MACCAFERRI

CASE HISTORY

Ref: CH/INT/IN/RWSR03 - Rev03 Sept16

WING WALLS AND CULVERT WALLS ON NH8

VADODARA to BHARUCH, GUJARAT, INDIA

RETAINING STRUCTURE

Product: Gabions, Reno Mattress®, Geotextile

Problem

The 83.3-km stretch of NH 8 between Vadodara and Bharuch is part of the Golden Quadrilateral and is an important link in the high-density corridor connecting Mumbai and Delhi. It passes through the districts of Anand, Vadodara, and Bharuch and traverses various urban centers with a number of road and rail crossings.

The project scope included widening of the existing four-lane road to a six-lane divided road with amenities and support infrastructure.

It involved construction of 10 major and 36 minor bridges, 11 flyovers and numerous pedestrian and cattle crossings at specified locations. It also includes junction improvements and construction of 8m wide service roads on both sides of the road at important sections. Culverts would also be required at all locations where streams and rivers intersected the highway.

Before construction showing highway

Solution

The insitu soil is clayey in nature with low frictional values. The average cohesion value is around 30kN/m2 and the average internal angle of friction was 12 degrees. Post-construction, streams would flow through the culverts, increasing to rivers during rainy periods. The estimated scour depth was 2m.

Larsen & Toubro's conventional solution was to install reinforced concrete retaining walls as wing walls for the minor bridges and culverts.

However, considering the factors above, especially the poor soils and risk of scouring at the toe of any retaining structure selected, a rigid (e.g. concrete or similar) structure would not have been appropriate. Differential settlement could damage the rigid concrete structures through cracking. Furthermore, calculations revealed that the embedment depth required to to ensure stability of a concrete structure would be significant compared to a more flexible retaining wall.

The project design engineer specified Maccaferri double twisted steel wire mesh gabion retaining walls as the most appropriate solution. Welded mesh gabions would not have been suitable (even Maccaferri's welded mesh units) in these demanding hydraulic works conditions due to the poor performance of the welded mesh under shear, punch and differential settlement loads.

During construction of a culvert

During construction of gabion retaining walls

Client:

NATIONAL HIGHWAY AUTHORITY OF INDIA

Main contractor:

LARSEN & TOUBRO ECC DIVISION

Designer:

ARTEFACT CONSULTING

Products used:

30,000m^3 DOUBLE TWIST MESH GABIONS

Date of construction

2008

However, gabion walls made from double twist woven wire hexagonal mesh are engineered, flexible and permeable in nature. They can accommodate extreme differential settlements without sustaining damage.

To achieve suitable factors of safety against foundation pressures and sliding, it was determined to replace the foundation with granular soil to a depth of 0.5m.

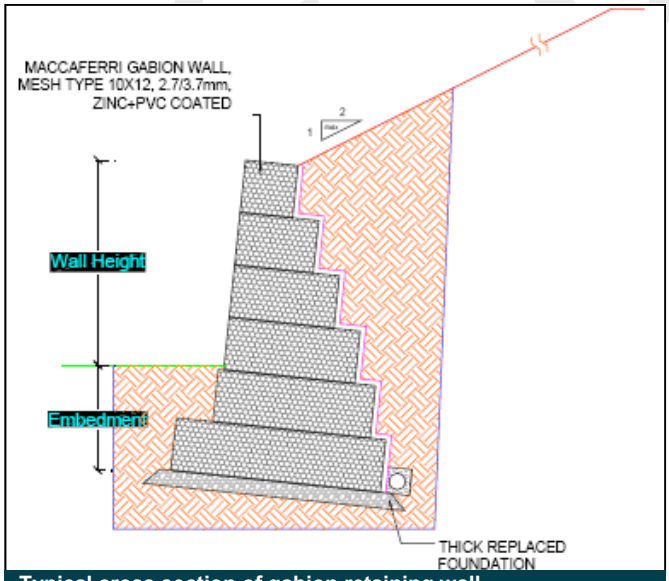
To prevent the scouring action, an apron of Reno Mattresses was detailed reaching into the channel for a length equal to 1.5 times the expected scour depth i.e 3m.

NHAI had the requirement that the wing walls for Minor Bridges and Culverts were to be placed at an angle of 45 degrees to the road alignment, Gabions being a flexible structure, could be placed at this skew-angle with minimal site problems and wastage could be controlled easily.

To provide a long design life, the double twist steel wire mesh was specified to be heavily galvanized and additionally polymer coated. In hydraulic works (where the units are to be regularly exposed to water flow and abrasion), a polymer coated gabion unit is essential.

The gabion walls were used as the standard solution for the multitude of culverts and crossings on the new highway.

During Construction - Gabion layer, Placed on skew



Typical cross section of gabion retaining wall

During construction of wing walls

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