भारतीय मानक
Indian Standard

IS 14715 (Part 1) : 2016

जूट के भू वस्त्र

भाग 1 सडक के सब ग्रेड को मजबूती प्रदान करने हेतु – विशिष्टि

(दूसरा पुनरीक्षण)

Jute Geotextiles

Part 1 Strengthening of Sub-Grade in Roads — Specification

(Second Revision)

ICS 59.080.70

भारतीय मानक ब्यूरो
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FOREWORD

This Indian Standard (Part 1) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Geosynthetics Sectional Committee had been approved by the Textile Division Council.

This standard was first published in 2000 and subsequently revised in 2013. This standard has been again revised to incorporate the following major changes:

a) Requirements for weave, ends/dm, picks/dm, mass, tensile strength, elongation, permittivity and apparent opening size for woven jute geotextiles have been modified.
b) Method of test for puncture resistance has been modified.
c) Requirement for tear strength for woven jute geotextiles has been excluded.
d) Requirements for elongation, permittivity and apparent opening size for non-woven jute geotextile have been modified.
e) Requirements for puncture resistance and tear strength have been excluded.

This standard has been published in two parts. The other part in the series is:

Part 2 Control of bank erosion in rivers and waterways — Specification

Poor sub-grade often causes pavement-failure as strains accumulate under repeated dynamic loads of traffic. It often happens that the materials in the sub-base course of the pavement get intermixed with the sub-grade reducing the required depth of the pavement decided on the basis of class of loading *vis-à-vis* California Bearing Ratio (CBR). A poor sub-grade may also cause lateral displacement of the sub-grade and the base materials under loads. Insufficient drainage of the surface water and also the entrapped moisture/water within the sub-surface layers along with the seepage of water from the sides often lead to road failure.

Jute geotextiles (JGT) can tackle all these problems effectively by segregating different layers of a road pavement, preventing movement of the sub-grade soil (soil-tightness) and facilitating filtration through it, leading to enhancement of CBR percentage of the sub-grade.

Concurrent functioning of separation, filtration and drainage causes the sub-grade soil to consolidate. Separation by a suitable woven JGT prevents interpenetration of the soil particles from the underlying layer (sub-grade) into the base course and aggregates from the overlying layer (base course) into the sub-grade. A properly designed woven JGT with the right porometric features and tensile strength ensures 'sand tightness' on the one hand and release of the entrained water from the sub-grade through the pores of the fabric (permittivity) and along the plane of the fabric (transmissivity). High hygroscopicity of jute facilitates transmissivity by acting as a drain within its own thickness.

Comparatively low elongation at break of jute also helps in enhancing the membrane effect and causes an upward reaction to develop to counteract the downward moving load of the road.

Non-woven JGT can be used to advantage as concealed drains encapsulating rubble for facilitating road side drainage. Such drains are especially suitable for hill roads.

Method of installation of JGT is given in Annex B for information only.

On the basis of several case studies (nearly 50) and on review of standards followed abroad especially CFGG Manual of France, it has been found that woven JGT with tensile strength of 25 kN/m (both in machine and cross machine direction) meets the strength criterion for most types of soil and traffic load.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

JUTE GEOTEXTILES

PART 1 STRENGTHENING OF SUB-GRADE IN ROADS — SPECIFICATION

(Second Revision)

1 SCOPE

This standard (Part 1) lays down requirements of woven and non-woven jute geotextile (JGT) for strengthening of road sub-grades.

NOTES

1 Selection of jute geotextile (woven) shall be decided principally on CBR (California Bearing Ratio), grain size distribution of soil and the *in-situ* permeability of sub-grade soil, volume of traffic (denoted by ESAL-Equivalent Single Axle Loading) and the allowable rut-depth.

2 Jute geotextiles covered under this standard are suitable for strengthening of flexible pavements on weak road sub-grades subjected to relatively low traffic load and intensity. Jute geotextiles control subsidence of a pavement by separating and preventing intermixing of the soft sub-grade and the harder sub-base, migration of soil particles and allows water to permeate across it.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 California Bearing Ratio (CBR) — It indicates the capacity of soil to bear certain loads. It is the ratio of the resistance of sub-grade soil to a standard plunger up to a pre-stated thickness (2.5 mm or 5 mm) to the corresponding resistance through a crushed rock expressed as percentage.

3.2 Consolidation of Soil — The process of gradual expulsion of water from voids of a soil due to imposition of loads. Soil consolidation is usually a long-drawn process.

3.3 Drapability — It is a measure of a jute geotextile to shape itself to the contours of any surface. It is a measure of 'flex-stiffness' that is binding of jute geotextile under its own weight between two points on a surface.

3.4 Elongation at Break — It is the measure of extension of jute geotextile specimen at failure (break) over its initial length. It is expressed in percentage.

3.5 Grain Size Distribution of Soil — It is represented by a semi-logarithmic curve that plots logarithm of the grain size in the abscissa against percentage of grains by weight smaller than the size denoted in the abscissa, in the ordinate. The more uniform is the grain size, the steeper is the curve.

3.6 Nonwoven Jute Geotextile — Mechanically bonded fabric formed by entangling fibres to ensure comparatively loose bonds where fibres cross over.

3.7 Open Area Ratio (OAR) — The ratio between total area of openings in a jute geotextile and total area covered by the jute geotextile expressed as percentage.

3.8 Permittivity — Flow capacity across a jute geotextile under a given hydraulic gradient and flow area. It is denoted by the following formula:

$$\psi = K_g / t_g$$

where

K_g = coefficient of permeability of jute geotextile, in m/s; and

t_g = thickness of the same jute geotextile, in m.

ψ is expressed in reciprocal of time (sec^{-1}).

3.9 Porometry — It is the pore size of a jute geotextile. A finer pore size reduces open area ratio (OAR), thus reducing its permittivity. It is also termed as apparent opening size (A.O.S.) denoted by symbol O_n.

3.10 Puncture Strength — It is a measure of resistance of a jute geotextile against puncturing under imposed loads.

3.11 Tensile Strength — The stretching load at which jute geotextile sample breaks. The jute geotextile is stretched by gripping it at two ends till its failure or break. It is expressed, in kN/m.

3.12 Transmissivity — Flow or draining capacity of a jute geotextile along its plane under a given hydraulic gradient and flow area.

3.13 Woven Jute Geotextile — Interlacement of warp and weft yarn to form a fabric, conforming to the specified weight, tensile strength, porometry,

transmissivity and permittivity.

4 REQUIREMENTS

The woven and non-woven jute geotextiles shall meet the requirements given in Table 1 and Table 2, respectively.

5 SAMPLING

Sampling shall be done in accordance with IS 14706.

6 PACKING

Packing shall be done as per IS 4744. Prolonged storage of packed material or its exposure to the open shall be avoided.

7 MARKING

7.1 Unless otherwise agreed to between the buyer and seller, the roll shall be stenciled with an indelible ink of any suitable colour with the following:

a) Name of manufacture;
b) Length and width, in metre;
c) Type of jute geotextile;
d) Roll number; and
e) Any other information as required by the law in force.

7.2 BIS Certification Marking

The jute geotextile may also be marked with the Standard Mark.

7.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act,* 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers and same may be obtained from the Bureau of Indian Standards.

Table 1 Requirements for Woven Jute Geotextiles

(*Clause* 4)

Sl No.	Characteristic	Requirement	Tolerance Percent	Method of Test, Ref to
(1)	(2)	(3)	(4)	(5)
i)	Construction	1/1 DW plain weave	—	Visual
ii)	Weight at 20 percent moisture regain, g/m^2, *Min*	724	—	IS 14716
iii)	Width, cm[1)]	As agreed	± 1	IS 1954
iv)	Ends × Picks / dm, *Min*	94 × 39	—	IS 1963
v)	Thickness at 2 kPa, mm	1.85	± 10	IS 13162 (Part 3)
vi)	Tensile strength in MD × CD, kN/m, *Min*	25 × 25	—	IS 13162 (Part 5)
vii)	Elongation at break in MD × CD, *percent*	10 × 10	± 10	IS 13162 (Part 5)
viii)	Puncture resistance, kN, *Min*	0.500	—	IS 13162 (Part 4)
ix)	Burst strength, kPa, *Min*	3 500	—	IS 1966 (Part 1) or IS 1966 (Part 2)
x)	Permittivity at 50mm constant head, sec^{-1}, *Min*	350 × 10^{-3}	—	IS 14324
xi)	Apparent opening size (A. O. S.) , O_{95}, *Micron*	150-400	—	IS 14294

[1)] Width of the fabric shall not be less than 100 cm.

Table 2 Requirements for Non-Woven Jute Geotextiles

(*Clause* 4)

Sl No.	Characteristic	Requirement	Tolerance Percent	Method of Test, Ref to
(1)	(2)	(3)	(4)	(5)
i)	Width, cm	150	± 1	IS 1954
ii)	Mass, g/m^2	500	± 5	IS 15891 (Part 1)
iii)	Thickness at 2 kPa, mm	4	± 10	IS 15891 (Part 2)
iv)	Tensile strength, kN/m, *Min:*		—	IS 15891 (Part 3)
	a) Machine direction	4	—	
	b) Cross machine direction	5	—	
v)	Elongation at break, percent:			IS 15891 (Part 3)
	a) Machine direction	5	± 15	
	b) Cross machine direction	6	± 15	
vi)	Permittivity at 50 mm constant head, sec^{-1}, *Min*	1.94	—	IS 14324
vii)	Bursting strength, kPa, *Min*	1 750	—	IS 1966 (Part 1) or IS 1966 (Part 2)
viii)	Apparent opening size (A. O. S.), O_{95}, *Micron*	265	± 10	IS 14294

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
1954 : 1990	Determination of length and width of woven fabrics — Methods (*second revision*)
1963 : 1981	Methods for determination of threads per unit length in woven fabrics (*second revision*)
1966	Textiles — Bursting properties of fabrics — Determination of bursting strength and bursting distension
(Part 1) : 2009	Hydraulic method (*second revision*)
(Part 2) : 2009	Pneumatic method (*second revision*)
4744 : 1991	Textiles — Packaging of jute products in rolls — Specification (*first revision*)
13162	Geotextiles — Methods of test
(Part 3) : 1992	Determination of thickness at specified pressures
(Part 4) : 1992	Determination of puncture resistance by falling cone method
(Part 5) : 1992	Determination of tensile properties using a wide width strip
14294 : 1995	Geotextiles — Method for determination of apparent opening size by dry sieving technique
14324 : 1995	Geotextiles — Methods of test for determination of water permeability — Permittivity
14706 : 1999	Geotextiles — Sampling and preparation of test specimens
14716 : 1999/ ISO 9864 : 1990	Geotextiles — Determination of mass per unit area
15891	Textiles — Test methods for non-wovens
(Part 1) : 2011	Determination of mass per unit area
(Part 2) : 2011	Determination of thickness
(Part 3) : 2011	Determination of tensile strength and elongation

ANNEX B

(*Foreword*)

INSTALLATION METHOD

B-1 The sub-grade is to be excavated to the required level, cleared of all foreign materials and compacted to the optimum moisture content (OMC). The sub-grade shall be done up with the specified profile. Vegetation, if any, shall be uprooted and the area levelled with earth and rolled.

B-2 Jute geotextile as selected shall be laid by unrolling, ensuring proper drapability so that the fabric touches the sub-grade surface at all points and stapled at an interval of 750 mm with overlaps of 150 mm. Staples shall be preferably U-shaped nails (11 gauge). It is advisable to avoid overlaps to the extent possible.

B-3 A thin cushion of local sand (maximum 75 mm thick) may be spread over the jute geotextile to prevent puncture/damage due to rolling of the overlying sub-base/base-layer.

B-4 The first layer of aggregates in the base-layer shall then be spread with grading as recommended. No traffic shall be allowed on an uncompacted sub-base.

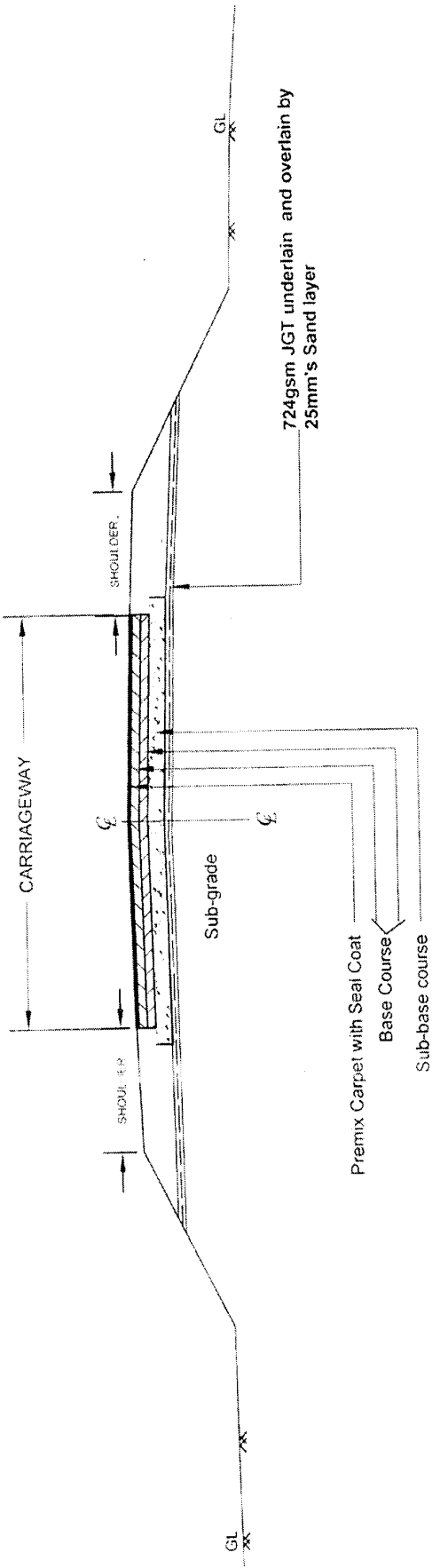
B-5 Any rut that may develop during construction shall be filled in.

B-6 Parallel rolls of jute geotextile shall be overlapped and stapled.

B-7 For application in curves, jute geotextile shall be folded or cut and overlapped in the direction of the turn. Folds in jute geotextile shall be stapled at an interval of 300 mm in curves.

B-8 Before covering up the jute geotextile, its condition shall be assessed for any construction/ installation damage. Torn/damaged portions may be covered by pieces of jute geotextile and duly stapled on all sides preferably at an interval of 300 mm. The extent of overlap shall be such as to fully cover the damage/torn portion fully, plus at least 75 mm beyond on all sides.

B-9 A typical cross-section of road with jute geotextile is given in Fig. 1.



Legend
Carriageway – usually 3.75 meter
Shoulder - usually 1.875 meter
Base Course & Sub-base course-thickness depends on CBR% of subgrade & ESAL

FIG. 1 TYPICAL CROSS-SECTION OF ROAD WITH JUTE GEOTEXTILE (JGT)

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Geosynthetics Sectional Committee, TXD 30

Organization	*Representative(s)*
The Bombay Textile Research Association, Mumbai	Dr A. N. Desai (***Chairman***) Shri V. K. Patil (*Alternate*)
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National Institute of Research on Jute and Allied Fibre Technology, Kolkatta	Dr Gautam Bose Dr Sanjoy Debnath (Alternate)
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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

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Amendments Issued Since Publication

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