



Sustainable Advantages of Concrete Frame

Energy Cost Savings

- The thermal mass of cast-in-place concrete in the frame alone can save 6-9% on total annual energy costs in cold and mild climates, up to 21% when both the frame and walls were concrete (based on "Modelling Energy Performance for LEED" by Medgar Marceau, Martha VanGeem, and Iyad Alsamsam).
- Using concrete walls eliminates the need to increase the R value of the structure's walls, which adds initial cost.
- Daylighting schemes are more easily enabled by concrete (thinner floor slabs and reduced floor-to-floor heights) and its naturally high SRI. Daylighting can reduce lighting costs 87% (University of Oregon)
- Concrete's naturally high Solar Reflective Index (SRI) of 30+ reduces heat island effect - both roof and non-roof, reducing HVAC costs. With slag or light fly ash, you can attain SRI of 78+.
- Concrete structures require less vertical than steel structures to achieve the same floor height. This adds up to savings in material, building skin, and length of related MEP runs - which can be extensive in a healthcare environment. This reduction in volume will also help the owner save on associated electrical and HVAC operational costs.

Less Vibration

- The wide module systems is a very rigid frame, reducing vibration and bounce common with steel structures that is not conducive to a healing environment or the use of sensitive healthcare equipment. This is also a moment frame, with no post-tensioning, so flexibility is not hindered
- A rigid frame throughout the structure can more easily accommodate electrical and monitoring equipment and therefore re-purposed spaces

Better Staff Productivity and Patient Wellness- Indoor Environmental Quality

- Concrete requires no fireproofing or corrosion protection, so there is no chance for contaminants, allergens or pathogens like aspergillus to be trapped and re-released over time, or during renovation. This increases air quality, which reduces chance for infection, increases feeling of well-being and increases productivity.
- No VOCs from sealants or coatings to deter air quality if you leave it exposed - concrete is an extremely inert material and no coating is required
- Up to 67% less sound transmission than steel, increasing well being and productivity
- Better accommodation of daylighting - which can increase feeling of well being and decrease recovery times
- Daylighting and air quality can increase staff productivity 6-16% (USGBC)

Increased Local Employment

- Concrete is more labor intensive than steel, creating 51% more local jobs than steel



General Sustainability and LEED Applications

A cast-in-place concrete frame is far more sustainable than steel (LEED points in parentheses):

- Increased energy efficiency via less volume, less lighting, thermal mass (EA 19 points possible)
- No fireproofing or corrosion protection - no sealants - exposed concrete (EQ 4.1-4.3)
- Heat Island Effect Roof and Non-Roof - Concrete has natural SRI of 30+, lighter fly ash or slag content can get you over 78 required for roof (SS 7.1 and 7.2)
- Recycled content via class C or F fly ash, silica fume or slag, grey water (MR 4.1 and 4.2)
- Local/regional materials (MR 5.1 and 5.2)
- Daylighting is more easily attained via floor to floor height and high SRI (EQ 8.1)
- Recycled construction waste via reefball.org, bollards or barricades (MR 2.1 and 2.2)
- FSC formwork (as FSC credit MR 7 or ID point) Recarbonation process ($\text{Ca(OH)}_2 + \text{CO}_2 = \text{CaCO}_3 + \text{H}_2\text{O}$) - reduction in carbon footprint (potential ID point)
- Increased life cycle / reduced life cycle costs (ID credit)
- Biolube or other organic form-release agents (ID point)
- Exposed concrete (ID point)
- Including the prime concrete subcontractor in the sustainable solutions for environmental value analysis and early team charrettes can earn one ID point (this would also show your team that with cast-in-place concrete, materials are actually 31-32% of total project cost, not the LEED default value of 45% - so less recycled material is required to earn MR points)