Japan's Saitama Stadium: Maximizing the land

BY CLINT MATTOX

When I wrote a former teacher that I was working on golf courses in Japan and had begun to work on new soccer stadiums for the 2002 World Cup, she questioned, "They have enough room to build golf courses and football stadiums?" She knew that land is precious here and must be used effectively, especially for these monster stadiums.

Saitama Stadium, located just north of metropolitan Tokyo, is a prime example. The area is accessible to many people and the stadium is a designated emergency evacuation site during natural disasters. With a solar power generation facility and a rainwater utilization design, this stadium is unique beyond being the largest soccer-only facility in Asia.

When it opens next June, fans will see the wonder that is Saitama, the new heart of Japanese soccer, with its two practice fields and special train line. For many reasons, we had to make this field special.

I worked for Kajima Construction Co., which has played a large role in designing, constructing, and maintaining many of the Japanese, and Korean World Cup stadiums and pitches. Kajima designs and constructs stadiums, bridges, and skyscrapers and its ecological division manages golf courses and some of the World Cup soccer pitches.

Kajima realized that Saitama Stadium made for some great opportunities but also some new hurdles for turfgrass management. The field has no running track, which allows the seats to edge up very near the field. This makes for tremendous views for fans, but Kajima was concerned about shade on the field being obstacle.

Top: Figure 3
Bottom left: Figure 1
Bottom right: Figure 2

Golf lessons

Because the roof hugs the field and shelters it from the sun, shade made for big disparities in on-field temperature, which in winter meant freezing, an unacceptable condition for a busy field so near to Tokyo. So Kajima installed a temperature control system similar to one that they had previously installed in a golf course green.

This system consists of 25 miles of piping and is designed to maintain the field at the ideal temperature year round (see Figure 1). After analyzing the testing facilities results, the optimum field temperature was determined to be 68 to 77 degrees Farenheit at 6 in. from the crown layer. Test results showed that the root system in the 2 to 6 in. range is the area of the most active nutrient uptake, so the system was placed at the 10-in. level in order to be a safe depth from machinery damage but close enough to have control of the root zone temperature.

Because it is necessary to both cool and heat the field, the system uses temperature-regulated water instead of an electric system. To resist pipe bursting, a seamless pipe design was incorporated; pure water was used instead of a heating/cooling liquid in case of a rupture that could potentially pollute the soil profile. The system circulates water at approximately 1,055 gpm throughout the field.

Using the results of a light intensity simulation test, Kajima divided the field into seven segments and computer controlled temperature gauges and moisture reading equipment was installed to counterbalance the temperature difference phenomenon. Due to the earth's rotation, two sub-sections had to be separated for different shading effects in the winter season. Depending on the weather, the system is not necessary during the mild temperature months of April, May, and October.

The 40-day installation of the soil temperature control system began in the middle of January 2001. A 4-in. gravel layer was deposited after the drainage tile system at approximately 26 ft. spacing was installed. Construction plans called for a 12-in. sand and soil amendment profile, but because tests showed the temperature control system was most effective at 10 in. from the crown layer, the lower 2 in. of sand was applied initially. Then came the web of seamless heating and cooling pipes of 20-mm diameter with a separation of 12-in. centers.

Once the temperature control system was in place a pressure and liquid omission test showed no risk of leaks or bursting, so the remaining 10 in. of soil profile was added.

Working the schedule

The players' stage required an all-natural lawn pitch (see Fig. 2), consisting of Mic-18 Tall Fescue, Cutter Perennial ryegrass, and a Kentucky bluegrass combination of the cultivars: America, New Grade, and Indigo. According to Mr. Takeuchi of Kajima, "The whole vitality of the pitch is increased with the power of the selection between the turf cultivars".

The temperature control system was used to ensure that the ideal integrated temperature would ensure successful germination by the multiple turfgrass varieties. A seeding date of March 26 allowed for the first mowing on April 21.

Kajima also used a compaction resistant fiber in the most trafficked areas, center field and the goal zones, because testing determined that the fibers made a noticeable increase in turf stability by increasing the bearing capacity of the treated areas, therefore aiding in compaction reduction and damage resistance.

The many different elements of Saitama Stadium came together to make the most of a wonderful opportunity (see Fig. 3). The simple task of providing a playing field for a soccer game has resulted in a soccer complex to promote a region, an emergency evacuation site to protect a country, and an experimental site to promote better soccer playing conditions for the future of not only Japan, but for the world of soccer.

I returned home with a great appreciation for the Japanese culture and especially their ability to consider every possible use for land, their most valuable commodity. ST

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