

भारतीय मानक  
जलसर और नमसर बनाने के लिए बिटूमैन नमदा —  
विशिष्टि  
( चौथा पुनरीक्षण )

*Indian Standard*  
BITUMEN FELTS FOR WATER-PROOFING AND  
DAMP-PROOFING — SPECIFICATION  
( *Fourth Revision* )

---

Second Reprint MAY 1998

UDC 691.165 : 699.82

© BIS 1993

**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

## FOREWORD

This Indian Standard ( Fourth Revision ) was adopted by the Bureau of Indian Standards, after the draft finalized by the Water-proofing and Damp-proofing Sectional Committee had been approved by the Civil Engineering Division Council.

This standard was first published in 1959 and revised in 1965, 1970 and 1982. The fourth revision of this standard is based on the experience gained during the last few years in the use of the bitumen felts for water-proofing and damp-proofing purposes. This revision mainly incorporates the method of test for determination of the binder content by Soxhlet extraction method, the revised method for determination of water absorption of bitumen felts and increasing of the total weight of the finished bitumen felt ( *see* Table 1 ) on the basis of the practical experience of using the minimum quantity of dusting powder. The requirement of base fabrics for fibre base felts has also been changed. The weight of saturant for fibre base felts has also been revised on the experience gained during the last few years. The self finished felt Type 2, Grade 2 has been deleted.

In the formulation of this standard due weightage has been given to international coordination among the standards and practices prevailing in different countries in addition to relating it to the practice in the field in this country.

The composition of the Sectional Committee responsible for the formulation of this standard is given in 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 : 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*

# BITUMEN FELTS FOR WATER-PROOFING AND DAMP-PROOFING — SPECIFICATION

( *Fourth Revision* )

### 1 SCOPE

This standard covers the requirements for saturated bitumen felts (underlay) and self-finished bitumen felts used for water-proofing and damp-proofing.

### 2 REFERENCES

The Indian Standards listed in Annex B are necessary adjuncts to this standard.

### 3 CLASSIFICATION

3.1 Bitumen felts shall be classified as given in 3.1.1 and 3.1.2 depending upon the type of base used in their manufacture and the uses to which the felts are suited.

#### 3.1.1 Fibre Base

Type 1 — Saturated felt for underlay

Type 2 — Self finished felt ( for water-proofing )

#### 3.1.2 Hessian Base

Type 3 — [ Self-finished felt ( for water-proofing ) — Grade 1 ]

— [ Self-finished felt ( for damp-proofing ) — Grade 2 ]

### 4 MATERIALS

#### 4.1 Base Fabrics

##### 4.1.1 Fibre-Base Felt

The base fabric for fibre-base felts shall consist of a suitable blend of vegetable and/or animal fibres. The weight of ash on incineration of the fabric shall not exceed 10 percent of its original weight.

##### 4.1.2 Hessian Base Fibre

The fabric shall conform to Type II hessian conforming to IS 2818 ( Part 2 ) : 1971.

#### 4.2 Bituminous Saturant

##### 4.2.1 Composition

The saturant used in the case of all types of felt shall conform to IS 73 : 1992 with a

penetration of not less than 80 at 25°C ( see IS 1203 : 1978 ).

##### 4.2.2 Weight

The weight of the saturant shall be not less than 110 percent of the weight of the untreated felt for fibre-base felts and not less than 60 percent of the weight of the untreated fabric for hessian base felts subject to the minimum weight given in Table 1.

#### 4.3 Bituminous Coatan

##### 4.3.1 Composition

a) The bituminous coatan used for Types 2 and 3 felts shall consist of bitumen conforming to IS 702 : 1988, with or without admixture of bitumen conforming to IS 73 : 1992 and inert and water insoluble fine mineral filler which shall pass 100 percent through 150-micron Sieve and 95 percent through 75 micron Sieve [ see IS 460 ( Part 1 ) : 1978 ] or inert and water insoluble fibrous mineral filler.

b) The inert filler shall not exceed 42 percent by weight of the coatan, subject to the minimum weight specified in Table 1 for coatan.

4.3.2 The bituminous coatan shall have a softening point of not less than 105°C when measured by the Ring and Ball method ( see IS 1205 : 1978 ) and a penetration of not less than 7 at 25°C ( see IS 1203 : 1978 ). The coatan shall be designed so that the finished felts comply with high temperature storage test and the low-temperature pliability test.

##### 4.3.3 Weight

The weight of the coatan shall comply with the minimum weights specified in Table 1 for Type 2 and Type 3 felts.

#### 4.4 Mineral Powder for Dusting

##### 4.4.1 Composition

The mineral powder shall be powdered mineral matter, for example, mica, talc or slate, passing through 600-micron IS Sieve [ see IS 460 ( Part 1 ) : 1985 ].

**Table 1 Minimum Weight of Bitumen Felt ( in kg )**  
( *Clauses, Foreword, 4.2.2, 4.3.1(b), 4.3.3, 5.4 and 7.2* )

Sl No.	Type of Felt	For 10 m <sup>2</sup>				Total Weight of the Finished Bitumen Felt in Dry Condition with Mica Dusting Powder, Min ( see Notes 2 and 3 )
		Untreated Base ( see Note 1 )	Saturant	Coatant	Bitumen Content	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
a)	Fibre Base					
	i) Type 1 Underlay	4.0	3.6	—	3.6	7.6
	ii) Type 2 Self finished felt	5.0	4.5	12.9	12.0	22.6
b)	Hessian Base					
	i) Type 3 Self finished felt Grade 1	2.3	1.8	17.7	12.1	23.0
	ii) Type 3 Self finished felt Grade 2	2.3	1.8	31.8	20.2	37.1

**NOTES**

1 The weight of the untreated base shall be taken as in dry condition for fibre base felts. In the case of hessian base the weight of untreated base shall conform to IS 2818 ( Part 2 ) : 1971.

2 Include allowance for 1.2 kg minimum mica dusting powder in dry condition except for Type 1.

3 When other type of mineral powders are used, the weights shown in the last column shall be changed on the basis of 4.4.2.

**4.4.2 Weight**

The weight of the dusting powder incorporated shall be as follows:

- a) Mica powder — 1.2 to 2 kg/10 m<sup>2</sup>
- b) Talc powder — 1.5 kg to 2.25 kg/10 m<sup>2</sup>
- c) Slate powder — 1.5 kg to 2.25 kg/10 m<sup>2</sup>

**5 MANUFACTURE**

5.1 The base fabric, fibre or hessian, after the removal of the major portion of the inherent moisture, shall be saturated by immersion in the bitumen maintained in a molted condition and the surplus saturant shall be removed. The manufacture of the underlay, that is, Type 1 felt, is complete at this stage.

5.2 The base fabric shall be thoroughly and uniformly saturated.

5.3 For the manufacture of self-finished felts,

the saturated felt shall be treated by passing through the bituminous coatant material. The coatant shall be uniformly applied. The resultant coated felts shall be given a superficial application of fine mineral powder.

**5.4 Weight**

The weights of the ingredients of bitumen felts for 10 m<sup>2</sup> shall be not less than those specified in Table 1 during process.

5.5 The finished material shall be free from visible external defects, such as holes, oil patches, ragged or untrue edges, breaks, cracks, tears, protuberances and indentations.

**6 DIMENSIONS**

Unless otherwise specified, bitumen felts shall be supplied in width of 90 cm or 100 cm and in lengths of 10 m or 20 m.

## 7 OTHER REQUIREMENTS OF BITUMEN FELTS

7.1 Bitumen felts shall be subjected to the following tests, in addition to bitumen content test as per 7.2, and shall conform to the requirements given in Table 2. Sample shall be cut as explained in Fig. 1

Type	Test	References to
Type 1 Underlay	Breaking strength test	IS 13826 ( Part 1 ) : 1993
	Pliability test	IS 13826 ( Part 2 ) : 1993
Type 2 and	Breaking strength test	IS 13826 ( Part 1 ) : 1993
Type 3 All grades	Pliability test	IS 13826 ( Part 2 ) : 1993
	Storage sticking test	IS 13826 ( Part 3 ) : 1993
	Pressure head test	IS 13826 ( Part 4 ) : 1993
	Heat resistance test	IS 13826 ( Part 5 ) : 1993
	Water absorption test	IS 13826 ( Part 6 ) : 1993

### NOTES

1 Diameter of Mandrel for pliability shall be as follows:

Type 1	} 50.0 mm
Type 2	
Type 3, Grade 2	

Type 3, Grade 2 75.0 mm

2 The tests shall be carried out not earlier than two days from the date of manufacture.

## 7.2 Total Bitumen Content

The minimum weight of bitumen in the bitumen felts, when determined in accordance with IS 13826 ( Part 7 ) : 1993 shall conform to the values given in col 6 of Table 1.

## 8 TESTS

Tests shall be carried out as per the relevant standards mentioned in 7 and as specified in col 2 to 8 of Table 2.

## 9 SAMPLING AND CRITERIA OF CONFORMITY

### 9.1 Sampling

#### 9.1.1 Lot

9.1.1.1 The conformity of the lot to the requirements of this standard shall be determined on the basis of inspection and tests carried out on the samples selected from the lot.

9.1.2 The number of rolls to be selected from the lot shall depend upon the size of the lot and shall be in accordance with col 1 and 2 of Table 3.

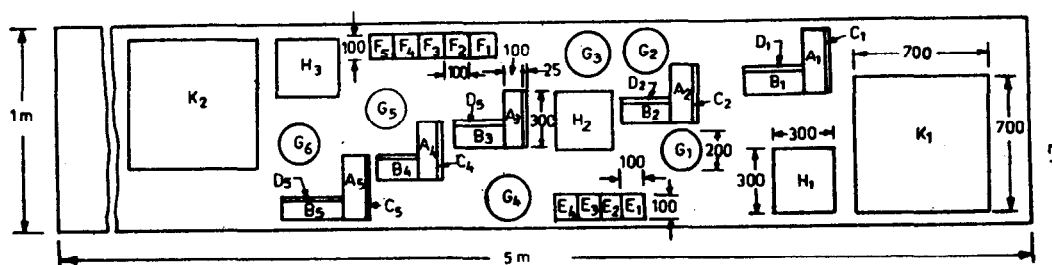
9.1.2.1 These rolls shall be selected at random from the lot, and in order to ensure randomness of selection, random number tables may be used. In case random number tables are not available, the following procedure may be adopted for the selection of the rolls.

Starting from any roll in the lot count them as 1, 2, 3, ...,  $r$ , and so on, in order. Every  $r$ th roll thus counted may be selected till the requisite number of rolls for the sample is obtained,  $r$  being the integral part of  $N/n$ , where  $N$  is the number of rolls in the lot, and the number of rolls to be selected in the sample.

#### 9.1.3 Test Samples and Number of Tests

9.1.3.1 All the rolls selected in 9.1.2 shall be inspected for width, length and visible external defects.

9.1.3.2 The number of rolls to be tested for breaking strength, pliability and storage sticking, heat resistance, water absorption test, pressure head test and binder content shall be in accordance with col 4 of Table 3. These rolls



A, B—Breaking Strength      C, D—Pliability      E—Storage Sticking  
F—Heat Resistance      G—Pressure Head      H—Water Absorption      K—Binder Content

All dimensions in millimetres.

FIG. 1 TYPICAL LAYOUT FOR CUTTING TEST PIECES FROM THE ROLL

shall be taken at random from those inspected under 9.1.3.1 and found satisfactory for dimensions. From each of these rolls, one test sample 5 m long and the full width of the felt shall be cut out for preparing test specimens. Test sample shall not be taken from damaged portion of the roll, if any. The required number

of test specimens shall be taken from each of the test sample and subjected to the corresponding tests.

9.1.3.3 From each sample the test specimens shall be cut out in the manner shown in Fig. 1 which depicts the layout of test specimens.

**Table 2 Requirements of Bitumen Felts**  
( Clauses 6 and 8 )

Type of Felt	Breaking Strength, Min, Kg		Pliability Test	Storage Sticking Test	Heat Resistance Test	Pressure Head Test	Water Absorption Test, Max
	Warpway	Weftway					
	IS 13826 ( Part 1 ) : 1993		IS 13826 (Part 2) : 1993	IS 13826 (Part 3) : 1993	IS 13826 (Part 5) : 1993	IS 13826 (Part 4) : 1993	IS 13826 (Part 6) : 1993
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Type 1	72	24	i) The roll shall not show cracks on unrolling	—	—	—	—
			ii) Consider any surface rupture exceeding 5 mm in length as failure	—	—	—	—
Type 2	95	60	i) The roll shall not show cracks on unrolling	The test pieces shall be examined after cooling	The test pieces shall show no sign of melting of the bitumen compound	The test pieces shall show no sign of leakage	5.0 per cent
			ii) Consider any surface rupture exceeding 5 mm in length as failure	After release of the load, the layers of felt shall be capable of being separated without damaging the coating, in any way	—	—	—
Type 3 ( all grades )	135	90	i) The roll shall not show cracks on unrolling	The test pieces shall be examined after cooling	The test pieces shall show no sign of melting of the bitumen compound	The test pieces shall show no sign of leakage	2.0 per cent
			ii) Consider any surface rupture exceeding 5 mm in length as failure	After release of the load, the layers of felt shall be capable of being separated without damaging the coating in any way	—	—	—

NOTE — Appropriate tests for the above requirements are described in 7.

**Table 3 Sample Size and Criterion of Conformity**

[ Clauses 9.1.2, 9.1.3.2 and 9.1.4.1(a) ]

No. of Rolls in the Lot	No. of Rolls to be Selected in the Sample	Permissible No. of Defective Rolls	Sub-Sample of Sizes, No. of Rolls to be Selected in the Sample
(1)	(2)	(3)	(4)
Up to 100	5	0	2
101 to 150	8	0	3
151 to 300	13	0	4
301 to 500	20	1	5
501 to 1 000	32	2	6
1 001 to 3 000	50	3	8
3 001 and above	80	5	10

#### 9.1.4 Criteria for Conformity

9.1.4.1 The lot shall be considered to be in conformity with the requirements of the standard if the following conditions are satisfied:

- The number of rolls found defective with respect to any characteristics mentioned in 9.1.3.1 does not exceed the corresponding number given in col 3 of Table 3.
- From the observed values of breaking strength, the average  $\bar{X}$  and the range  $R$  are calculated for each direction (that is, warp-way and weftway) separately, and the value of the expression  $\bar{X} - 0.6R$  is found to be greater than or equal to the applicable specified value.

#### NOTES

1 Average  $\bar{X}$  is the value obtained by dividing the sum of the observed values by the number of observed values.

2 Range  $R$  is the difference between the maximum and the minimum in a set of observed values.

- All the sample rolls tested for water absorption shall satisfy the conditions of IS 13826 (Part 6) : 1993 individually.
- For the other characteristics mentioned in 9.1.3.2 (except breaking strength and water absorption), all the test pieces satisfy all the requirements of the characteristics individually.

## 10 PACKING AND MARKING

### 10.1 Packing

Unless otherwise specified, bitumen felts should be securely packed in rolls. The rolls of hessian base Type 3 bitumen felts shall be wound on cores and the fibre base Types 1 and 2 bitumen felts need not be wound on cores, but they shall be securely wrapped in a kraft paper of the same width as the fabric. The wrapper shall completely encircle the roll and shall be pasted at the overlap in manner that will prevent it from opening out. The ends of the roll need not be covered.

### 10.2 Marking

Each package shall be legibly and indelibly marked with the following information:

- Indication of the source of manufacturer;
- Type and grade of the bitumen felt;
- Length, width and weight of the roll; and
- Batch number in code and date of manufacture.

## ANNEX A

( Foreword )

### COMMITTEE COMPOSITION

Water Proofing and Damp-Proofing Sectional Committee, CED 41

#### Chairman

PROF M. S. SHETTY

#### Members

CAPT ASHOK SHASTRY  
 SHRI S. K. BANERJEE ( Alternate )  
 SHRI T. CHAUDHURY  
 SHRI B. MANDAL ( Alternate )  
 DIRECTOR ( DESIGN )  
 SHRI D. C. GOEL  
 SHRI A. K. GUPTA  
 SHRI D. MOUDGIL ( Alternate )  
 SHRI A. K. GUPTA  
 SHRI K. RAJGOPALAN ( Alternate )  
 SHRI M. B. JAYAWANT  
 SHRI MOIZ S. KAGDI  
 SHRI SUBEN M. THAKKER ( Alternate )  
 SHRI M. K. KANCHAN  
 SHRI K. D. NARULA ( Alternate )  
 BRIG V. K. KANITKAR  
 SHRI C. S. S. RAO ( Alternate )  
 SHRI M. H. KHATRI  
 SHRI A. BOSE ( Alternate )  
 SHRI Y. P. KAPOOR  
 SHRI V. NATARAJAN ( Alternate )  
 SHRI H. C. METAI  
 SHRI M. M. MATHAI  
 SHRI R. D. NAYAK  
 SHRI P. C. SRIVASTAVA ( Alternate )  
 COL ( Retd ) D. V. PADSALGIKAR  
 SHRI R. P. PUNJ  
 SHRI A. K. SEN ( Alternate )  
 SHRI RAVI WIG  
 SHRI K. K. MADHOK ( Alternate )  
 SHRI T. K. ROY  
 SHRI B. B. BANERJEE ( Alternate )  
 SHRI SAMIR SUBLAKER  
 SHRI JAYANT DEOGAONKAR  
 ( Alternate )  
 SHRI R. SARABESWAR  
 SR DEPUTY CHIEF ENGINEER  
 SUPERINTENDING ENGINEER ( Madras Circle )  
 ( Alternate )  
 SHRI A. SHARIFF  
 SHRI D. KUSHWAHA ( Alternate )  
 SHRI J. S. SHARMA  
 SHRI R. S. RAWAT ( Alternate )  
 SHRI SRAMAL SENGUPTA  
 SHRI U. R. P. SINHA ( Alternate )  
 SHRI J. VENKATARAMAN,  
 Director ( Civ Engg )

#### Representing

In personal capacity ( No. 4, Sapan Baug, Near Empress Garden, Pune 411001 )

Osnar Chemical Pvt Ltd, Bombay  
 National Test House ( ER ), Calcutta  
 National Buildings Organization, New Delhi  
 Central Road Research Institute, New Delhi  
 Engineers India Ltd, New Delhi  
 Metro Railway, Calcutta  
 Synthetic Asphalts, Bombay  
 Polyseal India Engineering Centre, Bombay  
 Central Public Works Department, CDO  
 Engineer-in-Chief's Branch, Army Headquarters, New Delhi  
 Overseas Water-Proofing Corporation Ltd, Bombay  
 Fosroc India Ltd, Bangalore  
 Building Materials & Technology Promotion Council, New Delhi  
 Cempire Corporation, Madras  
 Bharat Petroleum Corporation Ltd, Bombay  
 B. G. Shirke & Co, Pune  
 Lloyd Bitumen Products Pvt Ltd, Calcutta  
 MES Builders' Association of India, New Delhi  
 STP Ltd, Calcutta  
 MC-Bauchemic ( India ) Ltd, Bombay  
 Integrated Water-proofing Ltd, Madras  
 Public Works Department, Government of Tamil Nadu  
 FGP Ltd, Bombay  
 Central Building Research Institute ( CSIR ), Roorkee  
 Projects and Development India Ltd, Dhanbad  
 Director General, BIS ( Ex-Officio Member )

#### Secretary

SHRI J. K. PRASAD  
 Joint Director ( Civ Engg ), BIS



## ANNEX B

( Clause 2 )

## LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
73 : 1992	Specification for paving bitumen ( <i>second revision</i> )	2818 ( Part 2 ) : 1971	Specification for Indian hessian: Part 2 305 and 229 g/m <sup>2</sup> at 16 percent contract regain ( <i>first revision</i> )
460 ( Part 1 ) : 1985	Specification for test sieves: Part 1 Wire cloth test sieves ( <i>third revision</i> )	13826	Methods of tests for bitumen based felt :
702 : 1988	Specification for industrial bitumen ( <i>second revision</i> )	( Part 1 ) : 1993	Breaking strength test
1203 : 1978	Methods of testing tar and bituminous materials: Determination of penetration ( <i>first revision</i> )	( Part 2 ) : 1993	Pliability test
		( Part 3 ) : 1993	Storage sticking test
		( Part 4 ) : 1993	Pressure head test
		( Part 5 ) : 1993	Heat resistance test
1205 : 1978	Methods for testing tar and bituminous materials: Determination of softening point ( <i>first revision</i> )	( Part 6 ) : 1993	Water absorption test
		( Part 7 ) : 1993	Determination of binder content

## Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

### Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

### Review of Indian Standards

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 Handbook' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. CED 41 ( 5186 ).

#### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

## BUREAU OF INDIAN STANDARDS

### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002  
Telephones : 323 01 31, 323 94 02, 323 33 75

Telegrams: Manaksanstha  
( Common to  
all offices )

### Regional Offices:

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg  
NEW DELHI 110002

#### Telephone

{ 323 76 17  
323 38 41

Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola  
CALCUTTA 700054

{ 337 84 99, 337 85 61  
337 86 26, 337 86 62

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022

{ 60 38 43  
60 20 25

Southern : C. I. T. Campus, IV Cross Road, CHENNAI 600113

{ 235 02 16, 235 04 42  
235 15 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)  
MUMBAI 400093

{ 832 92 95, 832 78 58  
832 78 91, 832 78 92

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR.  
COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR.  
KANPUR. LUCKNOW. NAGPUR. PATNA. PUNE. THIRUVANANTHAPURAM.

**AMENDMENT NO. 1 AUGUST 1995**  
**TO**  
**IS 1322 : 1993 BITUMEN FELTS FOR WATER-**  
**PROOFING AND DAMP-PROOFING — SPECIFICATION**

*( Fourth Revision )*

[ Page 1, clause 4.3.1(a), ninth line ] — Substitute '[ see IS 460 ( Part 1 ) : 1985 ]' for '[ see IS 460 ( Part 1 ) : 1978 ]'.

( Page 2, Table 1 ) — Substitute '4.5' for '3.6' and '5.7' for '4.5' in col 4.

( Page 2, clause 6 ) — Substitute the following for the existing matter:

'Unless otherwise specified, bitumen felts shall be supplied in widths of 90 cm or 100 cm and generally in lengths of 10 m or 20 m.'

( Page 3, clause 7.1 ) — Substitute 'Pliability test after conditioning the sample for 3 h at 5°C' for 'Pliability test' and 'Heat resistance test conducted at  $68 \pm 2^\circ\text{C}$ ' for 'Heat resistance test'.

( Page 3, clause 7.1, Note 1 ) — Substitute the following for the existing note:

'1 Diameter of Mandrel for pliability shall be as follows:

Type 1	}	50.0 mm
Type 2		
Type 3, Grade 1		
Type 3, Grade 2		75.0 mm'

( Page 3, clause 7.1, Note 2 ) — Substitute 'three' for 'two' in the first line.

( Page 3, clause 9.1.1 ) — Add the following matter below '9.1.1 Lot':

'All the rolls of the same type and grade and from the same batch of manufacture, in one consignment shall constitute a lot.'

( Page 3, clause 9.1.2.1, para 2, lines 6 and 7 ) — Insert 'n is' between the words 'lot, and' and 'the number'.

( Page 4, Table 2 ) — Substitute '( Clauses 7 and 8 )' for '( Clauses 6 and 8 )' below the title.

( CED 41 )