

# Tokyo Olympics: Platinum Track and Field Stadium Proposal

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# Location

- Moderate temperature range (~40-80°F)
  - Low HVAC energy use
- South, West, and East walls receive sunlight at this latitude
  - Relatively consistent sunlight (~5 peak sun hours during August)



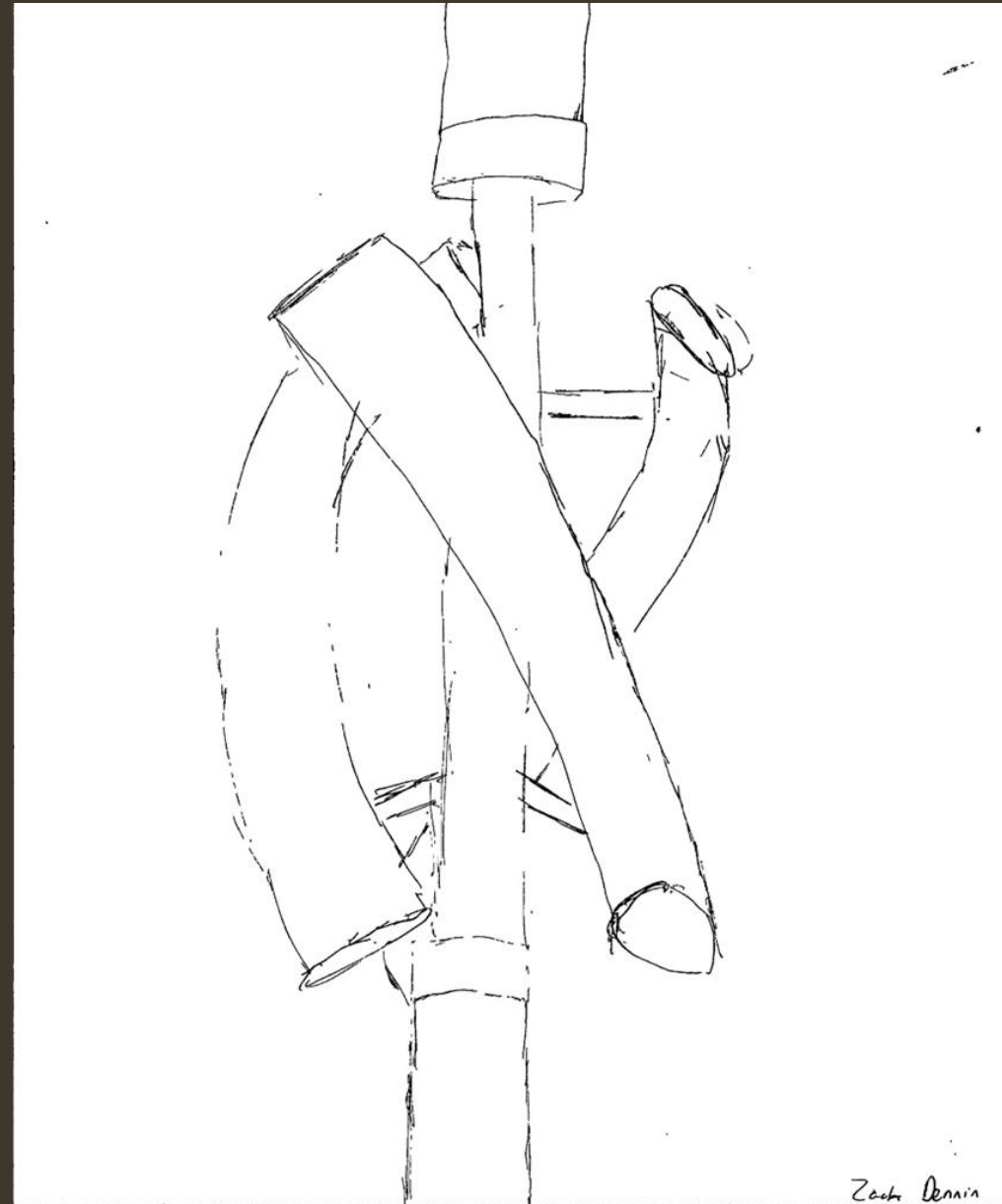
# Location

- Located on top of the 1964 National Olympic Stadium
- 52 Acres
- Demolished in 2015
  - Use the existing framework as a base for the new structure
  - Recycle as much original material as possible



# Green Energy Sources

- Solar panels
  - Located on east and west portions of roof
- Wind turbines
  - Located on building roof for maximum potential
  - Aesthetically pleasing while practical
- Extra energy returned to the grid when stadium dormant



# Turbine Array

[ ] = Wind Turbine

\* Painted based off of color

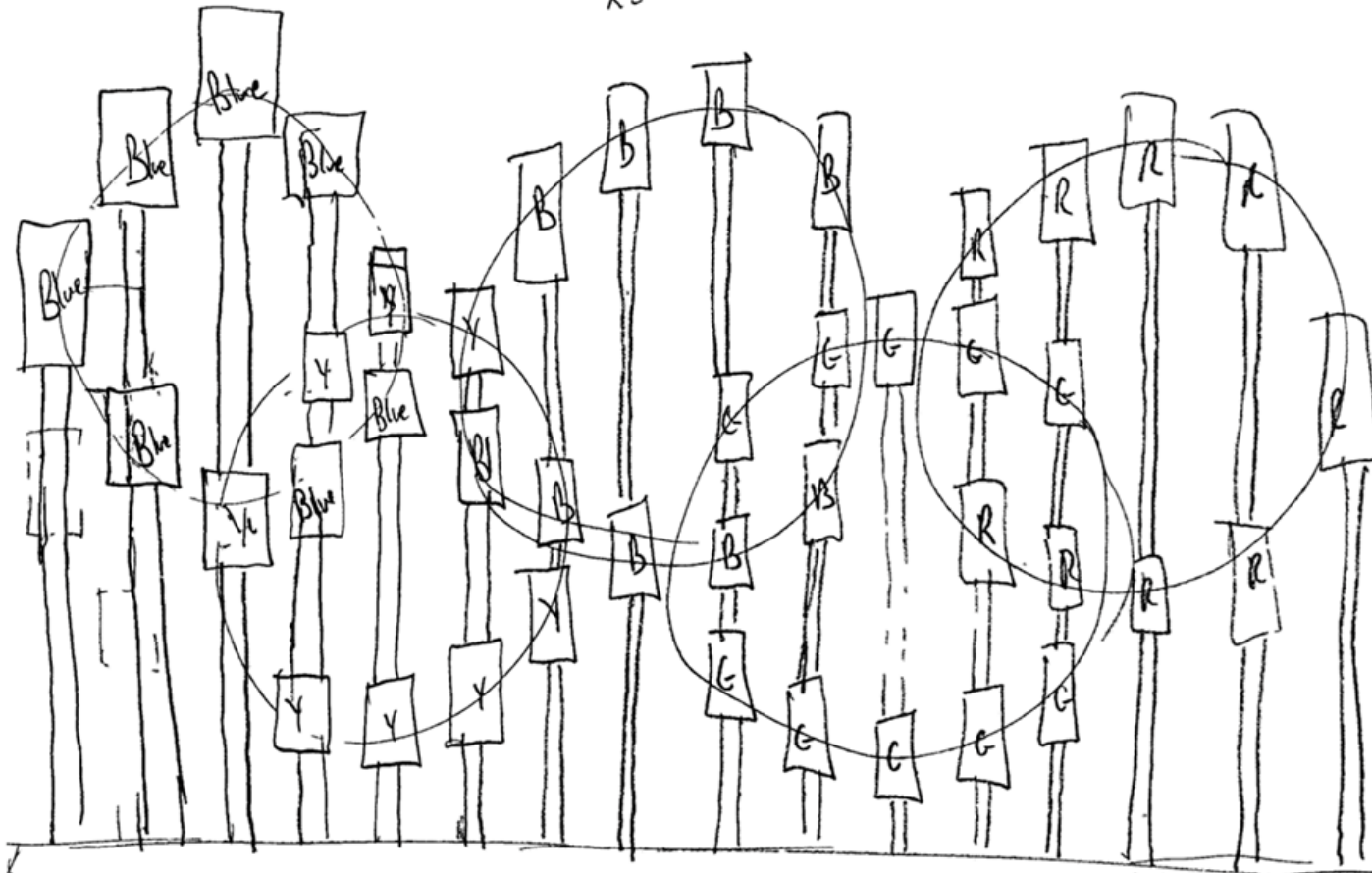
Blue = Blue

B = Black

Y = Yellow

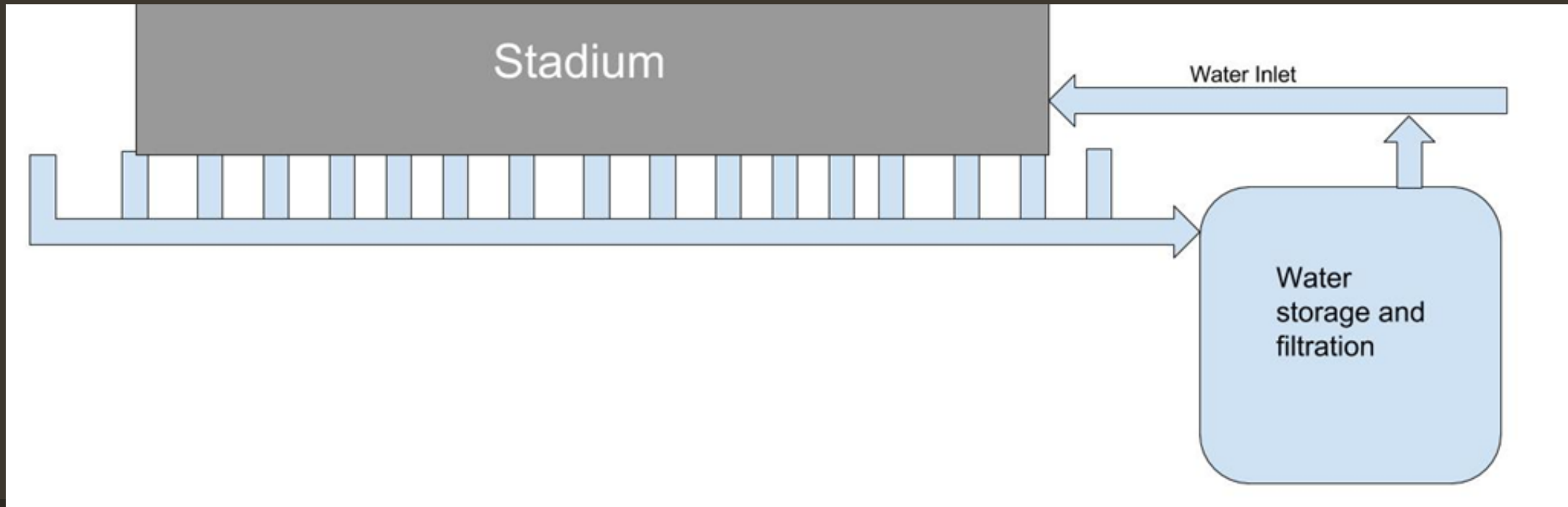
G = Green

R = Red



# Rainwater Collection System

- Located beneath the arena to collect rain and storm water
- Permeable surface feeds to a collection chamber
- Water is reused to hydrate the vegetation in and around the building



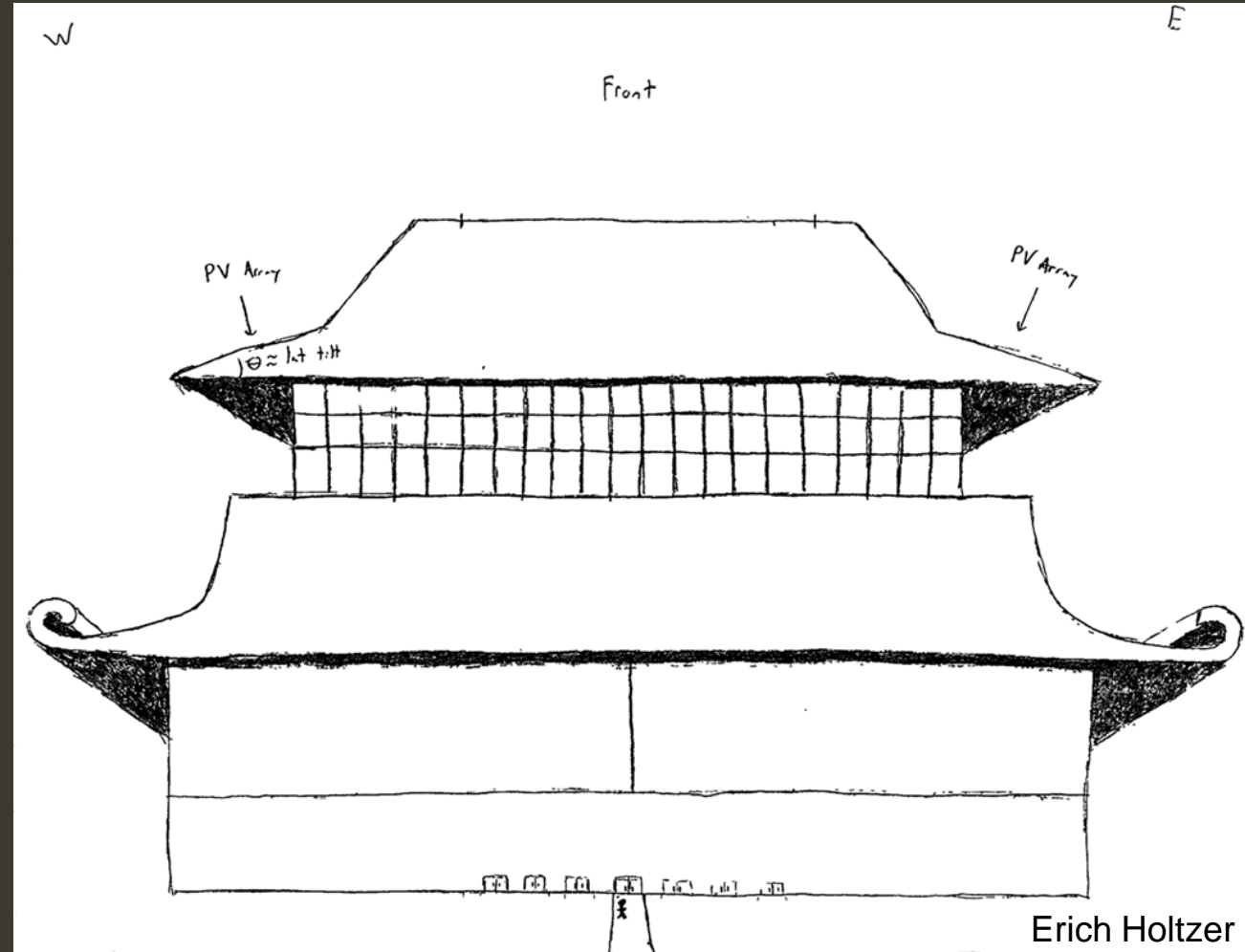
# Transportation

- Bike Racks
  - Free bike parking to encourage green transportation
- Underground Parking Facility
  - Off-site to reduce vehicle traffic
- Tokyo's high ranked public transportation system
  - Stops located in Olympic Village



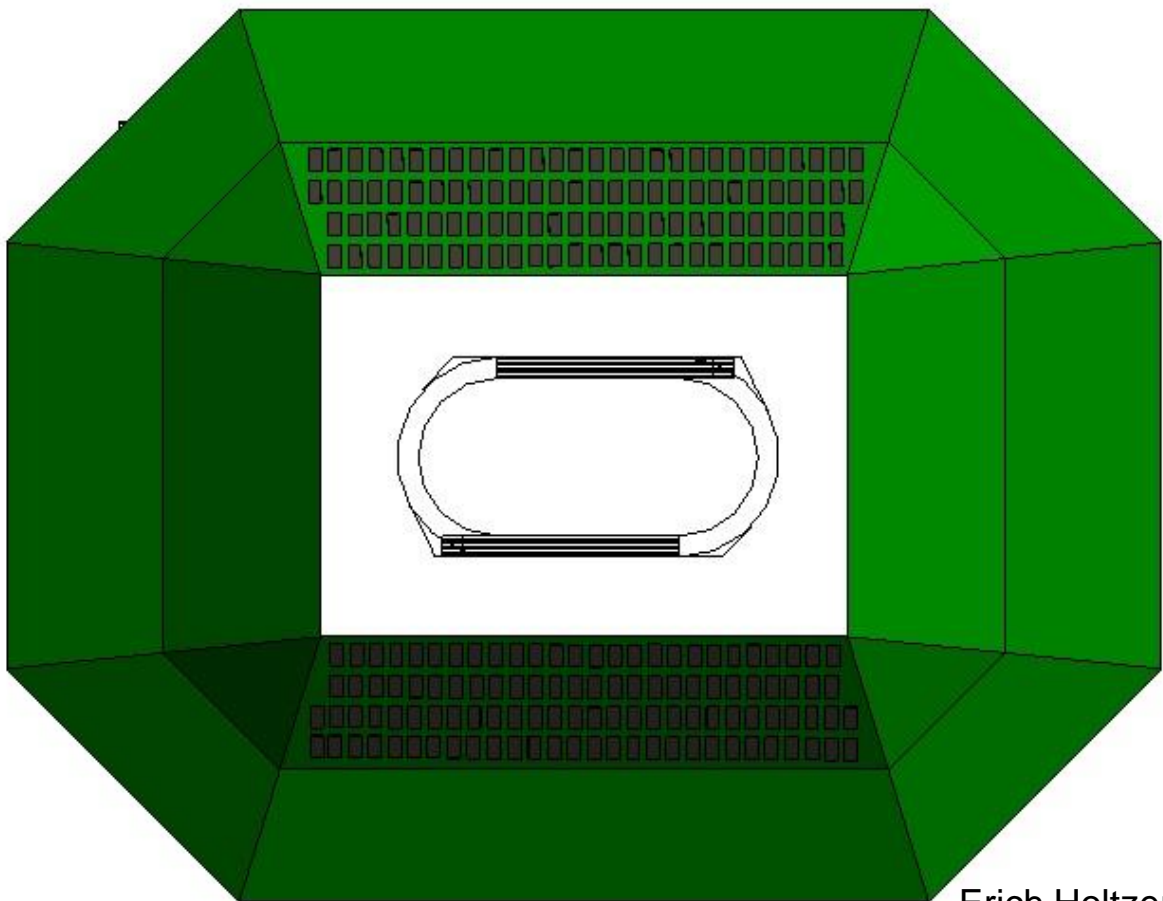
# Modern Cultural Design

- Traditional Japanese tiered building structure
- Modern materials and aesthetics
- Represents the technological prowess of the culture
- Local vendors to support local business and economy

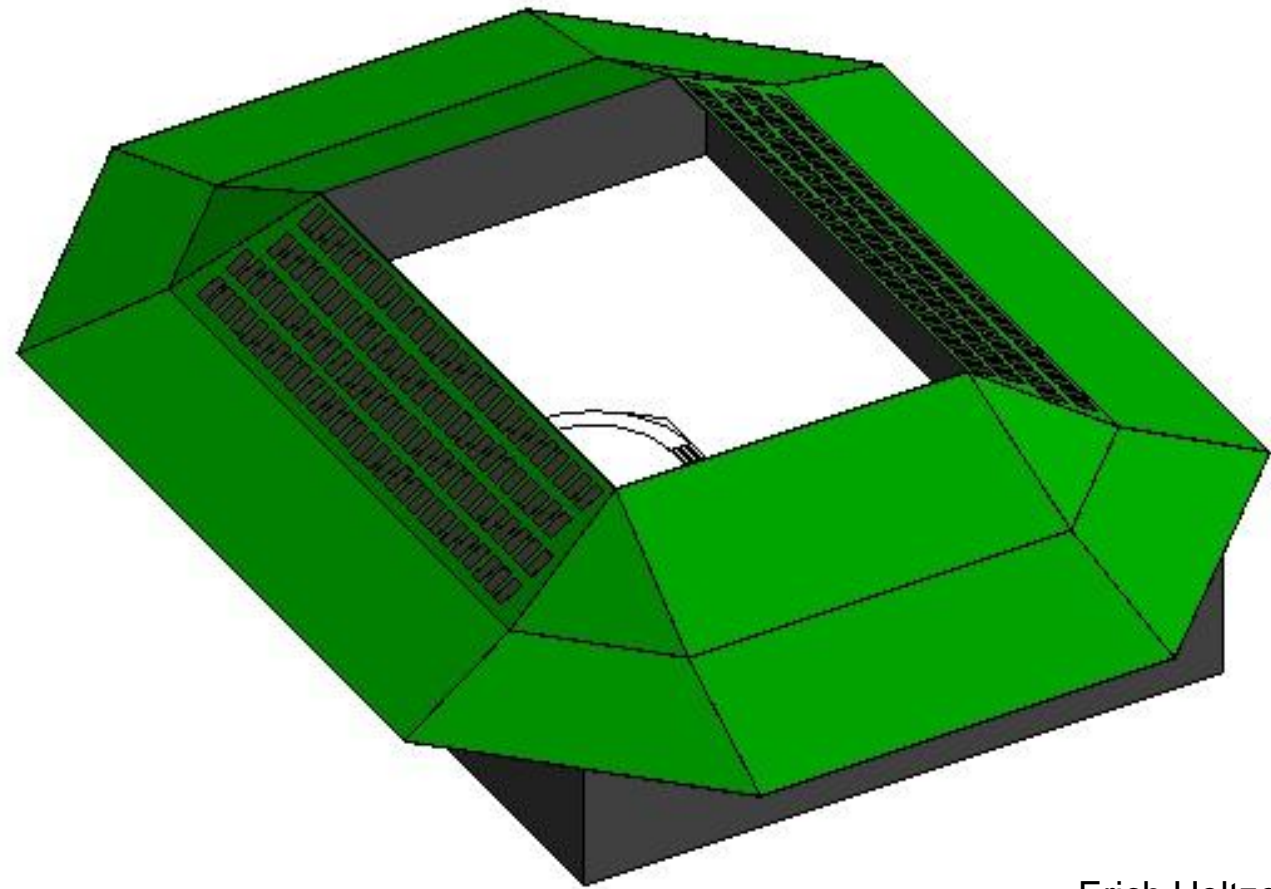




# Final Outer Design



Erich Holtzer



Erich Holtzer

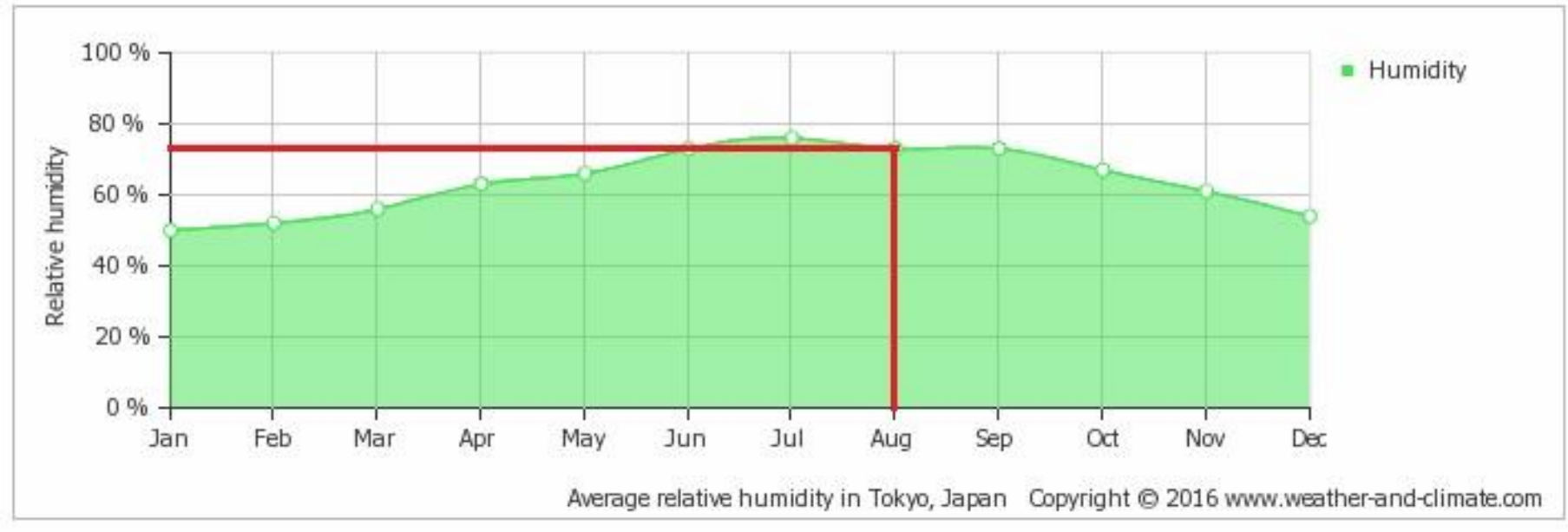
# Thermal Comfort

Six Factors:

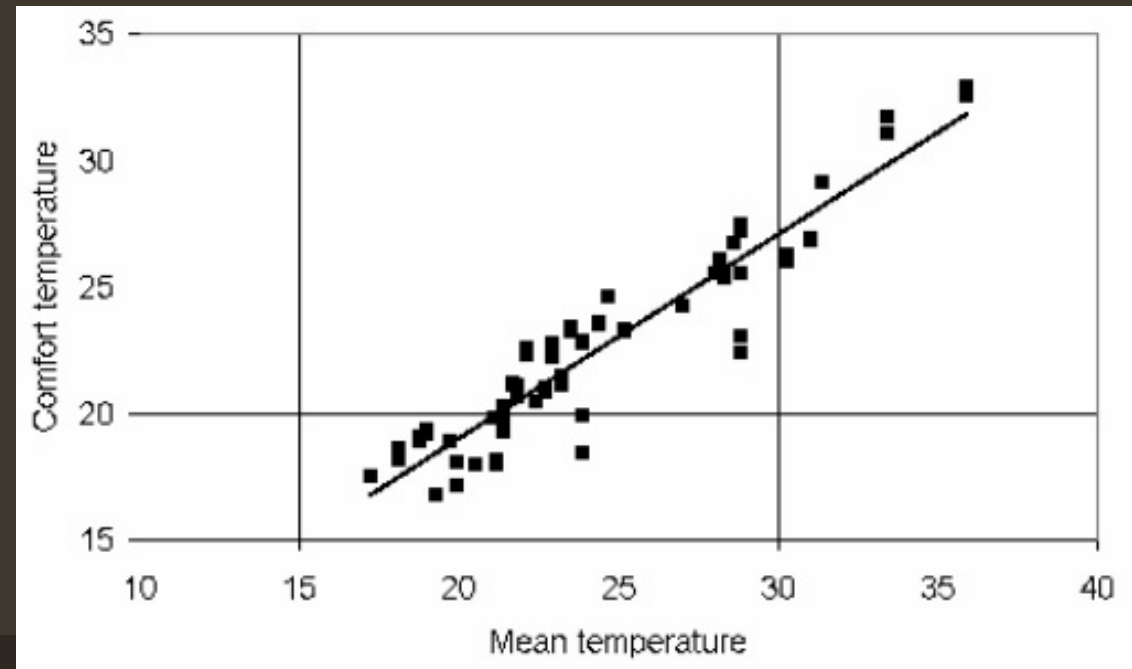
1. Air Temperature
2. Mean Radiant Temperature (MRT)
3. Air Velocity
4. Relative Humidity
5. Metabolic Rate (MET)
6. Clothing Insulation



The mean monthly relative humidity over the year in Tokyo, Japan.



1 Metabolic Rate (MET) =  $58.2 \text{ W/m}^2$  ( $18.4 \text{ Btu/h}\cdot\text{ft}^2$ ), which is equal to the energy produced per unit surface area of an average person seated at rest



Select method: PMV method

Air temperature  
26 °C  
Use operative temperature

Mean radiant temperature  
26 °C

Air speed  
0.1 m/s  
Local air speed control

Humidity  
76 %  
Relative humidity

Metabolic rate  
1 met  
Typing: 1.1

Clothing level  
0.57 clo  
Trousers, short-sleeve

Create custom ensemble

Dynamic predictive clothing

LEED documentation

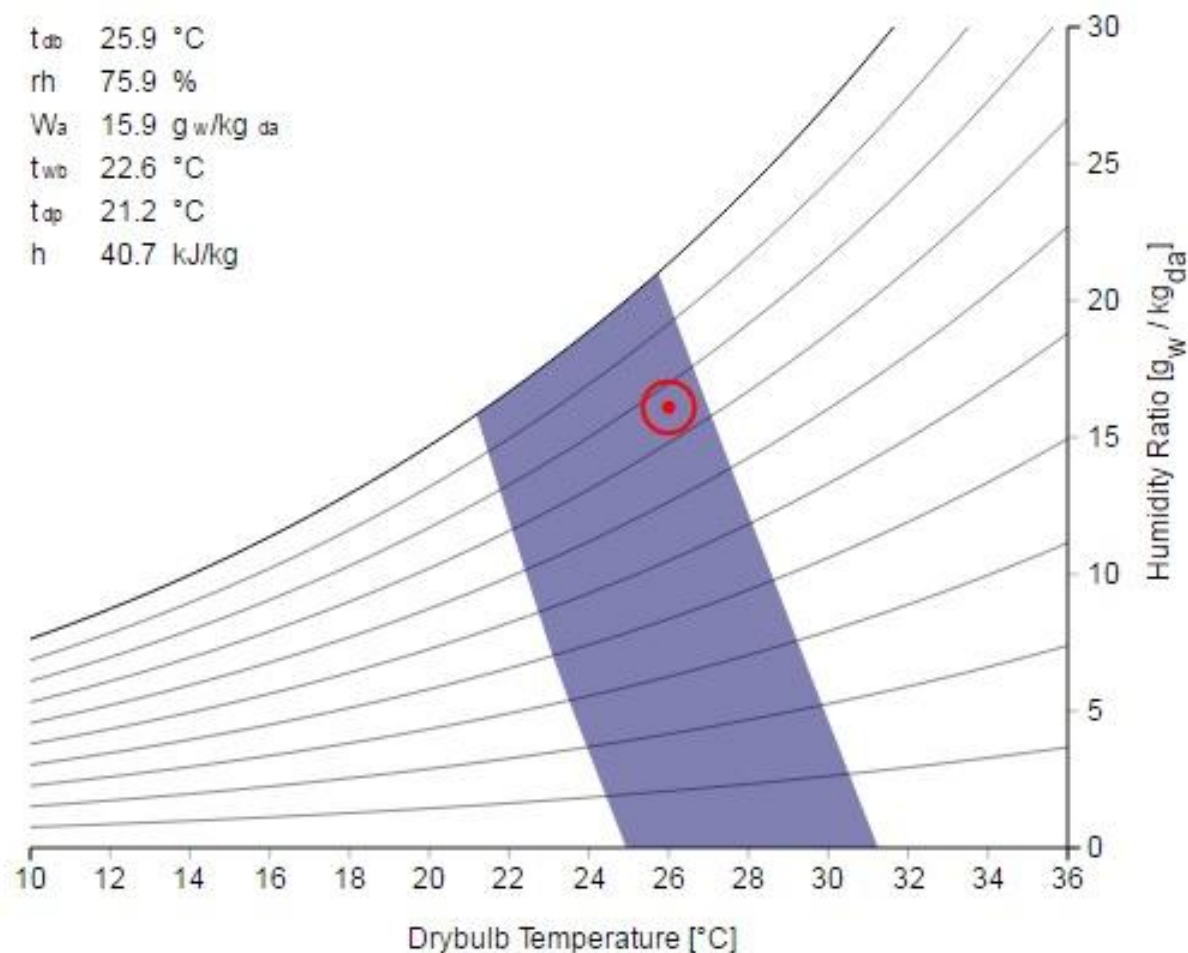
Globe temp SolarCal Specify pressure SI IP Local discomfort ? Help

✓ Complies with ASHRAE Standard 55-2013

PMV 0.34  
PPD 7%  
Sensation Neutral  
SET 26.6°C

Psychrometric chart (air temperature)

$t_{db}$  25.9 °C  
 $rh$  75.9 %  
 $W_a$  15.9 g<sub>w</sub>/kg<sub>da</sub>  
 $t_{wb}$  22.6 °C  
 $t_{dp}$  21.2 °C  
 $h$  40.7 kJ/kg



# Topography and Vegetation

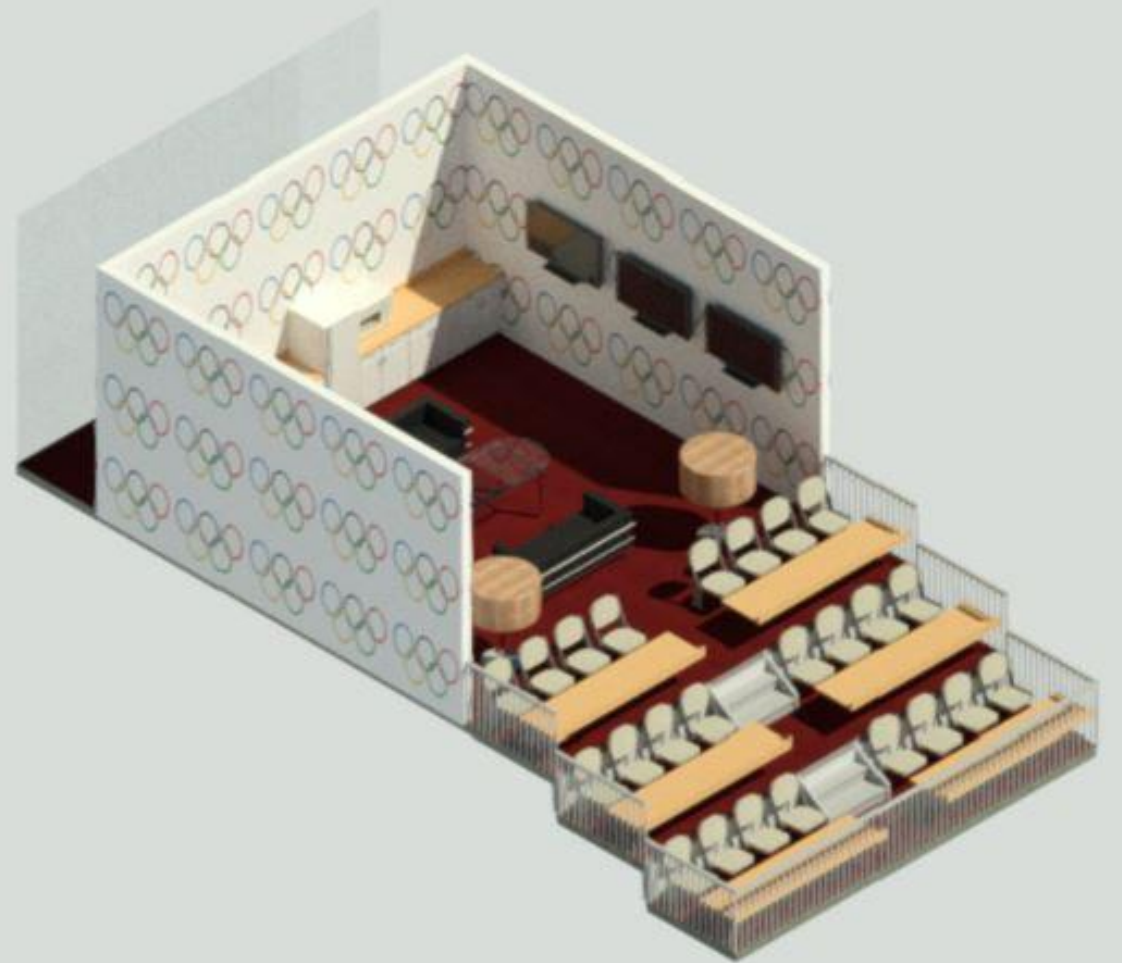
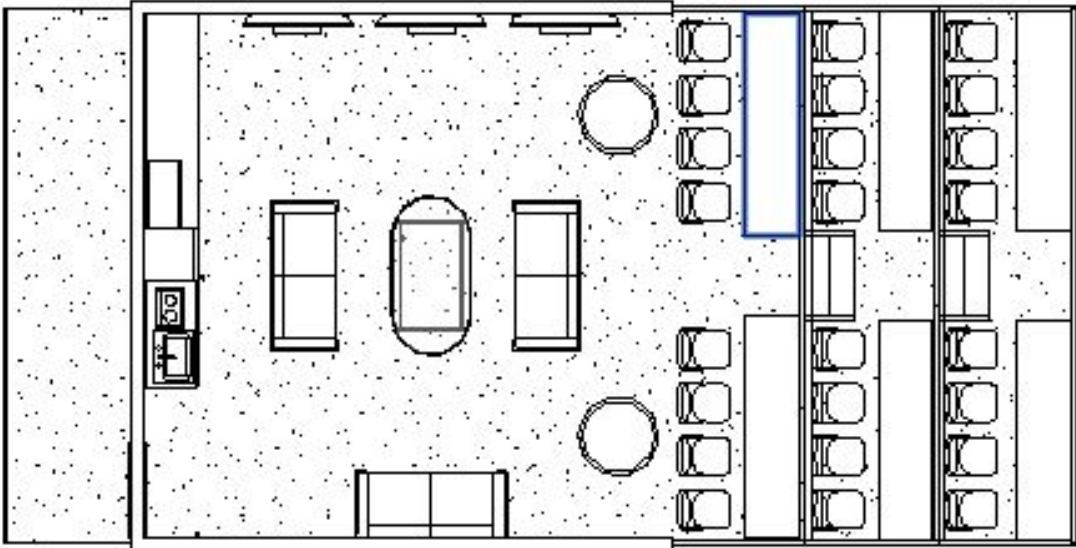
- Green Roof
- Large maple trees in and around all paved areas
- Traditional Japanese Garden
- Eelgrass Pond
- Use excess dirt to channel water into the collection system



# Green Roof

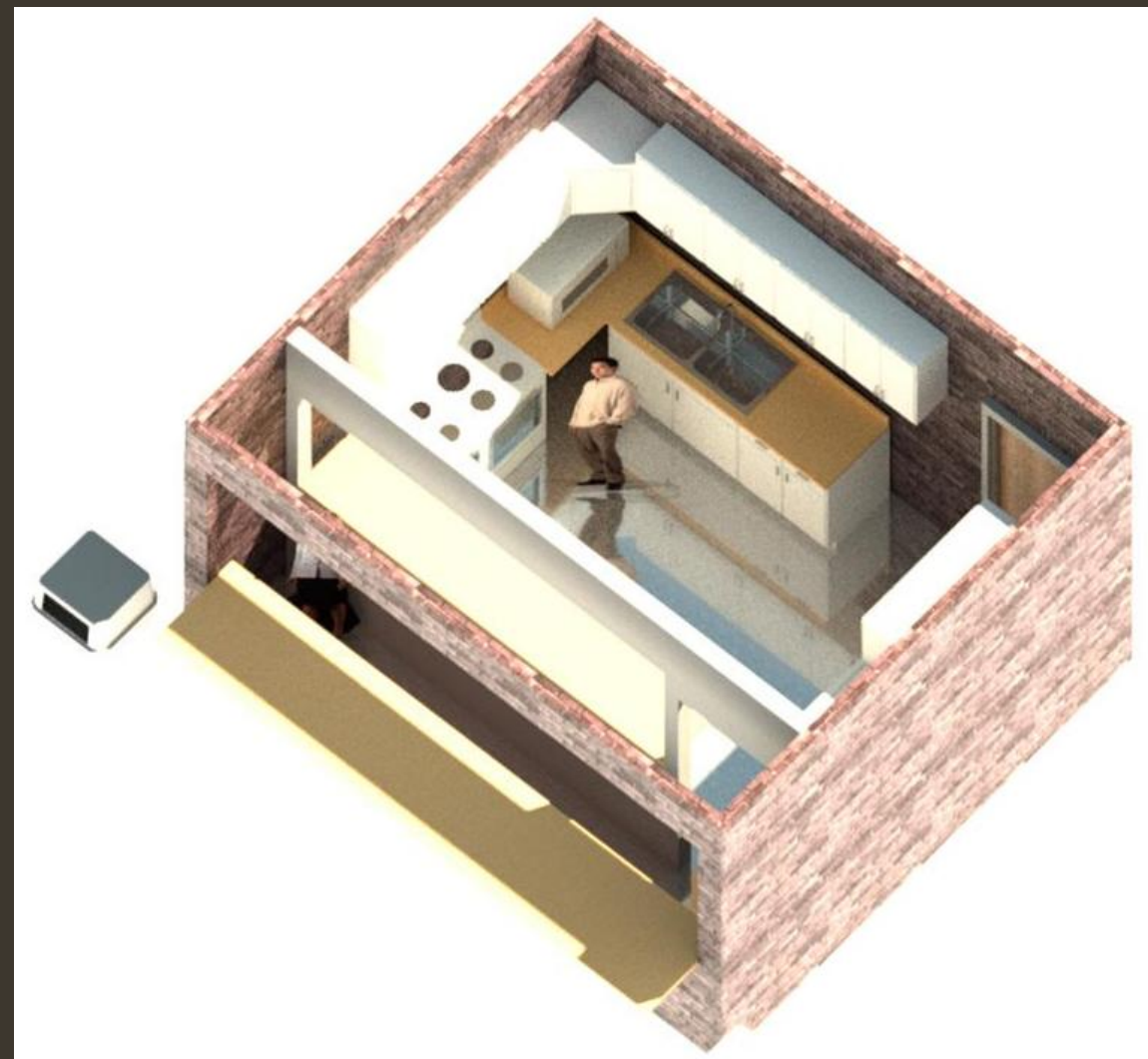
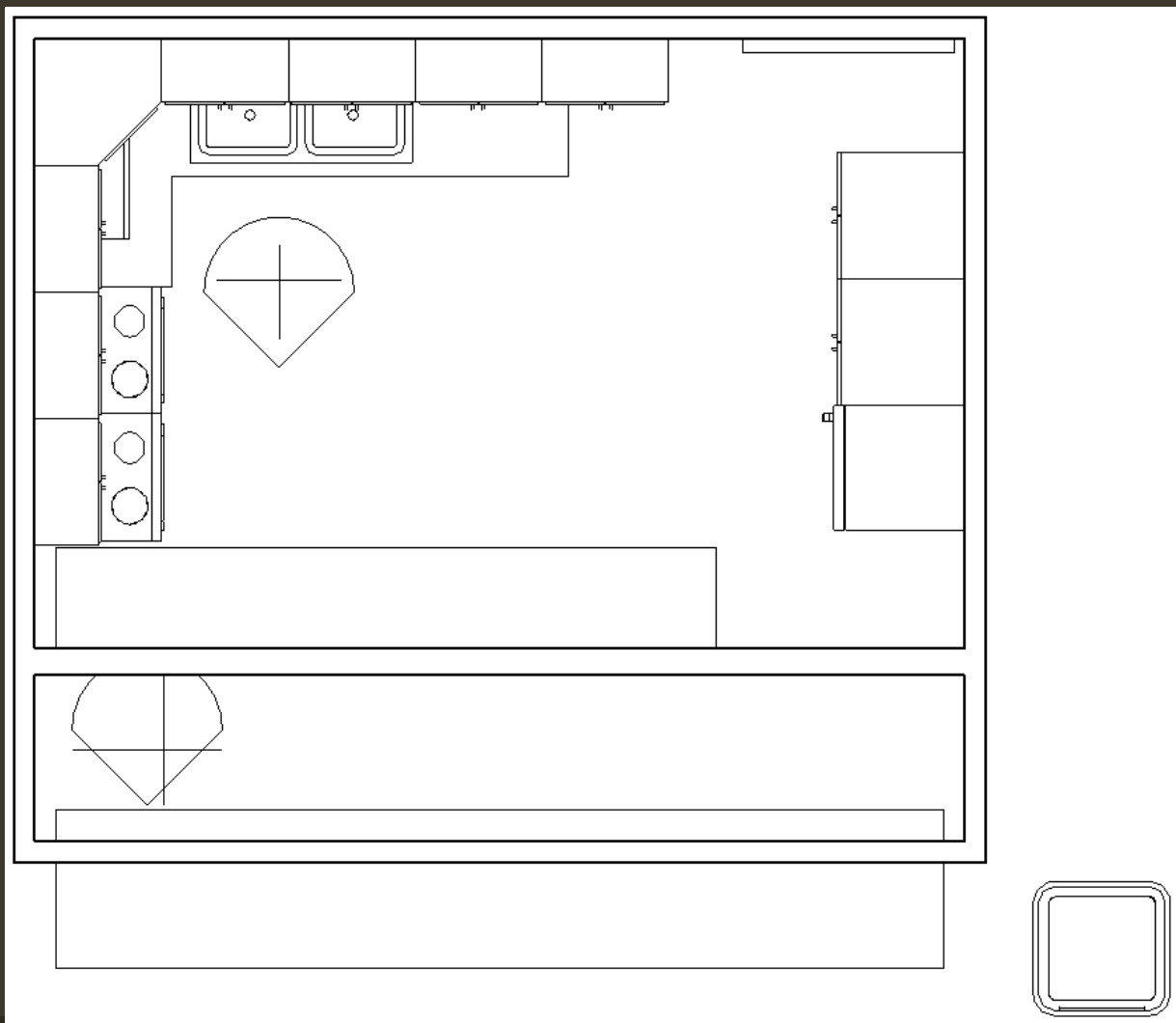


# Stadium Box Seats



Zach Dennin

# Vendor Facilities





# LEED Score Card

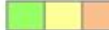


## LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

Project Name: 2020 Tokyo Arena  
Date:

Y ? N



Credit Integrative Process 1

### 15 0 0 Location and Transportation 16

1	0	0	Credit	LEED for Neighborhood Development Location	16
1	0	0	Credit	Sensitive Land Protection	1
1	0	0	Credit	High Priority Site	2
5	0	0	Credit	Surrounding Density and Diverse Uses	5
5	0	0	Credit	Access to Quality Transit	5
1	0	0	Credit	Bicycle Facilities	1
1	0	0	Credit	Reduced Parking Footprint	1
1	0	0	Credit	Green Vehicles	1

### 8 0 0 Sustainable Sites 10

Y	0	0	Prereq	Construction Activity Pollution Prevention	Required
1	0	0	Credit	Site Assessment	1
1	0	0	Credit	Site Development - Protect or Restore Habitat	2
1	0	0	Credit	Open Space	1
3	0	0	Credit	Rainwater Management	3
2	0	0	Credit	Heat Island Reduction	2
0	0	0	Credit	Light Pollution Reduction	1

### 9 0 0 Water Efficiency 11

Y	0	0	Prereq	Outdoor Water Use Reduction	Required
Y	0	0	Prereq	Indoor Water Use Reduction	Required
Y	0	0	Prereq	Building-Level Water Metering	Required
1	0	0	Credit	Outdoor Water Use Reduction	2
6	0	0	Credit	Indoor Water Use Reduction	6
1	0	0	Credit	Cooling Tower Water Use	2
1	0	0	Credit	Water Metering	1

### 29 0 0 Energy and Atmosphere 33

Y	0	0	Prereq	Fundamental Commissioning and Verification	Required
Y	0	0	Prereq	Minimum Energy Performance	Required
Y	0	0	Prereq	Building-Level Energy Metering	Required
Y	0	0	Prereq	Fundamental Refrigerant Management	Required
6	0	0	Credit	Enhanced Commissioning	6
14	0	0	Credit	Optimize Energy Performance	18
1	0	0	Credit	Advanced Energy Metering	1
2	0	0	Credit	Demand Response	2
3	0	0	Credit	Renewable Energy Production	3
1	0	0	Credit	Enhanced Refrigerant Management	1
2	0	0	Credit	Green Power and Carbon Offsets	2

### 7 0 0 Materials and Resources 13

Y	0	0	Prereq	Storage and Collection of Recyclables	Required
Y	0	0	Prereq	Construction and Demolition Waste Management Planning	Required
2	0	0	Credit	Building Life-Cycle Impact Reduction	5
1	0	0	Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
1	0	0	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1	0	0	Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2	0	0	Credit	Construction and Demolition Waste Management	2

### 11 0 0 Indoor Environmental Quality 16

Y	0	0	Prereq	Minimum Indoor Air Quality Performance	Required
Y	0	0	Prereq	Environmental Tobacco Smoke Control	Required
2	0	0	Credit	Enhanced Indoor Air Quality Strategies	2
1	0	0	Credit	Low-Emitting Materials	3
1	0	0	Credit	Construction Indoor Air Quality Management Plan	1
1	0	0	Credit	Indoor Air Quality Assessment	2
1	0	0	Credit	Thermal Comfort	1
1	0	0	Credit	Interior Lighting	2
3	0	0	Credit	Daylight	3
1	0	0	Credit	Quality Views	1
0	0	0	Credit	Acoustic Performance	1

### 6 0 0 Innovation 6

5	0	0	Credit	Innovation	5
1	0	0	Credit	LEED Accredited Professional	1

### 0 0 0 Regional Priority 4

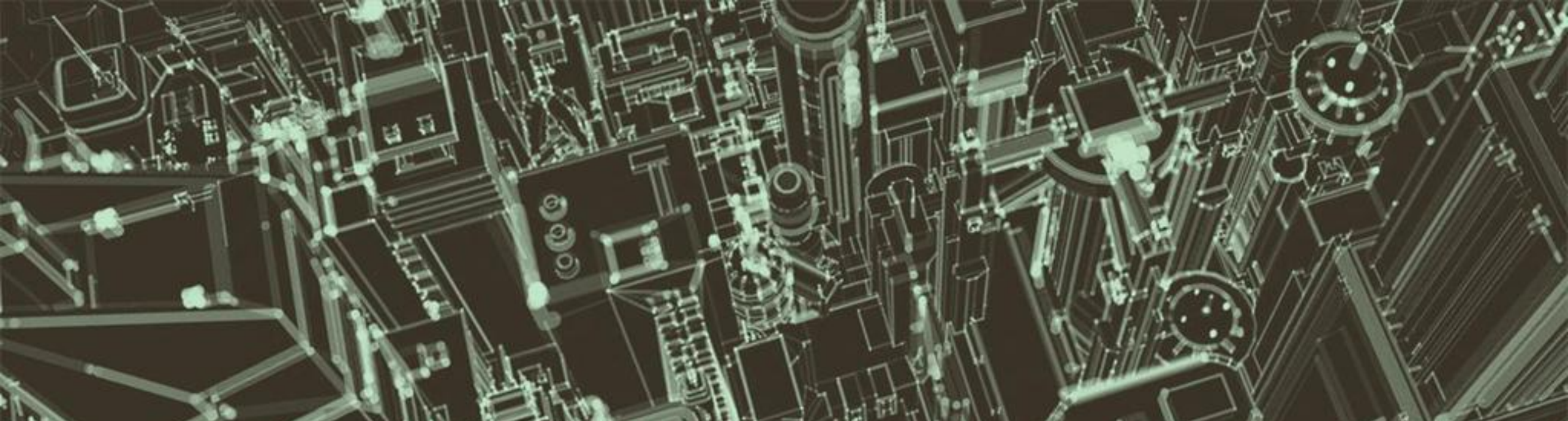
0	0	0	Credit	Regional Priority: Specific Credit	1
0	0	0	Credit	Regional Priority: Specific Credit	1
0	0	0	Credit	Regional Priority: Specific Credit	1
0	0	0	Credit	Regional Priority: Specific Credit	1

### 85 0 0 TOTALS Possible Points: 110

Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110

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# Thank You

Questions, Comments, or Concerns?

