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Light weight architecture-rational or irrational

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Abstract
Any structure designed responsibly aspires to be as 'light as a feather'. Not only it creates jobs as manual labor is required more, and is material efficient, the soft and slender structure evokes pleasant impression. A Spanish architect Santiago Calatrava used such engineering techniques in his buildings to create a light weight structure. The problem with the strachitect is that he has been in hot water over his building's shortcomings several times. Hence the question arises, is light weight architect rational or just for aesthetics.

Keywords: light, material efficient, starchitect

Introduction
This paper explores the idea of using engineering techniques to create light structures. Light weight architecture literally means creating light weight structures. The basic idea behind these light weight approaches is that you reduce the cost of evaluation (and design) by evaluating as you go rather than waiting until the end.
As Architect Santiago Calatrava used this idea but how he have failed, gives one more reason to learn about it. The research is to analyze Calatrava' work and to find solutions to evaluate light weight architecture.

Analysing Calatrava's work
Philosophy: Santiago Calatrava symbolizes a perfect blend of architecture and engineering capabilities at their best. His dynamic design integrate technology and aesthetics producing structural forms that challenge traditional practice in both architecture and engineering. Like most twentieth- century engineers, Calatrava doesn't limit himself. His detailing with connections like concrete and steel reveals a great deal about his ideas on structural composition. But then how come he went wrong?

Work outputs
1. Ernsting's Warehouse, Coesfeld, Germany. In 1985 Calatrava won a competition to design four facades for an existing industrial buildings. Each of the facades represents a different functions of aluminum: waves of corrugated aluminum in the long wall of the warehouse, aplenty of aluminum for the warehouse doors, a window shaped like a bellows camera on the south elevation, and an arched bridge that connects the old and new buildings. The entire structure becomes a study in light, material, movement, and three dimensional form [1].
2. Puento Del Alamillo, Seville, Spain. In 1992 Universal Exhibition in Seville, became one of the most exemplary works in the capital, as well as the first cable-stayed bridge supported only in a inclined mast. The bridge deck consists of a hexagonal steel box beam to which thirteen pairs of steel cable stays attached. The weight of the concrete-filled steel pylon, which rises 142 meters (466 feet), supports the deck. Its singularity and asymmetry makes it stronger. But the construction of the bridge, due to its structural abnormality, resulted in a series of peculiar challenges, as well as much higher costs than a common cable-stayed bridge [1].
3. World Trade Center, Manhattan, New York is a terminal station on the PATH system. Specially designed structural steel has been used to construct the WTC Transportation Hub Oculus. The Vierendeel Truss, serves as the "backbone" for the mezzanine roof and acts as a support for the northeast corner of the WTC Memorial. It's needlessly towering, lacking the agile combination of grand space and human scale and the absence of natural light make these spaces look practically resonant [1].

It gives us the idea of Calatrava's ideas. The usage of lightweight materials and designing something completely peculiar is something we can grasp from. Using of Concrete filled steel pylons or Aluminum sheets etc. materials as such will help us in many ways.

Potential of Light Weight Structures
Just because a material is light doesn't mean it's not sturdy**.** Their studies have shown that lightweight materials as steel, aluminium, or structure steel etc. are good for the construction of walls and roofs, henceforth saving energy and reducing waste from the fruit industry. Light weight structures are strong as long as the materials used are in ratio between a structure's dead load and supported live loads is lower. Natural loads are obstacles of lightweight structures but keeping physics in mind the light and strong structure can be approached. Bending stress should be avoided, density should be low, and tension strength should be high then only one can make a light structure. We have always seen them in Bridges, mostly suspension bridge, it is only a matter of time we accept them in buildings and houses.

Conclusion

Lightweight architecture is a rational style that is cost efficient, aesthetically alluring, and psychologically affecting. But it also faces many problems. One of the biggest challenges engineers face when using these materials is fire resistance. From Calatrava's work we can interpret that it requires a lot of time and mind troubling.

Reference

1. McQuaid, 1993.