



Taxonomy of Structural Material Quantities

SE 2050 – Structural Engineering Institute

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A Committee White Paper

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Executive Summary

An important aim of the SE 2050 Commitment (SE 2050) is to empower and encourage structural engineers to design more materially efficient structures, thereby reducing the embodied carbon of their projects. Just as the SE 2050 Database has provided insights on the embodied carbon intensity of a wide range of projects, the collection of structural material quantities (SMQs) could offer valuable insights regarding material use intensity. However, collecting SMQs for tracking and comparability requires a consensus on a structural component taxonomy that does not currently exist. Without a shared language to describe where and how structural materials are used, it remains difficult for designers and the broader profession to meaningfully evaluate material efficiency.

Even for embodied carbon assessments, a taxonomy of building components that clarifies what is included or excluded, down to the building component level, would enable more consistent, and thus fairer, comparisons of embodied carbon results. At this time, most embodied carbon assessment standards only prescribe the scope of assessment at the system or assembly level, such as the “primary superstructure and foundation elements.” This has led to vast discrepancies between scopes of assessment by different project teams. For a program like the SE 2050 Commitment which is collecting project embodied carbon results from hundreds of firms, the variety of scopes makes the results very difficult to use for comparison or benchmarking.

While construction classification systems such as *UniFormat II*, *OmniClass*, and *MasterFormat* exist within the architecture, engineering, and construction (AEC) industry, they lack the detail, structure, and specificity needed to accurately interrogate structural components for material efficiency and embodied carbon assessments. The SE 2050 Taxonomy was developed to address these limitations and to provide the SE 2050 Database with a consistent framework for collecting structural material quantities.

The proposed taxonomy establishes a hierarchical framework with seven levels. The first four levels align with select portions of the taxonomy of Table 21 of the *OmniClass* construction classification system, a widely used taxonomy limited by its lack of specificity that includes broad categories such as substructure, shell, and interiors (to accommodate interior structural walls). Levels 5 through 7 in the SMQ Taxonomy build upon this foundation, introducing additional granularity tailored to the needs of structural engineering. By linking the taxonomy to *OmniClass Table 21*, we aim to improve compatibility with organizations already using the *OmniClass* system, fostering broader coordination and integration.

The taxonomy supports four key objectives:

- **Component-Level Material Reporting:** Enables consistent data collection by structural component, providing the granularity needed for life cycle assessments (LCAs) and SMQ tracking. This clarity supports the evaluation of carbon and material use intensities and informs effective reduction strategies.
- **SE 2050 Project Performance Tracking:** The SE 2050 Taxonomy provides a standardized framework for organizing structural assemblies in embodied carbon reporting. The SE 2050 Database collects a targeted set of assemblies from this taxonomy, grouped into nine intuitive categories that reflect how structural engineers define building systems. By aligning with the taxonomy, the database ensures clarity, consistency, and industry-wide interoperability. Other organizations can now use this framework when collecting similar structural data.
- **Industry Integration:** Aligns with established classification systems such as OmniClass and *UniFormat II*, promoting compatibility across project workflows and improving comparability and consistency within the AEC industry.
- **Digital Tool Integration:** Uses unique identifiers that build on existing *OmniClass Table 21* codes, enabling integration with structural engineering firms internal project workflows, Building Information Modeling (BIM) platforms and publicly available embodied carbon tools. This has the potential to facilitate automated data extraction, streamlining both analysis and reporting.

The SE 2050 Taxonomy represents an important first step towards more consistent, detailed, and actionable SMQ data collection to examine the material efficiency and embodied carbon of projects. This taxonomy will continue to evolve as proficiency in embodied carbon accounting grows within the structural engineering profession.

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Glossary of Terms

ASCE (American Society of Civil Engineers) — A professional organization founded in 1852 that represents members of the civil engineering profession worldwide. ASCE sets standards for engineering practice, publishes technical resources, and supports research and policy initiatives.

Assembly — A collection of two or more structural components that perform a specific function within a structural system.

Assembly Class — A Level 5 category in the SE 2050 Taxonomy that groups structurally similar assemblies (e.g., Beam Assembly Class, Column Assembly Class) for material tracking and embodied carbon reporting.

Building Information Modeling (BIM) — A digital model that contains three-dimensional virtual representations of physical components within a building. Characteristic data of the components are typically stored in the model including type of material, volume, mass, and other pertinent properties.

Carbon Dioxide Equivalent (kgCO₂e) — A unit of measurement that expresses the impact of different greenhouse gases relative to carbon dioxide over a 100-year timespan, allowing for a single value to represent the combined effect of emissions. For example, 1 kg of methane traps as much heat as 21 kg of CO₂ in 100 years, so 1 kg of methane is equal to 21 kg of CO₂e. Used for tracking embodied carbon impacts.

Carbon Leadership Forum (CLF) — An industry-leading research and advocacy organization that focuses on reducing embodied carbon in the built environment. CLF connects architects, engineers, policymakers, and researchers through technical guidance, data tools, and collaborative networks. CLF ideated the concept of the SE 2050.

Construction Classification System — A framework that organizes building elements into broader categories for standardization and industry-wide use, such as *OmniClass Table 21* or *UniFormat II*.

Construction Specifications Canada (CSC) — A national multi-disciplinary association in Canada that develops standards and best practices for the specification, documentation, and communication of construction information. CSC is the Canadian counterpart to the CSI in the U.S. and collaborates with CSI on classification systems such as *MasterFormat*, *UniFormat*, and *OmniClass* to support consistent construction documentation across North America.

Construction Specifications Institute (CSI) — A U.S.-based professional association that develops standards and formats for organizing construction information, including *MasterFormat*, *UniFormat*, and *OmniClass*. CSI supports communication and coordination among all parties involved in design and construction through widely adopted specification frameworks and classification systems.

Component — The most granular level (Level 7) of the SE 2050 Taxonomy, representing individual structural materials or products that cannot be meaningfully subdivided (e.g., wide-flange beam, rebar, anchor bolt).

Component Types (Primary, Accessory, Ancillary, Excluded) — A categorization defined in the *SEI Prestandard* to describe the role and relevance of structural components in embodied carbon reporting. It helps clarify which elements should be included, excluded, or considered differently based on their structural function.

Element — A distinct portion of a building or structure classified within *OmniClass Table 21* (e.g., Floor Construction, Roof Construction).

Embodied Carbon — The total amount of greenhouse gas emissions associated with the extraction, manufacturing, transportation, installation, maintenance, and disposal of building materials over their life cycle.

Environmental Product Declaration (EPD) — A Type III declaration that reports third-party verified data about a product’s environmental performance across its lifecycle.

Life Cycle Assessment (LCA) — A systematic analysis of the environmental impacts of a product or system over its entire life cycle, from material extraction through manufacturing, use, and end-of-life.

Mapping — The process of linking elements or categories across different classification systems, such as mapping *OmniClass Table 21* elements to *UniFormat II* subgroups or SE 2050 Assembly Classes.

Material Efficiency — The ratio of structural demand vs. structural capacity for a given component. Highly materially efficient members use close to the minimum amount of material required to support a given structural load.

OmniClass — A multi-table classification system used in the U.S. construction industry to organize information about the built environment. Developed by CSI, OmniClass includes tables for elements, work results, products, and other categories. It is often used in BIM and facility management workflows.

OmniClass Table 21 — A taxonomy table within OmniClass that organizes building elements based on function and location.

Performance-Based Specification — A method of defining the requirements of a material or system based on desired outcomes or functional criteria, rather than prescriptive requirements.

Prestandard (SEI Prestandard) — The *SEI Prestandard* refers to the “*Prestandard for Assessing the Embodied Carbon in Structural Systems for Buildings*”, published by the Structural Engineering Institute (SEI) of ASCE. It provides guidance for structural engineers on how to quantify and report embodied carbon in building structures. The Prestandard includes recommended practices, definitions, and minimum requirements for embodied carbon assessments. (<https://ascelibrary.org/doi/10.1061/9780784486399>)

SE 2050 Commitment (SE 2050) — An initiative by the Structural Engineering Institute (SEI) encouraging structural engineers to track and reduce embodied carbon in their projects, with the goal of net-zero embodied carbon structural systems by 2050.

SE 2050 Database — A national data repository developed as part of the SE 2050 Commitment Program. Participating firms upload project information (e.g., building characteristics, structural material quantities, embodied carbon) to support industry benchmarking, trend analysis, and progress toward net-zero embodied carbon goals.

SE 2050 Taxonomy — A hierarchical framework developed to organize structural assemblies for embodied carbon assessment. Levels 1–4 align with *OmniClass Table 21*; Levels 5–7 are structure-specific.

SEI (Structural Engineering Institute) — A division of ASCE focused on advancing the practice of structural engineering. SEI develops technical standards, publishes research, and supports professional development for structural engineers.

Element (OmniClass Level 4) — The most detailed standard level within *OmniClass Table 21*, identifying specific types of building components.

Structural Material Quantities (SMQ) — The measured physical quantities of structural materials used in a project (e.g., volume of concrete, tonnage of steel), essential for understanding material use efficiency and performing embodied carbon assessments.

Structural System — A structural system is the organized assembly of structural elements, including beams, columns, slabs, walls, and foundations, that work together to support and transfer building loads. These systems are designed to resist both gravity loads (e.g., dead and live loads) and lateral loads (e.g., wind and seismic forces).

Sustainability Certification Programs — Systems that certify buildings based on environmental performance, such as LEED or BREEAM, often including embodied carbon assessment as part of their criteria.

Taxonomy — A hierarchical system for organizing components or elements based on shared characteristics, facilitating detailed material tracking and comparable LCAs across projects.

UniFormat II — A classification system that organizes building elements based on function rather than material composition, widely used for cost estimating and early design documentation.

Introduction

The SE 2050 Commitment (SE 2050), launched by the Structural Engineering Institute (SEI) in 2020, was created in response to the SE 2050 Challenge issued by the Carbon Leadership Forum (CLF) in 2019. The Challenge calls on structural engineers to achieve net-zero embodied carbon in structural systems by 2050. Given that structural materials such as concrete, steel, and timber typically account for the majority of a building's embodied carbon, the structural engineering profession must play a critical role in decarbonizing the built environment.

To support this goal, SE 2050 provides tools, resources, and guidance to help structural engineers engage with the topic of embodied carbon as well as measure and reduce the embodied carbon of their designs, primarily with more efficient structural systems and lower-carbon materials. Signatory firms also benefit from access to a collaborative community of practitioners, enabling knowledge-sharing and accountability to drive progress across the profession.

Central to SE 2050's data-driven approach is the SE 2050 Database, a repository of real project data (i.e., building characteristics, structural design parameters, material quantities, and total embodied carbon) submitted by participating firms. It is currently the largest database of U.S.-based projects with high-fidelity data on structural systems and embodied carbon. One function of the database is to identify and communicate trends in structural embodied carbon and material use intensity across the building sector in the U.S., with the long-term goal of establishing embodied carbon benchmarks for structural systems. These benchmarks, combined with a market-wide analysis, will support the development of embodied carbon and material reduction targets aligned with net-zero carbon goals.

To make collection of material use and embodied carbon data meaningful, it must follow a consistent, standardized framework that ties quantities to a functional role within the structural system. Engineers need to group materials and the associated carbon by functionally equivalent components to enable valid comparisons. Without this structure, and without sufficient granularity, subjective interpretation can lead to inconsistencies across projects.

Granularity is especially important for identifying the source of high material use or carbon intensity. Simply knowing that a superstructure has elevated embodied carbon isn't enough; structural engineers need to isolate whether it stems from assemblies like the floor slab, roof deck, beams, or columns. Each of these components is designed and

optimized differently. For example, comparing a lightweight concrete fill to a normal weight fill requires selecting associated components for a fair evaluation, something only possible with a component-level framework.

Early attempts to utilize existing construction classification systems such as *MasterFormat*, *UniFormat II*, and *OmniClass* revealed significant limitations in their specificity and suitability for tracking structural material quantities. In response, SE 2050 developed a custom taxonomy that integrates select portions of the *OmniClass Table 21* with additional levels of structure-specific detail down to individual components.

This framework, – referred to as the SE 2050 Taxonomy, – defines a standardized, hierarchical framework for describing how and where structural components and their materials are used within a building.

While the complete taxonomy can be found in ***The Complete SE 2050 Taxonomy***, use of the taxonomy may require one or more of the appendices.

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The intent of this white paper is to present the SE 2050 Taxonomy and explain its rationale, structure, and intended use. The white paper includes:

- Definition of the difference between a taxonomy and a classification system.
- A review of existing construction classification systems and their limitations.
- Detailed rationale and objectives of a standardized structural taxonomy.
- A detailed overview of the taxonomy’s structure, including its unique identifiers and linkage to *OmniClass Table 21*.
- Mapping and compatibility with the SE 2050 database and *SEI Prestandard*.
- Future directions for refining and expanding the taxonomy as industry needs evolve.

Construction Classification Systems in the U.S.

It is important to distinguish between a *construction classification system* and a *taxonomy*. While these terms are sometimes used interchangeably, they are different and have unique and distinct purposes. Both are tools for organizing information, but they differ in structure, intent, and level of detail, differences that are particularly relevant for tracking material quantities and embodied carbon in structural systems.

A classification system organizes information into predefined categories based on shared features, but not necessarily in a hierarchical way. A taxonomy¹, by contrast, is hierarchical, organizing items into nested categories with increasing specificity at each level. This structure supports consistent grouping, comparison, and analysis. Some classification systems can also function as taxonomies when they are hierarchical.

Figure 1 compares a classification system and a taxonomy. The *Dewey Decimal System* classifies books by subject using unique numerical codes, but the categories are not hierarchically related. In contrast, the *Taxonomy of Organisms* developed by Linnaeus organizes living things into nested categories, such as Kingdom, Genus, and Species, each adding a layer of specificity based on shared traits.

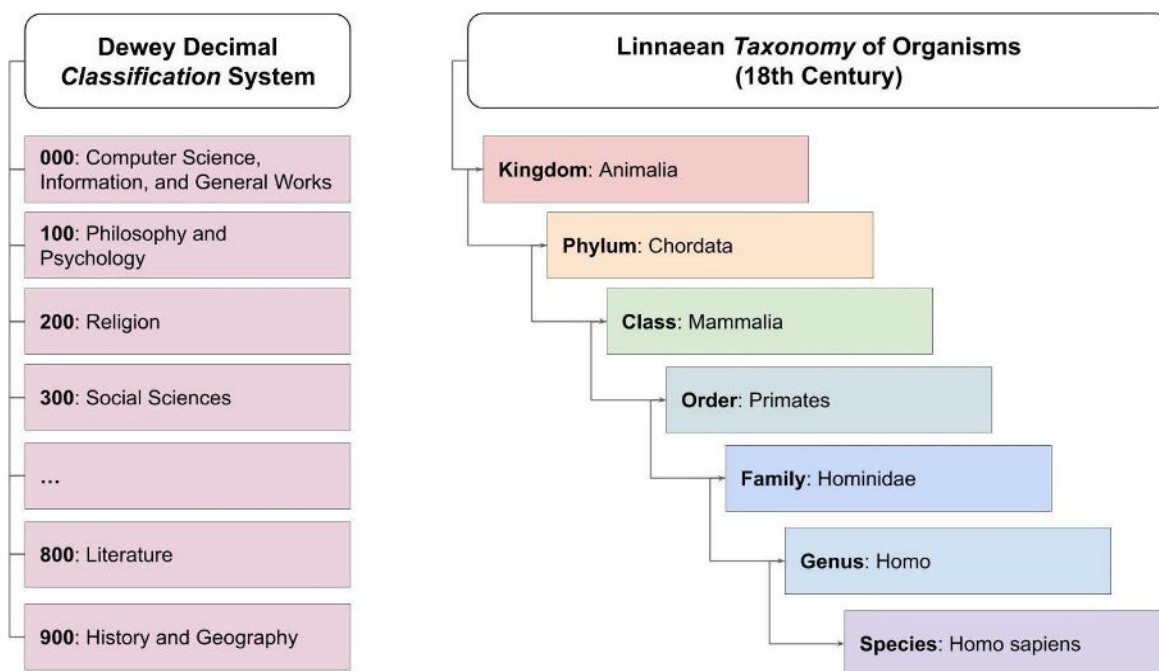


Figure 1: Classification System v Taxonomy Example

¹ The word “taxonomy” originates from the Greek roots *taxis* (arrangement) and *nomos* (law), coined in French as *taxonomie* before entering English.

The most widely used construction classification systems in the U.S. AEC industry are *MasterFormat*, *UniFormat II*, and *OmniClass*² each with a distinct role in the life cycle of a building project and often used in combination. The following provides a general summary of each³.

MasterFormat

MasterFormat is a widely used standard for organizing project specifications for construction contract documents in the United States and Canada. Developed by the Construction Specifications Institute (CSI) and Construction Specifications Canada (CSC), it provides a master list of 50 divisions, roughly organized by construction trades such as concrete, metals, finishes, HVAC, and electrical systems. Each division is partitioned into subdivisions and sections. (Carroll-Coelho & Riso, 2024).

The standardized six-digit number and title is referred to in the construction industry as a “specification section” and is essential for the design team to communicate expectations of work results to the construction team. Table 1 summarizes the divisions and subdivisions most often associated with structural systems.

Table 1: Typical Structural Portion of MasterFormat

Division	Section
Division 03 – Concrete	03 10 00 – Concrete Forming and Accessories 03 20 00 – Concrete Reinforcing 03 30 00 – Cast-in-Place Concrete 03 40 00 – Precast Concrete 03 50 00 – Cast Decks and Underlayment 03 60 00 – Grouting 03 70 00 – Mass Concrete
Division 04 – Masonry	04 20 00 – Unit Masonry 04 40 00 – Stone Assemblies 04 50 00 – Refractory Masonry 04 60 00 – Corrosion-Resistant Masonry 04 70 00 – Manufactured Masonry
Division 05 – Metals	05 10 00 – Structural Metal Framing 05 20 00 – Metal Joists 05 30 00 – Metal Decking 05 04 00 – Cold-Formed Metal Framing 05 50 00 – Metal Fabrications
Division 06 – Wood, Plastics, and Composites	06 10 00 – Rough Carpentry 06 05 00 – Structural Plastics

² Other classification systems exist in the U.S. but are far less common for building projects. Outside the US, other construction classification systems are used, such as RICS’s New Rules of Measurement (NRM) which is used in the RICS Professional Standard on Whole Life Carbon Assessment to structure calculations and reporting of results.

³ Refer to the appendices for further documentation of each of the three classification systems.

Table 2 illustrates the added detail available at the section level in *MasterFormat*, highlighting the system’s ability to distinguish between components within broader material categories. While *MasterFormat* supports some granularity in specification such as separating Section 03 31 16 *Lightweight Structural Concrete* under 03 31 00 *Structural Concrete*, structurally relevant sections are often combined for simplicity. For instance, lightweight concrete is typically folded into 03 30 00 *Cast-in-Place Concrete*, bypassing multiple sub-levels. This pattern is common across the four divisions most relevant to structural engineers.

In many cases, engineers consolidate specifications even further, collapsing subdivisions into a single section. For example, 03 30 00 *Cast-In-Place Concrete* is often used to encompass embedded items, reinforcement, finishing, and accessories even though, for example, 03 20 00 *Concrete Reinforcing* exists as a distinct section for reinforcement. While *MasterFormat* offers significant depth, this depth is often underutilized in practice.

Table 2: Example of *MasterFormat* Division 03 Hierarchy

Subdivision	Subdivision (2 nd tier)	Section (2 nd tier)
03 30 00 Cast-In-Place Concrete	03 31 00 Structural Concrete	03 31 13 Heavyweight Structural Concrete 03 31 16 Lightweight Structural Concrete
03 20 00 Concrete Reinforcing	03 21 00 Reinforcement Bars	03 21 19 Stainless Steel Reinforcement Bars 03 21 21 Composite Reinforcement Bars

More importantly, the primary limitation of *MasterFormat* from a structural engineering perspective is that it organizes information by construction work results, focusing on material types and performance requirements rather than by functional systems or structural components. As a result, materials are classified independently of their role or location, making it difficult to link material quantities with specific components. This disconnect limits *MasterFormat*’s effectiveness for tracking material intensities and embodied carbon alongside the functional performance that building components and assemblies provide within the building.

UniFormat II

UniFormat II is a construction classification system used to organize building elements based on functional assemblies rather than materials. It employs a hierarchical structure that supports consistent breakdowns across design, estimating, and specification

workflows. As such, it serves as both a classification system and a taxonomy of building elements.

The system was formalized by the American Society for Testing and Materials (ASTM) under the designation ASTM E1557, titled *Standard Classification for Building Elements and Related Sitework – UniFormat II*. It builds upon the original UniFormat, which emerged from parallel efforts led by the American Institute of Architects (AIA) and the U.S. General Services Administration (GSA) during the 1970s and 1980s. ASTM began developing its version in 1989, leading to the standardized *UniFormat II*⁴⁵ in use today.

UniFormat II organizes building information across three hierarchical levels:

- Level 1 – Major Group Elements
- Level 2 – Group Elements
- Level 3 – Individual Elements

Each level is further broken into categories for additional specificity. Level 1 includes nine major group elements covering the major subjects of building construction described below with the most relevant Level 1 groups for structural systems in bold.

- **A: Substructure**
- **B: Shell**
- C: Interiors
- D: Services
- E: Equipment and Furnishings
- F: Special Construction and Demolition
- G: Building Sitework
- H: General
- Z: General (Project Description and Supporting Information)

Table 3⁶ illustrates the hierarchical organization of *UniFormat II* for the **A Substructure** and **B Shell** groups, along with their alphanumeric coding. It highlights how structural components such as foundations, basement walls, floor construction, and roof

⁴ *UniFormat II* has largely superseded the original AIA-developed UniFormat, which is now considered outdated and rarely used in current practice. When referencing building elements in modern classification systems like OmniClass, *UniFormat II* should be used.

⁵ The terms "UniFormat" and "UniFormat II" are often used interchangeably, which can lead to confusion. In most current contexts, especially in industry and BIM applications. The shorthand "UniFormat" is typically intended to refer to the standardized *UniFormat II* system developed by CSI and CSC.

⁶ Refer to *Appendix D2: UniFormat II Reference Information* for the full *UniFormat II* Classification.

construction, are treated as distinct individual elements within separate groupings reflecting their differing functions within the overall structural system.

Table 3: A Substructure and B Shell Major Group Elements and subsequent levels of UniFormat II

Level 1 Major Group Elements	Level 2 Group Elements	Level 3 Individual Elements
A Substructure	A10 Foundations	A1010 Standard Foundations A1020 Special Foundations A1030 Slab on Grade
	A20 Basement Construction	A2010 Basement Excavation A2020 Basement Walls
B Shell	B10 Superstructure	B1010 Floor Construction B1020 Roof Construction
	B20 Exterior Enclosure	B2010 Exterior Walls B2020 Exterior Windows B2030 Exterior Doors
	B30 Roofing	B3010 Roof Coverings B3020 Roof openings

UniFormat II is primarily intended for use in early design stages and cost estimation, offering a medium level of granularity. Its functional, system-based structure aligns with how buildings are conceptualized during early design when detailed material specifications are not yet available, making it useful for high-level comparisons and parametric cost estimating.

While Level 3 represents the most detailed tier within the standard, it lacks clarity and precision when applied to structural systems. For instance, all superstructure components are grouped into broad categories such as *B1010 Floor Construction* and *B1020 Roof Construction*, with no further breakdown of critical components like beams, columns, or braces.

This lack of specificity limits more detailed analysis of material usage or embodied carbon with structural systems differentiated. Without a clear account of component scope and organization, it becomes prohibitively difficult to identify high-carbon elements, components, or systems, which is necessary in developing a more effective, targeted embodied carbon reduction strategy.

Efforts have been made to define sub-elements beyond Level 3 to address these limitations (Charette & Marshall, 1999). While some of these efforts demonstrated value, they have largely been superseded by the development of OmniClass, which provides expanded taxonomies with deeper levels of classification for certain categories.

OmniClass

OmniClass is a standardized classification system developed for the AEC industry in North America to organize information across the life cycle of a built asset. Maintained by CSI and CSC, it serves as both a classification system and a set of nested, category-specific taxonomies. These are organized into 15 interrelated tables, each addressing a different aspect of the built environment, such as spaces, elements, materials, and activities. The tables can be used independently or in combination, supporting flexible organization, cross-referencing, and precise classification.

Unlike *UniFormat II*, which focuses primarily on building elements for early design and cost estimating, OmniClass offers a broader and more versatile framework that includes work results, products, and organizations. This structure makes it particularly well-suited for Building Information Modeling (BIM), where multi-dimensional classification and consistent data organization across design, construction, and operations are essential. Its modularity and breadth also supports facilities management, specifications, procurement, and digital integration throughout a building's life cycle.

The 15 OmniClass tables include:

- **Table 11** – Construction Entities by Function
- **Table 12** – Construction Entities by Form
- **Table 13** – Spaces by Function
- **Table 14** – Spaces by Form
- **Table 21** – Elements
- **Table 22** – Work Results
- **Table 23** – Products
- **Table 31** – Phases
- **Table 32** – Services
- **Table 33** – Disciplines
- **Table 34** – Organizational Roles
- **Table 35** – Tools
- **Table 36** – Information
- **Table 41** – Materials
- **Table 49** – Properties

OmniClass incorporates and refines and expands established classification systems, creating a unified framework that supports consistency across disciplines and project phases. *Omniclass Table 22 – Work Results* is based on *MasterFormat*, while *OmniClass Table 21 – Elements* builds upon *UniFormat II*. Integration helps to not only preserve

industry familiarity but also enables interoperability with existing workflows in design, specification, and construction documentation. OmniClass is further aligned with the international standard *Building construction – Organization of information about construction works – Part 2: Framework for classification*, ensuring its compatibility with global classification frameworks and thus its applicability for international projects.

OmniClass Table 21 – Elements

Within the OmniClass framework, *Table 21 – Elements* is the most relevant to an SMQ taxonomy, as it classifies building elements in a way that closely aligns with structural system components. Its hierarchical structure imparts both the location and functional role of the components, making it especially relevant for defining, organizing, and analyzing structural systems and their material use intensities.

OmniClass Table 21 serves as a natural extension of *UniFormat II*, another widely accepted CCS, reinforcing its continuity and integration across industry practices. It retains *UniFormat II*'s foundational structure, including major groupings like “A: Substructure” and “B: Shell,” and follows a similar multi-level coding convention. However, CSI and CSC expanded upon the original *UniFormat II* content by introducing additional subdivisions and detail lacking in the original standard.

OmniClass Table 21 supports up to four hierarchical levels, though the number of levels may vary by element. Levels 1 through 3 largely mirror those in *UniFormat II*, but Level 4 introduces further specificity for certain elements. For example, within *B1010 Floor Construction*, six additional subcategories are added to differentiate between floor framing types. Table 4 presents a portion of the “Shell” category under “Floor Construction” for comparison with the corresponding *UniFormat II* hierarchy shown previously in Table 3⁷.

Table 4: Portion of OmniClass Table 21 – Elements

Level 1	Level 2	Level 3	Level 4
21-02 Shell	21-02 10 Superstructure	21-02-10 10 Floor Construction	21-02 10 10 10 Floor Structural Frame 21-02 10 10 20 Floor Decks, Slabs, and Toppings 21-02 10 10 30 Balcony Floor Construction 21-02 10 10 40 Mezzanine Floor Construction 21-02 10 10 50 Ramps 21-02 10 10 90 Floor Construction Supplementary Components

⁷ Refer to *Appendix G: UniFormat II Reference Information* and *Appendix H: OmniClass Reference Information* for additional information on *UniFormat II* and *OmniClass Table 21*.

It is also important to note that OmniClass uses a distinct numbering convention. In *OmniClass Table 21*, all entries begin with the table number “21”, followed by a hyphenated numerical code that represents the level of detail rather than the alphanumeric format used in *UniFormat II* (e.g., *B1010 Floor Construction*). For example, “B1010” in *UniFormat II* corresponds to “21-02-10 10” in OmniClass. This numeric-only format is consistent across all OmniClass tables and reinforces its modular, table-driven structure.

The Need for a Component-Level Taxonomy

Despite the widespread use of classification systems in construction, there has been no consensus-based taxonomy of structural components for buildings in the U.S. Engineers often rely on internal or project-specific conventions, which can vary significantly and are difficult to scale across firms or platforms.

Even seemingly simple classification questions reveal inconsistencies:

- Are above-grade columns and beams considered "superstructure," and those below-grade as "substructure"?
- Should all structural elements be categorized only as “vertical” or “horizontal,” regardless of their location?
- How should diagonal bracing be classified?
- Should slabs and beams be grouped as a floor system or treated separately?
- Should structural assemblies for roof framing be classified independently from floor framing?

These ambiguities complicate material tracking, limit embodied carbon comparisons, and disrupt data alignment across disciplines. The problem is further compounded by inconsistent use of classification systems across project phases; specifications may follow *MasterFormat*, cost estimates *UniFormat II*, BIM models OmniClass, and quantity takeoffs internal conventions.

This fragmentation hinders coordination, benchmarking, and meaningful system-level analysis. A shared, component-level taxonomy is needed to align structural classification with engineering practice, support carbon analysis, and enable consistent reporting across the industry. While these questions may appear straightforward, the lack of a common understanding makes it difficult to establish best practices. This ambiguity not only limits consistency but also undermines efforts to compare embodied carbon across projects.

The new SE 2050 Taxonomy addressed these challenges through a 3-year development process, described in detail in *Appendix E: SE 2050 Taxonomy Development Process*. Summarized below are the key limitations of the existing construction classifications systems and the aspects of other relevant standards which factored into the development process.

Limitations of Existing Construction Classification Systems

As summarized in Table 5, while *MasterFormat*, *UniFormat II*, and *OmniClass* each offer valuable frameworks for organizing construction information, none fully meet the needs of a structural system taxonomy. *MasterFormat* is organized by trade and focused on work results, making it poorly suited for comparing structural typologies or tracking structural material use. *UniFormat II* and *OmniClass Table 21* offer a more functional, system-based approach, but still fall short of the granularity needed for SMQ tracking that informs component-specific embodied carbon reduction strategies.

Table 5: Comparison of Construction Classification Systems

	System	Primary Focus	Typical Use	Structure	Structural Granularity
1	MasterFormat	Work results by trade	Specifications, bidding, documentation	Hierarchical: Divisions, Subdivisions, Sections	Low – grouped by trade, not function
2	UniFormat II	Functional systems and assemblies	Early design, cost estimating, LCA	Hierarchical: Systems, Subsystems, Elements	Medium – e.g., superstructure, foundation
3	OmniClass	Multi-dimensional classification	BIM, facility management, life cycle data	15 modular hierarchical tables	Medium – (varies by table; <i>OmniClass Table 21</i> , <i>Table 22</i> most relevant)

Of these, *OmniClass Table 21* was deemed the closest to meeting the needs of an SMQ Taxonomy and offers greater granularity than *UniFormat II*. However, it shares a similar limitation when applied to structural systems: a lack of clear and consistent component-level definitions. While the hierarchy extends to Level 4, many structural categories still do not specify which components, such as beams, columns, bracing, are included within a given element.

Coordination with the SEI Prestandard

A critical aspect of the SE 2050 Taxonomy’s development was its coordination with the *SEI Prestandard for Assessing the Embodied Carbon of Structural Systems for Buildings* (SEI Prestandard), which was developed in parallel to this taxonomy. The Prestandard defines

requirements for structural embodied carbon assessments and includes key provisions that directly influenced the taxonomy, most notably the classification of component categories (i.e., primary, accessory, and ancillary), and identifies which components are to be excluded from structural LCAs.

The brief descriptions below are adapted from the *SEI Prestandard*; users should refer to the Prestandard for more specific criteria.

- **Primary:** Major load-carrying elements building's gravity or lateral system.
- **Accessory:** Subcomponents that support or connect primary elements and are necessary for stability or code compliance.
- **Ancillary:** Structural elements that carry loads from non-structural items but are not part of the primary system.
- **Excluded:** Non-structural components and certain exterior or isolated items not considered part of the structural system in a standard LCA. Some may be included at the discretion of the user for functional comparisons.

This raised the need to distinguish how components of the SE 2050 Taxonomy should be organized into the four categories of the *SEI Prestandard*.

Organization of the SE 2050 Taxonomy

This section presents the SE 2050 Taxonomy in its final form, informed by the development, refinement, and validation process described in *Appendix E: SE 2050 Taxonomy Development Process*. While how the taxonomy maps to other systems and tools may change over time, the SE 2050 Taxonomy is designed as a durable, standalone reference and this section explains the taxonomy's structure, logic, and purpose.

High-Level Organization

The SE 2050 Taxonomy is a hybrid system that merges:

- Select portions of *OmniClass Table 21* Levels 1-4, which categorize building elements by location and function, and
- Three SE 2050-specific levels (Levels 5-7), developed to capture structural assemblies and components nested below *OmniClass Table 21* for structural material quantity tracking and embodied carbon analysis.

This structure ensures interoperability with established construction classification systems while providing the granularity needed for structural system evaluation and whole-building LCA.

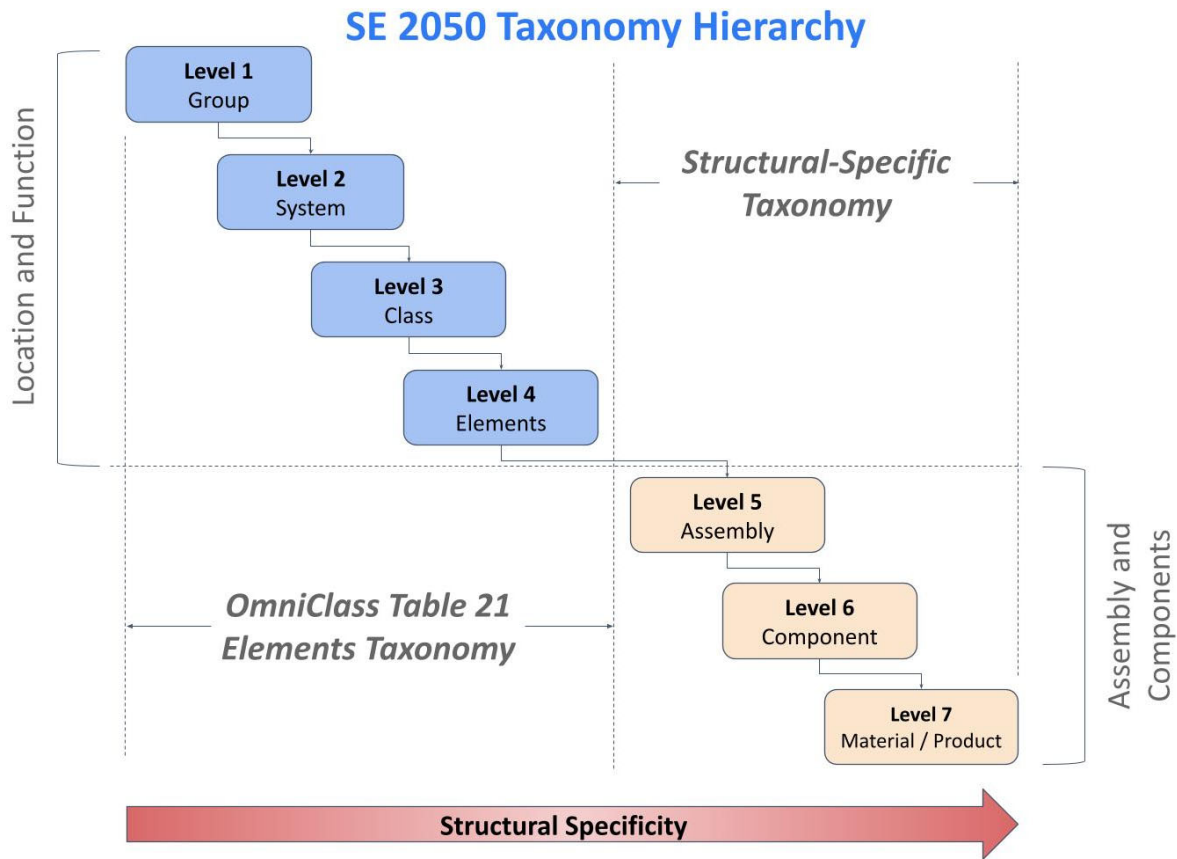


Figure 2: SE 2050 Taxonomy Organization

Figure 2 illustrates the full hierarchical structure of the SE 2050 Taxonomy, which integrates the first four levels of *OmniClass Table 21* (left side) with three structural-specific levels developed for SE 2050 (right side). The diagram presents a continuum of increasing granularity, transitioning from location- and function-based classification to detailed structural assemblies and components.

Table 6 complements this figure by summarizing each taxonomy level, including its purpose, naming convention, and example entries. Table 6 highlights how the hierarchy increases in both specificity and material relevance. This starts with broader location-based groupings, such as “Shell,” “Superstructure,” “Floor Construction,” and “Floor Structural Frame” (Levels 1–4), and narrows down to assemblies at Level 5 like “Columns,” and components at Level 6 like “Built-Up Column.”

Finally, Level 7 captures the component materials and/or products that make up each component and have independent embodied carbon factors. For example, a “Built-Up

Column” may consist of a wide flange section and welded cover plates, whose constituent materials would also be identified at Level 7 (e.g., hot-rolled steel).

The taxonomy builds on *OmniClass Table 21*’s established numeric coding system: 2-, 4-, 6-, and 8-digit codes for Levels 1 through 4. Levels 5 and 6 extend this pattern using 10- and 12-digit codes, respectively. Level 7 does not use a standardized numeric code, as the diversity of materials and/or products makes a universal scheme impractical. Level 7 is prioritized for use with the *MasterFormat* “Divisions” which cover common materials and/or products used in buildings.

Table 6: SE 2050 Taxonomy Hierarchy with OmniClass Table 21 Alignment

SE 2050 Reference	OmniClass/ SE 2050 Hierarchy	OmniClass Level Name	SE 2050 Taxonomy Level Name	Description (examples)
Level 1	OmniClass (2-digit code)	Major Group Elements	Group	High-level grouping which conveys general location within the building with respect to grade (e.g., <i>Shell, Interiors</i>)
Level 2	OmniClass (4-digit code)	Group Elements	System	Major building system based on high level function (e.g., <i>Superstructure, Subgrade Enclosure</i>)
Level 3	OmniClass (6-digit code)	Individual Elements	Class	Classes within systems indicating standard versus special purpose (e.g., <i>Standard vs. Special Foundations and Standard vs. Structural Slabs-on-Grade</i>)
Level 4	OmniClass (8-digit code)	Sub-elements	Elements	Specific building element groups, separates out structural from non-structural elements (e.g., <i>Foundation Wall</i>)
Level 5	SE 2050 (10-digit code)	n/a	Assembly	Structurally specific assembly based on load-carrying function (e.g., <i>Grade Beams, Raft/Mat Foundation, Beams, Columns, Braces, Exterior Walls</i>)
Level 6	SE 2050 (12-digit code)	n/a	Component	Specific configuration or type of structural assembly or subassembly (e.g., <i>Bored CIP Piles</i>)
Level 7	--	n/a	Material / Product	Most granular, indivisible materials and/or components (e.g., <i>Concrete, Steel, Timber, Rebar</i>)

Level 1-7 Definitions and Relationships

Level 1: Group

Level 1 represents the highest and broadest classification within the SE 2050 Taxonomy and aligns directly with the 2-digit codes from *OmniClass Table 21*. For the purposes of structural material quantity tracking and embodied carbon assessment, the SE 2050 Taxonomy adopts two Groups, each corresponding to a 2-digit OmniClass code:

- **01 – Substructure:** Foundations, below-grade walls, and slabs-on-grade
- **02 – Shell:** Floor structures, roof framing, and exterior structural walls

This level organizes building elements by their general location above or below grade. See **Error! Reference source not found.** for detailed explanation of how the SE 2050 Taxonomy delineates “Substructure.”

Technically, each of these grouping codes is preceded by “21” to denote *OmniClass Table 21* (e.g., 21-01 Substructure, 21-02 Shell), but this prefix is omitted here for clarity and readability. While *OmniClass Table 21* includes additional high-level categories (e.g., Interiors [03], Services [23], Equipment [24]), only these two (i.e., Substructure, Shell, and Interiors) are included in the SE 2050 Taxonomy, as they are the only ones relevant for structures.

Level 2: System

Level 2 refines the broad building groups from Level 1 into major structural system functions and aligns with the 4-digit codes from *OmniClass Table 21*. These classifications fall within the primary system types within each Group (i.e., Substructure, Shell).

Here are common Systems within each Group in the SE 2050 Taxonomy:

- **01 10 – Foundations**
(Under Level 1: Substructure – Code 01)
Includes shallow and deep foundation systems such as spread footings, piles, caissons, and mat foundations.
- **01 40 – Slabs on Grade**
(Under Level 1: Substructure – Code 01)
Includes standard and structural slabs on grade, topping slabs and pads that are within the demarcation for Substructure.
- **02 10 – Superstructure**
(Under Level 1: Shell – Code 02)
Encompasses major above-grade framing systems, including floors, roofs, columns, and beams. Also includes interior structural walls, particularly shear and bearing walls, which are relevant for structural material accounting but not clearly defined under Shell in *OmniClass*.

Level 2 is the first level of *OmniClass Table 21* that uses naming structural engineers commonly refer to as “systems.” By adopting Level 2, the taxonomy ensures that structural components are correctly attributed to the high-level systems they belong to, while maintaining interoperability within *OmniClass Table 21*.

Level 3: Class

Level 3 further refines the structural system classifications established at Level 2 by organizing them into standard versus special purpose element groupings, aligning with the 6-digit codes from *OmniClass Table 21*. The distinctions within this level allow one to identify components that are very standard, where an engineer can often follow rules-of-thumb, versus special, where engineering is usually required for the loading, site conditions, technology or design approach employed. This can be useful, for example, to know that the embodied carbon of the slab-on-grade is higher than expected for standard slab-on-grade because it is a structural slab-on-grade. Similarly, uniform roof loads are typically less than floor loads, but in some cases, roofs may need to support heavy rooftop equipment or to resist extreme environmental stressors, so it can be useful to keep them separate when tracking their embodied carbon.

Here are common Classes within different Systems in the SE 2050 Taxonomy:

- **01 10 10 – Standard Foundations**
(Under Level 2: Foundations – Code 01 10)
Includes typical piers, pilasters, spread footings and wall footings that are part of the foundation system.
- **01 10 20 – Special Foundations**
(Under Level 2: Foundations – Code 01 10)
Encompasses special foundation types such as driven and bored piles, foundation anchors, rafts, pile caps and grade beams.
- **01 40 10 – Standard Slabs on Grade**
(Under Level 2: Slabs on Grade – Code 01 40)
Represents a standard slab cast on grade which depends on the capacity of the soil beneath it to withstand loads on the slab.
- **01 40 20 – Structural Slabs on Grade**
(Under Level 2: Slabs on Grade – Code 01 40)
Represents a slab that must be designed to support loads due to insufficient load-bearing capacity of the soil below. May be framed for the slab to span between supports.
- **02 10 20 – Floor Construction**
(Under Level 2: Superstructure – Code 02 10)
Covers structural floor systems, including slabs, framing, and composite assemblies.

- **02 10 30 – Roof Construction**

(Under Level 2: Superstructure – Code 02 10)

Includes structural roof systems and horizontal framing that support roofing membranes and insulation.

Level 4: Elements

Level 4 represents the most detailed level available in *OmniClass Table 21*, aligning with 8-digit codes that specify distinct building element groups. This level captures elements with more specific function within a system, such as framing, supports, or enclosures. Within all of *OmniClass Table 21*, it begins to separate structural from non-structural elements.

Here are common Elements under different Classes in the SE 2050 Taxonomy:

- **01 10 10 10 – Wall Foundations**

(Under Level 3: Standard Foundations – Code 01 10 10)

Defines footings below non-retaining walls.

- **01 10 10 20 – Column Foundations**

(Under Level 3: Standard Foundations – Code 01 10 10)

Includes standard foundations under columns such as piers and spread footings.

- **01 20 10 10 – Subgrade Enclosure Wall**

(Under Level 3: Walls for Subgrade Enclosures – Code 01 20 10)

Defines retaining walls that resist lateral earth pressure and support superstructure loads.

- **02 10 10 10 – Floor Structural Frame**

(Under Level 3: Floor Construction – Code 02 10 10)

Represents the framing and load-carrying elements that carry the slab of a structural floor system, including columns, beams, interior walls. Does not include the floor slab itself.

- **02 10 10 20 – Floor Decks, Slabs and Toppings**

(Under Level 3: Floor Construction – Code 02 10 10)

Represents the suspended floor slab within the structural floor system. Does not include the framing to support the slab.

Level 5: Assembly

Level 5 marks the transition from OmniClass-based classification to the SE 2050-specific classification, introducing the first layer tailored exclusively for structural engineering applications⁸. Assemblies reflect how structural engineers conceptualize and organize

structural systems in practice, based on load-carrying function, beyond the classifications provided by *OmniClass Table 21*.

Each Assembly uses a 10-digit numeric code developed specifically for SE 2050. The coding convention maintains compatibility with *OmniClass Table 21* by following a similar format while adding two digits beyond the 8-digit Level 4 code.

Here are common Assemblies within different Element groupings in the SE 2050 Taxonomy:

- **02 10 10 10 01 – Column Assembly**
(Under Level 4: Floor Structural Frame – 02 10 10 10)
Includes vertical load-carrying elements such as steel columns, concrete piers, and wood posts.
- **02 10 10 10 02 – Beam Assembly**
(Under Level 4: Floor Structural Frame – 02 10 10 10)
Includes horizontal elements that span between supports and carry floor or roof loads.
- **02 10 10 10 03 – Bracing Assembly**
(Under Level 4: Floor Structural Frame – 02 10 10 10)
Encompasses lateral force-resisting elements such as diagonal steel braces, wood bracing, or moment-resisting frames.

Level 6: Components

Level 6 describes the specific configuration or type of components that comprise each structural assembly. Components at this level often distinguish between options that serve similar purposes but are materially or technically different. In many cases engineers can choose between different Level 6 components within the Level 5 assemblies, for portions of the structure that have the same design criteria.

This level provides added resolution to differentiate between structural options, usually consisting of different combinations of materials and entailing different design approaches resulting in different embodied carbon implications. Level 6 granularity is essential for more accurate quantity tracking when needed, to make better embodied carbon comparisons, especially when different components can have vastly different impacts.

Each Level 6 Component is identified by a 12-digit SE 2050-specific code, created by adding two digits to the Level 5 code.

Here are examples of Components within different Assemblies in the SE 2050 Taxonomy:

- **02 10 10 10 01 02 – Built-Up Steel Column**

(Under Level 5: Column Assembly – 02 10 10 10 01)

A steel column fabricated by welding or bolting together multiple steel plates or shapes (e.g., box or cruciform sections). This is distinct from a more conventional steel column with a standard, catalogued section. An engineer may choose to use a built-up column for better material efficiency than a standard section or may need a more compact section for architectural reasons, which could result in a less materially efficient, more carbon-intensive choice.

- **02 10 10 10 02 02 – Composite Beam**

(Under Level 5: Beam Assembly – 02 10 10 10 02)

A steel beam designed to act compositely with a concrete slab using shear connectors. Other options within a beam assembly could include trusses joists, or non-composite beams.

- **02 10 10 10 03 02 – Bracing - Horizontal**

(Under Level 5: Bracing Assembly – 02 10 10 10 03)

Bracing in the horizontal plane, with or without floor or roof deck above, to transfer lateral loads or used for stability. Horizontal bracing may be an option to increase capacity for load transfer in the horizontal plane instead of increasing materials within the slab.

To support consistency and alignment with the *SEI Prestandard for Assessing the Embodied Carbon of Structural Systems for Buildings*, Level 6 components should be differentiated between four component types:

- **Primary Components**

Core structural elements responsible for carrying gravity and lateral loads

Examples: Wide-flange steel section, cast-in-place concrete, reinforcing bar, CLT panel

- **Accessory Components**

Elements that provide load transfer, stability, or detailing support for primary systems

Examples: Base plates, anchor bolts, shear studs, grout pads

- **Ancillary Components**

Items with limited structural function but required for system performance or constructability

Examples: Bearing pads, waterstops, rebar couplers, pipe sleeves

- **Excluded Components**

Materials that are not considered structural and are typically excluded from structural embodied carbon scope

Examples: Fireproofing, intumescent paint, vapor barriers

Refer to *Appendix B: Assembly Definitions and SEI Prestandard Components Categories* for Level 6 Component definitions and corresponding Level 7 materials and/or products organized by *SEI Prestandard* component types.

Level 7: Material/Products

Level 7 represents the most rudimentary building block of the SE 2050 Taxonomy and identifies the individual materials and/or products that make up Components. The materials or products identified in Level 7 should match an embodied carbon profile, most commonly provided in an Environmental Product Declaration, but which could also come from within a structural LCA tool or other reliable source, depending on the goal and scope of the embodied carbon calculations.

Unlike Levels 1–6, Level 7 does not use a fixed numeric coding structure, due to the vast range and variability of possible material or product environmental profiles. Therefore, the SE 2050 framework leaves Level 7 as an open, descriptive classification, enabling engineers to identify and tag components as appropriate to their scope of analysis. At a minimum, Level 7 should allow one to match the material quantities collected with its embodied carbon, or a more complete set of environmental impacts, that will be multiplied by the quantities to produce the total embodied carbon of the component.

Level 7 items can be sourced from a *MasterFormat* section (e.g., *03 30 00 – Cast-in-Place Concrete*, *05 12 00 – Structural Steel Framing*, etc.) consistent with a typical project specification. *OmniClass Table 23* may also serve as an appropriate framework for Level 7 product classification and is the basis of a standardized product nomenclature system to support wbLCA led by the Athena Sustainable Materials Institute (Bowick, 2023). Use of either would improve alignment with other industry classification systems. Until one is adopted broadly, either may be used at the user’s discretion.

Example: Built-Up Steel Column

A built-up steel column composed of a wide flange section with welded steel cover plates can be classified using the SE 2050 Taxonomy as follows:

- **Level 1: Shell**

(SE 2050 Code: 02, OmniClass Code: 02)

Represents structural systems located above the substructure, including exterior and interior framing.

- **Level 2: Superstructure**

(SE 2050 Code: 02 10, OmniClass Code: 02 10)

High-level classification for structural elements above the substructure forming the load-bearing framework.

- **Level 3: Floor Construction**

(SE 2050 Code: 02 10 10, OmniClass Code: 02 10 20)

Captures systems supporting horizontal floor loads, including framing and slabs.

- **Level 4: Floor Structural Frame**

(SE 2050 Code: 02 10 10 10, OmniClass Code: 02 10 20 10)

Defines the structural framing supporting floors, including beams and columns.

- **Level 5: Column Assembly**

(SE 2050 Code: 02 10 10 10 01)

A broad structural group for vertical framing systems.

- **Level 6: Built-Up Column Component**

(SE 2050 Code: 02 10 10 10 01 01)

A specific configuration of a column built from multiple steel components, typically for high-load or custom-profile applications.

- **Level 7 – Material/Product:**

Each material that has a different source for embodied carbon factors should be included. These materials are distinguished below within the four component categories of the *SEI Prestandard*. This example assumes only the Primary Components will be included in the analysis, so appropriate sources for environmental impact factors have only been listed for them. Industry-wide EPDs are listed below as a generic illustration. Use of mill-specific EPDs are encouraged when available.

Table 7: Level 7 Example for a Steel Built-Up Column

Primary:	Source for embodied carbon factors:	
1. Wide flange steel section (e.g., W14x132) 2. Welded steel cover plates	1. AISC Fabricated Sections EPD 2. AISC fab plate EPD	
Accessory:	Ancillary:	Excluded:
● Base plate	<i>(None in this example)</i>	● Spray-applied fireproofing

<ul style="list-style-type: none"> Anchor bolts Base plate grout 		<ul style="list-style-type: none"> Temporary splice channels
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Note: Level 7 is considered the final level of detail in the taxonomy. No further breakdown is currently recommended. Material types, fabrication methods, and associated components should all be captured here to support embodied carbon accounting and detailed life cycle assessments.

The Complete SE 2050 Taxonomy

The following table presents the complete SE 2050 Structural Material Quantities (SMQ) Taxonomy from Level 1 through Level 6, providing a standardized hierarchical structure for categorizing structural components.

Level	Number	Name
1	1	Substructure
2	01 10	Foundations
3	01 10 10	Standard Foundations
4	01 10 10 10	Wall Foundations
5	01 10 10 10 01	Foundation Walls and Footings (non-retaining)
6	01 10 10 10 01 01	Foundation Wall (non-retaining)
6	01 10 10 10 01 02	Foundation Wall Footing (non-retaining)
6	01 10 10 10 01 03	Foundation - Walls and Footings (non-retaining) - Other
4	01 10 10 20	Column Foundations
5	01 10 10 20 01	Foundation - Columns and Footings
6	01 10 10 20 01 01	Foundation - Column Pier / Pilaster
6	01 10 10 20 01 02	Foundation - Spread Footing
6	01 10 10 20 01 03	Foundation - Columns and Footings - Other
3	01 10 20	Special Foundations
4	01 10 20 10	Driven Piles
5	01 10 20 10 01	Driven Pile
6	01 10 20 10 01 01	Driven Pile (various types)
4	01 10 20 15	Bored Piles
5	01 10 20 15 01	Bored / Drilled Pile
6	01 10 20 15 01 01	Bored Cast-in-Place (CIP) Pile
6	01 10 20 15 01 02	Auger Cast-in-Place (CIP) Pile

6	01 10 20 15 01 03	Drilled Displacement (DD) Piles
6	01 10 20 15 01 04	Drilled Shaft Piles
6	01 10 20 15 01 05	Micropile or Minipile
4	01 10 20 20	Caissons
5	01 10 20 20 01	Caissons
6	01 10 20 20 01 01	Open Caissons (Open Piers)
6	01 10 20 20 01 02	Closed Caissons (Cofferdams)
4	01 10 20 30	Special Foundation Walls
5	01 10 20 30 01	Special Foundation Walls
6	01 10 20 30 01 01	Special Foundation Wall
4	01 10 20 40	Foundation Anchors
5	01 10 20 40 01	Foundation Anchors
6	01 10 20 40 01 01	Mechanical Rock Anchors
6	01 10 20 40 01 02	Grouted Rock Anchors
6	01 10 20 40 01 03	Post-Tensioned Rock Anchors
6	01 10 20 40 01 04	Multi-Strand Rock Anchors
6	01 10 20 40 01 05	Passive Rock Anchors
4	01 10 20 50	Underpinning
5	01 10 20 50 01	Underpinning
6	01 10 20 50 01 01	Underpinning
4	01 10 20 60	Raft Foundations
5	01 10 20 60 01	Raft / Mat Foundation
6	01 10 20 60 01 01	Raft / Mat Foundation
4	01 10 20 70	Pile Caps
5	01 10 20 70 01	Pile Cap
6	01 10 20 70 01 01	Pile Cap
4	01 10 20 80	Grade Beams
5	01 10 20 80 01	Grade Beam
6	01 10 20 80 01 01	Grade Beam
2	01 20	Subgrade Enclosures
3	01 20 10	Walls for Subgrade Enclosures
4	01 20 10 10	Subgrade Enclosure Wall Construction
5	01 20 10 10 01	Subgrade Enclosure Foundation Wall and Footing (retaining)
6	01 20 10 10 01 01	Subgrade Enclosure Foundation Wall (retaining)
6	01 20 10 10 01 02	Subgrade Enclosure Foundation Wall Footing (retaining)

2	01 40	Slabs-on-Grade
3	01 40 10	Standard Slabs-on-Grade
4	01 40 10 01	Standard Slabs-on-Grade
5	01 40 10 01 01	Standard Slab-on-Grade
6	01 40 10 01 01 01	Standard Slab-on-Grade
6	01 40 10 01 01 02	Topping Slab
6	01 40 10 01 01 03	Housekeeping Pad
3	01 40 20	Structural Slabs-on-Grade
4	01 40 20 01	Structural Slabs-on-Grade
5	01 40 20 01 01	Structural Slab-on-Grade
6	01 40 20 01 01 01	Structural Slab-on-Grade
1	2	Shell
2	02 10	Superstructure
3	02 10 10	Floor Construction
4	02 10 10 10	Floor Structural Frame
5	02 10 10 10 01	Column
6	02 10 10 10 01 01	Column
6	02 10 10 10 01 02	Built-up or Composite Column
6	02 10 10 10 01 03	Column - Other
5	02 10 10 10 02	Beam
6	02 10 10 10 02 01	Beam
6	02 10 10 10 02 02	Built-up or Composite Beam
6	02 10 10 10 02 03	Truss
6	02 10 10 10 02 04	Joist
6	02 10 10 10 02 05	Beam - Other
5	02 10 10 10 03	Bracing
6	02 10 10 10 03 01	Bracing - Vertical
6	02 10 10 10 03 02	Bracing - Horizontal
6	02 10 10 10 03 03	Bracing - Other
5	02 10 10 10 04	Interior Walls
6	02 10 10 10 04 01	Interior Wall - Bearing Wall
6	02 10 10 10 04 02	Interior Wall - Shear Wall
6	02 10 10 10 04 03	Interior Wall - Insulated Panel Wall (load bearing)
6	02 10 10 10 04 04	Interior Wall - Other
5	02 10 10 10 05	Supplemental Floor Structural Frame
6	02 10 10 10 05 01	Façade Support Framing

6	02 10 10 10 05 02	Elevator Framing and Support
6	02 10 10 10 05 03	Hung Pit/Elevator Pit Framing
6	02 10 10 10 05 04	Supplemental Framing - Other
4	02 10 10 20	Floor Decks, Slabs, and Toppings
5	02 10 10 20 01	Floor Decks, Slabs, and Toppings
6	02 10 10 20 01 01	Slab - Flat Plate and Flat Slab (Mild Reinforcement)
6	02 10 10 20 01 02	Slab - Flat Plate and Flat Slab (Post-Tensioned)
6	02 10 10 20 01 03	Floor Deck - Composite Concrete Topping on Metal Deck
6	02 10 10 20 01 04	Floor Deck - Bare Metal Deck
6	02 10 10 20 01 05	Floor Deck - Planks and Panels
6	02 10 10 20 01 06	Slabs - Topping Slabs (For Strength and Serviceability)
6	02 10 10 20 01 07	Decks, Slabs, and Toppings - Other
3	02 10 20	Roof Construction
4	02 10 20 10	Roof Structural Frame
5	02 10 20 10 01	Columns Supporting Roof
6	02 10 20 10 01 01	Column Supporting Roof
6	02 10 20 10 01 02	Built-up or Composite Column Supporting Roof
6	02 10 20 10 01 03	Column - Other Supporting Roof
5	02 10 20 10 02	Beams Supporting Roof
6	02 10 20 10 02 01	Beam Supporting Roof
6	02 10 20 10 02 02	Built-up or Composite Beam Supporting Roof
6	02 10 20 10 02 03	Truss Supporting Roof
6	02 10 20 10 02 04	Joist Supporting Roof
6	02 10 20 10 02 05	Beam - Other Supporting Roof
5	02 10 20 10 03	Roof Bracing
6	02 10 20 10 03 01	Roof Bracing - Vertical
6	02 10 20 10 03 02	Roof Bracing - Horizontal
6	02 10 20 10 03 03	Roof Bracing - Other
5	02 10 20 10 04	Roof Interior Wall
6	02 10 20 10 04 01	Interior Wall - Bearing Wall Supporting Roof
6	02 10 20 10 04 02	Interior Wall - Shear Wall Supporting Roof
6	02 10 20 10 04 03	Interior Wall - Insulated Panel Wall Supporting Roof (load bearing)
6	02 10 20 10 04 04	Interior Wall - Other Supporting Roof
5	02 10 20 10 05	Supplemental Roof Structural Frame
6	02 10 20 10 05 01	Roof Façade Support Framing
6	02 10 20 10 05 02	Roof Elevator Framing and Support
6	02 10 20 10 05 03	Roof Hung Pit / Elevator Pit Framing
4	02 10 20 20	Roof Decks, Slabs, and Toppings

5	02 10 20 20 01	Roof Decks, Slabs, and Toppings
6	02 10 20 20 01 01	Roof Slab - Flat Plate and Flat Slab (Mild Reinforcement)
6	02 10 20 20 01 02	Roof Slab - Flat Plate and Flat Slab (Post-Tensioned)
6	02 10 20 20 01 03	Roof Floor Deck - Composite Concrete Topping on Metal Deck
6	02 10 20 20 01 04	Roof Floor Deck - Bare Metal Deck
6	02 10 20 20 01 05	Roof Floor Deck - Planks and Panels
6	02 10 20 20 01 06	Roof Slabs - Topping Slabs (For Strength and Serviceability)
6	02 10 20 20 01 07	Roof Decks, Slabs, and Toppings - Other
3	02 10 80	Stair Construction
4	02 10 80 10	Stair Construction
5	02 10 80 10 01	Stairs
6	02 10 80 10 01 01	Stair Framing / Ornamental Stair Framing
3	02 20 10	Exterior Walls
4	02 20 10 20	Exterior Wall Construction
5	02 20 10 20 01	Exterior Walls
6	02 20 10 20 01 01	Exterior Wall - Bearing Wall
6	02 20 10 20 01 02	Exterior Wall - Shear Wall
6	02 20 10 20 01 03	Exterior Wall - Insulated Panel Wall (load bearing)
6	02 20 10 20 01 04	Exterior Wall - Other
5	02 20 10 20 02	Exterior Walls Supporting Roof
6	02 20 10 20 02 01	Exterior Wall Supporting Roof- Bearing Wall
6	02 20 10 20 02 02	Exterior Wall Supporting Roof - Shear Wall
6	02 20 10 20 02 03	Exterior Wall Supporting Roof - Insulated Panel Wall (load bearing)
6	02 20 10 20 02 04	Exterior Wall Supporting Roof - Other

Using the SE 2050 Taxonomy

The following sections clarify the relationship between the SMQ Taxonomy and the SE 2050 Database and provide guidance on several terms used in the Taxonomy, mostly arising from our best attempts to align with *OmniClass Table 21*.

Application to the SE 2050 Database

Development of the SMQ Taxonomy occurred in parallel with the transition from the SE 2050 Beta Database to the SE 2050 Database, which introduced reporting of structural material quantities for the first time. While we initially hoped to identify a single level within the Taxonomy for reporting of SMQs, it became clear through examination of individual

Taxonomy levels that this would not be practical. Instead, the reporting structure for the SE 2050 Database selectively uses different levels of the SE 2050 Taxonomy.

Acknowledgements

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Appendix A: SMQ Data Collection in the SE 2050 Database charts which Level 5 or 6 components should be included in the reporting structure of the SE 2050 Database.

While it is not as ideal that a level of the Taxonomy does not match up 1:1 with database reporting, the current solution reflects a balance between alignment with *OmniClass Table 21* and minimizing reporting effort for project teams. The mapping of the Taxonomy to the SE 2050 Database and other systems (see *Appendix C: Mapping to Other Classification Systems*) demonstrates the intended adaptability of the SE 2050 Taxonomy, whose levels can be selectively utilized depending on the use case.

Demarcation of Substructure and Superstructure

The demarcation between substructure and superstructure in the SE 2050 Taxonomy builds on the logic developed in the initial structural taxonomy and is illustrated in Figure 8. A key principle was to avoid splitting continuous vertical elements such as columns or walls across categories. Rather than using finish grade as the dividing line, the substructure is defined as the "bathtub" formed by perimeter foundation walls, whether or not they retain soil, and the lowest level slab, whether slab-on-grade or a framed slab that interfaces with the underlying soil. Any vertical structural element inside this perimeter and extending upward from the lowest level slab is considered part of the superstructure.

Some exceptions will require engineering judgment. For example, a column that penetrates modestly below a slab-on-grade for anchorage or detailing would still be classified as superstructure. These practical nuances are anticipated, and users are encouraged to interpret the taxonomy in alignment with its underlying intent, as shown in Figure 3. Note that the red line indicates finished grade.

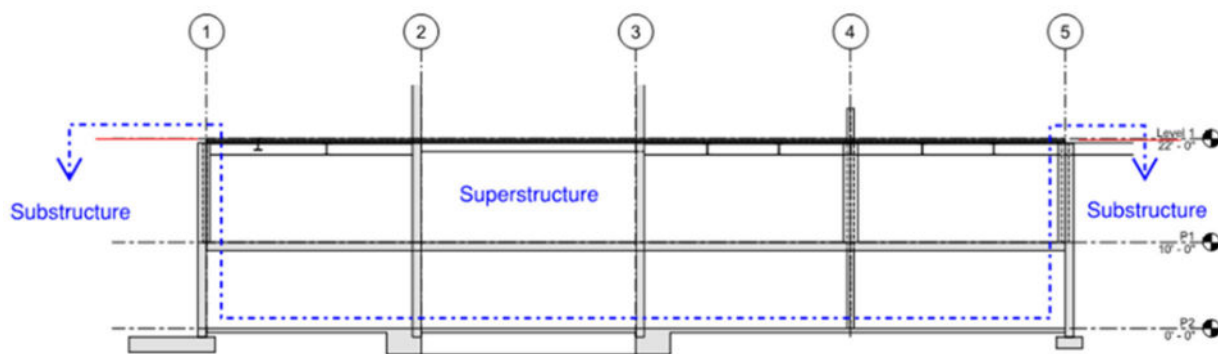


Figure 3: Demarcation between Superstructure and Substructure

Clarifications and Concessions for OmniClass Table 21

As described above in *Limitations of Existing Construction Classification Systems*, adopting *OmniClass Table 21* came with some challenges. How key issues were resolved is presented below in order to clarify intended use of the SE 2050 Taxonomy. Further explanation of these issues can be found in *Appendix C: Mapping to Other Classification Systems*.

Skipping Level 4 of OmniClass Table 21

In several instances, *OmniClass Table 21* lacks a Level 4, resulting in a direct mapping from Level 3 to Level 5, and sometimes to Level 6, in the SMQ Taxonomy. This mapping led to some unavoidable repetition across Levels 3-6, as shown in Table 8, for slabs on grade and driven piles.

Table 8: Snippet of Final Driven Pile Taxonomy for Levels 3 through 6.

Level 3	Level 4	Level 5 (SE 2050 reporting level)	Level 6
Standard Slabs-on-Grade	Standard Slabs-on-Grade	Standard Slabs-on-Grade	Standard Slabs-on-Grade
Special Foundations	Driven Piles	Driven Pile	Driven Pile (various types)

Instead of also leaving gaps where *OmniClass* had gaps, it seemed important to complete the Taxonomy through to Level 6 to fulfill the intent to create a component-based taxonomy.

Substructure – Special Foundations

The *Special Foundation* branch at Level 3 of *OmniClass Table 21* expands into a long list of specific foundation types, particularly deep foundations, such as piles, drilled shafts, caissons, and auger-cast piles, at Level 4. To maintain compatibility with *OmniClass*, *Special Foundations* are used as the primary grouping for deep foundation types. This diverges from standard engineering terminology, as most practitioners would not typically classify driven piles or caissons as “special.”

Substructure Wall Classification: Retaining vs. Non-Retaining

The SE 2050 Taxonomy distinguishes below-grade walls based on their functional role, specifically, whether they retain soil. As shown in Figure 4, this distinction reflects two commonly encountered conditions in structural engineering:

- Non-Retaining Walls** (Figure 4, left): Sometimes referred to as “frost walls” in northern climates, these walls have soil on both sides and do not act in soil retention. They are typically used in shallow foundation systems and are laterally supported by adjacent soils. In the taxonomy, these are *Foundations* at Level 2 and are classified at Level 5 as *Foundation Walls and Footings (non-retaining)*.
- Retaining Walls** (Figure 4, right): Often referred to as *basement walls* or *retaining walls*, these resist lateral soil pressures on one side and are generally supported by the lowest-level slab and a floor above, or they may act as cantilevers depending on construction sequence. These are categorized under *Level 2: Subgrade Enclosures* and appear at Level 5 as *Subgrade Enclosure Foundation Wall (retaining)*.

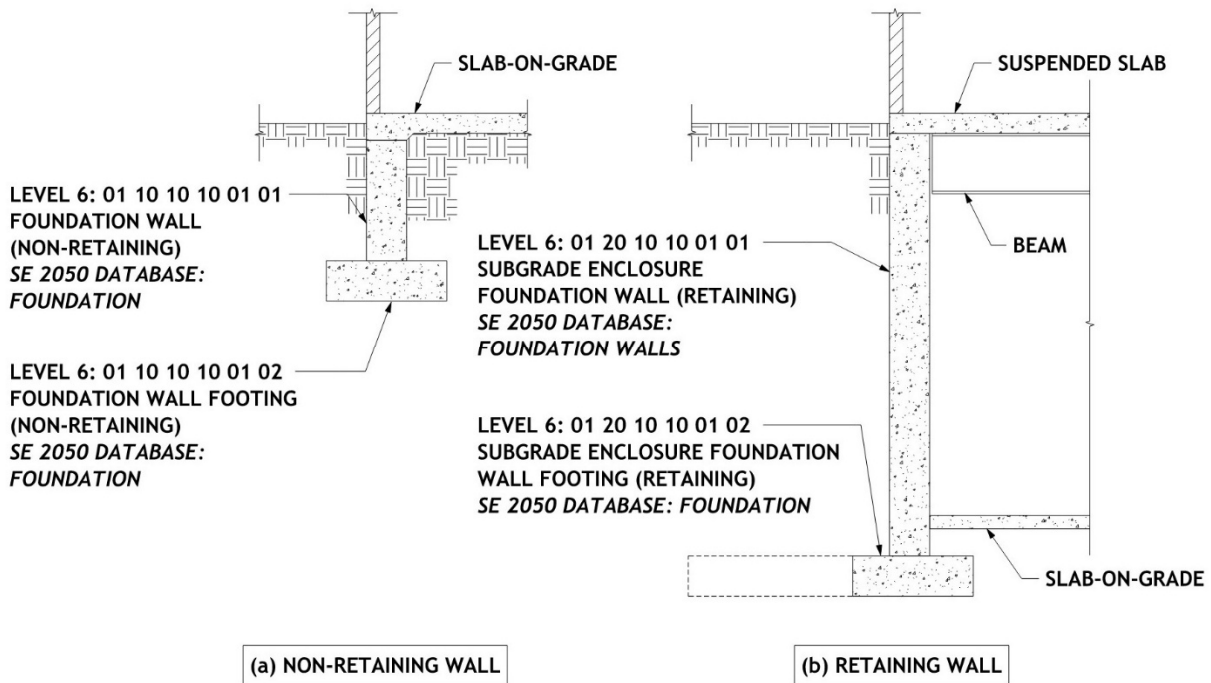


Figure 4: Substructure Wall Classification: Retaining vs. Non-Retaining

This classification approach was chosen for both functionality and interoperability. A “subgrade enclosure” implies a protected, enclosed space below grade, typically including waterproofing and insulation layers, which are important in embodied carbon calculations. While the division may not perfectly align with how engineers traditionally describe “foundation walls,” it supports consistency with *OmniClass Table 21* and other industry workflows that use structural component relationships.

Substructure Column Foundation

The SE 2050 Taxonomy defines column foundations as structural elements that support primary columns, which typically terminate at or just below the demarcation between superstructure and substructure. These columns are generally supported either on standalone piers, usually cast-in-place concrete, or on pilasters integrated into foundation or subgrade enclosure walls (i.e., basement walls). Refer to Figure 5 below for a graphical representation.

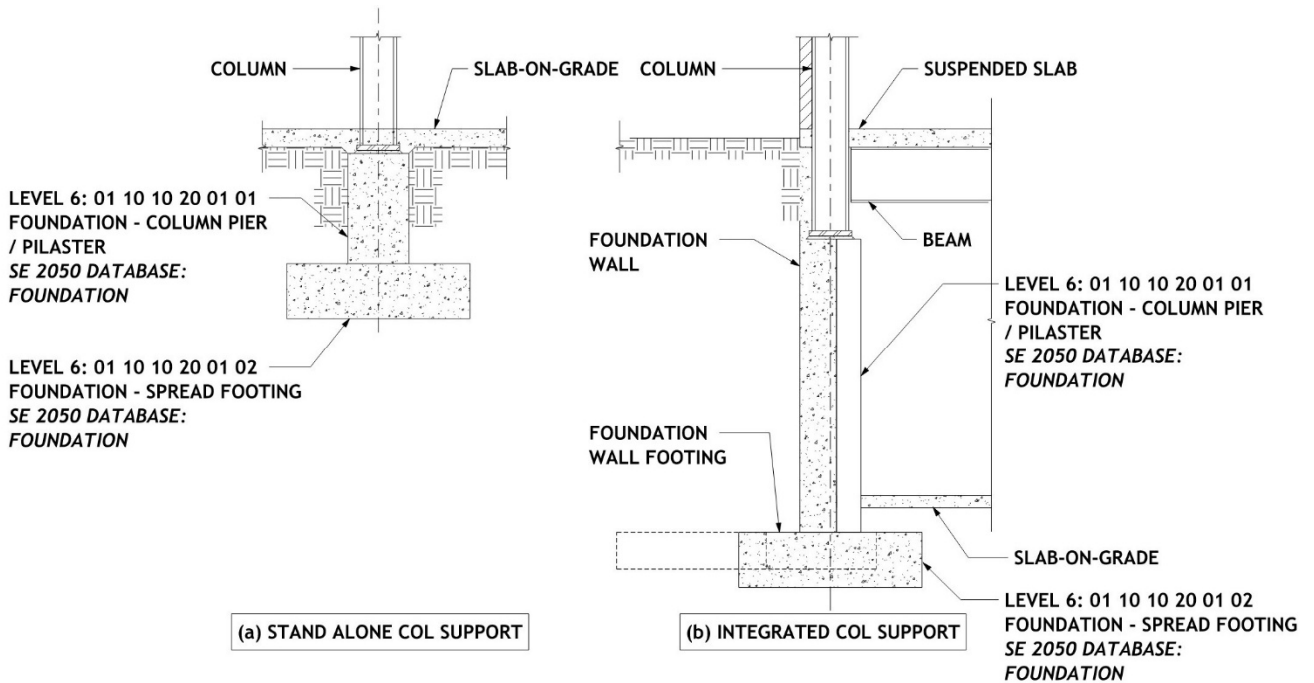


Figure 5: Column Foundation Support

Structural Walls – Interior Structural Walls vs. Exterior Structural Walls

Interior superstructure walls, such as shear walls and load-bearing walls, are mapped to *Floor Construction > Floor Structural Frame*, even though structural engineers do not think of concrete and masonry walls as “framing.” This non-intuitive location is due to the gap in *OmniClass Table 21*, wherein no clear location for interior walls exists. Finding a location for interior walls was one of the most debated decisions during the mapping process.

Table 9 shows where exterior and interior walls of the Superstructure reside in the SMQ Taxonomy, with their division starting at Level 3.

Table 9: Location of Exterior Walls and Interior Walls within the SE 2050 Taxonomy

Level 1	Level 2	Level 3	Level 4	Level 5

Shell	Superstructure	Exterior Walls	Exterior Wall Construction	Exterior Walls (structural)
Shell	Superstructure	Floor Construction	Floor Structural Frame	Interior Walls (structural)

Conclusion and Future Outlook

The SE 2050 Taxonomy represents a significant step forward in enabling structural engineers to report structural material quantities and embodied carbon through a consistent, transparent, and interoperable framework. Built upon the organization of *OmniClass Table 21* and refined through structural-specific Levels 5 through 7, the taxonomy fills gaps and introduces definition in existing classification systems with a level of precision informed by structural engineering practice.

By providing a standardized, component-level framework that aligns data with structural function, structural engineers can gain insights to more effectively reduce the embodied carbon of their designs. At the same time, consistency and granularity in reporting to programs like SE 2050 will help the industry more quickly develop reliable benchmarks.

The SE 2050 Taxonomy offers value beyond embodied carbon reporting. It can support cost exercises, internal benchmarking, and early-stage decision-making, offering firms a standardized way to assess and compare structural systems. Continued development of the taxonomy itself should focus on expanding classifications to capture emerging technologies (e.g., mass timber, modular systems, 3D printing), improving digital integration, and refining benchmarks based on aggregated industry data.

Successful use of the SE 2050 Taxonomy will require ongoing, interdisciplinary collaboration. Alignment with evolving standards such as the *SEI Prestandard*, ASHRAE 240p, and certification programs like LEED will be critical. Just as important is integration with digital design tools, including BIM and LCA platforms, to enable seamless data exchange and minimize disruption to current workflows.

Remaining challenges, such as data standardization, software adoption, and industry-wide training, can be addressed through pilot projects, knowledge dissemination, and continued stakeholder engagement. Adoption will be further strengthened by partnerships with architects, contractors, researchers, and regulatory bodies, ensuring the taxonomy remains flexible, relevant, and scalable as the industry evolves.

Above all, the SE 2050 Taxonomy is not just a classification tool; it is a strategic framework that invites practitioners and researchers in building design and construction to critique

and improve how our industry tracks materials and reduces embodied carbon. The continued success of the SE 2050 Taxonomy will rely on collaboration, feedback, and a shared commitment to transforming design practices in response to the urgent demands of the climate crisis.

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Appendix A: SMQ Data Collection in the SE 2050 Database

The new SE 2050 database will play a critical role in standardizing the collection of SMQ across projects in a centralized repository. The collects SMQ data at **Level 5** of the SE 2050 Taxonomy, but as has been discussed in the Using the SE 2050 Taxonomy section, some exceptions have been made to account for how most structural engineers currently track quantities.

The new SE 2050 database SMQ data collection is structured as **nine categories** under *Substructure* and *Superstructure*. The relationship between SE 2050 Database SMQ categories to the SE 2050 Taxonomy is shown in Table 10 below. The left column identifies the nine categories and the right column identifies the specific categories of the SE 2050 Taxonomy that are included within the nine categories.

Table 10: SE 2050 Database Collection Mapping from SE 2050 Taxonomy

SE 2050 Database	SE 2050 Taxonomy
Substructure	Level 5 Assembly (or Level 6 Components) included
Foundation	01 10 10 10 01 Foundation – Walls ¹ and Footings 01 10 10 20 01 Foundation – Columns ¹ and Footings 01 10 20 10 01 Driven Pile 01 10 20 15 01 Bored / Drilled Pile 01 10 20 20 01 Caissons 01 10 20 30 01 Special Foundation Walls 01 10 20 40 01 Foundation Anchors 01 10 20 50 01 Underpinning 01 10 20 60 01 Raft / Mat Foundations 01 10 20 70 01 Pile Cap 01 10 20 80 01 Grade Beam 01 20 10 10 01 02 Subgrade Enclosure Foundation Wall Footing (retaining) ²
Foundation Walls	01 20 10 10 01 01 Subgrade Enclosure Foundation Wall (retaining) ²
Slabs-on-grade	01 40 10 01 01 Standard Slab-on-Grade 01 40 20 01 01 Structural Slab-on-Grade
Superstructure	Level 5 Assembly included
Slabs/Decks ³	02 10 10 20 01 Floor Decks, Slabs, and Toppings 02 10 20 20 01 Roof Decks, Slabs, and Toppings
Beams ³	02 10 10 10 02 Beam

	02 10 20 10 02 Beams Supporting Roof
Columns	02 10 10 10 01 Column 02 10 20 10 01 Columns Supporting Roof
Bracing	02 10 10 10 03 Bracing 02 10 20 10 03 Roof diagonal bracing
Stairs	02 10 80 10 01 Stairs
Exterior Structural Walls ³	02 20 10 20 01 Exterior Walls 02 20 10 20 02 Exterior Walls Supporting Roof
Interior Structural Walls ⁴	02 10 10 10 04 Interior Walls 02 10 20 10 04 Interior Walls Supporting Roof
<i>At Engineer's Discretion</i> ⁵	<i>02 10 10 10 04 Supplemental Floor Structural Frame</i> <i>02 10 20 10 04 Supplemental Roof Structural Frame</i>

Some items that warrant explanation:

1. “Walls” and “Columns” associated with the *Foundation – Walls and Footings* and *Foundation – Columns and Footings* assemblies, respectively, refer to relatively short walls (e.g., frost walls and cripple walls) and columns (e.g., pilaster and piers) under the slab-on-grade. Refer to Figure 4 for clarification. Full height walls would normally belong with Subgrade Enclosure Foundation Walls while taller subgrade columns would more likely belong in the pile and caisson assemblies.
2. Level 6 components *Retaining Wall* and *Retaining Wall Footings* have been split into different categories for the SE 2050 Database because most engineers consider the footings below retaining walls part of the foundation rather than part of the foundation walls. Foundation walls were created as a separate category from foundation for the walls of subgrade enclosures, typically basement walls, because they are often constructed after completion of the foundation. In many cases, the concrete mixture for the basement wall is different from the footing below the wall. In contrast, much shorter walls and columns such as frost walls, pilasters, and piers below the slab on grade are often considered part of the foundation and are more likely to use the same concrete mixture as other assemblies within the foundation system. Refer to section *Substructure Wall Classification: Retaining vs. Non-Retaining* and Figure 4 for further discussion.
3. Within Superstructure, the Database has chosen to group together floor and roof components for slabs/decks, toppings, beams, and horizontal bracing. While the Taxonomy keeps these separate in order to align with *OmniClass Table 21*, and because there is some rationale to differentiating these assemblies. Future versions of the database may split roof and floor construction apart so that more

functionally equivalent comparisons can be made, but this is not likely to happen until the industry is ready to examine buildings at such a granular level.

4. As noted in the Refining and Mapping section above, Interior Structural Walls have been kept separate from Exterior Structural Walls. This is due to the separation of Exterior Walls from Floor Construction at Level 3 in *OmniClass Table 21*. *OmniClass Table 21* does not offer a clear category for interior wall elements. Thus, Interior Wall was created at Level 5, under Floor Structural Frame, alongside Beams, Columns, Bracing, and Supplemental Floor Structural Frame. While this will likely impose some burden of change to current practice, alignment with *OmniClass Table 21* was deemed more important in this instance.
5. The Supplemental Floor and Roof Structural Frames, also in Level 5 of the SE 2050 Taxonomy, are not included in a specific Database category because they fall into the definition of Ancillary components according to the *SEI Prestandard*. The inclusion of these is optional and categorization is left to the engineer's discretion. In the future, the Database may consider adding a Supplemental Framing category but as most engineers do not include the quantities, and to minimize the number of Database input fields, it has been omitted at this time.

For further definition and detail on what is included in each Level 5 assembly class, see *Appendix B: Assembly Definitions and SEI Prestandard Components Categories*.

Appendix B: Assembly Definitions and SEI Prestandard Components Categories

This appendix presents a structured breakdown of Level 5 Assemblies along with their corresponding Level 6 Components and Level 7 Materials / Products. It provides clearer definitions and distinctions between related structural assemblies to support consistent interpretation and classification.

Each table includes illustrative examples of Primary, Accessory, Ancillary, and Excluded components. These categories align with the intent of the *SEI Prestandard* and are provided to show classification scope and usage context. However, they should be viewed as illustrative only and not as exhaustive lists. Furthermore, while Level 7 lists materials using *MasterFormat* Divisions, more detailed specification is necessary to associate the collected structural material quantities with embodied carbon factors, or environmental impacts in an LCA. See *Level 7 items can be sourced from a MasterFormat section (e.g., 03 30 00 – Cast-in-Place Concrete, 05 12 00 – Structural Steel Framing, etc.)* consistent with a typical project specification. *OmniClass Table 23* may also serve as an appropriate framework for Level 7 product classification and is the basis of a standardized product nomenclature system to support wbLCA led by the Athena Sustainable Materials Institute (Bowick, 2023). Use of either would improve alignment with other industry classification systems. Until one is adopted broadly, either may be used at the user’s discretion.

Example: Built-Up Steel Column for more detailed example of how to use Level 7.

Exercising engineering judgment is still important. For instance, a pipe sleeve may include flanges or connectors that could theoretically be further subdivided, but in practice, such items often come as pre-manufactured assemblies with a single Environmental Product Declaration (EPD), making further breakdown unnecessary or even misleading.

While discrepancies between structural material detailing and embodied carbon accounting may arise, Level 7 provides a consistent, actionable foundation for applying component type classifications and improving the precision of material takeoffs.

Level	Function
5	Assembly
	01 10 10 10 01 Foundation Walls and Footings (non-retaining)
6	Component
	Primary - Included for all SEI Prestandard Assessment Tiers
	01 10 10 10 01 01 Foundation Wall (non-retaining)
	01 10 10 10 01 02 Foundation Wall Footing (non-retaining)
	01 10 10 10 01 03 Foundation Walls and Footings – Other

	<p>A non-retaining foundation wall is typically constructed of reinforced concrete and cast-in-place on site using temporary formwork. It supports vertical loads, such as façade or perimeter wall loads, and is not designed to resist lateral soil pressure, as soil exists on both sides of the wall. These walls are commonly topped with a slab-on-grade. In colder climates, they are often referred to as “frost walls” due to their role in extending below the frost line.</p> <p>The wall typically bears on a spread footing, which is also constructed of reinforced concrete and is generally a few feet wide, running concentric with the base of the wall. This footing distributes the vertical loads from the wall to the underlying soil.</p>		
	<i>Included or Optional per SEI Prestandard Assessment Tier</i>		
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement around openings or through cold joints; Rebar couplers; Masonry mortar; Stone mortar; Other;	Elevator support; Pit grating; Other;	Pipe sleeves; Insulation; Waterproofing; Vapor barriers; Waterstops; Enclosure materials; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete Div 04: Stone, Masonry Block and Grout Div 05: Steel Reinforcement and Tendons		
5	Assembly		
	01 10 10 20 01 Foundation – Columns and Footings		
6	Component		
	<p>Primary 01 10 10 20 01 01 Foundation – Column Pier / Pilaster 01 10 10 20 01 02 Foundation – Spread Footing 01 10 10 20 01 03 Foundation – Columns and Footings – Other</p>		
	<p>These foundation elements are typically constructed of reinforced concrete and cast-in-place on site using formwork. A column pier is a vertical structural element, typically isolated, that transfers loads from a column down to a spread footing. It is aligned along the column line and is commonly used in shallow foundation systems.</p> <p>When this type of vertical element is partially or fully embedded within a foundation wall, it is referred to as a pilaster. Pilasters serve the same load-transferring function but are integrated into the wall, often to provide additional thickness and bearing capacity at column locations.</p> <p>The footing beneath a column pier or pilaster is typically a square spread footing, centered concentric with the column, and sized to distribute the vertical loads to the underlying soil within allowable bearing pressures.</p>		
	Accessory	Ancillary	Excluded
	Embedded steel elements;	Elevator support;	Pipe sleeves;

	Secondary reinforcement around openings or through cold joints; Rebar couplers; Masonry mortar; Stone mortar; Other;	Other;	Insulation; Waterproofing; Vapor barriers; Waterstops; Enclosure materials; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete Div 04: Stone, Masonry Block and Grout Div 05: Steel Reinforcement		
5	Assembly		
	01 10 20 10 01 Driven Pile		
6	Component		
	Primary 01 10 20 10 01 01 Driven Pile (various types)		
	A driven pile is a deep foundation element installed by mechanically driving it into the ground using a pile driver or similar equipment. It transfers structural loads to deeper, more stable soil strata or bedrock, bypassing weaker or compressible near-surface soils.		
	Accessory	Ancillary	Excluded
	Cap plates; Supplemental reinforcement; Rebar couplers; Other;	Other;	Temporary guide support; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 05: Structural Steel, Steel Reinforcement and Tendons Div 06: Timber		
5	Assembly		
	01 10 20 15 01 Bored / Drilled Pile		
6	Component		
	Primary 01 10 20 15 01 01 Bored Cast-in-Place (CIP) Pile 01 10 20 15 01 02 Auger Cast-in-Place (CIP) Pile 01 10 20 15 01 03 Drilled Displacement (DD) Piles 01 10 20 15 01 04 Drilled Shaft Piles 01 10 20 15 01 05 Micropile or Minipile		
	Bored or drilled pile foundations are deep foundation systems formed by creating a cylindrical hole in the ground and placing concrete or grout (typically with reinforcement) to construct a cast-in-place structural element. These systems are used to transfer loads to deeper, competent soil or rock layers, especially where surface soils are weak or compressible. Compared to driven piles, they generate minimal vibration and are well-suited for constrained or sensitive sites. <ul style="list-style-type: none"> • Bored Cast-in-Place (CIP) Piles – Drilled and filled with reinforcement and concrete; often supported with casing or slurry. 		

	<ul style="list-style-type: none"> ● Auger Cast-in-Place (CIP) Piles – Installed using a continuous flight auger with grout or concrete injected as the auger is withdrawn. ● Drilled Displacement (DD) Piles – Use a displacement tool to laterally compact soil and are filled with concrete as the tool is removed. ● Drilled Shaft Piles – Large-diameter piles used for heavy loads, often with slurry or casing during excavation. ● Micropiles (Minipiles) – Small-diameter, high-capacity piles installed by rotary drilling and pressure grouting, ideal for retrofit and limited-access sites 		
	Accessory	Ancillary	Excluded
	Cap plates; Supplemental reinforcement; Rebar couplers; Other;	Other;	Temporary guide support; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete Div 05: Structural Steel, Steel Reinforcement and Tendons		
5	Assembly		
	01 10 20 20 01 Caissons		
6	Component		
	Primary 01 10 20 20 01 01 Open Caissons (Open Piers) 01 10 20 20 01 02 Closed Caissons (Cofferdams)		
	<p>Caisson foundations are large, watertight, deep foundation systems used to support heavy loads in challenging soil or water conditions, such as for bridges and marine structures. They are typically constructed at the surface and lowered into position by excavation or weight.</p> <p>This assembly includes:</p> <ul style="list-style-type: none"> ● Open Caissons (Open Piers): Hollow, open-top and bottom structures sunk by internal excavation; often filled with concrete once in place. ● Closed Caissons (Cofferdams): Watertight enclosures, dewatered after installation to allow dry construction of foundations below water or unstable soil. 		
	Accessory	Ancillary	Excluded
	Cap plates; Supplemental reinforcement; Rebar couplers; Other;	Other;	Temporary guide support; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete Div 05: Steel Reinforcement		
5	Assembly		
	01 10 20 30 01 Special Foundation Walls		
6	Component		
	Primary 01 10 20 30 01 01 Special Foundation Wall		

	A special foundation wall is a structural wall element that does not fall within standard retaining or non-retaining categories and is used to address unique loading, geotechnical, or constructability conditions. These may include walls designed for seismic isolation, vibration mitigation, deep excavation support, or integration with shoring or hybrid systems.		
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement around openings or through cold joints; Rebar couplers; Masonry mortar; Stone mortar; Other;	Elevator support; Pit grating; Other;	Pipe sleeves; Insulation; Waterproofing; Vapor barriers; Waterstops; Enclosure materials; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 04: Stone, Masonry Block and Grout Div 05: Structural Steel, Steel Reinforcement and Tendons, Aluminum Div 06: Timber		
5	Assembly		
	01 10 20 40 01 Foundation Anchors		
6	Component		
	Primary 01 10 20 40 01 Mechanical Rock Anchors 01 10 20 40 02 Grouted Rock Anchors 01 10 20 40 03 Post-Tensioned Rock Anchors 01 10 20 40 04 Multi-Strand Rock Anchors 01 10 20 40 05 Passive Rock Anchors		
	<p>Foundation anchors are structural elements used to transfer tension forces from a structure into competent rock or soil, providing stability against uplift, sliding, or overturning. They are commonly used in retaining systems, deep foundations, slope stabilization, and structures subject to lateral or uplift forces. Anchors are typically installed in pre-drilled holes and can be mechanical, grouted, or post-tensioned, depending on performance and load requirements.</p> <p>This assembly class includes:</p> <ul style="list-style-type: none"> ● Mechanical Rock Anchors – Anchors that engage rock through mechanical expansion at the tip. ● Grouted Rock Anchors – Anchors bonded to rock using cementitious or resin grout. ● Post-Tensioned Rock Anchors – Grouted anchors tensioned after installation to apply active force. ● Multi-Strand Rock Anchors – High-capacity, post-tensioned anchors made of multiple steel strands. ● Passive Rock Anchors – Anchors that develop tension only in response to structural or ground movement (no active stressing). 		

	Accessory	Ancillary	Excluded
	Other;	Other;	Temporary guide support; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Anchor Grout Div 05: Structural Steel, Steel Reinforcement and Tendons		
5	Assembly		
	01 10 20 50 01 Underpinning		
6	Component		
	Primary 01 10 20 50 01 01 Underpinning		
	Underpinning is a construction technique used to strengthen, stabilize, or extend the depth of an existing foundation. It is typically employed when a building's original foundation is inadequate due to changes in load, soil conditions, nearby excavation, or structural settlement. Underpinning methods vary and may include mass concrete piers, micropiles, needle beams, or jet grouting. The goal is to transfer building loads to deeper, more stable strata or to increase foundation capacity without disturbing the existing structure.		
	Accessory	Ancillary	Excluded
	Other;	Other;	Temporary guide support; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 04: Stone, Masonry Block and Grout Div 05: Structural Steel, Steel Reinforcement and Tendons Div 06: Timber		
5	Assembly		
	01 10 20 60 01 Raft / Mat Foundations		
6	Component		
	Primary 01 10 20 60 01 01 Raft / Mat Foundation		
	A raft foundation (also known as a mat foundation) is a large, thick concrete slab that supports multiple columns or an entire structure across a broad area, distributing loads evenly to the underlying soil. It is typically used where soil bearing capacity is low or where differential settlement must be minimized. Raft foundations can be flat, ribbed, or cellular in form, and often incorporate significant reinforcement. They are commonly used in mid- to high-rise buildings, tanks, silos, and sites with poor or variable subsurface conditions.		
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement around openings or through cold joints; Rebar couplers; Other;	Elevator support; Pit grating; Other;	Pipe sleeves; Insulation; Waterproofing; Vapor barriers; Waterstops; Enclosure materials; Formwork;

			Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 05: Steel Reinforcement and Tendons		
5	Assembly		
	01 10 20 70 01 Pile Cap		
6	Component		
	Primary 01 10 20 70 01 01 Pile Cap		
	<p>A <i>pile cap</i> is a reinforced concrete element that sits atop a group of piles, distributing structural loads from columns, walls, or slabs to the piles below. It acts as a load-transfer platform, tying multiple piles together to function as a single foundation unit. Pile caps are designed to spread loads evenly, ensure structural continuity, and provide rigidity to the pile group.</p>		
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement around openings or through cold joints; Rebar couplers; Stone mortar; Other;	Elevator support; Pit grating; Other;	Pipe sleeves; Insulation; Waterproofing; Vapor barriers; Waterstops; Enclosure materials; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 04: Stone Div 05: Steel Reinforcement and Tendons		
5	Assembly		
	01 10 20 80 01 Grade Beam		
6	Component		
	Primary 01 10 20 80 01 01 Grade Beam		
	<p>A <i>grade beam</i> is a horizontal structural element, typically made of reinforced concrete, that spans between foundation supports such as piers, piles, or footings at or near ground level. It is designed to carry and transfer loads from above-grade walls or columns to these supports, often across soil conditions that do not allow for continuous wall footings. Unlike ground-supported footings, grade beams are designed to span and resist bending between supports. They may be cast integrally with a slab-on-grade or constructed as a standalone element using concrete, steel, or other structural materials, depending on project requirements.</p>		
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement around openings or through cold joints; Rebar couplers;	Elevator support; Other;	Pipe sleeves; Insulation; Waterproofing; Vapor barriers; Waterstops;

	Stone mortar; Other;		Enclosure materials; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 05: Steel Reinforcement and Tendons		
5	Assembly		
	01 20 10 10 01 Subgrade Enclosure Foundation Wall and Footings (retaining)		
6	Component		
	Primary 01 20 10 10 01 01 Subgrade Enclosure Foundation Wall (retaining) 01 20 10 10 01 02 Subgrade Enclosure Foundation Wall Footing (retaining)		
	<p>This assembly includes retaining walls and associated footings that form part of a shallow foundation system, typically used in basement construction. These elements are designed to resist both vertical structural loads and lateral earth pressures from retained soil.</p> <ul style="list-style-type: none"> Subgrade Enclosure Foundation Wall (retaining) A vertical structural wall, typically cast-in-place reinforced concrete, that retains soil on one side while supporting superstructure loads. Commonly used to form basement or subgrade levels in buildings, these walls often also serve as part of the building envelope and may include waterproofing or insulation. Subgrade Enclosure Foundation Wall Footing (retaining) A spread footing located beneath the retaining wall that distributes vertical and lateral loads to the underlying soil. These footings are typically wider than the wall itself and may include keying or shear elements to resist sliding and overturning due to soil pressure. 		
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement around openings or through cold joints; Rebar couplers; Masonry mortar; Stone mortar; Other;	Elevator support; Pit grating; Other;	Pipe sleeves; Insulation; Waterproofing; Vapor barriers; Waterstops; Enclosure materials; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 04: Stone, Masonry Block and Grout Div 05: Steel Reinforcement and Tendons		
5	Assembly		
	01 40 10 01 01 Standard Slab-on-Grade		
6	Component		
	Primary		

01 40 10 01 01 01 Standard Slab-on-Grade			
01 40 10 01 01 02 Topping Slab			
01 40 10 01 01 03 Housekeeping Pad			
<p>This assembly class includes cast-in-place concrete slab systems placed directly on the ground and designed to transfer building loads to the supporting soil or base layer. Slab-on-grade systems are typically used for ground-level floors in buildings and may include structural or non-structural applications, depending on reinforcement and loading conditions.</p> <p>This class includes:</p> <ul style="list-style-type: none"> ● Standard Slab-on-Grade: A reinforced or unreinforced concrete slab poured directly on compacted subgrade or granular base, typically used for ground floors in buildings, warehouses, and garages. ● Topping Slab: A thin concrete overlay placed on an existing slab or structural deck to provide a finished surface, increase elevation, or enhance durability. ● Housekeeping Pad: A small, isolated concrete pad placed on top of a slab or foundation to support mechanical or electrical equipment, typically raised to protect from washdown or spills. 			
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement around openings or through cold joints; Rebar couplers; Other;	Elevator support; Pit grating; Other;	Pipe sleeves; Insulation; Waterproofing; Vapor barriers; Waterstops; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 05: Steel Reinforcement and Tendons, Aluminum		
5	Assembly		
	01 40 20 01 01 Structural Slab-on-Grade		
6	Component		
	Primary		
	01 40 20 01 01 01 Structural Slab-on-Grade		
<p>A structural slab-on-grade, also known as a framed slab, is a reinforced concrete slab designed to act as a self-supporting structural element. Unlike standard slabs that rely on continuous support from the subgrade, structural slabs span between grade beams, pile caps, or other foundation elements, and are engineered to carry loads through bending and shear.</p> <p>These slabs are typically used where the underlying soil is not capable of providing uniform support, as in areas with expansive soils, voids, trenches, or with differential settlement risk. They are common in industrial buildings, utility areas, and structures with heavy point loads or poor subgrade conditions. Structural slabs often incorporate dense reinforcement, thickened sections, or are integrated into pile-supported systems.</p>			
	Accessory	Ancillary	Excluded
	Embedded steel elements;	Elevator support; Pit grating;	Pipe sleeves; Insulation;

	Secondary reinforcement around openings or through cold joints; Rebar couplers; Other;	Other;	Waterproofing; Vapor barriers; Waterstops; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 05: Structural Steel, Steel Reinforcement and Tendons, Aluminum		
5	Assembly		
	02 10 10 10 01 Column		
6	Component		
	Primary 02 10 10 10 01 01 Column 02 10 10 10 02 Built-up or Composite Column 02 10 10 10 03 Column – Other		
	<p>This assembly class includes vertical structural elements designed primarily to transfer axial loads from beams, slabs, or other superstructure components down to the foundation. Columns are essential for carrying gravity loads and, in many cases, also contribute to lateral stability.</p> <p>This class includes:</p> <ul style="list-style-type: none"> ● Column: A single-material vertical element, typically made of reinforced concrete, structural steel, or heavy timber, designed to carry compressive loads. ● Built-up or Composite Column: A column composed of two or more materials acting together (e.g., concrete-filled steel tube or steel-reinforced concrete), or assembled from multiple components (e.g., laced or battened steel members). Used where increased capacity, ductility, or fire resistance is required. ● Column – Other: Includes non-standard or specialized column types not classified above, such as architectural-integrated columns, temporary shoring columns, or columns with atypical geometry or materials. 		
	Accessory	Ancillary	Excluded
	Baseplates; Secondary reinforcement; Splice plates and channels; Anchor rods; Baseplate grout bed; Screws and nails; Bolts; Headed shear connectors; Blocking; Other;	Façade connections; Elevator support; Canopy support; Other;	Fireproofing; Safety cables; Pipe sleeves; Insulation; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 04: Stone, Masonry Block and Grout Div 05: Structural Steel, Steel Reinforcement and Tendons, Aluminum Div 06: Timber		

5	Assembly		
	02 10 10 10 02 Beam		
6	Component		
	Primary 02 10 10 10 02 01 Beam 02 10 10 10 02 02 Built-up or Composite Beam 02 10 10 10 02 03 Truss 02 10 10 10 02 04 Joist 02 10 10 10 02 05 Beam – Other		
	<p>This assembly class includes horizontal or sloped structural framing elements that primarily resist bending and shear forces. Beams transfer loads from floors, roofs, or secondary framing elements to vertical supports such as columns or walls. They can be constructed from a wide range of materials and configurations depending on structural demands, span length, and construction method.</p> <p>This class includes:</p> <ul style="list-style-type: none"> ● Beam: A conventional single-material element, such as a steel wide-flange beam, reinforced concrete beam, or sawn lumber beam, designed to support loads through flexure. ● Built-up or Composite Beam: A beam constructed from multiple components or materials acting together (e.g., laminated timber, flitch beams, or steel-concrete composite beams) to achieve enhanced structural capacity or performance. ● Truss: A structural assembly composed of interconnected members arranged in triangular units to efficiently carry loads through axial forces. Trusses are used to span large distances with minimal material. ● Joist: A lightweight, standardized steel truss-like element typically used in floor and roof framing, designed for efficient material use and ease of MEP integration. ● Beam – Other: Non-standard or specialized beam types not covered above, including transfer girders, shelf angles acting as structural elements, or beams with unconventional geometry or detailing. 		
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement; Connection materials; Splice channels; Splice plates; Bearing plates; Screws and nails; Bolts; Headed shear connectors; Knife plates; Blocking; Other	Façade connections; Elevator support; Canopy support; Other;	Fireproofing; Acoustic materials; Safety cables; Pipe sleeves; Insulation; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat:		

	Div 03: Concrete, Precast Concrete Div 04: Stone, Masonry Block and Grout Div 05: Structural Steel, Steel Reinforcement and Tendons, Aluminum Div 06: Timber		
5	Assembly		
	02 10 10 10 03 Bracing		
6	Component		
	Primary 02 10 10 10 03 01 Bracing – Vertical 02 10 10 10 03 02 Bracing – Horizontal 02 10 10 10 03 03 Bracing – Other		
	<p>This assembly class includes structural elements that provide stability to a building or structure by resisting lateral loads such as wind, seismic forces, or unbalanced loading. Bracing systems function primarily through axial tension and compression and are critical to the overall lateral force-resisting system.</p> <p>This class includes:</p> <ul style="list-style-type: none"> • Bracing – Vertical: Diagonal or cross-bracing elements located in vertical planes (e.g., between floors or in walls) that resist lateral loads and control building sway. Common types include steel rod, angle, or HSS bracing in X, K, or Chevron configurations. • Bracing – Horizontal: Elements installed in horizontal planes (e.g., roof or floor diaphragms) to distribute lateral forces and maintain frame geometry. Often used in conjunction with deck diaphragms or trusses. • Bracing – Other: Includes specialized or non-standard bracing systems not classified above, such as buckling-restrained braces (BRBs), tension-only systems, or architectural-integrated bracing. 		
	Accessory	Ancillary	Excluded
	Secondary reinforcement; Connection materials; Gusset plates; Splice plates and channels; Headed shear connectors; Knife plates; Screws and nails; Bolts; Strapping; Other	Façade connections; Elevator support; Canopy support; Other;	Acoustic materials; Safety cables; Pipe sleeves; Insulation; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 05: Structural Steel, Steel Reinforcement and Tendons, Aluminum Div 06: Timber		
5	Assembly		
	02 10 10 10 04 Interior Walls		
6	Component		
	Primary 02 10 10 10 04 01 Interior Wall – Bearing Wall 02 10 10 10 04 02 Interior Wall – Shear Wall		

02 10 10 10 04 03 Interior Wall – Insulated Panel Wall (load bearing)			
02 10 10 10 04 04 Interior Wall – Other			
<p>This assembly class includes structural interior walls that provide vertical and/or horizontal load-bearing capacity within a building. These walls may support gravity loads from floors or roofs, resist lateral forces as part of the building’s seismic or wind-force-resisting system, or serve as structural partitions. While they may also divide interior spaces or accommodate insulation and finishes, their primary function is structural.</p> <ul style="list-style-type: none"> ● Interior Wall – Bearing Wall: A structural wall that supports vertical gravity loads from above. ● Interior Wall – Shear Wall: A structural wall designed to resist in-plane lateral loads as part of the building’s lateral force-resisting system. ● Interior Wall – Insulated Panel Wall (Load Bearing): A prefabricated panelized wall system providing both structural support and interior insulation, commonly used in modular or panelized construction. ● Interior Wall – Other: Structural interior walls not captured above, including hybrid, specialty, or architecturally integrated systems. 			
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement around openings or through cold joints; Rebar couplers; Masonry mortar; Stone mortar; Blocking; Other;	Elevator support; Other;	Pipe sleeves; Formwork; Fireproofing; Acoustic materials; Safety cables; Other;
7	Material / Product		
	<p>e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 04: Stone, Masonry Block and Grout Div 05: Structural Steel, Steel Reinforcement and Tendons, Aluminum Div 06: Timber Div 08: Glass</p>		
5	Assembly		
	02 10 10 10 04 Supplemental Floor Structural Frame		
6	Component		
	<p>Ancillary 02 10 10 10 05 01 Façade Support Framing 02 10 10 10 05 02 Elevator Framing and Support 02 10 10 10 05 03 Hung Pit/Elevator Pit Framing</p>		
	<p>This assembly class includes structural framing elements that are not part of the primary gravity or lateral load-resisting system but are required to support architectural, mechanical, or functional features within the floor system. These elements are typically localized, custom-detailed, and coordinated closely with non-structural systems. This class includes:</p>		

	<ul style="list-style-type: none"> ● Façade Support Framing: Secondary framing elements at floor edges used to support cladding systems, façade anchors, or window wall assemblies. ● Elevator Framing and Support: Structural framing to support elevator rails, equipment loads, and openings through floor slabs, typically located at shaft edges or within elevator machine rooms. ● Hung Pit / Elevator Pit Framing: Framing systems that suspend or support elevator pit slabs above grade or over other program spaces, used when below-grade excavation is not feasible. 		
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement; Connection materials; Splice channels; Splice plates; Bearing plates; Screws and nails; Bolts; Headed shear connectors; Knife plates; Blocking; Other	Other;	Fireproofing; Acoustic materials; Safety cables; Pipe sleeves; Insulation; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 04: Stone, Masonry Block and Grout Div 05: Structural Steel, Steel Reinforcement and Tendons, Aluminum Div 06: Timber Div 08: Structural Glass		
5	Assembly		
	02 10 10 20 01 Floor Decks, Slabs, and Toppings		
6	Component		
	Primary 02 10 10 20 01 01 Slab – Flat Plate and Flat Slab (Mild Reinforcement) 02 10 10 20 01 02 Slab – Flat Plate and Flat Slab (Post-Tensioned) 02 10 10 20 01 03 Floor Deck – Composite Concrete Topping on Metal Deck 02 10 10 20 01 04 Floor Deck – Bare Metal Deck 02 10 10 20 01 05 Floor Deck – Planks and Panels 02 10 10 20 01 06 Slabs – Topping Slabs (For Strength and Serviceability) 02 10 10 20 01 07 Decks, Slabs, and Toppings – Other		
	<p>This assembly class includes structural and semi-structural floor elements that provide horizontal load transfer, support superimposed loads, and contribute to diaphragm action within a building. These elements may be cast-in-place, precast, or assembled from metal decking systems and may include supplemental toppings for strength, serviceability, or integration with other systems.</p> <p>This class includes:</p> <ul style="list-style-type: none"> ● Slab – Flat Plate and Flat Slab (Mild Reinforcement): Monolithic reinforced concrete slabs with uniform thickness (flat plate) or local thickening at columns (flat slab), typically used in residential, commercial, or institutional buildings. 		

	<ul style="list-style-type: none"> ● Slab – Flat Plate and Flat Slab (Post-Tensioned): Similar to above but incorporating post-tensioning to reduce slab thickness, increase spans, and control deflection and cracking. ● Floor Deck – Composite Concrete Topping on Metal Deck: A composite system where concrete topping works together with a profiled steel deck to support floor loads, commonly used in steel-framed buildings. ● Floor Deck – Bare Metal Deck: A steel deck system used as a form or working surface without concrete topping, often found in mezzanines, roofs, or equipment platforms. ● Floor Deck – Planks and Panels: Structural decking systems such as precast concrete planks, hollow-core slabs, or structural panels (e.g., CLT or SIPs) used in floor construction. ● Slabs – Topping Slabs (For Strength and Serviceability): Concrete overlays applied over an existing structural deck or slab to improve strength, stiffness, durability, or accommodate elevation changes. ● Decks, Slabs, and Toppings – Other: Includes non-standard or hybrid systems not listed above, such as fiber-reinforced slabs, high-performance overlays, or specialty structural toppings. 		
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement; Stud rails; Pour stops; Headed shear connectors; Bearing plates; Screws and nails; Bolts; Knife plates; Blocking; Other	Façade connections; Elevator support; Canopy support; Other;	Pipe sleeves; Insulation; Waterproofing; Vapor barriers; Waterstops; Enclosure materials; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 05: Structural Steel, Steel Reinforcement and Tendons, Aluminum Div 06: Timber Div 08: Glass		
5	Assembly		
	02 10 20 10 02 Beams Supporting Roof		
6	Component		
	Primary 02 10 20 10 02 01 Beam Supporting Roof 02 10 20 10 02 02 Built-up or Composite Beam Supporting Roof 02 10 20 10 02 03 Truss Supporting Roof 02 10 20 10 02 04 Joist Supporting Roof 02 10 20 10 02 05 Beam – Other Supporting Roof		
	This assembly class includes horizontal structural elements, as defined in the beam assembly class, that are specifically used to support roof loads rather than floor loads.		

	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement; Connection materials; Splice channels; Splice plates; Bearing plates; Screws and nails; Bolts; Headed shear connectors; Knife plates; Blocking; Other	Façade connections; Elevator support; Canopy support; Other;	Fireproofing; Acoustic materials; Safety cables; Pipe sleeves; Insulation; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 04: Masonry Block and Grout Div 05: Structural Steel, Steel Reinforcement and Tendons, Aluminum Div 06: Timber		
5	Assembly		
	02 10 20 10 03 Roof Bracing		
6	Component		
	Primary 02 10 20 10 03 02 Roof Bracing – Horizontal		
	This assembly class includes diagonal structural elements, as defined in the bracing assembly class, that are specifically used to provide lateral stability to roof structures.		
	Accessory	Ancillary	Excluded
	Secondary reinforcement; Connection materials; Gusset plates; Splice plates and channels; Headed shear connectors; Knife plates; Screws and nails; Bolts; Strapping; Other	Façade connections; Elevator support; Canopy support; Other;	Acoustic materials; Safety cables; Pipe sleeves; Insulation; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 05: Structural Steel, Steel Reinforcement and Tendons Div 06: Timber		
5	Assembly		
	02 10 20 20 01 Roof Decks, Slabs, and Toppings		
6	Component		
	Primary 02 10 20 20 01 01 Roof Slab – Flat Plate and Flat Slab (Mild Reinforcement) 02 10 20 20 01 02 Roof Slab – Flat Plate and Flat Slab (Post-Tensioned)		

	02 10 20 20 01 03 Roof Floor Deck – Composite Concrete Topping on Metal Deck 02 10 20 20 01 04 Roof Floor Deck – Bare Metal Deck 02 10 20 20 01 05 Roof Floor Deck – Planks and Panels 02 10 20 20 01 06 Roof Slabs – Topping Slabs (For Strength and Serviceability) 02 10 20 20 01 07 Roof Decks, Slabs, and Toppings – Other		
	This assembly class includes structural and semi-structural elements, as defined in the floor decks, slabs, and toppings assembly class, that are specifically used to support and span roof areas.		
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement; Stud rails; Pour stops; Headed shear connectors; Bearing plates; Screws and nails; Bolts; Knife plates; Blocking; Other	Façade connections; Elevator support; Canopy support; Other;	Pipe sleeves; Insulation; Waterproofing; Vapor barriers; Waterstops; Enclosure materials; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 05: Structural Steel, Steel Reinforcement and Tendons Div 06: Timber Div 08: Glass		
5	Assembly		
	02 10 80 10 01 Stairs		
6	Component		
	Primary 02 10 80 10 01 01 Stair Framing / Ornamental Stair Framing		
	This assembly class includes the structural framing of stairs that are exposed to view and serve as architectural features within a building. Often referred to as ornamental stairs, these assemblies encompass both the stair framing itself (including stringers, treads, and risers). They are typically located in public or visually prominent areas and constructed from steel or other finished materials, with detailing coordinated closely with the architectural design.		
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement around openings or through cold joints; Rebar couplers; Masonry mortar; Stone mortar; Other;	Other;	Pipe sleeves; Insulation; Waterproofing; Vapor barriers; Waterstops; Enclosure materials; Formwork; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete		

	Div 05: Structural Steel, Steel Reinforcement and Tendons Div 06: Timber Div 08: Glass		
5	Assembly		
	02 20 10 20 01 Exterior Walls		
6	Component		
	Primary 02 20 10 20 01 01 Exterior Wall – Bearing Wall 02 20 10 20 01 02 Exterior Wall – Shear Wall 02 20 10 20 01 03 Exterior Wall – Insulated Panel Wall (load bearing) 02 20 10 20 01 04 Exterior Wall – Other		
	<p>This assembly class includes structural exterior walls that provide vertical and/or horizontal load-bearing capacity, such as supporting gravity loads from floors and roofs or resisting lateral forces from wind or seismic events. These walls may also serve as part of the building envelope, but their primary function is structural. They are often located at the building perimeter and may integrate enclosure components such as insulation or cladding.</p> <ul style="list-style-type: none"> ● Exterior Wall – Bearing Wall: A structural wall that primarily supports vertical gravity loads. ● Exterior Wall – Shear Wall: A structural wall designed to resist in-plane lateral loads. ● Exterior Wall – Insulated Panel Wall (Load Bearing): A prefabricated wall panel system that provides structural support and includes integrated thermal insulation. ● Exterior Wall – Other: Structural exterior wall systems not captured by the categories above, including hybrid or specialized assemblies. 		
	Accessory	Ancillary	Excluded
	Embedded steel elements; Secondary reinforcement around openings or through cold joints; Rebar couplers; Masonry mortar; Stone mortar; Blocking; Other;	Façade connections; Elevator support; Canopy support; Other;	Pipe sleeves; Insulation; Waterproofing; Vapor barriers; Enclosure materials; Formwork; Fireproofing; Acoustic materials; Safety cables; Other;
7	Material / Product		
	e.g., per MasterFormat: Div 03: Concrete, Precast Concrete Div 04: Stone, Masonry Block and Grout Div 05: Structural Steel, Steel Reinforcement and Tendons, Aluminum Div 06: Timber Div 08: Glass		

Appendix C: Mapping to Other Classification Systems

The following appendices provide detailed mapping of the SMQ Taxonomy to the classification systems covered in Construction Classification Systems in the U.S.

Although not provided as an appendix, a comparison was also made to RICS' New Rules of Measurement (NRM), which is used in the RICS *Professional Standard on Whole Life Carbon Assessment*⁸ to structure calculations and reporting of results. A high-level mapping exercise between RICS' NRM and the SE 2050 Taxonomy showed a clear alignment between the structural elements in NRM and their counterparts in the SE 2050 Taxonomy, but only up to Level 3 of the latter.

Appendix C1: Mapping of SE 2050 Taxonomy to Component Classification of SEI Prestandard

The table below lists the Level 6 Components of the SE 2050 Taxonomy that correspond to the *SEI Prestandard* component categories as they are listed in the four classifications of Primary, Accessory, Ancillary, and Excluded.

Classification	SEI Prestandard Component Categories	SE 2050 Component Code	SE 2050 Component
Primary	Slab-on-Grade	01 40 10 01 01 01	Standard Slab-on-Grade
		01 40 10 01 01 02	Topping Slab
		01 40 10 01 01 03	Housekeeping Pad
		01 40 20 01 01 01	Structural Slab-on-Grade
	Deep Foundations	01 10 20 10 01 01	Driven Pile (various types)
		01 10 20 15 01 01	Bored Cast-in-Place (CIP) Pile
		01 10 20 15 01 02	Auger Cast-in-Place (CIP) Pile
		01 10 20 15 01 03	Drilled Displacement (DD) Piles
		01 10 20 15 01 04	Drilled Shaft Piles
		01 10 20 15 01 05	Micropile or Minipile
		01 10 20 20 01 01	Open Caissons (Open Piers)
		01 10 20 20 01 02	Closed Caissons (Cofferdams)
		01 10 20 40 01 01	Mechanical Rock Anchors
		01 10 20 40 01 02	Grouted Rock Anchors

⁸ Royal Institute of Chartered Surveyors (n.d.). Whole life carbon assessment (WLCA) for the built environment. Retrieved from <https://www.rics.org/profession-standards/rics-standards-and-guidance/sector-standards/construction-standards/whole-life-carbon-assessment>

	01 10 20 40 01 03	Post-Tensioned Rock Anchors
	01 10 20 40 01 04	Multi-Strand Rock Anchors
	01 10 20 40 01 05	Passive Rock Anchors
Shallow Foundations	01 10 10 20 01 01	Foundation - Column Pier / Pilaster
	01 10 10 20 01 02	Foundation - Spread Footing
	01 10 10 20 01 03	Foundation - Columns and Footings - Other
	01 10 20 50 01 01	Underpinning
	01 10 20 60 01 01	Raft / Mat Foundation
	01 10 20 70 01 01	Pile Cap
	01 10 20 80 01 01	Grade Beam
	01 20 10 10 01 02	Subgrade Enclosure Foundation Wall Footing (retaining)
Foundation Walls ¹	01 10 10 10 01 01	Foundation Wall (non-retaining)
	01 10 10 10 01 02	Foundation Wall Footing (non-retaining)
	01 10 10 10 01 03	Foundation - Walls and Footings (non-retaining) - Other
	01 10 20 30 01 01	Special Foundation Wall
Retaining Walls ¹	01 20 10 10 01 01	Subgrade Enclosure Foundation Wall (retaining)
Columns	02 10 10 10 01 01	Column
	02 10 10 10 01 02	Built-up or Composite Colum
	02 10 10 10 01 03	Column - Other
	02 10 20 10 01 01	Column Supporting Roof
	02 10 20 10 01 02	Built-up or Composite Column Supporting Roof
	02 10 20 10 01 03	Column - Other Supporting Roof
Beam, Joist, Girders	02 10 10 10 02 01	Beam
	02 10 10 10 02 02	Built-up or Composite Beam
	02 10 10 10 02 03	Truss
	02 10 10 10 02 04	Open web joist
	02 10 10 10 02 05	Beam - Other
	02 10 20 10 02 01	Beam Supporting Roof
	02 10 20 10 02 02	Built-up or Composite Beam Supporting Roof
	02 10 20 10 02 03	Truss Supporting Roof
	02 10 20 10 02 04	Open web joist Supporting Roof
	02 10 20 10 02 05	Beam - Other Supporting Roof

Floor Plates	02 10 10 20 01 01	Slab - Flat Plate and Flat Slab (Mild Reinforcement)
	02 10 10 20 01 02	Slab - Flat Plate and Flat Slab (Post-Tensioned)
	02 10 10 20 01 03	Floor Deck - Composite Concrete Topping on Metal Deck
	02 10 10 20 01 04	Floor Deck - Bare Metal Deck
	02 10 10 20 01 05	Floor Deck - Planks and Panels
	02 10 10 20 01 06	Slabs - Topping Slabs (For Strength and Serviceability)
	02 10 10 20 01 07	Decks, Slabs, and Toppings - Other
Roof Plates	02 10 20 20 01 01	Roof Slab - Flat Plate and Flat Slab (Mild Reinforcement)
	02 10 20 20 01 02	Roof Slab - Flat Plate and Flat Slab (Post-Tensioned)
	02 10 20 20 01 03	Roof Floor Deck - Composite Concrete Topping on Metal Deck
	02 10 20 20 01 04	Roof Floor Deck - Bare Metal Deck
	02 10 20 20 01 05	Roof Floor Deck - Planks and Panels
	02 10 20 20 01 06	Roof Slabs - Topping Slabs (For Strength and Serviceability)
	02 10 20 20 01 07	Roof Decks, Slabs, and Toppings - Other
Steel Reinforcement ²		
Topping Slabs - Strength & Serviceability ³	01 40 10 01 01 02	Topping Slab
	01 40 10 01 01 03	Housekeeping Pad
Exterior Bearing Walls	02 20 10 20 01 01	Exterior Wall - Bearing Wall
	02 20 10 20 01 03	Exterior Wall - Insulated Panel Wall (load bearing)
	02 20 10 20 01 04	Exterior Wall - Other
	02 20 10 20 02 01	Exterior Wall Supporting Roof-Bearing Wall
	02 20 10 20 02 03	Exterior Wall Supporting Roof - Insulated Panel Wall (load bearing)
	02 20 10 20 02 04	Exterior Wall Supporting Roof - Other
Interior Bearing Walls	02 10 10 10 04 01	Interior Wall - Bearing Wall
	02 10 10 10 04 03	Interior Wall - Insulated Panel Wall (load bearing)

		02 10 10 10 04 04	Interior Wall - Other
		02 10 20 10 04 01	Interior Wall - Bearing Wall Supporting Roof
		02 10 20 10 04 03	Interior Wall - Insulated Panel Wall Supporting Roof (load bearing)
		02 10 20 10 04 04	Interior Wall - Other Supporting Roof
	Shear Walls	02 20 10 20 01 02	Exterior Wall - Shear Wall
		02 20 10 20 02 02	Exterior Wall Supporting Roof - Shear Wall
		02 10 10 10 04 02	Interior Wall - Shear Wall
		02 10 20 10 04 02	Interior Wall - Shear Wall Supporting Roof
	Bracing & Frames	02 10 10 10 03 01	Bracing - Vertical
		02 10 10 10 03 02	Bracing - Horizontal
		02 10 10 10 03 03	Bracing - Other
		02 10 20 10 03 01	Roof Bracing - Vertical
		02 10 20 10 03 02	Roof Bracing - Horizontal
		02 10 20 10 03 03	Roof Bracing - Other
	Diaphragms ⁴		

Classification	SEI Prestandard Component Categories	SE 2050 Component
Accessory	Ledgers	See Appendix B
	Blocking	
	Deck Edge Angle	
	Kickers	
	Primary Connections (Framing to Framing)	
	Accessory Connections ⁴	
	Diaphragm Connections	
	Structural Adhesives	

Classification	SEI Prestandard Component Categories	SE 2050 Component Code	SE 2050 Component
Ancillary	Ancillary Connections	<i>Ancillary to Primary or Accessory Components</i> port Framing	
	Finish & Façade Support ⁵	02 10 10 10 05 01	Façade Support Framing
		02 10 20 10 05 01	Roof Façade Support Framing

Stairs and Ramps – Framing & Support	02 10 80 10 01 01	Stair Framing / Ornamental Stair Framing
Handrail, Guardrail – Framing & Support	02 10 10 10 05 04	Supplemental Framing - Other
Elevator – Framing & Support ⁶	02 10 10 10 05 02	Elevator Framing and Support
	02 10 10 10 05 03	Hung Pit/Elevator Pit Framing
	02 10 20 10 05 02	Roof Elevator Framing and Support
	02 10 20 10 05 03	Roof Hung Pit / Elevator Pit Framing
Roof Screenwall – Framing & Support	02 10 20 10 05 01	Roof Façade Support Framing
Canopies – Framing & Support	02 10 10 10 05 04	Supplemental Framing - Other

Classification	SEI Prestandard Component Categories	SE 2050 Component
Excluded	Site Walls, Bridges, Culverts	n/a
	Site Paving & Flatwork	
	Excavation Shoring & Support	
	Site & Earth Work	
	Landscape Furnishings ⁷	
	Landscaping	
	Topping Slabs – Non-Structural ⁸	
	Curbs ⁹	
	Exterior Enclosure ¹⁰	
	Exterior Glass	
	Exterior Non-Load Bearing Walls ¹¹	
	Interior Non-Load Bearing Walls & Partitions ¹²	
	Signage – Framing & Support	
	Housekeeping Pads & Mechanical Support Pads	
	Finish Materials	
	Finish Attachments & Fasteners	
Ceiling Materials		
Furnishings ¹³		

Insulation
Waterproofing
Acoustic Materials
Fire Resistance Materials
Mechanical Components
Electrical Components
Plumbing Components
IT Components
Utility Components
Elevators
Appliances
Doors

See *Appendix B: Assembly Definitions and SEI Prestandard Components Categories* for guidance on how each of the primary components are defined and what the other three categories encompass.

Appendix C2: Mapping of SE 2050 Taxonomy to UniFormat II

The table below shows how Level 5 Assembly Classes from the SE 2050 Taxonomy align with Level 3 Individual Elements in *UniFormat II*. Blank entries indicate that no corresponding SE 2050 assembly class currently exists for that *UniFormat II* element. Note that interior structural walls supporting floors or roofs have been grouped under floor or roof construction, respectively.

UniFormat II Level 3	SE 2050 Taxonomy (Level 5)	
A1010 Standard Foundations	01 10 10 10 01	Foundation Walls and Footings (non-retaining)
	01 10 10 20 01	Foundation – Columns and Footings
	01 10 20 10 01	Driven Pile
	01 10 20 15 01	Bored / Drilled Pile
	01 10 20 50 01	Underpinning
	01 10 20 20 01	Caissons
	01 10 20 40 01	Foundation Anchors
	01 10 20 60 01	Raft / Mat Foundation
	01 10 20 70 01	Pile Cap
	01 10 20 80 01	Grade Beam
A1020 Special Foundations	01 10 20 30 01	Special Foundation Walls
A1030 Slab on Grade	01 40 10 01 01	Standard Slab-on-Grade
	01 40 20 01 01	Structural Slab-on-Grade
A2010 Basement Excavation		
A2020 Basement Walls	01 20 10 10 01	Subgrade Enclosure Foundation Wall and Footing (retaining)
B1010 Floor Construction	02 10 10 10 01	Column
	02 10 10 10 02	Beam
	02 10 10 10 03	Bracing
	02 10 10 10 04	Interior Walls
	02 10 10 10 05	Supplemental Floor Structural Frame
	02 10 10 20 01	Floor Decks, Slabs, and Toppings
	02 10 80 10 01	Stairs
B1020 Roof Construction	02 10 20 10 01	Columns Supporting Roof
	02 10 20 10 02	Beams Supporting Roof

	02 10 20 10 03	Roof Bracing
	02 10 20 10 04	Interior Walls
	02 10 20 10 05	Supplemental Floor Structural Frame
	02 10 20 20 01	Roof Decks, Slabs, and Toppings
B2010 Exterior Walls	02 20 10 20 01	Exterior Walls
	02 20 10 20 02	Exterior Walls Supporting Roof
B2020 Exterior Windows		
B2030 Exterior Doors		
B3010 Roof Coverings		
B3020 Roof openings		

Appendix C3: Reviewing SE 2050 against ASHRAE 240p Draft Requirements

While we did not undertake a formal mapping to ASHRAE/ICC Standard 240P, we conducted a high-level review of its draft data collection requirements to assess general alignment with the SE 2050 Taxonomy.

During this review, we noted that ASHRAE 240P proposed tracking certain elements such as equipment pits and base slabs that were not explicitly called out as standalone components in our taxonomy. However, we found that these elements could reasonably fit within the existing *OmniClass Table 21* categories, and therefore did not require dedicated entries in our framework.

Figure 6 illustrated an early coordination effort between the initial taxonomy and Table A.1 of ASHRAE 240P, highlighting areas of alignment and potential refinement.

The draft version of ASHRAE 240P did not include “Interiors” under structural elements. This may require future coordination, particularly for interior structural walls and other components currently mapped to *OmniClass Table 21*'s Interiors category in our taxonomy.

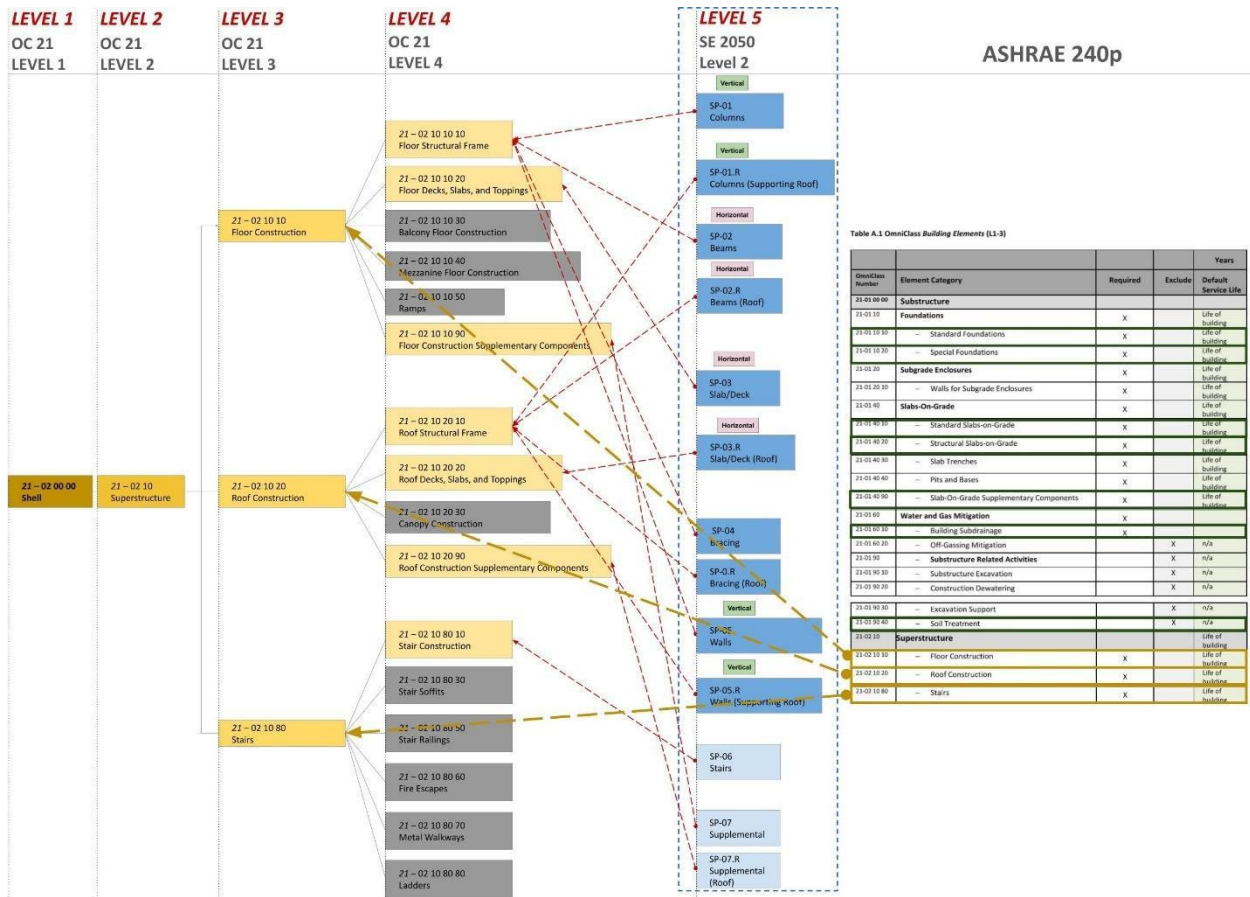


Figure 6: Sample review of ASHRAE 240p to Levels 1 through 5 of SE 2050

Appendix D: Reference Information for Other Classification Systems

Appendix D1: MasterFormat Reference Information

Below are the Groups and Divisions that make up the *MasterFormat* construction classification system, which organizes construction information primarily by trade and work results.

Group	Subgroup	Division
Procurement and Contracting Requirements		Division 00 – Procurement and Contracting Requirements
Specifications	General Requirements Subgroup	Division 01 – General Requirements
	Facility Construction Subgroup	Division 02 – Existing Conditions Division 03 – Concrete Division 04 – Masonry Division 05 – Metals Division 06 – Wood, Plastics, and Composites Division 07 – Thermal and Moisture Protection Division 08 – Openings Division 09 – Finishes Division 10 – Specialties Division 11 – Equipment Division 12 – Furnishings Division 13 – Special Construction Division 14 – Conveying Equipment
	Facility Services Subgroup	Division 21 – Fire Suppression Division 22 – Plumbing Division 23 – Heating, Ventilating, and Air Conditioning (HVAC) Division 25 – Integrated Automation Division 26 – Electrical Division 27 – Communications Division 28 – Electronic Safety and Security
	Site and Infrastructure Subgroup	Division 31 – Earthwork Division 32 – Exterior Improvements Division 33 – Utilities Division 34 – Transportation Division 35 – Waterway and Marine Construction
	Process Equipment Subgroup	Division 40 – Process Interconnections Division 41 – Material Processing and Handling Equipment Division 42 – Process Heating, Cooling, and Drying Equipment Division 43 – Process Gas and Liquid Handling, Purification and Storage Equipment Division 44 – Pollution and Waste Control Equipment

		Division 45 – Industry-Specific Manufacturing Equipment Division 46 – Water and Wastewater Equipment Division 48 – Electrical Power Generation
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Appendix D2: UniFormat II Reference Information

Below are the Groups and Elements of the *UniFormat II* construction classification system, which organizes building components by functional elements typically used during early design and cost estimating.

Level 1 Major Group Elements	Level 2 Group Elements	Level 3 Individual Elements
A Substructure	A10 Foundations	A1010 Standard Foundations A1020 Special Foundations A1030 Slab on Grade
	A20 Basement Construction	A2010 Basement Excavation A2020 Basement Walls
B Shell	B10 Superstructure	B1010 Floor Construction B1020 Roof Construction
	B20 Exterior Enclosure	B2010 Exterior Walls B2020 Exterior Windows B2030 Exterior Doors
	B30 Roofing	B3010 Roof Coverings B3020 Roof openings
C Interiors	C10 Interior Construction	C1010 Partitions C1020 Interior Doors C1030 Fittings
	C20 Stairs	C2010 Stair Construction C2020 Stair Finishes
	C30 Interior Finishes	C3010 Wall Finishes C3020 Floor Finishes C3030 Ceiling Finishes
D Services	D10 Conveying	D1010 Elevators & Lifts D1020 Escalators & Moving Walks D1090 Other Conveying Systems
	D20 Plumbing	D2010 Plumbing Fixtures D2020 Domestic Water Distribution D2030 Sanitary Waste D2040 Rain Water Drainage D2090 Other Plumbing Systems
	D 30 HVAC	D3010 Energy Supply D3020 Heat Generating Systems D3030 Cooling Generating Systems D3040 Distribution Systems D3050 Terminal & Package Units D3060 Controls & Instrumentation D3070 Systems Testing & Balancing D3090 Other HVAC Systems & Equipment
	D40 Fire Protection	D4010 Sprinklers D4020 Standpipes D4030 Fire Protection Specialties D4090 Other Fire Protection Systems
	D50 Electrical	D5010 Electrical Service & Distribution D5020 Lighting and Branch Wiring

		D5030 Communications & Security D5090 Other Electrical Systems
E Equipment & Furnishings	E10 Equipment	E1010 Commercial Equipment E1020 Institutional Equipment E1030 Vehicular Equipment E1090 Other Equipment
	E20 Furnishings	E2010 Fixed Furnishings E2020 Movable Furnishings
F Special Construction & Demolition	F10 Special Construction	F1010 Special Structures F1020 Integrated Construction F1030 Special Construction Systems F1040 Special Facilities F1050 Special Controls and Instrumentation
	F20 Selective Building Demolition	F2010 Building Elements Demolition F2020 Hazardous Components Abatement

Appendix D3: OmniClass Reference Information

The following is a brief description of the 15 tables that make up the OmniClass Construction Classification System, each of which organizes information related to a distinct aspect of the built environment.

	OmniClass Table	Table Description
1	Construction Entities by Function – Table 11	Construction Entities by Function are significant, definable units of the built environment consisting of elements and interrelated spaces and characterized by function.
2	Construction Entities by Form – Table 12	Construction Entities by Form are significant, definable units of the built environment consisting of elements and interrelated spaces and characterized by form.
3	Spaces by Function – Table 13	Spaces by Function are basic units of the built environment delineated by physical or abstract boundaries and characterized by function.
4	Spaces by Form – Table 14	Spaces by Form are basic units of the built environment delineated by physical or abstract boundaries and characterized by physical form.
5	Elements (includes Designed Elements) – Table 21	<p>An Element is a major component, assembly, or "construction entity part which, in itself or in combination with other parts, fulfills a predominating function of the construction entity" (ISO 12006-2). Predominating functions include, but are not limited to, supporting, enclosing, servicing, and equipping a facility. Functional descriptions can also include a process or an activity.</p> <p>A Designed Element is an "Element for which the work result(s) have been defined." (ISO 12006-2).</p>
6	Work Results – Table 22 (Pre Consensus Approved Draft 2013-08-25)	Work Results are construction results achieved in the production stage or phase or by subsequent alteration, maintenance, or demolition processes and identified by one or more of the following: the particular skill or trade involved; the construction resources used; the part of the construction entity which results; the temporary work or other preparatory or completion of work which is the result.
7	Products – Table 23	Products are components or assemblies of components for permanent incorporation into construction entities.
8	Phases – Table 31	<p>Life cycle phases are often represented by two terms used somewhat interchangeably in our industry. For the purposes of clarity and standardization, OmniClass™ defines these terms:</p> <p>Stage: A categorization of the principal segments of a project. Stages usually are: Conception, Project Delivery Selection, Design, Construction Documents, Procurement, Execution, Utilization, and Closure.</p> <p>Phase: A portion of work that arises from sequencing work in accordance with a predetermined portion of a Stage.</p>

		For purposes of usage in OmniClass™ classifications, a Stage is a higher-level of categorization and a Phase is a subordinate level of titling within a Stage.
9	Services – Table 32	Services are the activities, processes and procedures relating to the design, construction, maintenance, renovation, demolition, commissioning, decommissioning, and all other functions occurring in relation to the life cycle of a construction entity.
10	Disciplines – Table 33	Disciplines are the practice areas and specialties of the actors (participants) that carry out the processes and procedures that occur during the life cycle of a construction entity.
11	Organizational Roles – Table 34	Organizational Roles are the functional positions occupied by the participants, both individuals and groups, that carry out the processes and procedures which occur during the life cycle of a construction entity. Table 34 can be combined with Table 33 – Disciplines, to provide a full classification of each participant in the creation and support of a facility.
12	Tools Table 35	Tools are the resources used to develop the design and construction of a project that do not become a permanent part of the facility, including computer systems, vehicles, scaffolding and all other items needed to execute the processes and procedures relating to the life cycle of a construction entity.
13	Information – Table 36	Information is data referenced and utilized during the process of creating and sustaining the built environment.
14	Materials – Table 41	Materials are substances used in construction or to manufacture products and other items used in construction. These substances may be raw materials or refined compounds and are considered subjects of this table irrespective of form.
15	Properties – Table 49	Properties are measurable or definable characteristics of construction entities.

Appendix E: SE 2050 Taxonomy Development Process

The development of the SE 2050 Taxonomy was an iterative, practice-informed process shaped by structural engineering workflows, industry feedback, and the need for integration across the AEC industry. What began as a standalone structural taxonomy evolved into a hybrid framework grounded in structural engineering practice and aligned with established construction classification systems to support broader adoption.

Figure 7 illustrates the five key phases of this development process, which are described below:

- **Phase 1 – Initial Approach:** Independently developed taxonomy rooted in structural engineering workflows for SMQ tracking.
- **Phase 2 – Shift Toward Integration:** Feedback-driven decision to align with an established construction classification system and map to others.
- **Phase 3 – Refinement and Mapping:** Structural taxonomy adjusted to integrate with *OmniClass Table 21* and map to *UniFormat II*.
- **Phase 4 – Industry Review, Testing, and Validation:** External input gathered through surveys, workshops, and independent peer reviews.
- **Phase 5 – Updates and Documentation:** Final refinements made to support adoption, with considerations for evolving digital tools and industry practices.

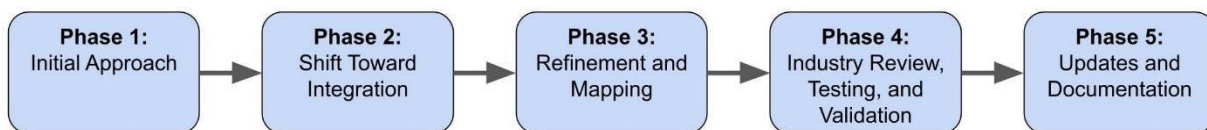


Figure 7: SE 2050 Development Process

Each phase is detailed below, explaining how the taxonomy was shaped by real-world needs, ensuring it is both technically rigorous and practical for broad industry adoption.

Phase 1 – Initial Approach

The effort to create an SMQ taxonomy began in 2019 with the newly formed SE 2050 working group within the SEI Sustainability Committee. From the start, the goal was to develop a system by structural engineers, for structural engineers, prioritizing the logic and language used in daily design practice rather than conforming to existing classification systems, which were found to be insufficient without major modification.

This early phase focused on how engineers intuitively describe, organize, and track structural components. Several engineers independently developed and reviewed drafts, emphasizing clarity, functional purpose, and real-work workflow alignment. The team experimented with a three-level hierarchy:

- **Level 1:** Location within the structure (e.g., substructure vs. superstructure)
- **Level 2:** Component grouping (e.g., beams, columns, slabs, walls)
- **Level 3:** Specific component types (e.g., built-up beam, truss, spread footing)

To support digital workflows, a custom **alphanumeric coding scheme** was introduced (e.g., SP-01-01 for a superstructure column). This structure was designed to support integration with firms’ internal tools, popular BIM platforms, and embodied carbon reporting standards. Table 11 includes an excerpt of the three-level hierarchy and coding scheme for superstructural columns and beams. Refer to Appendix E: Structural Taxonomy (Initial Approach) for the complete initial structural taxonomy.

However, this initial framework **lacked clear guidance on how components should be grouped**. For instance, what constitutes “floor construction,” and how should Level 2 components be consistently organized within *SP Superstructure*. The team also recognized that some components, such as trusses, are systems composed of multiple subcomponents (e.g., chords, diagonals, gussets), and thus not easily captured as single items.

Table 11: Excerpt of initial structural taxonomy

Level 1 Location	Level 2 Group Components	Level 3 Individual Components
SP Superstructure	SP-01 Column	SP-01-01 Column/Built-Up Column SP-01-02 Composite Column
	SP-02 Beam	SP-02-01 Beam/Built-Up Beam SP-02-02 Truss SP-02-03 Joist

The group also debated whether to structure Level 1 by **location** (substructure vs. superstructure) or by **orientation** (vertical vs. horizontal). Ultimately, they chose the substructure/superstructure split, as it better reflected how structural engineers describe structural systems. Still, this raised logistical challenges, especially in BIM workflows, for classifying continuous elements like shear walls or columns that span varying finished grade lines, particularly on sloped or benched sites.

Despite these challenges, this exercise proved invaluable. It clarified the level of granularity, engineering specificity, and component clarity needed for practical use. Just as

important, it exposed the limitations of existing classification systems and became the foundation for the hybrid taxonomy that followed.

Structural Taxonomy (Initial Approach)

The structural taxonomy from the initial approach is shown below. It is organized into three levels using a unique alphanumeric coding system. Only Level 1 provides a loose indication of location, distinguishing between substructure and superstructure.

Level 1 Location	Level 2 Group Components	Level 3 Individual Components
SB Substructure	SB-01 Column	SB-01-01 Column/Built-Up Column SB-01-02 Composite Column
	SB-02 Beam	SB-02-01 Beam / Built-Up Beam SB-02-02 Truss SB-02-03 Joist
	SB-03 Slab/Deck	SB-03-01 Suspended Slab – Mild SB-03-02 Suspended Slab – PT SB-03-03 Bare Metal Deck SB-03-04 Metal Deck with Composite Topping SB-03-05 Plank and Decking SB-03-06 Topping Slab SB-03-07 Rigid Insulation SB-03-08 Slab on Grade
	SB-04 Bracing	SB-04-01 Vertical Bracing SB-04-02 Horizontal Bracing
	SB-05 Wall	SB-05-01 Bearing Wall SB-05-02 Shear Wall SB-05-03 Sandwich Wall SB-05-04 Retaining Wall SB-05-05 Basement Wall SB-05-06 Frost and Stem Wall SB-05-07 Slurry Wall
	SB-06 Deep Foundation	SB-06-01 Drilled Pile SB-06-02 Driven Pile SB-06-03 Caisson SB-06-04 Auger Cast Pile SB-06-05 Pressure Injected Footing (PIF) SB-06-06 Load Bearing Element (LBE)
	SB-07 Shallow Foundation	SB-07-01 Spread Footing SB-07-02 Mat/Raft Foundation SB-07-03 Pile Cap SB-07-04 Grade Beam
	SB-08 Other	SB-08-01 Embedded Steel Elements SB-08-02 Temporary Earth Retaining Wall SB-08-03 Ground Improvement SB-08-04 Rigid Insulation/Geofoam SB-08-05 Other
SP Superstructure	SP-01 Column	SP-01-01 Column/Built-Up Column SP-01-02 Composite Column
	SP-02 Beam	SP-02-01 Beam/Built-Up Beam

		SP-02-02 Truss SP-02-03 Joist
	SP-03 Slab/Deck	SP-03-01 Suspended Slab – Mild SP-03-02 Suspended Slab – PT SP-03-03 Bare Metal Deck SP-03-04 Metal Deck with Composite Topping SP-03-05 Plank and Decking SP-03-06 Topping Slab
	SP-04 Bracing	SP-04-01 Vertical Bracing SP-04-02 Horizontal Bracing
	SP-05 Wall	SP-05-01 Bearing Wall SP-05-02 Shear Wall SP-06-03 Sandwich Wall
	SP-06 Other	SP-06-01 Connectors and Fasteners SP-06-02 Supplemental Arch/Mech Framing SP-06-03 Stair Framing / Ornamental Framing SP-06-04 Stair Framing SP-06-05 Connection Steel SP-06-06 Miscellaneous Steel SP-06-07 Other

Phase 2 – Shift Towards Integration

While the initial taxonomy was useful for tracking SMQs and reflected how engineers typically organize structural systems, the team recognized a key limitation: it lacked compatibility with existing standards and digital tools. Through stakeholder meetings, industry workshops, and collaboration with external groups, it became clear that a standalone taxonomy, though intuitive for structural engineers, would be difficult to integrate into broader AEC workflows, limiting its impact.

To improve usability and interoperability, the team began evaluating alignment with established classification systems. *OmniClass Table 21* emerged as the most appropriate framework for three key reasons:

- **Widespread use:** *OmniClass Table 21* is already in use or planned for use by several leading embodied carbon initiatives.
- **Functional organization:** It categorizes systems by function, offering a logical foundation for layering in a structural component detail.
- **Compatibility:** It builds upon *UniFormat II*, maintaining continuity with a familiar, industry-accepted structure.

Importantly, this direction was informed and reinforced by parallel efforts in the embodied carbon space. The following partner organizations had already selected or were moving toward *OmniClass* for their data structures:

- **Athena Sustainable Materials Institute** used OmniClass in its *Proposed Construction Nomenclature for Use in LCA for Buildings* (Bowick, Matt; O'Connor, Jennifer; Lopez, Diana;, 2023), aimed at standardizing data for building LCA
- **Building Transparency and the CLF** adopted OmniClass for the **ECHO Project** (Lewis et al. 2024), a national effort to align environmental data with digital design workflows.
- **ASHRAE/ICC Standard 240P** (ASHRAE 2024), focusing on quantifying the life cycle greenhouse gas emissions of buildings, also references OmniClass in its proposed framework.

These initiatives indicated that aligning with *OmniClass Table 21* would increase interoperability with emerging tools, databases, and regulatory frameworks across the industry.

Phase 3 – Refinement and Mapping

To fully integrate the structural taxonomy with *OmniClass Table 21*, the SE 2050 team refined the original component-based framework to align with a broader classification structure. This involved mapping detailed structural groupings from the initial taxonomy to the generalized element categories of *OmniClass Table 21*, ensuring compatibility while preserving engineering specificity.

Simultaneously, the team coordinated with the authors of the *SEI Prestandard* to align across multiple SEI initiatives and to incorporate component definition and boundaries from the *SEI Prestandard*. This coordination helped ensure consistency in how structural components are included or excluded for LCAs of different levels of detail ..

Figure 8 illustrates this integration process, showing how the final SE 2050 Taxonomy emerged from the intersection of three inputs: the initial structural taxonomy, *OmniClass Table 21*, and the *SEI Prestandard* component requirements.

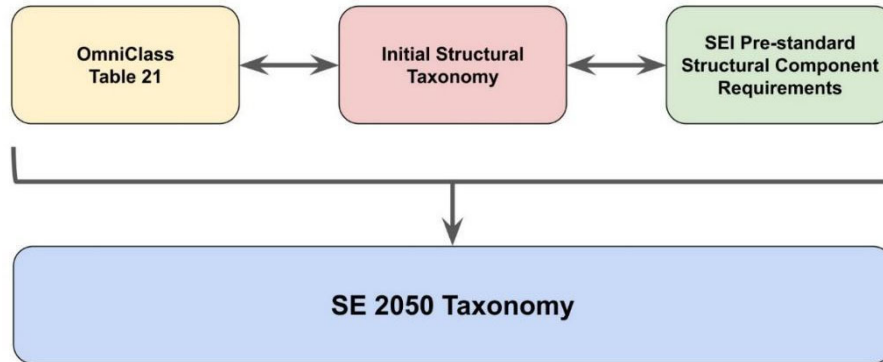


Figure 8: Schematic linking the initial structural taxonomy to OmniClass Table 21 and SEI Pre-Standard requirements, forming the SE 2050 Taxonomy.

Linking to OmniClass Table 21

In aligning the initial taxonomy with *OmniClass Table 21*, we first removed the original Level 1 classifications (e.g., *SP – Superstructure*, *SB – Substructure*), as *OmniClass Table 21* already defines locational groupings at its highest level such as *Shell* and *Substructure*. For example, what was previously designated as *SP-01 Superstructure* was replaced by *21 02 00 00 Shell* in the revised hierarchy.

Our original Level 2, focused on structural components, was effectively realigned with the lowest level of *OmniClass Table 21* (Level 4), since these components would, in many cases, become nested beneath broader categories. In this revised structure, Level 5 and below are aligned with *OmniClass Table 21*'s Level 4. Figure 9 and Figure 10 below show a snapshot of this mapping process, which revealed two primary challenges:

1. **Mismatch in granularity** – *OmniClass Table 21* included more Level 4 entries than we had in corresponding Level 5 components, requiring us to omit or consolidate some categories (shown greyed out in Figure 9 and Figure 10).
2. **Component splitting** – *OmniClass Table 21* distinguishes between floor and roof construction, which prompted us to create paired Level 5 entries (e.g., *beams* and *roof beams*, *columns* and *roof columns*, etc.) for clarity.

As we refined Level 5 to map cleanly to various levels with *OmniClass Table 21*, we simultaneously developed Level 6 to support further component breakdowns. This led to a revised hierarchy in which:

- **Level 5** became known as “assemblies”
- **Level 6** as “components,” and
- **Level 7** as “materials” that make up each assembly.

This process was highly iterative. While Figure 4 and Figure 5 served as initial visual mapping tools, the working taxonomy was ultimately transitioned into spreadsheets for continued development and refinement.

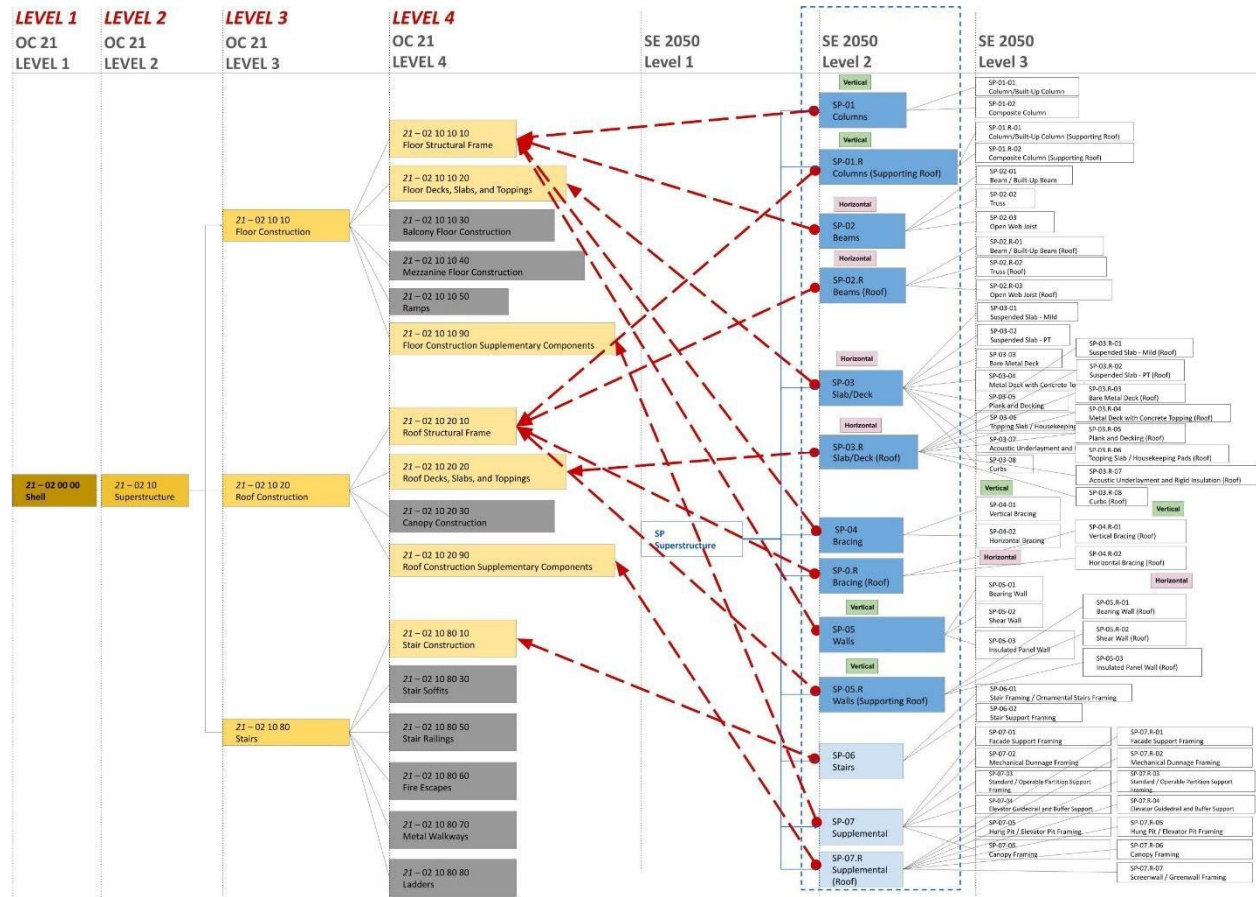


Figure 9: Shell and Superstructure example of taxonomy mapping and refinement via OmniClass Table 21 alignment

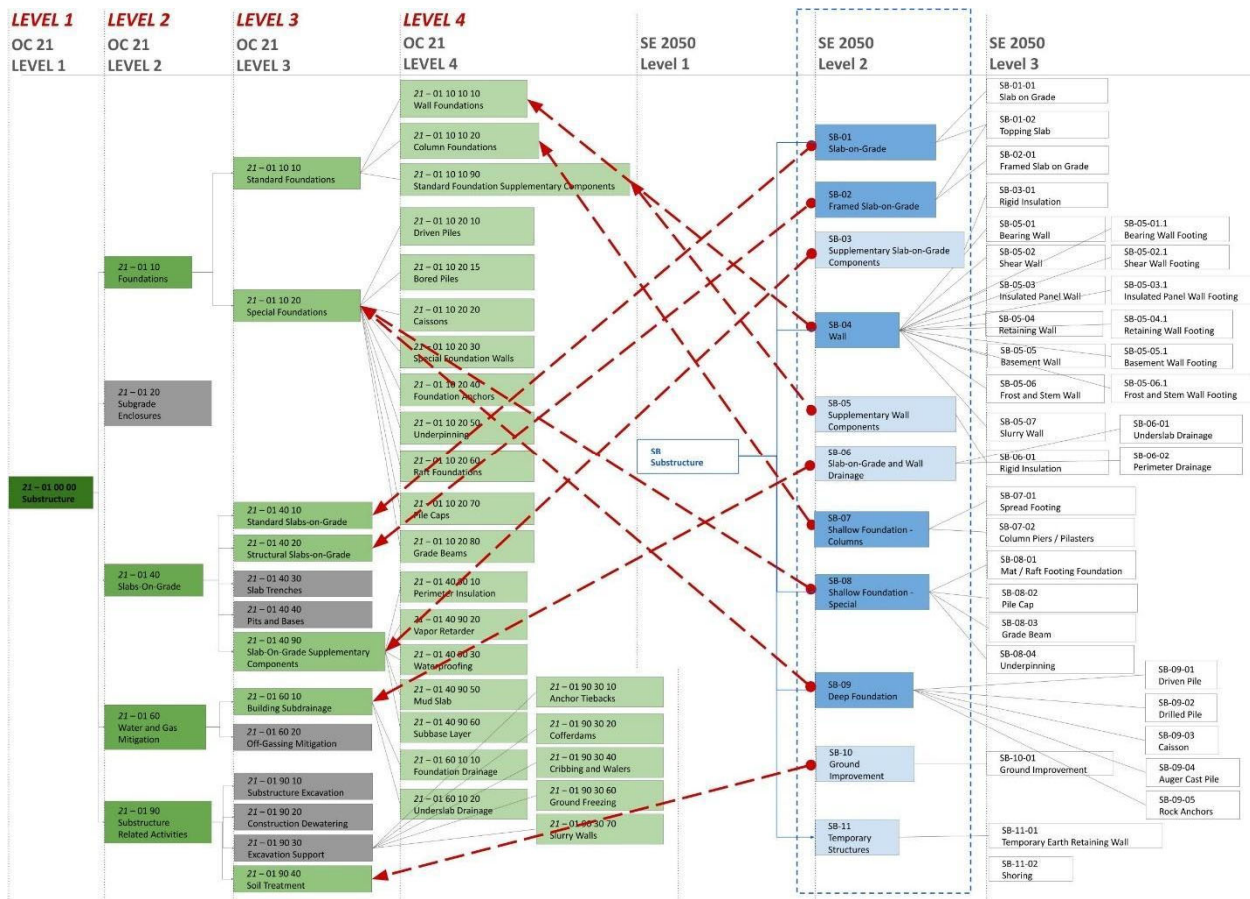


Figure 10: Substructure and Foundation example of taxonomy mapping and refinement via OmniClass Table 21 alignment

Special Considerations

Structural roofs, walls, and substructure required particular attention during the alignment process and are discussed in detail below.

Structural Roofs – Roof Construction vs. Floor Construction

OmniClass Table 21 separates roof from floor construction. This is rational from a whole building embodied carbon perspective since roofs often include distinct non-structural elements such as insulation and membranes that do not exist in floors. On the other hand, separating the entire roof construction from floor construction presents complications for the framing, particularly for columns, bracing and walls of multi-level buildings which can run continuously from the roof to one or more floors. This can be an onerous exercise for buildings that have complicated, yet little, roof area in proportion to total floor area, like a high-rise with stepped roofs, that yields little value for material and embodied carbon benchmarking.

At one point, for the SMQ Taxonomy, only the horizontal assemblies were included under Roof Construction, while the remaining structural framing remained categorized under

Floor Construction. However, in certain building typologies like stadiums, warehouses, and data centers, the roof structure can represent a significant portion of overall material quantities and carbon totals, so designating the supporting frame as floor construction could lead to confusion if grouped together for future benchmarking. Thus, the decision was made to keep roof and floor construction separate, while combining them for SE 2050 Database SMQ reporting.

Structural Walls – Interior Structural Walls vs. Exterior Structural Walls

One of the most debated decisions during the mapping process was whether to include interior structural walls, such as shear walls and load-bearing walls, under **Level 1B: Shell** or **Level 1C: Interiors**. The core issue was the gap in *OmniClass Table 21*, wherein exterior walls are clearly defined under Shell > Floor Construction > Exterior Wall Construction, but there is no designated location for interior structural walls.

Table 12 shows the only explicit wall-related entries currently defined in *OmniClass Table 21*.

Table 12: 'Walls' that are part of *OmniClass Table 21*

Level 1	Level 2	Level 3	Level 4	Level 5
Shell	Superstructure	Exterior Walls	Exterior Wall Construction	Exterior Walls (structural)
Interiors	Interior Construction	Interior Partitions	Interior Fixed Partitions	Interior Walls (structural)

To address this, we initially placed interior structural walls under **Interior Fixed Partitions** within Level 1C: Interiors. While imperfect, this solution was logically consistent with *OmniClass* inclusion of Exterior Wall Construction, suggesting that a parallel category for interior structural walls is not an unreasonable interpretation. It also seemed to maintain alignment with whole-building LCA practice, which increasingly includes both enclosures and partitions.

However, this initial decision received significant pushback from various contributors, as it introduced a Level 1 Group that is widely associated with non-structural components into a structural taxonomy. Thus, interior structural walls have been mapped to *Floor Construction*, even though structural engineers do not typically think of walls as “framing” and interior walls do not appear until Level 5 while exterior walls begin to appear at Level 3, as shown in Table 13.

Table 13: Categorization of Exterior Walls and Interior Walls in SE 2050 Taxonomy

Level 1	Level 2	Level 3	Level 4	Level 5
Shell	Superstructure	Exterior Walls	Exterior Wall Construction	Exterior Walls (structural)
Shell	Superstructure	Floor Construction	Flooring Structural Frame	Interior Walls (structural)

We recognize that neither solution is ideal. Both will require structural *engineers to* separate interior and exterior walls during material quantity collection—an approach that is not currently standard practice.

Substructure – Special Foundations and Skipping Level 4 of OmniClass Table 21

Level 1: Substructure presented unique challenges:

1. The *Special Foundation* branch at Level 3 of *OmniClass Table 21* expands into a long list of specific foundation types, particularly deep foundations, such as piles, drilled shafts, caissons, and auger-cast piles, at Level 4.
2. For other substructure elements, *OmniClass Table 21* lacks a Level 4, resulting in a direct mapping from Level 5 to Level 3 in the SMQ Taxonomy, such as with slabs-on-grade.

Figure 5 illustrates both challenges. In our original taxonomy, foundation elements were grouped at Level 5 into “Shallow and Deep Foundations”, with specific types (e.g., auger piles, driven piles, caissons) defined at Level 6, reflecting how structural engineers typically organize and communicate design information.

However, to maintain compatibility with OmniClass, we adapted our structure to follow *OmniClass Table 21’s* use of *Special Foundations* as the primary grouping for deep foundation types. While this diverges from standard engineering terminology, most practitioners would not typically classify driven piles or caissons as “special.” The adjustment ensures consistency and interoperability. It also maintains the intent of Level 6 to include components that offer similarities in function and can be interchanged by a structural engineer.

Table 14: Snippet of Final Driven Pile Taxonomy for Levels 3 through 6.

Level 3	Level 4	Level 5 (SE 2050 reporting level)	Level 6

Special Foundations	Driven Piles	Driven Pile	Driven Pile (various types)
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This mapping led to some unavoidable repetition across Levels 3-6, as shown in Table 14. Highly specific foundation types were preserved at Level 6 to maintain the same level of granularity within the level, which repeats itself for Levels 4 and 5 while other Level 5 categories remained broadly defined for consistency across the taxonomy.

Phase 4 – Industry Review, Testing, and Validation

The preceding sections described how the SE 2050 Taxonomy was developed through iterative collaboration and integration with existing classification systems. As the taxonomy matured, particularly through its integration with *OmniClass Table 21*, we recognized the need to validate both our structural logic and the practical usability of the taxonomy through broader testing and review.

This validation phase involved two key efforts:

Testing the Taxonomy on Real Projects

A structured testing program was implemented using actual building projects across a variety of building typologies. The goal was to ensure the taxonomy could:

- Accommodate all structural component types across different material types.
- Clearly categorize every element.
- Be applied consistently and effectively by structural engineers.

Engaging Industry Feedback

We solicited feedback from a wide range of AEC professions, including:

- Trade organizations.
- Developers of digital LCA tools.
- Green building certification bodies.
- Authors of structural LCA guidance documents.

To facilitate feedback, we hosted a series of webinars that offered insight into the taxonomy’s development and invited participants to evaluate its structure from their perspective.

We then assessed all input holistically. Most feedback resulted in meaningful adjustments to improve clarity, completeness, or alignment. A smaller portion did not prompt changes either because it was beyond the project scope or did not affect the taxonomy’s core structure.

Several key takeaways emerged based on this feedback:

- Full consensus is unlikely, but constructive input affirmed the overall direction.
- The initial independent development by structural engineers proved valuable, grounding the taxonomy in practice and allowing us to respond confidently to conflicting perspectives.
- Most importantly, industry engagement was essential. The collective feedback significantly strengthened the taxonomy and reinforced its relevance for real-world application.

Phase 5 – Updates and Documentation

This white paper represents the culmination of Phase 5: the formal documentation of the SE 2050 Taxonomy. It reflects the iterative refinements made through testing, industry review, and alignment with classification systems and standards. This document is intended to serve as the primary reference for understanding the taxonomy’s structure, development process, and intended applications.

Future updates will accommodate additional feedback from practitioners and stakeholders to support the SE 2050 Taxonomy’s continued evolution as it is implemented more broadly.

Appendix F: Review Comments and Responses

The following section includes selected comments received during our formal review process, along with our responses. Reviewer names have been removed to maintain anonymity. These comments reflect a snapshot in time and may not capture the full scope of what was ultimately included, excluded, or debated throughout the development of the SE 2050 Taxonomy. The comments listed here were collected through formal surveys and do not represent the many informal conversations that also shaped the process. Nonetheless, all feedback was critical in advancing and refining the taxonomy.

Reviewer Comment	Our Response
Consider rephrasing to "Stair Framing (including ornamental, non-traditional, etc.)" or something similar. The "/" confused me when I first read it.	Ahh good point. Will consider making the change.
Are the SB-XX-XX labels correct for these? This one in particular should be SB-03-01 if I'm interpreting this correctly, right?	Good catch!
See the comment in the above cell	Copy.
I think that structural material and assemblies should ONLY be classified in 01 -substructure or 02-shell - 10-superstructure, and so I find the interiors and exterior wall categorizations to be problematic on a categorization and reporting basis. Furthermore, I think the excel table should contain all of the omniclass categories up to level 4 and clearly define which sections are out of scope. This will help other practitioners understand where structures scope ends and others' begins	Agreed about the walls except the only way to make the taxonomy mappable to <i>Omniclass Table 21</i> for other orgs is to have walls in interiors because that's how OC handles it. And yes the full taxonomy is in an excel spreadsheet starting at OC Table 21 Level 1 - this is the guidance document for reviews only. Its a good point.
This might be off base, since we're a little late to this party, but does this map to Omniclass in a direct way and just add in "level 5-7"? Are there any categories that deviate from omniclass, and if so, can you track those?	It maps directly but not all categories within Shell, Substructure, and Interiors are needed to map to the structural specific portion. We are only including Interiors because as far as I can tell its the only way to may a bearing or shear wall to OC 21. OC21 also has a lot of extra fluff, particularly in the substructure that we aren't mapping to because its unnecessary.
In order to effectively review this table, I would strongly suggest adding the omniclass L3 numbers so everyone can keep the main sections straight	Understood and it's a good point. This was only for general review - the full taxonomy starts at L1 of OC21.
Suggest adding an "other" option for the user inputs at Level 6 and Level 7. Other for assembly type, material	I'm not exactly sure what you mean by this. I don't think we were able to dive into this during our previous review call

type, etc as a catch all for anything not considered directly by this mapping scheme.	but I do know we were trying to avoid 'other'. Could you clarify?
Current Lists as written seem to be focused on specific materials, prioritizing steel and concrete system examples. Inconsistency regarding connection materials, fireproofing, acoustic, and insulation inclusions vs exclusions. Currently does not align w/ SEI Prestandard	Agreed. The Level 7 has been changed to include categories: Primary, Accessory, Ancillary, and Excluded to align with the pre-standard.
What's the method to the organization of SB-01 through SB-14? It seems chaotic that it bounces around between deep items (piles) to shallow items (SOG)...	Agreed. I'm going to remove the SB and SP scheme and make the components a continuation of the OC number scheme.
Confusing that this seems to include walls and wall foundations - from title, I would think just foundations	Understood. I'm going to change the title to 'Wall and Footings'.
Clarification if the wall is attached or detached from the main building structure. SEI Prestand - excludes elements that are not attached	Good point - I'm going to remove detached elements.
Footing?	Yes.
Footing?	Yes.
Again, confusing that this seems to include walls and wall foundations - from title, I would think just foundations	Agreed. Title to include footings.
Is this to say a basement wall (because it's retaining soil)?	Yes, but this has been moved to 'Subgrade Enclosures' because that's how it seemed best to map to OC21.
Footing?	Yes.
Taxonomy lists this as SB-01-01 SOG 01-02 Topping Slab 01-03 Housekeeping Pad	Correct. I'm taking out the non-structural topping and housekeeping pads. If they are for strength and serviceability and on a SOG I think they should just fall under SOG instead of having a separate category. What do you think?
Are timber piles a thing anymore? I feel like that is, in theory, something that could have been used?	
I would think timber piles could still fall under this assembly class	
What about permanent tie-downs?	Ooh, interesting. Would this fall under the SB-10 rock anchors? Aren't tie downs always tied to rock? Hm, good question.

Suggest adding wood elements into the examples so it is not exclusively focused on steel and concrete systems	Noted. Good point.
Why are base plates and bearing plates excluded when in the beam sections we're including connections? These are column "connections" in a sense.	The updated version specific for the new SE 2050 database does not require connections for beams or columns but rather requires the main component and encourages inclusion of the connections.
Agree with other comments about the column connection materials (plates, rods, splices, and connections) - why is it included for beams, but excluded for columns?	The updated version specific for the new SE 2050 database does not require connections for beams or columns but rather requires the main component and encourages inclusion of the connections.
Why is fireproofing included as structural scope? What about acoustic materials? Currently does not align w/ SEI Prestandard	Fireproofing and acoustic materials are required to align with the PS.
I agree with this	
What distinguishes this from SB-02-02?	The capital is at the top to control punching shear though nowadays stud rails are used.
In category of other comments around column connections - are they included or excluded? Seems included given included for beams	This has been changed so that the material of the main member is required but connection material or allowance is encouraged for both beams and columns.
Is breaking this out as a separate assembly class from SP-01 necessary?	I agree in principle that it's not necessary but there is a clear demarcation in <i>OmniClass Table 21</i> so in an effort to make the mapping easier we broke it out between roof and non-roof supporting columns.
I will buck the trend and say that it is necessary to break out roof construction to be in line with how other trades will use omniclass. Roofing is a separate endeavor for other trades, and so allowing for a categorization for roof construction will align with omniclass and allow for people to sort across trades into roofing and make better decisions.	OK, sounds good.
Agree with other comments that it seems unnecessary to break out roof supporting vs. not. But understand if it is to align with OmniClass. I wonder if we can combine in the database, though? If	The new database collects SMQs rolled up to Level 5 so the user won't have to break them out between roof and non-roof.

not, Users will need to break out quantity data and enter it twice	
Agree with prior comment, is there a reason for separate entry from SP-01?	I agree in principle that it's not necessary but there is a clear demarcation in <i>OmniClass Table 21</i> so in an effort to make the mapping easier we broke it out between roof and non-roof supporting columns.
How do wood ljoists, wood truss joists, and wood trusses fall into these categories?	Yes the wood joists are solid lumber so those would be 'beam assembly', wood truss joists I consider 'open web joist assembly', and wood trusses as 'truss'. Does that make sense?
Would these fall under SP-03-04?	
Same comment, is it useful/necessary to breakout roof beams and columns?	Please refer to previous response.
How does this handle something like a waffle slab or maybe potential slabs in the future that may be vaulted or curved in nature? do they go in flat slab?	
For concrete slabs with joists underneath, how are these joined elements supposed to be considered? Do you put the beams, with subtracted slab depth, in the beam section, and the slab here?	It's a good point but it doesn't seem like something that should be resolved by a taxonomy but rather within the database guidance document.
Is this title coming from something? Seems awkward (bare deck)	Quite awkward. It has been removed and will now fall under slabs/decks.
Acoustic system is only considered for plank, decking, and panels? Steel systems often have dropped acoustic assemblies as well. CLT systems sometimes have fireproofing coverings and that is not listed here like other floor assemblies?	Acoustic systems and fireproofing are no longer part of the required elements to align with PS.
This may be a bit unfounded, as it is clearly labeled, but if you're just looking at SP-05-03 and SP-05-06, you might accidentally put the topping in 06 for composite deck. There is a possibility that this gets split from someone quickly glancing through this taxonomy. If that's a nonissue, that's fine, but maybe there is a way to further clarify the name to make sure things get classified correctly	Toppings have been moved into a single category with slabs/decks to try and eliminate the confusion and keep it simple.
Is this intended to address diaphragm assemblies? The floor and roof assemblies do not specifically address if strapping, nailing, connections for diaphragm capacity should be included or excluded	Great question. I think it should include the wood items you described. Will update.

<p>It might be good to include/callout gypsum wallboard used to increase fireproofing of mass timber. This may be applicable to beams and columns too.</p>	<p>Fireproofing and acoustic materials have been moved out of the required category and moved to 6</p>
<p>Agreed. However, this should be addressed for all material systems.</p> <p>Consider acoustic materials as well.</p>	
<p>as an architect, its pretty confusing that you're placing essential structural elements in "interiors" rather than in superstructure. So, if a whole-building LCA model excludes "interiors" does that mean that the results will exclude all of the building's shear walls? I'm assuming this isn't the point...</p>	<p>I completely agree with you but we really don't know what to do with these types of walls because Interiors is the only location that <i>OmniClass Table 21</i> includes walls. Do you suggest we ignore those walls in Interiors and just move them to a walls category within the shell and substructure?</p>
<p>Is this common for shear walls? (fireproofing)</p>	<p>Negative. But we're moving fireproofing out of the required portion regardless.</p>
<p>Bearing conditions only? (SIP)</p>	
<p>Insulation is excluded elsewhere. What is the reason for its inclusion here? Insulation is an exclusion in the SEI Prestandard</p>	<p>Fireproofing and Insulation have been moved to exclude to align with the PS.</p>
<p>general comment: I think these categories make sense, but I think for many people, the main game here will be to map to omniclass and it is very confusing that the numbers and categories are completely out of order.... and bounce between L3 categories and even different L1 categories. Why are there structural elements in Interiors?</p>	<p>I think because you don't have the full taxonomy when reviewing it's harder to see but I do agree about the numbering scheme. I'm ditching the SB and SP numbers and simply making an extension to the OC numbers. Again, I completely agree about the structural elements being in Interiors - please see previous comment. Help. :)</p>
<p>Is this worth breaking out separately from SP-09?</p>	<p>I agree in principle that it's not necessary but there is a clear demarcation in <i>OmniClass Table 21</i> so in an effort to make the mapping easier we broke it out between roof and non-roof supporting columns.</p>
<p>I think we should not be putting structural elements outside of substructure and superstructure. (Exterior walls)</p>	<p>OK, please refer to previous comments on this.</p>
<p>IMO, "Insulation" is in a similar category as "Wall Finishes." Maybe consider including wall finishes?</p>	<p>We are moving the insulation, fire proofing and acoustic materials to excluded so it aligns with the PS.</p>

Is this worth breaking out separately from SP-11?	Please refer to other comments regarding the breakout of roof v non-roof.
What about architectural elements that need structural design? Like an exterior canopy?	The framing and support for things like canopies fall under the 'Ancillary' category of the pre-standard and would not be required to be included in the new database though not excluded.
Would structural framing support for a roof screen fall under this?	The framing and support for things like screenwalls fall under the 'Ancillary' category of the pre-standard and would not be required to be included in the new database though not excluded.
Considering adding: railings balconies	OK.
What if it isnt steel? (connections at 5%)	Good question. Will adjust.
How is this different from SP-13-02 (elevator framing)	It's not. Will update.