INTERNATIONAL STANDARD 252

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Conveyor belts — Minimum requirements for ply adhesion and method of test

Courroies transporteuses — Caractéristiques minimales pour l'adhérence entre éléments constitutifs et méthode d'essai

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 252 was drawn up by Technical Committee ISO/TC 41, *Pulleys and belts (including vee-belts)*, and circulated to the Member Bodies in April 1973.

It has been approved by the Member Bodies of the following countries :

Australia	Germany	South Africa, Rep. of
Belgium	India	Spain
Bulgaria	Mexico	Thailand
Canada	Netherlands	Turkey
Czechoslovakia	New Zealand	United Kingdom
Denmark	Poland	U.S.A.
Finland	Portugal	U.S.S.R.
France	Romania	

No Member Body expressed disapproval of the document.

This International Standard cancels and replaces ISO Recommendation R 252-1962, of which it constitutes a technical revision.

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Conveyor belts — Minimum requirements for ply adhesion and method of test

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the minimum adhesion values between plies, and between covers and carcase, of conveyor belts. It also specifies the corresponding test method, the basic conditions of the test method, being in conformity with ISO/R 36.

This International Standard applies to all types of construction of conveyor belting with the exception of belts of textile construction with a strength less than 200 N/mm, belts containing steel cord reinforcement and belts of solid woven construction.

2 REFERENCE

ISO/R 36, *Determination of the adhesion strength of vulcanized rubbers to textile fabrics.*

3 MINIMUM ADHESION VALUES

The minimum adhesion values shall be as given in the following table.

Value (See 4.5)	Adhesion between adjacent plies N/mm	Adhesion between covers and carcase	
		Covers 0,8 to 1,5 mm thick N/mm	Covers more than 1,5 mm thick N/mm
Mean value of results in the longitudinal direction	3,15	2,10	2,70
Mean value of results in the transverse direction	3,15	2,10	2,70
Mean value of all results	3,50	2,40	3,00
Lowest graphically recorded value from all tests	2,70	1,60	2,20

NOTE — With certain synthetic fabrics it is possible to obtain higher values than those given in the table.

4 TEST METHOD

4.1 Principle

The test consists in determining, by one of two alternative test methods, the mean force required to strip the covers from the carcase, and also each ply from the next, using a constant rate of traverse machine.

Two test methods are given since neither individual method is satisfactory with all types of belt construction. The belting manufacturer shall decide the method to be used in the case of each particular belt of his manufacture.

Method A ("ply by ply" technique)

After first carrying out a cover adhesion test, this method consists in stripping each ply separately from the remainder of the test piece.

Method B ("two plies by two plies" technique)

After first carrying out a cover adhesion test, this method of determining the adhesion between plies consists in stripping either the first ply and unseparated cover, or two unseparated plies, from the remainder of the test piece.

4.2 Apparatus

Use a suitable power-driven tensile testing machine complying with the requirements of ISO/R 36.

4.3 Test piece

4.3.1 *Shape and dimensions*

Each test piece shall consist of a strip of belting of rectangular cross-section with clean cut edges, 25 ± 0,5 mm wide, and 300 mm minimum length so as to permit a length of at least 100 mm to be stripped. If necessary and possible, the thickness shall be reduced to a suitable value which will ensure that during the test the line of separation remains as near as possible to the plane through the axes of the components of the test piece held between the grips (see figure 1).

The minimum thickness should be such that the weakest component can transmit the necessary force for separation without breaking.

4.3.2 *Number of test pieces*

For both methods A and B the following test pieces are required :

a) two pairs of test pieces cut in the longitudinal direction, and/or

b) two pairs of test pieces cut in the transverse direction.

4.3.3 *Sampling*

The test pieces shall be taken not less than 100 mm from the edges of the available belt sample and from places as widely spaced as possible.

4.3.4 *Conditioning*

The belt sample shall be allowed to stabilize for at least 24 h after manufacture before the test pieces are taken from it.

The test shall be carried out under normal temperate atmosphere conditions (temperature approximately 20 °C or 23 °C). If the laboratory temperature differs from one of these temperature by more than ± 2 °C then the test pieces shall be conditioned at 20 ± 2 °C or 23 ± 2 °C for 24 h immediately prior to testing.

4.4 Procedure

4.4.1 *Method A* (see figure 2)

At one end of the longitudinal test piece, separate the face cover from the first ply for a suitable distance appropriate to the test grips to be used. Fix the separated ends in the grips of the tensile testing machine and make an autographic record of the force required to strip a further 100 mm with a rate of traverse of the driven jaw of 50 ± 5 mm/min or 100 ± 10 mm/min. The test piece shall be unsupported.

Repeat this procedure using the same test piece for each consecutive ply up to the middle of the test piece.

Carry out a similar series of tests on a second longitudinal test piece but commencing with the back cover.

Test the other pair of longitudinal test pieces and/or test the two pairs of transverse test pieces in a similar manner.

4.4.2 *Method B* (see figure 3)

At one end of the longitudinal test piece separate the face from the first ply for a suitable distance appropriate to the test grips to be used. Fix the separated ends in the grips of the tensile testing machine and make an autographic record of the force required to strip a further 100 mm with a rate of traverse of the driven jaw of 50 ± 5 mm/min or 100 ± 10 mm/min. The test piece shall be unsupported.

Repeat this procedure using the same test piece, stripping consecutively two unseparated plies from the remainder of the test piece.

Carry out a similar series of tests on a second longitudinal test piece but commencing by separating the unseparated face cover and first ply, from the second ply.

Test the other pair of longitudinal test pieces, and/or test the two pairs of transverse test pieces in a similar manner.

NOTE — Any separation occurring outside the plane of contact between the two components, for example inside one of the components (such as a cover) subjected to the test, is considered as a rupture of the material which constitutes the component. Such a separation should be noted but should not be considered as representative of the adhesion strength.

4.5 Expression of results

4.5.1 *Examination of test traces.*

On each graph, eliminate the first 15 % (see figure 4). In the remaining part of the trace, note the force at the lowest graphically recorded peak and calculate the mean force by counting the number (n) of peaks in the remaining part of the graph and calculating the arithmetic mean of the ordinates, to scale :

— either of the $n/2$ lowest peaks (if the total number of peaks is an even number) or the $(n+1)/2$ lowest peaks (if n is an odd number);

— or of the 10 lowest peaks,

taking the lower of these two numbers.

Calculate the average adhesion for the plies as the quotient of the mean force (in newtons) divided by the nominal width (in millimetres) of the test piece; similarly calculate the lowest adhesion.

4.5.2 *Calculation of mean values*

4.5.2.1 Longitudinal samples

Calculate the mean value of :

a) all the tests made on the four test pieces cut in the longitudinal direction in which the cover is stripped from the carcase;

b) all the tests made on the four test pieces cut in the longitudinal direction in which ply is stripped from ply.

4.5.2.2 Transverse samples

Make a similar calculation for the four test pieces cut in the transverse direction.

4.5.2.3 Mean values of results

Calculate the mean value of all results (in the longitudinal and/or transversal direction) for :

a) all tests in which the cover is stripped from the carcase;

b) all tests in which ply is stripped from ply.

4.6 Test report

The test report shall include the following particulars :

a) mean value of cover to carcase tests on the longitudinal samples and

b) mean value of ply to ply tests on the longitudinal samples and/or

c) mean value of cover to carcase tests on the transverse samples and

d) mean value of ply to ply tests on the transverse samples;

e) the mean value of results of all cover to carcase tests;

f) the mean value of results of all ply to ply tests;

g) the lowest graphically recorded value of all cover to carcase tests;

h) the lowest graphically recorded value of all ply to ply tests;

i) any cases of one of the components failing before the adhesion strength between the two components is reached and the force at which the failure occurred (see note in 4.4.2);

j) the temperature of the test.

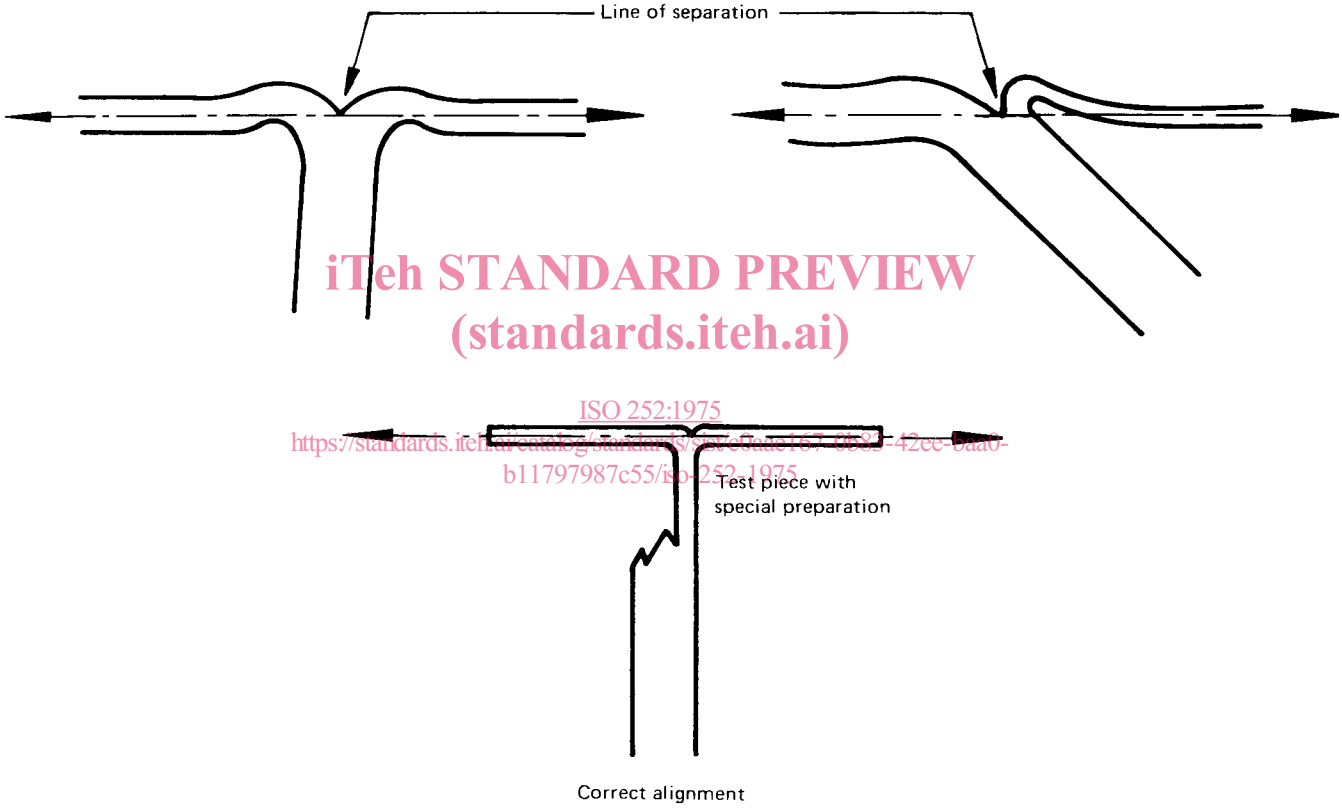


FIGURE 1 — **Position of line of separation of plies**

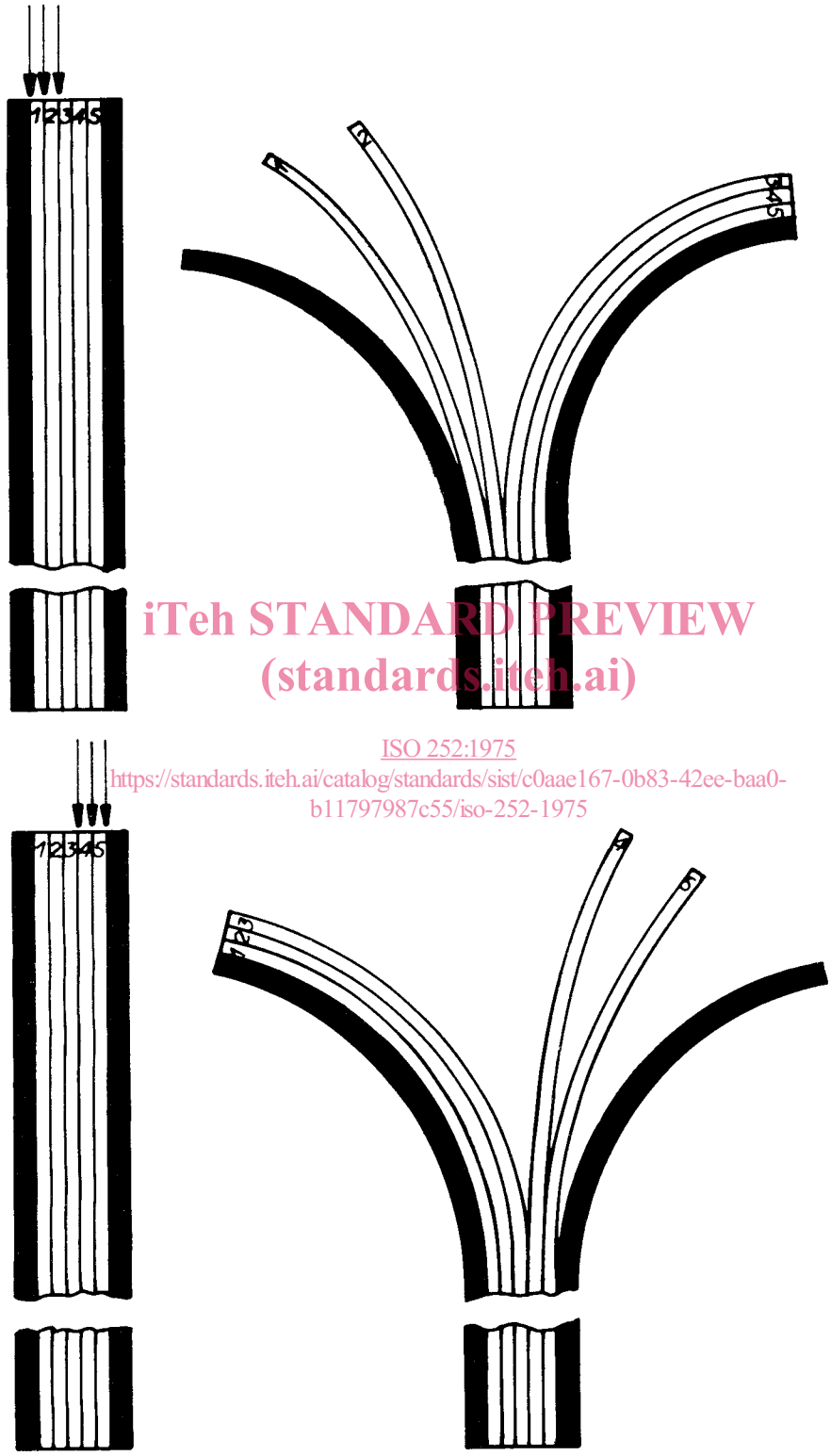


FIGURE 2 – Sequence of separation of components for Method A (5-ply belt shown as example)

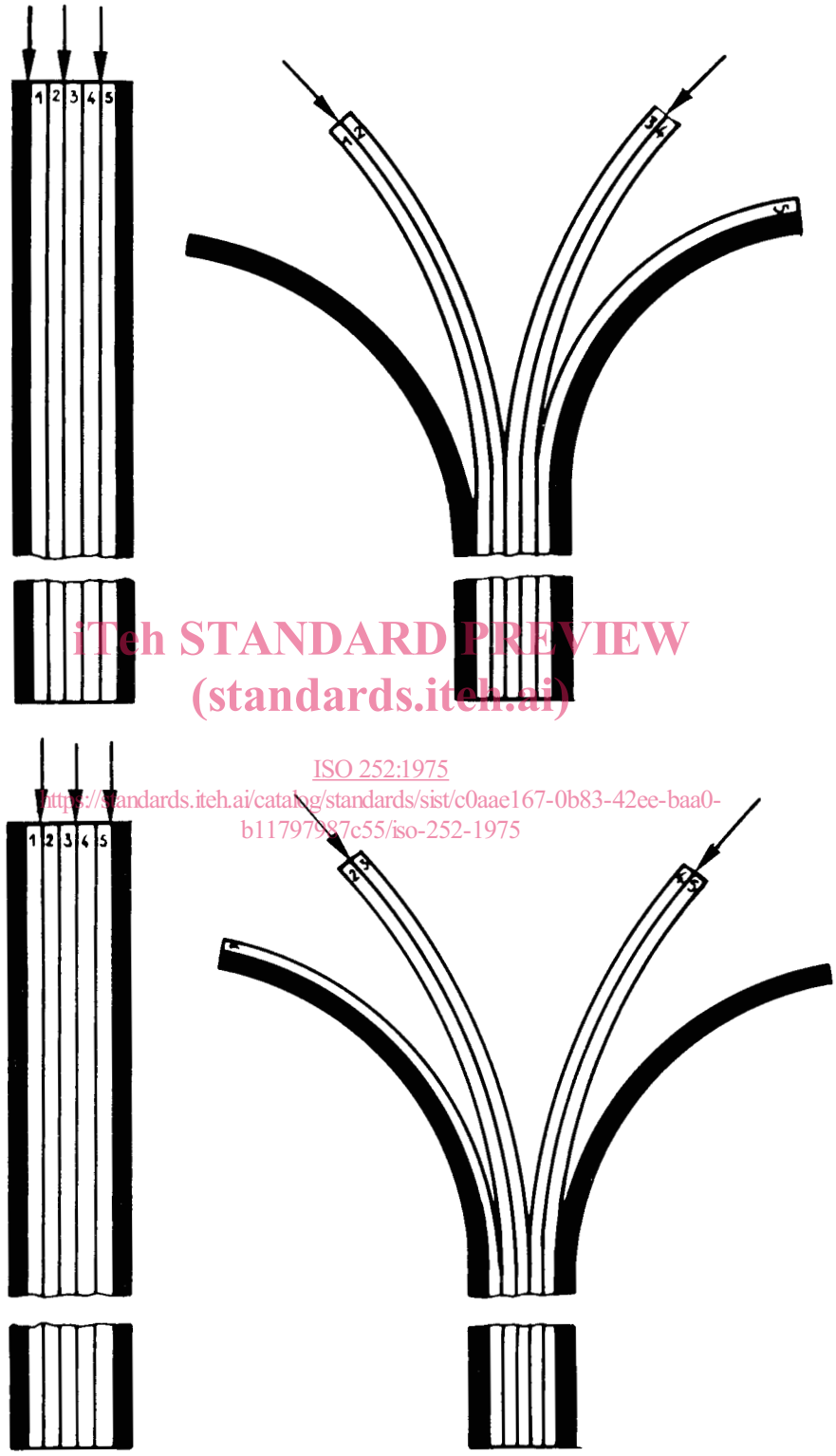
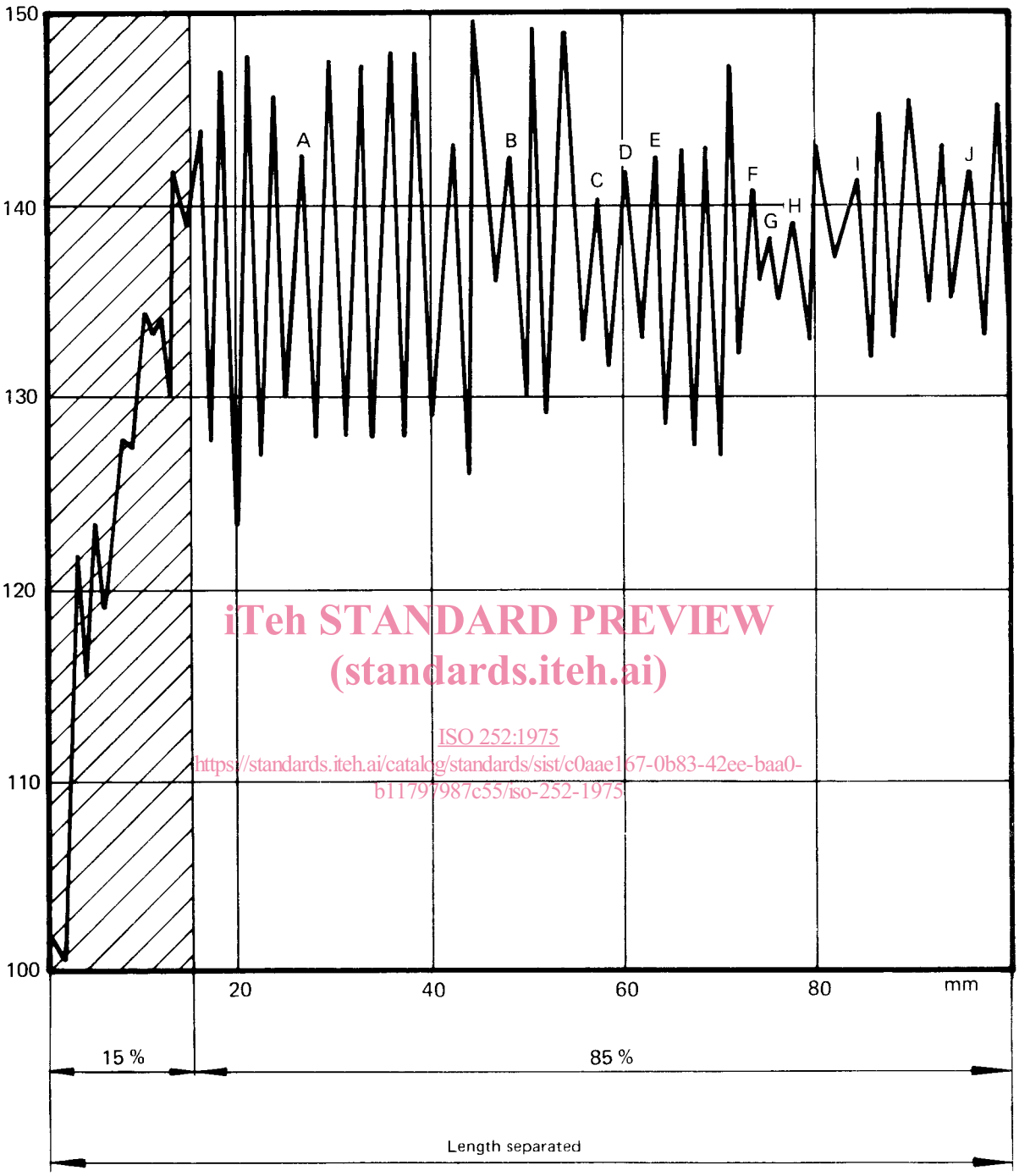


FIGURE 3 – **Sequence of separation of components for Method B (5-ply belt shown as example)**



Number of peaks : 30

Number of peaks to be used for the calculation : 10 (A, B, . . . ,J)

Peak G : lowest graphically recorded value

FIGURE 4 — **Typical trace for adhesion test**