Building Green with Reinforced Concrete

“Human design can learn from nature to be effective, safe, enriching, and delightful. Industry must create products for cradle-to-cradle cycles, whose materials are perpetually circulated in closed loops. Closed loops maximize material value without damaging ecosystems.”

— McDonough Braungart Design Chemistry LLC

Steel Reinforced Concrete helps architects and engineers meet owners’ goals for achieving sustainable design.

Design Flexibility
Reinforced concrete offers flexibility to design dynamic architectural shapes with long-span capability. This can be achieved through putting in reinforcing steel in any orientation, creating flexibility in design spaces and allowing for the building of much more quickly. An design change, after the frame has been set, can be instituted to allow building to expand, adding floors and making material placement.

Reduced Floor Heights
Reinforced concrete beam or column offers substantially lower floor-to-floor heights, creating energy-efficient designs that may be able to add more generating floors to the building while adhering to building restrictions on height.

Aesthetic Variety
Reinforced concrete can imitate the look of many types of stone that would be costly to quarry and transport. Thin bricks can be embedded in concrete walls to resemble masonry, significantly reducing material costs and maintenance for these added elements.

Significant Social Benefits
Reinforced concrete provides high fire resistance, lower noise transmission, and vibration dampening—creating safe, secure, comfortable spaces. Combined with its ability to build taller and closer to city centers, improved indoor air quality, and ventilation, reinforced concrete can help keep buildings, outdoor structures and office environments safer, healthier, and more sustainable, offering a higher quality, “greener” way of life.

Steel Reinforced Concrete
Contributes to buildings that are sustainable, safe, healthy and comfortable.

Concrete Reinf orc e d Ste el Institute
951 North Plank Road
Schaumburg, IL 60173
847.517.1200
www.crsi.org

For more information on these benefits and how reinforced concrete can help architect sustainable design goals, contact:

Virtual 100% Recyclable Product, Provides Cradle to Cradle Construction.

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STEEL REINFORCED CONCRETE: The Sustainable Solution

Building owners and users have discovered the array of benefits achieved with sustainable construction. These advantages go beyond environmental gains helpful to the community and marketing prestige. They include durability and other features that produce bottom-line savings, cutting time and cost during a project’s construction and service life.

No material aids these needs more than steel reinforced concrete.

Long Service Life

Reinforced concrete’s durability ensures that buildings will retain their structural and aesthetic properties for many years, allowing the need for repair or replacement to be minimized. This not only is economical but also is environmentally proactive, as the new structure is eliminated.

Safety

Reinforced concrete buildings can withstand a variety of forces, including hurricanes, tornados, earthquakes, and floods. This resistance minimizes the need for replacement or renovation in the wake of such calamities.

Fire Resistance

Inherent fire resistance is a valued benefit of reinforced concrete construction. The simplest concrete structural frame can easily achieve the code requirements. The most complex structural design can be created with reinforced concrete. Without reinforced concrete, steel would be necessary as a natural barrier to fire, in addition to other building applications.

Energy Efficiency

Reinforced concrete’s thermal mass absorbs heat during the day and releases it at night, reducing HVAC costs and enhancing energy efficiency. This is especially important in buildings containing heat-generating equipment.

Improved Indoor Air Quality

Concrete contains no volatile organic compounds (VOCs), improving indoor air quality. Because it is inorganic, it also does not present toxic-growth.

Low Maintenance

Concrete’s durability also requires little patching or cleaning. Only the need for fireproofing remains, lowering overall maintenance cost.

Concrete’s Energy Use

As with any material, manufacturing and transporting steel reinforced concrete to the site involves costs. But reinforced concrete is resource efficient, requiring little manufacturing for its creation, as noted in the National Ready Mixed Concrete Association.

Concrete is the key energy intensive material in concrete. Its ingredients comprise calcium (94% by weight), silica (12%), aluminum (7%), iron (18%), and small amounts of other ingredients, according to the Portland Cement Association (PCA). The mixture of grainy limestone, silica, sand and aluminum is heated to 2700°F to create the base for cement. However, cement makes up only about 10% of concrete’s composite: limestone, the remaining 90% is made up of fine and coarse aggregates and 10% of the total material in the concrete components. This addition adds little cost or weight, yet increases strength dramatically.

Concrete manufacturers and steel mills have worked to minimize the energy intensiveness of concrete manufacturing and steel production, respectively. Many of its attributes have been recognized by green-building programs, especially the Leadership in Energy & Environmental Design (LEED) program operated by the U.S. Green Building Council. As a result, reinforced concrete provides a variety of ways for owners and architects to increase their building’s sustainable design.

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Recycled Materials

Concrete components typically are cast and used, with 90% of the raw materials used in manufacturing. Virtually all of these activities result in some form of residual material, such as fly ash, silica fume, and blast-furnace slag. Use of these by-products in concrete lowers energy costs and reduces concrete waste, while in many cases producing an even more durable product.

Each year, producing reinforcing bars through steel recycling saves an energy equivalent to electrically powering one fifth of America's households (4 million) for one year.

Concrete Reinforcing Steel Institute

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The simplest concrete structural frame can easily achieve the code compliance. The steel acts as a natural barrier to the wind and rain needed for additional waterproofing applications.

Energy Efficiency

Concrete's use of steel offers thermal mass benefits. During the day and evening, it stores and releases heat, enhancing energy efficiency. This is especially important in colder countries or homes with geothermal heating equipment.

Improved Indoor Air Quality

Concrete contains no volatile organic compounds (VOCs), improving indoor air quality. Because VOCs are toxic, it also does not present indoor growth.

Safety

Building reinforced concrete buildings can withstand extraordinary abnormal conditions, including hurricanes, tornadoes, earthquakes, and floods. These advantages go beyond environmental gains helpful to the community and marketing prestige. They include durability and other features that produce bottom-line savings, cutting time and cost during a project's construction and service life. No material adds these needs more than steel reinforced concrete.

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Cement is the key energy-intensive material in concrete. Its ingredients comprise calcium (94% by weight), silicon (6%), aluminium (1%), iron (1%), and small amounts of other ingredients, according to the Portland Cement Association (PCA). The mixture of primary components, lime, silica, and alumina is heated to 2700°F to create the basis for cement. However, cement makes up only about 10% of concrete’s components. Lime, the primary material, accounts for about 30% of the total material in the concrete components. This adds little cost or weight, yet increases strength dramatically.

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Recycled Materials
Steel reinforced concrete is inherently recyclable, meaning it typically is reclaimed by manufacturers, who use the bars as a natural barrier to fire with no need for additional fireproofing applications. Improved Indoor Air Quality
Concrete contains no volatile organic compounds (VOCs), improving indoor air quality. Because it is non-toxic, it also does not present methuselah.

Long Service Life
Bonded steel reinforcement ensures that when it is properly installed it will retain its structural and aesthetic properties for many years, allowing the need to supplement or replace it. Reinforced concrete buildings are unique in that the flexural strength is maintained when the need to build a new structure is determined.

Safety
Reinforced concrete buildings are steadfastly supported by the cancellation of force, including hurricanes, tornadoes, earthquakes, and floods. This resistance minimizes the need for replacement or renovation in the wake of such calamities.

Energy Efficiency
Building designers can trend thermal noise absorb heat during the day and release it at night, reducing HCE costs and enhancing energy efficiency. This is especially important in buildings containing heat-generating equipment.

Fire Resistance
Inherent resistance to a valued benefit of steel reinforced concrete. The simplest structural steel frame can easily achieve the code compliance. The steel acts as a natural barrier to fire with no need for additional fireproofing applications.

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Low Maintenance
Concrete’s relatively low maintenance also requires little patching or cleaning. It often is precast, helping to lower overall maintenance cost.

Each year, producing reinforcing bars through steel recycling saves the energy equivalent to electricity generating for about one-fifth of America’s households (8,000,000)

Reduced Waste
Concrete scrap is typically made in electric arc furnaces, which produce about 45% of the steel products made in America. Nearly 100% of the steel scrap used in America is recycled. Steel reinforced concrete in providing recycled reinforcing bars to the construction site, a key element in achieving LEED points.

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Reinforced concrete buildings are steadfastly supported by the cancellation of force, including hurricanes, tornadoes, earthquakes, and floods. This resistance minimizes the need for replacement or renovation in the wake of such calamities.

Energy Efficiency
Building designers can trend thermal noise absorb heat during the day and release it at night, reducing HCE costs and enhancing energy efficiency. This is especially important in buildings containing heat-generating equipment.

Fire Resistance
Inherent resistance to a valued benefit of steel reinforced concrete. The simplest structural steel frame can easily achieve the code compliance. The steel acts as a natural barrier to fire with no need for additional fireproofing applications.

Energy Efficiency
Concrete contains no volatile organic compounds (VOCs), improving indoor air quality. Because it is non-toxic, it also does not present methuselah.

Improved Indoor Air Quality
Concrete contains no volatile organic compounds (VOCs), improving indoor air quality. Because it is non-toxic, it also does not present methuselah.

Low Maintenance
Concrete’s relatively low maintenance also requires little patching or cleaning. It often is precast, helping to lower overall maintenance cost.
“Human design can learn from nature to be effective, safe, enriching, and delightful. Industry must create products for cradle-to-cradle cycles, whose materials are perpetually circulated in closed loops. Closed loops maximize material value without damaging ecosystems.”

— McDonough Braungart Design Chemistry LLC

For more information on these benefits and how reinforced concrete can help architects and engineers meet owners’ goals for achieving sustainable design, contact:

STEEL REINFORCED CONCRETE helps architects and engineers meet owners’ goals for achieving sustainable design.

Design Flexibility
Reinforced concrete offers flexibility to design dramatic architectural shapes with long-span capability. This flexibility can create new interior spaces, allowing buildings to be constructed in a fraction of the time required for traditional construction. Reinforced concrete is an excellent choice for projects requiring flexibility in design spaces and promoting the efficient use of valuable equipment quickly. An design change, once within the concrete formwork, can be modified to allow building to expand, extend, or modify the final, building without wasting material.

Reduced Floor Heights
Reinforced concrete framing systems offer substantially lower floor-to-floor heights, creating energy-efficient designs that may be able to add revenue-generating floors to the building under existing zoning restrictions on height.

Aesthetic Variety
Reinforced concrete can imitate the look of many types of stone that would be costly to quarry and transport. Thin bricks can be embedded in concrete walls to resemble masonry, significantly reducing material costs and maintenance for these added elements.

Significant Social Benefits
Reinforced concrete provides high fire resistance and fireproofing, meeting safety and structural requirements. Combined with its ability to build taller and closer to city centers, improved indoor air quality, and resilience under extreme weather and other natural conditions, reinforced concrete can offer a higher quality, “greener” way of life.

For more information on these benefits and how reinforced concrete can help architects and engineers design green, contact:

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Building Green

With Reinforced Concrete

virtually 100% recyclable product, provides cradle-to-cradle construction.

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Design Flexibility
Reinforced concrete offers flexibility to design creative architectural shapes with long-span capability. This allows designers to create imaginative forms and spaces, enhancing building performance and reducing construction time.

Aesthetic Variety
Reinforced concrete can replicate the look of many types of stone that would be costly to quarry and transport. Thin steel reinforced concrete can be used to create designs that resemble masonry, significantly reducing material and labor costs.

Reduced Floor Heights
Reinforced concrete framing systems offer substantially lower floor-to-floor heights, creating energy-efficient designs that may be able to add more revenue-generating floors to the building, thereby increasing potential revenue.

Significant Social Benefits
Reinforced concrete provides high fire resistance, lower noise transmission, and vibration dampening—creating safe, secure, and peaceful environments. Combined with its ability to be easily shaped, it can be used to create buildings that meet strict zoning limitations on height and massing.

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Regional offices nationwide.

Concrete Reinforcing Steel Institute

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