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What are the Key Considerations When Demolishing a Tall Building?

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As it seems the industry is about to crack the 200-meter threshold for "tallest building peacefully demolished" (*Tall Buildings in Numbers,* Journal 2018 Issue II), the practical considerations of tall building demolition are now front and center. We asked a CTBUH Expert, "What are the key considerations when demolishing a tall building?"

About the Author

Stefano Panseri is CEO of Despe, one of the largest engineered demolition companies in Italy, and the chair of the CTBUH Demolition Working Group.

The discipline of demolition is an engineering science with comparable complexities to that of its counterpart, construction. The key considerations of demolition engineering are the following:

Customer expectations. The customer must give a clear indication of the engineering objectives he aims to achieve. The speed and safety of execution, the environmental impact, budget requirements, are all vital objectives, but they must be modulated among themselves in order to successfully respond to the customer's demands.

Construction features and type of materials used on the building to be demolished. The analysis of the construction and material types of the building is a fundamental step that determines a number of factors. These include the composition of the skyscraper – is it built of steel, reinforced concrete, special mixes, or with precompressed portions? What is the overload capacity? The building's ability to withstand the dynamic action of a scaffolding, or a protective "cocoon" during demolition must be assessed, alongside other forms of dynamic behavior. This also determines the order of operations. The capacity of the floors and ceilings on each individual floor must also be understood, as well as the material type, to determine the specifications of the demolition equipment to be used.

External context: boundaries, roads, adjacencies, and limitations of land logistics. The analysis of the context in which the building is located is equally important, because each demolition site interacts with the surrounding areas. A congested or isolated urban location would have a bearing on the demolition method. Objects that need to be protected with temporary works, the location of internal vehicle paths and site facilities, identification of utility connection points, and capacity of adjacent road networks to accommodate the volume and mass of construction vehicles, are all major considerations.

Fall protection for workers and debris. Protecting operators working at height from falls, and those on the ground from falling debris, is paramount. Both results are achieved by providing "passive protection" in case of error. The choice is usually between the installation of a traditional scaffolding structure or dedicated "cocoon" systems; my personal recommendation is for the latter, as it is more comprehensive.

Lifting equipment for work-at-height requirements. The best solution is to use a tower crane, suitably anchored to the building using tie rods. As the demolition proceeds downwards, the crane must also autonomously shorten itself, by removing pieces of the support stem. The tower crane can be used to assemble cocoon-type protection systems, move the demolition devices from one floor to another, provide a disposal route, and help resolve emergency situations.

Logistics of tall buildings: personnel, services, and waste removal. The logistics of the work site change continuously, floor by floor, once a week on average. It is therefore essential to design the site utilities so that they have the flexibility to adapt to new situations from level to level.

Moreover, all personnel require an external hoist that allows them to reach the height of the demolition site without difficulty. Waste removal from the demolition level to the ground can be effectuated by gravity (using an empty elevator shaft), by elevators, or by using caissons lifted by the tower crane.

Fire prevention and emergency evacuation. The greatest risk of a demolition sites is that of a fire event. The higher up the fire develops, the more likely it is to be fatal, because the chances of escape are reduced to a minimum. It is therefore essential to conduct a risk assessment that leads to the identification of these three fundamental aspects: (i) the use of demolition technologies that minimize or eliminate the use of hot cutting and flammable gases, (ii) equipping the worksite with oversized extinguishing systems, which not only include portable fire extinguishers, but also contain sufficient reserves of water or suitable foaming liquids (iii) equipping the tall building with a means of egress that allows operators to evacuate as quickly as possible. In this case, an external hoist could be slow or unreachable, so the most effective system is a safety-rated basket that can be raised and lowered by the tower crane. ■