

Here Are 11 Serious Flaws Discovered In the Surfside Tower

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The collapse of the Champlain Towers South condo on the morning of June 24 in Surfside, Fla., left 98 people dead and prompted investigations that could last years. Such a catastrophic failure almost certainly had many contributing factors, engineers said. The New York Times created a 3-D model of the tower based on the original design drawings. That model, as well as a review of documents and interviews with structural experts, reveals how design errors, last-minute changes, dubious construction practices and years of deteriorating conditions could all have contributed to the collapse.

Additional reporting by Patricia Mazzei and Alexandra E. Petri.

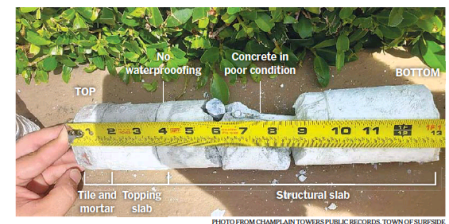
nytimes#HD911748499

A Troubled Pool Deck

The pool deck was the first to fall, according to witnesses. Invasive plantings and faulty waterproofing on the deck led to a deterioration of the deck's surface, and may have contributed to the corrosion of beams and columns directly beneath it in the underground parking garage.

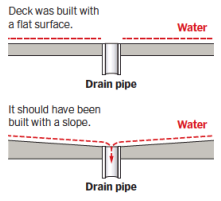


1 Heavy planters and invasive tree roots On the pool deck sat large planters, many of which were not in the original designs. But the planters became major components of the deck, contributing tens of thousands of pounds of weight, with several of them holding large palm trees until recent years. The palm trees became such a big concern that they were removed, according to a 2017 memo obtained by The Times. The roots had been penetrating pipes and "causing significant water damage and intrusion." Crews also removed planters on the property's south end, where other plant roots "were damaging the pavers and the wall."



2 Faulty waterproofing and inadequate drainage Engineers in 2018 noted problems with waterproofing in the planters and on the deck itself. "The failed waterproofing is causing major structural damage to the concrete structural slab below these areas," one wrote. One engineer working for the condo complex also found that waterproofing for the pool deck had been laid on a flat surface, rather than on a slope that would have allowed water to drain properly. In 2018, he called that a "major error" of the original design. Later, in 2020, crews took a core sample from the pool deck slab near the planters. They didn't find any original waterproofing, and the concrete appeared to crumble away from the steel reinforcement inside the sample.

A core sample, left, was taken from the pool deck slab in 2020. It showed an absence of waterproofing.



3 Little or no reinforcement on deck slab As the pool deck fell, the columns that held it up punched through the slab. An image obtained by The Times showed that a corner of the deck appeared to have little or no reinforcing steel, surprising some engineers who reviewed the photo.

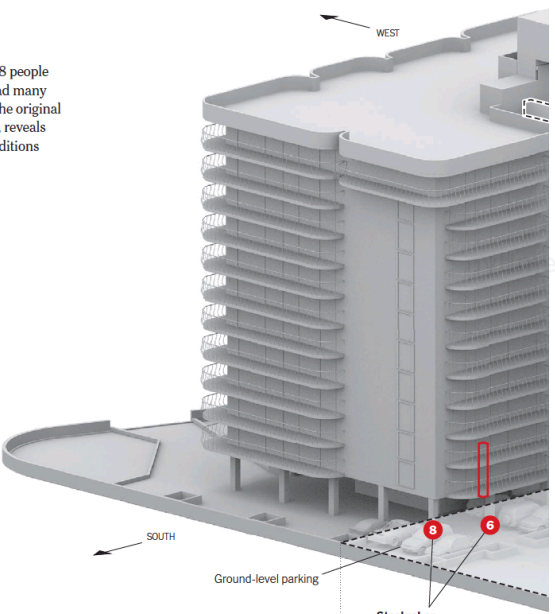
Inadequate Support Underground

This is where initial problems were flagged on the day of the collapse. Witness accounts and the first 911 calls described the pool deck and adjacent parking area caving into the garage below. The structural components that supported the pool deck may have been inadequate to support the required loads, according to independent engineers reviewing the collapse. An engineering report from 2018 had also found "abundant" cracking of supporting members in the garage.

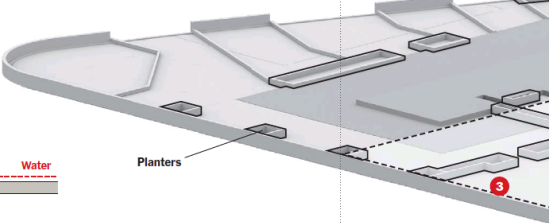


4 Video seems to show a fallen or obscured column Minutes before the tower fell, a witness captured video looking down the garage ramp that showed debris and water pouring from above. In a still from the video, left, one of the columns — labeled M11.1 in the original drawings — is not visible. It is unclear whether that column, which was below the section of the deck that would soon be first to collapse, had failed or whether it was obscured by debris that could have fallen from above.

5 Overstressed columns beneath the pool deck Two structural engineers who have been studying the collapse independently concluded that parts of the deck were designed with inadequate support. In one area, where columns were spaced relatively far apart — with about 28 feet between them — one engineer's analysis found that the deck was "overstressed" even before additional weight was placed on it. The collapse of the deck could have destabilized columns at the base of the structure, compromising the eastern half of the tower, which fell soon after.



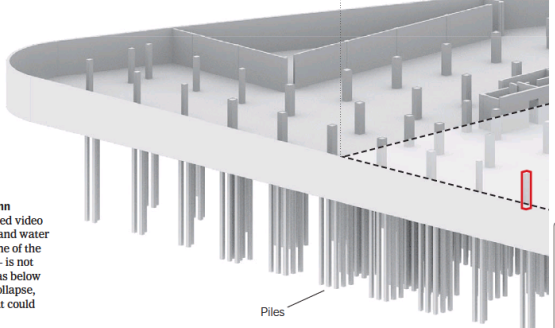
Pool Deck



Support Beams



Underground Garage



Foundation

The foundation, which included piles buried deep for stability, had problems with water intrusion. A 2018 memo obtained by The Times warned that water was seeping up "from the underground as a result of storm surge."

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