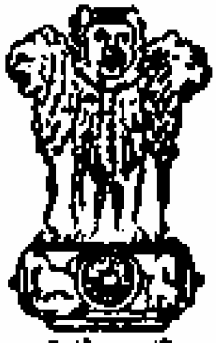

सत्यमेव जयते

INDIAN RAILWAY STANDARD SPECIFICATION FOR TERMINAL BLOCKS, FUSE BLOCKS AND COLOUR LIGHT SIGNAL LAMP HOLDER UNITS FOR SIGNALLING INSTALLATIONS

(TENTATIVE)

SPECIFICATION NO. IRS: S 75/2006

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RESEARCH DESIGNS & STANDARDS ORGANISATION
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Title of Document **Indian Railway Standard Specification for Terminal Blocks, Fuse Blocks and Colour light Signal Lamp Holder Units for Signalling Installations.**			
Authors **Director/ Signal/ RDSO**			
Approved by **Sr. Executive Director/ Signal, RDSO**			
Abstract This document specifies Technical specification for Terminal Blocks, Fuse Blocks and Colour light Signal Lamp Holder Units for Signalling Installations.			

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NAME	ORGANIZATION	FUNCTION	LEVEL
Director/ Signal	**RDSO**	**Member**	**Prepare**
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AMENDMENTS

Version	Chapter/ Annexure	Amendment	Effective date
IRS: S 75/1989	-	FIRST ISSUE	1989
IRS: S 75/1991	-	Revision 1	1991
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GOVERNMENT OF INDIA
(MINISTRY OF RAILWAYS)
RESEARCH DESIGNS & STANDARDS ORGANISATION

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INDIAN RAILWAY STANDARD SPECIFICATION FOR TERMINAL BLOCKS, FUSE BLOCKS AND COLOUR LIGHT SIGNAL LAMP HOLDER UNITS FOR SIGNALLING INSTALLATIONS (TENTATIVE)

SPECIFICATION No. IRS: S 75 / 2006

0. FOREWORD

0.1 This specification is issued under fixed Serial No. S 75/2006 the final number indicating the year of original adoption as standard, or in the case of revision, the year of last revision.

0.2 This specification requires reference to the following Indian Railway Standards (IRS), Indian Standards (IS), British Standards (BS) and American Society of Testing Materials (ASTM) specification.

IRS: S 23	Electrical Signalling and Interlocking equipment (tentative).
IS : 319	Free cutting leaded brass bars, rods and sections.
IS : 410	Cold rolled brass sheet, strip and foil.
IS : 3403	Dimensions for knurls.
IS : 9000	Basic environmental testing procedure for electronic and electrical items.
IS: 7814	Phosphor Bronze sheet and strip.
IS: 4454	Steel wires for cold formed springs
BS : 2782	Method of testing plastics.
ASTM :D570	Method of test for water absorption of plastics.

ASTM : D638 Method of test for tensile properties of plastics.

ASTM : D792 Method of test for specific gravity and density of plastics by displacement.

0.3 Wherever in this specification any specification(s) is/are referred to by number only without mentioning the year of issue, the latest issue of that specification is implied, otherwise the particular issue referred to is only to be considered.

0.4 This specification is intended to mainly cover the technical provisions relating to the manufacture and supply of terminal blocks, fuse blocks and colour light signal lamp holder units and does not include all the necessary provisions of contract.

1. SCOPE

1.1 This specification covers the technical requirements of terminal blocks, fuse blocks and colour light signal lamp holder units for signalling installations.

2. TERMINOLOGY

2.1 For the purpose of this standard, the terminology given in IRS Specification No. S. 23 shall apply.

3. GENERAL REQUIREMENTS

3.1 Terminal blocks shall be manufactured as per drawing Nos. SA 23741A, SA 23745, SA 23746 and SA 23756 which cover only two types of terminal blocks, viz. one way and six way. The number of ways shall be suitably increased or decreased if required by the purchaser. Fuse blocks shall be manufactured as per drawing No. SA 23748. Colour light signal lamp holder units shall be manufactured as per drawing No. SA 24831 and SA 23030/M.

3.2 Terminal blocks, fuse blocks and colour light signal lamp holder units shall be robust and capable of withstanding such handling as encountered in service, storage, transit and installation.

3.3 Terminals shall be moulded in the insulated blocks so that they do not become loose in service. This shall be achieved by using a round head suitably knurled as per IS: 3403 to prevent rotation.

3.4 30% glass fibre reinforce polybutylene terephthalate (PBT) suitably compounded with flame retardants shall be used for the manufacture of terminal blocks, fuse blocks and colour light signal lamp holder units so as to conform to the requirements of this specification. Moulded item shall have its natural colour unless otherwise specified in the relevant drawing.

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3.5 Terminal blocks, fuse blocks and colour light signal lamp holder units shall be manufactured by automatic screw type injection moulding machine.

3.6 Insulating material for terminal blocks, fuse blocks and colour light signal lamp holder units shall be tough, non- hygroscopic and suitable for use in temperature range of – 10 deg C to + 85 deg C.

3.7 The surface of terminal blocks, fuse blocks and colour light signal lamp holder units shall be smooth, free from moulding defects such as surface streaks, splash marks, burn marks, surface sinking, windows, warping, blistering, laminations, cracks, etc. and when sectioned, shall be free from voids and porosities.

3.8 A guarantee shall be given by the manufacturer that no reconstituted or recovered material has been used in the manufacture of terminal blocks, fuse blocks and colour light signal lamp holder units.

3.9 The metallic parts of terminal blocks, fuse blocks and colour light signal lamp holder units shall comply with the following specifications, as applicable-

Sl. No.	Description of metallic parts	Material	Specicification	Vickers Hardness
i.	Bolt, terminal, binding and clamp nuts	Brass rod (annealed) Grade 2.	IS: 319	-
ii.	Washer, link and locking plate	Brass sheet (Half Hard), Cu Zn 37 alloy.	IS: 410.	90HV* (Min.)
iii.	Clip	Phosphor Bronze Grade III (HB).	IS: 7814	170HV (Min.)
iv.	Contact spring	Phosphor Bronze Grade II (HE).	IS: 7814	200HV (Min.)
v.	Adjusting plate	Brass sheet (Hard), Cu Zn 37 alloy.	IS: 410.	130HV* (Min.)
vi.	Adjusting spring (Helical)	Spring steel Grade 3, Section II.	IS: 4454	-

* Applicable for telecommunication industries

3.10 All metallic parts used in the construction of terminal blocks, fuse blocks and colour light signal lamp holder units shall be protected against corrosion.

4. ELECTRICAL REQUIREMENTS

4.1 Applied High Voltage Test:

This test shall be carried out on terminal blocks, fuse blocks and colour light signal lamp holder units. The terminals shall be so insulated that they shall withstand the high voltage test as specified below:
"A test voltage of 2000 volts A.C (r.m.s) of approximately sine wave form at a frequency between 25 and 100 cycles per second shall be applied for one minute between the adjacent pair of terminals after removing the nuts, washers and the link. If there are more than one pair of terminals, this voltage shall be applied for one minute each between each pair of terminals individually."

4.2 Insulation Resistance Test:

Immediately after the High Voltage test, insulation resistance shall be measured between the terminals (as mentioned in clause 4.1) at a potential of not less than 500V D.C. The insulation resistance shall not be less than 50 Gega ohms under ambient conditions.

4.3 Temperature Cycle Test:

This test shall be carried out on three samples of terminal blocks, fuse blocks and colour light signal lamp holder units as given below:

(a) The terminal blocks, fuse blocks and colour light signal lamp holder units shall be quickly and completely immersed in a water bath maintained at a temperature of 70° C (± 5° C) above that of another bath of cold water and left for a period of 15 minutes. They shall then be withdrawn and quickly and completely immersed, without being placed in an intermediate container in the bath of cold water for the same period of 15 minutes.

(b) The complete test shall comprise five transfers, viz- hot to cold, cold to hot, hot to cold, cold to hot and hot to cold. The time taken to transfer the terminal blocks from one bath to the other shall be as short as possible and in no case shall exceed 10 seconds. The quantity of water in both the baths and the methods of heating/cooling the baths shall be such that any variation of temperature in either of the baths shall not exceed ± 5° C.

(c) The terminal blocks, fuse blocks and colour light signal lamp holder units on removal from the bath shall be wiped dry and left under ambient conditions for 10 minutes after which it shall be subjected to insulation resistance test as per clause 4.2. The insulation resistance shall not be less than 5000 megohms.

5. INSPECTION AND TESTING

5.1 Type Tests: Five no. of every type of terminal blocks, fuse blocks and ~~triple pole~~ colour light signal lamp holder units, as applicable, as per RDSO drawings alongwith six no. of every type of dumb-bells/test specimens as specified for following type tests, shall be submitted for type tests. Any one type of terminal block against drawing nos. SA 23745 and SA 23746 may be tested. Triple pole signal lamp holder unit may only be tested for maintenance type approval in case of colour light signal lamp holder units. Following type tests shall be carried out -

(i) Visual inspection (Clause 3.7)
(ii) Raw material test (Appendix 'A')
(iii) Applied High Voltage Test (Clause 4.1)
(iv) Insulation Resistance test (Clause 4.2)
(v) Temperature cycle test (Clause 4.3)
(vi) Chemical composition test for metallic components (Clause 5.3)
(vii) Climatic tests (Clause 5.7)

5.1.1 The tensile test mentioned in Appendix 'A' shall be conducted on "As moulded specimens". "As moulded specimens" are defined as those which upon immediate removal from the mould are sealed in containers impermeable to water vapour before being subjected to testing. However, such periods of storage shall not exceed a period of fifteen days under any circumstance. After taking the specimens out of the container, the tensile test shall be completed within one hour. The specimen for tensile test shall conform to Fig. I. The test shall be conducted on 6 specimens and the average values shall fall within the prescribed limits.

5.1.2 The test equipment required to carry out all the tests mentioned in Appendix 'A' shall be available at the manufacturer's premises. These equipments shall be calibrated periodically at a test house approved by the Inspecting Authority.

5.1.3 Visual inspection, applied high voltage and insulation resistance tests shall be carried out on minimum three samples of terminal blocks, fuse blocks and colour light signal lamp holder units. Number of samples for rest tests shall be as per relevant clauses.

5.2 Acceptance Tests: The following shall constitute acceptance tests which shall be conducted on finished products:-

i) Visual inspection (Clause 3.7)
ii) Dimensional check (Clause 5.4)
iii) High Voltage test (Clause 4.1)
iv) Insulation Resistance test (Clause 4.2)
v) Melting point test (Clause 5.5)
vi) Temperature cycle test (Clause 4.3)

vii) Bend test on terminals and link (Clause 5.2.2)
viii) Hardness test on metallic components (Clause 5.2.3)
ix) Specific gravity test (Clause 5.6)
x) Flamability test (Appendix 'B')
xi) Glass fibre content test (Appendix 'C')

5.2.1 The samples for acceptance tests shall be selected as per Appendix 'D'. All the selected samples shall be subjected to acceptance tests indicated above except where indicated otherwise in the relevant sub- clause.

5.2.2 Bend Test on terminals and link:

This test shall be conducted on five samples in case of one way and two samples in case of six way terminal blocks. This test shall also be conducted on terminals of two samples of fuse blocks.

5.2.2.1 The body of the terminal shall be held tight in a vice and the brass terminals shall be bent over a mandrel of 15 $\pm$ 2 mm diameter to an angle of 90° after removing the washers, link and nuts (Fig. 2). The terminal shall not break.

5.2.2.2 The link shall be bent in the middle by 180° after flattening the sides so as to form nearly a close bend (with gap between the bent surfaces not exceeding 2mm) as shown in Fig. 3. There shall be no breakage where the link is bent.

5.2.3 Hardness test on metallic components**:**

Metallic components shall be tested for Vickers Hardness as per clause 3.9. This test shall be conducted on at least three samples.

5.3 Chemical composition test for metallic components:

From the finished terminal blocks, fuse blocks and colour light signal lamp holder units, metallic components shall be removed and tested for chemical composition. Care should be taken to remove the nickel plating on these components, as applicable. The chemical analysis shall conform to clause 3.9 of this specification.

5.4 Dimensional Check :

Dimensions of the body and metallic components shall be in conformance to the relevant drawings. There shall be no excessive slackness or play between the terminals and the nuts.

5.5 Melting point Test :

A piece of suitable dimensions shall be cut from the insulating parts of the terminal block, fuse block and colour light signal lamp holder unit,, and subjected to melting point test in accordance with method 103C of Pt.I of BS: 2782. This will be conducted on PBT samples (2 Nos.) only.

5.6 Specific gravity test:

A piece of suitable dimensions shall be cut from the insulating parts of the terminal blocks, fuse blocks and colour light signal lamp holder units and subjected to specific gravity test in accordance with ASTM. D 792. The specific gravity shall lie between 1.67 and 1.71. This test shall be conducted on two samples only.

5.7 Climatic Tests: Climatic tests as per IS: 9000 are to be conducted on three samples of terminal blocks, fuse blocks and colour light signal lamp holder units in the under mentioned sequence.

a) Dry Heat test at 85° C $\pm$ 3°C for 16 hours.
b) Cold Test at -25°C $\pm$ 3°C for 16 hours.
c) Damp Heat Cycle Test: Six cycles (12 +12 hrs) of 24 hours each.
d) Salt atmosphere test as per procedure 2 (three cycles instead of specified four cycles).
e) Driving rain test for two hours.

5.7.1 The insulation resistance value shall be measured after each of the above tests after recovery period of 2 hours and shall not be less than one gega ohm.

5.8 Routine Tests :

Following routine tests besides other tests, as deemed fit to ensure quality, reliability and compliance of this specification, shall be conducted by the manufacturer. The manufacturer shall certify that the routine tests have been carried out on the lots offered for inspection.

i) Raw material test (Appendix ‘A’)
ii) Chemical composition test for metallic components (Clause 5.3)
iii) Visual inspection (Clause 3.7)
iv) Dimensional check (Clause 5.4)
v) High Voltage test (Clause 4.1)
vi) Insulation Resistance test (Clause 4.2)

5.8.1 Raw material test and chemical composition test for metallic components shall be carried out lot-wise. Visual inspection, High Voltage and Insulation Resistance tests shall be conducted on every terminal block, fuse block and colour light signal lamp holder unit. Dimensional check shall be carried out as per sampling plan given in Appendix 'D'.

5.8.2 Test record shall be properly maintained with traceability to lot / samples tested, which may be verified by inspecting officials.

6. MARKING

6.1 Every terminal block, fuse block and colour light signal lamp holder units shall be clearly and indelibly marked to indicate the following:

i) Name or trade mark of the manufacturer.
ii) Assembly drawing number.
iii) The legend 'IR' to signify that it is the property of Indian Railways.
iv) Lot number
v) Year of manufacture by last two digit of the year.

7. PACKING

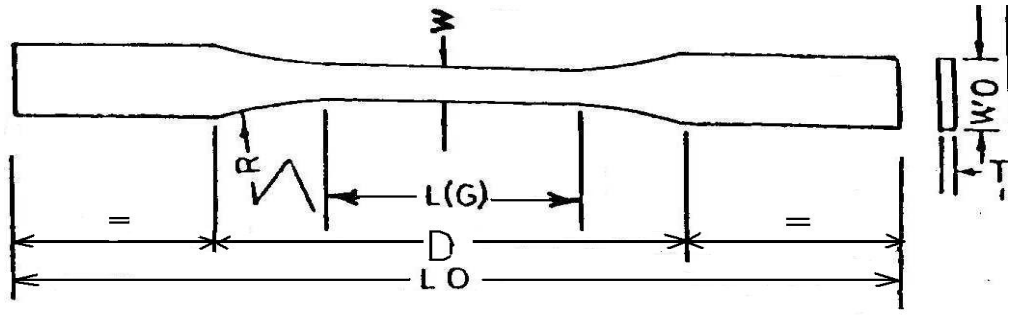
7.1 Terminal blocks, fuse blocks and colour light signal lamp holder units shall be so packed as to permit convenient handling and to protect against loss or damage during transit and storage.

APPENDIX 'A'
(Clause 5.1)

S.No.	Properties of PBT	Specified value	Method of Test
1	Specific gravity	1.67- 1.71	ASTM: D 792
2	Crystalline melting Point (°C)	220° - 225°	BS: 2782 Part I (Method 1 or capillary method or approved melting point apparatus.)
3.	Min. tensile strength (kg/mm²)	13	ASTM: 638
4.	Glass fibre content test (%)	30 ± 5	Appendix 'C'
5.	Flamability test	-	Appendix 'B'

SPECIMEN FOR TENSILE TEST FOR GLASS FILLED PBT COMPONENTS

FIG-1



DIMENSIONS FOR TEST SPECIMEN

DESIGNATION	DIMENSIONS	TOLERANCE
W- Width of Narrow section	10	± 0.5
L(G) LENGTH OF NARROW SECTION (ALSO) GAUGE LENGTH	60	± 0.5
WO-WIDTH OVERALL	20	± 0.5
LO-LENGTH OVERALL	216	± 5.0
D- DISTANCE BETWEEN GRIPS	115	± 5.0
R- RADIUS OF FILLET	60	± 5.0
T- THICKNESS	3.5	± 0.5

NOTE:

4. The specimen shall be free of draft or fin.
3. Speed of testing shall be 5mm/minute.
2. Min. area of cross section within gauge length shall be adopted for calculation of tensile strength.
1. All dimensions in mm.

BEND TEST ON TERMINAL

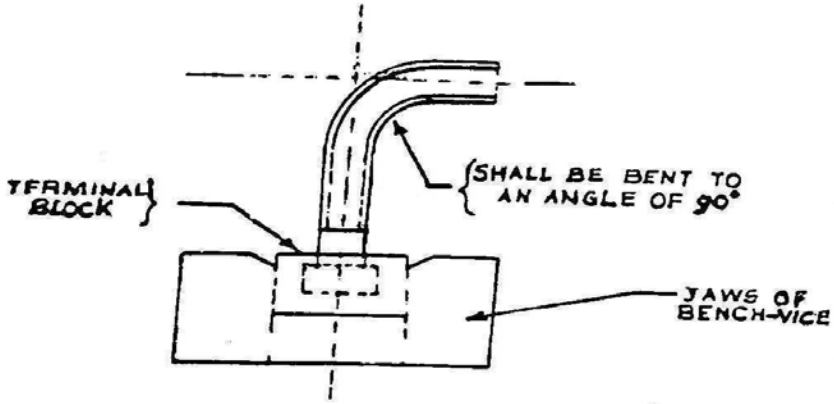


FIG - 2

BEND TEST ON LINK

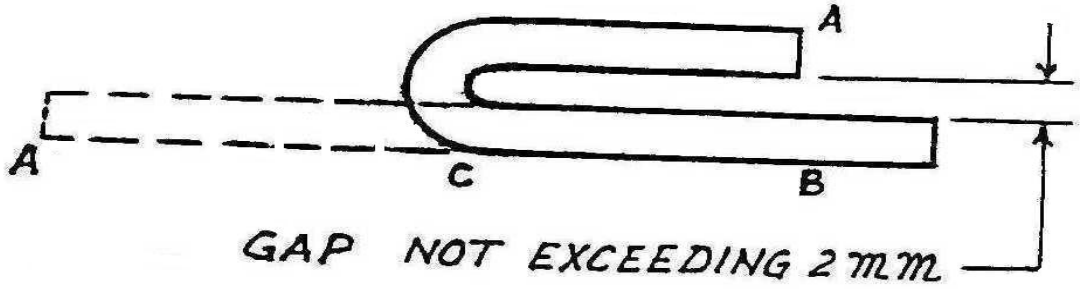


FIG - 3

APPENDIX 'B'
(Clause 5.2)

FLAMABILITY CHARACTERISTICS

Metallic components shall be removed from the terminal block, fuse block and colour light signal lamp holder unit. The sample specimen shall then be subjected to luminous bat swing flame preferably supplied by a Bunsen burner. The specimen shall be held with the flat side up, its longitudinal axis at an angle of 45° to the horizontal. The flame shall be of 25mm width across the tips. The lower end of the specimen shall be at the mid point of the flame. The flame shall be applied for 30 seconds and removed for a similar period and then applied again at the same location for a second period of 30 seconds and then again removed. The tests shall be carried out on either side of the specimen.

Should the specimen get ignited, it shall not continue to burn for more than 10 seconds after the flame has been removed, and shall not drip.

Flammability test shall be conducted on two samples only.

APPENDIX 'C'
(Clause 5.2)

GLASS FIBRE CONTENT TEST

C- 1 Method

C- 1.1 Take a crucible and heat it by keeping in a muffle furnace till a constant weight is obtained of the crucible.

Let the weight of the crucible = W1

C- 1.2 Take approximately 2 gm of the specimen of the component in the above crucible and find the weight of the crucible and the specimen as above.

Let the combined weight of the crucible and specimen = W2

C-1.3 Burn the Nylon of the specimen by keeping the crucible in the muffle furnace till shining glass is noticed. Allow it to cool to the room temperature.

C-1.4 Weigh the above crucible and glass after cooling.

Let the combined weight of the crucible and glass = W 3

C-2 Glass fibre percentage calculation

C- 2.1 The weight of the specimen of the components W 4 = W2 – W1

C- 2.2 The weight of the Glass Fibre content in the specimen W5 = W3 – W1

C- 2.3 Percentage of the Glass Fibre content = (W5/W4) x 100

C- 2.4 This test shall be conducted on two samples only.

APPENDIX 'D'
(Clause 5.2.1 & 5.8.1)

SAMPLING PLAN FOR ACCEPTANCE TEST

Lot is a collection of terminal blocks or fuse blocks or colour light signal lamp holder units of one type, size and lot number manufactured by same process under similar conditions of production. In case terminal blocks or fuse blocks or colour light signal lamp holder units manufactured in a lot are offered for inspection in more than one smaller lots, sampling plan for acceptance test may be adopted as per offered quantity.

The samples to be selected from a lot for testing shall be in accordance with the following table. Samples shall be randomly picked up to ensure correct representation of the lot.

TABLE

Lot size	Sample size N1	Acceptance limit C1
0-250	5	0
250- 1000	10	1
1000-5000	15	2
Above 5000	20	3

If the number of defectives found is less than or equal to C1, the lot shall be considered as conforming to the requirements of the specification. Otherwise, the lot shall be considered as not conforming to the requirements of the specification and rejected.

AMENDMENTS

Version	Chapter/ Annexure	Amendment	Effective date
IRS: S 75/1989	-	FIRST ISSUE	1989
IRS: S 75/1991	-	Revision 1	1991
IRS: S 75/1991	-	Amendment 1	November 2000
IRS: S 75/1991	-	Amendment 2	February 2001
IRS: S 75/2006	-	Revision 2	2006
IRS: S 75/2006	-	Corrigendum letter no. STS/E/FTB dated 27.4.2006	27.04.2006

Following corrections may be incorporated in the specification no. IRS: S 75/2006-

Clause 3.9

Sl. No.	Description of metallic parts	Material	Specicification	Vickers Hardness
ii.	Washer, link and locking plate	Brass sheet (Half Hard), Cu Zn 37 alloy.	IS: 410.	90HV (Min.)
v.	Adjusting plate	Brass sheet (Hard), Cu Zn 37 alloy.	IS: 410.	130HV (Min.)

~~* Applicable for telecommunication industries~~

APPENDIX 'A'
(Clause 5.1)

S.No.	Properties of PBT	Specified value	Method of Test
2	Crystalline melting Point (°C)	~~220°~~222° - 225°	BS: 2782 Part I (Method ~~1~~ 103 C or capillary method or approved melting point apparatus.)

APPENDIX 'C'
(Clause 5.2)

GLASS FIBRE CONTENT TEST

C-1.3 Burn the ~~Nylon~~ PBT material of the specimen by keeping the crucible in the muffle furnace till shining glass is noticed. Allow it to cool to the room temperature.
