

DIGITAL ARCHITECTURE, DESIGN, & ENGINEERING ASSETS

11.16.2017

LIBRARY OF CONGRESS
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NATIONAL GALLERY OF ART

DENNIS SHELDEN, AIA PHD
DIRECTOR, DIGITAL BUILDING LABORATORY
ASSOCIATE PROFESSOR, GEORGIA TECH

Academic

MIT

- BS Architectural Design '88
- MS Civil & Environmental Eng.
- PhD in Design Computation

Assoc Professor of Practice 2005–2015

UCLA, SCIARC, UCB,...

Georgia Tech

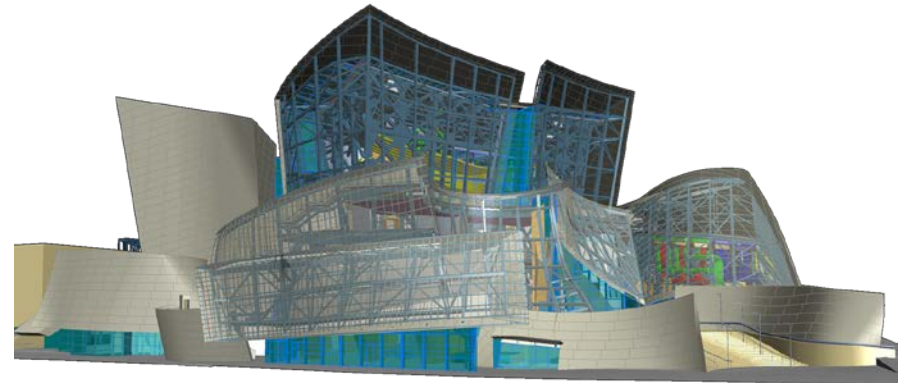
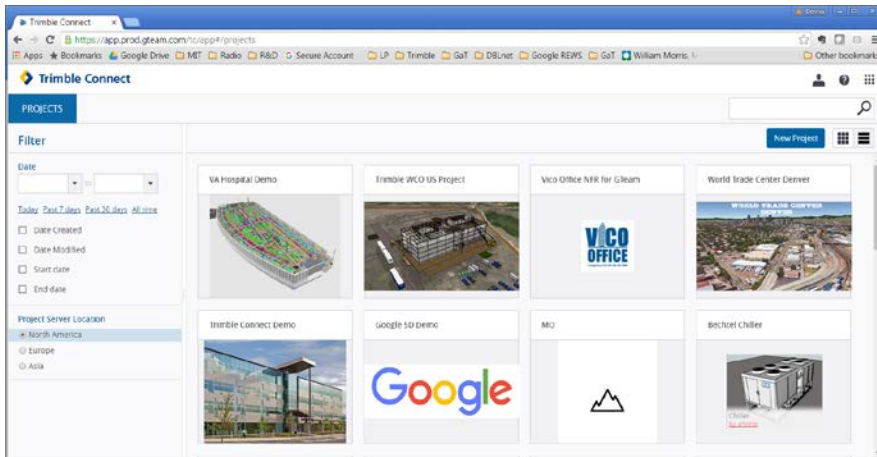
Director, Digital Building Lab Apr. 2016

Professional

Technology Director for Frank Gehry, 1997



CTO Gehry Technologies 2002-2014





Design Data Systems

“Facebook for models”

Courtsweb

Design Language

Shape Grammars

Generative Reconstructions

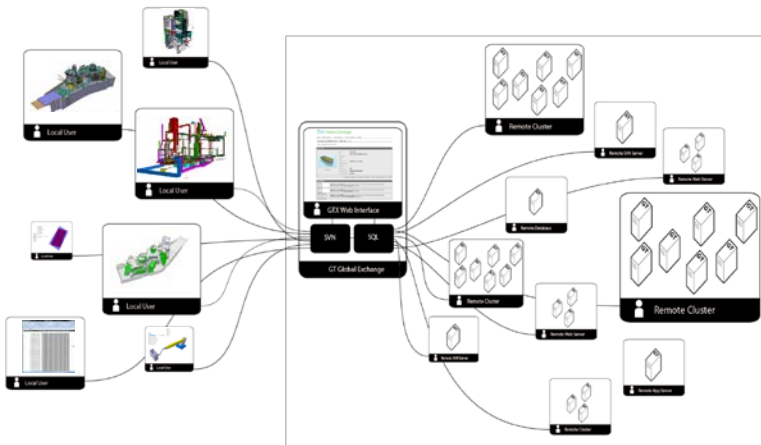
ORIGINS

Field developed on FLV Project 2008
(A. Witt)

200 users, 80 modelers, 10 organizations

10,000+ files, hundreds versioned daily

Intensive cloud processing



GT Global Exchange

Home | My Projects - 7 | My Actions - 1 | My Contacts | Admin

You are logged in as: [awitt@gtglobal.com](#) Location: France Logout

Projects >> My Projects >> GT_DP_Doc >> Folder: C:\Live Doc\Comps\Glp\010 - Complete Gby with Drawing Generation >> File: MAR_DRWCATP.rvt

File Details

File Path	C:\Live Doc\Comps\Glp\010 - Complete Gby with Drawing Generation\MAR_DRWCATP.rvt
File Size	118,06 KB
Revision	214
Locked By	-
Lock Created On	-
Last Changed Author	gtwittltdier
Last Changed Date	2009-03-17 19:22:27 GMT

File History | Export File | Create Action | Watch | Add to Opt | Set Detail 3D Preview

Local Files

2009-03-17 19:22:27 GMT	File has been removed from the server.
2009-03-17 19:22:27 GMT	File has been removed from the server.
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2009-03-17 19:22:27 GMT	File has been removed from the server.
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2009-03-17 19:22:27 GMT	File has been removed from the server.
2009-03-17 19:22:27 GMT	File has been removed from the server.
2009-03-17 19:22:27 GMT	File has been removed from the server.
2009-03-17 19:22:27 GMT	File has been removed from the server.
2009-03-17 19:22:27 GMT	File has been removed from the server.

Project Definition

Item	Author	Project	Priority	Status	PDF
24	RV LUGAS 2009-03-17	Caden Plants			
35	RV LUGAS 2009-03-17	Caden Plants			
33	RV LUGAS 2009-03-17	Caden Plants			
17	RV LUGAS 2009-03-17	Export of installation			

User Dashboard

Item	Author	Project	Priority	Status	PDF
37	Andreas Witt	Lighting			

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GT Global Exchange

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Last Changed Date	2009-03-17 19:22:27 GMT

File History | Export File | Create Action | Watch | Add to Opt | Set Detail 3D Preview

File Preview

Select an object or a command
Click on the preview and left click to view in 7/11 screens.

Covered to 3dm! At: 2009-03-16 16:06:38 GMT. Force update of file preview.
How to use the 3D viewer | Download the 3D viewer plug-in

File Comments

Comments: [Text input field] [Post]

2009-03-08 14:19:51 GMT Andrew Witt: Please modify XYZ

File Markups

Create Markups

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My Projects » Sharvain Project Document

Activity

Files

Sync

Invite

Settings

Show Files Updates

Project Activity

Empty text input field for comments

Add Comment

Chuck Xu added 117 files
2 hours ago



Reply

Chuck Xu updated 1 file
9 days ago



Reply

CHAO XIE updated 4 files
12 days ago



Reply

CHAO XIE restored 4 files, updated 6 files
12 days ago



enter search

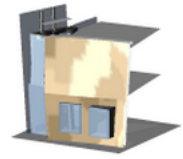
- Upload
- Download
- Check In/Out
- Delete
- New Folder
- Message
- View 3D

0 files checked

Files

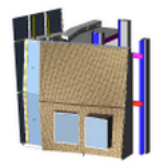
- Sharvain Project Document (Root Folder)
 - Snapshots
 - 01.BIM
 - 01.BIM_DESIGN
 - DSF

- Users
- Date
- File Sets
- Releases



SHAR_UTS_SUB_FAC_DSF.C
ATProduct

02.BIM_EXECUTION



SHAR_UTS_SUB_FAC_ALL_A
LL.CATProduct

02.DOCUMENT

Revisions

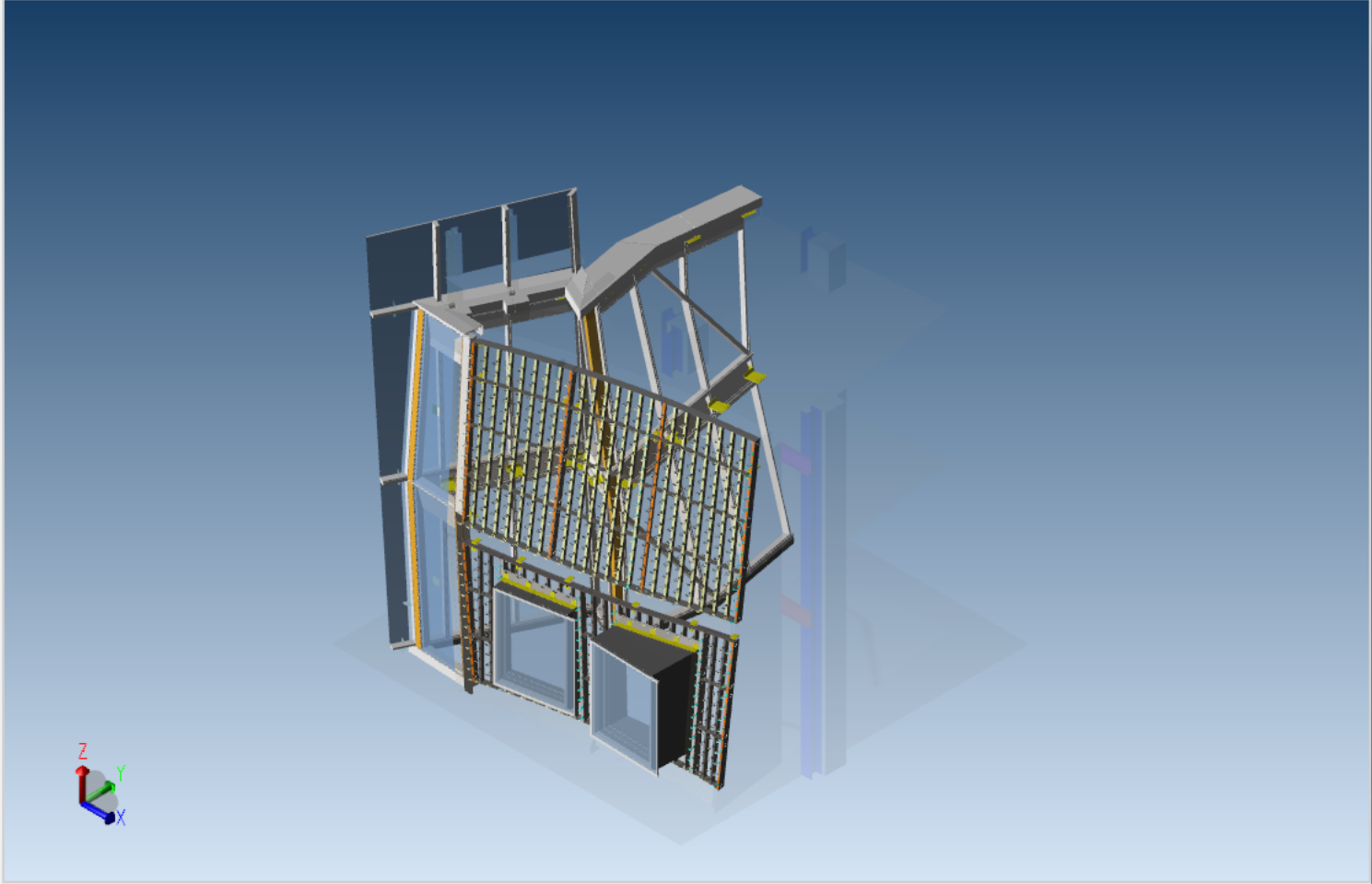
Revision	Changed by	Time	Size
#14	CHAO XIE	12 days ago	195 KB
#13		12 days ago	
#12		13 days ago	
#11		14 days ago	
#10		35 days ago	
#9		36 days ago	
#8		37 days ago	
#7		44 days ago	
#6		44 days ago	
#5		63 days ago	
#4		63 days ago	
#3		63 days ago	
#2		69 days ago	
#1		76 days ago	

Download Checkout Delete Message View 3D

Rotate Model



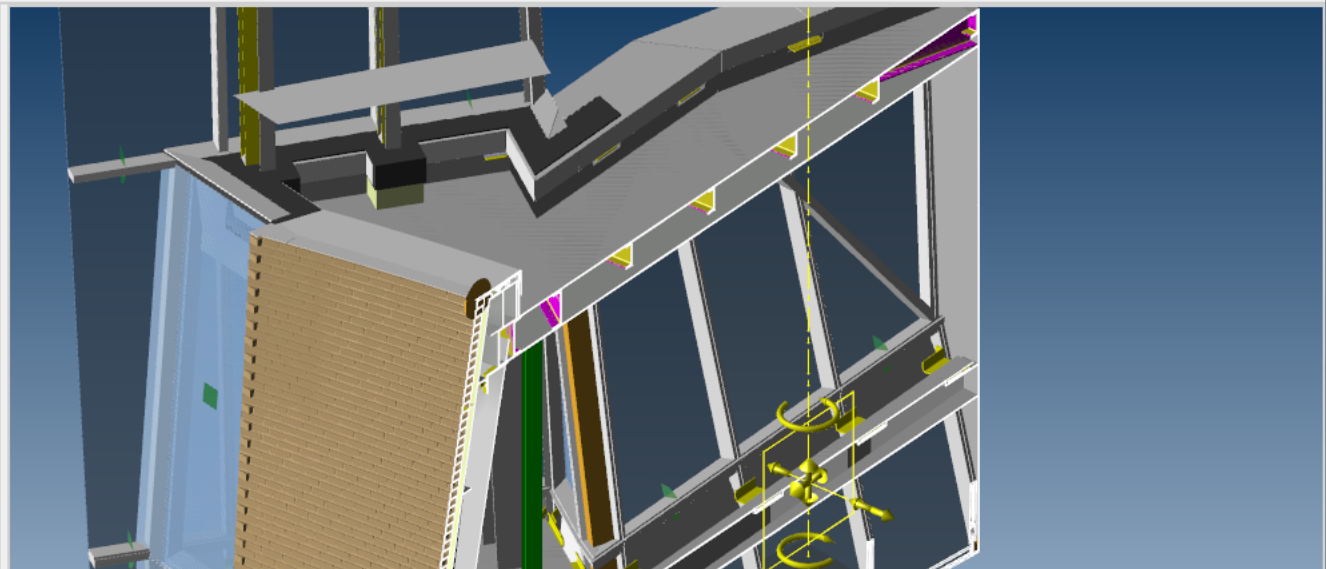
- Model Tree**
- Sharvain Project Document
 - Project SHAR_UTS_SUB_FAC_DSF
 - SHAR_UTS_SUB_FAC_DSF_ALL
 - SHAR_UTS_SUB_FAC_DSF_ALL_DRIVE
 - Geometry
 - Project SHAR_UTS_SUB_FAC_ALL_ALL
 - SHAR_UTS_SUB_FAC_EXE_ALL.1
 - SHAR_UTS_SUB_FAC_MSP.1
 - SHAR_UTS_SUB_FAC_DTL.1
 - SHAR_UTS_SUB_FAC_BRK.1
 - SHAR_UTS_SUB_FAC_GLZ.1
 - SHAR_UTS_SUB_FAC_SUP.1
 - SHAR_UTS_SUB_FAC_WBX.1





Model Tree

- Sharvain Project Document
 - Project SHAR_UTS_SUB_FAC_DSF
 - SHAR_UTS_SUB_FAC_DSF_ALL
 - SHAR_UTS_SUB_FAC_DSF_ALL_DRIVERS.1
 - Geometry
 - Project SHAR_UTS_SUB_FAC_ALL_ALL
 - SHAR_UTS_SUB_FAC_EXE_ALL.1
 - SHAR_UTS_SUB_FAC_MSP.1
 - SHAR_UTS_SUB_FAC_MSP_L02.1
 - SHAR_UTS_SUB_FAC_MSP_L02_02003.1
 - SHAR_UTS_SUB_FAC_MSP_L02_02002.1
 - SHAR_UTS_SUB_FAC_MSP_L02_02001.1
 - SHAR_UTS_SUB_FAC_MSP_L02_BRACKETS.1
 - SHAR_UTS_SUB_FAC_MSP_L01.1
 - SHAR_UTS_SUB_FAC_DTL.1
 - SHAR_UTS_SUB_FAC_BRK.1
 - SHAR_UTS_SUB_FAC_GLZ.1
 - SHAR_UTS_SUB_FAC_SUP.1
 - SHAR_UTS_SUB_FAC_WBX.1



Reports



g research update - Google Chrome

gto11.prod.gteam.com/knkdw7snbmx/files/file_details?VID=DFKU34GUCGZQVWFN6

GTeam

My Projects » Sharvain Project Document

Activity Files Sync Invite Settings

Revisions

/02.DOCUMENT/01.SHOP/PDF/1601-PM-0321.pdf

Download Checkout Delete Message

- #8 61 days ago
- #7 61 days ago
- #6 61 days ago
- #5 61 days ago
- #4 61 days ago
- #3 63 days ago
- #2 63 days ago

#1 Changed by: **Dean Demko** 75 days ago

- 5/11/2012 0:38:29 GMT
- 98 KB

NO.	DATE	DESCRIPTION
1	5/11/2012	ISSUED FOR PERMIT
2	5/11/2012	ISSUED FOR PERMIT
3	5/11/2012	ISSUED FOR PERMIT
4	5/11/2012	ISSUED FOR PERMIT
5	5/11/2012	ISSUED FOR PERMIT
6	5/11/2012	ISSUED FOR PERMIT
7	5/11/2012	ISSUED FOR PERMIT
8	5/11/2012	ISSUED FOR PERMIT

10:10 PM 7/25/2012

(7) GTeam_Demo_01 on F x
 https://apps.facebook.com/gteam_demo/

facebook Search for people, places and things Dennis Sheldon Find Friends Home

GTeam™

BUILDING TOGETHER



Reports

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Recommend Send Be the first of your friends to recommend this.

Recommended Games More
 GALAXY LIFE DRAGON CITY CASINO FORTUNE CASINO
 MORE CASINOS W P FORTUNE

People You May Know See All
 Ranjeet Das 4 mutual friends Add Friend
 DH Reddy 8 mutual friends Add Friend

Sponsored See All
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 palms.com Party and relax in style at the Palms in Vegas. Sign up now to get 30% off your next stay!

Score Big Savings!
 choosenissan.com Put style and technology on your team. Save big on the all-new Nissan Altima, NOW!

small business Deals
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Western Union Online
 westernunion.com We believe you deserve a great value. Send money starting at \$5 fee, in minutes!*

GTeam_Demo_01 · Report/Contact this App
 English (US) · Privacy · Terms · Cookies · More

Chat

Courtsweb

<https://publiccourts.gsa.gov/>

PI: Athanassios Economou

Agency: GSA

CourtsWeb is an online information database designed to document new courthouses and to serve as a significant resource for new courthouse design. It provides an information-rich resource for General Services Administration (GSA), the Judiciary, and the contracted architects and engineers, who design new courthouses.

The web-based application supports multiple ways of retrieving, comparing, and ranking diverse types of media including

- three-dimensional interactive models,
- figure-ground diagrams,
- adjacency diagrams,
- 360 degree panoramic images, photos,
- drawings, numbers and text, and

U.S. Courthouses x
https://publiccourts.gsa.gov/courtsweb/

Apps ★ Bookmarks Google Drive MIT Radio R&D Secure Account LP Trimble GaT DBLnet Google REWS GaT William Morris, M Other bookmarks

COURTSWEB

A Visual Description of Contemporary US Courthouses

Home search

GSA

- [Introduce](#)
- [Browse](#)
- [Analyze](#)
- [Compare](#)
- [Search](#)

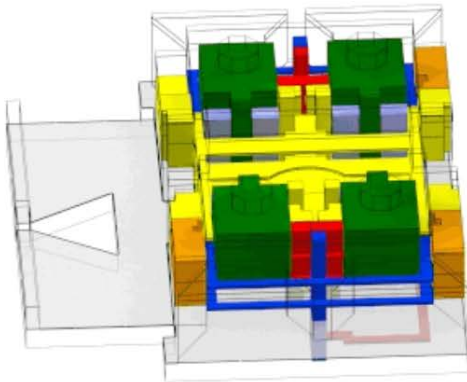
CourtsWeb

Explore the database in a variety of ways

- [Introduce](#)
Information about the CourtsWeb project
- [Browse](#)
Browse the database for courthouse and courtroom information: statistics, drawings, photographs, panoramas
- [Analyze](#)
Analyze various spatial representations of the courthouses
- [Compare](#)
Compare the complete data set: courthouse and courtroom areas, building inventory, cost
- [Search](#)
Search the database for information related to individual courthouses or the entire data set

Public Version

A limited selection of contemporary United States (U.S.) courthouse case studies



[Hammond United States Courthouse > 3D Diagrams](#)

Courthouse Program x U.S. Courthouses x U.S. Courthouses x Keep your Firefox healthy ... x Get Silverlight | Microsoft ... x Download Java for Windows x

https://publiccourts.gsa.gov/courtsweb/

Allow https://publiccourts.gsa.gov to run "Java"?

GSA
COURTSWEB
Home

A Visual Description of Contemporary US Courthouses

Introduce

Browse

Analyze

Compare

Search

Rentable Area

Usable Area

Efficiency

Parking

Courtrooms per Floor

Number of Courtrooms

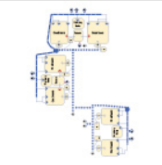
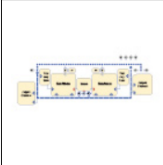
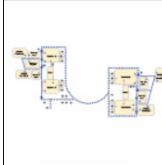
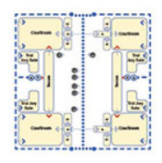
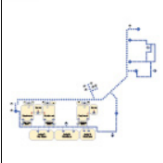


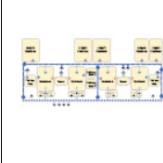
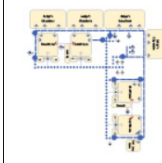
Number of Chambers

Compare

Compare the metrics of the individual case studies and their relationship to the entire dataset

The **efficiency** of the courthouse is derived by dividing the usable area by the gross area, then subtracting the structured parking.

Efficiency

		
Eugene, OR 2006 Morphosis Architects 9 JC 67.00 %	San Diego, CA 2012 Richard Meier & Par... 9 JC 66.00 %	Jackson, MS 2011 H3 Hardy Collaborat... 5 JC 66.00 %
		
Salt Lake City, UT 2014 Thomas Phifer and ... 10 JC 65.00 %	Tucson, AZ 2000 Hardy Holzman Pfeif... 9 JC 63.00 %	Portland, OR 1997 Kohn Pedersen Fox ... 9 JC 63.00 %
		
Seattle, WA 2004 NBBJ 9 JC 62.00 %	Orlando, FL 2007 Leers Weinzapfel As... 11 JC 62.00 %	Fresno, CA 2005 Moore Ruble Yudell 9 JC 62.00 %

Sort

- City
- State
- Year Built
- Architect
- Circuit
- Efficiency**

View

- List
- Photographs
- Adjacency**
- Figure-grounds

Select

Show selection

The screenshot shows a web browser window with two tabs: "Courthouse Program" and "U.S. Courthouses". The address bar displays "https://publiccourts.gsa.gov/courtsweb/". The website header features the GSA logo and the title "COURTSWEB" with the subtitle "A Visual Description of Contemporary US Courthouses". A search bar is located in the top right corner.

The main navigation menu includes the following categories:

- Introduce
- Browse
- Analyze
- Compare
- Search

Regional links are provided for:

- Austin, TX
- Boston, MA
- Central Islip, NY
- Eugene, OR
- Fresno, CA
- Gulfport, MS
- Hammond, IN

Other menu items include:

- Context
- Courthouse
- Courtroom
- Special Proceedings
- District Court
- Magistrate Judge
- Bankruptcy
- Photographs
- Panoramas

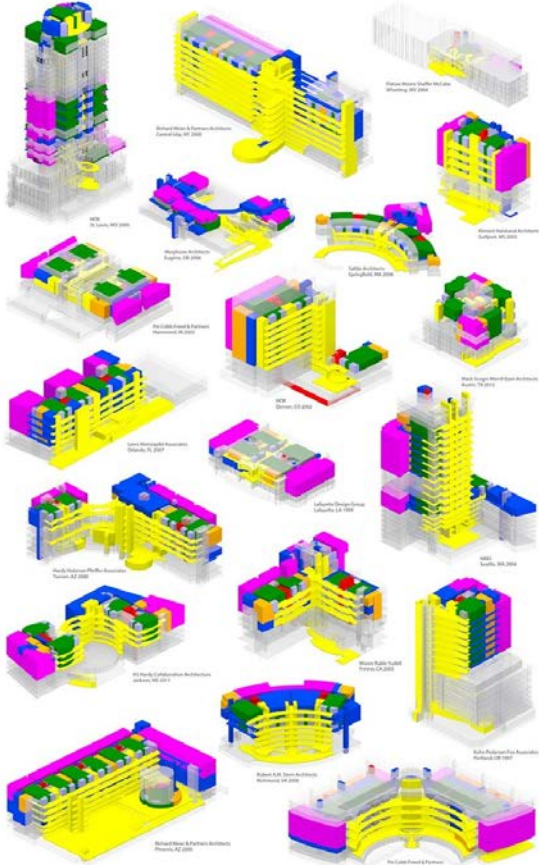
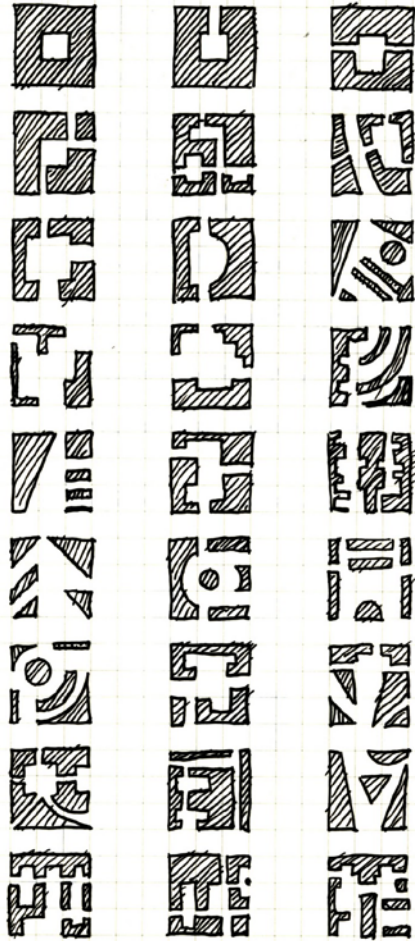
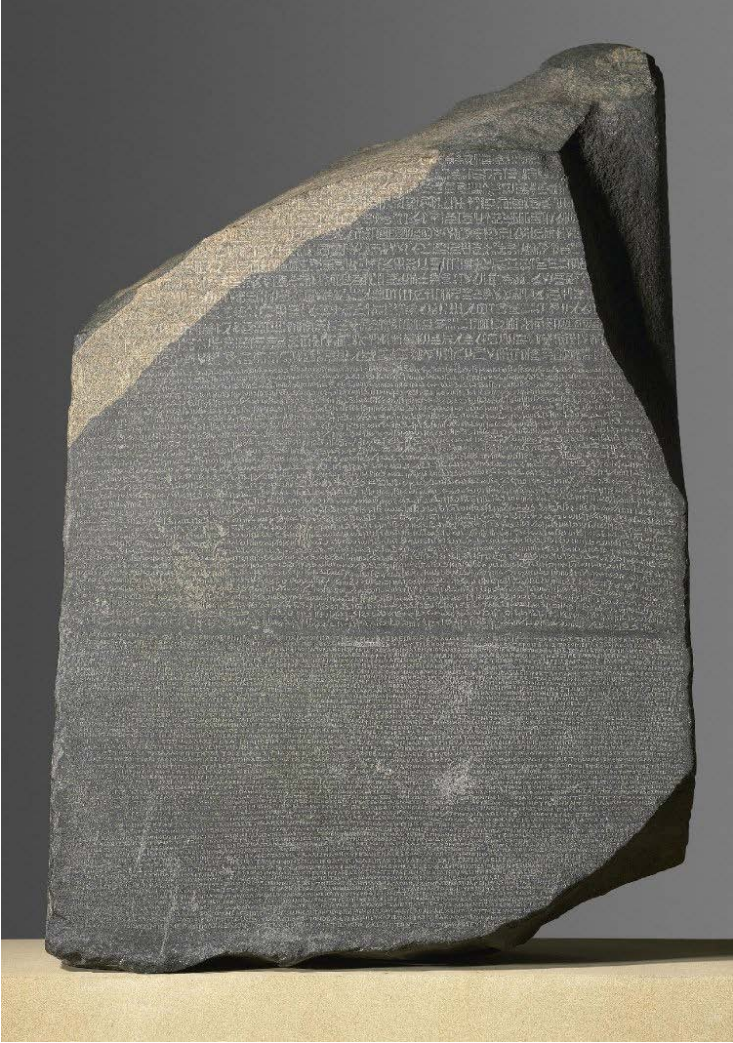
The "Panoramas" section is highlighted, showing three images of the interior of the Wayne Lyman Morse United States Courthouse:

01. View of the Judge's Bench
02. View from the Jury Box
03. View from the Witness Stand

Below the featured section, the text reads: "Developed by GSA, U.S. Courts and Georgia Institute of Technology" and a "Share" link is visible.



Encoding languages of design

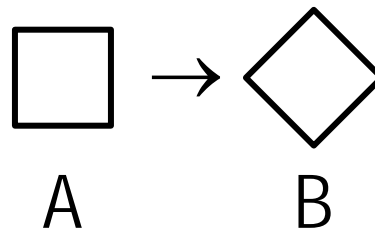


SHAPE GRAMMARS

Very simple formulas:

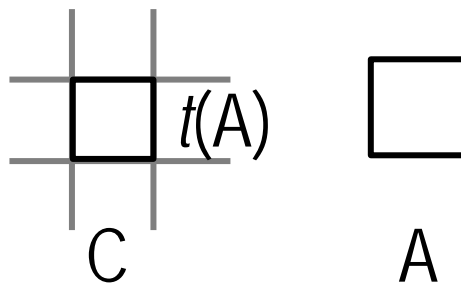
$A \rightarrow B$

shape rule



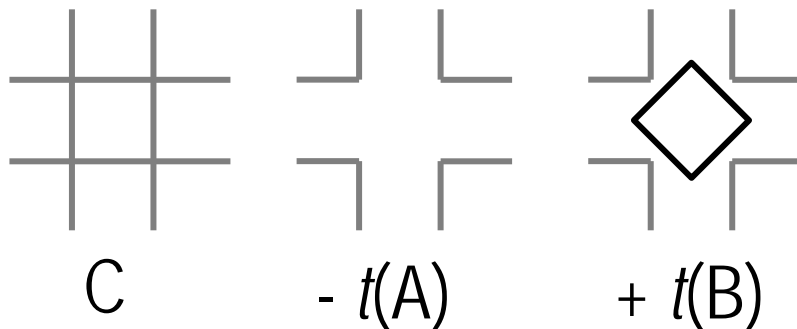
$C \geq t(A)$

subshape



$C \rightarrow C - t(A) + t(B)$

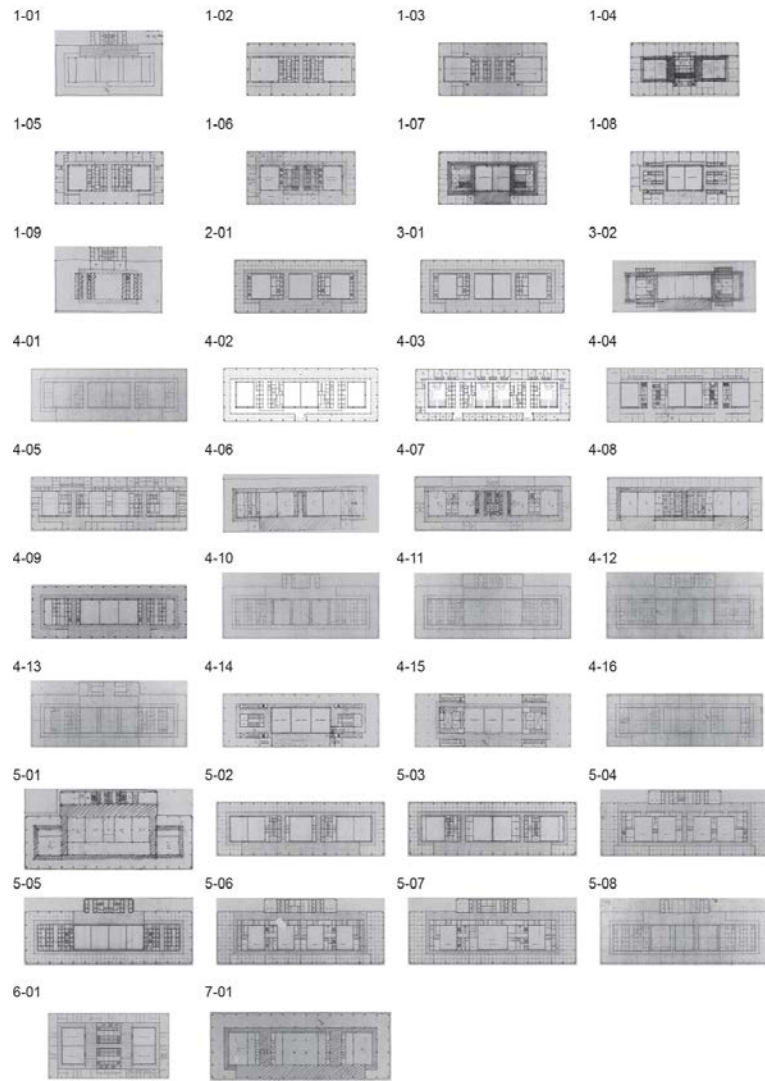
substitution



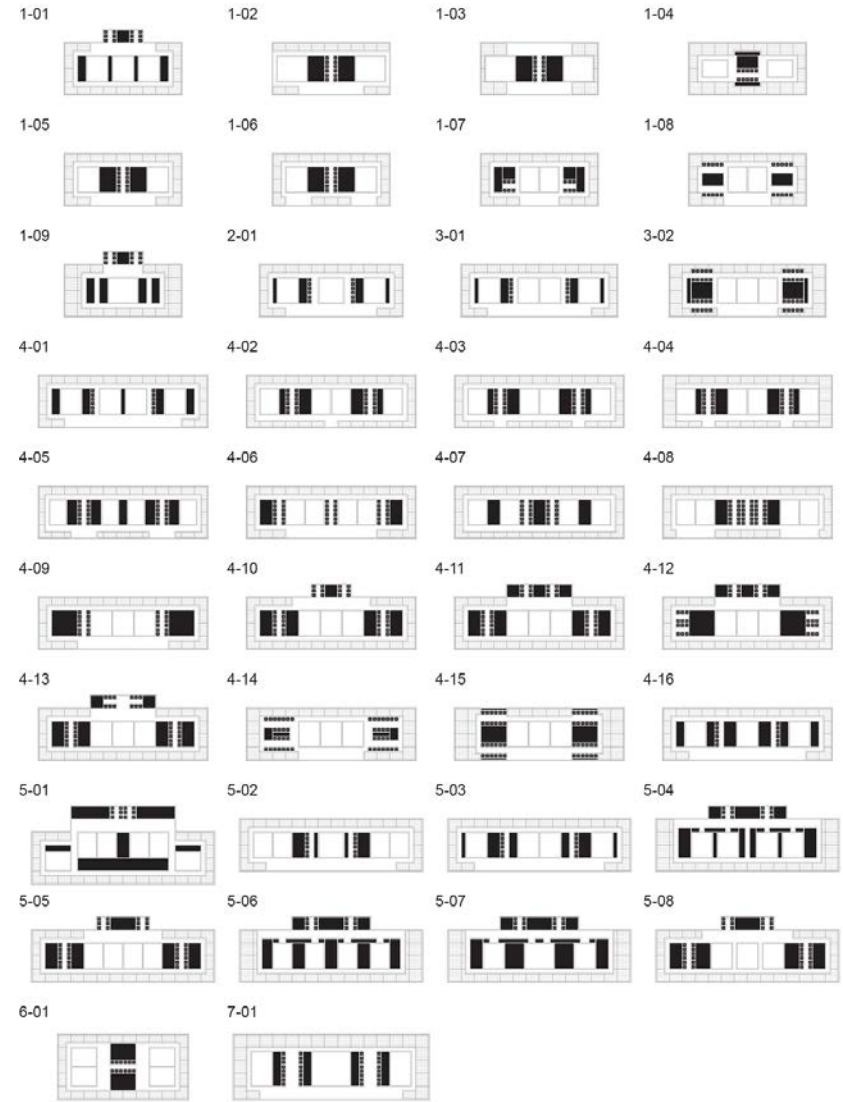
The Everett McKinley Dirksen United States Courthouse in Chicago is one of the most significant buildings built by Mies van der Rohe in United States. Significantly the Dirksen Courthouse is the only courthouse that Mies ever designed; in this sense, it provides the sole window towards the architect's language, expression and vision of the relationship between architecture and law. The work here presents a three-dimensional generative description of Mies's courthouse design language in the form of a shape grammar and discusses its significance for the study of the courthouse building type at large.



A set of three photographs of the Dirksen Courthouse. Photographs by Hedrich-Blessing Photographers, Chicago History Museum: a) a perspectival view from West Adams Street, b) an exterior view of the south-east corner from West Jackson Boulevard, and c) an interior view of the public lobby.



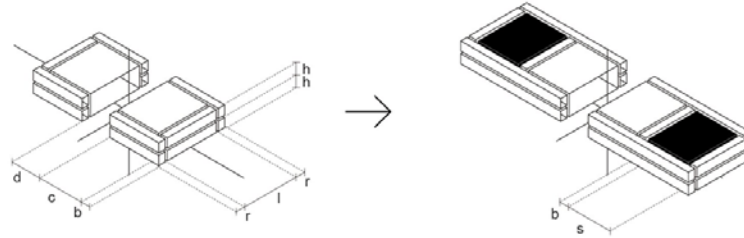
The complete set of 38 original sketches of the identified courtroom plate design variations by the office of Mies. Archived at the Museum of Modern Art New York.



The complete set of 38 two-dimensional diagrammatic representations of the identified courtroom plate design variations.

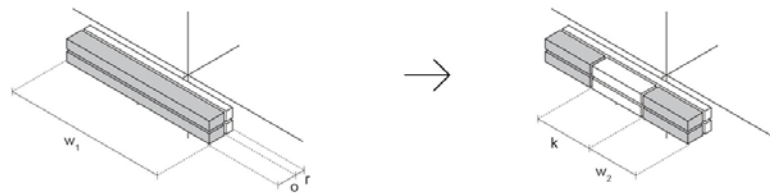
$$n = 4'-8'' = 56''; m = 6n = 28' = 336''; f = 12' = 144''; t = 2'-4'' = 28''$$

Rule 17



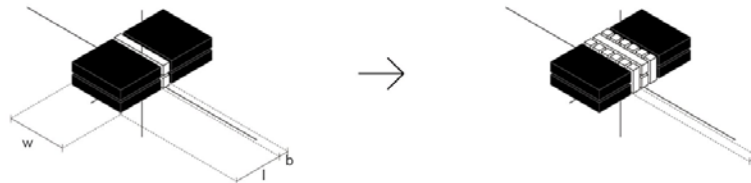
$$b \in \{2n, 3n, 4n\}; c \in \{8n, 9n, 10n, 12n, 14n, 18n\}; 2n \leq d \leq 60n; h = f, l \in \{2m, 3m\}; r = 2n; s \in \{2n, 4n, 5n, 6n, 8n, 9n, 10n, 12n, 14n\}$$

Rule 29



$$k \in \{6n, 12n, 18n, \dots, 66n\}; o \in \{3n, 4n\}; r \in \{2n, 3n\}; 7m \leq w_1 \leq 13m; w_2 = (w_1 - k)/2$$

Rule 56



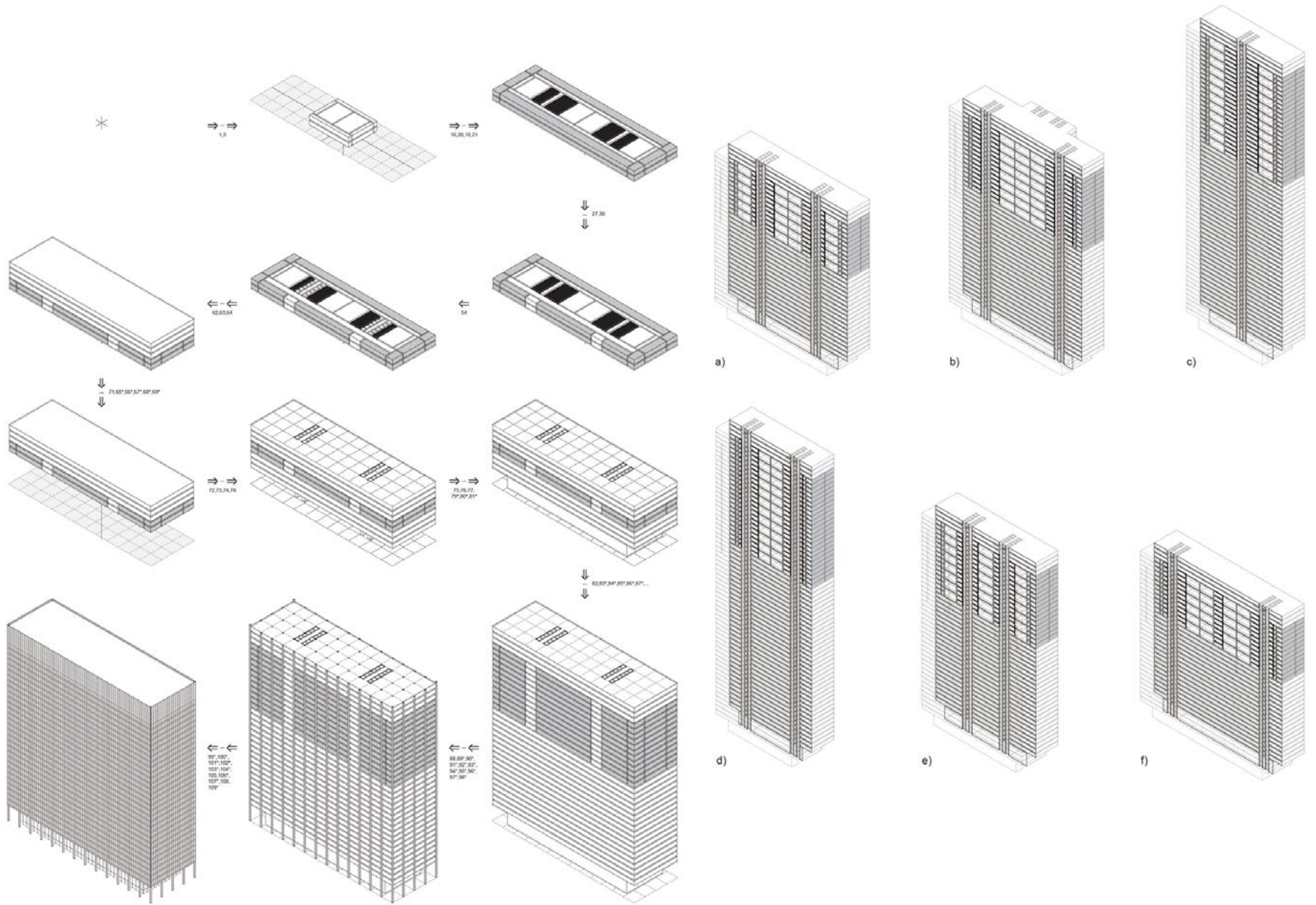
$$b = 2n; 2n \leq l \leq 9n; v = 2n; w \in \{8n, 10n, 12n\}$$

Rule 68



$$b \in \{2n, 3n, 4n\}; h = f, l \in \{2m, 3m\}; p = t/2$$

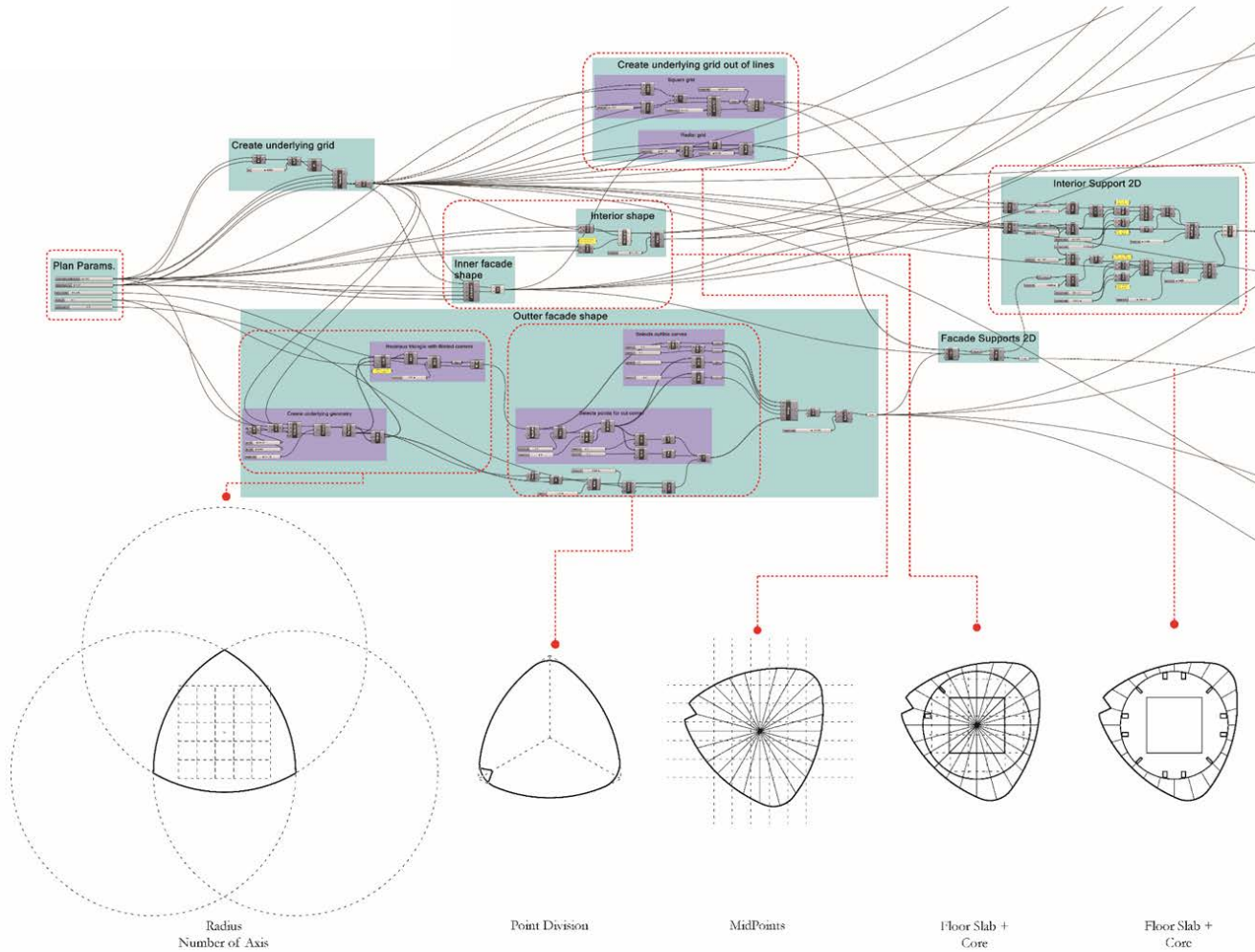
A sample set of four three-dimensional shape rules and their parametric definitions.



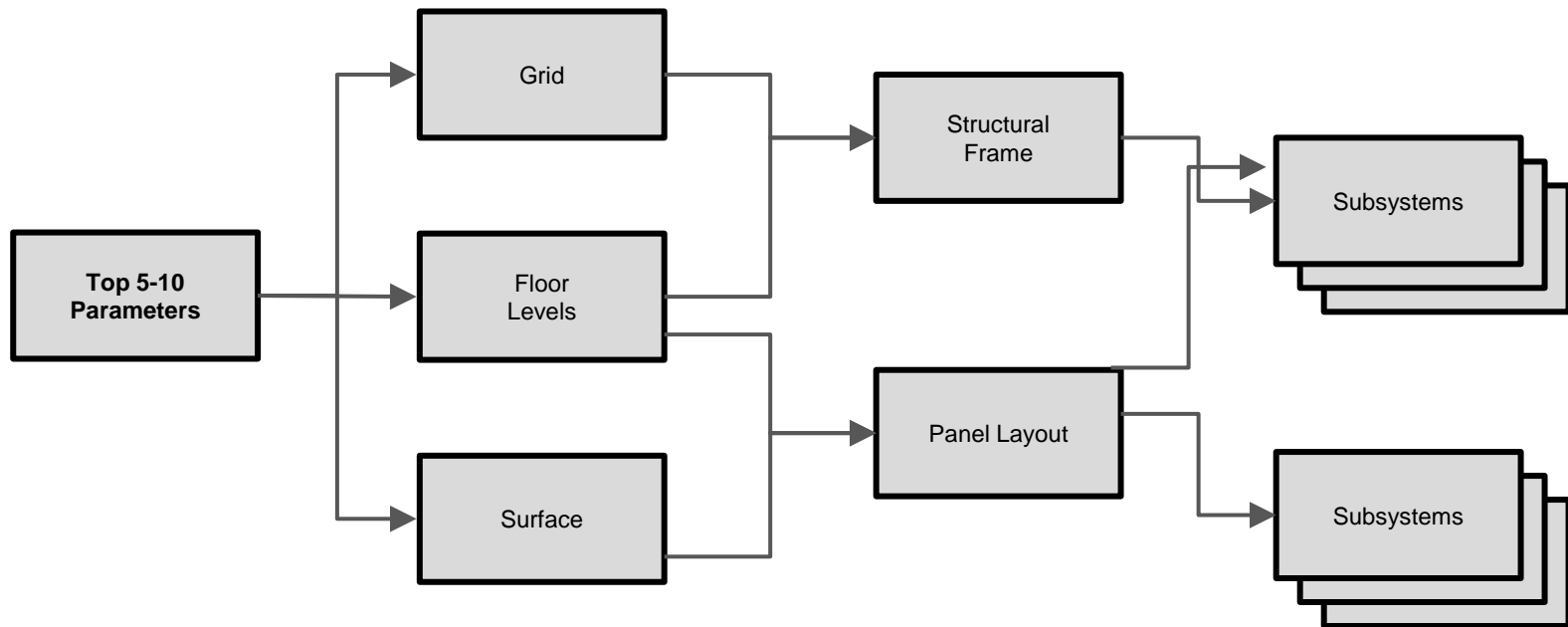
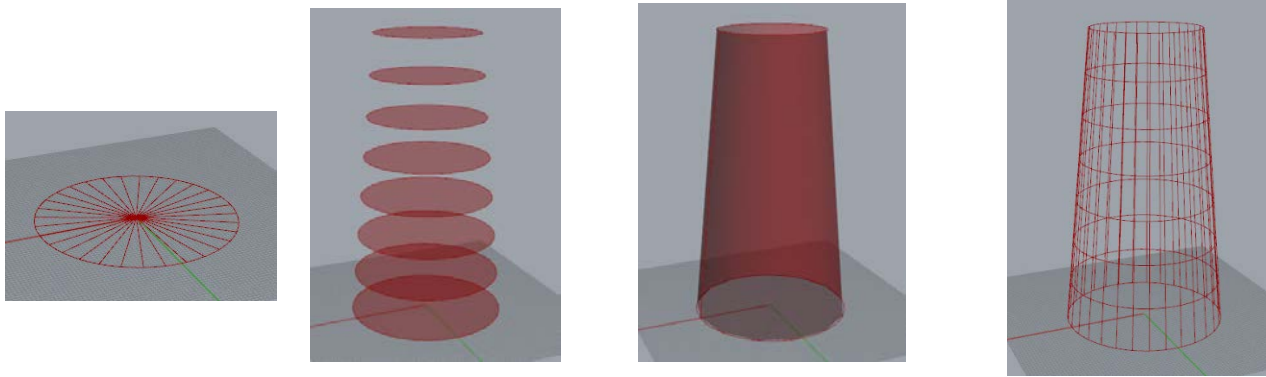
A derivation of the schematic three-dimensional model of the Dirksen Courthouse.

Six sectional models of Miesian courthouse designs all satisfying the requirement of having 24 courtooms and the appropriate volume of public, administrative and support space

PARAMETRIC ENCODINGS



THE CANONICAL ORGANIZATION



BUILDING TYPOLOGIES

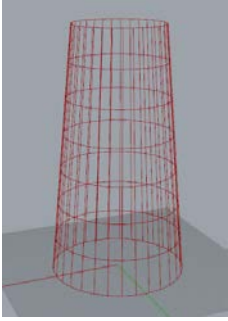
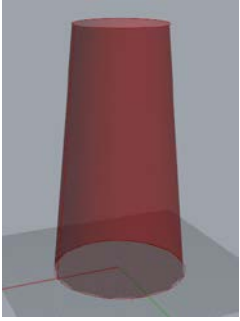
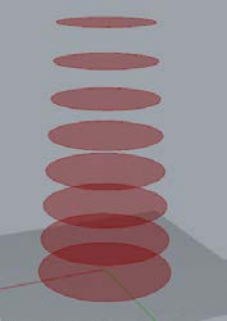
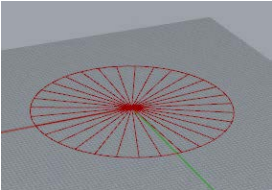
Grid

Levels

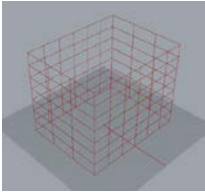
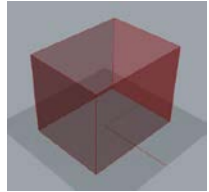
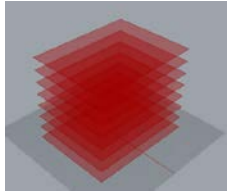
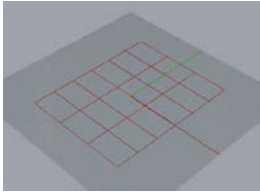
Surface

Intersections

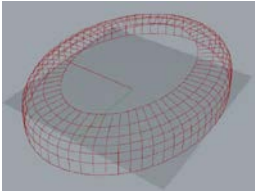
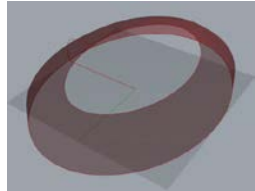
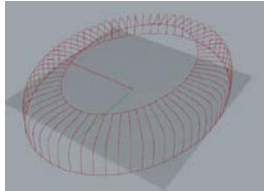
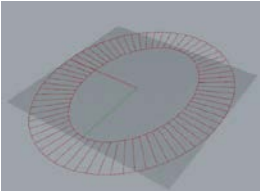
TOWERS



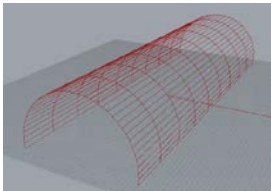
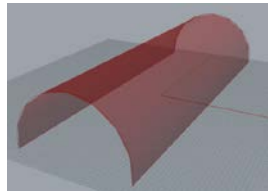
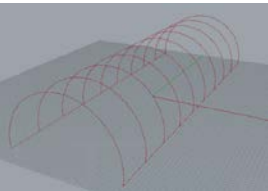
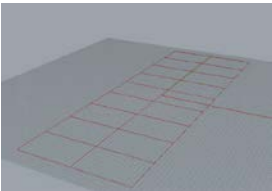
GRID



STADIUM



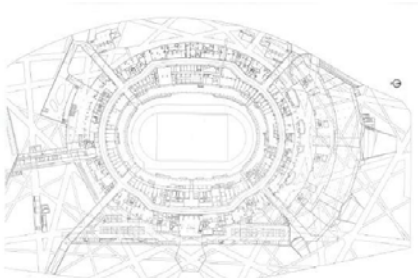
STATION



PRECEDENT | BEIJING NATIONAL STADIUM



Project: Olympic Green in Chaoyang District
 Location: Beijing, China
 Architect: Jacques Herzog & Pierre de Meuron
 Year: September 2007



Site Plan

Inspired by the outward appearance of the bird's nest, the Beijing National Stadium was designed to incorporate Chinese art and culture. It consists of two independent structures that are situated 50 feet apart: a red concrete seating bowl and the outer steel frame. The stadium is considered the world's largest enclosed space with a gross volume of three million cubic meters and is also the world's largest steel structure with 26 kilometers of unwrapped steel. It extends 333 meters from north to south and 294 meters from east to west, with a height of 69.2 meters (226 feet, equivalent to 20 stories); each half of the stadium is nearly symmetrical. The complex geometry of the facade is based on a main structure of 24 pillars, with interwoven grid-like structures to produce a dramatic visual effect.



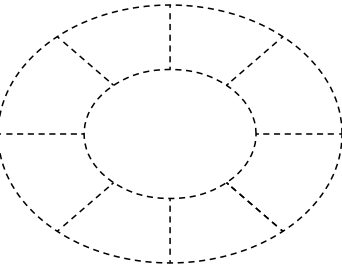
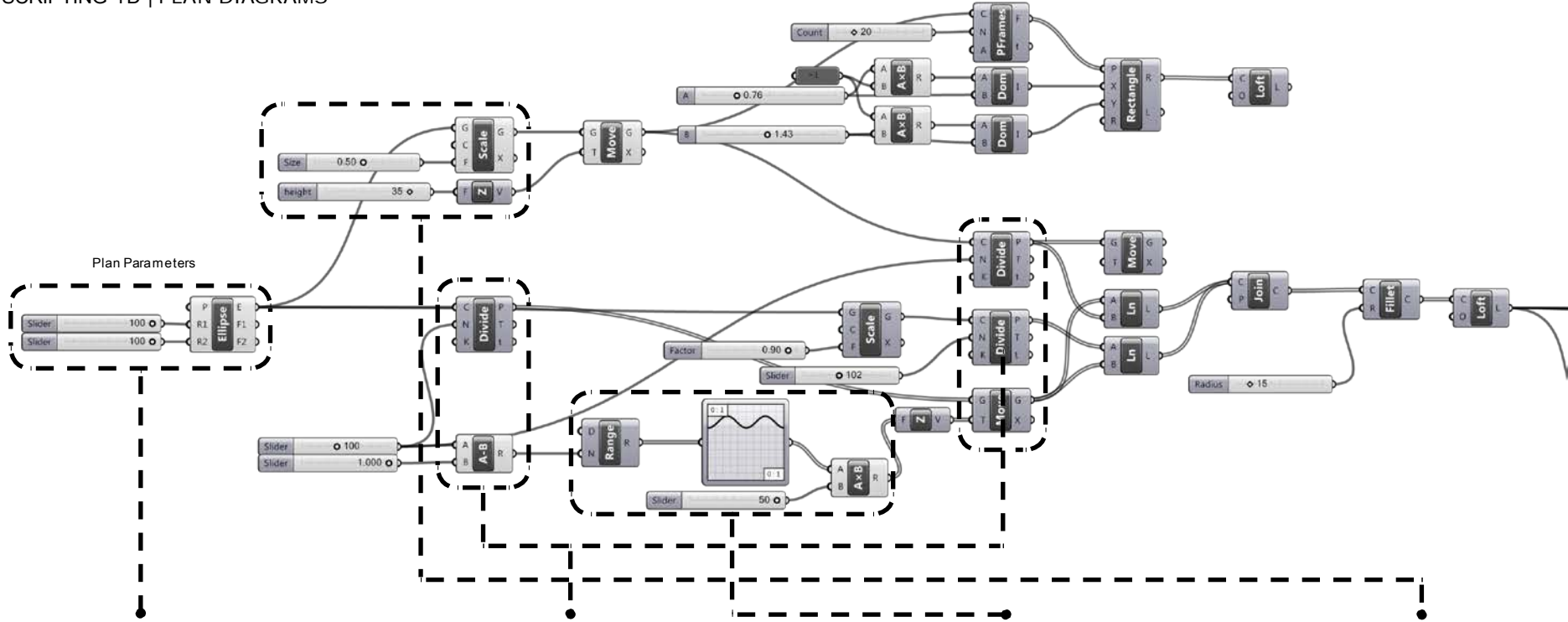
North-South Section

The innovative structure of the Beijing National Stadium was designed for the 2008 Summer Olympics with a capacity of 91,000 people. It staged the opening and closing ceremonies, athletic events, and football final. The stadium also hosted the 2008 Summer Paralympics and continues to host other sporting events as well as concerts. In 2022 the stadium will be used for the Summer and Winter Olympics and Paralympics. EFTA was inserted between the several beams of steel to enable the passage of light, one of the concepts of the Bird's Nest. Located in an earthquake zone, it was constructed to withstand the earth's movement structure to handle considerable seismic activity. The main criteria for the stadium included a stadium capacity of approximately 100,000 people, a multi-functional design, to efficiently incorporate a range of uses in the future, and an emphasis on green building and advanced technology.

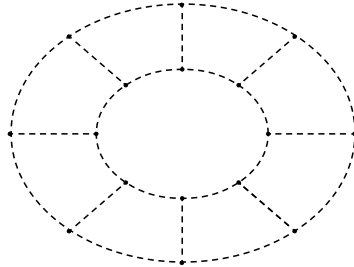


East-West Section

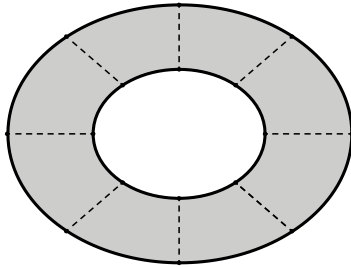
SCRIPTING 1D | PLAN DIAGRAMS



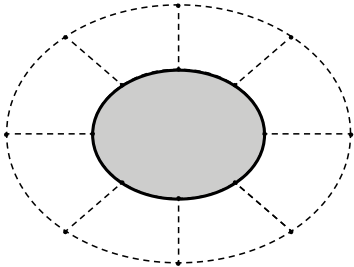
Radius



Point Division

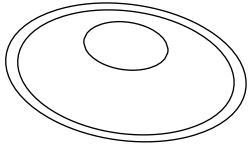
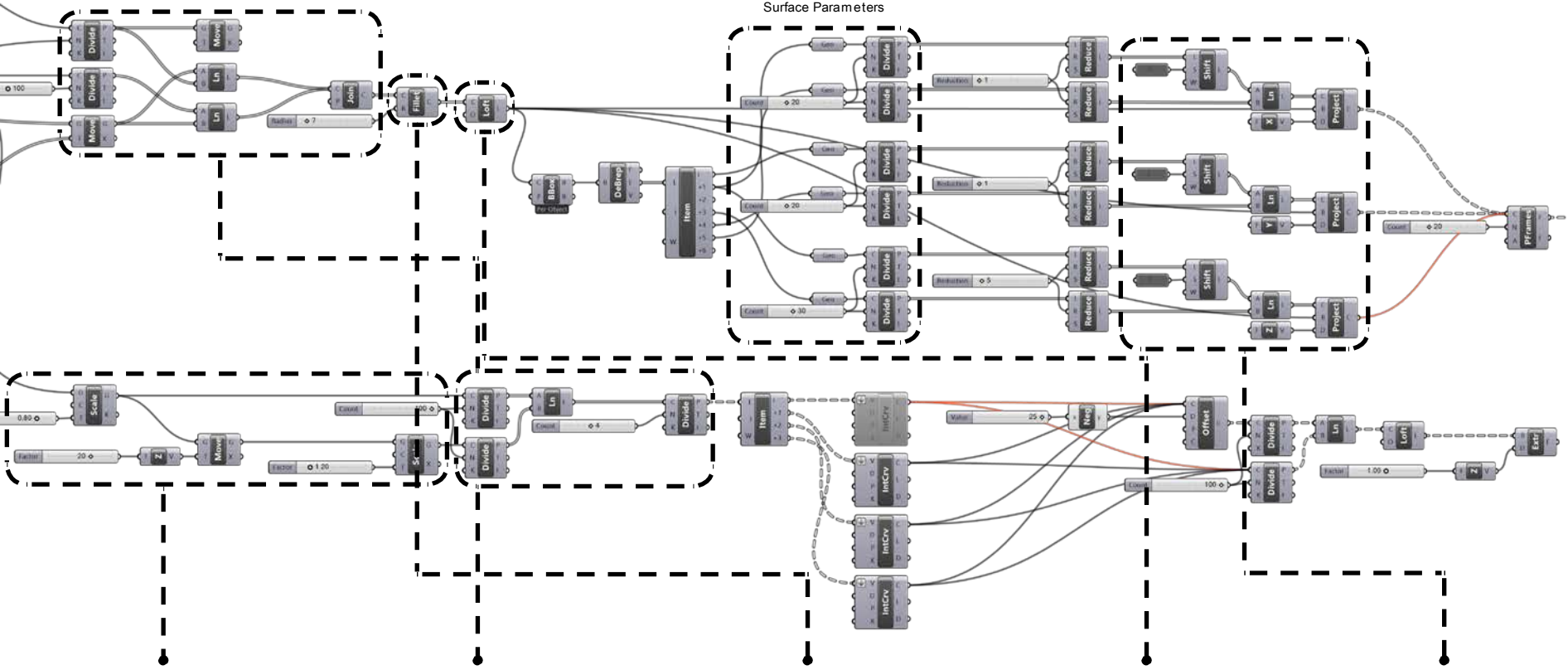


Envelope



Core

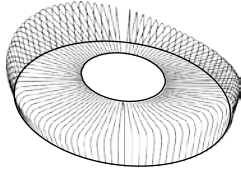
SCRIPTING 2D | SURFACE DIAGRAM



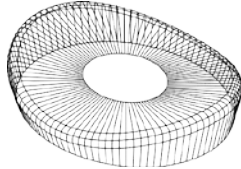
Scale



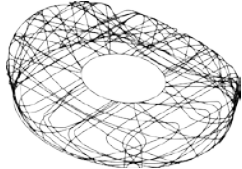
Divide & Join



Fillet

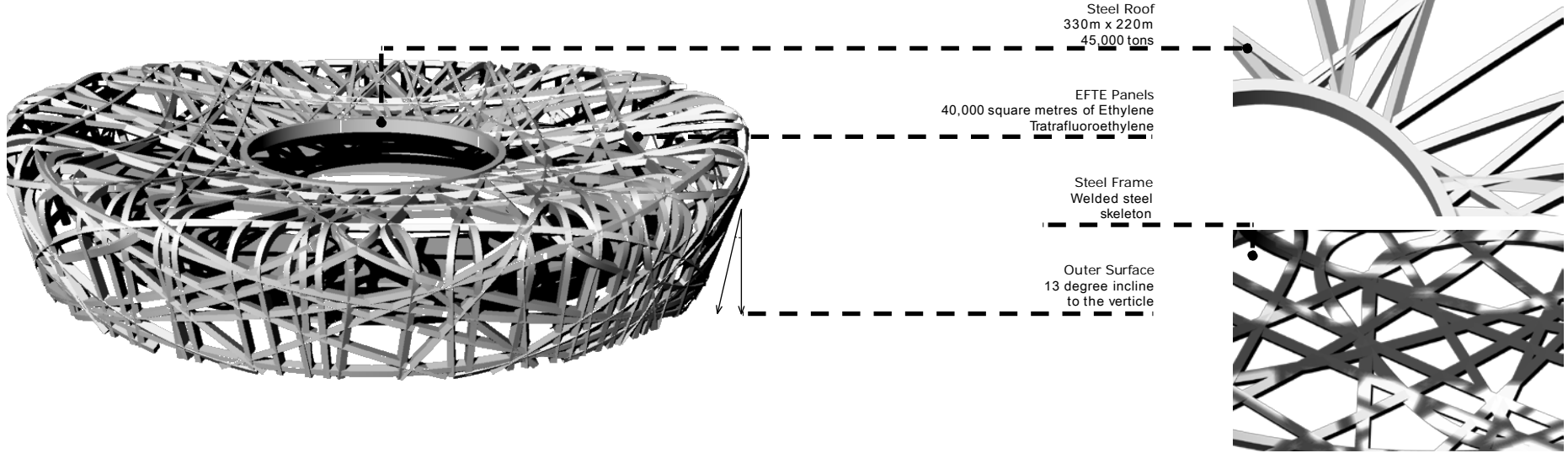


Loft

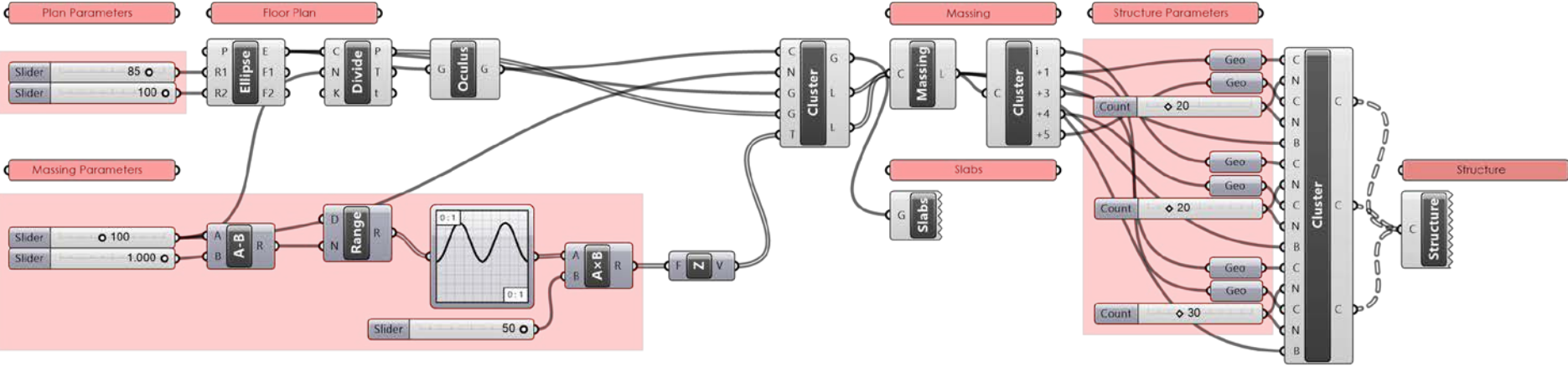


Shift & Project

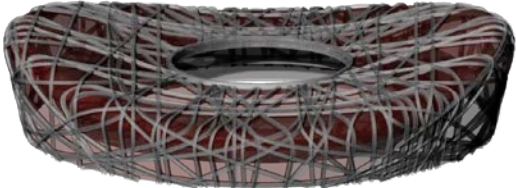
FACADE DETAIL



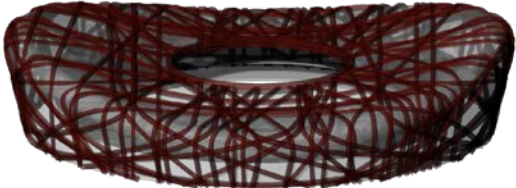
SYSTEM DIAGRAMS



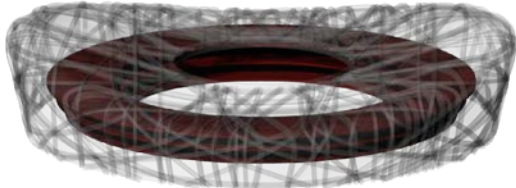
VARIATION MATRIX 3D | MASSING



Surface



Structure



Floor Slabs

