NYCON

CASE STUDY

MORRISTOWN BRIDGE

Morristown, Vermont | 2002

V-ROD® GFRP rebar, available in multiple sizes

The Morristown Bridge (BR 213) is located over Ryder Brook on Route 100 near Morristown, Vermont. The bridge is subjected to traffic of 7000+ vehicles per day.

OWNER
Vermont Agency of Transportation

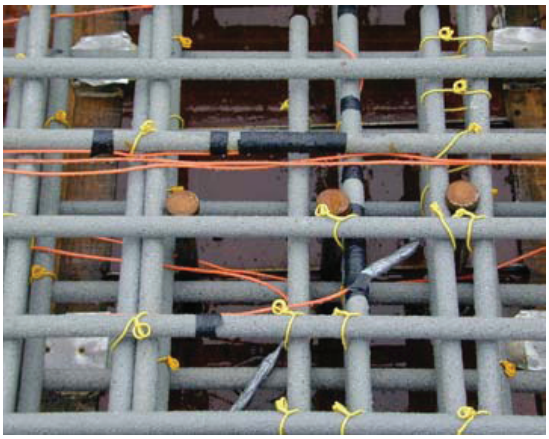
STRUCTURE

The bridge is a girder type, with five main steel girders, integrally cast with the two end abutments over one span of 144 ft. The deck is a 9 in. thick concrete slab continuous over four spans of 7 ft 9 in. each with an overhang of 3 ft on each side. Two identical Glass Fiber Reinforced Polymers (GFRP) mats, No.19 @ 4 in. and 6 in. in the transverse and longitudinal directions, respectively, were used at top and bottom. Clear concrete covers of 1.5 in. and 2.5 in. at bottom and top, respectively were used.

PROJECT HIGHLIGHTS

- Name and Location: Morristown Bridge, Morristown, Vermont
- Construction of the bridge: Started in May 2002
- Opening of the bridge to traffic: September 2002
- Structure category: Medium span (girder bridge)
- Spans: one span of 144 ft
- Structural system: 5 steel girders continuous integrally cast with the two end abutments. The concrete bridge deck slab was entirely reinforced with GFRP rebar in all directions.
- Start of monitoring: August, 2002
- 12 fiber optic sensors installed – Classified as Smart Bridge
- Instrumentation design: University of Sherbrooke, Sherbrooke, Quebec, Canada
- Why GFRP rebar: Corrosion resistance and weight savings
- This is the first bridge deck worldwide, of this size and category, where the concrete slab was fully reinforced with GFRP reinforcing bars.

Field testing of the bridge



Fiber optic sensors on GFRP bars

TESTING

The bridge was tested for service performance (October 2003) under static loads using two calibrated truckloads with three axles each. Four paths, two in each direction, corresponding to the direction of each with seven stations (truck stops) were marked along the longitudinal direction of the bridge to give critical loading cases and influence lines at the instrumented section of the bridge (mid-span). The test was carried out using a single truck over the four paths and two simultaneously along one path such that the total of 35 (7 stations × 5 paths) readings were recorded for each gauge. The maximum value on the vertical axis represents the location on the bridge that contains the gauge under consideration (mid-span). For the single truck loading, the maximum measured strains in bottom and top GFRP bars were 31 and 4 micro-strains, respectively.

BENEFITS

Using Structural Health Monitoring (SHM) technologies in the Morristown Bridge project provides two main benefits:

- The ability to collect information about the behavior of the innovative GFRP rebar
- The opportunity to predict any sign of deterioration and any expected problem before it happens

Results are positive for both the monitoring of the fiberglass rebar and the overall behavior of the bridge. Analysis of data collected demonstrates that:

- The GFRP rebar is functioning very well
- The measured strains and deflections do not indicate any kind of deterioration