Government of India

Ministry of Railways

Research Designs and Standards Organisation (RDSO)

Manak Nagar, Lucknow (INDIA) -226011

Global Notice for Expression of Interest

Notice No. CT/SRC/EOI/ UBM-USP dated **28.03.2016**

Ministry of Railways, Research Designs and Standards Organisation (R.D.S.O.), Lucknow is interested in **'Exploring the Worldwide Technological Advancements and Global availability of proven/promising product /systems to enable substantial reduction in the ballast cushion in track from existing cushion of 300/350mm on important routes and suitable for use on Indian Railway Network under prevailing and envisaged operating conditions minimum for 25T axle load as per details given in the document".**

Firms who have experience/capability in manufacturing and supplying such products viz. Under sleeper pads (USP) and/or Under Ballast Mat (UBM)/or any other proposed material, use of which can enable substantial reduction in the requirement of ballast cushion in track are requested to see the complete details and document on RDSO's website www.rdso.indianrailways.gov.in→Tenders →EoI. For any clarification, Firms may contact Director/Track-IV, RDSO, Lucknow on Telephone No. +91-522-2452796 or/and email: dtd5rdso@gmail.com on any working day for further details.

The firms are requested to submit details in the prescribed format latest by **16.05.2016** (15:00 hrs) to Director/Track-IV, Anusandhan Bhawan, Track Design Directorate, RDSO, Manak Nagar, Lucknow –226011 (INDIA).

Firms expressing interest shall note that:

1. Technical details submitted for proposed specifications of Ballast reduction system using USP & UBM or any other material proposed may mention the relevant values/properties against the parameters described in the Technical requirements of this document.
2. Supply details submitted for proposed material like USP & UBM or any other proposed material in last three years and in the current year may mention country wise the quantity of such material supplied for ballast reduction purpose.
3. It may please be noted that this EOI is only for the purpose of exploring the Worldwide Technological Advancements and Global availability of proven/promising product /systems available to substantially reduce the ballast cushion from standard cushion of 300-350mm, meeting stipulated Technical requirement with the objective of framing the technical requirements/ parameters & generic draft specification for Indian Railways.

Director/Track-IV
for Director General (Track)
RDSO, Lucknow
(for & on behalf of President of India)

भारत सरकार- रेल मंत्रालय

अनुसंधान अभिकल्प और मानक संगठन (अ॰ अ॰ मा॰ स॰)

मानक नगर, लखनऊ -226 011 (भारत)

रुचि की अभिव्यक्ति के लिए वैश्विक सूचना

सूचना सं: सीटी/एस आर सी/ई ओ आई/यू बी एम-यू एस पी दिनांक: 28.03.2016

अनुसंधान अभिकल्प और मानक संगठन (अ॰ अ॰ मा॰ स॰), रेल मंत्रालय, लखनऊ, भारतीय रेल नेटवर्क पर प्रचलित एवं प्रकल्पित परिचालन परिस्थितियों में उपयुक्त तथा न्यूनतम 25 टन धुरा भार हेतु अभिलेख में दिए गए विवरण के अनुसार, महत्वपूर्ण मार्गों पर मौजूदा 300/350 मिमी. मोटे बैलास्ट कुशन में पर्याप्त कमी में सक्षम, प्रमाणित/आशाजनक उत्पाद/प्रणाली की **वैश्विक उपलब्धता एवं विश्वस्तरीय प्रौद्योगिकी उन्नयनता खोजने के लिए इच्छुक है।**

ऐसी कंपनियॉ (**फ़र्मे**) **जिनके पास इस प्रकार** के उत्पाद अन्डर स्लीपर पैड (यू एस पी) एवं/अथवा अंडर बैलास्ट मैट (यू बी एम) अथवा कोई अन्य प्रस्तावित सामग्री **के निर्माण एवं आपूर्ति का सामर्थ्य एवं अनुभव है, उनसे निवेदन है कि अ॰ अ॰ मा॰ स॰ की वेब साइट** www.rdso.indianrailways.gov.in → Tenders → EOI **पर विस्तृत विवरण का अवलोकन करें** । किसी भी **अन्य** स्पष्टीकरण के लिये **फ़र्मे, निदेशक / रेलपथ-, अनुसंधान अभिकल्प और मानक संगठन, लखनऊ के फोन संख्या** +91-522-2452796 **अथवा ईमेल**: dtd5rdso@gmail.com **पर किसी भी कार्य दिवस में अन्य जानकारी हेतु संपर्क कर सकते हैं।**

इच्छुक कंपनियों (फर्मों) से अनुरोध है कि वे अपना विवरण निर्धारित प्रोफॉर्मा में निदेशक / रेलपथ-, अनुसंधान भवन, रेलपथ अभिकल्प निदेशालय, अनुसंधान अभिकल्प और मानक संगठन, मानक नगर, लखनऊ -226 011 (भारत) को दिनांक 16.05.2016 (15:00) **बजे तक प्रस्तुत कर दें।**

अभिरुचि व्यक्त करने वाली फ़र्मे कृपया ध्यान दें कि:

1. यू एस पी एवं यू बी एम अथवा अन्य प्रस्तावित सामग्री के प्रयोग द्वारा बैलास्ट कम करने की प्रणाली **की विशिष्टयों हेतु उनके द्वारा प्रस्तावित तकनीकी विवरण मे, के अंतर्गत दर्शाए गए** प्राचलों **के सापेक्ष, प्राप्त किये गए** प्रासगिंक मूल्यों/गुणों **का उल्लेख** कर सकते है।
2. **पिछले तीन वर्षों एवं वर्तमान वर्ष में** बैलास्ट में कमी करने **हेतु आपूर्ति की गई** प्रस्तावित सामग्री जैसे यू एस पी एवं यू बी एम अथवा अन्य प्रस्तावित सामग्री की **आपूर्ति** का **विवरण विभिन्न देशों के अनुसार मात्रा सहित उल्लेख** कर सकते है।
3. **कृपया ध्यान दें कि, इस रुचि अभिवयक्ति का उद्देश्य केवल** 300/350 मिमी मानक बैलास्ट कुशन में पर्याप्त कमी हेतु निर्धारित **तकनीकी** आवश्यकताओं के अनुरुप प्रमाणित/आशाजनक उत्पाद/प्रणाली की वैशिक उबलब्धता एवं **विश्वस्तरीय प्रौद्योगिकी उन्नयनता की खोज** तथा तकनीकी आवश्यकताओं/प्राचलों को एवं व्यापक ड्राफ्ट विशिष्टियां तैयार करना है।

निदेशक / रेलपथ-IV

कृते महानिदेशक/रेलपथ

अ॰ अ॰ मा॰ स॰, मानक नगर, लखनऊ

(भारत सरकार के राष्ट्रपति की ओर से)

ANNEXURE-A

Instructions/ Guidelines for the firms expressing their interest against Global Expression of Interest (EoI) Notice No. CT/SRC/ EoI/ UBM-USP

1. DISCLAIMER:

Indian Railways reserves the right not to proceed with the process or at a later stage to change the process as per the requirements of Indian Railways. It also reserves the right to decline to discuss the process further with any party expressing interest. This EoI shall not be considered in any way a proposal for procurement of USP/UBM/other material for ballast reduction purpose. The intending participants will furnish offer at their own cost and no claims, whatsoever, in this reference will be entertained by the Railways.

2. PURPOSE OF INVITING EoI:

The purpose of this Global EoI is to explore the Worldwide Technological Advancements and Global availability of proven/promising product /systems to substantially reduce the ballast cushion from standard cushion of 300-350mm on important routes and suitable for use on Indian Railway Network under prevailing and envisaged operating conditions for minimum 25T axle load. Objective of reduction in ballast thickness is to reduce the consumption of ballast for environmental reasons as well as for maintenance cost perspective.

With above objective, Indian Railways seeks to explore the proven/promising and cost effective products & technologies available worldwide to frame the technical requirements/ parameters & generic specification for Indian Railways, for their possible use in future.

The broad functional requirement for such a system is given in this document as **Annexure 'C' or** the proposed material or system for ballast reduction can also be submitted as per **International Standards,** giving details of material specification and international standards followed worldwide**.**

3. GENERAL INSTRUCTIONS FOR SUBMITTING RESPONSE TO EOI:

3.1 Eligibility criteria

i) Firm should be an existing manufacturer / supplier of USP / UBM or of any other proposed material for ballast thickness reduction purpose.

ii) The USP / UBM or any other proposed material for ballast thickness reduction purpose offered by the Firm should meet the functional requirements mentioned in this document (**Annexure – 'C'**) or it should be as per International Standards.

3.2 i) If the offered UBM/USP or any other proposed system is a proven product, then the Firm shall provide the details of supply & its performance on any of the World Railway in last three years in the following format.

Year of supply	Name of the railway where proposed USP/UBM or any other proposed material has been supplied and used for ballast thickness reduction.	Approximate quantity of such USP / UBM or any other proposed material System for Ballast Thickness reduction used	Specification/ performance parameters of the supplied USP / UBM or any other proposed material in reference to ballast thickness reduction	Performance Guarantee Given (if any)
2012-13				
2013-14				
2014-15				
2015-16 (till current month)				

ii) Budgetary estimate of approximate cost of USP & UBM or any other proposed material for Ballast thickness reduction including its installation cost to be submitted.

3.3 General & Technical details to be provided by firm: General & technical details as per **Annexure-C** shall be submitted by the firm with their offer. The firm will be required to furnish supporting documents (such as lab reports, field reports etc.) to establish that they are meeting the laid down requirements.

3.4 The details submitted by the firm shall be scrutinized by RDSO. The deficiency as observed in the offer during technical scrutiny or additional information as considered necessary will be advised to the firm. The additional information must be made available by firm within two weeks of advice.

3.5 **Submission by firms:** The intending firm shall ensure the submission in the format given in **Annexure - B**.

3.6 The submission by Interested firms shall be made to Director/Track-IV, RDSO, Anusandhan Bhawan, Manak Nagar, Lucknow- 226011 by **16.05.2016** (15:00 Hrs) in the enclosed Format for **"Letter of Response at Annexure B".** In the EoI, the firms should mention RDSO's Notice No.CT/SRC/EOI/ UBM-USP dated 28.03.2016.

3.7 The respondents must furnish the application form & details **in duplicate** as required in the enclosed **"Format for Letter of Response"** at **Annexure-B** and details stipulated in **Annexure-C**. All pages of the documents should be signed with stamp.

3.8 The firm shall legally indemnify Ministry of Railways against any possible claims/legal/other disputes at present or which may arise in future from any other party in connection with the intellectual property rights of the drawings and design or any other documents submitted by the firm or any other patent rights.

3.9 RDSO reserves all the right of this exercise. In case of any doubt/dispute, decision of RDSO shall be final.

Director/Track-IV,
For Director General (Track)
RDSO, Lucknow.

ANNEXURE - B

FORMAT FOR LETTER OF RESPONSE

Respondents Ref No.:

Date:

Director/Track-IV
Building: Anusandhan Bhawan,
Research Designs & Standards Organization (RDSO)
Ministry of Railways, Manak Nagar
Lucknow (INDIA), Pin - 226011

Dear Sir,

Subject: RESPONSE TO – GLOBAL 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. CT/SRC/ EoI/ UBM-USP dated 28.03.2016.

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)_____.

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.

4.5 Copies of any market research, business studies, feasibility reports etc sponsored by the respondent, relevant to the project under consideration

5. We shall assist Ministry of Railways (MoR) and/or its authorized representatives to obtain further clarification from us, if needed.

5.1 RDSO and/or its authorized representatives may contact the following nodal persons for further information on any aspects of the Response:

S. No.	Contact Name	Address	Telephone	E Mail

6. This application is made in the full understanding that:

6.1 The EoI is only for exploring Worldwide Technological advancements and Global availability of proven/promising product /systems to substantially reduce the ballast cushion from standard cushion of 300-350mm and suitable for use on IR network under prevailing & envisaged operating conditions for 25T axle load and not for its procurement or short-listing of Firms.

6.2 Information furnished in response to EoI shall be used confidentially by RDSO as required. Confidentiality of the information furnished by the firm in this EoI will be maintained by RDSO.

6.3 RDSO reserves the right to consider or not to consider any or all applications, cancel the EoI without any obligation to inform the respondent about the grounds of same.

7. In response to the EoI, we hereby submit the following details annexed to this application -

7.1 Turn-over of the firm during the last three financial years with the copies of annual report.

7.2 Details of customer(s)/Railways where USP/UBM or any other proposed material for ballast thickness reduction have been supplied by the firm including quantity during last 3 years.(Para 3.2(i))

7.3 Experience and expertise for the USP/UBM or any other proposed material for ballast thickness reduction proposed in EoI.

7.4 Complete details of the USP/UBM system for ballast thickness reduction with drawing and specification as per **Annexure-C** to this EoI.

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

7.6 Details of ISO/equivalent certification, if any.

7.7 Documents in proof of Eligibility criteria

7.8 Para-wise compliance of Requirements as per Annexure-C and supporting documents.

8. The undersigned declare that the statements made and the information provided in the duly completed application are complete, true, and correct in every detail.

Yours sincerely,

(Sign)
NAME:
In the Capacity of
duly authorized to sign the
response for and on behalf of

Date:

ANNEXURE - C

SALIENT TECHNICAL AND FUNCTIONAL REQUIREMENTS FOR UNDER BALLAST MAT(UBM) & UNDER SLEEPER PAD(USP) OR ANY OTHER MATERIAL FOR BALLAST THICKNESS REDUCTION

A. GENERAL

1. **Existing Track Structure on Indian Railways:**

   UIC 60 grade-880 Rails laid on Pre-stressed Concrete Sleepers at sleeper density 1540/1660 nos. per km with elastic fastenings and ballast cushion of 300/350 on important Broad Gauge routes.

   Indian Railways desires to explore worldwide available technology/ materials to enable substantial reduction in ballast cushion from existing 300/350 mm.

2. **Operating conditions of IR:**

   i) Axle load and Speed

Traffic Type	Axle Load	Speed
Goods	25T	100 kmph
Passenger	21T	160 KMPH (Existing) 200 kmph(Proposed)

   ii) Traffic Density, GMT(A Route) : 7.0 to 130
   iii) Electric Traction (Minimum) : 25 KV AC.
   iv) Track Circuits : DC.
   v) Gauge: : Broad Gauge, Nominal (1676 mm).
   vi) Ambient Temperature : (-) 5^0C to 50^0C.
   vii) Rail Temperature : (-) 15^0C to (+) 76^0C.
   viii) Humidity : 100%

B. Technical requirements for Under ballast mat (UBM) / Under sleeper pad (USP) or any other proposed material for ballast thickness reduction

1. The current ballast thickness on Indian Railways is of the order of 300 mm to 350 mm on important lines on BG with 1673mm gauge. A typical track profile & sleeper profiles are available in annexure D & E respectively. The UBM/USP or any other proposed material should be capable of substantially reducing thickness of ballast cushion on a normal BG track on embankment & for special locations i.e. tunnels, ballast Deck Bridge.

2. Indian Railway is also planning to use wider & heavier PSC sleepers for 25T axle load. This sleeper has 7% more base area of 7132.5 cm^2 as compared to base area of existing sleeper as 6662.5 cm^2 which can accommodate bigger size USP. The USP/UBM/or any other proposed material shall be capable of substantially reducing thickness of ballast cushion in both cases for wider sleeper (sleeper profile at Annexure-F) and normal sleeper (Annexure-E) without causing any adverse effects on ballast & formation pressure, lateral & longitudinal track resistance, track settlement, retentively of track geometry etc. in comparison to full ballast cushion. Cost of USP along with other relevant data mentioned in subsequent paras are to be given in reference to normal sleeper & wider sleeper both.

3. The UBM/USP or any other proposed material, when provided in the track, should be able to substantially reduce the ballast thickness requirement on Indian Railway tracks from existing 300/350 mm without compromising or adversely affecting the functional, safety and structural performance of track for supporting/carrying passenger traffic (axle load of 21T) for a maximum speed of 160 kmph as well as freight traffic (axle load of 25 T) at 100 kmph. The proposed system can preferably be either UBM or USP or a combination of both or any other proven material on any world Railway system.

4. The use of UBM/USP or any other proposed material when provided with reduced ballast cushion. It should not adversely affect :

    i) The drainage which is available with the conventional ballasted track.
    ii) It must not adversely reduce the lateral or longitudinal resistance of the track for functioning of LWR/CWR.
    iii) it should not adversely increase the maximum pressure at the top of formation vis-à-vis the pressure with full ballast section (300/350 mm) & must not adversely increase the track/formation settlement .
    iv) It must not affect adversely other track components i.e. sleeper, rail, fastening components in terms of increased stresses & service life when compared to track with full ballast cushion of 300/350mm ballast.
    v) The above may be demonstrated by the applicant either through detailed calculation/FEM modeling/study or through a certificate from any established railway user for similar conditions.

5. The UBM/USP/other proposed material should be easy to handle, quick to install, maintain & withstand the passage of heavy construction equipments.

6. The combination of USP & UBM /other proposed material should not lead to unpredictable & unsafe behavior of track stability, ballast & track components.

7. In Indian Railways the frequency of machine tamping is once in a two years or passage of 100 GMT of traffic whichever is earlier. The firm/JV should bring out if there will be any significant decrease/increase in tamping requirement with the introduction of proposed USP/UBM/other material with reduced ballast cushion. The USP/ UBM or other proposed material should not get damaged during tamping / deep screening process.

8. The requirement of formation condition/parameters should be mentioned for effective use of UBM/USP/other proposed material for ballast reduction purpose.

9. The required friction between the UBM/other proposed material and ballast should be ensured. The UBM/other proposed material should preferably also be able to provide reduction of impact on structures, premature ballast degradation etc.

10. The requirement of the gluing if any the UBM with substructure in order to avoid any sliding of the UBM during installation or during ballast cleaning is to be given. Provision of any other material viz. Geo-textile, Geo-grid with/without UBM, if any should be mentioned along with material details & their purposes.

11. The surfaces of UBM may also be suitably reinforced/ protected with the protective layer to prevent penetration of ballast into UBM.

12. The UBM/USP/other proposed material must maintain their physical properties for ambient temperatures ranging between -5° to 50°C and should

be termite resistant. The proposed system should be able to function effectively under varying Indian Climatic Conditions.

13. There should not be use of any binding agent / binders in the UBM /USP/other proposed material and manufacturing of UBM / USP/other proposed material using reprocessed / recycled rubber or polymer is preferably not allowed.
14. Wherever required, necessary sketches/photo/drawings etc. should be given along with description for better understanding of the system and components.
15. Relevant mechanical properties & test values for USP/UBM/other proposed material should be given as per relevant international railway standards viz ASTM / EN/DIN/ DB codes or as per International practices
16. Basic constituent material, brief specification, colour & other materials used in USP/UBM/other proposed material should be mentioned.
17. Life expectancy of UBM/USP/other proposed material under laid condition should be given in terms of years and traffic carried (GMT) along with supporting test codes. The typical deep screening period over Indian Railways is at least once in ten year or 500 GMT whichever is earlier. The service life of UBM should preferably be matched with deep screening cycle/cycles.
18. Expected change in track elasticity (track modulus) due to introduction of USP/UBM/other proposed material in replacement of ballast cushion should be mentioned.
19. Value of stiffness of proposed USP for Indian condition should be given. Composite grooved rubber sole pad (CGRSP) having static stiffness of approximately 110 KN/mm & normal grooved rubber sole pad of stiffness of approximately 200 KN/mm being are used presently in Indian Railways. Method of measurement of track stiffness with USP may also be given as per relevant test codes. Any special requirements such as desirable values of rail pad stiffness etc. in combination with proposed UBM/USP/other material may also be mentioned.
20. The values of bedding modulus of proposed UBM may be given along with the expected dynamic track vertical deflections under passing loads. The detail of UBM e.g. very soft/ soft/medium/ hard (as per UIC Code) suggested for Indian Railway context preliminary for ballast thickness reduction purpose is to be brought out.
21. Minimum requirement of ballast cushion depth with proposed system should be mentioned.
22. Firm/JV may submit the actual behavior of track like track settlement, increased deep screening cycle, better track riding quality, saving in terms of ballast etc. wherever USP/UBM/other proposed material have been provided by them in past from user railways. Any previous case where USP/UBM/other proposed material are provided preliminary for ballast thickness reduction may be given along with the performance certificate from user Railway system.
23. Minimum length of transition required between track with USP/UBM/other proposed material and normal track may be submitted. The characteristics of USP/UBM/other proposed material & its composition suggested for transition zone is to be given & transition zones to be illustrated by means of drawings.

C. LIST OF DOCUMENTS TO BE SUBMITTED

Following documents are required to be submitted in the EoI:

(i) Drawings (minimum A3 size) of each component & as in track assembled condition and specifications of UBM/USP or any other proposed material
(ii) Supply made in last 3 years and in current year in the format given at 3.2 (i) of **Annexure-A**.
(iii) Drawing, specification, name of railway, length of work executed, year of laying.
(iv) Certificate of satisfactory working performance from the Customer/User, or study report in this regard for case of ballast reduction, if any.
(v) Design, drawings & laying procedure, construction methodology giving brief of activities.
(vi) Estimated cost of material (component wise) & installation/fixing cost per meter run & per sq m.
(vii) All the details stipulated under Para A&B of Annexure "C".
(viii) ISO/ equivalent Certificate, if any.

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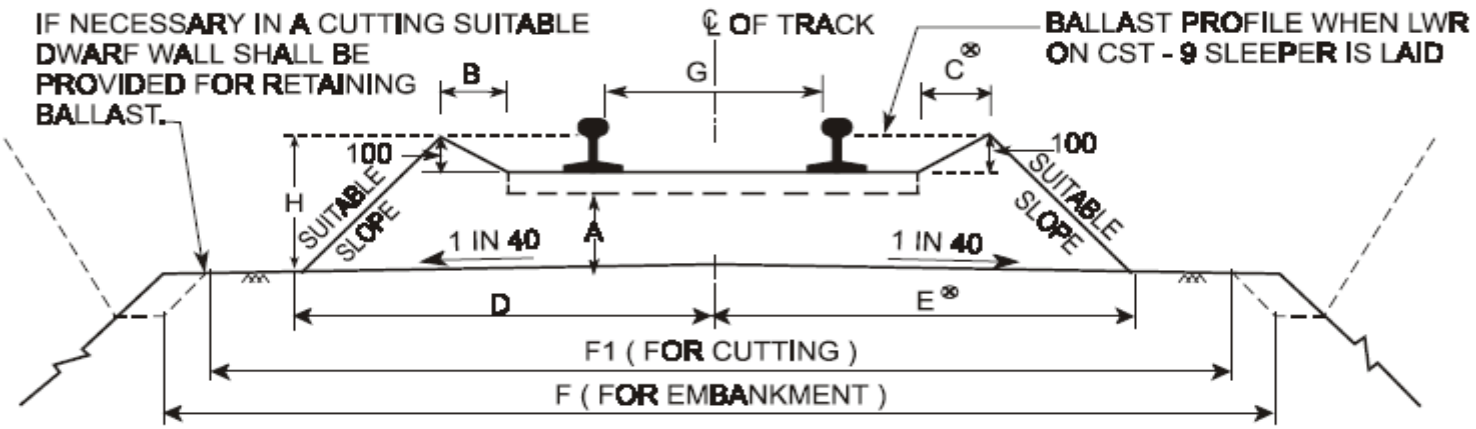
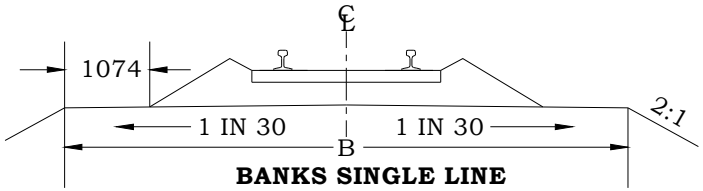
Annexure – D

BALLAST PROFILE FOR LWR TRACK (SINGLE LINE B.G.)

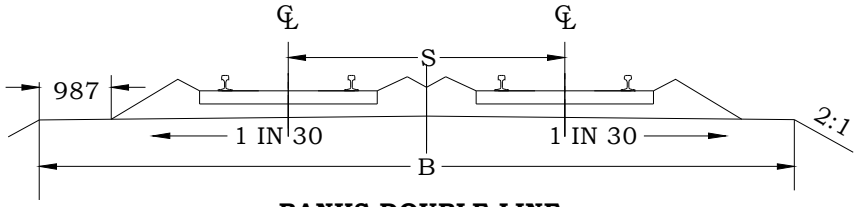


G Gauge	Type of Sleeper	A	B	C*	D	E*	F	F1	H	Quantity of Ballast per meter in		Remarks
										Straight Track	Curved Track	
1676 mm	Wooden	250	350	500	2,270	2,420	6,850	6,250	540	1.682 M³	1.646 M³	1. The Minimum Clean Stone Ballast cushion below the bottom of sleeper i. e., A–250 mm.
	"	300	"	"	"	"	"	"	590	1.782 "	1.853 "	2. For routes where increase in speeds are to be more than 130 Km.p.h. A–300 mm. or 200 mm. along with 150 mm. of sub-ballast.
	"	¶	"	"	"	"	"	"	640	1.982 "	2.060 "	
	Steel Trough	300 ¶	350	500	2,280	2,430	6,850	6,250	550	1.762 M³	1.827 M³	3. Suitable dwarf walls shall be provided in case of cuttings, if necessary for retaining ballast.
			"	"	"	"	"	"	600	1.962 "	2.035 "	
			"	"	"	"	"	"	650	2.162 "	2.242 "	
	PRC	250	350	500	2,360	2,510	6,850	6,250	630	1.954 M³	2.032 M³	4. *On outer side of curves only.
	"	300	"	"	"	"	"	"	680	2.158 "	2.243 "	5. Cess may be widened where required depending on local conditions and outside of curves.
	"	¶	"	"	"	"	"	"	730	2.362 "	2.455 "	
	2 Block	250	350	500	2,360	2,510	6,850	6,250	630	2.110 M³	2.193 M³	6. All dimensions are in mm.
	"	300	"	"	"	"	"	"	680	2.314 "	2.405 "	7. ¶ 200 over 150 Sub-Ballast.
	"	¶	"	"	"	"	"	"	730	2.518 "	2.616 "	

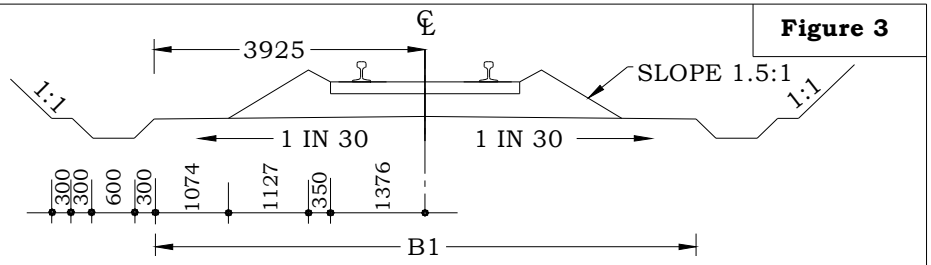
Figure 3



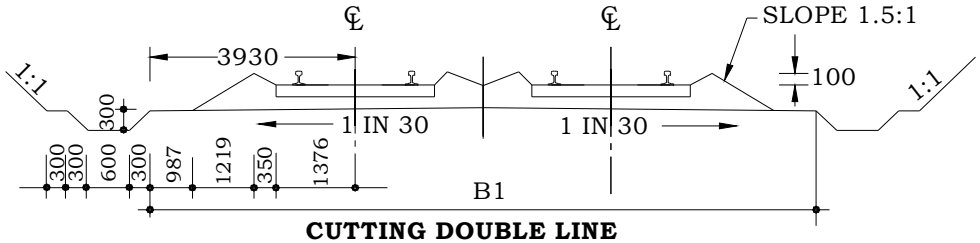
BANKS SINGLE LINE
DIAGRAM 1



BANKS DOUBLE LINE
DIAGRAM 2



CUTTING SINGLE LINE
DIAGRAM 3



CUTTING DOUBLE LINE
DIAGRAM 4

NOTES:

1. ALL DIMENSIONS SHOWN IN THE DIAGRAMS ARE IN mm.
2. ON BG AND MG DOUBLE LINES, THE MINIMUM FORMATION WIDTH IS BASED ON DISTANCE (S) BETWEEN TRACK CENTRES OF 5.30m AND 3.96m RESPECTIVELY.
3. IN FLAT TERRAINS THE HEIGHT OF BANK/DEPTH OF CUTTINGS SHOULD PREFERABLY BE NOT LESS THAN 1m FOR ENSURING GOOD DRAINAGE, FORMATION STABILITY AND TO AVOID TRESSPASSING.
4. THESE DIMENSIONS ARE BASED ON A BALLAST CUSHION OF 35cm.
5. THESE DIMENSIONS ARE ALSO APPLICABLE IN CASE OF ALL NEW LINES BECAUSE OF THE POSSIBILITY OF USE OF CONCRETE SLEEPER AT A LATER DATE.
6. ON CURVES THE FOLLOWING INCREASE IN FORMATION WIDTHS SHALL BE MADE:-
   (1) FOR EXTRA BALLAST CUSHION ON OUTERSIDE OF THE CURVE 0.15m ON SINGLE LINE AND 0.30m ON DOUBLE LINE (INCLUDING 0.15m INCREASE IN TRACK CENTRES).
   (2) FOR EXTRA CLEARANCE REQUIRED ON DOUBLE LINE DUE TO EFFECT OF SUPER-ELEVATION ETC. AS STIPULATED IN APPENDIX TO THE SCHEDULE OF DIMENSIONS FOR BG./MG.
7. FORMATION WIDTH HAS BEEN CALCULATED ASSUMING A BALLAST SIDE SLOPE OF 1.5:1.
8. WIDTH OF CUTTING WILL HAVE TO BE ADEQUATELY INCREASED TO ACCOMODATE DESIGNED FILL OF BLANKET MATERIAL.

GAUGE	MINIMUM FORMATION WIDTHS			
	IN BANKS (B)		IN CUTTINGS (B1)	
	SINGLE LINE	DOUBLE LINE	SINGLE LINE	DOUBLE LINE
BG 1676 (for existing lines)	6.85m	12.16m	6.25m	11.55m
BG 1676 (for all doublings, gauge conversions & new lines)	7.85m	13.16m	7.85m	13.16m
MG 1000	5.85m	9.81m	5.25m	9.21m

NOT TO SCALE

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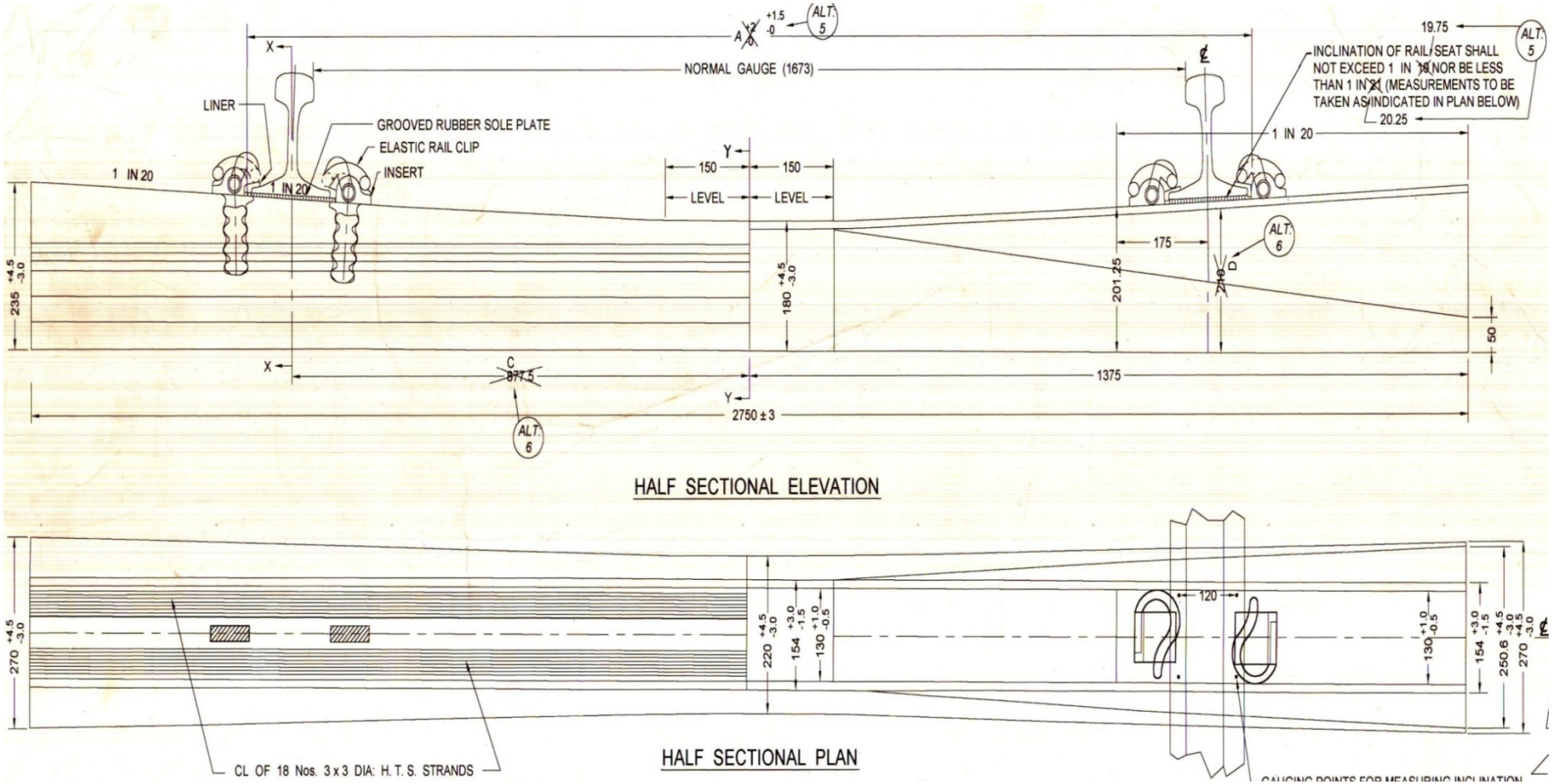
MINIMUM RECOMMENDED FORMATION WIDTHS FOR BANKS/CUTTINGS FOR CONCRETE SLEEPER TRACK

DRG.NO: GE/SK/GL/128/Rev.2/2015

Annexure – E

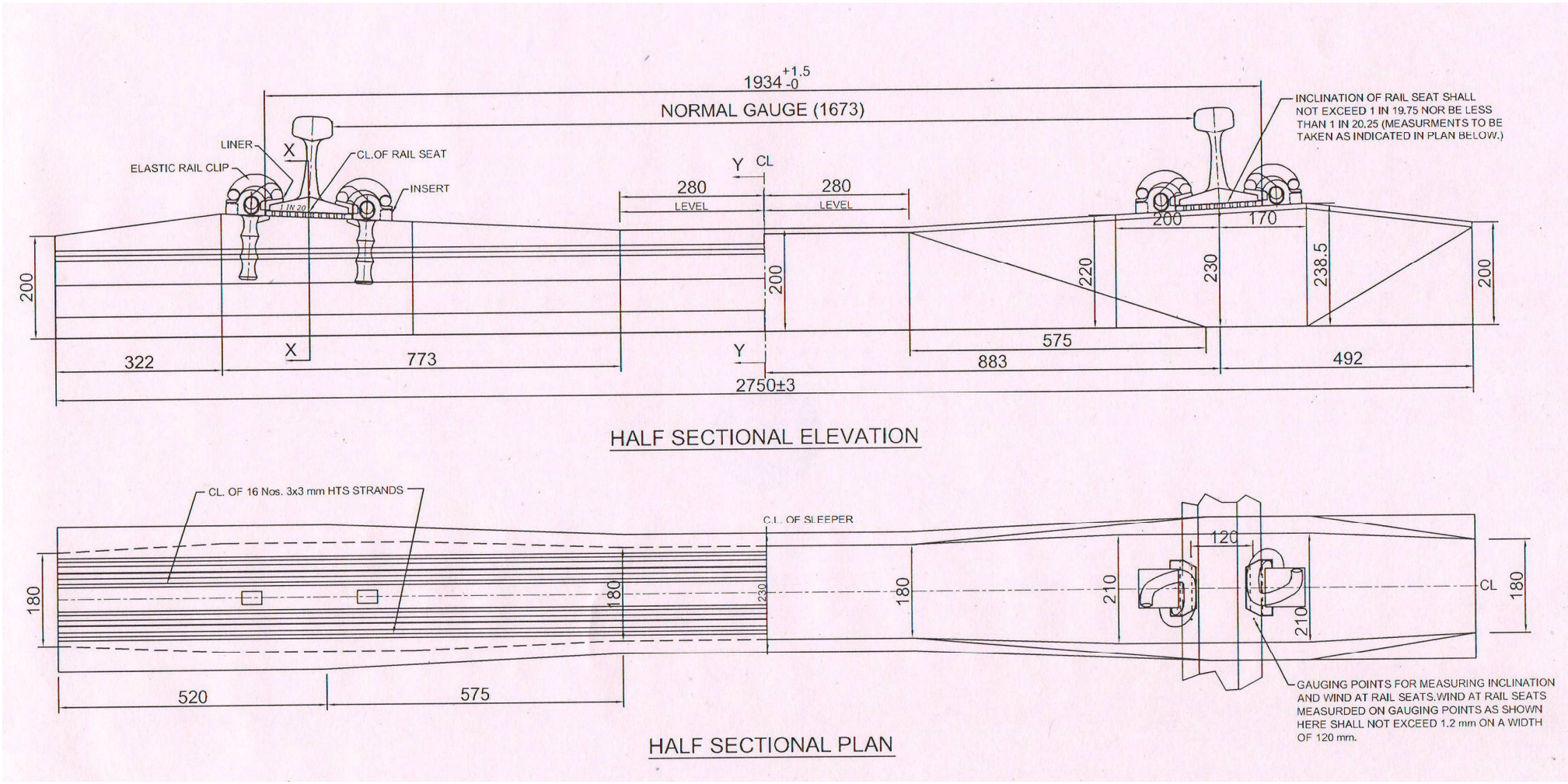
Normal Broad Gauge Line Concrete Sleeper in use on Indian Railways



Weight of normal concrete sleeper = 267 Kg

Annexure-F

25T axle load wider & Heavier Concrete Sleeper for Indian Railways



Weight of wider concrete sleeper = 332 Kg