APPLICABILITY OF

GREEN ENGINEERING

IN COMMERCIAL CONSTRUCTION

Looking back almost a decade ago, there has been a rapid surge of green engineering and energy-saving building materials in the construction industry.Today, green engineering is seen as the rising front runner for the future of commercial construction – and it is here to stay for good.

CIVE

DESIGN BUILD - ENGINEERED WITH VALUE

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DEFINING GREEN ENGINEERING

For many years, the term "green" has always been associated with environmental awareness. The same concept applies to green engineering – which refers to the design and commercialization of buildings that promote sustainability, minimize pollution, protect human health, and nurture the environment without sacrificing marketability.

12 DESIGN PRINCIPLES OF GREEN ENGINEERING

While green engineering can be quite a simple concept to understand, designers aiming to incorporate green engineering in commercial construction must keep its 12 key principles in mind.

Principle 1: All energy and material inputs and outputs must be as non-hazardous as possible.

Primarily, this is the main responsibility of chemists and product manufacturers. The main idea of this principle is that designers must look for materials that will not potentially cause any biological and environmental hazard – throughout its lifetime.

Principle 2: Instead of treating or cleaning up waste after its formation, it is better to prevent waste production altogether.

As a general rule, prevention is always better than cure – and the same thing is applied in green engineering. In green engineering, it is essential to only purchase enough materials to complete the process at hand.

When seen inside a business perspective, this principle makes perfect sense when it comes to saving both the capital and profit. Purchasing what is only needed will also save construction personnel the hassle of disposing any excess building material.

Principle 3: Material and energy resources must be renewable instead of depleting.

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Principle 4: When formulating design choices on reuse, recycle, and beneficial disposition, embedded entropy and complexity must be seen as investments.

Given that one of the key goals of green engineering is to maximize the end-of-life (EOL) of materials while minimizing their "afterlife" debris, the concept of retaining complexity must be applied.

Principle 5: All processes, systems, and products must be designed to optimize energy, space, time, and mass efficiency.

This principle boils down to one word – simplicity. When correlated with commercial construction, it pertains to the idea of achieving operational sustainability through simpler means. Now, what is meant by simpler means? This can range from maximizing the use of natural light, pressure, and ventilation to the use of vernacular materials engineered to surpass modern problems.

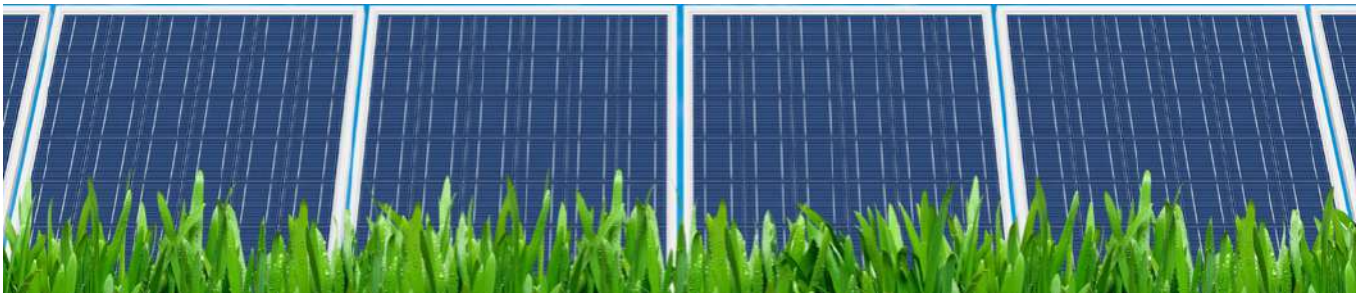
Principle 6: By selecting the right energy and materials, all processes and systems must be "output pulled" instead of "input pushed."

Historically, the global energy and chemical markets have always been driven by the vast availability of abundant and affordable materials. However, these generic facilities are bound to generate inevitable waste.

Instead of using resources that can possibly run out in the future, resorting to renewable resources like the wind and the sun will push the industrial sector to focus on quality over quantity.

Principle 7: Minimizing energy consumption & material use must be the main goal of separation and purification processes.

While this principle is more on the technical side, its main idea is to either avoid or minimize distillation by preventing the integration of chemicals that will need to be separated later. Although this is not purely limited on commercial construction, this principle must be applied in the manufacturing of construction materials like crude and steel.



Principle 8: Instead of immortality, the primary design goal must be targeted durability.

In relation to this principle, doing the opposite is a common mistake among manufacturing companies. Instead of focusing on their by-products to be immortal, they must give utmost attention on maximizing their efficiency throughout their lifetimes.

While builders must produce buildings with high stability and resiliency, they must not overlook durability on their visions. By having a user-oriented perspective, any commercial construction process will result in a well-built establishment with maximum user satisfaction.

Principle 9: To promote value retention and disassembly, there must be minimal material diversity in multi-component products.

To encourage disassembly and retain value in any constructed establishment, builders must utilize various building materials and processes.

Principle 10: Systems, products, and processes must be designed to survive the commercial "afterlife."

Although this principle is more applicable on today's digital technology, such can also be correlated with commercial construction. When buildings get dilapidated after their expected lifetime, disposing them must not cause immense stress, hazard, and budget.

Principle 11: In designing systems, products, and processes, inter connectivity and integration must be highly considered; as long as energy and materials allow.

It is a well-known fact that the building construction process is a collaborative work. No matter how diverse the building materials and processes are, they must result in a comprehensive construction process that can maximize time, budget, and manpower.

Principle 12: Unnecessary capabilities or capacities disguised as design solutions are considered as design flaws.

Unnecessary design accessories, processes, and materials must be perceived as design flaws. Hence, builders and designers must avoid them at all costs.

PROCESS OF GREEN ENGINEERING CONSTRUCTION

Although the construction process of green engineered-buildings doesn't completely differ from conventional construction methods, green engineering focuses on the meticulous selection of innovative and environment-friendly materials.

Knowing that green engineering comprises of branching benefits that can vary per building and construction materials used, its benefits can be narrowed down into four.

Phase 1: Pre-Building Stage

The pre-building stage is arguably the most vital phase in green engineering construction. This is where the research and delivery of building materials that fit certain building codes like LEED (Leadership in Energy and Environmental Design) commence.

In choosing raw materials for green engineering, it's essential to consider their location, manufacturing period, and possible environmental impacts. Since the main goal of green engineering in commercial construction is to produce an environmentally-friendly yet structurally sound facility, the entirety of the construction process must yield little to no environmental risks.

Phase 2: Building Stage

The building stage consists of the assembly, maintenance, and repair of the accumulated building materials into a cohesive building envelope. Aside from the construction process itself, it's essential to closely monitor construction waste. As much as possible, all construction waste must be reused. Doing so keeps this phase in-line with its green engineering endeavors.

Phase 3: Post-Building Stage

The post-building stage commences when a building has exhausted the expected performance of its building materials. There are only two possible outcomes of its by-products; they will either be thrown away or recycled. However, the latter is preferred as throwing away building waste can impose environmental risks. By doing so, a building drifts away from the key principles of green engineering.

ADVANTAGES OF GREEN ENGINEERING IN CONSTRUCTION

Saving Money

While it is true that green engineering efforts cost higher at the primary stages of construction, their return-of-investment can be even higher compared to their initial costs. Through green engineering, users can save money in utility bills – even up to 50%.

Knowing that green-engineered buildings can cost quite a fortune, it is essential for potential owners to look at them as future investments instead of luxuries. Green buildings made from green engineering hold the future of the world's construction industry. Hence, it is justifiable to spend more than a few bucks when the planet's potential change for the better is on the line.

Lifetime and Property Value

Compared to traditional buildings, green-engineered buildings are made to have longer lifetimes with minimal "afterlife" waste. In the case of geothermal systems, their warranties can reach up to half a century. Meanwhile, a wind system can last two decades. This makes green engineering a perfect choice for those looking for sustainability.

When properly maintained, green-engineered buildings can last a few generations, which can serve as a long-time legacy for environmental sustainability enveloped into an aesthetically pleasing yet functional property.

Positive Environmental Impacts

From the word itself, green engineering seeks to help the environment regenerate itself without degrading the quality of life that humans become accustomed to. Green engineering aids in reducing carbon emissions, reducing water bills, lowering generated waste, and using less energy than conventional buildings.

For instance, a single solar water heater can last for more than two decades while keeping over 50 tons of carbon emissions out of the planet's atmosphere. Geothermal pumps can reduce carbon emissions for up to 70 percent while using half of the conventionally used amount of electricity.

Tax Incentives

Upon the incorporation of green engineering initiatives in the building codes of cities and states, this makes them eligible for government tax incentives. Manifested through a point-credit system, home and building owners can continuously save money while helping the environment.

INNOVATIVE GREEN ENGINEERING TRENDS TO WATCH OUT FOR

At present, many states, cities, and towns are starting to integrate energy efficiency policies in their existing building codes. While they may vary per locality, most of them are geared towards reducing emissions, moisture resistance, durability, and most importantly, recycling. However, one thing that makes today's green engineering efforts phenomenal is its adamant incorporation with technology.

Sustainable and Innovative Building Materials

With advanced building materials entering the market today, construction costs are expected to lower in the coming years. Albeit their lengthy recycling process, such innovations are of huge help in slowing the depletion of the planet's natural resources.

Zero Energy Buildings

In a nutshell, zero energy buildings entirely depend on renewable energy to power their operations. At present, the most commonly-used renewable energy sources are wind, water, and the sun.

Since zero energy buildings operate on renewable energy, no waste is generated. This makes zero energy buildings excellent profit generators since they save more energy than what is initially invested.

Solar Energy

Knowing that energy is the biggest inevitable operating cost in most buildings, energy efficiency efforts have experienced immense popularity recently. Since the possibility of decentralized energy systems are highly likely in the next five years, businesses and home owners must learn to adapt to such change.

While there are numerous renewable energy resources available today, solar energy maintains its place as the most sought-after renewable energy source. This results in an increasing competition between traditional and renewable energy providers.

Green Renovations and Retrofits

By definition, retrofit is the process of accessorizing used spaces with updated building systems and materials. When incorporated with green engineering, this results in an energy saving space with appealing interiors.

Aside from aesthetics and efficiency, green renovations and retrofits can also produce resilient buildings that can withstand natural disasters brought about by climate change.

LEED Certifications

Also known as the Leadership in Energy and Environmental Design, LEED is a rating system formulated by the United States Green Building Council (USGBC). Globally, more than 15 billion square feet of build-able space had been certified by LEED as of May 2016.

What makes LEED an exceptional building policy is its major role as the primary catalyst of change in traditional commercial construction. Upon the establishment of LEED, the construction industry has witnessed a sudden surge in green building rating organizations. However, LEED remains to be the most notable green organization at present.

More Interior Efficiencies

With more residents living in bustling urban centers, there has been a surge of tenants looking for more convenient ways to use their units. These include evaporative condensers, innovative ice machines, cooling towers, and water-saving toilets.

Platforms of Automation

With the continuous threat of climate change, the humankind is expected to sustain itself by initiating automated developments. By incorporating green engineering with automation, this results in an increased production of state-of-the-art construction equipment and building materials with optimized security and energy efficiency.

In the coming years, a project increase in the integration of automation among commercial buildings, retrofit projects, schools, and hospitals is to be expected. In the long run, this results in lower building costs, energy conservation, and high marketability.

Water Protection and Conservation

While the world is mostly composed of water, the global population is surprisingly in dire need of water faster than it can regenerate itself. With water as one of the primary needs for biological beings to survive, this resulted in the integration of science and engineering to provide adequate water supply for the generations to come.

Product Declarations

With the rise of new green policies like Health Product Declarations (HPD) and Environmental Product Declarations (EPDs), there has been an increased transparency in the composition of building materials. This is because manufacturers are now required to disclose all components used in the manufacturing of their building materials.

Through such policies, home and establishment owners can be assured of the quality and safety of their purchased building materials.

END RESULT – A GREEN BUILDING

The lengthy and meticulous process of green engineering in commercial constructions has resulted in the "green building." Broadly defined as a facility promising positive environmental impacts, the continuous rise of green buildings will be the future of commercial construction.

While green buildings can vary per locality and purpose, their features can be narrowed down into eight key components:

A. Efficient utilization of water, energy, and other resources
B. Excellent environmental air quality indoors
C. Highlighting the adaptability of building design amidst the changing environment
D. Immense consideration of the natural environment in the construction, design, and operation of buildings
E. Promoting the use of ethical, sustainable, and non-toxic chemicals
F. Providing utmost attention on improving the quality of life of its residents
G. Strengthening legal policies on reuse and recycling
H. Using renewable energy like solar and wind energy as the primary energy resource

While green engineering can be an overwhelming process at first glance, it is essential to focus on its main goal – which is to prove that economic growth and environmental sustainability can work together. Instead of mindlessly working against the natural flow of the planet, green engineering teaches humankind to go back to the basics – which can potentially serve as the key in the world's constant war against climate change.

PROJECT ALPHA

Location: Doha, QATAR
Size: 160,000 sq. ft
Scope: Design

We provide one of the most diverse range of environmental sustainability services to global industrial, commercial and government clients. We use internationally recognized standards and practices to assist our clients in managing and improving their environmental and social impacts, through the integration of innovative strategies and cost-effective solutions.

We assist our clients with following:

- Green Building & LEED Certifications
- Carbon Management
- Energy Audits
- Environmental Sustainability Management
- Environmental Impact Assessment

If you wish to discuss, or partner with CIVE for your next project, connect with us and schedule a consult with our engineers.

CIVE is an upscale Design-Build firm, specializing in top down build process driven by value engineering – from state-of-the-art architecture, leading edge engineering, high quality construction and elite project management.

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