

# SB 2030 As-Designed Training

Chris Baker, AIA, PE, LEED® AP, BEMP

November 14, 2019



# Agenda

01 About SB 2030

02 Navigating SB 2030

03 Creating SB 2030 Models

- Building
- HVAC
- Design
- Results



# **BUILDINGS, BENCHMARKS & BEYOND**

Tools and Programs for Sustainable Buildings in Minnesota

Administered by:







For new buildings or renovations to meet sustainability goals for site, water, energy, indoor environment, materials and waste



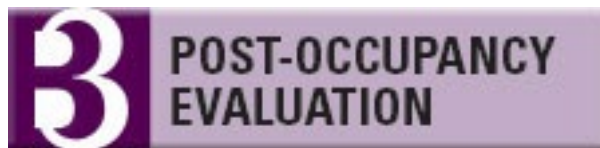
Meet energy use and carbon emissions goals



Track and compare energy use on existing buildings



Minimize energy use during building operations  
This program can be applied to any existing building



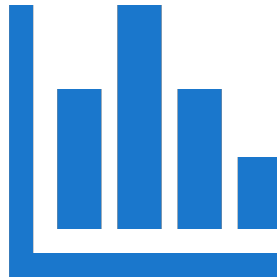
Determine occupants' perceptions of the building indoor environmental quality  
The POE survey is required for B3 buildings

# Three Types of Code Compliance

About SB 2030



**Prescriptive**



**Performance**



**Outcome**

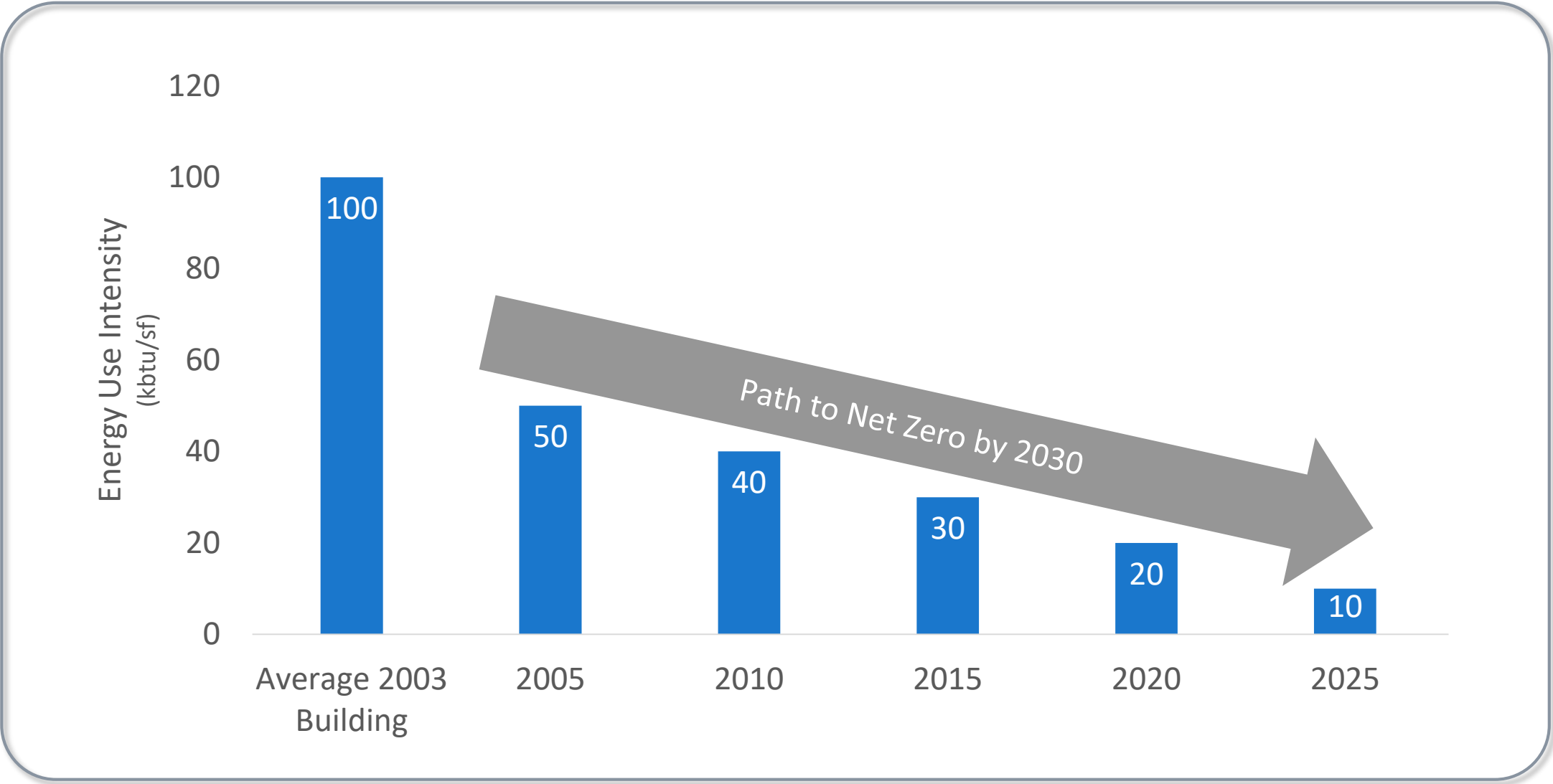
# Minnesota's SB 2030

About SB 2030

- Outcome-based energy goal for State-bonded buildings
- Sets energy use and carbon emissions as a % reduction from typical building of that type
- Requires 10 years of metered performance
- 15-year payback maximum



# Energy Use Goal Tapering to Zero in 2030



# Moving to 80% Better in 2020

About SB 2030

For projects stating schematic design or later on or after January 1, 2020

## ■ Proposed Approach

- Evaluation of compliance based both on carbon and on site energy consumption
- Modify the requirements around on-site renewable energy evaluation
- Allow a campus-based approach to renewable energy development
- Eliminate the relaxed standard for renovation projects
- Exclude EV charging and process loads
- Characterize biomass derived using carbon-neutral methods

## ■ Future Considerations

- Time-of-day CO<sub>2</sub> emissions factors



MINNESOTA

3

CASE STUDIES DATABASE

Search for a project by name

Home

Projects

Contact

Use the filters below to narrow down to a specific organization, building type, or set of strategies.

Organization:

(All Organizations)

Building Type:

(All Buildings)

Strategies

☐ Choose Specific Strategies

Customize Table

Table Views:

Custom

Custom Columns...






















Submit

Export To Excel

Tile View

Card View

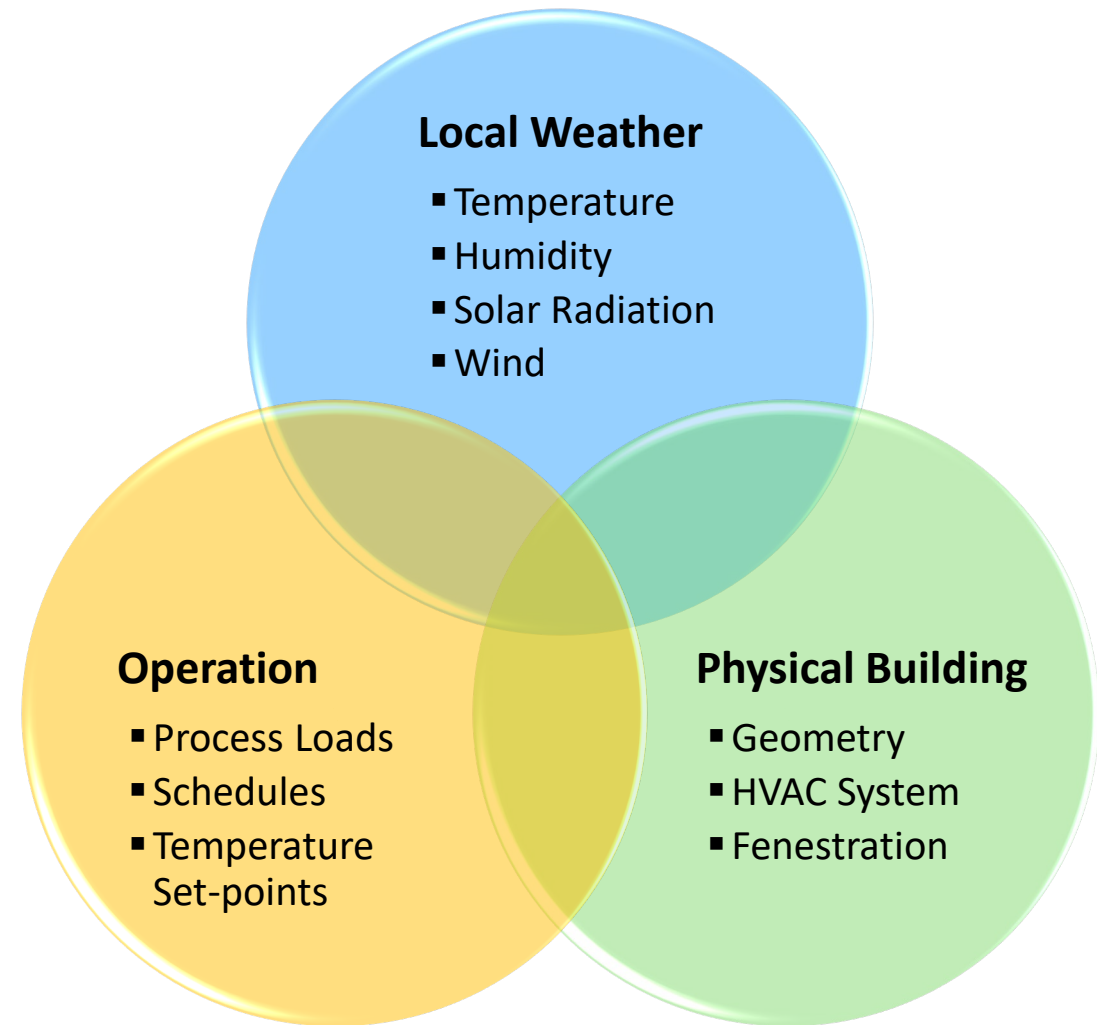
Table View

Name	Organization	Building Type(s)	Building Area (sf)	SB 2030 Compliance	Design Energy – SB 2030 Standard (kBtu/sf-yr)	Design Energy – Design (kBtu/sf-yr)	Design Energy – Ratio (Design/Standard)	Design Energy – Graphic (Design/Standard)
 2700 University	City of Saint Paul	Housing, Retail, Parking	345,594		65	32	0.49	
 Camp Ripley COE Training Facility	Military Affairs	Military Training	22,100		74	71	0.95	
 Camp Ripley Education Center	Military Affairs	Classroom	67,436		68	54	0.79	
 CHS Field	Minnesota Department of Employment and Economic Development	Athletic Facility	80,349		85	85	1.00	
 City of Mankato Transit Facility	Minnesota Department of Transportation	Transit Facility	43,651		112	69	0.61	
 DNR Area Office, Glenwood	Minnesota Department of Natural Resources	Office	8,828		74	36	0.48	
 Duluth Entertainment and Convention Center	Minnesota Department of Employment and Economic Development	Ice Arena	188,700		90	80	0.89	

# SB 2030 Tool

---

- SB 2030 Tool uses DOE-2, a simulation engine developed by the Department of Energy
- DOE-2 performs an hour-by-hour analysis of the building accounting for
  - Physical building
  - Operation
  - Local weather



- Each hour of the year, DOE-2 accounts for the following things:
  - Outdoor weather conditions
  - Sun position
  - Number of people in the building
  - Amount of lighting turned on
  - Infiltration
  - Ventilation requirements
  - Wall/roof insulation levels
  - Window properties
  - HVAC efficiencies and controls
  - And more!





## ■ Default Building Characteristics

- Industry data to set defaults for building and space characteristics
- Standards such as ASHRAE 90.1, COMNET, ASHRAE Fundamentals, AIA Healthcare Guide, ASHRAE 62.1, and more...
- Where industry standards lack data, SB 2030 pulls data from nearly 2,500 real buildings

## ■ Web Based Simulation Tool

- HTML5 and AngularJS technologies
  - Compatible with most browsers and devices. IE11, Edge, Chrome, FireFox, Safari
  - No need for iOS or Android apps!
- Responsive web design automatically responds to window size and screen size
- Touch-friendly design can be used on laptops or tablets down to 7.8" x 5.3" in size

# Navigating SB 2030

---

# Navigating to SB 2030 Tool

Navigating SB 2030

- Access full version of tool from B3 Guidelines Tracking Tool
- Goal Setting version available at <https://www.b3mn.org/2030energystandard/>

The screenshot shows a web browser window with the URL <https://trackingtool.b3mn.org/ProjectManager>. The page header includes the Minnesota B3 logo and the text "GUIDELINES TRACKING TOOL". A user is logged in as "Chris Baker" with options for "My Account" and "Sign Out". The navigation menu includes "Home", "Projects", "Reports", "About", and "Administrator".

The main content area is titled "Project Manager" and displays "448 project(s)". Below this is a table with the following columns: Name, Code, Group, Type, Status, State Funded, Current Phase, and Created.

Name	Code	Group	Type	Status	State Funded	Current Phase	Created
<b>DEED Perham Area Family &amp; Wellness Center</b> 620 3rd Avenue SE, Perham Perham, MN 56573	G126	Department of Employment and Economic Development (DEED)	New Construction/ Renovation	Active	Yes	Predesign In Process (0%)	3/14/20
<b>Rolf 3.0 Test Project</b> 123 Fake Street Minneapolis, MN 55455		Testing	New Construction	Active	Unspecified	Predesign In Process (0%)	3/6/20
<b>DEED KSMQ Public Television Station</b> 107 West Oakland Avenue Austin, MN 55912			New Construction	Active	Unspecified	Predesign In Process (53%)	2/6/20
<b>Hennepin County Triage</b> 1800 Chicago Avenue Minneapolis, MN 55404	PS06	Hennepin County	Renovation	Active	Yes	Predesign In Process (50%)	12/21/

On the left side of the interface, there is a "FILTER" section with dropdown menus for "Current Phase", "Project Group", "Project SubGroup", "Status", and "State Funded", each with "(All)" as the selected option. Below these are "Submit" and "Reset" buttons. There is also an "EXPORT" section with an "Export To Excel" button, and an "ADD" section with a "Create a New Project" button.

# Navigating to SB 2030 Tool

- Tool is under E1A
- Separate instances of tool for each phase

SB 2030

Rolf 3.0 Test Project

2030energystandard - B3

https://trackingtool.b3mn.org/ProjectDashboard?ProjectID=1717

MINNESOTA 3 GUIDELINES TRACKING TOOL

Welcome Chris Baker  
My Account | Sign Out

Home

Projects

Reports

About

Administrator

OCCUPANCY

This project is not defined for occupancy. [Click here to set an occupancy date](#)

FILTER

Expand the grid to display:

My Action Items

LEGEND

Action Item

Completed

Variance

Not applicable

Current Phase

Required

Actual Phase

Rolf 3.0 Test Project

123 Fake Street  
Minneapolis, MN 55455

General Team Roles Actions Schedule Notes Admin

Current Phase: **Predesign Phase**  
Phase State: **In Process**  
You have no open action items for this project

Guideline	Responsible Role	Person	Action	PD*	D	FD	CO
Phase Summary Reports:				0%			
PERFORMANCE MANAGEMENT				PD*	D	FD	CO
SITE AND WATER				PD*	D	FD	CO
ENERGY AND ATMOSPHERE				PD*	D	FD	CO
E.0. Energy and Atmosphere Strategies				Read the Guideline			
E.1. Energy Use				Read the Guideline			
E1A. Meet SB 2030 Energy Standards	Energy Leader	(Unassigned)	Required				
E1B. Document predicted energy use by type	Energy Leader	(Unassigned)	Required				
E.2. Renewable Energy				Read the Guideline			
E.3. Efficient Equipment and Appliances				Read the Guideline			
E.4. Atmospheric Protection				Read the Guideline			



# Creating SB 2030 Models

---

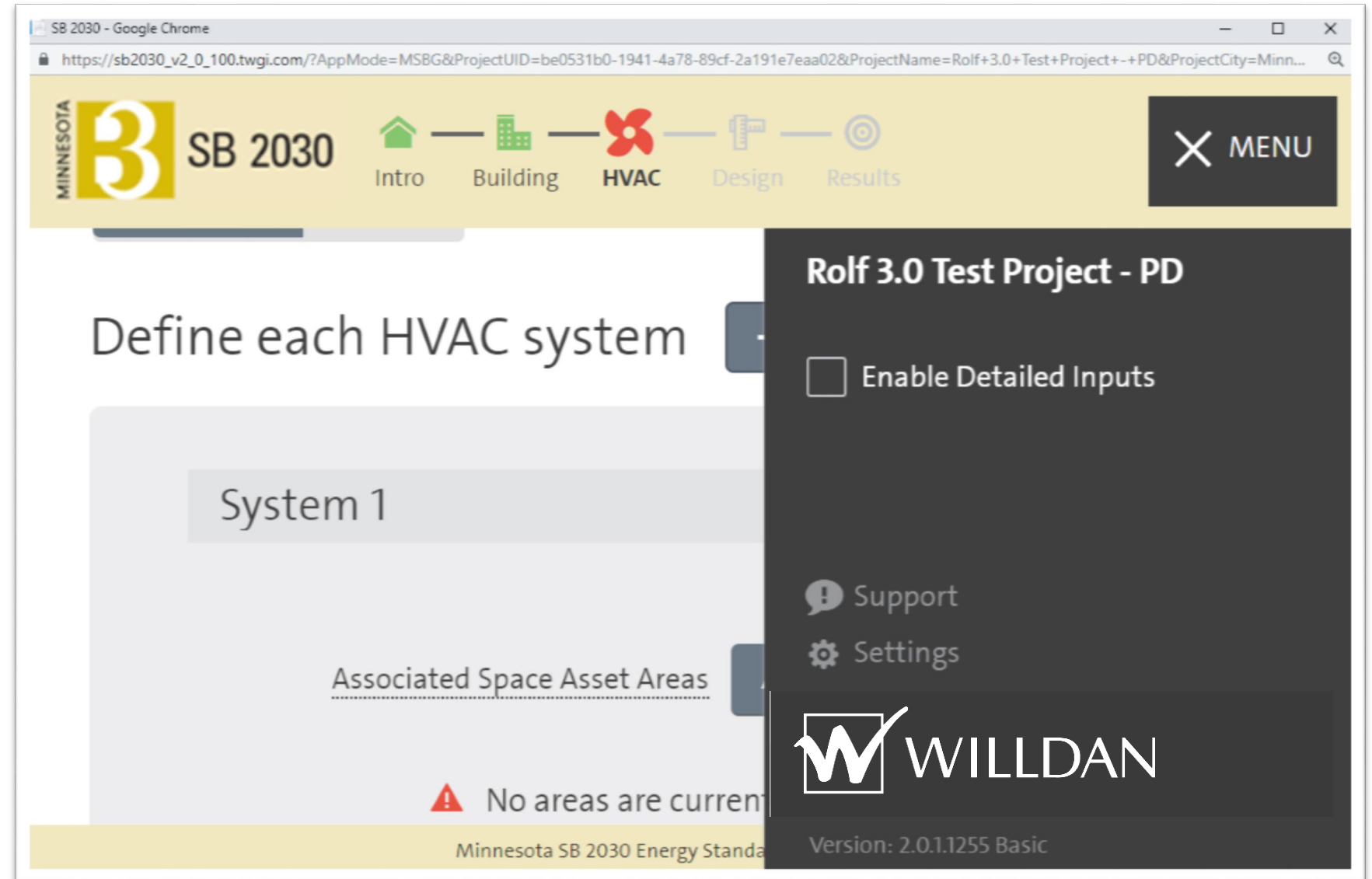


# USER INTERFACE OVERVIEW

- Two modes
  - Standard Tool
  - As-Designed Mode

The screenshot shows a web browser window titled "SB 2030 - Google Chrome" with the URL [https://sb2030\\_v2\\_0\\_100.twgi.com/?AppMode=MSBG&ProjectUID=be0531b0-1941-4a78-89cf-2a191e7eaa02&ProjectName=Rolf+3.0+Test+Project+-+PD&ProjectCity=Minn...](https://sb2030_v2_0_100.twgi.com/?AppMode=MSBG&ProjectUID=be0531b0-1941-4a78-89cf-2a191e7eaa02&ProjectName=Rolf+3.0+Test+Project+-+PD&ProjectCity=Minn...). The page header includes the Minnesota SB 2030 logo, the project name "Rolf 3.0 Test Project - PD", and navigation links for Intro, Building, HVAC, and Results. A yellow banner reads "Welcome to the SB 2030 As-Designed Tool". The main content area has a welcome message, a "What it does" section explaining the tool's purpose, and a "How it works" section describing the process. On the right, there are input fields for "Project Name" (filled with "Rolf 3.0 Test Project - PD") and "Organization" (filled with "Organization"), and a checkbox for "Create 'As-Designed' Model". A yellow "Building >" button is at the bottom right. The footer contains the text "Minnesota SB 2030 Energy Standard Tool. © 2009-2019 The Willd Group, Inc. All Rights Reserved."

- Top menu shows steps
  - Building
  - HVAC
  - Design
  - Results
- Color indicates status
  - Red – error Light gray – not complete
  - Green – complete
  - Bold – indicates location
- Enable Detailed Inputs for
  - Schedules
  - Geometry
  - Constructions
  - Plug/process loads





# User Interface Overview

## Error Messaging

Creating SB 2030 Models

Next, define the building's mechanical system

### Define central equipment

Service Water Heating Fuel Type: None

Heating Plant: None

Cooling Plant: None

Water to Air Heat Pump Plant: None

Dedicated Outside Air System: Not Installed

### Define each HVAC system

+ Add System

System 1

Conditioning: Heating and Cooling

System Type:

**No areas are currently assigned**

Edit

- Watch out for red error messaging...
- Hovering over the warning will expand it
- Red outlines or underlines will guide you to the issue

# User Interface Overview

## Help and Definitions

- Help is indicated by lines under headings and are located throughout the tool – use them!

The screenshot displays the SB 2030 Energy Standard Tool interface. The top navigation bar includes the Minnesota SB 2030 logo, the project name "Rolf 3.0 Test Project - PD", and a menu with icons for Intro, Building, HVAC, Design, and Results. A yellow banner at the top of the main content area reads "First, define the building's parameters". Below this, the "Building Definition" section features an "Unlock" button and three input fields: "Building Type" (set to "Office"), "Gross Building SF" (set to "200,000 ft²"), and "Location" (set to "Minneapolis"). The "Space Asset Areas" section includes buttons for "Add Area", "Scale All To Fit", and "Summary". A checkbox for "Legacy baseline for residential SAAs" is present. A card for the "Office" area shows details: Type: Office, Area: 200,000 ft² (100%), Floors: 4, Arrangement: Adjacent, and Construction Type: New. An "Edit" button is at the bottom of the card. The "Exterior Lighting" section has input fields for "Parking Area Illuminated", "Number of Main Entrances", and "Number of Secondary Entrances". The footer contains the text "Minnesota SB 2030 Energy Standard Tool. © 2009-2019 The Weidt Group, Inc. All Rights Reserved."




---

# **BUILDING A SB 2030 ENERGY MODEL**

# Starting a SB 2030 Model

## Building Type

- Users start by reviewing the building
- This creates defaults as starting points for the model
- User is able to modify as many defaults as known to further refine the model
- The building types comes from the B3 Guidelines Tool, but you can change it here

 First, define the building's parameters

Building Definition

DoneCancel

Building Type	Gross Building SF	Location
Office ▼	180,000 ft <sup>2</sup>	Minneapolis ▼



# Available Building Types

Creating SB 2030 Models

- Automotive Facility
- Bank
- Broadcast Facility
- Computer Center
- Convention Center
- Core and Shell
- Corrections Facility
- Courthouse
- Data Center
- Dining – Bar  
Lounge/Leisure
- Dining – Cafeteria/  
Fast Food
- Dining - Family
- Dormitory
- Education – College/  
University
- Education – Elementary
- Education – High School
- Education – Middle School
- Fire Station
- Gymnasium
- Healthcare Clinic
- Hospital
- Hotel
- Laundry
- Library
- Mall
- Manufacturing Facility
- Multifamily
- Museum
- Nursing home
- Office
- Other
- Parking – Enclosed Garage
- Police Facility
- Post Office
- Religious Facility
- Retail – Big Box
- Retail – Convenience Store
- Retail – Strip Mall
- Retail – Supermarket
- Senior Housing
- Student Union
- Theater/Auditorium
- Town Hall
- Transportation
- Warehouse – Active
- Workshop





# CREATING THE UNIQUE BUILDING

# Space Asset Areas

Creating the unique building

- Building blocks to create the unique building
- Represent different programmatic functions within a building
- Users can build custom buildings from the collection of available types
- Definitions are based on ASHRAE, COMNET and past experience
  - Some details are editable by the user
- Additional Space Asset Areas can be used to represent different building conditions
  - Original Apartment Units with PTACs
  - 2010 addition with air source heat pump
  - Building would have two Apartment Space Asset Areas



# Space Asset Areas vs. Space Type



- SAAs were developed primarily by assigning Building-Type level characteristics
- Most SAAs are applied broadly across areas of the building
- Some Space Asset Area (SAA) characteristics are more representative of a specific space type
- Practice called for some SAAs to be more specific
  - AIA Healthcare ventilation requirements
  - Space-type lighting power densities



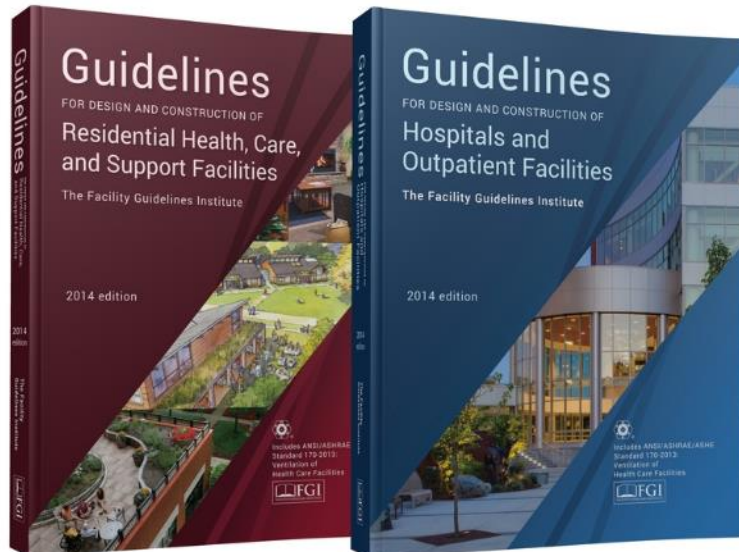


# Space Asset Areas vs. Space Type

Space Asset Areas that can fall in this SAA/Space Type gray area

## ■ Healthcare Ventilation

- Emergency Departments
- Laboratory
- Operatory
- Patient Room
- Treatment





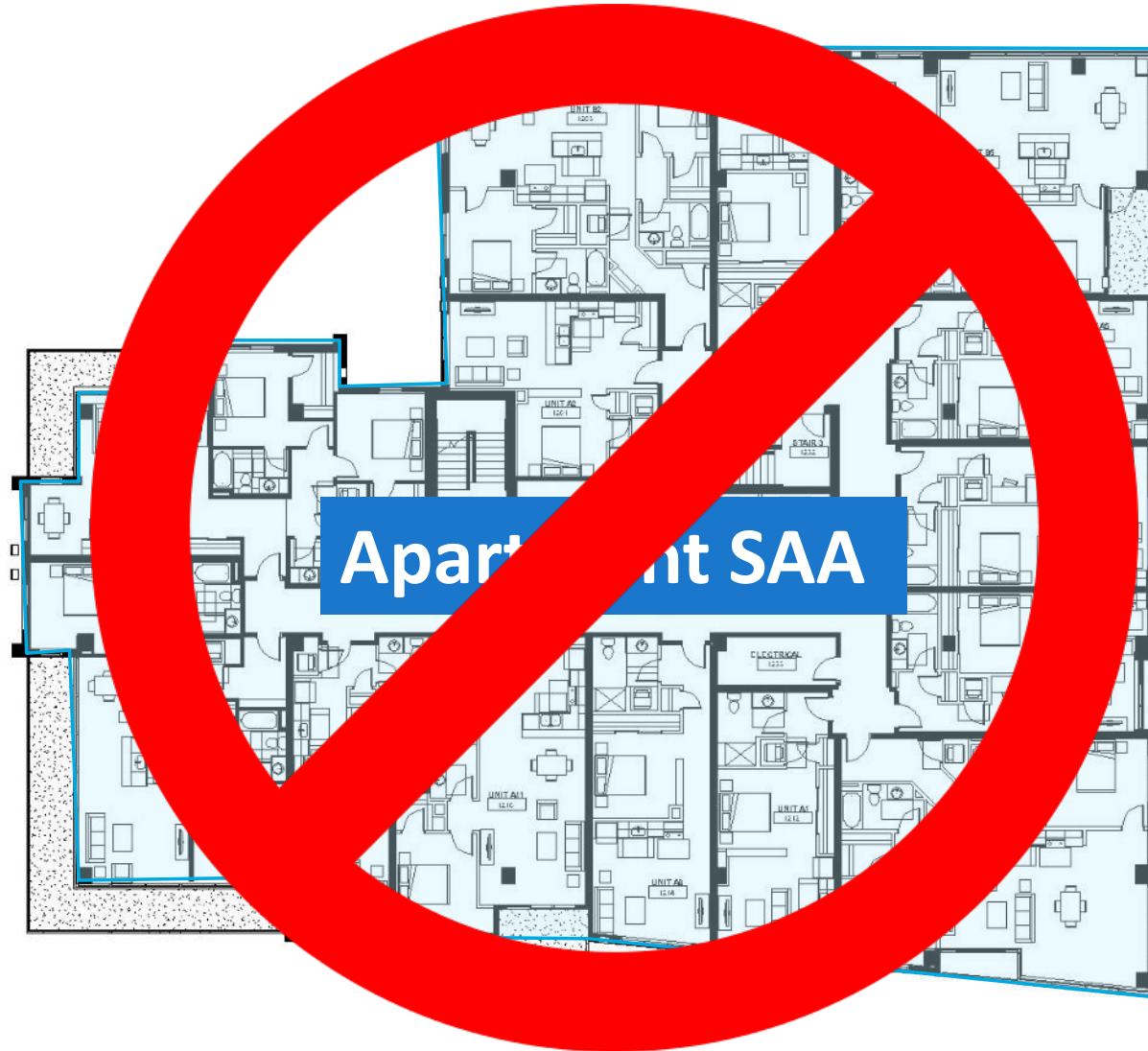
# Space Asset Areas vs. Space Type

Space Asset Areas that can fall in this SAA/Space Type gray area

- Space-Type loads
  - Apartments
  - Laboratory
  - Computer Center
  - Kitchen
  - Laundry
  - Locker Rooms
  - Convention Center
  - Conference/Meeting area
- Not an exact science
  - Do not overthink
  - If using drawings, take in large chunks
    - Model is an abstraction based on a typical building; as such, SAA areas should be developed similarly



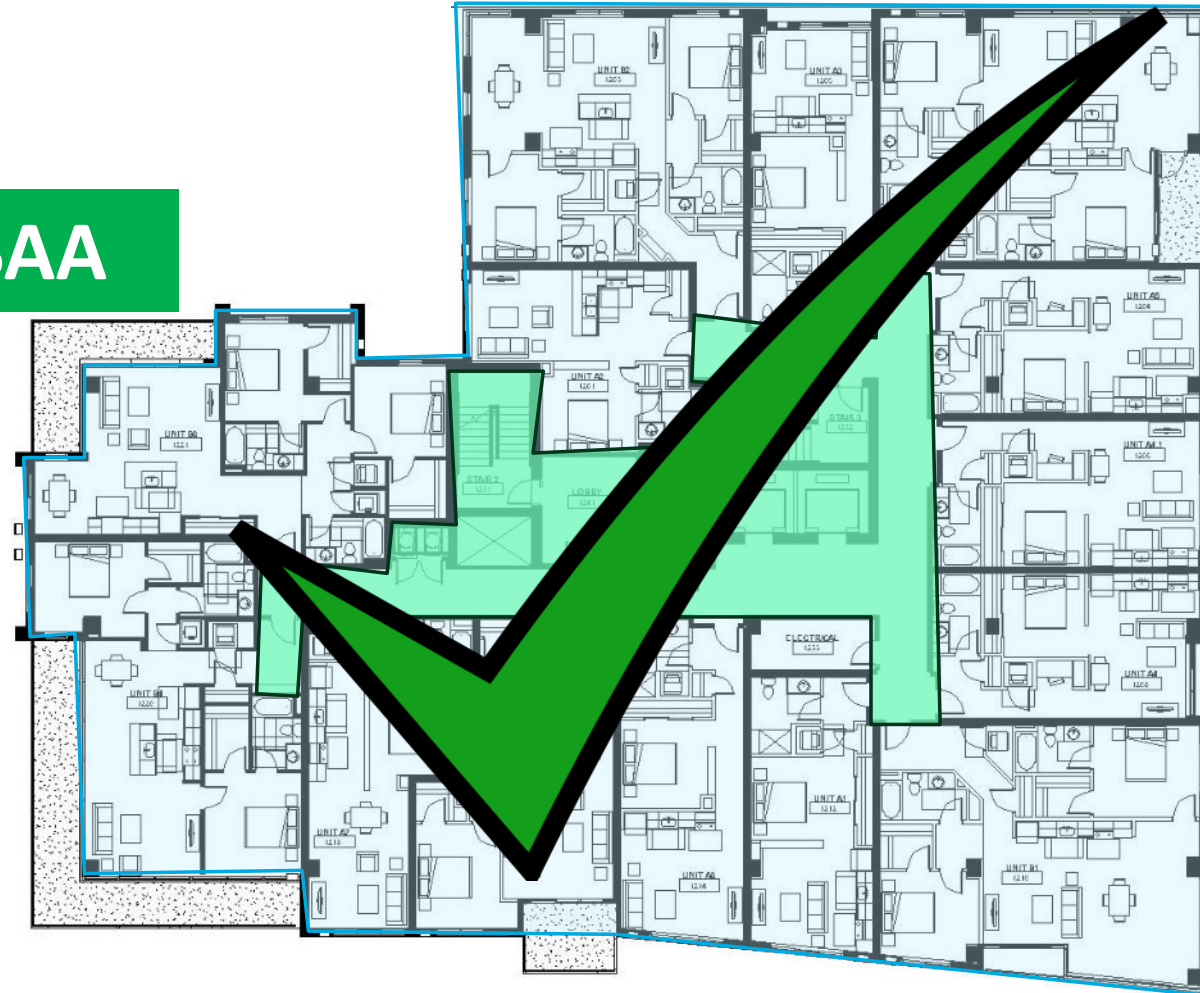
## Example Area Take-offs: Apartments



# Example Area Take-offs: Apartments

Apartment SAA

Common Areas SAA

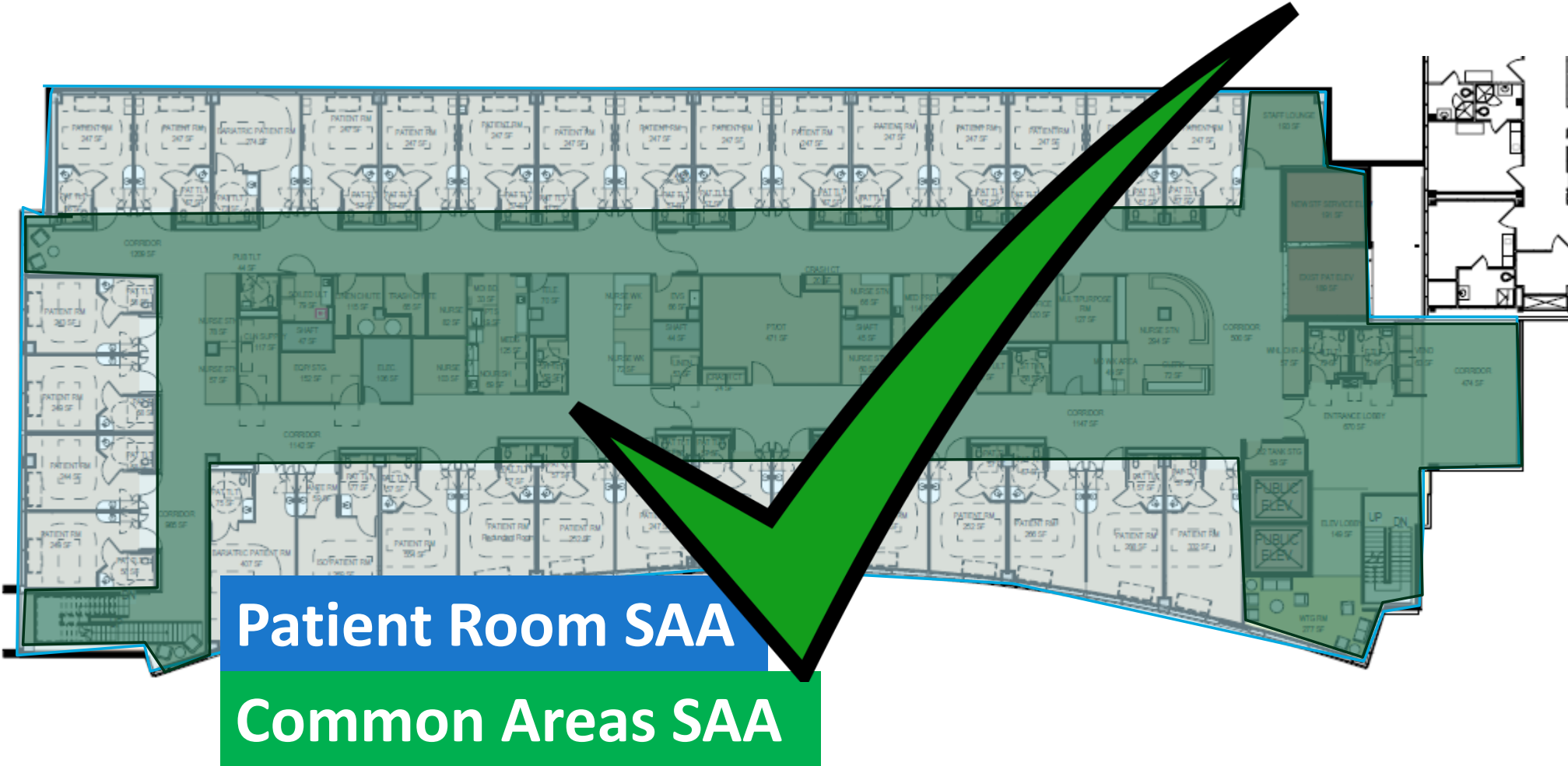


# Example Area Take-offs: Hospital





# Example Area Take-offs: Hospital





# Current Available Space Asset Types

Creating SB 2030 Models

- Apartment
- Auto Repair
- Classrooms
- Common Areas – Multifamily
- Computer Center
- Conference/Meeting Area
- Convention Center
- Core and shell
- Data Center
- Dining
- Dorm Rooms
- Exhibit Space and Archives
- Fitness
- Garage – Emergency Vehicle
- Garage – Enclosed
- Guest rooms
- Gymnasium
- Jail Holding Area
- Kitchen
- Laboratory – Educational
- Laboratory – Research
- Laundry
- Locker rooms
- Maintenance/Repair
- Manufacturing
- Office
- Operatory
- Patient Room
- Retail
- Retail – Refrigerated
- Stacks and Reading
- Tenant Shell
- Theater/Auditorium
- Treatment
- Vivarium
- Warehouse – Active
- Warehouse – Inactive
- Workshop
- Worship Area



# Starting a SB 2030 Model

## Building Definition

Creating SB 2030 Models

### ■ Define the Space Asset Areas

- Default based on building type
- Add with 'add area' button
- Delete with 'trash can'
- Scale area to fit
- More than one of the same SAT can be used within the building

The screenshot shows the 'Space Asset Areas' interface. At the top, there are three buttons: '+ Add Area', 'Scale All To Fit', and 'Summary'. Below these are four asset area cards arranged in a 2x2 grid. Each card has a title, type, floors, area with percentage, arrangement, and an 'Edit' button. Annotations with blue lines and dots point to specific elements: the '+ Add Area' button, the 'trash can' icon on the 'Retail' card, the 'Scale All To Fit' button, and the 'Type: Apartments' text on both the 'East Apartments' and 'West Apartments' cards.

Area Name	Type	Floors	Area (ft²)	Percentage	Arrangement
Retail	Retail	1	8,250	11%	Adjacent
Common areas	Common areas	3	9,000	12%	Hosted
East Apartments	Apartments	2	27,750	37%	Adjacent
West Apartments	Apartments	3	30,000	40%	Adjacent

# Starting a SB 2030 Model

## Refining Space Asset Types

### ■ Edit Space Asset Areas

- Use the Edit Button under the SAT
- Give a custom name
- Adjust type
- Select # of floors
- Adjust the size
- Adjust the geometry
  - Adjacent – SAT is next to another
  - Stacked - SAT is on top of another
  - Hosted – SAT if fully contained in another

The screenshot shows the configuration interface for the 'Apartments' Space Asset Type. The interface includes a title 'Apartments' at the top. Below it, there are four main sections: 'Space Asset Type' with a dropdown menu showing 'Apartments'; 'Number of Floors' with a text input field containing '1'; 'Arrangement' with a dropdown menu showing 'Adjacent / Grade'; and 'Area' with a text input field containing '13,200' and a unit selector set to 'ft²'. Below the 'Arrangement' dropdown, there is a 'Number of units' text input field containing '12'. At the bottom of the form are two buttons: 'Done' and 'View Details' (which has a gear icon). Blue arrows from the list on the left point to specific elements: 'Use the Edit Button under the SAT' points to the 'View Details' button; 'Give a custom name' points to the 'Apartments' dropdown; 'Adjust type' points to the 'Number of Floors' input; 'Select # of floors' points to the 'Number of units' input; 'Adjust the size' points to the 'Area' input; and 'Adjust the geometry' points to the 'Arrangement' dropdown.



---

## **MODIFYING SPACE ASSET AREA DETAILS**

# Starting a SB 2030 Model

## Refining Space Asset Types

- Edit space asset area, select
- Sets additional parameters when known
- Not required to complete a model
- Default is selected energy code
- Details include
  - Schedules
  - Ventilation rates
  - Geometry
  - Floor to floor heights
  - Space temperatures
  - Plug and process loads
- Each Space Asset Area can be different

Apartments

Space Asset Type  
Apartments ▼

Area <sup>ft²</sup>  
50,000

Number of Floors  
2

Number of units  
55

Arrangement  
Stacked ▼

Stacked On  
Retail ▼

Done Modify Details

### Details for *Apartments* ↻

Operations

Mechanical

Architectural

Electrical & Process



# Starting a SB 2030 Model

## Operational details

- Make a SAA unoccupied
- Adjust the # of people in a SAA
- Typically, defaults are fine here

### People

Area Occupancy

Occupied

Unoccupied

People Density

40.0

ft<sup>2</sup>/person

# Starting a SB 2030 Model

## Operational details

- Select use by day
  - None, partial, full
- Select hours in use per day
  - This is full-time use
- Choose the months for which this schedule applies
- Add a 2<sup>nd</sup> schedule if needed
- Schedules impact lights, plugs, people and fans
- Default schedules are from ASHRAE

Creating SB 2030 Models

### Schedules

Add 2nd Schedule

#### Daily Use

Sun	None	Partial	Full
Mon	None	Partial	Full
Tue	None	Partial	Full
Wed	None	Partial	Full
Thu	None	Partial	Full
Fri	None	Partial	Full
Sat	None	Partial	Full

#### Applicable Months

<input checked="" type="checkbox"/> January	<input checked="" type="checkbox"/> February
<input checked="" type="checkbox"/> March	<input checked="" type="checkbox"/> April
<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> June
<input checked="" type="checkbox"/> July	<input checked="" type="checkbox"/> August
<input checked="" type="checkbox"/> September	<input checked="" type="checkbox"/> October
<input checked="" type="checkbox"/> November	<input checked="" type="checkbox"/> December

Hours In Use per Day:

# Starting a SB 2030 Model

## Mechanical details

- Adjust thermostat setting
  - Separate heating and cooling
  - Separate occupied and unoccupied
  - Settings carry forward, no operation strategies at this time to adjust for savings
- Ventilation
  - Ability to set on air change or flow rate basis
  - Defaults to ASHRAE 62.1

Operations

Mechanical

Architectural

Electrical

Thermostat

Cooling Set Point, Occupied

75°F

Cooling Set Point, Unoccupied

80°F

Heating Set Point, Occupied

70°F

Heating Set Point, Unoccupied

60°F

Ventilation Requirements

Air Changes

Flow

Minimum Air Changes, Unoccupied

ACH

Minimum Air Changes, Occupied

ACH

Outside Air Fraction

Outside Air Per Person

10.0

ft<sup>3</sup>/min/person

Outside Air Per Area

0.12

ft<sup>3</sup>/min/ft<sup>2</sup>

Exhaust Flow Per Area

0.00

ft<sup>3</sup>/min/ft<sup>2</sup>


# Starting a SB 2030 Model

## Architectural details

- Geometry
  - Covered later
- Envelope Construction
  - Hover over underlined name to gain additional information or see defaults
  - Floor to Floor Height –
    - Enter specific value

### Envelope Construction

Floor to Floor Height

ft 

---

### Infiltration

Air Sealing Blower Door Test, Pressure Boundary

☒ Included ☐ Excluded

---



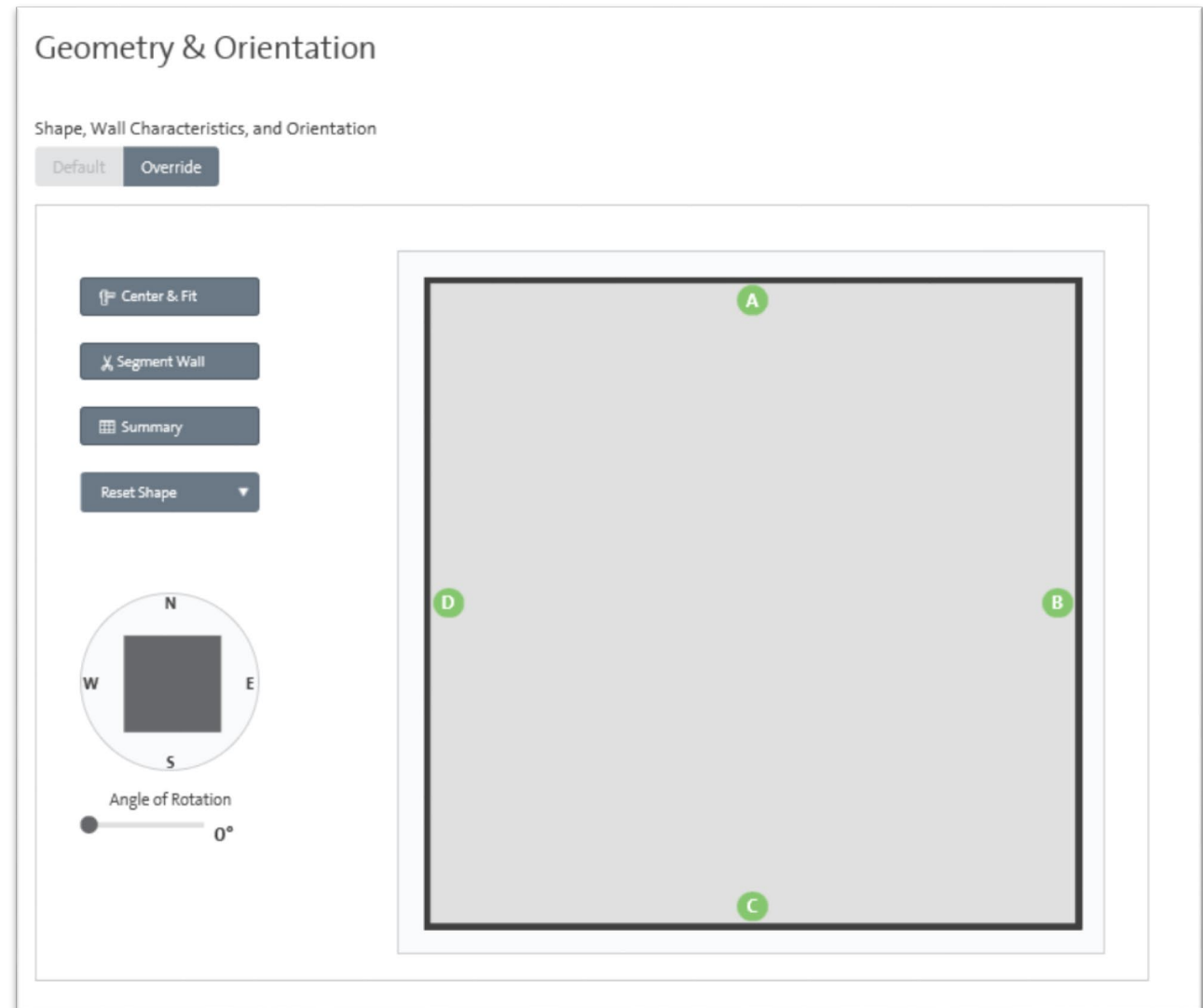
---

# MODIFYING DETAILED GEOMETRY

# Starting a SB 2030 Model

## Architectural details

- Adjust geometry beyond SAT arrangement
  - Do only if unique
  - Done on a SAT-by-SAT basis
  - Can segment or note shared walls
  - Can set window to wall ratio by orientation
- May impact heat pump or VRF systems more than central systems
- Intended to be high level geometry;  
**DO NOT** include every cut out and corner!





# Starting a SB 2030 Model

## Architectural details

### ■ Custom Geometry

- Choose from standard shapes
- Rotate building
  - Note rotation only shown here
- Segment wall to further change shape



# Starting a SB 2030 Model

## Architectural details

### ■ Custom Geometry

#### ■ Summary

- Note shared walls with another SAA
- Adjust window to wall ratio

### Geometry & Orientation

Shape, Wall Characteristics, and Orientation

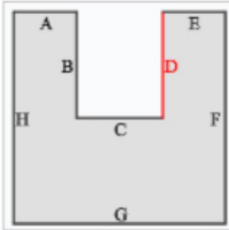
Default Override

Center & Fit

Segment Wall

Done

Reset Shape



Walls reference

	Whole Wall Shared	Shared Wall Width (ft)	Shared Wall Height (ft)	Window:Wall Ratio (non-shared wall, %)
A	<input type="checkbox"/>	0.0	0.0	10.0
B	<input type="checkbox"/>	0.0	0.0	20.0
C	<input type="checkbox"/>	0.0	0.0	30.0
D	<input type="checkbox"/>	0.0	0.0	20.0
E	<input type="checkbox"/>	0.0	0.0	10.0
F	<input type="checkbox"/>	0.0	0.0	30.0
G	<input type="checkbox"/>	0.0	0.0	30.0
H	<input type="checkbox"/>	0.0	0.0	30.0



---

# HVAC SYSTEMS

# Starting a SB 2030 Model

## HVAC details

- Define any central plant
- Then define system and zone level HVAC components
- HVAC systems are defined and one or more SAAs can be added to a system
- Red triangles let you know a system is not fully defined

The screenshot shows the SB 2030 web application interface in a Google Chrome browser. The URL is [https://sb2030\\_v2\\_0\\_100.twgi.com/?AppMode=MSBG&ProjectUID=be0531b0-1941-4a78-89cf-2a191e7eaa02&ProjectName=Rolf+3....](https://sb2030_v2_0_100.twgi.com/?AppMode=MSBG&ProjectUID=be0531b0-1941-4a78-89cf-2a191e7eaa02&ProjectName=Rolf+3....). The page title is "SB 2030 Rolf 3.0 Test Project - PD". The navigation bar includes links for Intro, Building, HVAC (active), Design, and Results. A yellow banner at the top says "Next, define the building's mechanical system". Below this, the "Define central equipment" section contains dropdown menus for "Service Water Heating Fuel Type" (None), "Heating Plant" (None), "Cooling Plant" (None), and "Water to Air Heat Pump Plant" (None). There are also buttons for "Dedicated Outside Air System" (Not Installed, Installed) and a "Modify Details" button. The "Define each HVAC system" section has an "Add System" button and a list of systems. One system, "VRF Heat Recovery", is shown with details: "Conditioning: Heating and Cooling", "System Type: VRF Heat Recovery", and "Serving: Kitchen, Office". An "Edit" button is at the bottom of the system list. The footer text reads "Minnesota SB 2030 Energy Standard Tool. © 2009-2019 The Weldt Group, Inc. All Rights Reserved."



---

# CENTRAL PLANT EQUIPMENT



# Starting a SB 2030 Model

## HVAC details – central plant

- Select service water heating system fuel type
  - Select none if SWH is not a factor in the project
- Select heating plant type
  - Boiler
  - District
  - None if no central equipment
- Select cooling plant type, if no chiller select none
  - District cooling
  - Air-cooled chiller
  - Water-cooled chiller
  - None if no central equipment

The screenshot shows the SB 2030 web application in a Google Chrome browser. The URL is [https://sb2030\\_v2\\_0\\_100.twgi.com/?AppMode=MSBG&ProjectUID=be0531b0-1941-4a78-89cf-2a191e7eaa02&ProjectName=Rolf+3...](https://sb2030_v2_0_100.twgi.com/?AppMode=MSBG&ProjectUID=be0531b0-1941-4a78-89cf-2a191e7eaa02&ProjectName=Rolf+3...). The page title is "SB 2030 Rolf 3.0 Test Project - PD". The navigation bar includes links for Intro, Building, HVAC, Design, and Results. A yellow banner at the top says "Next, define the building's mechanical system". The main section is titled "Define central equipment" and contains several dropdown menus: "Service Water Heating Fuel Type" (set to None), "Heating Plant" (set to None), "Cooling Plant" (set to None), and "Water to Air Heat Pump Plant" (set to None). There are also radio buttons for "Dedicated Outside Air System" (Not Installed selected) and an "Installed" option. A "Modify Details" button is at the bottom.

# Starting a SB 2030 Model

## HVAC details

- Dedicated outside air systems set at this level
  - If selected as Installed, specify additional details
- Select cooling option
  - DX
  - Heat pump
  - VRF
  - Central plant
- Select heating option
  - Furnace
  - Heat pump
  - VRF
  - Central plant
  - Electric resistance

The screenshot shows the SB 2030 web application in a Google Chrome browser. The URL is [https://sb2030\\_v2\\_0\\_100.twgi.com/?AppMode=MSBG&ProjectUID=be0531b0-1941-4a78-89cf-2a191e7eaa02&ProjectName=Rolf+3...](https://sb2030_v2_0_100.twgi.com/?AppMode=MSBG&ProjectUID=be0531b0-1941-4a78-89cf-2a191e7eaa02&ProjectName=Rolf+3...). The page title is "SB 2030 Rolf 3.0 Test Project - PD". The navigation bar includes links for Intro, Building, HVAC (selected), Design, and Results. A yellow banner at the top says "Next, define the building's mechanical system". Below this, the "Define central equipment" section contains several dropdown menus: "Service Water Heating Fuel Type" (None), "Heating Plant" (None), "Cooling Plant" (None), and "Water to Air Heat Pump Plant" (None). There are also radio buttons for "Dedicated Outside Air System" (Not Installed / Installed). At the bottom, there are dropdowns for "DOAS Cooling Option" and "DOAS Heating Option", and a "Modify Details" button.



# CREATING HVAC SYSTEMS

# Starting a SB 2030 Model

## HVAC details - systems

- Define each system
  - Provide system name
    - Default is System 1
- Add space asset areas; can be 1 or many
- Complete drop-downs for other choices
  - Conditioning type
  - System type
  - Cooling source
  - Heating source
  - Zone heating source
- Use DOAS is only available if DOAS was selected in the plant section
- Repeat for additional systems

Define each HVAC system used in *Scenario A* + Add System

System 1

Associated Space Asset Areas

Assign Area ▼

▲ No areas are currently assigned

Conditioning Type ▼

System Type ▼

Cooling Source ▼

Use DOAS (defined above) No Yes

System Heating Source ▼

Zone Heating Source ▼

Done ⚙️ Modify Details



# ADDING MEASURES



- Categories
  - Mechanical
  - Architectural
  - Lighting/Electrical
  - Plug/Process
  - Refrigeration
  - Service Water Heating
- Three levels of applicability
  - Facility
  - System
  - Space Asset Area

## ■ Mechanical

### ■ Facility

- Equipment efficiencies
- Pump controls
- Pump power reductions
- DOAS related strategies

### ■ System

- Equipment efficiencies
- Motor efficiencies
- Fan power reductions
- Fan controls
- Heat recovery

### ■ Space Asset Area

- Ventilation controls
- Thermostat setback controls

#### **Mechanical**

##### **Facility**

- Beyond premium efficiency pump motor
- Reduced heating water pump head
- VFD on building heating water pump
- Increased gas boiler efficiency
- Increased condensing gas boiler efficiency

##### **Variable Air Volume**

- Sensible heat recovery
- Total heat recovery
- Remove heat recovery
- Demand control ventilation for Office
- Remove demand control ventilation for Office
- Occupancy sensor control of terminal boxes for Office
- Displacement ventilation for Office
- Beyond premium efficiency fan motor
- Reduced fan power
- Increased DX cooling efficiency
- Standard efficiency DX compressor part load performance
- High efficiency DX compressor part load performance
- Premium efficiency DX compressor part load performance

- Architectural
  - Facility
    - Infiltration
  - System
    - None
  - Space Asset Area
    - Wall insulation
    - Roof insulation
    - Roof reflectivity
    - Improved glazing characteristics

Architectural	
Facility	
	Reduced air infiltration
Retail	
	As-designed glazing
	Increased wall assembly R-value
Office	
	As-designed glazing
	Increased roof assembly R-value
	White roof
	Increased wall assembly R-value

- Lighting
  - Facility
    - Exterior lighting power reduction
  - System
    - None
  - Space Asset Area
    - Interior lighting power reductions
    - Occupancy/Vacancy controls
    - Daylighting controls

## Lighting

### Retail

Stepped daylighting control  
Multi-stepped daylighting control  
Dimming daylighting control  
Occupancy sensor controls  
Dual level occupancy sensor control  
Vacancy sensor controls  
Reduced lighting power density

### Office

Stepped daylighting control  
Multi-stepped daylighting control  
Dimming daylighting control  
Remove daylighting control  
Occupancy sensor controls  
Dual level occupancy sensor control  
Vacancy sensor controls  
Remove automated lighting controls  
Reduced lighting power density

- Plug/Process
  - Facility
    - Snow melt system efficiency
    - Elevator efficiency
  - System
    - None
  - Space Asset Area
    - Office plug load controls
    - Residential ENERGY STAR® appliances
    - Commercial ENERGY STAR appliances

## Plug/Process

### Office

Occupancy sensor control of office equipment

Remove occupancy sensor control of office equipment



- Service Water Heating
  - Facility
    - System efficiency
    - On-demand water heater
    - Heat Pump water heater
  - System
    - None
  - Space Asset Area
    - Residential low-flow showerheads

## Service Water Heating

### Facility


SWH efficiency

Gas fired on-demand SWH

- Refrigeration
  - Facility
    - None
  - System
    - None
  - Space Asset Area
    - Casework lighting
    - Casework antisweat heat controls
    - Casework door improvements

# Adding Measures

- First come, it will be blank
- Use Add Strategy button to choose from a list of available measures

 Finally, modify your design to meet the EUI target

+ Add Design Parameter

Expand All

Collapse All

Calculate

As Designed  
25

02895

Target

**Mechanical** ✓  
**Facility** ✓  
DOAS, Beyond premium efficiency fan motor  
Improved heat pump cooling efficiency (DOAS) - ( Improved heat pump efficiency - 13.00 EER ) ▼  
Increased gas furnace efficiency (DOAS) - ( Explicit efficiency percent - 95 % ) ▼  
DOAS, Total heat recovery - ( Summer/winter effectiveness - 75 % | Latent effectiveness - 75 % ) ▼  
**VRF Heat Recovery** ✓  
CO2 control of outside air for Office  
Displacement ventilation for Office

**Architectural** ✓  
**Office** ✓  
Increased wall assembly R-value - ( R-value - 16.00 hr-ft<sup>2</sup>-°F/Btu ) ▼  
Increased roof assembly R-value - ( R-value - 24.00 hr-ft<sup>2</sup>-°F/Btu ) ▼  
As-designed glazing - ( Unit u-value - 0.42 Btu/hr-ft<sup>2</sup>-°F | Center of glass u-value - 0.29 Btu/hr-ft<sup>2</sup>-°F | Solar heat gain coefficient (SHGC) - 0.38 | Visible transmittance (VT) - 0.70 | Infiltration - 0.0010 cfm/ft<sup>2</sup> ) ▼



---

## UPDATES FOR 2020

- Updated tracking tool, Energy Standard Tool, and SB 2030 As-Designed Tool live January 1, 2020
  - Evaluation of compliance based both on carbon and on-site energy consumption
  - Modify the requirements around on-site renewable energy evaluation
  - Allow a campus-based approach to renewable energy development
  - Update cost-effectiveness evaluation
  - Eliminate the relaxed standards for renovation projects
  - Adding Solar PV to SB 2030 As-Designed Tool



---

# SB 2030 SUPPORT



## ■ Resources

- 'How NEO® Works' videos at: <https://netenergyoptimizer.com/how-it-works>
- [sb2030@b3mn.org](mailto:sb2030@b3mn.org)

## ■ Helpful information to provide when reporting an issue

- Brief description of error or issue and when it occurred
- Brief description of the building and model
- Provide screenshots if available

# Acknowledgements

## ■ Clients



## ■ Partners



---

**QUESTIONS?**

# Thank You

---



**Chris Baker**  
**[cbaker@willdan.com](mailto:cbaker@willdan.com)**