**Comment/Explanation\*:**
*Include your justification for your proposed change to the draft standard below.*
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**SECTION 1: PURPOSE**

**Purpose Comment A:** Terminologically, the standard refers to ‘embodied carbon emissions’ 49 times throughout the document, whereas here in the first sentence of the Purpose it is referring to ‘embodied greenhouse gas emissions.’ The reference to ‘emissions’ in the expression ‘embodied carbon emissions’ is redundant in light of the definition for embodied carbon. Need to use common preferred terminology for consistency throughout the document. (See also Purpose Comment B below.)

**Purpose Comment B:** The ultimate/critical value determined in accordance with this document is not ‘embodied carbon / greenhouse gas emissions,’ but instead, it is the ‘net embodied carbon’, which takes into consideration both GHG emissions as well as GHG removals, the latter represented by the biogenic carbon stored within the biobased products. This needs to be made transparent up front here in the Purpose as well as within the Title and Foreword of the document to ensure readers/users are fully aware of the approach/methodology/metric being standardized. (See also related comments later.)

**Purpose Comment C:** Not all ‘building products’ used in the dwelling are implicated in the standard and the Purpose should be revised accordingly to highlight the limited focus, e.g., refer to a ‘limited set’ or ‘selected list’ of building products.

**SECTION 3.2: DEFINITIONS**

**Definitions Comment A**: **General - *highlighting* of defined terms**

In the main text of the document, *italicized font* is used to identify preferred terms/concepts that are otherwise defined in Section 3.2. Yet, within Section 3.2, no such style is used whenever a preferred term is otherwise used within the various definitions. To improve clarity and to show relationships between the various concepts, the similar use of italics should be applied within all of the definition wordings.

**Definitions Comment B**: **General - missing defined terms**

In the main text of the document, there are a number of important concepts that are implicated including many with respect to what is included within the system boundary, yet there are no definitions here within Section 3.2 for those concepts, which is necessary to understand the intent of such exclusions. This includes the concepts of

* Carbonation
* Sequestration
* Avoided GHG emissions
* Carbon capture
* Carbon offsets
* Carbon credits
* Renewable energy credits
* Environmental attribute crediting mechanisms

**Definitions Comment C: ‘approved’**

Definitions cannot contain (shall) requirements. Also, the definition wording is circular with the use of the defined term within its own definition. Consider replacing ‘*shall mean approved by an entity…’* with ‘*acceptable to an entity*…’

**Definitions Comment D: ‘biogenic carbon’**

The document needs to be clear on what ‘fossil carbon’ means and is thus a form of carbon excluded from ‘biogenic carbon.’ A definition of ‘fossil carbon’ should be provided.

**Definitions Comment E**: **‘carbon dioxide’**

Remove this term entry and related text. A dictionary definition will suffice. The text is only providing a commentary on sources of CO2 and is not a proper definition. CO2 is not a reference gas used for ‘measuring’ GHGs, but instead its assigned global warming potential reference value of ‘1’ is used as a reference unit to compare/establish global warming potentials attributed to other GHGs, based on a common unit, CO2e.

**Definitions Comment F**: **‘carbon dioxide equivalent (CO2e)’**

Editorially, with the term entry already indicating the equivalent abbreviated designation, there is no need to also repeat a reference to the abbreviated form ‘CO2e’ within the definition wording. Also, this metric/unit is used for comparing the radiative forcing of GHGs. Wording is poorly structured and includes unnecessary commentary/detail. Should use ISO definition from GHG management standard ISO 14064-1.

**Definitions Comment G**: **‘comparable product type’**

The definition refers to the concept of a ‘reference product.’ There is no definition as to what this represents, and the term ‘reference product’ is not otherwise used in the document. Further explanation or definition is needed to understand the intent. Editorially, within the definition it should refer to a singular building product.

**Definitions Comment H**: **‘confirmed assessment’ / ‘projected assessment’ / ‘minimum assessed products’**

The definition wordings of ‘confirmed assessment’ and ‘projected assessment’ are circular with the definition wording of ‘minimum assessed products’ by the fact that the latter definition refers to both other terms. This results in each definition having a reference to the defined term itself through the principle of substitution. This principle requires that a proper definition be written such that it can be inserted within the text, including other definitions where it is used, and be contextually accurate.

The following shows the results of substituting within the definition for ‘minimum assessed product’ the other two definitions:

***Minimum Assessed Products*** – The products included in an *embodied carbon* assessment which are the basis for the calculation of *global warming potential* results for the purpose of a ***projected*** or ***confirmed assessment*** in accordance with this Standard, and which are assessed by *Certified Raters* or *Approved Inspectors* in accordance with the on-site inspection procedures described in Appendix 10.3 to collect the data necessary to create an *embodied carbon* assessment.

***Confirmed Assessment*** – An assessment accomplished using data gathered from verification of *Minimum Assessed Products* of the home in accordance with this Standard.

***Projected Assessment*** – An assessment accomplished using GWP factors for all Minimum Assessed Products derived from construction documents.

***Minimum Assessed Products*** – The products included in an *embodied carbon* assessment which are the basis for the calculation of *global warming potential* results for the purpose of an ***assessment accomplished using GWP factors for all Minimum Assessed Products derived from construction documents*** or ***an assessment accomplished using data gathered from verification of Minimum Assessed Products of the home in accordance with this Standard*** in accordance with this Standard, and which are assessed by *Certified Raters* or *Approved Inspectors* in accordance with the on-site inspection procedures described in Appendix 10.3 to collect the data necessary to create an *embodied carbon* assessment.

As can been seen, this results in the definition for ‘minimum assessed products’ using the term itself within its own definition. This circular issue needs to be avoided in order for the meaning to be properly and consistently understood. Either revise the definition for ‘minimum assessed products’ to remove both ‘assessment’ references or revise the two assessment definitions to remove reference to the ‘minimum assessed product.’

**Definitions Comment I**: **‘embodied carbon’, ‘6 embodied carbon emissions calculations’, ‘8 reporting requirements’**

The definition for embodied carbon “…refers only to emissions from life cycle stages A1-A3…” and makes no reference to carbon storage. Yet section 6 subtracts the ‘gross carbon storage’ from ‘gross embodied carbon’ to arrive at ‘net embodied carbon’. The document should define the difference between ‘net’ and ‘gross’ embodied carbon so that there is a clear link between GHG emissions and carbon storage.

Also, the definition for embodied carbon should not reference only information modules A1-A3 (see later comment noting that these are not life cycle stages). The definition of embodied carbon should be revised to include all life cycle stages so that it aligns with existing standards and guidelines on embodied carbon, life cycle assessments (LCA), environmental product declarations (EPD), and product category rules (PCR). Secondly, section 5.2 informative note 8 indicates that subsequent tiers incorporating additional life cycle stages are intended to be added in future versions of the standard. Therefore, the definition should be redefined now as opposed to redefining it with every new version of the standard to avoid confusion and additional work.

Lastly, it is unclear as to what is the difference between ‘gross carbon storage’ and ‘net carbon storage.’ ‘Gross and net carbon storage’ is referenced in section 8.1.8. It is recommended to only refer to ‘carbon storage’ and provide a new definition for it.

**Definitions Comment J**: **‘Greenhouse Gas Emissions’**

The text after ‘atmosphere’ is unnecessary/inappropriate and needs to be removed. It is redundant to what is already included in the definition of GHG.

**Definitions Comment K**: **‘GWP Factor’**

The reference to ‘**pollutants** released to the atmosphere’ in this context could cause confusion and should instead refer to ‘GHG emissions.’ Referencing ‘activities’ is confusing as the list of ‘units’ expressed within the wording don’t all relate to an ‘activity’ and instead could relate to a material, product a/o element. The ‘system boundary’ definition refers to building elements, processes, flows, and activities. The GWP factor can also be divided by a function. For instance, insulation products are defined as 1 m2 of insulation with a thermal resistance of RSI = 1.

**Definitions Comment L**: **‘Industry-average EPD’**

The expression “Type III” has been deprecated from use in the generic ISO standard for EPDs, ISO/DIS 14025, which is currently undergoing revision within ISO TC 207/SC 3. The expression has also been deprecated from the overarching ISO standard ISO 14020 on environmental statements published in 2022. We therefore suggest removing the expression “type III” throughout the document and simply refer to “Environmental Product Declaration(s).”

**Definitions Comment M**: **‘Module A1, Module A2, Module A3’**

The elements of the life cycle represented by the designations A1, A2 and A3 are ‘information modules’. And the concept of information modules is defined by the vocabulary ISO 14050 as follows:

**information module**

compilation of data covering a *unit process* or a combination of unit processes that are part of the *life cycle* (of a *product*

Elsewhere in the document, there are many occasions where these information modules are incorrectly referred to as stages of the life cycle, which they are not.

**Definitions Comment N: ‘shall’**

The document needs to be clarified regarding use of normative language, including ‘shall’ and the alternative ‘must’ as well as ‘may’ and the alternatives ‘it is allowable’ and ‘is/are allowed.’ Also, within the terminological data included in Section 3.2 on Definitions, there are numerous normative references to ‘shall’ and ‘must.’ It is not appropriate to include such ‘requirements’ within a Definitions Section of a standard.

**Section: 5.3.5 Biogenic Carbon**

The reporting of biogenic carbon flows should align with existing standards such as ISO 21930:2017, in which they are accounted for and reported in the modules in which the flows take place. Also, Section 5.2 informative note 8 indicates that subsequent tiers incorporating additional life cycle stages are intended to be added in future versions of the standard. Therefore, section 5.3.5 should be revised so that biogenic carbon flows are not *only* reported in modules A1-A3 to both align with existing standards and to avoid revision of this section in future versions of the standard. Since Tier I is limited to modules A1-A3, biogenic carbon flows will only be reported in modules A1-A3 for this version of the standard.

This section should also align with ISO 21930:2017 section 7.2.7 which indicates that biogenic carbon in wood products shall be accounted for only when the wood originates from sustainably managed forests to ensure responsible sourcing.

**Section: 5.3.6 Carbonation**

The carbonation process begins during the service life and is therefore accounted for in information module B1 of the Use Stage (and later during the End-of-life Stage). As such, it is incorrect (outside the system boundary) to report the sequestered carbon from the carbonation process in information modules A1-A3 as little-to-no carbonation occurs. The current text in this standard does not align with existing LCA/embodied carbon standards and guidelines that are both published and in-development (ISO 21930:2017, RICS Whole Life Carbon Assessment for the Built Environment, ASHRAE/ICC Standard 240P, etc.), which creates inconsistency and confusion. Therefore, section 5.3.6 should be revised so that it indicates that sequestered carbon from the carbonation process should be accounted for in the use-stage information module (B1) and end-of-life (C3/C4). Since the system boundary in this version of the standard is currently limited to information modules A1-A3, rather than completely deleting this section, an informative note can be added to indicate that carbonation will be accounted for in future versions of the standard when additional life cycle stages are added.

**Section: 6.2.2 Gross carbon storage for products**

The GCSproduct equation is oversimplified and inaccurate. Also, is the term 'Carbon Content Factor' actually specified in EPDs and LCAs? It seems like a new term/concept, and directing users to search for it in relevant data sources might be misleading and unproductive. Moreover, the Carbon Content Factor equation is inaccurate. When you substitute the existing Carbon Content Factor equation into the GCSproduct equation, you are multiplying the total Material Quantity by itself. It also contains no units for Carbon Content Factor and Carbon Content, the Carbon Content description is inaccurate, and there is no definition for ‘Carbon content of feedstock material’. Note, ‘Carbon Content’ is the fraction (or percentage) of the material which is carbon that can be converted to CO2. For wood, 50% of the mass (+/- 0.5%) is carbon, and therefore the ‘Carbon Content’ for wood would be 0.5. Due to all these reasons, the term Carbon Content Factor term should be removed, and new carbon storage calculations should be provided for both biogenic carbon and carbonation, as they differ and are not accurately represented in this section.

**Section: 6.2.3 Net *embodied carbon* for products**

There is a typo on the ‘Gross Embodied Carbon’ acronym.

**Section: 8 Reporting Requirements and 8.1.5**

‘Software Rating Tool’ is used twice in this text and is italicized in both cases, but there is no definition for the concept. Also, there are no requirements included in this document for any such tool.

**Section: 8.1 Reporting Requirements**

It is unclear what subsection 8.1.6 is implicating in the text that reads “*Projected Assessment* Based on Plans Only”. Is this referring to plan drawings? This text can be improved by referencing construction documents.

**Table 10.1.1 Dimension Takeoff Guidance**

The dimension takeoff guidance for ‘Stairs’ should also include stringers, when applicable, as there are several different stair structures. The area calculation may not accurately capture each type.

**Table 10.1.2 Framing Fractions**

How were the default framing fractions (% total wall area) derived? Can a link be provided to the source? Please ensure that the values consider actual lumber area as opposed to nominal.

**Table 10.2.1 Waste Rates for Products**

How was the 15% waste rate determined for ‘Standard sheets, boards, or panels cut-to-size on site…’? A 15% waste factor appears fairly high. Can a link be provided to the source?

**Section: 10.4 Building Component Exclusions (Informative)**

**Comment:** This section is included in Section 10 Appendix, and designated as ‘informative, yet the wording within Section 10.4 includes normative (shall not) provisions.

 unclear what subsection 8.1.6 is implicating in the text that reads “*Projected Assessment* Based on Plans Only”. Is this referring to plan drawings? This text can be improved by referencing construction documents.

**Proposed Change to the Draft Standard\***
*Use “strikethrough” and “underline” formatting to indicate all proposed changes. Changes must be shown with “hard-formatting” strikethrough and underline, not “track changes”.*

*Use a color other than red to indicate proposed changes to the draft.*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Section: 1 Purpose**

Revise text to read as follows

The provisions of this document establish a methodology for quantifying and reporting *net embodied carbon* ~~greenhouse gas~~ ~~emissions~~ associated with a selected list of building products…

Revise the Title, Foreword and Purpose of the document to reference ‘net embodied carbon’ and add a definition to Section 3.2 for ‘net embodied carbon’ based on the requirements of this standard.

Throughout the document, remove the word ‘emissions’ whenever ‘embodied carbon emissions’ is referenced.

**Section: 3.2 Definitions -** **General – use of italicized font**

Definitions Comment A:

Within the definitions of Section 3.2, use italics for the font style for any defined term when it is used within the different definitions.

**Section: 3.2 Definitions -** **General - missing defined terms**

Definitions Comment B:

Add new terminological data (term entries, definitions, notes to entry, etc.) in Section 3.2 for important concepts that need to be clearly understood as they relate to what is and is not within the system boundary of any assessment conducted in accordance with this standard. This includes the concepts of

* Carbonation
* Sequestration
* Avoided GHG emissions
* Carbon capture
* Carbon offsets
* Carbon credits
* Renewable energy credits
* Environmental attribute crediting mechanisms

**Section: 3.2 Definitions – ‘approved’**

Definitions Comment C:

Revise definition to read as follows

Approved – ~~Shall mean approved by~~ acceptable to an entity adopting and requiring the use of this Standard as a result of investigation and tests conducted by the entity or by reason of accepted principles or tests by nationally recognized organizations.

**Section: 3.2 Definitions – ‘biogenic carbon’**

Definitions Comment D:

Add the following new definition of ‘fossil carbon’ to Section 3.2:

**fossil carbon**

carbon that is contained in fossilized material

Note 1 to entry: Examples of fossilized material are coal, oil and natural gas and peat.

[SOURCE: ISO 14067:2018]

**Section: 3.2 Definitions – ‘carbon dioxide’**

Definitions Comment E:

Delete this data

***~~Carbon Dioxide (CO2)~~*** ~~– A naturally occurring gas, CO2 is also a by-product of burning fossil fuels (such as oil, gas, and coal), of burning biomass, of land-use changes and of industrial processes (e.g., cement production). It is the reference gas against which other GHGs are measured and therefore has a global warming potential (GWP) of 1.~~

**Section: 3.2 Definitions – ‘carbon dioxide equivalent (CO2e)’**

Definitions Comment F:

Replace the definition with the ISO definition from GHG management standard ISO 14064-1.

~~Carbon Dioxide Equivalent (CO2e) – Carbon dioxide equivalent, abbreviated as CO2-e, is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP), by converting amounts of other gases to the equivalent amount of carbon dioxide with the same 100-year global warming potential in accordance with the IPCC Sixth Assessment Report.~~

**carbon dioxide equivalent**

**CO2e**

unit for comparing the radiative forcing of a *greenhouse gas (GHG)* to that of carbon dioxide

Note 1 to entry: The carbon dioxide equivalent is calculated using the mass of a given *GHG* multiplied by its *global warming potential*.

[SOURCE ISO 14064-1:2018]

**Section: 3.2 Definitions – ‘comparable product type’**

Definitions Comment G:

Revise to read as follows

***Comparable Product Type*** – *Building* product~~s~~ that is~~are~~ identical or materially similar to the *reference product* in terms of composition, function, performance, manufacturing, installation, and meeting the same code requirements.

Also, add the following new definition of ‘reference product’ to Section 3.2:

**reference product**

specific product and manufacturer or product type with no manufacturer that is referenced in the *construction documents*

**Section: 3.2 Definitions – ‘confirmed assessment’, ‘projected assessment’, ‘minimum assessed products’**

Definitions Comment H:

Either revise the definition for ‘minimum assessed products’ to remove both ‘assessment’ references or revise the two assessment definitions to remove reference to the ‘minimum assessed product.’

**Section: 3.2 Embodies carbon, 6 Embodied Carbon Emissions Calculations, and 8 Reporting Requirements**

Definitions Comment I:

Section 3.2:

* Expand the ‘embodied carbon’ definition to include all life cycle stages.
* Add notes to the ‘embodied carbon’ definition to clarify the difference between ‘gross’ and ‘net’ embodied carbon OR provide new definitions on ‘gross embodied carbon’ and ‘net embodied carbon’ so that there is a link between GHG emissions and carbon storage.
* Provide a definition for ‘carbon storage’.

Section 6:

* Delete ‘gross’ from every reference to ‘gross carbon storage’, including the term ‘GCSproduct’.

Sections 8.3 and 8.4:

* Delete ‘Gross’ from ‘Total Gross Carbon Storage’, as well as from ‘TGCS’ and ‘TGCSI’.

Section 8.1.8:

* Delete ‘Gross and Net’.

**Section: 3.2 Definitions – ‘greenhouse gas emissions’**

Definitions Comment J:

Revise definition to read as follows

Greenhouse Gas Emissions – The release of greenhouse gases into the atmosphere ~~that absorb and emit radiation at specific wavelengths within the range of the electromagnetic spectrum that radiation is emitted by the Earth’s surface, the atmosphere, and clouds~~.

**Section: 3.2 Definitions – ‘GWP factor’**

Definitions Comment K:

Revise definition to read as follows

***GWP Factor*** – A representative value that attempts to relate the quantity of a *greenhouse gas emission* ~~pollutant released to the atmosphere~~ in *carbon dioxide equivalent* with an activity, building element, process or flow associated with the emission ~~release of that pollutant~~. These factors are usually expressed as the weight of carbon dioxide equivalent divided by a unit weight, volume, distance, function, or duration of the activity, building element, process or flow that causes the *GHG emission* ~~emitting the pollutant~~ and are used in Environmental Product Declarations.

**Section: 3.2 Definitions – ‘industry-average EPD’**

Definitions Comment L:

Revise definition to read as follows

***Industry-average EPD*** – An ~~A Type III~~ *Environmental Product Declaration (EPD)* that declares average *GWP factors* for products from multiple manufacturers in a clearly defined sector and/or geographical area.

Section 5.3.1.1:

*Environmental Product Declarations. EPDs* shall be valid, independently verified, ~~Type III,~~ according to ISO 14025 and ISO 21930:2017 or EN 15804+A2. EPDs using EN 50693 shall be accepted for electrical equipment. *Product-specific EPDs* and *Industry-average EPDs* must be the most recently published *EPD* specific to the product type

**Section: 3.2 Definitions – ‘Module A1, Module A2, Module A3’**

Definitions Comment M:

Revise definitions to read as follows:

***Module A1***– The life cycle *information module* corresponding to all processes and materials associated with harvesting, extraction, collection, and further processing of raw materials. Also referred to as “Extraction and upstream production.”~~’known as life cycle stage A1.~~

***Module A2*** – The life cycle *information module* corresponding to the transport of raw materials to a product manufacturing facility or to multiple manufacturing facilities. Also referred to as “Transport to factory.”~~’known as life cycle stage A2.~~

***Module A3*** – The life cycle *information module* corresponding to the processes and materials required for the fabrication and production of a product. Also referred to as “Manufacturing.”~~’known as life cycle stage A2.~~

Add new definition for ‘information module’ to read as follows:

**information module**

compilation of data covering a unit process or a combination of unit processes that are part of the life cycle (of a product

[SOURCE ISO 14050:2020]

Scan the document and revise all cases where A1, A2 and A3 are referred to as ‘stages’ and refer to them as an ‘information module(s).’

**Section: 3.2 Definitions – ‘shall’**

Definitions Comment N:

Provide a definition of the normative term ‘may.’ Throughout the document replace ‘must’ with shall.’ Revise text to use ‘may’ in place of reference to ‘it is allowable’ and ‘is/are allowed.’ Remove all mandatory provisions (shall/must) contained within Section 3.2 Definitions (and Footnotes) and move the provisions to the main body of the document.

**Section: 5.3.5 Biogenic Carbon**

Revise text to read as follows:

*Biogenic carbon* flows shall be calculated in accordance with Section 6 and reported in the *information modules* in which the flows take place ~~for~~ *~~LCA~~* ~~modules A1-A3 only~~. For wood products, *biogenic carbon* flows shall only be accounted for when the wood originates from sustainably managed forests\*.

\*(Informative Note): The concept of sustainably managed forests is linked but not limited to respective certification schemes. Other evidences such as national reporting under the United Nations Framework Convention on Climate Change (UNFCCC) can be used to identify forests with stable or increasing forest carbon stocks.

**Section: 5.3.6 Carbonation**

Revise text to read as follows:

*Sequestered* carbon from the process of *carbonation* shall be calculated in accordance with Section 6 and reported for the use (B1) and end-of-life (C3/C4) modules, where applicable\* ~~LCA modules A1-A3 only~~.

\*(Informative Note) Since the system boundary in this current standard is limited to *information modules* A1-A3, calculation and reporting of *sequestered* carbon from the process of *carbonation* does not apply to this version but will be accounted for in future versions when the standard is expanded to include additional life cycle stages.

**Section: 6.2.2 Gross carbon storage for products**

Required Re-write of this section:

1. Provide an equation to calculate carbon storage of a product that includes biogenic carbon (this can be called CSbio-product). For wood products available references include ISO/FDIS 13391-1 and EN16449:2014. At a basic level this equation would multiply the molecular weight ratio of CO2/C (3.67) by the density (kg/m3) by the carbon content fraction (0.5).
2. Provide an equation to calculate carbon storage of a product from the carbonation process (this can be called CScarb-product). For concrete products available references include National Research Council Canada’s *National guidelines for whole-building life cycle assessment* and EN 16757:2017, Annex BB. This would require calculating the maximum CO2 uptake of a cement product, the depth of carbonation from the surface of the concrete product as a function of time, and the depth of carbonation from the surface of a concrete product as a function of time, in order to calculate the CO2 uptake of a volume of concrete as a function of time.

**Section: 6.2.3 Net *embodied carbon* for products**

**NECproduct = GECproduct ~~GEM~~~~product~~– GCSproduct**

**Section: 8 Reporting Requirements and 8.1.5**

Delete the two references to ‘approved software rating tool.’ Failing that, provide a definition for ‘Software Rating Tool’ in section 3.2 and include a list of approved software rating tools, if available. If no specific examples are listed, include in this document the requirements for such tools.

**Section: 8 Reporting Requirements**

Revise text to read as follows:

8.1.6 *Projected Assessment* reports shall contain the following text in no less than 14-point font at the top of the first page of the report: “*Projected Assessment* Based on Construction Documents ~~Plans Only~~.”

**Table 10.1.1 Dimension Takeoff Guidance**

Revise text to read as follows:

|  |  |  |
| --- | --- | --- |
| Stairs | Number of treads x tread width x tread depth + stringers, when applicable | Area, m2Length, m |

**Table 10.1.2 Framing Fractions**

Ensure that actual lumber sizes were used to develop the default framing fractions and revise accordingly if needed.

**Table 10.2.1 Waste Rates for Products**

Please provide a source for the waste rate of ‘Standard sheets, boards, or panels cut-to-size on site as needed: non-metal (gypsum, plywood)’ as 15% appears high. Revise accordingly if needed.