U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Building Energy Asset Score: Data Collection Long Form - *Full Input Mode*

FIELDS SHADED GREEN ARE REQUIRED

FIELDS SHADED YELLOW ARE ONLY REQUIRED IF APPLICABLE

Building name:	
Data collected by:	
Email, phone:	
Date of data collection:	

HOW TO USE THIS DATA COLLECTION FORM

This form is intended to facilitate your data collection and tracks closely with the user interface of the Energy Asset Scoring Tool. The Scoring Tool requires the user to --

1) Enter basic building information including data regarding the building's construction assembly (roofs, skylights, windows, walls, floors) and its major energy systems (HVAC, lighting, hot water systems);

2) Create one or more "blocks" to represent the building's geometry and configuration; and

3) Assign assembly components and energy systems to building block(s).

Required vs Optional Data Inputs:

- In order to generate a score for a building, all fields shaded in green are required.
- Fields shaded in yellow are only required if applicable (e.g., if skylights, plant chillers, or plant boilers have been entered).
- Users are encouraged to provide information for the optional data fields where available in order to generate a more accurate score. When optional items are left blank, the Asset Scoring Tool queries a database of energy-system configurations and performance data to infer building parameters based on year of construction and location.

Additional guidance regarding Asset Score inputs may be found in the Asset Score Users Guide at: http://help.buildingenergyscore.com/

General Building Information

FIELDS SHADED GREEN ARE REQUIRED

Year completed	YEAR IN WHICH THE BUILDING WAS COMPLETED *(or year of last major retrofit)*		
Gross floor area*	ft^2		
* Gross floor area (GFA) = total square footage of the building, with the exception of parking areas which should be excluded. To calculate GFA, use the external dimensions of the enclosing fixed walls of the buildings, including structures, partitions, corridors, stairs, and conditioned below-grade spaces. *Note: For reference only; this value may be different than the calculated value based on footprint dimensions entered and used for scoring.*			
Building location	STREET		
	CITY	STATE	POSTAL CODE

Building use type		
For mixed-use buildings, choose up to 5 use types. Each use type must be >2500 sq ft and >5% of the total building GFA. Choose "Office" for a college/university building containing mostly offices. If this building includes use types not listed here, exclude that portion of the building when entering data, or contact asset.score@ee.doe.gov for assistance.	☐ Assisted Living ☐ City Hall ☐ Community Center ☐ Courthouse ☐ Education (K-12 School, College/ University Training Facilities) ☐ Library ☐ Lodging ☐ Medical Office ☐ Multi-family (4 stories +) ☐ Multi-family (less than 4 stories)	☐ Office ☐ Parking Garage (heated only) ☐ Parking Garage (ventilation only) ☐ Police Station ☐ Post Office ☐ Religious Building ☐ Retail ☐ Senior Center ☐ Warehouse non-refrigerated

Construction Properties

FIELDS SHADED GREEN ARE REQUIRED

Make additional copies of this page if your building has more or different roof or floor types.

Roof type Choose applicable roof type.	☐ Built-up with Concrete Deck ☐ Built-up with Metal Deck ☐ Built-up with Wood Deck ☐ Metal Surfacing ☐ Shingles/Shakes
Roof thermal properties Fill in ONLY ONE of the following three data fields. If the building has multiple roof types, record each type separately.	ROOF INSULATION R-VALUE °F•ft2•h/Btu ROOF INSULATION THICKNESS in ROOF ASSEMBLY U-VALUE Btu/°F•ft^2•h
Cool roof	☐ Yes ☐ No (default)

Floor type Choose applicable floor type.	☐ Concrete (over Unconditioned Space) ☐ Slab on Grade ☐ Steel Joist ☐ Wood Frame
Floor thermal properties Fill in ONLY ONE of the following three data fields. If the building has multiple floor types, record each type separately.	FLOOR INSULATION R-VALUE °F•ft^2•h/Btu FLOOR INSULATION THICKNESS in FLOOR ASSEMBLY U-VALUE Btu/°F•ft^2•h
Slab on grade insulation Applicable for Slab-on-Grade Floor Type only.	☐ No insulation ☐ Vertical (Perimeter) insulation Depth (ft)

Construction Properties, continued

The scoring tool allows you to edit window properties for each exterior wall surface. Make additional copies of the following section for multiple wall surfaces with different, window types, or properties.

Wall type Choose applicable wall type.	☐ Brick/stone on Masonry ☐ Brick/stone on Steel Frame ☐ Brick/stone on Wood Frame ☐ Metal Panel/Curtain Wall ☐ Siding on Steel Frame ☐ Siding on Wood Frame
Wall thermal properties Fill in ONLY ONE of the following three data fields. If the building has multiple wall types, record each type separately.	WALL INSULATION R-VALUE °F•ft²•h/Btu
	WALL INSULATION THICKNESS in
	WALL ASSEMBLY U-VALUE Btu/°F•ft²•h

Window framing type If a wall surface has windows with multiple framing types, choose predominant type in that wall.	☐ Metal ☐ Metal with Thermal Breaks ☐ Wood/Vinyl/Fiberglass
Window glass type If a wall surface has windows with multiple glass types, choose predominant type in that wall.	☐ Single-pane ☐ Double-pane ☐ Double-pane w/ Low-E ☐ Triple-pane ☐ Triple-pane w/ Low-E
Window gas fill type	☐ Air (default) ☐ Other
Window U-value	Btu/°F•ft²•h
Window solar heat gain coefficient (SHGC)	(range 0-1)
Window visible transmittance (VT)	(range 0-1)

Skylight type Choose applicable skylight glazing material.	☐ Glass ☐ Plastic (default)
Skylight U-value	Btu/°F•ft²•h
Skylight solar heat gain coefficient (SHGC)	(range 0-1)
Skylight visible transmittance (VT)	(range 0-1)
Skylight layout	☐ All Zones ☐ Core Only (default)
Percent of roof area Estimate the percent of the roof area covered in skylights.	%

Lighting

FIELDS SHADED GREEN ARE REQUIRED

Make additional copies of this page if the same lighting type has different fixture configurations

Fixture	Lighting type	Mounting type Recessed Surface Pendant	Watts per lamp	Number of lamps per fixture (up to 12)
a.	Compact fluorescent			
b.	Fluorescent T5			
c.	Fluorescent T5 - High Output			
d.	Fluorescent T8			
e.	Fluorescent T8 - High Efficiency			
f.	Fluorescent T12			
g.	High-pressure sodium			
h.	Incandescent/Halogen			
i.	LED			
j.	Mercury vapor			
k.	Metal halide			

Lighting Fixture Details

Every fixture in an Asset Score 'block' must have either a percentage served value OR the total number of fixtures entered for the calculation of lighting power density (watts per square foot).

Fixture	Lighting type	Total number of fixtures	% Area Served	Occupancy Controls (yes/no)
a.	Compact fluorescent			
b.	Fluorescent T5			
c.	Fluorescent T5 - High Output			
d.	Fluorescent T8			
e.	Fluorescent T8 - High Efficiency			
f.	Fluorescent T12			
g.	High-pressure sodium			
h.	Incandescent/Halogen			
i.	LED			
j.	Mercury vapor			
k.	Metal halide			

Heating and Cooling

FIELDS SHADED GREEN ARE REQUIRED

Common HVAC systems are listed below. If your building contains one of these systems, you may select from the list and from the HVAC Systems pull down menu option in Asset Score to have the tool automatically create default system components. See Appendix C — *Common HVAC Systems as Configured in Asset Score* — to see the default components that the tool generates. System components may also be added and edited in the Plant Loop and, Air Handler and Zone Equipment sections of the Tool.

If the HVAC system of your building includes a central hot water, chilled water or condenser water supply from a source such as an on-site condenser, chiller or boiler or hot/chilled water produced at a central plant (District), then complete the relevant "Plant Loop" section(s). Otherwise, go directly to the 'HVAC Equipment Details' page.

Make additional copies of the following Heating and Cooling pages as needed if multiple HVAC systems or equipment types are present.

HVAC system type	
	Air Handler Units ☐ Packaged Rooftop Air Conditioner ☐ Packaged Rooftop Heat Pump ☐ Packaged Rooftop VAV with Hot-Water Reheat Packaged ☐ Rooftop VAV with Electric Reheat ☐ VAV with Hot-Water Reheat ☐ VAV with Electric Reheat ☐ Warm Air Furnace ☐ Ventilation Only*; for Parking Garage (Ventilation Only) Use Type* ☐ Dedicated Outdoor Air System (DOAS)*
	Zone Equipment ☐ Four Pipe Fan Coil Unit ☐ Packaged Terminal Air Conditioner ☐ Packaged Terminal Heat Pump ☐ Water-Loop Heat Pump ☐ Ground Source Heat Pump (currently not an available option)

** If a Dedicated Outdoor Air System AHU is selected and assigned to a block in the Tool, it will be treated as a Ventilation System. A primary Zone Equipment HVAC system type will also need to be selected and assigned.*

Distribution equipment	☐ Air Handler Unit (AHU) ☐ Zone Equipment (e.g. fan coil, forced air, or packaged terminal units)

Cooling source	☐ No cooling ☐ DX Coil ☐ Central Plant (District, Chiller, Condenser)
Heating source	☐ No heating ☐ Central Furnace ☐ Heat Pump (electric) ☐ Central Plant (District, Boiler)

Block name(s) *(see page 11)*	

Plant Loop Equipment: Cooling and Condenser

FIELDS SHADED GREEN ARE REQUIRED

This section is ONLY for buildings with a central cooling plant and/or a condenser plant.

Cooling Loop

Cooling plant type	☐ Chiller ☐ District - Chilled Water

If **Chiller** was selected as the Cooling Loop plant type, complete the items below

Chilled water reset	☐ Yes ☐ No (default)
Chiller pump control	☐ Constant Primary (default) ☐ Constant Primary; Variable Secondary
Chiller compressor type	☐ Reciprocating ☐ Screw/scroll (default) ☐ Centrifugal
Chiller condenser type	☐ Air (default) ☐ Water
Condenser Loop *Applicable ONLY if condenser type is Water; a Condenser Plant Loop must be created in the Tool before selection is available.*	☐ Yes ☐ No

Year of manufacture If any cooling plant equipment was installed or replaced after the building was constructed, indicate the year of manufacture. Otherwise, the asset scoring tool will assume that the year of manufacture is the same as the year in which the building was constructed.	YEAR
Number of pieces of cooling equipment Enter the total number regardless of size	#
Cooling equipment efficiency For multiple pieces of equipment with various efficiencies, enter the weighted average efficiency of the predominant equipment. To convert from different heating/cooling units, see Appendix B—HVAC Unit Conversion table. Note: If you specify the equipment's efficiency, the year of manufacture will not be used.	COP
Average output capacity For multiple pieces of equipment, enter the average capacity for all pieces of equipment.	tons

Condenser Loop

Condenser plant type	☐ Cooling Tower ☐ Ground Heat Exchanger *(currently not an available option)*
Condenser pump control	☐ Constant Speed (default) ☐ Variable Speed
Cooling tower fan control	☐ Single Speed (default) ☐ Variable Speed

For Water-Loop Heat Pump HVAC systems, complete the fields for Boilers on the next page.

Plant Loop Equipment: Heating

FIELDS SHADED GREEN ARE REQUIRED

This section is ONLY for buildings with a heating plant.

Heating Loop

Heating plant type	☐ Boiler ☐ District Hot Water ☐ District Steam

If **Boiler** was selected as the Heating Loop plant type and for Water Loop Heat Pumps, complete the items below

Boiler fuel type (*select one*)	☐ Natural Gas (default) ☐ Fuel Oil ☐ Electricity ☐ Propane
Boiler draft type	☐ Mechanical (default) ☐ Other draft

Year of manufacture If any cooling plant equipment was installed or replaced after the building was constructed, indicate the year of manufacture. Otherwise, the asset scoring tool will assume that the year of manufacture is the same as the year in which the building was constructed.	YEAR
Number of pieces of heating equipment Enter the total number regardless of size	#
Heating equipment efficiency For multiple pieces of equipment with various efficiencies, enter the weighted average efficiency of the predominant equipment. To convert from different heating/cooling units, see Appendix B—HVAC Unit Conversion table. Note: If you specify the equipment's efficiency, the year of manufacture will not be used.	%
Average output capacity For multiple pieces of equipment, enter the average capacity for all pieces of equipment.	KBtu/hr

Heating and Cooling Equipment Details

FIELDS SHADED GREEN ARE REQUIRED

Complete the items below if **DX coils** were selected as the Cooling source

Year of manufacture If any cooling plant equipment was installed or replaced after the building was constructed, indicate the year of manufacture. Otherwise, the asset scoring tool will assume that the year of manufacture is the same as the year in which the building was constructed.	YEAR
Number of pieces of cooling equipment Enter the total number regardless of size	#
Cooling equipment efficiency For multiple pieces of equipment with various efficiencies, enter the weighted average efficiency of the predominant equipment. To convert from different heating/cooling units, see Appendix B—HVAC Unit Conversion table. Note: If you specify the equipment's efficiency, the year of manufacture will not be used.	COP
Average output capacity For multiple pieces of equipment, enter the average capacity for all pieces of equipment.	tons

Complete the items below if **Central Furnace** was selected as the Heating source

Year of manufacture If any cooling plant equipment was installed or replaced after the building was constructed, indicate the year of manufacture. Otherwise, the asset scoring tool will assume that the year of manufacture is the same as the year in which the building was constructed.	YEAR
Number of pieces of heating equipment Enter the total number regardless of size	#
Heating equipment efficiency For multiple pieces of equipment with various efficiencies, enter the weighted average efficiency of the predominant equipment. To convert from different heating/cooling units, see Appendix B—HVAC Unit Conversion table. Note: If you specify the equipment's efficiency, the year of manufacture will not be used.	%
Average output capacity For multiple pieces of equipment, enter the average capacity for all pieces of equipment.	KBtu/hr
Fuel type *(select one)*	☐ Natural Gas (default) ☐ Fuel Oil ☐ Electricity ☐ Propane

Complete the items below if **Heat Pump** was selected as the Heating source

Year of manufacture If any cooling plant equipment was installed or replaced after the building was constructed, indicate the year of manufacture. Otherwise, the asset scoring tool will assume that the year of manufacture is the same as the year in which the building was constructed.	YEAR
Number of pieces of heating equipment Enter the total number regardless of size	#
Heating equipment efficiency For multiple pieces of equipment with various efficiencies, enter the weighted average efficiency of the predominant equipment. To convert from different heating/cooling units, see Appendix B—HVAC Unit Conversion table. Note: If you specify the equipment's efficiency, the year of manufacture will not be used.	COP
Average output capacity For multiple pieces of equipment, enter the average capacity for all pieces of equipment.	KBtu/hr
Fuel type	☐ Electricity (default and only data entry option for heat pumps; Dual Fuel Heat Pumps are currenlty not supported)
Sink/source type *(select one)*	☐ Air (default) ☐ Ground (currenlty not an available option) ☐ Water (available only if Water-Loop Heat Pump is selected as the HVAC System Type)

Air Handler Unit Distribution and Fan Systems

FIELDS SHADED GREEN ARE REQUIRED

Complete the items below if AHU was selected as the HVAC Distribution equipment type

Distribution

Distribution type	☐ Single Zone AHU (default) ☐ Multi Zone AHU

Terminal Unit *(Applicable ONLY for systems with Multi-zone AHU)*

Terminal unit	☐ Reheat ☐ Powered Induction Unit
Reheat source *IIf 'HotWater Plant is selected, a Heating Plant also needs to be defined*	☐ Gas Fired ☐ Electric Resistance ☐ Hot Water Plant
Minimum air flow fraction	☐ 0.3 ☐ 0.4

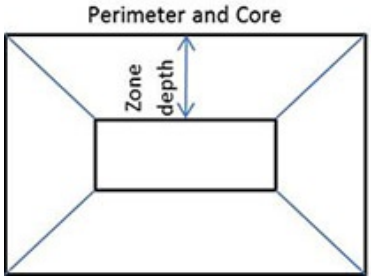
Fan Systems

Fan motor efficiency	%
Fan efficiency	%
Economizer	☐ Yes ☐ No (default)
Demand control ventilation	☐ Yes ☐ No (default)
Energy recovery ventilation	☐ Yes ☐ No (default)
Fan control *(select one per AHU)*	☐ Constant Air Volume (default) ☐ Variable Air Volume
Supply air temperature (SAT) Reset *Applicable ONLY for systems with Multi-zone AHU*	☐ Yes ☐ No (default)
Fan static pressure reset *Applicable ONLY for systems with Multi-zone AHU*	☐ Yes ☐ No (default)

Note: For Dedicated Outdoor Air Systems, fan control is set to constant; controls other than energy recovery ventilation are not available; and terminal units are not available in the Tool.

HVAC Thermal Zones

A building may be divided into thermal zones to reflect sections of the building that may have similar thermal loads, share a common thermostat, or are served by the same HVAC system. Your building may include either a single thermal zone or may be divided into four perimeters zones and one core zone (perimeter and core). If you don't know the thermal zone layout of your building, choose 'Single zone' for small buildings and 'Perimeter and core' for large buildings.



Thermal zone layout	☐ Single zone (default) ☐ Perimeter and core PERIMETER ZONE DEPTH (FT)
Carbon monoxide (CO) sensors *Applicable ONLY if the building use type is Parking Garage*	☐ Yes ☐ No (default)

Service Hot Water

FIELDS SHADED GREEN ARE REQUIRED

Fuel type *(select one)*	☐ Electric ☐ Natural Gas
Use of heat pump equipment (currently not an available option in the Tool)	☐ Yes ☐ No (default)
Distribution type	☐ Looped ☐ Distributed
Water heater efficiency	%
Tank volume	gallons
Tank insulation thickness	in
Tank insulation R-value	°F•ft^2•h/Btu
Use of Low Flow Faucets	☐ Yes ☐ No (default)

Block name(s) *(see page 11)*	

Building Operations

FIELDS SHADED GREEN ARE REQUIRED

Information about your building's operations can help inform the Scoring Tool's recommendations for energy efficiency upgrades; however, this information will not be used to calculate your building's current asset score.

Miscellaneous electric load	W/ft^2
Miscellaneous gas load	kBtu/ft^2
Total occupants	
Provide weighted average of full-time equivalent occupants. If this building includes use types not listed in the current version of the tool, EXCLUDE occupants associated with that portion of the building	
Setpoint, heating	°F
Setpoint, cooling	°F

Operating Hours

Opening time - closing time (weekdays)		to	
Opening time - closing time (Saturday)		to	
Opening time - closing time (Sunday)		to	

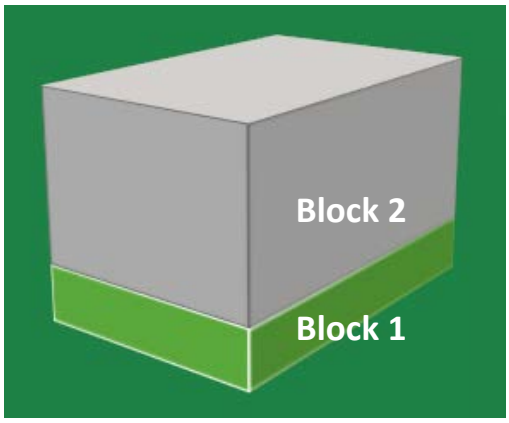
Elevators

Elevator type Buildings with fewer than 6 floors typically have hydraulic elevators. Buildings with 6 or more floors typically have traction elevators.	☐ Hydraulic ☐ Traction
Number of elevators	
Year of manufacture	

Block name(s) *(see page 11)*	

Block Geometry and Component Configuration

The energy asset score tool is designed to permit modeling a building with one or more 'blocks' that represent building sections with distinctly different energy assets or physical configurations. Most buildings may be scored as one block unless at least one of the follow situations applies:



a. The building has sections with different numbers of floors
b. The building footprint cannot be simplified by using only one of the available basic footprint shapes—rectangle, L-, T-, H-, or U-shape
c. Different parts of the building are served by different types of HVAC systems. (e.g., Block 1 is served by a local chiller; Block 2 is served by packaged DX units. Note that this does NOT refer to multiple pieces or sizes of equipment of the same type.)
d. The building is mixed-use. (e.g., Block 1 is retail; Block 2 is office.)
e. The building has sections with different operating schedules and/or internal loads. (e.g., Block 1 is occupied 16 hour per day; Block 2 is occupied 8 hours per day. Note that different operating conditions do NOT affect a building's asset score, but are considered in the economics of upgrade opportunities.)

Instructions:

1) Choose applicable block footprint shape and indicate dimensions for each surface (exterior wall)
2) Record window-to-wall ratios or the number and dimensions of the windows for each surface of the shape
3) Enter lighting power density options for the block
4) Enter HVAC system thermal zone layout for the block.

If your building contains more than one block, make additional copies of these pages as needed.

Block footprint shape	☐ Rectangular ☐ L-Shape ☐ T-Shape ☐ H-Shape ☐ U-Shape
Block name	
Number of floors *(enter whole numbers only)*	ABOVE GROUND
	BELOW GROUND
Average floor-to-floor height (default is 12 ft)	Ft
Average floor-to-ceiling height (default is 9 ft)	Ft
Orientation (default is 0.0 ○)	CLOCKWISE DEGREES FROM NORTH
Orientation of the main long axis: North=0, North East=45, East=90, South East=120, South=180, South West=225, West=270, North West=315.	

Block dimensions

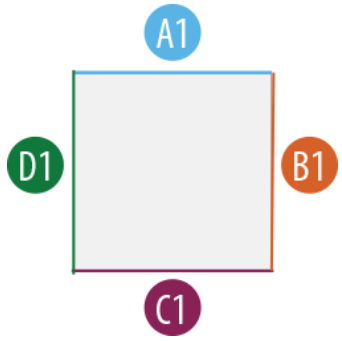
Enter the external dimensions (ft) of the block. The tool will automatically calculate the Total Block Floor Area (square feet).

Window to wall ratio

Every surface with a window must have a valid window-to-wall ratio. Select either a 'Continuous' (manually calculated) or 'Discrete' (calculated by the Tool) Window Layout approach for the window-to-wall ratio of your building. Refer to the Appendix B: Window Layout diagrams for assistance in recording data. If window-to-wall ratios are equivalent on all sides, you only need to record this information once.

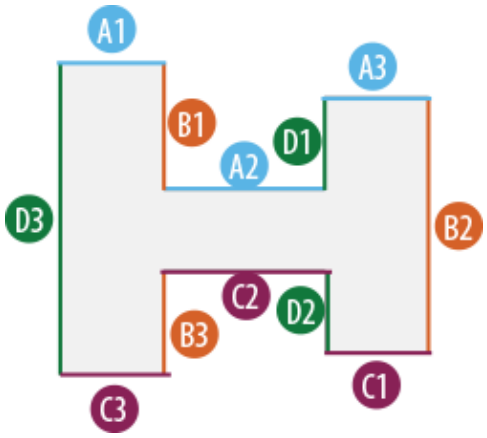
Footprint Shapes

Rectangular



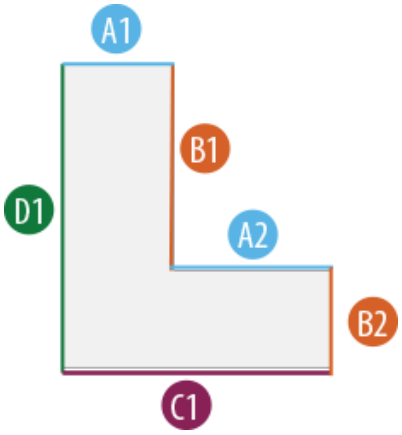
Block surface (wall length)		Window Layout				Lighting Daylight Controls (yes/no)
		Continuous	Discrete			
		Window-to-Wall Ratio	Window Width	Window Height	# of Windows	
A1 =	ft	%	ft	ft		☐
B1 =	ft	%	ft	ft		☐
C1 =	ft	%	ft	ft		☐
D1 =	ft	%	ft	ft		☐

H-Shape



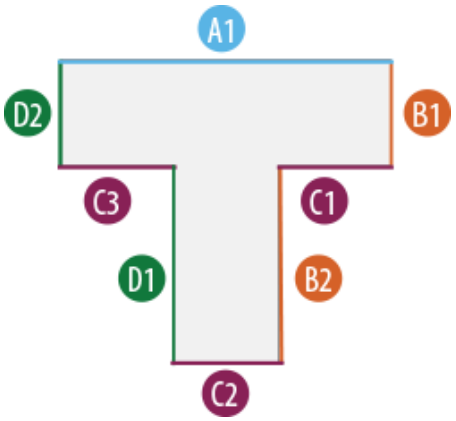
Block surface (wall length)		Window Layout				Lighting Daylight Controls (yes/no)
		Continuous	Discrete			
		Window-to-Wall Ratio	Window Width	Window Height	# of Windows	
A1 =	ft	%	ft	ft		☐
A2 =	ft	%	ft	ft		☐
A3 =	ft	%	ft	ft		☐
B1 =	ft	%	ft	ft		☐
B2 =	ft	%	ft	ft		☐
B3 =	ft	%	ft	ft		☐
C1 =	ft	%	ft	ft		☐
C2 =	ft	%	ft	ft		☐
C3 =	ft	%	ft	ft		☐
D1 =	ft	%	ft	ft		☐
D2 =	ft	%	ft	ft		☐
D3 =	ft	%	ft	ft		☐

L-Shape



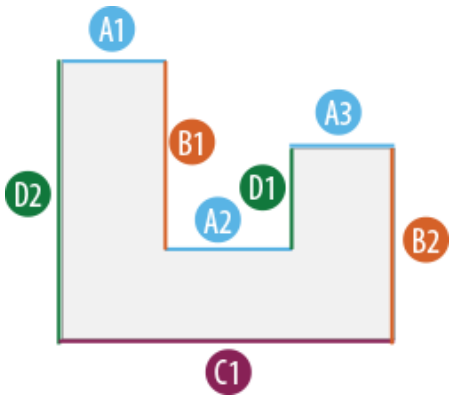
Block surface (wall length)		Window Layout				Lighting Daylight Controls (yes/no)
		Continuous	Discrete			
		Window-to-Wall Ratio	Window Width	Window Height	# of Windows	
A1 =	ft	%	ft	ft		☐
A2 =	ft	%	ft	ft		☐
B1 =	ft	%	ft	ft		☐
B2 =	ft	%	ft	ft		☐
C1 =	ft	%	ft	ft		☐
D1 =	ft	%	ft	ft		☐

T-Shape



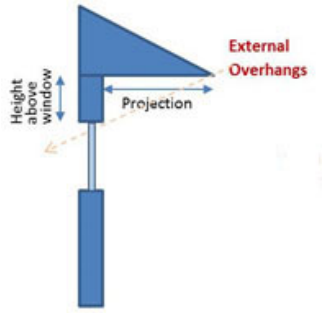
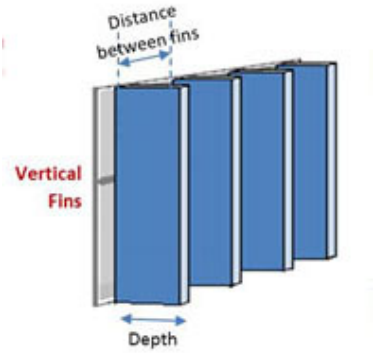
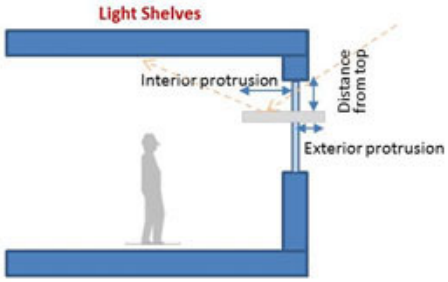
Block surface (wall length)		Window Layout				Lighting Daylight Controls (yes/no)
		Continuous	Discrete			
		Window-to-Wall Ratio	Window Width	Window Height	# of Windows	
A1 =	ft	%	ft	ft		☐
B1 =	ft	%	ft	ft		☐
B2 =	ft	%	ft	ft		☐
C1 =	ft	%	ft	ft		☐
C2 =	ft	%	ft	ft		☐
C3 =	ft	%	ft	ft		☐
D1=	ft	%	ft	ft		☐
D2=	ft	%	ft	ft		☐

U-Shape



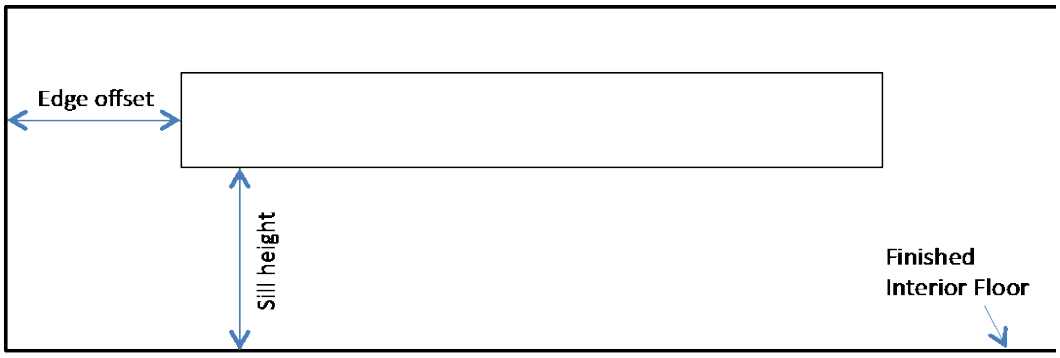
Block surface (wall length)		Window Layout				Lighting Daylight Controls (yes/no)
		Continuous	Discrete			
		Window-to-Wall Ratio	Window Width	Window Height	# of Windows	
A1 =	ft	%	ft	ft		☐
A2 =	ft	%	ft	ft		☐
A3 =	ft	%	ft	ft		☐
B1 =	ft	%	ft	ft		☐
B2 =	ft	%	ft	ft		☐
C1 =	ft	%	ft	ft		☐
D1 =	ft	%	ft	ft		☐
D2 =	ft	%	ft	ft		☐

Optional Window Block Entries

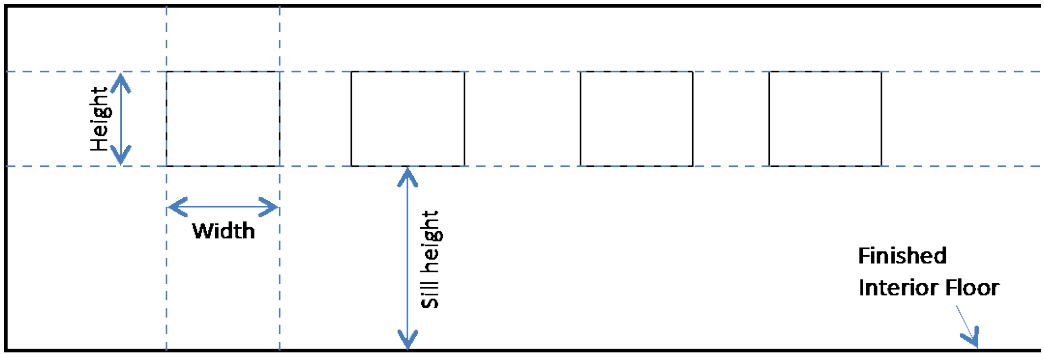
Window Exterior Shading Type		☐ No shading ☐ External overhangs ☐ Vertical fins ☐ Light shelves
	Overhang: Height above window	ft
	Overhang: Projection	ft
	Vertical fins: Fin depth	ft
	Vertical fins: Distance between fins	ft
	Vertical fins: Edge fin only	☐ Yes ☐ No
	Light shelves: Distance from top	ft
	Light shelves: Exterior protrusion	ft
	Light shelves: Interior protrusion	ft

Appendix A: Window layout

Continuous window layout—Manually calculate and enter the *Window-to-Wall Ratio*. The *Edge offset* and *Sill height* of the windows may be added per the following diagram (optional):



Discrete window layout—*E*nter the *number of windows* and the *width* and *height* of the windows per the following diagram, and the Tool will calculate the window-to-wall ratio:



Appendix B:

HVAC Unit Conversion table

Cooling			
1	**SEER to COP Conversion**		
	Step 1	EER	$(-0.0182 \times (SEER)^2) + (1.1088 \times SEER)$
	Step 2	COP	EER/3.413
2	**EER to COP Conversion**		
		COP	EER/3.412
3	**kW/ton to COP Conversion**		
		COP	(12/(kw/ton))/3.412

Heating			
1	**HSPF to COP Conversion**		
		COP	(-0.0255 x (HSPF)2) +(0.6239 * HSPF)
2	**AFUE to Thermal Efficiency for gas Furnaces**		
	All Single Packaged Equipment		
		E_t	0.005163 X AFUE + 0.4033
	All Split Systems (With AFUE <= 83.5)		
		E_t	0.002907 x AFUE +0.5787
	All Split Systems (With AFUE > 83.5)		
		E_t	0.011116 X AFUE - 0.098185
3	**AFUE to Thermal Efficiency for Boilers**		
	For 75% <= AFUE <80%		
		E_t	0.1 X AFUE + 72.5%
	For 80% <= AFUE <= 100%		
		E_t	0.875 X AFUE + 10.5%
4	**Combustion Effiiency to Thermal Efficiency**		
		E_t	E_c - 2%

Appendix C:

Common HVAC Systems as Configured in Asset Score

Selecting one of the HVAC System Types listed below in the Asset Score tool will automatically populate the default system components listed in the table. These (and other) system types may also be manually added and edited by selecting the associated Distribution Equipment types, and the Cooling and Heating sources.

HVAC System Type	Distribution Equipment	Cooling Source	Heating Source	Distribution Type	Heating Fuel	Fan Control	Terminal Unit	Condenser Loop Type
Packaged Rooftop Air Conditioner (RTU)	Air Handler	Central DX	Central Furnace	Single Zone	Natural Gas	Constant Volume		
Packaged Rooftop Heat Pump	Air Handler	Central DX	Heat Pump	Single Zone	Electricity	Constant Volume		
Packaged Rooftop VAV with Hot-Water Reheat	Air Handler	Central DX	Plant: Boiler Plant Loop	Multi Zone	Natural Gas	Variable Air Volume	Reheat	
Packaged Rooftop VAV with Electric Reheat	Air Handler	Central DX	Central Furnace	Multi Zone	Electricity	Variable Air Volume	Reheat	
VAV with Hot-Water Reheat*	Air Handler	Plant: Chiller Plant Loop	Plant: Boiler Plant Loop	Multi Zone	Natural Gas	Variable Air Volume	Reheat	Cooling Tower
VAV with Electric Reheat*	Air Handler	Plant: Chiller Plant Loop	Central Furnace	Multi Zone	Electricity	Variable Air Volume	Reheat	Cooling Tower
Warm Air Furnace	Air Handler	No Cooling	Central Furnace	Single Zone	Natural Gas	Constant Volume		
Ventilation Only*	Air Handler	No Cooling	No Heating	Single Zone		Constant Volume		
Dedicated Outdoor Air System*	Air Handler	Various - see below	Various - see below			Constant Volume		
Packaged Terminal Air Conditioner (PTAC)	Zone Equipment	Terminal DX	Central Furnace		Natural Gas			
Four Pipe Fan Coil Unit	Zone Equipment	Plant: Chiller Plant Loop	Plant: Boiler Plant Loop		Natural Gas			
Packaged Terminal Heat Pump (PTHP)	Zone Equipment	Terminal DX	Heat Pump		Electricity			
Water-Loop Heat Pump*	Zone Equipment	Terminal DX	Heat Pump	Single Zone	Electricity	Constant Volume		Cooling Tower
Ground Source Heat Pump*	Zone Equipment	Terminal DX	Heat Pump	Single Zone	Electricity	Constant Volume		Ground Heat Exchanger

* Asset Score Data Entry Notes:

Ventilation Only – Available as a selection for Air Handlers, a ventilation only (no cooling, no heating) system may only be assigned to a block with Parking Garage (Ventilation Only) selected as the use type.

VAV with Hot-Water Reheat and VAV with Electric Reheat -- For water-cooled chillers, first add a Condenser Plant Loop, then add a Cooling Plant Loop with a Chiller Plant and select the Condenser Loop so they are linked.

Dedicated Outdoor Air System (DOAS) – Available as a selection for Air Handlers, the following combinations of heating and cooling sources are permitted for a DOAS entry:

1. Heating Source = Plant; Cooling Source = Plant
2. Heating Source = Furnace; Cooling Source = Central DX
3. Heating Source = Heat Pump; Cooling Source = Central DX

Two component entries need to be created and assigned for a DOAS. DOAS is considered to be a 'Primary Ventilation' system, and will need to have a Zone Equipment added and assigned to a block as the 'Primary Heating/Cooling System' to complete the HVAC System entry.

Water-Loop Heat Pump – When assigning to a block in Asset Score, first add a Condenser Plant Loop with a Cooling Tower Plant, then add a Boiler Plant using the ‘Add a Boiler’ button.

Ground Source Heat Pump – To be available in a future version of Asset Score.