

Graduate Student Research Abstract – Construction Practice (Non-Pedagogical Content)

Energy Consumption of Office Building in China and the United States

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Starting in the 1950's energy consumption and intensity has been rising in the United States workplace. Buildings were being build bigger, more equipment was installed, therefore the energy used for operations increased. Energy efficiency was something that not many people paid much attention to. Most people would assume that this is a perfectly natural progression. However, what does not make any sense is that in recent years the amount of energy efficient technology that has been introduced to the market place and incorporated into buildings has greatly increased, and yet energy consumption and intensity still rises. This research analyzes the energy consumption of office buildings in China and the US, the two top energy consumers in the world. This was achieved by analyzing energy consumption data for an office building in the United States and one in China. Looking at the energy consumption over a typical day gives insight into the operation schedule of the building. Looking to see what these two buildings have in common and what things are different helps to give a better understanding of where these buildings consume the most energy and why. By using real time data from office buildings, behavioral habits can be established that affect building energy consumption. By looking at energy consumption data over a typical day, the building operation can be established. This shows energy consumption during operation and non-operation hours and helps to identify where energy can be saved. The study found that United States office buildings consume more than three times the amount of energy compared with Chinese office buildings in terms of the energy intensity per floor area or per capita. Since 1980 commercial floor area in the United States has grown by 54.8% in which 17% are office buildings. Large office buildings in particular only account for 5% of total floor space but consume 55% of total energy consumption in office buildings. The average energy consumption of an office building in the United States is 285 kilowatt hours per square meter. This high level of energy consumption can be attributed to many things including: HVAC equipment, lighting, plug loads, window treatments and building operation. Since 1950, the energy consumption of office buildings in the United States has been rising even though new energy efficient technologies have been introduced. Over time office buildings have changed in terms of use, architectural style and operation. Many factors have led to this high level of energy consumption including poor architectural design in terms of energy efficiency, a lack of energy efficiency policies, and extremely low energy prices during a time of economic prosperity in the United States, which lead to an oversight related to energy efficiency.

Key Words: Office building, Energy consumption, United States, China