Visitors to the 2008 World's Exposition in Zaragoza, Spain, won't need raincoats or umbrellas to stay dry as they enter the 400-sq-meter entrance pavilion, even though, if all goes as planned, its walls will be made of water. Thanks to digital controls, the walls will part, creating doorways; reconfigure to change room size; or even disappear, on command. And the roof, itself a shallow pond, will also move up and down. The building, when realized, will be a first.

“There have been prior attempts to digitally control water, but this is the first instance of usage in architecture,” says Carlo Ratti, whose firm carlorattiassociati, Torino, Italy, is designing the estimated $3-million Digital Water Pavilion. “Our key idea is adaptability: how to make an architecture that can reconfigure itself based on need,” he adds.

The design calls for two concrete cores—a 12-m-square tourist information center and a 30-m-square café—topped by a 40 x 10-m roof. Like a tabletop with two pedestals, the stainless steel roof itself is covered with 500 mm of water. The concrete boxes are designed to stabilize the roof, says Carlos Merino, project structural and mechanical engineer from Ove Arup & Partners' Madrid office.

The roof is designed to move up and down using 12 dispersed hydraulic pistons, each with its own maintenance pit to store the 5-ft-long retracted hydraulics. “It’s like a car lift,” says Merino.

The engineer considered a full basement foundation under the pavilion. But Arup ultimately selected a partial excavation because it uses less material and is therefore more sustainable, he adds.

The water walls cascade from the roof's surface. Digitally operated solenoid valves along both the perimeter and the interior control the water curtains, says Ratti, who in addition to leading the project's

"Walls in the pavilion can move; spaces can expand or shrink based on usage."
To absorb the water, the design calls for a sponge-like, aluminum floor where it can be pumped back into the system. Pumps would be buried in nearby pits.

Walls inside the pavilion would be able to move and interior spaces can expand and shrink based on usage to adapt to visitor traffic. The roof is designed to adjust, based on weather patterns. A windy day or blinding sun might prompt lowering the roof, says the architect. At night or when the pavilion is closed, the roof can be fully lowered to the ground, its only trace a shallow rectangular pond around the cores.

If physically prompted or programmed, the roof’s water valves could scroll text or graphic patterns down the liquid facade. And visitors would be able to interact with the walls through sensors, says the architect.

A person walking on one side of the structure could make the water fall in a certain pattern or function as a door opening, says the architect. The interface is under design, including how much control a passer-by can have over the water wall’s flow.

The pavilion would also be sustainable. Air-conditioning would not be necessary because the water-curtain system employs evaporative cooling techniques. Plans also call for using recycled water and steel.

The architect considers the water pavilion to be prefabricated because time and space on site are limited.

The pavilion’s technology bolsters the Expo’s water and sustainability themes, as well as Zaragoza’s own claim as one of Spain’s top cultural cities. The Expo will end in September 2008, but the water pavilion will remain as part of a park.

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