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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

**SPECIFICATION
FOR
MECHANICALLY PRODUCED
BLANKETING MATERIAL
FOR RAILWAY FORMATIONS
INCLUDING
GUIDELINES FOR LAYING**

SPECIFICATION No. : GE: IRS -2 (Final)

July - 2005

**Geo-technical Engineering Directorate,
Research Designs and Standards Organisation
Manak Nagar, Lucknow – 11**

PREFACE

This report is prepared on the basis of literature survey and field investigation. Views expressed in this report are subject to modification from time to time in the light of future developments on the subject and as such do not represent the views of the Ministry of Railways (Railway Board), Government of India.

(Nand Kishore)
Executive Director/Geotech. Engg,

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Specification for Mechanically Produced Blanketing Material for Railway Formations including Guidelines of Laying

Scope: This specification and guidelines are applicable for supply and laying of mechanically produced blanket material for use on railway formations alongwith its manufacture, transportation, compaction, testing, acceptance and measurement.

1.0 Definitions:

- 1.1 Formation:** An earthen structure of specified dimensions, both for cuttings and for embankment.
- 1.2 Blanket:** Blanket is a layer of specified coarse, granular material of designed thickness provided over full width of formation between subgrade and ballast (as shown in sketch –A).
- 1.3 Mechanical Production:** Production of blanket material from naturally available raw material at a plant.
- 1.4 Blending:** Mechanical mixing of more than one natural or mechanically produced granular soil material in tentatively predefined ratio in order to get final product of desired properties

2.0 Functions of Blanket Layer:

- a) It reduces traffic-induced stresses to a tolerable limit on the top of subgrade, thereby, prevents subgrade failures under adverse critical conditions of rainfall, drainage, track maintenance and traffic loadings.
- b) It prevents penetration of ballast into the subgrade and also prevents upward migration of fine particles from subgrade into the ballast under adverse critical conditions during service.
- c) It facilitates drainage of surface water and reduces moisture variations in subgrade, thereby reducing track maintenance problems.
- d) It prevents mud pumping by separating the ballast and subgrade soil. Thus, accumulation of negative pore water pressure in the soil mass is avoided which is responsible for mud pumping.

The quality of blanket material, as specified in these Guidelines, would carry out the above functions satisfactorily.

3.0 Provision of Blanket Layer

To avoid failure of track formation due to inadequate bearing capacity and to safeguard against swelling and shrinking, adequate blanket thickness must be provided in all cases at the time of construction of new lines, permanent diversions, raising of formation, in cuttings etc. or while rehabilitating a failing track formation.

3.1 Depth of Blanket Layer:

Depth of blanket layer of specified material depends primarily on type of subgrade soil and axle load of the traffic.

3.1.1 Depth of blanket to be provided for axle load upto 22.5 t different types of subgrade soils (describing top one meter thickness) has been given as under. In case more than one type of soil exists in top one meter then soil requiring higher thickness of blanket will govern.

a) Following soils shall not need blanket:

- Rocky beds except those, which are very susceptible to weathering e.g. rocks consisting of shales and other soft rocks, which become muddy after coming into contact with water.
- Well graded Gravel (GW)
- Well graded Sand (SW)
- Soils conforming to specifications of blanket material.

Note: Soils having grain size curve lying on the right side of the enveloping curves for blanket material like cobbles and boulders may/may not need blanket. In such cases, need of blanket and, its design should be done in consultation with RDSO.

b) Following soils shall need minimum 45cm thick Blanket:

- Poorly graded Gravel (GP) having Uniformity Coefficient more than 2.
- Poorly grade Sand (SP) having Uniformity Coefficient more than 2.
- Silty Gravel (GM)
- Silty Gravel – Clayey Gravel (GM – GC).

c) Following soils shall need minimum 60cm thick Blanket:

- Clayey Gravel (GC)
- Silty Sand (SM)
- Clayey Sand (SC)
- Clayey Silty sand (SM-SC)

Note: The thickness of blanket on above type of soils shall be increased to 1m, if the plasticity index exceeds 7.

d) Following types of soils shall need minimum 1m thick Blanket :

- Silt with low plasticity (ML)
- Silty clay of low plasticity (ML-CL)
- Clay of low plasticity (CL)
- Silt of medium plasticity (MI)
- Clay of medium plasticity (CI)
- Rocks which are very susceptible to weathering

- 3.1.2** Soils having fines passing 75 micron sieve between 5 & 12% i.e. for soils with dual symbol e.g., GP-GC, SW-SM, etc., thickness of blanket should be provided as per soil of second symbol (of dual symbol) as per para 3.1.1 . For example, if the soil of the subgrade over which the blanket is to be provided is classified as GP - GC then blanket depth for GC type of soil i.e. 60 cm as per para 3.1.1 (c) is to be provided.
- 3.1.3** Use of geo-synthetics can be considered at places where it is economical to use in combination with blanket as it reduces the requirement of thickness of blanket. It may be particularly useful in cases of rehabilitation of existing unstable formation and in new construction where availability of blanket material is scarce. Use and selection of geo-synthetics should be done in consultation with RDSO.
- 3.1.4** For other types of soil required to be used in subgrade not covered by above clauses, Railway may approach RDSO for getting guidance on deciding blanket thickness depth.
- 3.1.5** It may be a good practice to adopt one thickness of blanket layer over one block section (Based on poorest soil condition). However, where there are obvious soil variations spread over large stretches within the block section, layer thickness for blanket may be changed at natural boundaries, such as major bridges, level crossings, beginning or end of a long cutting etc.

4.0 Specifications of Mechanically Produced Blanket Material:

- 4.1** Blanket material produced in a plant should generally conform to following specifications:
- a) It should be coarse, granular and well graded.
 - b) Skip graded material is not permitted.
 - c) Non -plastic fines (particles of size less than 75 micron) are limited maximum to 12%, whereas plastic fines are limited maximum to 5%.
 - d) The blanket material should have particle size distribution curve within one of the bands of enveloping curves shown in sketch –B or the percent passing of the material through each IS sieves should lie between the upper and lower limit of blanket material as given in the Table 1.
 - e) The material should be well graded with C_u & C_c as under:
 Uniformity coefficient, $C_u = D_{60}/D_{10} > 7$
 Coefficient of curvature, $C_c = \frac{D_{30}^2}{D_{60} \times D_{10}}$ between 1 and 3
 - f) Particle size distribution must follow one of the gradation ranges tabulated below.

Table 1: Particle size distribution ranges for different grades of blanket material

S.No	IS Sieve size	Grade A	Grade B	Grade C
1.	40 mm	100	95-100	95-100
2.	20 mm	100	93-100	80-100
3.	10 mm	95-100	85-95	65-85
4.	4.75 mm	92-99	70-92	43-70
5.	2 mm	65-90	46-65	22-46
6.	600 micron	33-50	22-33	08-22
7.	425 micron	28-40	18-28	05-18
8.	212 micron	16-27	10-16	00-10
9.	75 micron	00-12	00-10	00-08

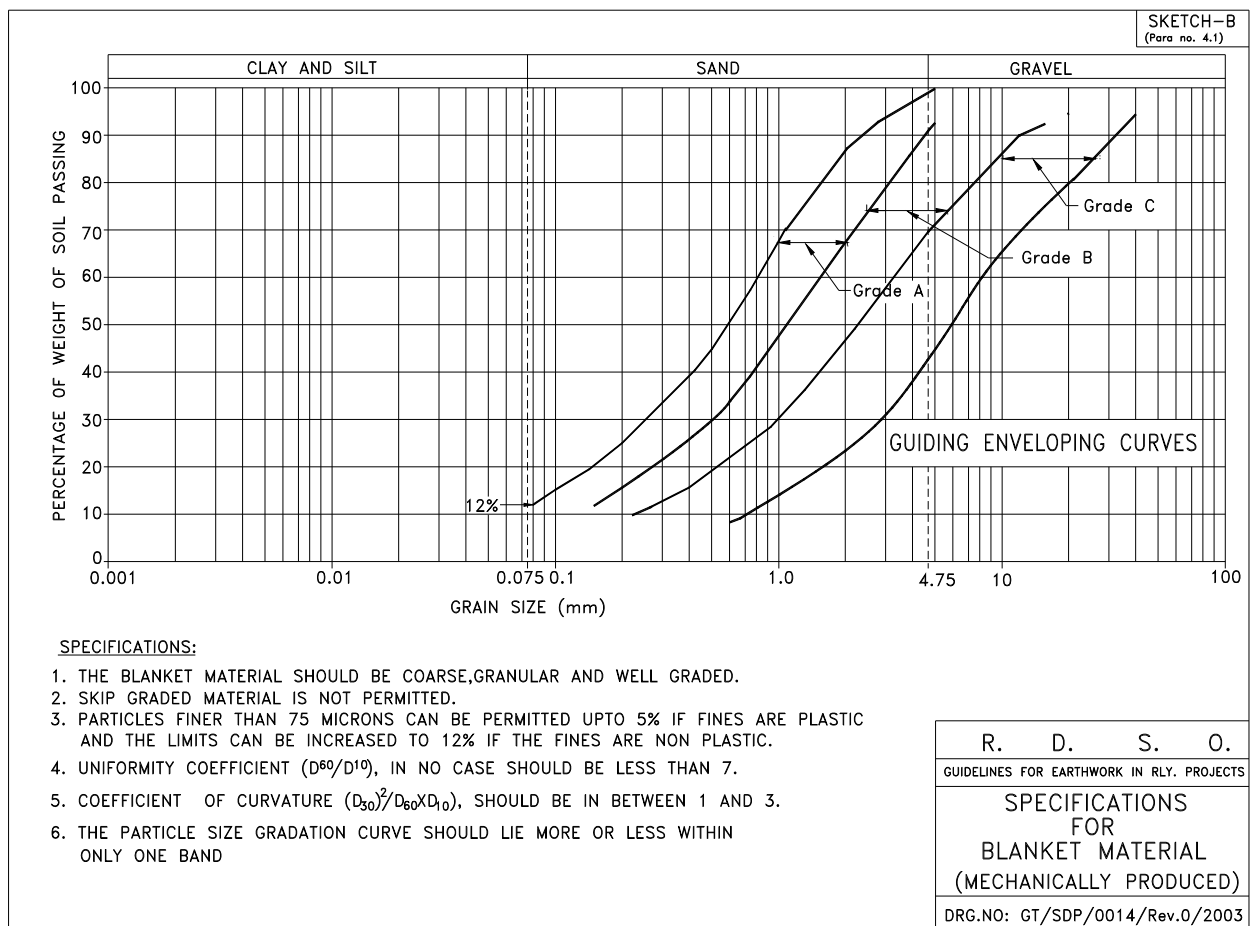


Fig 1: Graph showing the different enveloping curves for different grades of blanket material

5.0 Selection of Blanket Material:

Depending on the source of material, the blanket material can be categorized in the following categories:

- Natural material
- Machine manufactured material
 - Crushed material
 - Blended material

5.1 Proper survey of area close to projects needs to be carried out to identify suitable sources of blanket material required for the project. Aim of such source identification survey is to use naturally available material, or select alternatives of machine manufactured blanket material through crushing, blending or a combination, which is cheap and conforms to the specifications laid down.

5.2 The parent material of the blanket material so chosen should be chemically inactive and sturdy in normal working environment. Brickbats, factory slag, weak dissolvable stones like lime, shale, laterite etc. need not be selected as blanket material.

5.3 The choice of gradation as provided in 4.1(f), above, may be exercised judiciously, based on the availability of material. It may be advisable to choose the grade A for finest subgrade soils (requiring 1.0m thick layer of blanket), and grade B or C for coarser subgrades (requiring less thickness of blanket).

6.0 Mechanical Production:

6.1 Crushing Methodology:

In the event of non-availability of natural source of blanket material, depending on the proximity of project site from the parent rock/boulder sources, it may be decided to crush the rock/boulder in order to produce crushed blanket material. Salient features of this methodology are:

- Crushed blanket material may be produced as sole product or in conjunction with ballast or any other nominal size.
- Trials and permutations of feed speed, crushing cycle, sieve combinations may be required to arrive at the required particle size gradation.
- It is possible achieve near total produce of desired gradation through cycle management. Alternately, it may be possible to get by-products of other sizes in the desired proportion and blanket material as main produce or vice-versa.
- Optimisation of production rates and costs can be achieved by controlling the output at each sieve stage.

- It is ideal to mix the required quantity of water for OMC (accounting for loss/gain of moisture due to weather conditions) at the crusher plant and transport the material in wet condition.
- Quarry dust or natural by-product of production of higher size coarse aggregates may themselves be suitable for use as blanket material. In all such cases, where large scale crushing is taking place for production of ballast, trials may be conducted to arrive at ideal particle size gradation of the by-product also.

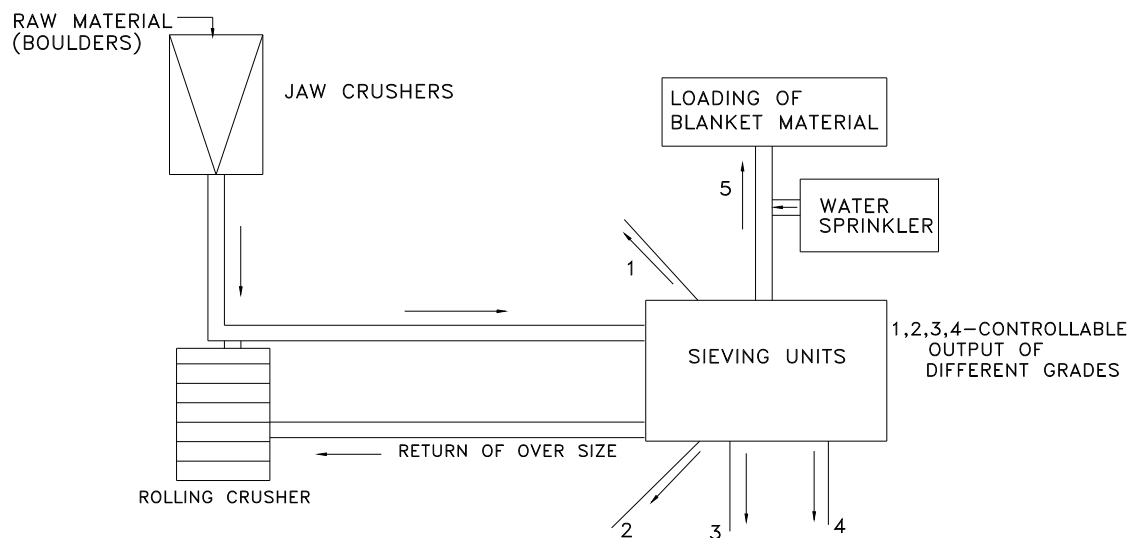


Fig.2 SCHEMATIC DIAGRAM OF MANUFACTURE OF BLANKET MATERIAL BY CRUSHERS

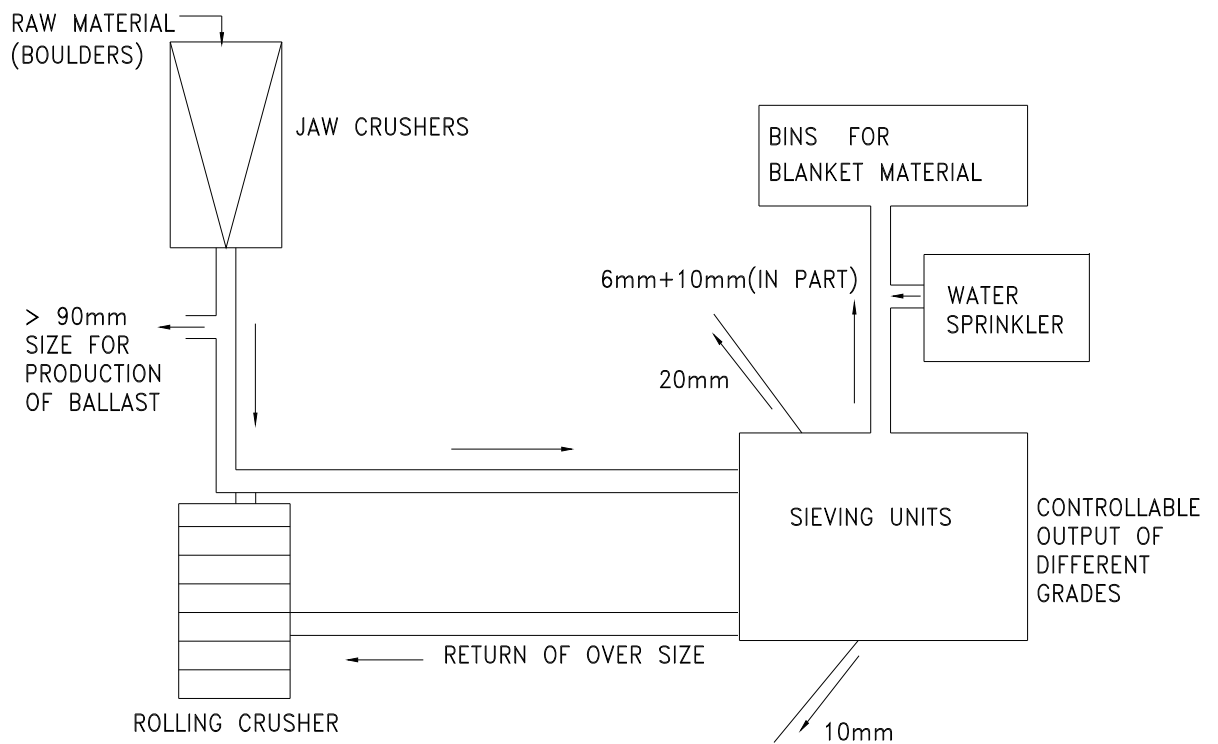
6.1.1 Case study :

Site visit was carried out in the month of May 2005 at Chandigarh to inspect crushing methodology for production of blanket material. Details collected are as follows:

- | | | |
|------|--|---|
| i) | Name of crusher owner: | Hargobind stone crusher |
| ii) | Address: | Burjkotian, Chandimandir, Panchkula, Chandigarh |
| iii) | Make of crusher: | Gurudev, Lalkuwan, Delhi |
| iv) | Source of stone: | River Ghaggar |
| v) | Plant capacity: | 830 cft/hour (Approximately) |
| vi) | Approximate cost: | 22 lakh |
| vii) | Number of persons for operating the plant: | 10 labourers, 1 foreman, 2 helpers |

- viii) Storage capacity : 4000 cubic feet
- ix) Power: 5 HP to 7HP
- x) Alternative power supply : Can be operated by 320 KVA Generator
- xi) Number of bins: Three
- xii) Number of sieve combination: Three of 20 mm, 10 mm & 6 mm sizes
- xiii) Tank (For water): For wet mixing facilities

The schematic diagram of for production of blanket at this crusher is given below:



SCHMATIC DIAGRAM OF MANUFACTURE OF BLANKET MATERIAL BY CRUSHERS

Some of the photographs of crusher site are as below:



VIEW OF STORAGE BIN



6.2 Blending Methodology:

6.2.1 Blanket material could be obtained by proper blending of two or more soils or in combination with soils and crushed material like stone chips or quarry dust.

6.2.2 Before approving such sources, trials for blending to judge the final product, needs to be done. Detail methodology of blending to be adopted to produce large quantity of blanket material with consistent quality, needs also to be laid down in advance.

- Blending of either natural or crushed materials in a pre decided ratio could be adopted.
- Theoretical and laboratory trials are required in order to establish the desirable ratio of the blending materials. This exercise may be done in advance before finalizing the contracts for such a material. The methodology of blending trials is explained below:
 - Identify the usable materials/soils.
 - Take equal weight of the soils for sieve analysis.
 - Write down the weight retained at each sieving stage for all the soils.
 - Apportion a percentage component to each soil and work out a theoretical mix.
 - Draw particle size distribution curve of the mix to find out desirability of gradation.
 - If not successful, make another trial, and so on.
 - Trials and plotting work can also be done using simple computer programs.

6.2.3 Mechanical blenders using simple technology are now available in the market. Two types of mechanical blenders are quite common:

- i) **Drum type blenders:** Drum type machines may involve weigh batching or manual feeding of material. They involve more moving parts. Hence, these machines are both manpower and maintenance intensive. They may pose a problem of segregation of material and as such do not afford any cost advantage either in the short or long run. These may be suitable for small quantities and not for large-scale production as required in construction projects.
- ii) **Pug mill type blenders:** For continuous production of mix in large quantities, the best way is to feed the aggregates/ soils of pre decided gradation by way of 3 or 4 bins with conveyor belt. The required output grading can be achieved by adjustment of gate openings of bins. The use of pug mill type blenders is found very cost effective, as the manpower involvement is very little and only 4-5 people can run a plant of 100 tph. The pug mill blender consists of:
 - 1) Four bin aggregate unit
 - 2) Pug mill mixer unit
 - 3) Water tank and metering system
 - 4) Conveyor belts
 - 5) Storage silos (optional)
 - 6) Anti segregation surge hopper
 - 7) Automation and controls

A schematic diagram showing the various arrangements is shown below:

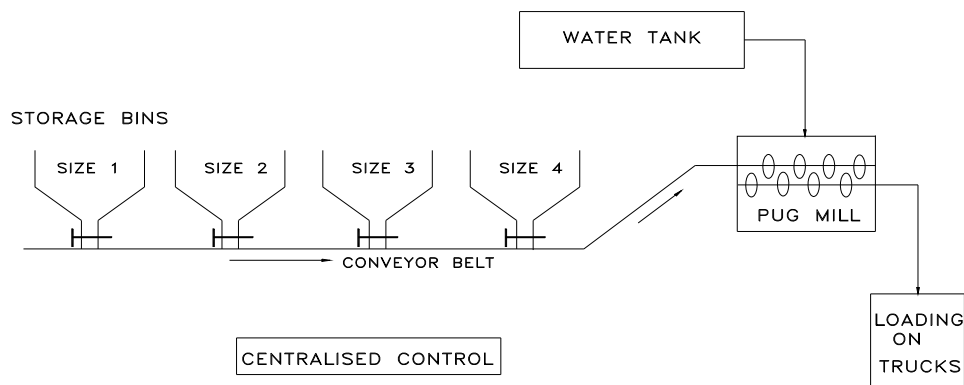


Fig. 3 SCHEMATIC DIAGRAM OF MANUFACTURE OF BLANKET MATERIAL BY BLENDING

The other important features of this technology are:

- Automatic feeding of soils/aggregates under gravity,
- Arrangement for precise control of mixing of water,
- Either direct loading into trucks, or optional storage at plant,
- Availability of domestic manufacturers, and low cost of set up,
- Advantage of removal and relocation with ease.

6.2.4 Case study:

NHAI project site between Sultanpur-Utratia Bye Pass Road, near Lucknow was visited in the month of June 2005 in connection with production of blanket by blending. Details collected are as follows:

- | | | |
|--------|---|---|
| (i) | Name of work executing agency: | Atlanta |
| (ii) | Address: | Amar Saheed Path, Lucknow |
| (iii) | Makes of blender: | Gujrat Appolo Equipment
Ahemdabad |
| (iv) | Plant capacity: | 160 ton per hour |
| (v) | Approximate cost: | 50 lakhs |
| (vi) | Number of persons
for operating the plant: | 7 |
| (vii) | Alternative Power supply: | Can be operated by 125 KVA
Generator |
| (viii) | Number of bins: | Four |
| (ix) | Salient features: | Four bins, pug mills, wet mix
computerized blender |

The photograph of the wet mix plant (Pug mill blender) is shown as below:



COMPUTER CONTROLLED BINS FOR MIXING



BLANKET MATERIAL BEING LOADED INTO TRUCK

6.2.5 The equipment for blending should enable blending of two or more materials uniformly so that the blended material satisfies the specification. The equipment chosen should be cost effective and easy to handle with and efficient. Some of the available mixers/blenders based on market survey & internet search are given in Annexure- I.

7.0 Quality Control on Blanket Material at production site:

7.1 The source of blanket material, detailed in para 5, needs to be identified based on tests & studies conducted and conformity of the material to the Specification as laid down in para 4.

7.2 It is desirable to have a check on quality of material at source/manufacturing point so that major deviation in quality of the material being sent to site does not exist. It would be in the interest of the supplier to have such tests conducted on his own to avoid any complication at a later stage.

7.3 The frequency of such test could be laid down by the engineer in-charge, if need be. In the absence of any other instructions, at least one test may be performed per day to check the particle size gradation at the point of loading into the trucks. However, the final acceptance of the blanket material should be at the site where it is laid, as per para **7.5**.

7.4 The supplier/ Engineer in-charge may also lay down proforma for 'Incoming Material Register ' to be maintained at manufacturing point for having a control on utilization of different grades of material, especially where blending is done using crushed as well as local material.

7.5 Frequency of Tests at Site: Minimum one test per 500 cum or part thereof.

7.5.1 Method of Test: Blanket material should be tested as per IS: 2720 (Part 4) to plot particle size distribution curve, so as to assess its suitability. It would be necessary to carry out wet analysis to assess actual percentage of fines. To expedite testing work, dry sieve analysis may be carried out if variation between results of dry and wet analysis are not significant and adequate margin exists with respect to acceptance criteria. However, in such cases also, wet analysis has to be carried out at frequent interval to verify the extent of variation. In any situation, acceptance of blanket material would be based on wet analysis only. The sample for wet analysis should be prepared as per para 4.3 of IS: 2720 (Part 4).

7.6 Acceptance Criteria:

The material should generally conform to specification as given at para 4.

8.0 Transportation:

The blanket material should be transported wet after mixing water in order to achieve OMC, in tippers for direct unloading on formation.

9.0 Laying and spreading and Compaction:

- 9.1** The blanket material must be spread with a tractor mounted grader or a paver-finisher in layers of uniform thickness, before allowing compaction.
- 9.2** Compaction to specified levels of RD or percentage of MDD (para **10.4.3**) will be carried out through a number of passes of vibratory rollers of 100-120 kN static weight or equivalent capacity. A combination of vibrating rolling initially and static finishing rolling may be established through trials. Speed of roller shall not exceed 5 km/hr.
- 9.3** Proper control of moisture is required to optimize the compaction effort. Optimum moisture content may be established through Modified Proctor Apparatus (IS:2720, part 8) and moisture may be added by sprinkling at the plant or at site as per the requirement.
- 9.4** Rolling is to be carried out in layers of not more than 300 mm each, following the same camber profile as provided in the subgrade layer and to be maintained upto the top layer.
- 9.5** No provision for uncompacted portion may be made on the edges of embankment. The sides may be hand rammed with a suitable rammer.

Note: The engineer should generally expect to get MDD above 2.1 gm/cc, and OMC in the range of 5-9%, as matter of guidance.

10.0 Quality Control Checks on Finished blanket work:

- 10.1** Degree of compaction of each layer of compacted blanket should be ascertained by measurement of dry density/Relative Density of soil at locations selected in specified pattern. The method of sampling, frequency of tests, method of tests to be conducted and acceptance criteria to be adopted are as under.

10.2 Method of Sampling:

- 10.2.1** The sampling adopted has to be such that effectiveness of proper compaction having been done for the entire area under consideration can be judged. For this, the Engineer in-charge should lay down the method adopted in detail depending on site conditions and accordingly records of checks done are properly maintained. However, in absence of such procedure laid down, following method should be adopted:

- 10.2.2 Suggested method of sampling:** For each layer, a minimum of one sample at a predetermined interval (in compliance with the requirement stated in next para) along the centerline of the alignment would be taken. The checking points may be staggered to the extent possible.

10.2.3 Frequency of Tests: Density check would be done for every layer of blanket material as per following minimum frequency :
At least one density check for every 200 sq.m of blanket layer. (say, every 18 to 30 m for single line, or doubling work and every 12 to 16 m for a double line construction.)

10.3 Method of in-situ dry density measurements:

Any of the following methods could be adopted as per the requirements at site.

Method of measurement	Procedure of test	Parameters to be measured	Remarks
i) Sand Replacement Method	As per IS-2720 (Part 28) 1974	a) Insitu Dry Density b) Moisture content	May be adopted for all type of material
ii) Core Cutter Method	As per IS-2720 (Part 29) 1975	-do-	In some of the coarse-grained soils (with little fines) taking core cutter samples is difficult. In such cases, sand replacement method may be used for density measurement.
iii) Nuclear Moisture Density Gauge	As issued by RDSO	a) Bulk density b) Moisture content c) Dry density d) Degree of compaction	May be used in consultation with RDSO
iv) Compactor meters fitted on roller (On roller continuous compaction control)	As issued by RDSO	As issued by RDSO	May be used in consultation with RDSO.

10.4 Acceptance Criteria:

10.4.1 The material should pass the test criteria laid under clause 7 above.

10.4.2 The blanket material, which contains fines passing 75 micron IS Sieve, upto 5 percent should have the Density Index (Relative Density) a minimum of 70% as obtained in accordance with IS: 2720 (Part 14) – 1983.

10.4.3 For other materials, field dry density should not be less than maximum attainable dry density obtained in field compaction trial. However, in field compaction trial, the maximum attainable dry density should not be less than 98% of MDD values as obtained by Heavy Compaction Test (IS: 2720 (part 8) – 1983) in the laboratory. In case, there are difficulties in achieving 98% of the MDD values as obtained by Laboratory test, in the field trials, the same may be relaxed upto 95% of MDD with the specific approval of Chief Engineer/construction, recording reasons of such relaxation.

10.4.4 During widening of bank in case of gauge conversion and rehabilitation of unstable formation, compaction of blanket layer should be minimum 95% of MDD as obtained by Laboratory test as per Heavy Compaction Test (IS: 2720 (part 8) – 1983) or 70% Relative Density for cohesionless soil (IS: 2720 (Part 14) – 1983).

11.0 Measurement:

11.1 Measurement of blanket material should be done on the basis of finished cross section after the material and workmanship have been accepted as per the above criteria. No deduction is to be made towards voids.

11.2 In very rare cases, where it is not possible to take blanket material on finished subgrade, measurement may be done on the basis of stack measurement with the permission of Chief Engineer in-charge. It may be necessary to frame different schedule items for different methods of measurement. There should be no occasion to change the method of measurement unless specifically provided for in the tender documents duly approved by competent authority.

11.3 Method of measurement in case of stack measurement may be the same as in case of ballast incorporated in "Specification for track ballast-1999".

11.4 It is advisable to tally the quantity and quality measured at site with the ' Incoming Materials Register' maintained at plant (para **7.4**) as a means of double check.

12.0 Side slopes and erosion protection:

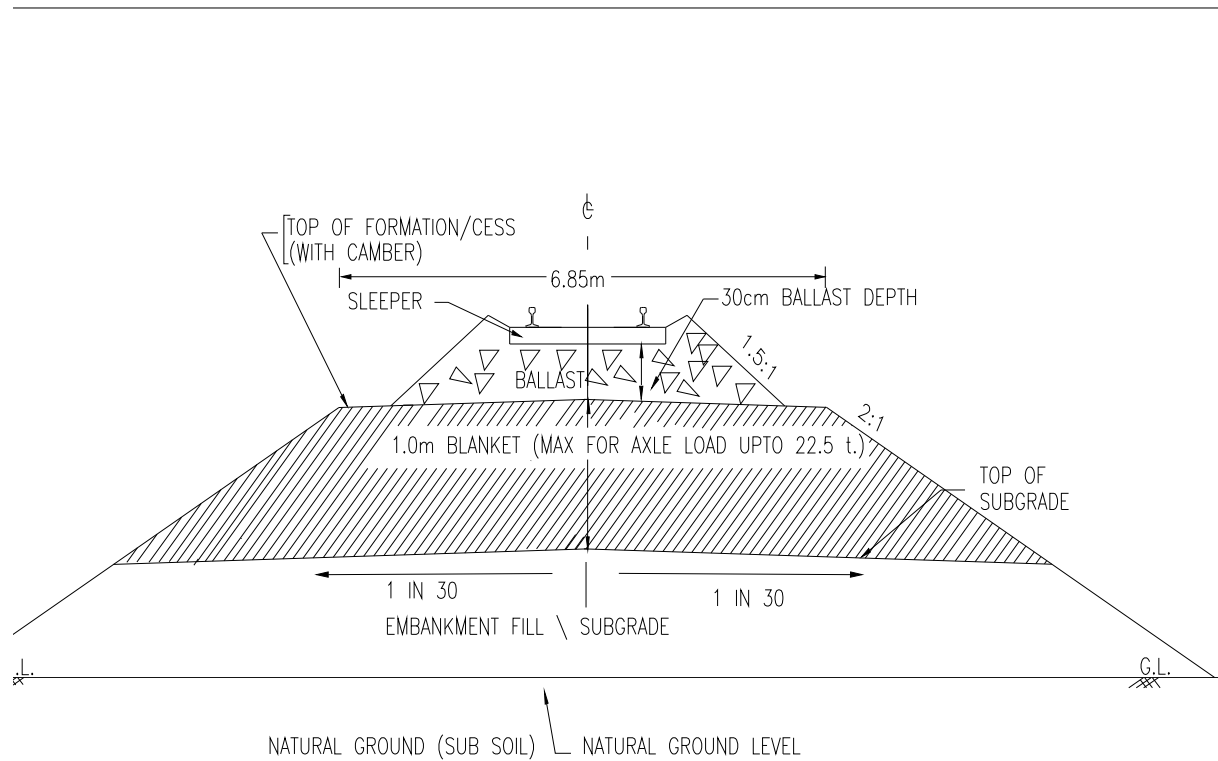
12.1 Embankment:

12.1.1 Side slopes of blanket layer are to be finished to the same slope as designed for the subgrade (formation layer below the blanket), which may be 2:1 in most cases. Normal erosion protection measures, such as turfing may be adopted. However, in some cases it may be necessary to provide geo-jute netting on side slope where normal vegetation/turfing is likely to get delayed because of prolonged dry spell.

12.2 Cuttings:

12.2.1 Where blanket is provided in cuttings replacing the parent material, depth of cutting and side drains is to be so adjusted that the filled material forms an embankment with side slopes of 2:1. Pitching of blanket slope may be planned upto 1.0 m height to check erosion due to flowing water.

12.2.2 In very deep cuttings, where it is not possible to increase the width of cutting due to the costs involved, it may be cheaper to entrench the blanket material. In such cases, proper drainage is to be planned below the subgrade level to drain out water from the bottom of blanket layer.



TRACK STRUCTURE – RAIL, SLEEPER, FASTENING

TRACK FOUNDATION – BALLAST, BLANKET & OTHER CONSTITUENTS

SKETCH-A

NOT TO SCALE

R. D. S. O.
GUIDELINES FOR EARTHWORK IN RLY. PROJECTS
BG TRACK SHOWING THE NOMENCLATURE OF VARIOUS ITEMS
DRG.NO.: GE/SD/0010/Rev.1/2002

Annexure-I

SOME OF THE EQUIPMENT FOR BLENDING AND MIXING

S. No.	Trade Name	Make	Mixing Capacity	Address	E-mail Address	Web-Site Address
1.	GeoMill	Conti	800 tons per hour	<i>Not available</i>	CGentilcore@conticorp.com	www.contienviro.com/geomill
2.	DAKOTA 2250 Blender	DAKOTA Peat & Equipment	250 tons per hour	DAKOTA Peat & Equipment PO Box 14088 Grand Forks, ND 58202 Peat Division: 800-424-3443 Equipment Division: 800-477-8415	sales@dakotapeat.com	www.dakotapeat.com/blending
3.	(i) Twister™ I & II Batch Mixers	Bouldin & Lawson	1-2 cubic yards per batch Up to 6 batches per hour	Bouldin & Lawson, LLC P.O.Box 7177 McMinnville, TN 37111 Phone 931-668-4090 Toll Free 800-443-6398 Fax 931-668-3209	sales@bouldinlawson.com	www.bouldinlawson.com
	(ii) MixMaker™ 10 Mixing System		Up to 12 cubic yards per hour			
	(iii) MixMaker™ 25 Mixing System		25 cubic yards per hour			

	(iv) MixMaker™ Custom Mixing Systems		Upto 150 cubic yards per hours			
4.	EARTHCO Soil Mixer	EARTHCO	ON-SITE SCREENING & BLENDING	EARTHCO Soil Mixer 401 Bowes Rd Concord, ON L4K1J1 Canada t: 416.789.4749 f: 905.738.5228	customerservice@earthcosoils.com	www.earthcosoils.com
5.	LENEXA, KS	FRONTIER EQUIPMENT	ON-SITE BLENDING	Barry E. Nelson 11145 Thompson Avenue Lenexa, KS 66219-2302 Ph: 913-310-8324 Fax: 913-310-8394	NelsonBarryE@JohnDeere.com	www.deere.com
6.	Seaman Travel Mixer (TO730H-K)	Maxon Industries, Inc (SEAMAN, REX, AND PETTIBONE SOIL STABILIZATION EQUIPMENT)	ON-SITE BLENDING	Maxon Industries Inc. 3204W, Mill road, Milwaukee, WI, USA 53209 Phone – 414.351.4000 Fax. – 414.351.9057	sales@maxon.com	www.maxon.com
7.	Scott Equipment Company's Pugmill mixer	Scott Equipment Company	1 to 250 tons of product per hour	Scott Equipment Company - New Prague, MN	<i>Not available</i>	www.scottequipment.com
8.	Ranco Model 5 Soil Blender	RLC Equipment	<i>Not available</i>	P.O. Box 606 Bonita, California 91908-0606	bob@rlcequip.com	www.rlcequip.com

				Telephone - (619) 470-2885 Fax - (619) 267-4553		
9.	Computer-controlled Custom Mixes	Golf Agronomics Supply & Handling (GASH)	<i>Not available</i>	Products & Services 800-626-1359 (N&S Florida) 800-542-9531 (Carolinas) 941-955-4690 (Fax)	gashoffice@aol.com	www.golfag.com
10.	AMADAS Blending Line	Amadas Industries, Inc.	<i>Not available</i>	Suffolk Plant 1100 Holland Rd. Suffolk, VA 23434 (757) 539-0231 Fax (757) 934-3264 Albany Plant 1701 South Slappey Blvd, Albany, GA 31706 (229) 439-2217 Fax (229) 439-9343	amadas@amadas.com	www.amadas.com
11	Drum Mix Plant	Speed Crafts Limited	15-120 ton per hour	Speed Crafts Limited Layak Bhawan Boring Canal Road Patna, Bihar	exports @ speedcrafttsindia.com, info@ speedcrafttsindia.com	<i>Not available</i>
12	30 M Supermobile Concrete Batching Plant	Shakti Industrials	12 to 30 m ³ /h	Shakti Industrials 65, Ganga, Off Marve Road Malad (W), Mumbai 400064	shakti_ind@vsnl.com	<i>Not available</i>
13	Wet Mix Plant	Gujrat Appolo Equipment	160 ton per hour	Gujrat Appolo Equipment Ahemdabad	sales@the-appolo.com	www.apollo.co.in