

An architectural rendering of a modern building complex. The main building is a multi-story, white, curved structure with several levels of balconies and terraces. It features a series of dark, horizontal slats on its upper levels. To the left, there is a historic stone building with arched windows. The foreground shows a paved area with some trees and a small, circular, landscaped area with yellow flowers. The background includes a green lawn and a row of trees.

INTEGRATED STUDIO SEMINAR BOOKLET

Four Freedoms Center

Alexander Llantada

ARCH 564-006

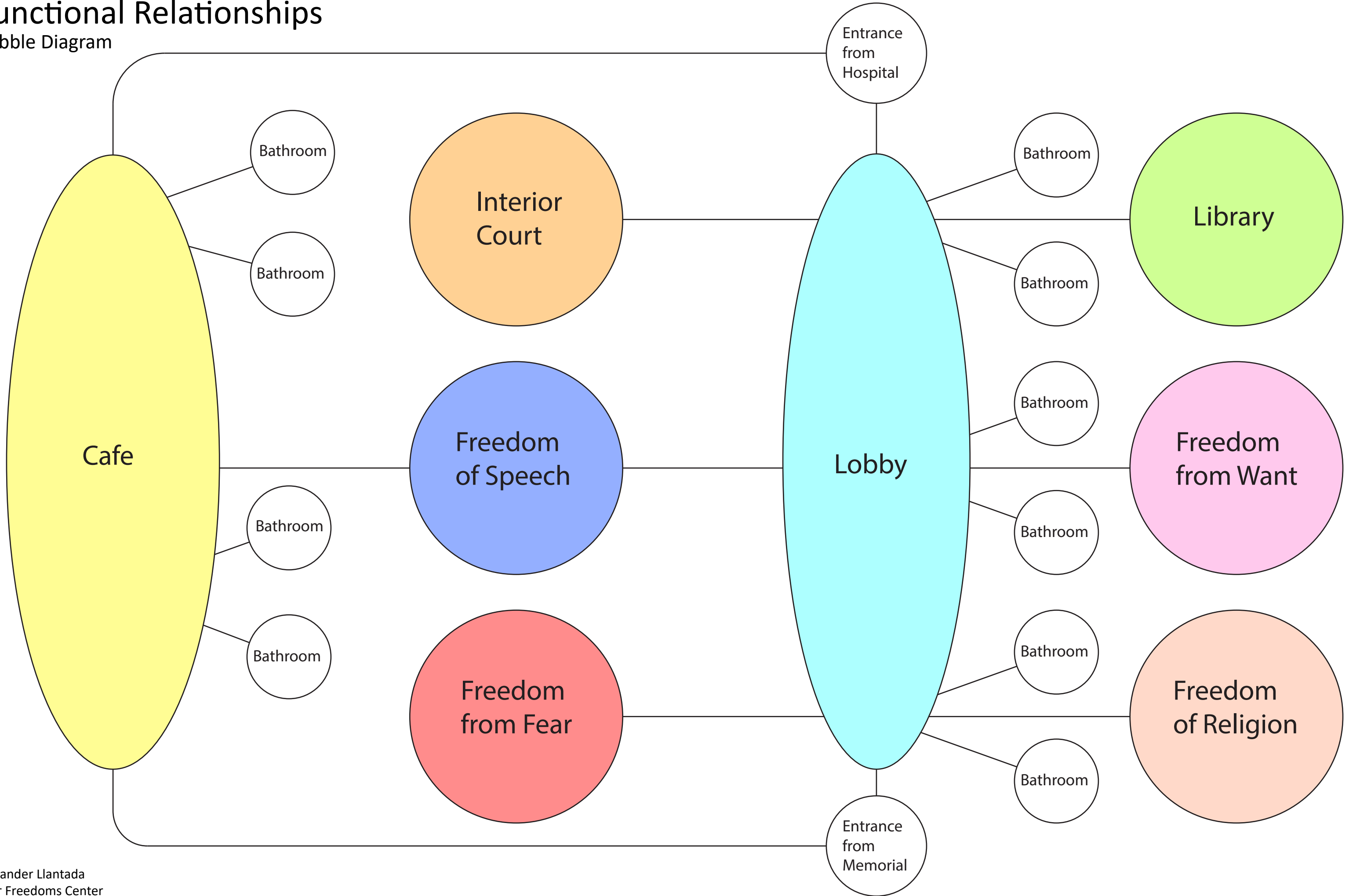
Table of Contents

User Requirements	p.03
Regulatory Requirements	p.28
Site Conditions	p.40
Environmental Concerns	p.44
Accessible Design	p.55
Building Envelope Systems and Assemblies	p.62
Structural Systems	p.68
Environmental Control Systems	p.75
Life Safety Systems	p.82
Environmental Simulations	p.90

User Requirements

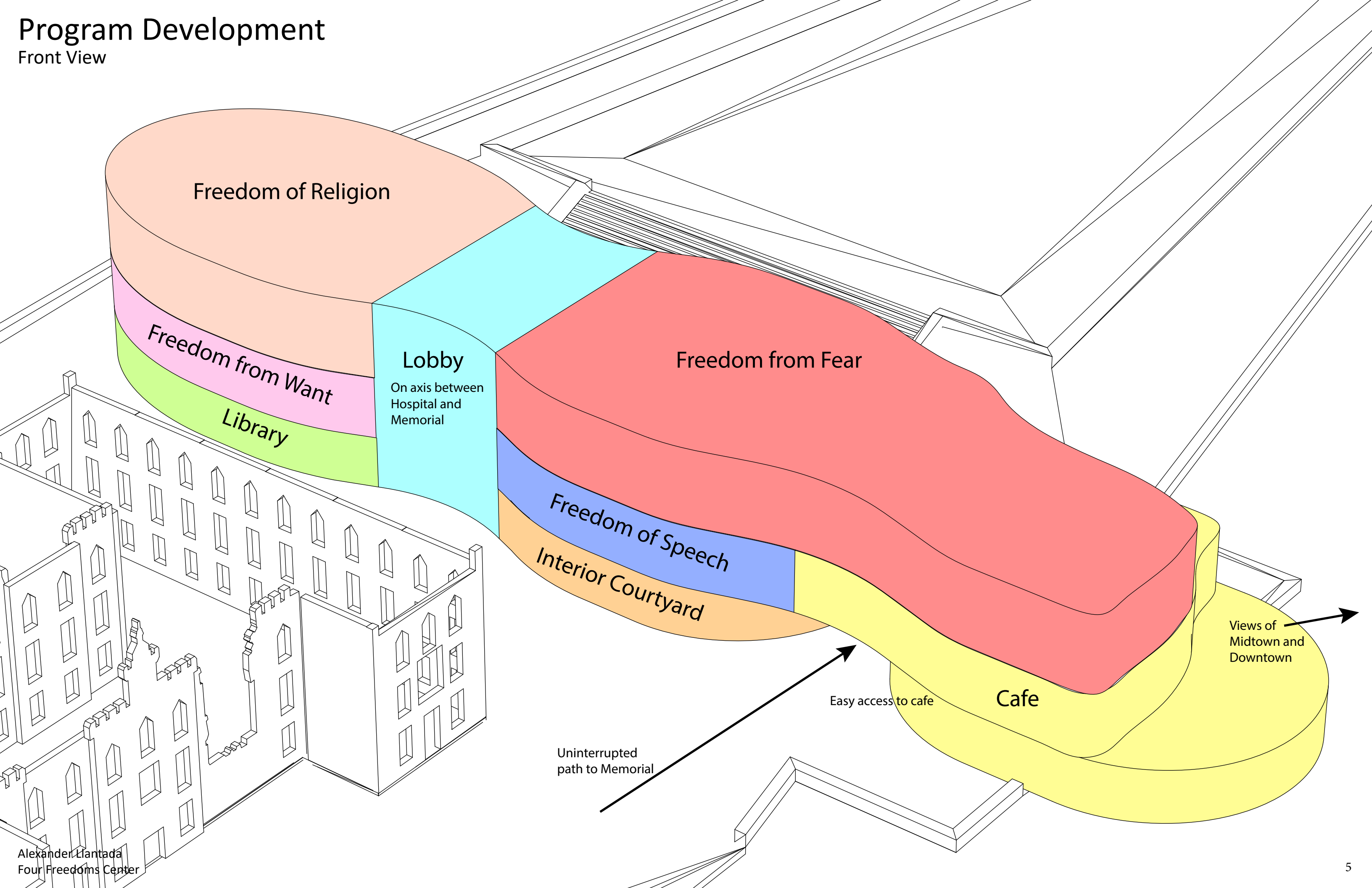
Functional Relationships

Bubble Diagram



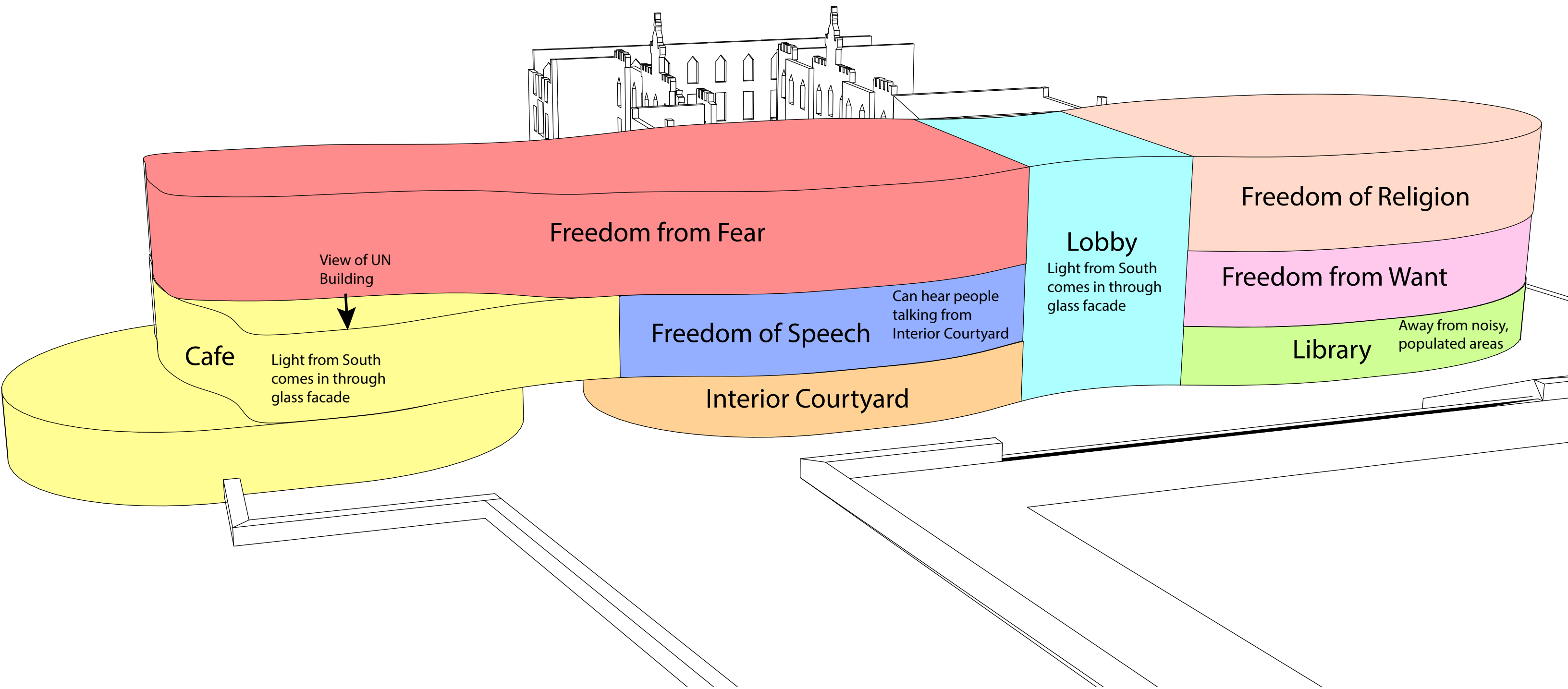
Program Development

Front View



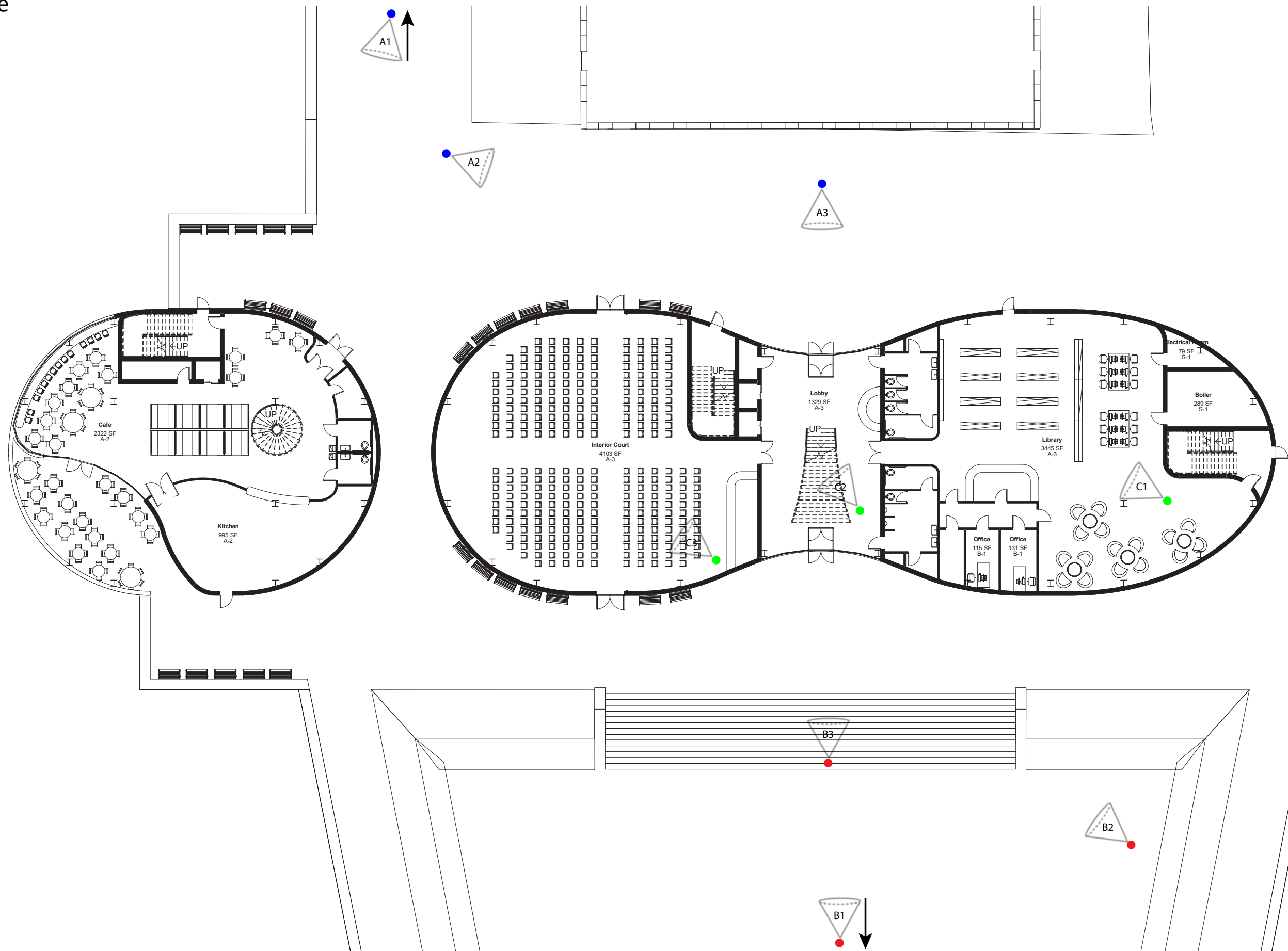
Program Development

Back View



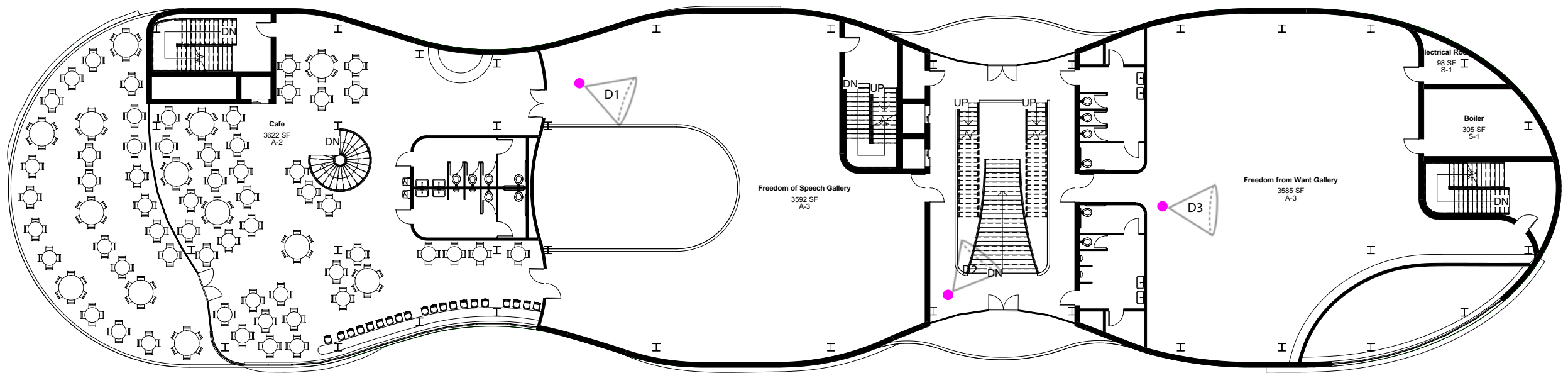
Wayfinding

Level 1 Guide



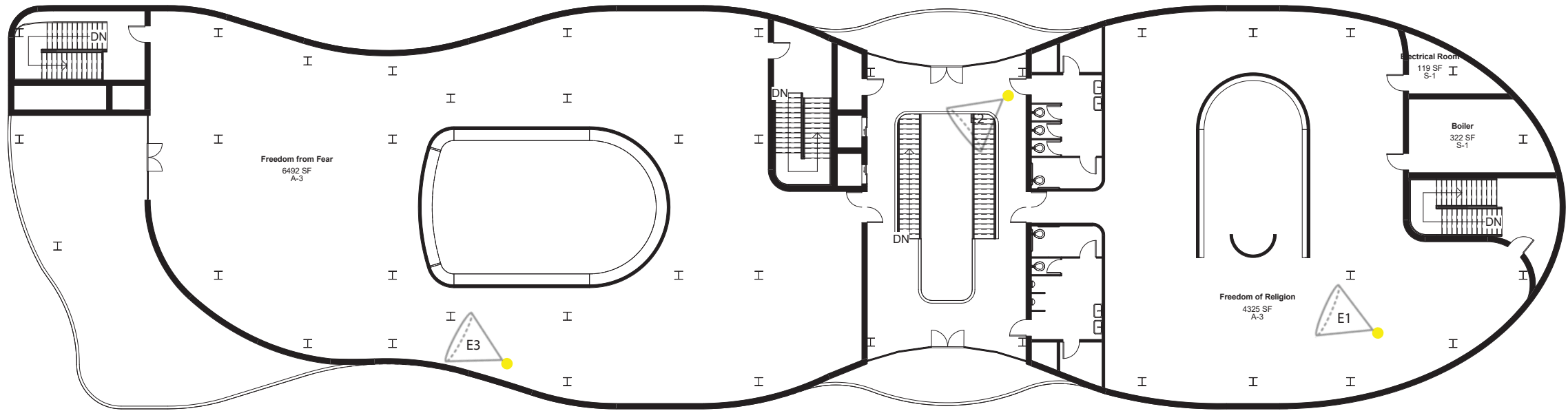
Wayfinding

Level 2 Guide



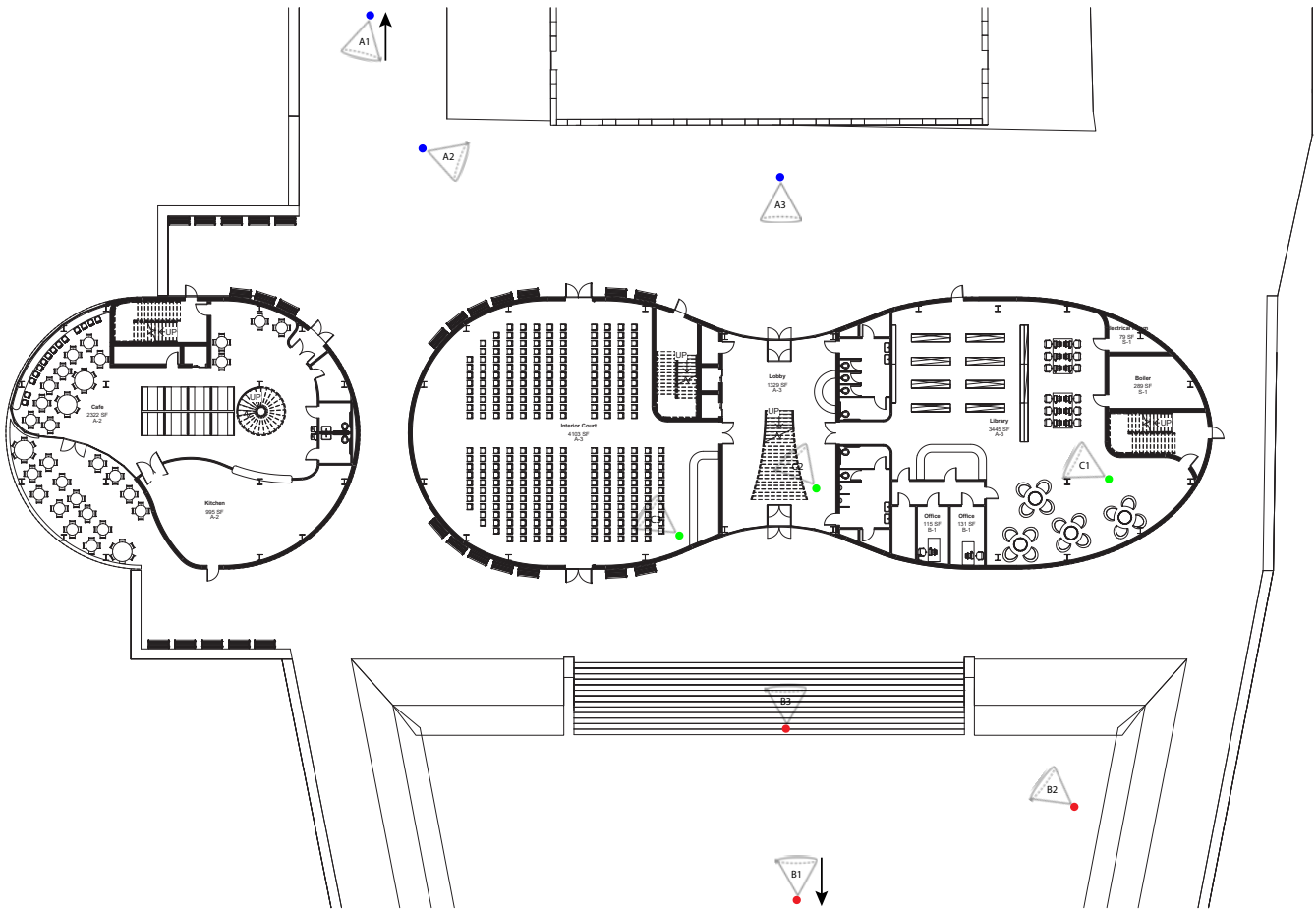
Wayfinding

Level 3 Guide



Wayfinding

A



A1



A2

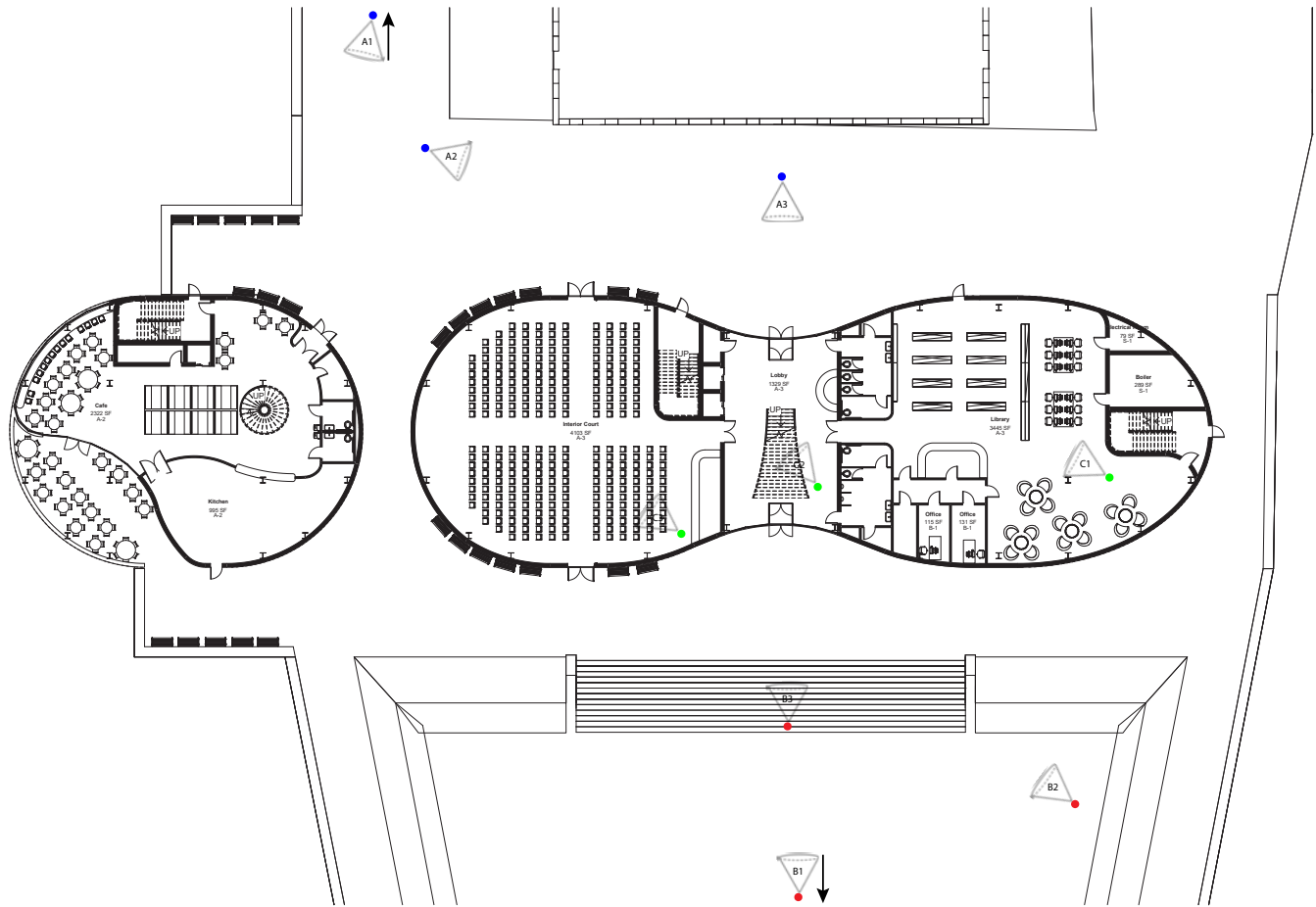


A3



Wayfinding

B



B2



B1

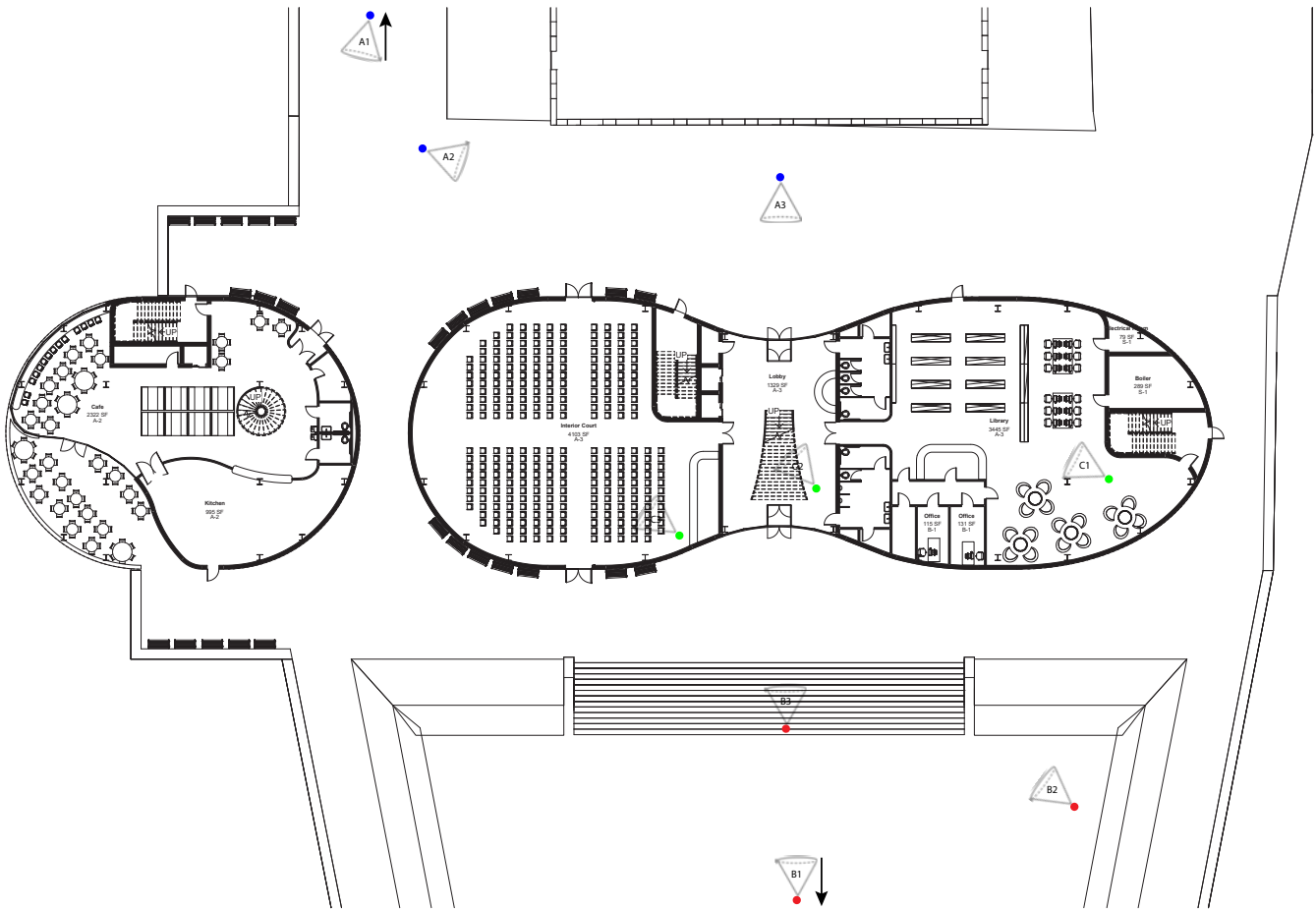


B3



Wayfinding

C



C2



C1

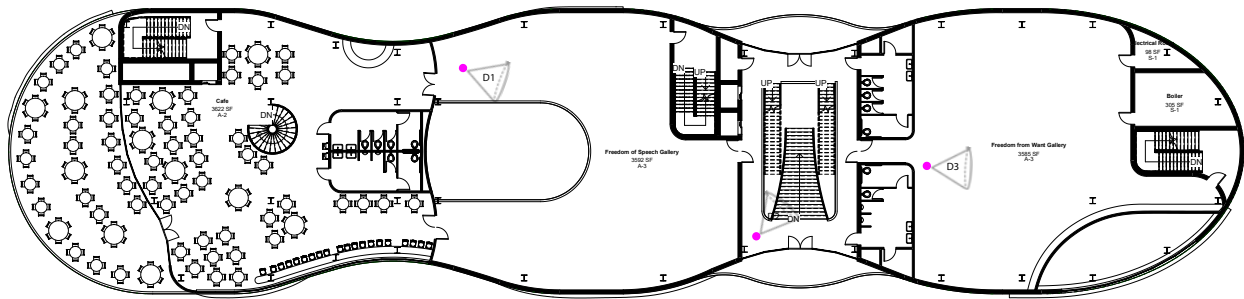


C3



Wayfinding

D



D1



D2

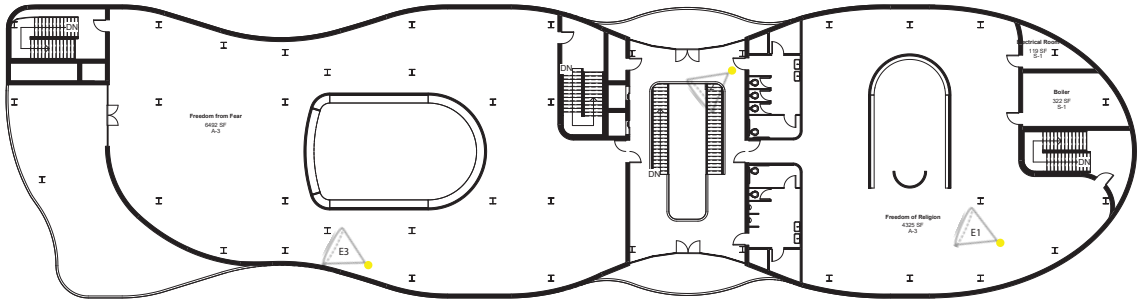


D3



Wayfinding

E



E1



E2

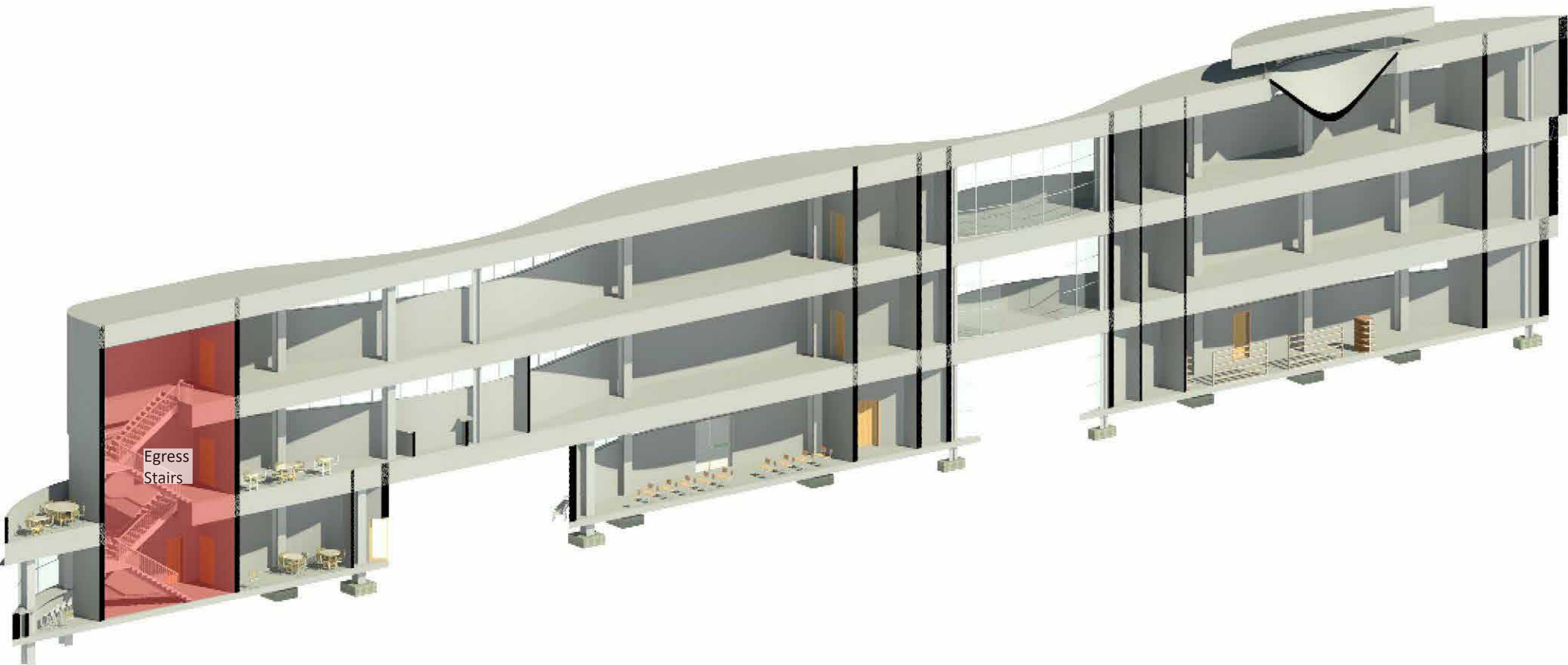


E3



Circulation

Elevators and Stairs



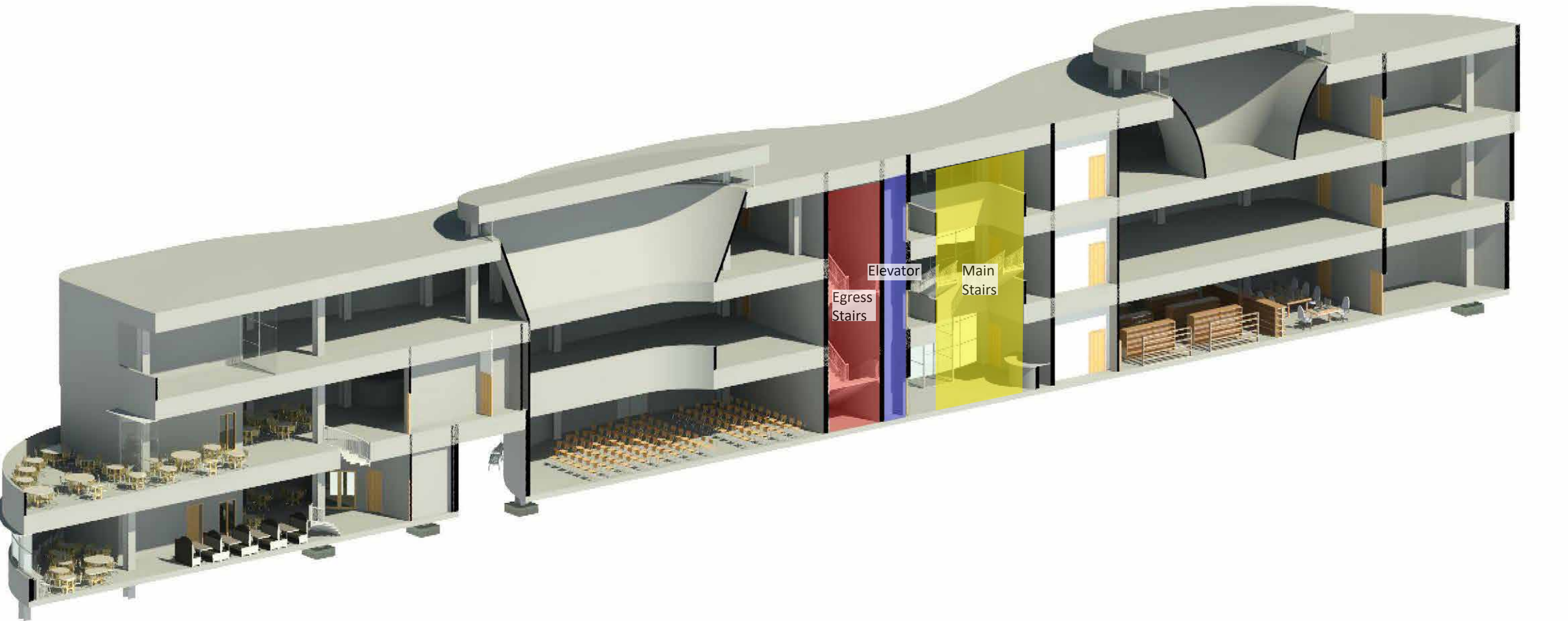
Circulation

Elevators and Stairs



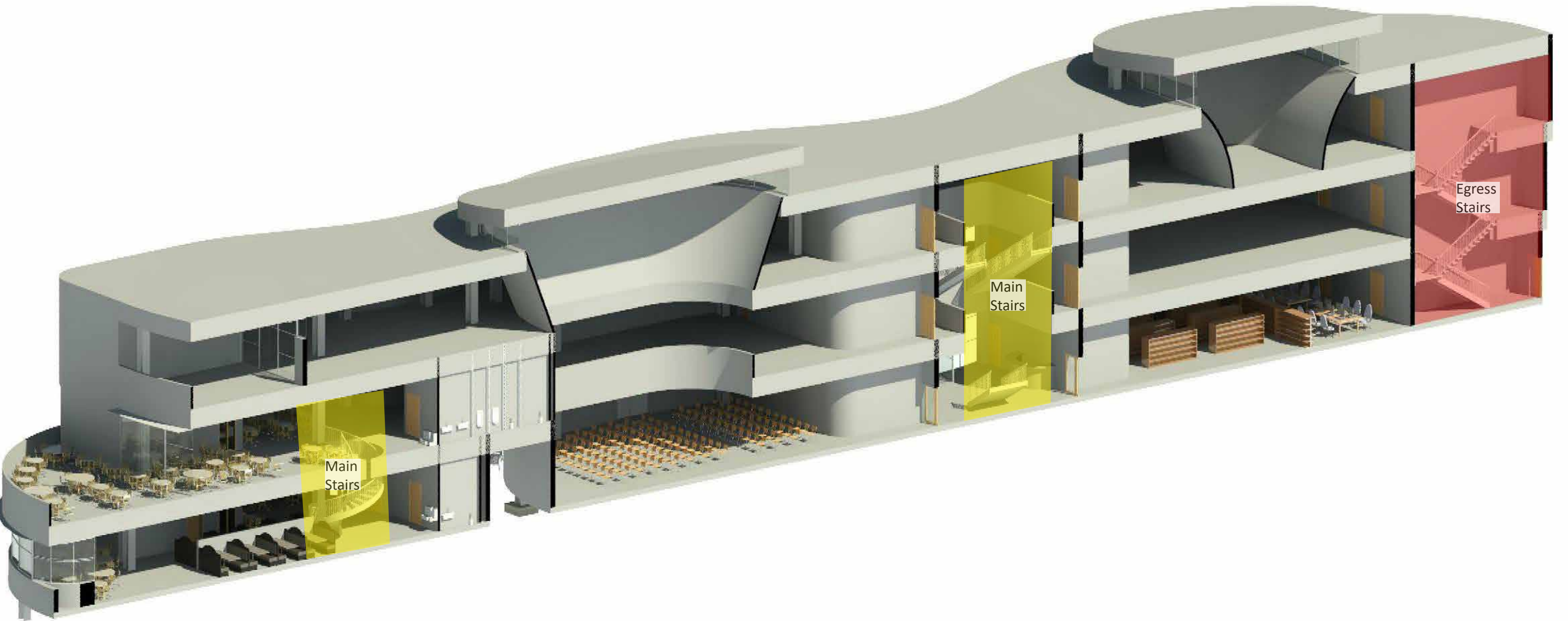
Circulation

Elevators and Stairs



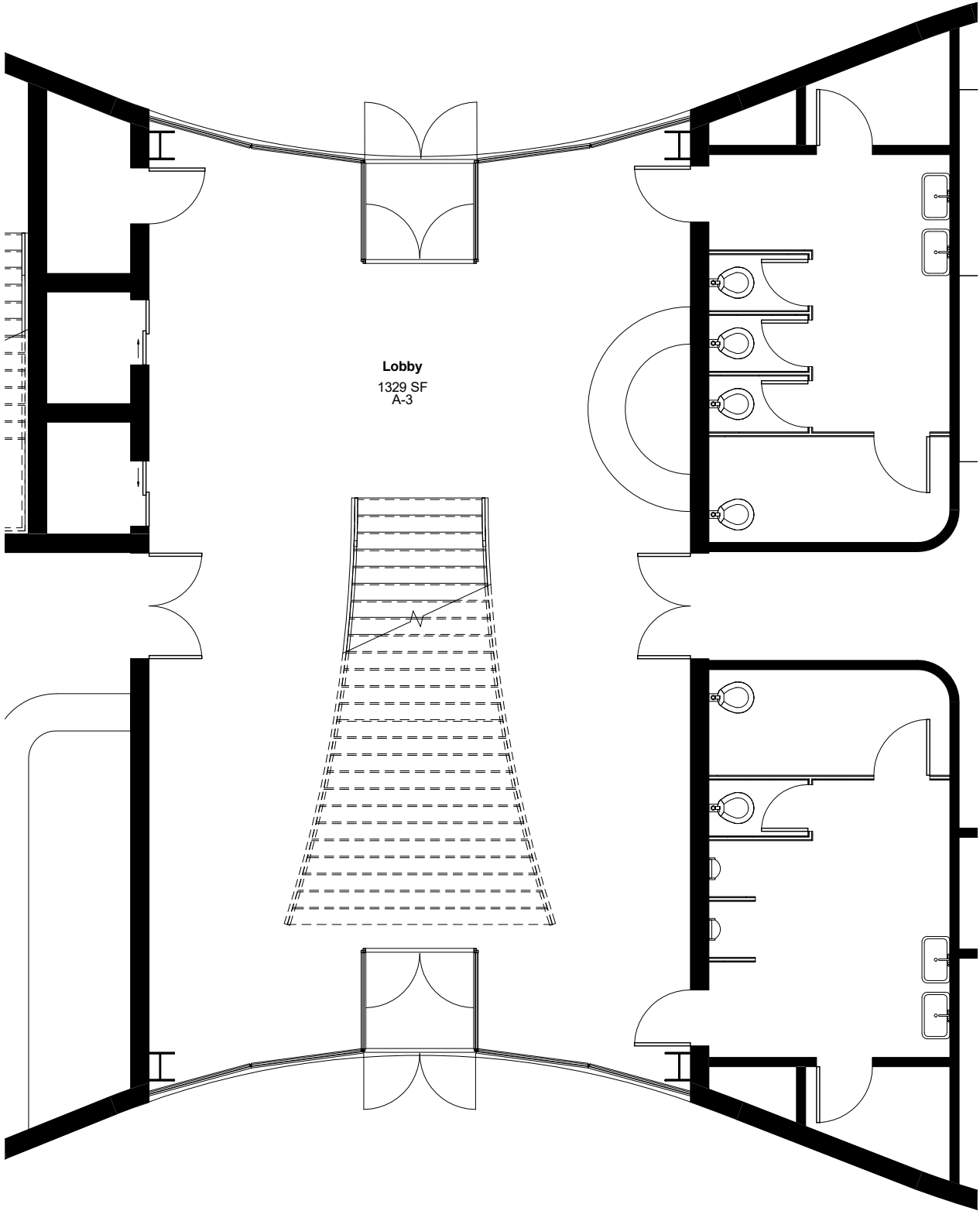
Circulation

Elevators and Stairs



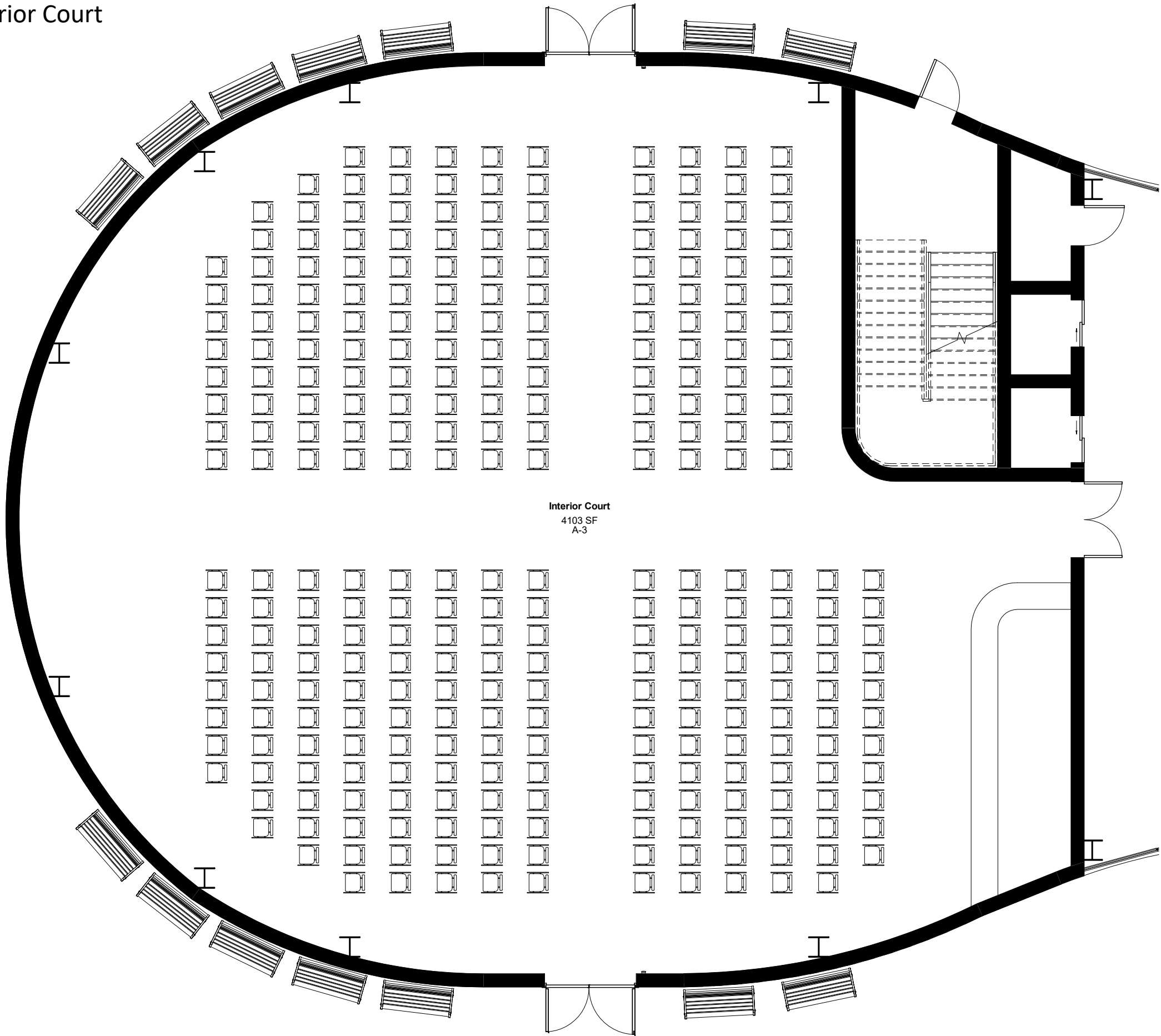
Social Conditions

Lobby



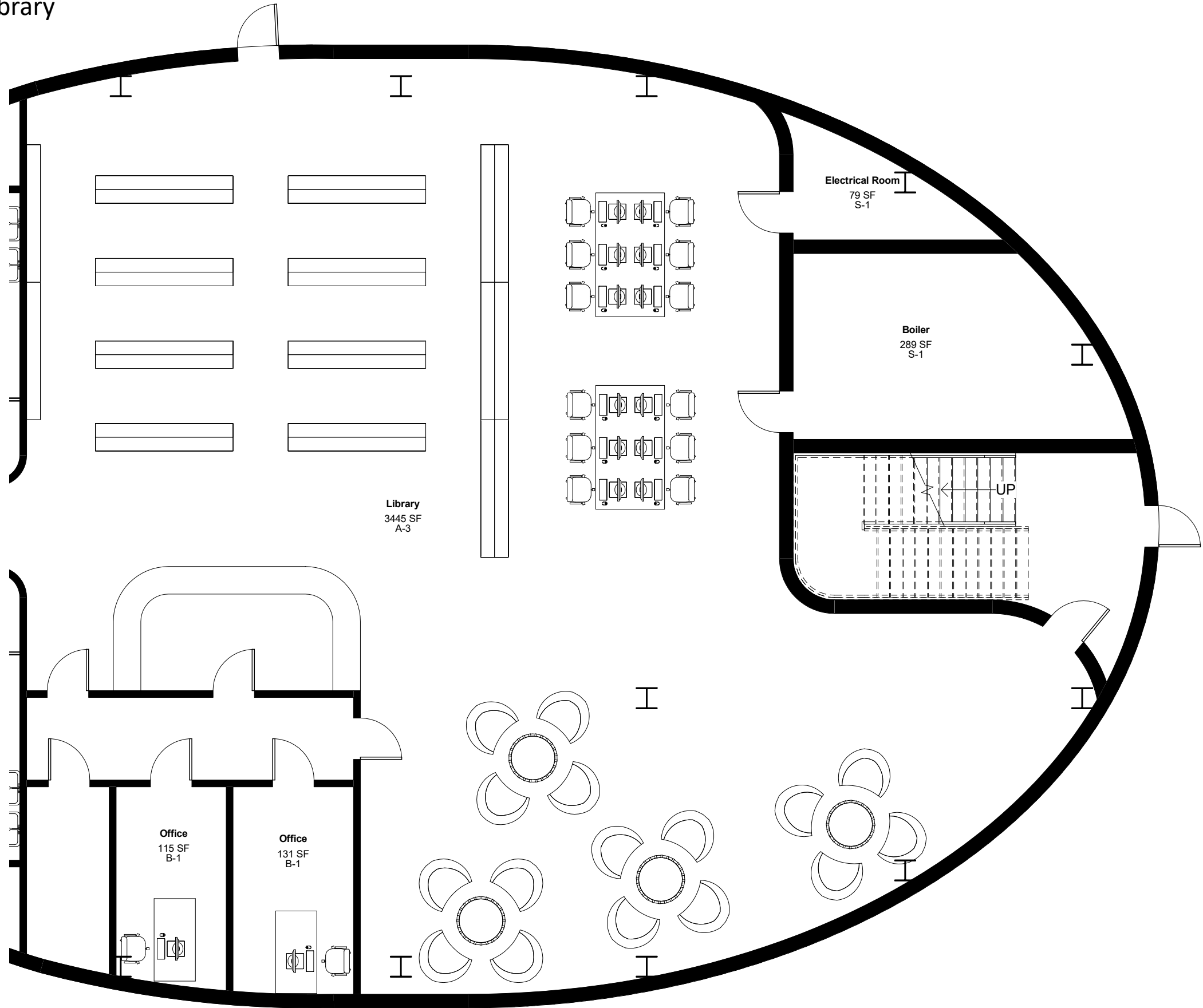
Social Conditions

Interior Court



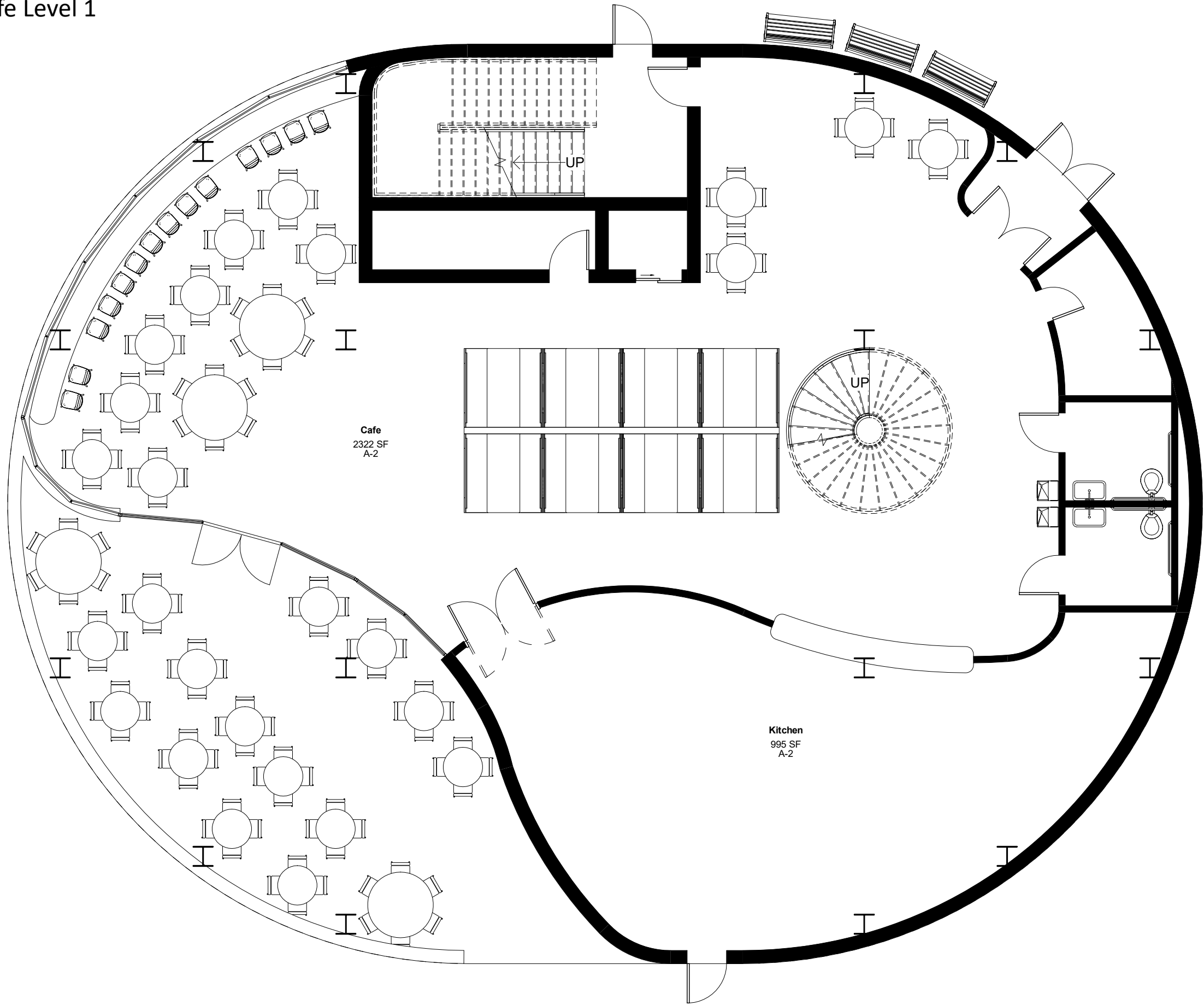
Social Conditions

Library



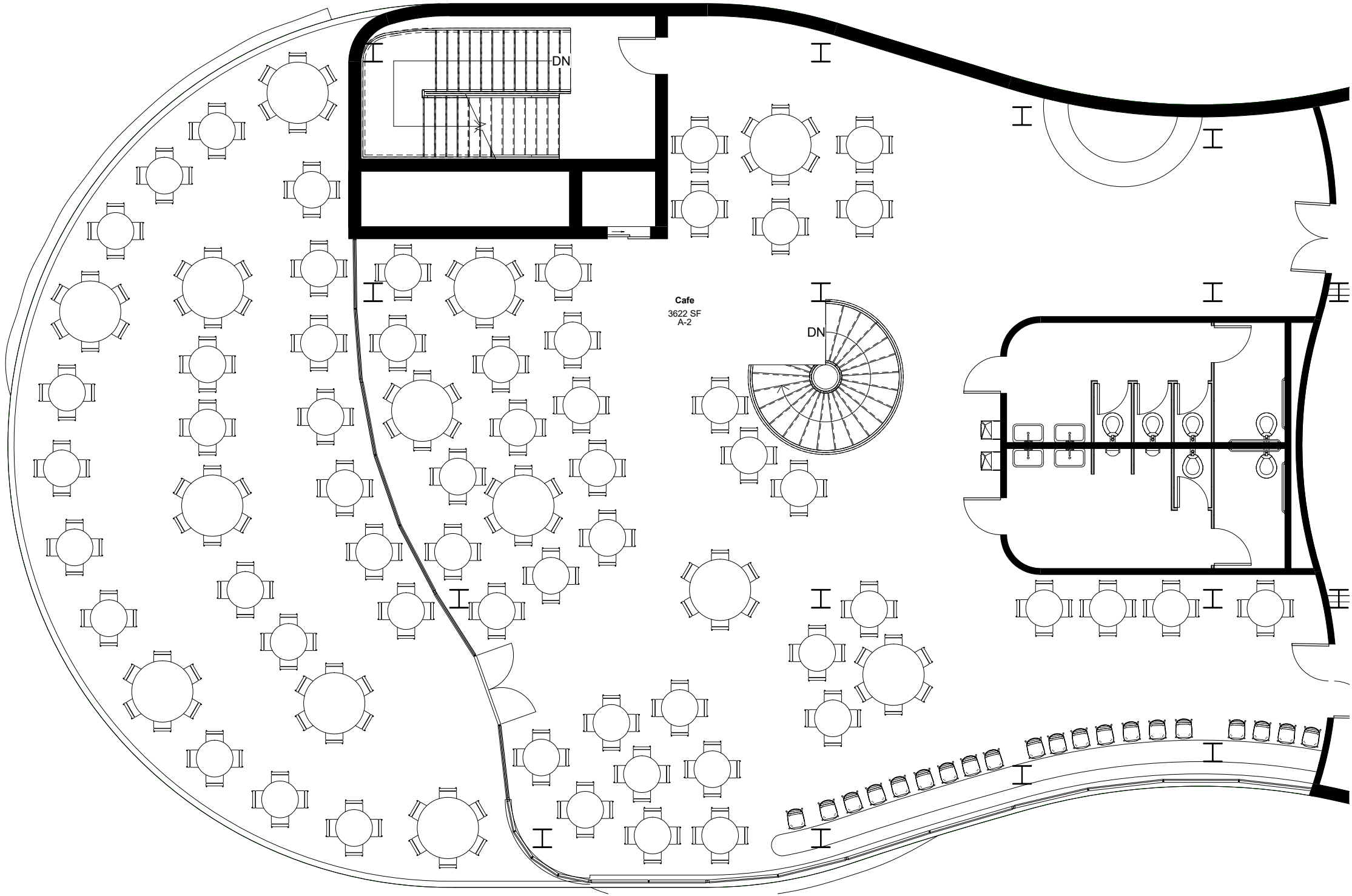
Social Conditions

Cafe Level 1



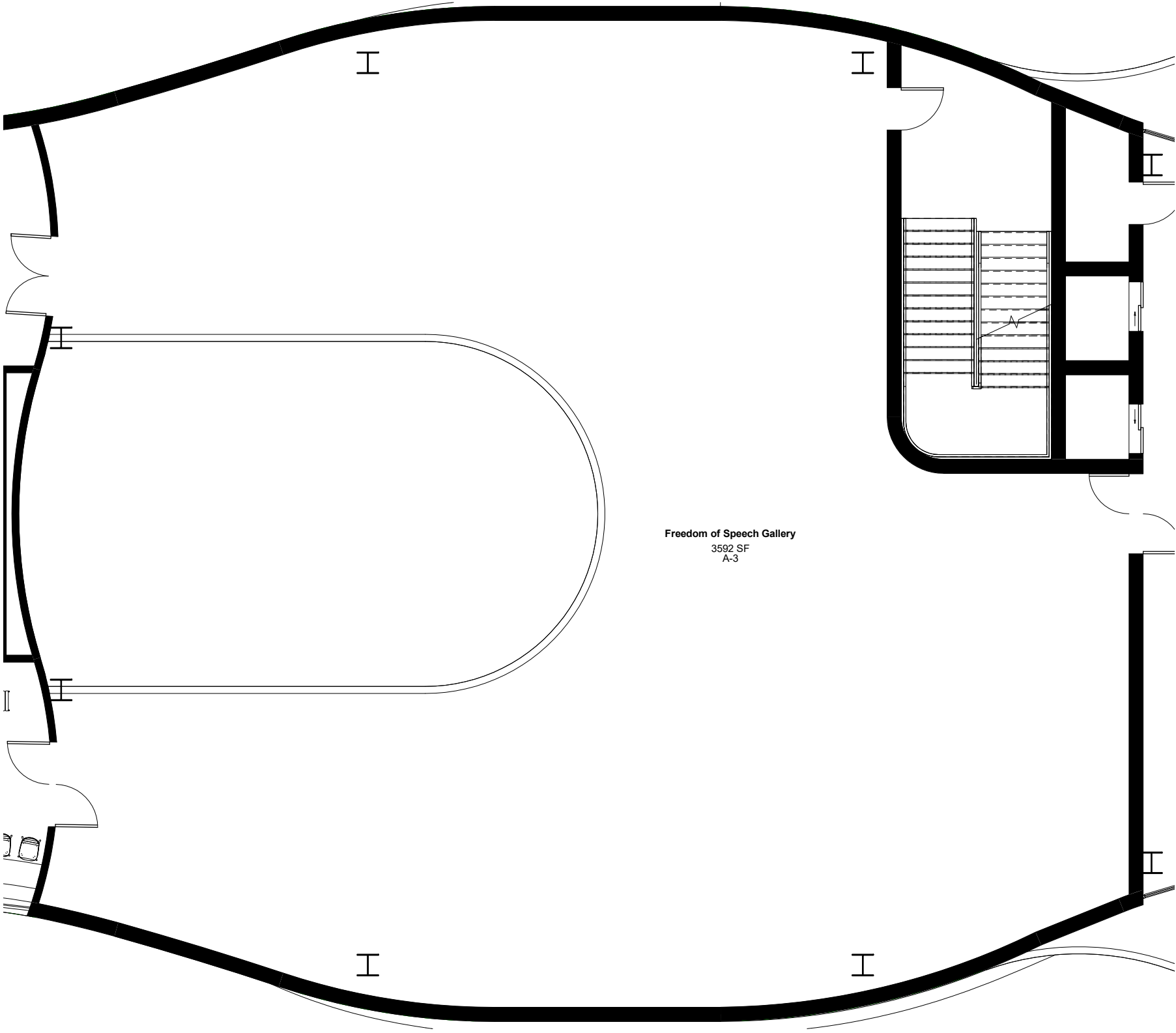
Social Conditions

Cafe Level 2



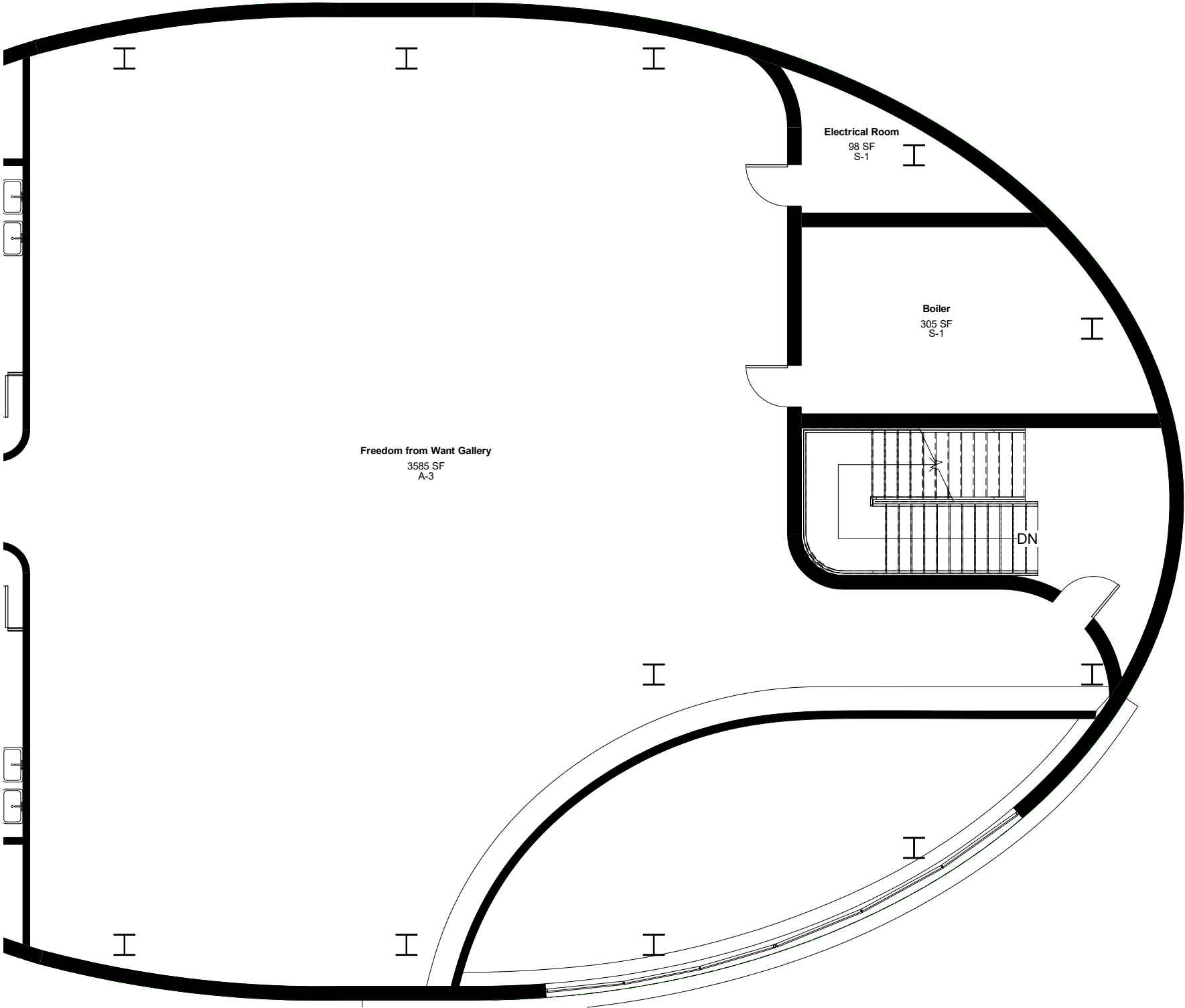
Social Conditions

Freedom of Speech Gallery



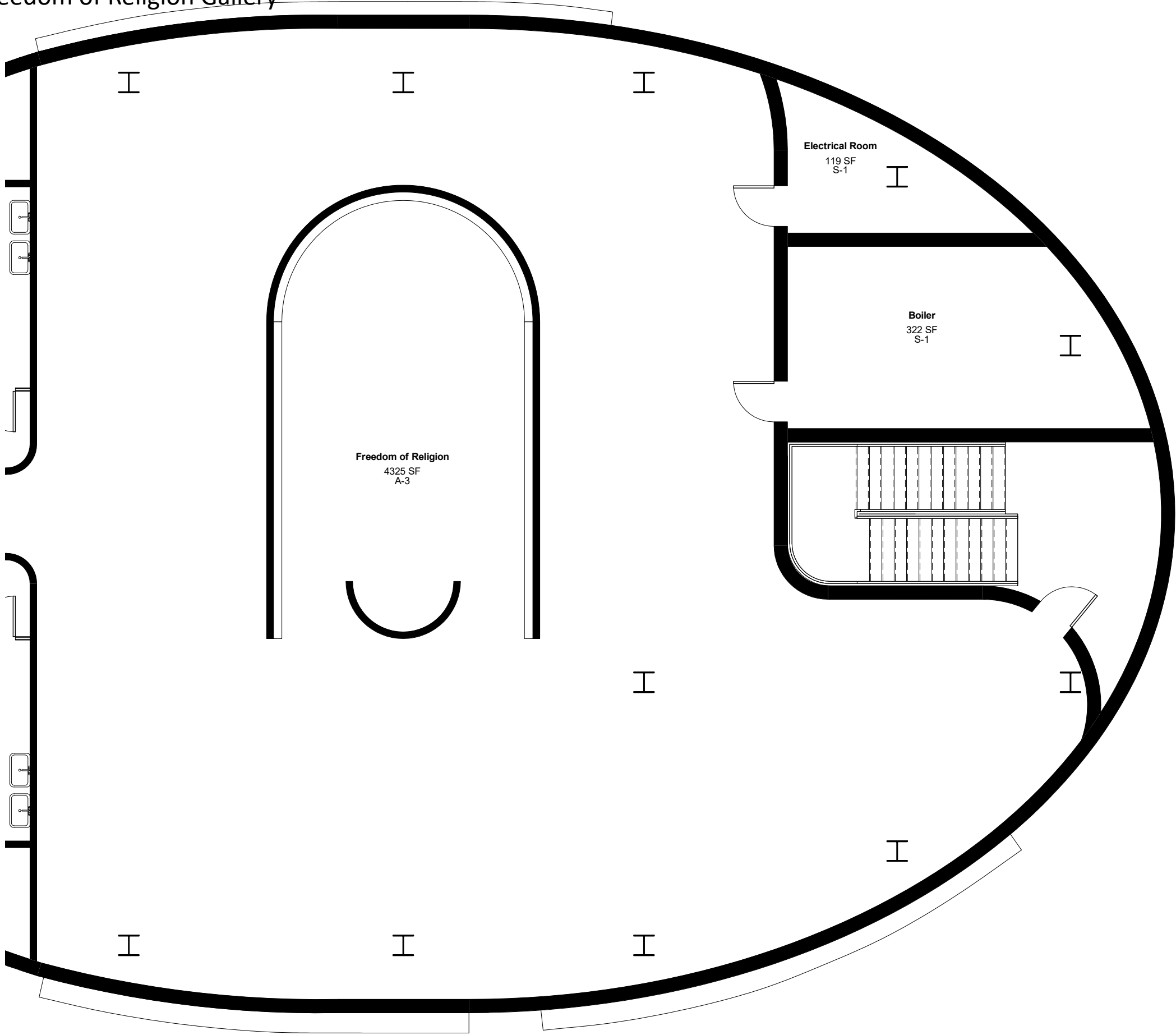
Social Conditions

Freedom from Want Gallery



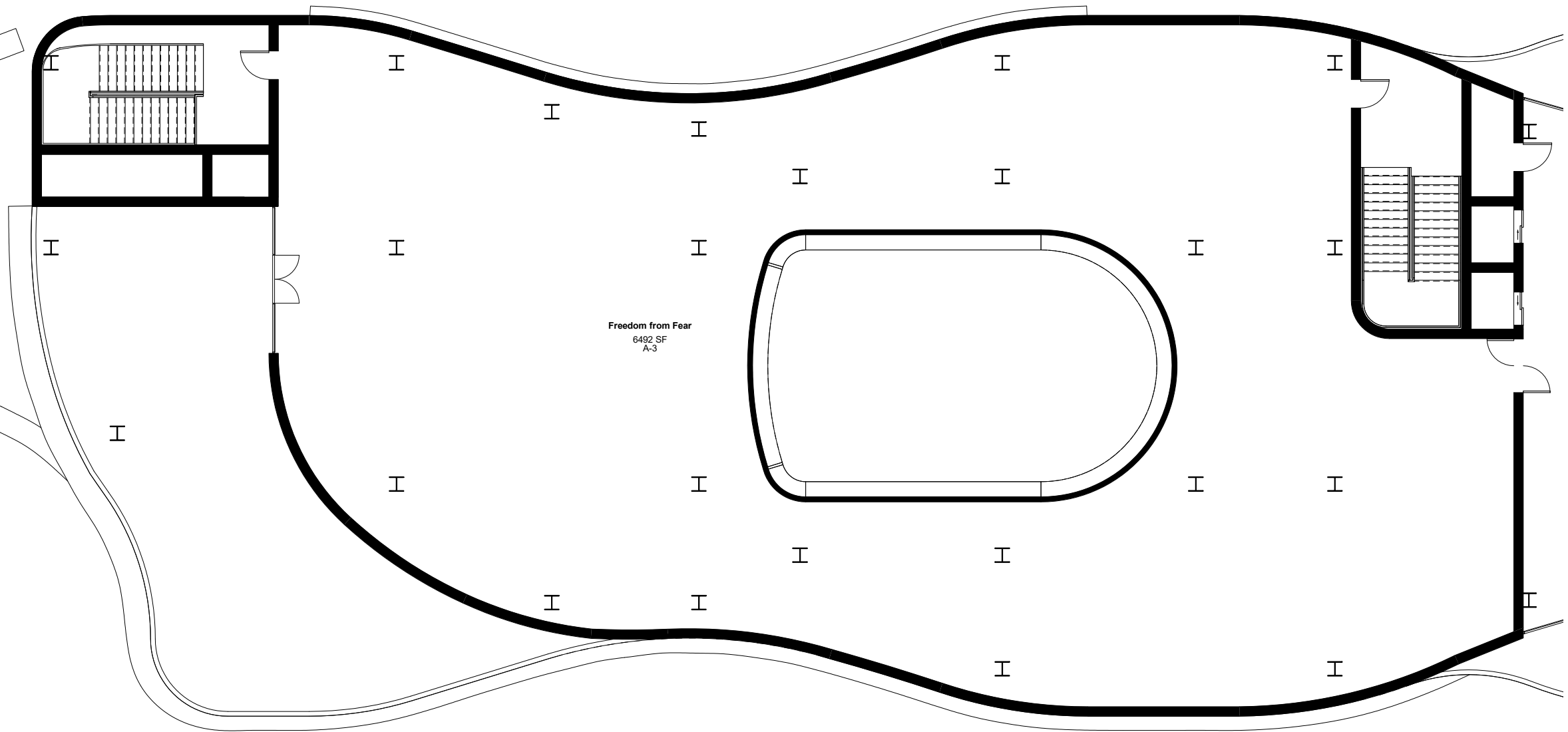
Social Conditions

Freedom of Religion Gallery



Social Conditions

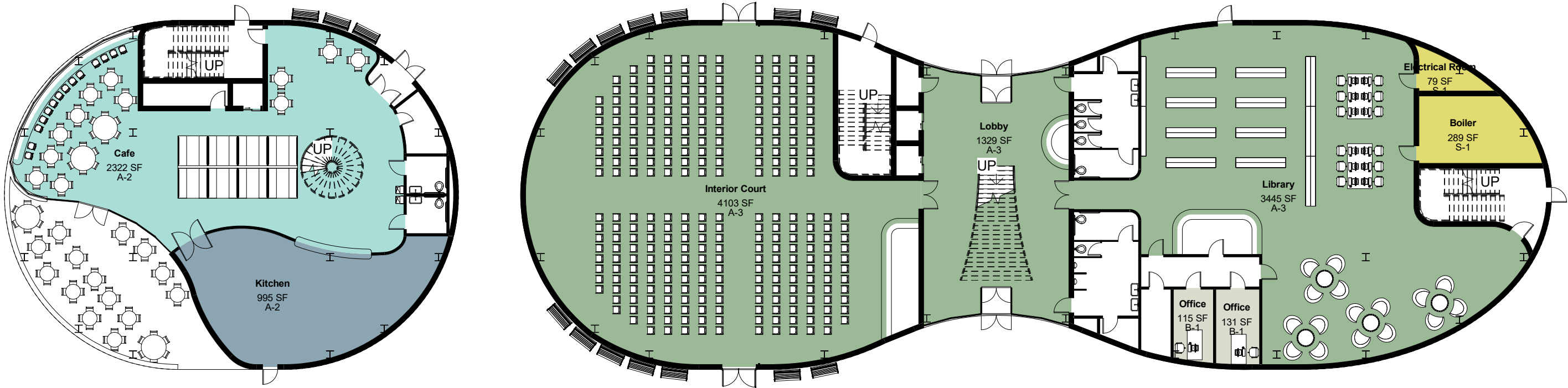
Freedom from Fear Gallery



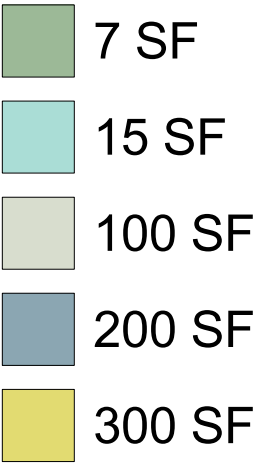
Regulatory Requirements

Occupancy Types

1st Floor

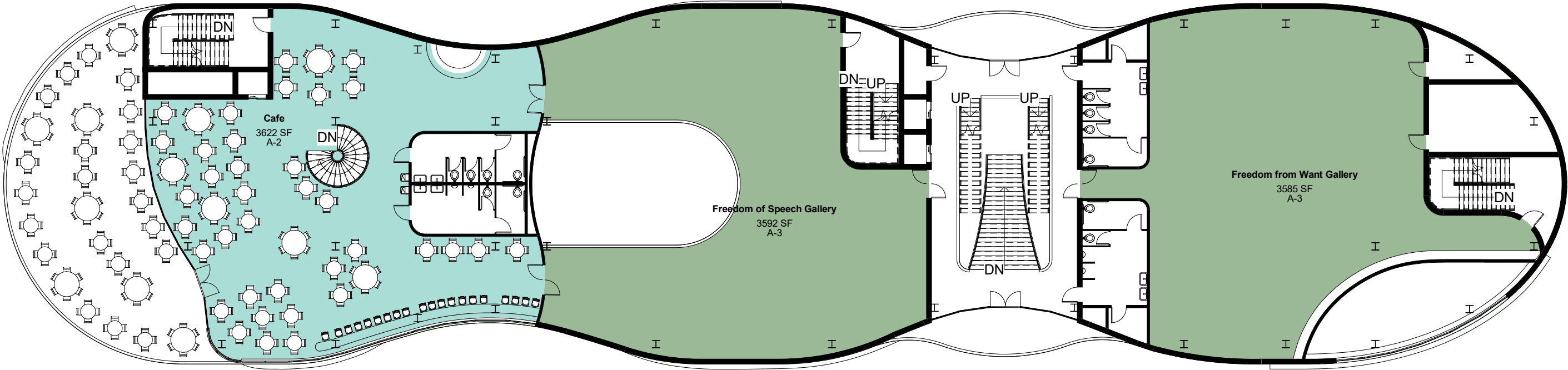


Load Factors



Occupancy Types

2nd Floor

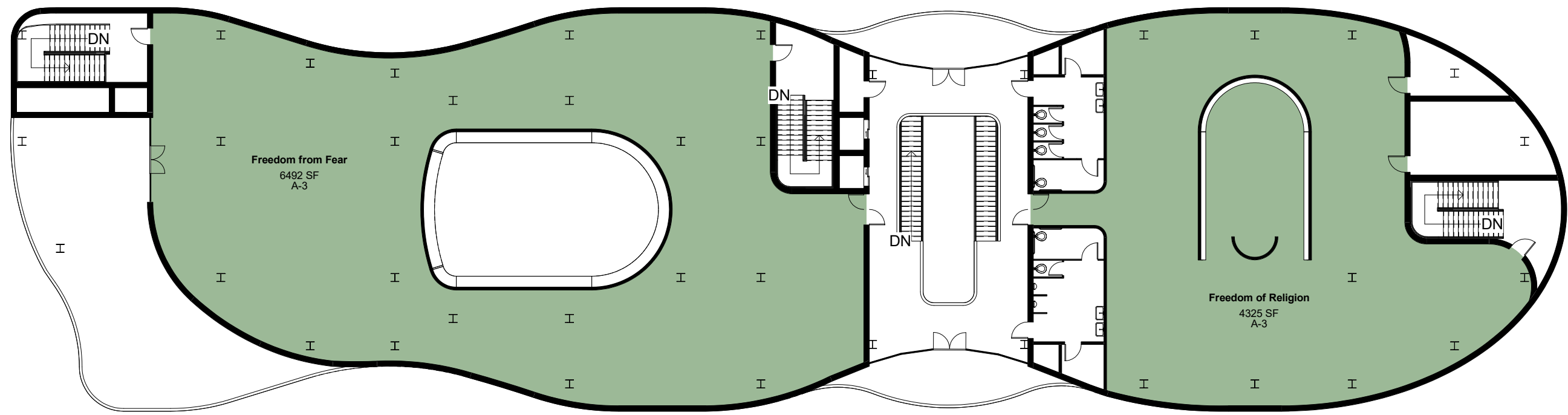


Load Factors

- 7 SF
- 15 SF

Occupancy Types

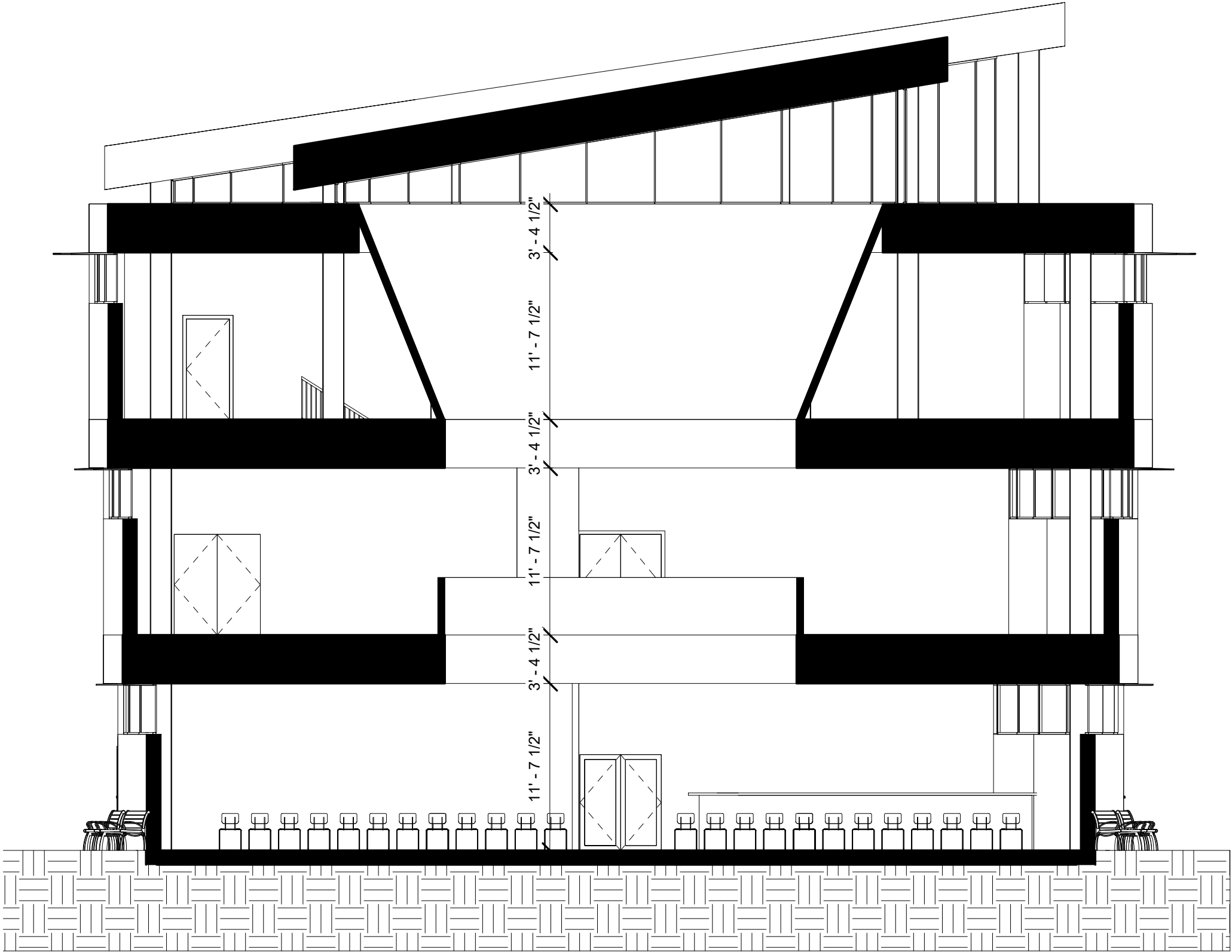
3rd Floor



Load Factors

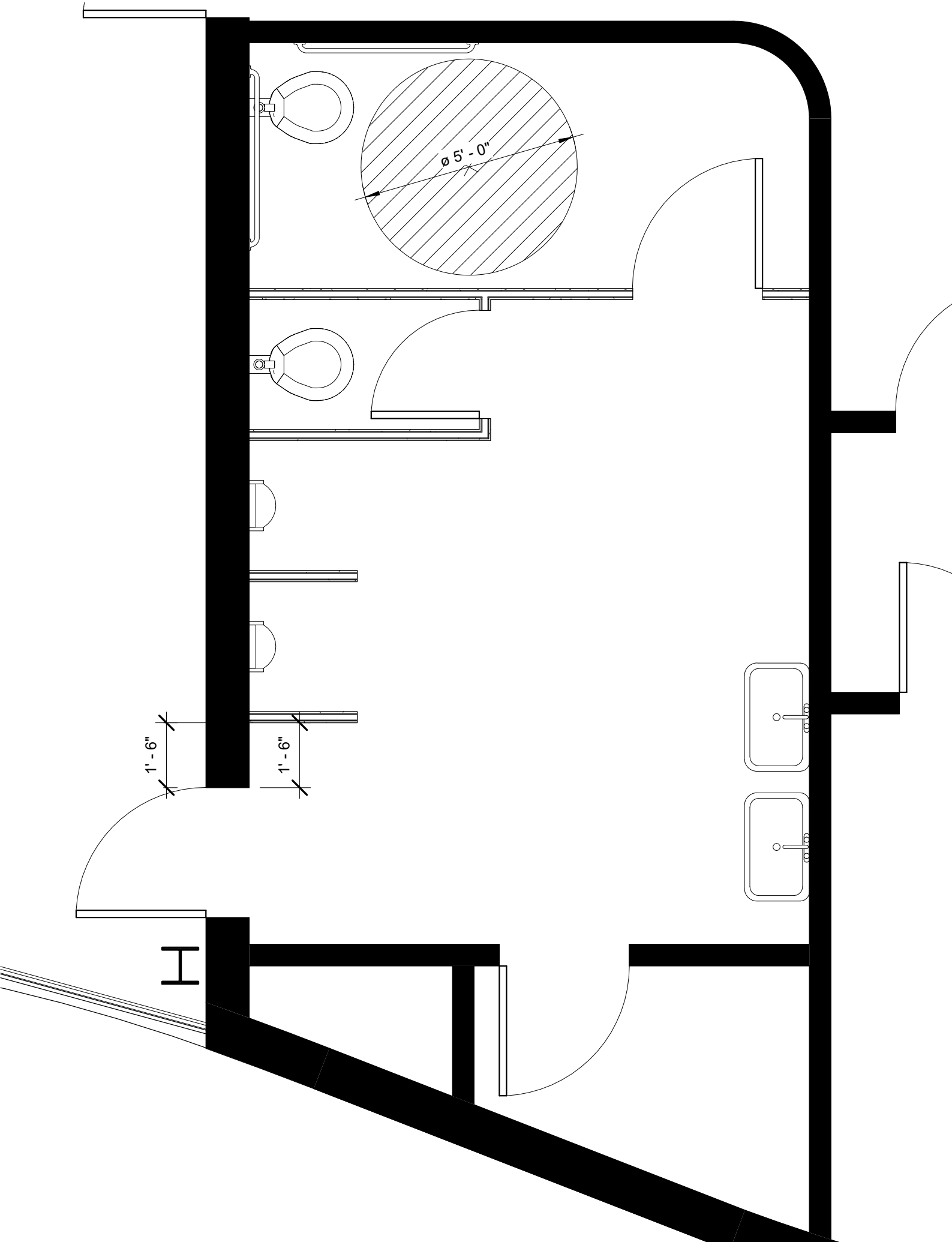
7 SF

Heights and Stories



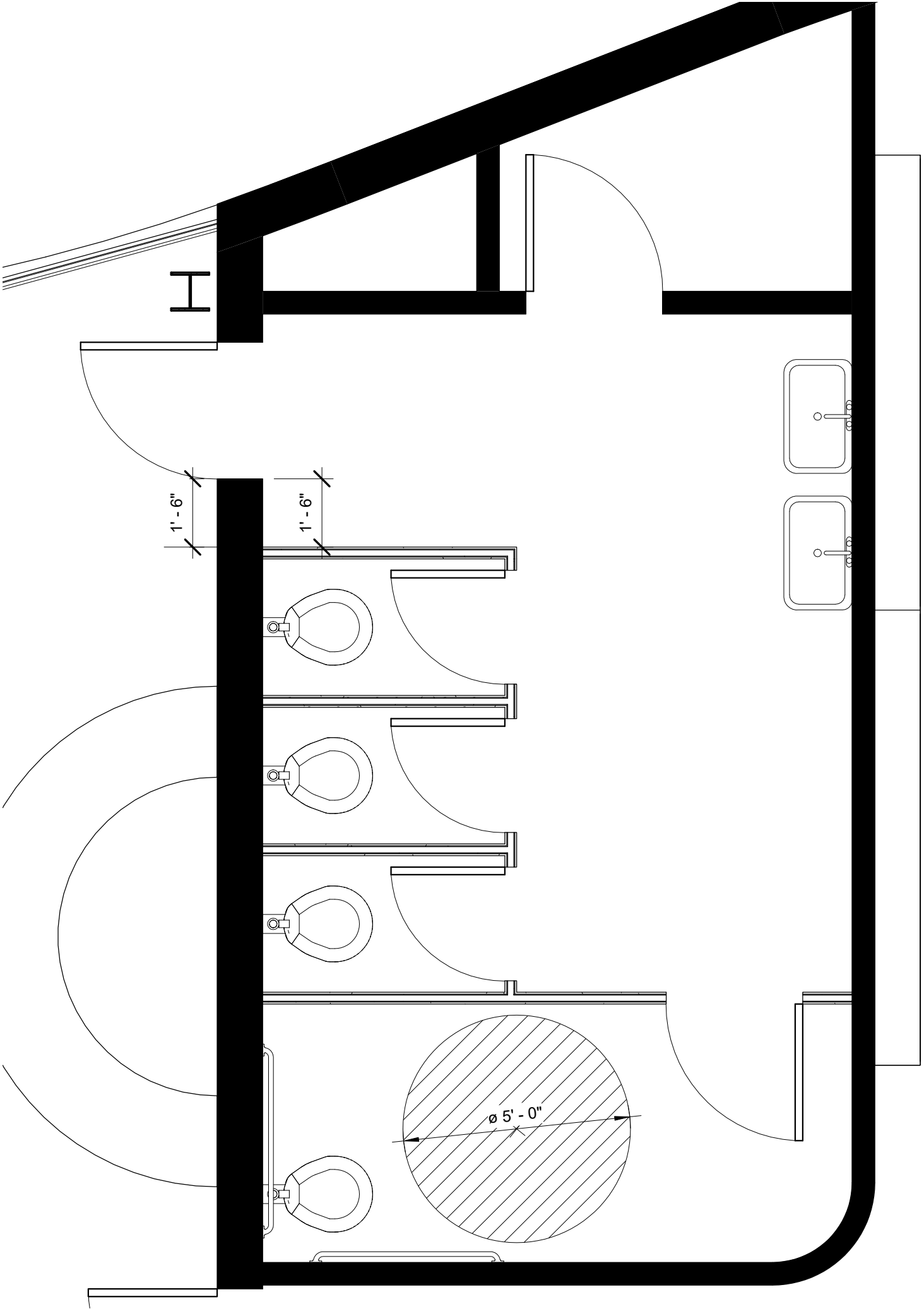
Restroom Design

Men's Restroom



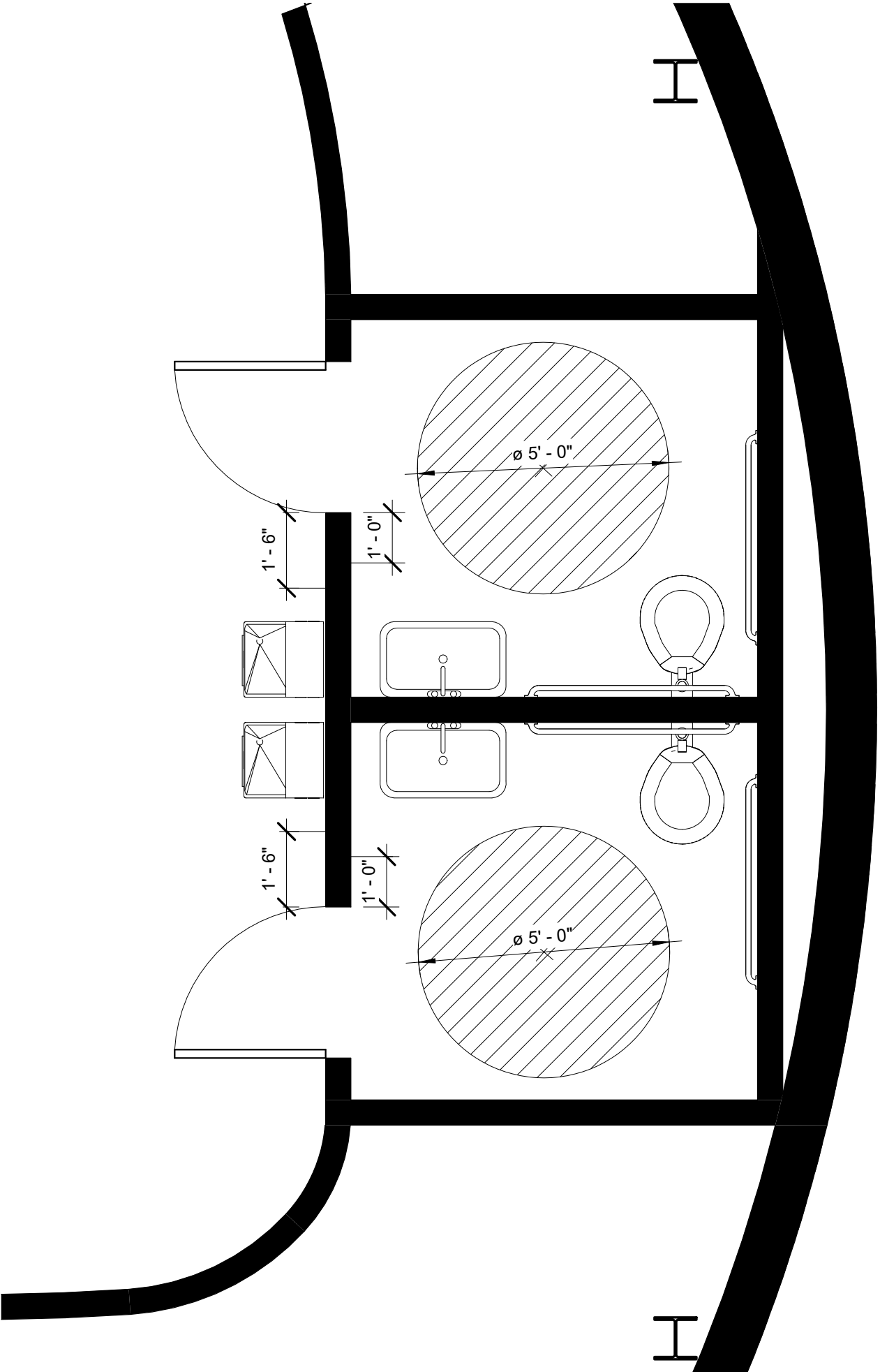
Restroom Design

Women's Restroom



Restroom Design

Small Restroom



Minimum Corridor and Door Widths

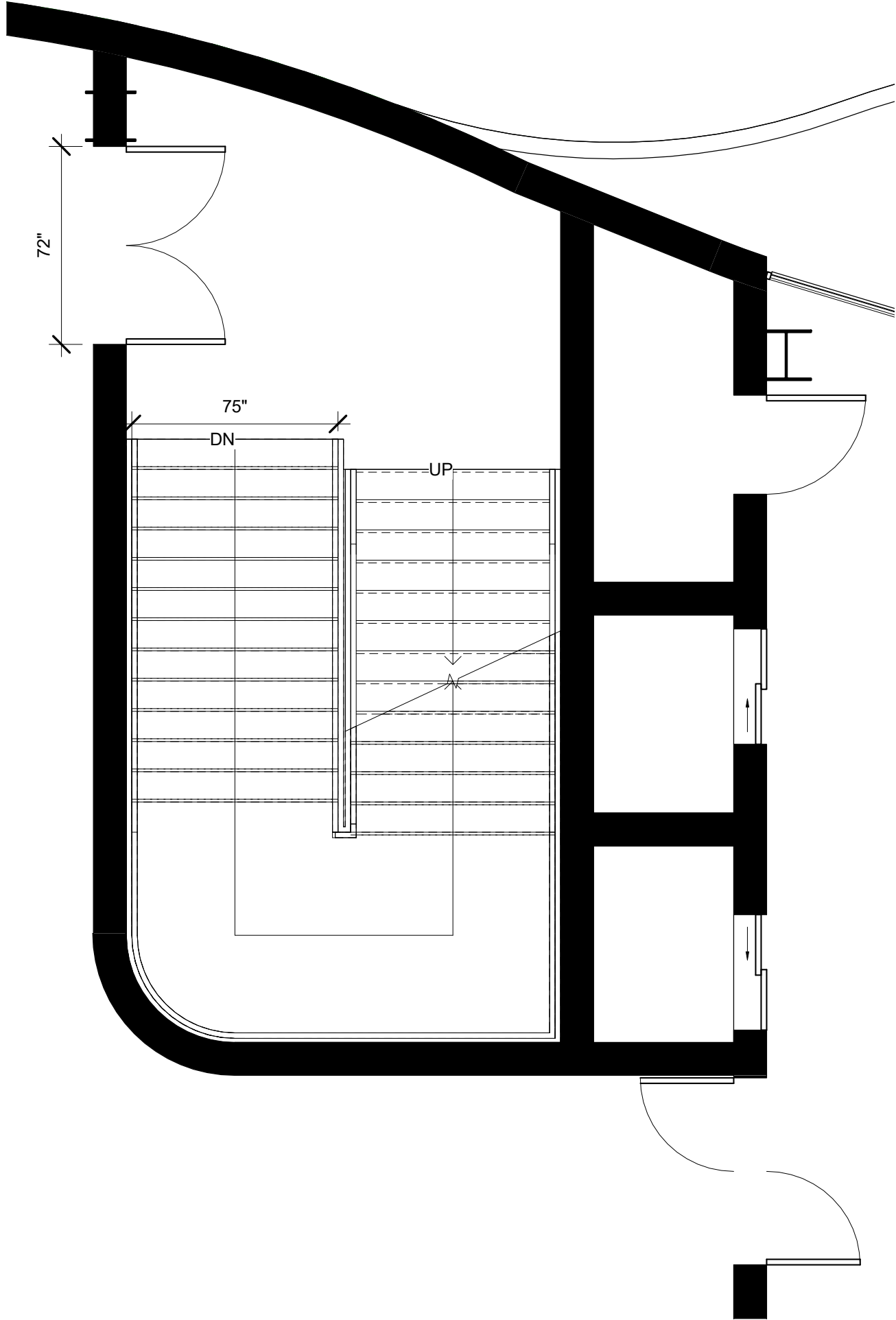
Room Schedule

Each room has 2 means of egress, so divide these numbers by 2.
Occupant Load x 0.2" (with sprinklers) Occupant Load x 0.15" (with sprinklers)

Room Schedule						
Name	Area	Occupancy	Load Factor	Occupant Load	Exit Stair Width Total	Exit Door Width Total
Interior Court	4103 SF	A-3	7 SF	586	9' - 9 7/32"	7' - 3 29/32"
Lobby	1329 SF	A-3	7 SF	190	3' - 1 31/32"	2' - 4 15/32"
Library	3445 SF	A-3	7 SF	492	8' - 2 7/16"	6' - 1 13/16"
Boiler	289 SF	S-1	300 SF	1	0' - 0 3/16"	0' - 0 5/32"
Electrical Room	79 SF	S-1	300 SF	0	0' - 0 1/16"	0' - 0 1/32"
Office	131 SF	B-1	100 SF	1	0' - 0 1/4"	0' - 0 3/16"
Office	115 SF	B-1	100 SF	1	0' - 0 7/32"	0' - 0 3/16"
Kitchen	995 SF	A-2	200 SF	5	0' - 1"	0' - 0 3/4"
Cafe	2322 SF	A-2	15 SF	155	2' - 6 31/32"	1' - 11 7/32"
Freedom of Speec	3592 SF	A-3	7 SF	513	8' - 6 5/8"	6' - 4 31/32"
Cafe	3622 SF	A-2	15 SF	241	4' - 0 9/32"	3' - 0 7/32"
Freedom from Wa	3585 SF	A-3	7 SF	512	8' - 6 7/16"	6' - 4 13/16"
Freedom from Fea	6492 SF	A-3	7 SF	927	15' - 5 15/32"	11' - 7 1/8"
Freedom of Religio	4325 SF	A-3	7 SF	618	10' - 3 19/32"	7' - 8 11/16"
Electrical Room	98 SF	S-1	300 SF	0	0' - 0 1/16"	0' - 0 1/16"
Electrical Room	119 SF	S-1	300 SF	0	0' - 0 3/32"	0' - 0 1/16"
	34642 SF			4244		

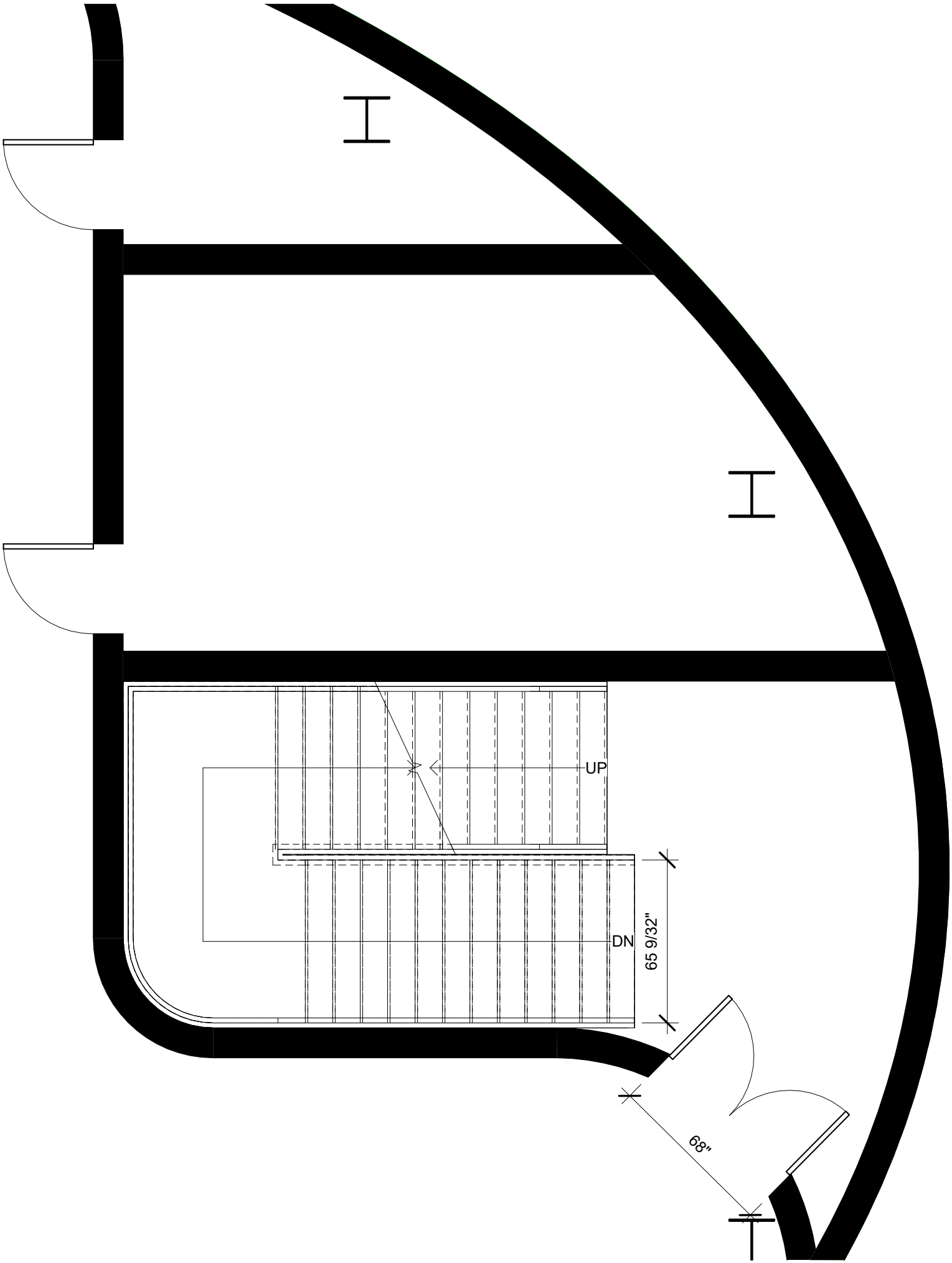
Fire Stair Design

Egress Stairs 1



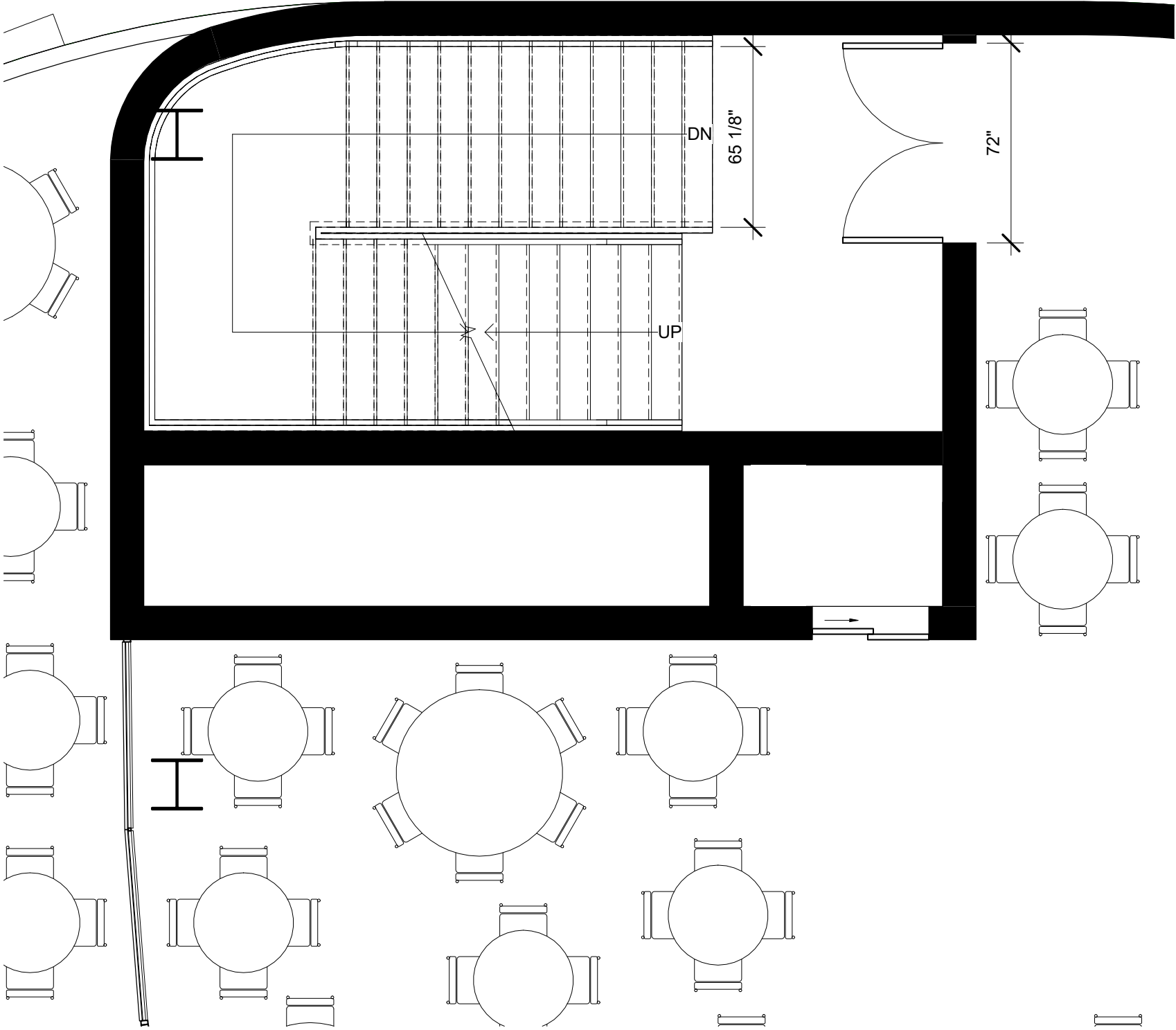
Fire Stair Design

Egress Stairs 2



Fire Stair Design

Egress Stairs 3



Site Conditions

Surrounding Context

Notable Views



Surrounding Context

Island Circulation

LEGEND

BUS

SUBWAY

TRAM

FERRY

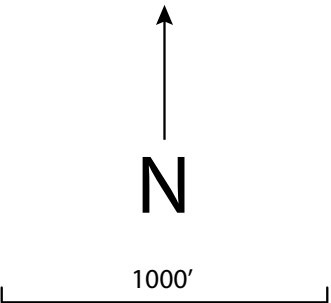
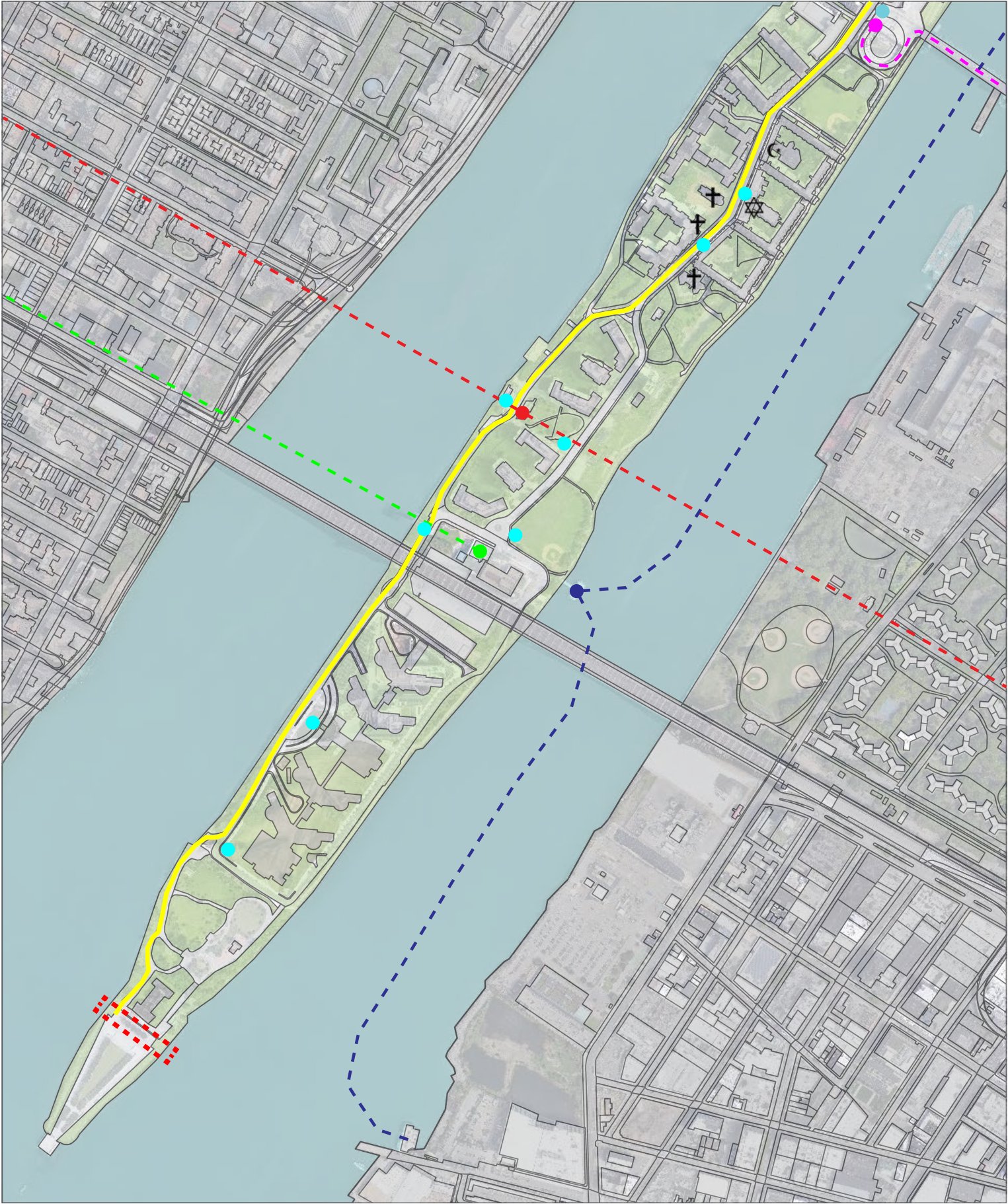
CAR PARKING

MAIN ROAD

CHURCH

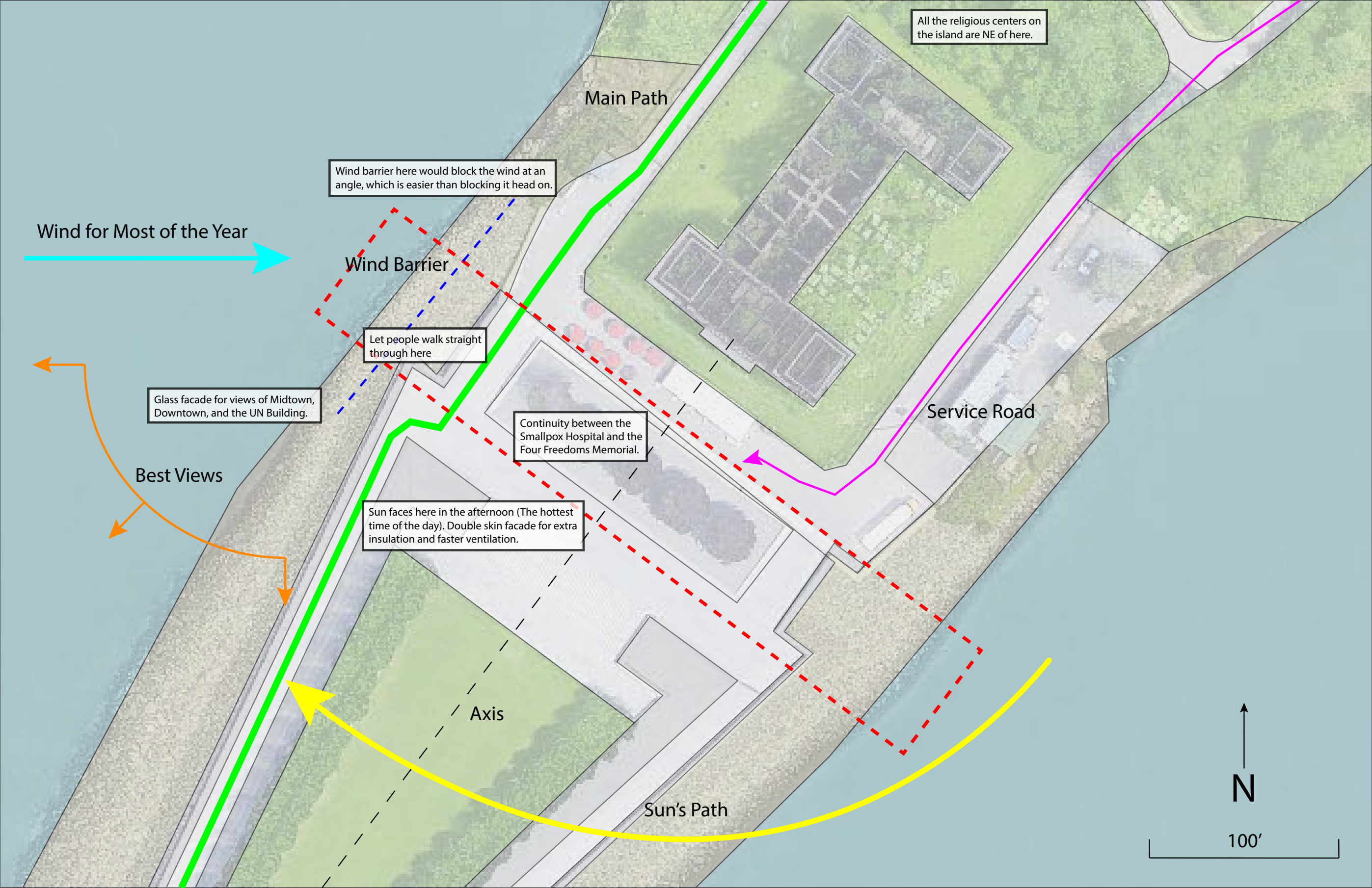
SYNAGOGUE

MOSQUE

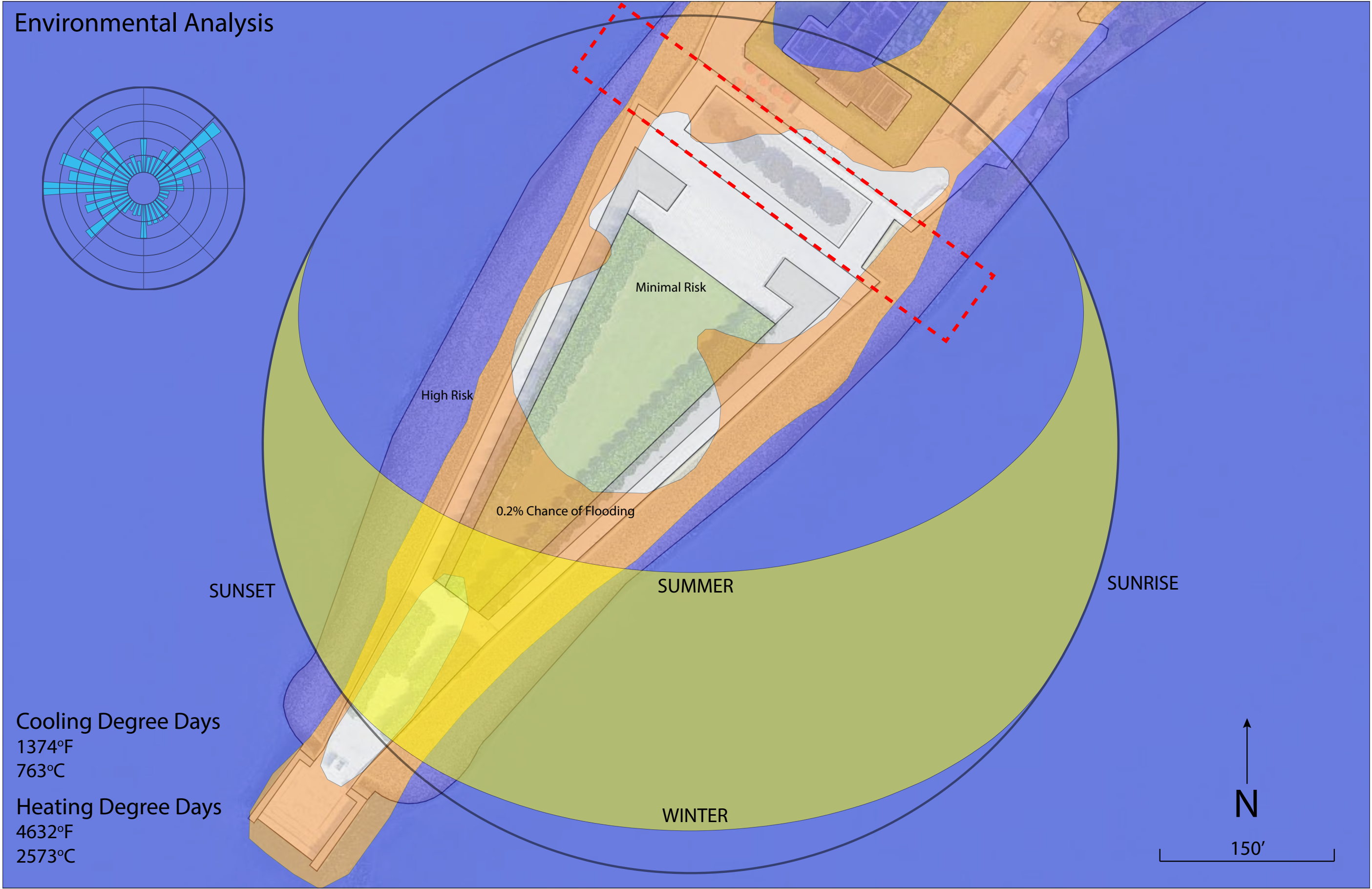


Surrounding Context

Site Synthesis



Environmental Concerns



Solar Access and Controlling

Interior Court

8 AM

10 AM

12 PM

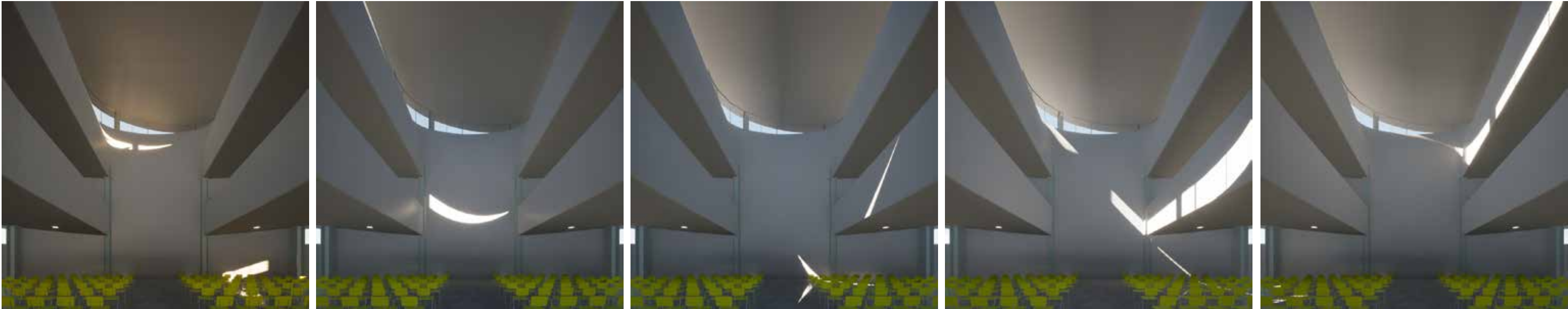
2 PM

4 AM

Winter



Spring/
Fall



Summer



Solar Access and Controlling

Library

8 AM

10 AM

12 PM

2 PM

4 AM

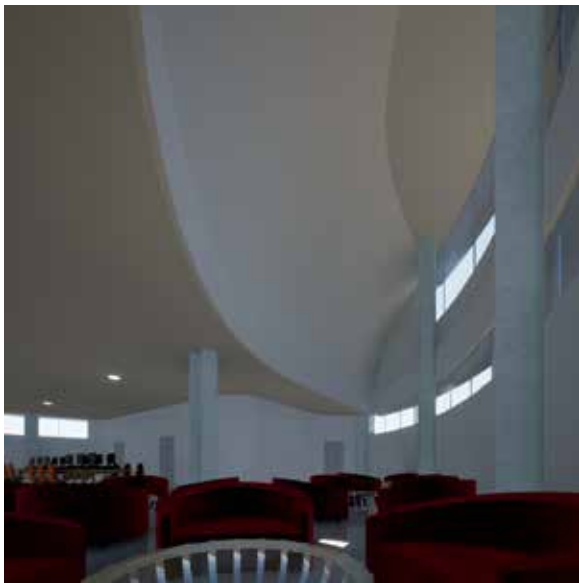
Winter



Spring/
Fall



Summer



Solar Access and Controlling

Cafe

8 AM

10 AM

12 PM

2 PM

4 AM

Winter

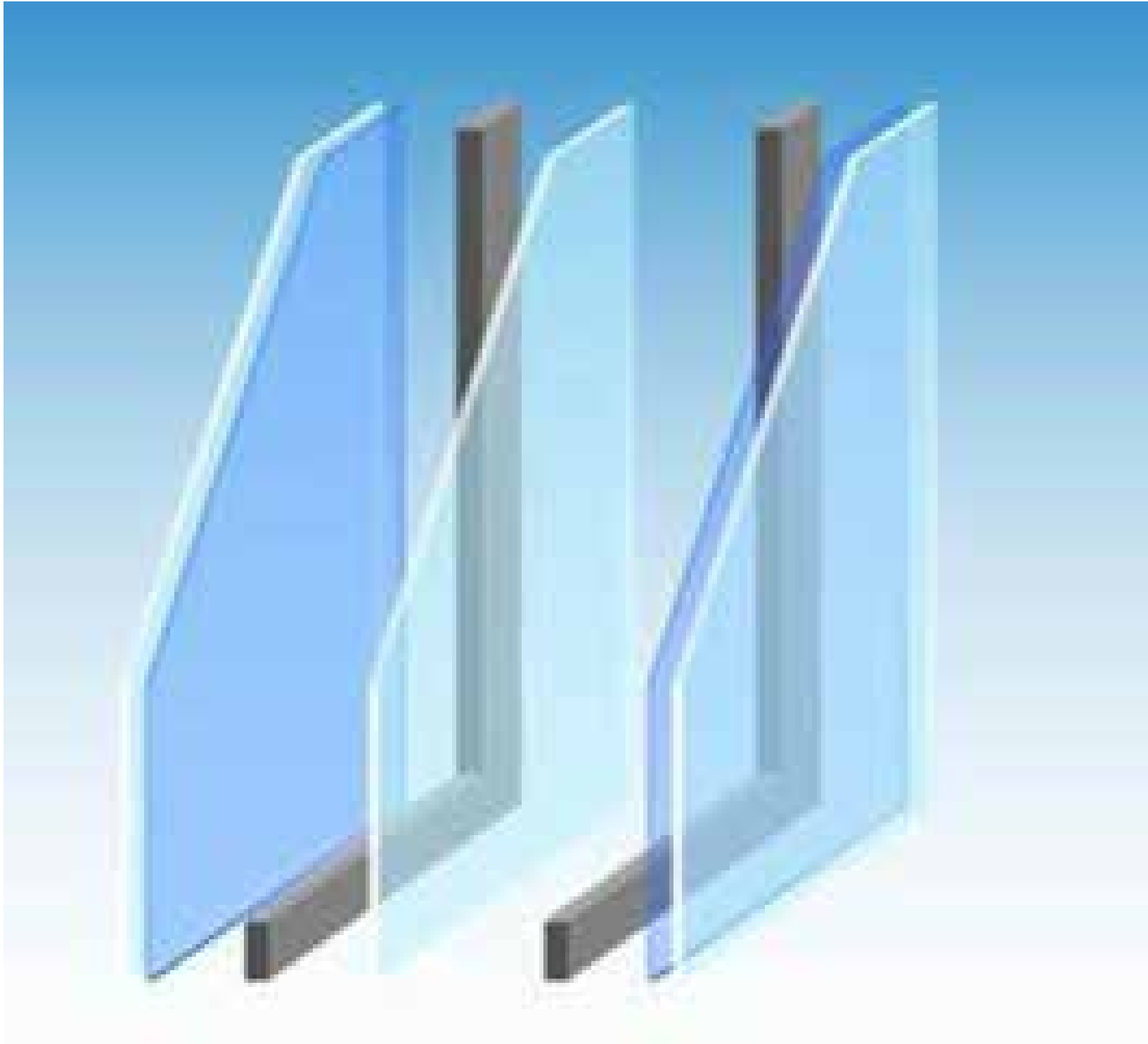


Spring/
Fall



Summer





CLIMATOP Triple Glazing

Environmental Impacts

Global Warming Potential: 49.6
Ozone Depletion: 6.56E-9
Acidification Potential: 0.244
Eutrophication Potential: 0.0584
Photochemical Ozone Creation: 0.0151
ADP Elements: 0.000381
ADP Fossil Fuels: 606

Resource Use

Renewable Primary Energy Excluding Raw Materials: 65
Renewable Primary Energy Used As Raw Materials: 0
Nonrenewable Primary Energy Excluding Raw Materials: 674
Nonrenewable Primary Energy Used As Raw Materials: 0
Use of Secondary Material: 2.99
Use of Renewable Secondary Fuels: 0
Use of Nonrenewable Secondary Fuels: 0
Use of Net Fresh Water: 0.198

Waste Categories

Hazardous Waste Disposed: 1.42E-6
Non-Hazardous Waste Disposed: 1.6
Radioactive Waste Disposed: 0.0272

Output Flows

Components for Reuse: 0
Materials for Recycling: 0.841
Materials for Energy Recovery: 0
Exported Energy: 0

Sustainable Materials

BLUE SCOPE Steel Hot Rolled



BLUE SCOPE Steel Hot Rolled

Environmental Impacts

Global Warming Potential: 1.46212

Ozone Depletion: 5.88E-11

Acidification Potential: 7.104E-3

Eutrophication Potential: 4.61E-4

Photochemical Ozone Creation: 9.72E-4

ADP Elements: 4.14E-8

ADP Fossil Fuels: 16.901

Resource Use

Renewable Primary Energy Excluding Raw Materials: 0.853

Renewable Primary Energy Used As Raw Materials: 0

Nonrenewable Primary Energy Excluding Raw Materials: 0.853

Nonrenewable Primary Energy Used As Raw Materials: 17.027

Use of Secondary Material: 0.17

Use of Renewable Secondary Fuels: 0

Use of Nonrenewable Secondary Fuels:0

Use of Net Fresh Water: 2.16E-3

Waste Categories

Hazardous Waste Disposed: 2.75E-5

Non-Hazardous Waste Disposed: 0.124

Radioactive Waste Disposed: 9.95E-6

Output Flows

Components for Reuse: 0

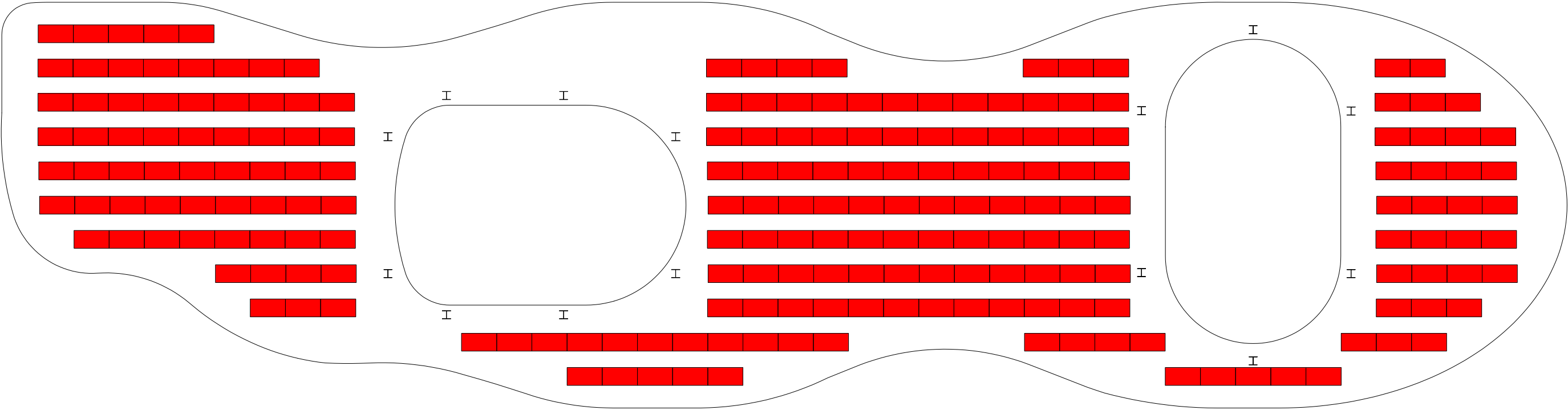
Materials for Recycling: 0.89

Materials for Energy Recovery: 0

Exported Energy: 0

Energy Efficiency

Solar Panel Diagram



RESULTS

144,533 kWh/Year*

System output may range from 136,815 to 153,567 kWh per year near this location.

Month	Solar Radiation (kWh / m ² / day)	AC Energy (kWh)	Value (\$)
January	4.71	9,281	1,072
February	5.66	10,025	1,158
March	6.65	12,906	1,491
April	7.20	13,146	1,518
May	7.43	13,847	1,599
June	8.23	14,583	1,684
July	8.47	15,431	1,782
August	7.78	14,035	1,621
September	7.17	12,596	1,455
October	6.04	11,324	1,308
November	5.04	9,496	1,097
December	3.96	7,863	908
Annual	6.53	144,533	\$ 16,693

Energy Efficiency

Solar Panel Info

Location and Station Identification

Requested Location	New York City
Weather Data Source	Lat, Lon: 40.77, -73.984.2 mi
Latitude	40.77° N
Longitude	73.98° W

PV System Specifications *(Commercial)*

DC System Size	78 kW
Module Type	Premium
Array Type	2-Axis Tracking
Array Tilt	0°
Array Azimuth	225°
System Losses	14.08%
Inverter Efficiency	96%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	0.116 \$/kWh
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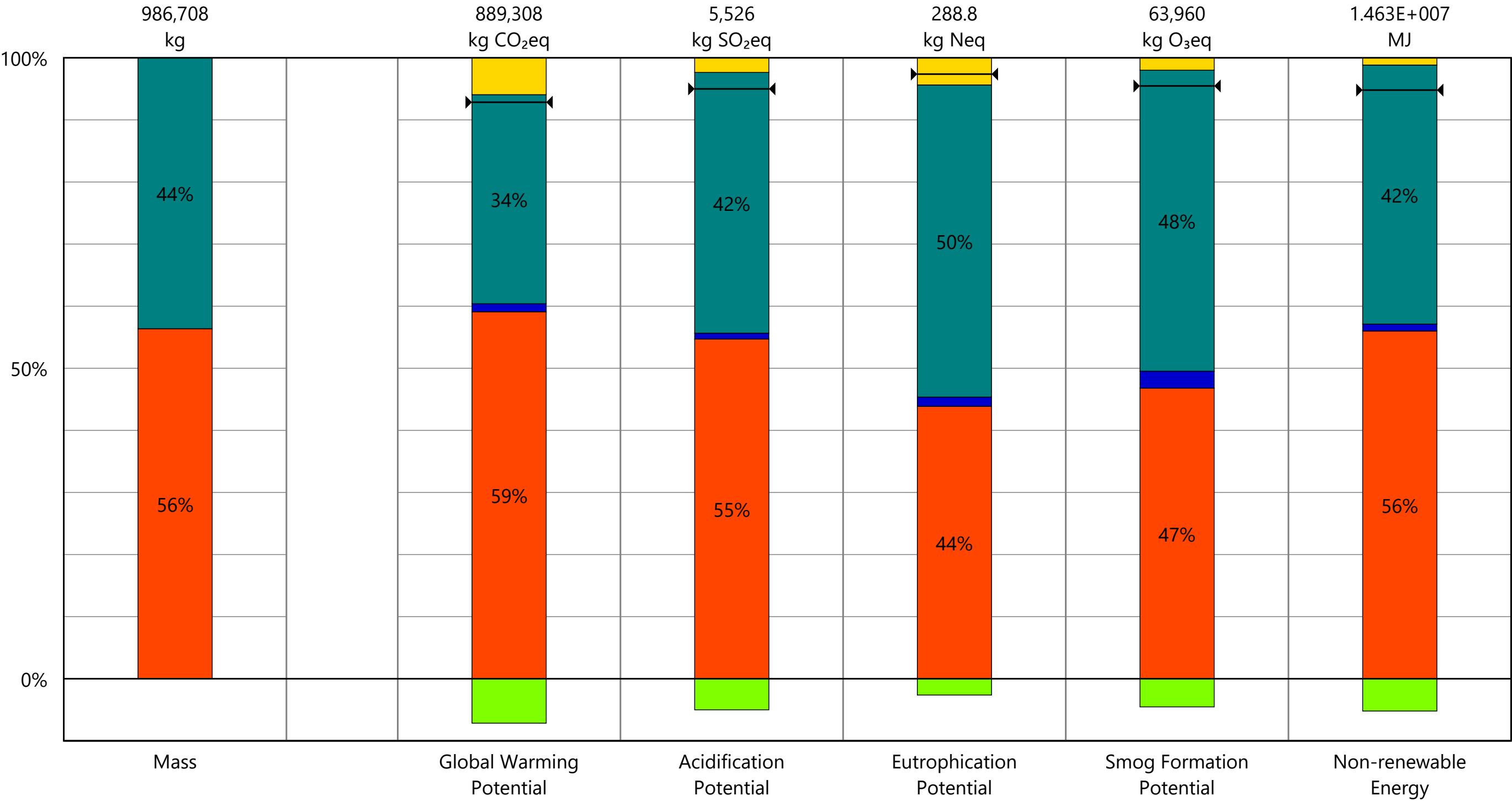
Performance Metrics

Capacity Factor	21.2%
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Carbon Footprint

Life Cycle Analysis

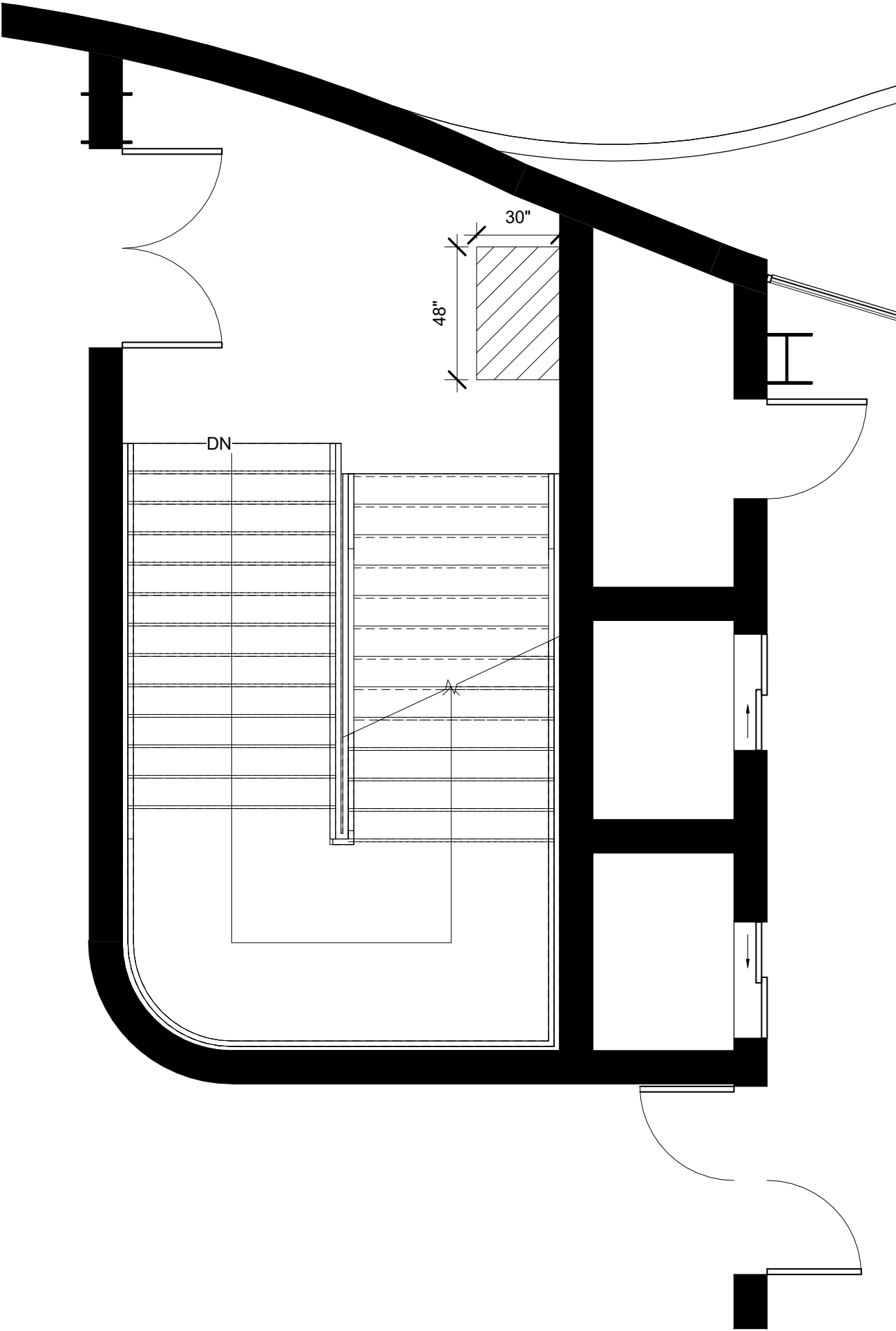
Results per Life Cycle Stage



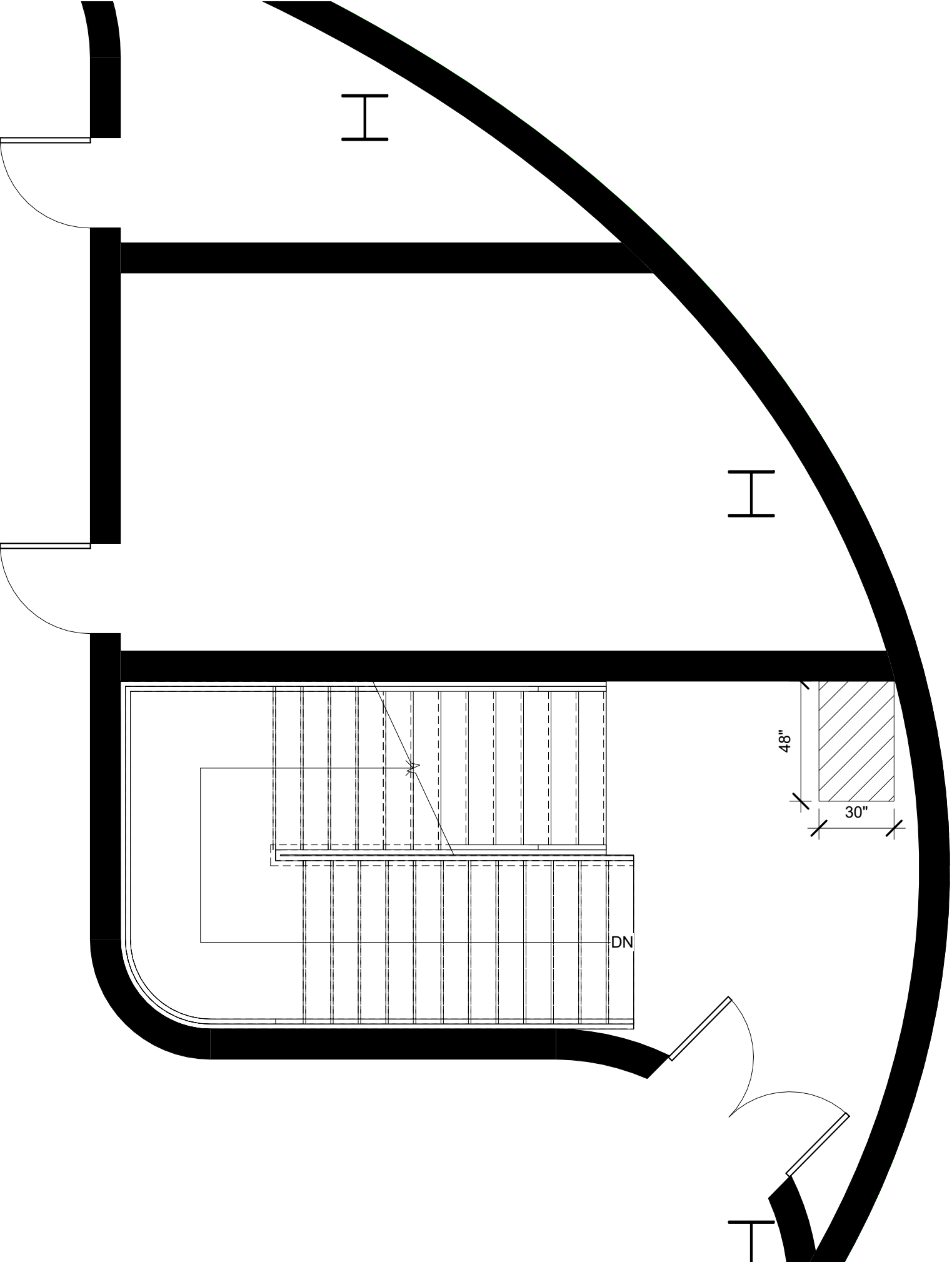
Accessible Design

Refuge Areas

Egress Stairs 1

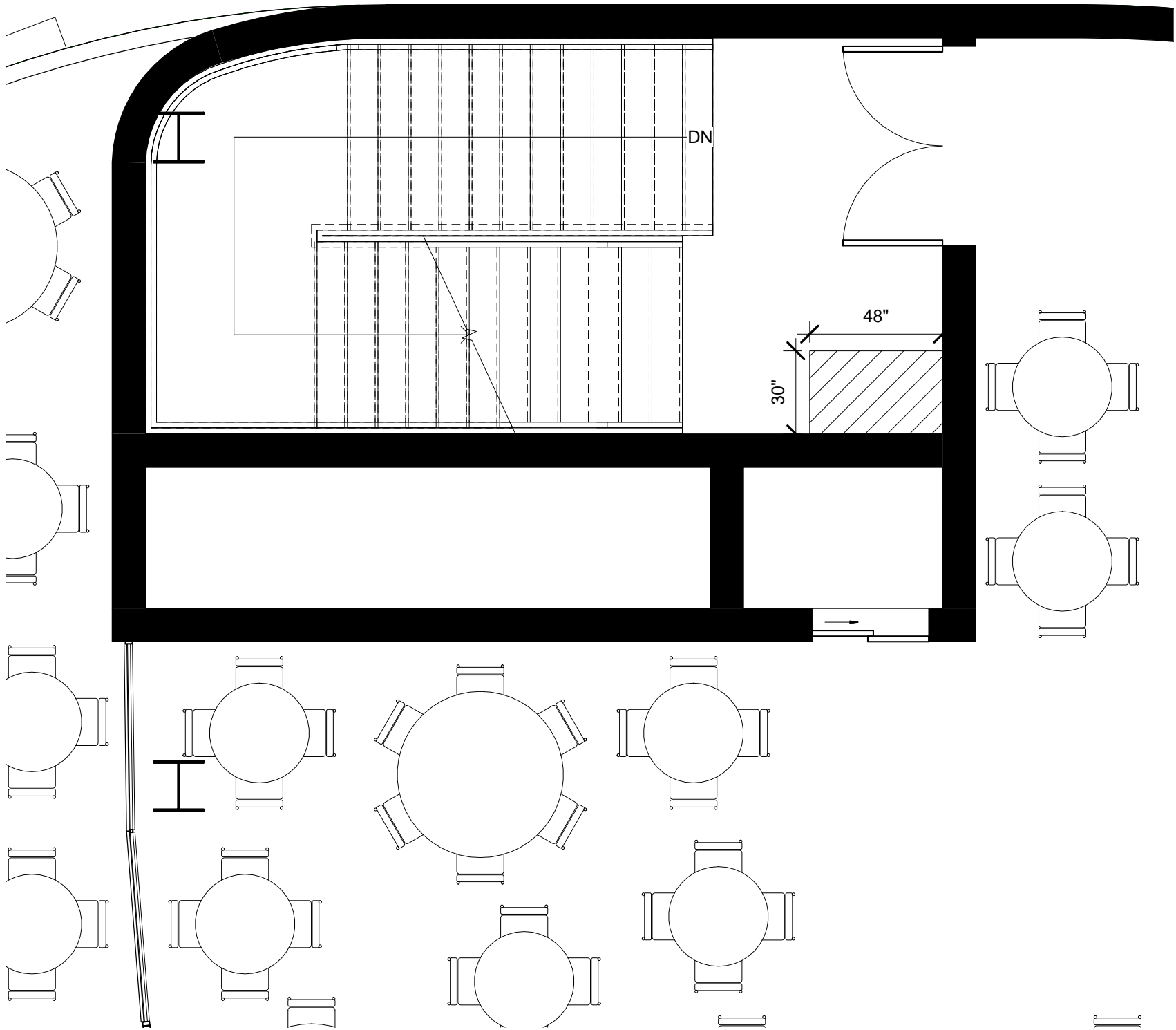


Refuge Areas
Egress Stairs 2



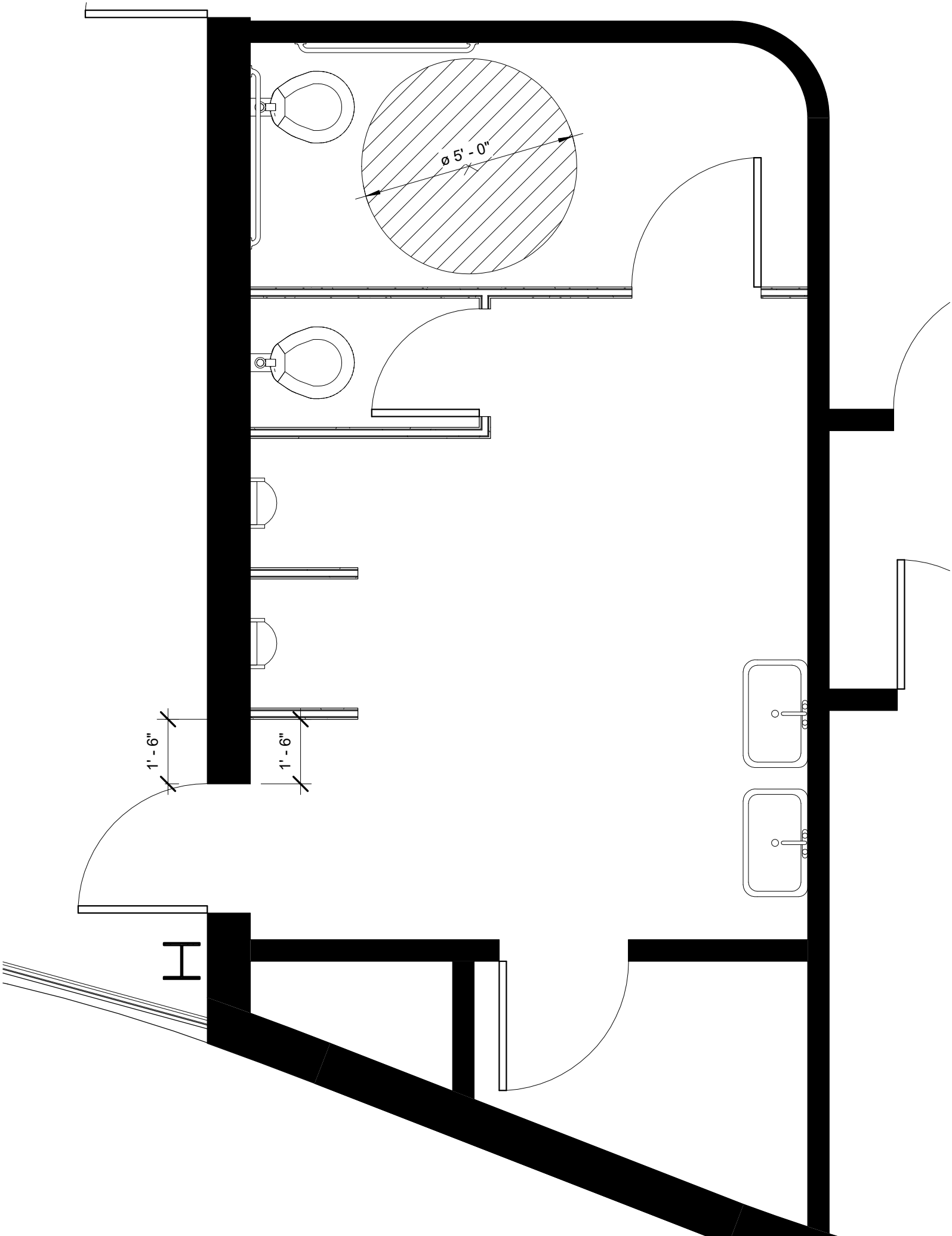
Refuge Areas

Egress Stairs 3



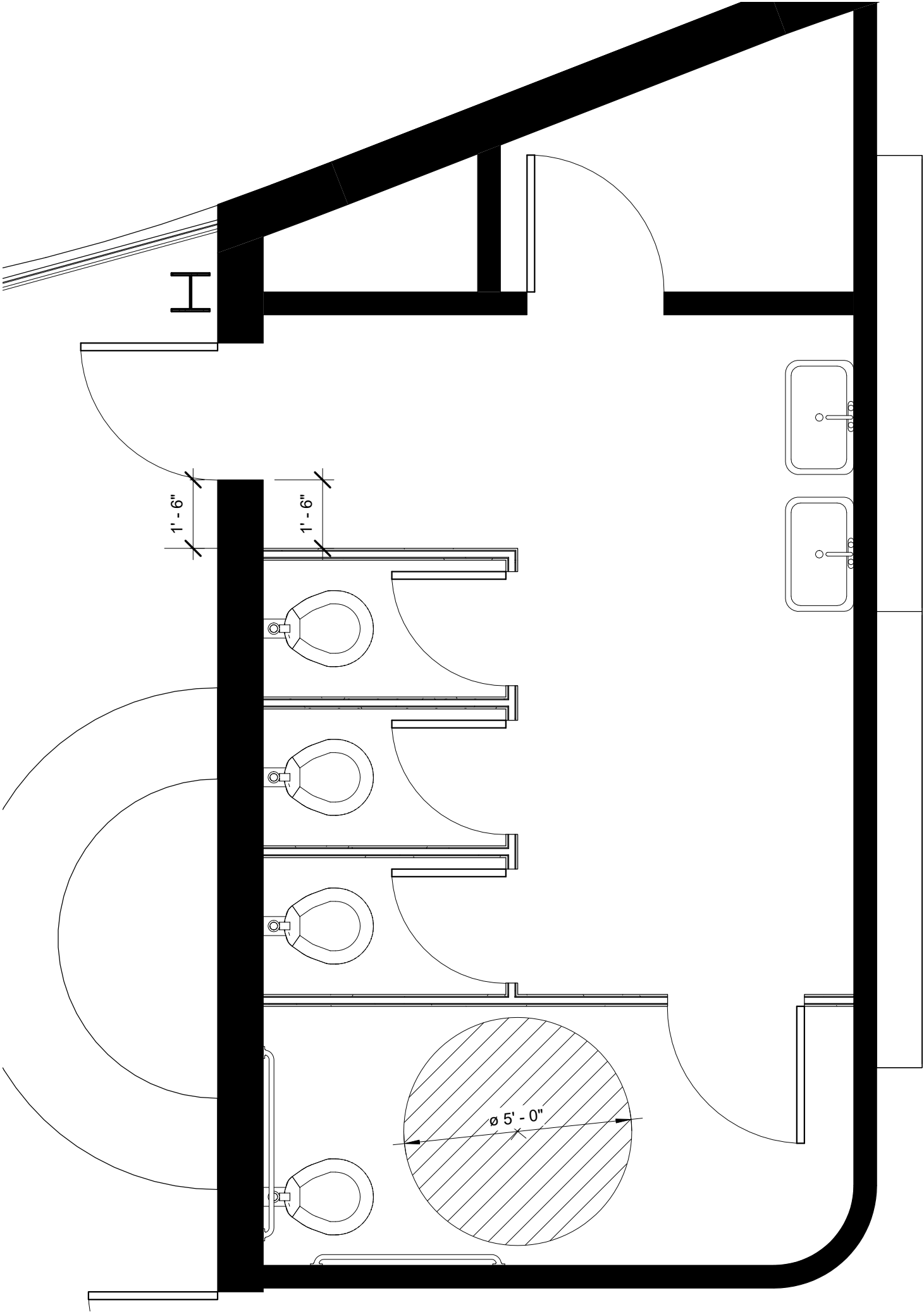
Restroom Design

Men's Restroom



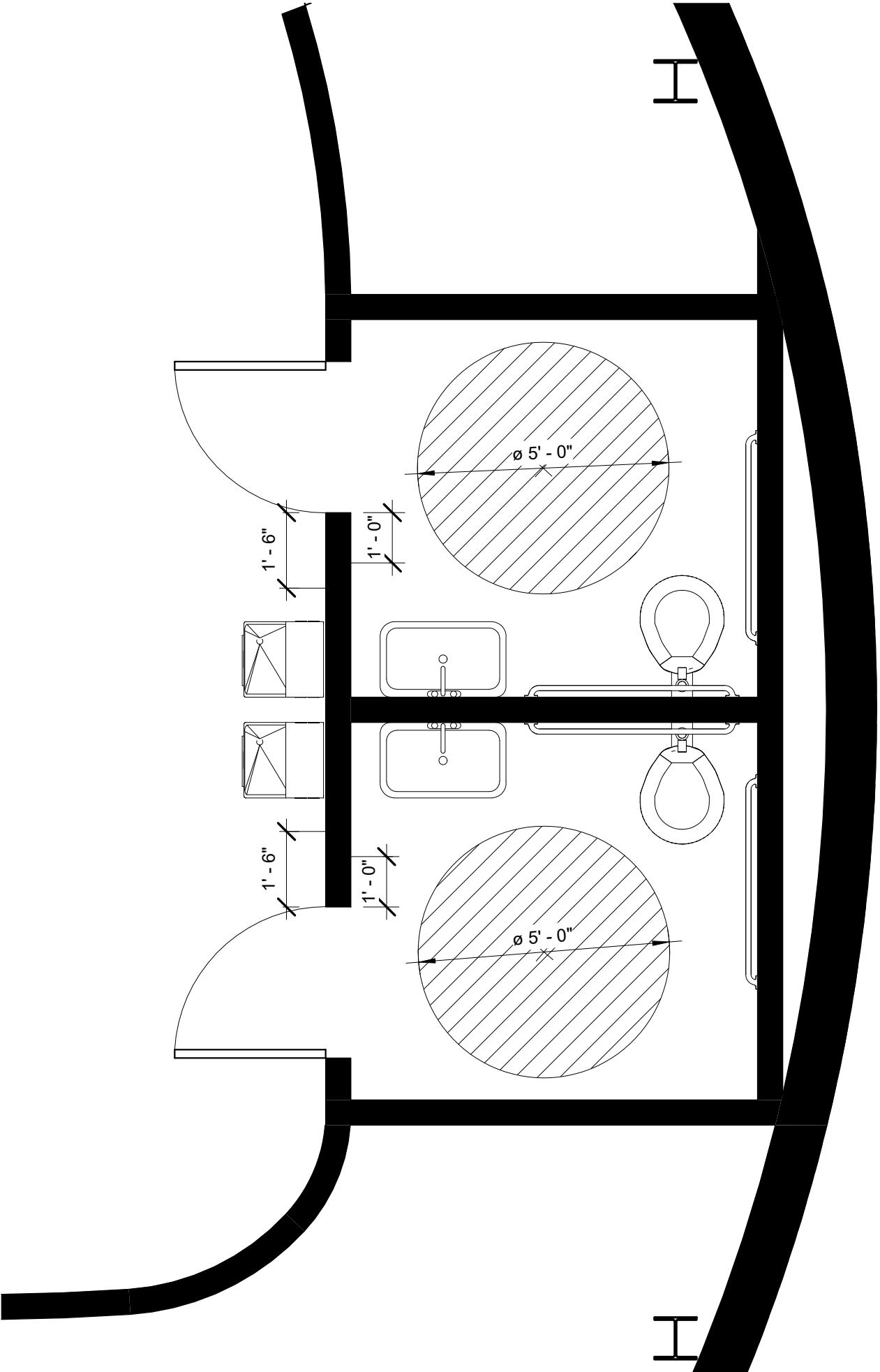
Restroom Design

Women's Restroom



Restroom Design

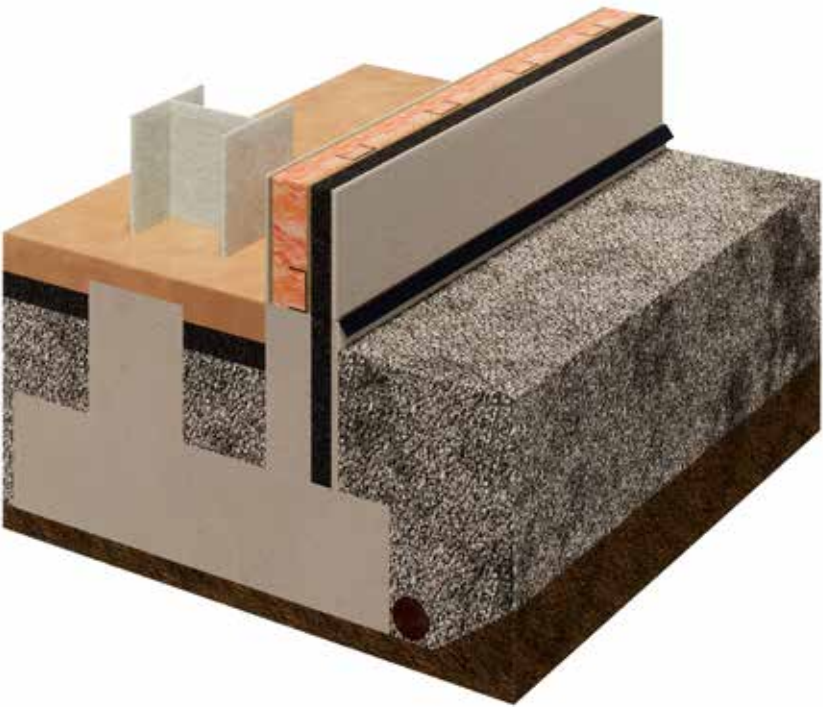
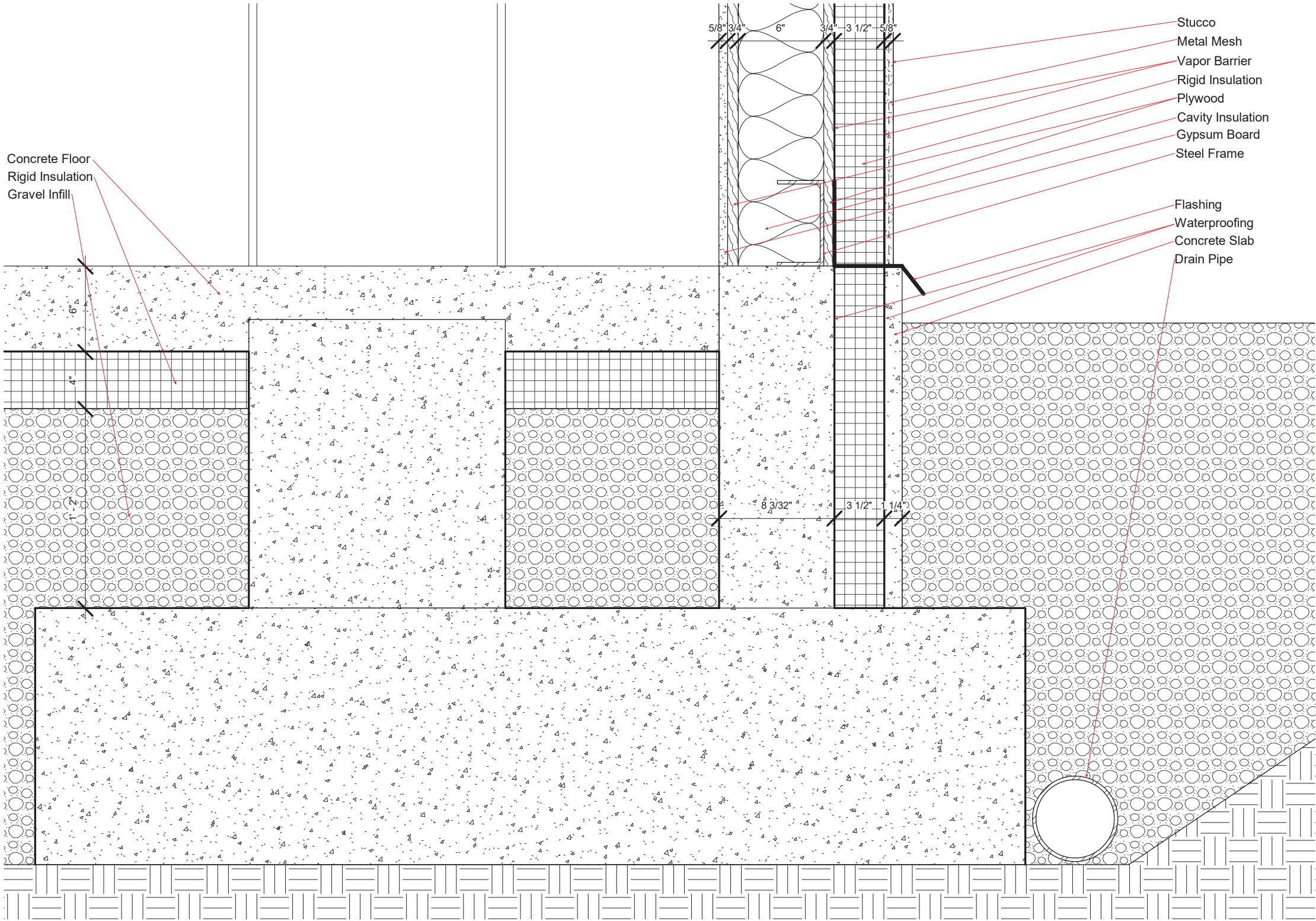
Small Restroom



Building Envelope Systems and Assemblies

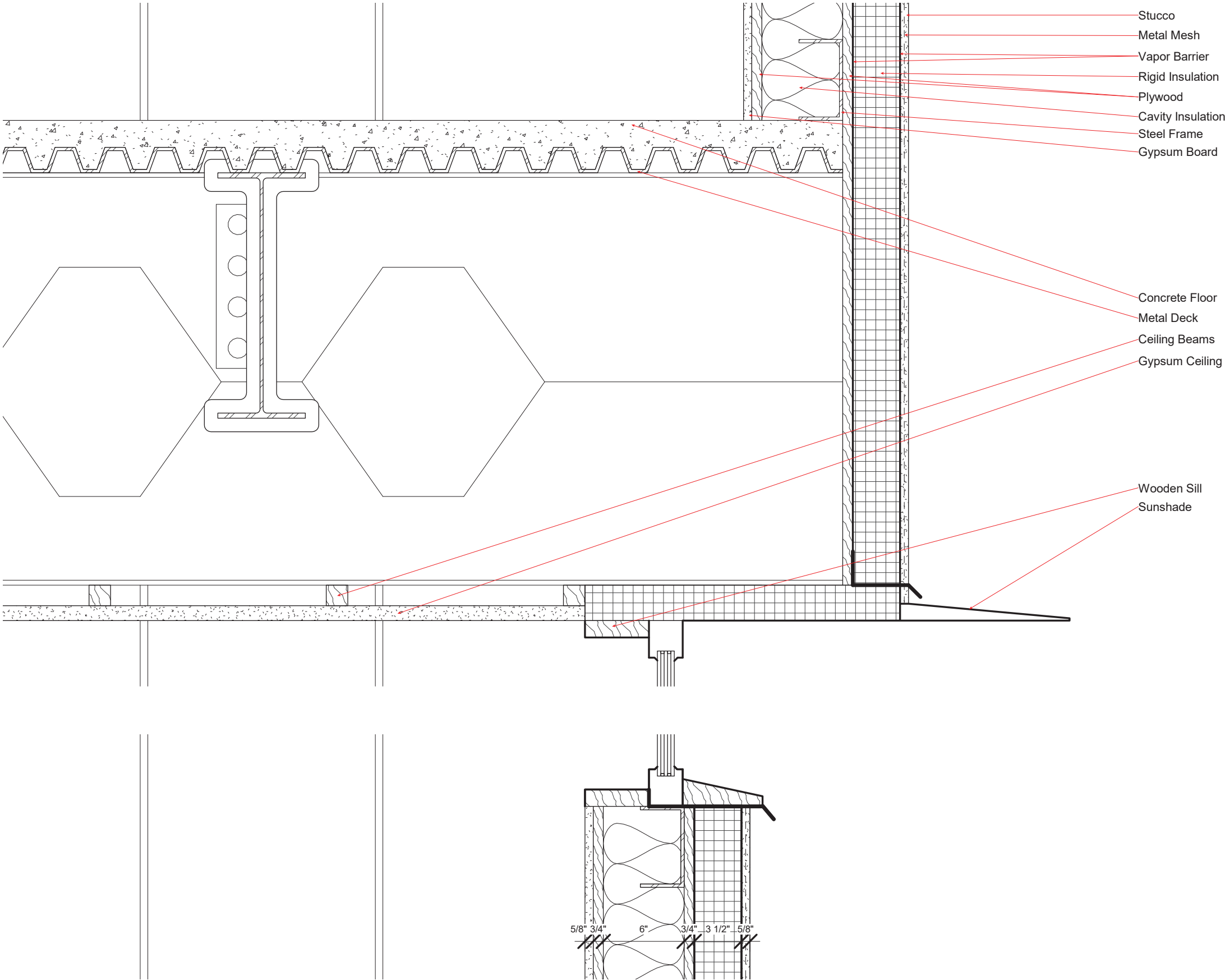
Wall Section

Ground



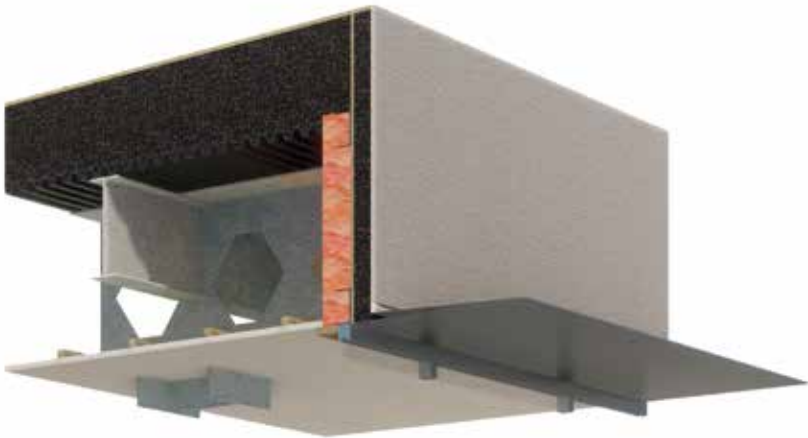
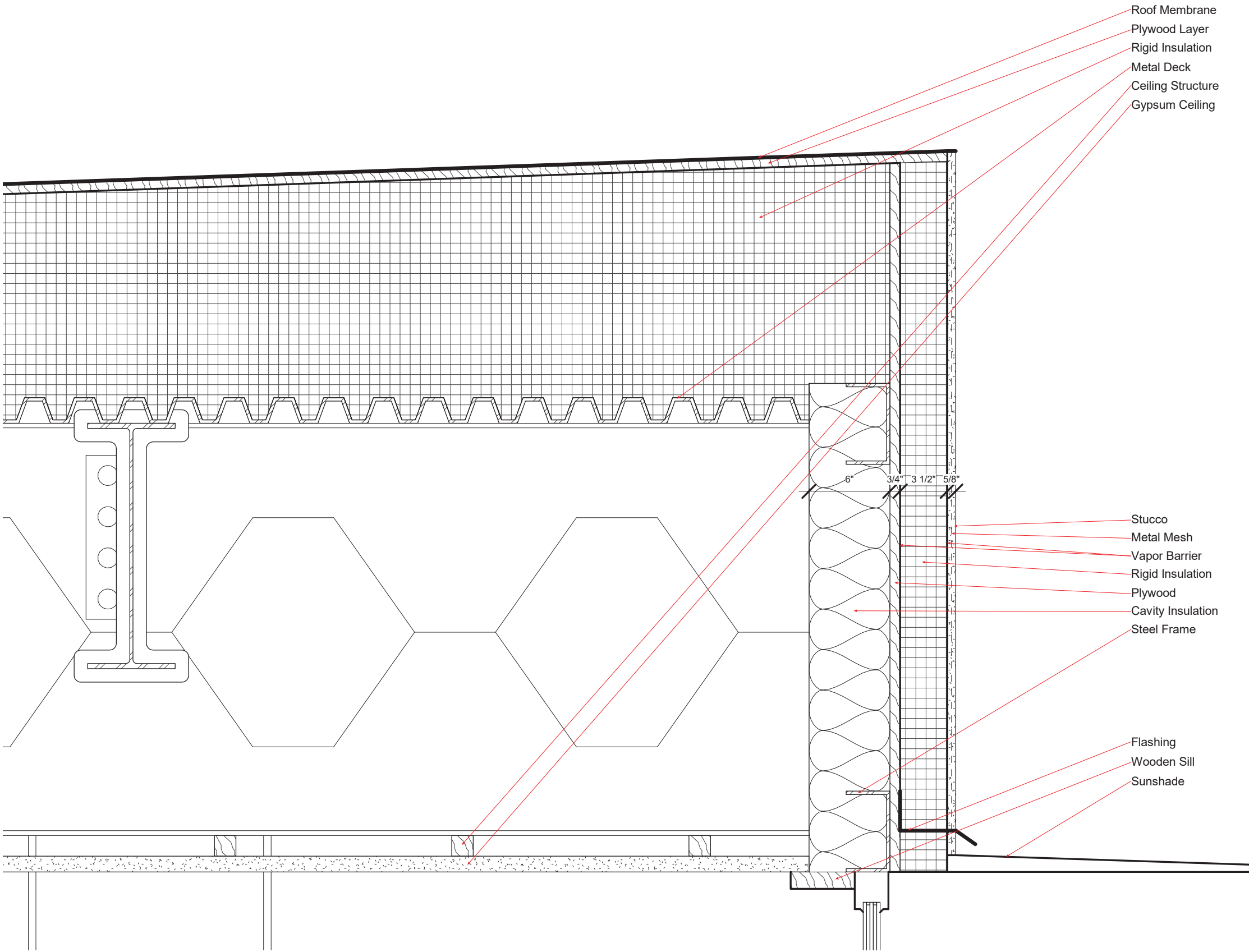
Wall Section

Floor and Window



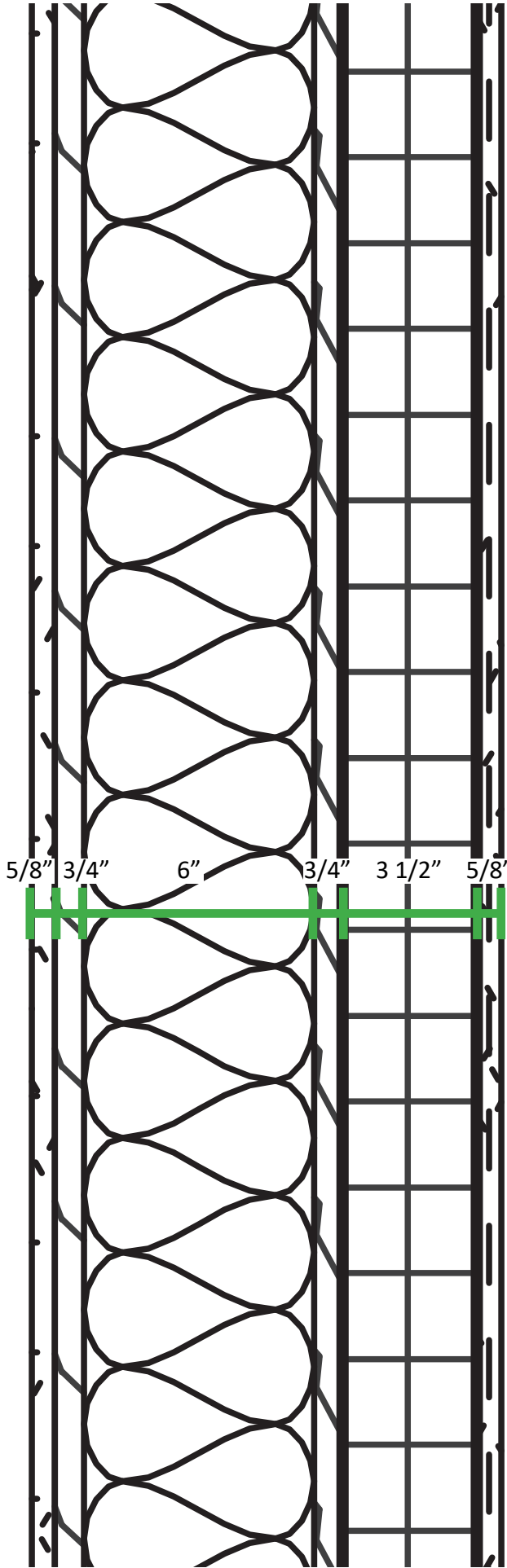
Wall Section

Roof



Thermal Insulation

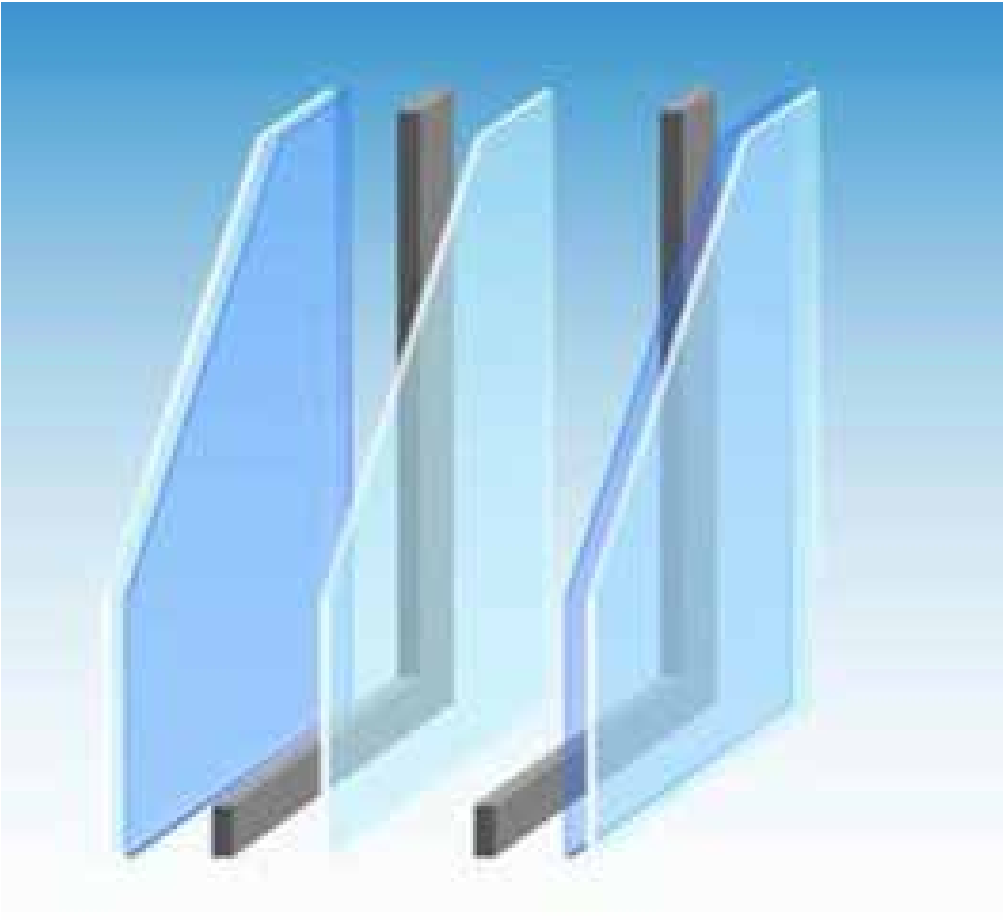
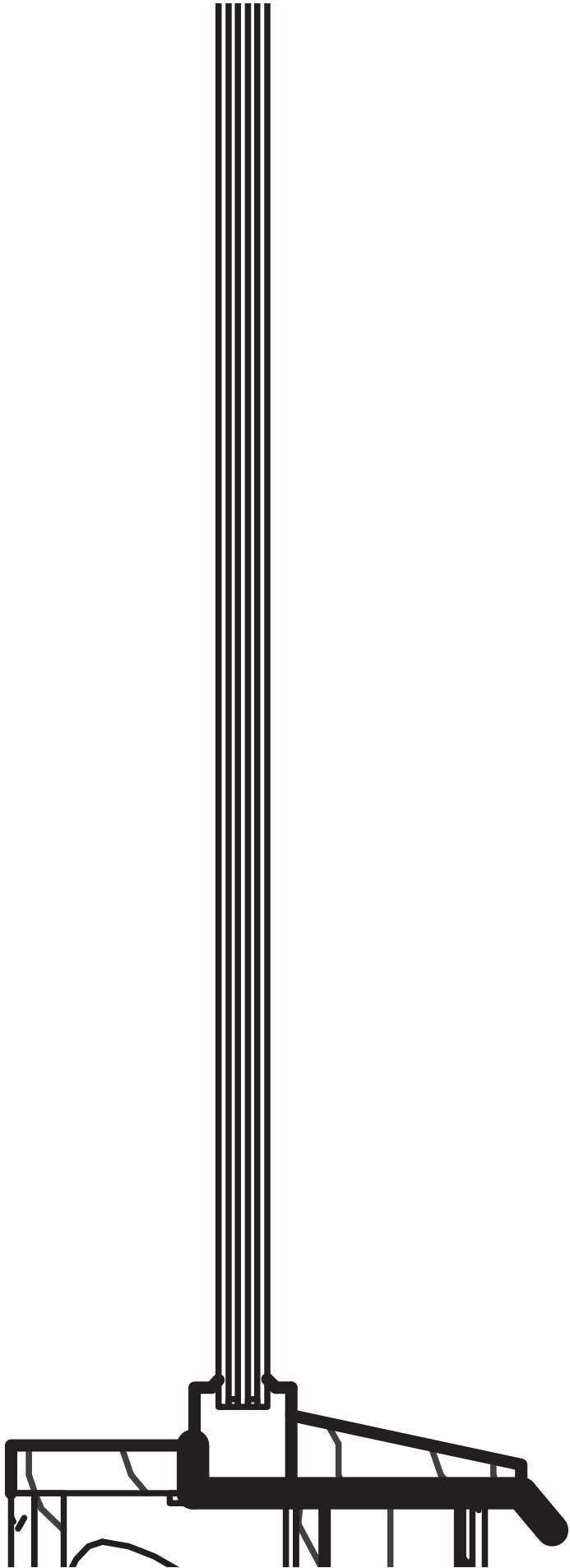
R Value



- Stucco R Value: 0.2/in
 - Rigid Insulation: 5/in
 - Plywood: 0.68/in
 - Cavity Insulation: 3.7/in
 - Plywood: 0.68/in
 - Gypsum: 0.45/in
- Total Wall R Value: 37.346**

Material and Product Specification

Triple Glazing EPD



CLIMATOP Triple Glazing

Environmental Impacts

Global Warming Potential: 49.6
Ozone Depletion: 6.56E-9
Acidification Potential: 0.244
Eutrophication Potential: 0.0584
Photochemical Ozone Creation: 0.0151
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ADP Fossil Fuels: 606

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Use of Nonrenewable Secondary Fuels: 0
Use of Net Fresh Water: 0.198

Waste Categories

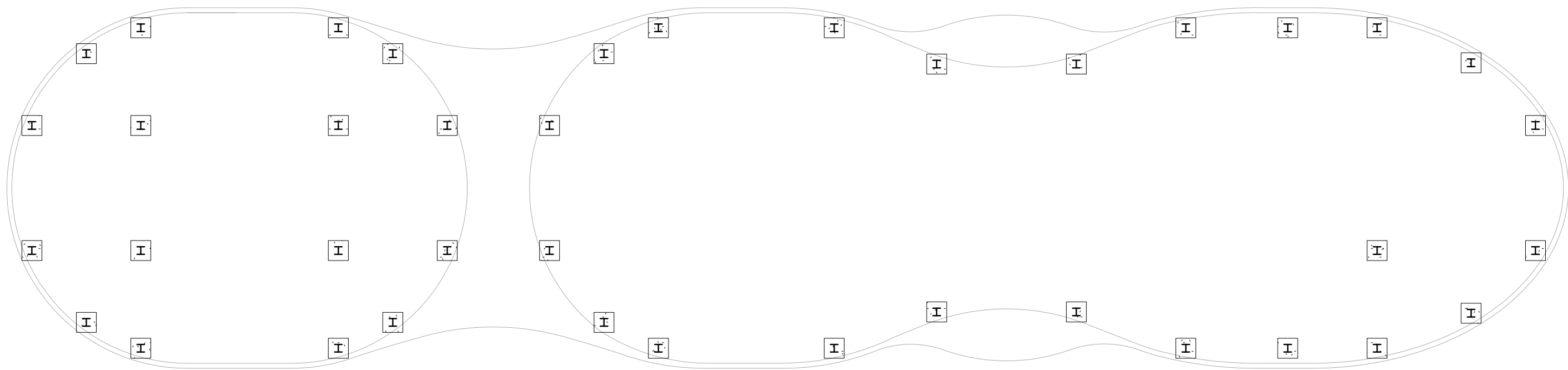
Hazardous Waste Disposed: 1.42E-6
Non-Hazardous Waste Disposed: 1.6
Radioactive Waste Disposed: 0.0272

Output Flows

Components for Reuse: 0
Materials for Recycling: 0.841
Materials for Energy Recovery: 0
Exported Energy: 0

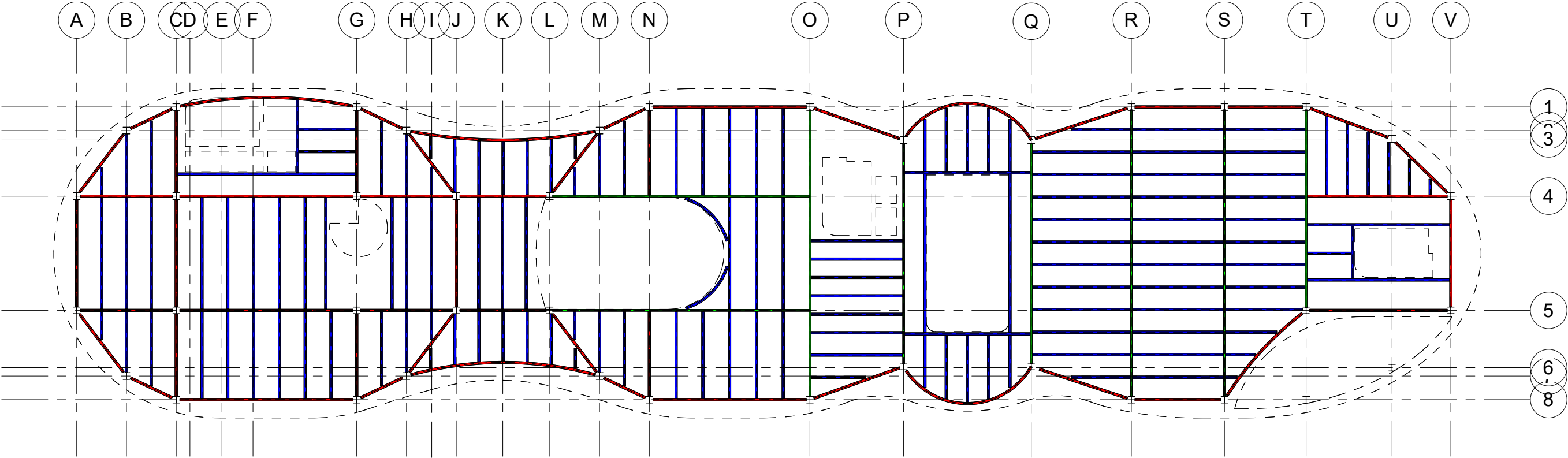
Structural Systems

Foundations



Primary and Secondary Structural Systems

2nd Floor Structure



LEGEND

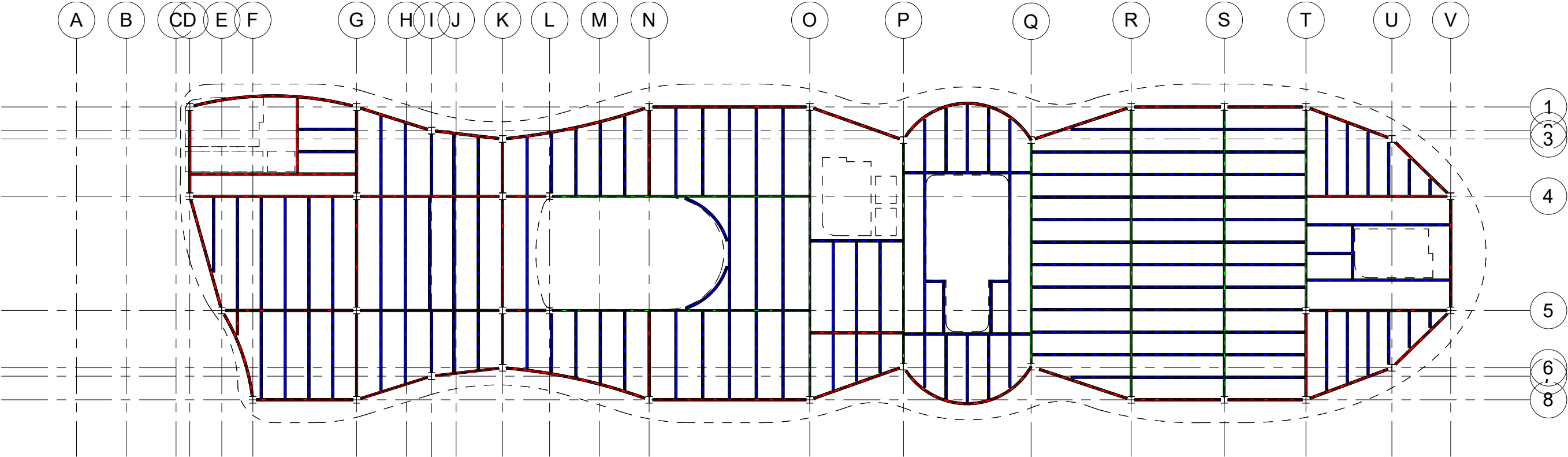
W18x26

W12x26

CB28x26

Primary and Secondary Structural Systems

3rd Floor Structure



LEGEND

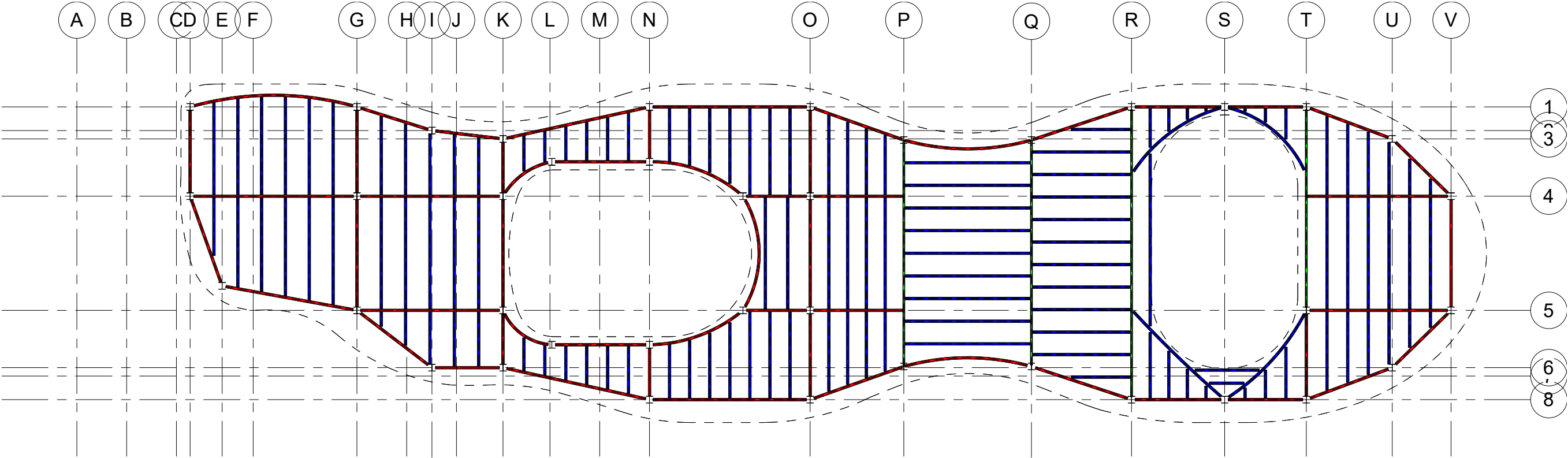
W18x26

W12x26

CB28x26

Primary and Secondary Structural Systems

Roof Structure



LEGEND

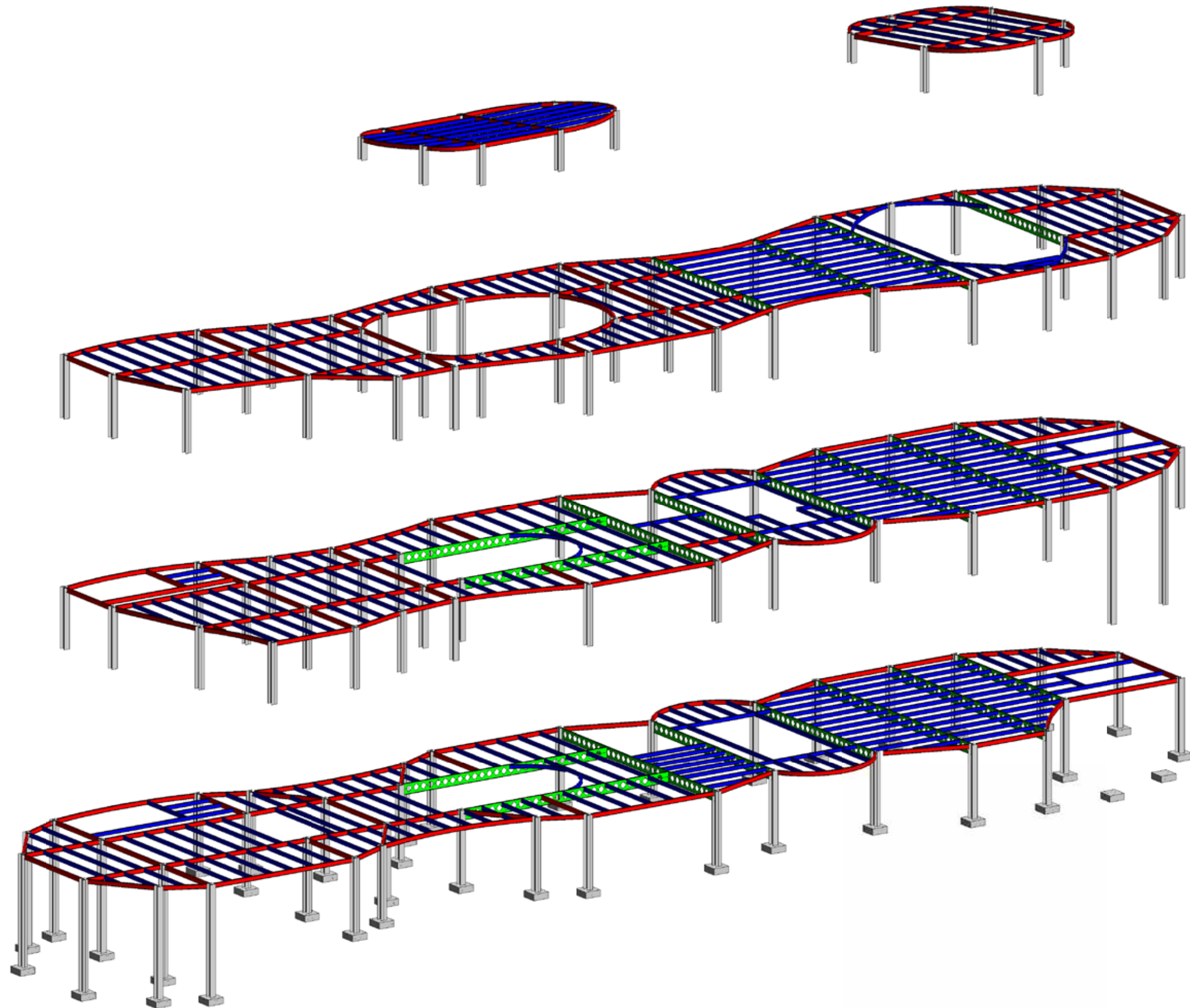
W18x26

W12x26

CB28x26

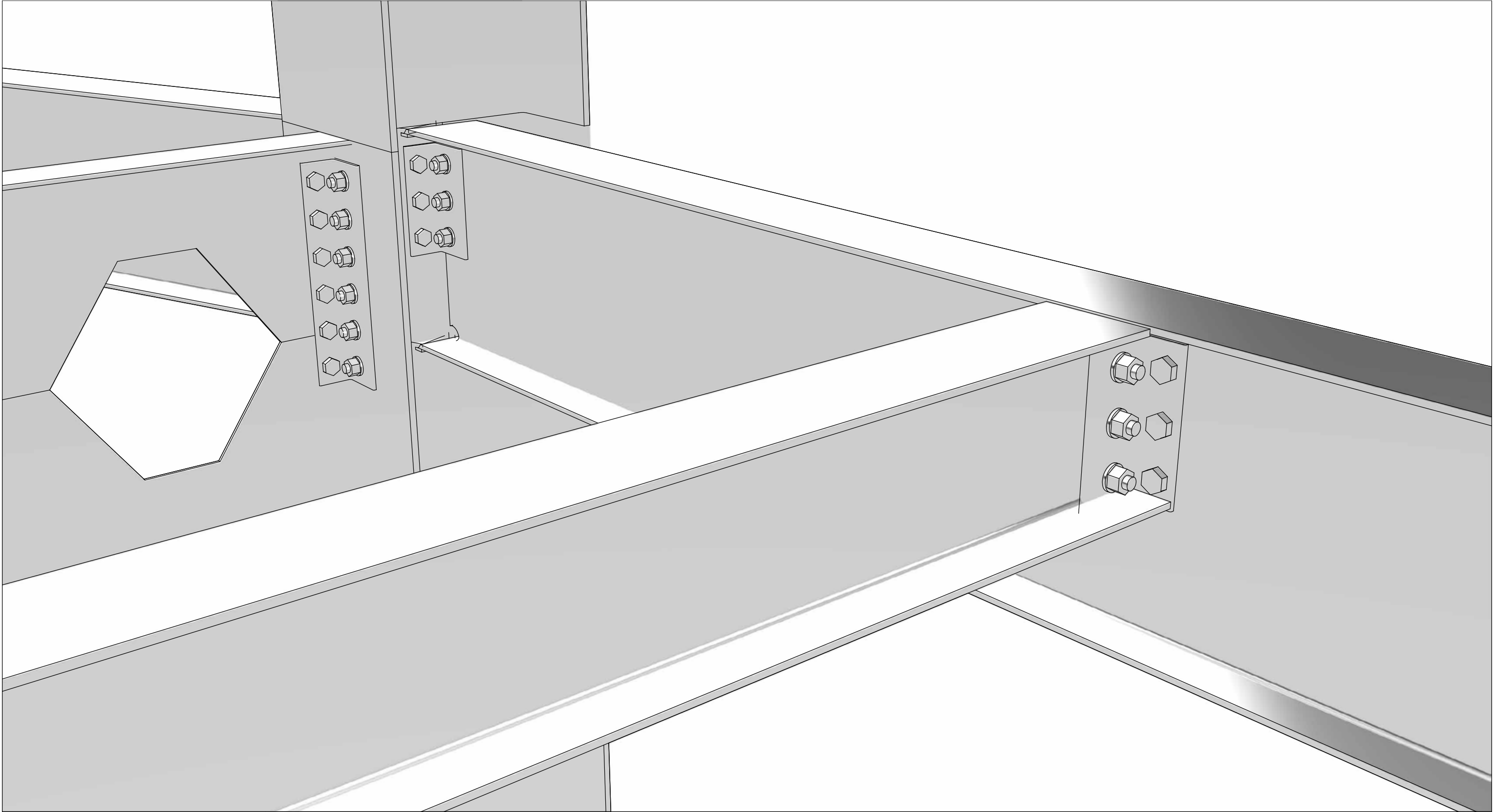
Primary and Secondary Structural Systems

Exploded Axon



Lateral Stability

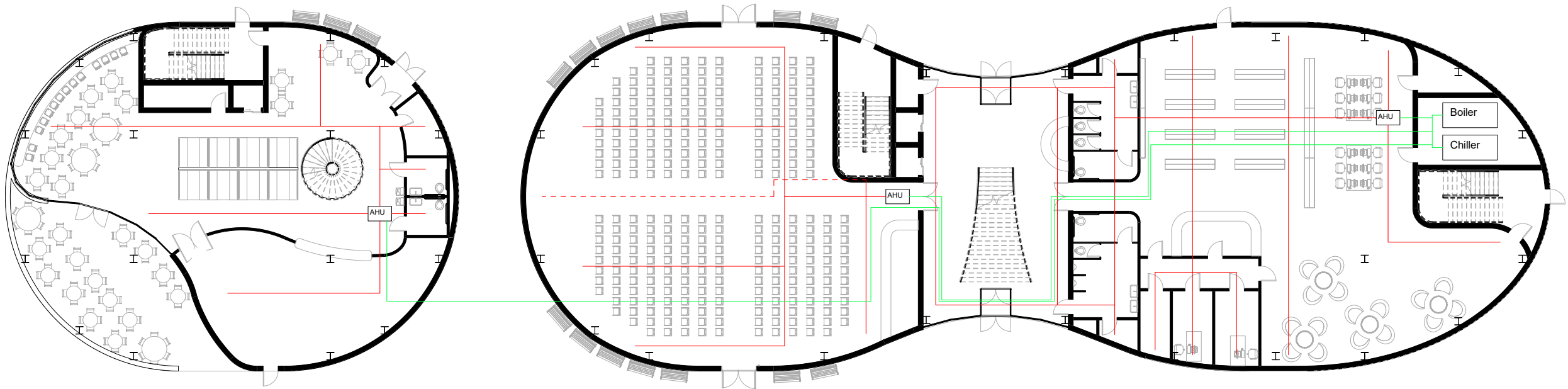
Lateral Bracing



Environmental Control Systems

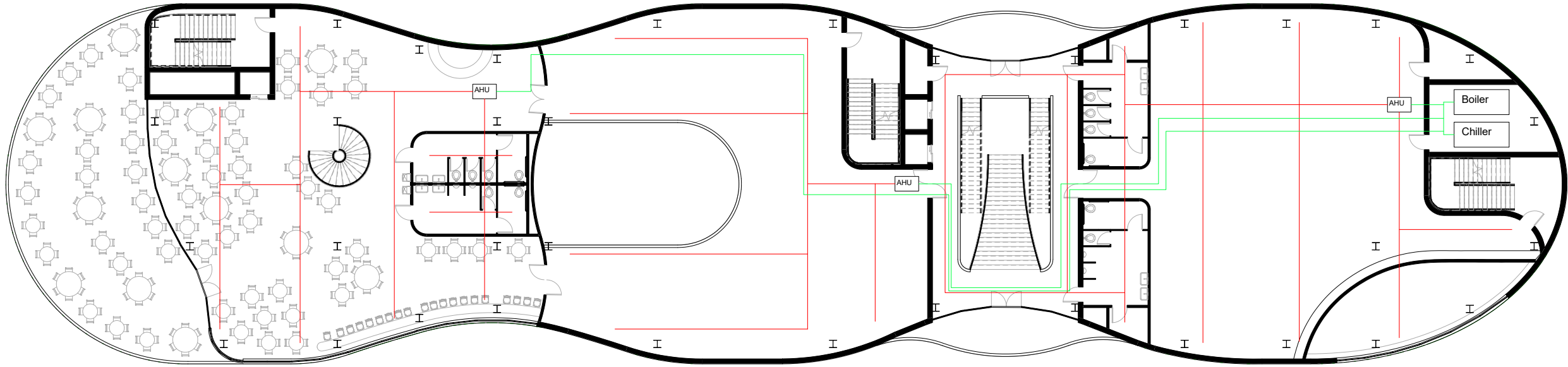
HVAC Systems

1st Floor



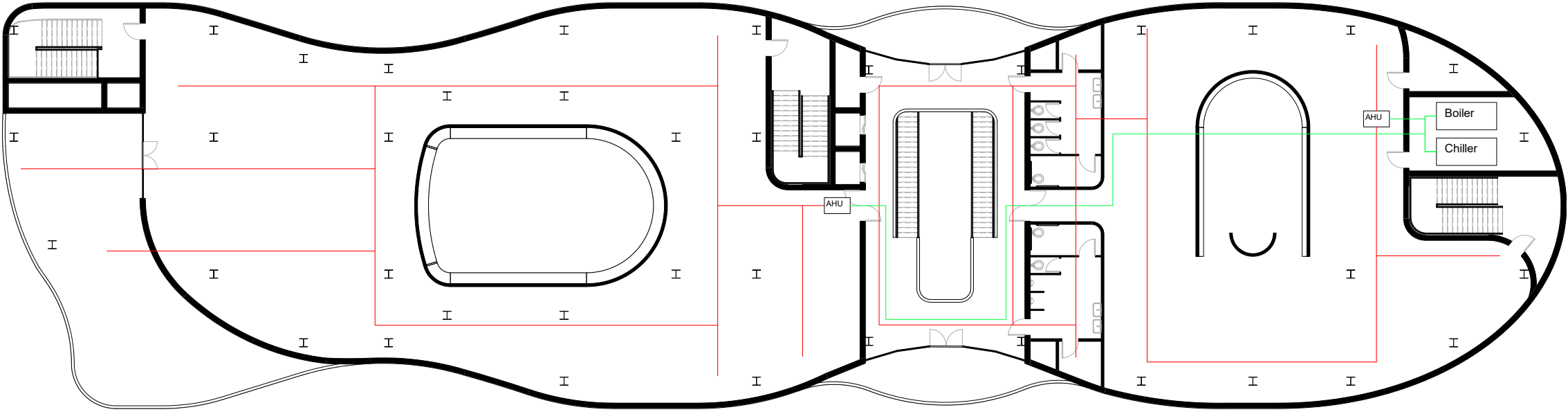
HVAC Systems

2nd Floor



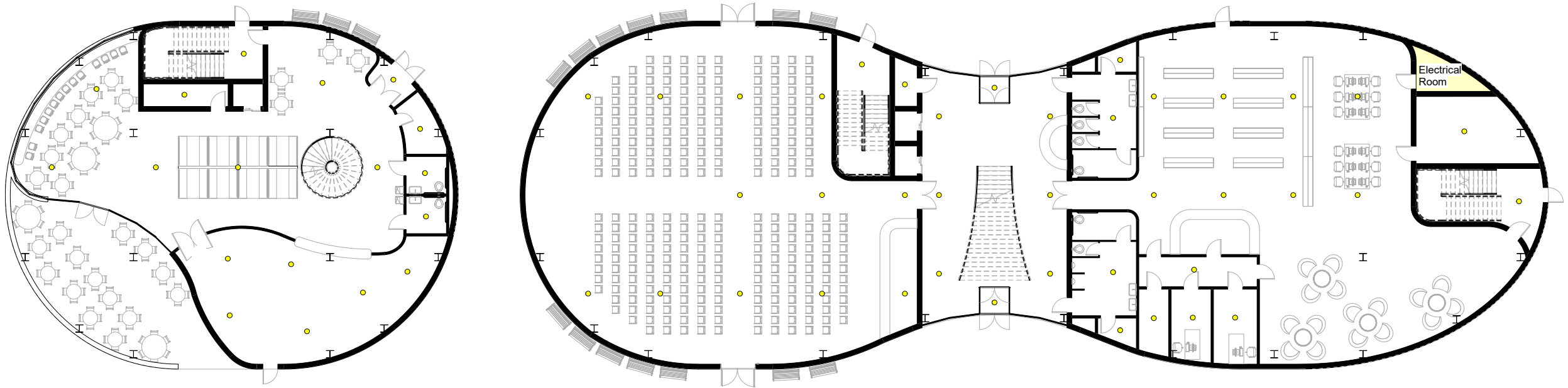
HVAC Systems

3rd Floor



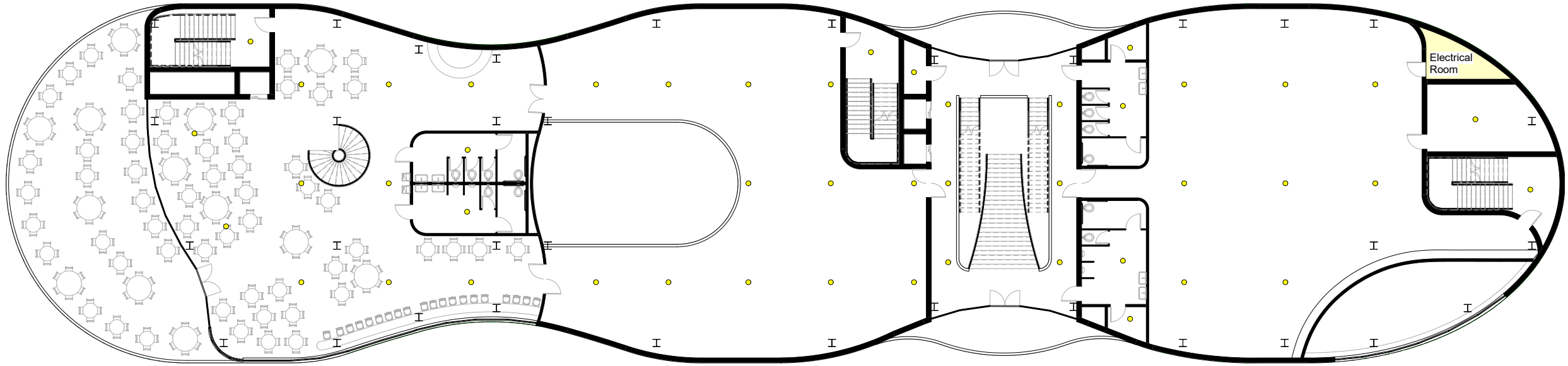
Lighting Systems

1st Floor



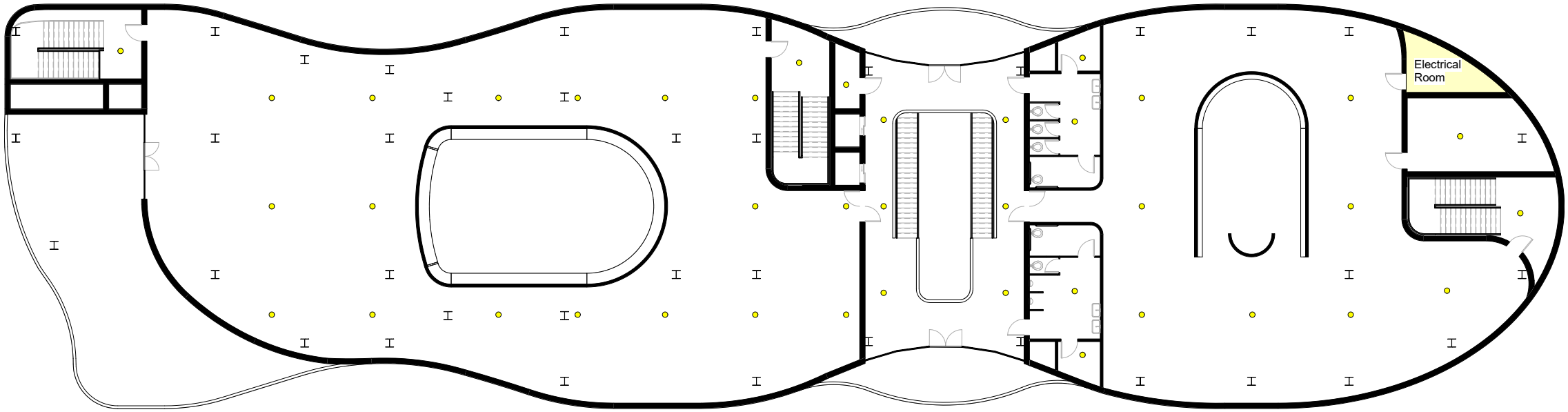
Lighting Systems

2nd Floor



Lighting Systems

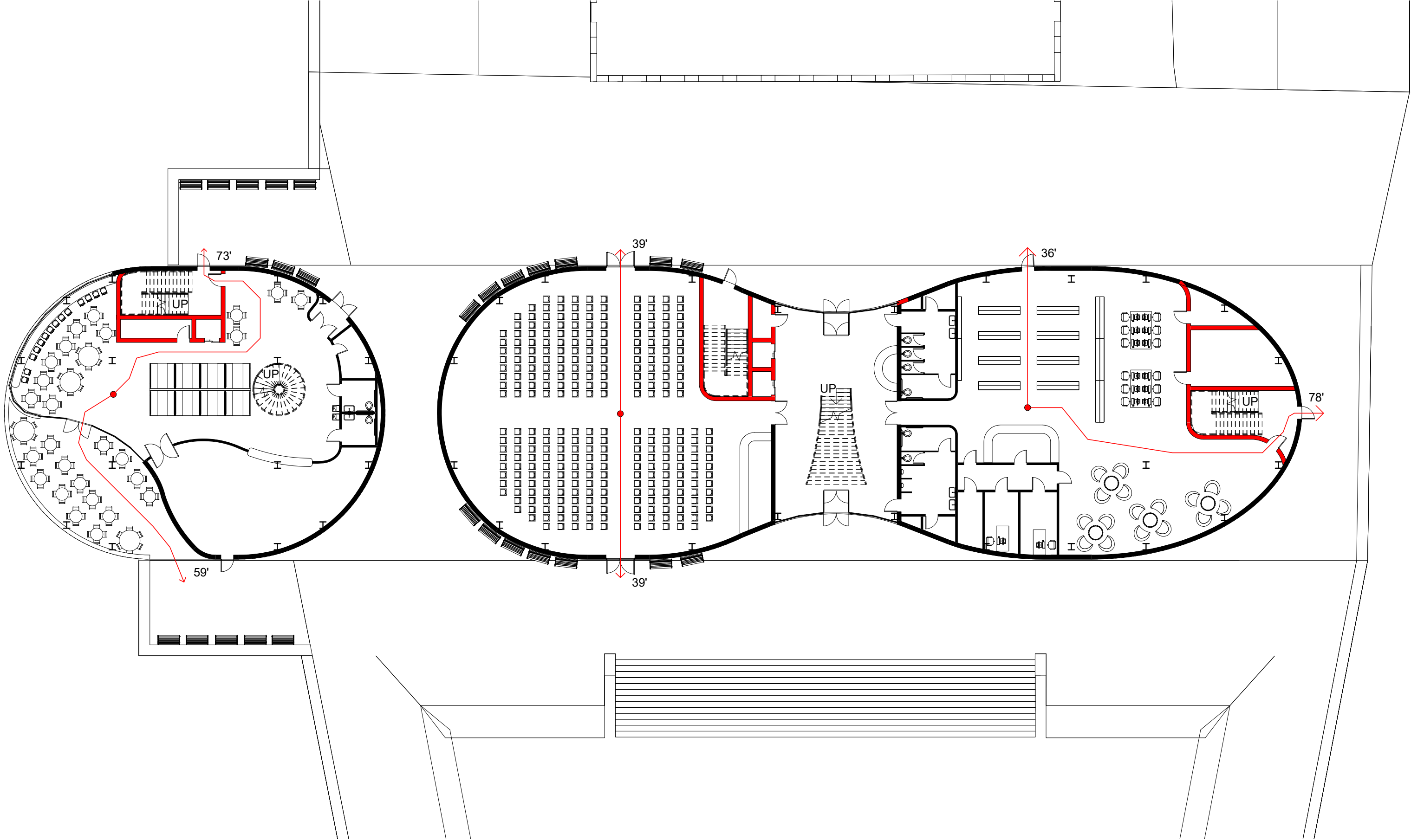
3rd Floor



Life Safety Systems

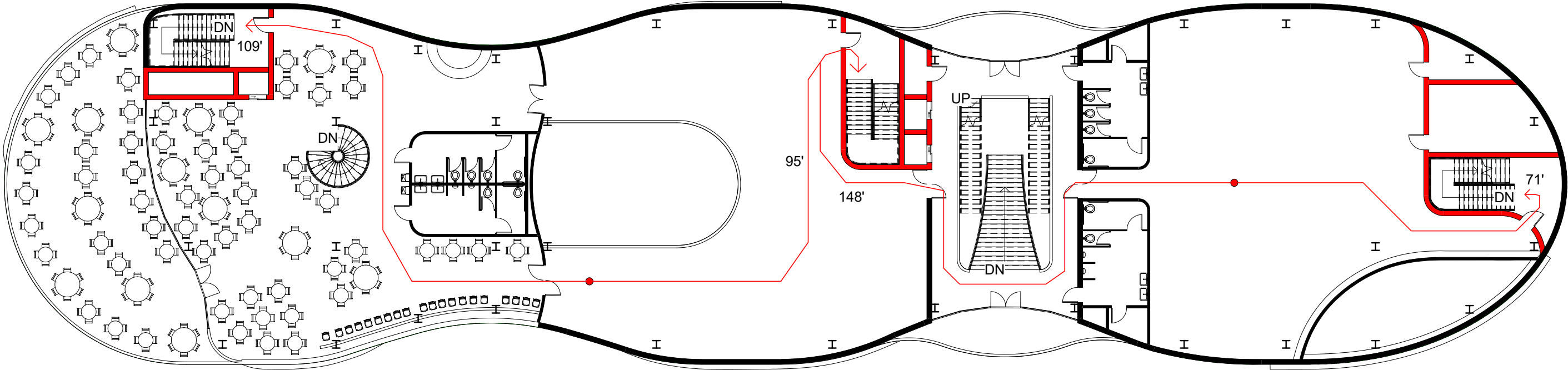
Fire Rated Walls and Travel Distances

1st Floor



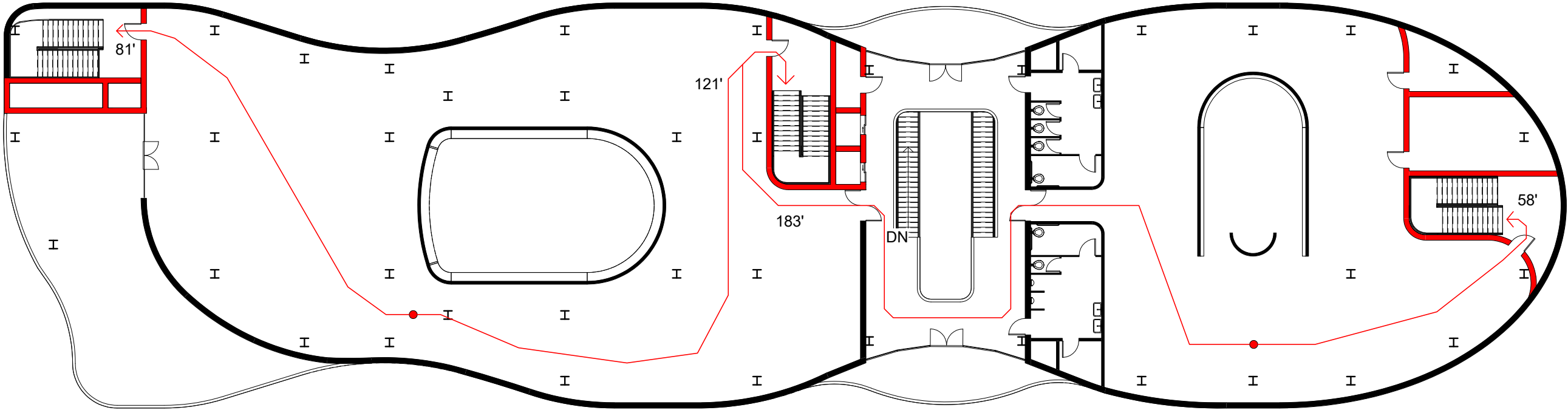
Fire Rated Walls and Travel Distances

2nd Floor



Fire Rated Walls and Travel Distances

3rd Floor



Occupancy and Widths

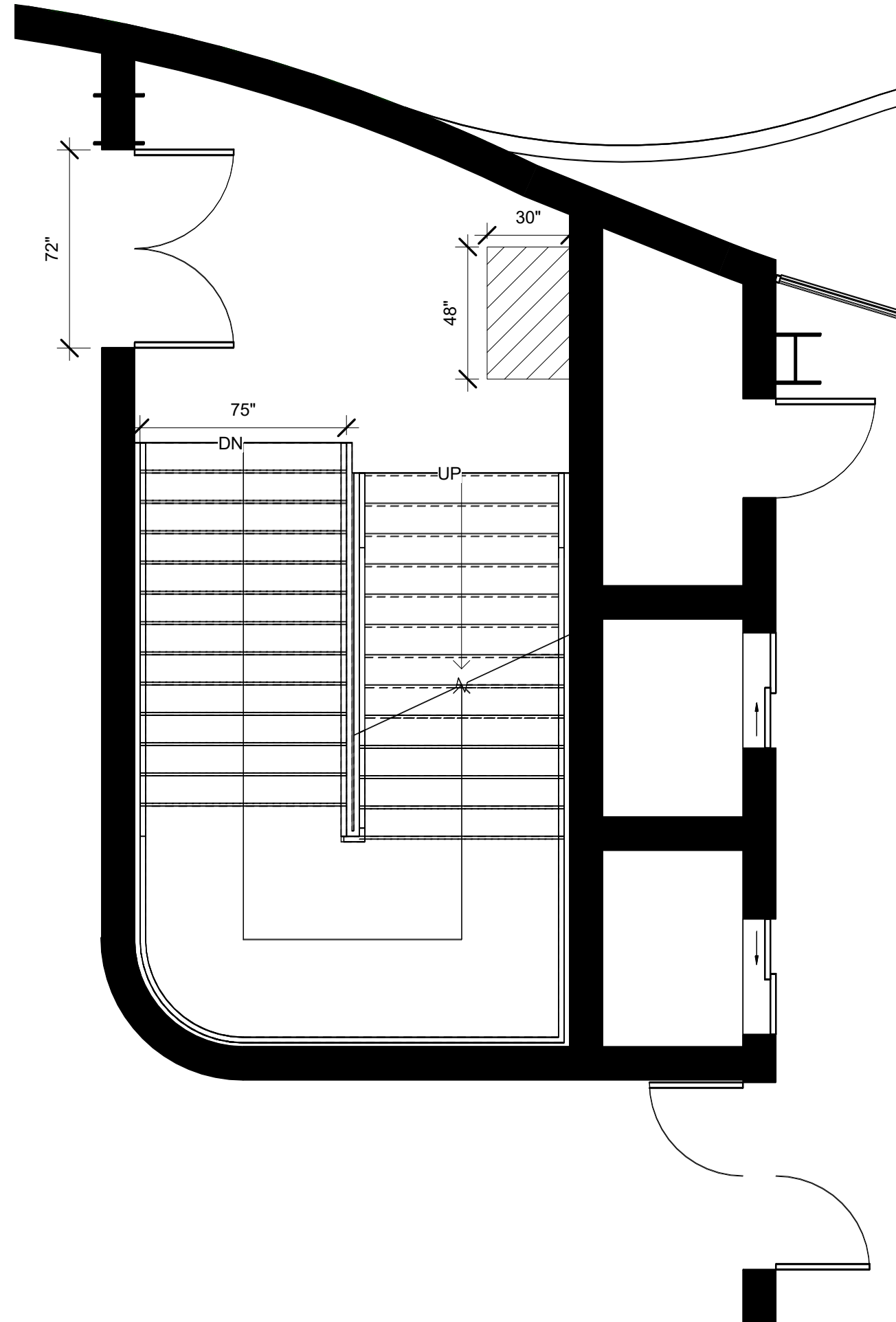
Room Schedule

Each room has 2 means of egress, so divide these numbers by 2.

Occupant Load x 0.2" (with sprinklers) Occupant Load x 0.15" (with sprinklers)

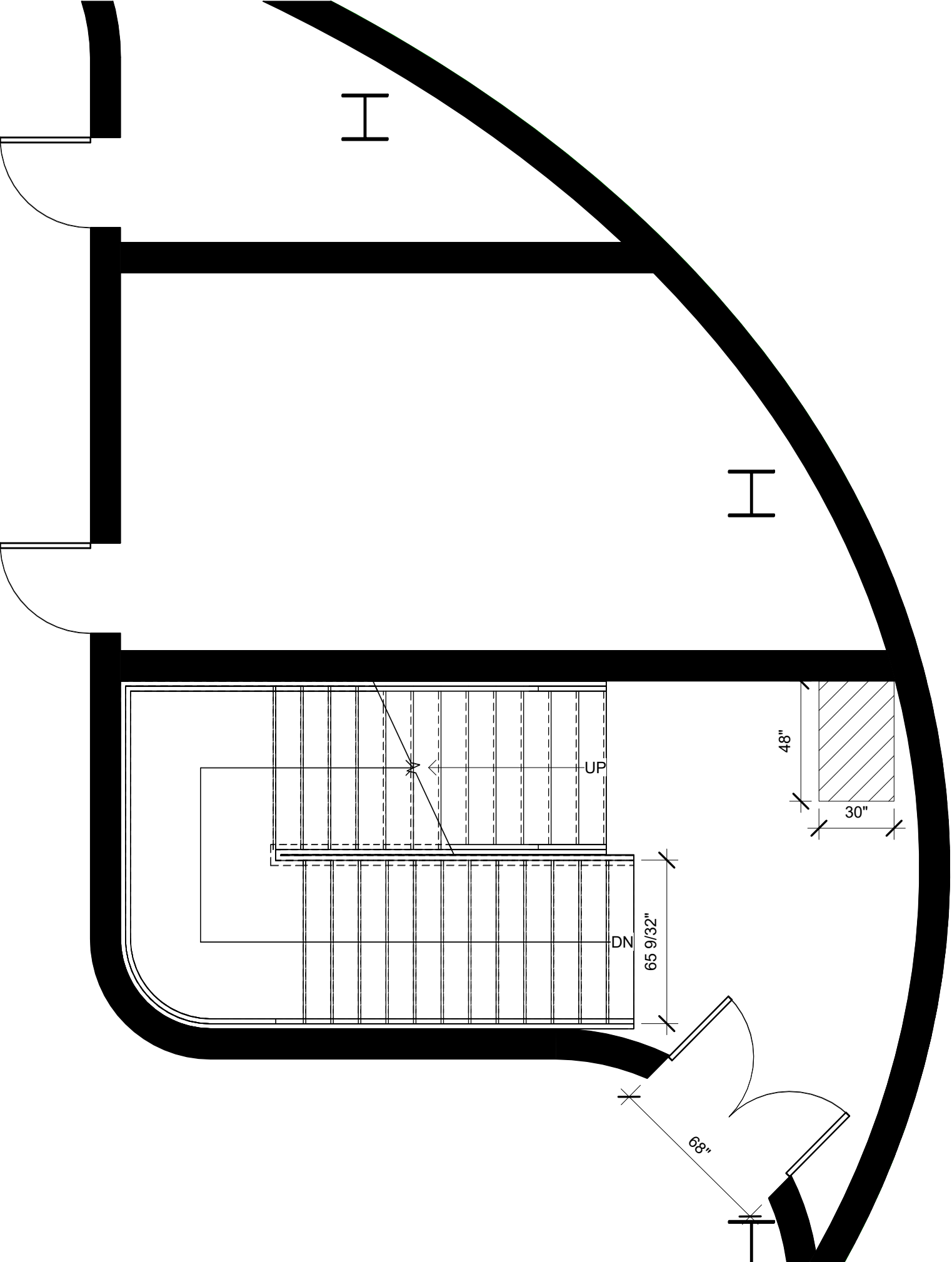
Room Schedule						
Name	Area	Occupancy	Load Factor	Occupant Load	Exit Stair Width Total	Exit Door Width Total
Interior Court	4103 SF	A-3	7 SF	586	9' - 9 7/32"	7' - 3 29/32"
Lobby	1329 SF	A-3	7 SF	190	3' - 1 31/32"	2' - 4 15/32"
Library	3445 SF	A-3	7 SF	492	8' - 2 7/16"	6' - 1 13/16"
Boiler	289 SF	S-1	300 SF	1	0' - 0 3/16"	0' - 0 5/32"
Electrical Room	79 SF	S-1	300 SF	0	0' - 0 1/16"	0' - 0 1/32"
Office	131 SF	B-1	100 SF	1	0' - 0 1/4"	0' - 0 3/16"
Office	115 SF	B-1	100 SF	1	0' - 0 7/32"	0' - 0 3/16"
Kitchen	995 SF	A-2	200 SF	5	0' - 1"	0' - 0 3/4"
Cafe	2322 SF	A-2	15 SF	155	2' - 6 31/32"	1' - 11 7/32"
Freedom of Speech	3592 SF	A-3	7 SF	513	8' - 6 5/8"	6' - 4 31/32"
Cafe	3622 SF	A-2	15 SF	241	4' - 0 9/32"	3' - 0 7/32"
Freedom from War	3585 SF	A-3	7 SF	512	8' - 6 7/16"	6' - 4 13/16"
Freedom from Fear	6492 SF	A-3	7 SF	927	15' - 5 15/32"	11' - 7 1/8"
Freedom of Religion	4325 SF	A-3	7 SF	618	10' - 3 19/32"	7' - 8 11/16"
Electrical Room	98 SF	S-1	300 SF	0	0' - 0 1/16"	0' - 0 1/16"
Electrical Room	119 SF	S-1	300 SF	0	0' - 0 3/32"	0' - 0 1/16"
	34642 SF			4244		

Egress Stairs 1



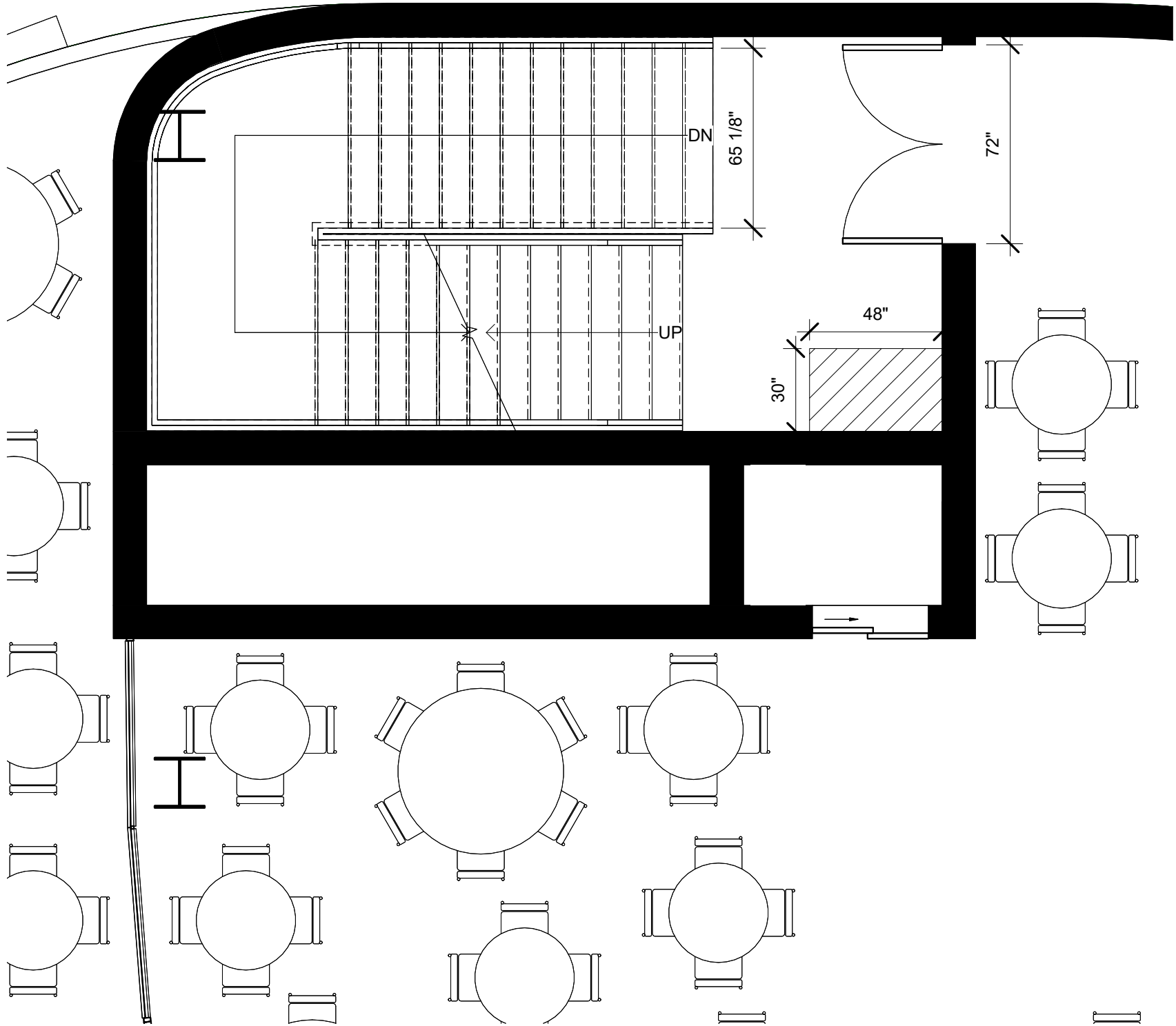
Widths and Area of Refuge

Egress Stairs 2



Widths and Area of Refuge

Egress Stairs 3



Environmental Simulations

Life Cycle Analysis

Table of Contents

Report Summary	1
LCA Results	
Results per Life Cycle Stage	2
Results per Life Cycle Stage, itemized by Division	3
Results per Division	4
Results per Division, itemized by Tally Entry	5
Results per Division, itemized by Material	6
Results per Revit Category	7
Results per Revit Category, itemized by Family	8
Results per Building Element	9
Appendix	
Calculation Methodology - Life Cycle Assessment Methods	10
Calculation Methodology - Life Cycle Stages	11
Calculation Methodology - Environmental Impact Categories	12
LCI Data	13

Report Summary

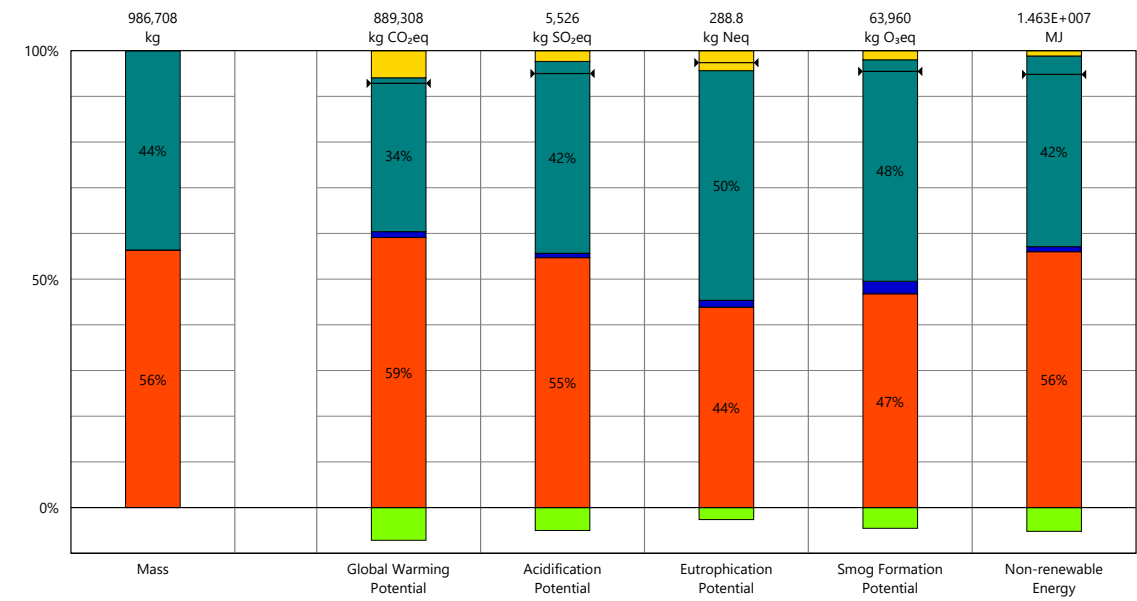
Created with Tally Non-commercial Version 2020.02.28.01		Goal and Scope of Assessment The goal of this assessment is to estimate the environmental impact of this building for the next century.
Author	Alexander Llantada	
Company	NJIT	
Date	05/14/2020	
Project	Four Freedoms Center	
Location	Roosevelt Island	
Gross Area	35,000 ft²	
Building Life	100	
Boundaries	Cradle to grave, inclusive of biogenic carbon; see appendix for a full list of materials and processes	

Environmental Impact Totals	Product Stage [A1-A3]	Construction Stage [A4]	Use Stage [B2-B5]	End of Life Stage [C2-C4]	Module D [D]
Global Warming (kg CO ₂ eq)	525,612	11,450	299,440	52,806	-63,640
Acidification (kg SO ₂ eq)	3,022	53.06	2,320	130.3	-277
Eutrophication (kg Neq)	126.7	4.320	145.2	12.63	-7.59
Smog Formation (kg O ₃ eq)	29,926	1,753	31,004	1,277	-2,901
Ozone Depletion (kg CFC-11eq)	0.006815	3.922E-010	0.005733	2.220E-009	2.935E-004
Primary Energy (MJ)	9,210,436	166,510	8,262,412	182,485	-942,951
Non-renewable Energy (MJ)	8,194,472	162,526	6,105,728	170,661	-761,136
Renewable Energy (MJ)	1,009,208	4,026	2,155,496	12,034	-181,710

Environmental Impacts / Area					
Global Warming (kg CO ₂ eq/m²)	161.6	3.521	92.09	16.24	-19.6
Acidification (kg SO ₂ eq/m²)	0.9294	0.01632	0.7135	0.04007	-0.08508
Eutrophication (kg Neq/m²)	0.03895	0.001329	0.04465	0.003884	-0.002333
Smog Formation (kg O ₃ eq/m²)	9.203	0.5392	9.535	0.3928	-0.8923
Ozone Depletion (kg CFC-11eq/m²)	2.096E-006	1.206E-013	1.763E-006	6.827E-013	9.028E-008
Primary Energy (MJ/m²)	2,833	51.21	2,541	56.12	-290
Non-renewable Energy (MJ/m²)	2,520	49.98	1,878	52.49	-234
Renewable Energy (MJ/m²)	310.4	1.238	662.9	3.701	-55.9

Life Cycle Analysis

Results per Life Cycle Stage

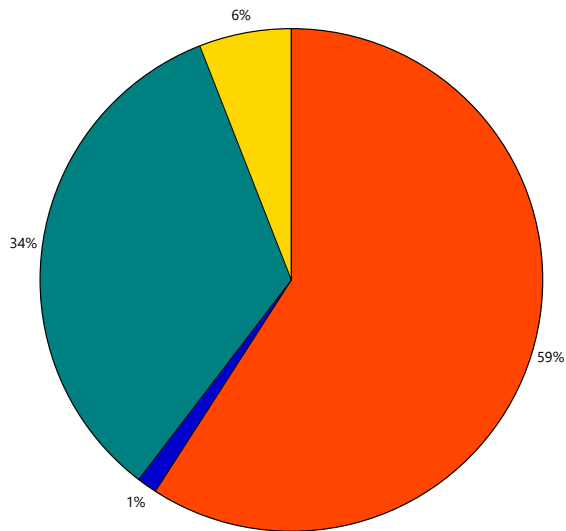


Legend

Net value (impacts + credits)

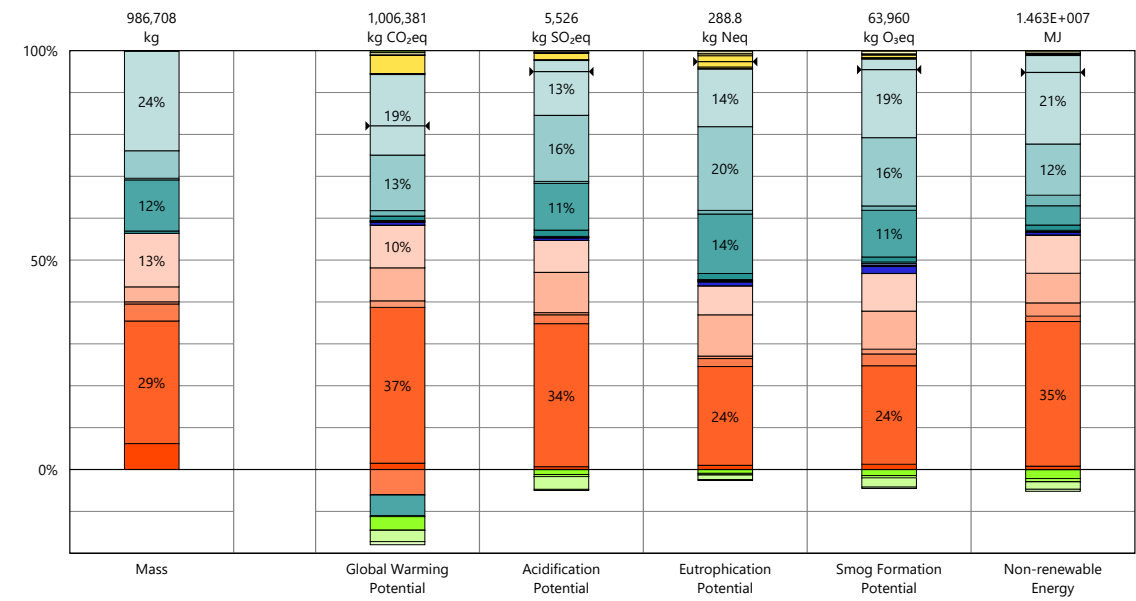
Life Cycle Stages

- Product [A1-A3]
- Transportation [A4]
- Maintenance and Replacement [B2-B5]
- End of Life [C2-C4]
- Module D [D]



Global Warming Potential

Results per Life Cycle Stage, itemized by Division



Legend

Net value (impacts + credits)

Product [A1-A3]

- 03 - Concrete
- 05 - Metals
- 06 - Wood/Plastics/Composites
- 07 - Thermal and Moisture Protection
- 08 - Openings and Glazing
- 09 - Finishes

Transportation [A4]

- 03 - Concrete
- 05 - Metals
- 06 - Wood/Plastics/Composites
- 07 - Thermal and Moisture Protection
- 08 - Openings and Glazing
- 09 - Finishes

Maintenance and Replacement [B2-B5]

- 03 - Concrete
- 05 - Metals
- 06 - Wood/Plastics/Composites
- 07 - Thermal and Moisture Protection
- 08 - Openings and Glazing
- 09 - Finishes

End of Life [C2-C4]

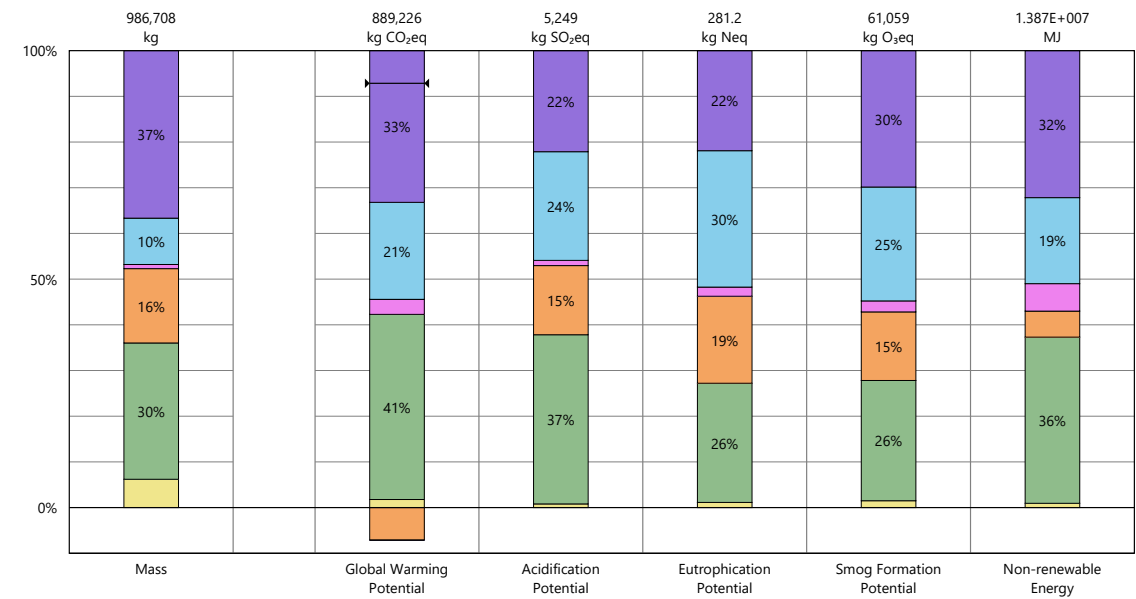
- 03 - Concrete
- 05 - Metals
- 06 - Wood/Plastics/Composites
- 07 - Thermal and Moisture Protection
- 08 - Openings and Glazing
- 09 - Finishes

Module D [D]

- 03 - Concrete
- 05 - Metals
- 06 - Wood/Plastics/Composites
- 07 - Thermal and Moisture Protection
- 08 - Openings and Glazing
- 09 - Finishes

Life Cycle Analysis

Results per Division

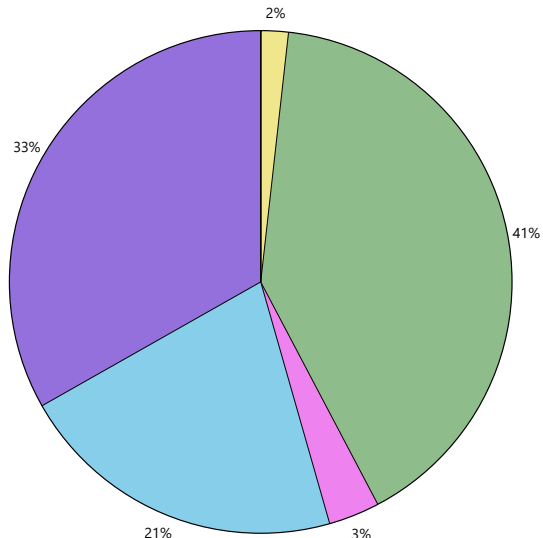


Legend

Net value (impacts + credits)

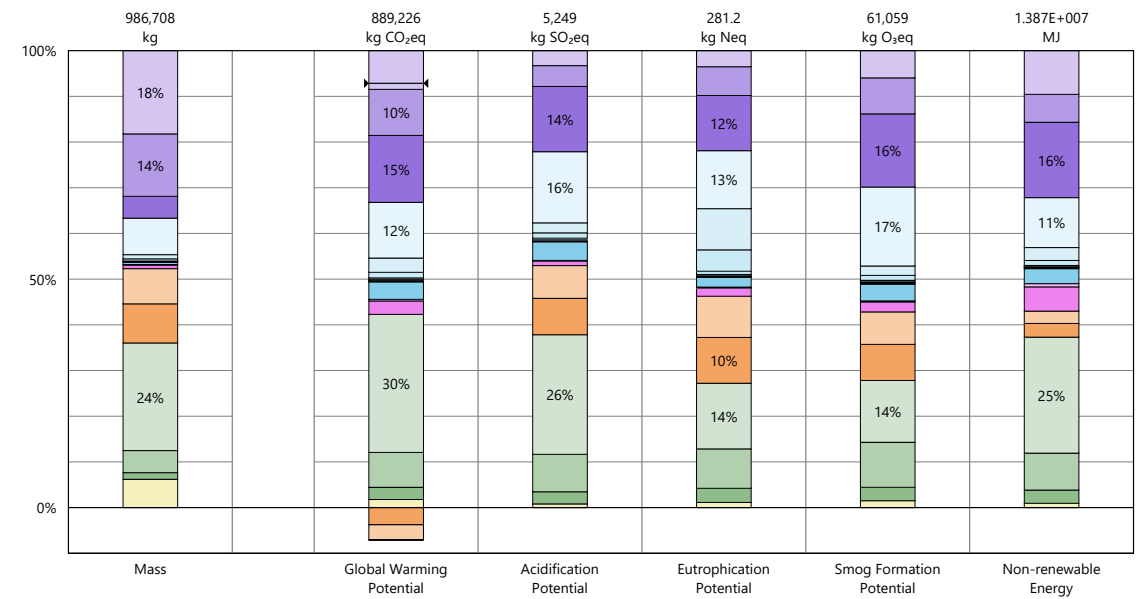
Divisions

- 03 - Concrete
- 05 - Metals
- 06 - Wood/Plastics/Composites
- 07 - Thermal and Moisture Protection
- 08 - Openings and Glazing
- 09 - Finishes



Global Warming Potential

Results per Division, itemized by Tally Entry



Legend

Net value (impacts + credits)

03 - Concrete

- Cast-in-place concrete, lightweight structural concrete, 2501-3000 psi
- Precast concrete slab

05 - Metals

- Steel, C-stud metal framing with insulation
- Steel, deck
- Steel, W section (wide flange shape)

06 - Wood/Plastics/Composites

- Plywood, exterior grade
- Plywood, interior grade

07 - Thermal and Moisture Protection

- Expanded polystyrene (EPS), board
- Polyethylene sheet vapor barrier (HDPE)

08 - Openings and Glazing

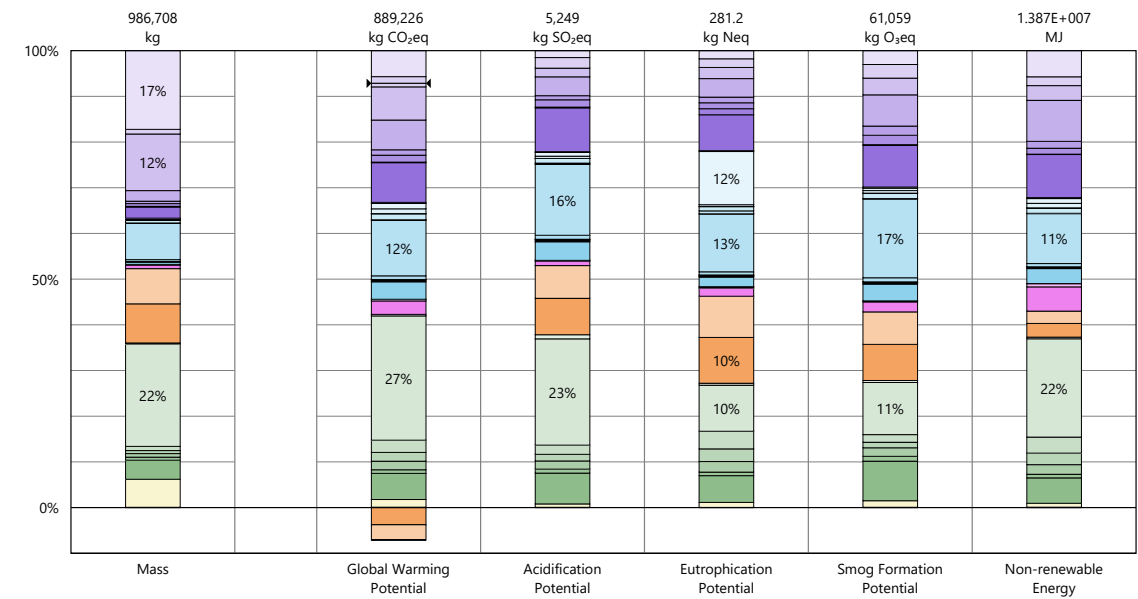
- Aluminum mullion system
- Door frame, aluminum
- Door frame, steel, galvanized
- Door, exterior, aluminum
- Door, exterior, steel
- Door, interior, glass
- Door, interior, steel
- Glazing, triple pane IGU

09 - Finishes

- Acoustic ceiling system, fiberglass
- Portland cement stucco
- Wall board, gypsum

Life Cycle Analysis

Results per Division, itemized by Material



Legend

Net value (impacts + credits)

03 - Concrete

- Lightweight concrete, 2501-3000 psi, 40-49% fly ash
- Steel, welded wire mesh
- Structural concrete, 4001-5000 psi, 0-19% fly ash and/or slag

05 - Metals

- Coated steel deck, SDI - EPD
- Cold formed structural steel
- Fiberglass blanket insulation, paper faced
- Fireproofing, intumescent paint
- Fireproofing, intumescent paint, by area
- Hot rolled structural steel, AISC - EPD
- Paint, exterior metal coating, silicone-based, by area

06 - Wood/Plastics/Composites

- Exterior grade plywood, US
- Interior grade plywood, US, AWC - EPD

07 - Thermal and Moisture Protection

- Expanded polystyrene (EPS), board
- Polyethelene sheet vapor barrier (HDPE)

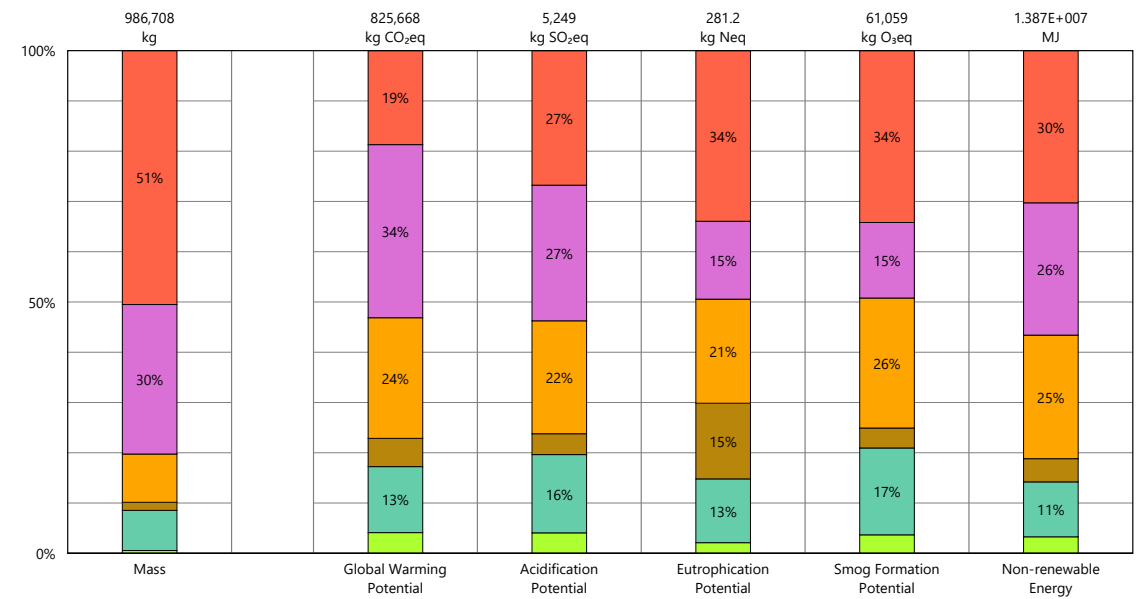
08 - Openings and Glazing

- Acid-etching (for glazing)
- Aluminum curtain wall system, YKK AP - EPD
- Aluminum entrance door, YKK AP - EPD
- Door frame, aluminum, powder-coated, no door
- Door frame, metal, galvanized, no door
- Fasteners, stainless steel
- Glazing, double, 3 mm, laminated safety glass
- Glazing, triple, insulated (air)
- Hardware, aluminum
- Hardware, stainless steel
- Hollow door, interior, steel, fire-rated
- Integrated door closer, cast iron
- Overhead door closer, aluminum
- Overhead door closer, cast iron
- Stainless steel door hinge
- Steel stiffened door, Assa Abloy, Legion/UltraDor door - EPD

09 - Finishes

- Acoustic ceiling tile (ACT), fiberglass
- Kraft paper
- Metal lath, for plaster
- Paint, exterior acrylic latex
- Paint, interior acrylic latex
- Stucco, portland cement
- Suspended grid
- Wall board, gypsum, natural

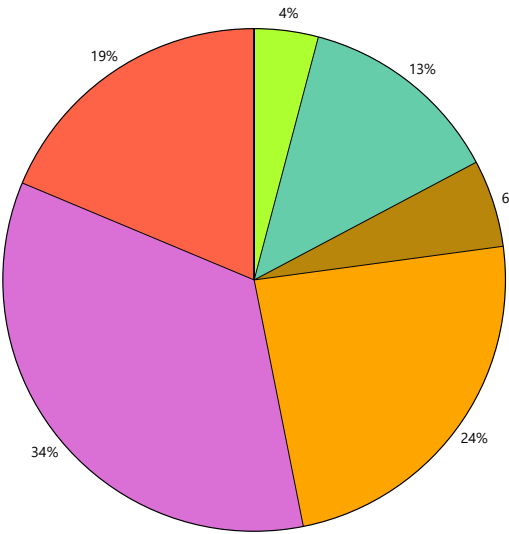
Results per Revit Category



Legend

Revit Categories

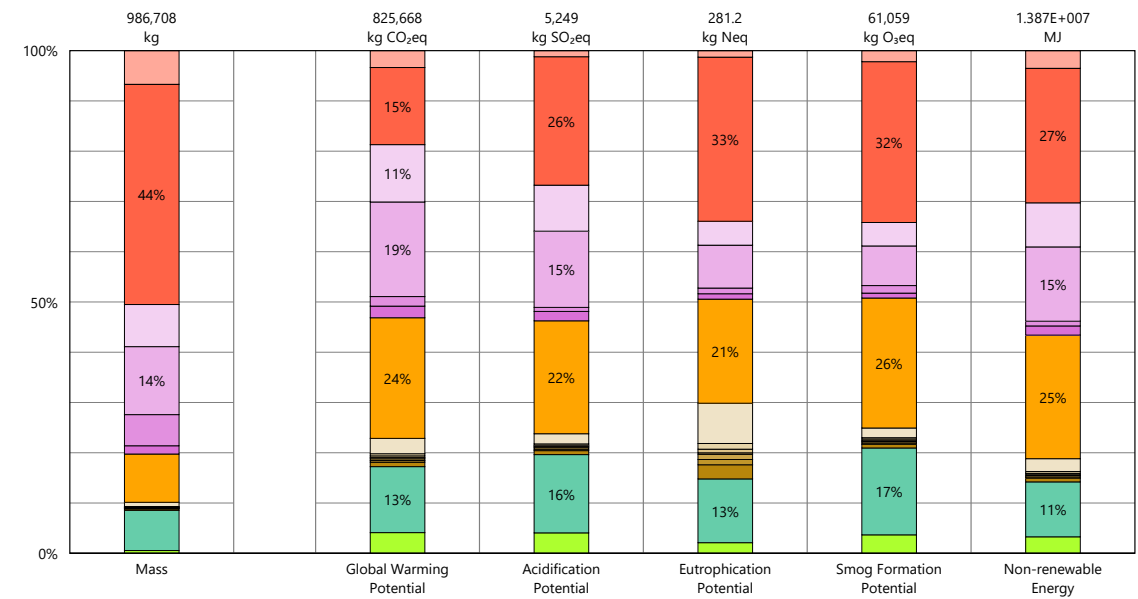
- Curtainwall Mullions
- Curtainwall Panels
- Doors
- Floors
- Structure
- Walls



Global Warming Potential

Life Cycle Analysis

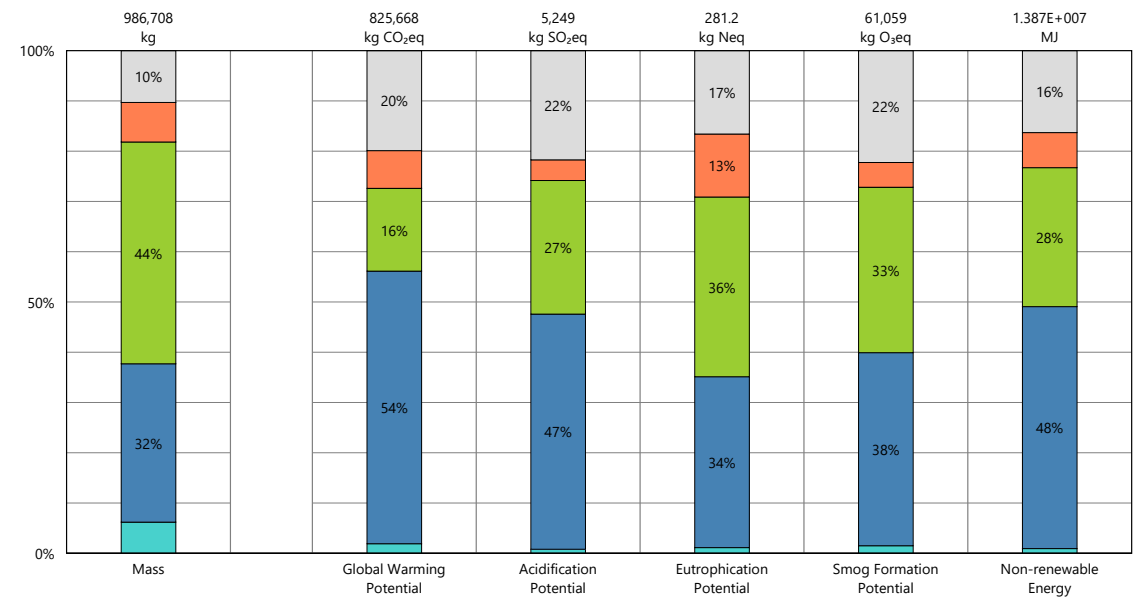
Results per Revit Category, itemized by Family



Legend

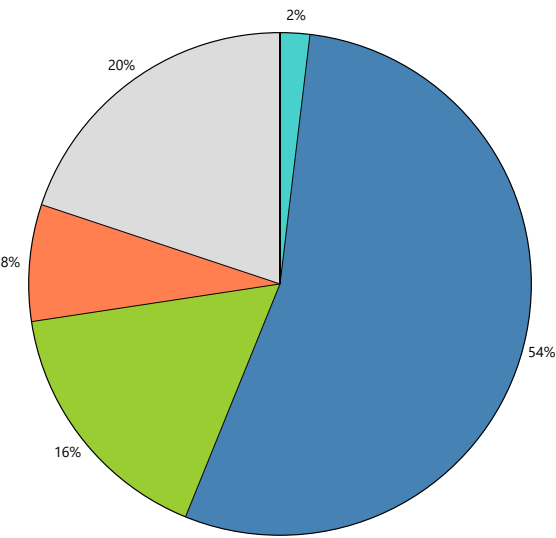
- Curtainwall Mullions
 - Rectangular Mullion
- Curtainwall Panels
 - System Panel
- Doors
 - Door-Curtain-Wall-Double-Glass
 - Door-Double-Glass
 - Door-Double-Sliding
 - Door-Passage-Double-Flush-Dbl_Acting
 - Doors_Door-sets_ASSA ABLOY_Egress-Door-with-FG-Motor-Lock_HardwareSet-3D
 - Double_Flush_-_OppSwing_2421
 - Single-Flush
- Floors
 - Generic - 36"
- Structure
 - Castellated_Beamrfa_5493
 - Footing-Rectangular
 - W Shapes
 - W Shapes-Column
- Walls
 - Generic - 12"
 - Interior - 3 1/8" Partition (1-hr)

Results per Building Element



Legend

- Building Elements
 - Substructure
 - Superstructure
 - Enclosure
 - Interiors
 - Undefined



Global Warming Potential