

How Can We Change Our Earth to be A Better Place?

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Engineers often say we contribute to solving a problem. Sometimes we may cause a problem. The solution in the old day may be a problem in the present. In past decades, engineers have developed various structural systems and technologies, that have accelerated massive construction, causing excessive CO₂ emission worldwide. The side effect has created global warming that has been risking human habitat on the earth.

It is time to rethink our Earth. The earth does not belong to any generation. The present generation should take ownership and hand it over to the next generation. Surely, we need to build an open-mindset, and acknowledge that we are not perfect, and ask more fundamental questions. How can we change our world into a better place? How can we prepare for the future?

With an open mind, engineers should thrive to discover problems with bare eyes, out of the status quo, and look for creative solutions. We need to use our imagination. To view out of the box, we need to cultivate creative engineering thinking in academia and the workplace. The future of engineering will be beyond solving the given engineering problems. Creativity comes in various ways when we view it from diverse perspectives.

The world is full of problems. Do you focus on problems or solutions? What you see as the problem may be the solution. During Covid Lock-down, I started to go out to a public park. One day, I stopped and looked around. Certainly, a bench came to my eyes. I realized creativity started with observation and recognition. The object I recognize comes in a form of inspiration and stirs my motivation. So, I sat down on the bench and started to sketch buildings. As known, the sketch is a universal language to help us to visualize inspiration and motivation. The sketch I made ignited my imagination and helped me to learn digital technology. And I was able to transform the sketches into digital parametric models. **I realized creativity comes in various ways when we view objects from diverse angles.**

How have engineers contributed to the world?

Engineers have contributed in various ways to make our world a better place. Global warming is real and everywhere. Engineers have been developing construction materials, and elements to preserve energy.

How do we improve energy efficiency?

Structural elements, like walls and roof, can be made of structural insulated panels, which provide high R values. The structural insulated panel can save a lot of energy during summer and wintertime. Engineers also developed ground Sourced Heat Pump system. The system absorbs heat from the ground. Geothermal heating is an energy source that controls the temperature of your home for heating and cooling.

How have engineers solved the problem?

By asking and reframing the questions, we explore and challenge the problems. Often geometry is the biggest challenge. Engineers challenge complex geometry by understanding load path, engineering mechanics, and simplifying details to make the complex structure constructible. The finite element analysis method and tools



enabled engineers to analyze and design complex structures. What are the benefits of all challenges? It is no doubt the benefit would be joyful space and health for the public. I believe this is the purpose of engineering.

How have engineers contributed to the vertical city?

The vertical city was found on a structural system evolution from semi-rigid frame to mega diagonal tube system. The structural system has been developed along with fundamental engineering, material, and construction technology. The engineer has been able to design 1 Kilometer tall tower. Steel has led the market in commercial buildings. Sloping building geometry is quite easily implemented these days. A concrete shear wall, a composite column with an outrigger truss is one of the common structural lateral load resisting systems. Contrary to the steel, the concrete building is going higher and higher, thanks to high strength concrete and admixture technology. Concrete strength reaches even close to steel strength. 14ksi concrete is used commonly in high-rise construction.

How about existing buildings?

Most buildings in major cities in the USA had been constructed in the early 1900s. As time passed the city has been transforming to demand modern office space. The existing warehouse buildings have been converted to modern office space based on the current building code. This adaptive reuse has addressed how engineers could upgrade the history of building and humans. In this retrofit effort, engineers assess the structural system, construction material and practice, resulting to cut existing columns, add new columns, reframe the floor, reinforce columns and foundations, upgrade lateral load resisting system.

Recently, humans succeeded to land new machine perseverance on Mars. What does it mean to engineers? Can we imagine humans will build habitat and live on Mars? What I am sure of is that we need a lot of creative engineers. The future will be more dynamic. Thanks to human DNA and emerging technologies, engineers can do a better job. In AEC industry, the design teams adopted digital technologies, from design tools, engineering software, manufacturing tools, and machines and robots. **When we imagine, we can create it.** Creativity helps us move forward. Construction Technology is moving forward as well. Machines are getting smarter, free up a human from mundane and hazardous work.

In near future, Artificial intelligence will take over many current jobs. As an engineer, we should prepare for future. **Let's use imagination, we can be more creative.**

To be creative, engineers should be open-minded. We should collaborate with artists and designers as well. Diverse perspectives bring new creative ideas. By integrating as many masterships, we can make our world a better livable space. In this creativity, engineers are in a leading role that will make all possible.

So let's rethink creativity. Creativity will give us a new opportunity.

How do we make our world a better place?

Be creative.

I believe engineers can make the world a better place together.

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