

Geotechnical Engineering Directorate

No: GE/GEN/148/EOI

Dated: 17.03.2015

Sub: Uploading on RDSO's Website

Please arrange to upload Notice for Expression of interest for developing specifications and for shortlisting of firms alongwith related document (copy enclosed) on RDSO's website. This has approval of ED/GE/RDSO.



(A.M. Rizvi)

Director/GE-I

Enclosure: As above

ADE/TMS

Expression of Interest

Ministry of Railways, Research, Design & Standards & Organisation (RDSO), Lucknow is interested in developing Specifications and in shortlisting of firms for use of geosynthetic products in Railway formation application. Firms who have enough experience and capabilities in the field and ISO certificate and are interested in developing and supply of said items are requested to see the details on the RDSO website <http://www.rdsso.gov.in> or contact Mr. A.M.Rizvi, Director/GE Geotechnical Engineering Directorate/RDSO/Lucknow at BSNL Ph. No. 0522-2465722 in lucknow on any working day for further details.

The firms are requested to submit details in the prescribed format by 30.04.2015, to the address mentioned below.

Contact Address:

Mr. A.M.Rizvi, Director/GE
Research Designs & Standards Organisation (RDSO),
Ministry of Railways,
Manak Nagar,
Lucknow – 226 011,
Uttar Pradesh, India

1. Objective

The objective is to develop an understanding of the performance improvement of the ballasted rail tracks using geosynthetics reinforcement, focusing on alternative economical design of formation thus reducing the requirement of earthwork and ballast/blanket depth.

Scarcity of land and quarry products and State governments' restrictive policies on mining and transportation ultimately lead to higher costs overrun due to delay in projects. Moreover large scale mining & excavations cause loss of cultivable land and adversely affect the environment. To arrest these problems, alternative economical design by using geosynthetics may help in many ways.

This EOI is aimed at

- i. Short listing of the firms based on their credentials
and
- ii. Development of suitable specifications/designs

for field trials in the area of Railway applications as detailed below.

2. Applications in Railway Formation

- Track Bed Design
- Reinforced Earth Structure

2.1 Track Bed Design

To reduce subgrade stresses and improvement in formation drainage, provision of blanket layer on top of subgrade proves to be an effective solution. Mostly, for poor/very poor subgrades, the requirement of the blanket thickness is very high. It is of the order of 100cm on IR system. Provision of geosynthetics on formation distributes the load uniformly on larger area and reduces formation pressure. Blanket thickness may be reduced by provision of geosynthetics by adopting proper design & selection of geosynthetics & its optimum location in formation. The goal is to judge the performance of geosynthetics in terms of reduction in induces stresses and deformation as well as the quantification of benefits as given below:

- i. Quantification of improved load capacity of the ballasted track due to the geosynthetic reinforcement thereby opening up the possibilities of building tracks for heavier axle loads.
- ii. Quantification of the influence of the geosynthetics in reducing the track settlement and ballast puncturing/pulverisation. Consequently, the reduction in maintenance effort and cost.
- iii. Quantification of the possible reduction in the thickness of the ballast cushion through inclusion of geosynthetics leading to economy in the design.

- iv. Quantification of the possible reduction in the thickness of the blanket layer through inclusion of geosynthetics leading to economy in the design.
- v. Optimum location of geosynthetics giving maximum performance improvement

In addition to reinforcing element i.e. geogrid, geotextile or geocomposite can also be used as a separator to separate the two dissimilar materials and to prevent them from mixing, such as the use of geotextile between fine-grained subgrade and granular material.

2.2 Reinforced Earth Structure

- i. **Reinforced Earth Slope** : In urban areas or in general, where there is scarcity of land, replacing a conventional flat slope with a steep reinforced one is an effective option. In railways, when track passing adjacent to an area which could not permit natural slope, steeper slope may be constructed by reinforcing the embankment using Geogrid. On IR, the side slope adopted in general is 2H:1V which can be made steeper by adopting RE technology.
- ii. **Reinforced Earth Wall**: In RE wall system, reinforcing elements like geogrid, steel strips etc. are used. These reinforcing elements are restrained by the frictional stresses mobilized between reinforcing elements and the selected fill. Thus, the lateral earth pressure causing failure is balanced by interaction of selected fill with layers of geogrid through friction. Designs of reinforced Earth Wall for supporting the railway embankment can also be developed. A combination of RE wall and steep slope can also be applied at places.

3. Draft Functional Requirement Specifications (FRS)

(A) Specifications

The technology of geosynthetic products is dynamic in nature and is growing at a faster rate. IR is not having much exposure/experience in this field. Therefore, the specifications being proposed here are based on limited exposure/experience of IR and are named as Draft Functional Requirement. Interested firms may offer upgraded/updated version of specifications for various parameters.

Geogrid Specifications:

Polymer	Polypropylene/Polyester or similar polymer
Mass per unit area	320 g/m ² (minimum)
Aperture size	35mm to 65 mm
Roll width	As per site requirement or 5 metres
Roll Length	50 m
Ultimate Tensile Strength (MD& CD)	30 kN/m (minimum)
Load at 2% strain (MD& CD)	9 kN/m (minimum)
Load at 5% strain (MD& CD)	18 kN/m (minimum)
Strain at Ultimate Tensile Strength (MD& CD)	8 - 15%
Creep limited strength for 15 years period at 30° C temperature (MD and CD)	15 kN/m (minimum)
Open area	70-75%
Rib thickness	1.27mm(minimum)
Junction thickness	4.0-4.4mm
Aperture stability @ 20cm-kg	5.8 – 6.5kg-cm/deg
Flexural Rigidity(MD)	450,000 – 750,000mg-cm
Tensile Modulus@ 2% strain (MD x CD)	270 x 437-277 x 474kN/m
Junction strength	13.9 – 15.7kN/m

Junction Efficiency	90%
Carbon Black	0.5%
Resistance to Installation Damage	90 to 95%
Resistance to Chemical Degradation	100%
Resistance to UV Light Weathering	100%

Geotextile Specifications:

Polymer	Polypropylene/ High Density Polyethylene/polyamide, polyester or similar polymer
Weight/Mass per unit area	300 g/m ² (Minimum)
Thickness of Fabric at 2 Kpa	2.0 mm (minimum)
Roll width	5.0 metre
Roll Length	50 metre
Elongation at failure	20 % to 70 %
Tensile Strength	15 kN/m (minimum)
Grab Tensile Strength	775 N(minimum)
Trapezoid Tear Strength	444 N(minimum)
Puncture Strength	485 N(minimum)
Abrasion Resistance (% strength retained in breaking load)	80%
Apparent opening size 095	40 to 85 microns
Water Flow Rate Normal to the Plane	20 lit./m ² /s(minimum)
Coefficient of Normal Permeability	0.1 cm/sec
Permittivity	0.30 (maximum)

Geocomposite Specifications:

Polymer	Polypropylene/ High Density Polyethylene/polyamide, polyester or similar polymer
Roll Width	5.0 m
Roll Length	50 m
Peak tensile Strength (MD & CD)	90 kN/m (minimum)
Elongation at designated peak tensile load (MD & CD)	15% (Maximum)
Apparent opening size	200 micron (Maximum)
Water flow rate normal to the plane	20 lit/m2/sec (minimum)
Aperture opening size of geogrid	25 mm to 65 mm as per requirement

(B) Functional Requirement of the Structures for Field Trials:

i. Track Bed Design:

By using Geosynthetic Products-

- a) Instrumentation for measurement of stress and deformation at different depths including interface of ballast and subgrade without Geosynthetics and with Geosynthetics so as to quantify the reduction in thickness of ballast/blanket layer.
- b) Improvement in drainage characteristics of the subgrade consisting of cohesive type of soil having poor drainage properties.
- c) Measurement of pore water pressure at different depths to ascertain the benefit in drainage properties.
- d) Reduction in maintenance effort and cost by reducing the frequency of tamping and deep screening activities.
- e) Optimum location of Geosynthetics for maximum benefit and with a consideration of avoiding damage to Geosynthetic products during mechanized maintenance of tamping, deep screening and other activities.
- f) The ultimate objective is to develop an economical alternative design for the formation of Indian Railway track with reduced requirement of quarry products and earthwork.

ii. Reinforced Earth Structures:

- a) Efficacy of design for Railway embankment with varying heights say up to 15 mts. for heavier axle loads of 25t, 30t and 32.5t.
- b) Vertical walls, steeper slope (1.5H:1V, 1H:1V or steeper) and combination of these two are proposed.
- c) Special emphasis to be given for the drainage arrangement.
- d) Ultimate objective is to adopt reinforced earth structures for Railway embankment with due importance to safety and with the purpose to reduce the requirement of land and earthwork.

Selection criteria for short listing

S.No.	Item	Marks
1	Turnover of the firm during last 3 years	20
2	Details of supplies made or/and works/projects completed in the field of items under EOI	30
3	Experience & expertise for item proposed under EOI	20
4	Manpower & their qualification	10
5	Details of patent held & MoU/agreement with OEM	20

Field Trials

Based on the specifications finalized (provisionally) through this EOI, field trials are intended to be taken up by Indian Railways. The sites and further detail for such trials will be decided and notified later on.

The field trials will include instrumentation and analysis to arrive at a logical conclusion on the parameters detailed in preceding paragraphs.

At present, maximum axle load on IR is 25 t whereas it is envisaged to run 32.5 t axle load in near future.

Field trial are proposed for 25t, 30t, 32.5t axle load. Agency entrusted for field trials shall maintain the structures for minimum 3 years period.

FORMAT FOR LETTER OF RESPONSE

Respondent's Ref No.:

Date:

**Executive Director
Geotechnical Engineering Directorate,
Research Designs & Standards Organisation
Ministry of Railways
Manak Nagar
Lucknow - 226011
Uttar Pradesh, India**

Dear Sir,

Subject: RESPONSE TO – EOI FOR PARTICIPATION

1. We, the undersigned, offer the following information in response to the Expression of Interest sought by you vide your Notification No._____, dated _____.
2. We are duly authorized to represent and act on behalf of _____ (hereinafter the "respondent")
3. We have examined and have no reservations to the EOI Document (including Addenda No(s) if any) _____.
4. We are attaching with this letter, the copies of original documents defining: -
 - 4.1. The Respondent's legal status;
 - 4.2 Its principal place of business;
 - 4.3 Its place of incorporation (if respondents are corporations); or its place of registration (if Respondents are cooperative institutions, partnerships or individually owned firms);
 - 4.4. Self-certified financial statements of Last three years, clearly indicating the financial turn over and net worth.
5. We shall assist MoR and/or its authorized representatives to obtain further clarification fromus, if needed.
- 5.1.RDSO and/or its authorized representatives may contact the following nodal persons forfurther information on any aspects of the Response:

S. No.	Contact Name	Address	Telephone	E Mail
1				
2				

6. This application is made in the full understanding that:
 - 6.1. Information furnished in response to EOI shall be used confidentially by RDSO for the purpose of shortlisting of firms and for developing the specifications.
 - 6.2RDSO reserves the right to reject or accept any or all applications, cancel the EOI and subsequent biddingProcesswithout any obligation to inform the respondent about the grounds of same.

6.3We confirm that we are interested in getting ourselves shortlisted for following products:

S.no.	Name of items/products

7. We certify that our turnover and net worth in the last three years is as under:

Financial Year	Turn over	Net worth

8. In response to the EOI we hereby submit the following additional details annexed to this application.

8.1. Details of various items being manufactured/consultancy or projects undertaken.

8.2. Details of customer(s) and supplies made in the field of item under Eol.

8.3. Experience and expertise for the items proposed in EOI.

8.4. Details of man-power with their qualification and experience.

8.5. Detailed proposal for items proposed in EOI including alternative proposal, if any.

8.6. Details of Intellectual Property Rights (IPR) held, patent filed/held and MoU/agreement signed.

8.7. Details of ISO certification

8.8. Proposed scheme for conducting field trials if shortlisted

8.9. Undertaking as per Annexure-A:

9. The undersigned declare that the statements made and the information provided in the duly completed application are complete, true, and correct in every detail. We also understand that in the event of any information furnished by us being found later on to be incorrect or any material information having been suppressed, RDSO may delete our name from the list of qualified Respondents. We further understand that RDSO will give first preference to the applicants considered relevant for the purpose. Our response is valid till (date in figures and words):_____

Annexure- A and

Yours sincerely,

(Sign)

NAME

In the Capacity of

Duly authorized to sign the
response for and on behalf of

Date

Annexure-A

(To be taken on non-judicial stamp paper of appropriate value as applicable in the respective state and duly notarised& witnessed)

UNDERTAKING

I,son of aged about Years resident of do hereby solemnly affirm as under

1. That the deponent is the Authorised signatory of (Name of the Sole Proprietorship Concern/Partnership Firm/ Registered Company/ Joint Venture).

2. That the deponent declares on behalf of (Name of the Sole Proprietorship Concern/ Partnership Firm/ Registered Company/Joint Venture) that:

a) In regard to matters relating to the security and integrity of the country, no charge sheet has been filed by an agency of the Government / conviction by a Court of Law for an offence committed by the -----
------(name of the entity)or by any sister concern of the -----
(name of the entity) that would result in disqualification.

b) In regard to matters other than the security and integrity of the country, ------(name of the entity) has not been convicted by a Court of Law or indicted / passed any adverse order by a regulatory authority against it or it's any sister concern which relates to a grave offence, or would constitute disqualification. Grave offence is defined to be of such a nature that it outrages the moral sense of the community.

DEPONENT

VERIFICATION

I declare that the contents of para 1 to 2 above are true as per my knowledge and nothing has been hidden.

DEPONENT