



**GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS**

**INDIAN RAILWAY  
STANDARD SPECIFICATION**

**FOR**

**POLYETHYLENE DOWELS FOR CONCRETE SLEEPER**

**Serial No. T-57- 2020**

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**Government of India  
Ministry of Railways  
(Railway Board)**

**INDIAN RAILWAY STANDARDS SPECIFICATION  
FOR  
POLYETHYLENE DOWELS FOR CONCRETE SLEEPERS  
(T-57-2020)**

**0.0 FOREWORD:**

0.1 Prior to the issue of this standard specification for the Polyethylene Dowels for concrete sleepers there were two standard specifications namely:-

- a) Indian Railway Standards Specification for Polyethylene dowels (Tentative)-1983.
- b) Indian Railway Standards Specification for Polyethylene dowels for HM Assembly (Provisional-1984).

The specification at (a) above, was for the dowels for use in concrete sleepers for yards and the specification at (b) above for dowels for use in the concrete sleepers with H.M. German fastening. The basic difference between the two specifications is for the grade of material with respect to "Melt Flow Index" (MFI) values which in the case of yard sleeper dowels is less than 0.5 gms per ten minutes and that for the HM fastening is less than 0.1 gm/10 minutes. The material with MFI less than 0.1gm/10 minutes is considered far superior for extended serviceability than the material with MFI less than 0.5gm/10 minutes. The material with MFI less than 0.1 gm/10 minutes which was hitherto imported, is now being produced in the country with satisfactory quality. Therefore, it was considered to use this material for dowels both for the yard sleeper as well as for the sleeper using HM Fastenings to drg. no. RDSO/T-3002 and to have a common specification for all types of Polyethylene dowels for use in the concrete sleepers in the track. With the issues of this specification, the two above mentioned standards were ceased to exist.

0.2 For deciding whether a particular requirement of this standard is complied with, the final value observed or calculated expressing the results of a test or analysis, shall be rounded off in accordance with IS:2. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

0.3 Corrigendum no. 01 regarding ISO procedure was issued in 2016. This specification has now been revised and issued in 2020, incorporating the above corrigendum and latest versions of codes/ standards as referred to in this specification.

## **1.0 SCOPE:**

1.1 This specification covers the requirements, methods of tests and sampling for polyethylene dowels for use in concrete sleepers and similar applications. The dowel is embedded in concrete at the time of manufacture of concrete sleepers and similar other assemblies.

1.2 All the provisions contained in RDSO's ISO procedures laid down in Document no. QO-D-7.1-11 dated 19.07.2016 (Titled "vendor-changes in approved status") and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways.

## **2.0 TERMINOLOGY:**

### **2.1 Melting point:**

It is the temperature at which material changes from solid to liquid state.

### **2.2 Melt Flow Index:**

It is the measurement of the rate of extrusion of molten resins through a die of a specified length and diameter under prescribed conditions of temperature, load and piston position in the barrel.

### **2.3 Tensile Strength:**

It is the tensile stress required to stretch the test specimen to the breaking point, the conditions being such that the stress is substantially uniform over the cross section.

### **2.4 Elongation at break:**

It is defined as the tensile strain in the test specimen stretch to breaking point the conditions being such that the stress is substantially uniform over the cross section.

### **2.5 Hardness:**

Hardness is the resistance of the material to penetration of a specific type of indenter when forced into the material under specified conditions.

### **2.6 Density:**

It is the mass per unit volume of the material.

**2.7 Ash content:**

Residue remaining after incipient combustion of a material (at 900° C in this case)

**2.8 Pre-acceptance tests:**

These refer to the tests which are required to be conducted on dowels as well as on the test specimens before a firm is cleared for manufacture and supply of this item.

**2.9 Acceptance tests:**

These refer to the tests conducted on the dowels for the purpose of acceptance/rejection of the dowels during inspection.

**3.0 REFERENCE DOCUMENTS:**

3.1 This standard refers to the following BS/ASTM/IS specifications. The latest version of following BS/ASTM/IS/EN specifications should be available at the manufacture's works for references.

S.No	Standard	Title
1.	ASTM-D-1238-13	Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
2.	ASTM-D-2240-15	Standard Test Method for Rubber Property—Durometer Hardness
3	EN-ISO 527-1:2019	Plastics — Determination of tensile properties
4	IS:5762-1970 (Reaffirmed-2020)	Methods for Determination of Melting Point and Melting Range
5	IS:2-1960	Rules for Rounding off Numerical Values

3.2 The specific provision in this standard will over-ride those in the above specification where these are not in conformity with one another. Any specific requirement given in the drawing of the dowel all over-ride the relevant provision of this standard specification.

3.3 RDSO drawing relevant to the dowel under production should be available for reference at the manufacturer's works.

#### 4.0 **MANUFACTURE:**

##### 4.1 **MATERIAL:**

4.1.1 The base material shall be special grade of high density polyethylene (H.D.P.) so as to conform to the requirement clause 4.1.2.

4.1.2 The physical properties of special grade high density polyethylene material used for the manufacture of dowel shall conform to the requirements given in table below:

**TABLE-1**

S. No.	Properties	Unit	Values	Test Method
1	Melt Flow Index I <sub>5</sub> at 190°C	gms/10 min.	0.1 max	ASTM-D-1238-13
2	Crystalline melting point	°C	135-137.5	IS:5762-1970
3	Density	gm/cm <sup>3</sup>	0.945 min	Buoyancy method
4	Ash content	%	0.5max	-
5	Hardness (shore D)	number	65 min.	ASTM-D-2240-15
6	Tensile strength	Mpa	32 min.	EN-ISO 527-1: 2019
7	Elongation at break	%	450 min.	-do-

##### 4.2 **MANUFACTURING PROCESS**

The dowels shall be manufactured by automatic screw type injection moulding machine.

##### 4.3 **MARKING:**

Each dowel moulding shall be legibly marked with 3mm deep letters and figures showing manufacturer's initials, last two digits of the year of manufacture and part number at suitable place as indicated in relevant drawing of the dowel.

##### 4.4 **FREEDOM FROM DEFECTS:**

The dowels shall be smooth, sound and free from moulding defects such as bubbles, burn marks, voids, surface sinking, crazing and blistering of surface, warping, lamination, cracks etc. All edges shall be neatly finished.

## **5.0 PRE-ACCEPTANCE TESTS:**

5.1 Tests as given from S. No. (i) to (v) in the Table-1 shall be carried out on the dowels as such. Other tests i.e. tensile test and elongation test shall be conducted on dumbell test specimens prepared from the same raw material used for the manufacture of dowels.

### **5.2 TEST SCHEME:**

All tests shall be done as per scheme of testing given in Appendix-I, and results of all the individual test shall be reported.

### **5.3 REPORT:**

The reporting of test results shall be as per Appendix-I

## **6.0 ACCEPTANCE TEST/INSPECTION:**

### **6.1 LOT SIZE:**

For the purpose of inspection of the dowels 5000 nos. or a part thereof shall constitute a lot.

### **6.2 SAMPLE SIZE:**

Sample size for test shall be as given in the following paragraphs against each test:

### **6.3 TESTS**

#### **6.3.1 Dimensional checks**

6.3.1.1 Dimensions shall be checked by means of approved inspection gauges (clause 10). The results shall be reported as per Appendix II.

6.3.1.2 One percent (1%) of polyethylene dowel per batch shall be drawn at random and checked for dimensions in the first 1,00,000 nos. of dowels of one design manufactured by a firm. 0.5% dowels per lot shall be checked for dimensions consequent to 1,00,000 nos. dowels of one design being found satisfactory.

6.3.1.3 In case, any lot is rejected for dimension, one percent dowels per batch shall be checked from next lot onwards till 1,00,000 nos. dowels are found continuously satisfactory and thereafter the sampling rate shall be 0.5% per lot again.

### **6.3.2 OTHER TESTS:**

6.3.2.1 Minimum 3 samples dowels from a lot of 5000 or part thereof shall be drawn for the following tests. Tests shall be carried out from the finished product as given below:

S.No.	Test per lot	Sample size per lot
i)	Melt Flow Index (MFI)*	3
ii)	Crystalline melting point	3
lii)	Density	3
iv)	Hardness	3
v)	Ash content	3

\*Note: One composite sample shall be made by mixing approximately equal quantity of samples from each of the 3 dowels and 3 reading shall be recorded during test run and highest value reported. The test results shall be reported as per Appendix-III

### **7.0 RE-TEST:**

- 7.1 In respect of dimensions only, if the lot offered failed to meet with the stipulations, in clause 6.3.1, the manufacturer shall offer the lot for re-inspection after sorting out the defective dowels.
- 7.2 Should any of the tests as mentioned in clause 6.3.2.1 fail to meet the specified requirements, double the number of samples from the same lot shall be drawn at random for re-testing in respect of each failure. Should these pass in re-testing, the lot of dowels represented by the test samples, shall be deemed to comply with the requirement of that particular test. Should the re-test samples fail, the entire lot shall be treated as rejected.

### **8.0 PACKING:**

- 8.1 The dowels shall be packed in poly bags which in turn shall be placed in sturdy/stout boxes and sealed. Alternately packing in gunny bags instead of boxes shall be permitted mutually agreed to by the purchaser and supplier.
- 8.2 For transportation by road, the sealed boxes containing the dowels shall be transported in a vehicle exclusively used for the dowels and no other containments shall be loaded with the dowel in the same vehicle.

### **9.0 TEST FACILITIES:**

The dowel manufacturer shall be required to install all the necessary test facilities for inspection of dowels in a separate well lit, clean and properly ventilated laboratory room provided with easily maintainable floor and platform.

## **10.0 INSPECTION GAUGES:**

The inspection gauges for dimensional check shall be manufactured by the supplier and two sets shall be submitted for approval by the inspecting authority. One set shall be used as 'Master Gauge' and shall be preserved safely by the supplier. The second set shall be for use by the inspecting official. For internal quality control, the firm should use an additional set of gauges.

## **11.0 DISPOSAL OF REJECTED DOWELS:**

The rejected dowels shall be cut into pieces in such a manner as to render them un-usable

## **12.0 REPORTS:**

The inspection official shall report the test observation in the format given in Appendix II & III

## **13.0 GENERAL:**

13.1 The base material shall be stored in original packing in cool/dry place.

13.2 The purchaser/the inspecting officer shall have free access at all reasonable times to the works of the supplier, where the polyethylene dowels are manufactured. He shall be at liberty to inspect the manufacture at any stage and to reject any material or supplies that do not conform to this specification. He can call for any records pertaining to manufacture which shall be made available to him within reasonable time.

13.3 The dowel manufacturer shall furnish, at his cost the dowels required for all tests and shall provide necessary manpower and facilities for carrying out tests at his cost.

13.4 The material shall be offered for inspection as per call letter given in Appendix IV.



**SCHEME OF TESTING FOR PRE-ACCEPTANCE TESTS**

(Ref. Para 5.0)

S. No	Property	No. of samples to be tested	Criteria value for acceptance/rejection	No. of samples to be drawn
1	Melt Flow Index	3	Highest of three measurement of a composite sample	4
2	Melting point	3	Individual	4
3	Density	3	-do-	4
4	Hardness	3	-do-	4
5	Ash content	3	-do-	4
6	Dimension	3	-do-	8
7	Tensile	5	-do-	7
8	Elongation at break	5	-do-	9

- Note: i) Tests at S.No.1 to 6 shall be conducted on dowels.  
ii) Tests at S.No.7 and 8 shall be done on specially prepared test specimen.  
iii) Tests at S.No.1 to 5 may be done on same samples.  
iv) Tests at S.No.7 and 8 may be done on same test specimen.

Name of firm  
M/s

**TEST RESULTS OF DIMENSIONS**

- 1) Railways P.O. No.....
- 2) Dowel to Drg. No.....
- 3) Quantity on order .....

Lot No.	Lot Qty in Nos.	Sample size in Nos.	Dimensions	
			As per Gauge to drg. no.	Failing in dimensions

**APPENDIX-III**  
**(IRST-57)**

Name of firm  
M/s.....

**TEST RESULTS OF TESTS OTHER THAN DIMENSIONS (CLAUSE 6.3.2)**

1. ....Railway P.O. No.....
2. Dowel to drawing No.....
3. Quantity on order.....
4. Lot No.....Lot Qty.....Nos.

Sl. No	Tests	Requirement	Observed values
1.	Melt Flow Index, I <sub>5</sub> (gm/10mts)	0.1 max	
2	Crystallising melting point, °C	135-137.5	
3	Density, gm/cm <sup>3</sup>	0.945 min	
4	Hardness (Shore 'D')	65 min	
5	Ash content %	0.5 max	

Letter of offer from the firm

To  
(Address of inspecting agency)

Sub: Call letter for inspection of polyethylene Dowels to drg no. RDSO/T....

Ref: Railway P.O.No.....dated.....for Polyethylene Dowels to drg. No.  
RDSO/T.....

Polyethylene Dowels as per following details are offered for inspection in terms of the above referred purchase order. These have been internally checked/found satisfactory as per drawing no. RDSO/T..... and relevant IRS specification.

The test results are mentioned in the proforma as prescribed in the IRS specification:

1. Lot No.
2. No.of batches
3. Quantity on order
  - (a) Against original order
  - (b) Against extension
4. Quantity previously inspected and passed
5. Quantity now offered for inspection
  - (a) Against original order
  - (b) Against extension
6. Rate per dowel
7. Marking on dowel
8. Delivery period
  - (a) Original
  - (b) Extended
  - (c) Letter No.(for extension)
9. Consignee
10. Consignee letter of authority No.
11. Packing
12. Test certificate of raw material

Thanking you,

Yours faithfully  
Signature with date of firm  
Authorized person)  
Name.....