

# Water tank built to last 60 years

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## Water tank built to last 60 years

BY K. KUWAYAMA

The city of Matsuyama on the Japanese island of Shikoku has built the country's first stainless steel municipal water tank in order to ensure its residents a safe, steady supply of drinking water well into the Twenty-First Century.

Large water tanks are usually made of concrete, but the oxidation of chlorine that is added to the water to kill bacteria neutralizes the surface of the concrete walls, promoting corrosion of some of the reinforcing bars and causing degradation of equipment. This makes it necessary to conduct repeated repairs at great expense.

Before building the ¥230 million water tank, the city undertook a comparative study of tank construction using reinforced concrete, prestressed concrete, mild steel and stainless steel.

Stainless steel was found to be superior in all six areas studied: ease of construction, length of construction period, resistance to earthquakes, ability to be made watertight, corrosion resistance, and durability.

The least expensive material for constructing the 4,600-m<sup>3</sup>-capacity tank was found to be prestressed concrete, but stainless steel was the least expensive to maintain. And when



Matsuyama's municipal water tank is constructed of three grades of stainless steel: S30400, S31600, and S31803.

a comparison was made of total construction costs plus maintenance costs, the results indicated that stainless steel was the best option, based on a useful life of at least 60 years.

### *The city undertook a comparative study of tank construction among concrete, mild steel and stainless steel.*

Stainless steel is generally a rust-resistant material, but the right type of stainless steel must be selected for specific conditions. The water tank presented an interesting situation because the inner wall must perform

in three types of environment: the top, where it is always exposed to gaseous conditions; the middle, where the water level fluctuates leaving the wall alternately dry and wet; and the bottom which is always under water. Therefore, three types of stainless steel were used.

The cylindrical tank measures 22.30 metres in diameter and is 16.16 metres high with side walls 13.70 metres high. The dome-shaped roof and upper 7.5 metres of the side wall, which is most affected by fluctuations of the water level, is made of 6-mm thick S31803 for its resistance to chlorine. The floor, also 6 mm thick, and the lower 2.2 metres of the side wall, 13 mm thick, is austenitic stainless steel S30400. The four-metre intermediate portion of the side walls, from nine to eleven mm thick, is of nickel-containing S31600.

Reinforcing materials for the side wall and the roof, the spiral staircase and piping are all of S30400.

A total of 143 tonnes of stainless steel was used — 76 tonnes of S30400, 23 tonnes of S31600 and 44 tonnes of S31803.

The city will do follow-up investigations for crevice corrosion and electrolytic corrosion before proceeding with plans to build two more tanks.

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