AIS-064 (Part 1)

AUTOMOTIVE INDUSTRY STANDARD

Automotive Vehicles – Retreaded Pneumatic Tyres for Commercial Vehicles

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ON BEHALF OF
AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE

UNDER
CENTRAL MOTOR VEHICLE RULES - TECHNICAL STANDING COMMITTEE

SET-UP BY
MINISTRY OF SHIPPING, ROAD TRANSPORT & HIGHWAYS
(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)

GOVERNMENT OF INDIA

November 2005

Status chart of the Standard to be used by the purchaser for updating the record

Sr. No.	Corr-igenda.	Amend-ment	Revision	Date	Remark	Misc.

General remarks:

INTRODUCTION

The Government of India felt the need for a permanent agency to expedite the publication of standards and development of test facilities in parallel when the work on the preparation of the standards is going on, as the development of improved safety critical parts can be undertaken only after the publication of the standard and commissioning of test facilities. To this end, the Ministry of Surface Transport (MoST) has constituted a permanent Automotive Industry Standards Committee (AISC) vide order No. RT-11028/11/97-MVL dated September 15, 1997. The standards prepared by AISC will be approved by the permanent CMVR Technical Standing Committee (CTSC). After approval, the Automotive Research Association of India, (ARAI), Pune, being the secretariat of the AIS Committee, has published this standard. For better dissemination of this information ARAI may publish this document on their Web site.

The retreaded pneumatic tyre is an important safety critical item. Now steps have been taken to place retreaded tyres on a similar footing to "OE" tyres with the introduction of this standard. To ensure safety of operation of retreaded tyres and vehicles, there was a need for a standard specifying the performance requirements of the retreaded pneumatic tyres.

Considerable assistance has been taken from ECE R-109 (Amd.1, Corr.1, Corr. 1 to supplement 1 to the original version of regulation subject to depository notification C.N. 367.2003.TREATIES 1, dated May 8, 2003) "Uniform provisions concerning the approval for production of retreaded pneumatic tyres for commercial vehicles and their trailers" and National and International tyre standards.

The Automotive Industry Standards Committee (AISC) responsible for preparation of this standard is given in Annex : J

Automotive Vehicles - Retreaded Pneumatic Tyres for Commercial Vehicles

1.0 SCOPE

This standard prescribes to the production of retreaded tyres intended to be fitted to commercial vehicles and their trailers used on the road. It does not however apply to:

1.1 Retreaded tyres for private (passenger) cars and their trailers.

1.2 Retreaded tyres with a speed capability below 80 km/h.

1.3 Tyres for cycles and motorcycles.

1.4 Tyres originally produced without speed symbols (This clause shall be applicable after 3 years from the date of commencement of tyre approval of new tyres)

1.5 Tyres originally produced without type approval (This clause shall be applicable after 3 years from the date of commencement of tyre approval of new tyres).

2.0 REFERENCES

2.1 ECE R 109: Uniform provisions concerning the Approval of the Production of Retreaded Pneumatic Tyres for Commercial Vehicles and their Trailers.

2.2 AIS-044 (Part 1): Automotive Vehicles – Pneumatic Tyres for Commercial Vehicles.

3.0 DEFINITIONS –see also figure in Annex : H

3.1 "**Range of retreaded pneumatic tyres**" means a range of retreaded pneumatic tyres as quoted in paragraph 5.1.4

3.2 "**Structure**" of a pneumatic tyre means the technical characteristics of the tyre's carcass. The following structures are distinguished in particular:

3.2.1 "**Diagonal or "bias-ply**" describes a pneumatic-tyre structure in which the ply cords extend to the beads and are laid at alternate angles of substantially less than "90°″ to the centreline of the tread;

3.2.2 "**Bias-belted**" describes a pneumatic-tyre structure of diagonal (bias-ply) type in which the carcass is stabilised by a belt, comprising two or more layers of substantially inextensible cord material laid at alternate angles close to those of the carcass;

3.2.3 "**Radial**" describes a pneumatic tyre structure in which the ply cords extend to the beads and are laid substantially at 90° to the centreline of the tread, the carcass being stabilised by an essentially inextensible circumferential belt;

3.3 "Category of Use"

3.3.1 **Normal tyre** is a tyre intended for normal road use only.

3.3.2 **Special use tyre** is a tyre intended for mixed use,both on and off road and/or at restricted speed.

3.3.3 " **Snow tyre** " is a tyre whose tread pattern, or tread pattern and structure is primarily designed to ensure, in mud and fresh or melting snow, a performance better than that of a normal tyre. The tread pattern of a snow tyre generally consists of groove (rib) and solid block elements more widely spaced than on a normal tyre.

3.4 "**Bead**" means the part of a pneumatic-tyre which is of such shape and structure as to fit the rim and hold the tyre on it.

3.5 "**Cord**" means the strands forming the fabric of the plies in pneumatic tyre

3.6 "**Ply"** means a layer of "rubber" coated parallel cords.

3.7 **"Belt"** applies to a radial ply or bias belted tyre and means a layer or layers of material or materials underneath the tread, laid substantially in the direction of the center line of the tread to restrict the carcass in a circumferential direction.

3.8 **"Breaker"** applies to a diagonal ply tyre and means an intermediate ply between the carcass and tread.

3.9 **"Protective breaker"** applies to a radial ply tyre and means an optional intermediate ply between the tread and belt to minimise damage to the belt.

3.10 **"Chafer"** means material in the bead area to protect the carcass against chafing or abrasion by the wheel rim.

3.11 "**Carcass**" means that structural part of a pneumatic tyre other than the tread and outermost "rubber" side walls which, when inflated, supports the load.

3.12 "**Tread**" means that part of a pneumatic tyre which is designed to come into contact with the ground, protects the carcass against mechanical damage and contributes to ground adhesion.

3.13 "**Side wall"** means the part of a pneumatic tyre between the tread and the area designed to be covered by the rim flange.

3.14 **"Lower area of tyre"** means the area included between the line of maximum section width of a tyre and area designed to be covered by the edge of rim.

3.15 "**Tread groove**" means the space between the adjacent ribs or blocks in the tread pattern.

3.16 "**Section width**" means the linear distance between the outsides of the side walls of an inflated pneumatic tyre, when fitted to the specified measuring rim, and excluding elevations due to labelling (marking), decoration or protective bands or ribs.

3.17 "**Overall width**" means the linear distance between the outsides of the sidewalls of an inflated pneumatic tyre, when fitted to the specified measuring rim and including labelling (marking), decoration and protective bands or ribs.

3.18 " **Nominal Section height**" means a distance equal to half the difference between the outer diameter of the tyre and the nominal rim diameter.

3.19 "**Nominal aspect ratio (Ra)"** means the one hundred times the number obtained by dividing the number expressing the nominal section height by the number expressing the nominal section width, both dimensions being in the same units.

3.20 "**Outer diameter**" means the overall diameter of an inflated, newly retreaded tyre.

3.21 "**Tyre-size designation**" means a designation showing:

3.21.1 **The nominal section width**. This must be expressed in millimeters, except in cases of tyres for which the size designation is shown in the first column of the tables in Annex A of AIS-044 (Part 1).

3.21.2 **The nominal aspect ratio** except in cases of tyres for which the size designation is shown in the first column of the tables in Annex A of AIS-044 (Part1).

3.21.3 **A conventional number "d"** (the "d" symbol) denoting the nominal rim diameter of the rim and corresponding to its diameter expressed either by codes (numbers below 100) or in millimeters (numbers above 100). Numbers corresponding to both types of measurements may be used in the designation.

3.22 "**Nominal rim diameter (d)"** means the diameter of the rim on which a tyre is designed to be mounted.

3.23 "**Rim**" means the support, either for a tyre-and-tube assembly, or for a tubeless tyre, on which the tyre beads are seated.

3.24 "**Measuring rim**" means the rim specified as a 'measuring rim width' or 'design rim width' for a particular tyre designation in any edition of one or more of the International Tyre Standards.

3.25 "**Test rim**" means any rim specified as approved or recommended or permitted in one of the International Tyre Standards for a tyre of that size designation and type.

3.26 **"International Tyre Standard"** means any one of the following standard documents:

a) The European Tyre and Rim Technical Organisation (ETRTO): 'Standard Manual'

b) The Tire and Rim Association Inc. (TRA): 'Year Book'

c) The Japan Automobile Tire Manufacturers Association (JATMA): 'Year Book'

3.27 "**Chunking**" means the breaking away of pieces of rubber from the tread;

3.28 "**Cord separation**" means the parting of the cords from their rubber coating;

3.29 "**Ply separation**" means the parting of adjacent plies;

3.30 "**Tread separation**" means the pulling away of the tread from the carcass

3.31 **"Service description"** means the specific combination of the load index and speed symbol of the tyre.

3.32 "**Load index**" means a numerical code which indicates the load the tyre can carry at the speed corresponding to the associated speed symbol and when operated in conformity with the service conditions specified by the manufacturer. A pneumatic tyre can have more than one load index to indicate its load capacity when used in single or dual formation. The list of load indices and the corresponding loads are shown in Annex A.

3.33 "**Speed symbol**" means

3.33.1 An alphabetical symbol indicating the speed at which the tyre can carry the load given by the associated load index.

3.33.2 The speed symbols and corresponding speeds are shown in the table below:

Speed Category symbol	Maximum speed (km/h)
F	80
G	90
J	100
K	110
L	120
M	130
N	140
P	150
Q	160
R	170
S	180
T	190
U	200
H	210

3.34 **"Unique point"** means an additional service description, marked adjacent to the normal service description, but which must not be used for calculating a load capacity variation as defined in paragraph 3.35 and in Annex B to this standard.

3.35 **"Load-capacity variation with speed"** means an alternative load capacity for the tyre when used at a speed different from that indicated by the speed symbol in the normal service description. The permissible variations are in given in the table in Annex B to this standard.

3.36 "**Retreading production unit**" means a site or group of localized sites where finished retread tyres are produced.

3.37 "**Retreading**" means the generic term for reconditioning a used tyre by replacing the worn tread with new material. It may also include renovation of the outermost sidewall surface and replacement of the crown plies or the protective breaker. It covers the following process methods:

3.37.1 "**Top capping**" replacement of the tread

3.37.2 "**Re-capping**" replacement of the tread and with the new material extending over part of the sidewall.

3.37.3 "**Bead to bead**" replacement of the tread and renovation of the sidewall including all or part of the lower area of the tyre.

3.38 "**Casing**" is the worn tyre comprising carcass and remaining tread and sidewall material.

3.39 **"Buffing**" is the process of removing old material from the casing to prepare the surface for the new material.

3.40 "**Repair**" is the remedial work carried out to damaged casings within recognised limits.

3.41 "**Tread material**" is material in a condition suitable for replacing the worn tread. It can be in several forms for example:

3.41.1 "**Camel-back**" pre-cut lengths of material which have been extruded to give the required cross section profile and subsequently fitted cold to the prepared casing. The new material must be cured.

3.41.2 "**Strip-wound**" a ribbon of tread material which is directly extruded and wound on to the prepared casing and build up to the required cross sectional contour. The new material must be cured.

3.41.3 "**Direct extrusion**" tread material extruded to give the required cross sectional profile and directly extruded on the prepared casing. The new material must be cured.

3.41.4 "**Pre-cured**" a previously formed and cured tread applied directly to the prepared casing. The new material must be bonded to the casing.

3.42 "**Sidewall Veneer**" is material used to cover the sidewalls of the casing thereby allowing the required markings to be formed.

3.43 "**Cushion gum**" is material used as a bonding layer between new tread and casing and for repairing minor damage.

3.44 "**Cement"** is an adhesive solution to hold new materials in place prior to the curing process.

3.45 "**Cure**" is the terms used to describe the change in physical properties of the new material which is brought about usually by the application of heat and pressure for a set period of time under controlled conditions.

4.0 MARKINGS

4.1 An example of the arrangement of retreaded tyre markings is shown in Annex C to this standard.

4.2 Retreaded tyres shall display on both sidewalls in the case of symmetrical tyres and at least on the outer sidewall in the case of asymmetrical tyres.

4.2.1 The brand name or trade mark.

4.2.2 The tyre size designation as defined in paragraph 3.21.

4.2.3 An indication of the structure as follows

4.2.3.1 On diagonal (bias-ply) tyres no indication, or the letter "D" placed in front of the rim-diameter marking

4.2.3.2 On radial-ply tyres; the letter "R" placed in front of the rim-diameter marking and optionally the word "RADIAL"

4.2.3.3 On bias belted tyres, the letter "B" placed in front of the rim-diameter marking and in addition the word "BIAS-BELTED"

4.2.4 The service description comprising.

4.2.4.1 An indication of the tyre's nominal load capacity/capacities in the form of the load index/indices prescribed in paragraph 3.32

4.2.4.2 An indication of the tyre's nominal speed capability in the form of the symbol prescribed in paragraph 3.33

4.2.5 If applicable, one alternative service description, the Unique point, comprising:

4.2.5.1 An indication of the tyre's nominal load capacity/capacities in the form of the load index or max load /indices prescribed in paragraph 3.32

4.2.5.2 An indication of the tyre's nominal speed capability in the form of the symbol prescribed in paragraph 3.33

4.2.6 The word "TUBELESS" if the tyre is designed for use without an inner tube.

4.2.7 The inscription M+S or MS or M.S. or M&S in the case of snow tyre.

4.2.8 The date of retreading as follows:

4.2.8.1 In the form of Month and year code in which the tyre was retreaded. For example , the marking MAR02 could indicate a tyre which was retreaded in month march of the year 2002. (OR) In the form of a group of four digits, the first two showing the week number and the second two showing the year in which the tyre was retreaded. The date code can cover a period of production from the week indicated by the week number up to and including the week number plus three. For example, the marking "2503" could indicate a tyre which was retreaded in weeks 25 of the year 2003.

This date code may be marked on one sidewall only.

4.2.9 In the case of tyres which can be regrooved, the symbol "U" in a circle at least 20mm diameter, or the word "REGROOVABLE", moulded into or on to each sidewall.

4.2.10 An indication by means of the kPa or bar or kg/cm^2 or any combination of this units of the inflation pressure to be adopted for the load/speed endurance tests.

This indication may be placed on one sidewall only.

4.2.11 The term 'RETREAD" at the request of retreader, the same term in other languages may also be added.

4.2.12 The inscription "ET" or "ML" or "MPT" for "Special use tyres" (This marking shall only be mandatory for tyre types approved to this standard)

4.3 Prior to approval tyres shall exhibit a free space sufficiently large to accommodate an approval mark as referred to in paragraph 6.8 and as shown in AIS 037.

4.4 Following approval, the markings referred to in paragraph 6.8 and as shown in AIS 037 shall be affixed in the free space referred to in paragraph 4.3. This marking may be affixed to one sidewall only.

4.5 The markings referred to in paragraph 4.2 and the approval mark prescribed in paragraphs 4.4 and 6.8 shall be clearly legible and shall be moulded on to or into the tyre or shall be permanently marked on to the tyre.

4.6 As far as any of the original manufacturer's specifications are still legible after the tyres have been retreaded, they shall be regarded as specifications of the retreader for the retreaded tyre. If these original specifications do not apply after retreading they shall be completely removed.

4.7 The original approval mark and approval number and any other subsequent retreading production unit's approval mark and number, if no longer applicable, shall be removed.

4.8 The number of times tyre retreaded shall be marked on the tyre.

5.0 APPLICATION FOR APPROVAL

The following procedures are applicable to the approval of a tyre retreading production unit.

5.1 The application for approval of a retreading production unit shall be submitted by the holder of the trade name or trade mark to be applied to the tyre or by his duly accredited representative. It shall specify:

5.1.1 An outline of the structure of the company producing the retreaded tyres.

5.1.2 A brief description of the quality management system, which ensures the effective control of the tyre retreading procedures to meet the requirements of this standard.

5.1.3 The trade names or marks to be applied to the retreaded tyres produced.

5.1.4 The following information in relation to the range of tyres to be retreaded:

5.1.4.1 The range of tyre sizes;

5.1.4.2 The structure of tyres (diagonal or bias ply, bias belted or radial)

5.1.4.3 The category of use of tyres (normal or snow tyres etc.)

5.1.4.4 The system of retreading and the method of application of the new materials to be used, as defined in paragraphs 3.37 and 3.41;

5.1.4.5 The maximum speed symbol of the tyres to be retreaded;

5.1.4.6 The maximum load index / load in kg and ply rating (PR) of the tyres to be retreaded

5.1.4.7 The nominated International Tyre Standard to which the range of tyre conform.

6 APPROVAL

6.1 Retread tyres requires the approval of the retreading production unit by the approval test agency in accordance with the requirements of this standard. The approval test agency shall takes the necessary measures as described in this standard in order to ensure that the tyres retreaded in the respective production unit will meet with the requirements stated in this standard. The retread production unit shall be fully responsible for ensuring that the retreaded tyres will meet the requirements of this standard and that they will perform adequately in normal use.

6.2 In addition to the normal requirements for the initial assessment of the tyre retreading production unit, the approval test agency shall be satisfied that the procedures, operation, instructions and specification documentation provided by material suppliers are in a language readily understood by the tyre retreading production unit operatives.

6.3 The approval test agency shall ensure that the procedures and operations documentation for each production unit contains specifications, appropriate to the repair materials and processes used, of the limits of repairable damage or penetrations to the tyre carcass, whether such damage is existing or is caused during the processes of preparation for retreading.

6.4 Before granting approval the test agency must be satisfied that retreaded tyres conform to this standard and that the tests prescribed in paragraphs 7.5 or 7.6 have been successfully carried out on at least 5 and not necessarily more than 20 samples of retreated tyres representative of the range of tyres produced by the retreading production unit.

6.5 In the case of each failure being recorded during tests, two further samples of the same specification tyre shall be tested. If either or both of these second two samples fail, then a final submission of two samples shall be tested.

If either or both of the final two samples fail, then the application for approval of the retreading production unit shall be rejected.

6.6 If all the requirements of this standard are met, then approval shall be granted and an approval number shall be assigned to each retreading production unit approved. The approval number shall be preceded by standard number and letter "R" signifying that the approval applies to a tyre retreaded as prescribed in this standard. The same test agency shall not assign the same number to another production unit covered by this standard.

6.7 Notice of approval or extension, refusal or withdrawal of approval or of production definitely discontinued pursuant to this standard as per AIS 017 and AIS 037.

6.8 There shall be affixed conspicuously to every retreaded tyre conforming to this standard, in the space referred to in paragraph 4.3 and in addition to the markings prescribed in paragraph 4.2, an approval mark consisting of:

6.8.1 An approval number as described in AIS 037 and paragraph 6.6

6.9 AIS 037 gives details of the arrangements of the type approval number

7 REQUIREMENTS

7.1 Tyres shall not be accepted for first retread unless they have been type approved and bear either an approval mark, except that this requirement shall not be mandatory until 3 years from date of commencement of type approval of new tyres

7.2 Conditions before retreading

7.2.1 Tyres shall be clean and dry before inspection.

7.2.2 Before buffing, each tyre shall be thoroughly examined both internally and externally to ensure its suitability for retreading.

7.2.3 Tyres where damage is visible which has resulted from overload or underinflation shall not be retreaded.

7.2.4 Tyres showing any of the following damage shall not be accepted for retreading:

7.4.4.1 General:

a) non repairable rubber cracking extending through to the carcass

b) carcass break up;

c) appreciable oil or chemical attack

d) damaged or broken bead core

e) previous repairs to damage outside specified injury limits-see paragraph 6.3.

7.2.4.2 Conditions outside specified limits of repairability- see paragraph 6.3

a) carcass penetrations or damage after preparation for repair

b) multiple damage too close together;

c) substantial deterioration of inner liner

d) bead damage

e) exposed carcass cords

f) loose cords

g) belt ply seperation

h) permanently deformed or kinked (steel) carcass cords

i) circumferential cracking above the bead

j) corroded steel cord or bead wire

k) deterioration due to weathering effect

7.3 Preparation:

7.3.1 After buffing, and before the application of new material, each tyre shall be thoroughly re-examined, at least externally, to ensure its continued suitability for retreading.

7.3.2 The entire surface to which new material is to be applied shall have been prepared without overheating. The buffed surface texture shall not contain deep buffing lacerations or loose material.

7.3.3 Where precured material is to be used the contours of the prepared are shall meet the requirements of the material manufacturer.

7.3.4 Damage caused during buffing must not exceed defined limits of repair, see paragraph 6.3 and must be repaired.

7.3.5 Buffing damage to diagonal ply tyres shall not extend beyond the outermost carcass ply in the crown area. It shall be assumed that the first ply encountered is a carcass ply unless a breaker can be positively identified. If a breaker is fitted, localized damage is permissible.

7.3.6 Localized buffing damage to the belt of radial tyres is permissible. For larger damage it is permissible for the complete belt or sections of the belt to be replaced. Where a protective breaker is fitted, and can be positively identified as such, if it is damaged it is permissible to remove it and it need not be renewed.

7.3.7 Exposed steel parts shall be treated as soon as possible with appropriate material as defined by the manufacturer of that appropriate material.

7.4 Retreading:

7.4.1 The retreader must ensure that either the manufacturer or the supplier of repair materials, including patches, is responsible for the following:

a) defining method(s) of application and storage, if requested by the retreader, in the local language of the state in which the materials are to be used.

b) defining limits of damage for which the materials are designed, if requested by the retreader, in the local language of the state in which the materials are to be used.

c) ensuring that reinforced patches for tyres, if correctly applied in carcass repairs, are suitable for the purpose.

d) ensuring that patches are capable of withstanding twice the maximum inflation pressure as given by the tyre manufacturer.

e) ensuring the suitability of any other repair materials for the service intended.

7.4.2 The retreader shall be responsible for the correct application of the repair material and for ensuring that the repair is free from any defects, which may affect the satisfactory service life of the tyre.

7.4.3 The area surrounding a reinforced repair to a sidewall or shoulder of a radial ply tyre may bulge slightly when the tyre is fitted and inflated to the recommended operating pressure. Reinforced repair materials with physical properties that restrict the height of the bulge to not more than 4mm shall be used.

7.4.4 The retreader shall ensure that either the manufacturer or the supplier of tread and sidewall material issues specifications concerning the conditions of storage and use of the material in order to guarantee the material's qualities. If requested by the retreader, this information shall be in the local language of the state in which the materials are to be used.

7.4.5 The retreader must ensure that the repair material and/or compound is documented in a manufacturer's or supplier's certificate. The material compound shall be as per the details/ specification of retreading material specifications/ retreader. Bonding gum, cushion gum, vulcanizing solution and tread rubber used for tyre retreading shall be compatible and preferable of the same make.

7.4.6 The processed tyre shall be cured as soon as possible after the completion of all repairs and building-up operations and at the latest according to the material manufacturer's specifications.

7.4.7 The tyre shall be cured for the length of time and at the temperature and pressure, appropriate to, and specified for, the materials and processing equipment used. The dimensions of the mould shall be appropriate to the thickness of the new material and the size of the buffed tyre.

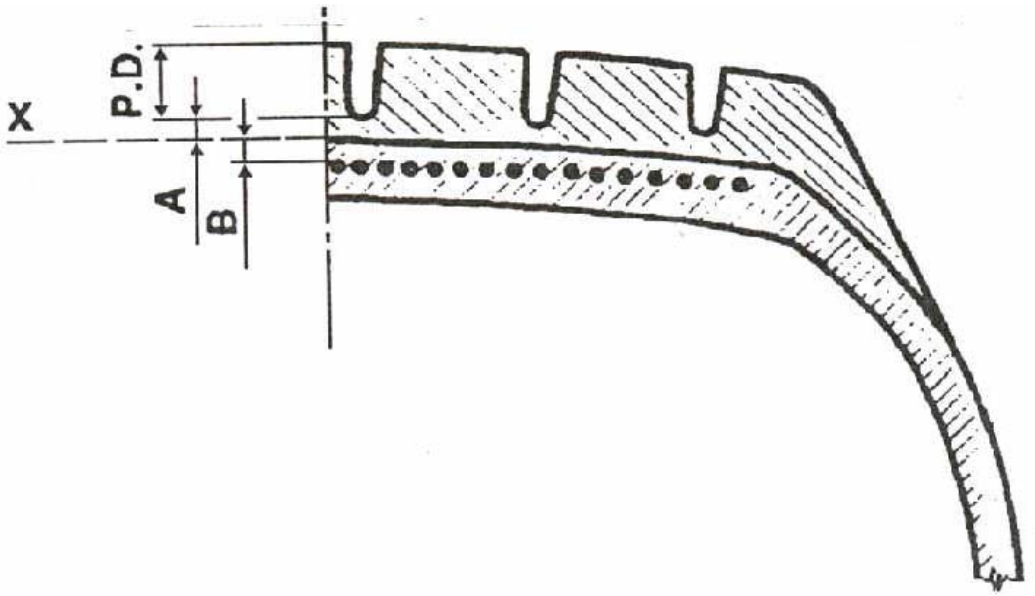
7.4.8 The thickness of original material after buffing and the average thickness of any new material under the tread pattern, after retreading shall be as given in paragraphs 7.4.8.1 and 7.4.8.2.

7.4.8.1 For radial ply tyres (mm)

$3 \leq (A+B) \leq 13$ (minimum 3.0 mm; maximum 13.0 mm)

$A \geq 2$ (minimum 2.0 mm)

$B \geq 0$ (minimum 0.0 mm)



P.D. = Pattern depth

X = Buff line

A = Average thickness of new material under pattern

B = Minimum thickness of original material above belt after buffing (cords shall not be visible)

7.4.8.2 For diagonal (Bias ply) tyres:

The thickness of original material above the breaker shall be ≥ 0.80 mm.

The average thickness of new material above the buffed casing line shall be ≥ 2.00 mm.

The combined thickness of original and new material beneath the base of the grooves of the tread pattern shall be ≥ 3.00 and ≤ 13.00 mm.

7.4.9 The service description of a retreaded tyre shall not show either a higher speed symbol or a higher load index than that of the original, first life, tyre unless approval has been granted to the manufacturer of the original, first life, tyre for that same carcass to be used at the revised service description.

Information that an original, first life, carcass has been upgraded in this way shall be made freely available by an approval authority to any retreading production unit.

7.4.10 Upgrading of the service description as given in paragraph 7.4.9 shall only be permitted for the first retread of an original, first life tyre.

Tyres, which have been previously retreaded, shall not have either the speed symbol or the load index raised above that shown on the used casing.

7.4.11 Tread wear indicators shall be incorporated as follows:

7.4.11.1 The retreaded pneumatic tyre shall include not less than six transverse rows of wear indicators, approximately equip-spaced and situated in the principal grooves of the tread. The tread wear indicators shall be such that they cannot be confused with the material ridges between the ribs or blocks of the tread.

7.4.11.2 However, in the case of tyres designed for mounting on rims of a nominal diameter of code 12 or less, four rows of tread wear indicators are permissible.

7.4.11.3 The tread wear indicators shall provide a means of indicating, with a tolerance of "+ 0.60 / - 0.0 mm", when the tread grooves are no longer more than "1.6 mm" deep.

7.4.11.4 The height of the tread wear indicators shall be determined by measuring the difference between the depth from the tread surface to the top of the tread wear indicators and the base of the tread grooves, close to the slope at the base of tread wear indicators.

7.5 Inspection:

7.5.1 After curing, whilst a degree of heat is retained in a tyre, each retreaded tyre shall be examined to ensure that it is free from any apparent defects. During or after retreading the tyre must be inflated to at least 1.5 bar for examination. Where there is any apparent defect in the profile of the tyre (e.g. blister, depression etc.) the tyre shall be specifically examined to determine the cause of this defect.

7.5.2 Before, during or after retreading the tyre shall be checked at least once for the integrity of its structure by means of a suitable inspection method.

7.5.3 For the purposes of quality control a number of retreaded tyres shall be subjected to destructive and/or non-destructive testing or examination. The quantity of tyres checked and the results shall be recorded.

7.5.4 After retreading, the dimensions of the retreaded tyre, when measured in accordance with Annex D to this standard, must conform either to dimensions calculated according to the procedures in paragraph 8 or to those given in Annex A of AIS-044 (Part 1) or Tyre sizes covered in other International tyre standard (ECE, JATMA, ETRTO and T&RA) shall meet the dimensional requirements of respective standards.

Further, if same size of tyre with different dimensions appears in more than one standard. It shall meet the dimension requirement of any one standard as per priority ITTAC, T&RA, JATMA, ECE, ETRTO.

Note that the maximum outer diameter of a retreaded tyre may be upto 1.5% greater than the maximum outer diameter of a new, original tyre permitted by AIS-044 (Part 1)

7.5.5 Tread wear indicators shall conform to the requirements of paragraph 7.4.11.

7.6 PERFORMANCE TEST

7.6.1 Load/Speed Endurance Test

7.6.1.1 Tyres retreaded to comply with this standard shall be capable of meeting the load/speed endurance test as specified in Annex E to this standard.

7.6.1.2 A retreaded tyre which after undergoing the load/speed endurance test does not exhibit any tread separation, ply separation, cord separation, chunking or broken cords shall be deemed to have passed the test.

7.6.1.3 The outer diameter of the tyre, measured six hours after the load/speed endurance test, must not differ by more than "± 3.5%" from the outer diameter as measured before the test.

7.6.2 Load/Speed Performance Test

7.6.2.1 Each type of pneumatic tyre having

a) Load index (Max load rating) 122 or more,

b) Load index (Max load rating) 121 or less and a speed category 150 km/h and below shall undergo Reference speed tests carried out by the procedure described in Annex F to this standard.

7.6.2.2 A tyre which, after undergoing the reference speed test, does not exhibit any tread separation, ply separation, cord separation, chunking or broken cords shall be deemed to have passed the test.

7.6.3 Tyre Strength Test

7.6.3.1 The Tyre Strength Test (Plunger Test) shall be carried out on a Tyre in accordance with the method set out in Annex G.

7.6.3.2 Nylon cord tyre should conform to the following requirements (for which load index is not shown) when tested as per Annex G

Tyre Strength Test Static Breaking Energy Values

Tyre Range and Size Designations	Ply Rating (PR)	Plunger Diameter	Test Inflation Pressure	Breaking Energy (Min.)
		mm	kPa	J
Ultra Light Trucks (Nylon)				
4.50-12	6	19 ± 0.2	MSP	203
4.50-12	8	19 ± 0.2	MSP	271
Light Truck (Nylon)				
All Sizes	6	19 ± 0.2	MSP	362
All Sizes	8	19 ± 0.2	MSP	514
All Sizes	10	19 ± 0.2	MSP	576
All Sizes	12	19 ± 0.2	MSP	644
All Sizes	14	19 ± 0.2	MSP	721
All Sizes	16	19 ± 0.2	MSP	768
Truck/Bus (Nylon)				
All Sizes	10	32 ± 0.3	MSP	1412
All Sizes	12	32 ± 0.3	MSP	1785
All Sizes	14	38 ± 0.3	MSP	2282
All Sizes	16	38 ± 0.3	MSP	2599
All Sizes	18	38 ± 0.3	MSP	2825
All Sizes	20	38 ± 0.3	MSP	3051
All Sizes	22	38 ± 0.3	MSP	3220
All Sizes	24	38 ± 0.3	MSP	3390

NOTES

1. Inflate to the pressure corresponding to the maximum load, or maximum dual load where there is both single and dual load marked on the tyre.
2. For rayon tyres, the minimum requirement shall be 60 percent of the above values for the corresponding size and ply rating tested under identical conditions.
3. MSP – Maximum schedule pressure applicable to the tyre size and ply rating.

7.6.3.3 Tyre strength of Light Truck and Truck and Bus tyres (For which the load capability Index is shown)

Air pressure corresponding to the maximum load capability kPa	Load capability index (single wheel) 121 max.		Load capability index (single wheel) 122 or more kgfcm (Joules)
	Nominal rim diameter under 13 kgfcm (Joules)	Nominal rim diameter 13 or more kgfcm (Joules)	
250 or less	1385 (136)	3000 (294)	-
251 to 350	2072 (203)	3690 (362)	-
351 to 450	2765 (271)	5240 (514)	-
451 to 550	-	5875 (576)	9910 (972)
551 to 650	-	6565 (644)	14400 (1412)
651 to 750	-	7260 (712)	17285 (1695)
751 to 850	-	-	21310 (2090)
851 or more	-	-	22465 (2203)

Diameter of Plunger (for the tyre of which the load capability index is shown)

Light Truck, Truck and Bus Tyres		
Load capability index (single wheel)	Load capability index (single wheel)	Load capability index (single wheel)
121 or less	122 or 134	135 or more
19 mm	32mm	38mm

8 SPECIFICATION

8.1 Tyres retreaded to comply with this standard shall conform to the following dimensions:

8.1.1 Section Width:

8.1.1.1 The section width shall be calculated by the following formula:

$$S = S_1 + K\ (A - A_1)$$

Where

S: is the actual section width in millimeters as measured on the test rim;

S_1 is the value of the "Design Section Width", referred to the measuring rim, as quoted in the international tyre standard specified by the retreader for the tyre size in question;

A is the width of the test rim in millimeters;

A_1 is the width in millimeters of the measuring rim as quoted in the International Tyre standard specified by the retreader for the tyre size in question.

K is a factor and shall be taken to equal 0.4

8.1.2 Outer Diameter:

8.1.2.1 The theoretical outer diameter of a retreaded tyre shall be calculated by the following formula:

$D=d+2H$

Where:

D: is the theoretical outer diameter in millimeters;

d is the conventional number defined in paragraph 3.21.3., in millimeters;

H is nominal section height in millimeters and is equal to S_n multiplied by 0.01 Ra

where:

S_n is the nominal section width in millimeters;

R_a is the nominal aspect ratio

All of the above symbols are as quoted in the tyre size designation as shown on the sidewall of the tyre in conformity with the requirements of paragraph 4.2.2. and as defined in paragraph 3.21

8.1.2.2 However, for tyres whose designation is given in the first column of the tables in Annex A to AIS-044 (Part 1), the outer diameter shall be that given in those tables.

8.1.3 Method of Measuring Retreaded Tyres:

8.1.3.1 The dimensions of retreaded tyres shall be measured in accordance with the procedures given in Annex D to this standard

8.1.4 Section Width Specification:

8.1.4.1 The actual overall width may be less than the section width or widths determined in paragraph 8.1 [dimension of the tyre shall not be measured at point of bulge (permissible bulge shall be as per Cl 7.4.3)]

The actual overall width may also exceed the value or values determined in paragraph 8.1, by

4% in the case of radial ply tyres and

8% in the case of diagonal (bias-ply) or bias belted tyres.

However, for tyres with a section width exceeding 305mm, intended for fitting in dual (twin) formation, the nominal value or values shall not be exceeded by more than:

2% in the case of radial ply tyres and

4% for diagonal (bias-ply) or bias belted tyres.

8.1.5 Outer Diameter Specifications:

8.1.5.1 The actual outer diameter of a retreaded tyre must not be outside the values of D_{min} and D_{max} obtained by the following formulae:

$D_{min} = d + (2H \times a)$

$D_{max} = 1.015 \times [d + (2H \times b)]$

Where:

8.1.5.1.1 For sizes not given in the tables in Annex A of AIS-044(Part1) and other International tyre standard viz., ECE, JATMA, ETRTO and T&RA, "H" and "d" are as defined in paragraph 8.1.2.1

8.1.5.1.2 For sizes mentioned in paragraph 8.1.2.2. above:

$H = 0.5 (D-d)$

Where "D" is the outer diameter and "d" the Nominal rim diameter quoted in the abovementioned tables for the size in question.

8.1.5.1.3 The coefficient "a" = 0.97

8.1.5.1.4 The coefficient "b" is:

	Radial tyres	Diagonal (bias-ply) and bias belted tyres
For normal use tyres	1.04	1.07
For special use tyres	1.05	1.09

8.1.5.2 For snow tyres the maximum outer diameter (D_{max}) calculated in paragraph 8.1.5.1 may be exceeded by not more than 1%

9 MODIFICATIONS TO THE APPROVAL

9.1 Every modification concerning a retreading production unit amending any of the information given by the retreading production unit in the Application for Approval, see paragraph 5, shall be notified to the approval test agency which approved the retreading production unit. That test agency may then either:

9.1.1 Consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the retreading production unit still meets the requirements; or

9.1.2 Require a further investigation of the approval

9.2 Confirmation of, or refusal of, approval, specifying the modifications, shall be communicated by the procedure specified in paragraph 6.7

10 CONFORMITY OF PRODUCTION

The conformity of production procedures shall comply with those set out in the AIS –037

10.1 The retreading production unit approved according to this standard shall conform to the requirements set out in paragraph 7.

10.2 The holder of the approval shall ensure that, during each year of production and spread throughout that year, at least the following number of tyres, representative of the range being produced, is checked and tested as prescribed in this standard.

10.2.1 0.01% of the total annual production but in any case not less than 2 and not necessarily more than 10.

10.3 If the requirements of paragraph 10.2 are carried out by or under the control of the approval test agency, the results may be used as part of, or instead of, those prescribed in paragraph 10.4.

10.4 The test agency which has approved the retreading production unit may at any time verify the conformity control methods applied in each production facility. For each production facility the type approval test agency shall take samples at random during each and every production year and at least the following number of tyres, representative of the range being produced, shall be checked and tested as prescribed in this standard.

10.4.1 0.01% of the total annual production but in any case not less than 2 and not necessarily more than 10.

10.5 The tests and checks of paragraph 10.4 may replace those required in paragraph 10.2

11. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

11.1 The approval granted in respect of a retreading production unit pursuant to this standard may be withdrawn if the requirements of paragraph 10 are not complied with or if the retreading production unit or the retreaded tyres produced by that retreading production unit have failed to meet the requirements prescribed in that paragraph.

11.2 Penalties for non-conformance of conformity of production shall be as detailed in AIS-037

12 PRODUCTION DEFINITELY DISCONTINUED

The test agency, which granted the approval of the retreading production unit, shall be informed if operations and manufacture of retreaded tyres approved within the scope of this standard cease.

ANNEX : A

(See para 3.32)

LIST OF SYMBOLS OF LOAD-CAPACITY INDICES

Load-capacity index	Corresponding maximum mass to be carried (kg)
60	250
61	257
62	265
63	272
64	280
65	290
66	300
67	307
68	315
69	325
70	335
71	345
72	355
73	365
74	375
75	387
76	400
77	412
78	425
79	437
80	450
81	462
82	475
83	487
84	500
85	515
86	530
87	545
88	56
89	580
90	600
91	615
92	630
93	650
94	670
95	690
96	710
97	730
98	750
99	775
100	800
101	825
102	850
103	875
104	900
105	925

Load-capacity index	Corresponding maximum mass to be carried (kg)
106	950
107	975
108	1000
109	1030
110	1060
111	1090
112	1120
113	1150
114	1180
115	1215
116	1250
117	1285
118	1320
119	1360
120	1400
121	1450
122	1500
123	1550
124	1600
125	1650
126	1700
127	1750
128	1800
129	1850
130	1900
131	1950
132	2000
133	1060
134	2120
135	2180
136	2240
137	2300
138	2360
139	2430
140	2500
141	2575
142	2650
143	2725
144	2800
145	2900
146	3000
147	3075
148	3150
149	3250
150	3350
151	3450
152	3550

Load-capacity index	Corresponding maximum mass to be carried (kg)
153	3650
154	3750
155	3875
156	4000
157	4125
158	4250
159	4375
160	4500
161	4625
162	4750
163	4875
164	5000
165	5150
166	5300
167	5450
168	5600
169	5800
170	6000
171	6150
172	6300
173	6500
174	6700
175	6900
176	7100
177	7300
178	7500
179	7750
180	8000
181	8250
182	8500
183	8750
184	9000
185	9250
186	9500
187	9750
188	10000
189	10300
190	10600
191	10900
192	11200
193	11500
194	11800
195	12150
196	12500
197	12850
198	13200
199	13600
200	14000

ANNEX : B

(See para 3.35)

VARIATION OF LOAD CAPACITY WITH SPEED COMMERCIAL VEHICLES TYRES – RADIAL AND DIAGONAL

Speed (km/h)	Variation of load capacity (%)									
	All load indices				Load indices ≥ 122 (1)		Load indices ≤ 121 (1)			
					Speed category					
	Speed category symbol				Symbol		Speed category symbol			
	F	G	J	K	L	M	L	M	N	P (2)
0	+150	+150	+150	+150	+150	+150	+110	+110	+110	+110
5	+110	+110	+110	+110	+110	+110	+90	+90	+90	+90
10	+80	+80	+80	+80	+80	+80	+75	+75	+75	+75
15	+65	+65	+65	+65	+65	+65	+60	+60	+60	+60
20	+50	+50	+50	+50	+50	+50	+50	+50	+50	+50
25	+35	+35	+35	+35	+35	+35	+42	+42	+42	+42
30	+25	+25	+25	+25	+25	+25	+35	+35	+35	+35
35	+19	+19	+19	+19	+19	+19	+29	+29	+29	+29
40	+15	+15	+15	+15	+15	+15	+25	+25	+25	+25
45	+13	+13	+13	+13	+13	+13	+22	+22	+22	+22
50	+12	+12	+12	+12	+12	+12	+20	+20	+20	+20
55	+11	+11	+11	+11	+11	+11	+17.5	+17.5	+17.5	+17.5
60	+10	+10	+10	+10	+10	+10	+15.0	+15.0	+15.0	+15.0
65	+7.5	+8.5	+8.5	+8.5	+8.5	+8.5	+13.5	+13.5	+13.5	+13.5
70	+5.0	+7.0	+7.0	+7.0	+7.0	+7.0	+12.5	+12.5	+12.5	+12.5
75	+2.5	+5.5	+5.5	+5.5	+5.5	+5.5	+11.0	+11.0	+11.0	+11.0
80	0	+4.0	+4.0	+4.0	+4.0	+4.0	+10.0	+10.0	+10.0	+10.0
85		+2.0	+3.0	+3.0	+3.0	+3.0	+8.5	+8.5	+8.5	+8.5
90		0	+2.0	+2.0	+2.0	+2.0	+7.5	+7.5	+7.5	+7.5
95			+1.0	+1.0	+1.0	+1.0	+6.5	+6.5	+6.5	+6.5
100			0	0	0	0	+5.0	+5.0	+5.0	+5.0
105				0	0	0	+3.75	+3.75	+3.75	+3.75
110				0	0	0	+2.5	+2.5	+2.5	+2.5
115					0	0	+1.25	+1.25	+1.25	+1.25

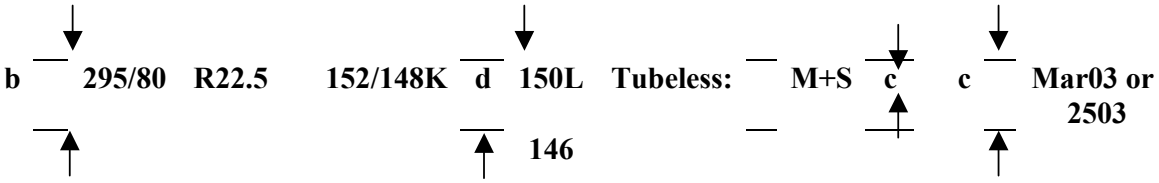
(1) The load indices refered to operation in single formation.

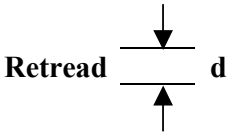
(2) Load variations are not allowed for speeds above 160 km/h. For speed symbols “Q” and above the speed corresponding to the speed symbols specifies the maximum permissible speed for the tyre.

Speed (km/h)	Variation of load capacity (%)									
	All load indices				Load indices ≥ 122 (1)		Load indices ≤ 121 (1)			
					Speed category					
	Speed category symbol				Symbol		Speed category symbol			
	F	G	J	K	L	M	L	M	N	P (2)
120					0	0	0	0	0	0
125						0		0	0	0
130						0		0	0	0
135									0	0
140									0	0
145										0
150										0

ANNEX: C
(See para 4.0)

ARRANGEMENT OF RETREAD TYRE MARKINGS
Example of the markings to be borne by retreaded tyres placed on the market after the entry into force of this standard





	MINIMUM HEIGHTS OF MARKINGS (mm)	
	Tyres of rim diameter	Tyres of rim diameter
	Tyres of rim diameter ≤code 20 or ≤ 508mm or of section width ≤235mm or ≤9”	Tyres of rim diameter ≥code 20 or ≥ 508mm or of section width ≥235mm or ≥9”
b	6	9
c	4	
d	6	

The above markings define a retreaded pneumatic tyre

Having a nominal section width of 295

Having a nominal aspect ratio of 80;

Of radial-ply structure (R);

Having a nominal rim diameter of 572mm, for which code is 22.5

Having load capacities of 3550 kg (single) and 3150 kg(twinned or dual), corresponding respectively to the load indices 152 and 148 shown in Annex A to this standard.

Having a nominal speed symbol K (reference speed 110 km/h).

Able to be used at the Unique point, speed symbol L (reference speed 120 km/h); with a load capacity of 3350 kg (single) and 3000 kg (twinned or dual), corresponding respectively to the load indices 150 and 146 shown in Annex A to this standard.

Intended to be used without an inner tube (“TUBELESS”); of snow type (M+S);
Retreaded month and year code (i.e) in March of the year 2003 or in the weeks 25 of the year 2003.

Requiring to be inflated to 620 kPa for load/speed endurance tests, for which the PSI symbol is 90.

The positioning and order of the markings constituting the tyre designation shall be as follows:

a) The size designation, comprising the nominal section width, the nominal aspect ratio, the type-of-structure symbol (where applicable) and the nominal rim diameter shall be grouped as shown in the above example: 295/80 R22.5;

b) The service description comprising the load index and the speed symbol shall be placed near the size designation. It may either precede the size designation or follow it or be placed above or below it;

c) The symbols "TUBELESS","REINFORCED", and "M + S" may be at a distance from the size designation.

d) The word 'RETREAD" may be at a distance from the size designation symbol.

e) If paragraph 4.2.5 of this standard is applied, the additional service description (Unique Point), comprising the load indices and speed symbol, must be shown inside a circle near the nominal service description appearing on the tyre sidewall.

In addition to above brand name or trade mark of Retreader and accreditation/approval number (when allotted) is to be marked.

ANNEX : D

(See para 8.1.3.1)

METHOD OF MEASURING PNEUMATIC TYRES

1 The tyre shall be mounted on the test rim specified by the retreader and inflated to the nominal inflation pressure quoted in the nominated International Tyre Standard (see paragraph 5.1.4.7 of this standard) in relation to the maximum load carrying capacity for that size and load index.

2 The tyre fitted to the appropriate rim, shall be conditioned to the ambient temperature of the laboratory for at least 24 hr save as otherwise required by paragraph 7.6.3 of this standard.

3 The pressure shall be re-adjusted to the value in paragraph 1 of this annex.

4 The overall width shall be measured at six equally spaced points around the tyre, taking account of the thickness of any protective ribs or bands. The highest reading obtained shall be taken as the overall width.

5 The outer diameter shall be calculated for a measurement of the maximum circumference of the inflated tyre.

ANNEX : E

(See para 7.6.1)

PROCEDURE FOR LOAD/SPEED ENDURANCE TESTS

E.0 PREPARING THE TYRE

E1.1 Mount a retreaded tyre on the test rim specified by the retreader.

E1.2 Use a new inner tube or combination of inner tube, valve and flap (as required) when testing tyres with inner tubes.

E1.3 Inflate the tyre to the appropriate pressure corresponding to the pressure index as specified in paragraph 4.2.10 of this standard.

E1.4 Condition the tyre and wheel assembly at test-room temperature for not less than three hours.

E1.5 Readjust the tyre pressure to that specified in paragraph 1.3 of this annex.

E.2 TEST PROCEDURE

E.2.1 Mount the tyre and wheel assembly on a test axle and press it against the outer face of a smooth surfaced power driven test drum either 1.70m ±1% diameter having a surface at least as wide as the tyre tread. In certain cases a 2.00m ±1% diameter drum may be used.

E.2.2 Apply to the test axle a series of test loads equal to a percentage of the load indicated in Annex A to this standard, corresponding to the load index indicated on the tyre, and in accordance with the test programme below. Where the tyre has load capacity indices for operation in both single and twin or dual formation the load corresponding to the load index for single operation shall be used for the test.

E.2.2.1 In the case of a tyre with a load index $\leq$121 and a speed symbol $\geq$ Q(160 km/h), the test procedure shall be as specified in paragraph 3 of this annex.

E.2.2.2 For all other tyres the test procedure is as shown in Appendix 1 to this annex.

E.2.3 Endurance Test Programme – See also Appendix 1 to this annex.

E.2.3.1 The tyre pressure shall not be corrected throughout the test and the test load shall be kept constant throughout each of the three test stages.

E.2.3.2 During the test the temperature in the test room must be maintained at between 20° and 40°C unless the tyre manufacturer or retreader agrees to the use of a higher temperature.

E.2.4 The endurance test programme shall be carried out without interruption.

E.3 LOAD/SPEED TEST PROCEDURE FOR TYRES WITH A LOAD INDEX ≤121 AND A SPEED SYMBOL ≥ Q (160 km/h)

E.3.1 The load on the wheel and tyre shall be the following percentage of that corresponding to the load index of the tyre:

E.3.1.1 90% when tested on a drum of 1.70m ± 1% diameter

E.3.1.2 92% when tested on a drum of 2.00m ± 1% diameter

E.3.2 The initial phase test speed shall be 20 km/h less than that indicated by the speed symbol for the tyre.

E.3.2.1 Time taken to reach initial test speed shall be 10min.

E.3.2.2 The duration of the first phase shall be 10 min.

E.3.3 The second phase test speed shall be 10 km/h less than that indicated by the speed symbol for the tyre.

E.3.3.1 The duration of the second phase shall be 10 min.

E.3.4 The final phase test speed shall be the speed corresponding to that indicated by the speed symbol for the tyre.

E.3.4.1 The duration of the final phase shall be 30 min.

E.3.5 The duration of the entire test shall be 1 hr.

ANNEX : E – APPENDIX : 1
(See para E 2.3)

ENDURANCE TEST PROGRAMME

Load index	**Speed symbol**	**Test drum speed (min^{-1})**		**Load placed on the wheel as a percentage of the load corresponding to the load index**		
		Radial ply	**Diagonal (bias-ply) and bias belted**	**7 h.**	**16 h.**	**24 h**
122 or more						
	F	100	100	66%	84%	101%
	G	125	100			
	J	150	125			
	K	175	150			
	L	200	-			
	M	225	-			
121 or less						
	F	100	100			
	G	125	125			
	J	150	150			
	K	175	175			
	L	200	175	70%	88%	106%
				4h	6h	24h
	M	250	200	75%	97%	114%
	N	275	-	75%	97%	114%
	P	300	-	75%	97%	114%

ANNEX : F

(See para 7.6.2)

LOAD / SPEED PERFORMANCE TEST

F.1.0 PREPARING THE TYRE

F.1.1 Mount a new tyre on the test rim specified by the manufacturer.

F.1.2 Use a new inner tube or combination of inner tube, valve and flap (as required) when testing tyres with inner tubes.

F.1.3 Inflate the tyre to the pressure corresponding to the pressure specified by the manufacturer.

F.1.4 Condition the tyre-and-wheel assembly at test-room temperature for not less than three hours.

F.1.5 Readjust the tyre pressure to that specified in paragraph F 1.3 above.

F.2.0 TEST PROCEDURE

F.2.1 Load placed on the wheel as a percentage of the load corresponding to the load index:

F.2.2 90% when tested on a test drum 1.70 m ± 1% in diameter;

F.2.3 92% when tested on a test drum 2.0 m ± 1%in diameter.

F.2.4 Initial test speed: speed corresponding to the speed category symbol less 20km/h;

F.2.4.1 Time to reach the initial test speed 10 min.

F.2.4.2 Duration of the first step = 10 min

F.2.5 Second test speed: speed corresponding to the speed category symbols less by 10 km/hr;

F.2.5.1 Duration of the second step = 20 min.

F.2.6 Final test speed: speed corresponding to the speed category symbol (Reference speed).

F.2.6.1 Duration of the final step = 20 min.

F.2.6.2 Total test duration: 1 H

ANNEX : G

(See para 7.6.3)

TYRE STRENGTH TEST (PLUNGER TEST)

G.1.0 APPARATUS

The equipment consists of a cylindrical steel plunger, having a hemispherical end of a diameter specified in the 7.6.3 for type of tyre and a device to force the plunger rod into a tyre at the rate of 50 ± 1.5mm per minute.

G.1.1 PREPARATION OF TYRE FOR THE TEST

The tyre with a tube shall be mounted and inflated on a test rim of the recommended size and shall be conditioned at approximately the temperature of the room in which the test is to bew conducted for at least 3 hours after which the pressure shall be adjusted, if necessary, to the test inflation pressure specified in 7.6.3 of this standard

G.1.2 TEST PROCEDURE

The plunger rod shall be forced into the tread of the tyre/wheel assembly mounted as described in G 1.1. Perpendicularly over a tread element at the centerline of the tread, or as near as possible to avoiding penetration into a tread groove. The rate of travel of the plunger; shall be 50 ± 1.5mm per minute until the tyre breaks or the plunger is stopped by the rim(bottoming of the plunger against the rim), in which case the tyre shall be deemed to have passed the test regardless of energy value. Measurement if force and penetration at break (or bottoming against the rim) shall be made at 5 points nearly equally spaced around the tyre circumference. The arithmetic mean energy absorbed shall be calculated from the five energy values obtained at the break, using the formula given in G 1.2.1.

G.1.2.1 Formula for calculating the breaking energy:

$$W = \frac{F \times P}{2} \times 10^{-3}$$

Where

W = Energy at break(or bottoming) in J (Joule)

F = Arithmetic mean of force at break (or bottoming) in N ; and

P = Arithmetic mean of penetration at break (or bottoming) in mm.

G.1.3 As an option, for purpose of conformity, if the plunger energy measurements meet or exceed the minimum value specified, it is not necessary to continue penetration of the plunger to break the tyre.

ANNEX : H

Explanatory Figure

Clause 3 of the Standard

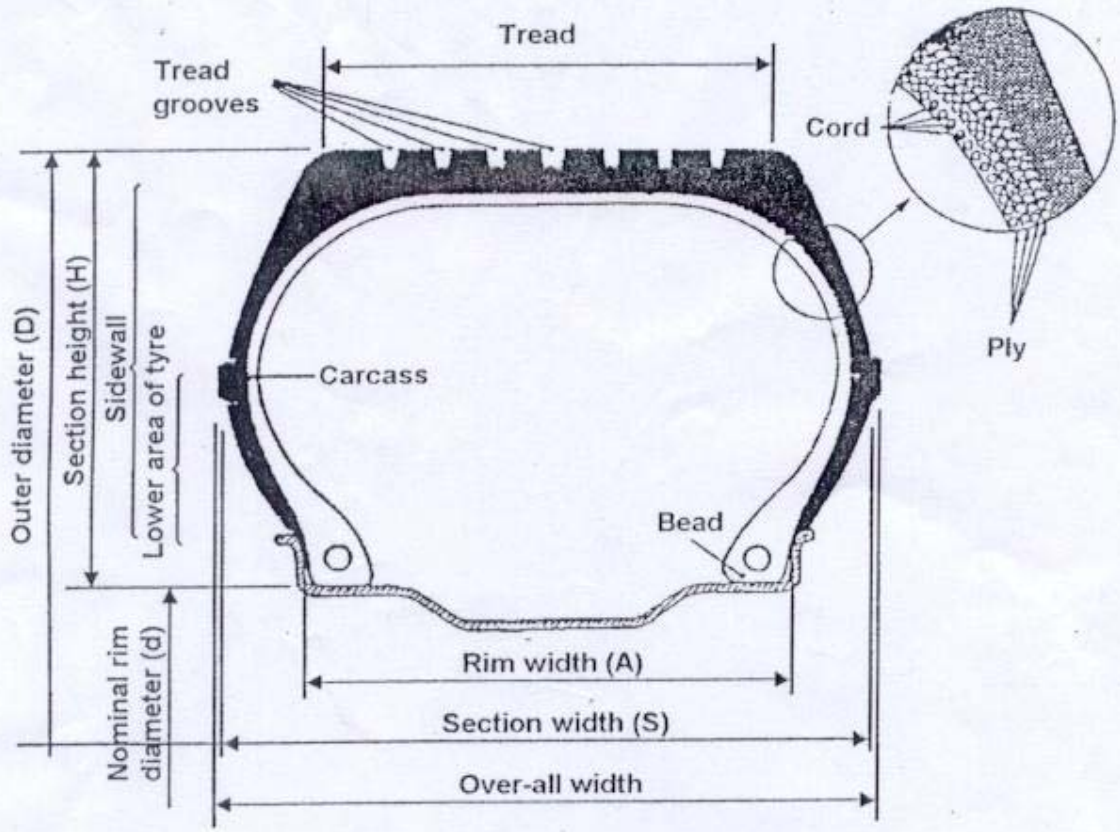


FIG.1

ANNEX : J

(See Introduction)

COMMITTEE COMPOSITION *

Automotive Industry Standards Committee

Chairman	
Shri B. Bhanot	Director The Automotive Research Association of India, Pune
Members	**Representing**
Shri Alok Rawat	Ministry of Shipping, Road Transport & Highways, (Department of Road Transport & Highways) New Delhi
Shri Sushil Kumar	Department of Heavy Industry, Ministry of Heavy Industries & Public Enterprises, New Delhi
Shri. Chandan Saha	Office of the Development Commissioner Small Scale Industries, Ministry of Small Scale Industries, New Delhi
Shri K. K. Goel Shri K. K. Vashistha (Alternate)	Bureau of Indian Standards, New Delhi
Shri A. S. Lakra Shri D. P. Saste (Alternate)	Central Institute of Road Transport, Pune
Director	Indian Institute of Petroleum, Dehra 'Dun
Shri R.C. Sethi Shri N. Karuppaiah (Alternate)	Vehicles Research & Development Establishment, Ahmednagar
Shri Rajat Nandi	Society of Indian Automobile Manufacturers
Shri T.C. Gopalan Shri Ramakant Garg (Alternate)	Tractor Manufacturers Association, New Delhi
Shri K.N.D. Nambudiripad	Automotive Components Manufacturers Association
Shri G. P. Banerji	Automotive Components Manufacturers Association

Member Secretary
Mrs. Rashmi Urdhwareshe
Deputy Director
The Automotive Research Association of India, Pune

* At the time of approval of this Automotive Industry Standard (AIS)