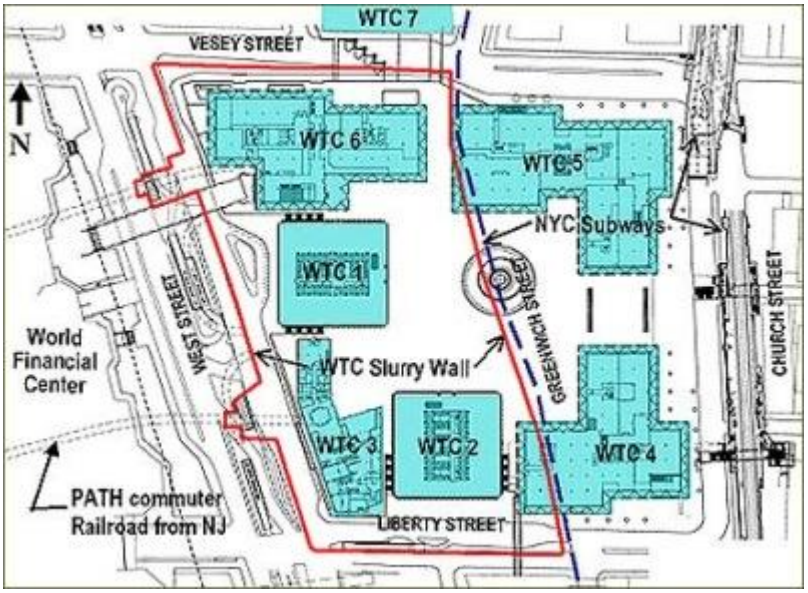
# The Bathtub

## The Deep Basement Containing the Twin Towers' Foundations

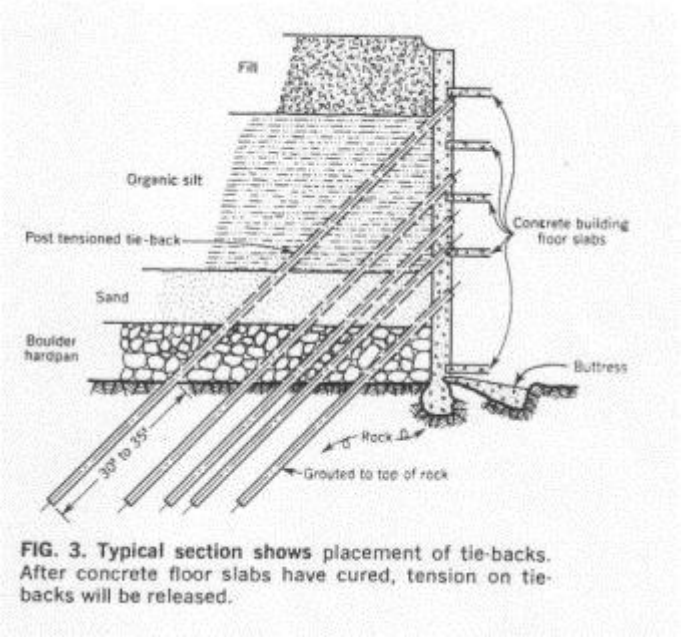


The bathtub contained the footprints of the Twin Towers and Buildings 3 and 6.

About half of the superblock that the World Trade Center occupied contained a deep basement, the so-called bathtub. It was a skewed rectangle with sides about 980 and 520 feet, and a depth of about seven stories. [1]

The bathtub is the 9-block area of the World Trade Center site that is excavated down to bedrock and hard soils and ringed by the slurry wall. The bathtub was created to enable the building of the Twin Towers' foundations, and was ultimately filled with seven stories of basements housing the parking garage, mall, and building services. Since the ground water level at the World Trade Center site was just a few feet below the surface, while bedrock was about 70 feet below the surface, creating the bathtub required first building a 7-story dam below the water level of the adjacent Hudson River -- the slurry wall. Ground excavated to make the bathtub was deposited west of West Street to make the land on which the World Financial Center and Battery Park now stand: 1,000,000 cubic yards moved in 100,000 truck loads filled a 700- by 1400-foot area, creating $90,000,000 worth of land. [2]

Four of the World Trade Center buildings -- the Towers and Buildings 3 and 6 -- rested on foundations entirely within the bathtub.



This illustration shows a cross-section of the bathtub tall. The diagonal lines represent the post-tensioned tie-backs: cables

that resist pressure pushing inward on the bathtub.

LINK

## Construction

Essentially, the bathtub was built underground and underwater. Construction crews would dig a section of trench three feet wide and down to bedrock level. As the trench was dug, it was filled with a bentonite slurry, which prevented the inflow of river water by filling the trench and sealing the adjacent soil. Once the section of trench was completely excavated, a pre-fabricated steel framework, weighing 22 tons, was lowered into it. Then concrete was poured through a pipe into the bottom of the trench while the lighter bentonite slurry was sucked from the top. The entire wall was built using 152 22-foot-long sections.

Each steel framework contained a set of guides for tiebacks -- cables that would pass through the walls and secure them to the ground outside the bathtub. The tiebacks were installed as the material inside of the bathtub was excavated, preventing the pressure of the soil and groundwater outside the bathtub from pushing the walls inward. The sub basement structures, once constructed, provided additional bracing of the walls.

LINK

## Damage on 9/11/01

Damage to the slurry wall was a concern in the wake of the attack. A breach in the wall and flooding of the bathtub would not only complicate rescue and recovery efforts; it might flood other adjacent below-grade structures, such as the Path tunnels that passed into the bathtub. Mueser Rutledge Consulting Engineers (MRCE) took a leading role in compiling information about and assessing the condition of the slurry wall. Inspection of different portions of the wall began as soon as access was possible, and monitoring continued with the instrumentation of the wall with inclinometers, survey points, and monitoring wells.

Most of The central portion of the wall's south side (bordering Liberty Street) was unsupported by intact sub-basement walls or debris, and it had moved inward more than 10 inches. This and other portions of the wall were re-habilitated as necessary. The tieback tendons were replaced throughout most of the southern half of the wall.

This photograph shows the bathtub wall after most of the rubble from the 9/11/01 attack was removed. Portions of basement floors are visible in the right-hand side of the photograph.

References


1. World Trade Center 'Bathtub': From Genesis to Armageddon, *The Bridge*, spring 2002
2. Rise and Fall of an American Icon, *History Channel*,