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Remote overnight concrete curing for bridge elements

For the densely populated state of New York the Tappan Zee bridge, crossing the Hudson river north of the city of New York constitutes a vital artery for residents, commuters, travellers and commercial traffic. The bridge opened to traffic in 1955 and was at that time designed for a humongous number of 100.00 vehicles per day. In the past decades, daily bridge traffic has grown to about 138,000 vehicles. Hundreds of millions of dollars have been spent to maintain the structure. Heavy traffic and lack of emergency shoulders can create unsafe driving conditions on the bridge and lead to frequent congestion and frustration for motorists.



Figure: New York State Thruway Authority

Reference project involving latest technology:
the „New NY Bridge“ spans the Hudson River north of New York City.



Figure: New York State Thruway Authority

The „New NY Bridge“ is designed to cope with more than 150,000 vehicles per day smoothly.

After a long delay, plans for a New NY Bridge to replace the Tappan Zee are becoming a reality. The first span of the new twin-span bridge, started in 2013, is scheduled to open in 2016, and the new bridge should be complete in 2018. The new bridge will be designed and constructed to last 100 years without major structural maintenance. The 3.1-mile twin span cable stayed bridge is the largest bridge construction project in New York’s history, with a total cost of \$3.9 billion.

Extensive measures have been taken to protect the environment and to monitor the impact of construction on surrounding communities. A special design that requires fewer piles, state-of-the-art vibration techniques for quieter pile driving and less dredging leads to less construction noise and an overall minimized environmental impact.

The New NY Bridge will mean less congestion for motorists, with eight traffic lanes, four breakdown/emergency lanes, and state-of-the-art traffic monitoring systems, as well as a dedicated commuter bus lane from the day it opens. Designed and constructed to be mass-transit-ready, the new crossing will be able to accommodate bus rapid transit, light rail or commuter rail. The bridge will also include a bike and pedestrian path.

As a reference project that has to be on-budget and on-time, the New NY Bridge requires all parties involved to fully comply with the quality and service stipulated. Public interest is high, the main sponsors New York State Thruway Authority and the State Department of Transportation of New York demand a detailed documentation of all steps as well as precise adherence to regulations and formalities.

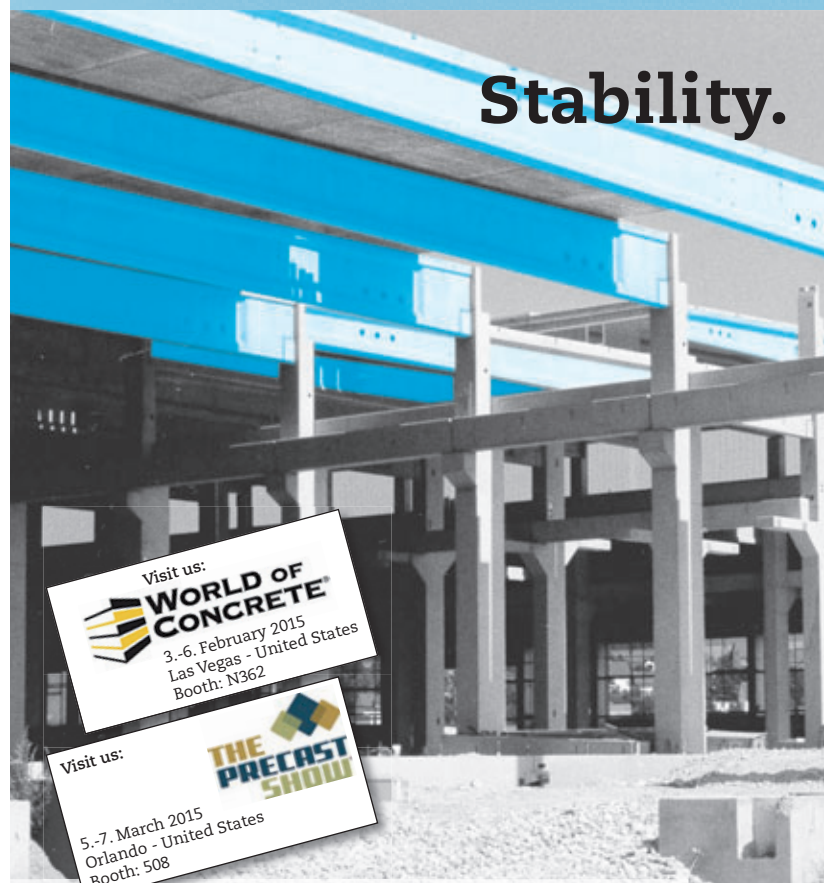


Precast concrete deck panel for the new bridge.





Heavy-duty valves distribute the vapor to the curing tables.

One of the main suppliers for precast structural elements for the bridge is Unistress Corporation, located strategically half way between New York and Boston in Pittsfield, Massachusetts. The company specializes in large scale precast elements for bridges, railway stations, manufacturing plants, stadiums, retail and industrial buildings and multi-level parking facilities. Unistress has completed more than 500 precast structures throughout the Northeast, and received numerous awards of excellence. Unistress has been selected by Tappan Zee Constructors (www.tappanzeestructors.com) to provide 6000 precast concrete deck panels for the new bridge. The \$70 million contract is the largest in the company's history. For the production of precast products for the New NY Bridge project, Unistress relies on concrete curing solutions from Kraft Curing. Only Kraft was able to guarantee the precise concrete curing specifications stipulated by the local authorities involved. The Unistress production is based on a Kraft Vapor Generator KC 50-2S. The generator distributes its vapor over a system of 9 valves, piped to a total of 18 prestress casting forms. Each casting form is enclosed with a retractable enclosure custom designed by Kraft to



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A single Kraft Vapor Generator (pictured during installation) supplies all curing enclosures of the Unistress production site with the optimal curing climate.

achieve the required curing specifications while allowing for work in inclement weather. The total length of the enclosure is 106 feet (32 meters) and it can be bi-directionally compressed to 15 feet (4 meters). Inside the curing enclosures, the vapor creates a specific curing climate that provides the optimal curing conditions of elevated temperature and humidity for the specific concrete product. This design allows for the independent production of up to 18 large scale precast products at the same time.

A special feature of the Unistress system is Kraft's AutoCure™ Automatic Curing Control System working in conjunction with Kraft's own VaporWare™ V2 Curing Data Recording and Storage Software. These unique components provide for a precise control and detailed supervision of the temperature and duration of every single curing production process, satisfying the local authority's requirements for documentation, quality control and management.

The VaporWare system provides control and adjustment of all curing procedures via the Internet. Any internet enabled device may be used to monitor and adjust with the production process. The curing process can be initiated, adjusted and controlled from a smartphone, tablet or PC allowing for curing overnight without making the physical



The VaporWare system allows for control and manipulation of all curing procedures over the internet.

presence of staff necessary. In the unlikely case of a fault the system sends notifications by email.

On-site control of the AutoCure system happens via a 12" color touch screen. Concrete temperature is measured at 3 locations per enclosure; directly in the concrete with thermocouple internal sensors, inside the enclosure with ambient sensors and at the surface of the steel casting forms. Outdoor ambient temperature is also monitored and recorded.

The extensive fully-automated measuring and control technology provided by Kraft represents state-of-the-art technology in the field of controlled concrete curing and eliminates any aspect of guessing and variation from the curing process and the project. The complete process as well as the results are monitored and fully documented. In this manner, Unistress Corp. not only benefits from the typical Kraft advantages such as reduced hardening times, cement savings and the lowest energy consumption of any curing system available. The precast producer can warranty the quality of their products to the local authorities involved without any limitations.

The custom formwork for the deck slabs was fabricated by Hamilton Form Company in Fort Worth, Texas. Seventeen tables were required. The tables were designed to cast 10 and 3/4-inch thick by 14-foot wide deck slabs at varying lengths. Most of the tables have center hinges to create the intersection of varying apex and concave slopes. A base side rail, top rail and hanging side rail were designed to produce and strip these unique slabs. The base side rails are keyed and are slotted to accommodate u-shaped protruding rebar at the side of the slabs. A bolt-on hanging

back pan used on one side of the slab is slotted to position rebar. A magnetic top rail is used on the other side to create the full depth of the product. The base rails are also magnetic for ease of set-up and to allow quick release when stripping the product.

FURTHER INFORMATION



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