

BASE ISOLATION SYSTEM

The Utah State Capitol's close proximity to the active **Wasatch Fault** became a great concern after comprehensive seismic studies were conducted in the 1990s.

While the Capitol was originally constructed of reinforced concrete, this material did not align with modern seismic standards. To address this, an extensive restoration from 2004–2008 introduced a **base isolation system** beneath the building. Should an earthquake occur, this upgrade significantly enhances life safety and enforces the architectural integrity of the building.



There are **265 base isolators** supporting the Capitol's nearly **168 million pound weight!**

These isolators allow the building to withstand a **7.3 magnitude earthquake** and reduce its impact by **75 to 80 percent**.



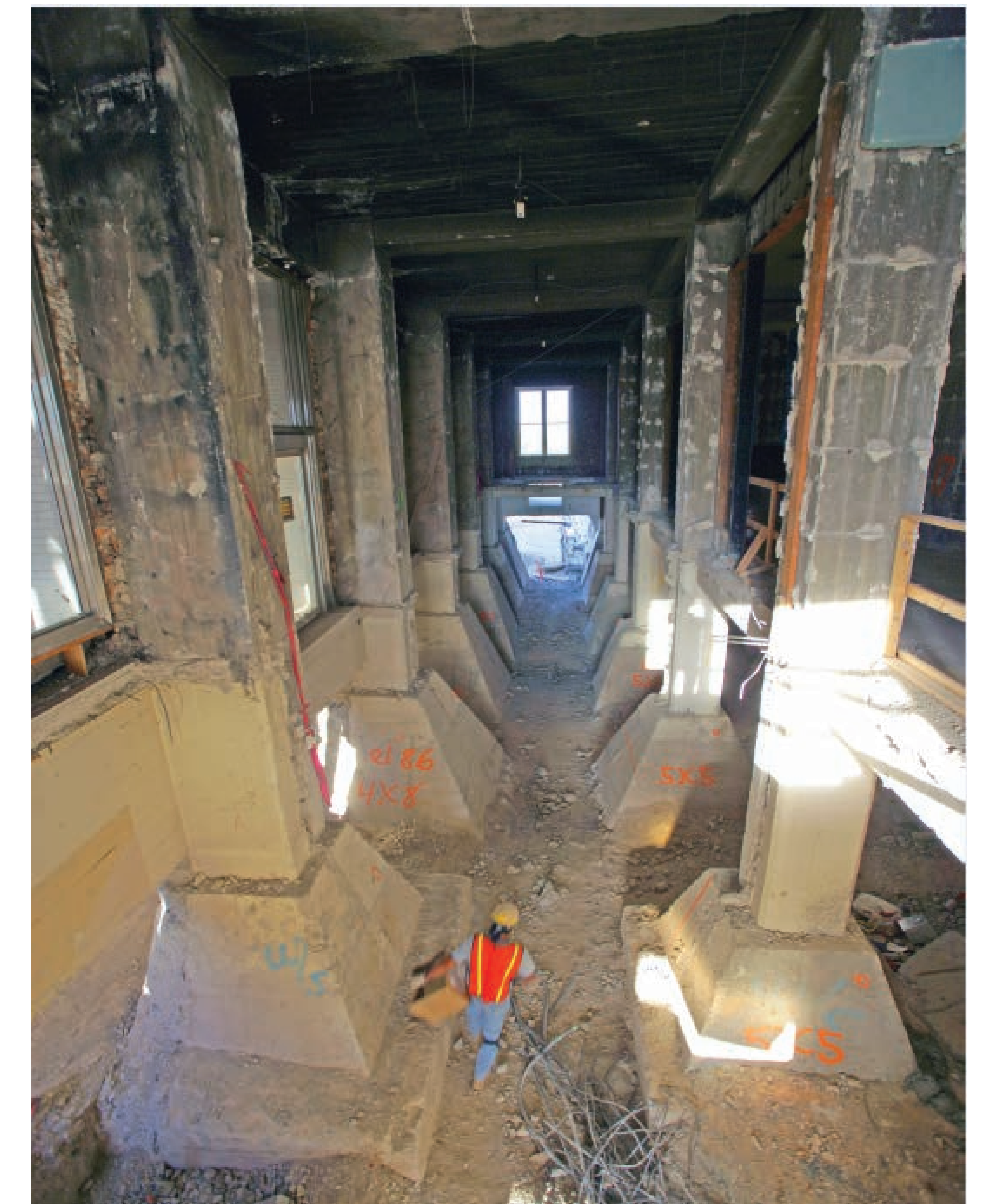
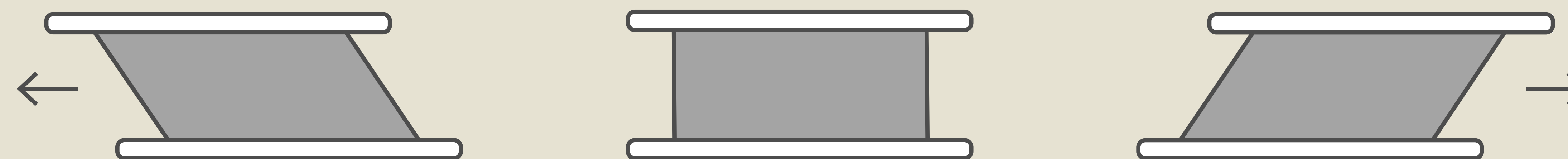
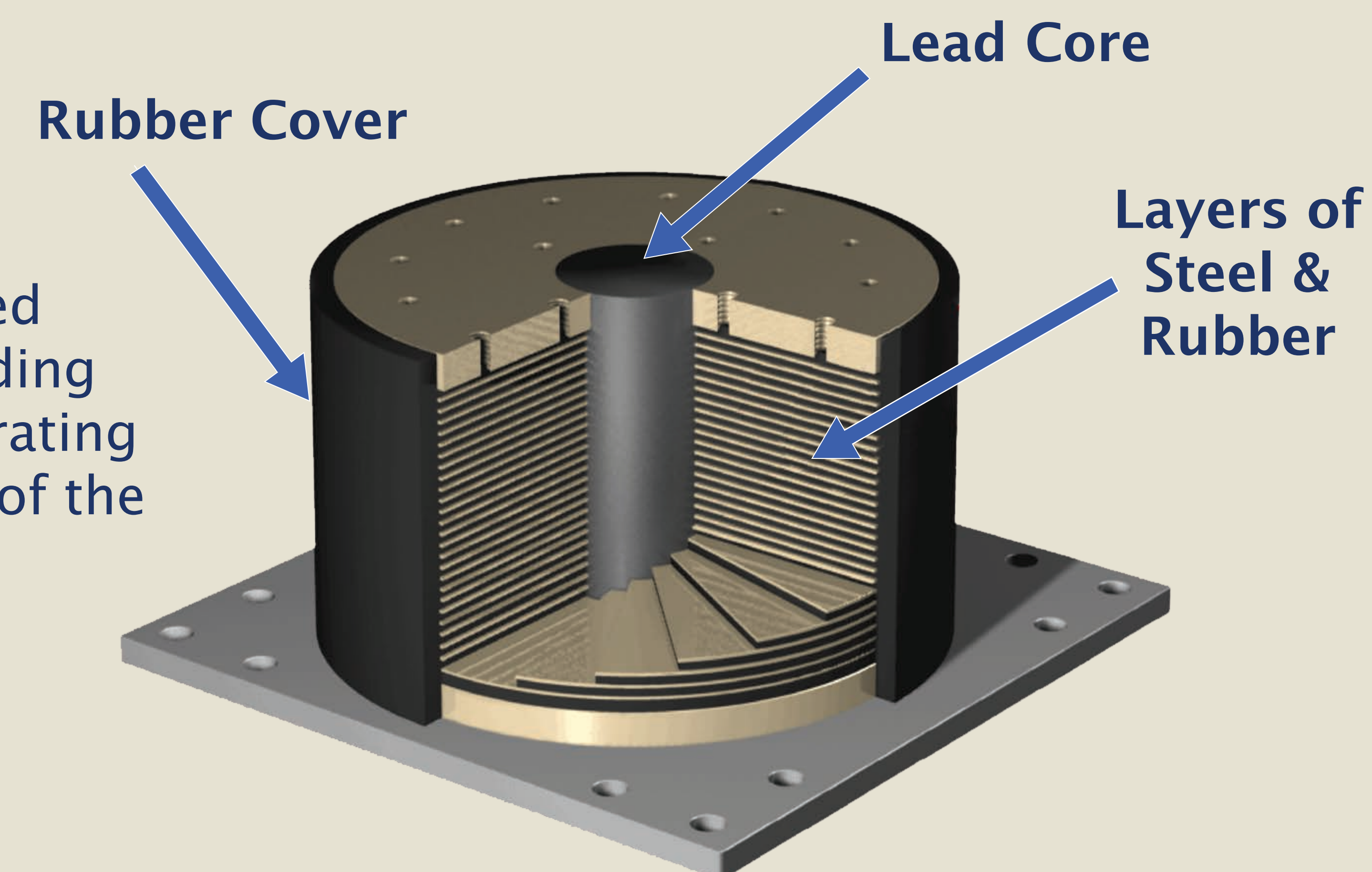
WHAT IS A BASE ISOLATOR?

A **base isolator** is an object placed between the foundation of a building and the earth, “isolating” or separating the building from the movement of the ground during an earthquake.

Isolators are made of **alternating layers of rubber and steel discs with a lead core**.

During an earthquake, seismic energy is partially absorbed by the base isolator's lead core, transforming the lead into a putty-like and malleable material. This plasticity allows the Capitol to shift independently from the movement of the ground **up to two feet in any lateral direction**. After the earthquake stops, the isolator returns to its original position and the lead core solidifies.

Base isolators are essential for preserving the Utah State Capitol and protecting its occupants. They reduce earthquake stress, minimize potential damage, and create a safer environment.



Base isolation is most successful when the building above the isolators is stiff and rigid.

To **increase rigidity**, hollow spaces in the walls, columns, and elevator shafts were reinforced with concrete.

To **protect the dome** from collapsing, the dome's weight was reduced and its supporting structure was reinforced.

BASE ISOLATOR INSTALLATION

1. EXCAVATION



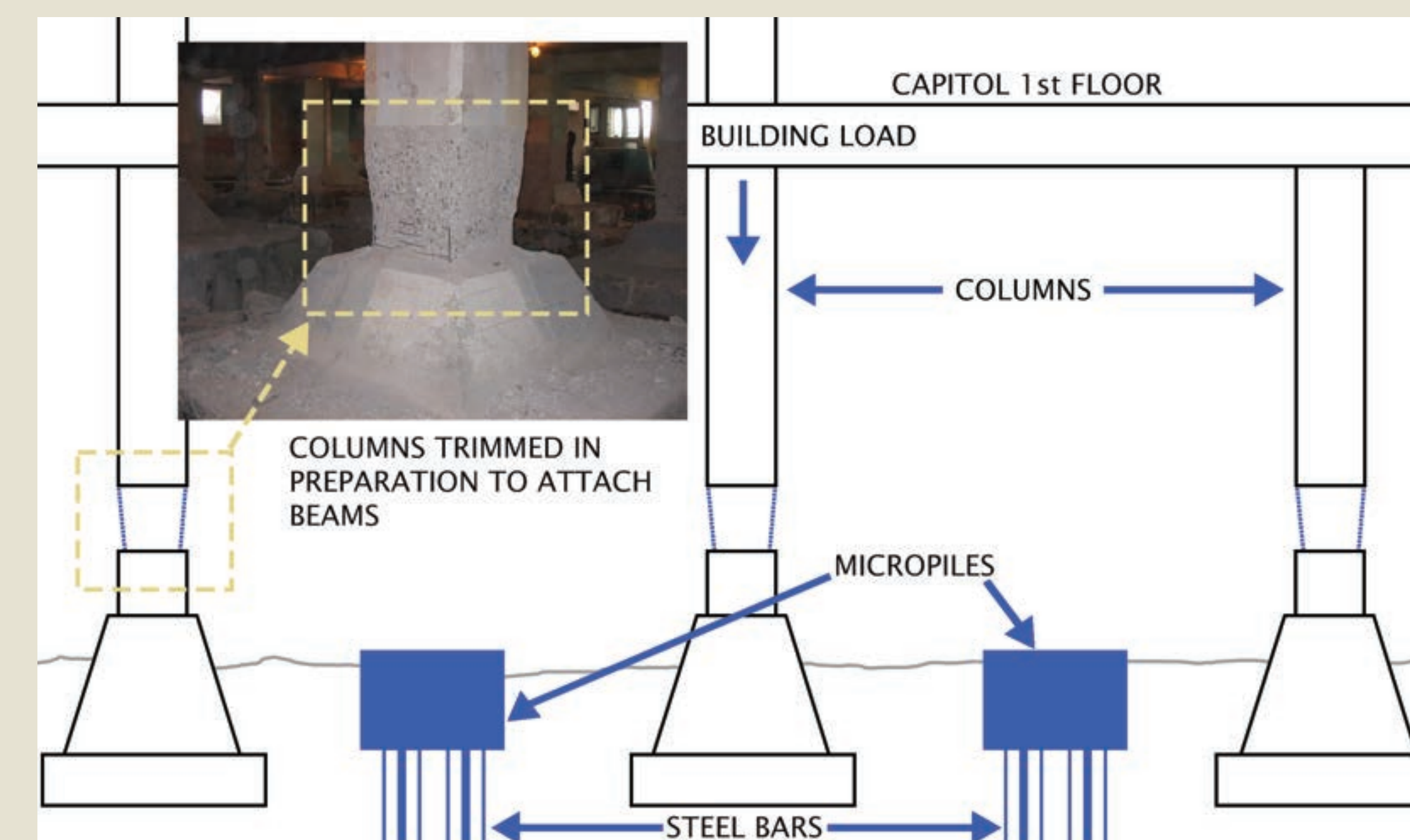
In preparation for the new base isolation system, **enormous amounts of soil were removed** from beneath the building.

This excavation provided access to the base of the Capitol's support columns.

2. MICROPILES INSTALLED

Between each of the columns, steel bars were drilled **38 feet below the building** and surrounded by grout and concrete.

Micropiles were placed on top of the steel bars, which would soon hold the building's weight.

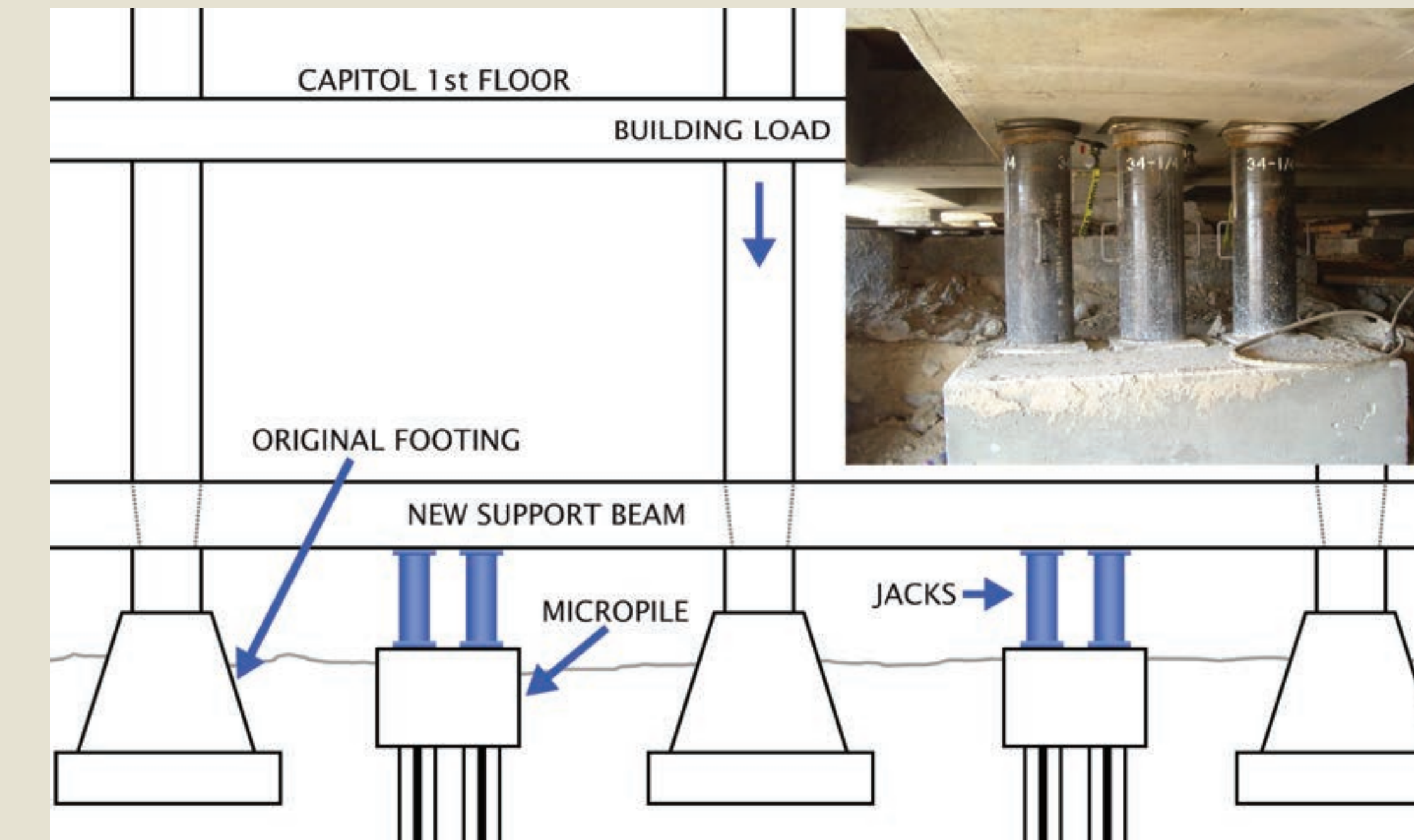


3. WEIGHT TRANSFER BEAMS INSTALLED



To support the weight of the building during the forthcoming installation of the base isolators, **temporary steel beams** and **permanent reinforced concrete beams** were cast around the newly trimmed columns.

4. BUILDING WEIGHT TRANSFERRED TO JACKS



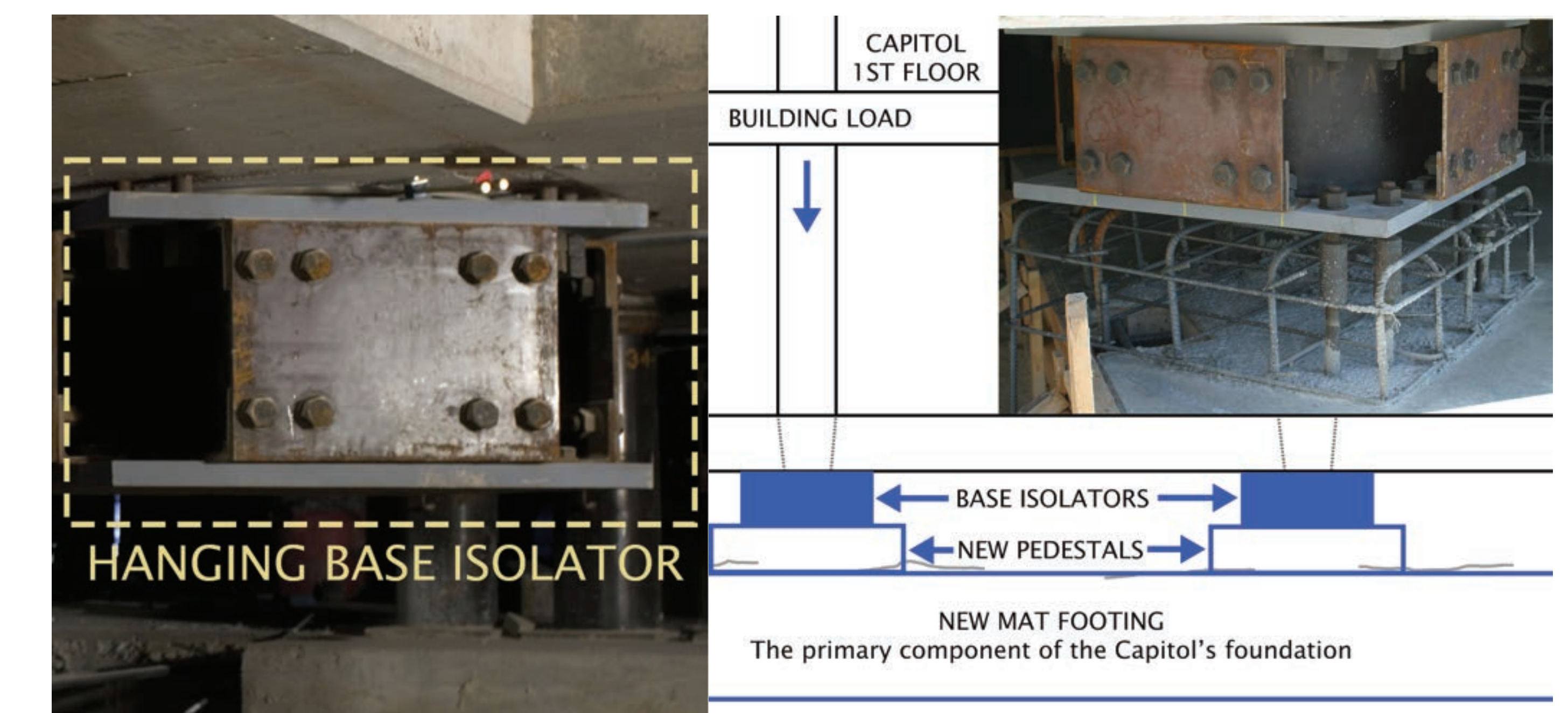
Temporary jacks were placed between the new support beams and the micropiles.

The building's weight was transferred from the original footings to the jacks and micropiles. The Capitol's original footings were then removed.

5. BASE ISOLATORS INSTALLED

In place of the original footings, **base isolators** were hung beneath each of the 265 support columns.

Pedestals were added between the base isolators and a new mat footing.



6. WEIGHT TRANSFERRED BACK



The jacks were then removed. The **Capitol's weight was transferred** to the new base isolators and foundation. During this process, the Capitol building remained completely still.

The addition of the base isolation system was a success!