**Comment/Explanation\*:***Include your justification for your proposed change to the draft standard below.*
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**Comment #1:** The Waste Factor should not be subtracted from Material Quantity. The total quantity of the product is calculated as per Tables 10.1.1 and 10.1.5, which does not include waste. This is supported by the GECproduct equation in section 6.2.1, where the Waste Factor is *added* to the Material Quantity.

**Comment #2:** The **carbon storage equation contains a mathematical error** due to circular substitution:

When you substitute the GWPbiogenic equation into the CSproduct equation (see below), you are multiplying the Material Quantity by itself, which is not correct.

(Eqn 1) CSproduct = Material Quantity x GWPbiogenic

(Eqn 2) GWPbiogenic = Material Quantity x Carbon Content x 3.67

When you substitute Eqn 2 into Eqn 1:

CSproduct = Material Quantity x Material Quantity x Carbon Content x 3.67

**Comment #3: It is incorrect and misleading to use the term GWPbiogenic**. GWPbiogenic reflects the climate impact of biogenic carbon flows. The definition of it in this draft conflates a mass-based quantity (physical measurement), with a climate impact metric (factor that modifies how that mass contributes to climate change over time). These are related but not interchangeable.

It is also misleading to use the term GWPbiogenicbecause the definition includes carbonation. Carbonation is a chemical reaction where CO2 from the atmosphere reacts with materials like concrete to form carbonates over time – this is not biogenic. As such, the GWPbiogenicterm should not be used.

Additionally, the standard guides users to obtain the GWPbiogenicvalue from EPDs, which is problematic for both biogenic carbon and carbonation. Regarding biogenic carbon, the GWPbiogenic value in a wood EPD reflects the biogenic carbon storage in the log that is used to produce 1m3 of wood product when it is ready to leave the forest, not the biogenic carbon stored in the final product used in the building. The correct way to calculate the biogenic carbon storage in 1m3 of the product used in the building is by multiplying the molecular weight ratio of CO2/C (3.67) by the dry or in-use condition density (kg/m3) by the fraction of the product’s mass that is carbon.

With respect to carbonation, while we acknowledge that some carbonation may occur during the product stage (A1-A3), although it is typically minimal, we believe that additional guidance is needed to help users of the standard interpret carbonation values in an EPD so that it is appropriately applied in calculating the carbon storage in the product. For instance, when referencing the [2021 NRMCA Industry-Average EPD for Ready Mixed Concrete](https://www.nrmca.org/wp-content/uploads/NRMCA-IW-EPD-v3.2-ext-2026.03.31.pdf), carbonation is grouped with calcination under *Calcination and carbonation emissions (CCE)* in Table 5. This grouping is commonly used in concrete EPDs because both are CO2 flows directly related to the cement chemistry in concrete. However, they represent opposite flows as calcination is the release of CO2 and carbonation is the uptake (removal) of CO2. Calcination emissions are therefore represented by a positive value (CO2 released) and carbonation removals are represented by a negative value (CO2 absorbed). The CCE value is the sum of these two, so depending on the balance it can be positive (net emission), negative (net uptake), or zero. For instance, in all summary results tables (Tables 6a to 14b) of the [EPD](https://www.nrmca.org/wp-content/uploads/NRMCA-IW-EPD-v3.2-ext-2026.03.31.pdf), the positive values under the CCE indicate net emissions, meaning no carbon storage. This distinction is critical because users may misinterpret a single CCE value without understanding its components. **If the committee decides to include calculations for carbon storage from carbonation in the A1–A3 modules, the standard should clearly define the interpretation of positive and negative values in EPDs related to carbonation and calcination, and, where possible, encourage separating these values in assessments to prevent misinterpretation.**

Finally, while the definition and equation for GWPbiogenic are not redlined in this draft, they are closely interlinked with the term’s application. It is important that the standard provides clarity and avoids creating confusion around how carbon storage is calculated.

**Comment #4:** The current definition of Carbon Content is confusing and redundant. It mixes the carbon content of the final product and the carbon content of the feedstock, it multiplies two percentages, and it is unclear whether the result fraction is a mass fraction (e.g. 0.5) or a percentage (e.g. 50%).

Therefore, due to the mathematical error in the original formulation, the misuse of the term GWPbiogenic, the complexity involved in accurately determining carbonation, and the ambiguous definition of Carbon Content, it is recommended that the equation for carbon storage (CSproduct) be separated into two distinct equations:

* One for biogenic carbon storage (applicable to biobased products)
* One for carbonation-based carbon uptake (applicable to mineral-based products such as concrete)

This separation will improve clarity and ensure that each mechanism is treated according to its unique scientific basis.

**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.*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

### 6.2.2 Carbon storage for products

Carbon storage for each *Minimum Assessed Product* that includes *biogenic carbon* as per Section 5.3.5 and carbonation as per Section 5.3.6 shall be calculated as follows:

**CSbio-product ~~CS~~~~product~~ = ~~(~~Material Quantity x Carbon Content x 3.67 ~~– Waste Factor) x GWP~~~~biogenic~~**

Where:

CSbio-product ~~CS~~~~product~~= Biogenic carbon ~~Carbon~~ storage for a project-specific quantity of a biobased *building product* for life cycle modules A1-A3 (kg CO2 ~~CO2~~)

Material Quantity = Total quantity of product (kg), calculated as per Tables 10.1.1 and 10.1.5. If the quantity is calculated in volumetric units (m3), it must be converted to mass using the appropriate dry or in-use condition density of the product as reported in the EPD or technical documentation.

Carbon Content = Fraction of the product’s mass that is elemental carbon

3.67 = Molar mass conversion factor from carbon (C) to carbon dioxide (CO2) content, based on 44/12

~~GWP~~~~biogenic~~ ~~=~~ *~~Biogenic carbon~~* ~~or carbonation associated with a~~ *~~building product~~* ~~for life cycle modules A1-A3 based on a data source selected according to Table 5.3.2. If the relevant data source does not include a GWP~~~~biogenic~~ ~~factor, the GWP~~~~biogenic~~ ~~factor shall be calculated as follows:~~

**~~GWP~~~~biogenic~~ ~~= Material Quantity (mass) x Carbon Content x 3.67~~**

~~Where:~~

~~GWP~~~~biogenic~~ ~~= Mass of atmospheric~~ *~~carbon dioxide~~* ~~stored in the product~~

~~Material Quantity = Mass of product calculated as per Tables 10.1.1 and 10.1.5~~

~~Carbon Content = Percentage of product mass represented by carbon content x Carbon content of feedstock material~~

~~3.67 = Molar mass conversion factor from carbon content to CO2 content~~

**CScarb-product = Material Quantity x Carbonation Factor**

Where:

CScarb-product= Carbonation-based storage for a project-specific quantity of a concrete *building product* for life cycle modules A1-A3 (kg CO2)

Material Quantity = Total quantity of product (kg or m3), calculated as per Tables 10.1.1 and 10.1.5

Carbonation Factor = Amount of CO2 absorbed per unit of product (kg CO2 /unit), derived from data source selected according to Table 5.3.2 or carbonation models1

Add footnote:

1: In many EPDs, carbonation (CO₂ uptake) is reported together with calcination (CO₂ release) under a combined category such as “Calcination and Carbonation Emissions (CCE).” While calcination represents a positive emission (release of CO₂), carbonation represents a negative emission (uptake of CO₂). Because these are opposing flows, the net CCE value can be positive, negative, or zero. To avoid misinterpretation, it is recommended that calcination and carbonation values be reported and assessed separately wherever possible.