

304.1 Life Cycle Assessment of Assemblies. At least two assembly types, including structural columns and beams, exterior wall, floor/ceiling or roof/ceiling assemblies, shall be selected based on life cycle assessment comparisons to environmental impact benchmarks listed in Table 304.1. The criteria for selection shall be assemblies that are better than the benchmarks in the impact measures chosen. One of the two benchmarks shall be Global Warming Potential (GWP) and the second benchmark shall be selected by the registered design professional.

304.1.1 Life Cycle Assessment Effects. Environmental impacts for assemblies shall be determined by methods of life cycle assessment. The life cycle assessment methodology shall consider the material impacts in 304.1.1.1 to 304.1.1.4. All components of the secondary members shall be included in an assembly.

304.1.1.1 Exterior Wall Assembly. The exterior wall assembly shall include all components of the exterior wall envelope, exterior wall covering, and the interior wall finish.

304.1.1.2 Floor/Ceiling Assembly. The intermediate floor assembly shall include all components of floor/ceiling assemblies, interior floor finish and interior ceiling finish

304.1.1.3 Roof/Ceiling Assembly. The roof ceiling assembly shall include the components of the roof assembly and the interior ceiling finish.

304.1.1.4 Structural columns and beams. The structural columns and beams shall include all members of the primary structural frame, which support floor or roof assemblies. A tributary area method approach shall be used to assign an area to columns and beams.

304.1.2 Life Cycle Assessment Boundaries. The LCA shall be based on a cradle to grave life cycle. The LCA shall assume a 60-year service life and take account of the full life-cycle of materials including on-site construction, maintenance and replacement where relevant, demolition and disposal. LCA shall be conducted in a whole building context and the results reduced to per-square-foot estimates for purposes of comparison to the benchmarks indicated in Tables 304.1 (low-rise) and 304.2 (high-rise) buildings.

Table 304.1
Seattle Low-Rise for Climate Zone 6

ASSEMBLY (ft² basis)	Primary Energy (MJ) TOTAL	GWP (tonnes CO₂eq) TOTAL	Acidification Potential (moles of H⁺ eq) TOTAL	Eutrophication Potential (mg N eq) TOTAL	Ozone Depletion Potential (mg CFC-11 eq) TOTAL	Smog Potential (g NO_x eq) TOTAL
Structural Columns & Beams	28.95	1.68	0.63	1483	0	5.45
Floor/Ceiling Assembly	50.03	4.4	1.56	1810	0.01	15.46
Exterior Wall Assembly	185.02	13.39	5.28	3584	0.03	59.97
Roof/ceiling assembly	228.14	10.32	5.04	2671	0.01	60.74

Table 304.2
Seattle High-Rise for Climate Zone 6

ASSEMBLY (ft² basis)	Primary Energy (MJ) TOTAL	GWP (tonnes CO₂eq) TOTAL	Acidification Potential (moles of H⁺ eq) TOTAL	Eutrophication Potential (mg N eq) TOTAL	Ozone Depletion Potential (mg CFC-11 eq) TOTAL	Smog Potential (g NO_x eq) TOTAL
Structural Columns & Beams	35.92	2.16	0.81	1960	0	6.19
Floor/Ceiling Assembly	50.03	4.4	1.56	1810	0.01	15.46
Exterior Wall Assembly	204.22	14.62	5.47	3544	0.03	57.71
Roof/ceiling assembly	228.14	10.32	5.04	2671	0.01	60.74

Note that lower table values are better

REASON: Energy is utilized in every step of the process of building materials, from creation (mining or planting/harvesting) to removal (recycling/reprocessing/landfilling). The single best method of minimizing the amount of energy consumed in creating, installing, and sunsetting a material is Life Cycle Assessment (LCA). LCA accounts for the energy utilized in each step. It is a far more accurate environmental accounting method than general assumptions such as “regional materials” or “renewable resources” or even “recycled materials”. Each of these ideas has built in assumptions about how it requires less energy than processing virgin material into building materials. Each of the assumptions has inherent loopholes which would overestimate the impact such material would have on energy consumption of building materials.

LCA attempts to inventory the energy costs at every phase of a material’s life from creation to grave (or sunset if you want to include all the possible outcomes). It is a more precise accounting of the actual energy cost. However, LCA is a difficult process to master. Several organizations have LCA tools which are simplified for the lay practitioner. This proposal is based upon common construction assemblies such as walls, or floors, or ceilings which a lay practitioner can readily understand and address. The tables represent the average values for the environmental impacts of various types of assemblies. It is the average of all the assemblies of that specific type (e.g. exterior wall) known to the LCA tool developer. Hence the averages are the median of a distribution from conventional to exceptional. Therefore, by definition, requiring an outcome better than the “average” produces an energy consumption better than conventional and simultaneously reduces other impacts on the environment.

When the International Code Council Sustainable Building Technology Committee (ICC SBTC or SBTC) began drafting a “green code”, now known as the International Green Building Code

or IgCC, it included LCA in its drafts. In the early iterations of IgCC, both a Whole Building LCA and a components or assemblies LCA were included. After much wrangling in the Materials subcommittee, assemblies LCA was omitted but the more expensive and complex Whole Building LCA was retained in Public Version 1. The advocates of the assemblies version point out that it is simple, succinct but reasonably accurate. This simplified version is encouraged by advocates to 1) encourage practitioners to utilize the more precise science of Life Cycle Assessment and 2) more accurately account for, thus minimizing, energy consumption and its attendant environmental impacts for construction materials.

This submittal is a simple but elegant solution to these problems. It will further enhance the Reach Code; encourage more accurate assessment of energy consumption and of environmental impacts as defined by international standards (ISO standards for LCA).