

# THE STAINLESS REBAR STANDARD



Kevin Cornell, Editor December 2008

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## ***Ottawa's Clyde Avenue Bridge Rapid Replacement on TransCanada Highway completed two hours ahead of schedule***

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Highway 417 (Queensway) is the main east-west provincial corridor passing through Ottawa. This stretch of the TransCanada Highway accommodates large volumes of tourist and commercial inter-city and intra-city traffic. The highway consists of three lanes of eastbound and three lanes of westbound traffic.

The original thin slab Clyde Avenue bridge deck was among ten others constructed in 1959 and rehabilitated in 1983. However, the decks continued to deteriorate from natural and manmade elements. In 2002/2003, temporary repairs were undertaken, but subsequent testing identified deficiencies including concrete delamination on the decks, abutments and wing walls, deteriorated decks, and corrosion and strain on the steel girders. Consequently, replacement and rehabilitation of the bridges were recommended.

The existing 21 meter (68 feet) bridge, which consisted of east and west-bound sections, was approaching the end of its design life. In addition, the bridge needed to be widened from 3 lanes each way to 4 lanes to accommodate future improvements.

Motorists were notified that there would be lane closures over the weekend of August 2



New precast structure set in place within 24 hours.



Old structure removed intact to make way for new bridge.

and 3 for bridge construction. The highway was closed to traffic at 6:00 pm on Saturday for removal of the existing bridge. The new bridge was installed and traffic was allowed to pass shortly after 9:00 am on Sunday.

The new bridge sections were built separately on top of two support structures in a staging area near the bridge. The original bridge sections consisted of reinforced concrete road decks supported on heavy steel girders. The new sections were designed in a similar way, but with one very important difference. The concrete decks and barrier walls of the new sections are reinforced with Alloy 2205 stainless steel reinforcing bar. The original bridge sections were built with carbon steel rebar, which corroded. Armatures Bois-Francis of Victoriaville, Quebec ordered about 95 tons of stainless steel rebar, cut and bent by Salit Specialty Rebar of Niagara Falls, NY.

In the months prior to the bridge replacement, the existing east and west abutments were repaired and widened to accommodate the wider road decks. At 6:00 on Saturday evening, the old sections were disconnected from the abutments. Remotely-controlled transporters were used to remove the decks and haul them away from the construction site. The transporters, which looked like huge, multi-wheeled flatbed trailers, then picked up the new sections for transportation to the modified abutments.

This \$9.6 million project represents the second time that the Ministry of Transportation Ontario (MTO) has used this modern technology to lift and move complete bridges on Highway 417. Using traditional methods, bridge replacements typically take 14-21 months.

When interviewed by *The Ottawa Citizen*, Mr. Frank Vanderlaan, the MTO Area Contracts Engineer said, “The great advantage of rapid replacement is that it virtually eliminates the lane closures associated with conventional rehabilitation over a period of two to three construction seasons”. By staying away from the two-year method, the MTO is saving about \$2.4 million, and motorists are also saving time and money.

“With no congestion due to construction, the traveling public is not delayed by stop-and-go traffic, which is detrimental to fuel economy and a major factor given the present high fuel prices” said Mr. Vanderlaan. The use of stainless steel rebar, which is resistant to attack by de-icing salt, will provide a service life expectancy of at least 75 years for the new bridge spans.



Old bridge deck being prepared for removal.



Bridge deck sections built separately in staging area.



Concrete decks and barrier walls reinforced with Alloy 2205 stainless steel.

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## ***Precast concrete modular decks a viable option for small bridges***

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The decks of two small bridges in Cattaraugus County, in Upper New York State were constructed with stainless steel reinforced precast concrete modules, instead of a traditional cast-in-place construction methodology. Construction of a third precast concrete deck is planned for early 2009. The decision taken by Cattaraugus County Department of Public Works, Engineering Division to design and construct the decks using precast panels, allowed the County to construct the bridges with its own forces.



The County's bridge crew did not have the skills or experience to form and pour a traditional cast-in-place concrete deck. In addition, speed of construction was a factor in determining the bridge type. Between the sheet pile abutments, which took four weeks to construct, and production and assembly of the precast deck (4 weeks), the County estimated a time savings of at least 8 weeks per bridge. Without these time savings, the County would not have been able to complete the two bridges with in-house forces. The County's bridge crew was required for repairs on several bridges, leaving little time for the construction of new structures.



Galvanized girders support precast slabs on Allegany 20 bridge.

The Machias 17 bridge was a town bridge that was closed to traffic due to its deteriorated condition. Upon completion of the new structure, the County took over ownership of the structure. The Allegany 20 bridge was in poor condition with a reduced load posted for 22 tons. The County was looking to further reduce the load, due to both superstructure and substructure deterioration. The reduced load of the bridge had a negative impact on the travelling residential population and the local logging contractor who needed to cross the structure regularly. County engineers also determined that the hydraulic openings for both structures was insufficient.

Rehabilitation of a third bridge, Ellicottville Bridge 49, was postponed until the spring of 2009. The superstructure was determined to be in poor condition but the substructure was in good condition and the hydraulic opening sufficient. The work had to be postponed because the County's crew simply ran out of good construction weather. Construction of all three bridges with stainless steel reinforced modular decks was a large order for the crew that had to complete additional scheduled capital works during the 2008 construction season.

County engineers were concerned about the dead load of the decks, so the concrete cover over the reinforcement had to be reduced to lighten the weight of the concrete. To achieve this, the engineers considered corrosion inhibitors and epoxy coated rebar. For the inhibitors to be effective, however, the panels needed at least 2 to 2-1/2 inches of concrete cover over the rebar. This was not an option. The county has had less than favorable experience with epoxy coated reinforcing on the heavily salted county roads of the snow-belt region, and with the reduced cover, this wasn't the ideal solution either. Stainless steel reinforcement with reduced cover became the most viable option. Although not used for the precast concrete panels, a corrosion inhibitor was used for concrete pours of other elements of the structures. The abutment walls and wing walls are all sheet pile, and the substructure or girders are

galvanized steel beams. The span of the Machias 17 bridge is 31.67 feet, while the span of the Allegany 20 bridge is 38.4 feet and the Ellicottville 49 bridge 31.67 feet. All are 28.67 feet wide.

The typical time required for forming and pouring a concrete deck on these sized structures would be two to three weeks with an additional cure time of 28-days thereafter, before opening to traffic. The concrete deck panels can be installed, shear studs placed and grouted within two to three days and opened to traffic within a week.

The three structures have been designed with a 50-year design life. The Machias 17 bridge had been previously closed to traffic. Reconstruction began on June 23 and the bridge reopened to traffic on September 2. Allegany bridge 20 was closed to traffic on September 11 and reopened on November-12. Although construction costs have not been finalized, the construction budgets for Machias 17 was \$340,000 for the bridge and approach work, and \$375,000 for Allegany 20, including the bridge and approach work plus an additional \$25,000 for the on-site detour.

For more information about these bridges, contact William A. Fox, PE., Senior Civil Engineer for Cattaraugus County Department, New York Division Public Works, Engineering Division, WAFox@cattco.org.

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## ***Reconstructed Bronte Road Bridge to last 100 years***

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The Queen Elizabeth Way through Oakville, Ontario is being widened from six to eight lanes to create an HOV lane in each direction from Third Line to Burloak Drive. Construction is expected to be complete by July 2011. The \$88.7 million contract is the second largest ever awarded by the Ministry of Transportation Ontario. Included in the project is the rehabilitation of the existing QEW bridge at Bronte Road and construction of a new bridge, under the QEW, as part of a widening and realignment of Bronte Road.



HOV lanes are dedicated for buses and vehicles carrying more than one occupant. The lanes provide fast and more reliable travel during peak travel periods when other lanes are congested. To minimize traffic disruption during construction, traffic on the QEW will be diverted to a new bridge being completed under a separate MTO contract. Once the project is completed, this bridge will accommodate only eastbound traffic, while westbound traffic will use the newly refurbished bridge completed by Aecon.

Salit Specialty Rebar (SSR) is supplying the steel required for two major deck replacements with substructure repairs to both the QEW over Bronte Creek west bound lanes and QEW over Bronte Road east and west bound lanes. Included in the project is at least half a kilometer of retaining wall at the off ramps, reinforced completely with stainless rebar. Both the bridges required pier repairs, new bridge abutments and capping beams, and a new deck slab with barrier walls. SSR is supplying 380 Tonnes of black reinforcing steel and 400 Tonnes of stainless reinforcing steel. There was no consideration for any other material except stainless in all exposed surfaces to corrosive conditions, since the MTO wants a structure that will last for 100 years, the design life of the project.

## ***The New Precast Show is a fit for SSR***

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The new Precast Show, running February 20 to 22, 2009 at the George R. Brown Convention Center in Houston is billed to be a built-in audience of manufacturers who are interested in the latest equipment, products and services for their businesses. The Precast Show is all about precast. The National Precast Concrete Association and the American Concrete Pipe Association are continuing their long-running partnership in creating a trade show specifically for the precast industry. In conjunction with The Precast Show, NPCA will conduct its Winter Conference, which features an awards celebration, committee meetings and other special events. ACPA will hold its annual Production Short Course School in conjunction with the trade show as well.



Developed by leading precast suppliers and manufacturers within the industry, The Precast Show feature an expansive trade show floor, and include technical education programming, plant tours, networking events and much more.



Salit Specialty Rebar will be at booth #1223, featuring the latest stainless steel applications and new products being specified by state DOTs. The booth will be staffed with specialists who are able to add value to the educational programs being provided by the two host associations. If you plan to be at the precast show, plan to spend some time with Salit Specialty Rebar representatives.

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## ***Upcoming Events***

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### **World of Concrete**

Las Vegas, Nevada  
February 4 to 7

### **The Precast Show (NPCA/ACPA)**

Houston, Texas  
February 20 to 22, 2009

### **CRSI Annual Spring Convention**

Tucson, AZ  
April 19 to 21

### **The International Bridge Conference**

Pittsburgh Pennsylvania  
June 14 to 17

### **Precast/Prestressed Concrete Institute Annual Meeting**

San Antonio, Texas  
September 12 to 15

