

Protecting Architectural Heritage

Engineers balance preservation with seismic protection.

by **Tim Hornyak**

Many visitors to Tokyo are enchanted by the way in which Japan's capital mixes old and new. Despite the fact that Tokyo has seen a multitude of disasters during its long history, the metropolis is still home to many old structures, and they must be protected from the ever-present threat of earthquakes. This preservation is carried out in addition to other earthquake countermeasures such as quake-resilient urban planning.

Older structures are protected by carefully balancing preservation with reinforcement. The Imperial Palace lies at the heart of Tokyo and was erected on the site of Edo Castle. Even though during World War II buildings were flattened only blocks away, massive earthworks and original gates dating to the 17th century still stand. The Shimizumon gate was built in 1624 and designated by the central government as an Important Cultural Property in 1961. The structure was repaired after the 2011 Great East

Japan Earthquake. To make the gate more quake-resilient, engineers fitted the base with a tie rod, a long bar that can support architectural structures. While helping relieve tensile force on the gate, it has little effect on its overall appearance.

Preservation efforts have also been undertaken for structures that are not very famous. The Pumping Station at the Former Mikawashima Sewage Disposal Plant is a sewage facility along the Sumida River that began operations in 1922, being Japan's first modern facility of its kind to purify sewage before disposal. It survived the 1923 Great Kanto Earthquake with minor damage and was finally shut down in 1999. In 2007, the Pumping



Surrounded by cherry trees, the Pumping Station at the Former Mikawashima Sewage Disposal Plant was reinforced against earthquakes around 2012.



Kiyosu Bridge has been outfitted with a vibration-control system to protect against earthquakes.



Rebuilt in 1926 after the Great Kanto Earthquake, Eitai Bridge has been equipped with bearings to dampen large seismic forces.

Station became the first sewage facility to be designated an Important Cultural Property. Thanks to seismic-reinforcement renovations carried out around 2012, the 10 massive pumps in the pump pit, where sewage was drawn from underground wells, are now clearly visible because large support trusses have been mostly removed in favor of more discrete strengthening measures. Visitors can now fully grasp the importance of the facility while admiring its nostalgic Taisho era (1912–1926) brickwork and the surrounding blossoming cherry trees.

Tokyo is a city of more than 100 rivers, and bridges form part of its civil engineering heritage. Two historic spans across downtown Tokyo's Sumida River, Eitai and Kiyosu bridges, are also being carefully preserved. First made of wood and erected in 1698, Eitai Bridge was celebrated by the woodblock print artist Utagawa Hiroshige. It suffered two disasters. In 1807, it partly collapsed under the weight of many revelers heading to a Shinto shrine festival

held for the first time in 12 years. In 1923, wooden slabs on the bridge burned in the Great Kanto Earthquake. It was rebuilt in 1926 as a massive steel arch and formed part of an earthquake reconstruction project along with Kiyosu Bridge, an elegant suspension bridge.

Work began in 2013 to extend the life of these spans by more than 100 years and to safeguard them against massive earthquakes, with reinforcements discretely installed. "To pass these assets on to future generations, in principle existing materials shouldn't be modified and the landscape should be considered," says an official with Tokyo's Bureau of Construction. "At Eitai Bridge, we have taken measures such as installing new bearings to dampen large seismic forces, and at Kiyosu Bridge, we installed vibration control devices to reduce seismic shaking."

Next time you are touring a heritage structure in Tokyo, take a closer look, and you may see evidence of the care that has gone into protecting it for future generations.