CASE HISTORY

Rev:01, Date : 25.08.2020

REINFORCED SOIL SLOPE AT SHILLONG BYPASS CONNECTING NH-40 TO NH-44, MEGHALAYA

SHILLONG, MEGHALAYA, INDIA

TECHFAB INDIA

Reinforced Soil Slope

Client:	Products used:
NATIONAL HIGHWAYS AUTHORITY OF INDIA (NHAI)	• TECHGRID – GEOGRID (KNITTED & PVC COATED POLYESTER GEOGRID) • TECHGEO NONWOVEN GEOTEXTILE • GEOTEXTILE BAGS • TECHFAB METAL GABIONS
Main Contractor:	
G R INFRAPROJECTS LTD.	
Design:	
BEST GEOTECHNICS PVT. LTD.	
Manufacturer & Supplier:	Year of construction:
TECHFAB (INDIA) INDUSTRIES LTD.	2014

Project description:

There is a construction of a Reinforced Soil Slope at Shillong bypass (Meghalaya) connecting NH-40 and NH-44 with the application of geosynthetics in that region which has natural mountain terrain, deep valley at rare end side, with touch of natural green aesthetic and state of the art design & architecture.

The reinforced soil slope & gabion retaining wall at toe has been proposed to slope elevated terrain in concurrence to design, consultant & architect. Their joint views have taken into many revisions before arriving at practicable solution which encircles the aesthetic view with as a final outcome at rare deep valley portion, based on the submission of M/s Best Geotechnics.

Keeping the above perspective, the scope work of Techfab India Industries Ltd., was to meet:

- Supply of Techgrid Geogrids, Metal Gabion, Nonwoven Geo textile.
- Supervision.

Reinforced Soil Slope – Top View

Salient features:

- Soil Reinforcement: Techgrid Geogrid (Knitted & PVC coated Polyester Geogrid).
- Facing: Wrap-around Geogrid facing for Reinforced Soil Slope, with Geotextile bags filled with sand. Techfab Metal Gabion as toe wall.
- Design Methodology : Ressa software for analysis.
- Techfab India Scope: Supply of TechGrid Geogrid, Metal Gabion, Nonwoven Geotextile.

Method statement:

- Installation of gabions, geogrids cannot be initiated until excavation; foundation preparation and levelling of soil have been completed, and properly inspected by the site engineer.
- In case of unsatisfactory preparation of sub grade by the installer, it must be rectified as guided by the Site Engineer.

Excavation:

- Excavate the sub grade vertically to the plan elevation & horizontally to the extent of the geogrid lengths.
- Remove & replace the unnecessary soil not meeting the requirement given by the design engineer with the approved materials from owner's side.
- Protect excavated materials that can be used as a backfill for the reinforcement zone against weather.

Techfab Metal Gabion Wall Layout – Initial Stage

RSS with TechGrid GeoGrid – Under Construction

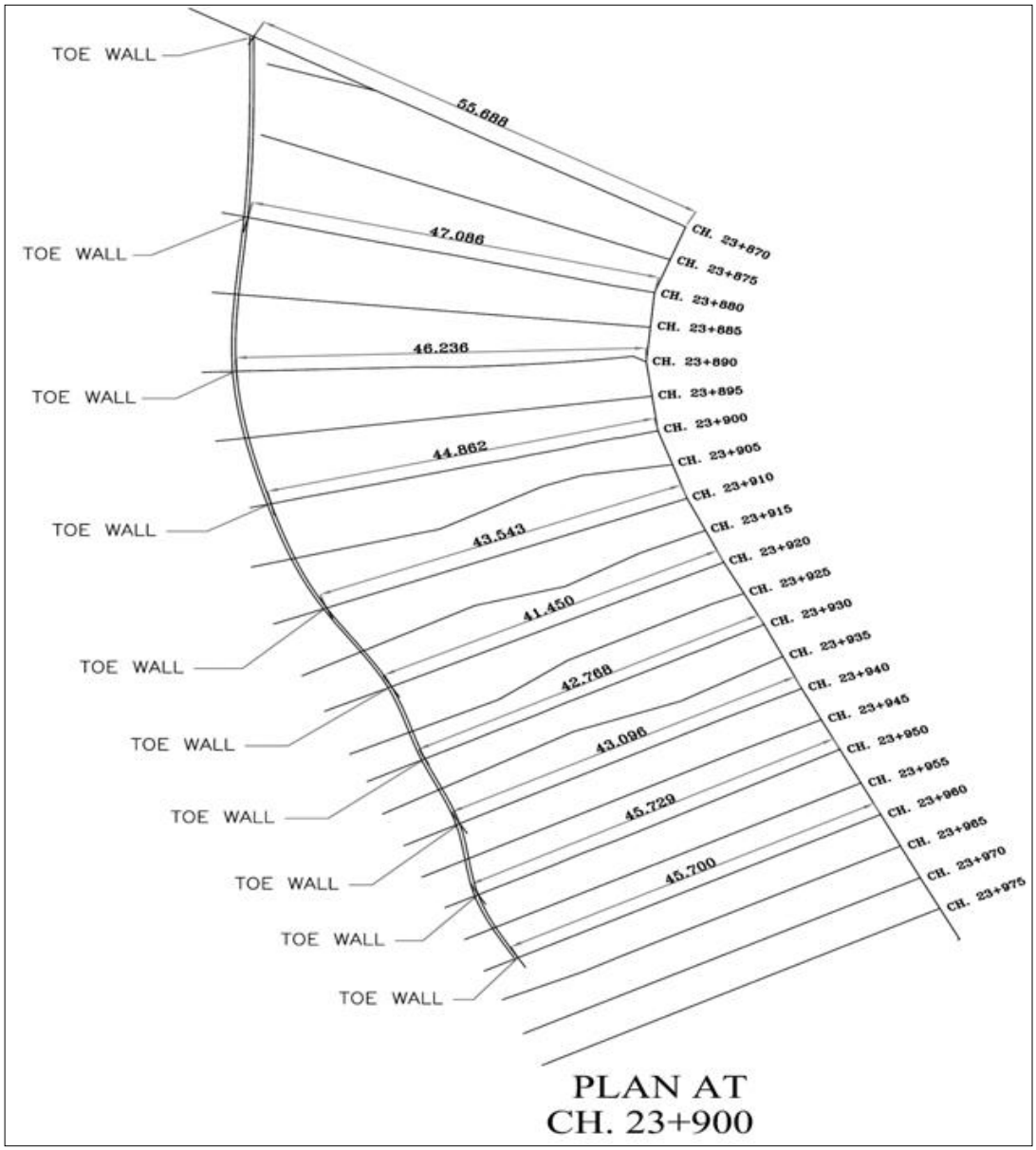
Pre Final Stage of Construction

Foundation Preparation:

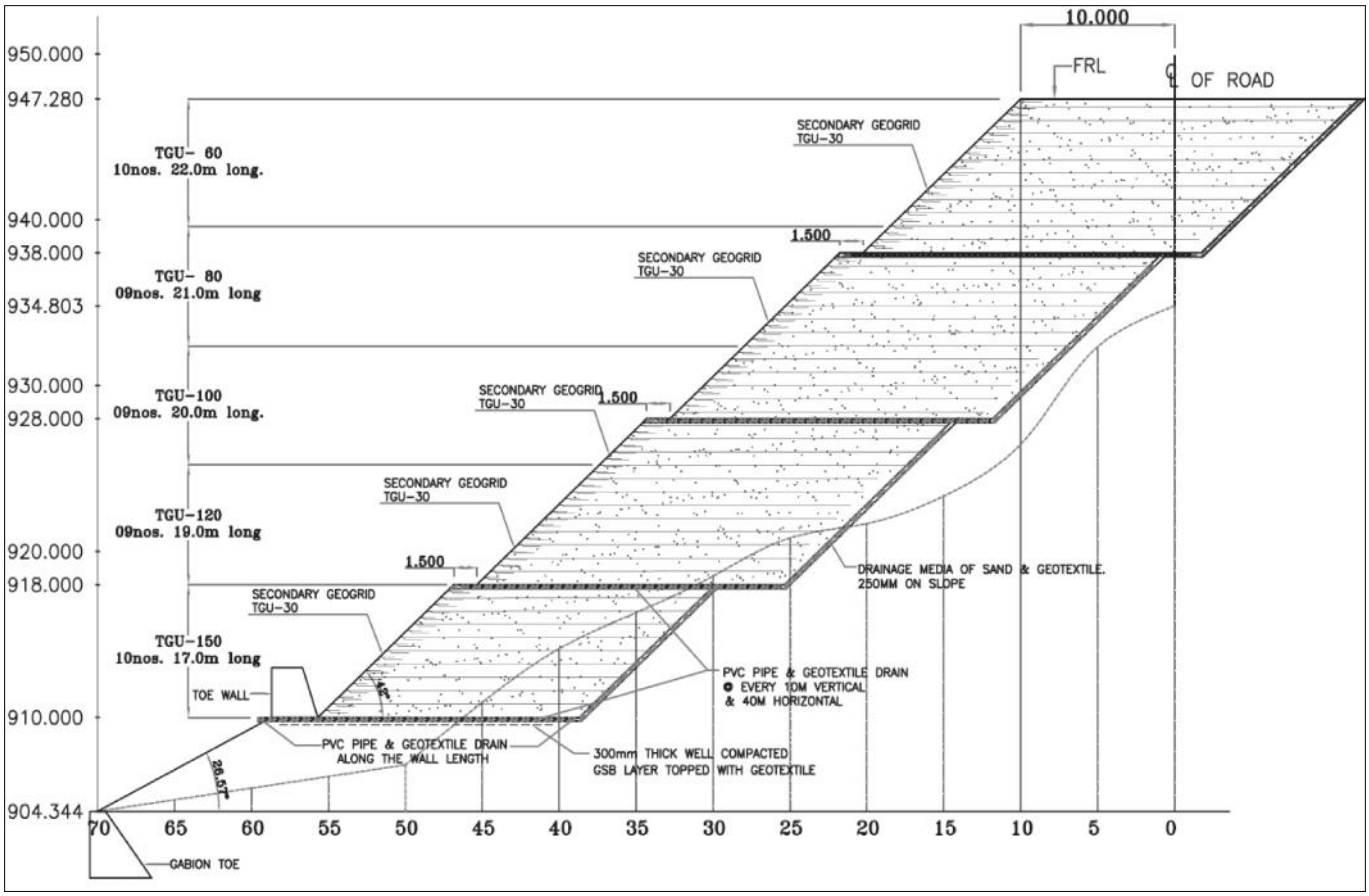
- Over- excavated area the sub grade shall be in maximum loose lifts of 250mm & shall be compacted to a minimum of 95% Standard Proctor Dry Density with 1% to 2% of OMC in accordance with relevant standard.
- Engineer In Charge inspect for the sub grade soil properties for the reinforced zone should fulfill the requirements according to design & drawings.

Construction:

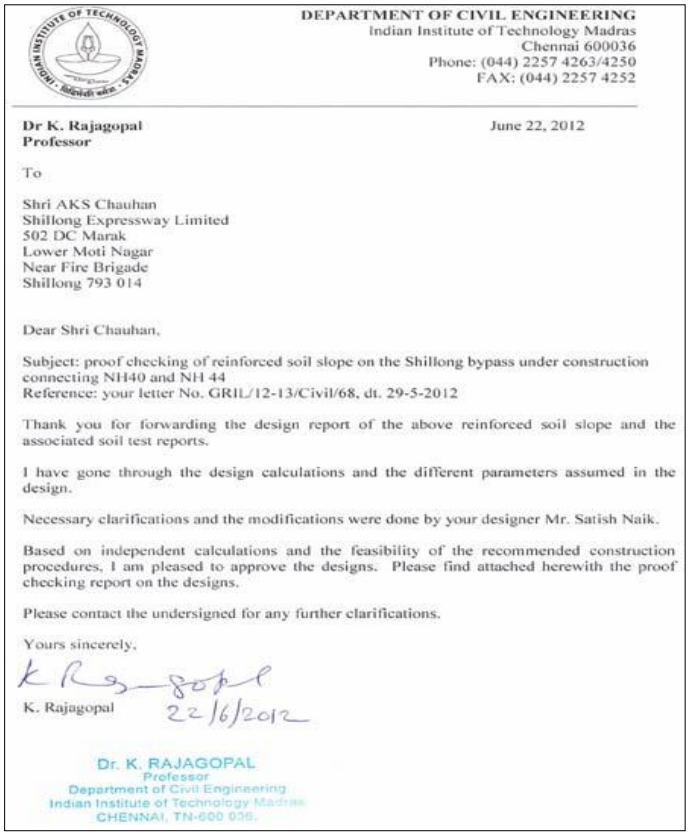
- Construct reinforced soil slope in accordance with the approved design & drawings.
- All precautions are to be taken while placing the geogrids to avoid damages.
- Reinforced soil & backfill must fulfill the requirements according to the approved design & drawings



Plan



Reinforced Soil Slope – Typical Cross-section



DEPARTMENT OF CIVIL ENGINEERING
Indian Institute of Technology Madras
Chennai 600036
Phone: (044) 2257 4263/4250
FAX: (044) 2257 4252

Dr K. Rajagopal
Professor

June 22, 2012

To

Shri AKS Chauhan
Shillong Expressway Limited
502 DC Marak
Lower Moti Nagar
Near Fire Brigade
Shillong 793 014

Dear Shri Chauhan,

Subject: proof checking of reinforced soil slope on the Shillong bypass under construction connecting NH40 and NH 44
Reference: your letter No. GRIL/12-13/Civil/68, dt. 29-5-2012

Thank you for forwarding the design report of the above reinforced soil slope and the associated soil test reports.

I have gone through the design calculations and the different parameters assumed in the design.

Necessary clarifications and the modifications were done by your designer Mr. Satish Naik.

Based on independent calculations and the feasibility of the recommended construction procedures, I am pleased to approve the designs. Please find attached herewith the proof checking report on the designs.

Please contact the undersigned for any further clarifications.

Yours sincerely,

K. Rajagopal 22/6/2012

Dr. K. RAJAGOPAL
Professor
Department of Civil Engineering
Indian Institute of Technology Madras
CHENNAI, TN-600 036.

DEPARTMENT OF CIVIL ENGINEERING
Indian Institute of Technology Madras
Chennai 600036
Phone: (044) 2257 4263/4250
FAX: (044) 2257 4252

Dr K. Rajagopal
Professor

June 22, 2012

Proof Checking of Reinforced Soil Slope on the Shillong bypass Under Construction Connecting NH40 and NH 44

Through a letter No. GRIL/12-13/Civil/68, dt. 29-5-2012, M/s GR Infraprojects Ltd. have requested IIT Madras to proof check the designs for the reinforced soil embankment being constructed at Shillong bypass road connecting NH40 and NH 44.

The complete design report, drawings and the soil investigation reports were supplied to the consultant. The designs were performed by M/s Best Geotechnics Pvt. Ltd. Mumbai. All the original design calculations were performed using the AASHTO/FHWA approved software ReSSA developed by M/s ADAMA Engineering Inc., USA.

The height of the embankments range from 28.5 m to 43 m and the slope angle as high as 50°. The reinforced soil slope design considered reinforcement layers at vertical spacing of 800 mm and secondary reinforcement layers at 400 mm vertical spacing. The soil slope is proposed to be given a wrap around slope with sand filled bag facing. The proposal is quite innovative and environmentally sustainable.

The soil properties assumed for design are reasonable and consistent with the soil test reports pertaining to the site.

The polyester knitted geogrids have very good creep resistance and will be able to provide the necessary resistance for the service life of the structure. The different reduction factors used for obtaining the long term allowable design strength are reasonable. The geogrid-soil interaction parameter of 0.80 is reasonable and slightly on the conservative side based on the data from several laboratory and field pullout tests.

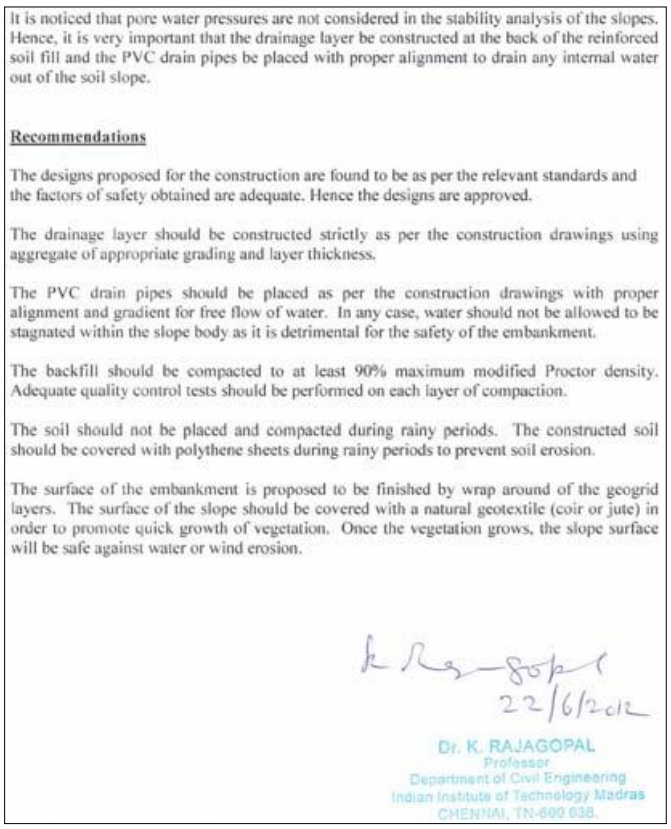
The uniform surcharge pressure considered in design of 24 kPa is as per the IRC load standards for national highways.

The seismic factor assumed for design is consistent with the provisions given in IS 1893-2002 for Shillong area. The different factors assumed for estimating the peak ground acceleration like the importance factor, spectral acceleration coefficient, etc. are reasonable and consistent with the nature of the soil embankments.

The factors of safety obtained for different embankments are more than 1.30. As the earthquake seismic forces are considered, this factor of safety is reasonable. The forces developed in the reinforcement layers are within the long term allowable design strength and the factor of safety against pullout failure is more than 1.50 for all the layers.

Dr. K. RAJAGOPAL
Professor
Department of Civil Engineering
Indian Institute of Technology Madras
CHENNAI, TN-600 036.

Design Checked by IIT (Madras) Prof. K. Rajagopal



It is noticed that pore water pressures are not considered in the stability analysis of the slopes. Hence, it is very important that the drainage layer be constructed at the back of the reinforced soil fill and the PVC drain pipes be placed with proper alignment to drain any internal water out of the soil slope.

Recommendations

The designs proposed for the construction are found to be as per the relevant standards and the factors of safety obtained are adequate. Hence the designs are approved.

The drainage layer should be constructed strictly as per the construction drawings using aggregate of appropriate grading and layer thickness.

The PVC drain pipes should be placed as per the construction drawings with proper alignment and gradient for free flow of water. In any case, water should not be allowed to be stagnated within the slope body as it is detrimental for the safety of the embankment.

The backfill should be compacted to at least 90% maximum modified Proctor density. Adequate quality control tests should be performed on each layer of compaction.

The soil should not be placed and compacted during rainy periods. The constructed soil should be covered with polythene sheets during rainy periods to prevent soil erosion.

The surface of the embankment is proposed to be finished by wrap around of the geogrid layers. The surface of the slope should be covered with a natural geotextile (coir or jute) in order to promote quick growth of vegetation. Once the vegetation grows, the slope surface will be safe against water or wind erosion.

22/6/2012

Dr. K. RAJAGOPAL
Professor
Department of Civil Engineering
Indian Institute of Technology Madras
CHENNAI, TN-600 036.

Design Checked by IIT (Madras) Prof. K. Rajagopal

GRIL

G R INFRAPROJECTS LTD.
(Formerly known as G.R. Agarwal Builders & Developers Ltd.)

TO WHOM IT MAY CONCERN

Dated: 10.12.2014

National Highway Authority of India (NHAI) has awarded the project of Shillong Bypass (NH-40 to NH-44), to the Concessionaire M/s Shillong Expressway Ltd., as one of the lead member of Consortium M/s GR Infra Project Limited has completed the project much before the scheduled completion date.

Since Shillong Bypass is passing through hilly terrain, there were various requirements like steep embankments, reinforced soil retaining walls & slope protection work. State-of-the-art technical solutions were adopted using advanced and latest technical methods such as mechanically stabilized soil slopes with the various grades of geogrid. The Geogrid Used for maximum height of 45 Mtrs.

We herewith certified that we have used different grades of Techfab Geogrids at this project.

FOR GR INFRAPORJECTS LTD.

AUTHORISED SIGNATORY

Letter from G R Infraprojects Ltd. to TechFab India

The supplied materials, Techgrid - Geogrid, Nonwoven Geotextile, and PVC coated galvanized Gabion are the in house manufactured products of Techfab India Ltd., in their state of the ISO 9001:2008 certified factory under the proven and tested qualified experienced faculties having edge of national globally accredited QTP & QTC.

RSS with TechGrid GeoGrid – Under Construction

After Completion of Project with vegetation

For further details kindly contact :

TechFab India Industries Ltd.
711/712, Embassy Centre, Nariman Point, Mumbai – 400021
Tel: + 91- 22 - 2287 6224 / 6225 Fax: + 91- 22 - 2287 6218
E: info@techfabindia.com
W: www.techfabindia.com