GG95-14
303, 303.1, 505.1

Proponent: Mark Nowak, representing Steel Framing Alliance

Delete without substitution:

~~**SECTION 303**~~
~~**WHOLE BUILDING LIFE CYCLE ASSESSMENT**~~

~~**303.1 Whole building life cycle assessment.** Where a whole building life cycle assessment is performed in accordance with Section 303.1, compliance with Section 505 shall not be required. The requirements for the execution of a whole building life cycle assessment shall be performed in accordance with the following:~~

1. ~~The assessment shall demonstrate that the building project achieves not less than a 20-percent improvement in environmental performance for global warming potential and at least two of the following impact measures, as compared to a reference design of similar usable floor area, function and configuration that meets the minimum energy requirements of this code and the structural requirements of the *International Building Code*. For relocatable buildings, the reference design shall be comprised of the number of reference buildings equal to the estimated number of uses of the relocatable building. The reference and project buildings shall utilize the same life cycle assessment tool.~~
    - ~~1.1. Primary energy use.~~
    - ~~1.2. Acidification potential.~~
    - ~~1.3. Eutrophication potential.~~
    - ~~1.4. Ozone depletion potential.~~
    - ~~1.5. Smog potential.~~
2. ~~The reference and project buildings shall utilize the same life cycle assessment tool.~~
3. ~~The life cycle assessment tool shall be *approved* by the *code official*.~~
4. ~~Building operational energy shall be included. For relocatable buildings, an average building operational energy shall be estimated to reflect potential changes in location, siting, and configuration by adding or subtracting modules, or function.~~
5. ~~Building process loads shall be permitted to be included.~~
6. ~~Maintenance and replacement schedules and actions for components shall be included in the assessment. For relocatable buildings, average transportation energy, material and waste generation associated with reuse of relocatable buildings shall be included in the assessment.~~
7. ~~The full life cycle, from resource extraction to demolition and disposal, including but not limited to, onsite construction, maintenance and replacement, relocation and reconfiguration, and material and product embodied acquisition, process and transportation energy, shall be assessed. The complete building envelope, structural elements, inclusive of footings and foundations, and interior walls, floors and ceilings, including interior and exterior finishes, shall be assessed to the extent that data are available for the materials being analyzed in the selected life cycle assessment tool.~~

    ~~**Exception:** Electrical and mechanical equipment and controls, plumbing products, fire detection and alarm systems, elevators and conveying systems shall not be included in the assessment.~~

8. ~~The complete building envelope, structural elements, inclusive of footings and foundations, and interior walls, floors and ceilings, including interior and exterior finishes, shall be assessed to the extent that data are available for the materials being analyzed in the selected life cycle assessment tool.~~
9. ~~The life cycle assessment shall conform to the requirements of ISO 14044.~~

Revise as follows:

505.1 Material selection and properties. Building materials shall conform to Section 505.2.

Exceptions:

~~1.~~ Electrical, mechanical, plumbing, security and fire detection, and alarm equipment and controls, automatic fire sprinkler systems, elevators and conveying systems shall not be required to comply with Section 505.2.

~~2. Where a whole building life cycle assessment is performed in accordance with Section 303.1, compliance with Section 505.2 shall not be required.~~

Reason: LCA is not an appropriate method for the IgCC or any building code for the following reasons:

1. Buildings that use energy are very different in their impacts compared to individual products or other uses of materials because the energy use during the building's life is the dominant variable and it is already addressed in the code. The ability to differentiate between different materials in a building that uses energy throughout its life is insignificant and falls outside normal ranges of statistical acceptability.
2. LCA has significant technical limitations that make it inappropriate for use in assessing a building design.
3. The use of LCA as included in the IgCC leaves open the opportunity to conduct LCA studies that are not in compliance with the ISO standards.
4. LCA is not an equivalent " trade-off" to the prescriptive path requirements in the IgCC.

Specific comments related to each of these points are as follows:

Buildings that use energy are very different in their impacts compared to individual products and other uses of materials.

Unlike many consumer products that use little or no energy after their transportation stage, the operational energy in a conditioned building represents 95 to 97% of the emissions over the life of a building. This overwhelms the impact of any other decision. The remaining 3 to 5% leaves little ability to differentiate between products. The potential improvement from selecting differing materials or products would only be a fraction of that 3% to 5%. Conducting an LCA study and requiring its enforcement by code officials is an expensive process to go through for little to no possible improvement.

Precision and other uncertainty associated with an LCA is rarely reported but is generally greater than the percentage that can be changed by substituting different products. Studies suggest the error related to just the LCI phase is greater than 10% (see for example Athena Institute study at http://www.cement.ca/images/stories/athena%20report%20Feb.%202%202007.pdf . Total error would be much greater. The outcomes are in the range of statistical noise when applied to building materials.

LCA has some significant technical limitations that make it inappropriate for use in assessing a building design.

1. A comprehensive LCA, which is the only acceptable form of an LCA, is not feasible for buildings due to a lack of data The current section 303.1 of the code attests to this fact in items number 7 and 8 that arbitrarily exclude systems and components for which data does not exist. Buildings have thousands of different materials and components. Without assessing every one of them in a comprehensive manner, there is no way to determine if the excluded items will have a significant impact.
2. LCA relies on subjective scope, boundary decisions and value judgments. The results of an LCA are neither reproducible nor comparable to other LCAs.
3. An LCA does not demonstrate environmental impacts but only provides a relative outcome. There are no thresholds established to determine whether a specific outcome is good or bad. There is no way to distinguish good versus bad products or buildings through an LCA.
4. LCA as currently practiced, does not account for time-dependent or spatial (point versus nonpoint) releases, or existing conditions of the local and regional areas impacted.

Unless the impact on a specific building location and the originating location of all materials in the building is considered, a building official could be approving buildings that are contributing to significant degradation of the environment.

The use of LCA as included in the IgCC leaves open the opportunity to conduct LCA studies that are not in compliance with the ISO standards

1. The ISO standards for LCA require the data to be representative for the materials or products being used. This data does not exist and instead, is being substituted with industry average data. By definition, average data rewards the lower performing materials and penalizes the better performing ones. It can result in the code official approving materials that may very well be seriously degrading the local environment.
2. The impact measures listed in the IgCC were selected for convenience. The requirements omit key impact measures of biodiversity, human health, land clearing, and others that are as or more important than the measures listed. A study done in accordance with the IgCC fails to meet the ISO requirements to be comprehensive given that all materials and activities degrade bio-diversity and other land use issues to some extent. Without these impact measures, code officials could approve buildings with materials that degrade the environment significantly.

3. The IgCC as currently written would allow selection of a building that performs lower on some impacts, as long as it improves in at least two others plus global warming potential. The lower performance could be devastating to a local habitat or sensitive area but could be ignored by selecting other impacts for improvement. Yet the building official would approve this without even being informed of the potential negative impact of the decision.
4. It is not possible to use a life-cycle assessment "tool" as permitted in the code and comply with the ISO standard that is referenced. Although there are some tools that can be used in the conduct of an LCA, there is no tool that can be used by itself to conduct a full ISO 14044-compliant LCA. Tools are aids much like a designer might use a spreadsheet but can't be used exclusively to conduct an LCA in accordance with the ISO standards.

LCA is not an equivalent trade-off for the prescriptive requirements in the IgCC.

The prescriptive requirements in the IgCC and the base codes upon which the IgCC builds typically address measurable improvements to the performance of a building. LCA, on the other hand, is a vague and subjective replacement that only serves as a relative point of comparison on selective and subjective environmental impacts. The uncertainty associated with an LCA study is unacceptable for a building code of any kind. Building officials would need to be trained to interpret the results of an LCA. This is an extra burden that is not necessary to ensure a high performing building. The LCA option should be deleted entirely from the code.

[1] A LIFE CYCLE PERSPECTIVE ON CONCRETE AND ASPHALT ROADWAYS: EMBODIED PRIMARY ENERGY AND GLOBAL WARMING POTENTIAL, Athena institute, Ottawa, Ontario, Canada, S e p t e m b e r 2006.

Cost Impact: Will not increase the cost of construction.

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