

Building Energy Asset Score: Building Use Type Operational and Equipment Sizing Assumptions

To estimate a building's energy use intensity per year, the Asset Scoring Tool applies standard assumptions¹ concerning how the building is operated. To allow building owners and operators to understand how well these assumptions reflect their building's actual operations, the following tables provide a simplified list of assumptions used for each building type.

These tables reflect the full-time equivalent occupancy hours assumed for each building type, but a building's level of operations varies according to the day of the week, hour of the day, and even by season in cases such as schools. To accommodate the fact that operations fluctuate, the Asset Scoring Tool applies a specific set of operational assumptions to every hour of the year, depending on each building type. Precise schedules of these assumptions are presented in the appendix at the end of this document.

To get an overall idea of the assumptions used to estimate a building's energy use, consult the tables. For a more granular understanding of the assumptions, see the graphs in the appendix.

¹ Operational assumptions included in this document are based on ASHRAE Standard 90.1 2013 and ASHRAE Standard 90.1 Prototype Building Model. New operational assumptions will be developed as other building types are added to the Asset Scoring Tool.

Operational Assumptions

Schedules of Operation

	Occupancy Schedule ² (hrs/wk)	Lighting Schedule (hrs/wk)	Equipment Schedule (hrs/wk)	Service Hot Water Schedule (hrs/wk)	Cooling Temperature Setpoints (°F)	Heating Temperature Setpoints (°F)
Assisted Living Facility	105.77	69.01	57.71	55.60	70	70
City Hall	48.60	56.50	86.15	27.70	75	70
Community Center	46.30	69.30	87.75	38.58	75	70
Courthouse	48.60	56.50	86.15	27.70	75	70
Education	41.75	80.38	85.80	29.05	75	70
Library	46.30	69.30	87.75	38.58	75	70
Lodging	105.77	69.01	57.71	55.60	70	70
Medical Office	90.40	104.60	99.90	34.93	75	70
Multi-family	114.75	55.14	110.58	88.06	75	70
Multi-family (less than 4 floors)	115.67	54.81	88.29	67.31	75	72
Office	48.60	56.50	86.15	27.70	75	70
Parking Garage	0.00	129.50	168.00	0.00	55 ³	NA
Police Station	90.40	104.60	99.90	27.70	75	70
Post Office	48.60	56.60	86.15	27.70	75	70
Religious Building	46.30	69.30	87.75	38.58	75	70
Retail	46.30	69.30	87.75	38.58	75	70
Senior Center	46.30	69.30	87.75	38.58	75	70
Warehouse non-refrigerated	0.00	54.55	60.00	0.00	80	60

² Closing times reflect those hours when occupant density is less than 20 percent and are only used for illustrative purposes.

³ Parking garages can be ventilation only systems as well as heating only systems. In case of heating only systems, a setpoint of 55F is assumed.

Internal Loads

	Occupancy Density (sq ft/occupant)	Equipment Power Density (plug and process loads) (W/sq ft)
Assisted Living Facility	250	1.11
City Hall	200	1.00
Community Center	100	1.50
Courthouse	14	0.25
Education	40	1.39
Library	100	1.50
Lodging	250	1.11
Medical Office	200	2.00
Multi-family	380	0.62
Multi-family (less than 4 floors)	600	0.91
Office	200	0.75
Parking Garage	N/A	0.00
Police Station	33	1.50
Post Office	33	1.00
Religious Building	100	1.50
Retail	67	0.30
Senior Center	100	1.50
Warehouse non-refrigerated	N/A	0.24

Outdoor Ventilation Rates

2 table format:

	Outdoor Air Ventilation Rates
Assisted Living Facility	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - assisted living space) • 5.0 cfm/person (for people) • 0.085 cfm/sq ft (calculated for building)
City Hall	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - city hall space) • 5.0 cfm/person (for people) • 0.09 cfm/sq ft (calculated for building)
Community Center	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - community center space) • 5.00 cfm/person (for people) • 0.31 cfm/sq ft (calculated for building)
Courthouse	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - courthouse space) • 5.00 cfm/person (for people) • 0.41 cfm/sq ft (calculated for building)
Education	<ul style="list-style-type: none"> • 0.22 cfm/sq ft (for area - school space) • 10.00 cfm/person (for people) • 0.47 cfm/sq ft (calculated for building)
Library	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - library space) • 5.0 cfm/person (for people) • 0.11 cfm/sq ft (calculated for building)
Lodging	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - lodging space) • 5.0 cfm/person (for people) • 0.085 cfm/sq ft (calculated for building)
Medical Office	<ul style="list-style-type: none"> • 0.44 cfm/sq ft (for area - medical office space) • 6.0 cfm/person (for people) • 0.47 cfm/sq ft (calculated for building)
Multi-family	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - apartment space) • 0.00 cfm/person (for people) • 0.06 cfm/sq ft (calculated for building)
Multi-family (less than 4 floors)	<ul style="list-style-type: none"> • 0.0375 cfm/sq ft (for area - low rise apartment space) • 0.00 cfm/person (for people) • 0.0375 cfm/sq ft (calculated for building)

	Outdoor Air Ventilation Rates
Office	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - office space) • 5.0 cfm/person (for people) • 0.085 cfm/sq ft (calculated for building)
Parking Garage	<ul style="list-style-type: none"> • 0.75 cfm/sq ft (for area - parking garage space) • 0.00 cfm/person (for people) • 0.75 cfm/sq ft (calculated for building)

	Outdoor Air Ventilation Rates
Assisted Living Facility	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - assisted living space) • 5.00 cfm/person (for people) • 0.085 cfm/sq ft (calculated for building)
City Hall	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - city hall space) • 5.00 cfm/person (for people) • 0.09 cfm/sq ft (calculated for building)
Community Center	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - community center space) • 5.00 cfm/person (for people) • 0.11 cfm/sq ft (calculated for building)
Courthouse	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - courthouse space) • 5.00 cfm/person (for people) • 0.41 cfm/sq ft (calculated for building)
Education	<ul style="list-style-type: none"> • 0.22 cfm/sq ft (for area - school space) • 10.00 cfm/person (for people) • 0.47 cfm/sq ft (calculated for building)
Library	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - library space) • 5.00 cfm/person (for people) • 0.11 cfm/sq ft (calculated for building)
Lodging	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - lodging space) • 5.00 cfm/person (for people) • 0.085 cfm/sq ft (calculated for building)
Medical Office	<ul style="list-style-type: none"> • 0.17 cfm/sq ft (for area - medical office space) • 5.00 cfm/person (for people) • 0.2048 cfm/sq ft (calculated for building)
Multi-family	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - apartment space) • 0.00 cfm/person (for people) • 0.06 cfm/sq ft (calculated for building)
Multi-family (less than 4 floors)	<ul style="list-style-type: none"> • 0.0375 cfm/sq ft (for area - low rise apartment space) • 0.00 cfm/person (for people) • 0.0375 cfm/sq ft (calculated for building)

Outdoor Ventilation Rates, continued

	Outdoor Air Ventilation Rates
Office	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - office space) • 5.00 cfm/person (for people) • 0.085 cfm/sq ft (calculated for building)
Parking Garage	<ul style="list-style-type: none"> • 0.75 cfm/sq ft (for area - parking garage space) • 0.00 cfm/person (for people) • 0.75 cfm/sq ft (calculated for building)
Police Station	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - police station space) • 5.00 cfm/person (for people) • 0.21 cfm/sq ft (calculated for building)
Post Office	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - post office space) • 5.00 cfm/person (for people) • 0.21 cfm/sq ft (calculated for building)
Religious Building	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - religious building space) • 5.00 cfm/person (for people) • 0.11 cfm/sq ft (calculated for building)
Retail	<ul style="list-style-type: none"> • 0.12 cfm/sq ft (for area - retail space) • 7.50 cfm/person (for people) • 0.23 cfm/sq ft (calculated for building)
Senior Center	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - senior center space) • 5.00 cfm³¹ /person (for people) • 0.11 cfm/sq ft (calculated for building)
Warehouse non-refrigerated	<ul style="list-style-type: none"> • 0.06 cfm/sq ft (for area - warehouse space) • 0.00 cfm/person (for people) • 0.06 cfm/sq ft (calculated for building)

Service Hot Water Use (for faucets/shower heads, etc.)

	Service Hot Water Use
Assisted Living Facility	14 gal/day/occupant
City Hall	0.26 gal/day/occupant
Community Center	0.18 gal/day/occupant
Courthouse	0.26 gal/day/occupant
Education	1.2 gal/day/occupant ⁴
Library	0.18 gal/day/occupant
Lodging	14 gal/day/occupant ⁵
Medical Office	3.01 gal/day/occupant
Multi-family	40 gal/day/occupant ⁶
Multi-family (less than 4 floors)	30 gal/day/occupant
Office	1.0 gal/day/occupant
Parking Garage	0.0 gal/day/occupant
Police Station	1.0 gal/day/occupant
Post Office	1.0 gal/day/occupant
Religious Building	0.18 gal/day/occupant
Retail	0.61 gal/day/occupant
Senior Center	0.18 gal/day/occupant
Warehouse non-refrigerated	0.0 gal/day/occupant

⁴ COMNET specifies this value as 0.61 gal/day/occupant for k-12 schools and 1.8 gal/day/occupant for high schools. An average of 1.2 gals/day/occupant is assumed for all schools.

⁵ COMNET specifies this value in accordance with number of rooms. For hotels with less than 20 rooms, a value of 20 gal/day/occupant is prescribed, for 20-100 rooms, 14 gal/day/occupant, for greater than 100 rooms, 10 gal/day/occupant. An average for 20-100 rooms is assumed.

⁶ Assuming each dwelling unit to be 1,000 sq ft

Equipment Sizing⁷

Heating and Cooling Equipment

- Cooling and Heating Capacity
- Sensible Heat Ratio
- Supply Air flow rate
- CHW and HW Loops: Maximum flow rate

Heating and cooling equipment is automatically sized based on the assumed internal loads specified above. The equipment capacity used in the energy model is based on the standard operation assumptions and does not reflect the actual equipment capacity. A building may have larger equipment to meet the specifically designed loads.

Ventilation Equipment

Maximum and minimum outdoor air flow rate are automatically calculated by the software based on the design outdoor air requirements specified.

Fans

Maximum air flow rate for fans is auto sized in the simulation software based on the system loads.

Pumps

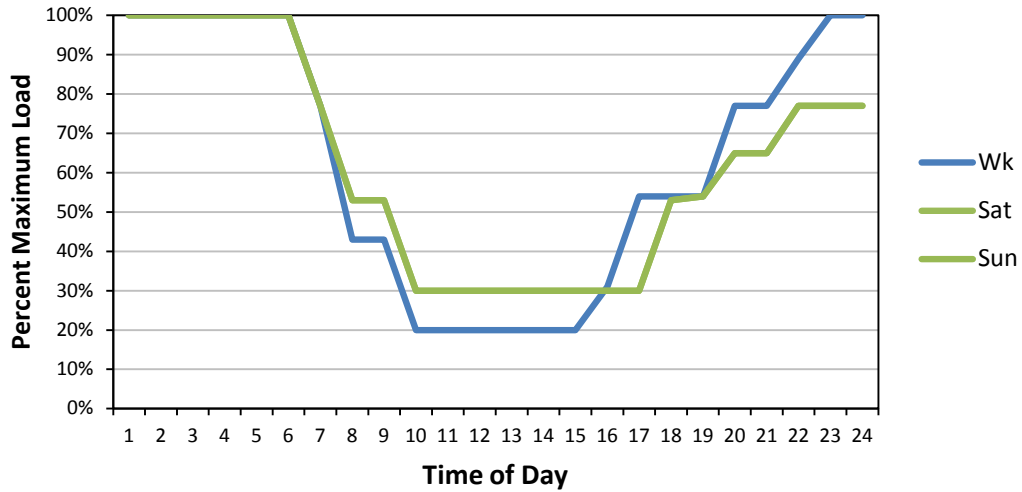
Rated flow rate is auto sized based on plant loads.

⁷ The scoring tool assumes that the energy equipment listed here is sized specifically to meet the load requirements corresponding to the operational assumptions.

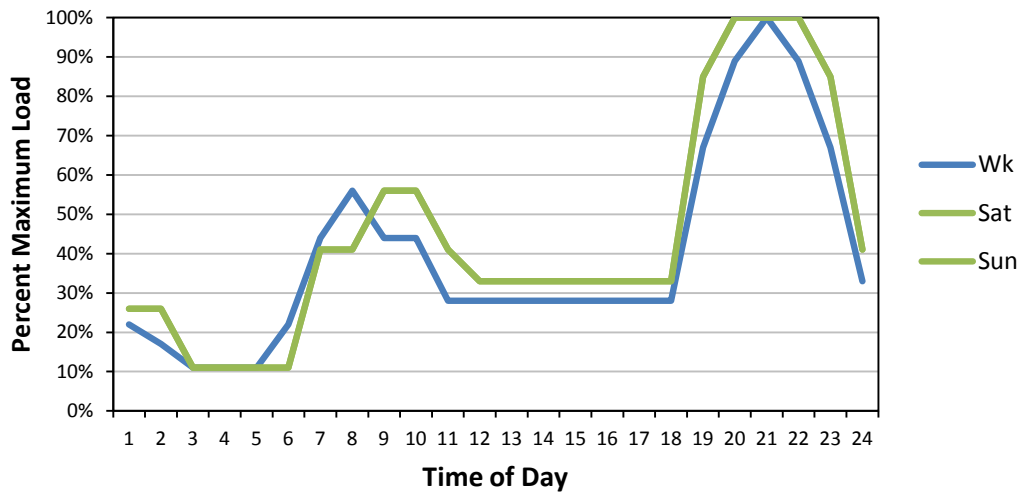
Appendix: Building Use Type Schedules

Assisted Living Facility

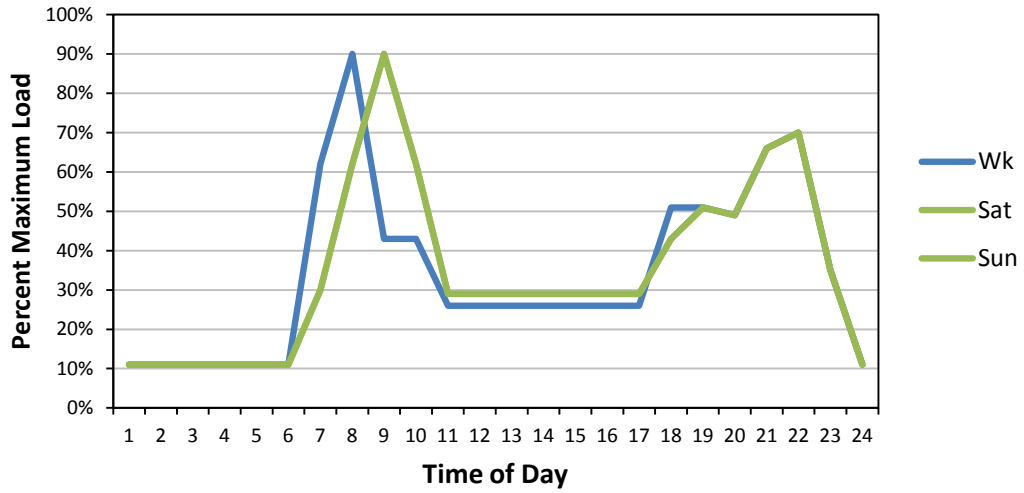
Assisted Living Facility: Occupancy



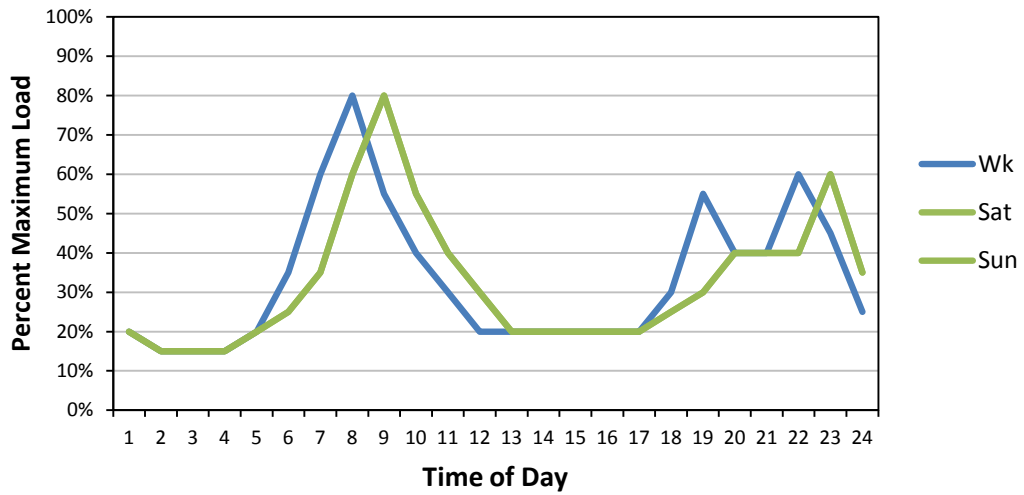
Assisted Living Facility: Lighting



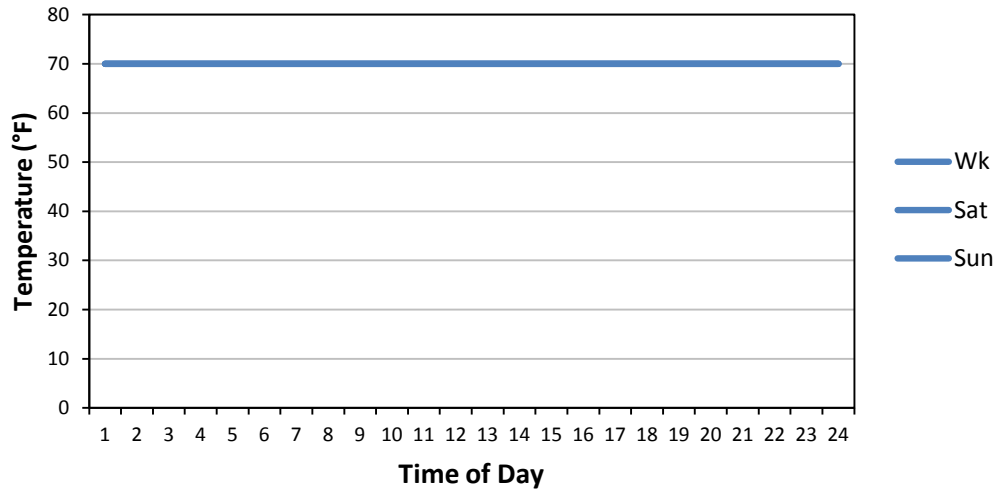
Assisted Living Facility: Equipment



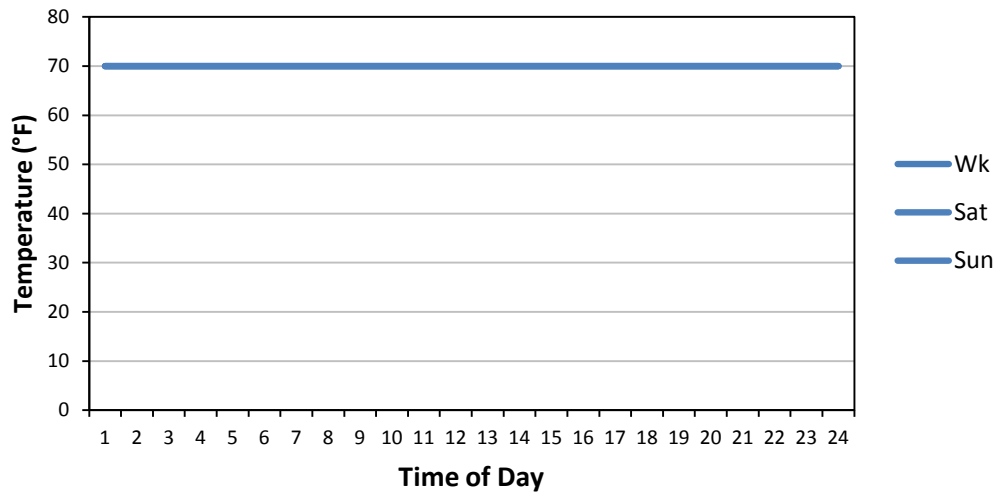
Assisted Living Facility: Service Hot Water



Assisted Living Facility: Heating Setpoint

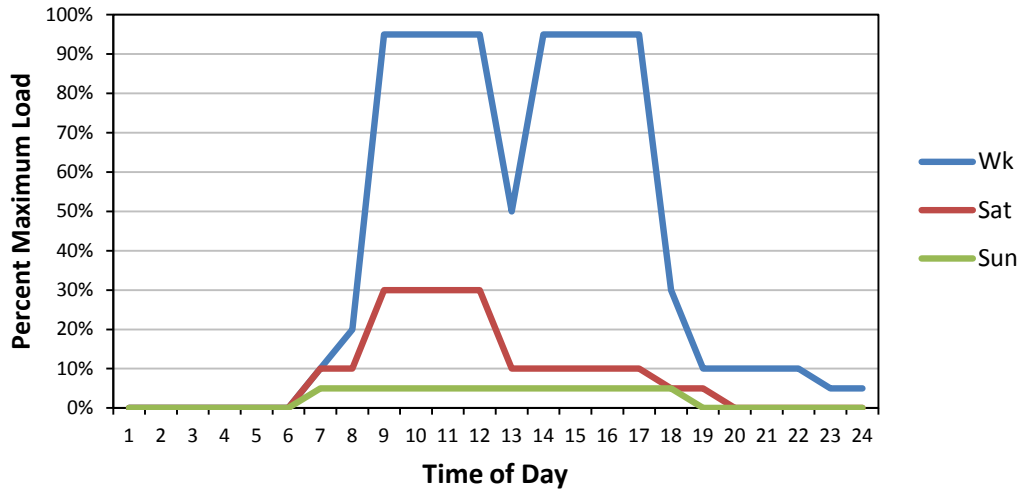


Assisted Living Facility: Cooling Setpoint

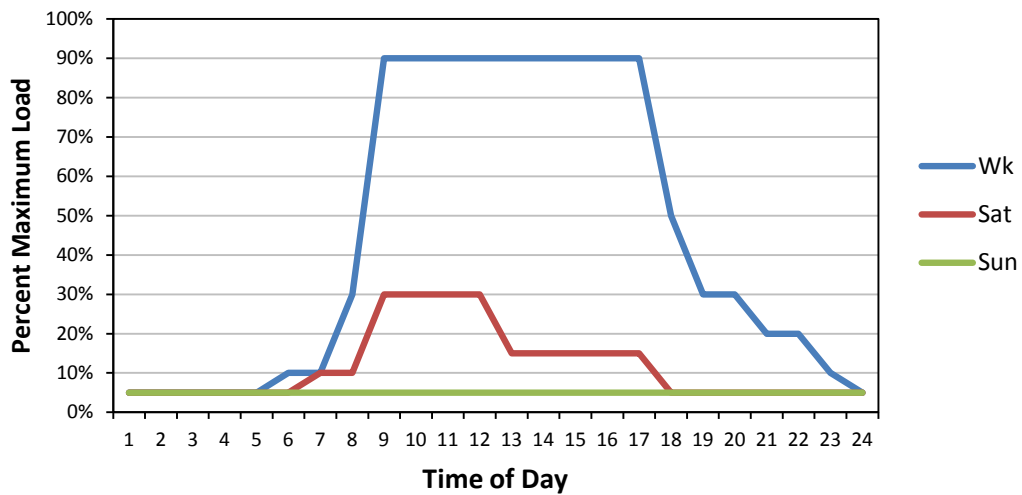


City Hall

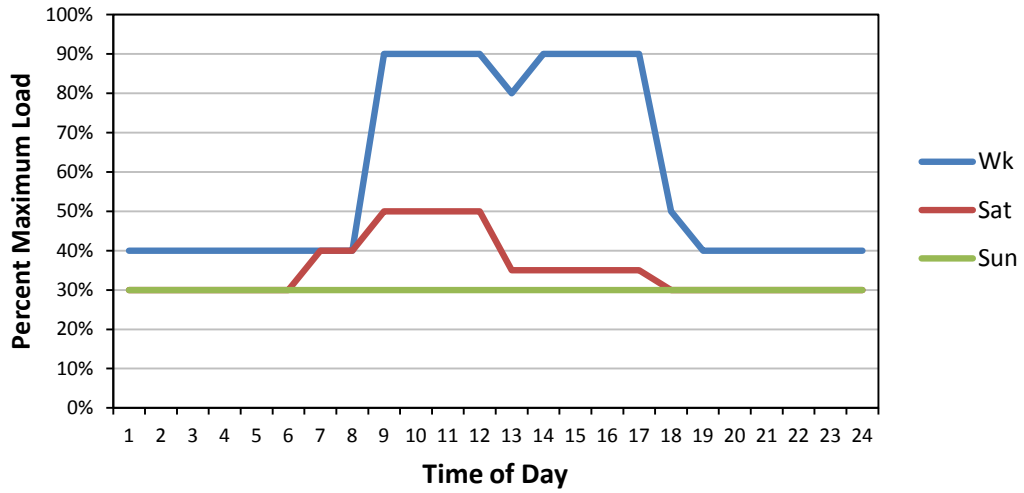
City Hall: Occupancy



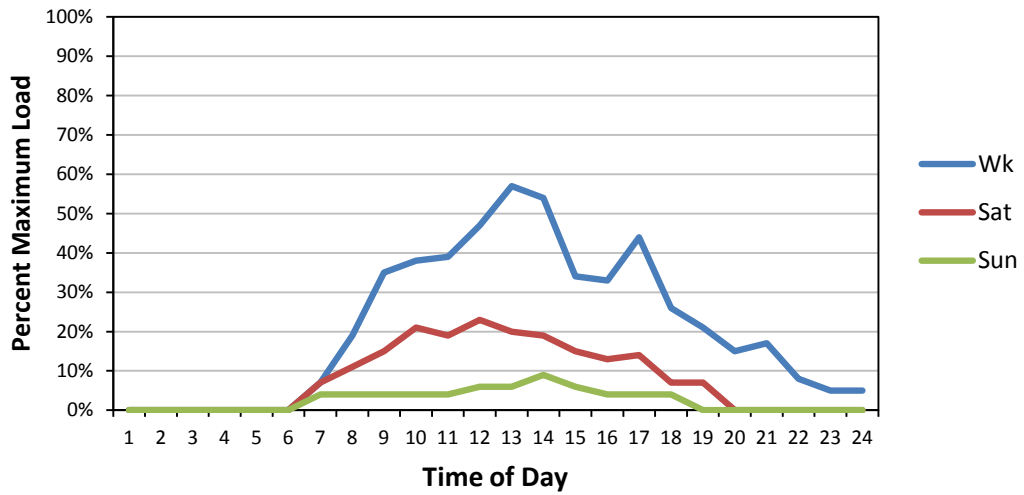
City Hall: Lighting



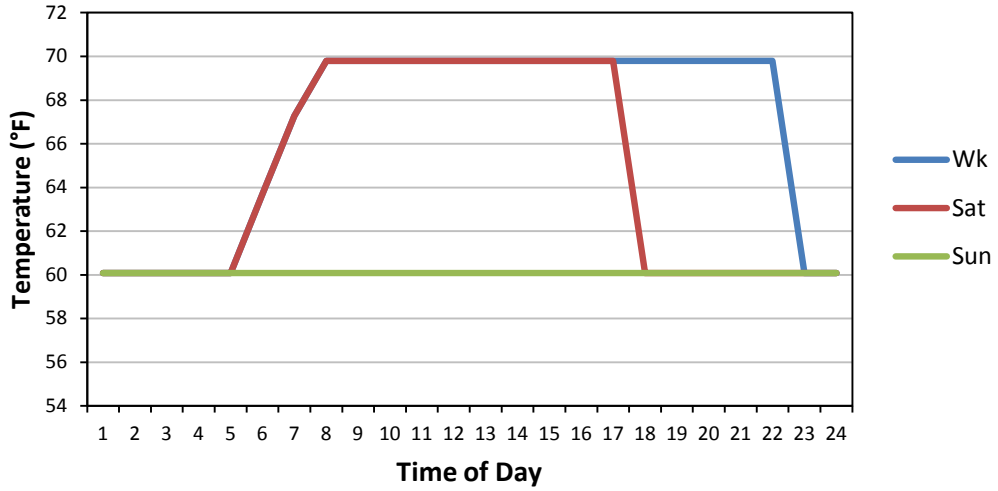
City Hall: Equipment



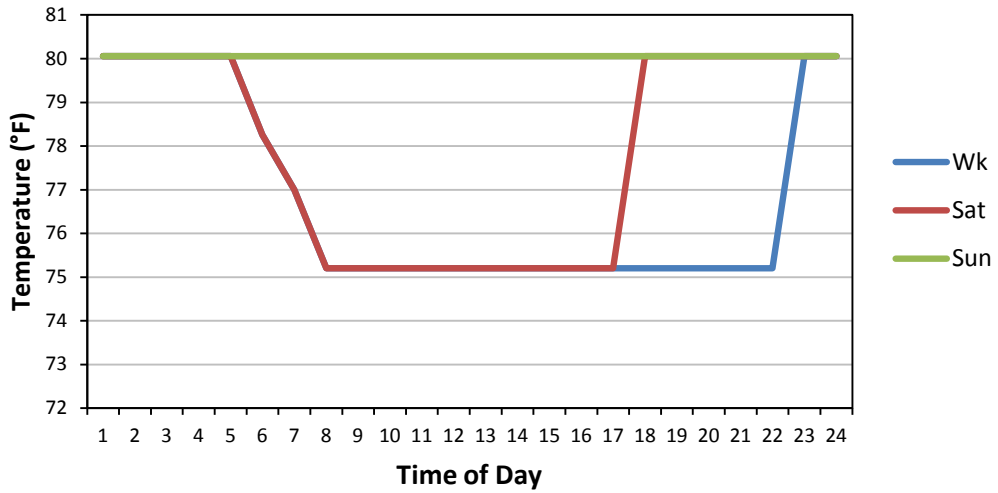
City Hall: Service Hot Water



City Hall: Heating Setpoint

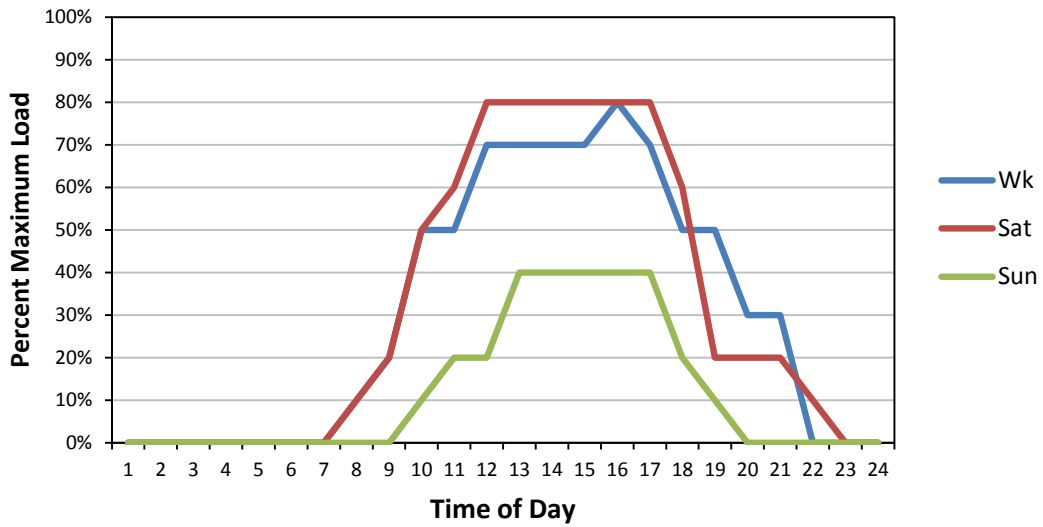


City Hall: Cooling Setpoint

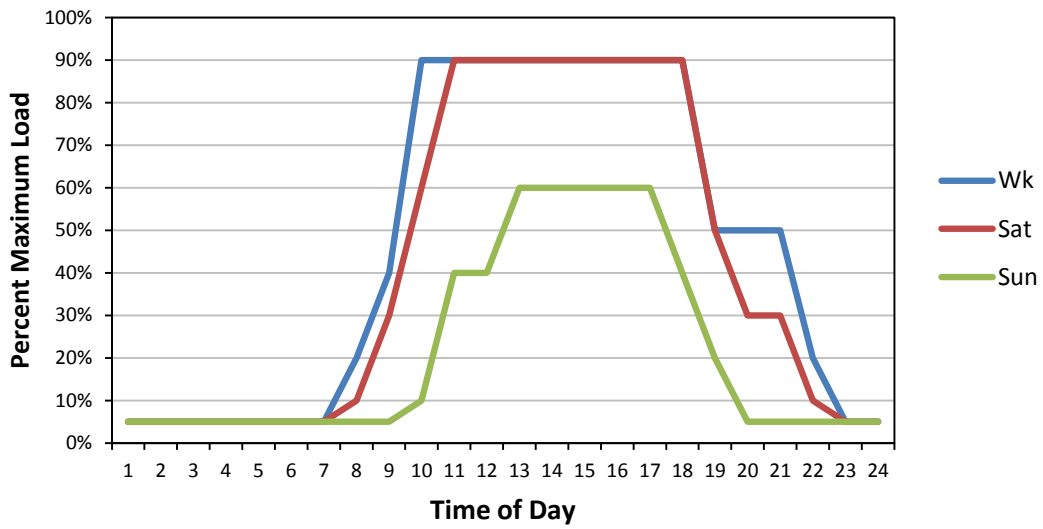


Community Center

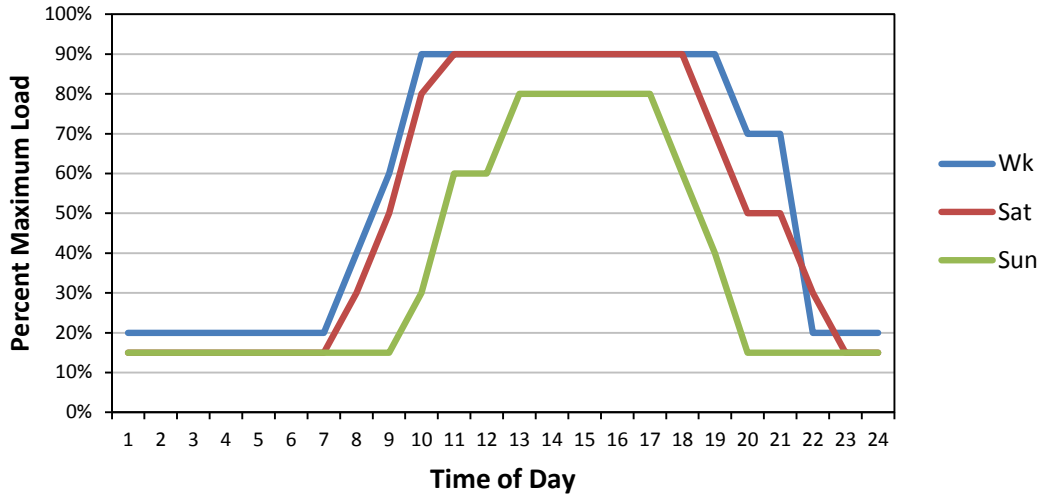
Community Center: Occupancy



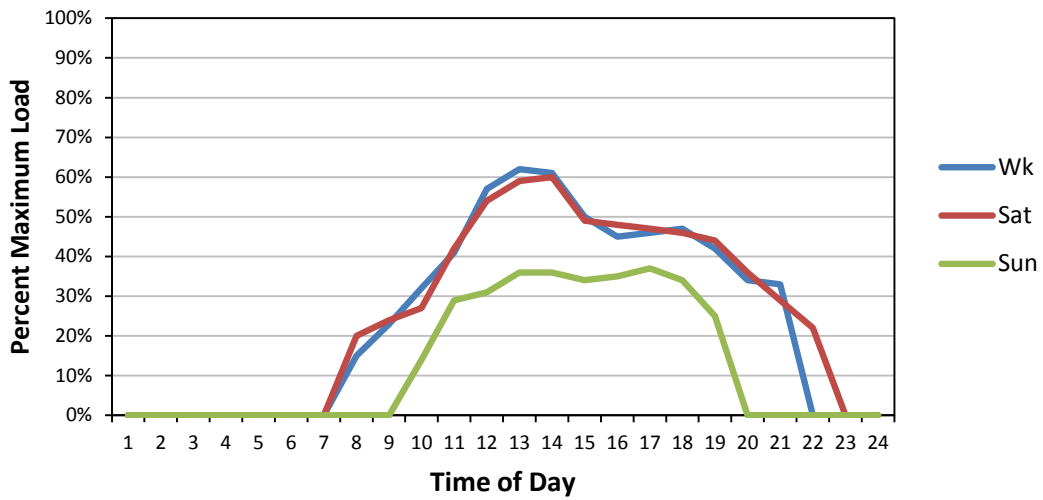
Community Center: Lighting



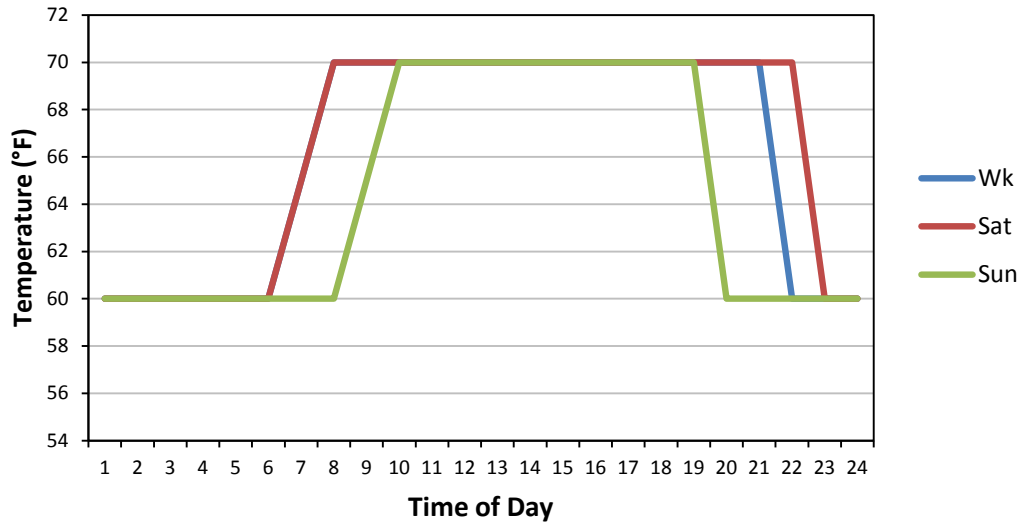
Community Center: Equipment



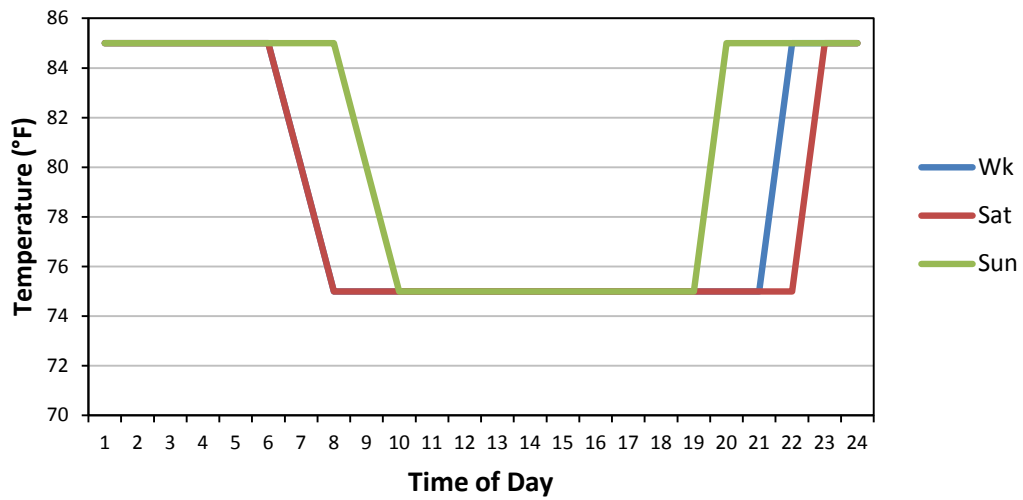
Community Center: Service Hot Water



Community Center: Heating Setpoint

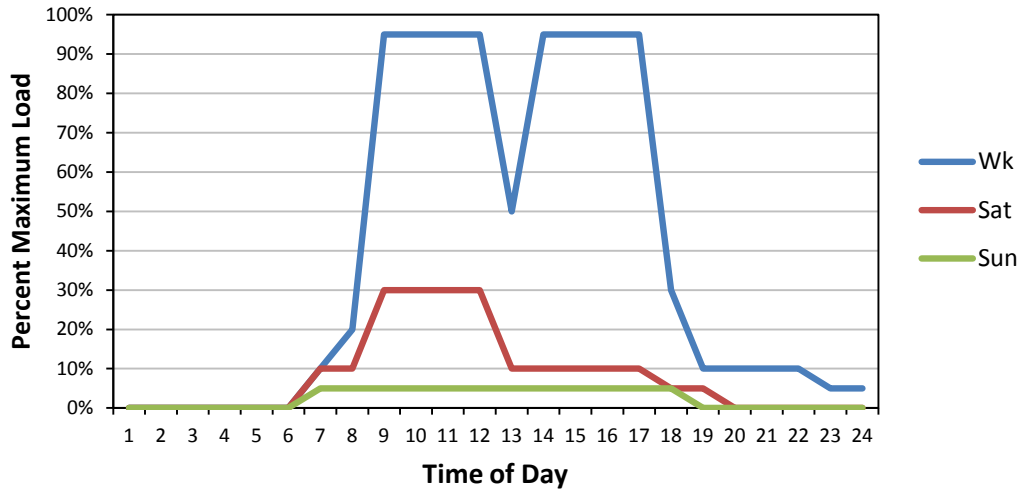


Community Center: Cooling Setpoint

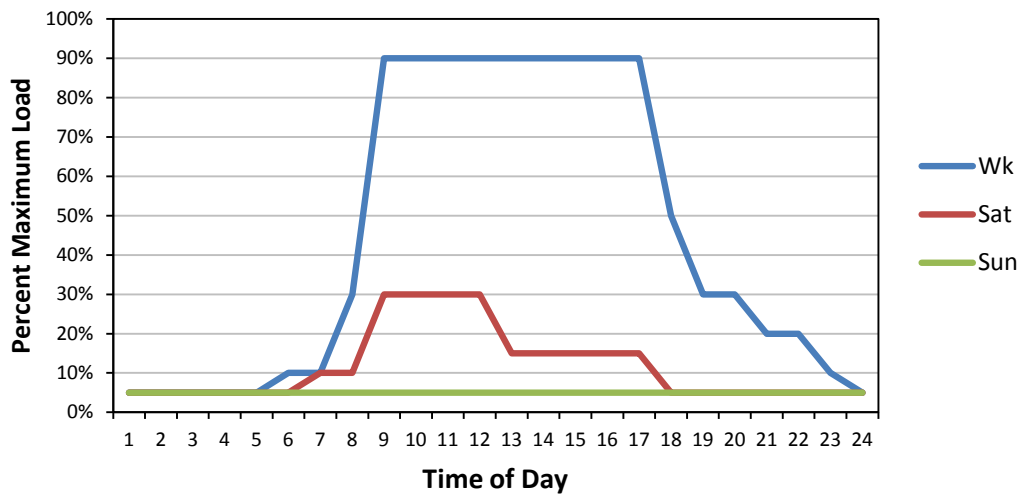


Courthouse

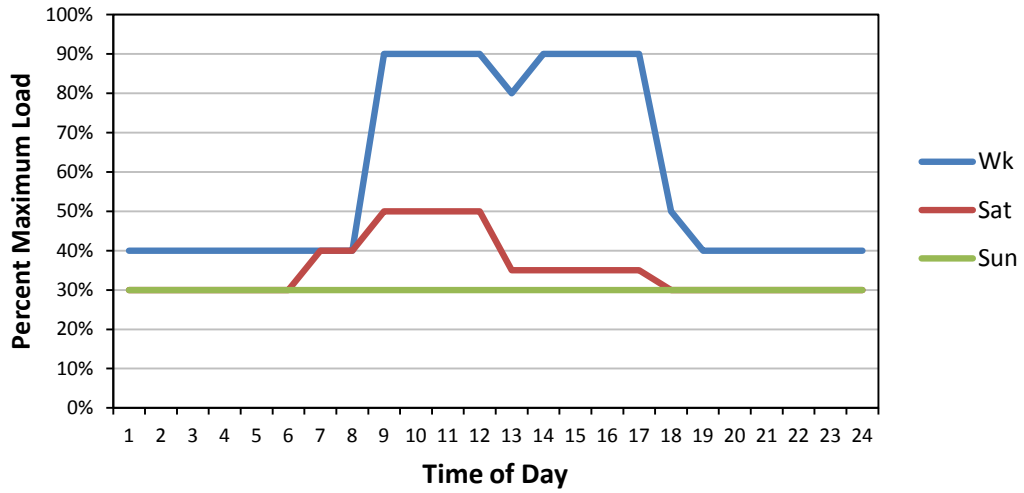
Courthouse: Occupancy



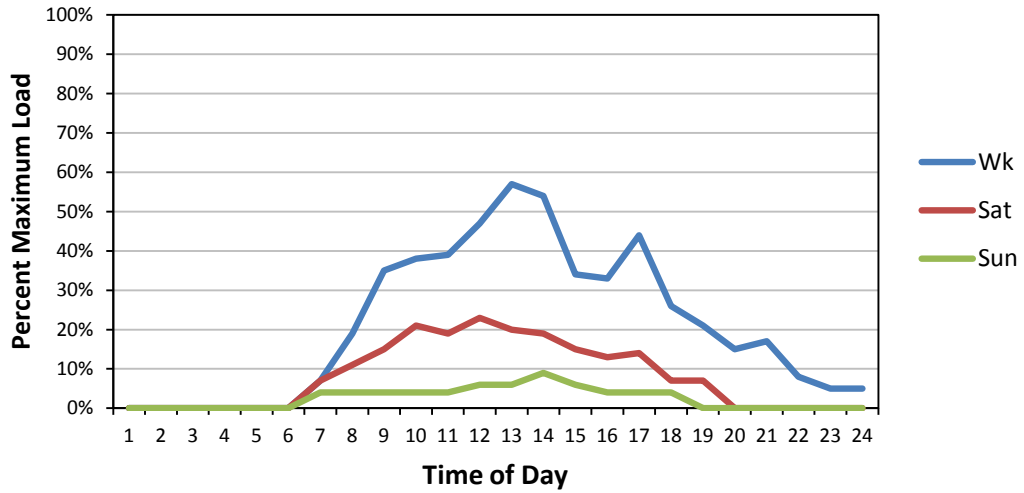
Courthouse: Lighting



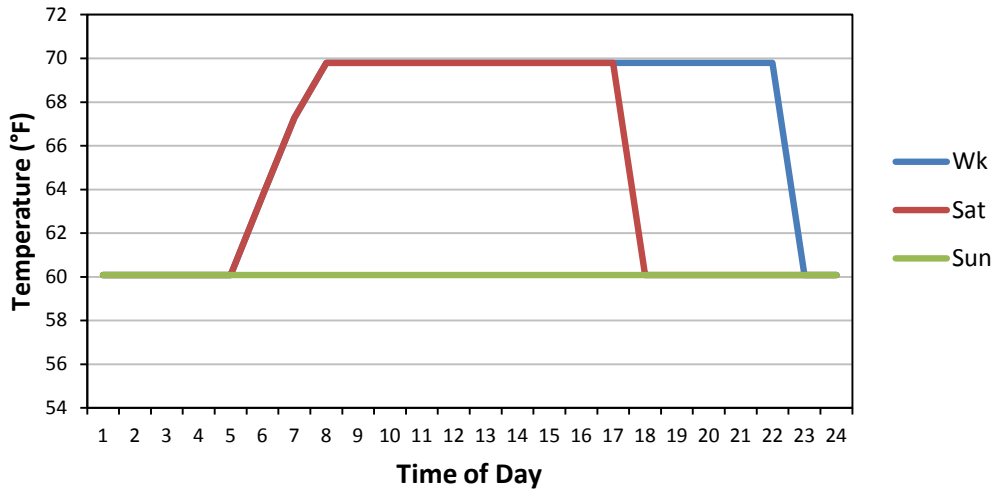
Courthouse: Equipment



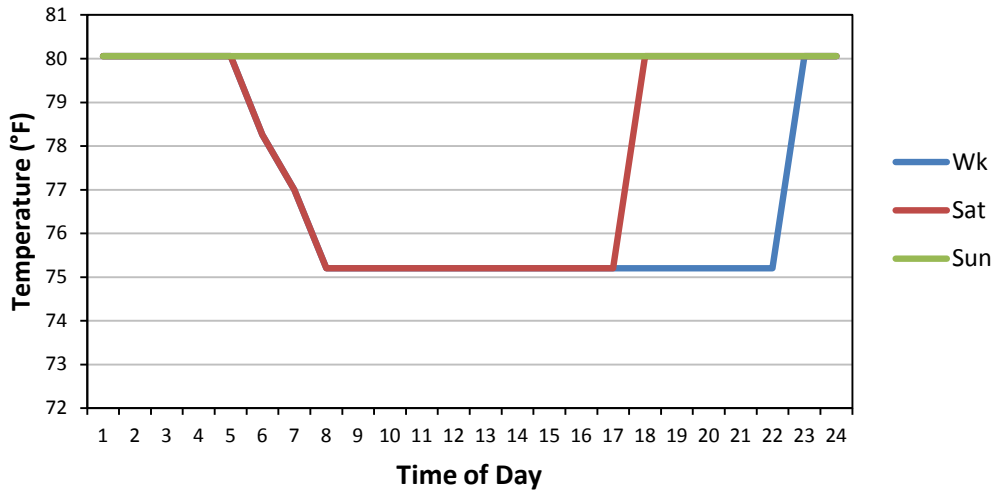
Courthouse: Service Hot Water



Courthouse: Heating Setpoint

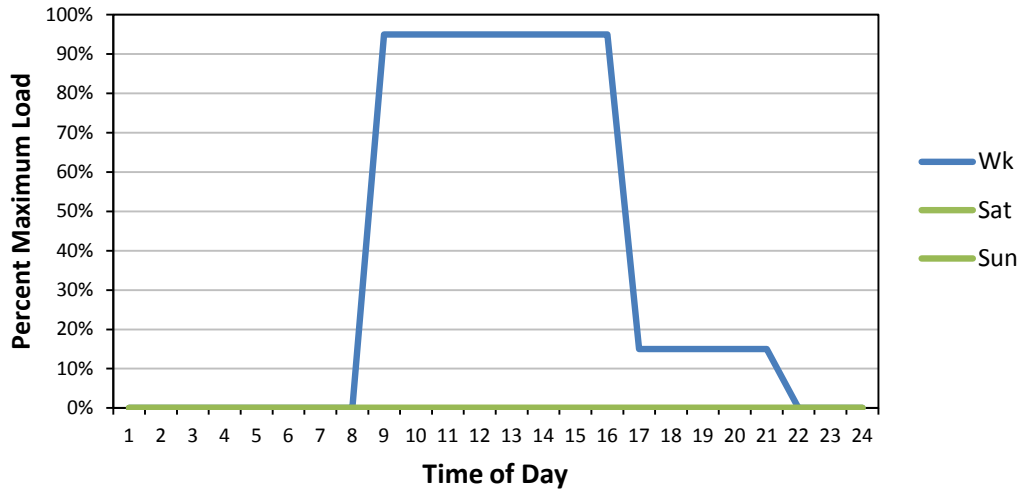


Courthouse: Cooling Setpoint

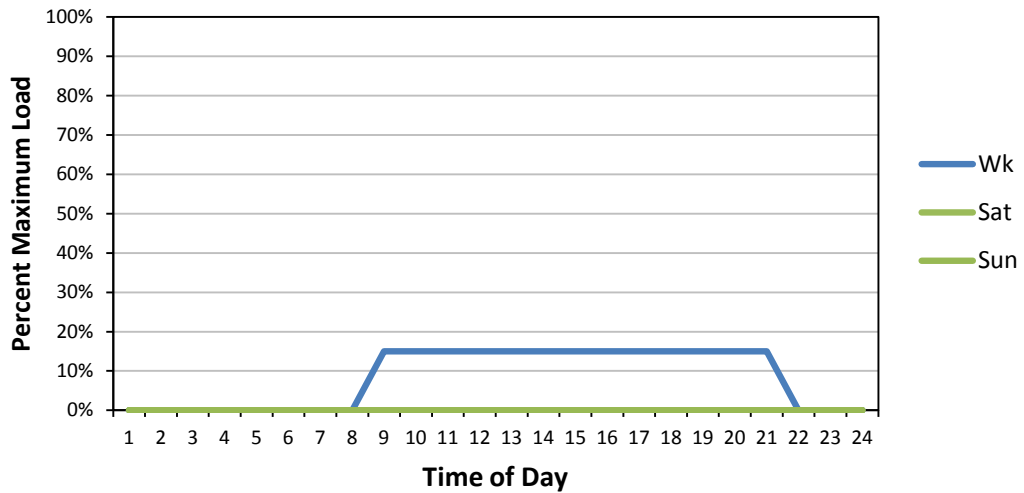


Education

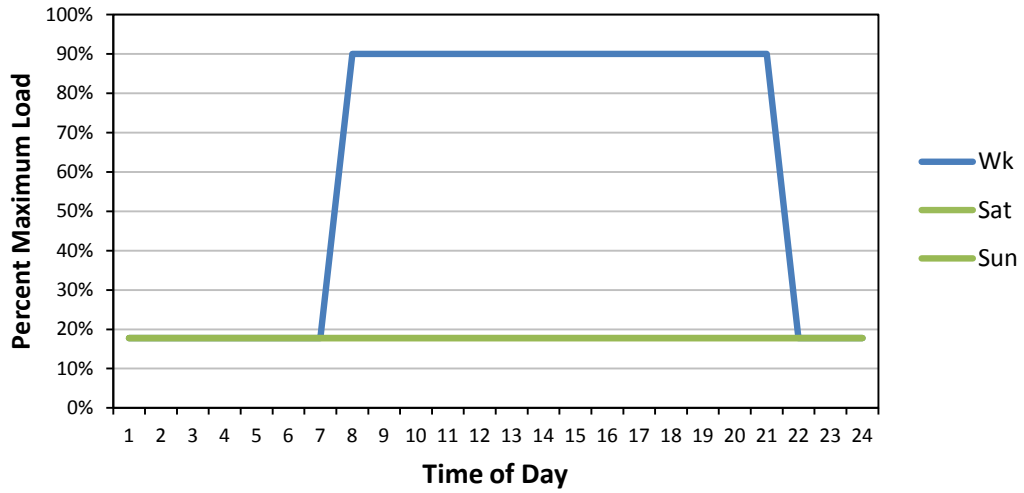
Education: Occupancy



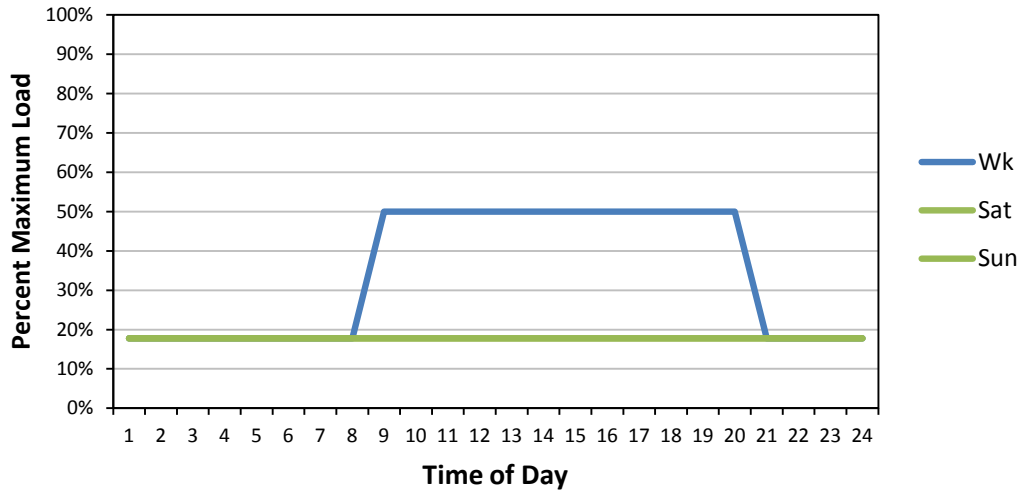
Education: Seasonal Occupancy



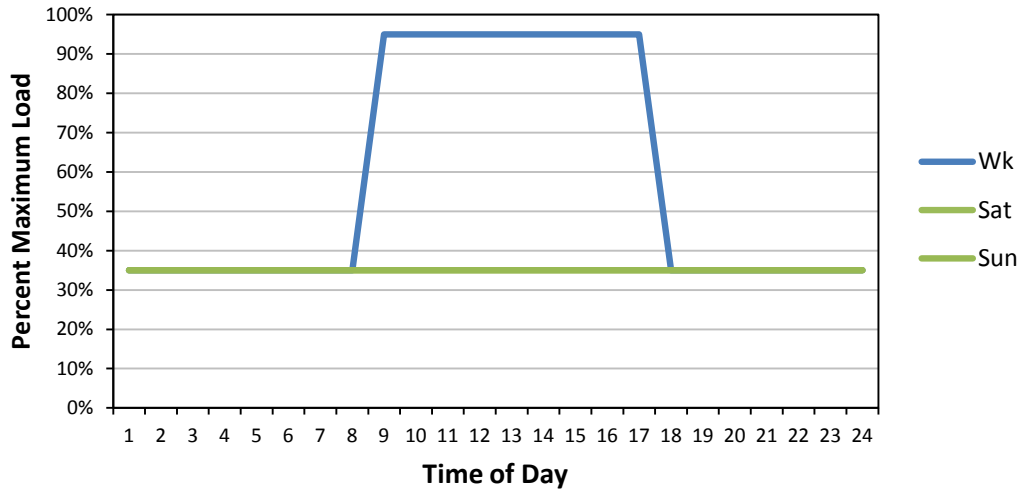
Education: Lighting



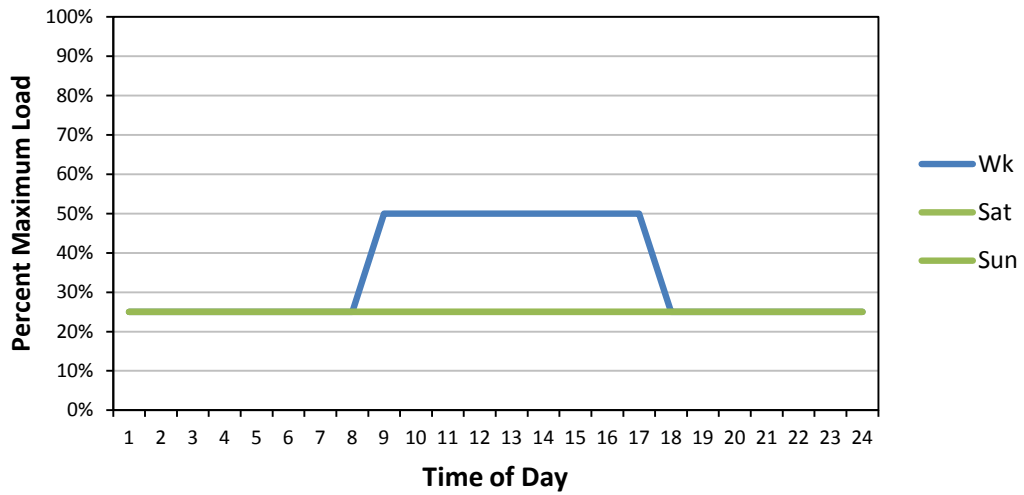
Education: Seasonal Lighting



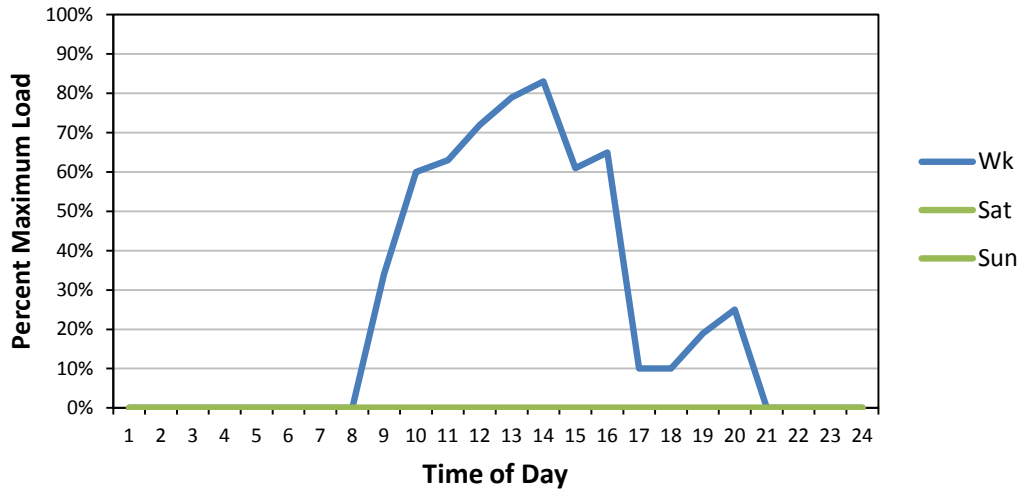
Education: Equipment



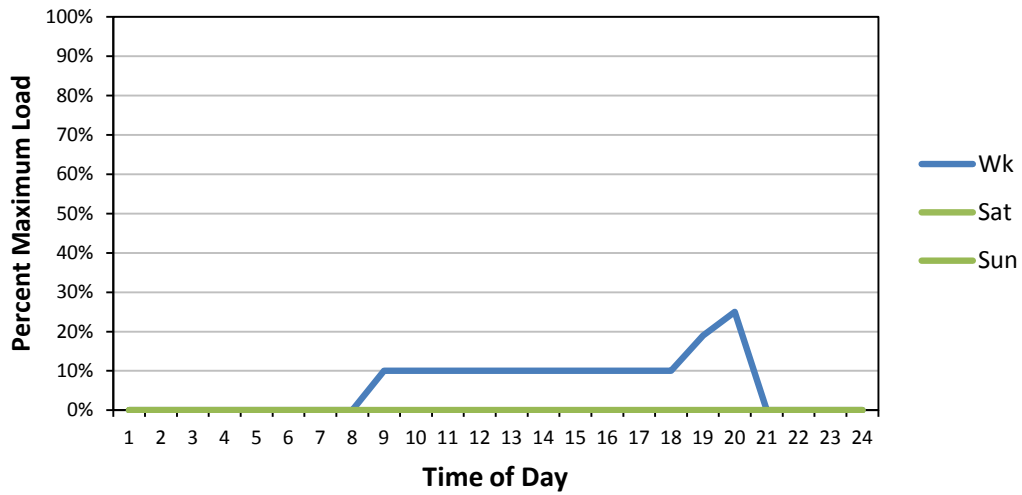
Education: Seasonal Equipment



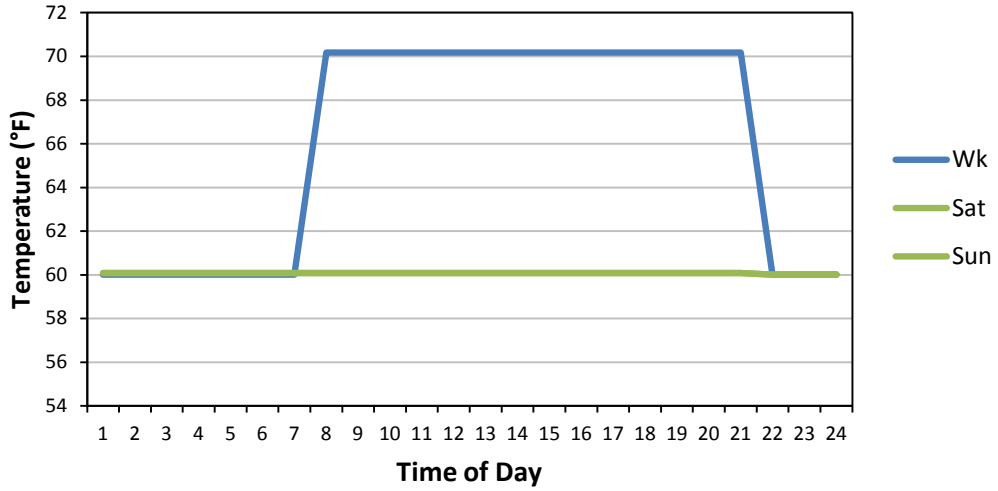
Education: Service Hot Water



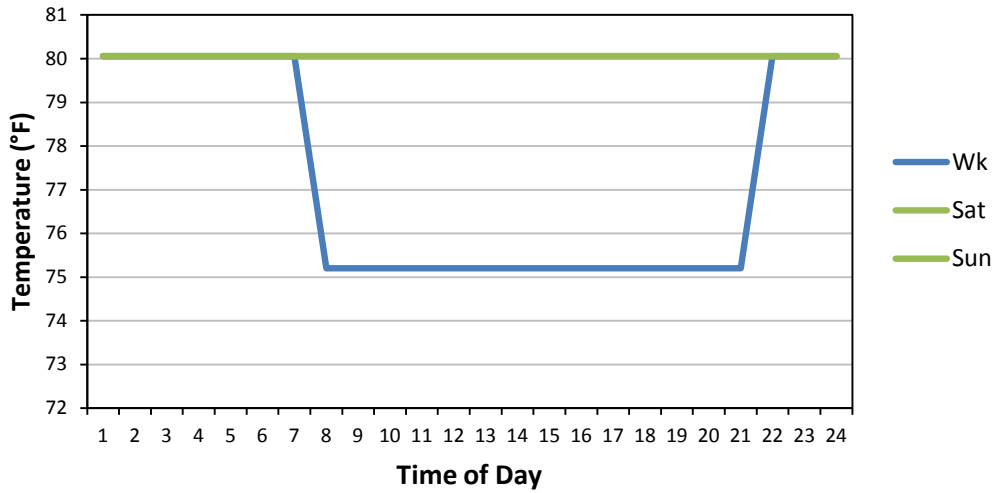
Education: Seasonal Service Hot Water



Education: Heating Setpoint

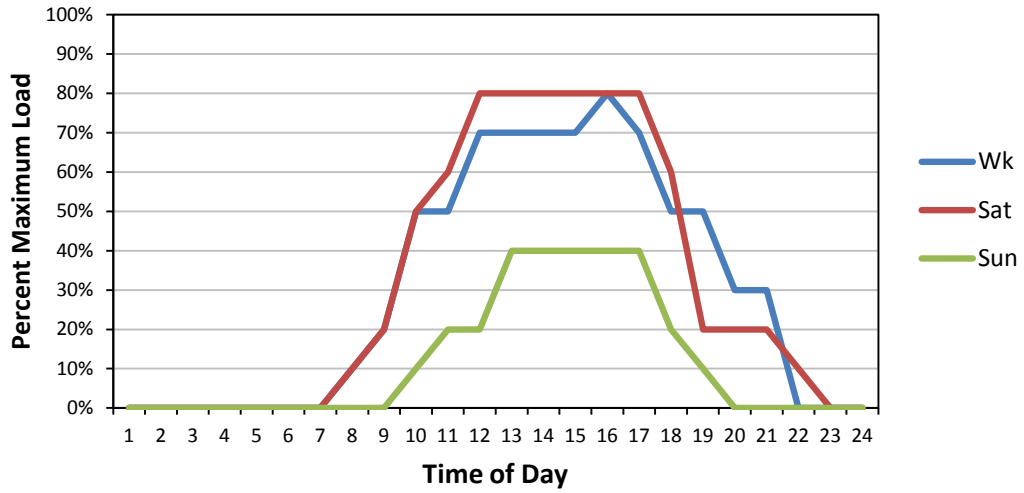


Education: Cooling Setpoint

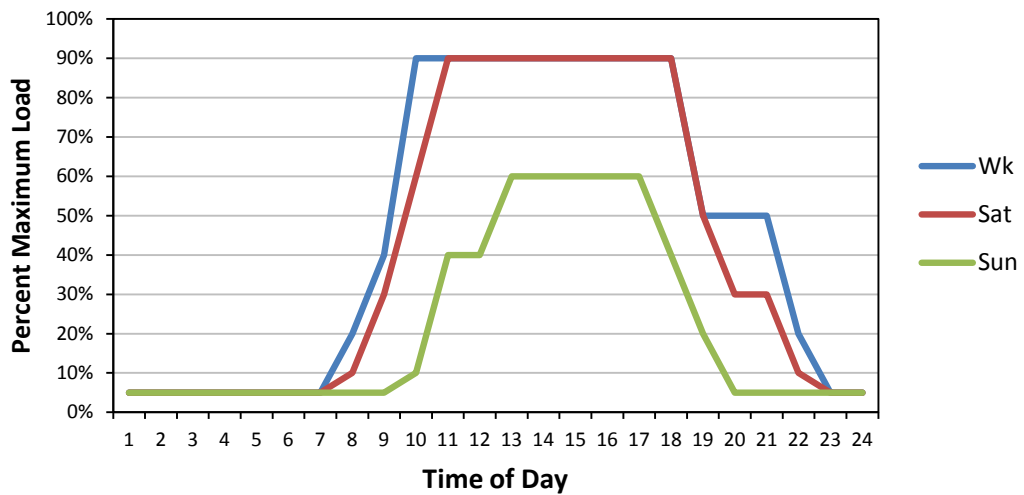


Library

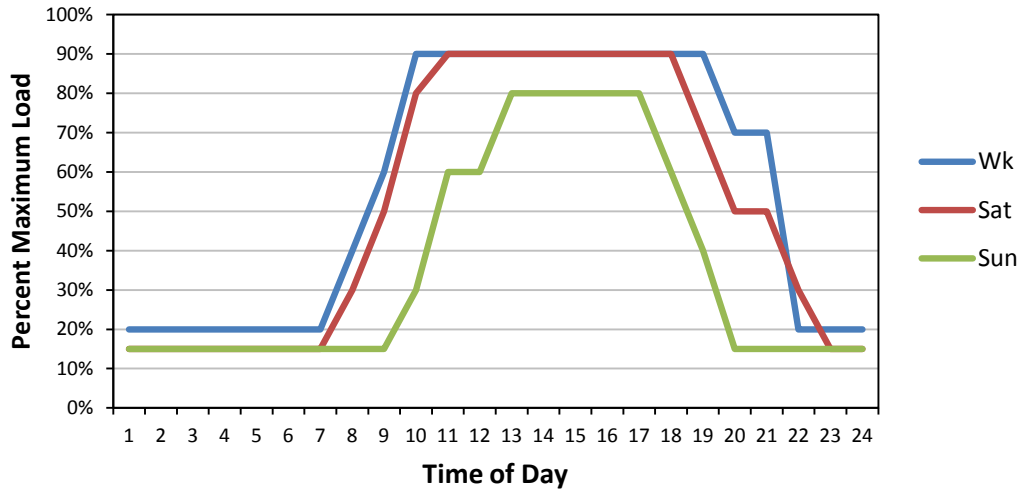
Library: Occupancy



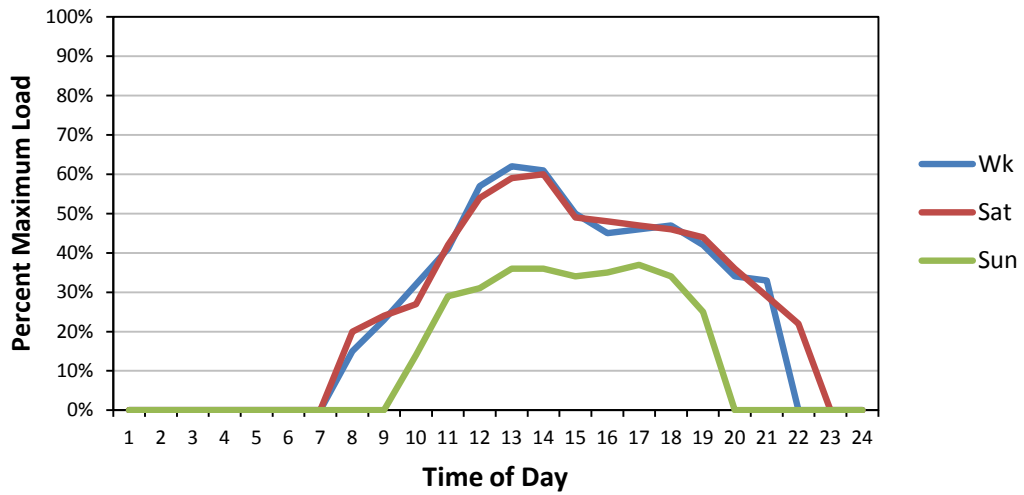
Library: Lighting



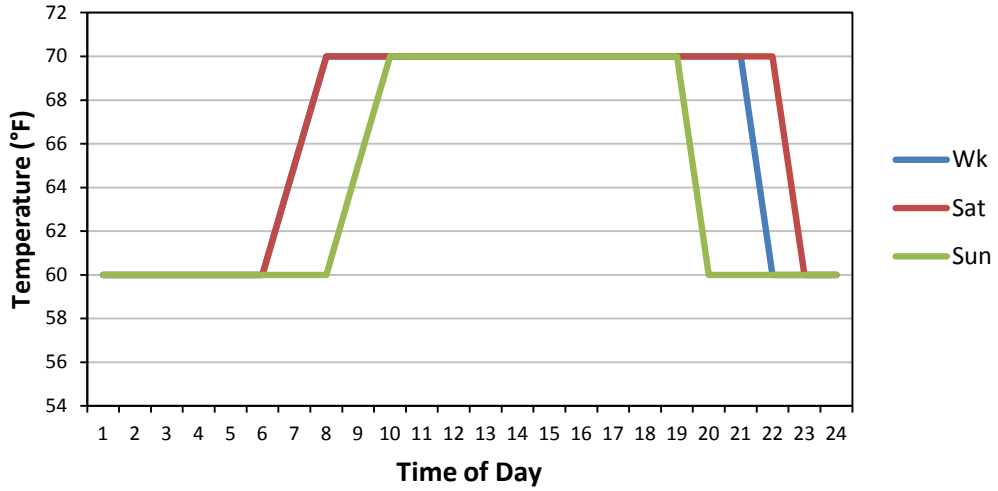
Library: Equipment



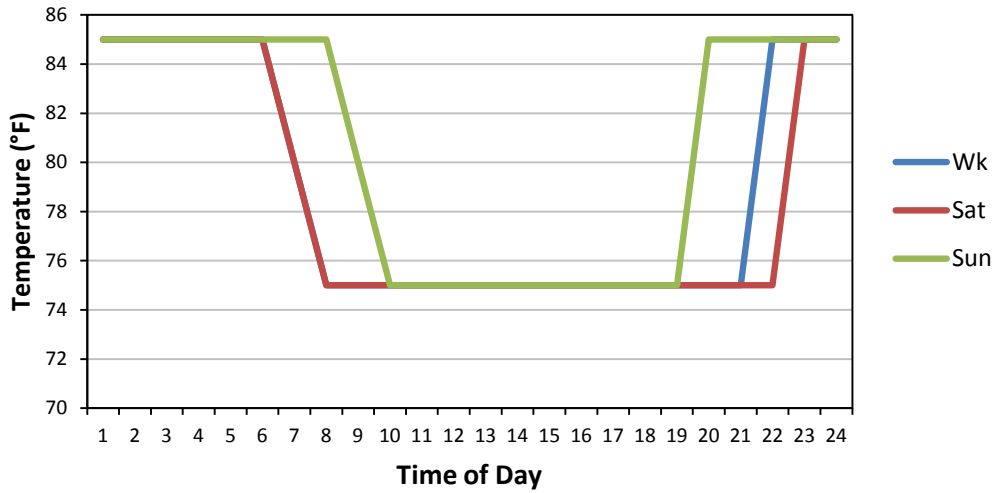
Library: Service Hot Water



Library: Heating Setpoint

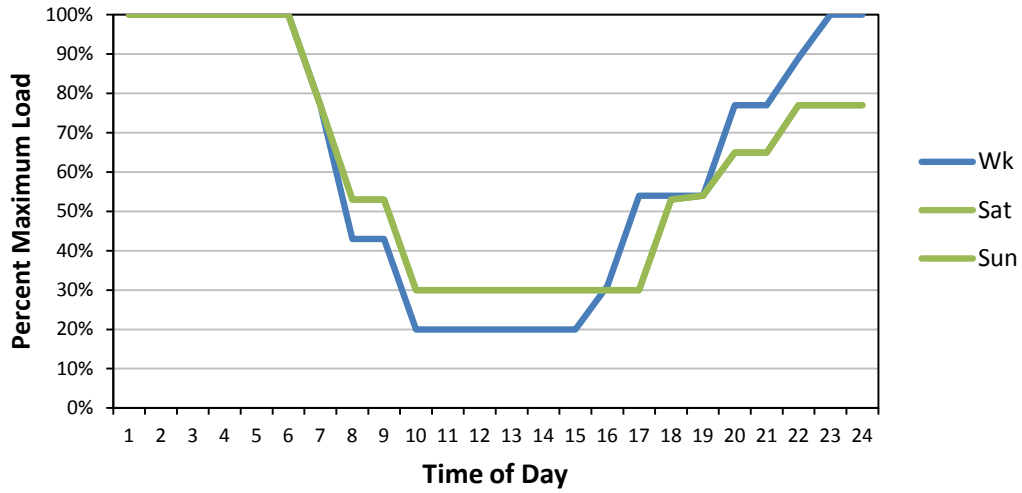


Library: Cooling Setpoint

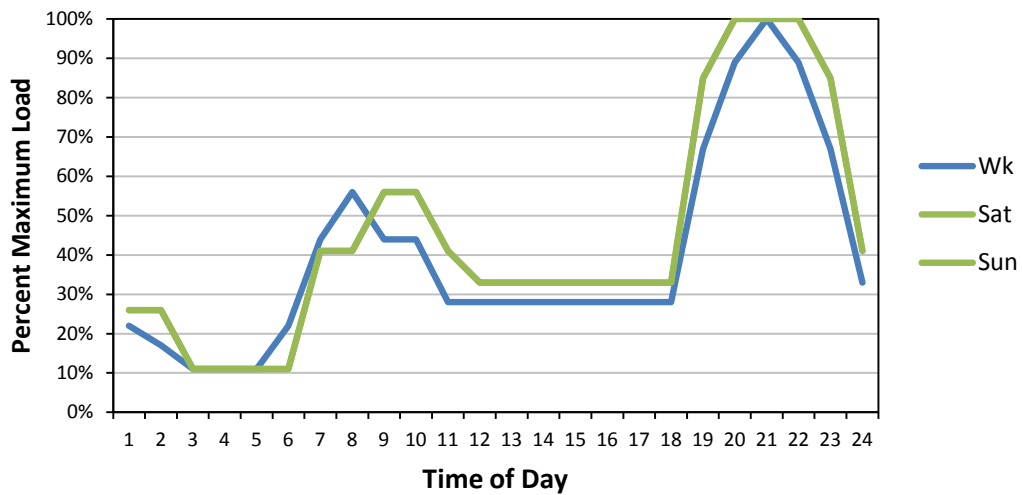


Lodging

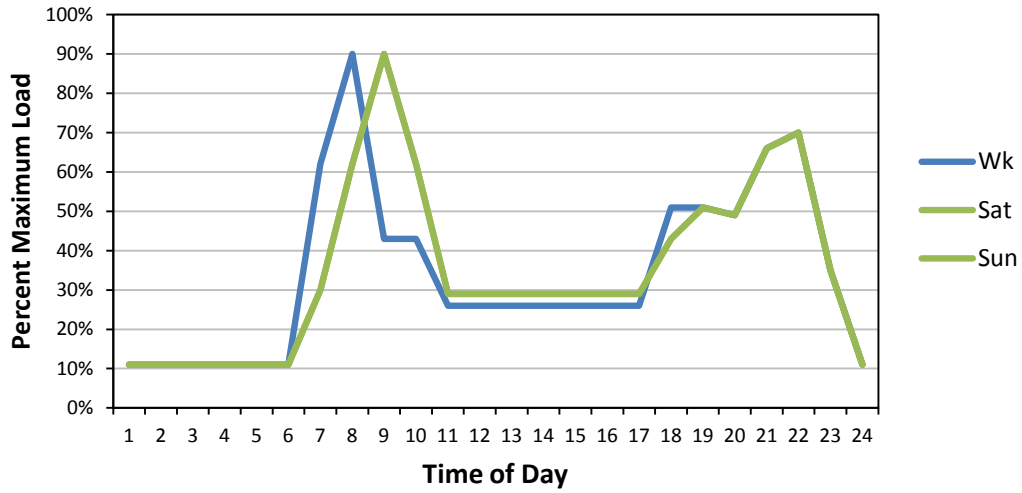
Lodging: Occupancy



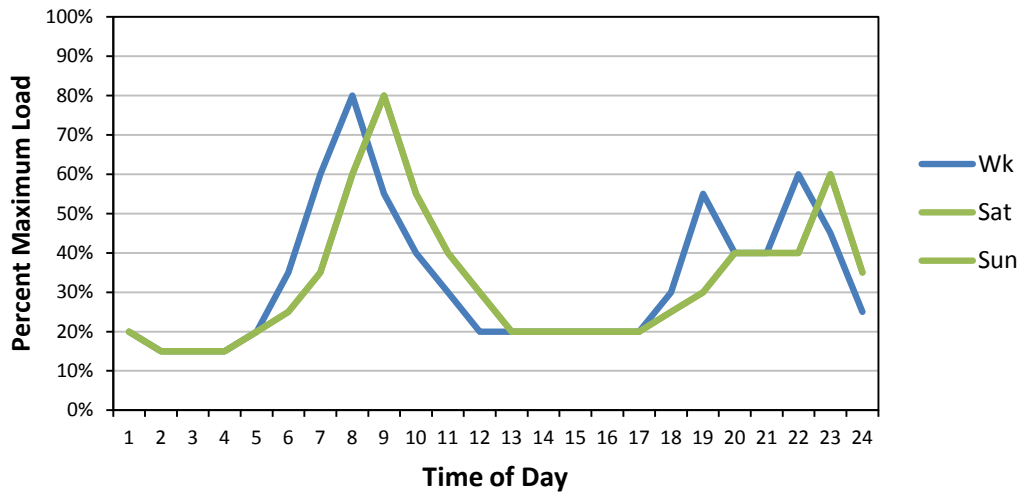
Lodging: Lighting



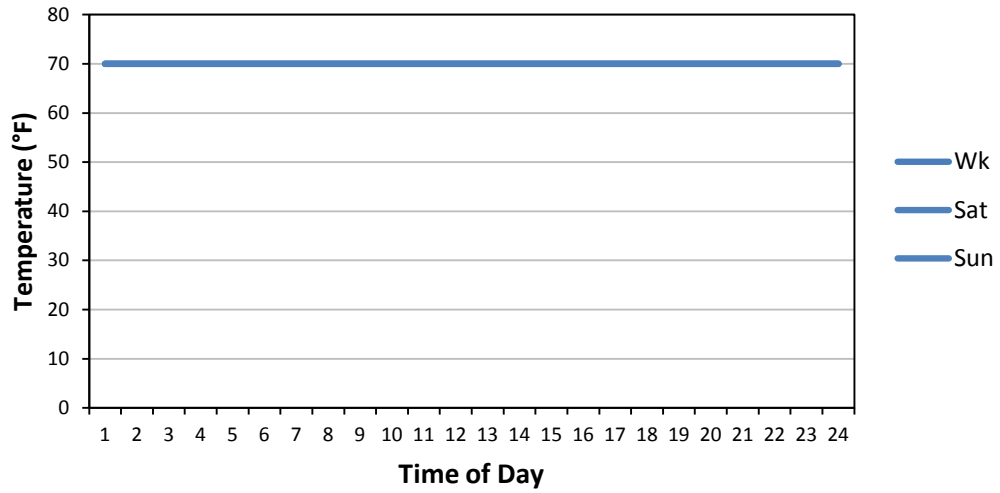
Lodging: Equipment



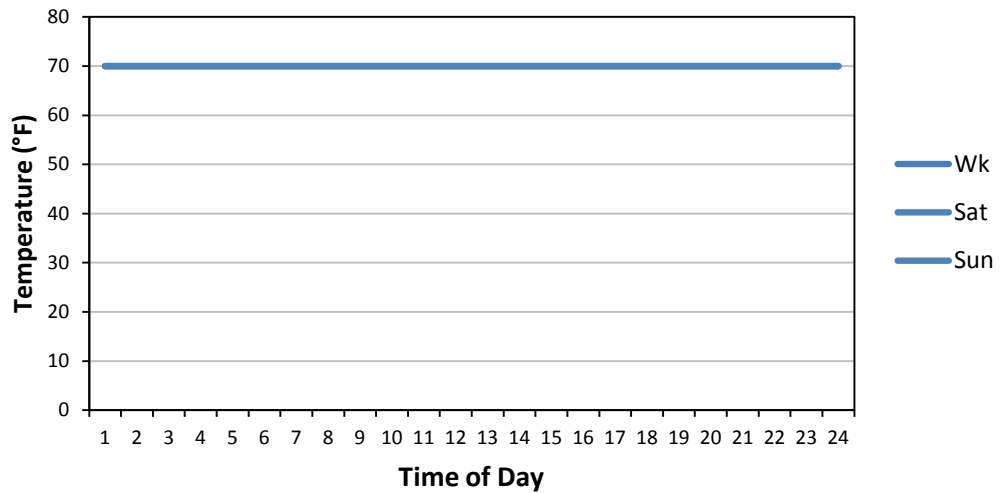
Lodging: Service Hot Water



Lodging: Heating Setpoint

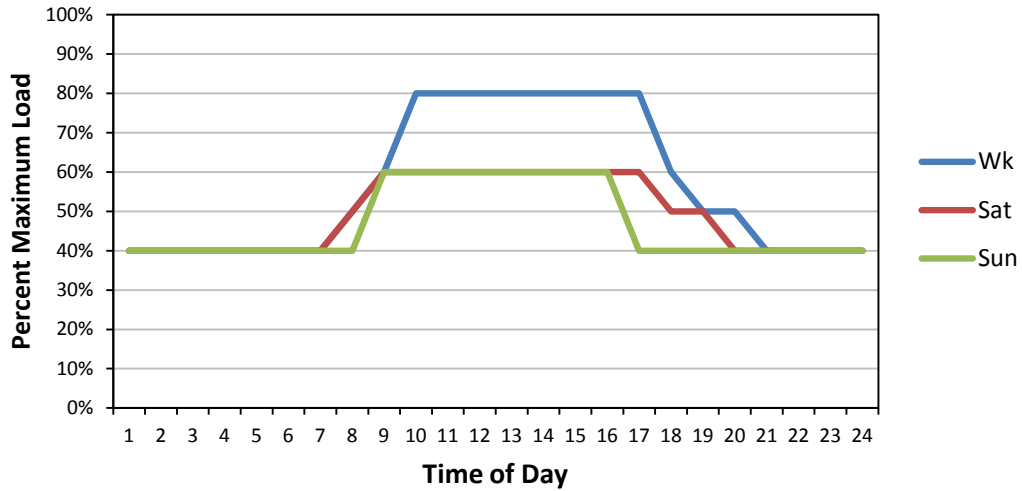


Lodging: Cooling Setpoint

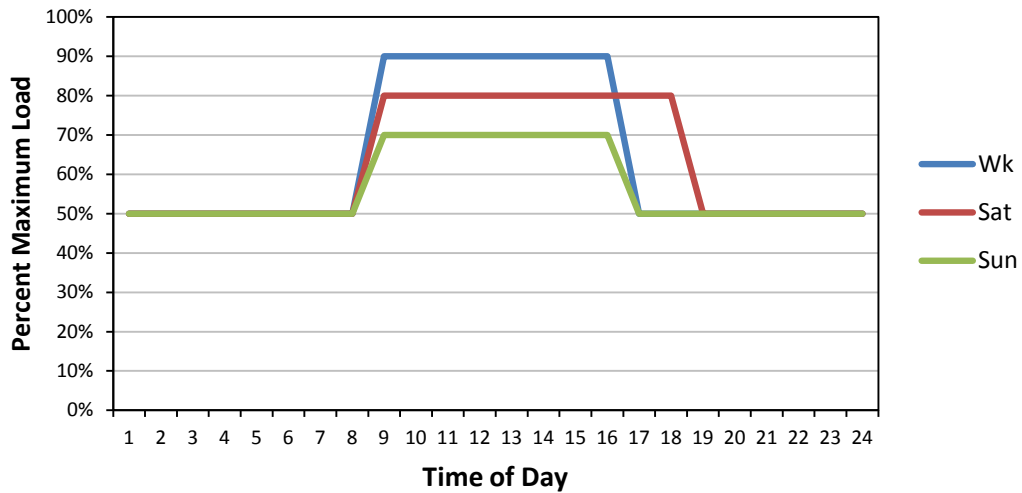


Medical Office

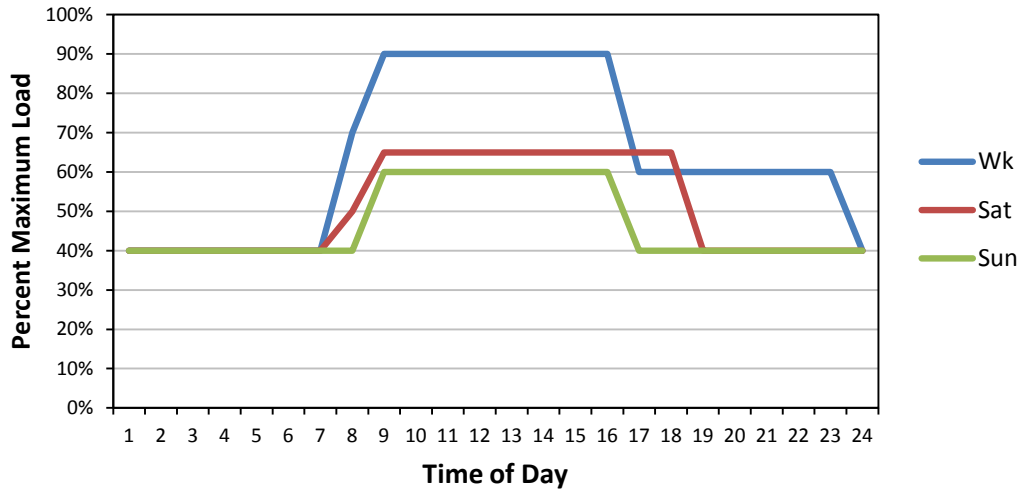
Medical Office: Occupancy



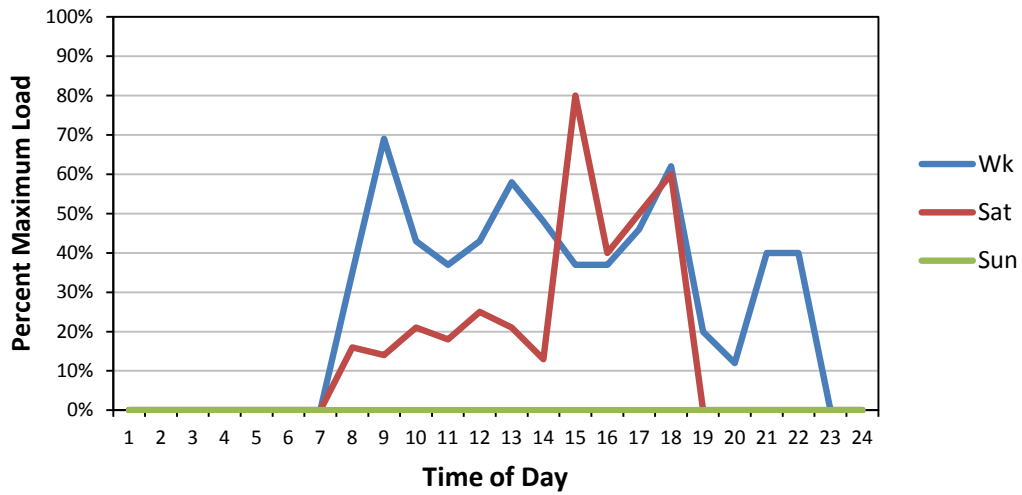
Medical Office: Lighting



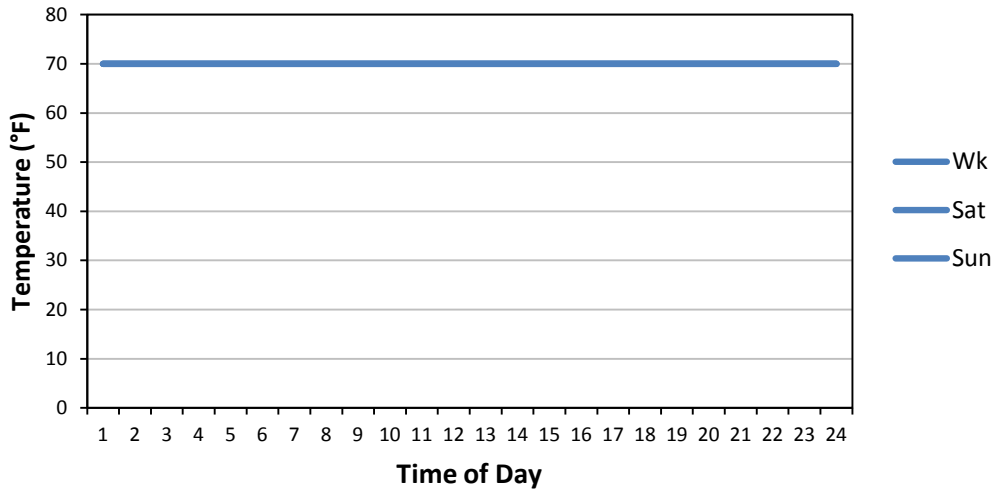
Medical Office: Equipment



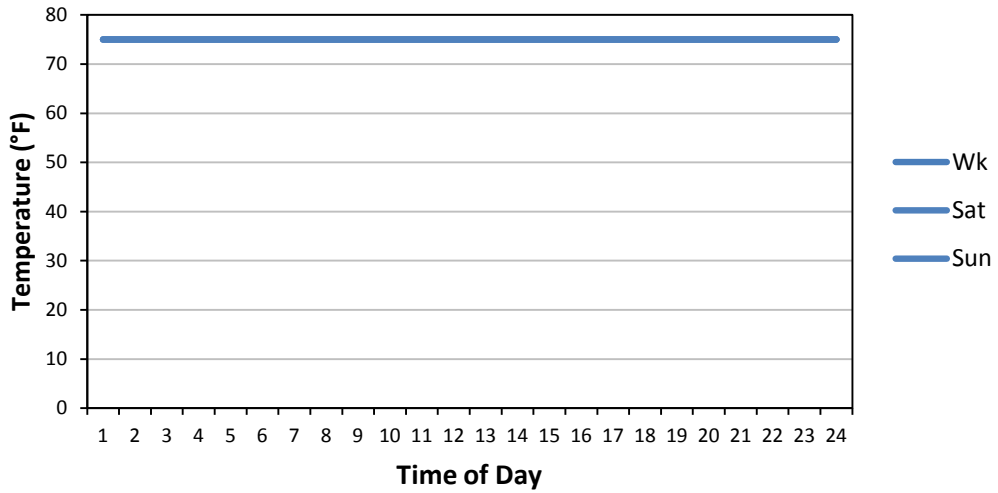
Medical Office: Service Hot Water



Medical Office: Heating Setpoint

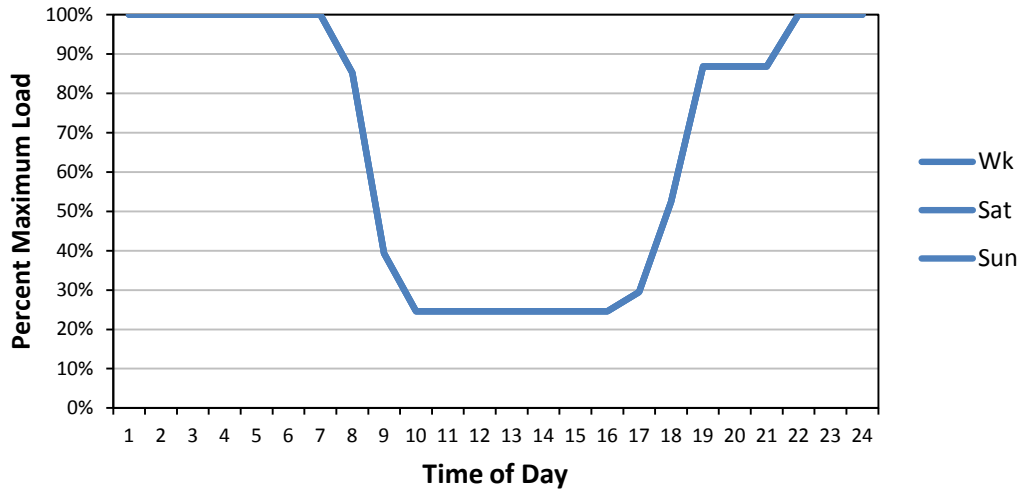


Medical Office: Cooling Setpoint

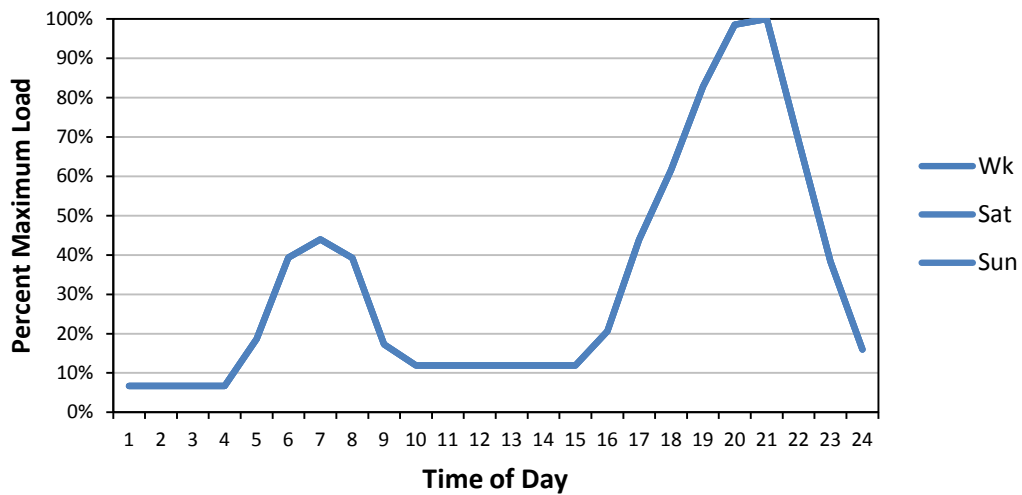


Multi-family

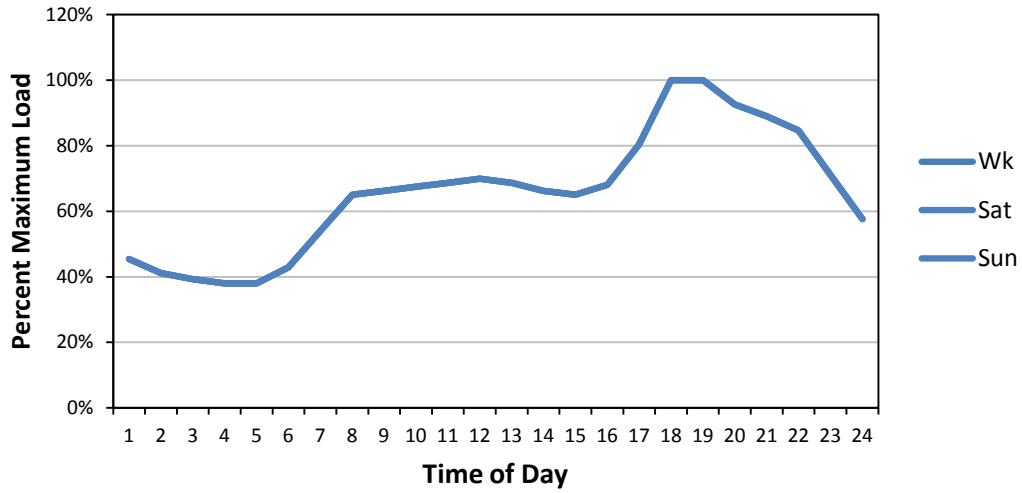
Multifamily: Occupancy



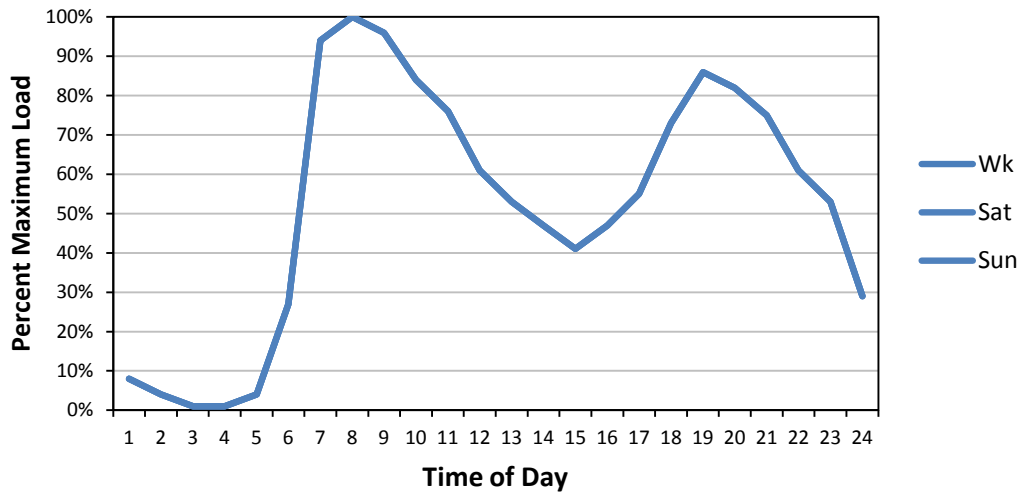
Multifamily: Lighting



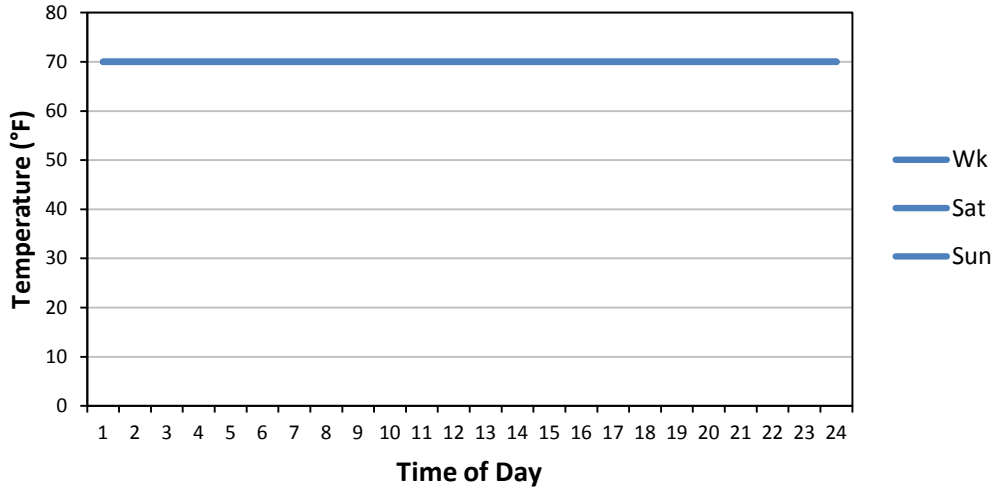
Multifamily: Equipment



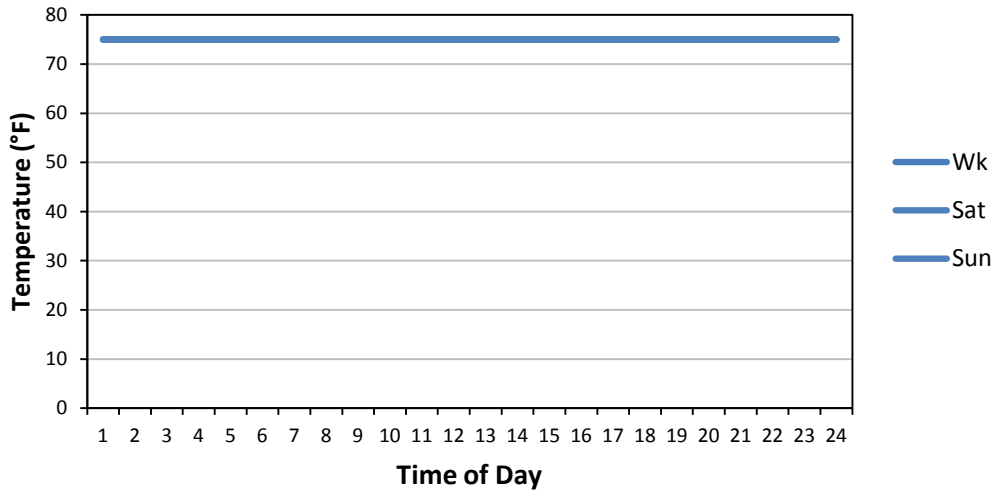
Multifamily: Service Hot Water



Multifamily: Heating Setpoint

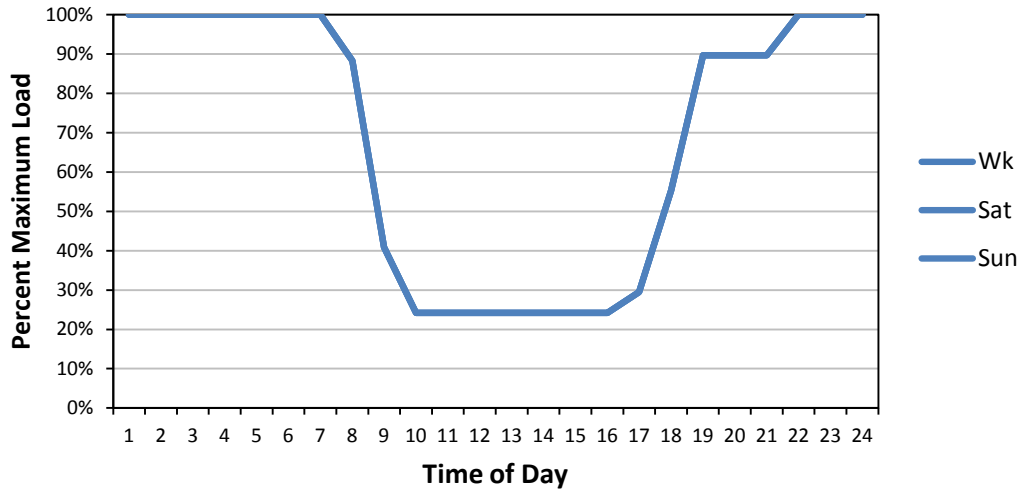


Multifamily: Cooling Setpoint

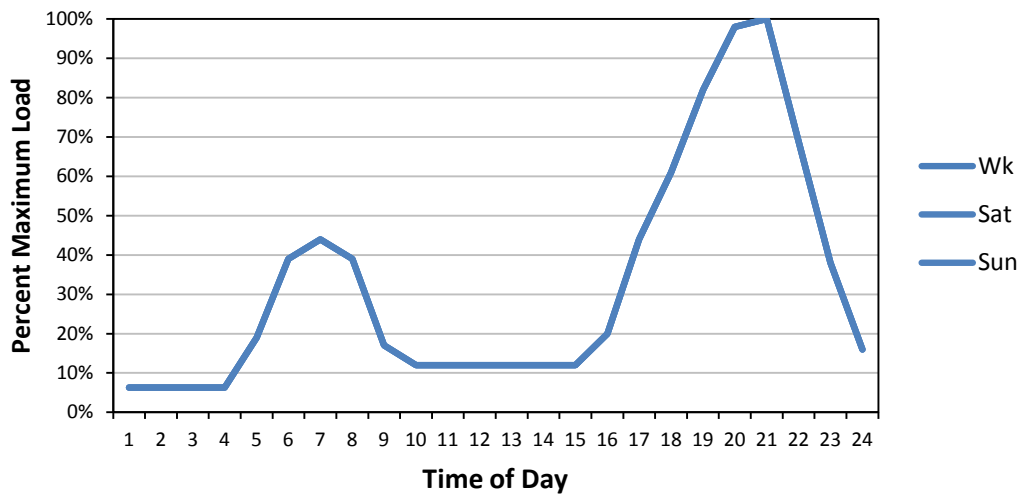


Multi family (less than 4 floors)

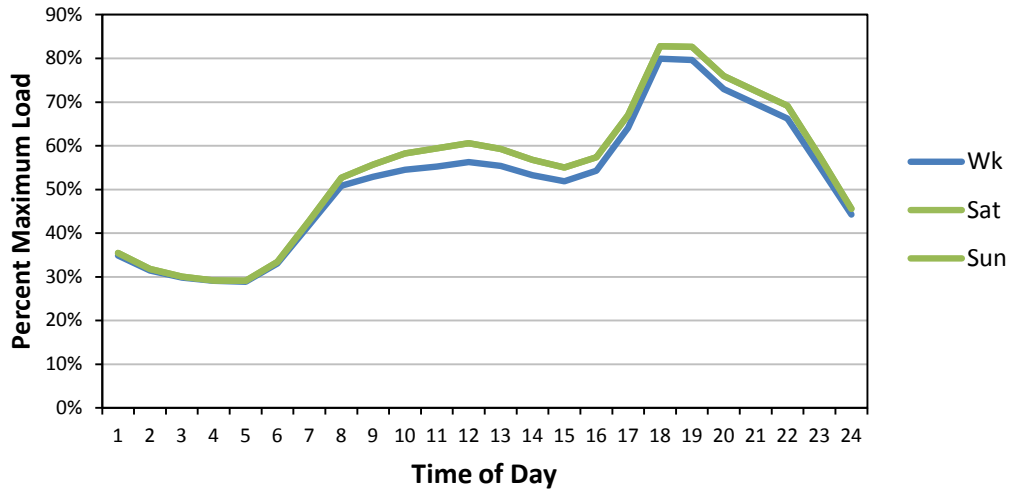
Multifamily (less than 4 floors): Occupancy



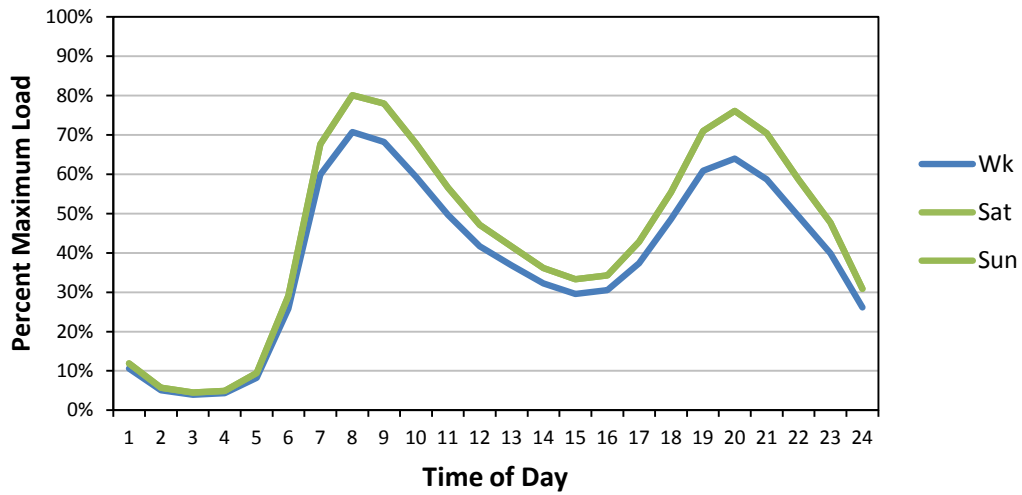
Multifamily (less than 4 floors): Lighting



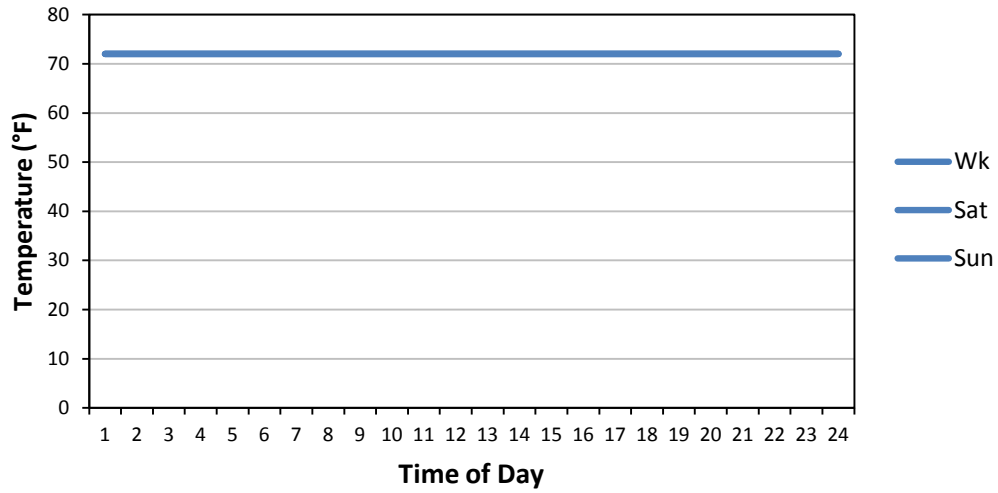
Multifamily (less than 4 floors): Equipment



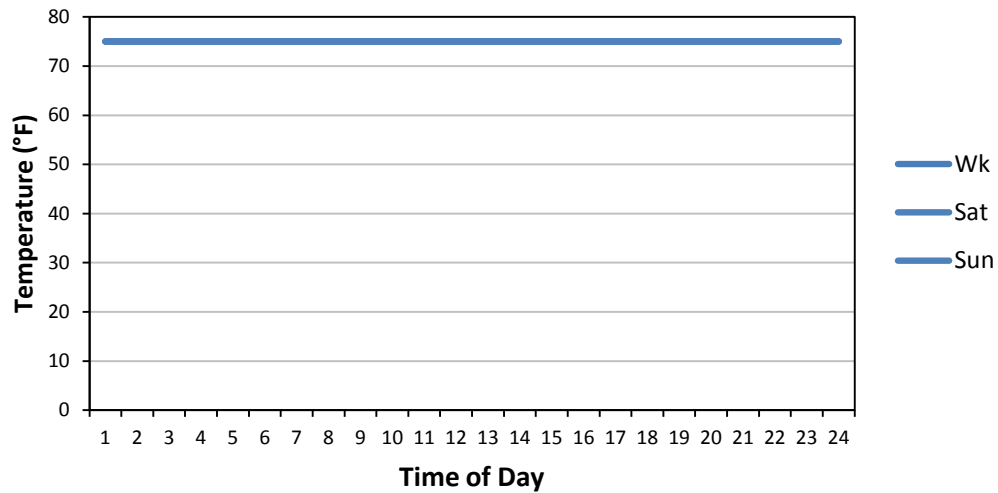
Multifamily (less than 4 floors): Service Hot Water



Multifamily (less than 4 floors): Heating Setpoint

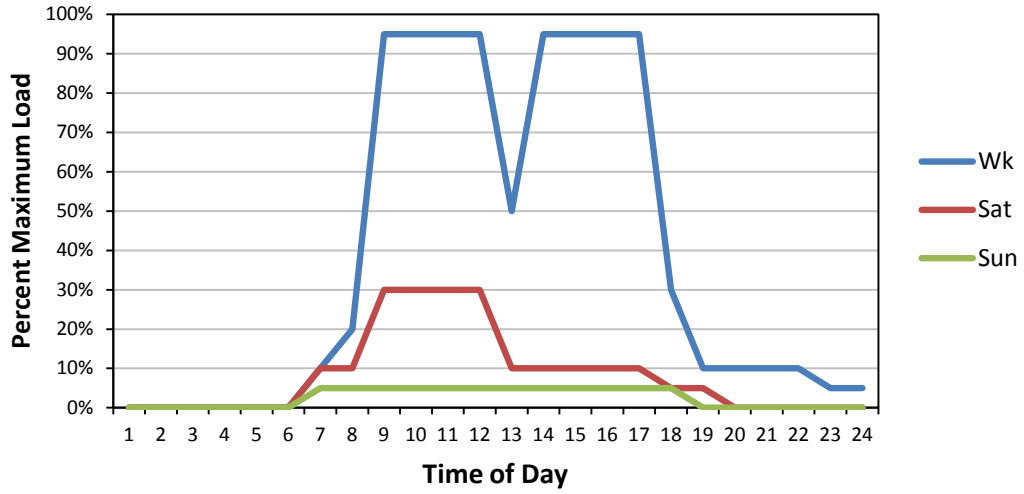


Multifamily (less than 4 floors): Cooling Setpoint

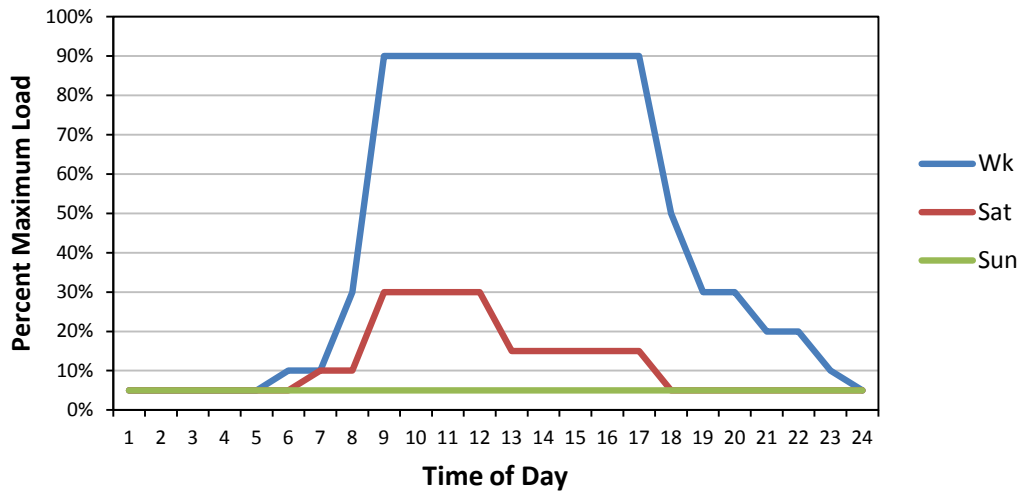


Office Building

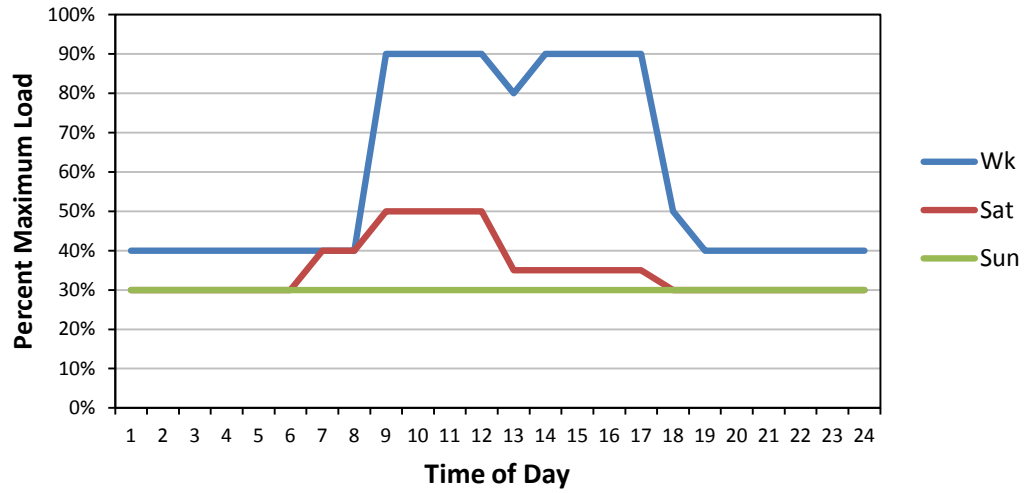
Office: Occupancy



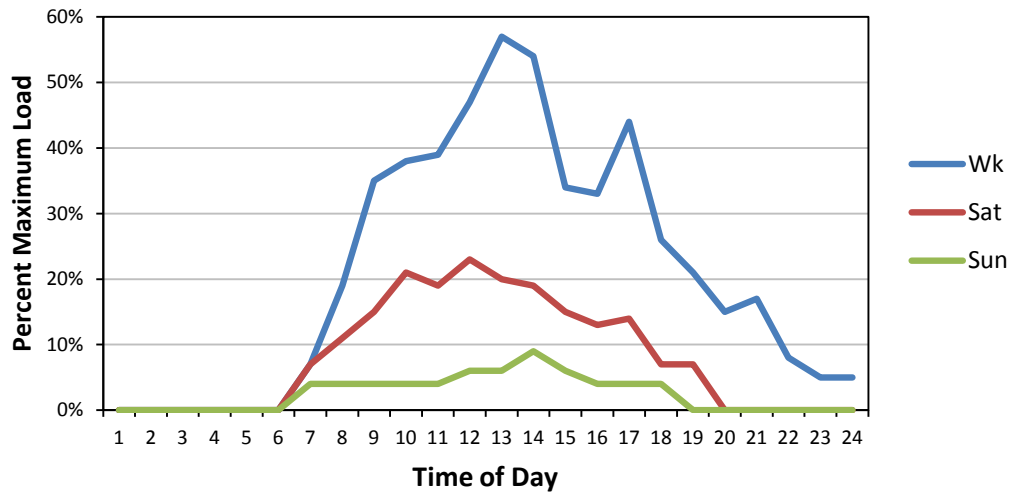
Office: Lighting



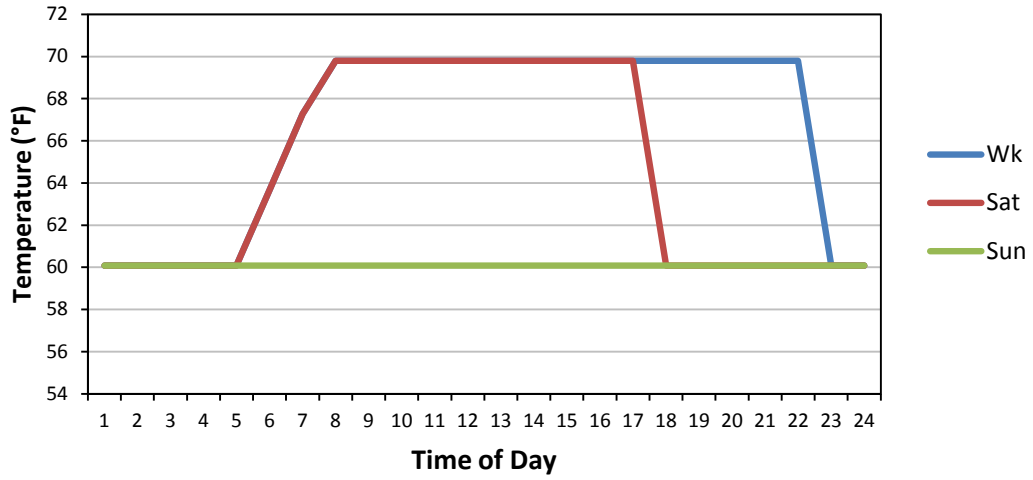
Office: Equipment



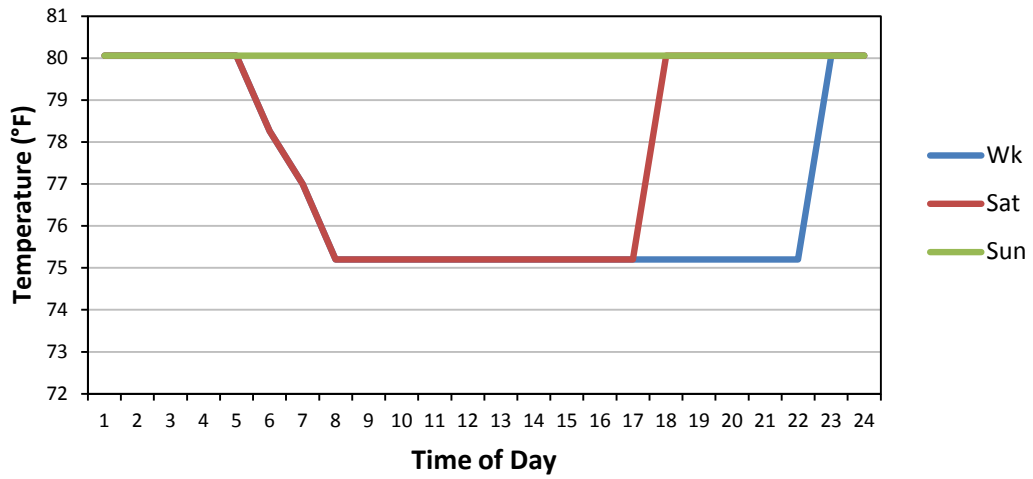
Office: Service Hot Water



Office: Heating Setpoint

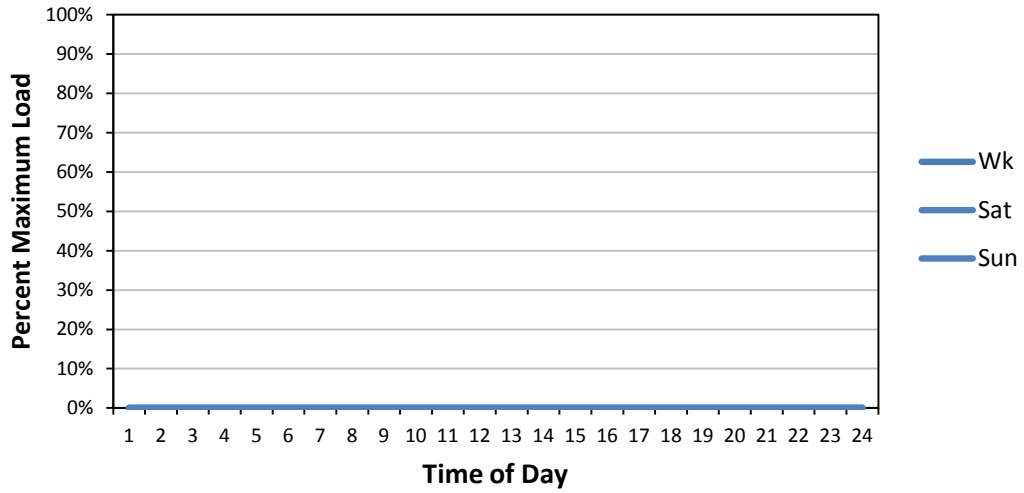


Office: Cooling Setpoint

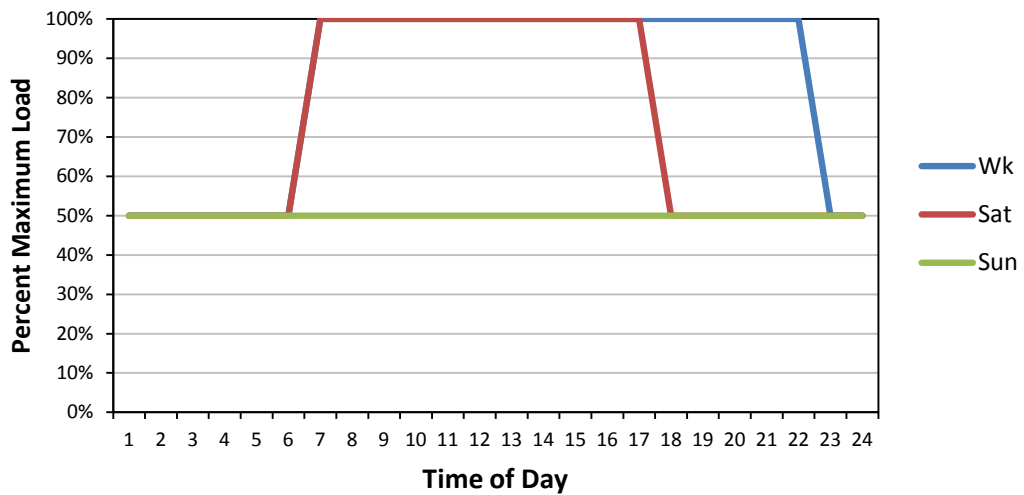


Parking Garage

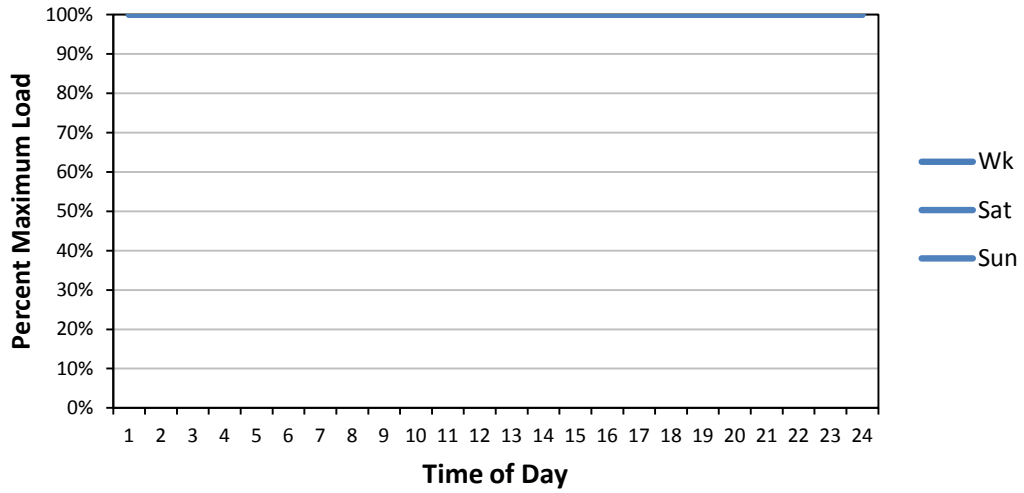
Parking Garage: Occupancy



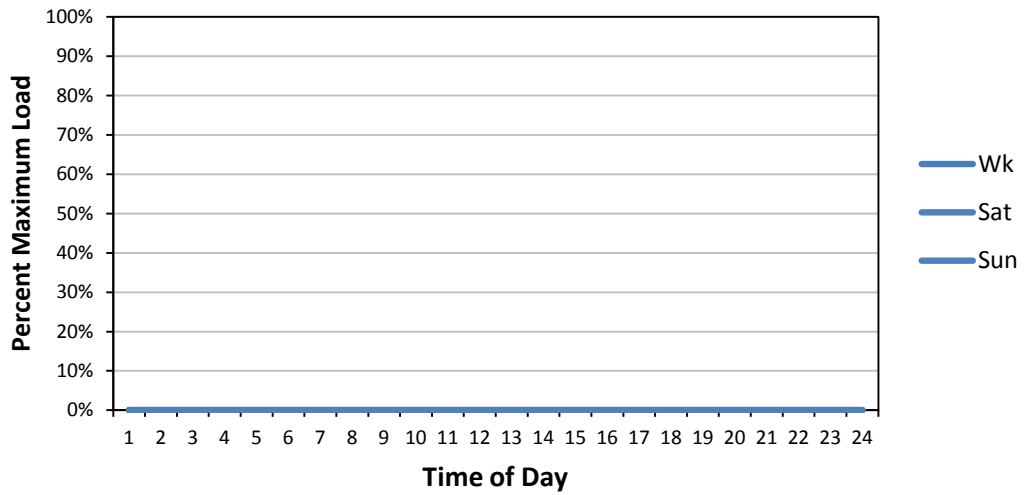
Parking Garage: Lighting



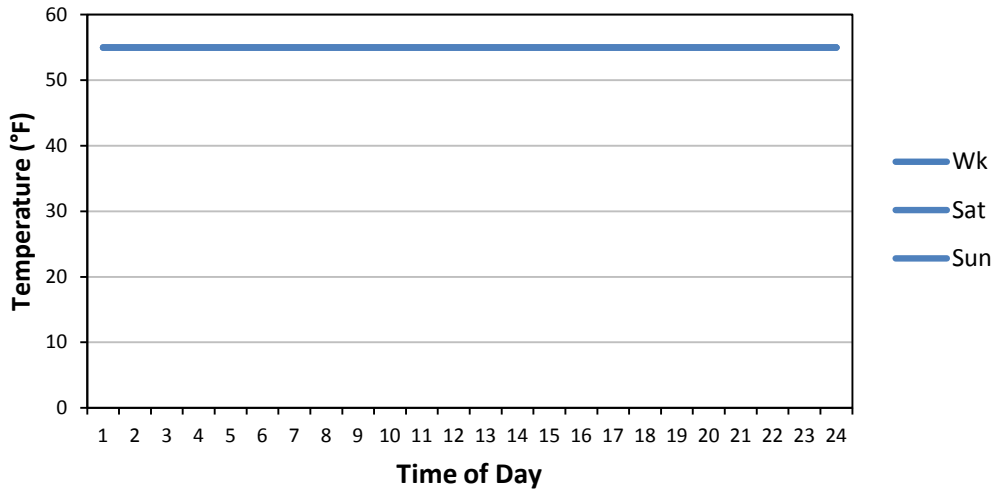
Parking Garage: Equipment



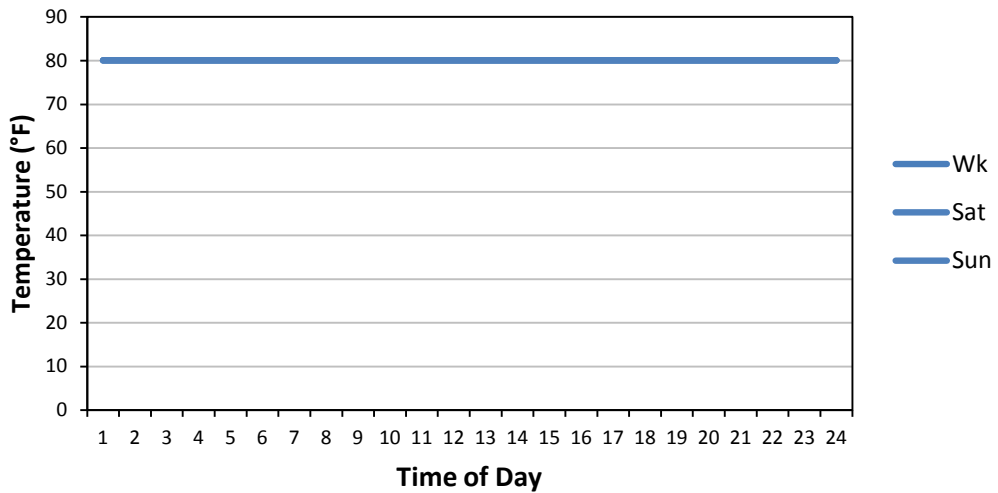
Parking Garage: Service Hot Water



Parking Garage: Heating Setpoint

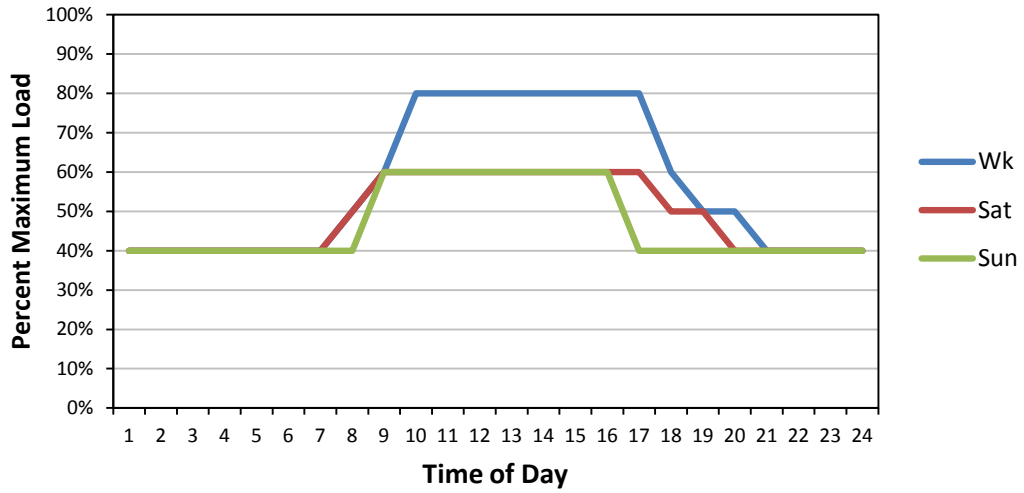


Parking Garage: Cooling Setpoint

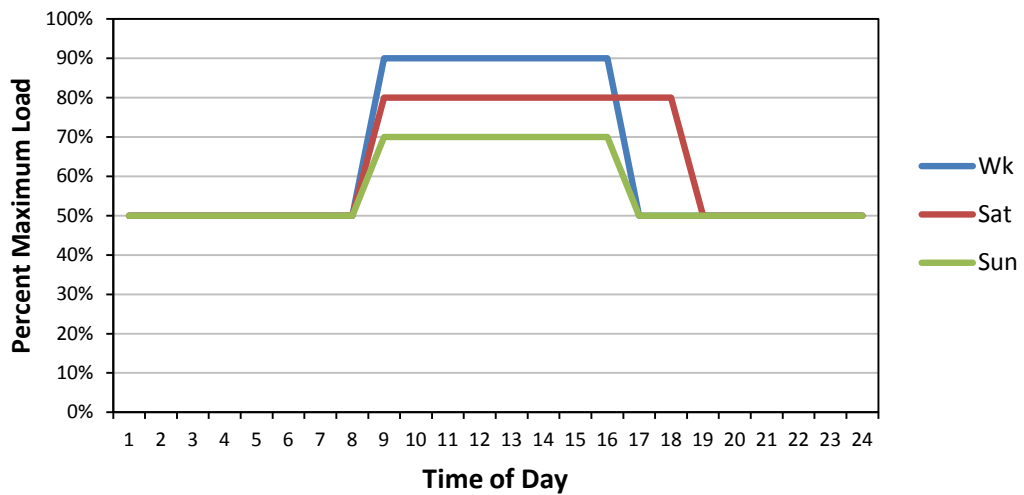


Police Station

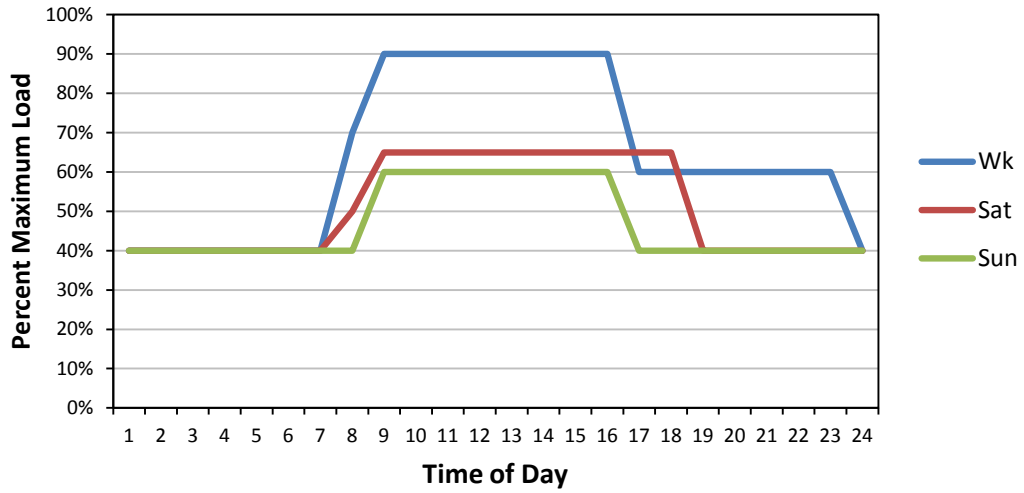
Police Station: Occupancy



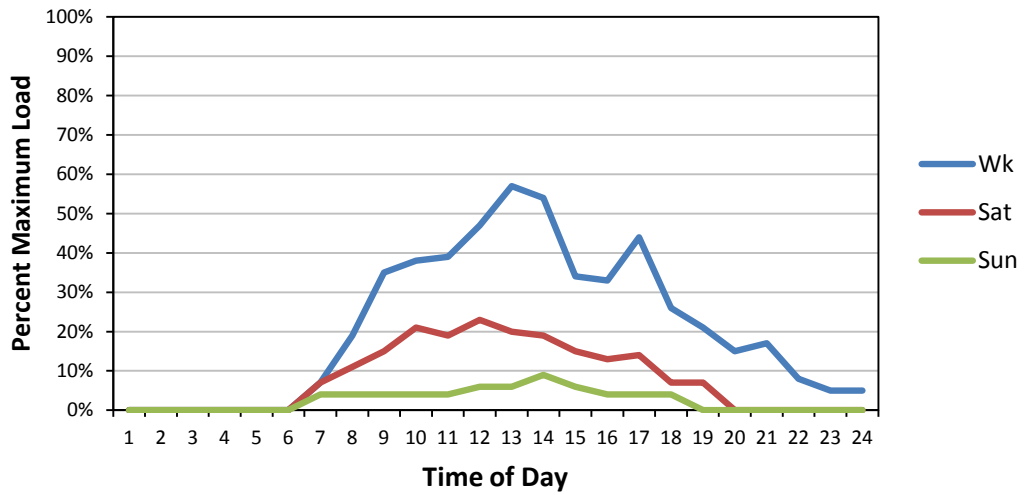
Police Station: Lighting



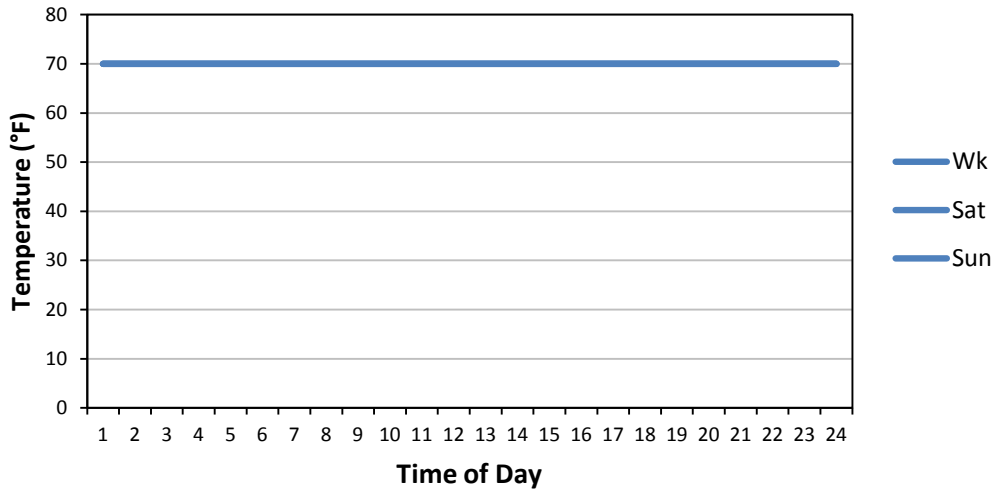
Police Station: Equipment



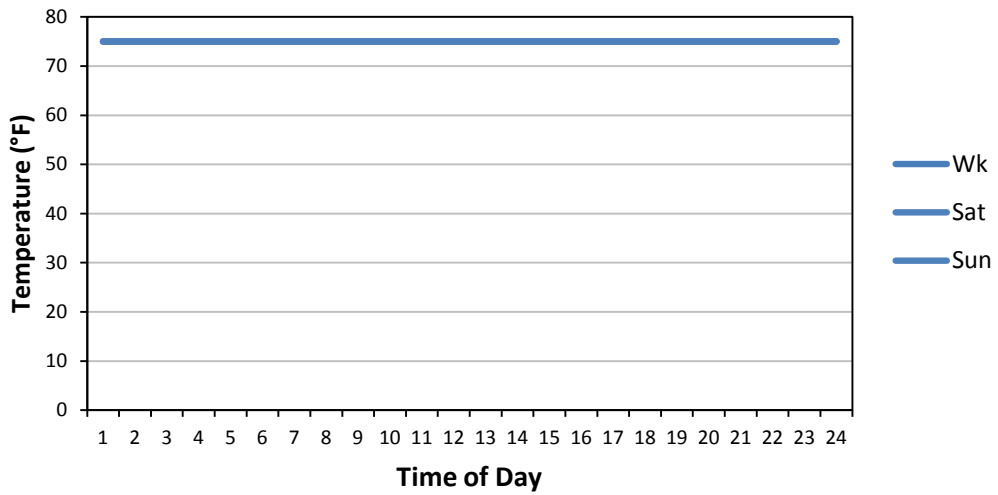
Police Station: Service Hot Water



Police Station: Heating Setpoint

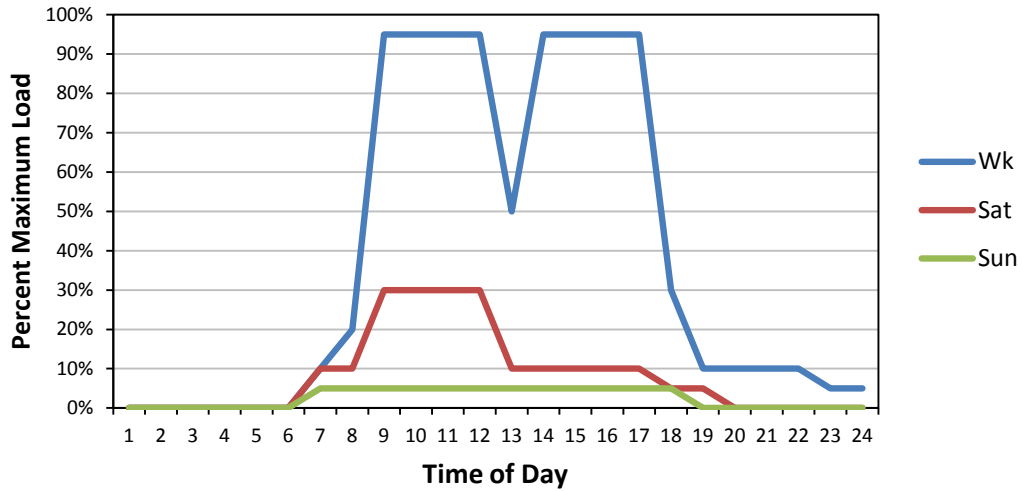


Police Station: Cooling Setpoint

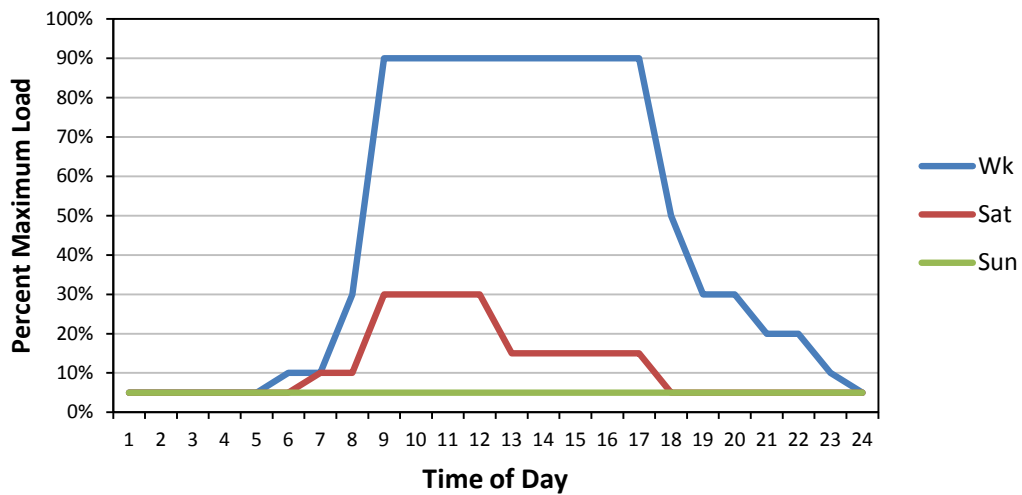


Post Office

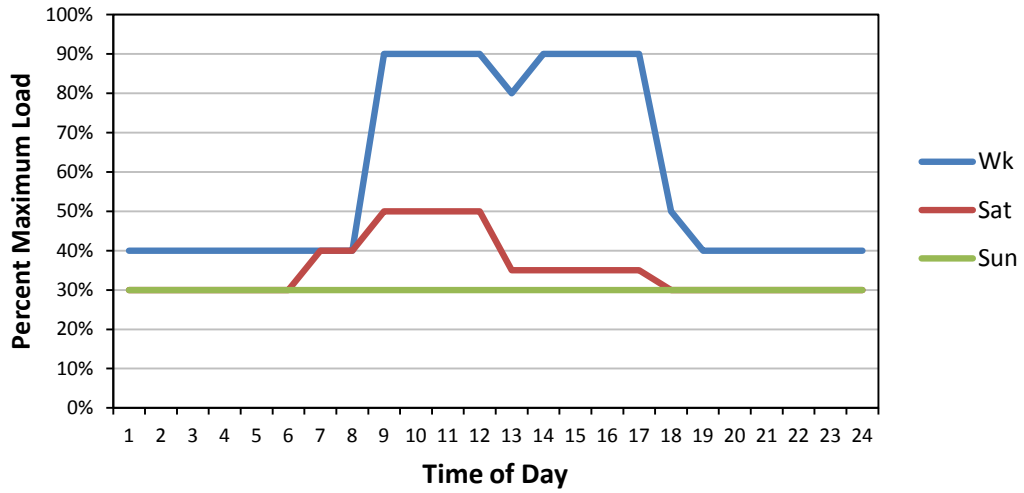
Post Office: Occupancy



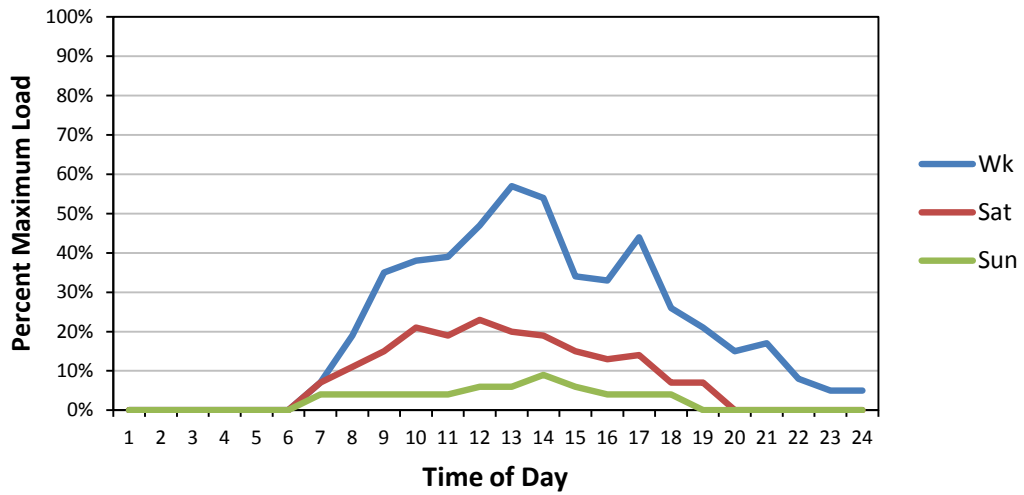
Post Office: Lighting



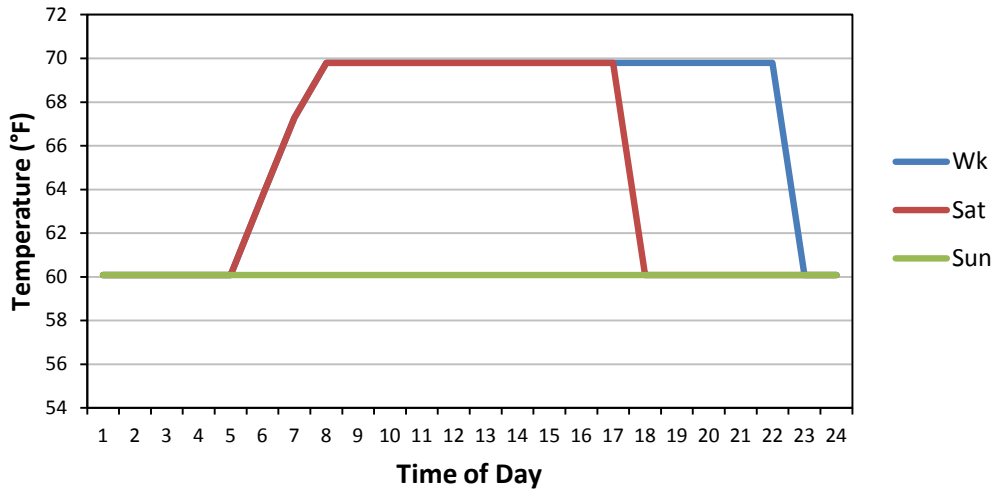
Post Office: Equipment



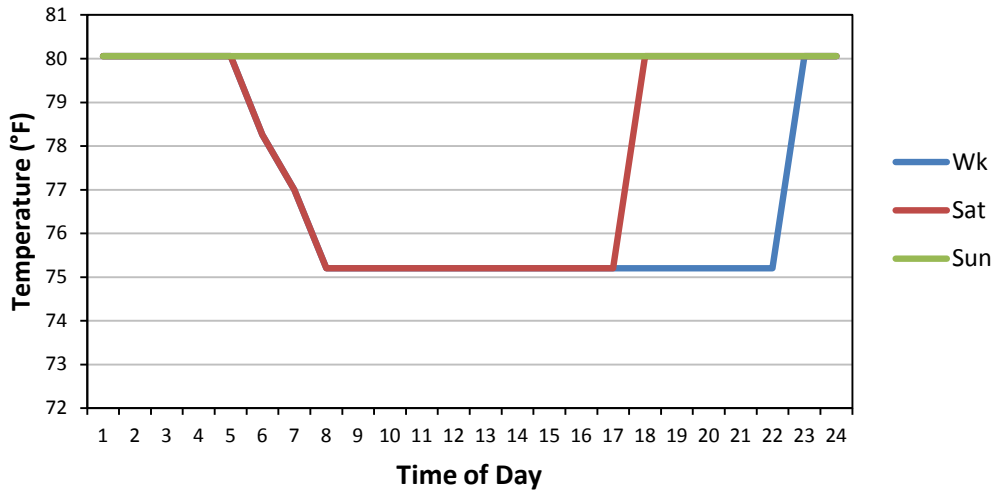
Post Office: Service Hot Water



Post Office: Heating Setpoint

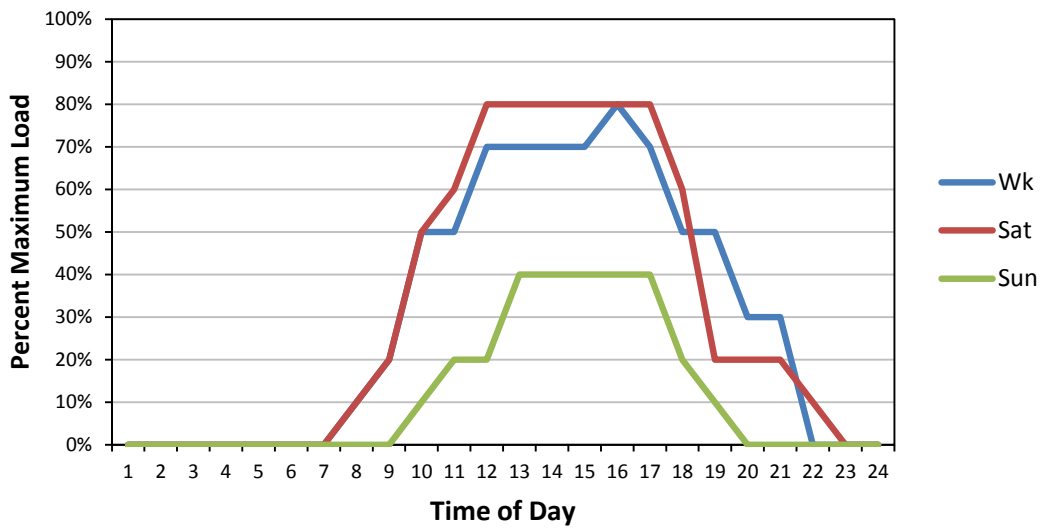


Post Office: Cooling Setpoint

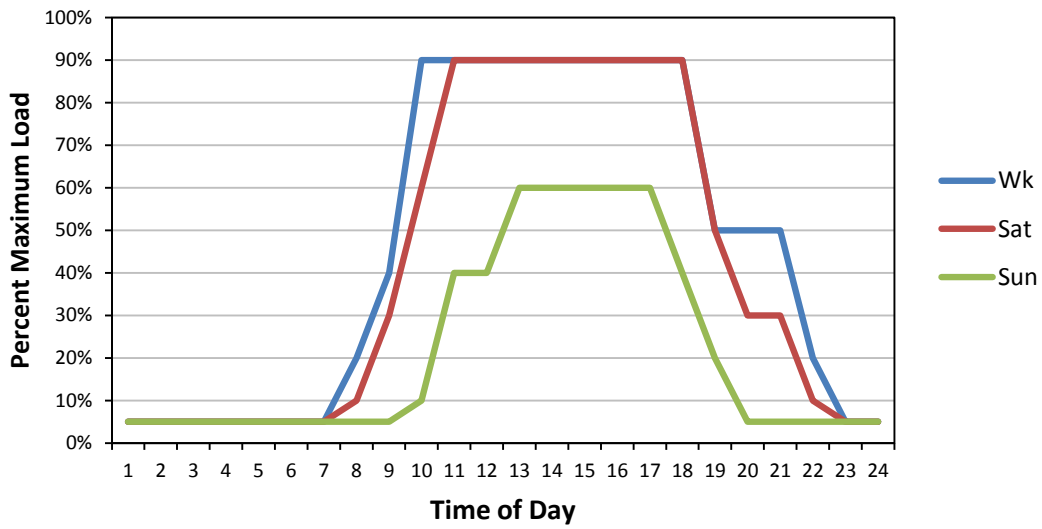


Religious Building

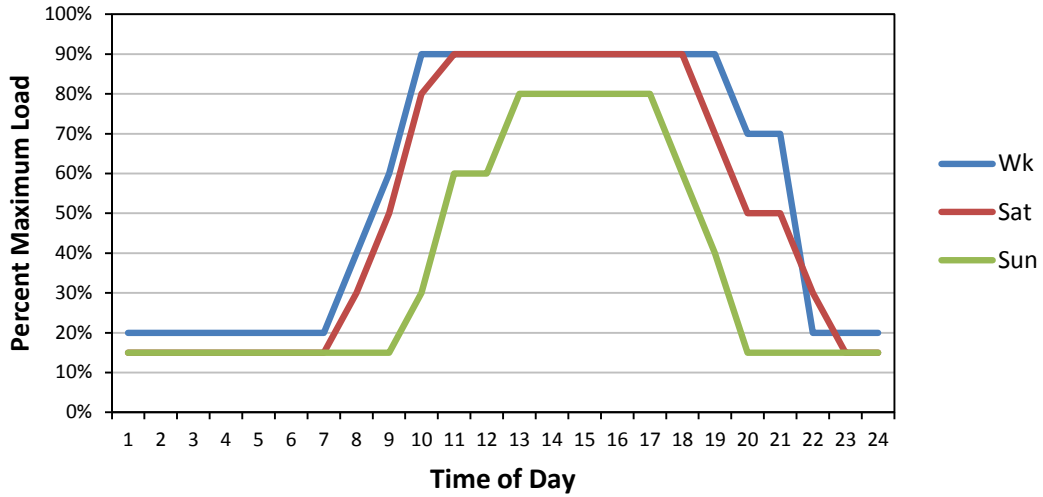
Religious Building: Occupancy



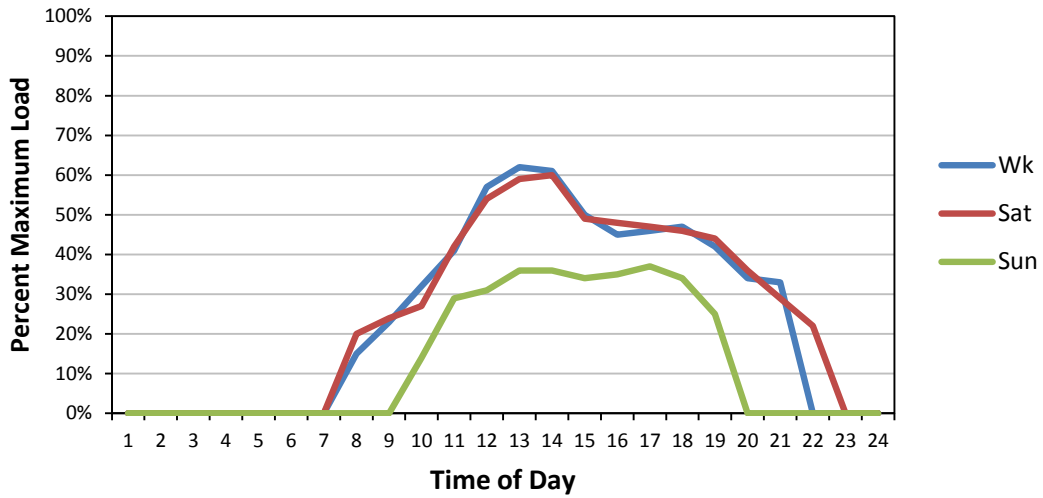
Religious Building: Lighting



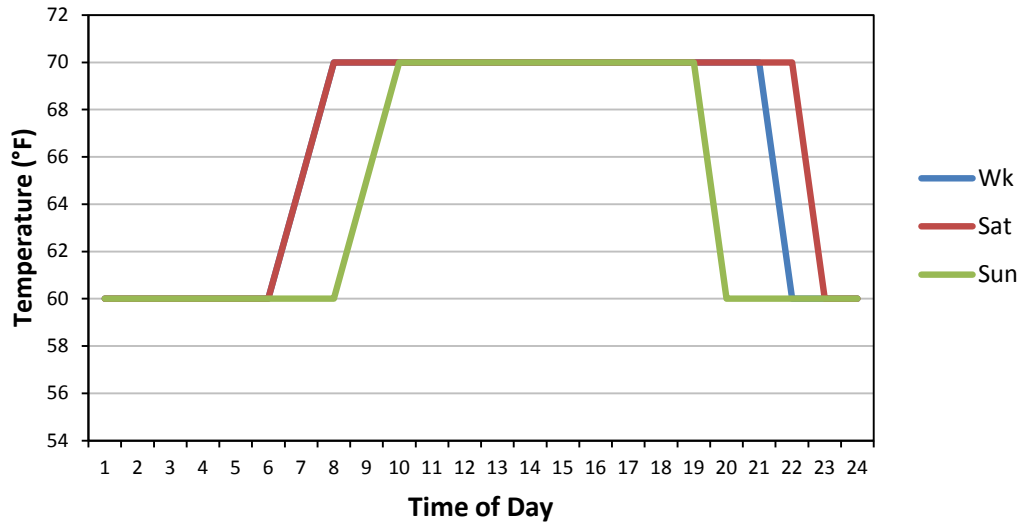
Religious Building: Equipment



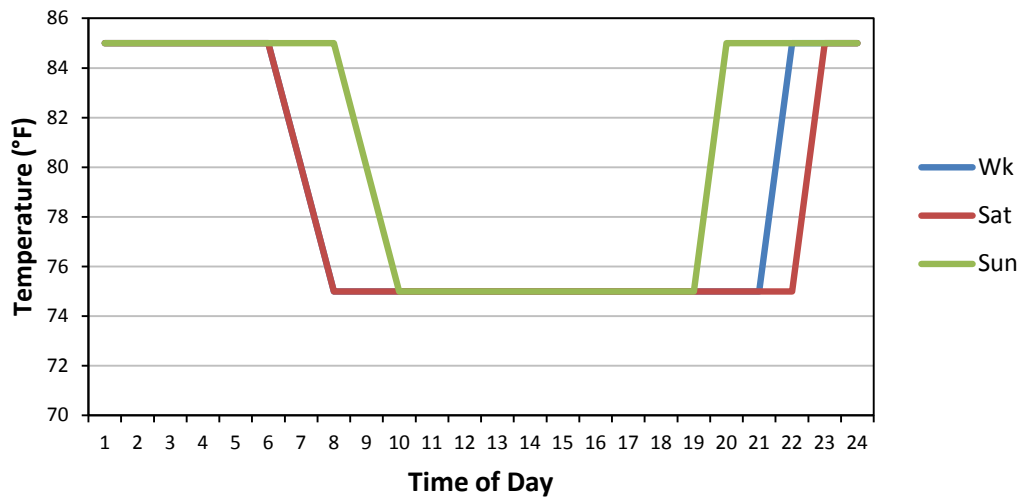
Religious Building: Service Hot Water



Religious Building: Heating Setpoint

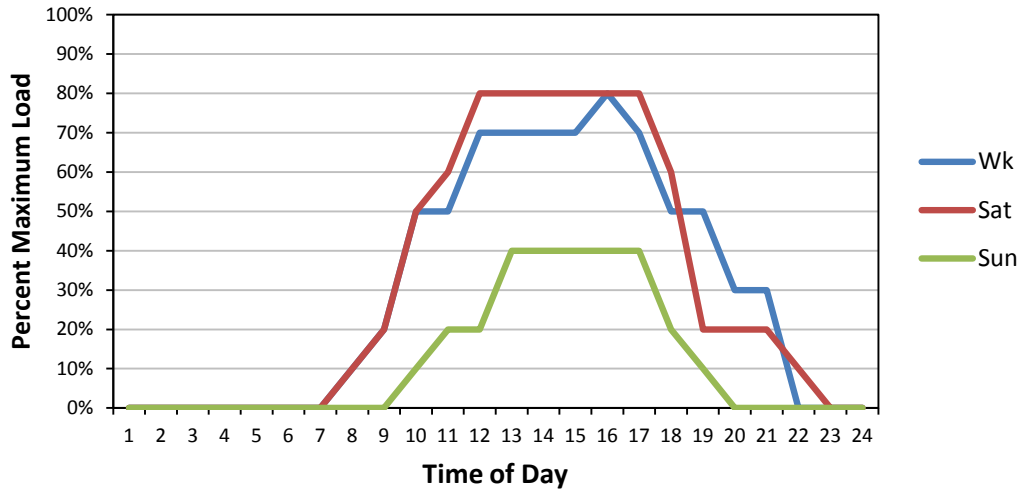


Religious Building: Cooling Setpoint

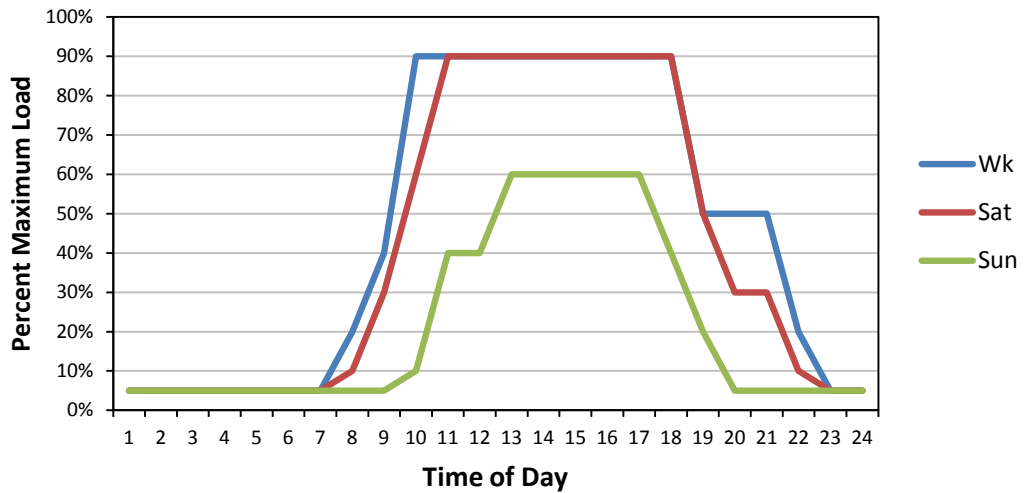


Retail

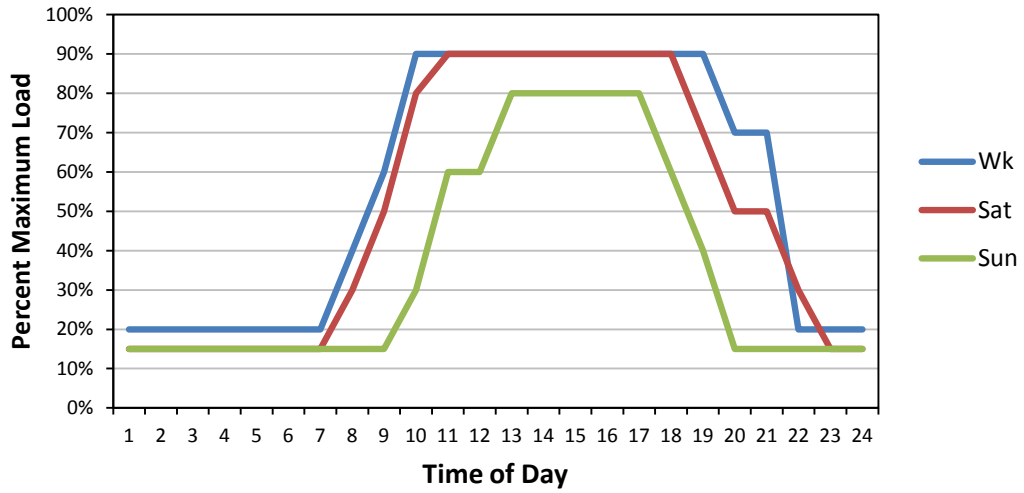
Retail: Occupancy



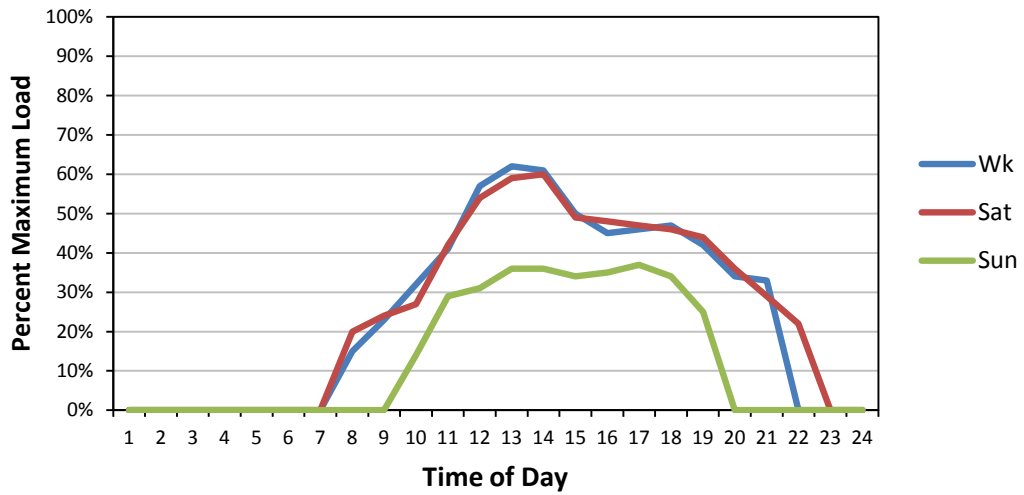
Retail: Lighting



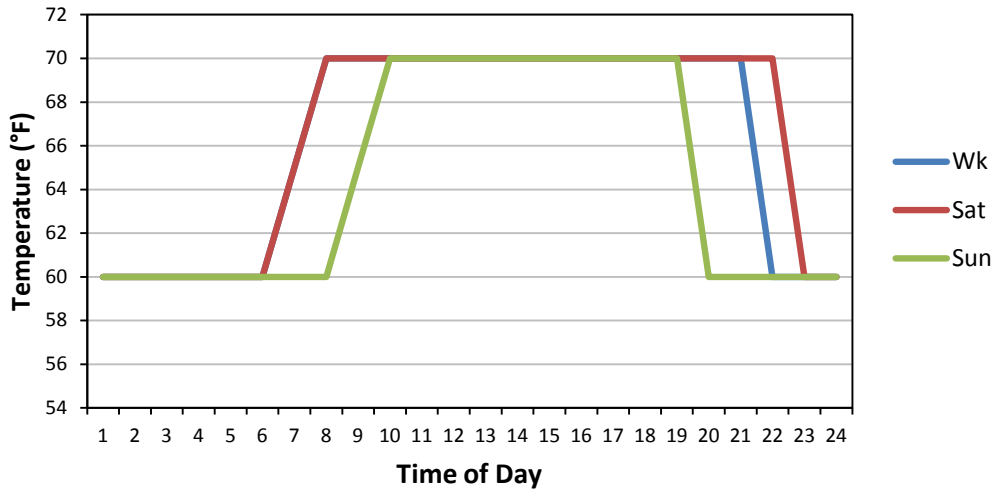
Retail: Equipment



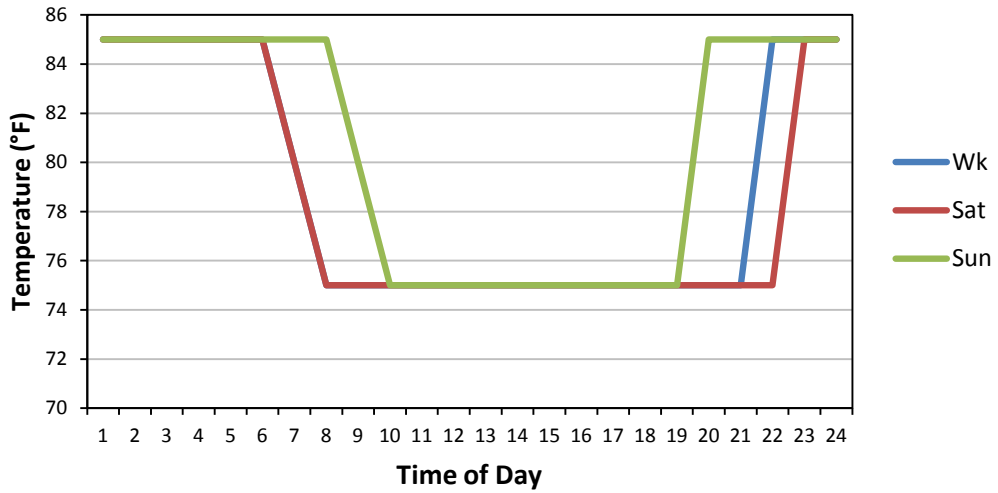
Retail: Service Hot Water



Retail: Heating Setpoint

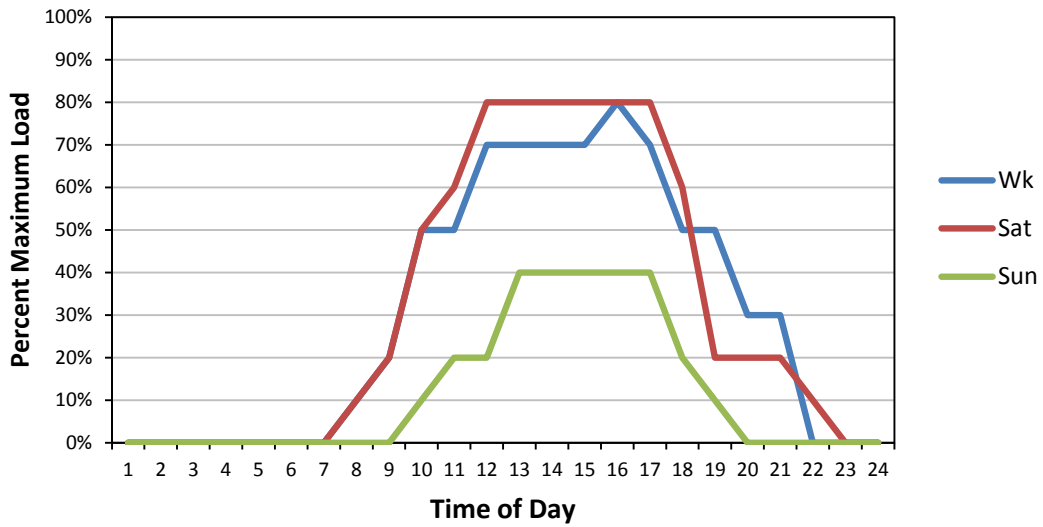


Retail: Cooling Setpoint

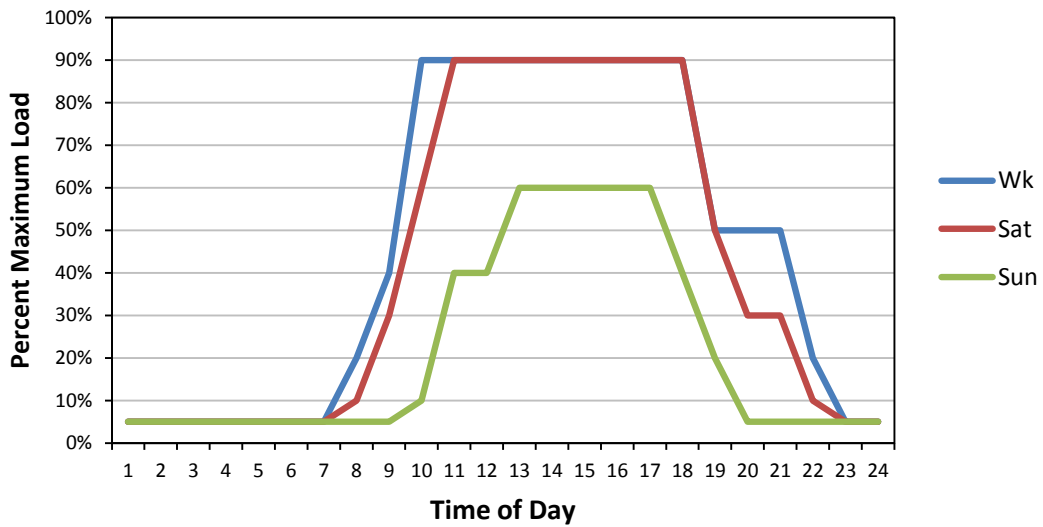


Senior Center

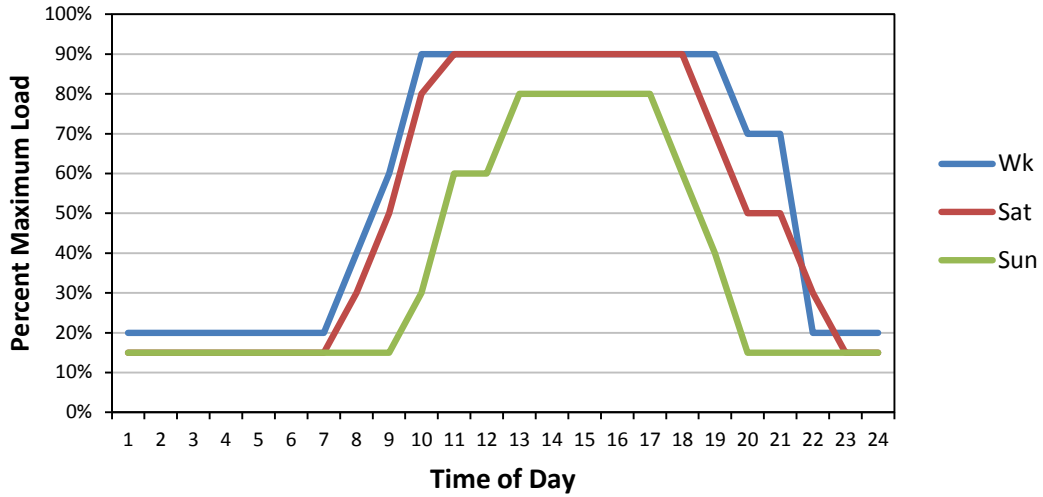
Senior Center: Occupancy



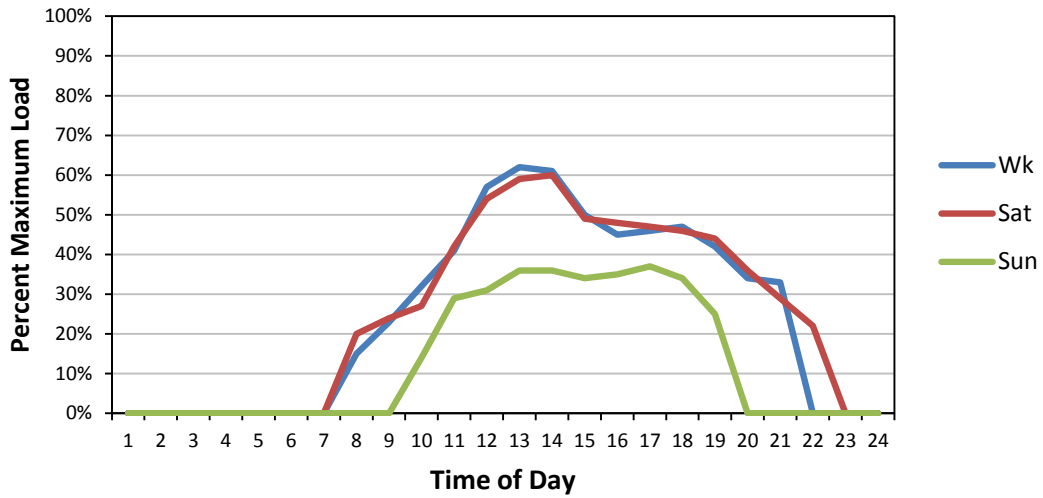
Senior Center: Lighting



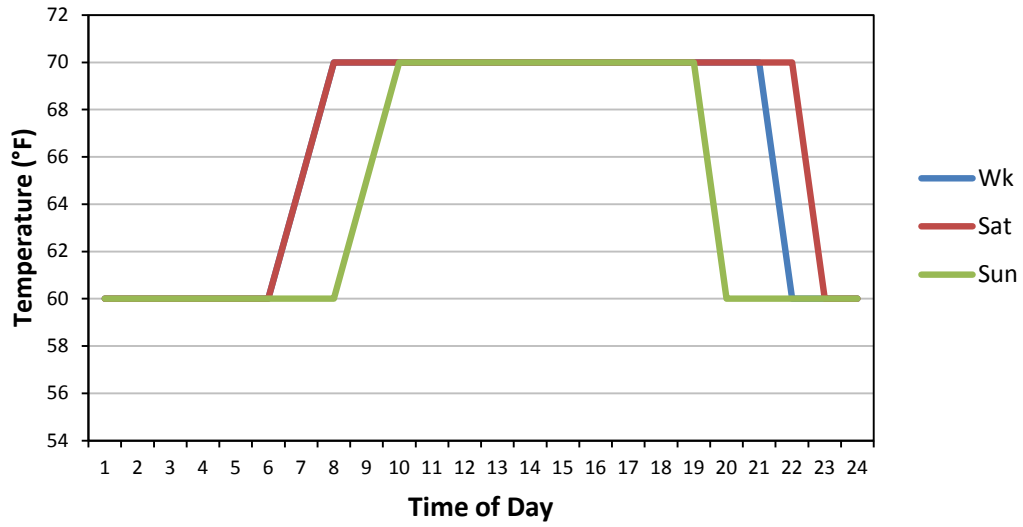
Senior Center: Equipment



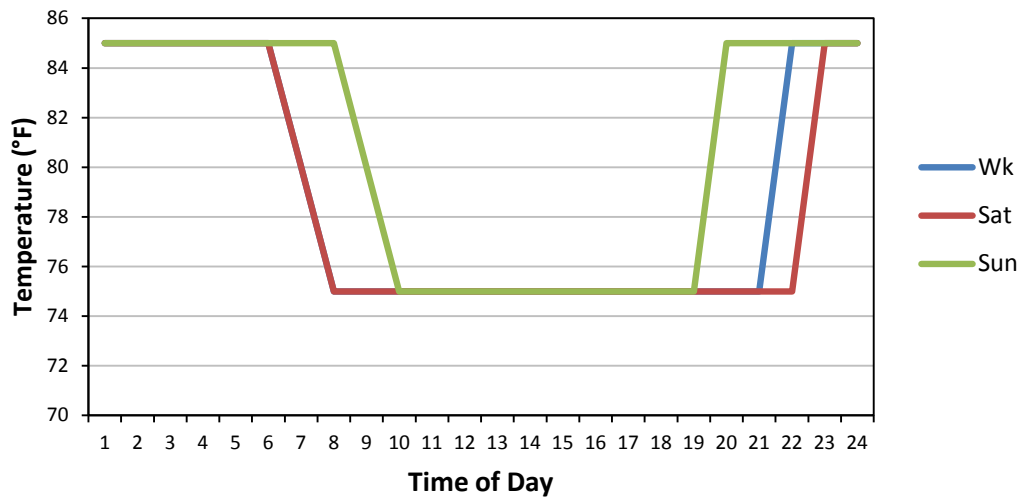
Senior Center: Service Hot Water



Senior Center: Heating Setpoint

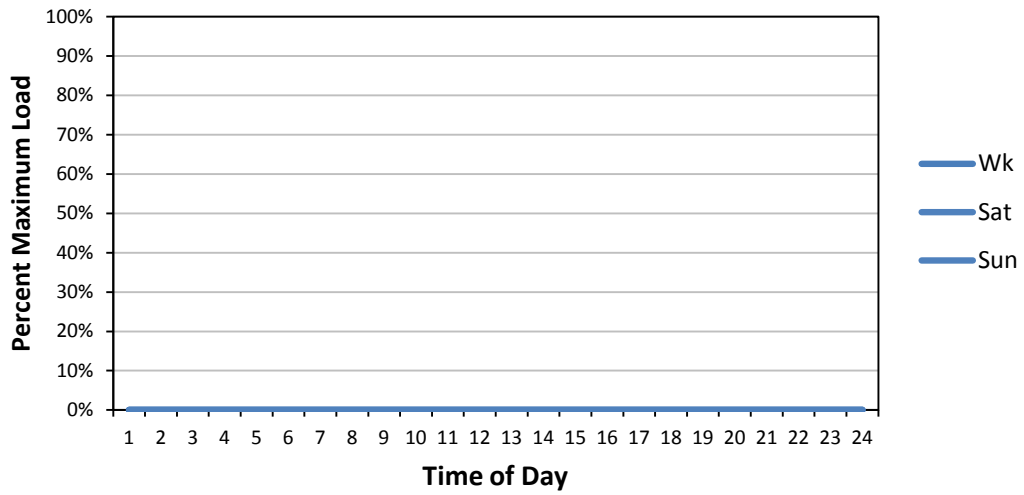


Senior Center: Cooling Setpoint

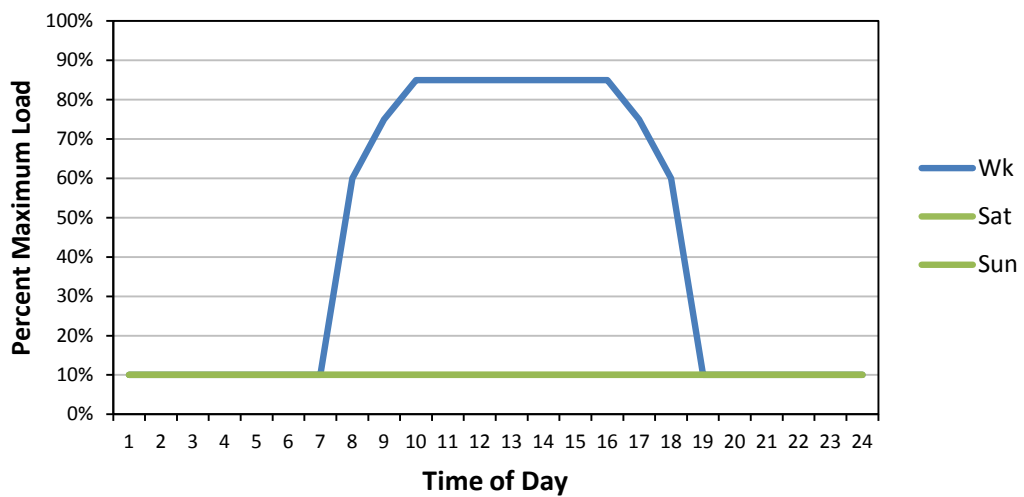


Warehouse non-refrigerated

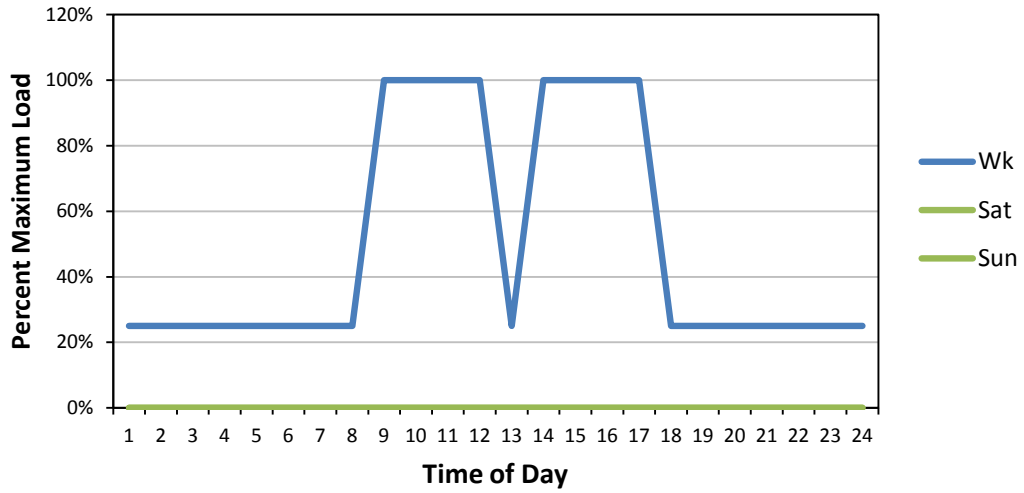
Warehouse: Occupancy



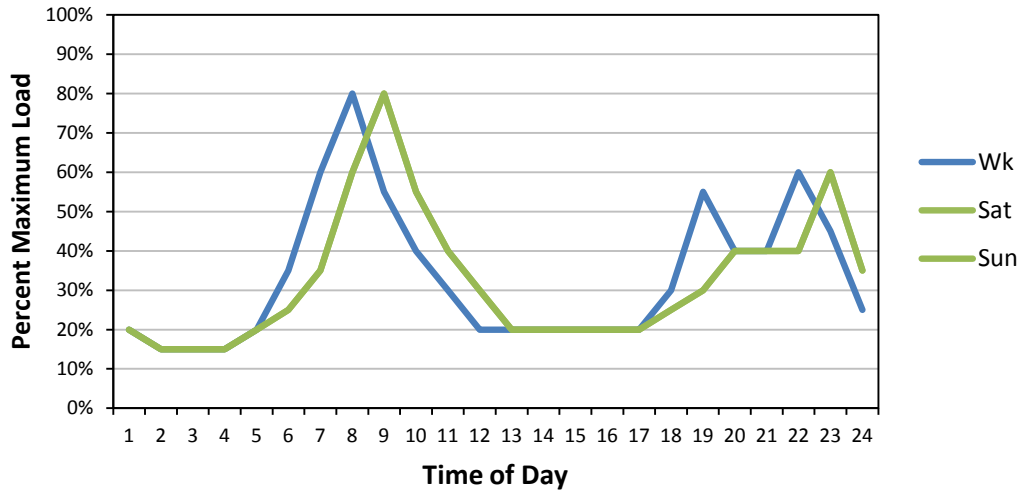
Warehouse: Lighting



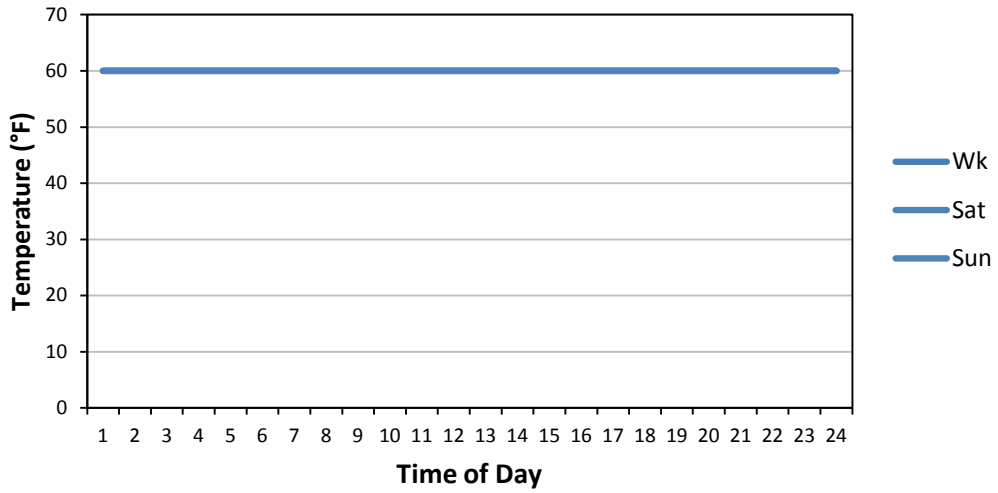
Warehouse: Equipment



Warehouse: Service Hot Water



Warehouse: Heating Setpoint



Warehouse: Cooling Setpoint

