SE 2050 Beta Database User Guide

Version 1.0
September 3, 2021

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Introduction

The goal of this User Guide is to assist structural engineers and project team members in submitting project data to the SE 2050 Database as part of their SE 2050 Commitment. The Database is populated by users with inputs for Project Information and Global Warming Potential (GWP) Data. This Guide provides a definition for each Database entry field accompanied by notes to the User.

Due to the complexity of project-specific data, it is acknowledged that not all projects will have the ability to follow this User Guide exactly. Users are encouraged to fill out the Database fields to the best of their ability while maintaining the "spirit" of the intended definition.

More detailed information about performing Life Cycle Assessments (LCA) will be provided in the forthcoming *SE 2050 Database LCA Methodology Guide*, intended for publication in 2022. However, users are encouraged to begin performing Life Cycle Assessments and submit projects to the database as soon as possible using available resources, including the SE 2050 Embodied and other tools mentioned in this User Guide. The SE 2050 Beta Database allows users to easily update any project at any time when the design progresses or the LCA is refined.

SE 2050 Beta Database User Guide

This document

- General information about the use of the SE 2050 Beta Database
- Basic guidance on SE 2050 Beta Database project input parameters

SE 2050 LCA Methodology Guide

Anticipated publication: 2022

- Detailed guidance on SE 2050 Beta Database project input parameters
- Best practices for performing Life Cycle Assessment (LCA)
- References to other LCA resources

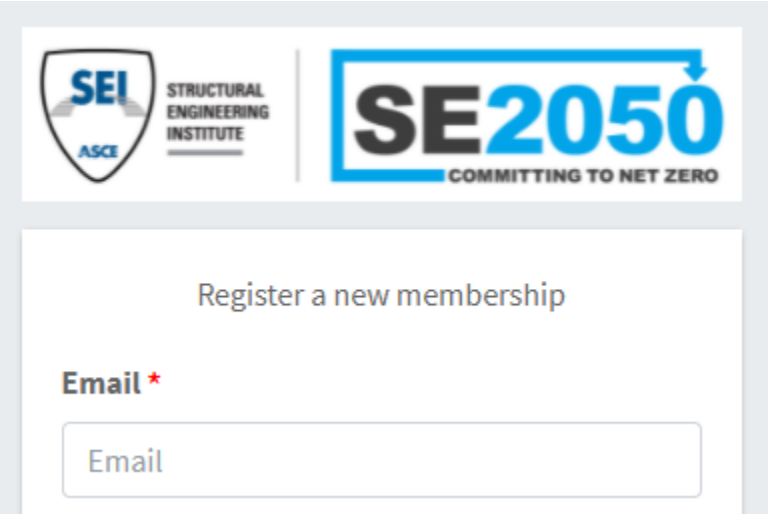
The User Guide has been written under the assumption that the project is located within the United States, and several database field descriptions are based on the most recent versions of International Building Code (IBC) and ASCE 7. While it is still encouraged that non-U.S. projects are added to the Database, this may require Users to determine appropriate equivalency to the Database entry fields.

This database would not exist without the participation and support of SE 2050 Signatory Firms. Your comments, questions, and suggestions are always welcome at database@se2050.org.

1.0 - Using the SE 2050 Database

1.1 - Accessing the Database

After a firm joins the SE 2050 Commitment Program, firm members may register for an SE 2050 Database user account here: https://database.se2050.org.

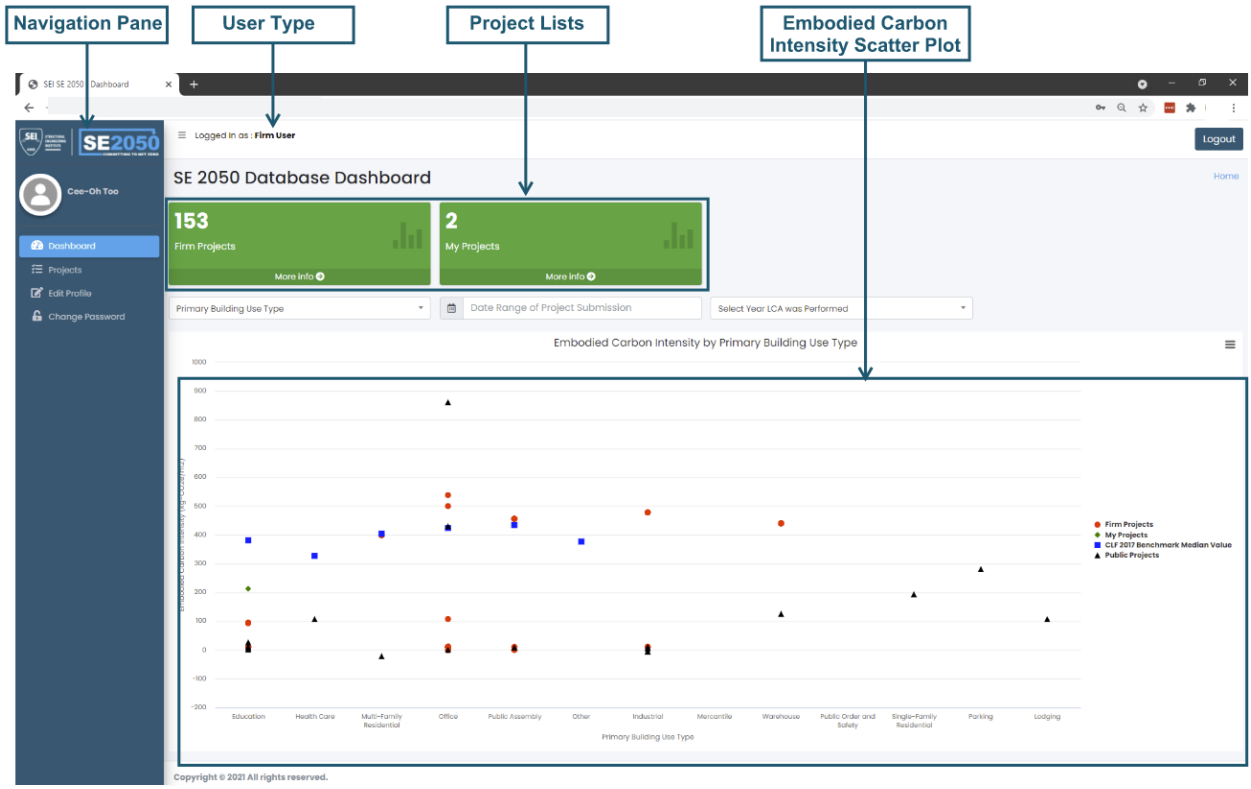


Upon registration, you will be assigned one of two user types:

User Type	Who	Privileges
Firm Admin	- The designated Embodied Carbon Champion for each firm is a Firm Admin by default - Additional users as designated by an existing Firm Admin	- Add new projects - View or edit data for any project submitted by the firm - Add new Firm Users - Upgrade a Firm User account to Firm Admin - Toggle Firm Users between Active/Inactive. This may be used, for example, if a Firm User leaves the firm. Projects created by a Firm User that becomes Inactive will still be associated with that Firm User, but the Inactive Firm User will not be able to access the SE 2050 Database. The Firm Admin can still edit or delete the Project.
Firm User	- Any user with a company email may request a Firm User account and must be approved by a Firm Admin	- Add new projects - View data for any project submitted by the user's firm - Edit data only for projects submitted by the user

1.2 - Dashboard

Once a registered account has been activated, Users may log in to the Database and access the SE 2050 Database Dashboard.



From the Dashboard, Users can see their User Type, how many projects they've added to the Database, how many projects their firm has added, and the Embodied Carbon Intensity Scatter Plot.

Navigation Pane

The Navigation Pane includes the following options:

- **Dashboard**: returns User to the Dashboard from any module
- **Firm Admin** (Available for Firm Admin user type only): List of all all Firm Admins in the Firm, *excluding the current user*
- **Firm Users** (Available for Firm Admin user type only): List of all Firm Users, *excluding Firm Admins*, with options to add new Firm Users, activate/deactivate Firm Users, or upgrade a Firm User to Firm Admin
- **Projects**: See Projects
- **Edit Profile**: User can edit their own name, email, profile picture, and Address
    - *Known bug: Upload New Profile Photo is not functional. A photo is not required.*
- **Change Password**: User will need to enter the current password and

Embodied Carbon Intensity Scatter Plot
This plot shows the Embodied Carbon Intensity for:

- Buildings submitted by the User's firm
- Buildings submitted by other firms that have been made public (see Show Project GWP Intensity on dashboard for all signatory firms)
- CLF 2017 Benchmark Median Values, where available

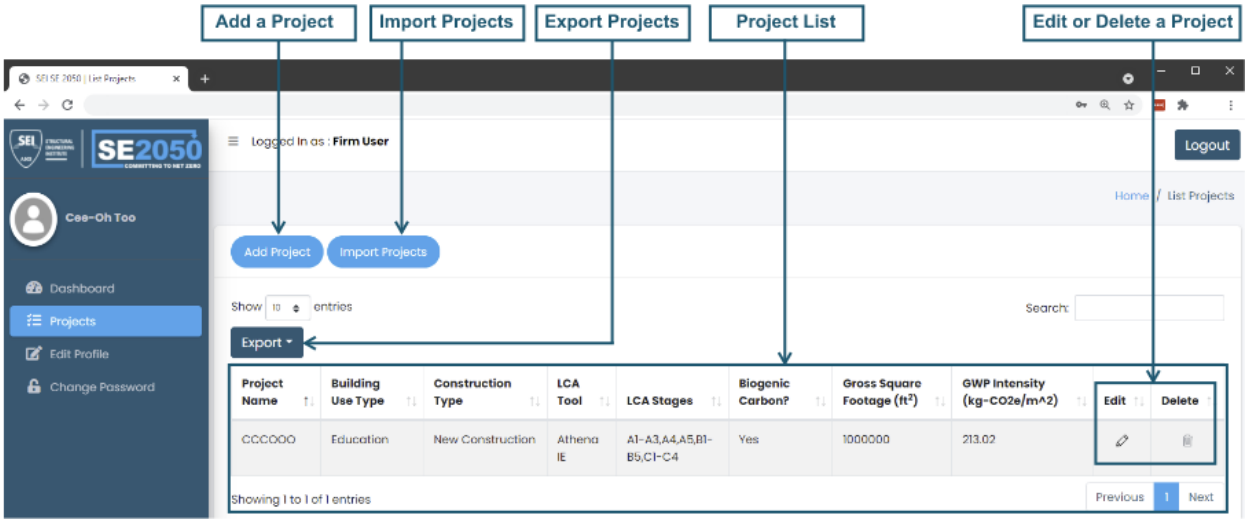
Users can sort the data in three ways:

- By Primary Building Use Type
- By Number of Stories Above Grade
- By Gross Square Footage

The data can also be filtered by the "Date Range of Project Submission." As noted in the field, this date refers to the date the project was added to the Database, not the date of construction. The intent is to assist firms in verifying compliance with database submission requirements. This may also be accomplished using sorting tools on the Projects page.

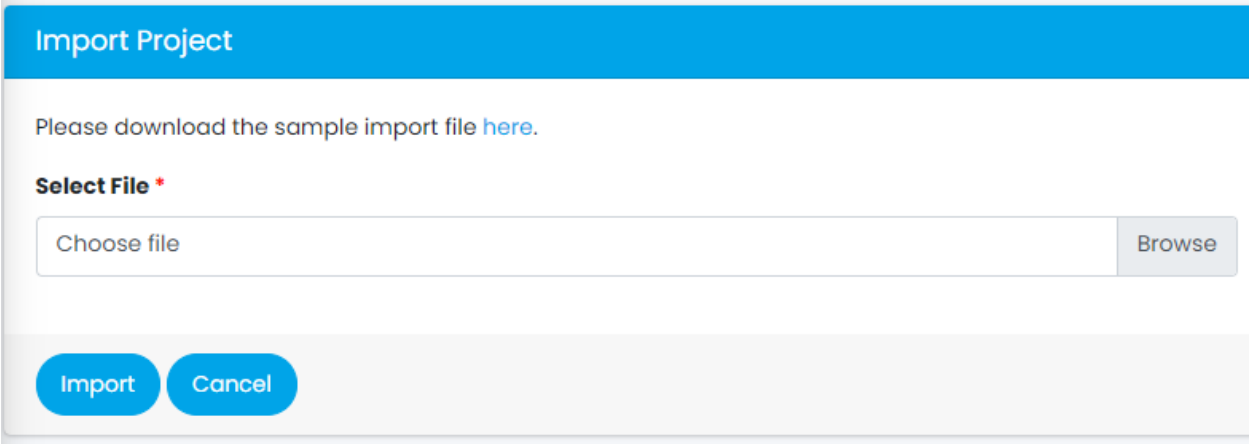
1.3 - Projects

Navigate to the Projects page by clicking on "Projects" in the navigation pane. Here, Users can add a project, edit existing project data (subject to the limitations of the User Type), and view existing firm data.



Add Project
Click this to open the New Project page and add a new project. See User Guide section 2.0 - Project Information for detailed guidance about each input parameter.

Import Projects
Click this to open the Import Project module:



To import one or more projects using a spreadsheet (.xlsx) or .csv file, first download the sample import spreadsheet by clicking the link on the word “here.” The spreadsheet contains detailed instructions for properly filling out the spreadsheet and importing projects using either the .xlsx or a .csv file.

All fields for a project must have an appropriate input value for the project to import successfully. The sample spreadsheet lists acceptable data types for each field, and in-cell data validation is used in certain fields to limit potential import errors. After an import is attempted, a message will appear at the top of the screen indicating either that all projects were imported successfully or that certain projects were not imported successfully. Users are highly encouraged to review project data after an import to verify the imported values.

Please contact database@se2050.org for any questions or to report unexpected behavior.

Known error in the instructions within the sample import spreadsheet: the instructions in cell C4 refer to “Gray cells in rows 10-22...” but should refer to “Gray cells in rows 23-35...”

Project List

This list shows a select set of important project parameters for a user’s projects. There are two ways to view all parameters for a project:

- Edit Project using the (Edit) button
- Export Projects using the Export button as described below

Additional Project List features:

- Sort the Project List by clicking on the up/down arrows next to any column heading
- Filter the list by typing in the Search bar in the upper right corner of the Project List. This will search across all parameters shown on the list. To search or filter based on a specific parameter, we recommend exporting the full project list as an Excel spreadsheet and adding a filter to the header row of the spreadsheet.

Export Projects

This will export a complete list of parameters for all of the projects that a user has access to (see 1.1 - Accessing the Database for more information about User permissions). Select one of the following options from the 

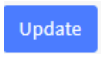
button dropdown:

- **Copy -** Copy plain text to your clipboard
- **Excel -** Download an Excel (.xlsx) file
- **CSV -** Download a comma delimited (.csv) file
- **PDF -** Download a (.pdf) file
    - *Known bug: The PDF option cuts off some of the table content. You may use the "Print" option instead and select the Print Dialogue for greater control*
- **Print -** Print a document using your browser's Print dialogue

Note: If you have typed anything in the search bar in the upper right corner of the project list, the exported project list will be filtered.

Edit Project

Project data may be edited at any time by any user that has the required permission (see 1.1 - Accessing the Database for more information about User permissions).To begin editing, click on the  (Edit) button in the Project List. This will take you to the Edit Project page. This page is similar to the Add Project page, but all input fields will be prefilled with the current project data.

To make changes, edit any number of inputs, then click the 

button at the bottom of the page to apply changes to the project. To return to the Projects page without saving changes, click the 

button.

Delete Project

A project may be deleted at any time by any User that has the required permission to edit the project (see 1.1 - Accessing the Database for more information about user permissions).To delete a project, click on the  (Delete) button in the Project List, then click "OK" when prompted by the popup to confirm the deletion. Once a project is deleted, it cannot be recovered.

2.0 - Project Information

Project Information inputs collect project-specific data not directly related to the GWP. The goal of collecting this data is to allow for the eventual development of industry-wide benchmarks and targets specific to relevant project parameters.

The following sections provide a description of each input related to Project Information with notes to the User as appropriate:

2.1 - Project Name

Enter the name of the project, using the official project name at completion if known.

2.2 - Address

Enter the project street address or closest known address in the text box.

The “Google Address Lookup” form is an aid to save time and improve address accuracy. Start typing an address in the form, then select from the list of known addresses to autofill the Address, State, City, Zip Code, and Country fields. It is not necessary to use the Google Address Lookup form, and values autfilled from using this form can be manually overridden.

2.3 - City

Enter the name of the city where the project is located.

2.4 - State

Enter the two-letter abbreviation for the state where the project is located.

2.5 - Country

Enter the country where the project is located. Enter “United States” for projects in the United States (not US, USA, etc).

2.6 - Zip Code

Enter the 5-digit zip code in the text box. If Google Address Lookup box autofills a four-digit extension, delete the hyphen and four-digit extension

If the project is not in the United States:
Enter the relevant postal code for the country the project is in, or enter “00000” if no postal code is used.

2.7 - Primary Building Use Type

Select one of the following options using the dropdown:

Primary Building Use Type
Input Options
Office
Public Assembly
Education
Industrial
Mercantile
Multi-Family Residential
Warehouse
Other
Public Order and Safety
Single-Family Residential
Parking
Lodging
Health Care

For mixed-use buildings:
Select the use with the greatest floor area devoted to it.

What is the basis of this list of options?
Various building use classification systems were considered in creating the available list of options - primarily those used by the IBC and the Commercial Buildings Energy Consumption Survey (CBECS).

Appendix C - Primary Building Use Classification provides a comparison between these classification systems and includes references to further guidance if the proper classification is not clear.

2.8 - Construction Type

Select one of the following options using the dropdown:

Construction Type	
Input Options	*Description*
New Construction	- Brand new building on a greenfield or brownfield site - New building in the place of a demolished building if no existing elements are being reused - Horizontal expansion of an existing building in which there is very little structural interaction between the old and new buildings
Major Renovation of Existing Building	- Vertical expansion of an existing building (new stories added on top of existing stories) - Renovation that involves significant modifications to structural framing such that IEBC code is triggered (5% of mass, … - Retrofitting for seismic or other hazards

The database is not currently intended for the following types of projects:

- Tenant improvement (TI) projects which primarily include modification to non-structural elements
- Infrastructure projects that are not similar to buildings
    - For example, a train station is an appropriate project type for the database, whereas a concrete gravity dam or highway should be excluded.
    - Future development to the Database is planned to incorporate infrastructure projects.

2.9 - Construction Year Completed (or Anticipated)

Enter the year when the contractor has completed or anticipates completing all work specified in the construction contract in accordance with the construction documents (specifications and drawings). All punch list work and final inspections have been completed (or are anticipated to be complete) at this time.

2.10 - Project Phase at LCA

Select one of the following options using the dropdown:

Project Phase at LCA	
Input Options	*Description*
Concept	The concept phase includes developing the building concept, investigating its feasibility, and proposing the concept to stakeholders to make a decision to develop the concept further.
Schematic	The schematic phase includes rough drawings or a narrative that illustrate the basic concepts of the building design which most often include spatial relationships as well as basic scale and forms the owner might desire. At this time, initial descriptions of the structural, mechanical, HVAC, plumbing and electrical, interior and exterior finishes and building site are often included. The schematic phase also includes initial cost estimates.
Design Development	The design development phase involves finalizing the building design and specifying items such as materials, window and door locations and general structural details.
Construction Documents	The construction document phase includes the development of final architectural, structural, civil, mechanical, and electrical drawings to be used for construction. These drawings are in greater detail than drawings produced during design development and typically include specifications for construction details and materials.
Construction	The contractor constructs the building in accordance with the construction documents during the construction phase. The architect, engineers, and consultants perform quality control inspections, respond to Requests for Information (RFIs), review and approve technical submittals and generally ensure that the project is constructed by the contractor in accordance with the construction documents.
Completed	The contractor has completed the construction contract in accordance with the construction documents, and a Certificate of Occupancy has been issued.

2.11 - Expected Building Life (years)

Select one of the following options using the dropdown:

Expected Building Life (years)
Input Options
20
60
75
100

The expected building life is the period of time for which the building meets or exceeds its performance requirements. The expected building life is typically assumed by the designer based on the owner's project requirements. The expected building life selected should match the expected building life used within the LCA tool.

Additional guidance regarding Expected Building Life will be provided in the forthcoming SE 2050 LCA Methodology Guide. In the absence of more specific guidance, 60 years is a commonly assumed expected building life.

2.12 - Gross Square Footage (ft^2)

Gross square footage (or gross area) of a building shall represent the total horizontal area, measured in plan, taken to the outer edge of the exterior envelope. The area value reported shall be consistent with the architectural information of the project and follow a standard calculation method, such as those published by the Building Owners and Managers Association International (BOMA) for various building types. It is not recommended for structural engineers to calculate this value separately.

For renovation projects:
The gross area shall represent the total area of the existing building being renovated/retrofitted and any new area added.

2.13 - Mean Roof Height (feett)

Mean roof height shall match the quantity "h" per ASCE 7 wind loading provisions, measured from the base to the roof of the structure. For sloped roof structures, the average elevation of the roof shall be used to calculate "h". Parapets or other roof appendages shall not be included in roof height.

For renovation projects:
The roof height shall be that of the total completed building, including the existing structure and any additions.

2.14 - Number of Stories, Above Grade

Enter any non-negative number of above grade stories following ASCE 7, which defines a story above the grade plane as one in which “the floor or roof surface at the top of the story is more than 6 ft above grade plane or is more than 12 ft above the finished ground level at any point on the perimeter of the structure.” Small mezzanine areas that have floor areas of less than 10% of that of an adjacent floor shall not be counted in the total number of stories.

For renovation projects:
The number of stories shall be that of the total completed building, including the existing structure and any additions.

2.15 - Number of Stories, Below Grade

See 2.13 for definition of stories above grade. Stories below grade shall be any stories below those considered above grade.

3.0 - Structural System Information

3.1 - Typical Column Grid, Long Direction (feet)

Enter the center-to-center spacing of the project's typical column grid in the long direction. It is acknowledged that projects will have columns at some non-typical spacing. Engineers shall use judgment to establish what column grid represents a majority of the horizontal framing area of the building. The purpose of collecting this information is to understand how embodied carbon is related to span lengths due to changes in beam framing material quantities, so the users shall select a span value that is representative of the predominant framing configuration for their project. An average span may be used if the building has a very irregular column layout with no "typical" bays.

For light-frame floors (typically wood or cold-formed steel joists) supported by continuous walls: Enter the typical joist span.

3.2 - Typical Column Grid, Short Direction (feet)

This quantity is defined as the center-to-center spacing of the project's typical column grid in the short direction. See 2.15 for additional information.

For light-frame floors (typically wood or cold-formed steel joists) supported by continuous walls: Enter the typical joist spacing.

3.3 - Risk Category

Select the Risk Category as defined by ASCE 7.

3.4 - Typical Floor Live Load (psf)

Enter the typical design live load pressure in the occupied areas of the building in units of pounds per square foot (psf). As the building will have a variety of live load requirements, this value should represent the loading value that covers the majority of the building framing. Note that this floor live load shall represent the actual design load of the project, which may be greater than the code minimum live load values specified in ASCE 7 due to building-specific requirements.

3.5 - Ground Snow Load (psf)

Ground snow load shall match the value of p_g as defined by ASCE 7. The reported value shall represent the actual value used for the project, which may be greater than minimum values in

ASCE 7, based on specific requirements for the project or as required by the AHJ. For projects in which snow loads were not considered, a value of 0 shall be entered.

3.6 - Ultimate Wind Speed (mph)

Wind speed defined as V per ASCE 7. The reported value shall represent the actual value used for the project, which may be greater than minimum values in ASCE 7, based on specific requirements for the project as required by the AHJ.

3.7 - Seismic Site Class

Classification of site according to soils per ASCE 7.

3.8 - Seismic Design Category

Classification based on risk category and design earthquake level of the site per ASCE 7

3.9 - Primary Horizontal Gravity System

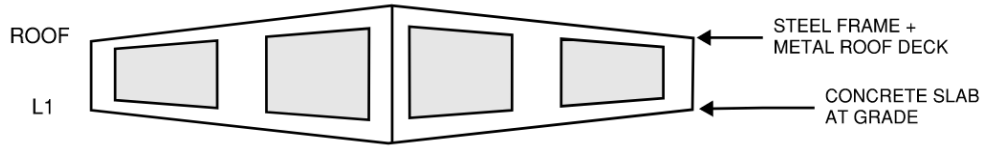
Select the option that best represents the building's primary horizontal gravity framing system based on the following system descriptions:

Primary Horizontal Gravity System	
Input Options	*Description*
Concrete: PT Framing	Concrete framing with PT tendons and mild reinforcing bars. Includes 2-way slab and1-way with beams.
Concrete: Non-PT Framing	Cast-in-place concrete system with only mild reinforcing. Includes 2-way slab and 1-way with beams.
Concrete: Precast	System of precast elements. System may be prestressed and may include a concrete topping.
Concrete: Other	2/3 of the floor area is composed of a concrete framing system not listed above or a combination of different concrete framing systems.
Steel: Frame + Concrete on Metal Deck	Concrete or Composite slab on metal deck with steel supports, such as wide-flange beams or open web steel joists (OWSJ).
Steel: Frame + Bare Metal Deck	Steel framing members with bare metal deck. This system should be selected when a majority of the horizontal framing in the structure is metal roof deck.
Steel: Other	2/3 of the floor area is composed of a steel framing system not listed above or a combination of different steel framing systems.

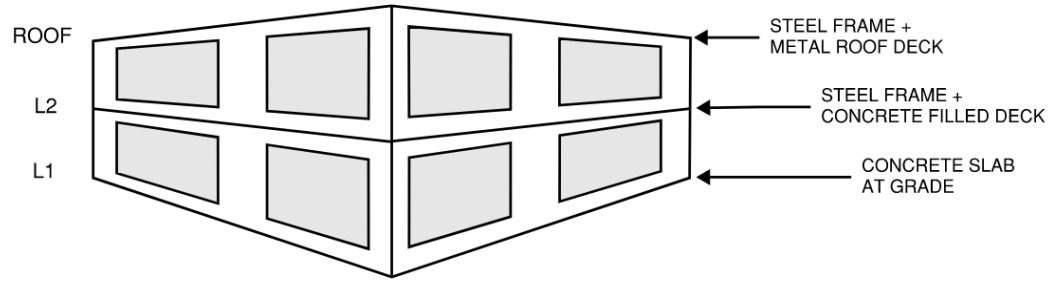
Wood: Joists and Sheathing	Plywood or OSB decking supported by wood joists. Joists may be standard wood or engineered wood.
Wood: Engineered Panels	CLT, DLT, NLT, GLT or other engineered wood panels. May include concrete topping.
Wood: Other	2/3 of the floor area is composed of a wood framing system not listed above or a combination of different wood framing systems.
Other Material (not concrete, steel, or wood)	2/3 of the floor area is composed of a framing system not listed above.

For the SE 2050 database, the Primary Horizontal Gravity System is defined as the system comprising at least ⅔ of the combined floor and roof area of the superstructure (excluding the slab at grade). The slab at grade is considered part of the substructure, regardless of whether the slab bears on soil or is designed as a suspended slab. See guidance examples below:

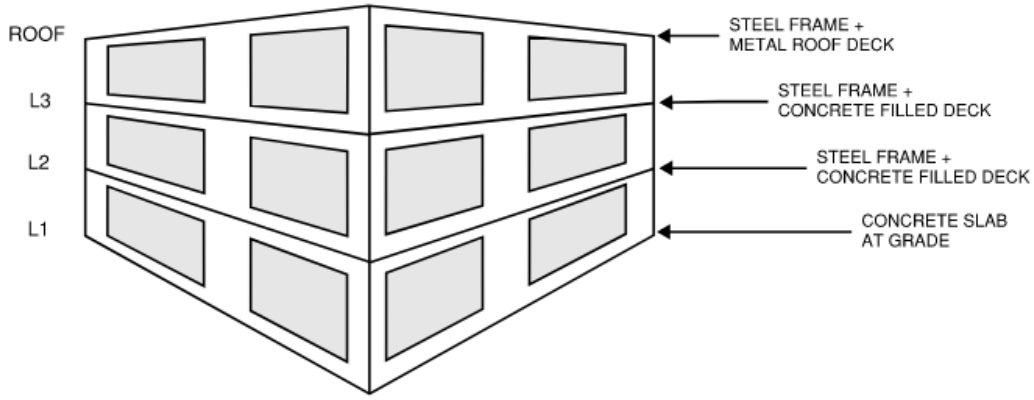
For a one story building with a concrete slab at grade and a steel frame with bare metal deck roof:
Select “Steel: Frame + Bare Metal Deck Roof” regardless of the type of slab at grade.



For a two-story building with a concrete slab at grade, steel frame with concrete filled metal deck floor at Level 2, and steel frame with metal deck roof:
Select “Steel: Other” because approximately 50% of the combined elevated floor and roof area is concrete filled metal deck and 50% is bare metal deck.



For a three-story building with a concrete slab at grade, steel frame with concrete filled metal deck floor at Levels 2 and 3, and steel frame with metal deck roof:
Select “Steel: Frame + Concrete on Metal Deck” because approximately ⅔ of the combined elevated floor and roof area is concrete filled metal deck, and this meets the ⅔ threshold.



For a structure that includes multiple materials, with no system making up more than ⅔ of the superstructure floor area:
Select the "Other" category associated with the material that makes up the most superstructure floor area.

3.10 - Primary Vertical Gravity System

Select the option that best represents the building's primary vertical gravity framing system based on the following system descriptions:

Primary Vertical Gravity System	
Input Options	*Description*
Concrete: CIP	Cast-in-place concrete columns and walls
Concrete: Precast	Precast concrete columns and walls
Concrete: Other	Other Concrete Vertical Gravity System
Steel: Columns	Steel wide flange or rectangular, square, or round hollow structural section columns
Steel: Cold-Formed	Cold-formed steel columns and/or Light-frame cold-formed steel bearing walls
Steel: Other	Other Steel Vertical Gravity System
Wood: Mass Timber	Mass or heavy timber columns, e.g. Glulam
Wood: Light-Frame	Light-Frame wood bearing walls
Wood: Other	Other Wood Vertical Gravity System

Masonry	Masonry columns and/or bearing walls

3.11 - Primary Lateral System

Select the option that best represents the building's primary lateral framing system based on the following system descriptions:

Primary Lateral System	
Input Options	*Description*
Concrete: Shear Walls	CIP or Precast Shear Walls
Concrete: Moment Frames	CIP or Precast Concrete Moment Frames
Concrete: Other	Other, including concrete cantilevered columns, or multiple steel systems including all-steel dual systems
Steel: Braced Frames	Steel braced frame, including buckling restrained braces (BRB)
Steel: Moment Frames	Steel moment frames
Steel: Other	Other, including steel plate shear walls, steel cantilevered columns, or multiple steel systems including all-steel dual systems
Light Frame Shear Panels	Wood or cold formed walls with shear panels such as plywood or OSB
Masonry: Shear Walls	Masonry Shear Walls
Wood: Shear Panels	Engineered wood shear panels, including CLT
Wood: Other	Other, including wood cantilevered columns or light-framed walls with shear panels of non-wood materials
Other	Material not listed above, or no single material predominates (includes Dual Systems with multiple materials)

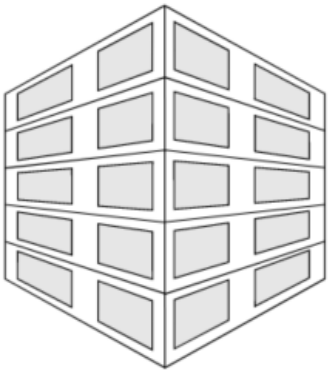
For mixed vertical and lateral systems, the guidelines for selection of the horizontal system also apply.

3.12 - Podium

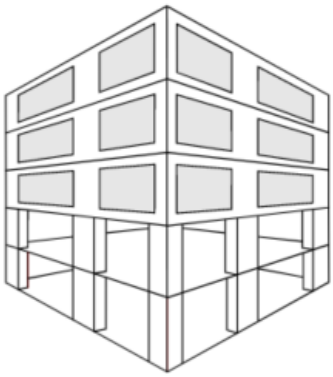
Select one of the following options using the dropdown:

Podium	
Input Options	*Description*
Not a Podium Building	Select this if the building does not have a podium (see definition below).
Primary System Defined Above is On a Podium	Select this when the majority of floors in the *superstructure* (excluding slab at grade - see Section 3.4) are above the podium.
Primary System Defined Above is a Podium	Select this when the majority of floors in the *superstructure* (excluding slab at grade - see Section 3.4) are a part of the podium.

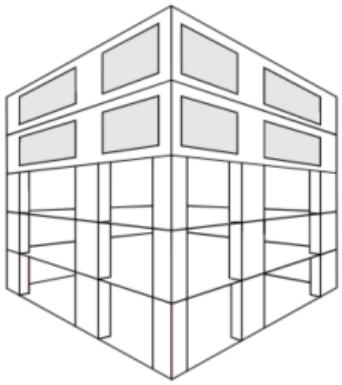
A podium building is one that is split vertically into two distinct zones with different structural systems and/or materials. One common example of this type of building is a residential structure comprising several stories of light wood framing over one or two levels of concrete framing.



Not a Podium Building



Primary System Defined Above is On a Podium



Primary System Defined Above is a Podium

Although it would be interesting and potentially beneficial for benchmarking purposes for the user to enter separate building information and GWP data for each system in a podium building, the SE 2050 Database does not have this feature currently. Furthermore, it may be more onerous on the user in many cases to split up the GWP attributed to the podium portion versus non-podium portions of the building.

Therefore, at this time, the user should select as the “primary” structural system whichever system is used for the majority of superstructure floors. By including this question in the SE 2050 Database, it will be possible to distinguish buildings that are generally one system (per the rules established in Section 2.23) from those that have multiple distinct systems.

If the number of podium and non-podium superstructure floors are equal:
Select the non-podium system as the “primary” system.

Should I enter the GWP for only the "primary" structural system?
No - always enter the GWP for the entire building structure, regardless of the structural system defined as "primary." This is because the podium design is still affected by the structure above and the foundation carries the load of both the podium and non-podium. Entering a fictitious structure with inherent incongruencies is likely to be more misleading than entering complete building information with identifiers for it to be easily set apart in future data analysis.

3.13 - Allowable Soil Bearing Pressure (psf)

Enter the allowable soil bearing pressure in pounds per square foot (psf), selecting from one of the following:

Allowable Soil Bearing Pressure (psf)
Input Options
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
10,000
15,000
20,000
30,000
40,000

The Allowable Soil Bearing Pressure represents the load the soil is capable of supporting without failure and without intolerable settlement of the structure and should be consistent with the value used for the design of foundations, whether from a site-specific geotechnical report or presumptive values found in the IBC.

If your project's allowable bearing pressure does not appear on this list:
Choose the value closest to your bearing pressure; round up as a tiebreaker

If your project has multiple bearing pressures at different locations on the site:
Use your judgment to input an approximate "weighted average" site bearing pressure based on the total weight supported at each .
Example:
⅔ of total building weight bears on shallow foundations with 6,000 psf allowable
⅓ of total building weight bears on shallow foundations with 8,000 psf allowable
Average: 0.67*6000+0.33*8000 = 6,660 → Input **7,000 psf**

If your building is supported primarily on deep foundations:
Enter the allowable soil bearing pressure for shallow footings on the site, if known. Enter 2000 if unknown. Do not include the allowable bearing pressure or side friction for deep foundations.

3.14 - Foundation Type

Select one of the following options using the dropdown:

Foundation Type	
Input Options	*Description*
Shallow Foundations	Spread footings, strip foundations, mat foundations, or raft foundations
Deep Foundations < 50ft/15m	Foundation systems with overall depth (e.g. piles) < 50 feet or 15m
Deep Foundations > 50ft/15m	Foundation systems with overall depth (e.g. piles) > 50 feet or 15m
Other Foundation System	Other foundations

4.0 - Global Warming Potential Data

Global Warming Potential (GWP) Input Parameters collect project-specific GWP, or embodied carbon, data. The goal of collecting this data is to promote transparency among structural engineers throughout the industry. When combined with Project Input Parameters, the GWP Input Parameters will allow future analysis and trend-spotting within the Database.

The following sections provide a description of each GWP Input Parameter with notes to the User as appropriate. Refer to the SE 2050 LCA Methodology Guide for additional discussion and explanation for each of these items.

4.1 - Total GWP (kg-CO2e)

Enter the total GWP or Climate Change value from the LCA software, tool, or spreadsheet. This value shall include the total embodied GWP of the structural system, reported in units of kg of CO_2-equivalent (CO_2-e), for the selected life-cycle stages in the Project Input Parameters. At a minimum, life-cycle stages must include A1-A3 (also known as cradle-to-gate). More information on which life-cycle stages to include will be covered in the forthcoming SE 2050 LCA Methodology Guide. Appendix B provides clarification for individual LCA tools about which output value should be reported for SE 2050.

4.2 - LCA Tool

Select the LCA tool that was used to calculate the GWP values reported.

LCA Tool	
Input Options	*Description*
Athena IE	Impact Estimator for Buildings, by the Athena Sustainable Materials Institute
Tally	Tally, by KT Innovations
One Click	One Click LCA, by Bionova Ltd
eTool	eTool, by eToolLCD
EC3	Embodied Carbon in Construction Calculator (EC3), by Building Transparency
Beacon	Beacon, by Thornton Tomasetti
Quartz	Quartz Common Products Database (note: no longer updated after January 2019)
Embodied Carbon Order of	Embodied Carbon Rough Order of Magnitude, https://se2050.org/ecom-

Magnitude (ECOM)	tool/
Environmental Product Declarations (EPDs)	Structural material quantities are used along with Environmental Product Declarations (EPDs) for individual materials to manually calculate a total Global Warming Potential
SimaPro	SimaPro, by PRé Sustainability
Other	If “Other” is selected, please specify the method used

Select “Other” if the tool used is not listed in the drop down menu. Properly identifying which tool was used is critical to understand underlying assumptions, data sets, and methodologies that led to the reported GWP value. It is recommended that engineers use one of the commercially-available LCA tools, as this will allow for some measure of consistency within a firm and allow for more rational comparisons across projects.

4.3 - Year LCA was Performed

Enter the year in which the LCA corresponding to the reported GWP values was completed. It is noted that projects may go through various iterations and LCA studies at intermediate stages, the year entered here shall represent the year that the reported GWP values are calculated.

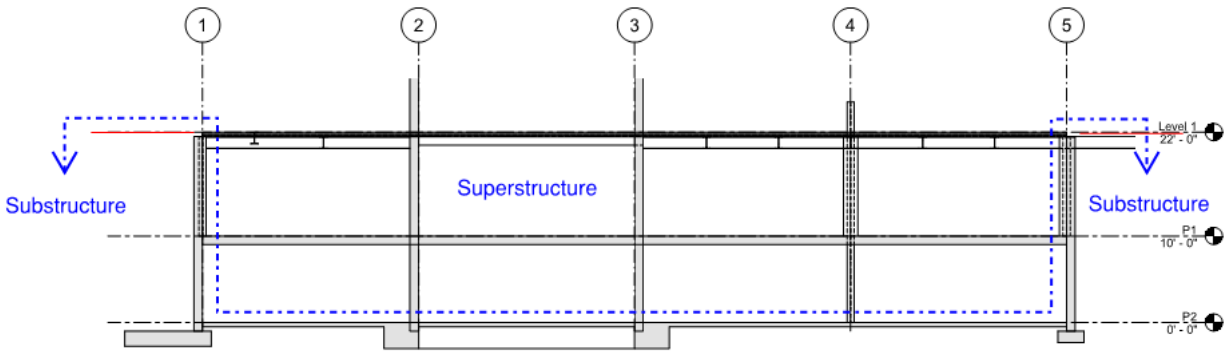
4.4 - Building Substructure Components (check all that apply)

Select the building substructure component(s) included in the LCA from the following options:

Building Substructure Components	
Input Options (multi-select)	*Description*
Deep Foundation	Drilled pile, driven pile, caisson, auger cast pile, pressure injected footing (PIF), load bearing element (LBE)
Shallow Foundation	Spread footing, mat/raft foundation, pile cap, grade beam
Slabs [slab at grade only; see diagram below]	Framed (mild reinforcing), framed (PT), slab on grade, topping slab
Walls	Retaining wall, basement wall, frost/stem wall, permanent earth support wall
Other: Embedded Steel Elements	Embedded steel elements, temporary earth retaining wall, ground improvement, rigid/geo foam

Other: Temporary Earth Retaining	Temporary earth retaining wall
Other: Ground Improvement	Ground improvement
Other: Rigid/Geo Foam	Rigid/geo foam

Note:
A warning is triggered if either Deep Foundation or Shallow Foundation are not selected.
The component “Slab” listed above refers only to the lowest level slab, which may either bear on soil or be designed as a suspended slab. See figure below for delineation of substructure and superstructure components.



4.5 - Building Superstructure Components (check all that apply)

Select the building superstructure component(s) included in the LCA from the following options:

Building Superstructure Components	
Input Options (multi-select)	*Description*
Columns	Column, built-up column, composite column
Beams	Beam, built-up beam, truss, open web joist
Slab/Deck	Suspended slab (mild reinforcing), suspended slab (PT), bare metal deck, metal deck with concrete topping, plank and decking, topping
Bracing	Vertical bracing, horizontal bracing
Walls	Bearing wall, shear wall, sandwich wall
Other: Anchor Rods, Bolts, Nuts and Washers	Anchor rods, bolts, nuts and washers

Other: Nails, Screws and Connections	Nails, screws, and connectors
Other: Screen Wall and Canopy Framing	Screen wall and canopy framing
Other: Stair Framing	Stair framing
Other: Connection Steel	Shear tabs, column base plates, bearing angles/plates, gusset plates, wood hangers, knife plates, etc.
Other: Miscellaneous Steel	Pour stops, beam penetration reinforcement, web stiffeners, etc.

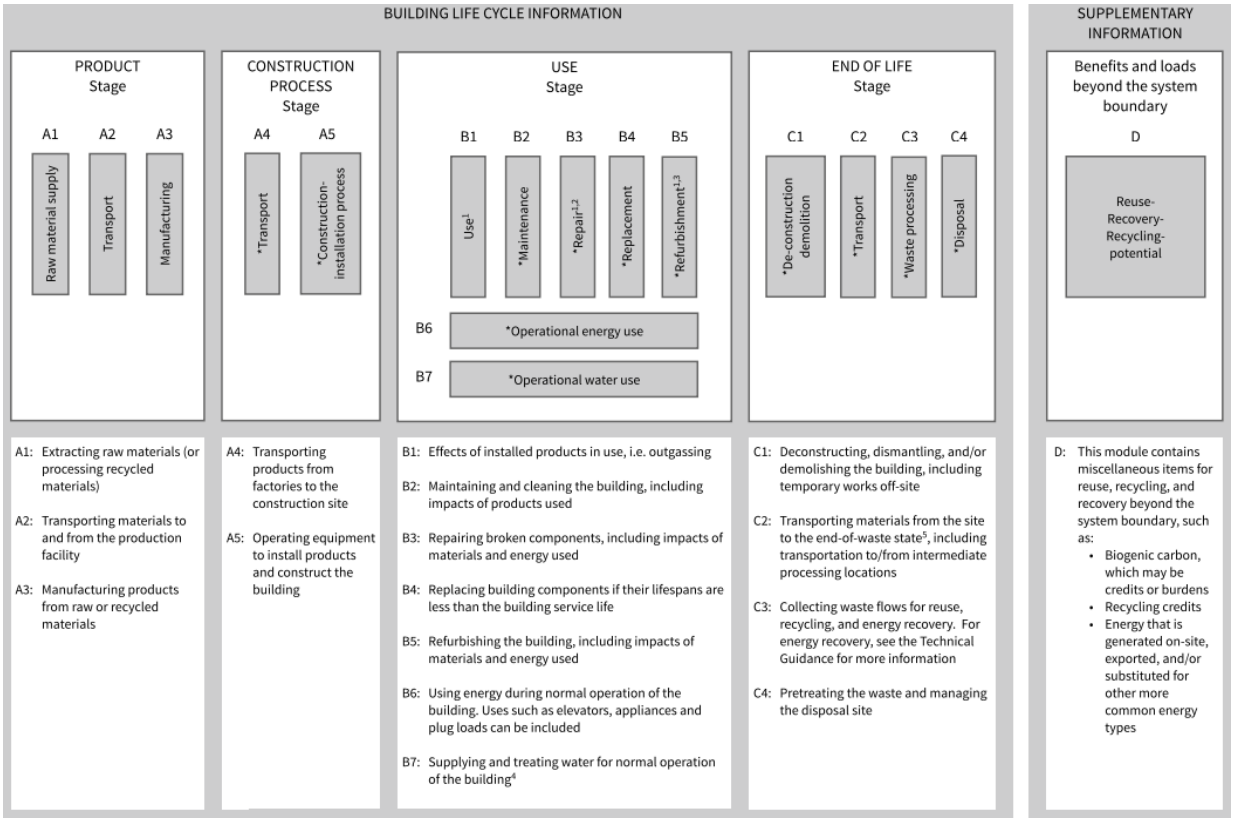
Note:
A warning is triggered if Slab/Deck is not selected.
A warning is triggered if either Columns or Walls are not selected.
Refer to SE 2050 SMQ classification system for description of components.

4.6 - LCA Stages Included (check all that apply)

Select the LCA stage(s) included in the reported Total GWP value.

LCA Stages	
Input Options (multi-select)	*Description*
A1-A3	Product Stage
A4	Construction Process Stage: Transport
A5	Construction Process Stage: Construction/Installation
B1-B5	Use Stage
C1-C4	End of Life Stage
D	Benefits and loads beyond the system boundary

Life-cycle stages are further described in the following figure:



Source: The Carbon Leadership Forum, “Life Cycle Assessment of Buildings: A Practice Guide,” (Figure 4. Standard life cycle stages and modules, adopted from EN 15978), University of Washington, June 2018. https://www.carbonleadershipforum.org/wp-content/uploads/2018/06/CLF-LCA-Practice-Guide-v1.0-2018-06-28.pdf

If your LCA Tool is Environmental Product Declarations (EPDs), EC3, or ECOM:
Check only the A1-A3 option. For other LCA Tools, refer to the tool’s user documentation or detailed results for more specific guidance about the LCA stages included.

If your LCA tool includes some of the “B” stages, but not all of B1-B5:
Check the B1-B5 option (and other options that apply).
Similarly check the C1-C4 option if your LCA tool includes some but not all of the “C” stages.

Only check Module D if you are certain your results contain GWP impacts in module D, which are benefits and loads beyond the building life cycle, such as reuse and recycling that benefits a different project. If possible, only report the GWP results for modules A-C, i.e. without Module D.

4.7 - Biogenic Carbon Included?

Select either “Yes” or “No” depending on the settings or capabilities of the LCA tool used.

Some tools allow the user to select whether biogenic carbon is included in the calculation of the Total GWP value. Guidance on whether or not to include biogenic carbon will be included in the forthcoming SE 2050 LCA Methodology Guide.

4.8 - Biogenic Carbon GWP (kg-CO2e)

This field will only appear if the user has selected “Yes” for the previous parameter, “Biogenic Carbon Included?”

If this field appears, enter the GWP attributed to biogenic carbon in this box. A positive number should be entered when there is a net increase in total GWP due to inclusion of biogenic carbon. This means there are additional emissions arising from biogenic sources, or that the biomass in the structure is a “source” of carbon emissions. A negative number should be used if there is a net decrease in carbon emissions due to inclusion of biogenic carbon, which means the structure is a “sink,” or sequestering carbon dioxide.

4.9 - Show Project GWP Intensity on dashboard for all signatory firms

Select either “Yes” or “No” per the following description

Show Project GWP Intensity	
Input Options	*Description*
Yes	The Embodied Carbon Intensity for this building will be visible as a plot point on the Embodied Carbon Intensity Scatter Plot for all users of the SE 2050 Database. No other project data will be visible to database users outside of your firm.
No	No information about this building will be visible to other database users outside of your firm.

Regardless of project visibility, all data entered into the spreadsheet may be used in accordance with the SE 2050 Beta Database User Agreement. Please refer to se2050.org/se-2050-database/ for more information regarding the individuals and organizations that will have access to the data in the database.

5.0 - Structural Material Quantities (Optional)

After the user has entered the required project information in accordance with Sections 2 through 4 above, the user has the option to enter Structural Material Quantities corresponding to the project. The input of Structural Material Quantities will help tracking embodied carbon impacts of structural building systems as well as comparing material efficiencies.

5.1 - Material

Select the Material from the following options:

Material
Input Options
Concrete
Steel Reinforcement
Masonry
Steel
Timber

5.2 - Type

Enter the material Type from the following options:

Concrete	
Input Options	*Units*
2500 PSI	Cubic Yards
3000 PSI	Cubic Yards
4000 PSI	Cubic Yards
5000 PSI	Cubic Yards
6000 PSI	Cubic Yards
8000 PSI	Cubic Yards

3000 PSI LW	Cubic Yards
4000 PSI LW	Cubic Yards
5000 PSI LW	Cubic Yards

Note:
LW stands for lightweight concrete.

Steel Reinforcement	
Input Options	*Units*
Rebar	Tons
Welded Wire Reinforcement	Tons
Post Tensioning	Tons

Masonry	
Input Options	*Units*
Normal Weight Masonry Block	Tons
Light Weight Masonry Block	Tons
Masonry Grout	Cubic Yards
Mortar	Cubic Yards

Steel	
Input Options	*Units*
Rolled Steel Shapes	Tons
Plate Steel Fabrications	Tons
Tube Steel (HSS)	Tons
Open Web Steel Joists	Tons
Steel Deck	Tons

Cold Formed Metal Framing	Tons

Timber	
Input Options	*Units*
Softwood Lumber	Cubic Feet
Softwood Plywood	Cubic Feet
Glulam	Cubic Feet
Cross Laminated Timber	Cubic Feet
Laminated Veneer Lumber	Cubic Feet
Wood I Joists	LBS

5.3 - Quantity

Enter any non-negative number for the structural material quantity. See tables above in Section 5.2 for the units associated with each material Type.

5.4 - Portland Cement Content - pcy (Optional)

If structural material quantities are reported for concrete, enter any non-negative number for the portland cement content for each concrete Type. The Portland cement content is reported in units of pounds per cubic yard (pcy) and is an optional input.

Appendix A - Glossary

AHJ

The Authority Having Jurisdiction, or the AHJ, is an organization, office, or individual responsible for enforcing the requirements of a code or standard.

Embodied Carbon

Embodied carbon is the sum of greenhouse gas emissions released throughout the following life-cycle stages: raw material extraction, transportation, manufacturing, construction, maintenance, renovation, and end-of-life for a product or system. It is reported in terms of GWP and units of kilograms of carbon dioxide equivalent (kg-CO_2e).

Embodied Carbon Intensity

Embodied carbon intensity is the total embodied carbon of a building divided by the building floor area. In accordance with international whole building life-cycle assessment standards, it is reported in units of kilograms of carbon dioxide equivalent per square meter (kg-CO_2e/m^2).

EPD

An Environmental Product Declaration, or EPD, is a document that provides information about the life-cycle environmental impact of products or materials. EPDs are based on ISO 14025 and require third party verification. While EPDs often only report A1-A3 environmental impacts, they should be used within consideration of the full life-cycle impact of products.

Expected Building Life

The expected building life is the period of time for which the building meets or exceeds its performance requirements. It may also be known as a building’s service life.

GWP

Global Warming Potential, or GWP, is the aggregation of various greenhouse gas emissions based on their relative global warming potential standardized to that of carbon dioxide. It is reported in units of kilograms of carbon dioxide equivalent (kg-CO_2e).

LCA

Life-Cycle Assessment, or LCA, is a method used to determine the potential environmental impacts over the life-cycle of a given material or product. When performed at the building level,

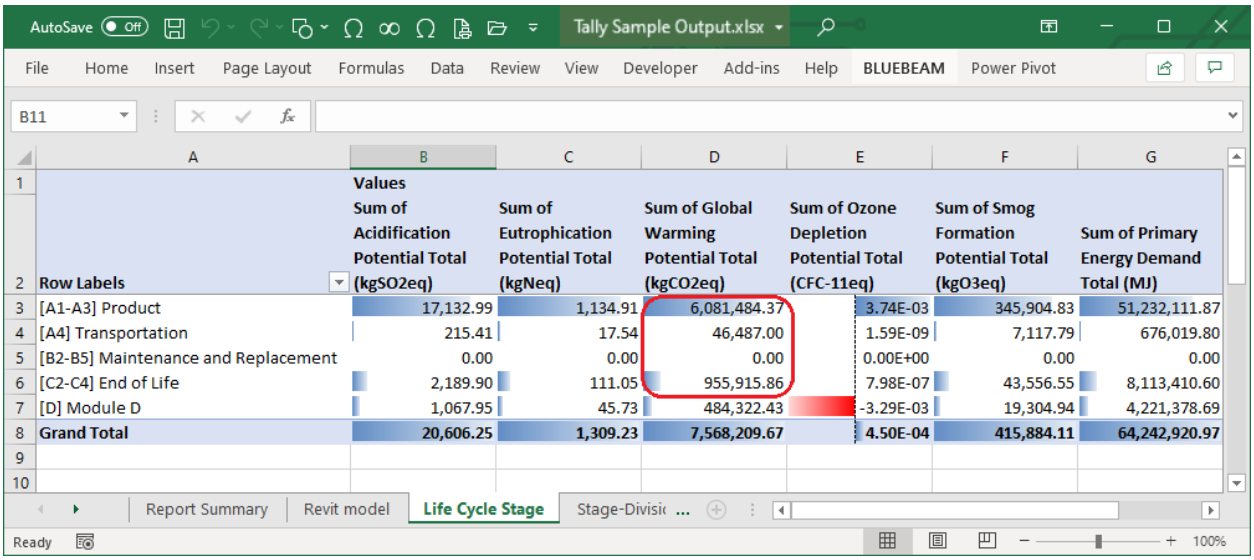
this is referred to as a Whole-Building Life-Cycle Assessment (WBLCA). LCA is performed according to ISO 14040 and ISO 14044 using commercially available software.

Appendix B - Finding “Total GWP” Using LCA Tools

This section aims to help users identify, for a few common LCA tools, which number to report in the Global Warming Potential Input Parameter *Total GWP*. The scope of this guidance is only to identify the correct final answer after an LCA is performed. More extensive guidance regarding the inputs and assumptions used to perform an LCA will be provided in the forthcoming *SE 2050 LCA Methodology Guide.* The guidance below assumes that only the structural portion of the building has been included in use of the following tools.

Tally

When saving a report from Tally, it is highly recommended to check the option to save the output as a spreadsheet in addition to the pdf report. The GWP values shown alongside the various graphical outputs in the .pdf report may differ from the GWP value that should be used for input to the database, for various reasons that are outside the scope of this User Guide. Therefore, it is highly recommended that the user save the output as a spreadsheet and find the values under *Sum of Global Warming Potential Total (kgCO2eq)* on the sheet labeled “Life Cycle Stage” in Column D as shown below:



Row Labels	Values Sum of Acidification Potential Total (kgSO2eq)	Sum of Eutrophication Potential Total (kgNeq)	Sum of Global Warming Potential Total (kgCO2eq)	Sum of Ozone Depletion Potential Total (CFC-11eq)	Sum of Smog Formation Potential Total (kgO3eq)	Sum of Primary Energy Demand Total (MJ)
[A1-A3] Product	17,132.99	1,134.91	6,081,484.37	3.74E-03	345,904.83	51,232,111.87
[A4] Transportation	215.41	17.54	46,487.00	1.59E-09	7,117.79	676,019.80
[B2-B5] Maintenance and Replacement	0.00	0.00	0.00	0.00E+00	0.00	0.00
[C2-C4] End of Life	2,189.90	111.05	955,915.86	7.98E-07	43,556.55	8,113,410.60
[D] Module D	1,067.95	45.73	484,322.43	-3.29E-03	19,304.94	4,221,378.69
Grand Total	**20,606.25**	**1,309.23**	**7,568,209.67**	**4.50E-04**	**415,884.11**	**64,242,920.97**

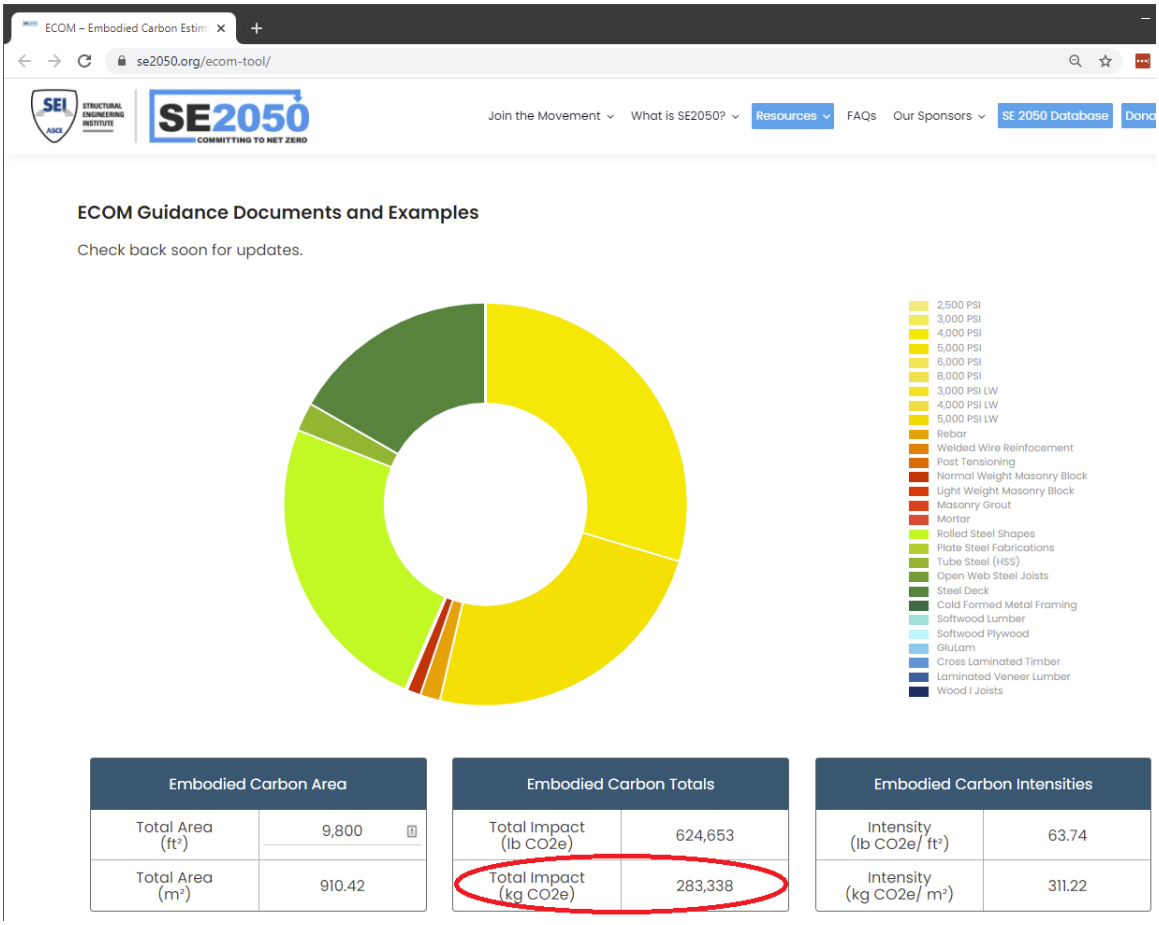
The Total GWP value to use for the SE 2050 database is the sum of GWP values from End of Life (Module C), Maintenance and Replacement (Module B, often 0 for structure), Product (A1-A3), and Transportation (A4). This is the same as the Grand Total minus the GWP value from Module D.

When biogenic carbon is included in a Tally study, neither the .pdf report nor the spreadsheet report provide a definitive value of GWP that is attributable to biogenic carbon. The most appropriate way is to find this value is as follows:

1. Save two Tally reports with spreadsheets, one with biogenic carbon included, and one with biogenic carbon excluded, with all other user options equal.
2. Find the Total GWP using the method above in each spreadsheet.
3. Subtract the *Total GWP* without biogenic carbon from the *Total GWP* with biogenic carbon. The result is the portion of GWP attributed to biogenic carbon. Note: this number might be a negative number. See section 3.8 - Biogenic Carbon GWP for more guidance.

SE 2050 ECOM Tool

The *Total GWP* is found where shown in the screenshot below:



One Click LCA

When using One Click LCA, export your results to an Excel spreadsheet and you can scroll to the bottom of the GWP column to see the total amount of embodied carbon with or without Module D included.

D: reuse, recovery and/or recycling potentials, expressed as net impacts and benefits	Steel roof and floor deck, 22-16 gauge (Steel Deck Institute)	Decking	2560	lbs	-878.79	-43.94	S Ir
D: reuse, recovery and/or recycling potentials, expressed as net impacts and benefits	Lightweight, ready-mix concrete, 0-3000 psi (0-20.68 MPa), 20-29% Fly Ash, 2500-20-FA (NRMCA industry-average)	Concrete 3000 psi	17.71	cu yd	-322.42	-44.41	N R
				TOTAL D =	**-1990.14**		
		TOTAL without Module D			**15718.16**	**785.95**	
		TOTAL with Module D			**13728.02**		

Athena Impact Estimator

After running your model, choose “detailed measure by life cycle stage” from the report tab. Here you will find the embodied carbon values in the Global Warming Potential row under the Total Effects column. It is preferred to report the value corresponding to A-C. If reporting the value for A-D, make sure to indicate that Module D was included in the LCA Stages portion of the project record for the database.

Detailed LCA Measure Table By Life Cycle Stages

Project: ECID check_Steel

		PRODUCT (A1 to A3)			CONSTRUCTION PROCESS (A4 & A5)				TOTAL EFFECTS	
LCA Measures	**Unit**	Manufacturing	Transport	**Total**	Construction-Installation Process	Transport	**Total**	Replacement Manufacturing	**A to C**	**A to D**
Global Warming Potential	kg CO2 eq	9.96E+03	1.23E+02	**1.01E+04**	4.55E+02	7.93E+02	**1.25E+03**	0.00E+0	**1.18E+04**	**1.12E+04**
Acidification Potential	kg SO2 eq	3.77E+01	1.46E+00	**3.92E+01**	3.70E+00	8.48E+00	**1.22E+01**	0.00E+0	**5.72E+01**	**5.58E+01**
HH Particulate	kg PM2.5 eq	2.32E+01	6.12E-02	**2.33E+01**	4.22E-01	4.41E-01	**8.63E-01**	0.00E+0	**2.48E+01**	**2.42E+01**
Eutrophication Potential	kg N eq	5.16E+00	9.05E-02	**5.25E+00**	4.03E-01	5.25E-01	**9.28E-01**	0.00E+0	**6.54E+00**	**6.46E+00**
Ozone Depletion Potential	kg CFC-11 eq	9.28E-05	4.53E-09	**9.28E-05**	4.64E-06	3.05E-08	**4.67E-06**	0.00E+0	**9.75E-05**	**9.75E-05**
Smog Potential	kg O3 eq	5.48E+02	4.71E+01	**5.95E+02**	1.10E+02	2.69E+02	**3.79E+02**	0.00E+0	**1.16E+03**	**1.15E+03**
Total Primary Energy	MJ	1.31E+05	1.74E+03	**1.33E+05**	5.30E+03	1.15E+04	**1.68E+04**	0.00E+0	**1.57E+05**	**1.54E+05**
Non-Renewable Energy	MJ	1.30E+05	1.74E+03	**1.32E+05**	5.25E+03	1.15E+04	**1.68E+04**	0.00E+0	**1.56E+05**	**1.53E+05**
Fossil Fuel Consumption	MJ	8.97E+04	1.74E+03	**9.15E+04**	4.76E+03	1.15E+04	**1.63E+04**	0.00E+0	**1.15E+05**	**1.09E+05**

Biogenic carbon for biobased products is found in Module D in Athena IE, but non-biogenic emissions that are deemed outside the building boundary can also be found in Module D. If the user wants to report biogenic carbon, it would be best to see the Athena IE User Guide to understand treatment of biogenic carbon to learn how to isolate the value for reporting to the SE 2050 database.

Appendix C - Primary Building Use Classification

Various building use classification systems were considered in creating the available list of options - primarily those used by the International Building Code (IBC), and the Commercial Buildings Energy Consumption Survey (CBECS).

The table below can be used to aid in mapping SE 2050 Use Types to IBC. CBECS is also shown for reference:

Building Use: Mapping SE 2050 to Other Categorization Systems		
SE 2050	**IBC**	**CBECS**
Office	Business	Office
Public Assembly	Assembly	Public Assembly Religious Worship
Education	Educational	Education
Industrial	Factory and Industrial	N/A
Mercantile	Mercantile	Mercantile (Enclosed and Strip Malls) Mercantile (Retail Other Than Mall) Food Sales Food Service
Multi-Family Residential	Residential	N/A
Warehouse	Storage	Warehouse and Storage
Other	Utility and Miscellaneous; High Hazard	N/A
Public Order and Safety	Institutional	Public Order and Safety
Single-Family Residential	Residential	N/A
Parking	Storage	N/A
Lodging	Residential	Lodging
Health Care	Institutional	Health Care (Inpatient) Health Care (Outpatient)

The table below can be used to aid in mapping IBC Use Types to SE 2050 Use Types. CBECS is also shown for reference:

Building Use: Mapping IBC to SE 2050 to CBECS		
IBC	**SE 2050**	**CBECS**
Assembly	**Public Assembly**	Public Assembly Religious Worship
Business	**Office**	Office
Educational	**Education**	Education
Factory and Industrial	**Industrial**	N/A
High Hazard	**Other**	N/A
Institutional	**Public Order and Safety**	Public Order and Safety;
	Health Care	Health Care (Inpatient); Health Care (Outpatient)
Mercantile	**Mercantile**	Mercantile (Enclosed and Strip Malls); Mercantile (Retail Other Than Mall); Food Sales; Food Service;
Residential	**Single-Family Residential**	N/A
	Multi-Family Residential	N/A
	Lodging	Lodging
Storage	**Warehouse**	Warehouse and Storage
	Parking	N/A
Utility and Miscellaneous	**Other**	N/A

For additional background in building use types, refer to the following sources:

- International Building Code 2018 - Building Code Chapter 3: Occupancy Classification and Use
- Commercial Buildings Energy Consumption Survey (CBECS) https://www.eia.gov/consumption/commercial/building-type-definitions.php