IS 15927-1 (2012): Polyethylene Fittings for use with Polyethylene Pipes for the Supply of Gaseous Fuels – Specification, Part 1: Fittings for Socket Fusion using Heated Tools [CED 50: Plastic Piping System]

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भारतीय मानक

गैसीय ईधन की पूर्ति के लिए पालीईथाइलीन पाइपों के साथ प्रयोग के लिए पालीईथाइलीन फिटिंगें — विशिष्टि

भाग 1 तप्त औजारों के प्रयोग से सॉकेटों की फिटिंगें

Indian Standard

POLYETHYLENE FITTINGS FOR USE WITH POLYETHYLENE PIPES FOR THE SUPPLY OF GASEOUS FUELS — SPECIFICATION

PART 1 FITTINGS FOR SOCKET FUSION USING HEATED TOOLS

ICS 75.200; 83.140.30

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Plastic Piping Systems Sectional Committee, CED 50

FOREWORD

This Indian Standard (Part 1) was adopted by the Bureau of Indian Standards, after the draft finalized by the Plastic Piping Systems Sectional Committee had been approved by the Civil Engineering Division Council.

The requirements for polyethylene fittings for use with polyethylene pipes for supply of gaseous fuels are covered by the following three parts. The other parts in the series are:

Part 2 Spigot fittings for butt fusion, for socket fusion using heated tools and for use with electro fusion fittings

Part 3 Electro fusion fittings

This standard covers polyethylene fittings for socket using heated tools in the nominal sizes 16 mm to 125 mm inclusive, where the size indicate compatibility of fitting with polyethylene pipes of the corresponding size in accordance with IS 14885 : 2001 'Polyethylene pipes for the supply of gaseous fuels — Specification'.

In the formulation of this standard considerable assistance has been derived from ISO 8085-1 : 2001 'Polyethylene fittings for use with polyethylene pipes for the supply of gaseous fuels — Metric series — Specification: Part 1 Fittings for socket fusion using heated tools'.

This standard does not purport to address all the safety requirements associated with the use of these fittings. It is the responsibility of users to establish safety and health practices. Regulatory norms associated with the product are to be adhered to.

The composition of the Committee responsible for the formulation of this standard is given in Annex B .

For the purpose of 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 : 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

POLYETHYLENE FITTINGS FOR USE WITH POLYETHYLENE PIPES FOR THE SUPPLY OF GASEOUS FUELS — SPECIFICATION

PART 1 FITTINGS FOR SOCKET FUSION USING HEATED TOOLS

1 SCOPE

This standard (Part 1) lays down requirements for buried polyethylene socket fittings using heated tools, where the shape and composition of the fitting is suitable for fusion with polyethylene pipes complying with IS 14885 : 2001 'Polythylene pipes for the supply of gaseous fuels — Specification' and spigot fittings conforming to IS 15927 (Part 2) : 2010 'Polyethylene fittings for use with polyethylene pipes for the supply of gaseous fuels — Specification: Part 2 Spigot fittings for butt fusion, for socket fusion using heated tools and for use with electro fusion fittings', for the supply of gaseous fuels for nominal outside diameters ranging from 16 mm to 125 mm with SDR 11 and SDR 17.6. Material grades PE 80 and PE 100, pressures 5.5 bar (*see* Note) and 7 bars and operating temperatures from – 5°C to 40°C.

NOTE — 1 bar = 10^5 N/m^2 = 0.1 MPa.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of 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:

IS No.	*Title*
2530 : 1963	Methods of test for polyethylene moulding materials and polyethylene compound
7328 : 1992	High density polyethylene materials for moulding and extrusion — Specification (*first revision*)
14885 : 2001	Polyethylene pipes for the supply of gaseous fuels — Specification
15927 (Part 2) : 2010	Polyethylene fittings for use with polyethylene pipes for the supply of gaseous fuels — Specification: Part 2 Spigot fittings for butt fusion, for socket fusion using heated tools and for use with electro fusion fittings

3 TERMINOLOGY

For the purpose of this standard the following definitions shall apply.

3.1 Nominal Diameter of Fitting (d_n) — The nominal diameter of a fitting is taken as the nominal diameter of the corresponding pipe series.

3.2 Nominal Wall Thickness of Fitting (e_n) — The nominal wall thickness of a fitting is taken as the nominal wall thickness of the corresponding pipe series.

3.3 Mean Inside Diameter — Arithmetic mean of at least two inside diameters measured at right angles to each other in transverse planes.

3.4 Out of Roundness of Socket (Ovality) — Maximum inside diameter minus the minimum inside diameter of the socket measured in the same plane, parallel to the plane of the mouth.

3.5 Maximum Out of Roundness of Socket — Greatest value of the out of roundness between the plane of the mouth and a plane separated from it by a distance *L* (the socket reference length).

3.6 Socket Taper — Included angle at the vertex of the triangle corresponding to the longitudinal cross-section of a cone based on the mean socket-mouth diameter, the mean socket-root diameter and the reference length of the socket.

3.7 Standard Dimension Ratio of Fitting (SDR) — The SDR value of a fitting is taken as quotient of the nominal out side diameter and the nominal wall thickness of the corresponding pipe (expressed rounded to one decimal) and is given by:

$$\text{SDR} = \frac{d_n}{e_n}$$

3.8 Wall Thickness of Fitting (*E*) — Wall thickness at any point of the body of the fitting, which could be submitted to the full stress induced by the pressure of the gas in the piping system.

3.9 Melt Flow Rate (MFR) — Value relating to the viscosity of the molten thermoplastic material at a specified temperature and rate of shear.

3.10 Maximum Allowable Operating Pressure (MAOP) — The highest effective pressure of the gas in the piping system expressed in bar, which is allowable in continuous use. It takes into account the physical and the mechanical characteristics of the components of a piping system. It is given by the equation:

$$\text{MAOP} = \frac{20\ \text{MRS}}{C(\text{SDR} - 1)}$$

3.11 Overall Service (Design) Coefficient (*C*) — An overall coefficient with a value greater than 1, which takes into consideration service conditions as well as properties of the components of piping system other than those represented in the lower confidence limit. For gas applications, *C* can have any value equal to or greater than 2.0.

3.12 Gaseous Fuel — Any fuel which is in the gaseous state at a temperature of +15°C and a pressure of 1 bar.

3.13 Virgin Material — Thermoplastics material in a form such as granules which has not been previously processed other than for compounding and to which no reprocessable or recyclable materials have been added.

3.14 Compound — Homogeneous mixture of base polymer (PE) and additives for example anti-oxidants, pigments and UV stabilizers at concentrations necessary for the particular application.

3.15 Lower Confidence Limit (σ_{LCL}) — Quantity with the dimensions of stress, in MPa, which can be considered as a property of the material and represents the 97.5 percent lower confidence limit of the mean long-term hydrostatic strength at 20°C for 50 years determined by pressurizing internally with water.

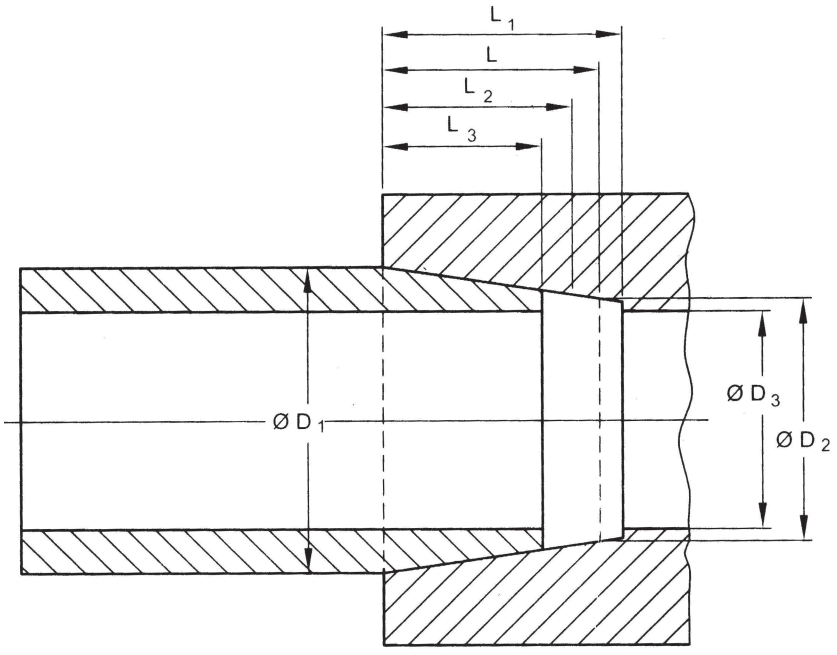
3.16 Minimum Required Strength (MRS) — Minimum value, in MPa, for long-term hydrostatic strength (LTHS) of the material.

4 SYMBOLS

The dimensions and symbols used in this standard are shown in Fig. 1.

5 DESIGNATION

5.1 Fittings shall be designated according to the grade of material used (*see* **5.2**); nominal diameter (*see* **8.2.1**) and standard dimension ratio (SDR) (*see* **3.7**). For



D_1 = mean inside diameter of the socket mouth that is the mean diameter of the circle at the intersection of the extension of the socket with the plane of the socket mouth.

D_2 = mean inside diameter of the socket root that is the mean diameter of the circle in a plane parallel to the plane of the mouth and separated from it by a distance *L* which is the reference length of the socket.

D_3 = minimum bore that is the minimum diameter of the flow channel through the body of the fitting.

L = reference socket length that is the theoretical minimum socket length used for calculation purposes.

L_1 = actual length of the socket from mouth to shoulder (if any).

L_2 = heated length of the fitting that is the length of penetration of the heated tool into the socket.

L_3 = insertion depth that is the depth of penetration of the heated pipe end into the socket.

FIG. 1 SOCKET DIMENSIONS

example PE 80 DN90 SDR 11 indicates that the fitting is made from the material grade PE 80, of nominal diameter 90 mm having SDR 11 rating.

5.2 Grade of Material

5.2.1 Fittings shall be classified according to the grade of material as given in Table 1 of IS 14885.

5.2.2 The maximum allowable hydrostatic design stress(σ) of a fitting is obtained by applying the design safety coefficient of 2.0 minimum at 20°C to the MRS value of the material.

5.2.3 The raw material supplier shall give the material grading.

5.3 Colour

The colour of the fittings shall be yellow/black for PE 80 and black for PE 100 fittings.

6 MATERIAL

6.1 The polyethylene compound used in the manufacture of fittings shall be polyethylene, which shall be produced by adding only those additives necessary for the manufacture and end use of fittings conforming to this standard and for their fusion jointing. It shall be free from visible water, when checked with unaided human eyes and shall comply with the requirements as specified in Table 2 of IS 14885.

All additives shall be uniformly dispersed. The additives shall not have a negative influence on the performance with respect to fusibility.

6.2 Anti-oxidant

The percentage of anti-oxidant used shall not be more than 0.3 percent by mass of finished resin as per IS 2530.

6.3 U V Stabilizer

The percentage of U V stabilizer used shall not be more than 0.5 percent by mass of finished resin.

6.4 Carbon Black Content (for Black Compounds Only)

When tested, in accordance with IS 2530, the carbon black content shall be within 2.5 ± 0.5 percent.

6.5 Carbon Black Dispersion (for Black Compounds Only)

When tested, in accordance with IS 2530, the dispersion of carbon black shall be satisfactory.

6.6 Pigment Dispersion (for Non-black Compounds Only)

When tested as per Annex E of IS 14885, the grading should be ≤ 3.

6.7 Effects of Gas Constituents on the Hydrostatic Strength

When tested as per **5.5** of IS 14885, the fitting shall pass the test.

6.8 Compatibility

Conformity to **9** shall be established by the fitting manufacturer to ensure compatibility of the fittings with polyethylene pipes conforming to IS 14885. The polyethylene pipe used for this demonstration, the fusion conditions and the tooling shall be as detailed in Annex A.

7 GENERAL REQUIREMENTS

7.1 Multiple Connections

If a fitting includes one or more spigot ends, these shall conform to IS 15927 (Part 2).

7.2 Appearance of the Fitting

When viewed without magnification, the internal and external surfaces of the fitting shall be smooth, clean and free from scoring, cavities and other surface defects which might prevent conformity to this standard.

7.3 Appearance of the Joint

When viewed without magnification, the internal and external surfaces of the pipe and fitting after fusion jointing shall be free from melt exudation (spillage) outside the confines of the fitting.

8 GEOMETRICAL CHARACTERISTICS

8.1 General

The dimensions of the fittings shall be measured, not less than 24 h after manufacture, and after conditioning for at least 4 h without any support for re-rounding of the fusion ends.

The fittings are designated by the nominal diameter of the socket, which corresponds to the nominal outside diameter d_n of the pipe with which these are to be used.

8.2 Socket Dimensions

8.2.1 *Nominal Diameter*

The nominal diameter of the fittings covered in this standard are 16, 20, 25, 32, 40, 50, 63, 75, 90, 110 and 125 mm (*see* Table 1 and Table 2).

Fittings shall be classified by fusion type, as follows:

a) *Type A* — Fittings intended for use with pipes having dimensions and tolerances as given in IS 14885. No external peeling of the pipe shall be carried out. The measured value D_1 shall be greater than equal to that of D_2.

b) *Type B* — Fittings intended for use with pipes, having dimensions and tolerances as given in IS 14885 but with the outside surface of the pipe peeled in accordance with the manufacturer's instructions. The measured value D_1 shall be greater than equal to that of D_2.

8.3 Wall Thickness (*E*) of the Fitting

8.3.1 *General*

The minimum wall thickness *E* of the fitting corresponding to a particular SDR rating for production shall be in accordance with Table 4 of IS 14885.

Fittings and associated fusion joints shall meet the requirements for mechanical characteristics given in **9.2**.

Any changes in wall thickness inside the body of the fitting shall be gradual in order to prevent stress concentrations.

8.3.2 *Relationship Between Fitting and Pipe Wall Thickness*

The minimum wall thickness of the fitting *E*,

a) shall be ≥ the minimum wall thickness of the corresponding pipe e_{Min} at every part of the fitting located at a distance beyond $2L_1/3$ from any entrance face of the fitting, when the fitting and the corresponding pipe belong to the same MRS; and

b) shall conform to Table 3 when the fitting and the corresponding pipe do not belong to the same MRS classification.

Table 1 Dimensions and Tolerances for Type A Sockets
(*Clause* 8.2.1)

All dimensions in millimetres.

Sl No.	Nominal Inside Diameter of Socket	Mean Inside Diameter				Ovality (For D_1 and D_2)	Reference Minimum Length of Bore Socket	
		At Socket Mouth D_1		At Distance L D_2			L	D_3
	d_n	*Min*	*Max*	*Min*	*Max*	*Max*		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	16	15.20	15.50	15.10	15.40	0.40	13.30	9.00
ii)	20	19.20	19.50	19.00	19.30	0.40	14.50	13.00
iii)	25	24.10	24.50	23.90	24.30	0.40	16.00	18.00
iv)	32	31.10	31.50	30.90	31.30	0.50	18.10	25.00
v)	40	39.10	39.50	38.80	39.20	0.50	20.50	31.00
vi)	50	49.00	49.50	48.70	49.20	0.60	23.50	39.00
vii)	63	62.00	62.50	61.60	62.10	0.60	27.40	49.00
viii)	75	74.30	74.80	73.00	73.50	1.00	30.00	59.00
ix)	90	89.30	89.90	87.90	88.50	1.00	33.00	71.00
x)	110	109.40	110.00	107.70	108.30	1.00	37.00	87.00
xi)	125	124.40	125.00	122.60	123.20	1.00	40.00	99.00

Table 2 Dimensions and Tolerances for Type B Sockets
(*Clause* 8.2.1)

All dimensions in millimetres.

Sl No.	Nominal Inside Diameter of Socket	Mean Inside Diameter				Ovality (For D_1 and D_2)	Reference Minimum Length of Bore Socket	
		At Socket Mouth D_1		At Distance L D_2			L	D_3
	d_n	*Min*	*Max*	*Min*	*Max*	*Max*		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	16	15.00	15.30	14.95	15.25	0.40	13.30	9.00
ii)	20	19.20	19.50	19.00	19.30	0.40	14.50	13.00
iii)	25	24.10	24.50	23.90	24.30	0.40	16.00	18.00
iv)	32	31.10	31.50	30.90	31.30	0.50	18.10	25.00
v)	40	39.05	39.45	38.80	39.20	0.50	20.50	31.00
vi)	50	48.95	49.45	48.70	49.20	0.60	23.50	39.00
vii)	63	61.90	62.40	61.60	62.10	0.60	27.40	49.00
viii)	75	73.50	74.20	73.45	73.95	1.00	31.00	59.00
ix)	90	88.60	89.20	88.25	88.85	1.00	35.50	71.00
x)	110	108.45	109.05	108.05	108.65	1.00	41.50	87.00
xi)	125	123.35	123.95	122.90	123.50	1.00	46.00	99.00

Table 3 Relationship Between Fitting and Pipe Wall Thickness
(*Clause* 8.3.2)

Sl No.	Pipe and Fitting Material		Relationship Between Fitting (E) and Pipe (e_n) Wall Thickness
	Pipe	Fitting	
(1)	(2)	(3)	(4)
i)	PE 80	PE 100	$E \geq 0.8\ e_n$
ii)	PE 100	PE 80	$E \geq e_n / 0.8$

9 PERFORMANCE REQUIREMENTS

9.1 General

Fittings shall be tested using pipes which conform to IS 14885. Jointed pipe and fitting assemblies shall be prepared in accordance with Annex A and shall comply with the requirements of **9.2** and **9.3**.

Fittings shall be used as per MAOP values given in **3.10**, with a minimum *C* factor of 2.9.

9.2 Hydraulic Characteristics

A fitting joint assembly prepared as per Annex A of this standard and tested in accordance with Annex A of IS 14885 shall conform to the requirements given in Table 4.

In the event of modification of the fusion-jointing parameters, the manufacturer shall ensure that the joint conforms to requirements of this clause.

9.3 Melt Flow Rate (*MFR*)

Melt Flow Rate of the material taken from the fitting, when tested as per IS 2530 at 190°C with nominal load of 5 kgf and when tested from a composite sample of three fittings shall not differ by more than 30 percent from the values specified by the raw material manufacturer.

The change of MFR by processing that is the difference between the measured value for material from the fitting and the measured value from the raw material shall not be more than 25 percent.

9.4 Density

When tested as per Annex A of IS 7328, it shall meet the requirements as given in Table 2 of IS 14885.

9.5 Thermal Stability

The minimum oxidation induction time (OIT) of the

Table 4 Hydraulic Pressure Test Characteristics
(*Clause* 9.2)

Sl No.	Property	Requirement	Test Parameters			Method of Test , Ref to Annex of IS 14885
(1)	(2)	(3)	(4)			(5)
i)	Acceptance test at 20°C, h	Failure time ≥100	a) End caps orientation b) Conditioning time c) Type of test d) Pressure calculated to produce the following circumferential (hoop) stress: 1) PE 80 pipe 2) PE 100 pipe 3) Test temperature	: : : : : :	Not applicable 1 h Water-in-water 10 MPa 12.4 MPa 20 ± 1°C	A
ii)	Acceptance test at 80°C, h	Failure time ≥165	a) End caps orientation b) Conditioning time c) Type of test d) Pressure calculated to produce the following circumferential (hoop) stress: 1) PE 80 pipe 2) PE 100 pipe 3) Test temperature	: : : : : :	Not applicable 12 h Water-in-water 4.6 MPa 5.5 MPa 80 ± 1°C	A
iii)	Type test at 80°C, h	Failure time ≥1 000	a) End caps orientation b) Conditioning time c) Type of test d) Pressure calculated to produce the following circumferential (hoop) stress: 1) PE 80 pipe 2) PE 100 pipe 3) Test temperature	: : : : : :	Not applicable 12 h Water-in-water 4 MPa 5 MPa 80 ± 1°C	A

NOTE — For hydrostatic strength test at 80°C, only brittle failure shall be taken into account. If ductile failure occurs before the required time, a lower stress shall be selected and the minimum test time shall be obtained from Table 5.

material from the fitting shall be ≥ 20 min when tested as per Annex D of IS 14885.

9.6 Volatile Matter Content

When tested in accordance with Annex H of IS 14885, the value of volatile matter content shall be ≤ 350 mg/kg.

10 ACCEPTANCE TESTS

Acceptance tests are carried out on sample selected from a lot for the purpose of acceptance of the lot. Sample for acceptance tests shall be prepared in accordance with Annex A.

10.1 Lot

For moulded fittings a lot shall be defined as the production of a machine from the time it commences to produce fittings complying with this standard until the machine is closed down.

A production lot shall not exceed either 170 h or 10 000 components, whichever is less. Any break in production that exceeds 8 h shall be considered as a termination of lot.

Any change over in raw material lot number shall also be considered as a termination of a lot.

For ascertaining conformity of the lot requirements of this standard, the number of samples shall be selected in accordance with the provisions as mentioned in Table 6 and tested for compliance. When a lot acceptance is carried out the sampling plans shall be as per Table 7 and Table 8.

The number of fittings to be selected from each lot shall depend on the size of the lot and shall be in accordance with col 2 and col 3 of Table 7. Each fitting so selected shall be examined for proper workmanship, appearance and dimensional requirements. Any fitting failing in one or more of these requirements shall be considered as defective. The lot shall be considered as conforming to requirements of this standard, if the number of defective fittings found in the first samples are less than or equal to the corresponding acceptance number given in col 6 of Table 7. The lot shall be deemed not to have met these requirements, if the number of defective found in the first sample is greater than or equal to the corresponding rejection number given in col 7 of Table 7.

If however, the number of defective found in the first sample lies between the corresponding acceptance and rejection numbers given in col 6 and col 7 of Table 7, the second sample of the size given in col 4 of Table 7 shall be taken and examined for these requirements, if the number of defective found in the cumulative samples is less than or equal to the corresponding acceptance number given in col 6 of Table 7 otherwise not.

Table 5 Hydrostatic Strength (80°C) — Stress/Minimum Failure Time Correlation
(*Table* 4)

Sl No.	PE 80		PE 100	
	Stress MPa	Minimum Failure Time h	Stress MPa	Minimum Failure Time h
(1)	(2)	(3)	(4)	(5)
i)	4.6	165	5.5	165
ii)	4.5	219	5.4	233
iii)	4.4	293	5.3	332
iv)	4.3	394	5.2	476
v)	4.2	533	5.1	688
vi)	4.1	727	5.0	1 000
vii)	4.0	1 000	—	—

Table 6 Acceptance Tests
(*Clause* 10.1)

Sl No. (1)	Description of Test (2)	Sample Size as per Table (3)	Method of Test, Ref to (4)
i)	Visual appearance (*see* **7.2**)	7	—
ii)	Dimensions (*see* **8.2**)	7	—
iii)	Melt flow rate (*see* **9.3**)	8	IS 2530
iv)	Density (*see* **9.4**)	8	Annex A of IS 7328
v)	Carbon black content (*see* **6.4**)	8	IS 2530
vi)	Carbon black dispersion (*see* **6.5**)	8	IS 2530
vii)	Pigment dispersion (*see* **6.6**)	8	Annex E of IS 14885
viii)	Thermal stability (*see* **9.5**)	8	Annex D of IS 14885
ix)	Hydrostatic resistance test at 20°C (*see* **9.2**)	8	Annex A of IS 14885
x)	Hydrostatic resistance test at 80°C (165 h) (*see* **9.2**)	8	Annex A of IS 14885

Table 7 Scale of Sampling for Visual and Dimensional Requirements
(*Clause* 10.1)

Sl No. (1)	No. of Fittings (2)	Sample No. (3)	Sample Size (4)	Cumulative Sample Size (5)	Acceptance No. (6)	Rejection No. (7)
i)	Up to 150	First	13	13	0	2
		Second	13	13	1	2
ii)	151-280	First	20	20	0	3
		Second	20	40	3	4
iii)	282-500	First	32	32	1	4
		Second	32	64	4	5
iv)	501-1 200	First	50	50	2	5
		Second	50	100	6	7
v)	1 201-3 200	First	80	80	3	7
		Second	80	160	8	9
vi)	3 201-10 000	First	125	125	5	9
		Second	125	250	12	13
vii)	Above 10 000	First	200	200	7	11
		Second	200	400	18	19

Table 8 Sampling Plan for Hydraulic Characteristics, MFR, Thermal Stability and Joint Hydrostatic Strength
(*Clause* 10.1)

Sl No. (1)	No. of Fittings (2)	Sample Size (3)
i)	Up to 800	3
ii)	801-1 600	4
iii)	1 601-2 400	5
iv)	2 401-3 200	6
v)	Above 3 200	7

11 TYPE TESTS

11.1 Type tests are intended to prove the suitability and performance of a new composition of raw material, a new technique or new size of fitting. Such tests therefore need to be applied only when a change is made in composition or method of manufacturing or a new size of a fitting is to be introduced.

11.2 Samples of fittings should be selected at random for each type test and shall be tested for compliance with the requirements as indicated against each test as given in Table 9.

Table 9 Type Tests

Sl No. (1)	Description of Test (2)	Sample Size (3)	Method of Test , Ref to (4)
i)	Volatile matter content (*see* **9.6**)	3	Annex H of IS 14885
ii)	Hydrostatic resistance test at 80°C (1000 h) (*see* **9.2**)	3	Annex A of IS 14885
iii)	Effects of gas constituents on the hydrostatic strength (*see* **6.7**)	3	Clause 5.5 of IS 14885

12 MARKING

12.1 All fittings shall be indelibly marked using characters of minimum 3 mm height for sizes $d_n \leq 90$ mm and minimum 5 mm height for sizes $d_n > 90$ mm .

12.2 The following information shall be given on the fitting:

a) Manufacturer's identity;
b) Nominal diameter and fittings rating (SDR);
c) Date of manufacture or batch No.; and
d) Material (PE + Designation).

12.2.1 All fittings shall be permanently and legibly marked in such a way that the marking does not initiate cracks or other types which adversely influence the performance of the fitting.

12.2.2 If printing is used the colour of the printed information shall differ from the basic colour of the product.

12.2.3 The marking shall be such that it is legible without magnification.

12.2.4 Any additional information (such as barcode) may be printed on a label associated with the fitting.

12.3 All marking shall remain legible under normal handling, storage and installation procedures. The method of marking shall not prevent the fitting from meeting the requirements of this standard.

12.4 BIS Certification Marking

The fittings may also be marked with the Standard Mark.

12.4.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder.

The details of conditions under which a licence for use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

13 PACKAGING OF FITTINGS

The fittings shall be packed in bulk or individually sealed in transparent polyethylene or equivalent bags of at least 75µ thickness in order to prevent deterioration. The outer pack shall be suitable for stacked storage and be marked with the information required in **12.2** (a), **12.2** (b) and **12.2** (c) together with fitting type and quantity in the pack. They shall be packed appropriately in cardboard boxes or cartons.

ANNEX A

(*Clauses* 6.8, 9.2 *and* 10)

PREPARATION OF TEST ASSEMBLIES (SOCKET FUSION)

A-1 ASSEMBLY COMPONENTS

Fittings selected for testing shall have dimensions conforming to Table 1 or Table 2 as applicable.

A-2 TEST ASSEMBLY

For testing, pipe conforming to IS 14885 shall be used. In case of type testing, pipe from coils should be used for sizes ≤ 125 mm. For acceptance testing straight pipe may be used.

The preparation and assembly of test samples shall be carried out using appropriate tooling.

Prior to fusion, pipes and fittings shall be conditioned in an environment maintained at a temperature of 27 ± 2°C for at least 8 h.

In socket fusion, which requires heating tools, the pipe end is inserted into the socket of the fitting, without using additional material. The pipe end and fitting socket are heated to fusion temperature on a heating bush and a heating spigot and then pushed together. The pipe end, fitting socket and heating tools are matched in size so that fusion pressure is built up during jointing, resulting in a homogeneous joint.

The basic rule is that only similar material can be fusion jointed, that is PE with PE. In socket fusion attention must be paid to minimum wall thickness of pipe.

A-3 REQUIRED TOOLS

Apart from the tools usually used in plastic pipeline installation, such as pipe cutters or saws with cutting guide, special tools as required for socket fusion shall be made available.

A-3.1 Peeling and Chamfering Tool

This is used to calibrate the pipe end. At the same time it removes the oxidized layer, which would otherwise have a detrimental effect on the fusion joint. It is essential for the quality of the joint to remove the oxidized top layer from the pipe.

A-3.2 Heating Element for Manual Fusion Jointing

The element is heated electrically. The heating bush and spigot are removable. A separate pair is required for each pipe size. The surfaces of the heating tool which come into contact with the pipe or the fitting must have a non-stick coating.

A-3.3 Fusion Jointing Machine

A fusion jointing machine is recommended for fittings with $d_n \geq 63$ mm. It is also better to use a machine for joints of smaller diameter, if there is a large number to be made. Refer to the fitting-manufacturer's operating instructions for setting up and operating the fusion jointing machine.

ANNEX B
(*Foreword*)

COMMITTEE COMPOSITION

Plastic Piping System Sectional Committee, CED 50

Organization	*Representative(s)*
Central Institute of Plastic Engineering and Technology, Chennai	Dr S. K. Nayak (***Chairman***)
Bharat Sanchar Nigam Ltd, New Delhi	Chief Engineer Shri A. K. Nagar (*Alternate*)
Central Building Research Institute, Roorkee	Dr S. P. Agarwal Shri Ajay Singh (*Alternate*)
Central Institute of Plastic Engineering and Technology, Chennai	Dr K. Palanivelu Shri R. K. Dwivedi (*Alternate*)
Central Public Health Environmental Engineering Organization, New Delhi	Adviser (PHE) Assistant Adviser (*Alternate*)
Central Public Works Department, New Delhi	Chief Engineer Superintending Engineer (*Alternate*)
Chemplast Sanmar Ltd, Chennai	Representative
Chennai Metropolitan Water Supply & Sewerage Board, Chennai	Shri S. Ranganathan Shri V. Sivakumaran (*Alternate*)
Chloroplast, Kerala	Shri N. Suresh Shri T. S. Manoj (*Alternate*)
Delhi Development Authority, New Delhi	Superintending Engineer Executive Engineer (*Alternate*)
Delhi Jal Board, New Delhi	Engineer-in-Chief Chief Engineer (*Alternate*)
Directorate General of Supplies & Disposals, Mumbai	Shri A. K. Jain Shri A. K. M. Kashyap (*Alternate*)
Engineer-in-Chief's Branch, New Delhi	Shri S. K. Aggarwal Shri A. K. Ray (*Alternate*)
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Finolex Industries Limited, Pune	Shri V. V. Khandekar Shri S. B. Singh (*Alternate*)
GAIL India Ltd, Noida	Shri Rajneesh Yadav Shri Manish Khandelwal (*Alternate*)
Haldia Petrochemicals Ltd, Kolkata	Representative
Indian Oil Corporation Ltd (Polymer Division), Panipat	Shri Abhay Mulay Shri R. V. Prabhu (*Alternate*)
Jain Irrigation System Limited, Jalgaon	Dr H. C. Mruthyunjaya Shri S. Narayanaswamy (*Alternate*)
Kolkata Municipal Corporation, Kolkata	Shri D. K. Sanyal Shri A. K. Biswas (*Alternate*)
Municipal Corporation of Greatermumbai, Mumbai	Deputy Hydraulic Engineer Executive Engineer (*Alternate*)
National Environmental Engineering Research Institute, Nagpur	Dr M. V. Nanoti Dr S. P. Pande (*Alternate*)
Public Health Engineering Department, Jaipur	Superintending Engineer Executive Engineer (*Alternate*)
Reliance Industries Limited, Mumbai	Shri S. V. Raju Shri Mihir Banerji (*Alternate*)
RITES, New Delhi	Shri C. K. Sharma
Rural Water Supply and Sanitation Department, Orissa	Representative

Organization	*Representative(s)*
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Tamil Nadu Water Supply and Drainage Board, Chennai	Joint Chief Engineer (Contract) Engineering Director (*Alternate*)
In personal capacity (*Plot No. 1763 6th Avenue, Anna Nagar West, Chennai 600 040*)	Shri G. K. Srinivasan
In personal capacity (*A-59, Sector 35, Noida 201 301*)	Shri Kanwar A. Singh
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Member Secretary
Shri D. K. Agrawal
Scientist 'F' (CED), BIS

Polyolefins and GRP Piping System Subcommittee, CED 50 : 1

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Delhi Jal Board, New Delhi	Engineer-in-Chief Chief Engineer (*Alternate*)
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Organization	*Representative(s)*
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Strategic Engineering (P) Ltd, Chennai	SHRI G. S. VISWANATH DR M. RAMAKIRISHNAN (*Alternate*)
Telecommunications Consultant India Limited, New Delhi	SHRI C. B. NAIR SHRI RAVINDRA SHAH (*Alternate*)
In personal capacity [*313/314, Raikar Chambers, Govandi (E), Mumbai 400 088*]	SHRI A. R. PARASURAMAN

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