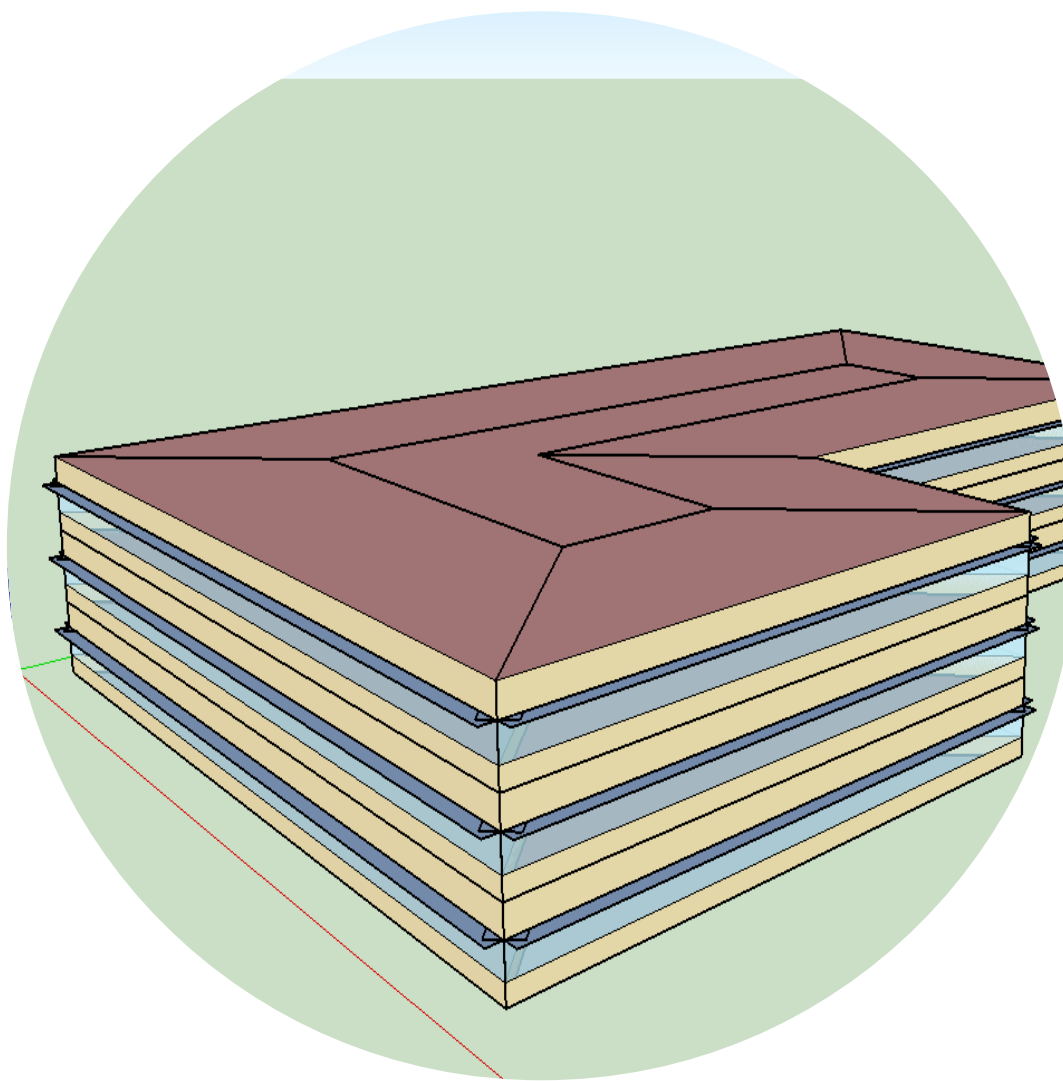


# Technical Environmental System

Piacenza Campus

B. Najafi

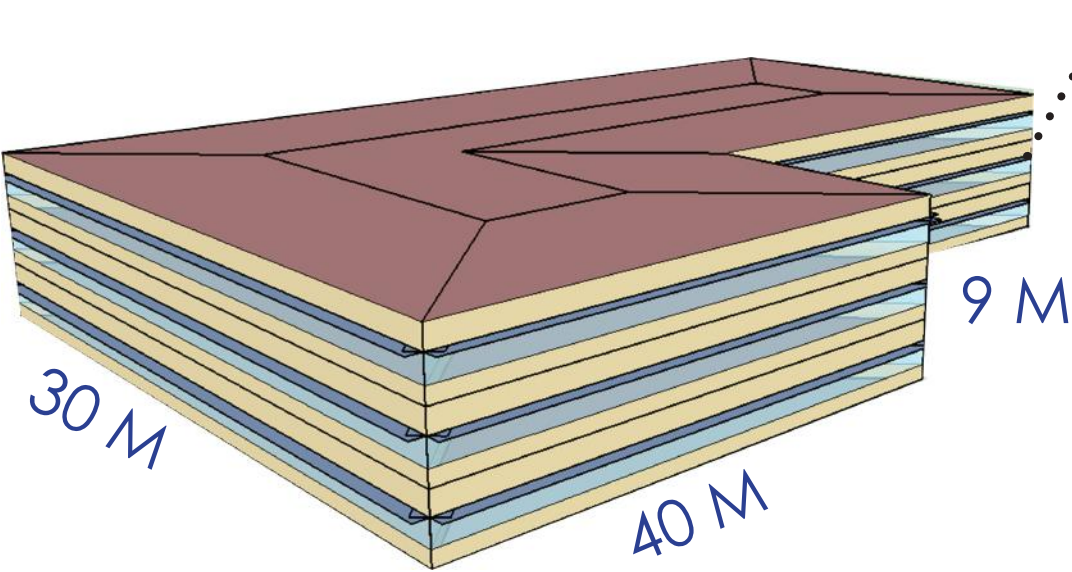
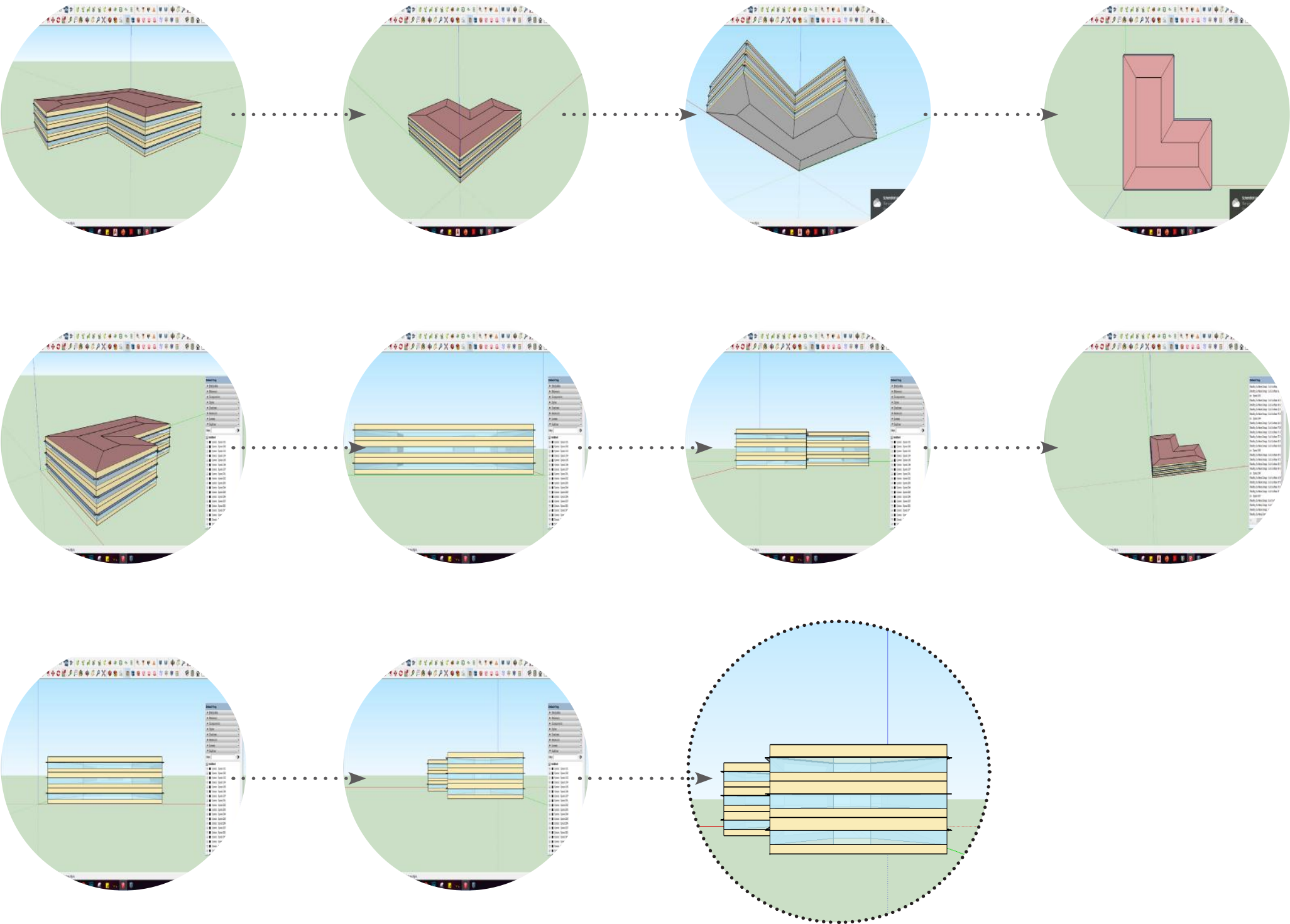


Final Project : Presentation

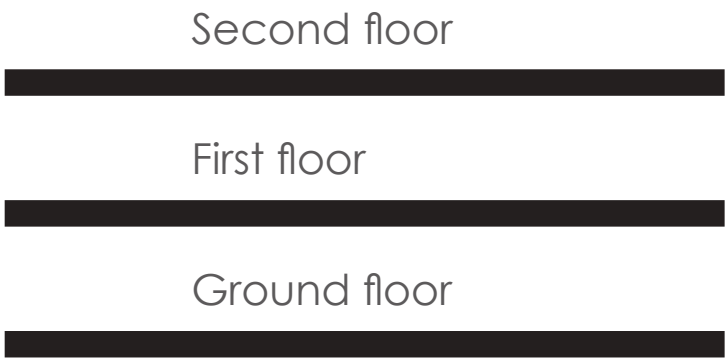
Dhanasekaran | Gopikumar | Balaganesan | Koottiyaniyil

# GEOMETRY & BUILDING CHARACTERESTICS

## Sketchup Model



Over hangs - 60 cm



3 floors

## Piacenza Base Case :



Longitude : 9.73  
Latitude : 44.92  
Elevation : 440 ft  
Time Zone : 1

## WEATHER DATA

Max - 29 degree / Min 16 degree ( Summer )  
Max - 16 degree / Min - 2 degree ( Winter )

Wall type : Base case - Stucco : Concrete : Insulation : Gypsum

## End Use

Cooling	355,403 ( kBtu )
Heating	1,563,766 ( kBtu )

# Design Day

## Max Dry Bulb

Cooling	.4DB	91.58 F
Heating	99.6	21.02 F

## End Use components

End Use	Consumption (kBtu)
Heating	1,563,766
Cooling	355,403
Interior Lighting	678,855
Exterior Lighting	0
Interior Equipment	715,005
Exterior Equipment	0
Fans	0
Pumps	0
Heat Rejection	0
Humidification	0
Heat Recovery	0
Water Systems	0
Refrigeration	0
Generators	0

# Envelop Window Wall Ratio

## WWR & Skylight Ratio

Description	Total (%)	North (%)	East (%)	South (%)	West (%)
Gross Window-Wall Ratio	40.0	40.0	46.92	31.72	40.0
Gross Window-Wall Ratio (Conditioned)	40.0	40.0	46.92	31.72	40.0
Skylight-Roof Ratio	0.0				

# Envelop Summary

## Envelope

### Base Surface Constructions

Construction	Net Area (ft^2)	Surface Count	R Value (ft^2*h*R/Btu)
ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 1	50,621	18	19.96
ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 2-5	11,690	3	24.73
ASHRAE 189.1-2009 ExtWall Mass ClimateZone 1	28,537	72	5.76
ASHRAE 189.1-2009 ExtWall Mass ClimateZone 3	6,895	18	8.77

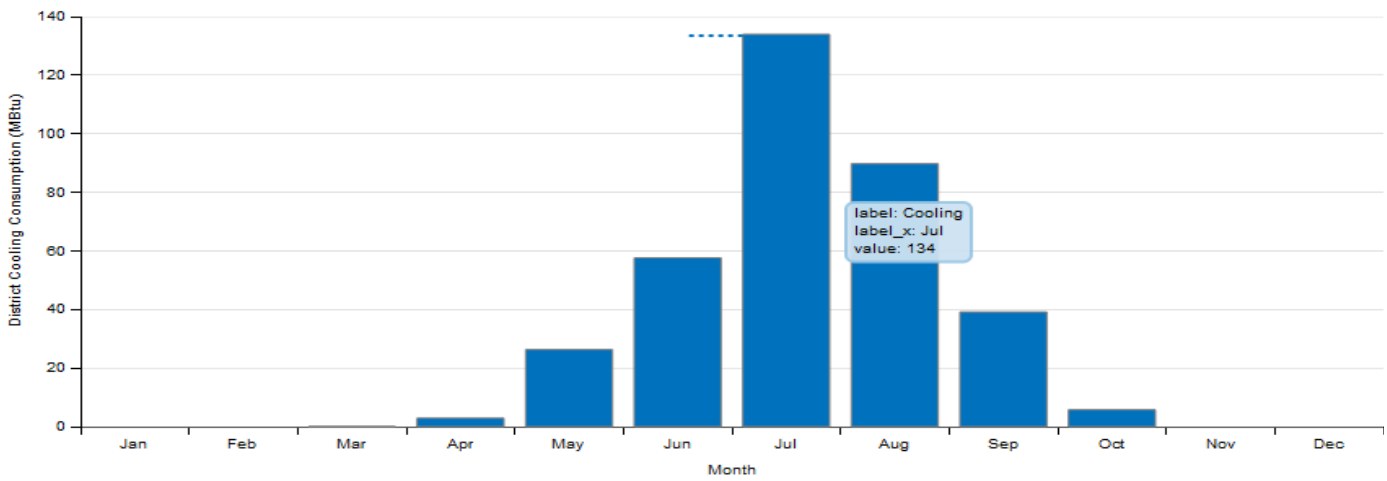
# Site and Source Energy

## Site and Source Summary

### Site and Source Energy

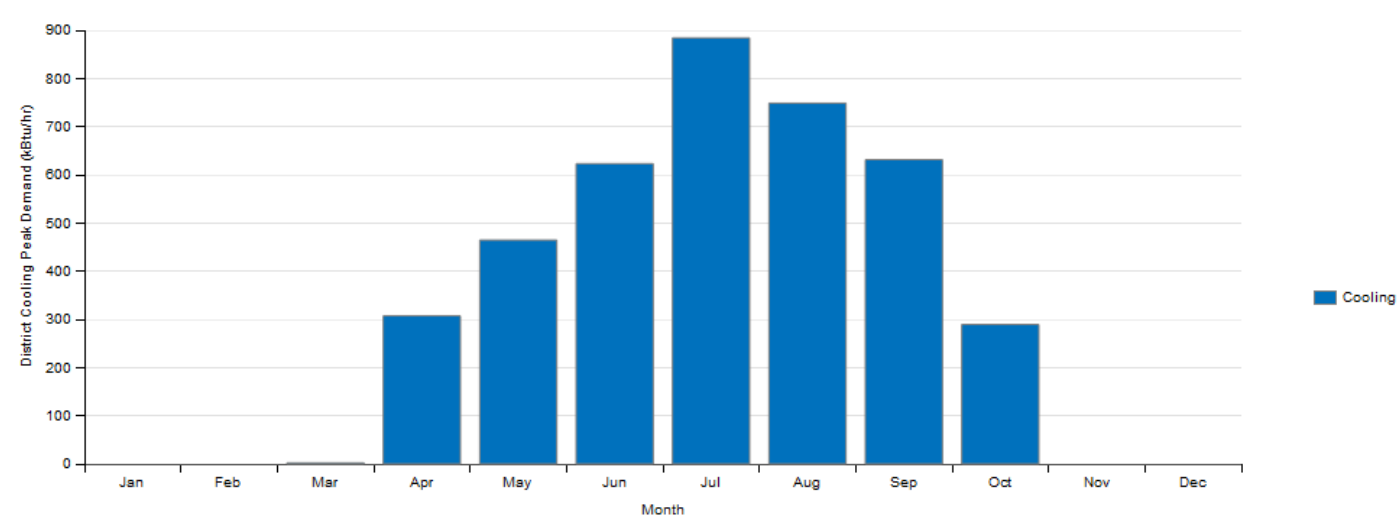
	Total Energy (kBtu)	Energy Per Total Building Area (kBtu/ft^2)	Energy Per Conditioned Building Area (kBtu/ft^2)
Total Site Energy	3313028.3	53.2	53.2
Net Site Energy	3313028.3	53.2	53.2
Total Source Energy	10439959.4	167.5	167.5
Net Source Energy	10439959.4	167.5	167.5

# District Cooling Consumption( MBTU )

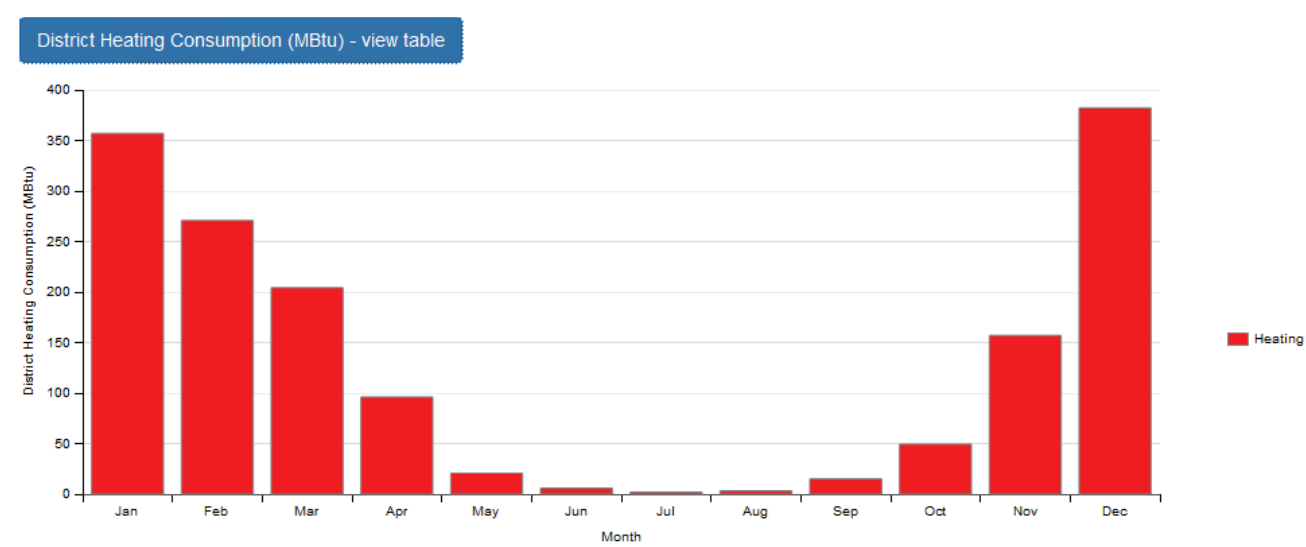




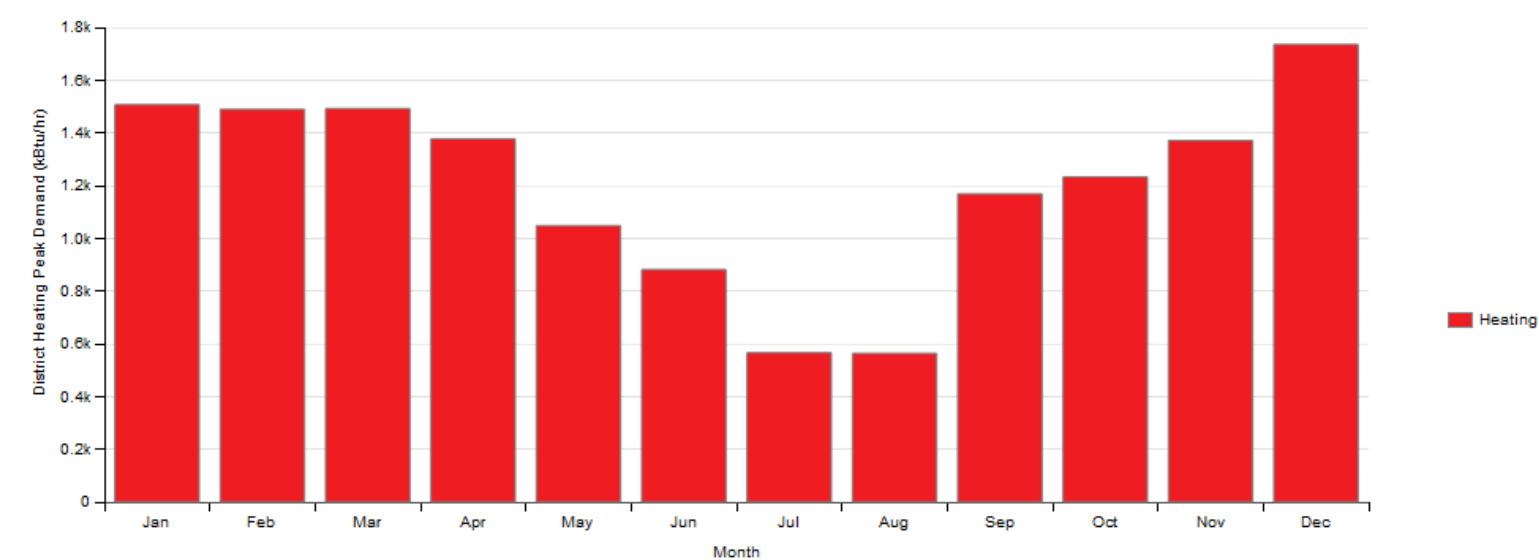
# District Cooling Peak Demand ( KBTU / HR )



# District Heating Consumption ( MBTU )



# District Heating Peak Demand ( KBTU / HR )



Wall type 1: Concrete 8 inches

End Use

Cooling	424,139( kBtu )
Heating	2,287,651 ( kBtu )



Design Day Max Dry Bulb

Cooling .4DB	91.58 F
Heating 99.6	21.02 F

End Use components

End Use	Consumption (kBtu)
Heating	2,287,651
Cooling	424,139
Interior Lighting	678,855
Exterior Lighting	0
Interior Equipment	715,005
Exterior Equipment	0
Fans	0
Pumps	0
Heat Rejection	0
Humidification	0
Heat Recovery	0
Water Systems	0
Refrigeration	0
Generators	0

Envelop Window Wall Ratio

WWR & Skylight Ratio

Description	Total (%)	North (%)	East (%)	South (%)	West (%)
Gross Window-Wall Ratio	40.0	40.0	46.92	31.72	40.0
Gross Window-Wall Ratio (Conditioned)	40.0	40.0	46.92	31.72	40.0
Skylight-Roof Ratio	0.0				

# Envelop Summary

## Envelope

### Base Surface Constructions

Construction	Net Area (ft^2)	Surface Count	R Value (ft^2*h*R/Btu)
ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 1	62,310	21	19.96
NEW PROJECT ASHRAE 189.1-2009 ExtWall Mass ClimateZone 7	35,432	90	1.09

### Sub Surface Constructions

Construction	Area (ft^2)	Surface Count	U-Factor (Btu/ft^2*h*R)
ASHRAE 189.1-2009 ExtWindow ClimateZone 1	23,621	90	

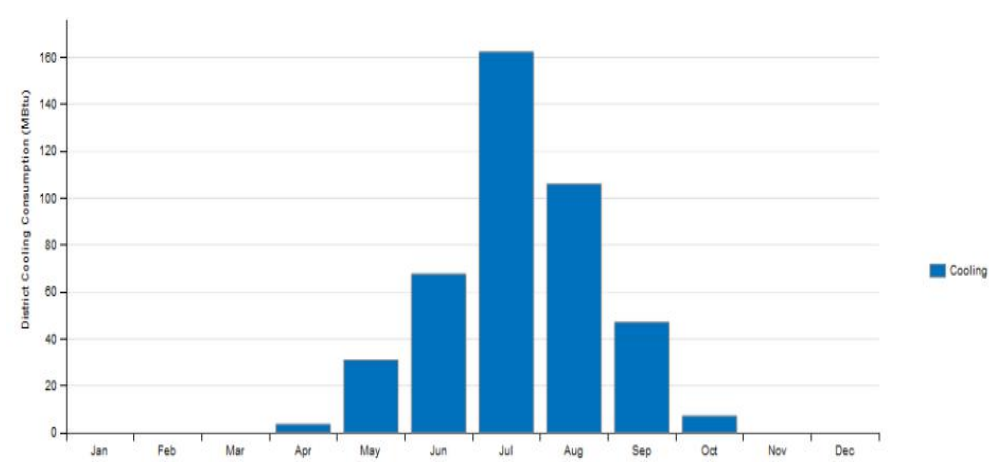
# Site and Source Energy

## Site and Source Summary

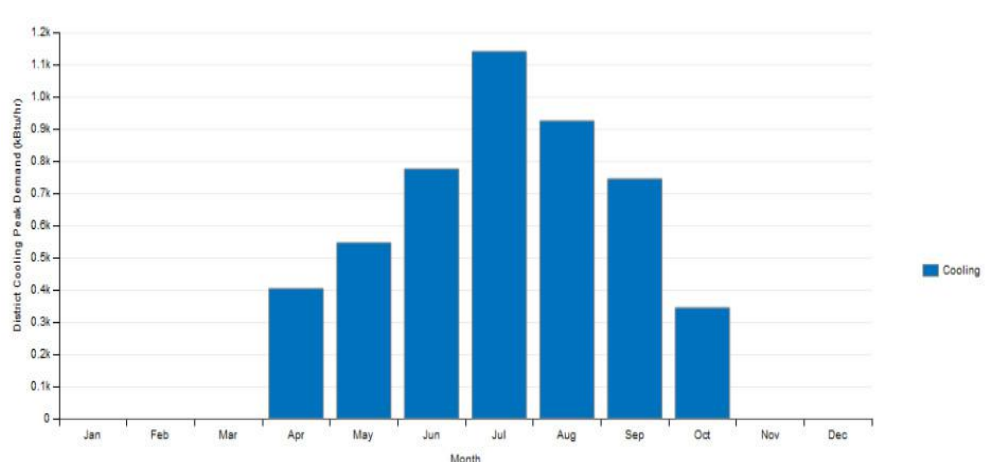
### Site and Source Energy

	Total Energy (kBtu)	Energy Per Total Building Area (kBtu/ft^2)	Energy Per Conditioned Building Area (kBtu/ft^2)
Total Site Energy	4105659.6	65.9	65.9
Net Site Energy	4105659.6	65.9	65.9
Total Source Energy	13128177.0	210.7	210.7
Net Source Energy	13128177.0	210.7	210.7

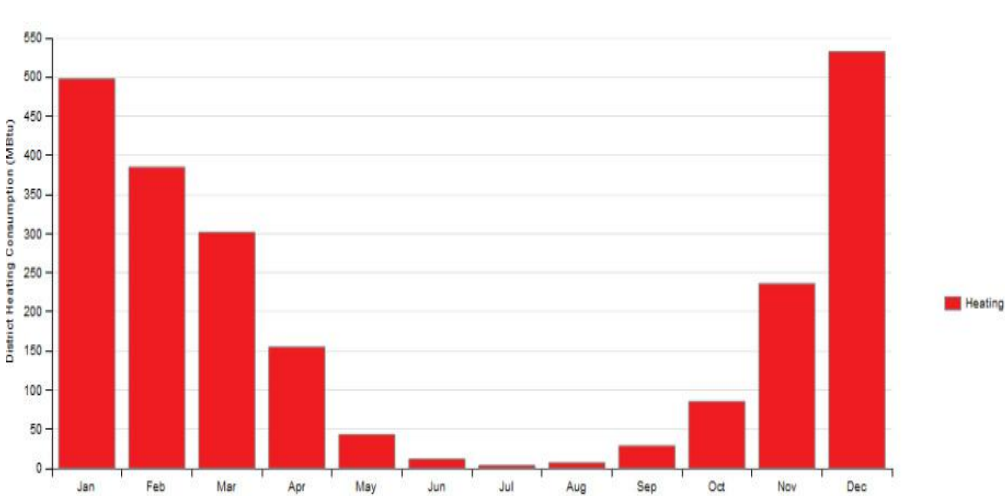
## District Cooling Consumption( MBTU )



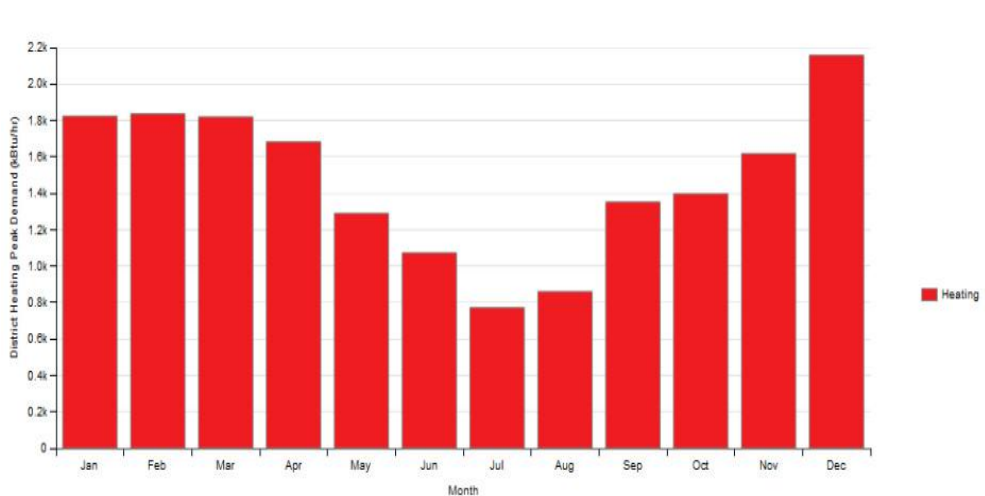
## District Cooling Peak Demand ( KBTU / HR )



## District Heating Consumption ( MBTU )



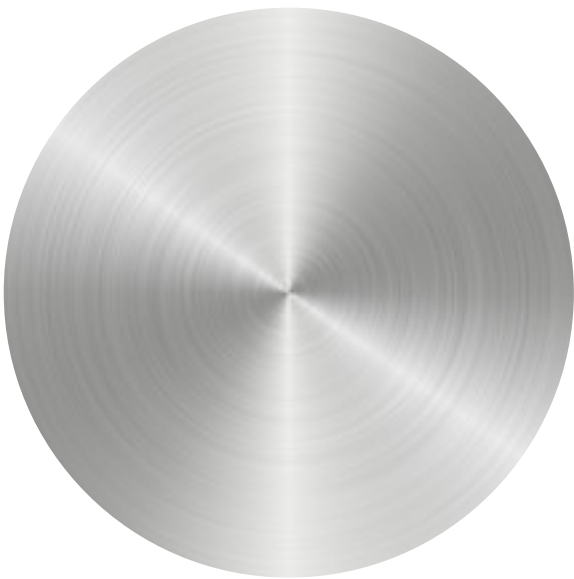
## District Heating Peak Demand ( KBTU / HR )



Wall type 2: METAL SURFACE

End Use

Cooling	779,987 ( kBtu )
Heating	2,857,204 ( kBtu )



Design Day                      Max Dry Bulb

Cooling .4DB	91.58 F
Heating 99.6	21.02 F

End Use components

End Use	Consumption (kBtu)
Heating	2,857,204
Cooling	779,987
Interior Lighting	678,855
Exterior Lighting	0
Interior Equipment	715,005
Exterior Equipment	0
Fans	0
Pumps	0
Heat Rejection	0
Humidification	0
Heat Recovery	0
Water Systems	0
Refrigeration	0
Generators	0

Envelop Window Wall Ratio

WWR & Skylight Ratio

Description	Total (%)	North (%)	East (%)	South (%)	West (%)
Gross Window-Wall Ratio	40.0	40.0	46.92	31.72	40.0
Gross Window-Wall Ratio (Conditioned)	40.0	40.0	46.92	31.72	40.0
Skylight-Roof Ratio	0.0				



# Envelop Summary

## Envelope

### Base Surface Constructions

Construction	Net Area (ft^2)	Surface Count	R Value (ft^2*h*R/Btu)
1 NEW PROJECT ASHRAE 189.1-2009 ExtWall Mass ClimateZone 7	35,432	90	0.00
ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 1	62,310	21	19.96

### Sub Surface Constructions

Construction	Area (ft^2)	Surface Count	U-Factor (Btu/ft^2*h*R)
ASHRAE 189.1-2009 ExtWindow ClimateZone 1	23,621	90	

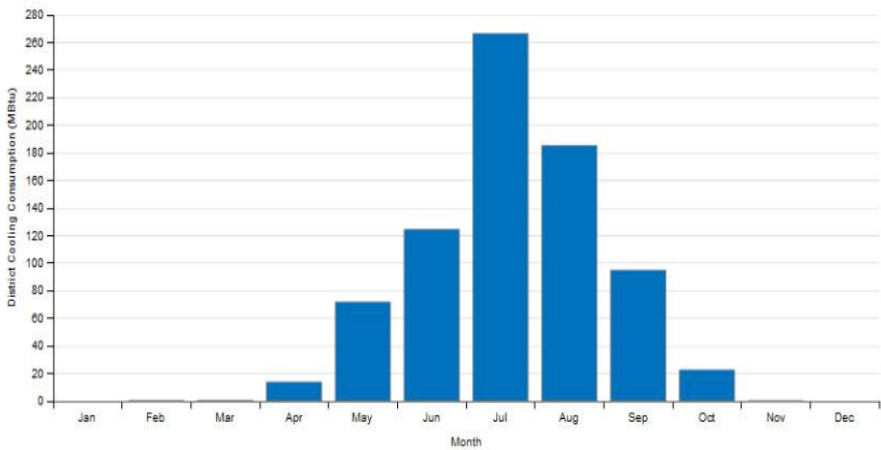
# Site and Source Energy

## Site and Source Summary

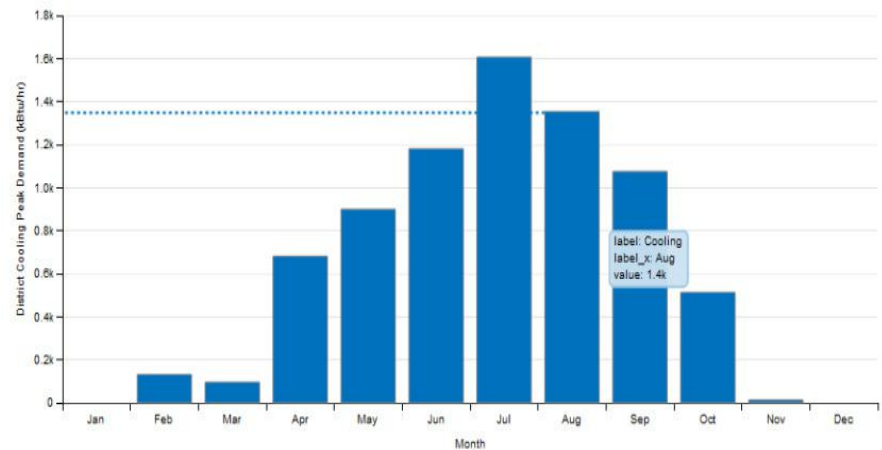
### Site and Source Energy

	Total Energy (kBtu)	Energy Per Total Building Area (kBtu/ft^2)	Energy Per Conditioned Building Area (kBtu/ft^2)
Total Site Energy	5031051.2	80.7	80.7
Net Site Energy	5031051.2	80.7	80.7
Total Source Energy	15561811.3	249.7	249.7
Net Source Energy	15561811.3	249.7	249.7

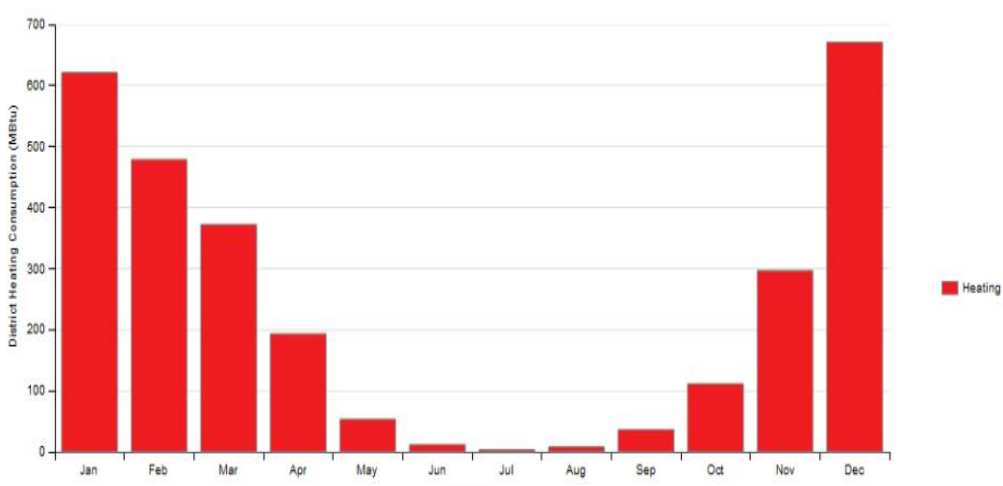
## District Cooling Consumption( MBTU )



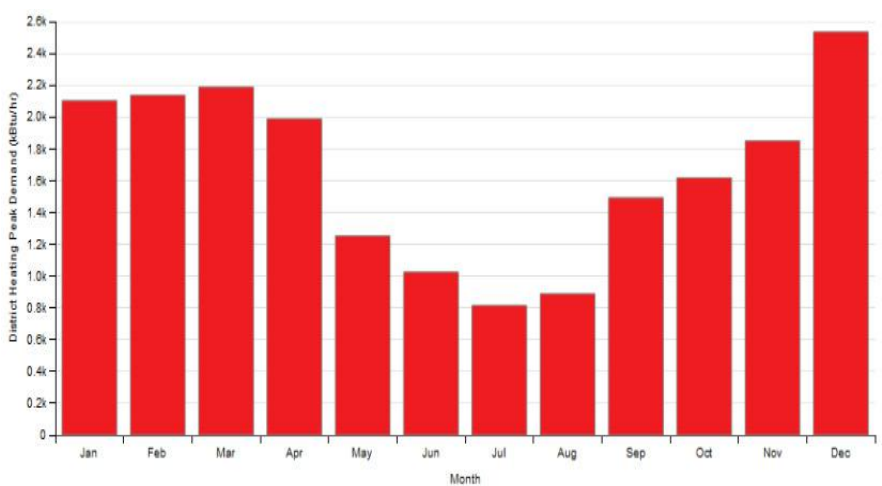
## District Cooling Peak Demand ( KBTU / HR )



## District Heating Consumption ( MBTU )



## District Heating Peak Demand ( KBTU / HR )



**Wall type 3: WOOD 25 mm : Gypsum Bd 19mm : Insulation**

## End Use

Cooling	359,915 ( kBtu )
Heating	1,67,760( kBtu )



# Design Day

## Max Dry Bulb

Cooling	.4DB	⋮	91.58 F
<hr/>			
Heating	99.6	⋮	21.02 F

## End Use components

[End Use - view table](#)

End Use	Consumption (kBtu)
Heating	1,671,760
Cooling	359,915
Interior Lighting	678,855
Exterior Lighting	0
Interior Equipment	715,005
Exterior Equipment	0
Fans	0
Pumps	0
Heat Rejection	0
Humidification	0
Heat Recovery	0
Water Systems	0
Refrigeration	0
Generators	0

## Envelop Window Wall Ratio

### WWR & Skylight Ratio

Description	Total (%)	North (%)	East (%)	South (%)	West (%)
Gross Window-Wall Ratio	40.0	40.0	46.92	31.72	40.0
Gross Window-Wall Ratio (Conditioned)	40.0	40.0	46.92	31.72	40.0
Skylight-Roof Ratio	0.0				

# Envelop Summary

## Envelope

### Base Surface Constructions

Construction	Net Area (ft^2)	Surface Count	R Value (ft^2*h*R/Btu)
ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 1	62,310	21	19.96
ASHRAE 189.1-2009 ExtWall Mass ClimateZone 1	35,432	90	5.76

### Sub Surface Constructions

Construction	Area (ft^2)	Surface Count	U-Factor (Btu/ft^2*h*R)
ASHRAE 189.1-2009 ExtWindow ClimateZone 1	23,621	90	

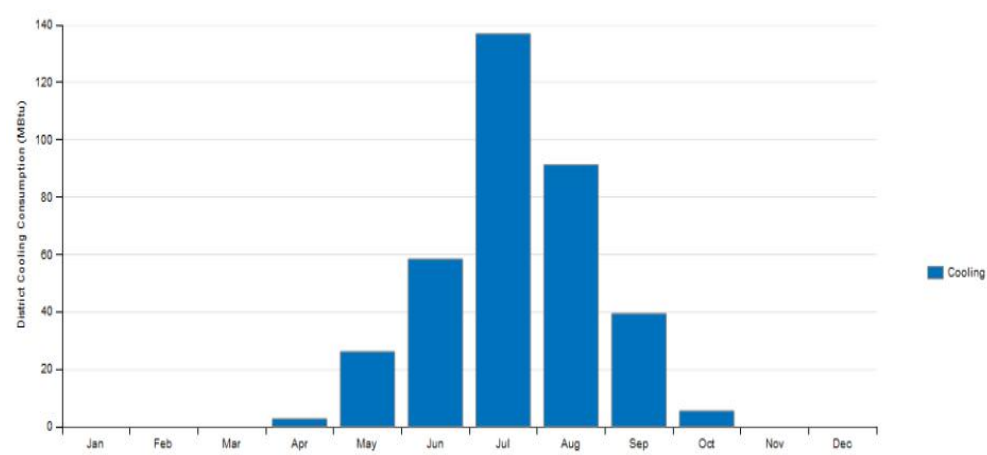
# Site and Source Energy

## Site and Source Summary

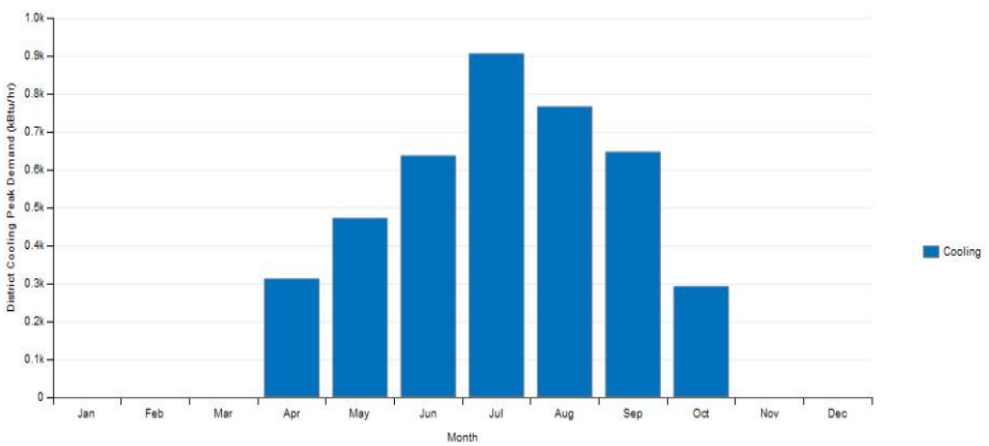
### Site and Source Energy

	Total Energy (kBtu)	Energy Per Total Building Area (kBtu/ft^2)	Energy Per Conditioned Building Area (kBtu/ft^2)
Total Site Energy	3425534.2	55.0	55.0
Net Site Energy	3425534.2	55.0	55.0
Total Source Energy	10834924.2	173.9	173.9
Net Source Energy	10834924.2	173.9	173.9

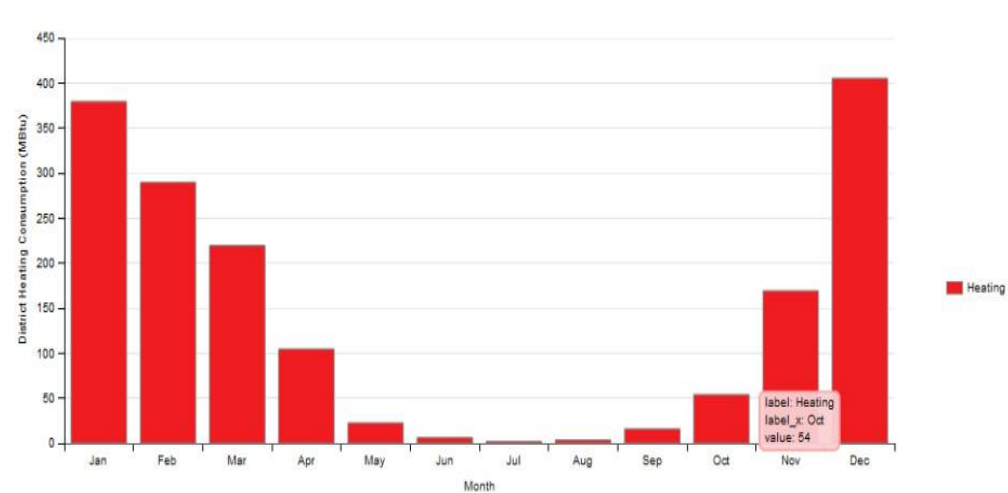
## District Cooling Consumption( MBTU )



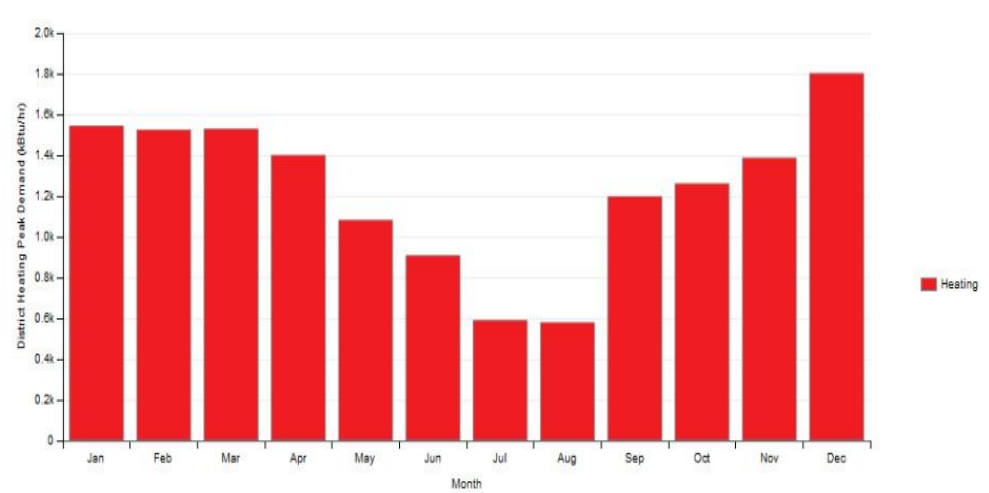
## District Cooling Peak Demand ( KBTU / HR )



## District Heating Consumption ( MBTU )



## District Heating Peak Demand ( KBTU / HR )





# LOS ANGELES

## Wall type 3: WOOD 25 mm : Gypsum Bd 19mm : Insulation

Longitude : -118.4  
Latitude : 33.93  
Elevation : 105 ft  
Time Zone : -8.0

### WEATHER DATA

Max - 30 degree / Min 14 degree ( Summer )  
Max - 16 degree / Min 9 degree (Winter )



## End Use components

End Use - view table

End Use	Consumption (kBtu)
Heating	249,911
Cooling	305,425
Interior Lighting	678,855
Exterior Lighting	0
Interior Equipment	715,005
Exterior Equipment	0
Fans	0
Pumps	0
Heat Rejection	0
Humidification	0
Heat Recovery	0
Water Systems	0
Refrigeration	0
Generators	0

## Envelop Window Wall Ratio

WWR & Skylight Ratio

Description	Total (%)	North (%)	East (%)	South (%)	West (%)
Gross Window-Wall Ratio	40.0	40.0	46.92	31.72	40.0
Gross Window-Wall Ratio (Conditioned)	40.0	40.0	46.92	31.72	40.0
Skylight-Roof Ratio	0.0				



# Envelop Summary

## Envelope

### Base Surface Constructions

Construction	Net Area (ft^2)	Surface Count	R Value (ft^2*h*R/Btu)
2 NEW PROJECT ASHRAE 189.1-2009 ExtWall Mass ClimateZone 7	35,432	90	16.15
ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 1	62,310	21	19.96

### Sub Surface Constructions

Construction	Area (ft^2)	Surface Count	U-Factor (Btu/ft^2*h*R)
ASHRAE 189.1-2009 ExtWindow ClimateZone 1	23,621	90	

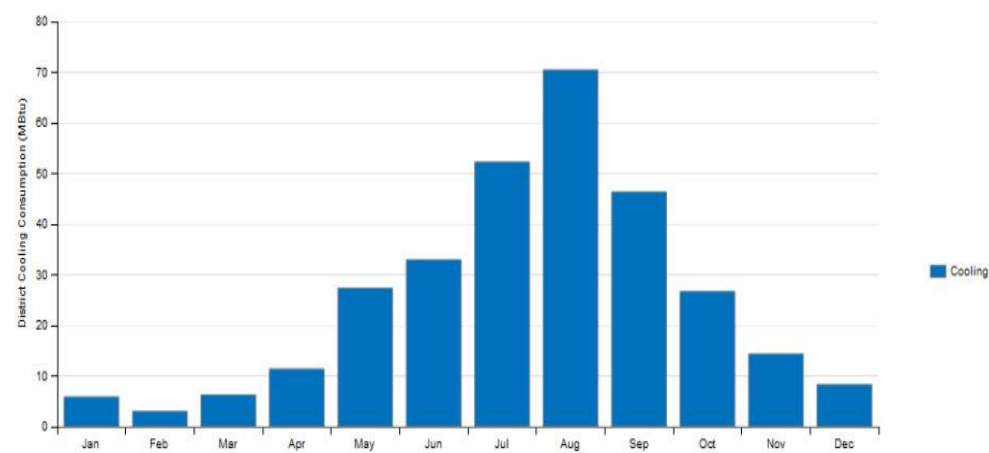
# Site and Source Energy

## Site and Source Summary

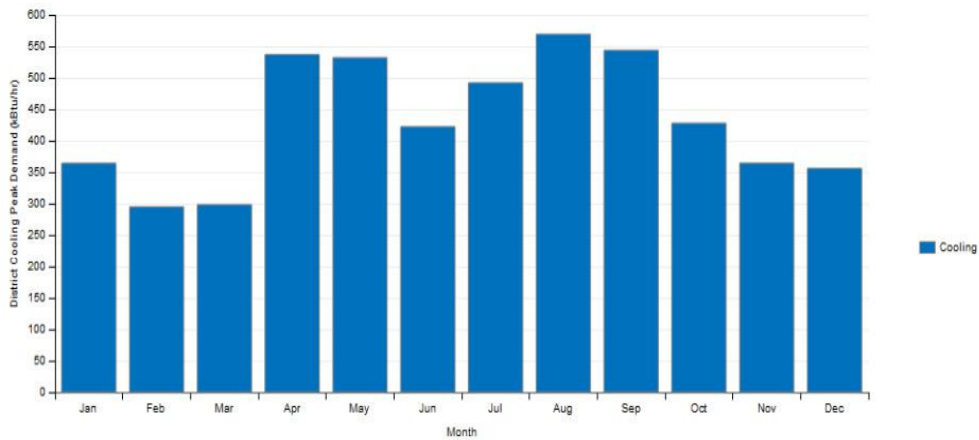
### Site and Source Energy

	Total Energy (kBtu)	Energy Per Total Building Area (kBtu/ft^2)	Energy Per Conditioned Building Area (kBtu/ft^2)
Total Site Energy	1949195.4	31.3	31.3
Net Site Energy	1949195.4	31.3	31.3
Total Source Energy	5639796.0	90.5	90.5
Net Source Energy	5639796.0	90.5	90.5

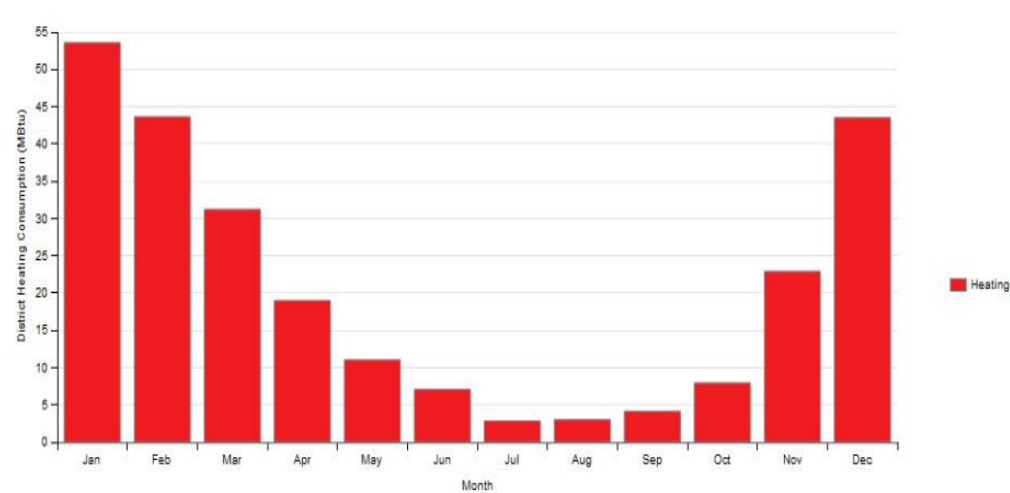
## District Cooling Consumption( MBTU )



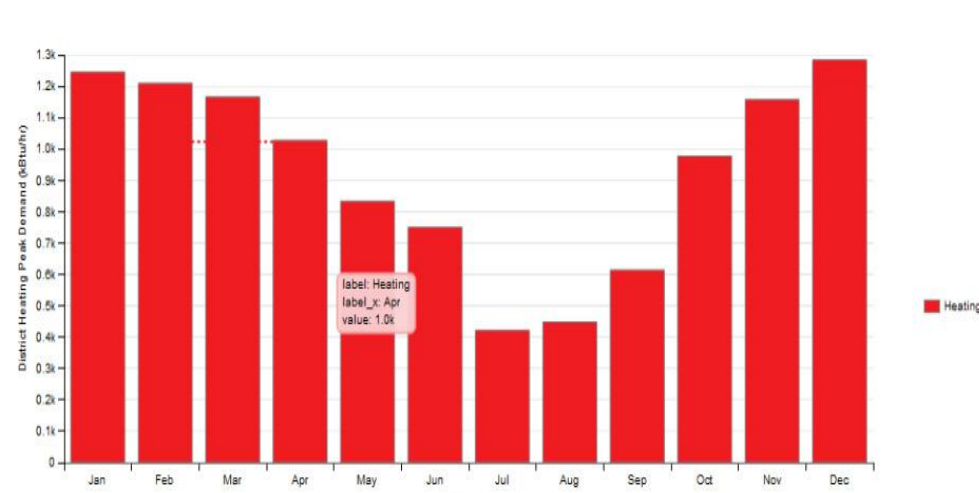
## District Cooling Peak Demand ( KBTU / HR )



## District Heating Consumption ( MBTU )



## District Heating Peak Demand ( KBTU / HR )



# CHENNAI

## Wall type 3: WOOD 25 mm : Gypsum Bd 19mm : Insulation

Longitude : 80.18  
Latitude : 13  
Elevation : 52 ft  
Time Zone :5.50

### WEATHER DATA

Max - 34.5 degree / Min 32 degree ( Summer )  
Max - 26 degree / Min - 22 degree (Winter )



## End Use components

End Use - view table

End Use	Consumption (kBtu)
Heating	872
Cooling	2,485,622
Interior Lighting	678,855
Exterior Lighting	0
Interior Equipment	715,005
Exterior Equipment	0
Fans	0
Pumps	0
Heat Rejection	0
Humidification	0
Heat Recovery	0
Water Systems	0
Refrigeration	0
Generators	0

## Envelop Window Wall Ratio

WWR & Skylight Ratio

Description	Total (%)	North (%)	East (%)	South (%)	West (%)
Gross Window-Wall Ratio	40.0	40.0	46.92	31.72	40.0
Gross Window-Wall Ratio (Conditioned)	40.0	40.0	46.92	31.72	40.0
Skylight-Roof Ratio	0.0				

# Envelop Summary

## Envelope

### Base Surface Constructions

Construction	Net Area (ft^2)	Surface Count	R Value (ft^2*h*R/Btu)
2 NEW PROJECT ASHRAE 189.1-2009 ExtWall Mass ClimateZone 7	35,432	90	16.15
ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 1	62,310	21	19.96

### Sub Surface Constructions

Construction	Area (ft^2)	Surface Count	U-Factor (Btu/ft^2*h*R)
ASHRAE 189.1-2009 ExtWindow ClimateZone 1	23,621	90	

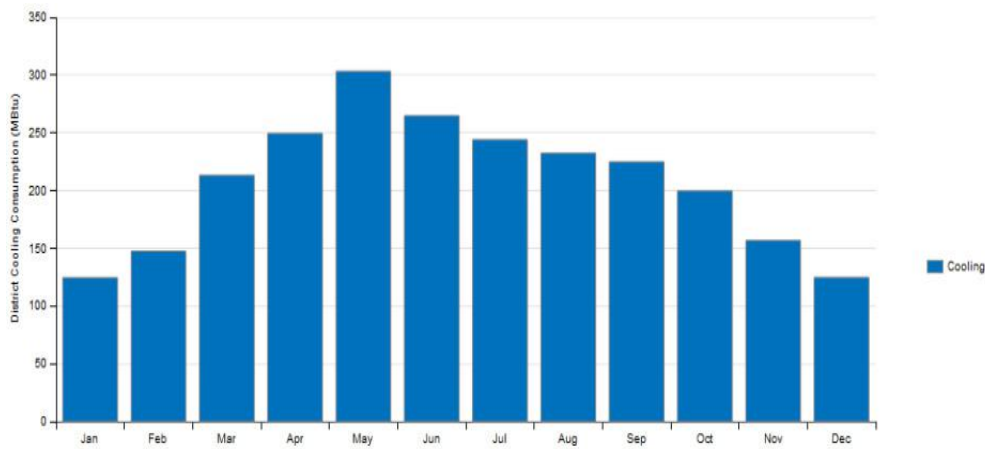
# Site and Source Energy

## Site and Source Summary

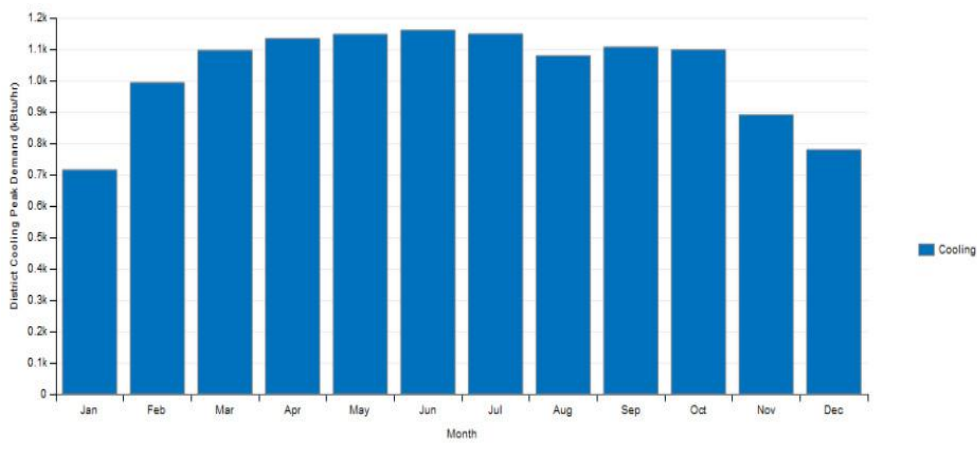
### Site and Source Energy

	Total Energy (kBtu)	Energy Per Total Building Area (kBtu/ft^2)	Energy Per Conditioned Building Area (kBtu/ft^2)
Total Site Energy	3880353.8	62.3	62.3
Net Site Energy	3880353.8	62.3	62.3
Total Source Energy	7041513.4	113.0	113.0
Net Source Energy	7041513.4	113.0	113.0

## District Cooling Consumption( MBTU )



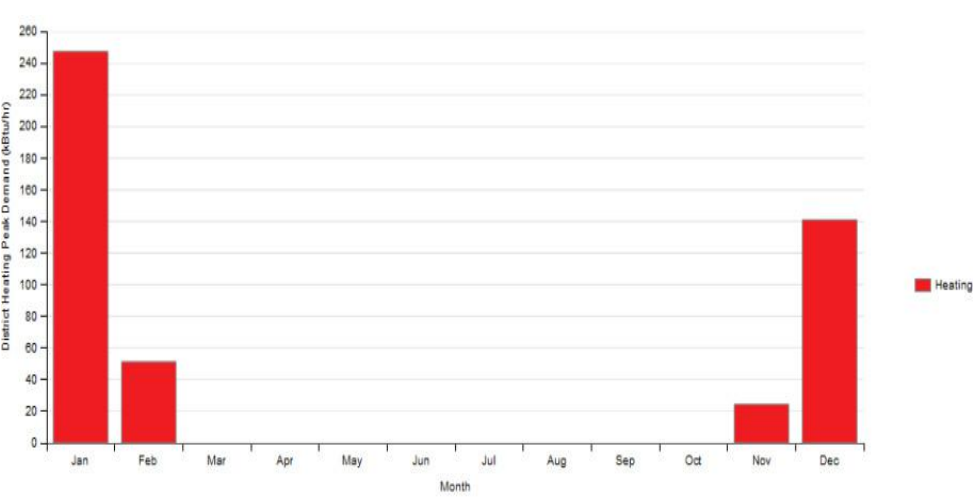
## District Cooling Peak Demand ( KBTU / HR )



## District Heating Consumption ( MBTU )



## District Heating Peak Demand ( KBTU / HR )



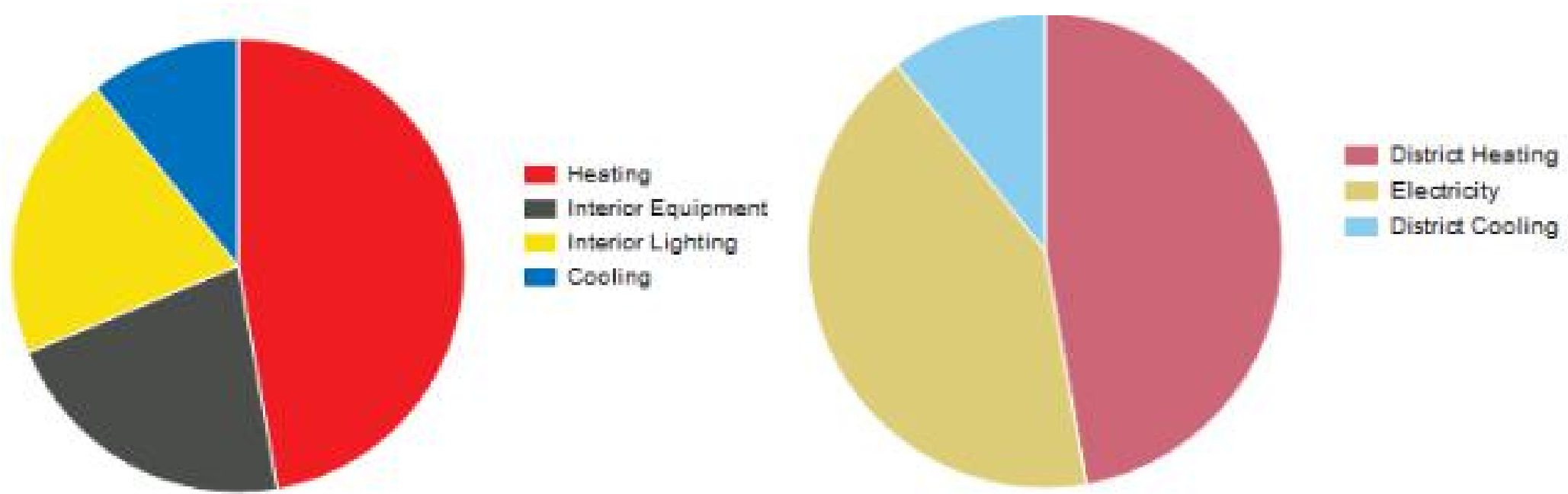
# ANNUAL OVERVIEW COMPARISON

Wall type 3: WOOD 25 mm : Gypsum Bd 19mm : Insulation

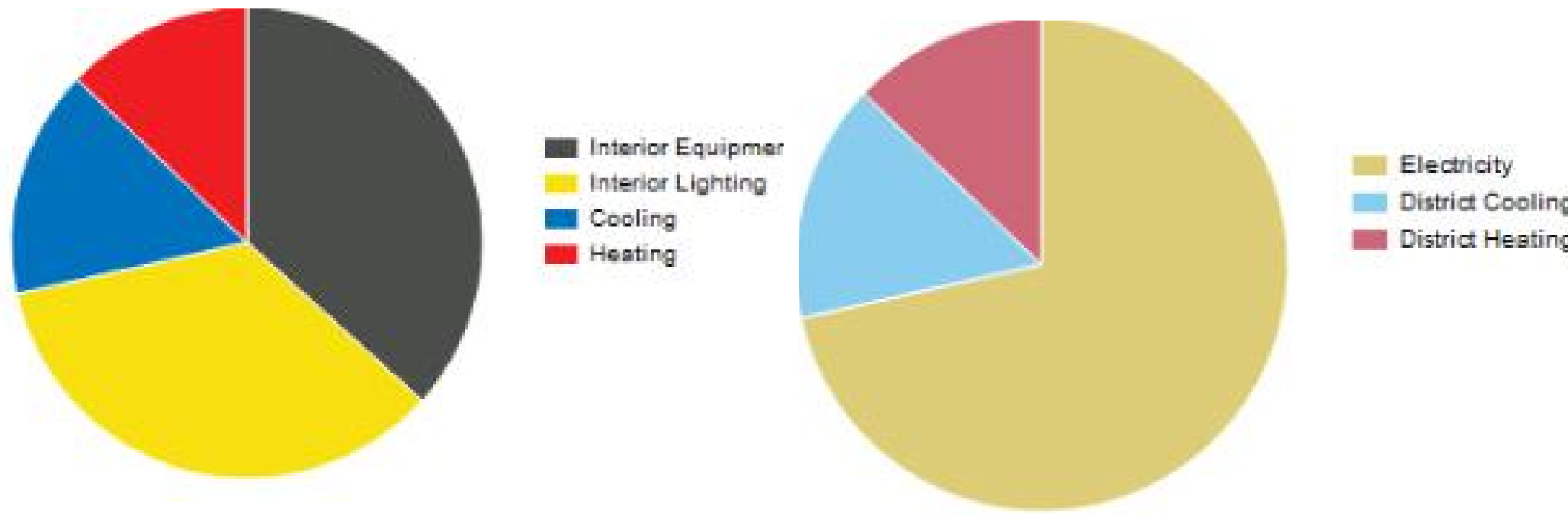
End Use

Energy Use

## PIACENZA



## LOS ANGELES



## CHENNAI

