Grasshopper

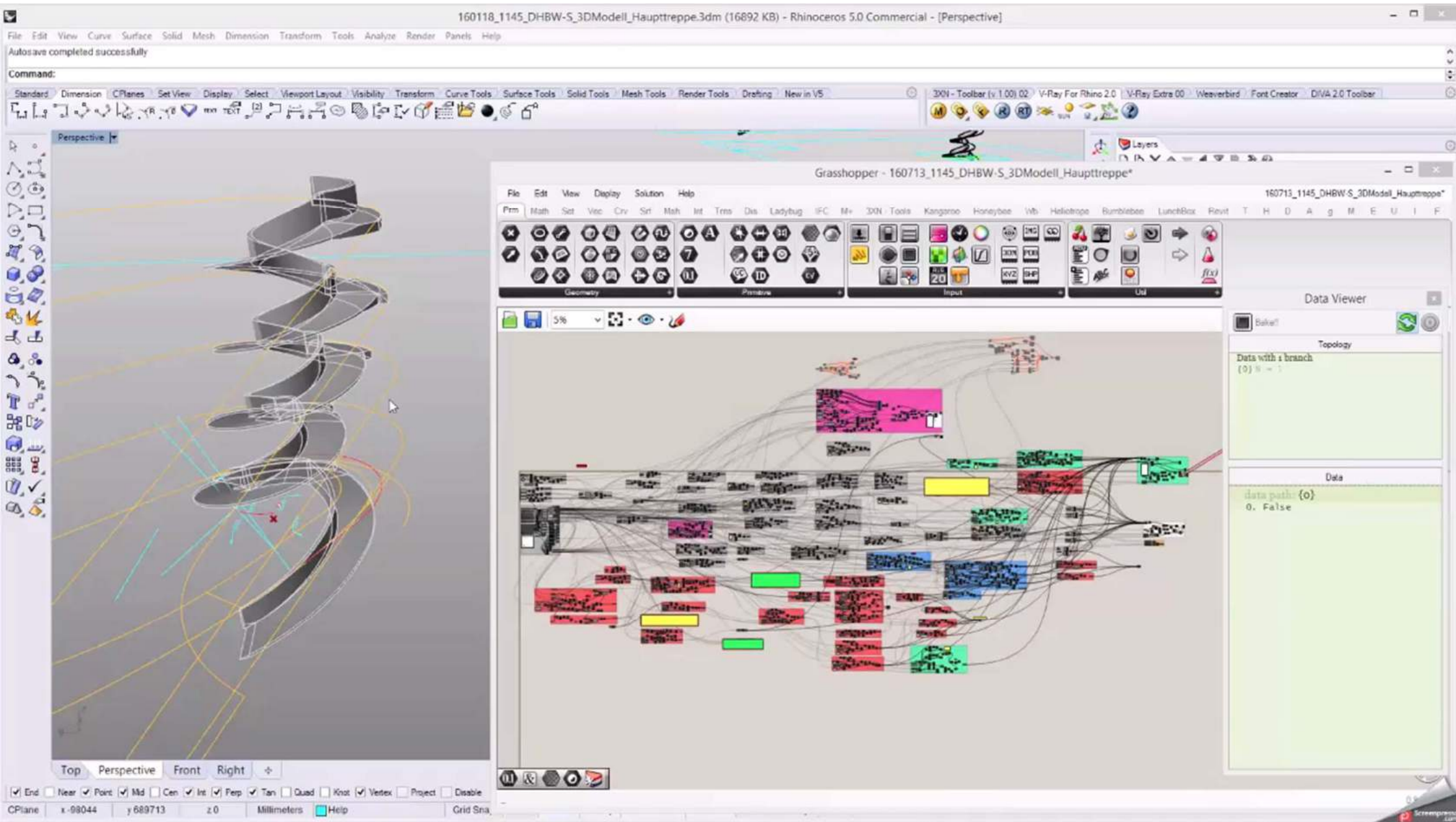
Geometry + Data



REVIT
+ Dynamo

BIM Documentation Model

Documentation Model (Full Team):
- Plan, Sections, Elevations
- Types / Families
- Details
- ...



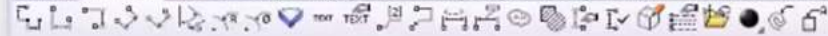
File Edit View Curve Surface Solid Mesh Dimension Transform Tools Analyze Render Panels Help

1 curve added to selection

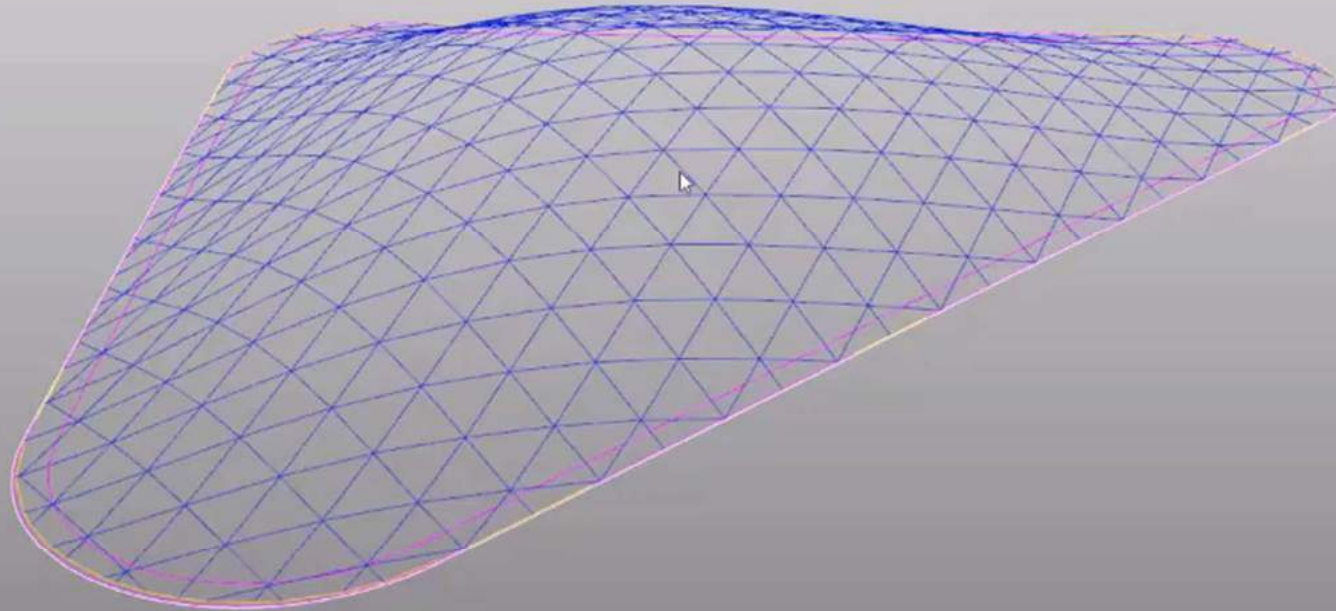
Command:

Standard Dimension CPanes Set View Display Select Viewport Layout Visibility Transform Curve Tools Surface Tools Solid Tools Mesh Tools Render Tools Drafting New in V5

3XH - Toolbar (v.1.00) 02 V-Ray For Rhino 2.0 V-Ray Extra 00 Weaverbird Font Creator DIVA 2.0 Toolbar



Perspective



Perspective Top Front Right Variant

☒ End ☐ Near ☒ Point ☒ Mid ☐ Cen ☒ Int ☒ Perp ☒ Tan ☐ Quad ☐ Knot ☒ Vertex ☐ Project ☐ Disable

CPlane x 30450.63 y -37373.15 z 0.00 Millimeters V1 Grid Snap Ortho Planar Osnap SmartTrack Gumball Record History Filter CPU use: 0.7 %

Layers

Name	Color	Linetype	Layer
Default	Yellow	Continuous	Dr
2D (production)	Yellow	Continuous	Dr
HoleCurves	Yellow	Continuous	Dr
DachSubdivisionCurves	Yellow	Continuous	Dr
ReferencePoint to CAD files	Yellow	Continuous	Dr
HelpLines	Yellow	Continuous	Dr
3D (production)	Yellow	Continuous	Dr
DachOberfläche	Yellow	Continuous	Dr
OberflächeProfile	Yellow	Continuous	Dr
V1_LoadCaseing	Yellow	Continuous	Dr
RO 323 9x20.0 (ohne Norm_war...	Yellow	Continuous	Dr
TO 180(SLASH)60(SLASH)10(SL...	Yellow	Continuous	Dr
V2_LoadCaseing	Yellow	Continuous	Dr
RO 323 9x20.0 (ohne Norm_war...	Yellow	Continuous	Dr
TO 180(SLASH)60(SLASH)10(SL...	Yellow	Continuous	Dr
V3_LoadCaseing	Yellow	Continuous	Dr
RO 323 9x20.0 (ohne Norm_war...	Yellow	Continuous	Dr
TO 140(SLASH)60(SLASH)8(SL...	Yellow	Continuous	Dr
2D (ref layer PLANDSTAND)	Yellow	Continuous	Dr
2D (ref layer REVIT)	Yellow	Continuous	Dr
3D (user)	Yellow	Continuous	Dr

Properties

Viewport

Property	Value
Title	Perspective
Width	1356
Height	827
Projection	Perspective

Camera

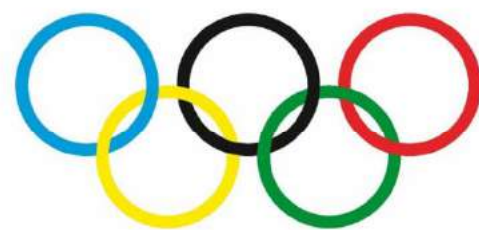
Property	Value
Lens Length	50.0
Rotation	0.0
X Location	97835.190
Y Location	36414.139
Z Location	32459.776
Location	Place...

Target

Property	Value
X Target	35475.948
Y Target	39027.766
Z Target	-1852.606

INTERNATIONAL OLYMPIC COMMITTEE HQ

LAUSANNE, SWITZERLAND

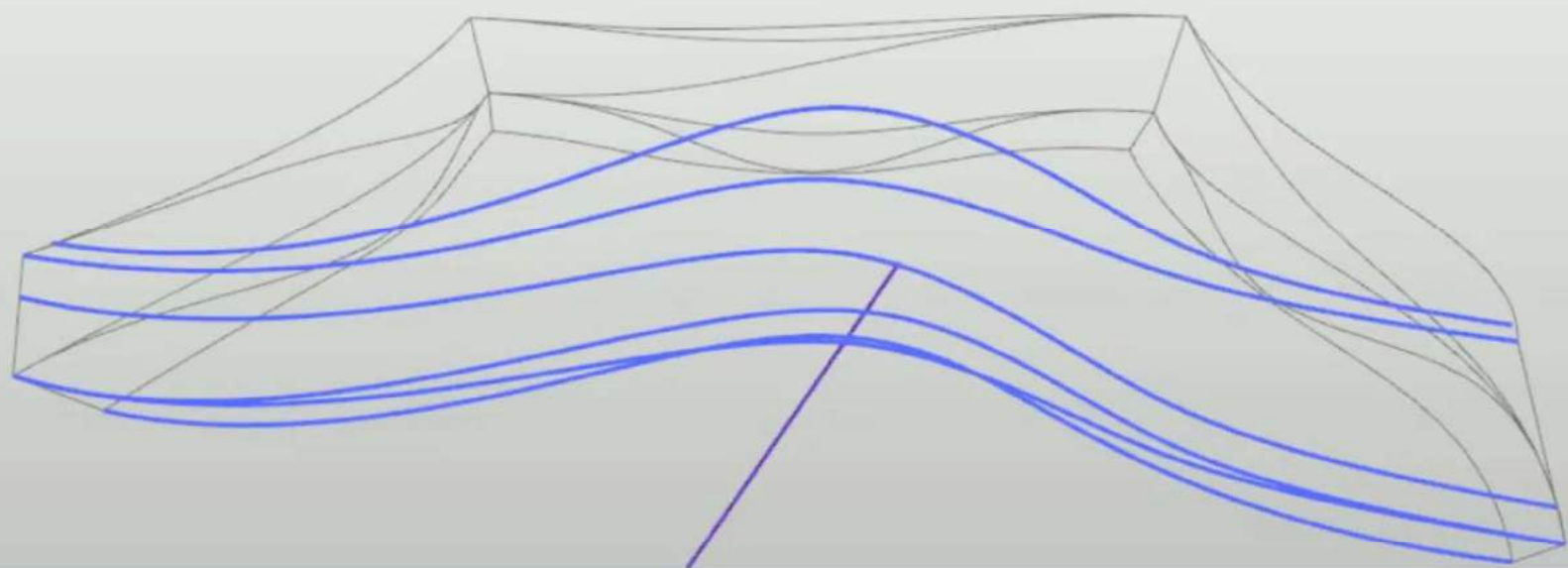


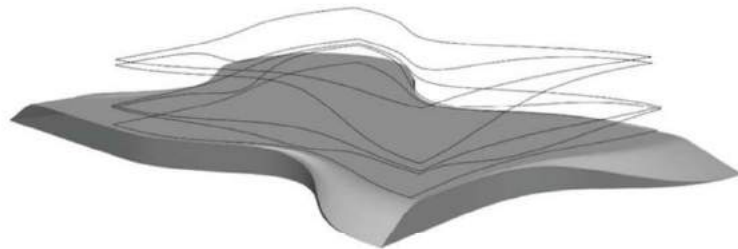
MOVEMENT



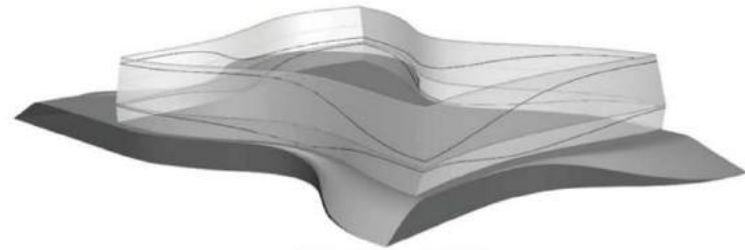








STEP01 - CURVED GEOMETRY



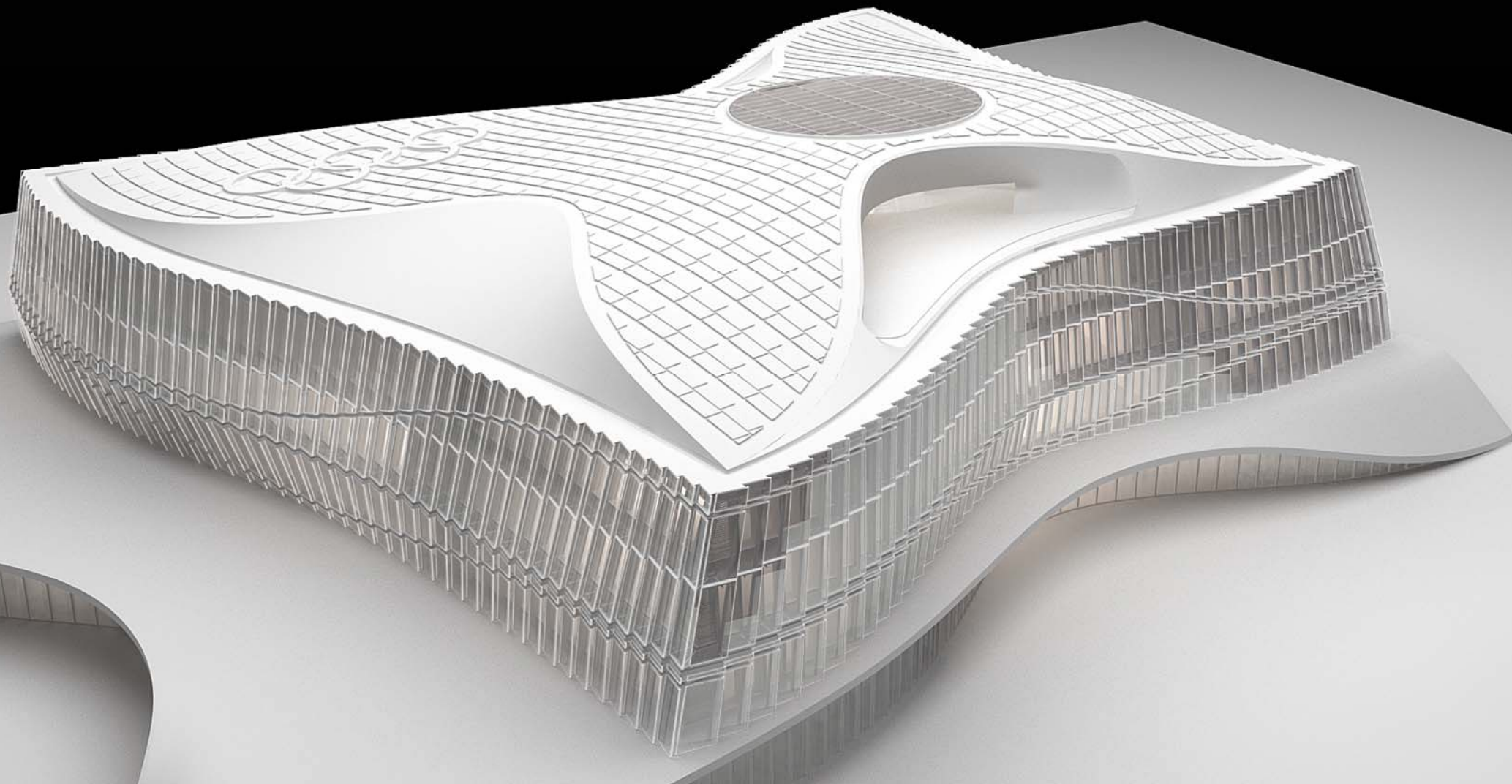
STEP02 - MASSING GEOMETRY

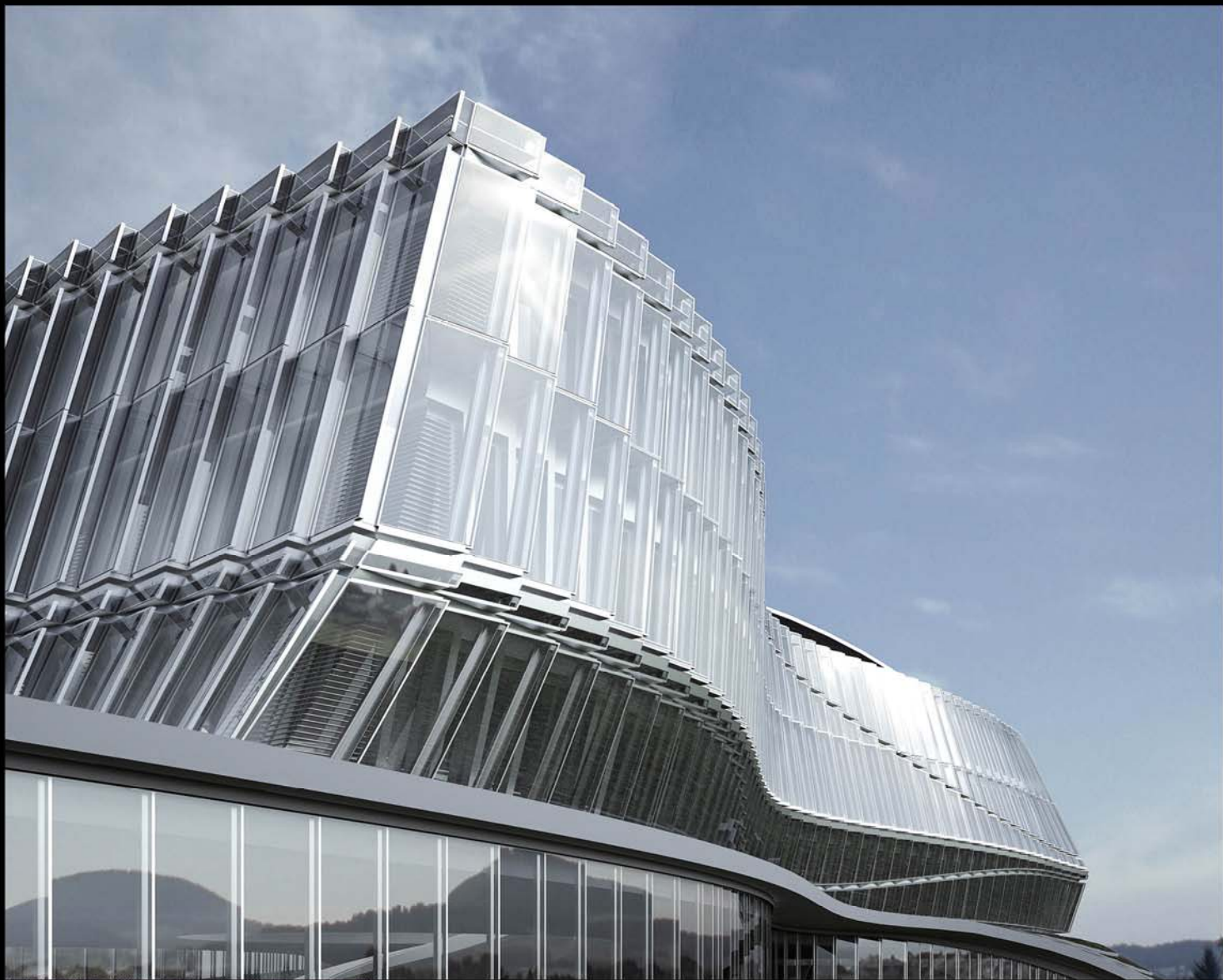


PARAMETRIC SETUP
GRASSHOPPER + VB-SCRIPT



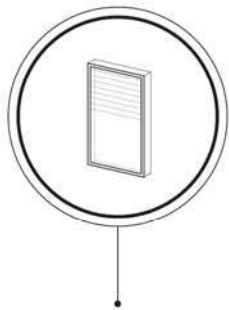
STEP03 - FACADE DESIGN





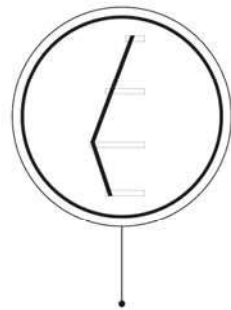
V-Ray Adv. 3.15.03 | File: 1154_KCC_2A_20160308_Alt.37_Thumbnail.glb | Frames: 100000 | Progress: 84% | Render time: 0h 50m 25.7s





Collaborator - Facade engineering
Emmer Pfenninger Partner AG

Collaborator - Facade contractor
Frener & Reifer



Collaborator - Structural engineering
Ingeni



Collaborator - Lead design architect
3XN architects GXN innovation

(Spacing parameters)



(Angle parameters)



(Design Curves) + Planarization



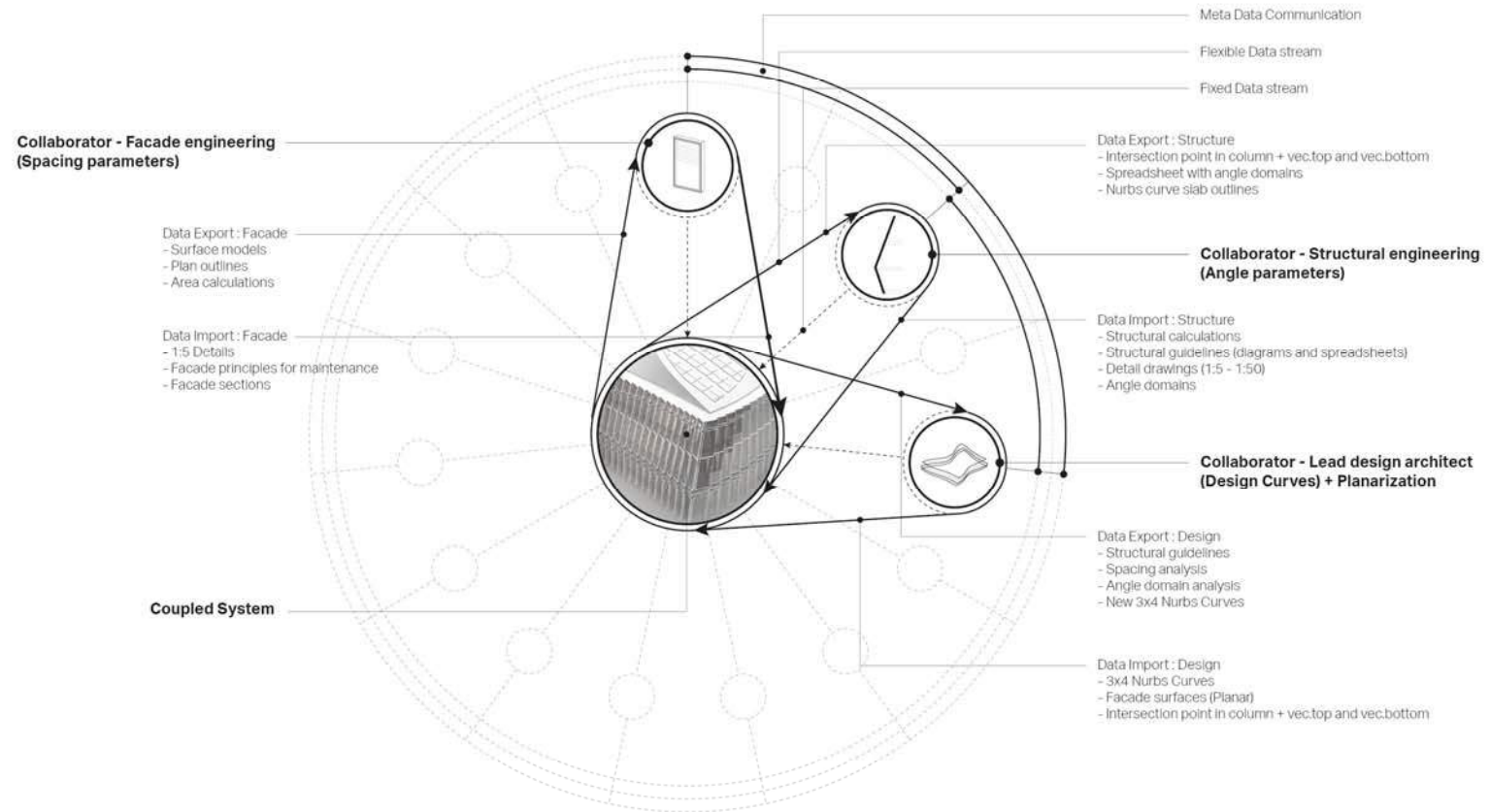
PLAYERS AND PARAMETERS

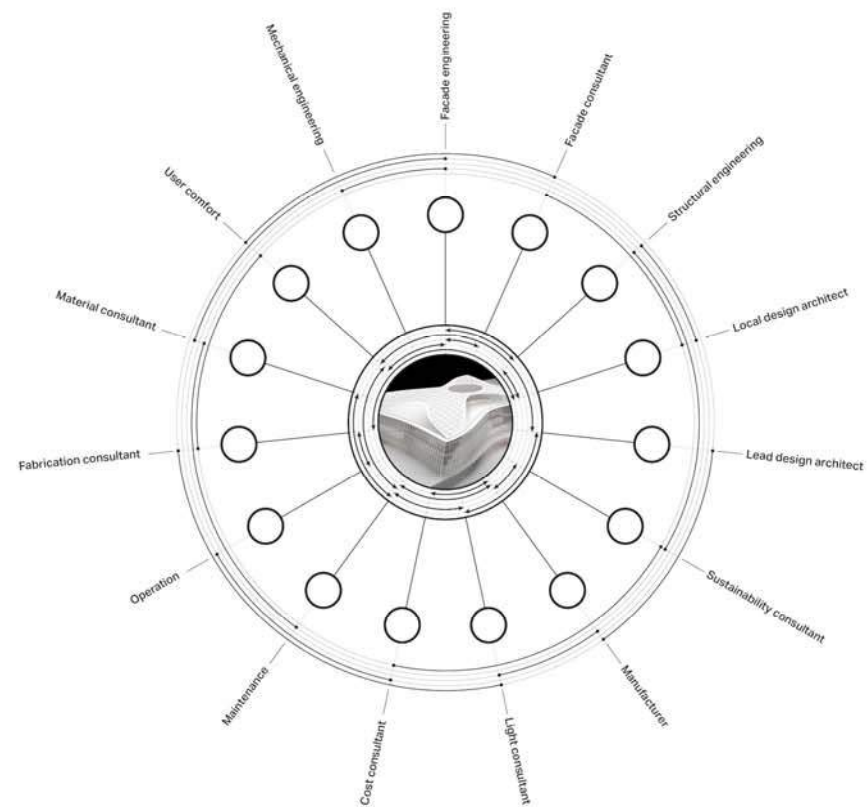
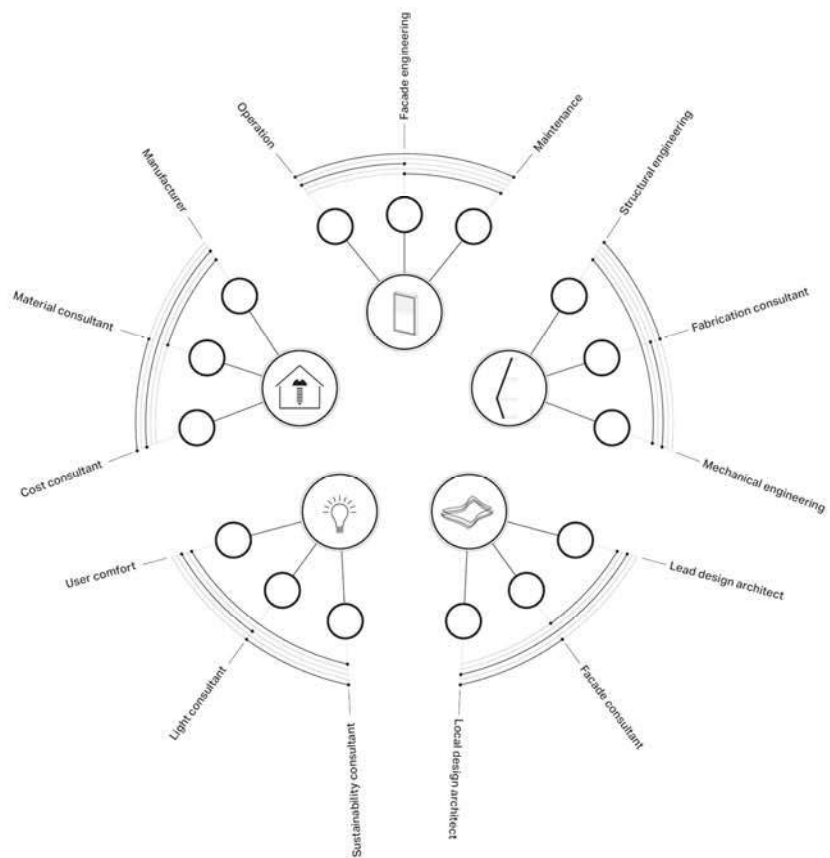
ROLE

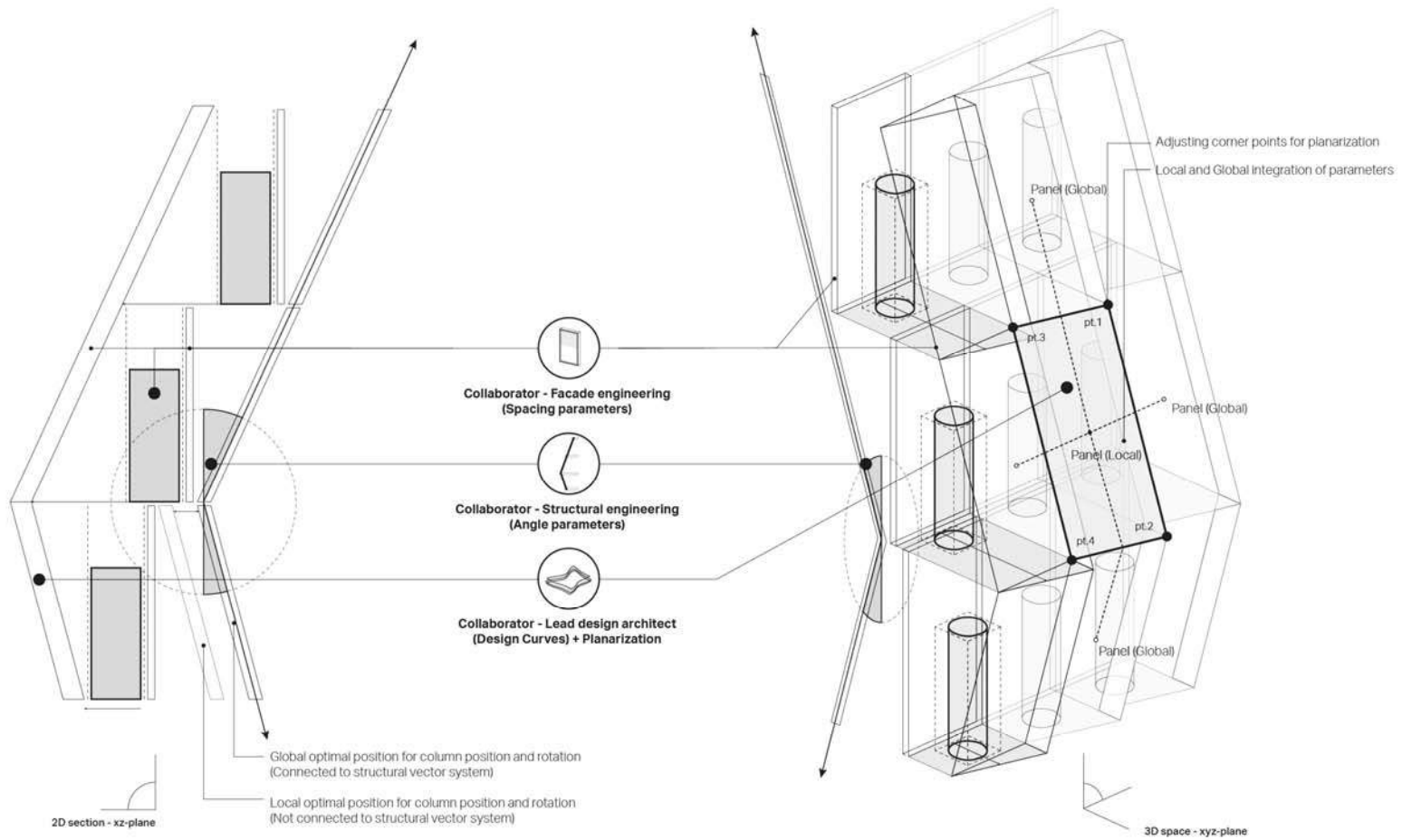
PARAMETERS

FILETYPES FOR DATA EXCHANGE

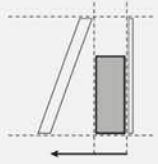
OTHER FILETYPES - COLLABORATOR WORKFLOW



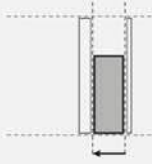




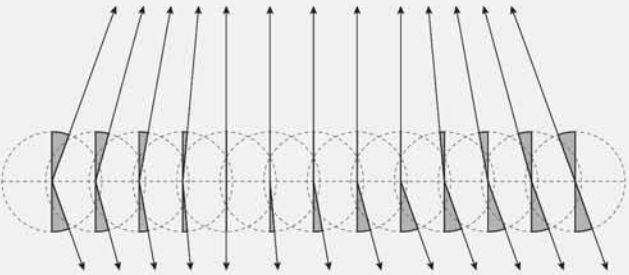
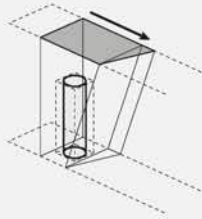
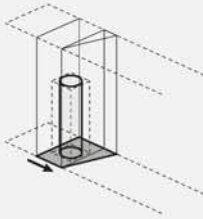
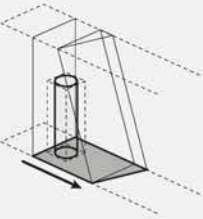
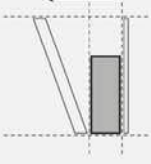
Condition-A: Top rotation



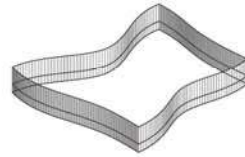
Condition-B: Extrusion



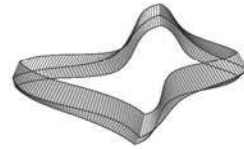
Condition-C: Bottom rotation



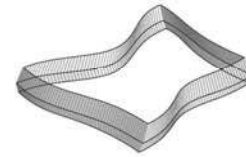
Angle domain: Structural constraints in column rotation



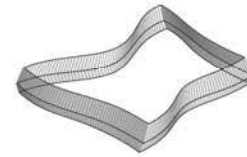
Model.005
(Geometry Extruded)



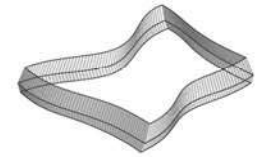
Model.027
(Geometry Exploration)



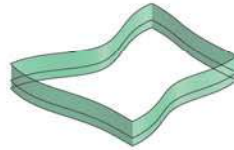
Model.052
(Geometry Optimized)



Model.065
(Geometry Optimized)

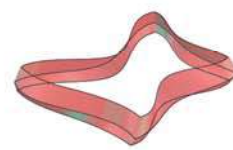


Model.073
(Geometry Optimized)



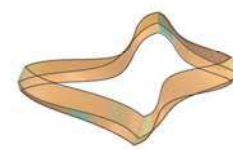
Model.005 - Angle
(Inside Domain)

00 - 05	< 100%
05 - 10	< 0%
10 - 15	< 0%
15 - 20	< 0%
20 -	< 0%



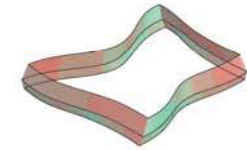
Model.027 - Angle
(Outside Domain)

00 - 05	< 4%
05 - 10	< 1%
10 - 15	< 3%
15 - 20	< 10%
20 -	< 82%



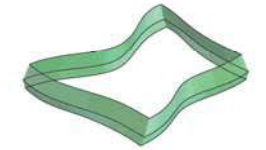
Model.052 - Angle
(Inside Domain)

00 - 05	< 4%
05 - 10	< 1%
10 - 15	< 3%
15 - 20	< 10%
20 -	< 82%



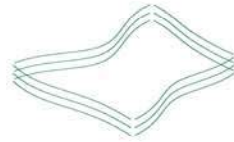
Model.065 - Angle
(Inside Domain)

00 - 05	< 10%
05 - 10	< 21%
10 - 15	< 36%
15 - 20	< 22%
20 -	< 2%



Model.073 - Angle
(Inside Domain)

00 - 05	< 10%
05 - 10	< 21%
10 - 15	< 36%
15 - 20	< 22%
20 -	< 2%



Model.005 - Spacing
(Inside Domain)

0 - 500	< 100%
500 - 1000	< 0%
1000 - 1500	< 0%
1500 - 2000	< 0%
2000 -	< 0%



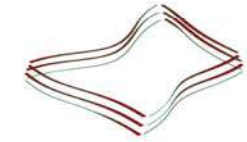
Model.027 - Spacing
(Outside Domain)

0 - 500	< 18%
500 - 1000	< 13%
1000 - 1500	< 3%
1500 - 2000	< 13%
2000 -	< 53%



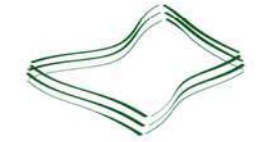
Model.052 - Spacing
(Inside Domain)

0 - 500	< 10%
500 - 1000	< 13%
1000 - 1500	< 3%
1500 - 2000	< 13%
2000 -	< 53%



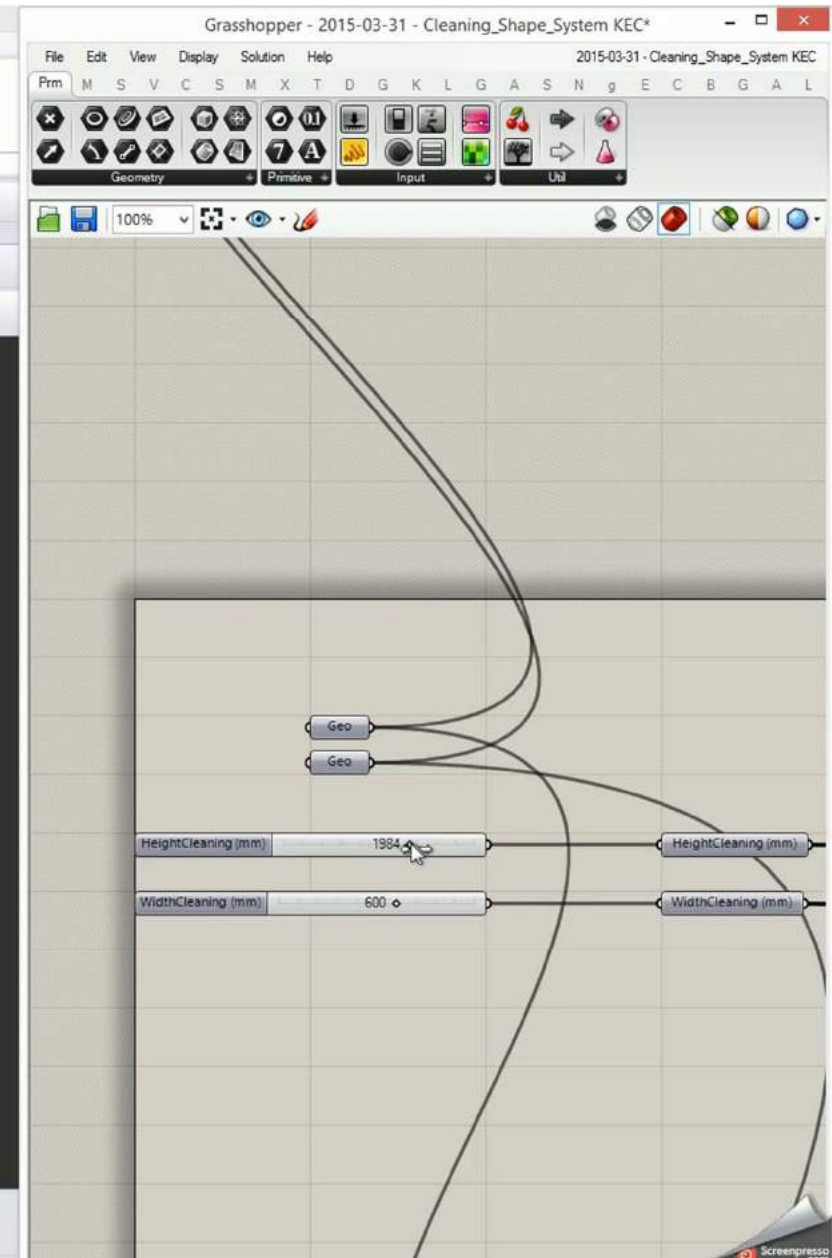
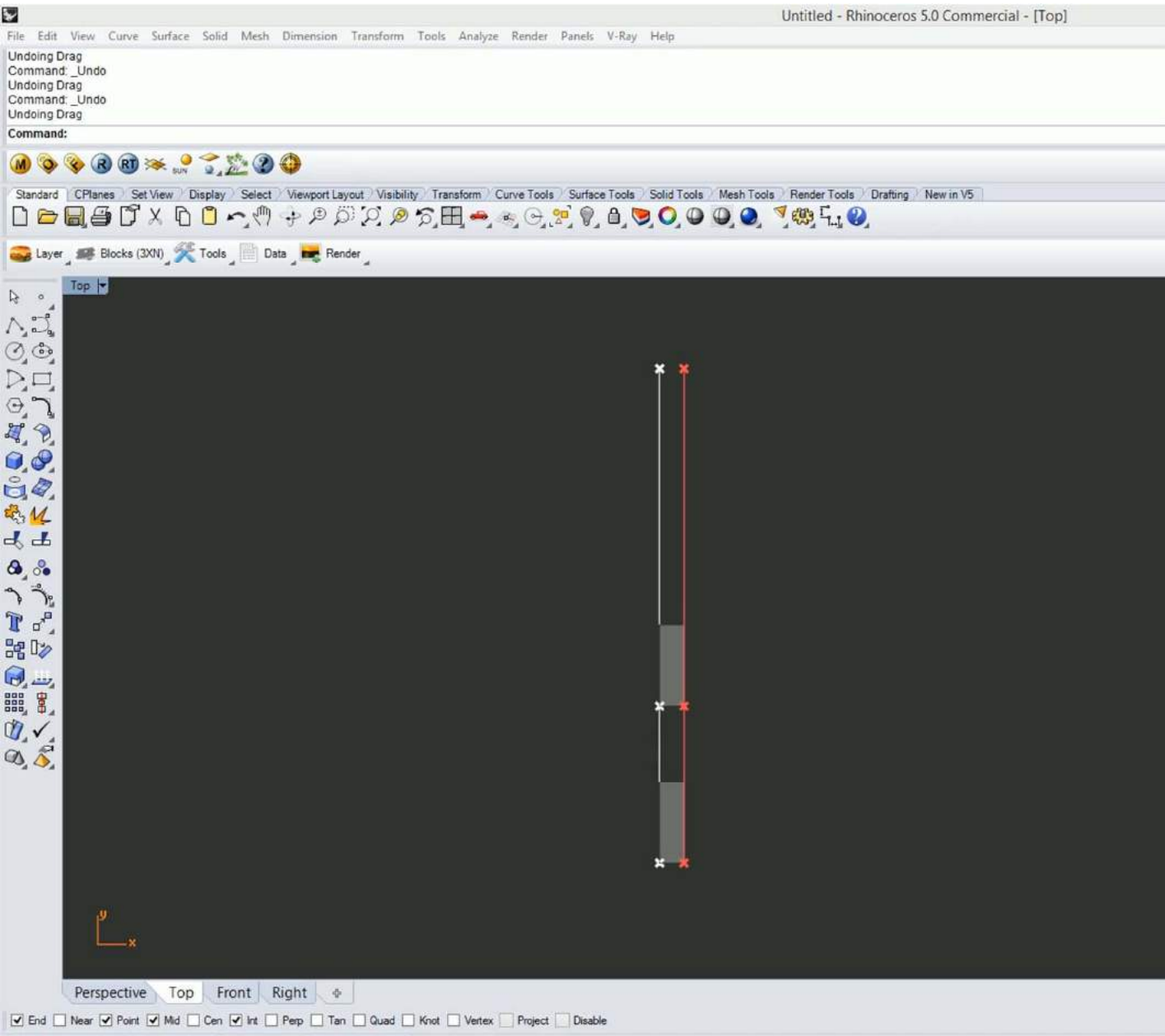
Model.065 - Spacing
(Inside Domain)

0 - 500	< 21%
500 - 1000	< 21%
1000 - 1500	< 30%
1500 - 2000	< 27%
2000 -	< 1%

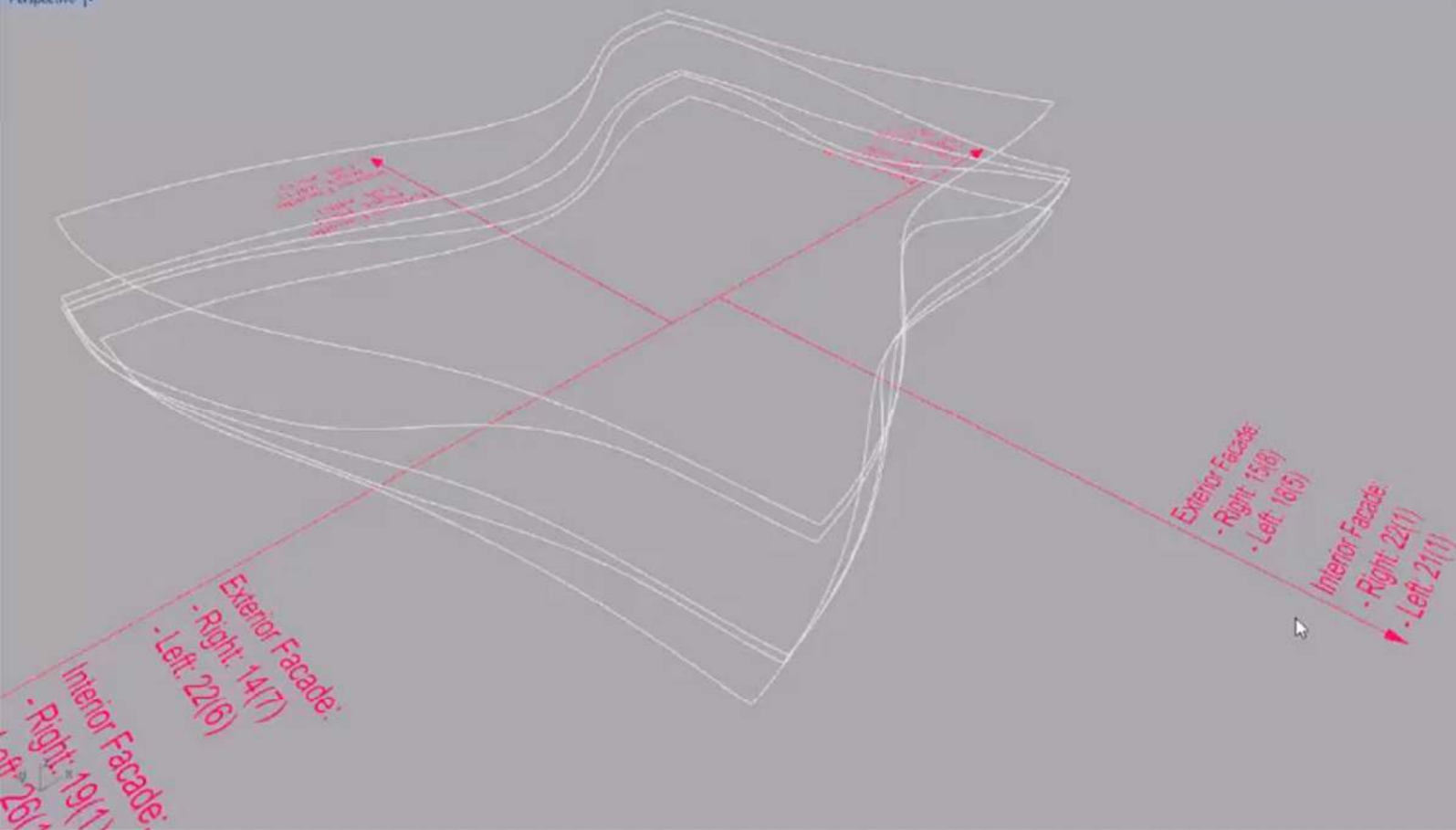


Model.073 - Spacing
(Inside Domain)

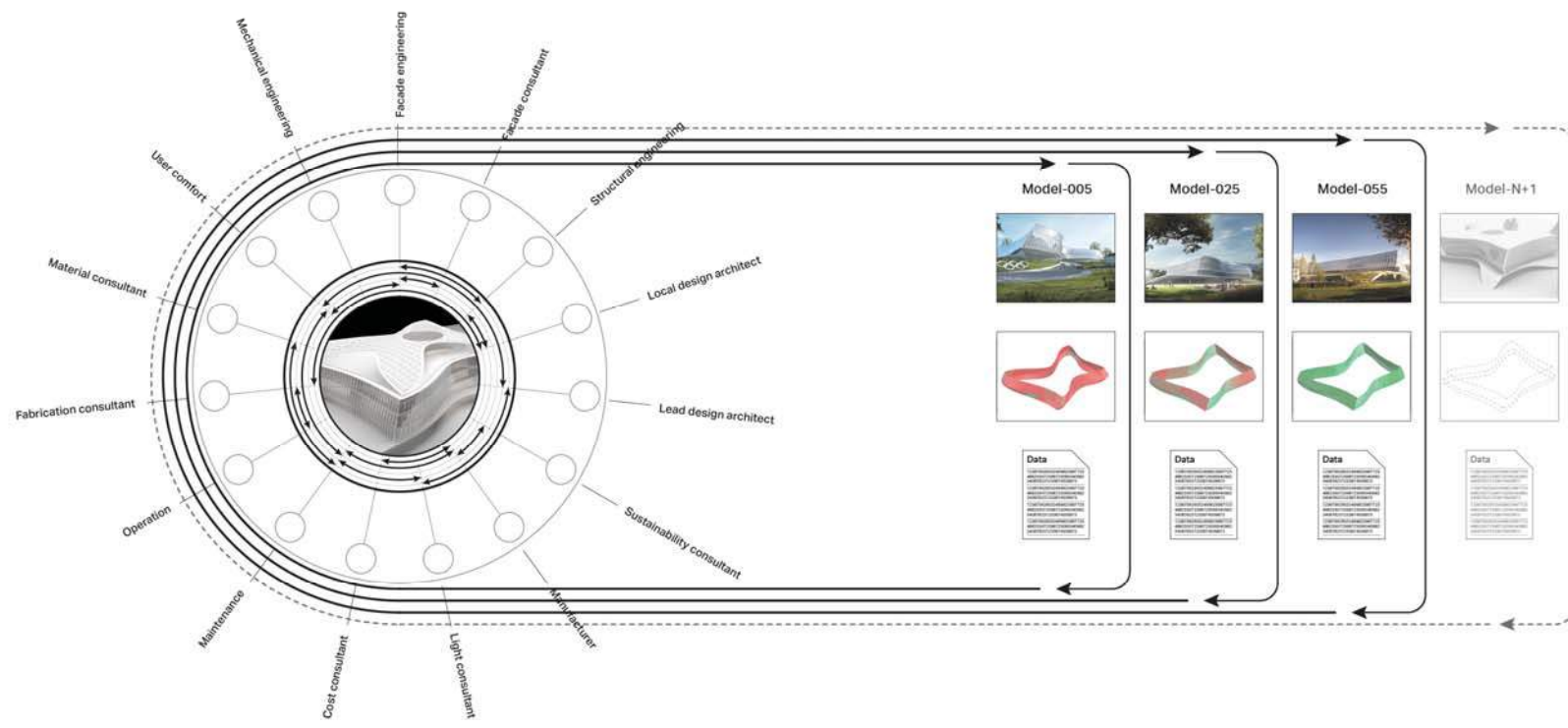
0 - 500	< 21%
500 - 1000	< 21%
1000 - 1500	< 30%
1500 - 2000	< 27%
2000 -	< 1%



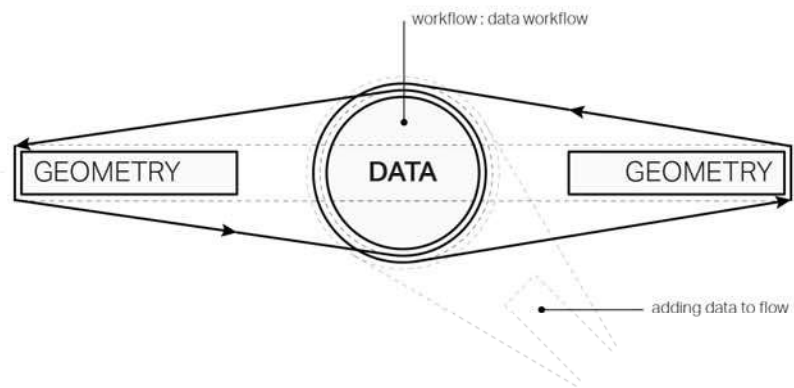
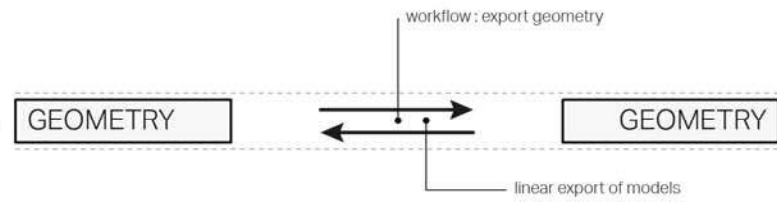
Perspective

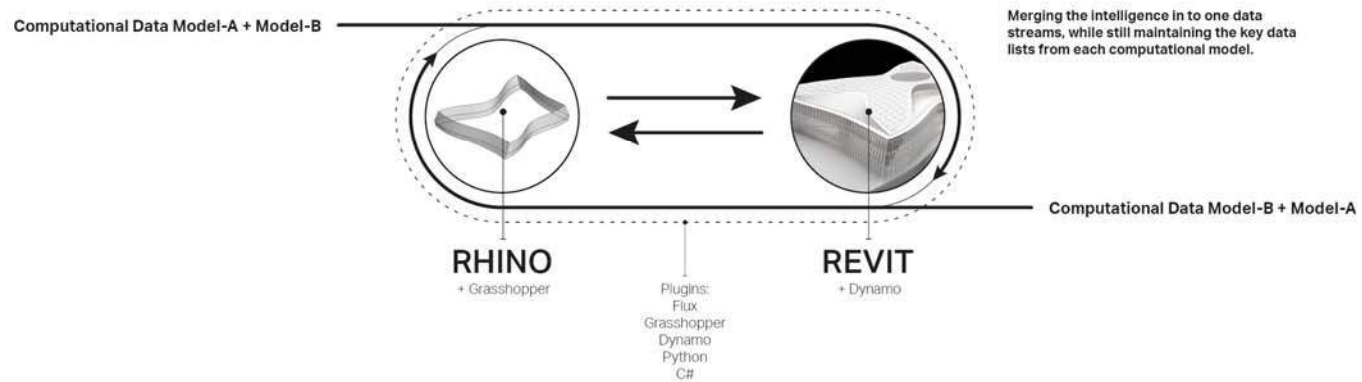
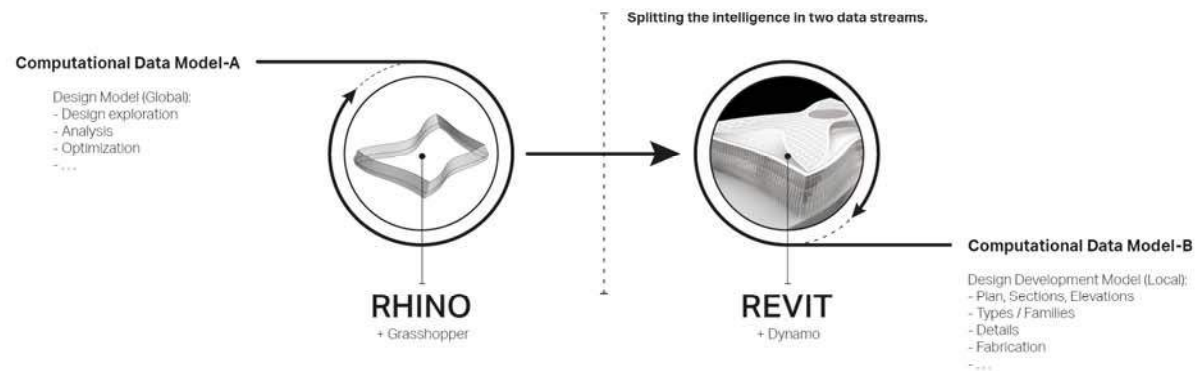


Name	Material	Linetype
Default		Continuous
Main - New_Heights (April)		Continuous
Main - Interior (SAVE_COMPARISON)		Continuous
Main - Building_Border		Continuous
Massing (Vectors)		Continuous
Massing - Vectors (2015.06.01)		Continuous
Massing (Curves_Main)		Continuous
Massing (Dynamics)		Continuous
Massing (Surfaces)		Continuous
Models		Continuous
Model(2014.12.04)		Continuous
Model(2015.06.01)		Continuous
Model(2015.06.10)		Continuous
Model(01)		Continuous
Model(01a)		Continuous
01a - Curves		Continuous
01a - Surfaces		Continuous
01a - Interior_Facade		Continuous
01a - Exterior_Facade		Continuous
01a - Circulation		Continuous
01a - Gutter		Continuous
Model(02)		Continuous
Analysis		Continuous





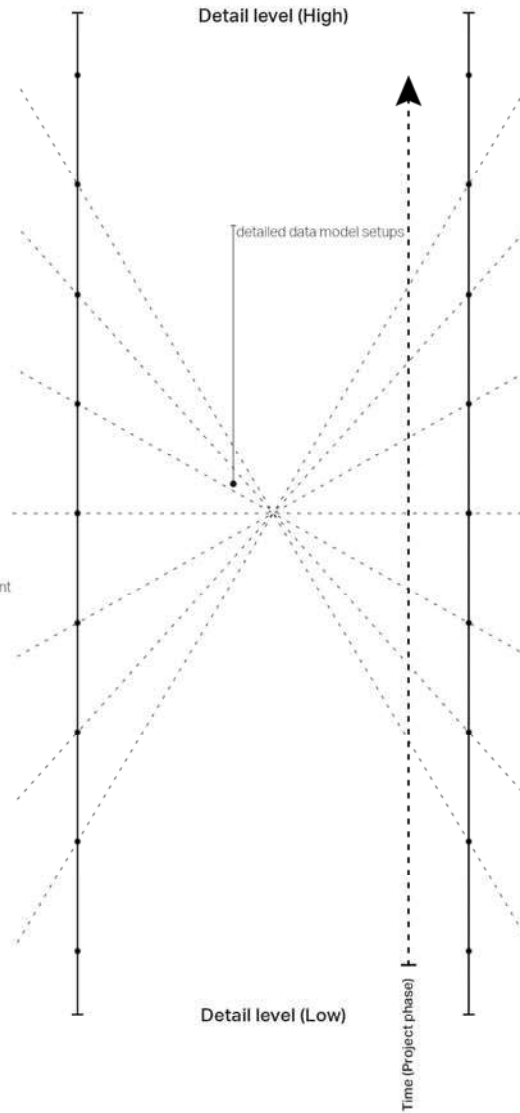






RHINO

BIM (Small)
Competition
Design development
Simulation
Analysis



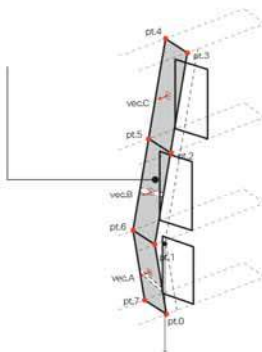
REVIT

BIM (Large)
Design development
Construction
Execution
Fabrication



Panel properties :

- ID Location in system
- 4 Points
- Vector Direction
- Rotation
- Surface Front
- Surface Back
- Area (m2)



RHINO
+ Grasshopper

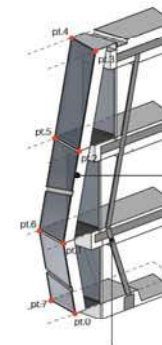
BIM (Small)
Competition
Design development
Simulation
Analysis

Detail level (High)

Plugins:
Flux
Grasshopper
Dynamo
Python
C#

REVIT
+ Dynamo

BIM (Large)
Design development
Construction
Execution
Fabrication

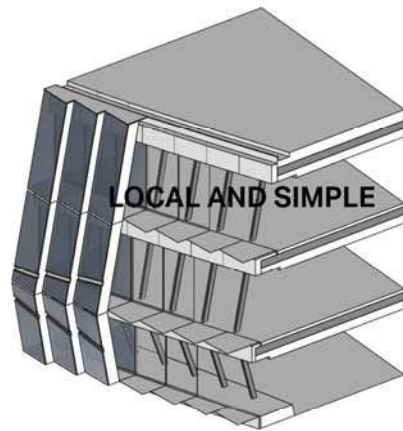


Panel properties :

- ID Location in system
- 4 Points
- Vector Direction
- Rotation
- Surface Front
- Surface Back
- Area (m2)
- Volume (m3)
- Frames
- Fins (S/L)
- Structural System
- Water System
- Maintenance System (Spacing)
- Floor built-up

Detail level (Low)

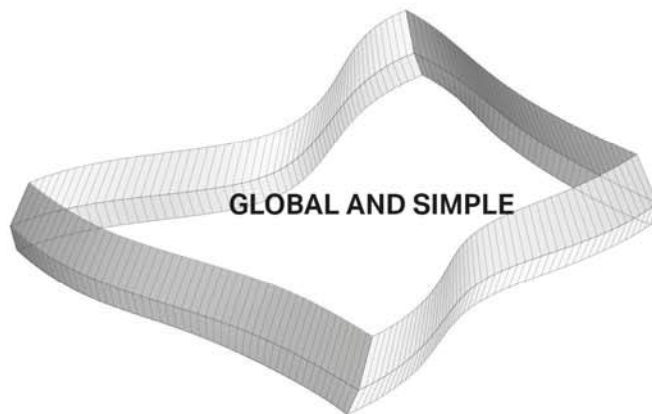
Time (Project phase)



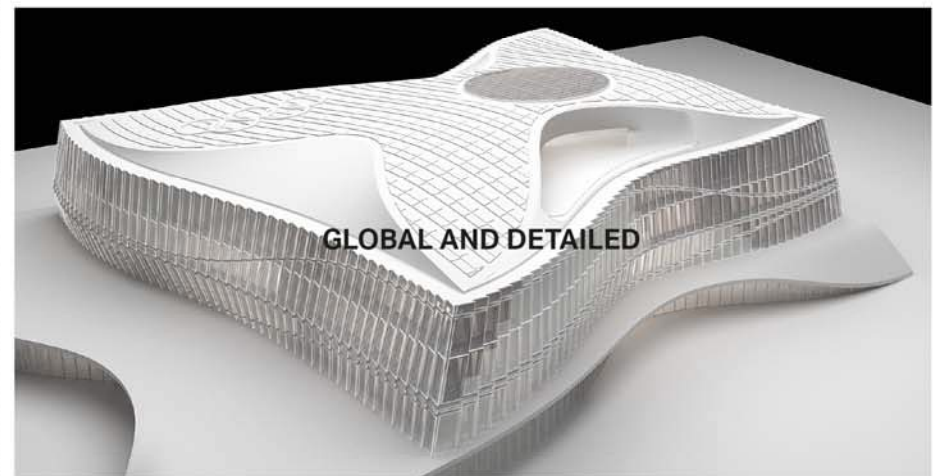
LOCAL AND SIMPLE



LOCAL AND DETAILED



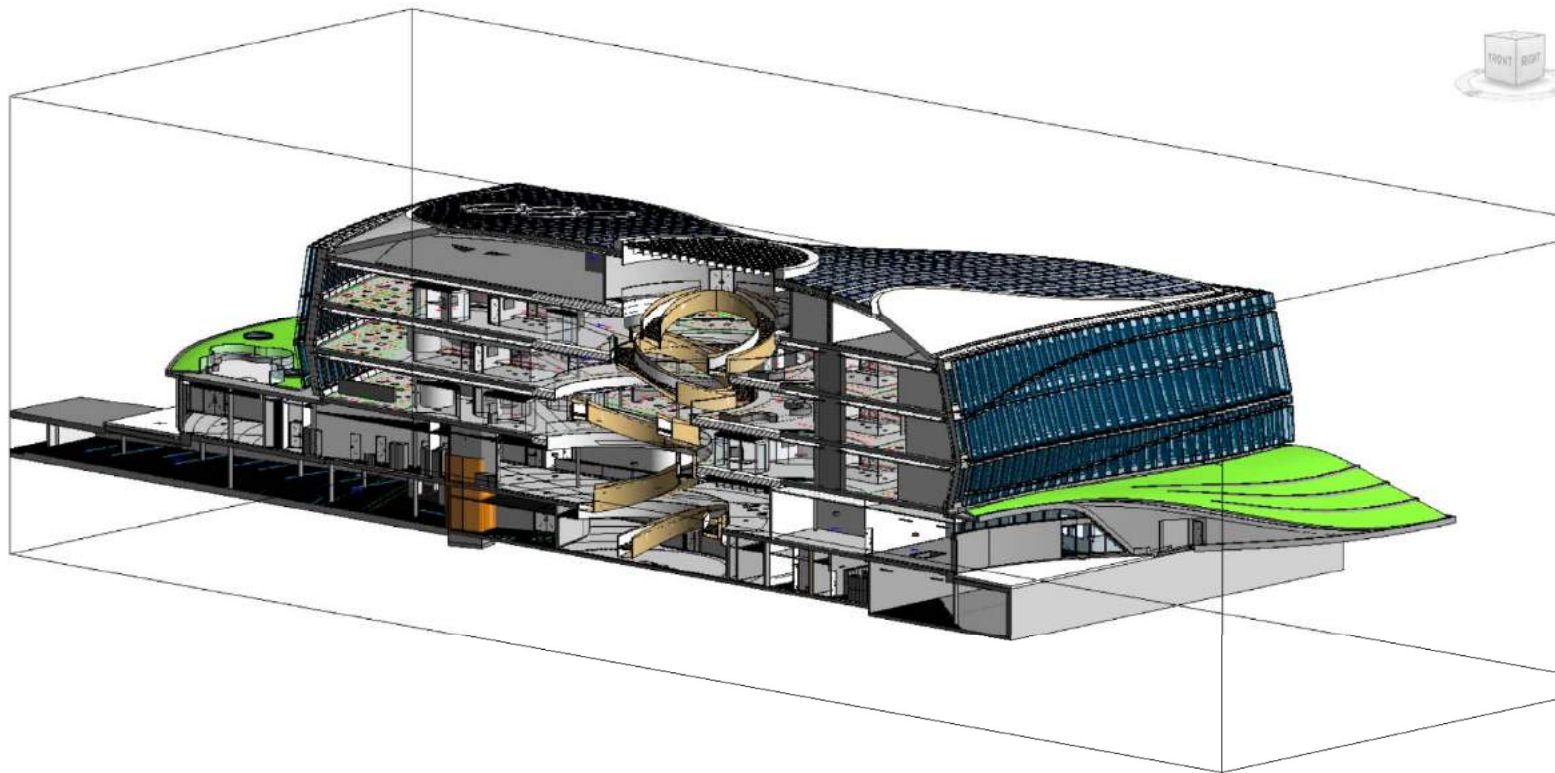
GLOBAL AND SIMPLE



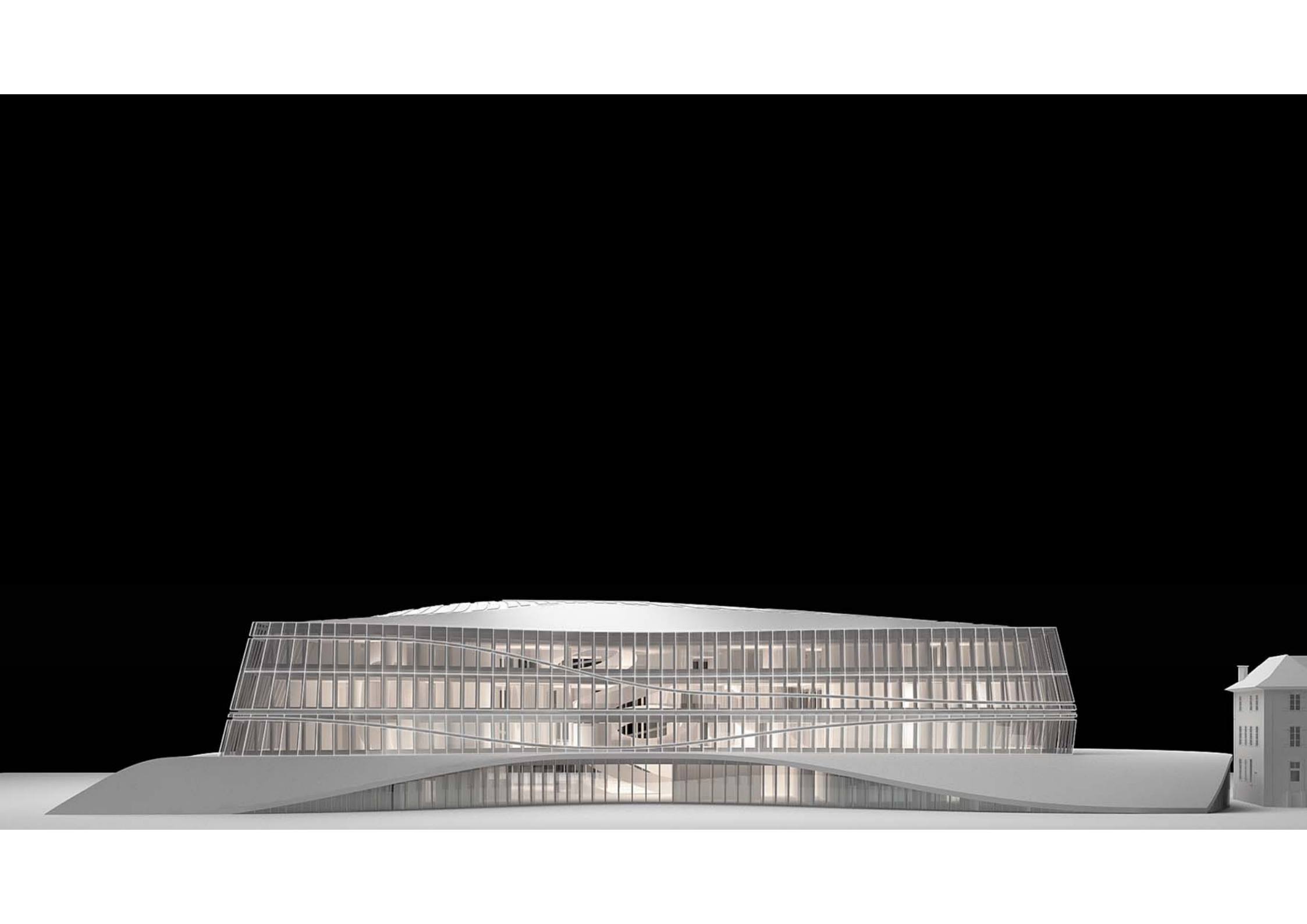
GLOBAL AND DETAILED

LOCAL
↓
GLOBAL

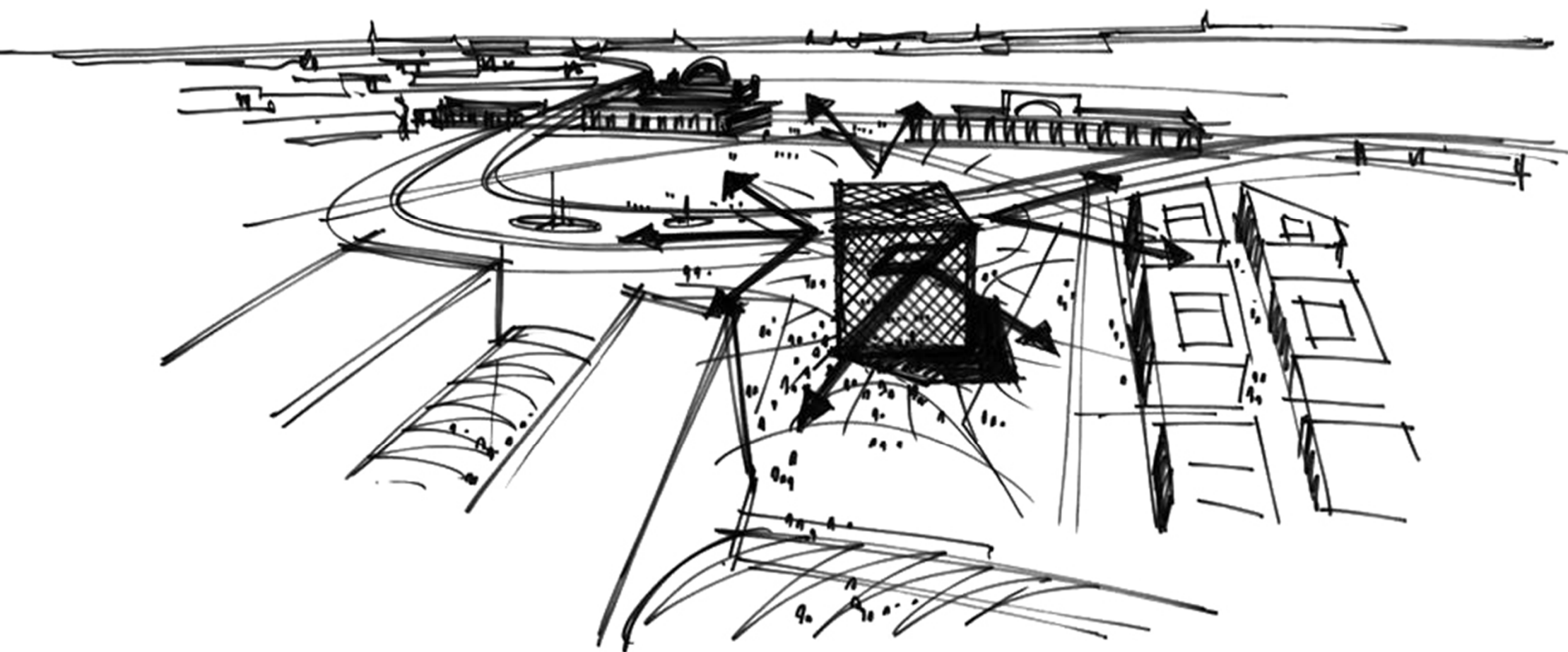
← SIMPLE → DETAILED







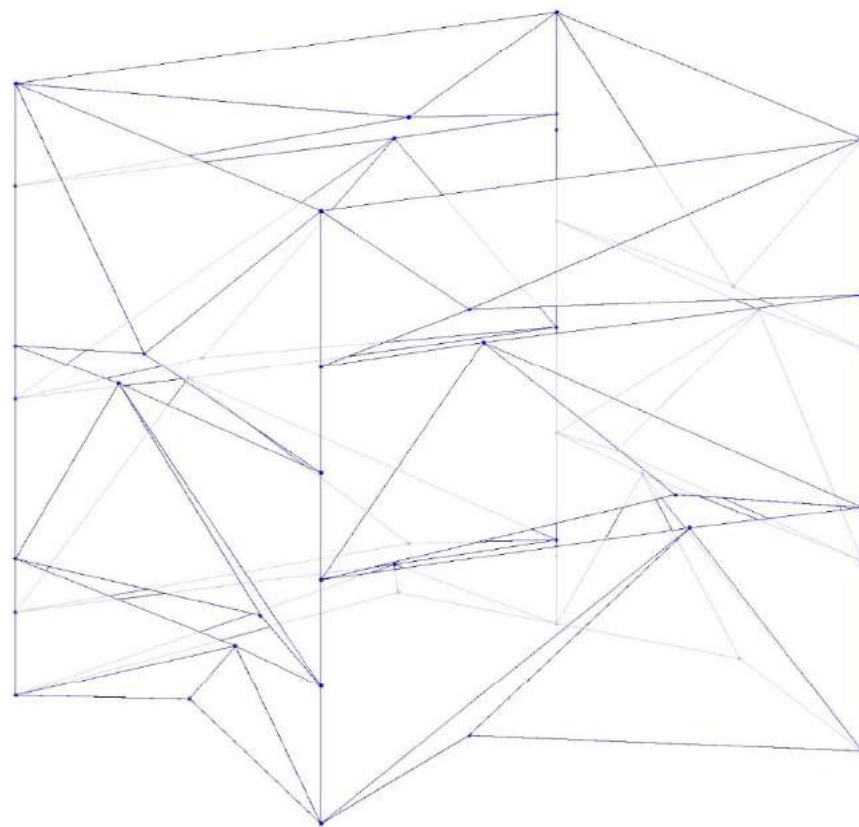
CUBE
BERLIN, GERMANY





09/12/12





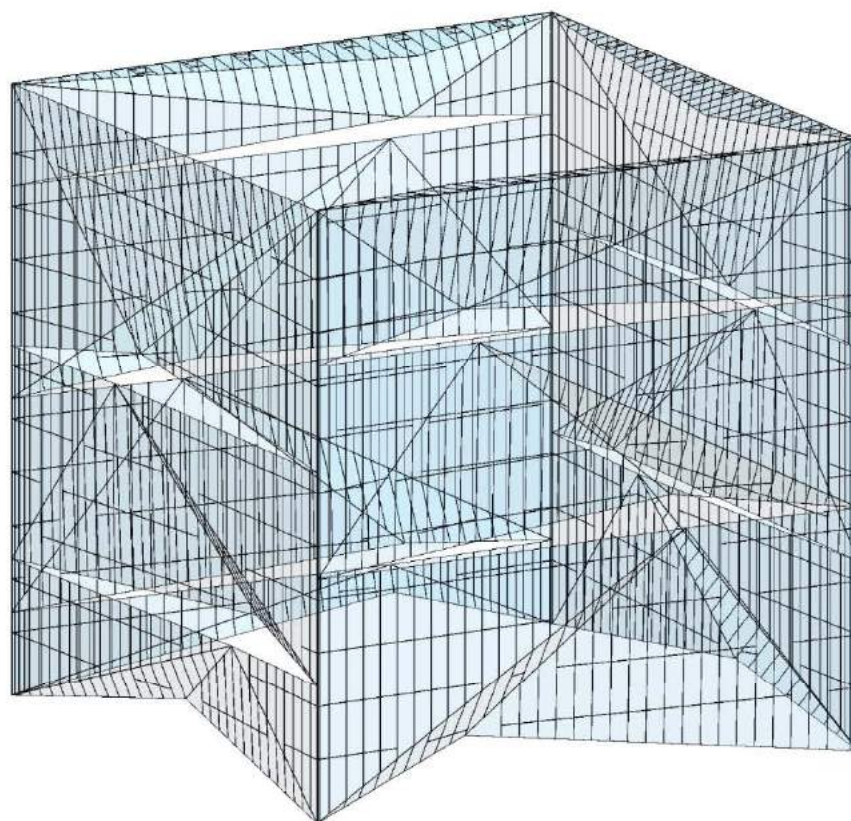
RULES

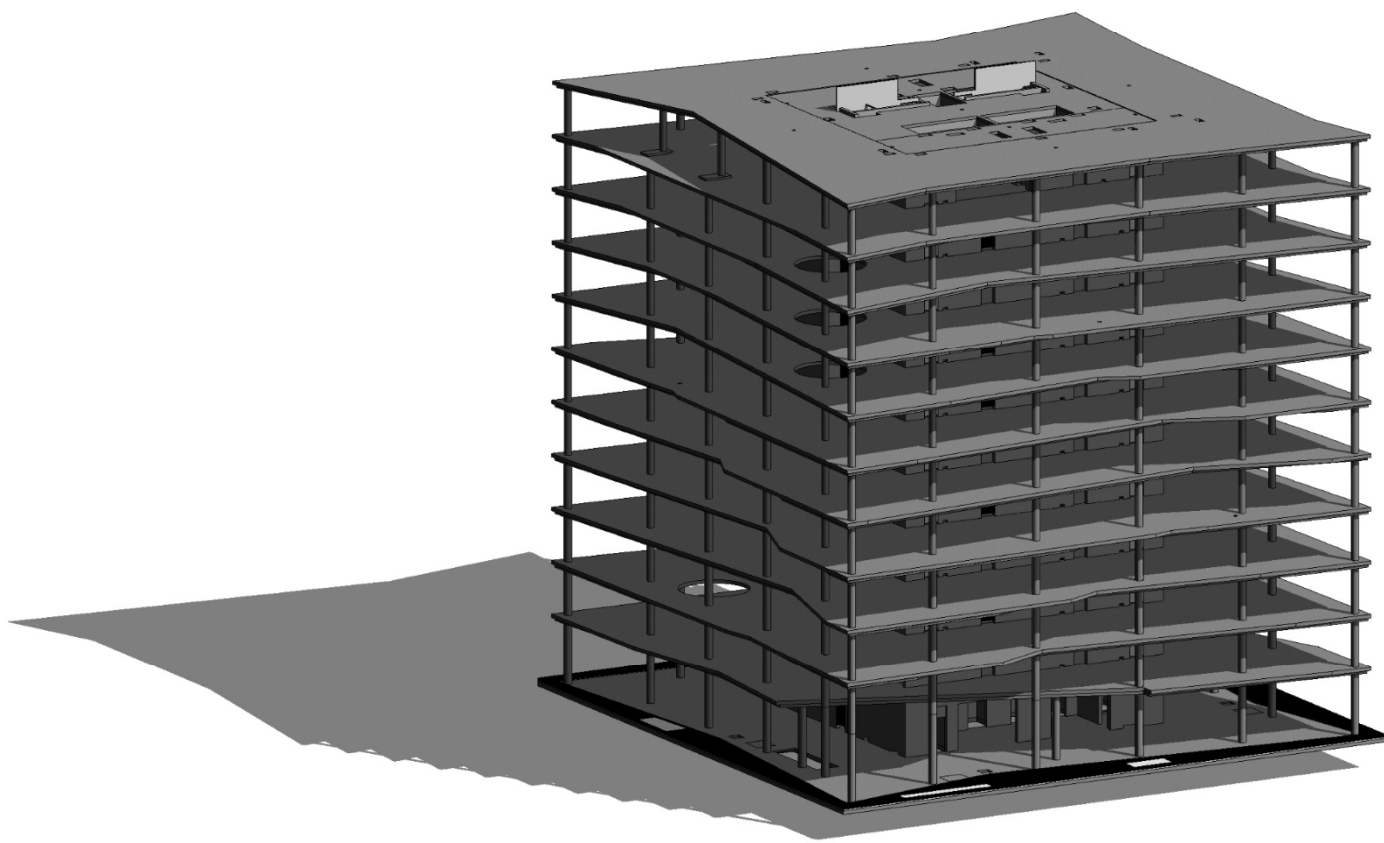
Air gap for ventilation

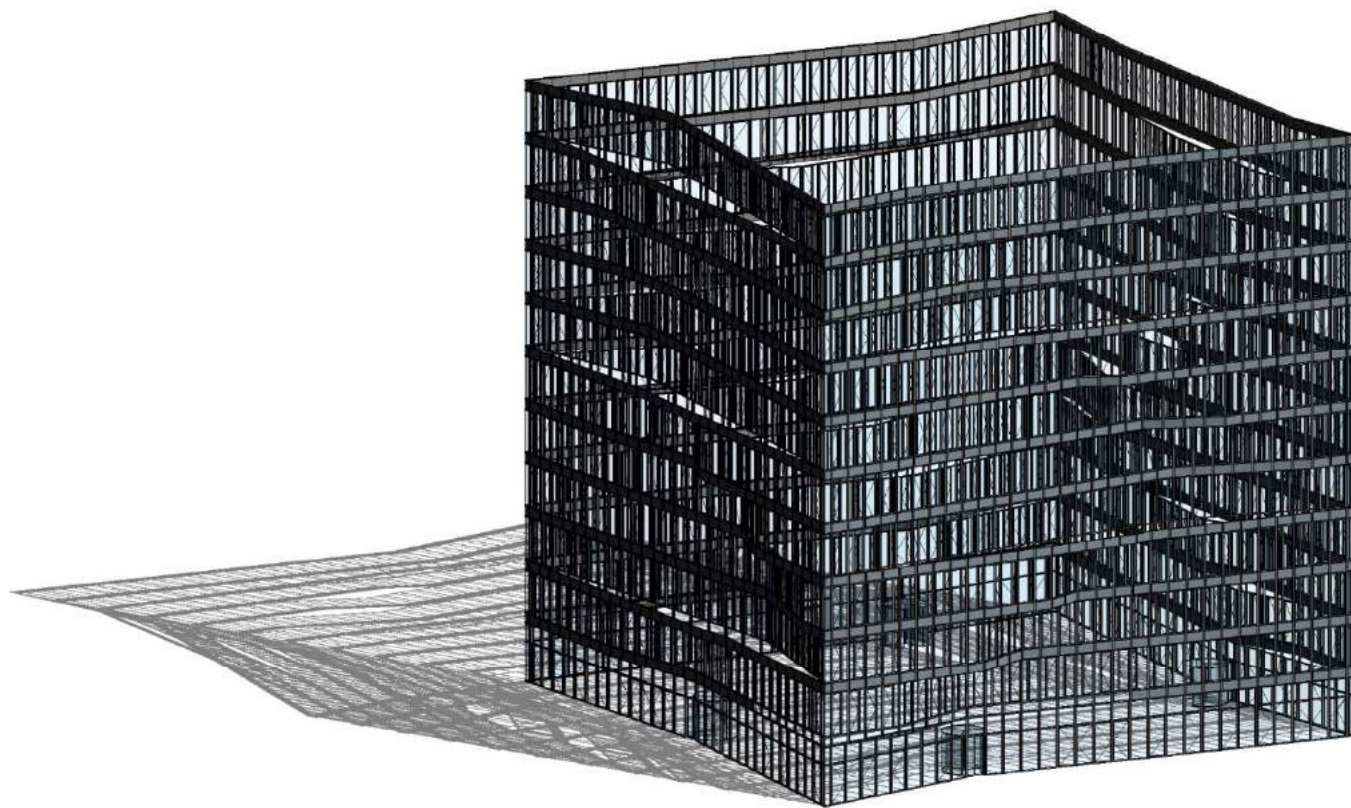
Vertical inner facade

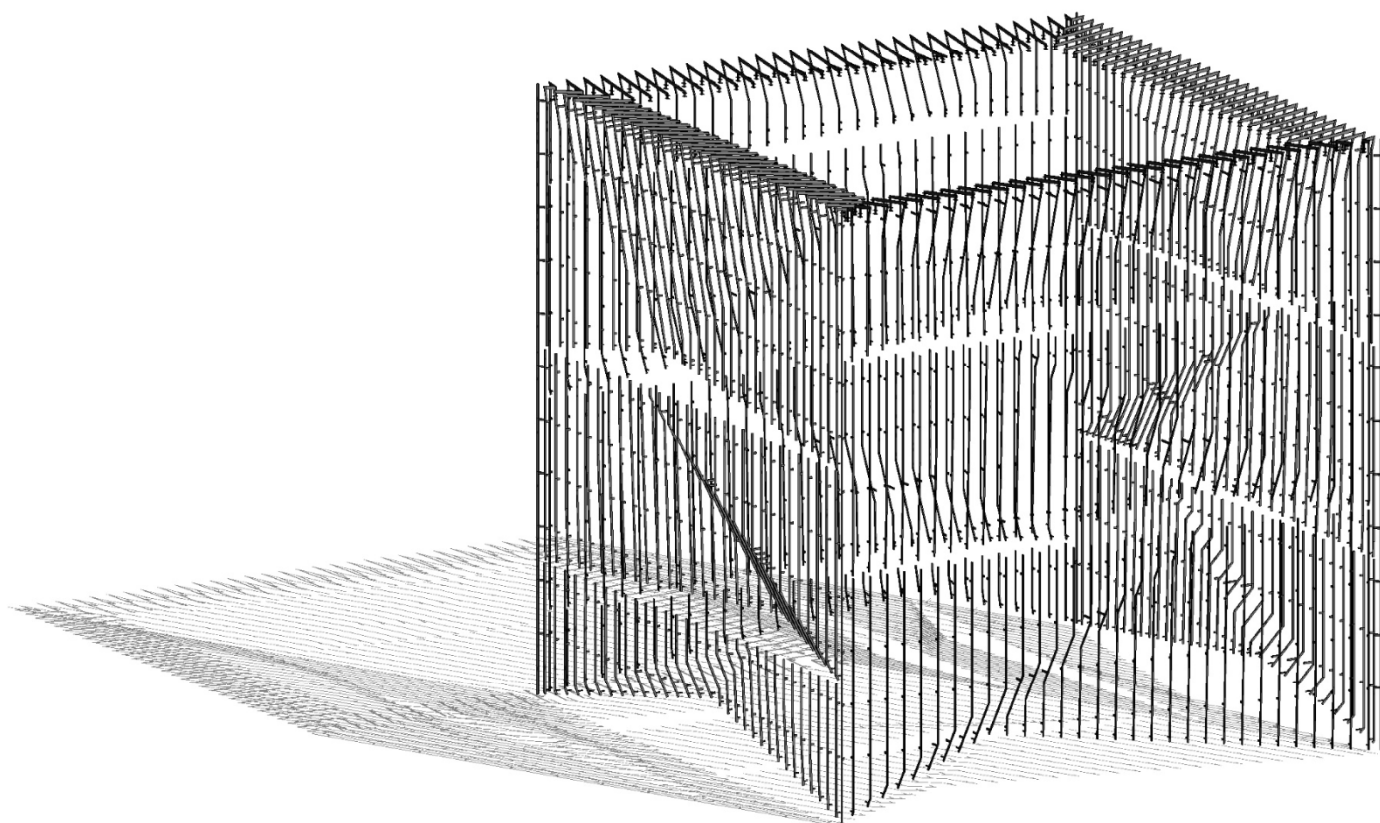
Elements on grid

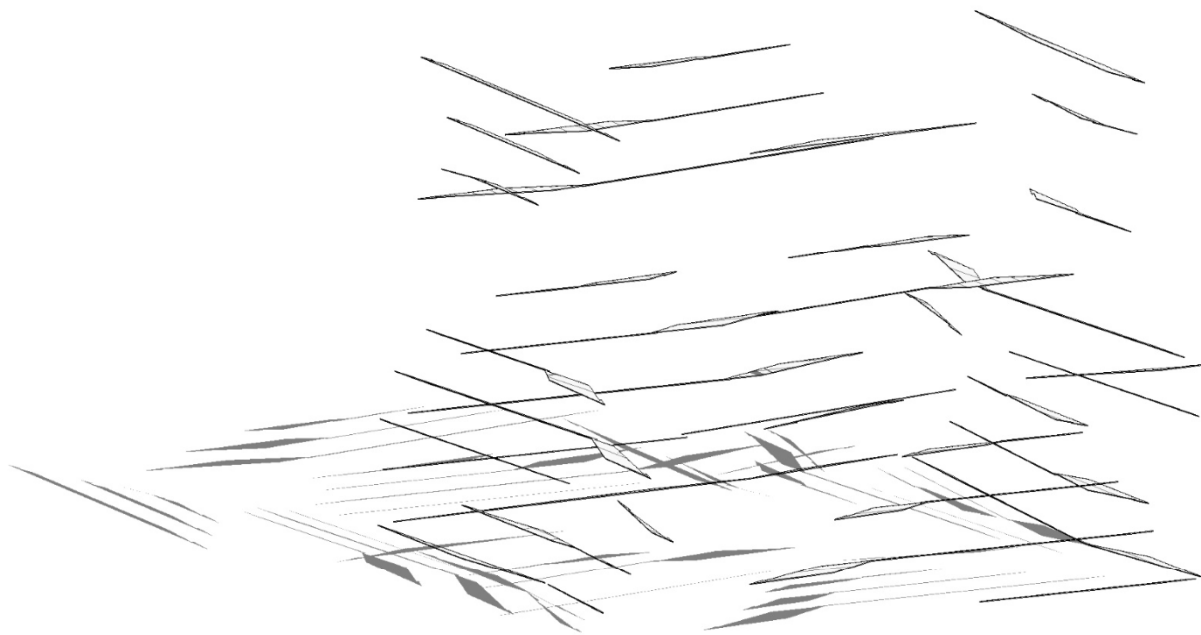
Angled mullions

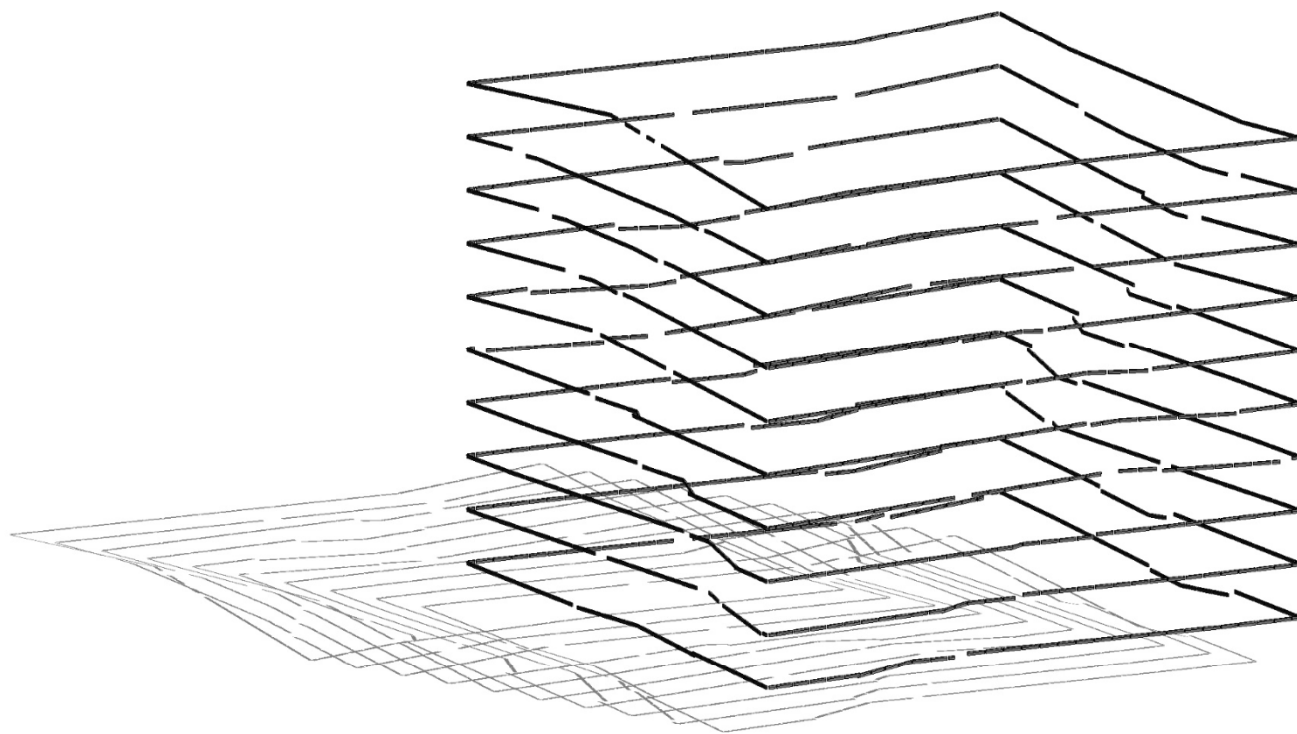


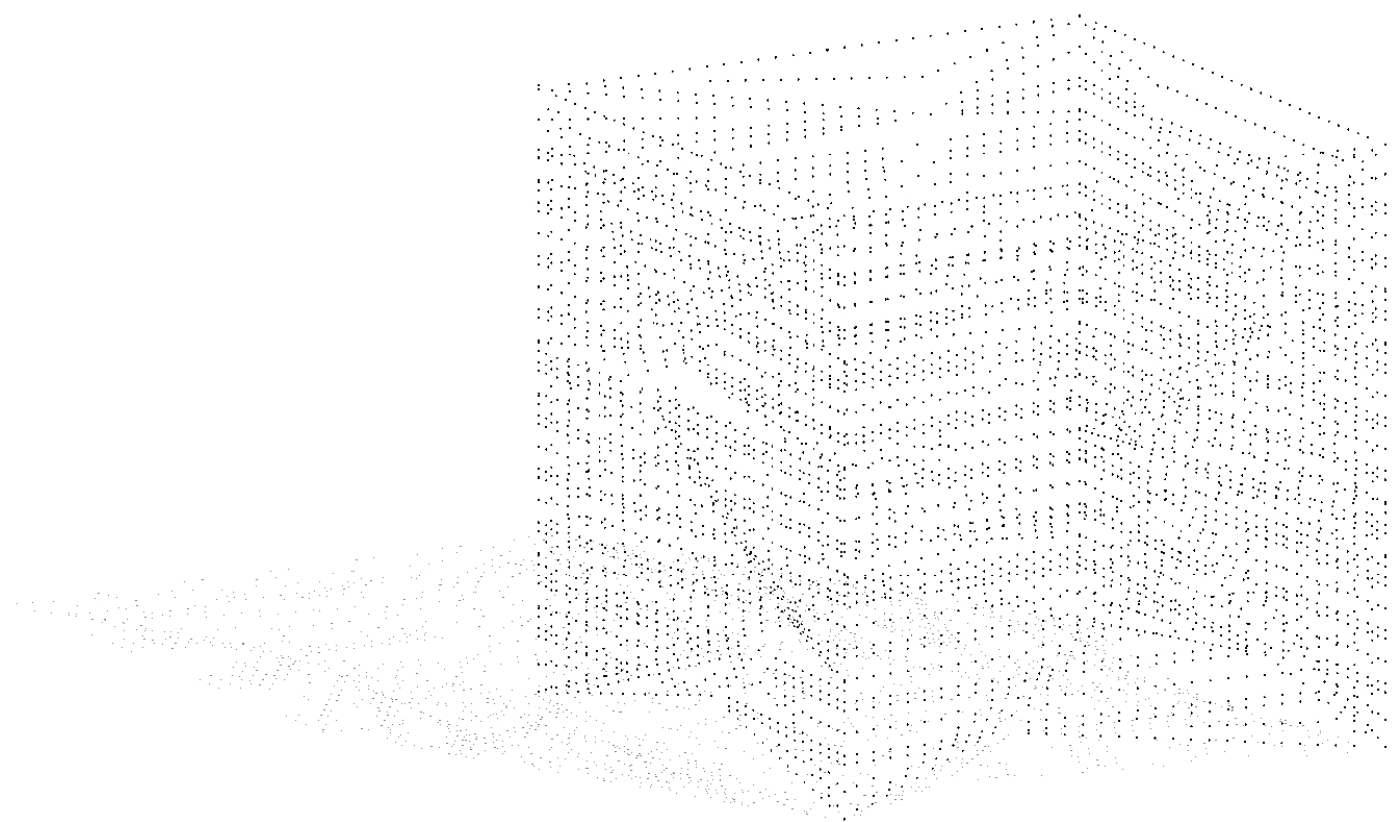


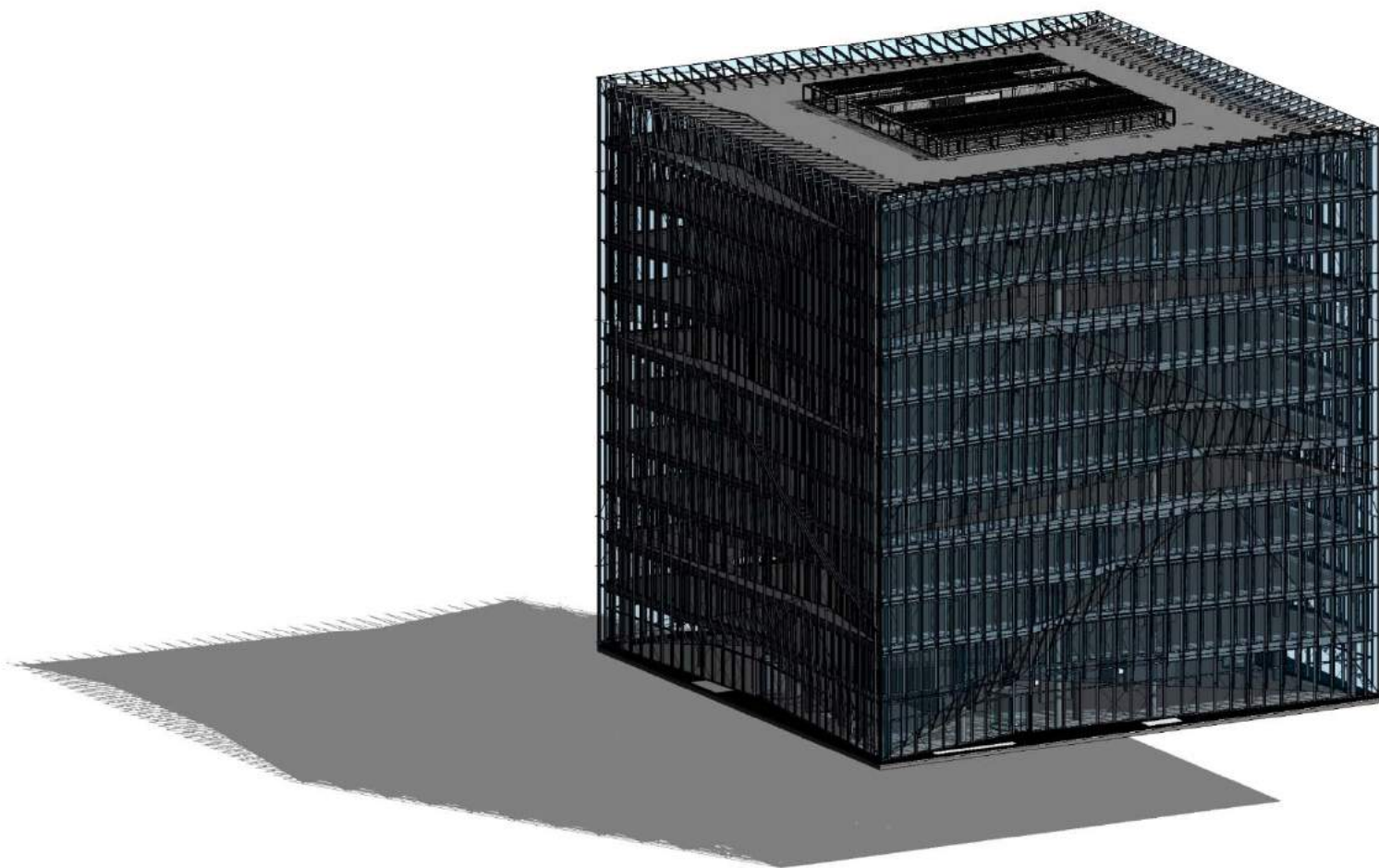


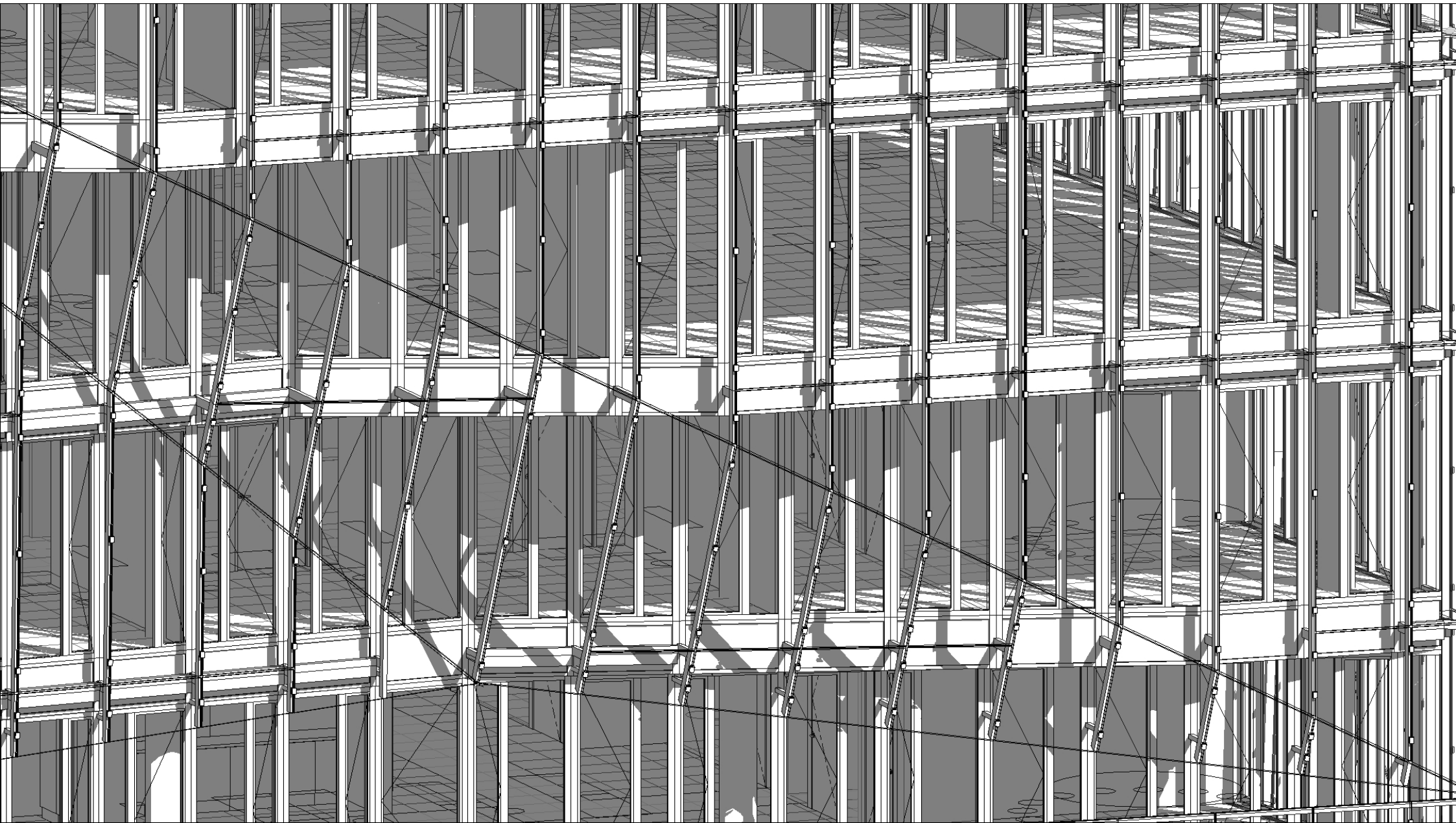


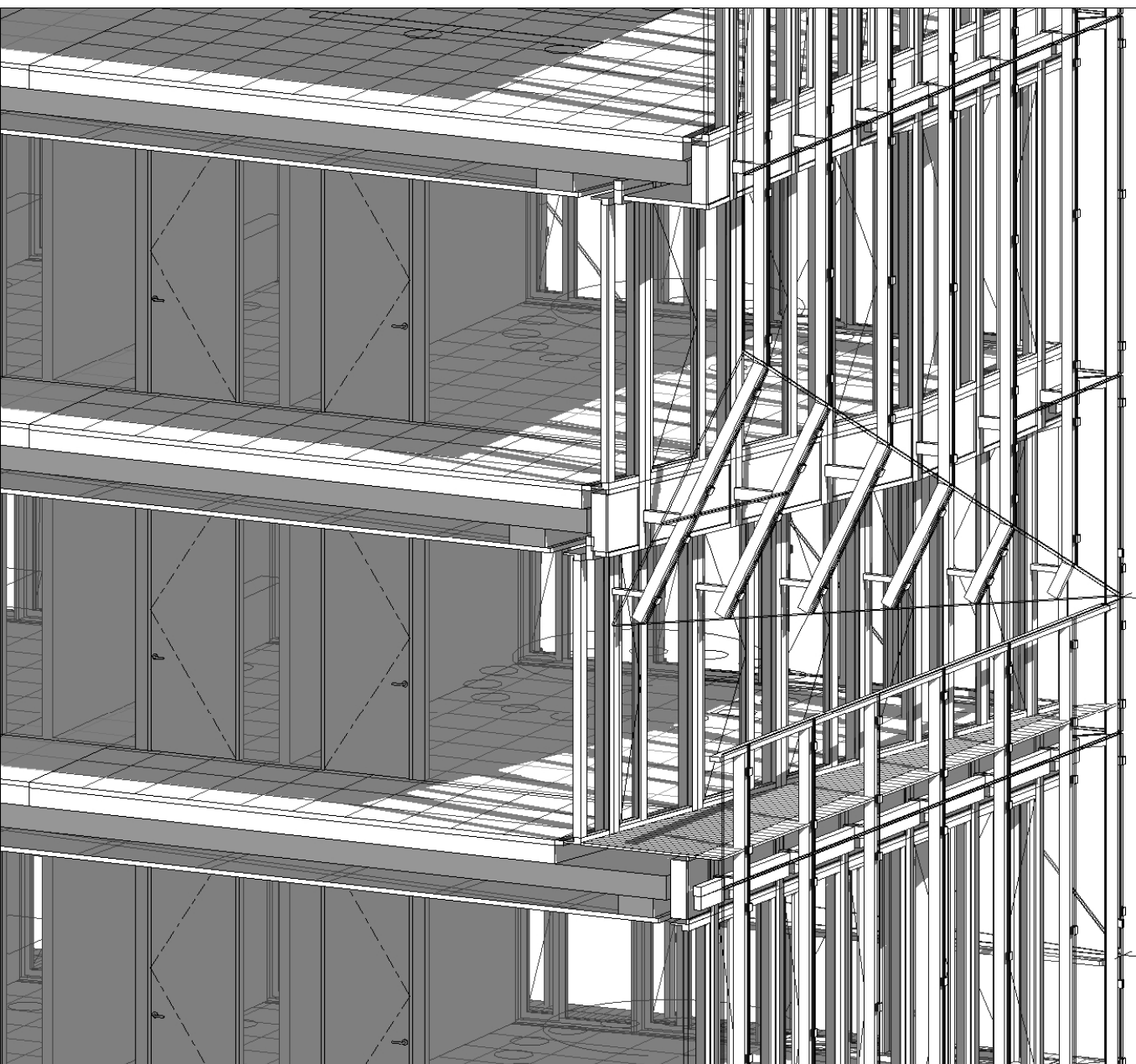


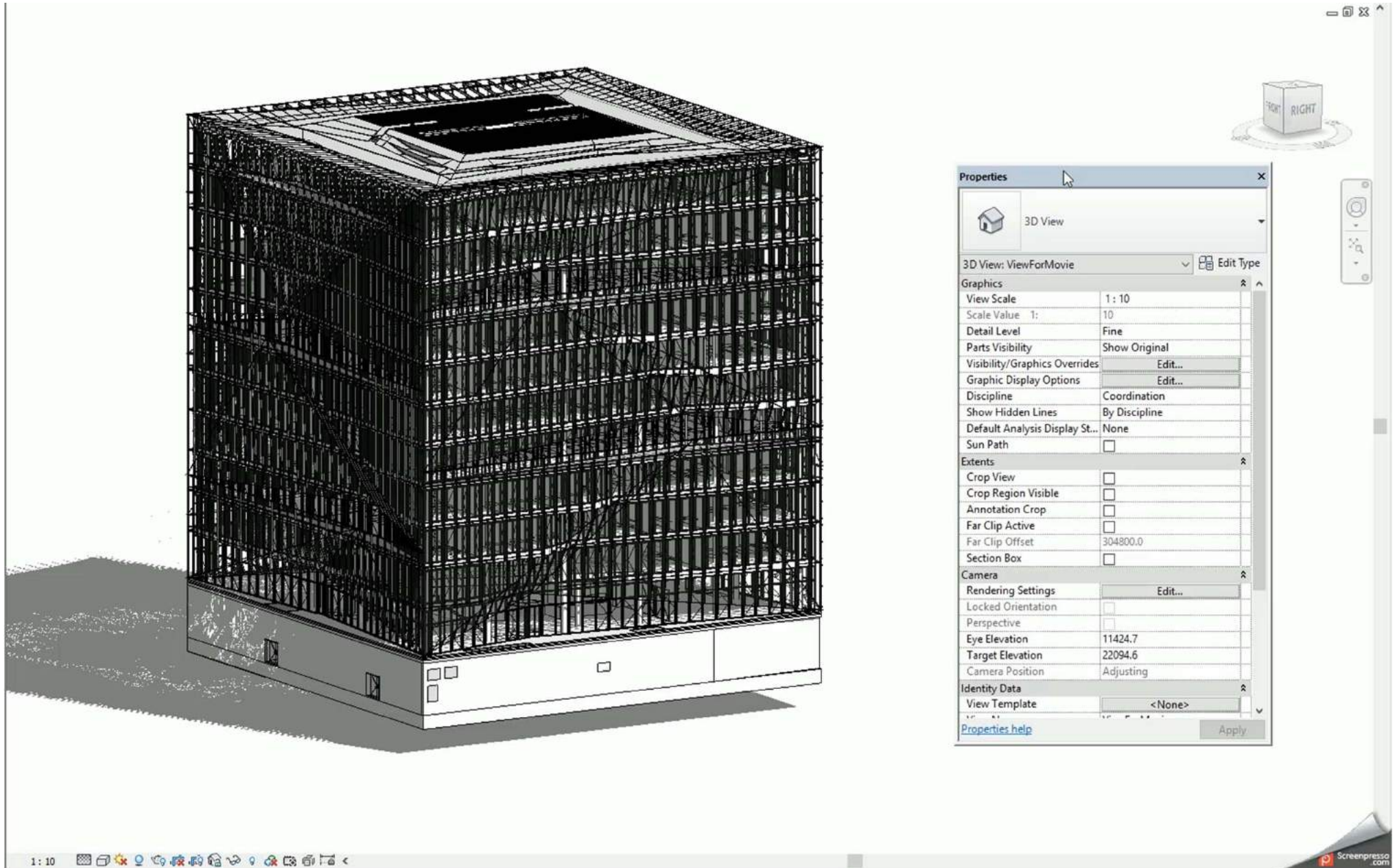














2017-10-03 16:30:58



HAUS DER TECHNIK SCHUCO

BIELEFELD, GERMANY



Atrium





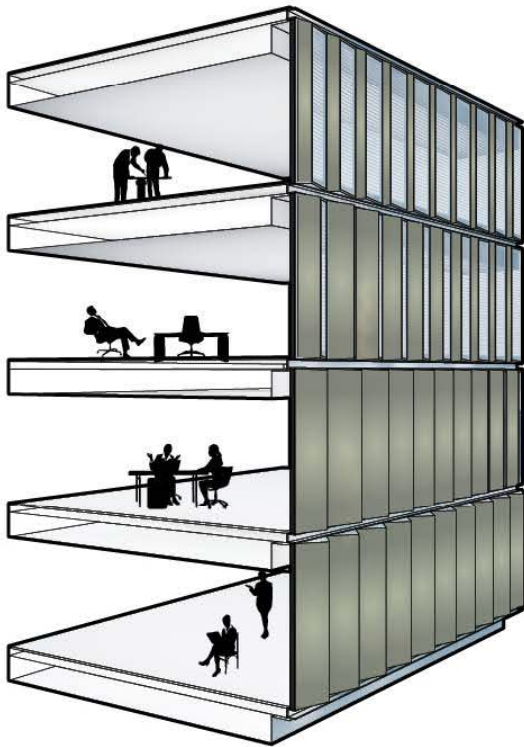
Ansicht West

- DACH +25,82 ▽
= 116,69NN
- L06 + 22,00 ▽
- L05 + 18,40 ▽
- L04 + 14,80 ▽
- L03 + 11,20 ▽
- L02 + 7,60 ▽
- L01 + 4,00 ▽
- L00 + 0,00 ▽
= 90,87 NN

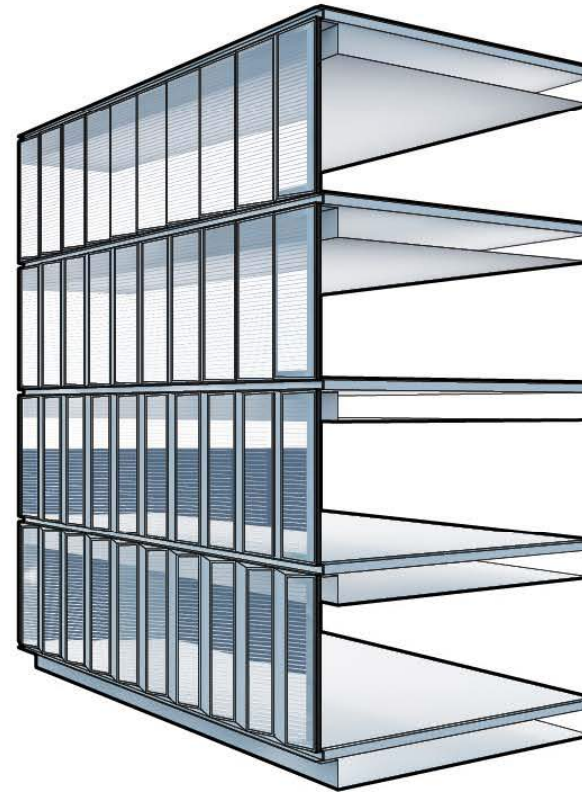


Fassadenkonzept

Die massiven Füllungselemente auf der Ost- und Westseite sind nach Süden geneigt, um das Aufheizen zu minimieren, die Energiegewinnung zu optimieren und gleichzeitig den Ausblick zu optimieren.



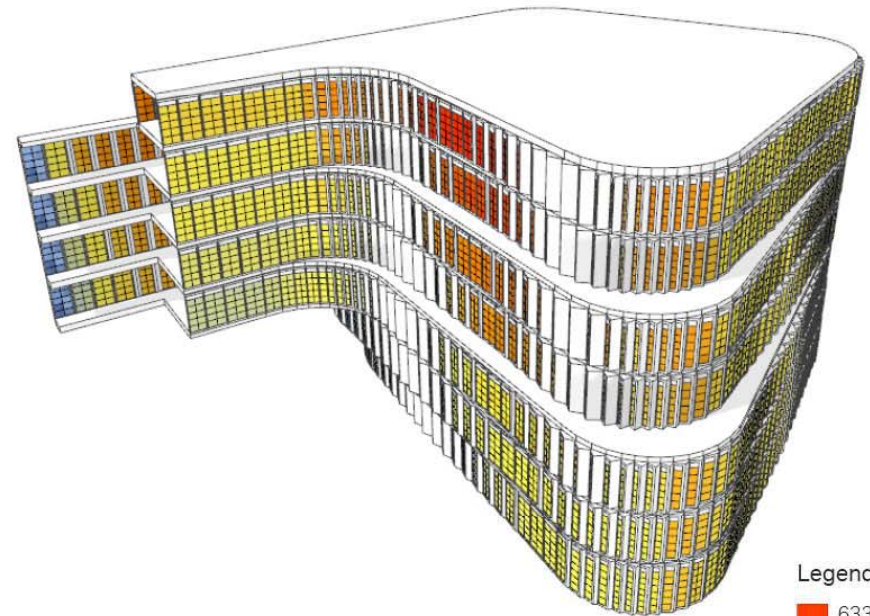
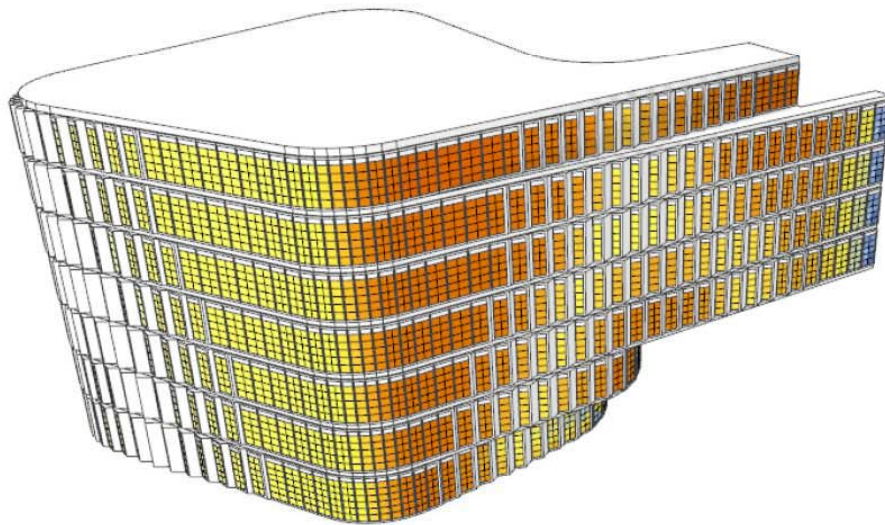
Die Fassade ist nach Süden geschlossen.



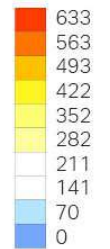
...und nach Norden offen.

Unerwünschte Erhitzung

Die Erhitzung von Sonneneinstrahlung wird durch die Geometrie der Glaspaneele um 15% reduziert.

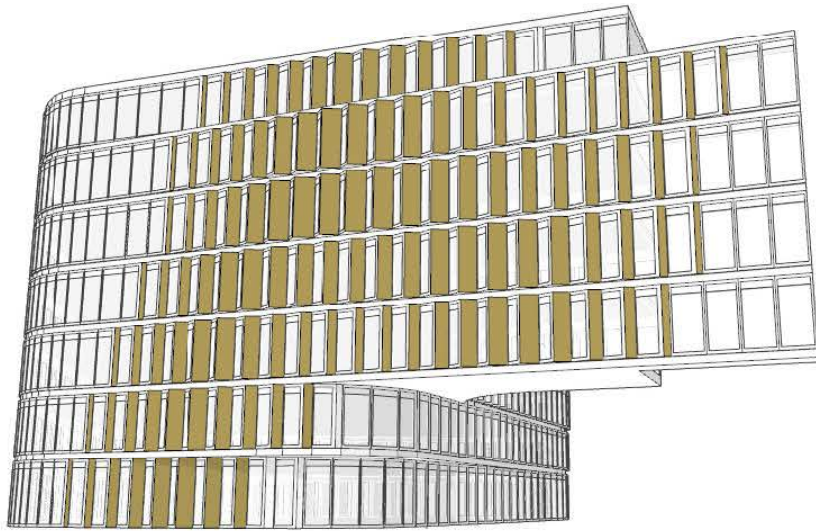


Legende (kWh/m²)

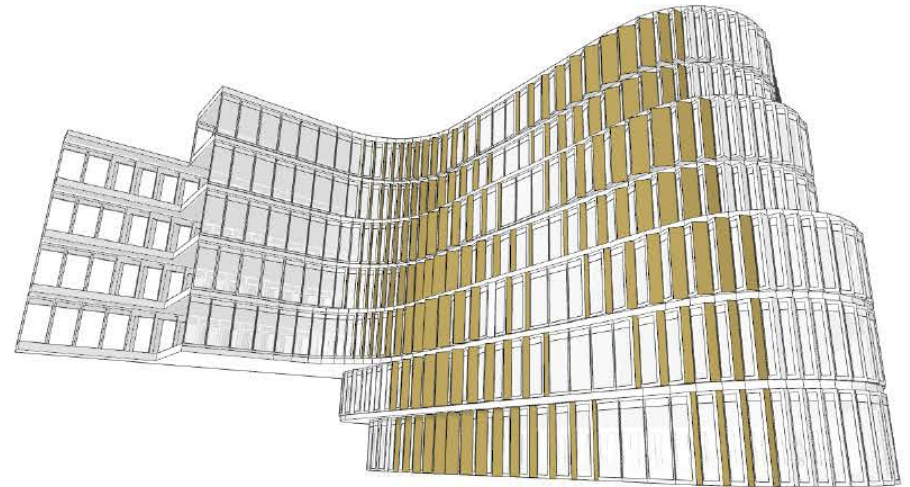


Photovoltaik

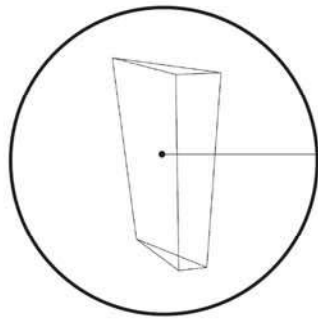
Photovoltaikmodule können in den nach Süden orientierten, opaken Fassadenelementen integriert werden.



240 m² Sud-West

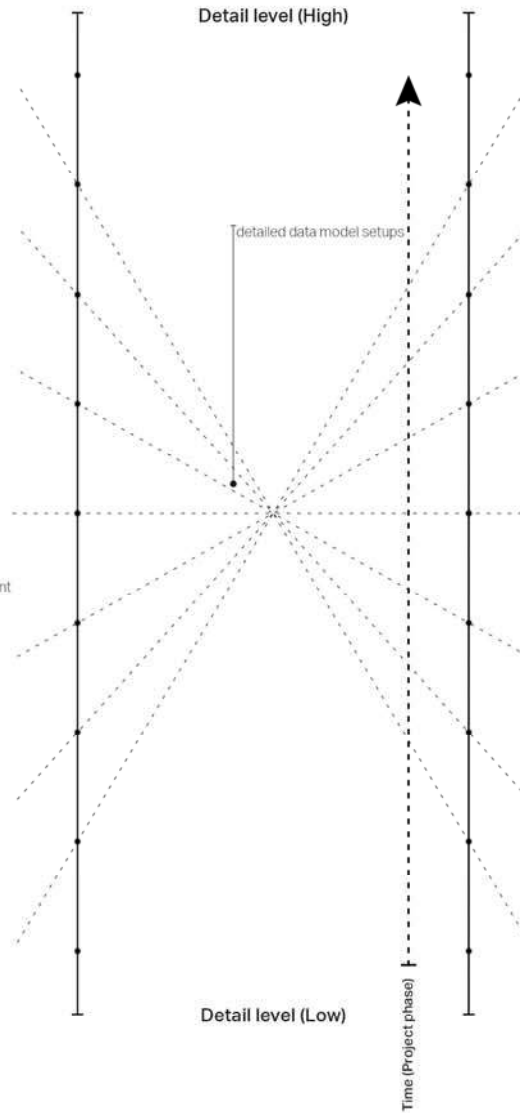


257 m² Sud-Ost



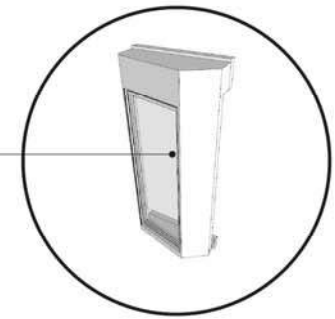
RHINO

BIM (Small)
Competition
Design development
Simulation
Analysis



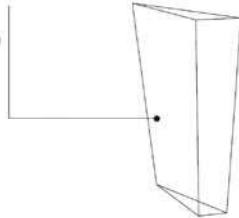
REVIT

BIM (Large)
Design development
Construction
Execution
Fabrication



Panel properties :

- ID Location in system
- 4 Points
- Vector Direction
- Rotation
- Surface Front
- Surface Back
- Area (m2)



RHINO
+ Grasshopper

BIM (Small)
Competition
Design development
Simulation
Analysis

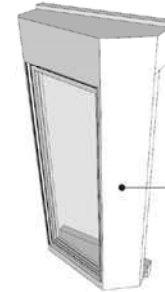
Detail level (High)

Plugins:
Flux
Grasshopper
Dynamo
Python
C#

Detail level (Low)

Time (Project phase)

REVIT
+ Dynamo

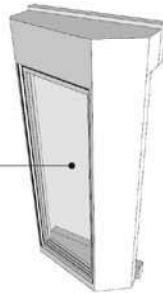


Panel properties :

- ID Location in system
- 4 Points
- Vector Direction
- Rotation
- Surface Front
- Surface Back
- Area (m2)
- Volume (m3)
- Frames:
- Fins (S/L)
- Structural System
- Water System
- Maintenance System (Spacing)
- Floor built-up

Panel properties :

- ID Location in system
- 4 Points
- Vector Direction
- Rotation
- Surface Front
- Surface Back
- Area (m2)



RHINO
+ Grasshopper

BIM (Small)
Competition
Design development
Simulation
Analysis

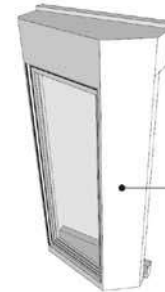
Detail level (High)

Plugins:
Flux
Grasshopper
Dynamo
Python
C#

REVIT
+ Dynamo

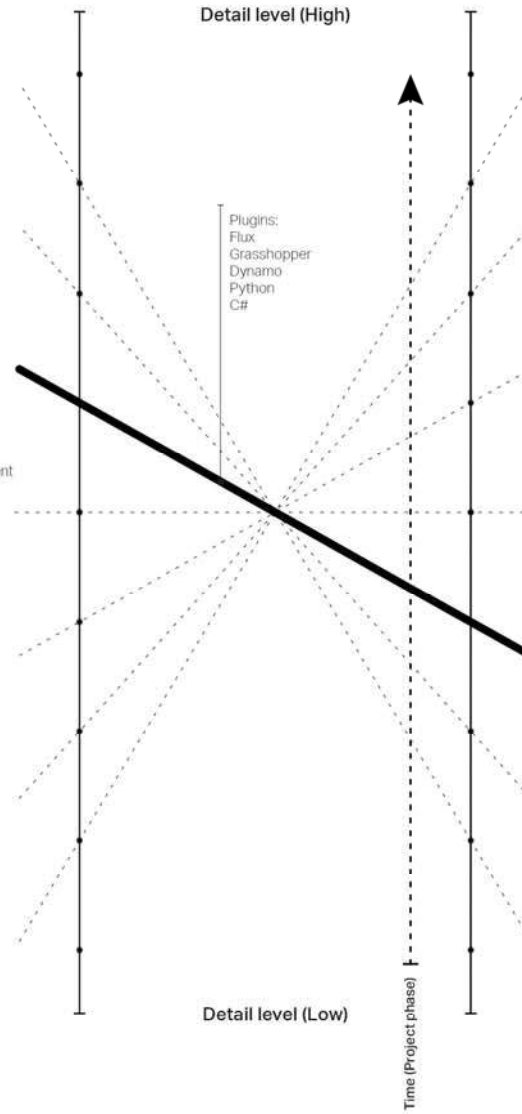
Panel properties :

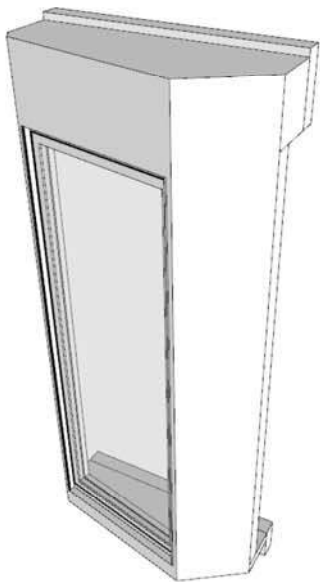
- ID Location in system
- 4 Points
- Vector Direction
- Rotation
- Surface Front
- Surface Back
- Area (m2)
- Volume (m3)
- Frames
- Fins (S/L)
- Structural System
- Water System
- Maintenance System (Spacing)
- Floor built-up



Detail level (Low)

Time (Project phase)





Geometry representation

1221_Data_01_UniqueID

Array - (7) Monst L. Tue Sep 05 2017

1221_GH_Export_Data_All_input

Table Rows 1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Level	NL0	NL0	NL0	NL0	NL0	NL0	NL0	NL0	NL0	NL0	NL0	NL0	NL0	NL0	NL0	NL0
2	Index	Number_0	Number_1	Number_2	Number_3	Number_4	Number_5	Number_6	Number_7	Number_8	Number_9	Number_10	Number_11	Number_12	Number_13	Number_14	Number_15
3	Type	Type_A	Type_A	Type_A	Type_A	Type_A	Type_A	Type_A	Type_A	Type_A	Type_B	Type_B	Type_B	Type_B	Type_B	Type_B	Type_B
4	Width_Full(mm)	180	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1330	1330	1500	1500	1500
5	Width_O1(mm)	89	186	290	290	400	290	186	186	89							89
6	Width_O2(mm)	1411	1314	1210	1210	1100	1210	1214	1314	1411							1411
7	Depth(mm)	79	148	206	206	231	206	148	148	79							79
8	Height(mm)	1800	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
9	3D_Glazing(m2)	4.95	4.63	4.3	4.3	3.95	4.3	4.63	4.63	4.95	5.25	5.25	4.65	4.65	5.25	5.25	4.95
10	3D_Solid(m2)	0.42	0.83	1.24	1.24	1.65	1.24	0.83	0.83	0.42							0.42
11	Project_Glazing(m2)	4.94	4.6	4.24	4.24	3.95	4.24	4.6	4.6	4.94	5.25	5.25	4.65	4.65	5.25	5.25	4.94
12	Project_Solid(m2)	0.31	0.65	1.01	1.01	1.4	1.01	0.65	0.65	0.31							0.31

Array - (12) Kent C. Fri Jul 07 2017

FLUX data hub

Type Properties

Family: Facaden_Schurz_Fenster_Recht Load...

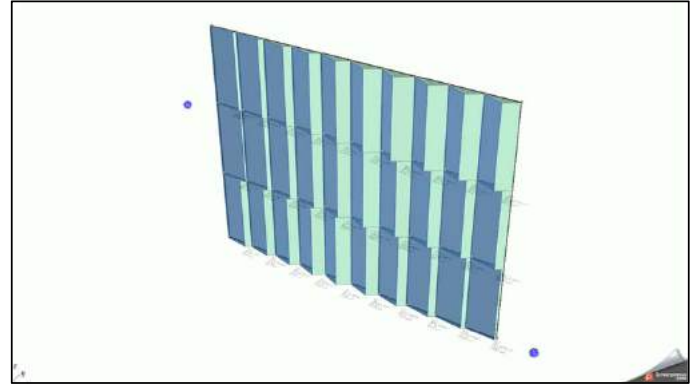
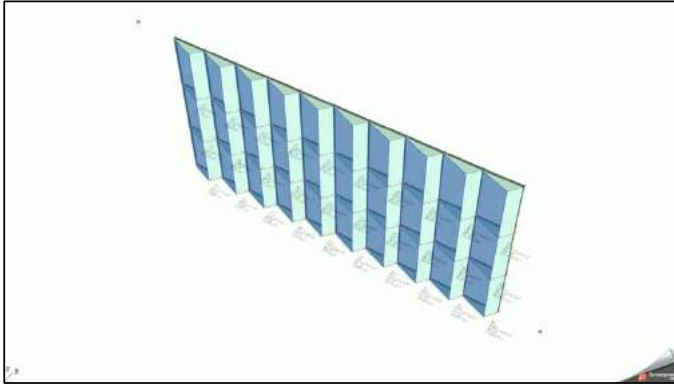
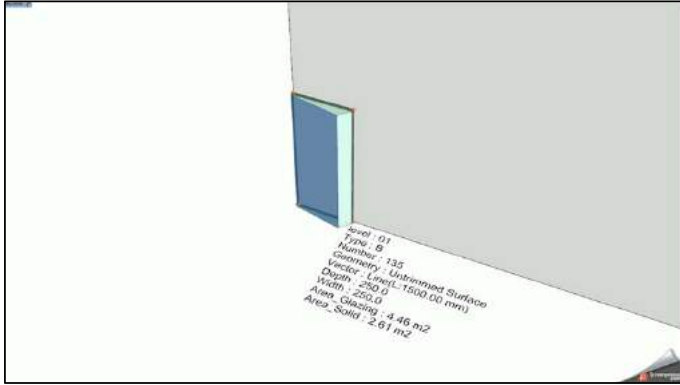
Type: Window Duplicate... Rename...

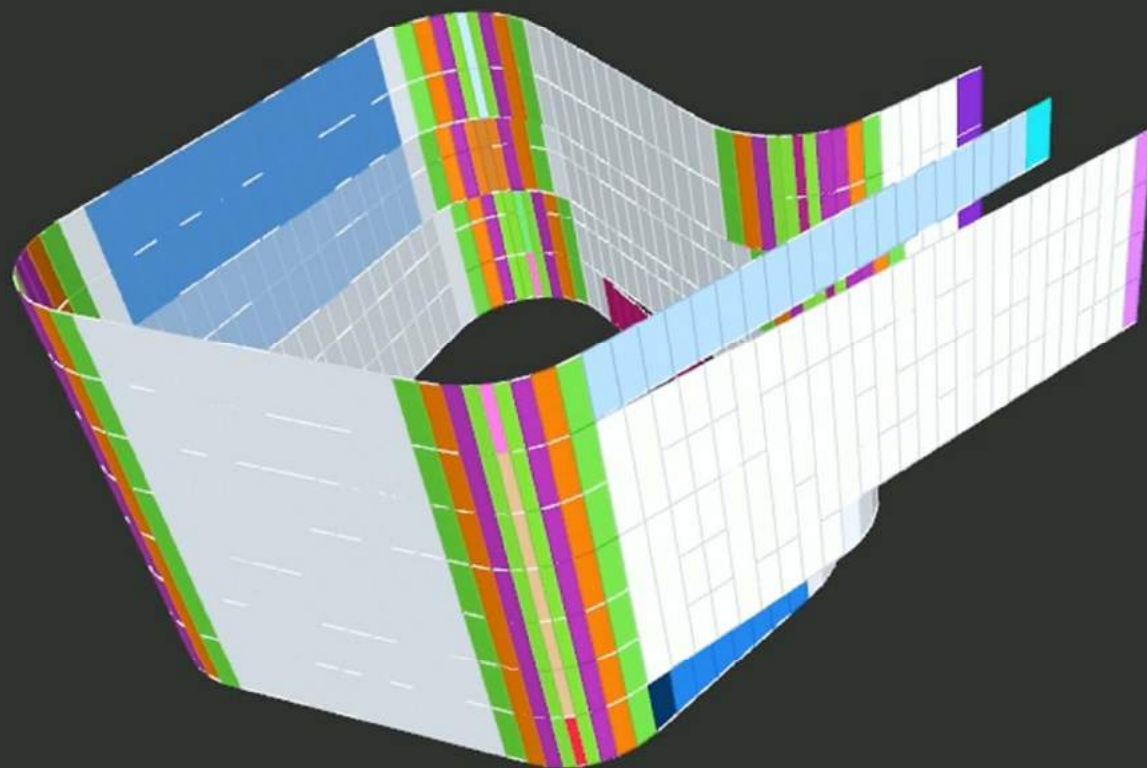
Type Parameters

Parameter	Value
Construction	
Dimensions	
Programme/Offset	100.000
DoorHeight	2400.000
FacadeOffset	240.000
Glass Thickness	40.000
OffsetBottom	175.000
OffsetTop	700.000
ShadingHeadHeight	150.000
Thickness	250.000
ThicknessBottom	100.000
ThicknessInsulation	100.000
Rough Width	
Rough Height	
Analytical Properties	
Material Data	
Type Image	
Keynote	
Model	
Manufacturer	
Type Comments	
URL	
Description	
Assembly Code	
Cost	
Assembly Description	
Type Mark	
Workset	Family - Windows - Facaden_Schurz_Fenster
Edited by	
Owner/Class Number	23,23,20,34,11,11,07
Owner/Class Title	Infat Panels
Code Name	
IFC Parameters	
Visibility	
Door	☐
Window	☒

<< Previous OK Cancel >>

Revit parameters





Curves (Design)

Curves (Design)

Curves (Grid)

Curves (Grid)

Number - Top_Edge_Move



Number - Top_Edge_Move

Number - Division (Standard)

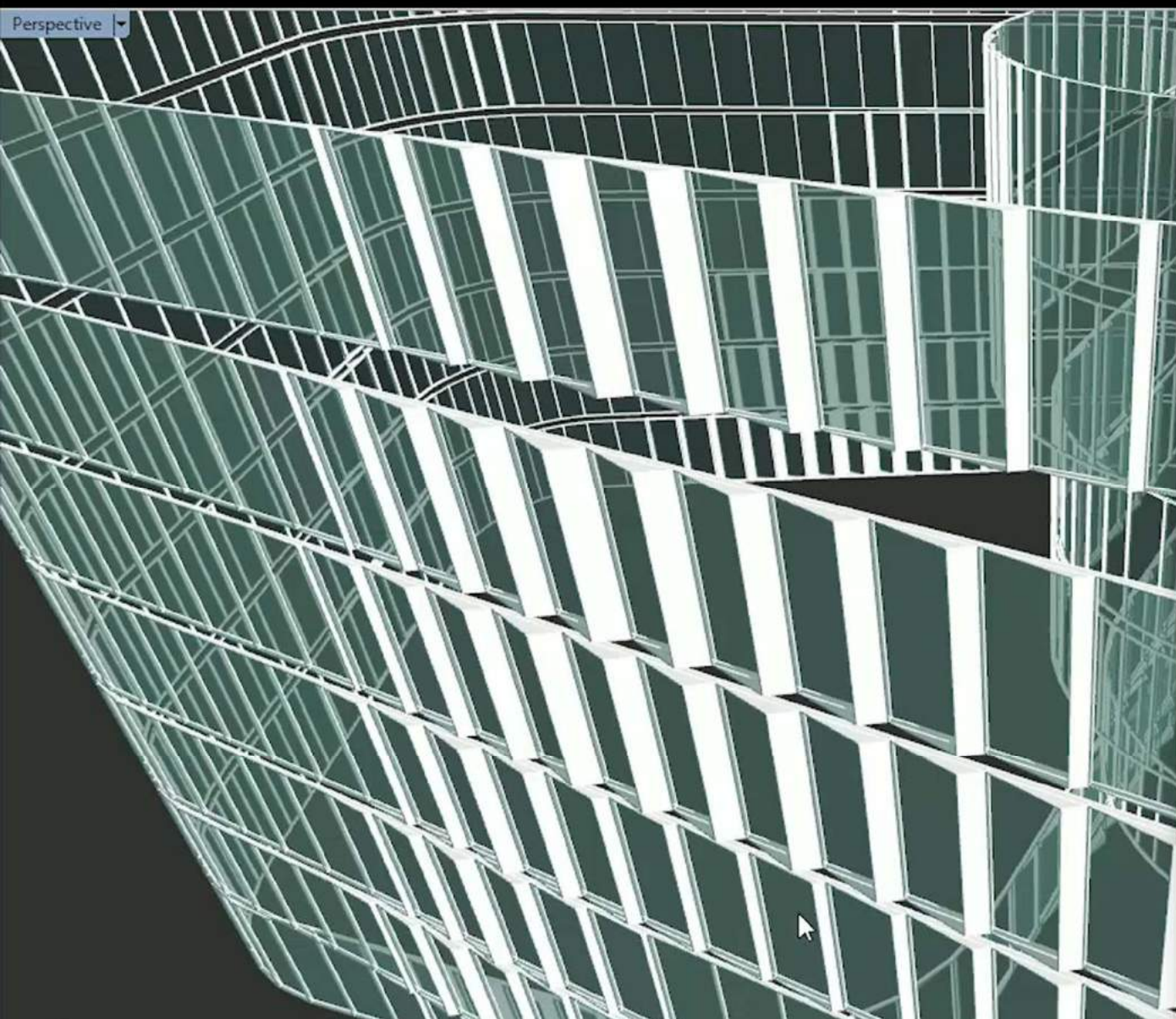
1500

	{0}
0	583
1	584
2	585
3	633
4	635
5	638
6	646
7	661
8	691
9	700
10	726
11	745
12	750
13	900
14	1025
15	1100
16	1300
17	1428

	{0}
0	0.3 %
1	0.3 %
2	0.4 %
3	0.1 %
4	0.3 %
5	0.7 %
6	0.5 %
7	0.3 %
8	0.3 %
9	7.4 %
10	0.3 %
11	0.1 %
12	0.5 %
13	9.4 %
14	0.1 %
15	7.0 %
16	7.0 %
17	0.5 %



Perspective



Curves (Design)
Curves (Grid)
Curves (Gradients)

Number - Division (Standard) 1500

Selection (Division) (%) 30

Top_Edge_Move (lvl_0-5) 500

Top_Edge_Move (lvl_6) 780

Bottom_Edge_Move (lvl_All) 150

Element (Depth) (Fixed) 100

Element (Depth) (Min) 500

Element (Depth) (Max) 50

Element (Width) (Min) (%) 95

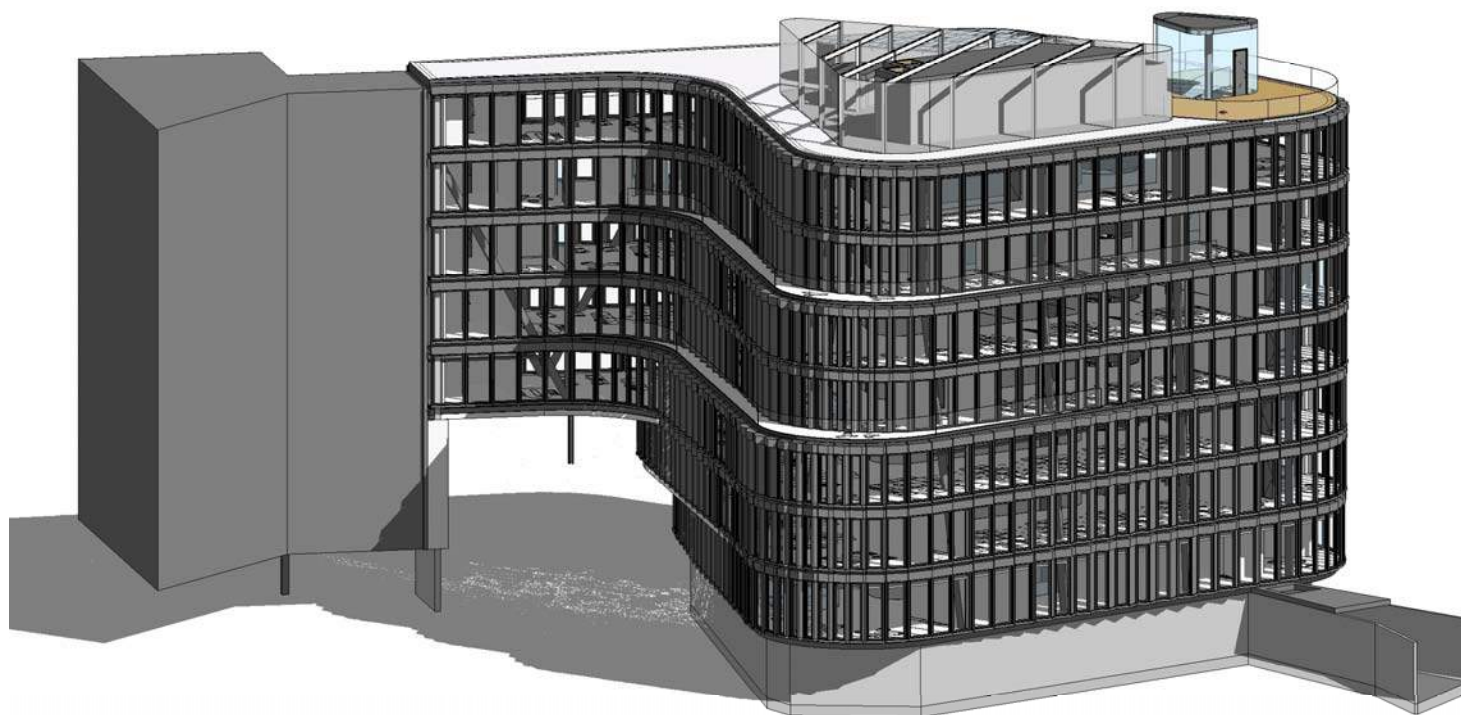
Element (Width) (Max) (%) 50

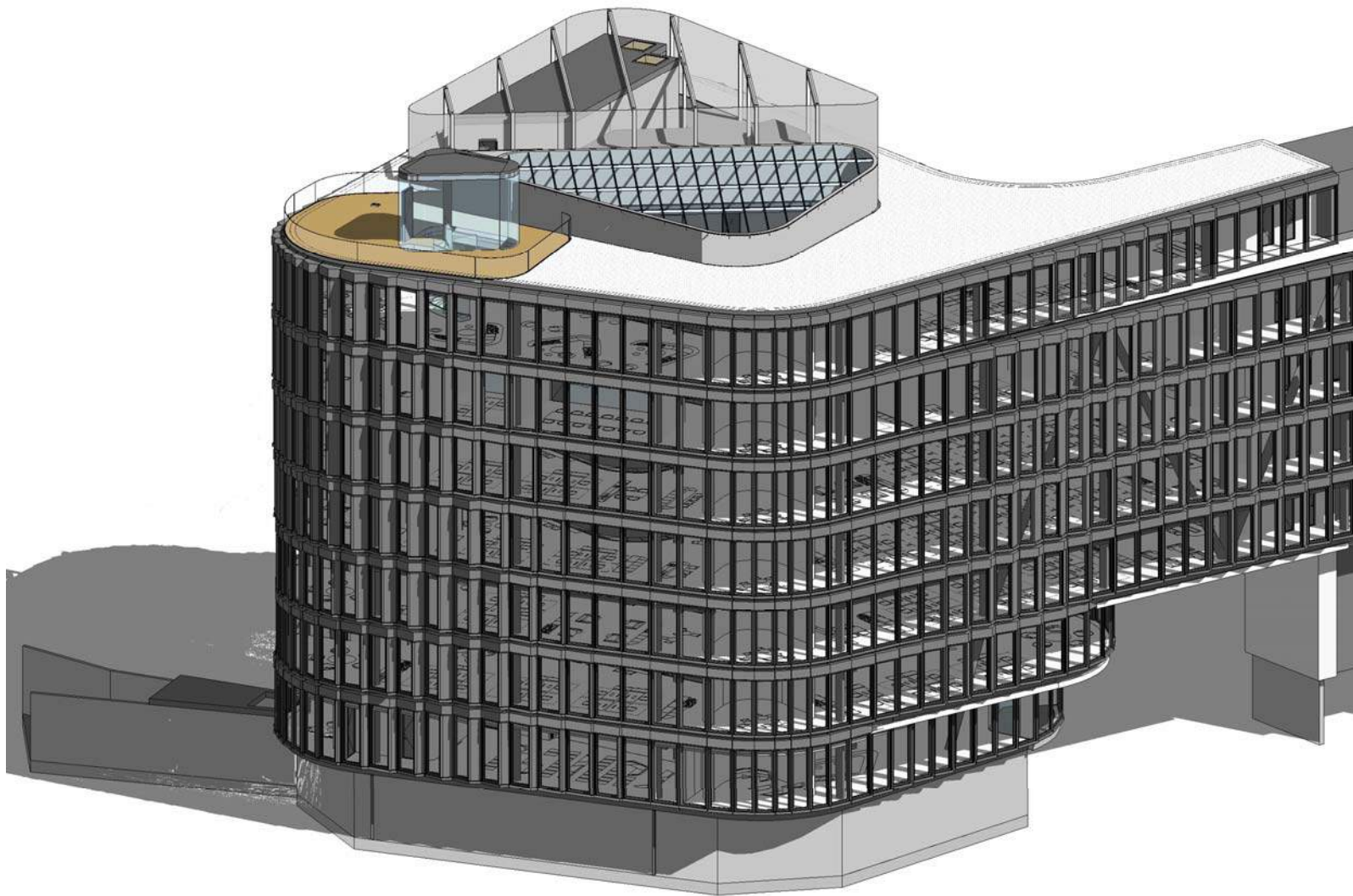
Pipeline

Layer: Script (Output) - Surfaces*

Name: *

Type:

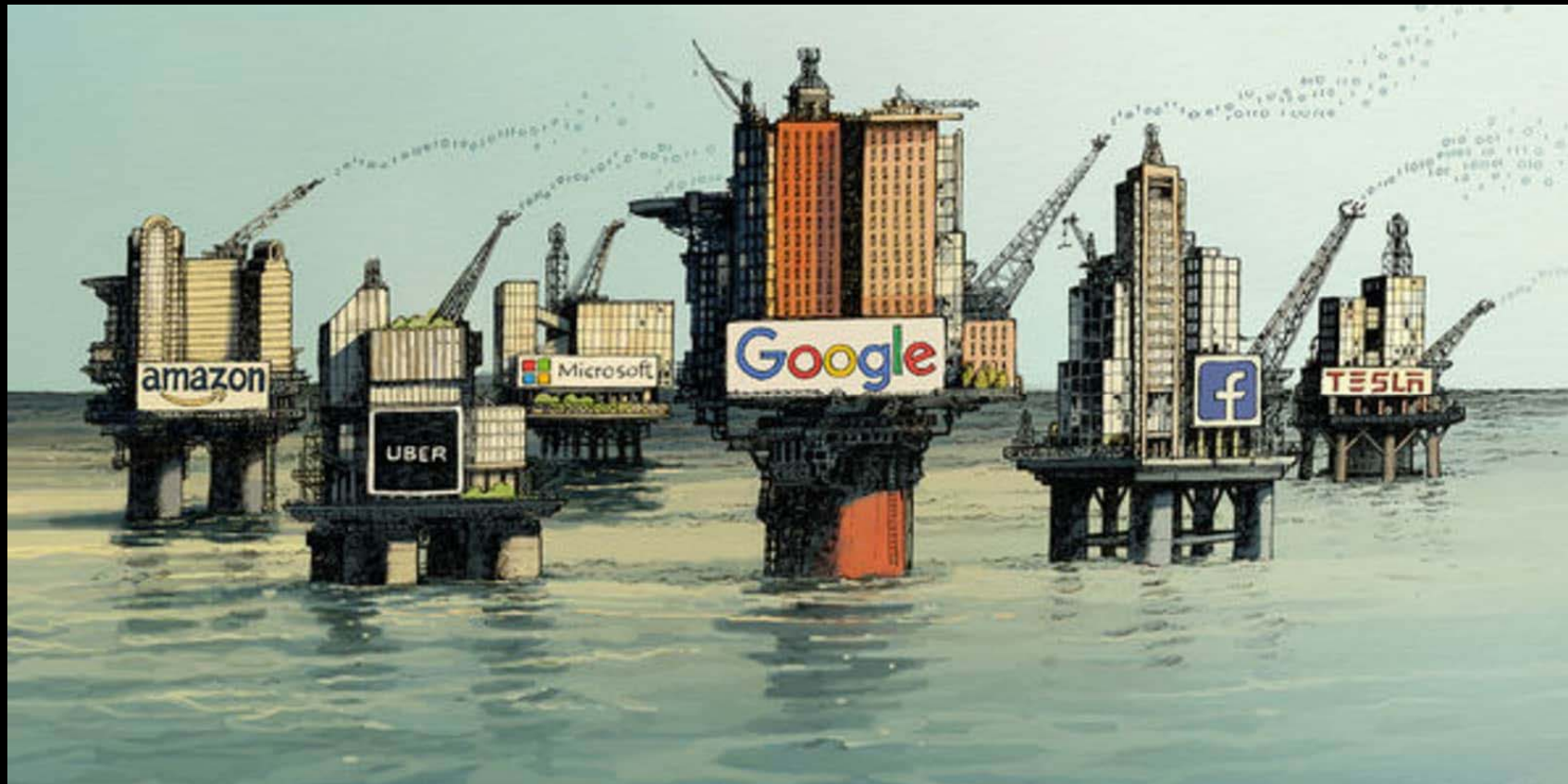






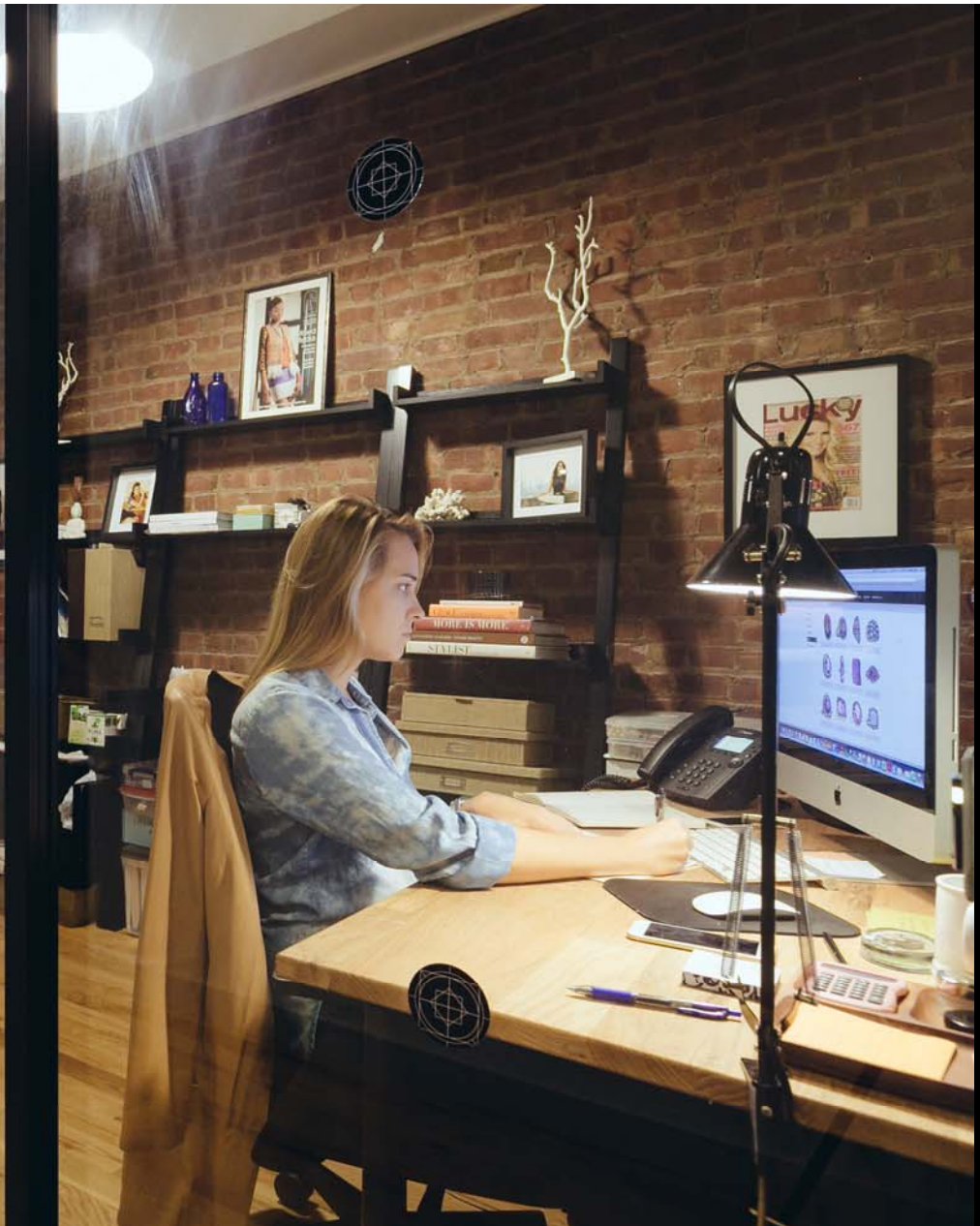


BIM IS DEAD ?

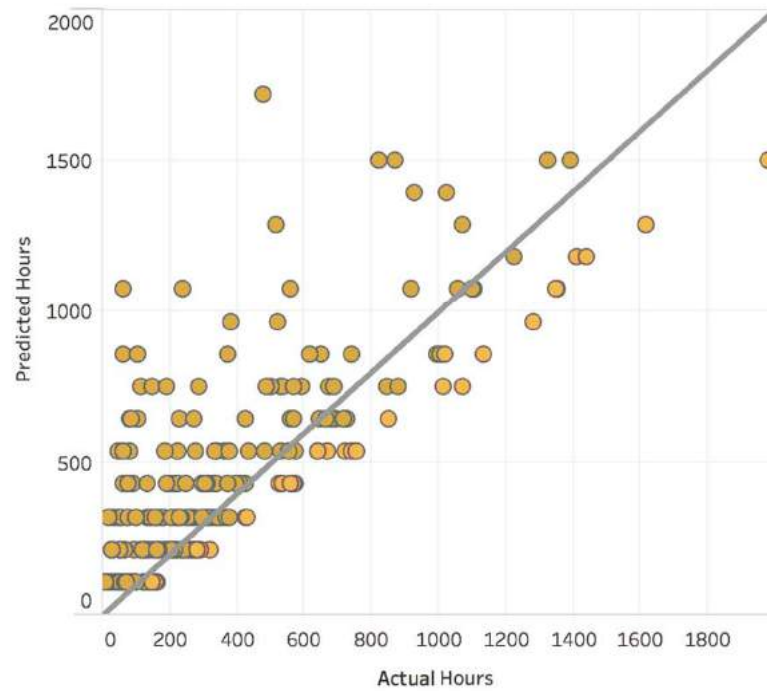


A photograph of a modern, open-plan office space. In the foreground, a large, dark leather sofa is covered with a blue and white striped blanket and a red and white patterned pillow. A red book is visible on the sofa. In the background, several people are working at desks and sitting on the sofa. The office has a high ceiling with exposed ductwork and several large, spherical pendant lights. A large potted plant is on the right side. The word "wework" is overlaid in the center in a white, lowercase, serif font.

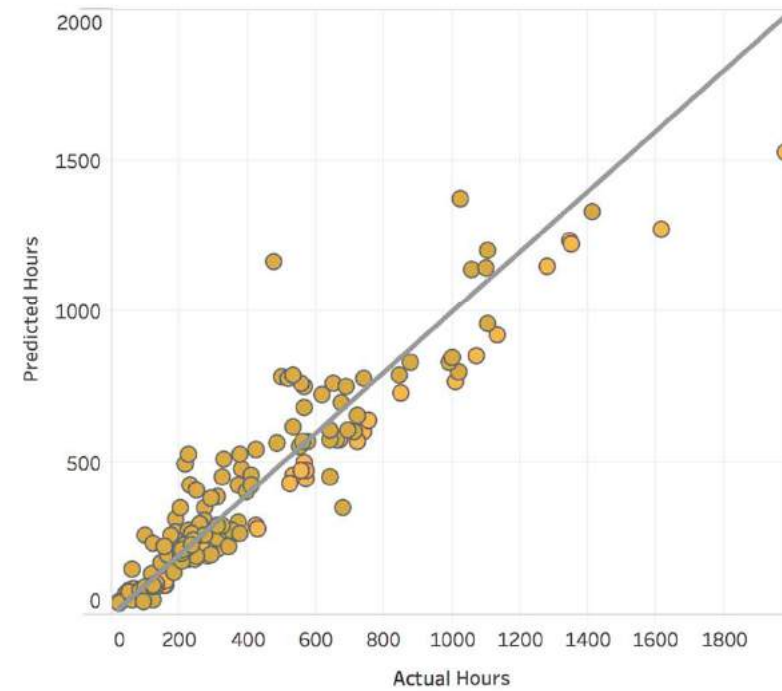
wework



PREDICTION BY DESIGNERS



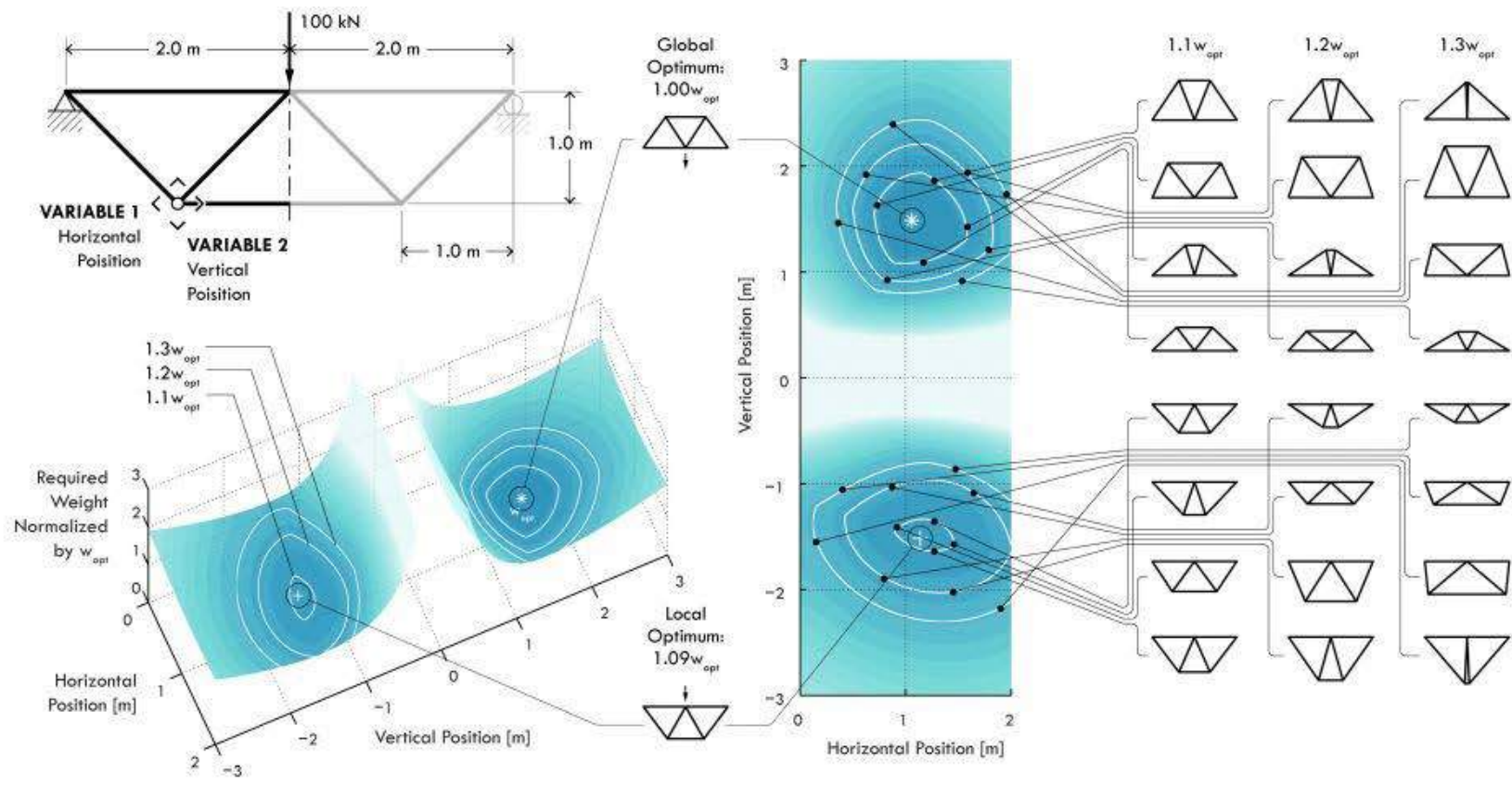
PREDICTION BY COMPUTER



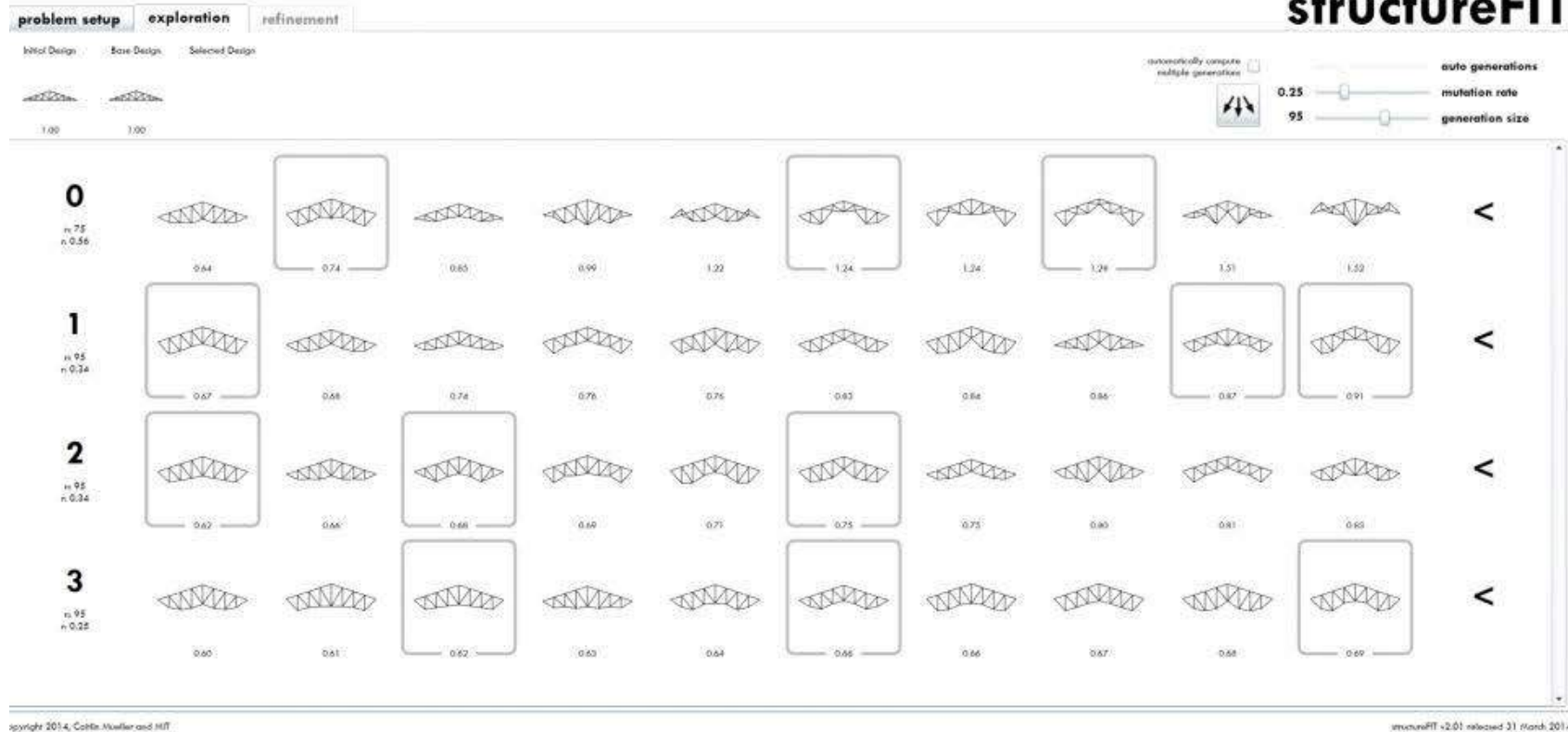
Share data. Not files.

Flux plugins send and receive data seamlessly between your existing design tools





structureFIT





design-0042.png



design-0043.png



design-0044.png



design-0045.png



design-0046.png



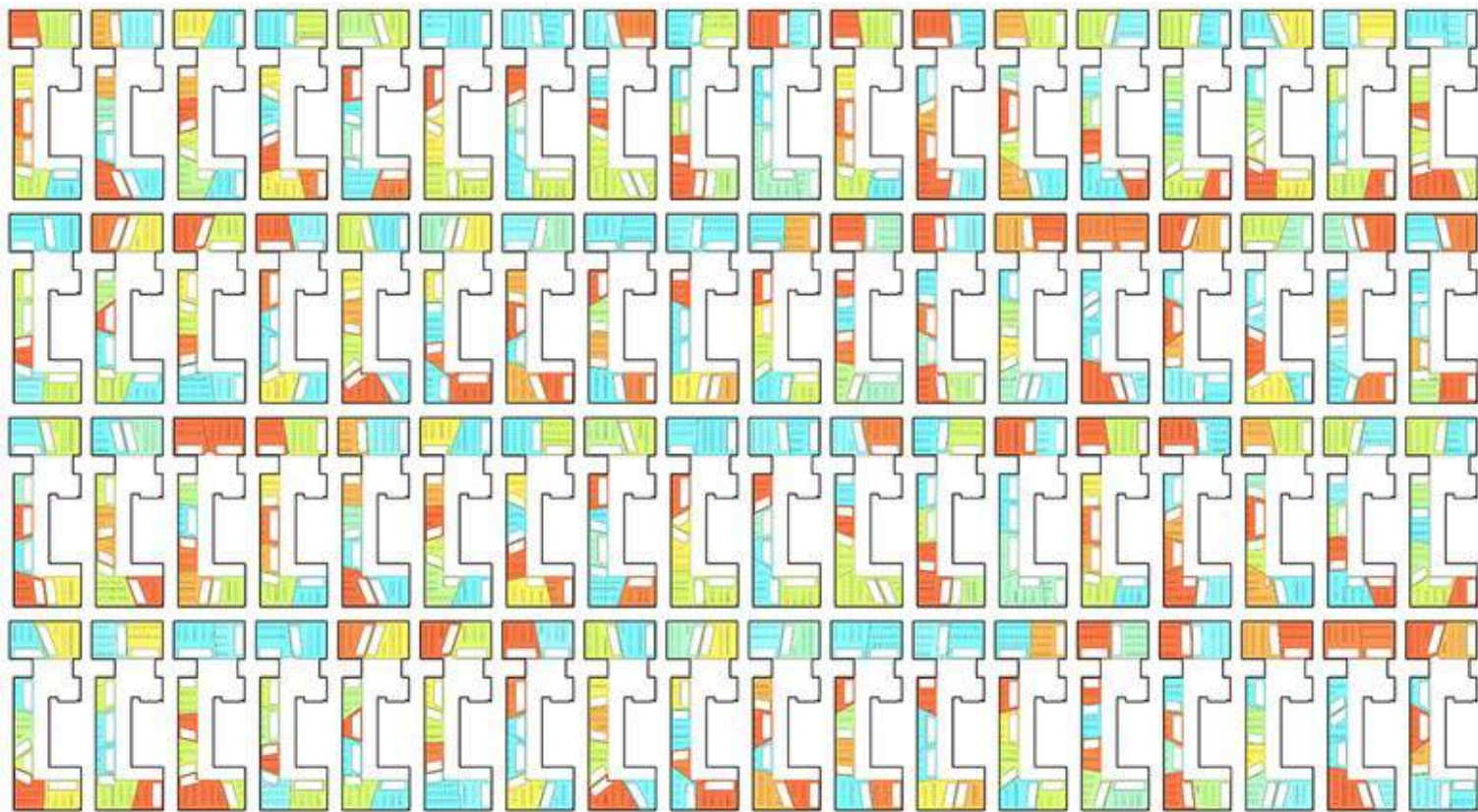
design-0047.png



design-0048.png



design-0049.png





AA-PH153
scale 1:200
Site Area II

fin