

Example of research paper on engineering: world trade center new york

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Different types of steel materials were used in constructing the One World Trade Center. Structural steel is the major type steel that was utilized in building One World Trade Center given the strong core it required and because of its unique characteristics (E. McQuillan, 1)

The main types of steel materials used are:

- Vierendeel trusses which were high strength loading perimeter steel columns fitted together to form a strong, rigid structure.
- Spandrel plates were welded to columns that sprung from the core so as to create modular pieces. The plates would be enforced on every floor so as to transmit stress and enhance stability
- Live loads helped each floor support its own weight at the same time distributing wind loads to ensure lateral stability.
- Viscoelastic dampers were used to connect the perimeter spandrel to the floor. The purpose of this was to reduce the amount of sways by building tenants.
- Structural and Bar Channels for holding the main core of the building in a firm position. It was created through the tube frame design that runs vertically from the base of the building to the apex.
- Aluminum was mixed with steel to create steel bushings that ensured the core as firmly fixed and no loose ends were hanging.

The major categories of structural steel include:

- ASTM A529
- ASTM A572
- ASTM A242

- ASTM A588

- ASTM A514.

Various diverse grades of steel were utilized with an estimated number of 12. A point to note is that the yield strength allocated to grade of steel depends on the point at which bending occurs to the extent that the original shape cannot be restored. One such form of steel is the A36 steel. This type is well known for its strength, and it is approximated to produce strength of about 36 kilo pounds per square inch. A36 steel is made of a mixture of iron and carbon, just like any other form of steel, but can sustain about 36 kilopounds of pressure before deforming. The A36 type of steel was the lowest grade used, and the highest was 100-kilopounds per square inch (Ross and Shmuel, 6).

Besides, steel used in building the external walls varied in terms of thickness, to tolerate diverse pressure loads at various levels. 10 centimeters steel was commonly used in the lower levels, whereas as low as half a centimeter steel was used in the higher levels. The combination of A36 and ASTM A242 steel was used in the construction of the floors. ASTM A 242 is also called the high-strength, low-alloy (HSLA) steel. However, less of this form of steel was used to add the required strength, but at the same time to make for a lighter building; the outcome of these being a more stable building. In total, it is approximated the about 200, 000 tons of steel were utilized during the construction (Ross and Shmuel, 9).

As mentioned above, thousands of tons of steel, plus tons of other construction materials, were required in the construction of One World Trade Center. Therefore, there was a limitation of space, which is why the

contractors used the Just-In-Time system in acquiring materials (F. Michael, 1). This method minimized the cost of storage of construction material especially steel, as the materials were strictly sourced only when needed. Specifically, steel was acquired from various steel companies in the United States. Among these suppliers were:

- Parker Steel Company
- A. Finkl and Sons
- A. K. Steel and
- Admiral Metals.

The sources of the different grades of steel included China (Ross and Shmuel, 10). The suppliers were contracted to deliver steel at the construction site specifically, and other construction materials in general, whenever the contractors required such material. In addition to cost reduction, steel was also obtained locally with an objective of promoting the growth of local steel companies. Some of the companies that benefited from this are Laclede Steel Company, Karl Koch erecting Company, Granite City Steel Company as well as Pacific Car and Foundry Company.

The cost of steel in the United States varies depending on the location of the supplier, the form of steel, and the size in terms of inches of steel bought. For instance, acquiring A36, the best grade of stainless steel sheet/plate, the prices are expected to range between \$1800 and \$4000 per ton. ASTM A36 Steel plate costs a price range of \$520 to \$651, per ton. ASTM A36 Carbon Steel Plate is priced at \$600-750 per ton, with most companies with a supply capability of about 2500 tons per week. This explains the decision to have different suppliers of steel in order to minimize the total cost. In addition,

transportation as well as other costs are added to the buying price of form of steel bought (Ross and Shmuel, 22).

Works Cited

Ross, David Johnson and Shmuel. " World Trade Center History: Magnificent Buildings Graced Skyline." 2011. infoplease. <http://www.infoplease.com/spot/wtc1.html>

Franco, Michael . " What Grade of Steel Was used in The World Trade Center." How Stuff Works 1. 1 (2014): 1. Print.

McQuillan, Dara, and Elizabeth Kubany. " Architectural Fact sheet." World Trade Center Freedom Tower 1. 1 (2005): 1-4. Print.