Proficiency Exam Sample

Lecture Script for the Note-taking Section

Wooden Skyscrapers

Hello everyone, today I'd like to inform you about wooden skyscrapers. Most of us are unfamiliar with the idea, but more and more wooden skyscrapers are being built as an alternative to concrete or steel ones. In today's lecture, I'll introduce you to the world's tallest wooden skyscraper, which is in Norway, and give you details about the use of wood as a construction material in tall buildings, explaining its advantages and disadvantages.

Let me begin with some brief information about Mjøstårnet, the world's tallest wooden skyscraper. The name Mjøstårnet means the Tower of Lake Mjøsa, which is Norway's largest lake. Construction of the building, which is located next to Lake Mjøsa, was completed in 2019. The skyscraper is 85 meters tall, and has 18 floors. This 85-meter tall skyscraper is not composed of just flats. In addition to flats, the building has offices, a hotel, and a restaurant. Mjøstårnet is almost entirely made of trees from neighboring forests. It's not just the wood that's "green": alongside the building's dominant material, its energy supply and internal water recycling system have both been designed to be green, autonomous, and waste- and pollution-free. In addition, for every tree cut down to construct the building's frame, two were planted in the wild, in order to help ensure reforestation in the immediate area.

Mjøstårnet, the 18-floor skyscraper, was built with three types of processed, or engineered, wood: Glulam, Laminated Veneer Lumber (LVL), and Cross-Laminated Timber (CLT). Very little concrete or steel was used. Concrete has only been used in the foundation, as well as some parts of the first floor and in the uppermost floors. Steel was only used to connect certain structural parts.

Well, Mjøstårnet is rather miraculous since for a long time engineers had thought it was impossible to build a wooden building over six floors tall. Wood in the form of traditional boards of lumber lacked the strength of steel or concrete, which is necessary to support tall buildings. However, the end of the 19th century saw the invention of glue laminated timber, or glulam. Let me spell it: G-L-U-L-A-M. And a century later, engineers developed laminated veneer lumber, or LVL, and cross-laminated timber, or CLT. These new wood materials; namely, glulam, LVL and CLT, enabled wood to be used in taller buildings. In glulam, wooden boards are glued together in the same direction, and this makes the boards almost as strong as steel. In the case of CLT, the boards are glued together in alternating directions with each layer set at 90 degrees to its neighbors. The resulting material benefits from wood's structural strength in every direction, and this allows it to have a strength similar to that of concrete. LVL, on the other hand, is composed of multiple layers of thin pieces of wood, which undergo lamination and continuous heating.

Using such engineered forms of wood offers various advantages for construction. Firstly, they require less energy to produce; and therefore, have very low carbon footprints. Secondly, because they are lightweight and prefabricated materials, as exemplified in Mjøstårnet, construction is completed in a shorter time than needed for a conventional tall building. In fact, each floor of Mjøstårnet took just a week to construct. Yes! As all elements were prefabricated and light, the construction grew by almost one floor every week. Another advantage of processed wood is that it contributes to a healthier indoor environment. It regulates temperature, has good acoustic and aesthetic properties and provides a more harmonious experience. Research also shows wood can help reduce stress. This is based on the positive emotional experience that it causes, such as a greater sense of closeness to nature, warmth, and homeliness, and thus has a relaxing effect.

Now let's have a look at some of the disadvantages of using these materials. To begin with, the production of engineered wood is usually a quite expensive process. Moreover, wooden structures can easily lose their shininess, so they need to be regularly maintained. In addition to high cost and a need for regular maintenance, especially in windy areas, wood fails to provide enough stability above a certain height. As I mentioned before, Mjøstårnet, the 18-floor skyscraper, is not constructed entirely from wood. While wood elements, such as glulam, are dominant in the first ten floors of the building, the remaining upper eight floors use concrete as it is much stronger than processed wood. Being better able to resist heavy winds or storms, concrete is necessary in the eight upper floors to provide stability to the top of the building.

However, the disadvantages of processed wood are easily outnumbered by its advantages and it has been used successfully in the construction of buildings like Mjøstårnet. This is because of the characteristics of engineered wood, such as its renewability, efficiency, aesthetics and reduced emissions. The manufacture of steel, for example, takes about two to three times as much energy and six to 12 times more fossil fuels than the manufacture of wood products like glulam. Steel and concrete are good building materials, but both have high environmental costs. Combined, global steel and concrete production accounts for nearly one sixth of the world's carbon emissions. Using engineered wood as a building material cuts these emissions dramatically. Furthermore, tests done at Mjøstårnet show that glulam, one of the main materials used in its construction, is as resistant to fire as concrete. In short, wood in its natural form is not really practical, but processed wood that is combined with other materials can improve the properties of wood, and help decrease the need to produce steel and concrete, which, when combined, constitute almost one sixth of carbon emissions worldwide.

As the example of Mjøstårnet shows, tall buildings can be built using local resources and sustainable wood products. In fact, wooden skyscrapers are not unique to Scandinavia; countries like Austria and Canada also have tall wooden buildings. The world's tallest wooden skyscraper symbolizes environmental trends in construction, and many more high-rises around the world are being built with processed wood. Next week I'll introduce you to some ongoing projects that have been inspired by this building.

Thank you for listening.