MATERIAL STANDARD

FOR

GENERAL ELECTRIC ITEMS

ORIGINAL EDITION

MAY 1993

0. INTRODUCTION

This Standard consist of 12 Sections and 6 Appendices, as listed hereunder:

Section	1	Material Standard for Conduit and Fittings
Section	2	Material Standard for Cable Trunking
Section	3	Material Standard for Cable Trays and Accessories
Section	4	Material Standard for Switches (Domestic, Industrial and Explosionproof)
Section	5	Material Standard for Socket Outlets, Plugs and Couplers (Domestic, Industrial and Explosionproof)
Section	6	Material Standard for Cable Glands (Domestic, Industrial and Explosionproof)
Section	7	Material Standard for Luminaries
Section	8	Material Standard for Incandescent and Fluorecent Lamps and Lamp Holders
Section	9	Material Standard for Miniature, Low Voltage and Medium Voltage Fuses
Section	10	Material Standard for Domestic, Industrial and Explosionproof Boxes
Section	11	Material Standard for Mechanical and Compression Joints in Electrical Cable and Wire Connector or Termination
Section	12	Material Standard for Earting

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SECTION ONE
CONDUIT AND FITTINGS

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1.1 Scope

This Standard specifies requirements for conduits of circular cross section for the protection of the conductors and/or cables in electrical installations.

1.2 References

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)

IEC 423 (1973)	"Outside Diameters of Conduits for Electrical Installations and Threads for Conduits and Fittings"
IEC 614	"Specification for Conduits for Electrical Installation"

BS (BRITISH STANDARD INSTITUTION)

BS 4568:(1970)	"Specification for Steel Conduit and Fittings with Metric Threads of ISO Form for Electrical Installations"
Part 1:	"Steel Conduit, Bends and Couplers"
Part 2:	"Fittings and Components"

1.3 Description

1.3.1 Metal conduit

1.3.1.1 Conduit shall be steel, galvanized in and out with high protection, heavy gauge, solid drawn, seamless, threaded to metric threads of ISO form, with one coupling per length and approximately 4 meters long. Preferred sizes are given in Table 1.

TABLE 1

SIZE mm	WALL THICKNESS mm	LENGTH OF THREAD mm	RUNOUTOF THREAD mm
16	1.4 ±0.15	13	3
20	1.5 ±0.15	13	3
25	1.6 ±0.15	13	3
32	1.6 ±0.15	15	3
40	1.6 ±0.15	19	3
50	1.6 ±0.15	19	3
63	1.8 ±0.15	19	3

1.3.2 Steel conduit boxes

1.3.2.1 Steel conduit boxes with metric threads of ISO form for electric installation shall comply with the requirements of BS 4568 Part 2: 1979.

The following boxes of circular, small, internally screwed with flat covers are of common use in industrial non hazardous areas:

Through	16, 20, 25 mm size
Angle	16, 20, 25 mm size
Three way or tee	16, 20, 25 mm size
4 way or intersection	16, 20, 25 mm size
Back outlet	16, 20, 25 mm size
Through and back outlet	16, 20, 25 mm size
Angle and back outlet	16, 20, 25 mm size
Three way and back outlet	16, 20, 25 mm size
4 way and back outlet	16, 20, 25 mm size
Tangent (Angle)	16, 20, 25 mm size
Tangent (Through)	16, 20, 25 mm size
Tangent (3 way)	16, 20, 25 mm size
Branch 2 way or U	16, 20, 25 mm size
Branch 3 way or Y	16, 20, 25 mm size
Twin through way or H	16, 20, 25 mm size

1.3.3 Steel conduit fittings and components

The following steel conduit fittings shall comply with the requirements of BS 4568 Part 2 (1970).

Bends internally screwed	16, 20, 25, 32 mm size
Bends internally screwed inspection and covers	16, 20, 25, 32 mm size
Bushes circular internally screwed	16, 20, 25, 32 mm size
Bushes hexagonal externally screwed, long and short threads	16, 20, 25, 32 mm size
Couplers externally screwed (nipples)	16, 20, 25, 32 mm size
Couplers inspection internally screwed with covers	16, 20, 25, 32 mm size
Couplers flanged internally screwed	16, 20, 25, 32 mm size
Covers circular internally screwed domed, small and large	16, 20, 25, 32 mm size
Covers circular hook	16, 20, 25, 32 mm size
Crampet	16, 20, 25, 32 mm size
Locknuts, hexagonal screwed light and heavy (internally screwed)	16, 20, 25, 32 mm size
Locknuts circular screwed milled edge and crenellated	16, 20, 25, 32 mm size
Plugs hexagonal externally screwed	16, 20, 25, 32 mm size
Plugs slotted externally screwed	16, 20, 25, 32 mm size
Reducers screwed internally and externally	16, 20, 25, 32 mm size
Saddles	16, 20, 25, 32 mm size
Saddles- spacer bar	16, 20, 25, 32 mm size
Distance saddles	16, 20, 25, 32 mm size

To space conduit minimum 6 mm from wall

1.3.4 Explosionproof conduit fittings

The following standards are applicable where relevant.

IEC 79	"Electrical Apparatus for Explosive Gas Atmosphere"
IEC 79.0 Part 1	"Construction and Test of Flameproof Enclosures of Electrical Apparatus Type of Protection
IEC 79.7 Part 7	"Construction and Test of Electrical Apparatus Type of Protection 'e' "
IEC 79.15 Part 15	"Electrical Apparatus with Type of Protection 'n'"

Flameproof (explosionproof) apparatus certified for use in any group shall display the letters FLP or Ex as applicable in the outline of a crown, certificate number, group number, catalogue number and the name of manufacturer shall be given. Screwed conduit only must be used in explosive gas atmosphere.

Code of practice stipulates that solid drawn conduit to be used in explosive gas atmosphere. Every screwed entry must have a minimum length of 25 mm.

Note:

It is important to note that aluminum paint must not be used in situations where flammable gas laden atmosphere prevail.

SECTION TWO

CABLE TRUNKING

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2.1 Scope

This Standard gives the required guidance for selection of steel trunking and pertinent ancillary components, in compliance with the requirements of standards to which reference is made in Clause 2.

2.2 References

The following standards are applicable:

BSI (BRITISH STANDARD INSTITUTION)

BS 2989 (1982)	"Specification for Continuously Hot Dip Zinc Coated and Iron Zinc Alloy Coated Steel Wide Strip Sheet/Plate and Slit Wide Strip"
BS 4183 (1967)	"Machine Screws and Machine Screw Nuts-Metric Series"
BS 4678 Part 4 (1988)	"Specification for Cable Trunking Made of Insulating Materials"

2.3 Construction

2.3.1 Steel trunking

Steel surface trunking shall comply with the requirements of BS 4768 Part 1, while steel underfloor shall satisfy the requirements of BS 4678 Part 4.

Steel underfloor trunking shall meet the requirement of BS 4678 Part 2.

The steel trunking shall be from galvanized sheet steel to BS 2989.

The following consideration shall be satisfied:

The screw fixed cover shall be fastened to the inwardly turned flanges on the trunk body to give full earth continuity. The internal connector shall provide positive and adequate earth continuity through the use of screws with serrations under the head.

2.3.2 Steel cable trunking fittings

Materials of fittings shall satisfy the same requirements as trunking.

2.3.3 Dividers for standard cable trunking

Loose dividers of 50, 75, 100 and 150 mm depth may be selected for:

a) 90° bends
b) 45° bends
c) 90° Elbows (horizontal inside and outside)
d) horizontal tees:
- Top cover
- Inside cover

e) vertical tees:
- Top cover
- Inside cover

2.3.4 Sizes

Tables 1 to 19 show different sizes of steel trunking and pertinent accessories.

TABLES 1 TO 19

FOR

STEEL CABLE TRUNKING AND FITTING

TABLE 1 - STEEL CABLE TRUNKING

	NOMINAL TRUNKING SIZE mm	MATERIAL THICKNESS mm
Trunking (3 meters)	50 × 50	1.0
	75 × 50	1.2
	75 × 75	1.2
	100 × 50	1.2
	100 × 75	1.2
	100 × 100	1.2
	150 × 50	1.2
	150 × 75	1.2
	150 × 100	1.2
	150 × 150	1.6
	200 × 100	1.6
	225 × 150	1.6
	300 × 150	2.0
Spare Covers (1.5 meters)	50	1.0
	75	1.2
	100	1.2
	150	1.2
	200	1.6
	225	1.6
	300	1.6

TABLE 2 - HORIZONTAL BEND 90° ANGLE

Trunk Size

50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 3 - OUTSIDE COVER BEND 90° ANGLE

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 4 - INSIDE COVER BEND 90° ANGLE

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 5 - HORIZONTAL BEND 45° ANGLE

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 6 - INSIDE COVER BEND 45° ANGLE

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 7 - OUTSIDE COVER BEND 45° ANGLE

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 8 - CHANGE FACE UNIT LEFT HAND

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 9 - CHANGE FACE UNIT RIGHT HAND

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 10 - BELL MOUTH

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 11 - HORIZONTAL BEND 90° ANGLE (SHARP)

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 12 - OUTSIDE COVER BEND 90° ANGLE (SHARP)

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 13 - INSIDE COVER BEND 90° ANGLE (SHARP)

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 14 - SPARE STRAIGHT CONNECTOR

Trunk Depth
50 mm
75 mm
100 mm
150 mm

TABLE 15 - FLANGED CONNECTOR

Trunk Depth
50 mm
75 mm
100 mm
150 mm

TABLE 16 - SEALING END

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 17 - HORIZONTAL TEE

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 18 - HORIZONTAL TO VERTICAL TEE TOP AND INSIDE COVERS

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

TABLE 19 - HORIZONTAL CROSS

Trunk Size
50 mm × 50 mm
75 mm × 50 mm
75 mm × 75 mm
100 mm × 50 mm
100 mm × 75 mm
100 mm × 100 mm
150 mm × 50 mm
150 mm × 75 mm
150 mm × 100 mm
150 mm × 150 mm
200 mm × 100 mm
225 mm × 150 mm
300 mm × 150 mm

SECTION THREE
CABLE TRAYS AND ACCESSORIES

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3.1 Scope

This Guideline describes the minimum technical requirements for cable trays to be used in oil, gas and petrochemical industries.

3.2 References

The following standards have been referred to in this Standard.

BSI (BRITISH STANDARD INSTITUTION)

BS 729	"Specification for Hot Dip Galvanized Coating on Iron and Steel Articles"
BS 1449	"Steel Plate, Sheet and Strip"
BS 2989	"Specification for Continuously Hot Deep Zinc Coated and Iron-Zinc alloy Coated Steel: Wide Strip Sheet Plate and Slit Wide Strip"

3.3 Environmental Conditions

See Appendix A.

3.4 Description

Three types of cable trays are considered, they are:*

3.4.1 Light duty cable tray and accessories

Light duty cable tray shall comply with the requirements of BS 1449, BS 2989 and shall be hot galvanized to BS 729 after fabrication.

3.4.2 Medium duty returned flange cable tray

Medium duty return flange shall be similar to light weight, but with return flange and strong enough for most applications.

3.4.3 Heavy duty return flange

Heavy duty return flange cable tray. Shall be designed and manufactured for applications where strength and rigidity is paramount and shall be manufactured from steel to BS 1449, BS 2989 or stainless steel and shall be finished by hot deep galvanized to BS 729 after fabrication.

3.4.4 Accessories

The following accessories shall be of the same material and finish as straight trays:

90° Bends
45° Bends
90° Inside riser
45° Inside riser

*** For typical width and gauge see Table 1.**

90° Outside riser
45° Outside riser
Equal Tee
Equal cross
Straight reducer
Left hand reducer
Right hand reducer
Couplers

Cover where applicable:
Ventilated cover
Flat closed cover
Earth bonding strap (flexible PVC copper conductor 6 mm² cross section.)

Note:
For sizes of above mentioned items see Tables 2 to 11.

3.4.5 Support and fixing

Support and fixing shall consist of but not limited to the following:

Tray arms
Tray support brackets
Trapeze hanger bracket
Overhead hanger
Support channels
Fish-plates
Threaded rods
Threaded rod connectors
Ceiling brackets
Tray coupling bolts and nuts
Eye bolts

3.5 Data Sheet for Cable Tray System

TYPE:
Light Duty .....
Medium Return Flange.....
Heavy Duty Return Flange .....
Material .....

DIMENSIONS:
Width .....
Gage .....
Flange Height .....
Length .....

COUPLING SYSTEM:
Flat Bar .....
Wrapover Coupler .....
Loading ..... kg/m
Plastic Coating Required…… …….. NotRequired.....

TABLES 1 TO 11
SIZES
FOR
CABLE TRAYS

TABLE 1 - CABLE TRAYS PERFORATION PATTERN COMMON WIDTH AND GAGE

WIDTH (mm)	GAGE (mm)
50	1.0
50	1.5
75	1.0
75	1.5
100	1.0
100	1.5
150	1.0
225	1.0
225	1.5
300	1.5
450	1.5
450	2.0
600	2.0
750	2.0
900	2.0

CABLE TRAYS ACCESSORIES

TABLE 2 - INSIDE RISERS 90°

WIDTH (mm)	GAGE (mm)
100	1.5
150	1.5
225	1.5
300	1.5
450	2.0
600	2.0

TABLE 3 - OUTSIDE RISERS 90°

DIMENSION		GAGE (mm)
(mm)	(mm)	
100	407	1.5
150	457	1.5
225	535	1.5
300	610	1.5
450	762	2.0
600	915	2.0

CABLE TRAYS ACCESSORIES (continued)

TABLE 4 - INSIDE RISERS 45°

DIMENSION		GAGE
(mm)	(mm)	(mm)
50	50	1.5
75	50	1.5
100	100	1.5
150	100	1.5
225	100	1.5
300	200	1.5
450	200	1.5
600	200	1.5
900	250	1.5

TABLE 5 - OUTSIDE RISERS 45°

DIMENSION		GAGE
(mm)	(mm)	(mm)
50	50	1.5
75	50	1.5
100	100	1.5
150	100	1.5
225	100	1.5
300	200	1.5
450	200	1.5
600	200	1.5
900	250	1.5

TABLE 6 - CROSSES

DIMENSION		GAGE
(mm)	(mm)	(mm)
50	150	1.5
75	175	1.5
100	200	1.5
150	250	1.5
225	325	1.5
300	400	1.5
450	550	1.5
600	700	1.5
900	1000	1.5

CABLE TRAYS ACCESSORIES (continued)

TABLE 7 - EQUAL TEE

WIDTH (mm)	GAGE (mm)
50	1.5
75	1.5
100	1.5
150	1.5
225	1.5
300	1.5
450	2.0
600	2.0
750	2.0
900	2.0

TABLE 8 - 90° INSIDE ANGLE

WIDTH (mm)	GAGE (mm)
50	1.5
75	1.5
100	1.5
150	1.5
225	1.5
300	1.5
450	2.0
600	2.0
750	2.0
900	2.0

TABLE 9 - 90° INSIDE ANGLE

WIDTH (mm)	GAGE (mm)
50	1.5
75	1.5
100	1.5
150	1.5
225	1.5
300	1.5
450	2.0
600	2.0
750	2.0
900	2.0

CABLE TRAYS ACCESSORIES (continued)

TABLE 10 - 90° FLAT BEND

WIDTH (mm)	GAGE (mm)
50	1.5
75	1.5
100	1.5
150	1.5
225	1.5
300	1.5
450	2.0
600	2.0
750	2.0
900	2.0

TABLE 11 - REDUCERS

WIDTH W1* (mm)
75
100
150
225
300
450
600
750
900

*** Figures denotes the larger width (W1) and must be suffixed with the size of the smaller width required (W2).**

Example 300 mmreducting to 150 mm.

SECTION FOUR
SWITCHES
(DOMESTIC, INDUSTRIAL AND EXPLOSIONPROOF)

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4.1 Scope

This Guideline specifies the minimum requirements for switches to be used in domestic, industrial and potentially explosive atmospheres.

4.2 References

The following standards apply for the purpose of this Guideline.

IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)

IEC 328 (1972)	"Switches for Appliances"
IEC 529 (1976)	"Classification of Degrees of Protection Provided by Enclosure"
IEC 669.1 (1981) Part 1:	"General Requirements: Switches for Household and Similar Fixed Electrical Installation"

BSI (BRITISH STANDARD INSTITUTION)

BS 5501	"Electrical Apparatus for Potentially Explosive Atmosphere"
BS 5501 Part 5: 1977 (EN 50018)	"Flameproof Enclosure ‘d ‘"

4.3 General

4.3.1 Classification according to IEC 669.1 requirements:

4.3.1.1 Switches are classified:

4.3.1.1.1 According to nature of supply:

Switches for a.c. only

Switches for d.c. only

Switches for both a.c. and d.c.

4.3.1.1.2 According to the possible connections:

Following type of connections may be called for in switches:

Single pole switches

Double pole switches

Three pole switches

Three pole plus switched neutral

Two way switches

Two circuit switches with a common incoming line

Two way switches with one off position

Two way double pole switches

Two way double pole reversing switches

4.3.1.1.3 According to contact opening:

Switches of normal gap construction

Switches of mini-gap construction (only for a.c.)

Notes:

1) Switches of mini-gap construction, are switches having a clearance between the contacts which is less than 3 mm but is at least 1.2 mm.

2) They are intended for functional purposes and they are not intended to be used for safety isolation.

4.3.1.1.4 According to the degree of protection against electric shock:

Unenclosed switches

Enclosed switches (IP2X)

Notes:

1) The degrees of protection are based on IEC Publication 529.

2) For unenclosed switches the protection against electric shock is given by the enclosure in which the switch is intended to be mounted.

4.3.1.1.5 According to the degree of protection against harmful ingress of water:

Ordinary switches having no special protection against harmful ingress of water.

Splash-proof switches with degree of protection IPX4 (see IEC Publication 529).

Jet-proof switches with degree of protection IPX5 (see IEC Publication 529).

Note:

The term of ordinary applies only to the degree of protection against harmful ingress of water.

4.3.1.1.6 According to the method of actuating the switch:

Rotary switches;

Tumbler switches;

Rocker switches;

Push button switches;

Cord operated switches.

4.3.1.1.7 According to the method of application:

Surface type switches;

Flush type switches;

Semi flush type switches;

Panel type switches;

Architrave type switches.

4.3.1.1.8 According to the method of installation as a consequence of design:

Switches where the cover or cover plate can be removed without displacement of the

conductor (Design A).

Switches where the cover or cover plate can not be removed without displacement of the conductors (Design B).

4.3.1.2 Preferred combinations of number of poles and ratings are shown in Table 2.

TABLE 2

RATED CURRENT (A)	NUMBER OF POLES		
	Rated Voltages from 120 V up to 250 V included	Rated Voltages over 250 V a.c. only	Rated Voltages over 250 V d.c. only
1, 2 and 4	1	---	---
6	1 2	1 2	--- ---
10	1 2	1 2 3 4	2
16, 20, 25, 32, 40, and 63	1 2 3 4	1 2 3 4	2

4.4 Compliance with Standards

The following shall comply with the requirements of IEC 669.1:

Markings;

Dimensions;

Protection against electric shock;

Earthing;

Terminals;

Construction;

Mechanism;

Resistance to aging, to harmful ingress of water and humidity;

Insulation resistance and electric strength;

Temperature rise;

Mechanical strength;

Resistance to heat;

Screws, current carrying parts and connections;

Creepage distances, clearances and distances through sealing compound;

Resistance of insulating material to abnormal heat to fire and to tracking;

Resistance to rusting.

4.5 Weatherproof Switches

Switches shall be enclosed in hot dip galvanized, iron with entries tapped 20 mm as standard, and shall be provided with earth terminal/screw, and black polycarbonate knob to give rotary switch action. The following types of weatherproof switches may be considered for surface installation:

1 gang	1 way	S.P.	Back outlet	16 Amp.
1 gang	1 way	S.P.	Terminal	"
1 gang	1 way	S.P.	Through	"

1 gang	2 way	S.P.	Back outlet	"
1 gang	2 way	S.P.	Terminal	"
1 gang	2 way	S.P.	Through	"
1 gang	1 way	D.P.	Terminal	"
1 gang	1 way	S.P.	Through	"
2 gang	1 way	S.P.	Terminal	"
2 gang	1 way	S.P.	Through	"
2 gang	2 way	S.P.	Terminal	"
2 gang	2 way	S.P.	Through	"
3 gang	1 way	S.P.	Terminal	"
3 gang	1 way	S.P.	Through	"
4 gang	1 way	S.P.	Terminal	"
4 gang	1 way	S.P.	Through	"

For sunk installation the following types may be used:

1 gang	1 way	S.P.	16 Amp.
1 gang	2 way	S.P.	"
1 gang	1 way	D.P.	"

Switches shall be in cast iron box.

Hot dipped galvanized with plain sides.

An earth terminal/screw shall be fitted.

The cover shall be 1.6 mm brass finished.

Polished chrome. Cover engraved "off" and "on" with black polycarbonate knob giving rotary switch action.

4.6 Explosion Protected Switches

Switches shall be 16 amp. 240 volt a.c. In compliance with requirements of BS 5501 Part 5 or (EN 50018), and shall be convenient for zone 1 and zone 2 apparatus groups 11A, 11B with type of protection E Exd.

Entry diameter to be 20 mm and degree of ingress protection shall be IP 64.

The following type of explosionproof switches may be considered:

1 gang	One way	D.P.	(off-on)
1 gang	Two way	S.P.	changeover without off
1 gang	Changeover	S.P.	with center off
1 gang	Changeover		without center off

4.7 Data Sheet for Socket Outlets, Plugs and Couplers

(Domestic, Industrial and Explosionproof)

SUPPLY:

Voltage ..... volt
Phase .....
Frequency ..... Hz
Current Rating ..... AMP.

PURPOSE: .....

INGRESS PROTECTION: .....

EARTHING FACILITY: . .....

METHOD OF CONNECTING CABLE:

Rewireable (Plugs and Connectors only) .....

Non Rewireable (Plugs and Connectors only) .....

INTERLOCKING FACILITY: .....

ENCLOSURE:

Domestic .....
Industrial .....
Explosionproof .....

No. of ways .....
Cable entry size .....
Reference standard number .....

SECTION FIVE
SOCKET OUTLETS, PLUGS AND COUPLERS
(DOMESTIC, INDUSTRIAL AND EXPLOSIONPROOF)

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5.7 High Voltage Plug and Socket Connection 30
5.8 Requirements for ARC Welding Equipment Plugs, Socket Outlets and Couplers for Welding Cables 31
5.9 Data Sheet for Socket Outlets, Plugs and Couplers 31

5.1 Scope

This Guideline specifies the minimum requirements for socket outlets, plugs and cable couplers to be used in domestic, industrial and potentially explosive gas atmospheres.

5.2 References

The following standards apply for the purpose of this Guideline:

IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)

IEC 83(1975)	"Plugs and Socket-Outlets for Domestic and Similar General use Standards"
IEC 309.1 (1988)	"Plugs, Socket Outlets and Couplers for Industrial Purposes"
	Part 1: General Requirements
IEC 320 (1981)	"Appliance Couplers for Household and Similar General Purpose"
IEC 501 (1975)	"Safety Requirements for arc Welding Equipment Plugs, Sockets and Couplers for Welding Cables"

BSI (BRITISH STANDARD INSTITUTION)

BS 546 (1988)	"Specification for Two Pole and Earthing Pin Plugs, Socket Outlets, and Socket Outlet Adapters"
BS 4343 (1988)	"Specification for Industrial Plugs, Socket Outlets and Couplers for a.c. and d.c. Supplies (Industrial)"
BS5501Part5(1977)	"Electrical Apparatus for Potentially Explosive Atmospheres"
(EN 50010)	Flameproof Enclosure 'd'
BS 6038 (1986)	"Specification for High Voltage Cable Plug and Socket Connections for Medical 'X' Ray Equipment"

5.3 Classification

5.3.1 Accessories are classified

5.3.1.1 According to purpose

Plugs, socket-outlets, connectors, appliance inlets.

5.3.1.2 According to degree of protection either in accordance with IEC Publication 529 or according to degrees of protection against moisture:

- Ordinary accessories;
- splashproof accessories;
- watertight accessories.

5.3.1.3 According to earthing facilities:

- Accessories without earthing contact;

- accessories with earthing contacts.

5.3.1.4 According to the method of connecting the cable:

- Rewireable plugs and connectors;
- non-rewireable plugs and connectors.

5.3.1.5 According to interlocking facilities:

- Accessories without interlock, with or without integral switching device;
- accessories with mechanical interlock;
- accessories with electrical interlock.

5.4 Ratings

5.4.1 Preferred rated operating voltages are:

25 Volt
50 Volt
110 Volt
230 Volt
400 Volt

5.4.2 Accepted standard ratings are as follows:

- 10/16 A, 250 Volt Two pole socket outlets with side earthing.
- 10/16 A, 250 Volt Two pole plugs with side earthing.
- 10/16 A, 250 Volt Two pole socket outlets with pin type earthing contact.
- 10/16 A, 250 Volt Two pole plugs with pin type earthing contact.
- 10/16 A, 250 Volt Two pole plugs with pin type earthing contact.

Other preferred rated current are:

32 A
63 A
125 A

5.5 Marking

Accessories shall be marked with:

- Rated current in amperes;
- rated operating voltage in volts;
- symbol for nature of supply;
- name or trade mark of manufacturer;
- type reference;
- symbol for degree of protection as applicable;
- symbol indicating the position of earthing contact.

5.6 Explosion Protection

Appliances shall be in compliance with the requirements of BS 5501 Parts 5 (EN 50018) convenient for Zone 1 and Zone 2 apparatus Groups IIA and IIB with type of protection EEx ‘d’ degree of protection IP 64, 20 mm entry.

5.7 High Voltage Plug and Socket Connection

The appliance shall comply with the requirements of IEC 526 and the marking shall be in accordance to Table 1 of the same publication.

5.8 Requirements for ARC Welding Equipment Plugs, Socket Outlets and Couplers for Welding Cables

Plugs, socket outlets and couplers for the connection of two welding cables on the connection of welding cables to equipment supplying a welding current intended to be used under normal condition in non hazardous (safe) areas shall comply with the requirements of IEC 501.

The following rating are preferred values for welding plugs, socket and couplers:

100 A

160 A

250 A

400 A

630 A

5.9 Data Sheet for Socket Outlets, Plugs and Couplers

SUPPLY:

Voltage ..... Volts

Phase .....

Frequency ..... Hz

Current Rating ..... AMP.

PURPOSE: Socket Outlet ..... Plug ..... Coupler

INGRESS PROTECTION: .....

EARTHING FACILITY: .....

\METHOD OF CONNECTING CABLE:

Rewireable (only for plugs) .....

Non Rewireable (only for plugs) .....

INTERLOCKING FACILITY:

ENCLOSURE:

Domestic .....

Industrial .....

Explosionproof .....

BODY; Metal ..... Non-metal

Reference Standard Number: .....

SECTION SIX
CABLE GLANDS
(DOMESTIC, INDUSTRIAL AND EXPLOSIONPROOF)

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6.7 Stamping 34
6.8 Certification and Approval 34
6.9 Accessories 34
6.10 Stopping Plugs 34
6.11 Data Sheet for Cable Glands 34

6.1 Scope

This Guideline specifies minimum requirements for metallic and polymeric glands for use in domestic, industrial and potentially explosive gas atmospheres.

6.2 References

The following standards apply for the purpose of this Guideline:

BSI (BRITISH STANDARD INSTITUTION)

BS 5345 Part 3: (1989)	"Installation and Maintenance Requirements for Electrical Apparatus with Type of Protection 'd' "
BS 6121 Part 1: (1989)	"Mechanical Cable Glands, Specification for Metallic Glands"
BS 6121 Part 2: (1989)	"Mechanical Cable Glands, Specification for Polymeric Glands"
BS 6121 Part 5: (1993)	"Code of Practice for Selection, Installation and Inspection of Cable Glands Used in Electrical Installations"

6.3 Description

This Guideline gives recommendations on selection and inspection of cable glands to be used in all new, existing or replacement installations for domestic, industrial and potentially explosive atmospheres. The following sizes of glands are most commonly used:

16/20 mm
20 mm
25 mm
32 mm
40 mm
50 mm
63 mm
75 mm
80 mm
90 mm
100 mm

6.4 Gland Selection and Ordering

6.4.1 Material and finishes

Gland shall be manufactured from brass in compliance to requirements of BS 2874.

6.4.2 Body length

Body length of gland shall be within requirements of BS 6121.

6.4.3 Entry thread

Threads shall be metric 1.5 mm pitch in accordance to BS 3643. Ex.d flameproof glands entry threads shall be without an undercut.

Entry into "Ex.d" flameproof equipment must be threaded, no clearance holes are permitted.

The thread engagement must be as follows:

Parallel threads groups "11 A" and "11 B": 5 full threads and 8 mm axial engagements.

Group 11 C: 6 full threads and 12.5 axial engagement.

Taper threads groups 11 A, 11 B and 11 C: 5 full threads and 12.5 mm. axial engagements (BS 4683).

Groups 11 A, 11 B and 11 C parallel and taper threads, 5 full threads and 8 mm axial engagement (BS 5501 Part 5).

6.5 Earthing

Where very heavy fault current can be anticipated a gland entry portion incorporating an integral earth lug shall be supplied.

Where necessary an earth tag shall be placed between the gland and the apparatus into which is screwed.

It is essential to ensure metal to metal contact is achieved between equipment earth tag and gland.

Notes:
1) The minimum short circuit rating of gland shall be as specified in data sheet (sub-Clause 6.11).
2) IP Rating to BS 5420: 1977 shall be `66` with this rating and higher, the ingress of moisture is not permitted and adequate sealing arrangements must be made.
"Ex.d" flameproof with screwed entries:
To maintain the enclosures "IP" rating sealing washers or thread sealant may be used (refer to BS 5345 Part 3 Clause 14).

6.6 Corrosion

The Standard materials used in gland manufacture shall be brass to BS 2874, which is suitable for the majority of applications, however certain environment notably ammonia and derivatives can cause excessive material attack.

It is not advisable to have dissimilar metals in contact due to bimetallic corrosion and electrolytic action.

6.7 Stamping

Type size of entry thread and relevant approval details shall be given.

6.8 Certification and Approval

The cable gland components shall meet the requirements of BASEEFA and shall be suitable for use with "Ex.d" approved glands.

6.9 Accessories

Each gland shall be provided with appropriate locknuts, earth lugs, PVC shrouds and sealing washers.

6.10 Stopping Plugs

The plugs for sealing and stopping of unused threaded entries in flameproof enclosure shall meet the requirement of:

BASEEFA for "Ex.d" installation and may be used with "Ex.d" certified apparatus, providing that the certification refers to the use of stopping plugs.

6.11 Data Sheet for Cable Glands

LOCATION OF INSTALLATION:

Indoor .....

Outdoor: Humid.....Dry.....Dusty.....Corrosive.....

HAZARD PROTECTION REQUIRED:

.....

INGRESS PROTECTION REQUIRED:

GLAND IS REQUIRED FOR:

Armoured Cable .....

Non Armoured Cable .....

DETAILS OF CABLE FOR WHICH GLAND IS REQUIRED:

Type ..... Size ..... Outside dia ..... cm

CABLE ARMOUR:

Type .....

Size .....

SHORT CIRCUIT RATING:

Gland Size 16 to 40 mm: 26 kA minimum

Gland Size 50 to 75 mm: 43 kA minimum

SHROUD (ELASTOMERIC OR PLASTIC):

Required .....

Not Required .....

ENTRY STOPPING PLUG:

Required ..... Not Required .....

MANUFACTURERGLANDREFERENCEIF ANY:.....

Note:

For selection of cable glands used in electrical installations reference may be made to BS 6121 Part 5 (1993).

ENTRY THREAD SIZE:

.....

MATERIAL:

Brass (to BS 2874) .....

Mild Steel (to BS 970) .....

Stainless Steel (to BS 970) .....

Bronze (to BS 2874) .....

FINISH:

Unplated .....

Zinc Plated .....

EARTHING:

Integral .....

Non-Integral .....

LOCKING DEVICE (LOCK OUT):

Required .....

Not Required .....

SECTION SEVEN
LUMINAIRES

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7.3 Reference Standards 37
7.4 Construction and Test Requirements of Luminaires 38
7.5 Data Sheet for Luminaires 39

7.1 Scope

This Guideline gives general requirements applicable to luminaires for use with tungsten filament, tubular fluorescent and other discharge lamps on supply voltages not exceeding 250 V, single phase, 50 Hz and covers the following types of luminaires:

1 Fixed general purpose luminaires.
2 Recessed luminaires.
3 Luminaires for road and street lighting.
4 Portable general purpose luminaires.
5 Flood lights.
6 Luminaires with built-in transformers for tungsten filament lamps.
7 Portable luminaires for use in gardens and the like.
8 Hand lamps.
9 Luminaires for stage lighting.
10 Luminaires for swimming pools and the like.
11 Air handling luminaires (Safety requirements)
12 Lighting chains.
13 Luminaires for emergency lighting.

7.2 Environmental Conditions

See Appendix A.

7.3 Reference Standards

Luminaires shall be designed, constructed, wired and tested in accordance with all the applicable sections of the latest issue of the following standards including their latest amendments and supplements.

IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)

IEC 61	"Lamp Caps and Holders Together with Gages for the Control of Interchangeability and Safety"
IEC 61.1	"Lamp Caps"
Part 1	
IEC 61.2 (1969)	"Lamp Holders"
Part 2	
IEC 61.3 (1969)	"Gages"
Part 3	
IEC 64 (1987)	"Tungsten Filament Lamps for General Service"
IEC 81 (1984)	"Tubular Fluorescent Lamps for General Lighting Service"
IEC 82 (1984)	"Ballast for Tubular Fluorescent Lamps"
IEC 155 (1983)	"Starters for Tubular Fluorescent Lamps"
IEC 188 (1974)	"High Pressure Mercury Vapor Lamps"
IEC 192 (1973)	"Low Pressure Sodium Vapor Lamps"
IEC 238 (1987)	"Edison Screw Lamp Holders"
IEC 259 (1968)	"Miscellaneous Lamps and Ballast"
IEC 262 (1969)	"Ballast for High Pressure Mercury Vapor Lamps"

IEC 357 (1982)	"Tungsten Halogen Lamps (non vehicle) for Projection and Flood Lighting"
IEC 360 (1987)	"Standard Method for Measurement of Lamp Cap Temperature Rise"
IEC 399 (1972)	"Standard Sheets for Barrel Thread for E14 and E27 Lamp Holders with Shade Hold Ring"
IEC 400 (1987)	"Lamp Holders for Tubular Fluorescent Lamps and Starter Holders"
IEC 432 (1984)	"Safety Requirements for Tungsten Filament Lamps for Domestic and Similar General Lighting Purposes"
IEC 459 (1979)	"Ballasts for Low Pressure Sodium Vapor Lamps"
IEC 566 (1982)	"Capacitors for Use in Tubular Fluorescent and other Discharge Lamp Circuits"
IEC 570 (1985)	"Electrical Supply Track Systems for Luminaires"
IEC 598	"Luminaires"
IEC 630 (1979)	"Maximum Lamp Outlines for General Lighting Lamps"
IEC 634 (1978)	"Heat Test Source Lamps for Carrying Out Heating Test: on Luminaires"

7.4 Construction and Test Requirements of Luminaires

General design,construction and test requirements of following parts of luminaire for use with tungsten, filament, tubular fluorescent and other discharge lamps on supply voltages not exceeding 250 V 50 Hz a.c. shall meet the requirements of relevant standards referred to in clause 1 under title of "scope" and explained under title of "Reference" in Sub-clause 7.2.

1 Replaceable components
2 Wireways
3 Lamp holders
4 Starter holders
5 Terminal blocks
6 Terminal and supply connections
7 Switches
8 Insulating lining and sleeves
9 Insulation of Class II luminaires
10 Electrical connections and current carrying parts.
11 Screws and connections (mechanical) and glands.
12 Mechanical strength.
13 Suspensions and adjacing devices.
14 Flammable materials.
15 Luminaire marked with F symbol (see IEC 598-1 Sub-Clause 4.19).
16 Drain holes.
17 Resistance to corrosion.
18 Ignitors (see IEC 598-1 Sub-Clause 4.19).
19 External wiring.
20 Internal wiring.
21 Provision of earthing.
22 Protection against electric shock.
23 Insulation resistance and electric strength.
24 Creepage distance and clearances.

25 Endurance test and thermal test.
26 Resistance to heat, fire and tracking.
27 Screw terminals.
28 Screwless terminals and electrical connections.

7.5 Data Sheet for Luminaires

TYPE OF LUMINAIRE (See scope) .....
IEC STANDARD .....
SUPPLY VOLTAGE ..... Volt .....
SUPPLY FREQUENCY ..... Hz .....
DOMESTIC .....
ORDINARY TO IP .....
INDUSTRIAL ATMOSPHERE:
- Drip-Proof to IP .....
- Rain-Proof to IP .....
- Spalash-Proof to IP .....
- Jet-Proof to IP .....
- Water Tight (immerisible) to IP .....
- Pressure Water Tight (Submersible) to IP .....
- Protected against Solid Objects to IP-X .....

EXPLOSIVE ATMOSPHERE:
- Zone .....
- Temperature Class .....
- Grouping of Apparatus ..... ……..
- Type of Explosion Protection .....
- Ingress Protection Number IP .....

CORROSIVE ATMOSPHERE:
- Yes.....
- No .....

SERVICE CONDITIONS:
- Rough .....
- Ordinary .....

SECTION EIGHT
INCANDESCENT AND FLUORESCENT LAMPS
AND
LAMP HOLDERS

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8.4 Construction and Test Requirements 41
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8.6 Data Sheet for Fluorescent Lamps 42
8.7 Data Sheet for Tubular Fluorescent Lamp-Holder 42
8.8 Data Sheet for Edison Screw Lamp-Holders 43

8.1 Scope

This Recommendation covers a range of incandescent and fluorescent lamps and also their holders for general lighting service which are operated on a.c. main supply.

8.2 Environmental Conditions

See Appendix A.

8.3 References

Lamps and lamp holders shall be designed manufactured and tested in accordance with all the applicable sections of the following standards including their latest amendments and supplements:

IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)

a) Lamps:

IEC 61	"Lamp Caps and Holders"
IEC 64 (1987)	"Tungsten Filament Lamps for General Lighting Purposes, Performance Requirements"
IEC 81 (1984)	"Tubular Fluorescent Lamps for General Lighting Services"
IEC 82 (1984)	"Ballast for Tubular Fluorescent Lamps"
IEC 188 (1974)	"High Pressure Mercury Vapor Lamps"
IEC 357 (1982)	"Tungsten Halogen Lamps (Non Vehicle)"
IEC 432 (1984)	"Safety Requirements for Tungsten Filament Lamps for Domestic and Similar General Lighting Purpose"

b) Lamp Holders:

IEC 61.1 (Part 1)	"Lamp Caps"
IEC 61.2 (Part 2)	"Lamp Holders"
IEC 238	"Edison Screw Lamp Holders"
IEC 399	"Standard Sheets for Barrel Thread for E 14 and E 27 Lamp Holders with Shade Holder Ring"
IEC 400	"Lamp Holders for Tubular Fluorescent Lamp and Starter Holders"
IEC 838	"Miscellaneous Lamp Holders"

8.4 Construction and Test Requirements

General design construction and test requirements of tungsten filament, tubular fluorescent and lamp holders shall comply with requirement of above mentioned standards.

8.5 Data Sheet for Incandescent Lamps

CHARACTERISTICS:

Rated Voltage ..... Volt
Supply Frequency ..... Hz
Lamp Wattage ..... Watt

RATED LUMEN: .....

BULB:

Clear or .....

Internally Frosted .....

DIMENSIONS:

Select from Appendix C of IEC 64.

TYPE OF LAMP:

Screw Cap or .....

Bayonet Cap .....

TYPE AND GAGE OF CAP: .....

Select from IEC 61 Parts 1 and 2.

8.6 Data Sheet for Fluorescent Lamps

CHARACTERISTICS:

Supply Voltage ..... Volt

Supply Frequency ..... Hz

Lamp Wattage ..... Watt

Lamp Power Factor ..... (See IEC 81)

SHAPE:

Straight .....

Circular .....

Curved(u) .....

DIMENSIONS:

Select from IEC 81.

TYPE:

Preheated Cathode with the use of Starter .....

Preheated Cathode without the use of Starter .....

Non Preheated Cathode Operated without the use of a Starter .....

TYPE AND GAGE OF CAP:

Select from IEC 61.1-L (1987) using information on Table No. 1 of this recommendation.

LUMINUS FLUX IN LUMENS .....

See IEC 81.

DETAILS OF BALLAST IN LUMINAIRE (FITTING): . .....

.....

DETAILS OF STARTER IN LUMINAIRE (FITTING): .....

.....

DETAILS OF POWER FACTOR CORRECTING CAPACITOR IN LUMINAIRE (FITTING):

.....

8.7 Data Sheet for Tubular Fluorescent Lamp-Holder

CHARACTERISTICS:

Supply Voltage ..... Volt

Watt/Current of Pertinent Lamp .....Watt ..... Ampere

Required for Cap No. .....

DEGREE OF PROTECTION:

Ordinary .....

Drip-Proof .....

Rain-Proof .....

Splash-Proof .....

Jet-Proof .....

Water-Tight .....

Pressure Water-Tight .....

Pressure Water-Tight .....
Dust-Proof .....
Dust-Tight .....
RESISTANCE TO HEAT:
For operating temperature up to and including 80°C .....
For operating temperature over 80°C .....

Note:

Tick where relevant.

8.8 Data Sheet for Edison Screw Lamp-Holders

SUPPLY VOLTAGE: ..... Volt
WATT/CURRENT OF PERTINENT LAMP: .....Watt ..... Ampere
TO BE USED IN CONJUNCTION WITH:
Edison Screw Cap No. .....Lamp ..... Lamp
Bayonet Cap No. ..... Lamp
MATERIALS:
Insulating .....
Metal .....
DEGREE OF PROTECTION:
Ordinary .....
Drip-Proof…..
METHOD OF FIXING:
Threaded Entry Lamp-Holder .....
Corded-Grip Lamp-Holder .....
Back-Plate Lamp-Holder .....
Suspension Lamp-Holder .....
TYPE:
Switched Lamp-Holder .....
Non-switch Lamp-Holder .....
PROTECTION AGAINST ELECTRIC SHOCK:
Unclosed Lamp-Holder .....
Enclosed Lamp-Holder .....
Independent Lamp-Holder .....

Note:

Tick where relevant.

SECTION NINE

MINIATURE, LOW VOLTAGE AND MEDIUM VOLTAGE FUSES

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9.1 Scope

This Guideline describes three categories into which fuses may be divided, they are:

9.1.1 Miniature fuses:

These are for the protection of electric appliances, electronic equipment and components thereof, normally intended for use indoors.

9.1.2 Low voltage fuses:

These are fuses incorporating enclosed fuse links with rated breaking capacities of not less than 2 kA, intended for protecting power frequency a.c. circuits of rated voltages not exceeding 1000 V, or d.c. circuits of rated voltages exceeding 1000 V.

9.1.3 Medium voltage

9.2 Definitions

The following definition from IEC are applicable in this Guideline:

Fuse - A switching device that by the fusion of one or more of its specially designed and proportioned components opens the circuit in which it is inserted and breaks the current when this exceeds a given value for a sufficient time. The fuse comprises all the parts that forms the complete switching device.

Fuse base - The fixed part of a fuse provided with terminals for connection to the system. The fuse base comprises all parts necessary for insulation.

Fuse carrier - The movable part of a fuse designed to carry the fuse link.

Fuse holder - The combination of a fuse base with its fuse carrier.

Fuse link - The part of a fuse including the fuse element which requires replacement by a new fuse link after the fuse has operated and before the fuse can be put back into service.

9.3 References

Fuses shall be designed, manufactured and tested in accordance with all the applicable sections of the latest issue of the following standards including their latest amendments and supplements:

IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)

9.3.1 Miniature fuses

IEC 127 (1974)	"Cartridge Fuse Links for Miniature Fuses"
IEC 127A (1980)	"First Supplements Color Coding"
IEC 127B (1985)	"Second Supplement"

IEC 127C (1987)	"Third Supplement"
IEC 127.1 (1988)	"Definitions for Miniature Fuses and General Requirements for Miniature Fuse Links"
IEC 127.3 (1988)	"Part 3: Sub-Miniature Fuse Links"
IEC 127.5 (1988)	"Part 5: Guidelines for Quality Assessment of Miniature Fuse Links"
IEC 257 (1968)	"Fuse Holders for Miniature Cartridge Fuse Links"

9.3.2 Low voltage fuses

IEC 269	"Low Voltage Fuses"
IEC 269.1 (1986)	"Part 1: General Requirements"
IEC 269.2 (1986)	"Part 2: Supplementary Requirements for Fuses for Use by Authorized Persons (Fuses Mainly for Industrial Application). Amendment No. 1 (1978)"
IEC 269-2A (1975)	"First Supplement: Appendix A Examples of Standardized Fuses for Industrial Application Amendment No. 1 (1978)"
IEC 269-2-1 (1987)	"Part 2: Supplementary Requirements for Fuses for Use by Authorized Persons (Fuses Mainly for Industrial Application)" Section One: Examples of Types of Standardized Fuses for Use by Authorized Persons
IEC 269-3 (1987)	"Part 3: Supplementary Requirements for Fuses for Use by Unskilled Persons (Fuses Mainly for Household and Similar Applications)"
IEC 269-3A (1978)	"First Supplement: Appendix A: Examples of Standardized Fuses for Domestic and Similar Applications"
IEC 269-4 (1986)	"Part 4: Supplementary Requirements for Fuse Links for Protection of Semiconductor Devices"

9.3.3 Medium voltage fuses

IEC 282	"High Voltage Fuses"*
IEC 282.1 (1985)	"Part 1: Current Limiting Fuses Amendment No. 1 1988"
IEC 282.2 (1970)	"Part 2: Expulsion and Similar Fuses. Amendment No. 1 1978"
IEC 282.3 (1976)	"Part 3: Determination of Short Circuit Power Factor for Testing Current Limiting Fuses, and Expulsion and Similar Fuses"
IEC 549 (1976)	"High Voltage Fuses for the External Protection of Shunt Power Capacitors"
IEC 644 (1979)	"High Voltage Fuse Links for Motor Circuit Application"
IEC 787 (1983)	"Application Guide for the Selection of Fuse Links of High Voltage Fuses for Transformer Circuit Applications"

*** High voltage nomenclature, now is changed to "medium voltage"**

9.4 Standard Conditions of Operation

Because the behavior of fuses is affected by environmental conditions it is the practice for standards to state the range of conditions in which fuses will operate satisfactory.

The following operating conditions are usually included.

9.4.1 Ambient temperature

This affect the power which may be dissipated from the surfaces of fuse link and its fuse holder or mounting for any given element temperature and thus the operating times at low over current are also affected by it. The operating range is not the same for all fuses. The IEC requirement being that low voltage fuses should be suitable for operation in ambient temperatures between -5°C and 40°C whilst high voltage fuses must operate satisfactory over the wider range of -25°C to 40°C. This is because the latter fuses are often mounted outdoors in exposed positions. Limits are not specified for miniature fuses.

9.4.2 Humidity

This condition can affect the insulation levels of fuselinks and their associated parts and a typical requirement is that satisfactory operation should be obtained in relative humidities up to 50% at 40°C and higher levels at lower temperatures.

9.4.3 Altitude

This also affects insulation levels and the IEC requirement is that vary for the different categories of fuses.

Low voltage fuses must be suitable for operation up to 2000 m while 1000 meter is specified for high voltage fuses.

No value is specified for miniature fuses.

9.4.4 Atmosphere

To prevent the possibility of fuses being adversely affected by the surrounding atmosphere, it is usual for standards to contain statements to the effect that the ambient air should not be excessively polluted by dust, smoke, corrosive on flammable gases, vapour or salt.

9.5 Rating and Characteristics

The following rating and or characteristics shall be specified as required:

- Voltage
- Current
- Frequency
- Temperature rises on power dissipation of fuselinks
- Power acceptance of fuse holders or bases
- Breaking capacity
- Time/current characteristics
- Current cut off and its characteristics

9.6 Marking

9.6.1 It is necessary that the markings on fuses and fuse links should be permanent and in addition, it is desirable to prevent possible confusion and misunderstanding.

9.6.2 That the information provided should be in a standardized form.

The following details shall be given on fuses and fuselinks:

- Current rating
- Voltage rating
- Name of supplier or manufacturer
- Manufacturer's type reference for the device
- Reference to the type of characteristics possessed by the device
- Standard with which the device complies

9.7 Type Tests

Fuselinks unlike most other equipment can not be subjected to extensive routine proving test at the end of the production process, because if they are operated, they can not be used again.

The behavior of individual design must therefore be determined by very rigorous type tests and then the subsequent component parts must be produced to within very close limits of those used in the type tested fuselinks. In addition inspection and quality assurance system must be employed to ensure: that the volume production output corresponds closely with the initial devices.

The following are items to be type tested:

9.7.1 Construction and dimensions

9.7.2 Electrical resistance

9.7.3 Power dissipation

9.7.4 Power acceptance of fuse holders

9.7.5 Insulation levels

9.7.6 Conventional fuse currents

9.7.7 Breaking capacity

9.7.8 Time/current characteristics

9.7.9 Overload withstand capability

9.8 Application Guide

Application guide for the high voltage fuses and fuses used for the protection of semiconductor devices shall be supplied by manufacturer(s).

The guides shall explain the basis of the ratings and how to relate them to practical situations.

9.9 Approving Authorities

The following approving bodies are accepted:

1 A.S.T.A Association of Short Circuit Testing Authorities.
2 V.D.E Verband Deutscher Electrotechniker.
3 U.L. Underwriters Laboratories Inc.
4 KEMA N.V tot keuring van Electrotechnishe materialen.
5 CSA Canadian Standards Association.

9.10 Data Sheet for Fuses

VOLTAGE ..... Volts
FREQUENCY ..... Hz
CURRENT RATING ..... A
INTERRUPTING RATING ..... kA
PERTINENT STANDARD .....
TYPE OF FUSE:
- Time Delay .....
- Non Time Delay .....
- Rewireable .....

APPLICATION:
- Service Entrance Protection .....
- Motor " .....
- Transformer " .....
- Power Distribution " .....
- Semi conductor " .....
- Capacitor " .....
- Welding machine " .....
- Feeders combination starter " .....
- Contactor " .....

DIMENSIONS: .....
MATERIALS: .....
CATALOGUE No. IF ANY: .....
MANUFACTURER REFERENCE NUMBER IF ANY: .....

SECTION TEN

DOMESTIC, INDUSTRIAL AND EXPLOSIONPROOF BOXES

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10.10 Sizes of Terminal Assemblies for Boxes in Explosive Atmosphere 56

10.1 Scope

This Guideline specifies the requirements for boxes intended to contain current using appliances such as a switch, a fuse a socket outlet, switched socket outlets or similar appliances.

10.2 References

The following standards applies:

IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)

IEC 629 (1978)	"Standard Sheets for a Modular System (for Installation Accessories for Use in Domestic and Similar Installations)"
IEC 670 (1989)	"General Requirements for Accessories for Household and Similar Fixed Electrical Installation"

BS (BRITISH STANDARD INSTITUTION)

BS 4662	"Specification for Boxes for the Enclosure of Electrical Accessories"
BS 4683	"Specification for Electrical Apparatus for Explosive Atmosphere"
BS 5501or;(IEC 79)	"Electrical Apparatus for Potentially Explosive Atmosphere"

10.3 Basic Requirements

10.3.1 System

It is recommended to apply modular system in construction of boxes in compliance with the requirements of IEC 629.

10.3.2 Fixing of appliances

Provision shall be made within the box for mounting or suspending the electrical accessory clear of the base of the box.

Screw fixing means for covers or accessories shall be so designed to withstand mechanical stresses occurring during installation and normal use.

10.3.3 Knockouts

Knockouts shall be provided in the portion of the side or base of a box which can readily be removed, when required.

10.3.4 Wall thickness

Minimum wall thickness of boxes:

The minimum wall thickness of boxes shall be as shown in Table 1.

TABLE 1

MATERIAL	16 mm INTERNAL DEPTH mm	ABOVE 16 mm INTERNAL DEPTH mm
Steel	0.9 (1) Nominal	1.1 (1.25) Nominal
Cast Iron	2	2.3
Insulating Material	1.5	2

10.3.5 Earthing

Provision shall be made for the addition of means for the effective earthing of all metal boxes. In boxes of insulating material provision shall be made for the earth continuity conductor(s). The means provided shall be rigidly fixed to the box.

10.3.6 Securing holes

Provision shall be made for a hole or holes in the base of the box for securing it to a mounting surface, the holes shall not be less than 5 mm diameter. The fixing hole(s) in boxes made of insulating materials shall be situated in adequately strengthened sections of the moulding.

10.3.7 Drain holes

Surface and semi-flush mounting enclosures shall have IP × 1 to IP × 2 to allow opening a drain hole at least 5 mm in diameter or 20 mm² in area with a minimum width or length of 3 mm.

Drain holes shall be so located and available in such a number that one of the holes can always become effective in any intended position of the enclosure. Compliance shall be checked by inspection, measurement and the use of probes. For examples of PVC boxes for switch and socket see Clause 10.6.

10.3.8 Mechanical strength

Insulating boxes shall be resistant to:

- Heat, fire and tracking, steel and cast iron boxes shall be resistant to corrosion.

10.4 Tests

Boxes shall be tested in accordance with requirements of IEC 670 (1989).

10.5 Data Sheets for Domestic, Industrial and Explosionproof Boxes

PURPOSE: .....
MATERIAL:
Steel .....
Cast Iron .....
Polymeric .....
ENCLOSURE:
Domestic .....
Industrial .....
INGRESS PROTECTION:
Explosionproof weatherproof .....
SIZE: .....
ENTRIES (NUMBER AND SIZE):

Top .....
Bottom .....
Sides: .....Left ..... Right
STOPPING PLUGS REQUIRED:
Size .....Number .....
FINISH: .....

10.6 Sizes of PVC Boxes for Switch and Socket

Flush mounting plaster depth switch boxes

1 gang 16 mm deep, 75 mm × 75 mm overall. 2 × 16 mm and 1 × 20 mm oval knockouts. Fixed pillars, PVC threads.

1 gang 16 mm deep, 75 mm × 75 mm overall. 2 ×16 mm and 1 × 20 mm oval knockouts. One adjustable lug, PVC threads.

Flush mounting socket outline boxes

1 gang 35 mm deep, 75 mm × 75 mm overall. Round knockouts. Fixed pillars, PVC threads.

1 gang 35 mm deep, 75 mm × 75 mm overall. Round knockouts. Fixed brass thread pillar and moulded adjustable lug.

2 gang 35 mm deep, 75 mm × 135 mm overall. Round knockouts. Fixed brass thread pillar and moulded adjustable lug.

Surface mounting switch and socket boxes

1 gang 29 mm deep. Round corners, brass threads. Plain sides.

1 gang 32 mm deep. Square corners, brass threads. Plain sides.

2 gang 32 mm deep. Square corners, brass threads. Plain sides.

Fixing centers 1 gang 60.3 mm, 2 gang 120.6 mm, thread 3.5 mm. Overall dimensions are approximate. All boxes to have provision for earthing terminals.

10.7 Sizes of Metallic Flameproof Weatherproof Conduit Boxes and Accessories Suitable for Zone 1 and Zone 2 Areas

BOX TYPE	SIZE
Terminal	20 mm 25 mm 32 mm
Through	20 mm 25 mm 32 mm
Tee	20 mm 25 mm 32 mm
Intersection	20 mm 25 mm 32 mm
Angle	20 mm 25 mm 32 mm
EXTRAS	
Back Outlet	
Dome Cover for	20 mm 25 mm
Stopper Cover	
Spare Covers Complete with Screws	
Dome Cover for	20 mm 25 mm
Stopper Cover	
FLAMEPROOF FITTINGS FOR CONDUIT SYSTEMS	
FITTING	**SIZE**
nspection Bend	20 mm 25 mm 32 mm
Nipple	20 mm 25 mm 32 mm
Double Ended Nipple	20 mm 25 mm 32 mm
Unions -Internal -Internal/External	20 mm 25 mm 20 mm 25 mm
Solid Bends	20 mm 25 mm 32 mm 1½" 2"
Solid Couplers	20 mm 25 mm 32 mm 1½" 2"
Solid Elbows	20 mm 25 mm
Solid Tees	20 mm 25 mm
G º Galvanised	

10.8 Sizes of Industrial Box (Cast Iron)

SQUARE PATTERNS (INTERNAL SIZE)

75 mm × 75 mm × 37.5 mm
75 mm × 75 mm × 50 mm
100 mm × 100 mm × 37.5 mm
100 mm × 100 mm × 50 mm
100 mm × 100 mm × 75 mm

150 mm × 150 mm × 50 mm
150 mm × 150 mm × 75 mm
150 mm × 150 mm × 100 mm
225 mm × 225 mm × 75 mm
300 mm × 300 mm × 100 mm

RECTANGULAR PATTERNS (INTERNAL SIZE)

150 mm × 75 mm × 50 mm
150 mm × 100 mm × 50 mm
150 mm × 100 mm × 75 mm
225 mm × 150 mm × 75 mm
225 mm × 150 mm × 100 mm
300 mm × 150 mm × 75 mm

Note:

Covers and neoprene gaskets to be supplied.

10.9 Sizes of Industrial Boxes (Sheet Steel)

RECTANGULAR PATTERNS (INTERNAL SIZE)

100 mm × 75 mm × 50 mm
150 mm × 75 mm × 37.5 mm
150 mm × 75 mm × 50 mm
150 mm × 75 mm × 75 mm
150 mm × 100 mm × 37.5 mm
150 mm × 100 mm × 50 mm
150 mm × 100 mm × 75 mm
225 mm × 75 mm × 50 mm
225 mm × 75 mm × 75 mm
225 mm × 150 mm × 50 mm
225 mm × 150 mm × 75 mm
225 mm × 150 mm × 100 mm
300 mm × 150 mm × 50 mm
300 mm × 150 mm × 75 mm
300 mm × 150 mm × 100 mm
300 mm × 225 mm × 75 mm

SQUARE PATTERNS (INTERNAL SIZE)

75 mm × 75 mm × 37.5 mm
75 mm × 75 mm × 50 mm
75 mm × 75 mm × 75 mm
100 mm × 100 mm × 37.5 mm
100 mm × 100 mm × 50 mm
100 mm × 100 mm × 75 mm
100 mm × 100 mm × 100 mm
150 mm × 150 mm × 37.5 mm
150 mm × 150 mm × 50 mm
150 mm × 150 mm × 75 mm
150 mm × 150 mm × 100 mm
225 mm × 225 mm × 50 mm
225 mm × 225 mm × 75 mm
225 mm × 225 mm × 100 mm

225 mm × 225 mm × 150 mm
300 mm × 300 mm × 75 mm
300 mm × 300 mm × 100 mm
300 mm × 300 mm × 150 mm
450 mm × 450 mm × 150 mm

10.10 Sizes of Terminal Assemblies for Boxes in Explosive Atmosphere

Terminal assemblies shall be suitable to accommodate cable sizes ranging from 0.5 to 120 mm² e.g.:

MAX. CONDUCTOR SIZE (mm²)	MAX. No. WAYS
0.5 to 2.5	152
0.5 to 4	96
2.5 to 10	76
6 to 16	35
16 to 35	21
to 70	11
to 95	9
to 120	8

Entry Positions:

Entry sizes of 20, 25, 32 and 40 mm to be provided on all four sides. Maximum number of entries on any one side are as follows:

6 × 20 mm or 4 × 25 mm or 3 × 32 mm or 2 × 40 mm.

SECTION ELEVEN
MECHANICAL AND COMPRESSION JOINTS
IN
ELECTRICAL CABLE AND WIRE CONNECTOR
OR
TERMINATION

11.1 Scope 58
11.2 References 58
11.3 Definitions and Terminology 58
11.4 Test 59
11.5 Data Sheet for Connector and Termination 59

11.1 Scope

This Standard specifies requirements for mechanical and compression joints in electric cable and wire connectors or terminations for use with conductors for normal continuous operation at elevated temperature forming parts of factory built electrical equipment and for associated site installation work. The joints or connectors may be divided into the following groups.

11.1.1 The connectors, the conductors for which is suitable, have an operating temperature up to 85°C, such as copper conductors up to 1000 mm² cross sectional area.

11.1.2 The connectors of conductors for which is adequate have the range of joint operating temperature from 85°C to 210°C.

The conductor of this category may be stranded or solid and up to and including 1000 mm² in plated copper or up to and including 6 mm² in nickel, nickel alloy, iron or plated iron. The copper conductor may be plated with tin silver or nickel and the iron conductors with nickel.

11.1.3 The conductor of this category is aluminum of cross sectional area of 16 mm² and above.

11.2 References

The following standards are applicable in conjunction with performance of mechanical and compression joints in electrical cable and wire connectors:

BS (BRITISH STANDARD INSTITUTION)

BS 4579: Part 1 (1970)	"Compression Joints in Copper Conductors"
BS 4579: Part 2 (1973)	"Compression Joints in Nickel, Iron, and Plated Conductor"
BS 4579: Part 3 (1976)	"Mechanical and Compression Joints in Aluminum Conductors"

11.3 Definitions and Terminology

For the purpose of this Standard the following definitions apply:

Connector:

A lug, tag ferrule or other device with a barrel or socket at one or both ends to accommodate an electrical conductor with or without additional provision to secure the insulation.

Compression Jointing:

A method of firmly attaching a connector to a conductor by pressure forming or reshaping the barrel in association with the conductor to establish good electrical and mechanical contact.

Joint:

The connector barrel and that portion of conductor which have been brought into intimate contact by the compression jointing process.

Termination:

A device for connecting two or more conductor to other equipment.

11.4 Test

The connector and joints shall satisfy the requirement of relevant parts of BS 4579 while being test.

11.5 Data Sheet for Connector and Termination

TYPE OF CONNECTORS:

Straight Through .....

Termination .....

Branch .....

PRINCIPAL DIMENSIONS: .....

(Reference to any specific catalogue number and maker)

SIZE OF CONDUCTOR FOR WHICH CONNECTOR OR TERMINATION IS REQUIRED:

METHOD OF CONNECTION:

Compression .....

Mechanical .....

MATERIAL SPECIFICATION: .....

SURFACE FINISH (if any) .....

TYPE OF CABLE FROM WHICH TEST CONDUCTOR TO BE TAKEN:

Size and Conductor Form .....

Manufacturer .....

Compound if any: e.g., mass impregnated non draining .....

DESCRIPTION OF COMPOUND TO BE USED AS PART OF THE JOINTING SYSTEM:

.....

.....

.....

MAXIMUM OPERATING TEMPERATURE OF CONDUCTOR OR TERMINAL EQUIPMENT:

.....

SECTION TWELVE

EARTHING

12. MATERIAL STANDARD FOR EARTHING 61
12.1 Driving Head 61
12.2 Coupling 61
12.3 Rods 61
12.4 Clamps 61

12. MATERIAL STANDARD FOR EARTHING

Earthing device shall comprise of:

12.1 Driving Head

Driving head shall be made of high strength steel with good contact with rod, so that driving force is transferred directly to the rod allowing power hammer to be used for deep driving.

12.2 Coupling

Coupling shall be made of aluminum bronze counter bored to completely enclose treads and protecting them from damage and corrosion.

12.3 Rods

The rods shall be extensible, made from pure electrolyte copper molecularly bonded onto low carbon steel core with high tensile strength highly resistant and hard to bend, allowing power hammer to be used for deep driving.

To ensure strength and uniform layer of copper threads shall be rolled onto the rods.

The rods shall have 16 mm nominal diameter and 1.5 meters length with provision for extension (s) where required so.

12.4 Clamps

Clamps body shall be fabricated from silicon aluminum and the screw to be made from phosphor bronze to ensure strength and resistance to corrosion. The clamps shall have room for 50 to 70 mm^2 cross section copper conductors.

APPENDICES

GENERAL

APPENDIX A

A. ENVIRONMENTAL CONDITIONS

A.1 Site elevation: ---------- meter above sea level.

A.2 Maximum ambient air temperature: ---------- degree centigrade.

(Bare metal directly exposed to the sun can at times reach a surface temperature of ------- degree centigrade.)

A.3 Minimum air temperature: ---------- degree centigrade.

A.4 Relative humidity: ---------- percent.

A.5 Atmosphere: Saliferrous, dusty corrosive and subject to dust storms with concentration of 70-1412 mg/cubic meter, H_2S may be present.

A.6 Lightning storm isoceraunic level: ---------- storm days/year.

A.7 Maximum intensity of earthquake: ---------- richters.

Note:

Blanks to be filled by client.

APPENDIX B

B. INSPECTION/QUALITY CONTROL, AND QUALITY RECORDS

B.1 Inspection/Quality Control

B.1.1 The purchaser's inspector, or his authorised representative shall have free access to the manufacturing plant engaged in the manufacture of the equipment, to carry out necessary inspection at any stage of work.

B.1.2 Inspection may include the visit to quality control laboratories, work shops, testing bay etc.

B.1.3 The supplier shall make available technical data, test pieces and samples that the purchaser's representative may require for verification in conjunction with pertinent equipment.

If required the supplier shall forward the same to any person or location that the purchaser's representative may direct.

B.2 Quality Records

B.2.1 The supplier shall maintain appropriate inspection and test records to substantiate conformance with specified requirements.

B.2.2 Quality record shall be legible and relevant to the product involved.

B.2.3 Quality records that substantiate conformance with the specified requirements, shall be retained by manufacturer and made available on request by Purchaser.

B.2.4 The supplier shall establish and maintain procedure for identification collection, indexing, filing, storage, maintenance and disposition of quality records.

B.2.5 Supplier shall submit to purchaser: Reports, test, schedules, and test certificates (in ------- copies) on completion of tests.

Note:

Blanks to be filled by client.

APPENDIX C

C. TESTS AND CERTIFICATION

C.1 General Requirements

C.1.1 Test procedure as proposed by the supplier shall be agreed upon, and approved by the purchaser before any test is carried out.

C.1.2 Purchaser may require witnessed tests to be carried out in the presence of his nominated representative who should be informed at least ------ weeks in advance of the date of the tests and confirmed ------ weeks before the tests.

C.1.3 Test certificates and test reports shall refer to the Serial No. of the equipment tested and must bear the purchaser's name, Order No. and manufacturer's name and seal.

C.1.4 Approval by the purchaser's inspector or representative shall not relieve the Vendor of his commitments under the terms of this specification or any associated order.

C.1.5 The equipment may be rejected if measurement and inspection reveal any discrepancies between quoted figures resulting in purchase order and those measured actually.

Note:

Blanks to be filled by client.

APPENDIX D

D. PACKING

D.1 Materials must be carefully packed to provide necessary protection during transit to destination and shall be in accordance with any special provision contained in the order.

D.2 Special attention must be given to protection against corrosion during transit, and silica gel or similar dehydrating compound shall be enclosed.

D.3 The method of cleaning, preserving and the details of packing including moisture elimination, cushioning, blocking and crating shall be such as to protect the product against all damages or defects which may occur during handling, sea shipment to the port and rough road haulage, to site and extended tropical open air storage generally as client general conditions of purchase see Attachment No. 10.

D.4 Identification for Shipment

The marking and labels of products should be legible durable and in accordance to specification. Identification should remain intact from the time of initial dispatch at work to the final destination.

Marking shall be adequate for identifying a particular equipment in the event that a recall or inspection becomes necessary.

APPENDIX E

E. LANGUAGE

E.1 All correspondence drawings, documents, certificates, including testing operation and maintenance manuals and spare part lists etc., shall be in English.

E.2 Offers in other languages will not be considered.

APPENDIX F

F. FULL ADDRESS OF PURCHASER:

.....

.....

.....

.....

P.O.BOX No. ..... CODE No. .....

TELEPHONE No. .....

TELEX No. .....

FACSIMILE No. .....

Note:

Blank to be filled by client.