Examples of use of Galvanized Reinforcement in Highways and Bridges
Bridges and Highways: North America

In situ galvanized reinforced concrete road and bridge deck construction
In situ galvanized reinforced concrete road and bridge deck construction
In situ galvanized reinforced concrete road and bridge deck construction
Highway crash barriers

USA

Autoroute 40
France

Montreal, Canada
Results of periodic inspections undertaken by commercial laboratories on galvanized reinforced concrete bridges.
Notes on US bridge survey data

• Multiple inspections were undertaken on the Boca Chica and Tioga bridges, but not at the same general location. The data set is thus not unique at a single location.

• The ACI Chloride threshold (0.2% by mass of cement) is equivalent to 0.6 kg/m³ of chlorides for a cement content in the concrete of about 300 kg/m³. This was used as a basis for comparison.

• The minimum specified coating thickness for hot-dip galvanized reinforcement (as per ASTM A 767) is 85 microns, equivalent to a coating mass of 600-610 g/m².

• Since the thickness of the hot dip galvanized coating varies along the bar and in different batches of steel, thicker coatings may be measured at different inspection times.
Boca Chica Bridge, Florida (1972)

**Inspection Details:**

- **1975**
  - Zinc – 130 microns
  - Chlorides - 1.17 kg/m³

- **1991**
  - Zinc – 102 microns
  - Chlorides – 1.21 kg/m³

- **1999**
  - Zinc – 170 microns
  - Chlorides – 1.93 kg/m³

Chloride levels at all inspections were well above the ACI threshold level (to 3.2x) and the residual coating thicknesses indicate an estimate of an additional 40+ years of maintenance-free corrosion protection.
Chloride levels at 1991 and 2001 were well above the ACI threshold level (to 2.2x). The residual zinc coating thicknesses indicates a further 40+ years of maintenance-free corrosion protection.
Curtis Road Bridge, Michigan (1976)

Chloride level at 2002 were 6.9x above threshold level for black steel. Current coating thicknesses indicate an estimated 40+ years of maintenance-free corrosion protection for the galvanized rebar deck.

Inspection Details:
2002
Zinc – 155 microns
Chlorides – 4.13 kg/m³
Chloride levels were 4.2x above the ACI threshold for black steel. Galvanized bars were used in the upper mat of the bridge deck which was covered by 3.5 in of asphalt. The residual zinc coating thicknesses indicates an estimated 40+ years of maintenance-free corrosion protection.
Chloride levels were 2.6x above the ACI threshold for black steel. Galvanized bars were used in the upper mat of the bridge deck and the concrete cover was in the range 2 – 4 inches. Based on the current coating thickness, an estimated 40+ years of maintenance-free corrosion protection was predicted.
Route 66 bridge deck – a 30 year case study

The chloride content at the existing bar in the deck was 3.0 kg/m³, 5x the ACI threshold for black steel. The thickness of the zinc coating remaining was 247-270 microns, well above the specified minimum for ASTM A767 Class II coatings. There was no need for any refurbishment.

During maintenance in which a concrete Jersey crash barrier was to be installed, original galvanized deck reinforcement was uncovered. It was in excellent condition after 30 years and was cast into the new crash barrier. The tenacious bond of the bar to the surrounding concrete was noted confirming the excellent bond obtained with galvanized coatings.