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# **CIVIL ENGINEERING ACADEMY PODCAST**

Hosted By Isaac Oakeson

## **CEA 97 - THE SURFSIDE FLORIDA CONDO COLLAPSE WITH MARK OAKESON**

In every structural design class, students are presented with case studies of historical structural failures to learn from. And the case of the condominium collapse in Surfside, Florida, will certainly be one of them in the future.

On June 24, 2021, the Champlain Towers South, one single building of the three-building complex known as Champlain Towers, partially collapsed in Surfside, Florida. As of July 22, 2021, 98 people have been confirmed dead. This turned people's eyeballs and the media's attention to professionals in the civil engineering world, especially structural engineers.

The 12-story building was designed in 1979 and completed in 1981 under the old Uniform Building Code (UBC). At that time, most of the buildings being designed used a method called Allowable Stress Design (ASD), which focuses on finding the maximum stress a member can resist, and then give it some room by using a factor of

safety. Nowadays, even though ASD is still allowed, most engineers use the Load Resistance Factor Design (LRFD), which is a bit more reliable and focuses on the probability of failure based on the load it has to resist.

However, just because the method used to design the structure of the Surfside building is not the one used today, it doesn't mean it's wrong. In fact, many investigations have been set in motion after the collapse, and there's no evidence that it was designed inappropriately or not following the guidelines of the building code of the time.

These investigations also found that the most probable cause was the long-term degradation of the building's reinforced concrete structure at the ground-level parking garage. They determined that the water-proofing layer of the building's pool wasn't not constructed with the correct slope. This allowed the water to sit there on the pool's deck and, since concrete is a porous material, it started

to penetrate the structural concrete members. After getting through the outer concrete layer and reaching the reinforcing steel bars, these bars simply started to rust. And when steel rusts, it expands. As it expanded, it forced the concrete out of the members, creating what's called spalling concrete. These sequential sets of events, from a multi-year perspective, caused the slow, but surely, degradation of the structural members that then led to the collapse of the building.

These investigations were the ones performed after the fact. But in 2018, the owner received a report from a professional that identified the problem. Since the repair of the damage would not only cost a lot of money, but also cause a disruption in people's lives because it would be required to move people out, shore up the pool deck, and perform the repair, the owner was a bit reluctant and simply "let it go".

However, when dealing with people's lives, decisions should never be based on financial costs or effort required. The tragedy could have definitely been avoided if the right actions were taken way back in 2018, when the structural damage was first identified.

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