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भारतीय मानक मसौदा
रबर कन्वेयर और एलीवेटर टेक्सटाइल बेल्टिंग हेतु विशिष्टि
भाग 2 ऊष्मा प्रतिरोधी बेल्टिंग
(IS 1891-2 का चौथा पुनरीक्षण)

Draft Indian Standard
Rubber Conveyor and Elevator Textile Belting — Specification
Part 2 Heat Resistant Belting
(*Fourth Revision of IS 1891-2*)

ICS 53.040.10

Conveyor Belts Sectional Committee, PGD 40

Last Date for Comments: 07-05-2024

FOREWORD

(formal clause to be added later on)

This Indian Standard first published in 1972 and was subsequently revised in 1978, 1988 and 1993.

This standard is published in five parts. The other part in this series are:

- Part 1 General purpose belting
- Part 3 Oil-resistant belting
- Part 4 Hygienic belting
- Part 5 Fire resistant belting for surface application

This fourth revision has been brought out to take care of the experience gained since the last publication and to bring it in line with the current manufacturing practices vis-à-vis new technological advancements. SI systems of units have been followed in the standard.

The major changes made in this standard as compared to the third revision are:

- a) All the amendments issued to the previous version of the standard have been amalgamated and the text of the standard has been suitably modified to make it more user friendly;
- b) Introduction to various types of heat resistant belting used in food industry along with relevant tests applicable to them have been included;
- c) Some new tests like fire resistance, electrical surface resistance test (antistatic test), volume swelling, heat resistance, non-stick test and tear resistance test have been added; and
- d) Method of testing tear strength test has also been given in the standard.

The composition of the Committee, responsible for the formulation of this standard is given at Annex A.

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 : 2022 'Rules for rounding off numerical values (*second revision*).

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Rubber Conveyor and Elevator Textile Belting — Specification
Part 2 Heat Resistant Belting
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1 SCOPE

This Indian Standard (Part 2) covers the requirements of conveyor and elevator textile belting for use on flat or troughed idlers for conveying hot materials which are classified as follows:

Resistance to Temperature °C (max)

| Heat Resistance Grades | Guideline - Material Temperature predominantly Lumps | Guideline - Material Temperature predominantly Fines |
|--|--|--|
| Heat Resistance Grade T ₁ (HR T ₁) | 125 | 100 |
| Heat Resistance Grade T ₂ (HR T ₂) | 150 | 125 |
| Heat Resistance Grade T ₃ (HR T ₃) | 180 | 150 |

These classes do not correspond to the temperature of the transported product, they are generally lower to account for. Depending on the use for which the belt is intended, the manufacturer should state the class to be used for assessing compliance with this Indian Standard. For higher than the above-specified material temperature, user may consult the manufacturer for an alternative grade and should agree on ageing alternate temperature of ageing and /or duration.

2 NORMATIVE REFERENCES

The standards listed below contain provisions which, though reference in this text, constitute provisions of to 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 below:

| <i>IS No.</i> | <i>Title</i> |
|-------------------------|--|
| IS 1891 (Part 1) : 2021 | Conveyor and elevator textile belting – Specification Part 1 General purpose belting (<i>fifth revision</i>) |
| IS 3400 | Methods of Test for Vulcanized Rubber |
| (Part 1) : 2021 | Tensile stress — Strain properties |
| (Part 2) | Determination of hardness |
| (Sec 1) : 2022 | Hardness between 10 IRHD and 100 IRHD (<i>fifth revision</i>) |
| (Part 4): 2012 | Accelerated ageing and heat resistance (<i>third revision</i>) |
| IS 17527 : 2021 | Conveyor belts — Test atmospheres and conditioning periods |
| ISO 252 : 2023 | Conveyor belts — Adhesion between constitutive elements — Test methods |

3 PERFORMANCE REQUIREMENTS

When tested under the method specified are given in 4, the permissible variations in hardness, elongation at break and tensile strength shall be Table 1.

Table 1 Permissible variations

(Clauses 3 and 4.2)

| SI No. | Cover characteristic | Variation For Belt Class | | | | | |
|--------|--|--------------------------|-----------------------------|------------------------|-----------------------------|------------------------|-----------------------------|
| | | HR T1 | | HR T2 | | HR T3 | |
| (1) | (2) | (3) | | (4) | | (5) | |
| i) | Hardness (IRHD) | | | | | | |
| | — variation of initial value | + 20 | | + 20 | | + 20 | |
| | — maximum value | 85 | | 85 | | 85 | |
| ii) | Elongation at break (percent) | | | | | | |
| | — variation in percentage of initial value | - 50 | | - 50 | | - 55 | |
| | — minimum value | 200 | | 200 | | 180 | |
| iii) | Tensile strength (N/mm²) | | | | | | |
| | — variation in percentage of initial value | - 25 | | - 30 | | - 40 | |
| | — minimum value | 12 | | 10 | | 5 | |
| iv) | Adhesion strength (N/mm) | Natural Fibers Carcass | Synthetic Filaments Carcass | Natural Fibers Carcass | Synthetic Filaments Carcass | Natural Fibers Carcass | Synthetic Filaments Carcass |
| v) | Between adjacent plies | | | | | | |
| | — variation in percentage of initial value | -50 | -50 | -50 | -50 | -50 | -50 |
| | — minimum value | 1.6 | 3.0 | 1.6 | 3.0 | 1.6 | 3.0 |
| vi) | Cover to ply Adhesion (0.8mm to 1.5 mm) | | | | | | |
| | — variation in percentage of initial value | -50 | -50 | -50 | -50 | -50 | -50 |
| | — minimum value | 1.05 | 1.6 | 1.05 | 1.6 | 1.05 | 1.6 |
| vii) | Cover to ply Adhesion (0.8mm to 1.5 mm) | | | | | | |
| | — variation in percentage of initial value | -50 | -50 | -50 | -50 | -50 | -50 |
| | — minimum value | 1.35 | 2.25 | 1.35 | 2.25 | 1.35 | 2.25 |

NOTE — Actual application condition may not match exactly within the frame of the standard, hence, the above acceptance parameters are for guidance only. End use and manufacture of the conveyor belt may decide on specific acceptance based on past performance and accuracy of application conditions.

4 TEST METHODS

4.1 Principle

The following properties are measured, before and after exposure to heat according to **4.3.1**:

- a) The hardness of covers as per IS 3400 (Part 2);
- b) Elongation at break of covers as per IS 3400 (Part 1); and
- c) Tensile strength of covers as per IS 3400 (Part 1).

NOTE — The temperatures selected for the tests are usually not those corresponding to the temperature of the product to be transported; they are generally lower to take account of:

- a) the possibility of the conveyor belt cooling, and
- b) the fact that contact between the product and the conveyor belt will not equalize the temperature.

4.2 Classification

Conveyor belts shall be classified as presented in clause 1 and Table 1.

4.3 Procedure

4.3.1 *Exposure to Heat*

Cut a sample belt of full thickness measuring 400 mm × 400 mm from the centre of the belt at a distance of at least 100 mm from the edges. Place it in an air oven following IS 3400 (Part 4) for 72 h at a temperature of 100 °C for HR T₁ belts, 125 °C for HR T₂ belts and 150 °C for HR T₃ belts.

After exposure to heat, remove the belt sample from the oven and leave it to cool.

4.3.2 *Preparation of Test Pieces for Evaluating Properties*

4.3.2.1 *Test pieces for measuring the hardness of covers*

The test pieces shall either be the belt sample itself or covers removed from the belt by cutting away the covers from the belt sample. Test pieces shall be lightly buffed on each surface but left at maximum thickness. Condition the test pieces for 24 h at a temperature of (27 ± 2) °C and relative humidity of (65 ± 5) percent (atmosphere B in accordance with IS 17527)

4.3.2.2 *Test pieces for measuring elongation at break and tensile strength*

Cut away the covers from the belt samples as described in **4.3.1** and bring them to a thickness of (2 ± 0.2) mm by cutting on both faces and finishing off with a light buffing. Condition the test pieces for 24 h at a temperature of (27 ± 2) °C and relative humidity of (65 ± 5) percent (atmosphere B in accordance with IS 17527).

4.3.2.3 *Test pieces for measuring the adhesion strength of the belt*

Cut away the adhesion test piece specimen from the belt as per ISO 252. Condition the test pieces for 24 h at a temperature of (27 ± 2) °C and relative humidity of (65 ± 5) percent (atmosphere B in accordance with IS 17527).

4.4 Determination of Properties

4.4.1 *Hardness*

Using the test pieces prepared as described in **4.3.2.1** measure the hardness of covers using one of the methods specified in IS 3400 (Part 2/Sec 1) according to the available thickness of the rubber material.

4.4.2 *Elongation at Break and Tensile Strength*

Using the test pieces as described in **4.3.2.2** measure the elongation at break of covers and tensile

strength in accordance with IS 3400 (Part 1).

4.4.3 Adhesion Strength

Using a test piece prepared as described in **4.3.2.3**, measure the adhesion strength as described in ISO 252.

4.4.4 Initial Values

Determine the initial values of hardness, elongation at break and tensile strength by measuring these properties using test pieces cut from the same belt and prepared as described in **4.3.2**, but without exposure to heat.

4.5 Expression of Results

Record the results for the hardness of covers, the elongation at break of covers and the tensile strength of covers for the samples not exposed to heat and those exposed to heat. Calculate the variation in hardness, and elongation at break and breaking strength between the results obtained for the samples not exposed to heat and those obtained for the samples exposed to heat.

5 TEST REPORT

The test report shall contain the following information:

- a) Identification of the conveyor belt tested;
- b) The belt class as given in **4.2**;
- c) The test piece used (*see* **4.3.2**);
- d) The conditions of exposure to heat;
- e) Details of the conditioning used;
- f) The results of the test as described in **4.4**; and
- g) Date of the test.

6 BIS CERTIFICATION MARKING

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the Bureau of Indian Standards Act, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Conveyor Belts Sectional Committee, PGD 40

| <i>Organization</i> | <i>Representative(s)</i> |
|--|--|
| National Thermal Power Corporation Limited, New Delhi | SHRI APURBA GHOSH (<i>Chairperson</i>) |
| Directorate General of Mines Safety, Dhanbad | SHRI M ARUMUGAM |
| Central Mine Planning and Design Institute Limited, Ranchi | MR. SHRI PARAG MAJUMDAR MR. SHRI P.K. PAUL (<i>Alternate</i>) MR. AJOY KUMAR SINGH (<i>Convenor</i>) |
| Directorate General of Mines Safety, Dhanbad | SHRI D B NAIK MR. SHRI KAUSHIK SENGUPTA (<i>Alternate</i>) |
| Fenner Conveyor Belting Private Limited, Madurai | SHRI M VIVEK SHRI SANTOSH N KOSARKAR (<i>Alternate I</i>) MR. SHRI N.SRIDHAR (<i>Alternate II</i>) |
| Forech India Limited, Sonipat | SHRI I.K. BAHL SHRI TIMIR BHATTACHARYYA (<i>Alternate</i>) |
| Indian Rubber Manufacturers Research Association, Mumbai | MR. K. RAJ KUMAR MS. SUCHISMITA SAHOO (<i>Alternate</i>) |
| International Conveyors Limited, Aurangabad | SHRI U. D. DOUND MR. SHRI PINAKI SEN (<i>Alternate I</i>) MR. SHRI SUDEEP SAHA (<i>Alternate II</i>) |
| J K Fenner India Limited, Madurai | MR. SHRI S. MAJUMDAR MR. SHRI D SRINIVASAN (<i>Alternate</i>) |
| Multiple Fabric Company Limited, Kolkata | SHRI SHABBIR TOPIWALA SHRI HAMZA TOPIWALA (<i>Alternate</i>) |
| NTPC Hyderabad, Secunderabad | MR. SHRI VIVEK KUMAR UPADHYAY |
| NTPC Limited, New Delhi | MR. SHRI ABHIJIT NAG MR. SHRI VIVEK KUMAR UPADHYAY (<i>Alternate</i>) |
| Oriental Rubber Industries Private Limited, Pune | MR. SHRI CHINMAY RAY SHRI VIKRAM MAKAR (<i>Alternate</i>) |
| Phoenix Conveyor Belt India Private Limited, Kolkata | MR. SHRI. MAYUKH SAHA MR. SHRI SUBRATA CHAKRABORTY (<i>Alternate I</i>) MR. DR. SUGATA CHAKRABORTY (<i>Alternate II</i>) |
| Scandia Belting Company Private Limited, Kolkata | SHRI G. B. GANGULY SHRI PARTHA SARTHI BISWAS (<i>Alternate I</i>) MR. SHRI ARSHED HUSSAIN (<i>Alternate II</i>) |
| In Personal Capacity (D-1, Kailashpuri Complex, Kusum Vihar. Phase-2, Koylanagar, Dhanbad, Jharkhand) | MR. SHRI K. K. S. SINHA |
| In Personal Capacity (A1-201, Doshi Firstnest Apartment, Thirumudivakkam Main Road Thirumudivakkam Chennai 600132) | SH. K.EUGENE PACCELLI |
| BIS Directorate General | SHRI R.R. SINGH, SCIENTIST 'F' AND HEAD (PGD) [REPRESENTING DIRECTOR GENERAL (<i>Ex-officio</i>)] |

Member Secretary
SHRI VICHITRA VIR SINGH
SCIENTIST 'D'/JOINT DIRECTOR (PGD), BIS