40th Annual National Convention (2015)
of
The Institution of Integrated Electrical Engineers of the Philippines (IIEE)

Best Practices in
Low Voltage Systems (Malaysia)

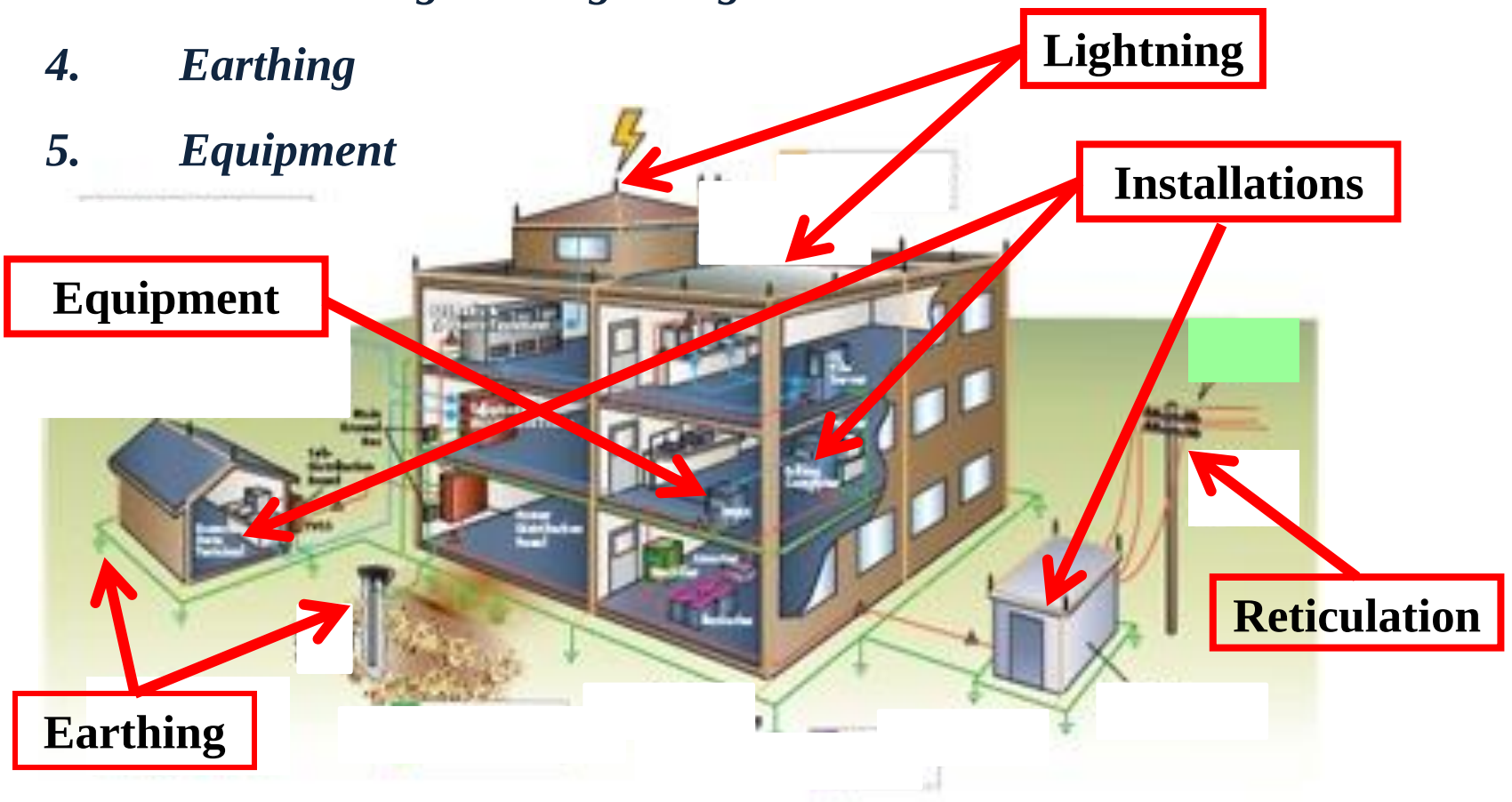
Ir. K.T. Lim (Lim Kim Ten)

The Institution of Engineers, Malaysia

3:30pm – 4:20pm 27th November 2015

LV Electrical Systems of Fixed Buildings

1. *Electricity supply reticulation*
2. *Electrical installations of fixed buildings*
3. *Protection against Lightning*
4. *Earthing*
5. *Equipment*



Notes:

Malaysia Does not Develop

National Low Voltage (LV) Electrical Installations Codes or Standards

We Adopt Relevant British and/or IEC / ISO Standards

Notes:

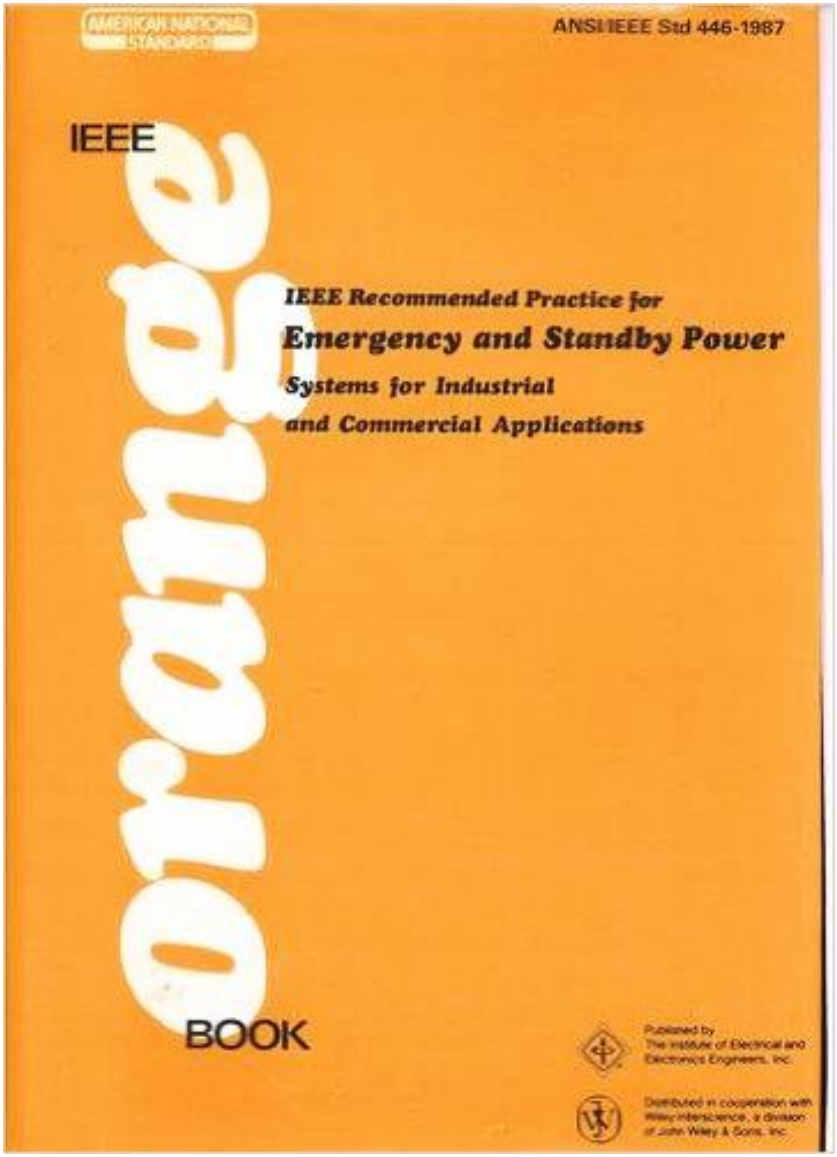
Malaysia "Adopt" Elements or Whole of Other LV Electrical Codes and Standards which Enhance Electrical Safety

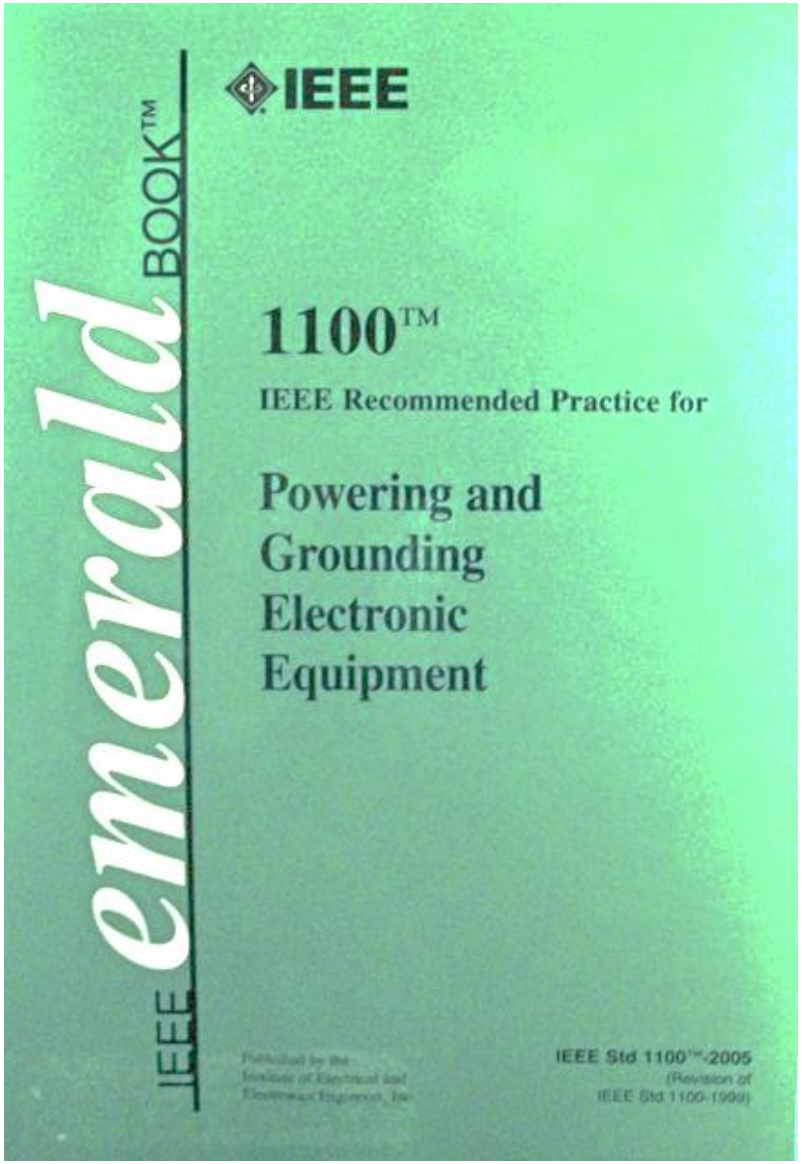
Examples:

USA: National Electric Code

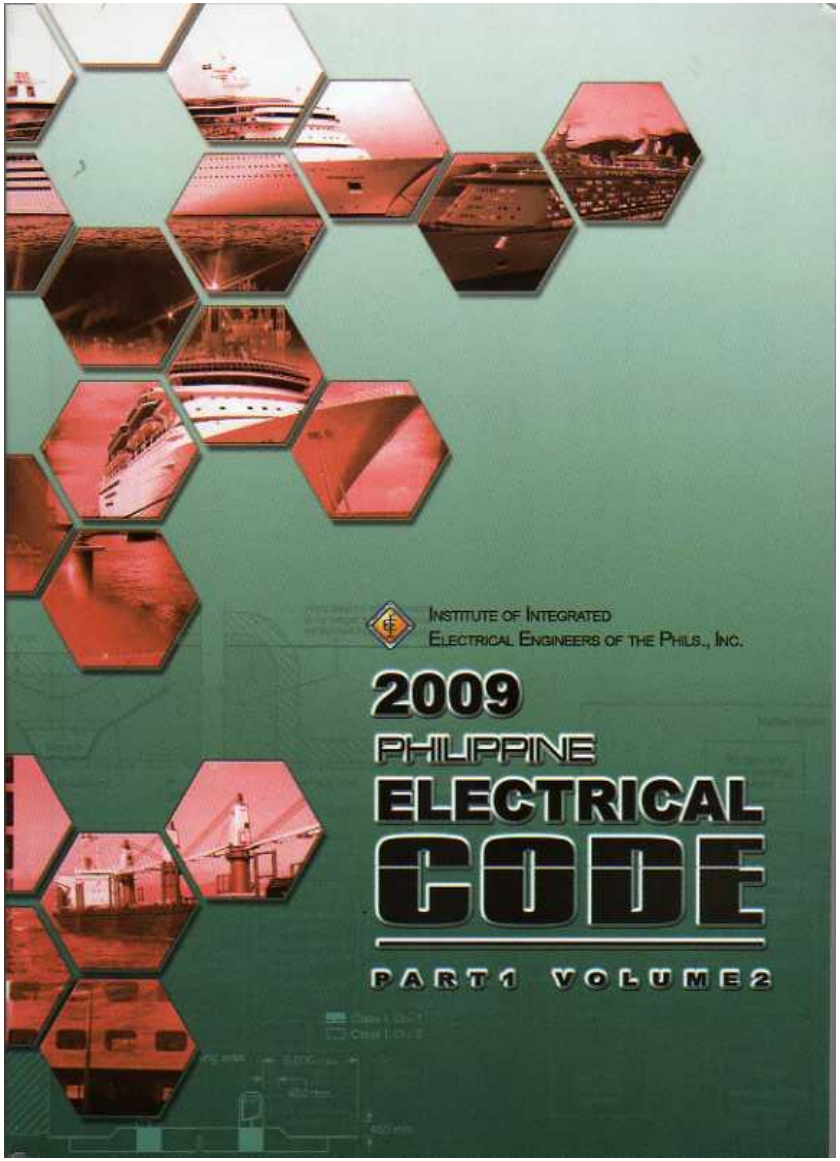
IEEE Color Books

IEEE Color Books

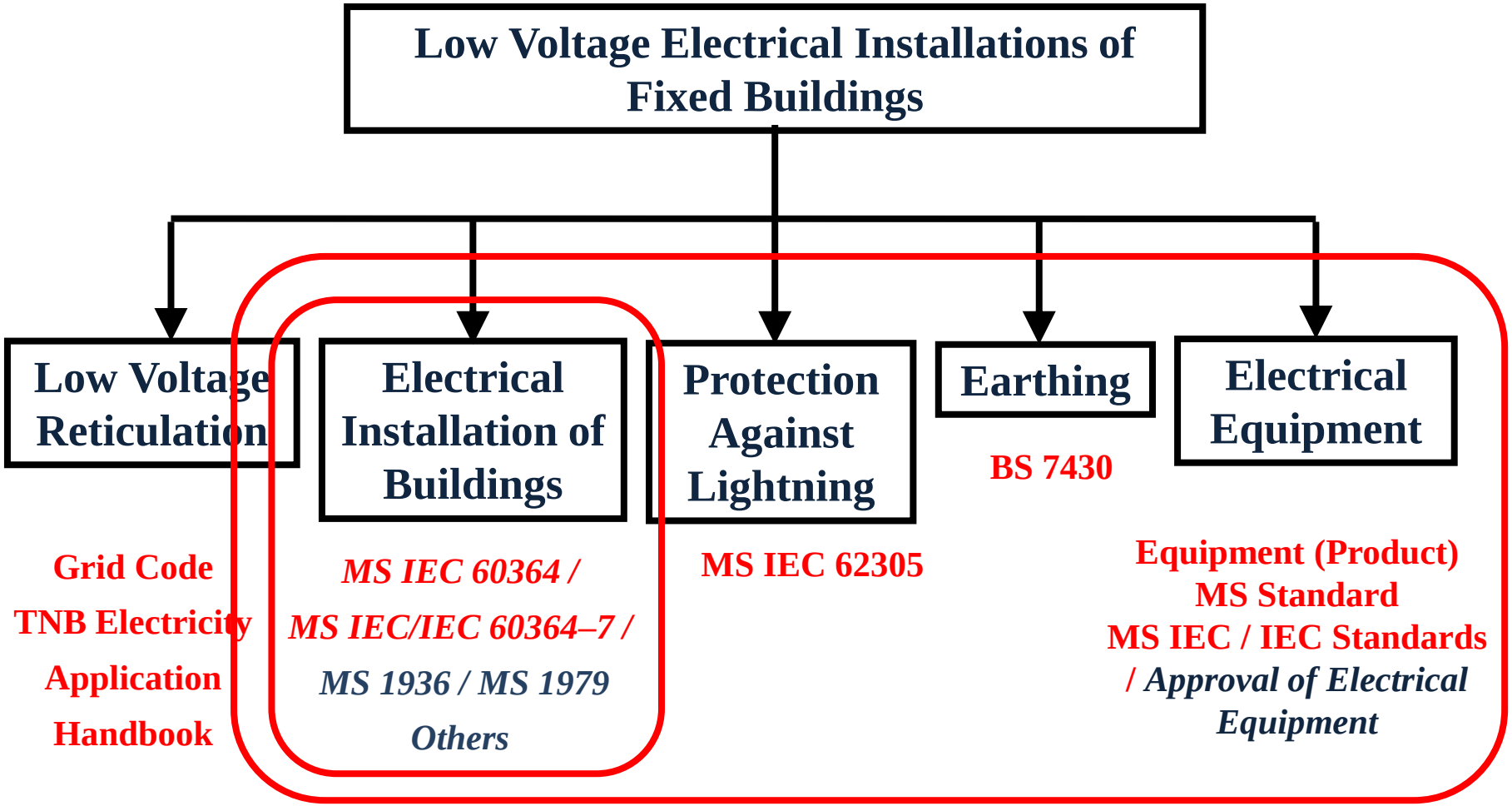




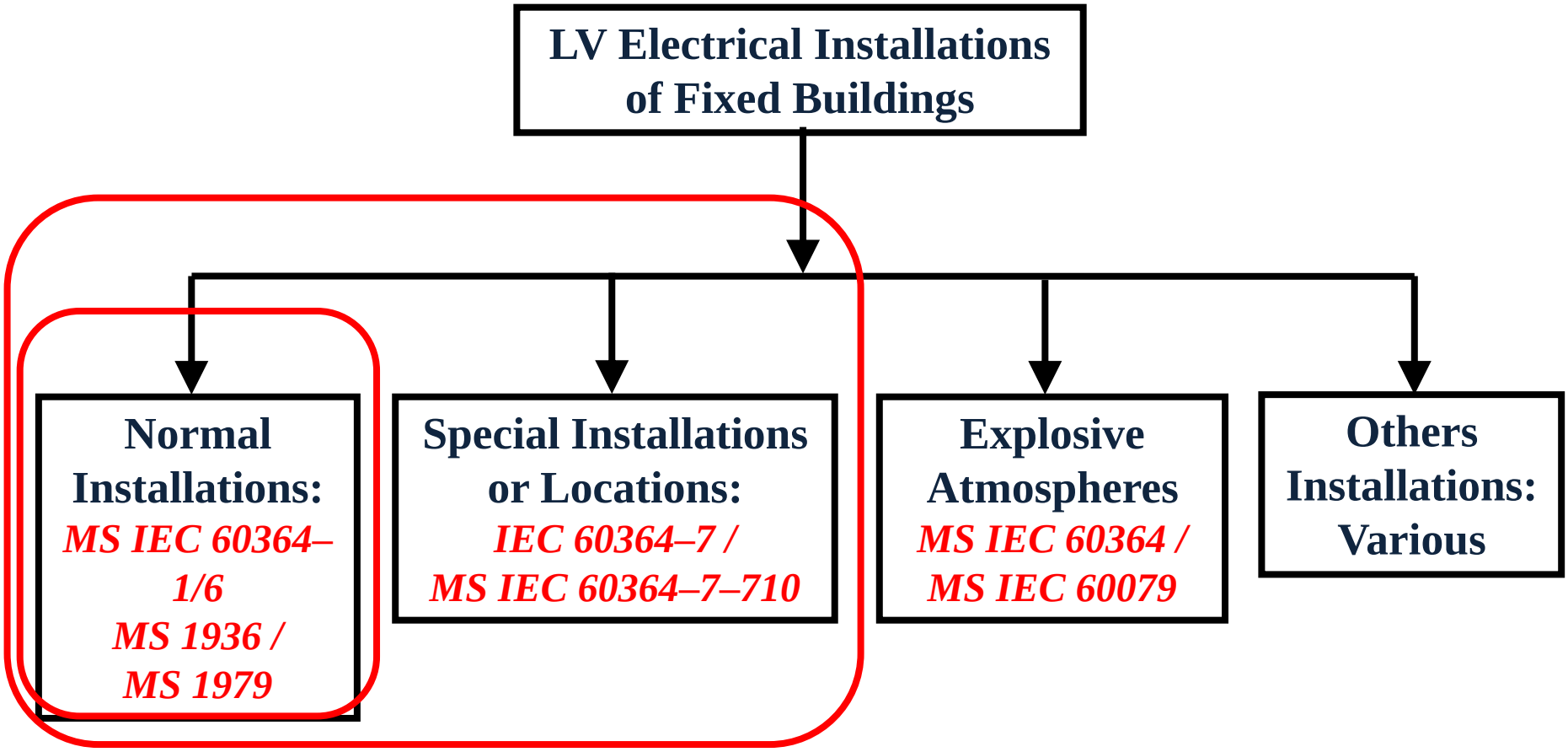
Philippine Electricity Code



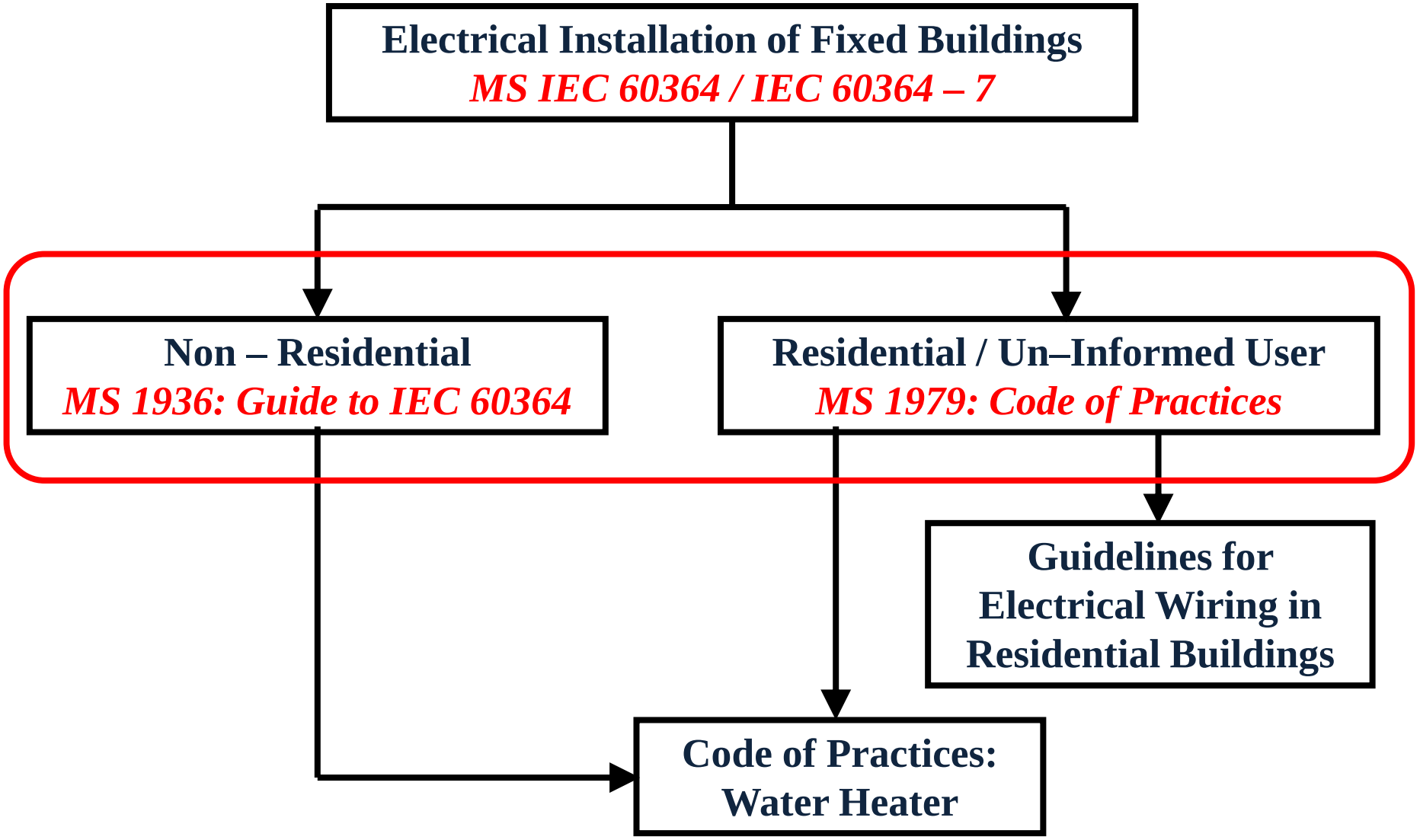
Standards, Guides, Codes and Code of Practices



Grouping of Electrical Installations of Fixed Buildings



Standards, Guides & Code of Practices



Non – Residential: MS IEC 60364 / MS 1936

Commercial Buildings

Outdoor: Carpark / Guard House

Factories

Fixed Buildings

Condominiums

Schools

Airport: KLIA

Residential: MS IEC 60364 / MS 1979

Apartments

Fishing Villages

Residential Buildings

Rural Houses

Condominiums

Illegal Settlements

Residential

Non – Residential: Special Installations

Hospitals: University of Malaya Medical Faculty

MS IEC 60364–7–710

MS 2366

Swimming Pool

IEC 60364–7–702

Special Installations /Locations

Water Features and Fountains

IEC 60364–7–702

Marina's: ***IEC 60364–7–709***

Bath room: ***IEC 60364–7–701***

Agriculture & Horticulture

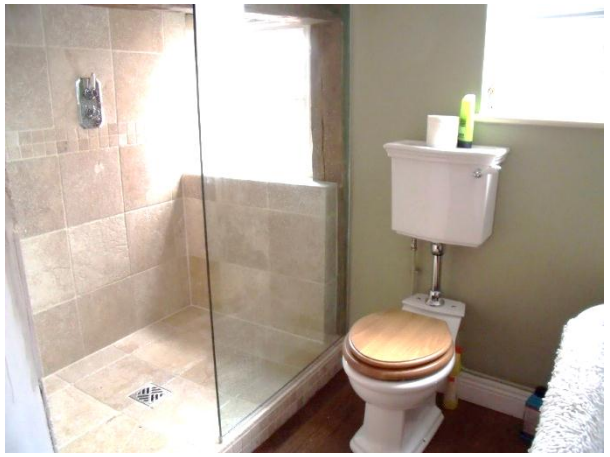
IEC 60364–7–705

Residential Buildings: *Special Installations*

Residential Solar PV:
IEC 60364–7–712

Guard House:
MS IEC 60364

Water Heater: *Code of Practice*



Bathroom: *IEC 60364–7–701*

Residential Buildings

Fountain: *IEC 60364–7–702*

Electric Vehicle Charging:
IEC 60354–7–722

Fish Tank: *IEC 60364–7–702*

Explosive Atmospheres: IEC 60364 / IEC 60079

Tank Farm

Chemical Complex

Explosive Atmospheres

Oil & Gas Platform

Chemical Store

Grain Silos

Oleo Refinery

Others Installations

Ships: ***IEC 60092***

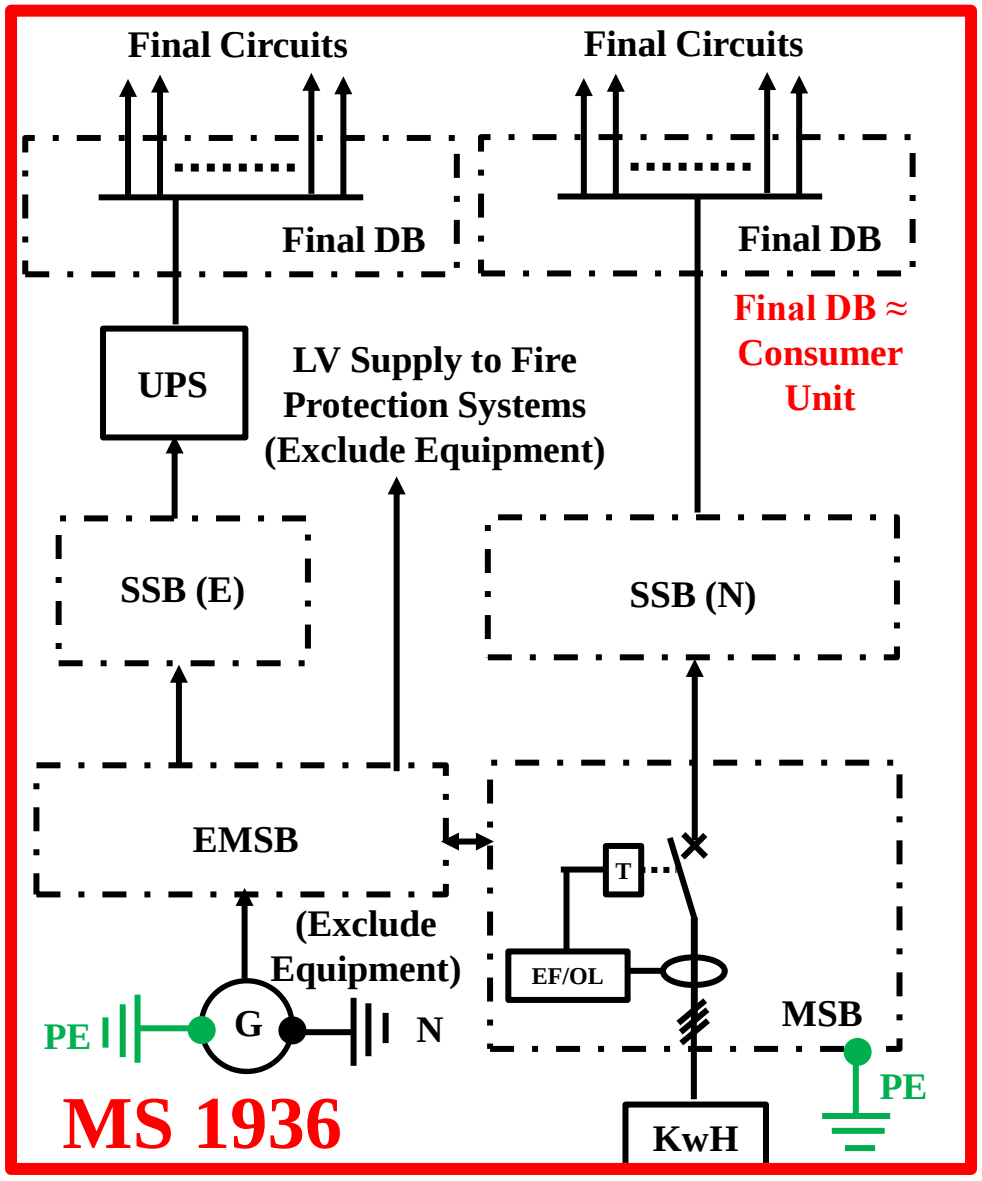
Aviation & Aerospace

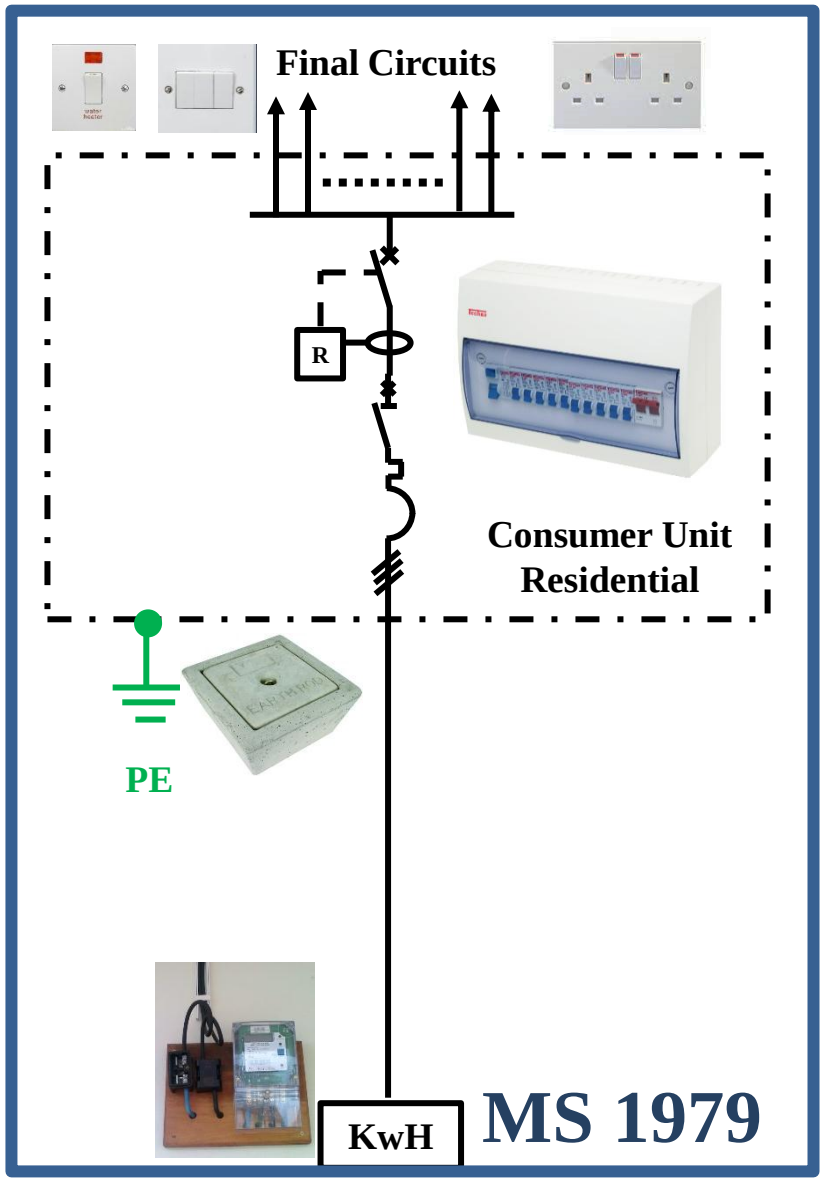
Others Installations

Ponds, Rivers, Seas & Oceans

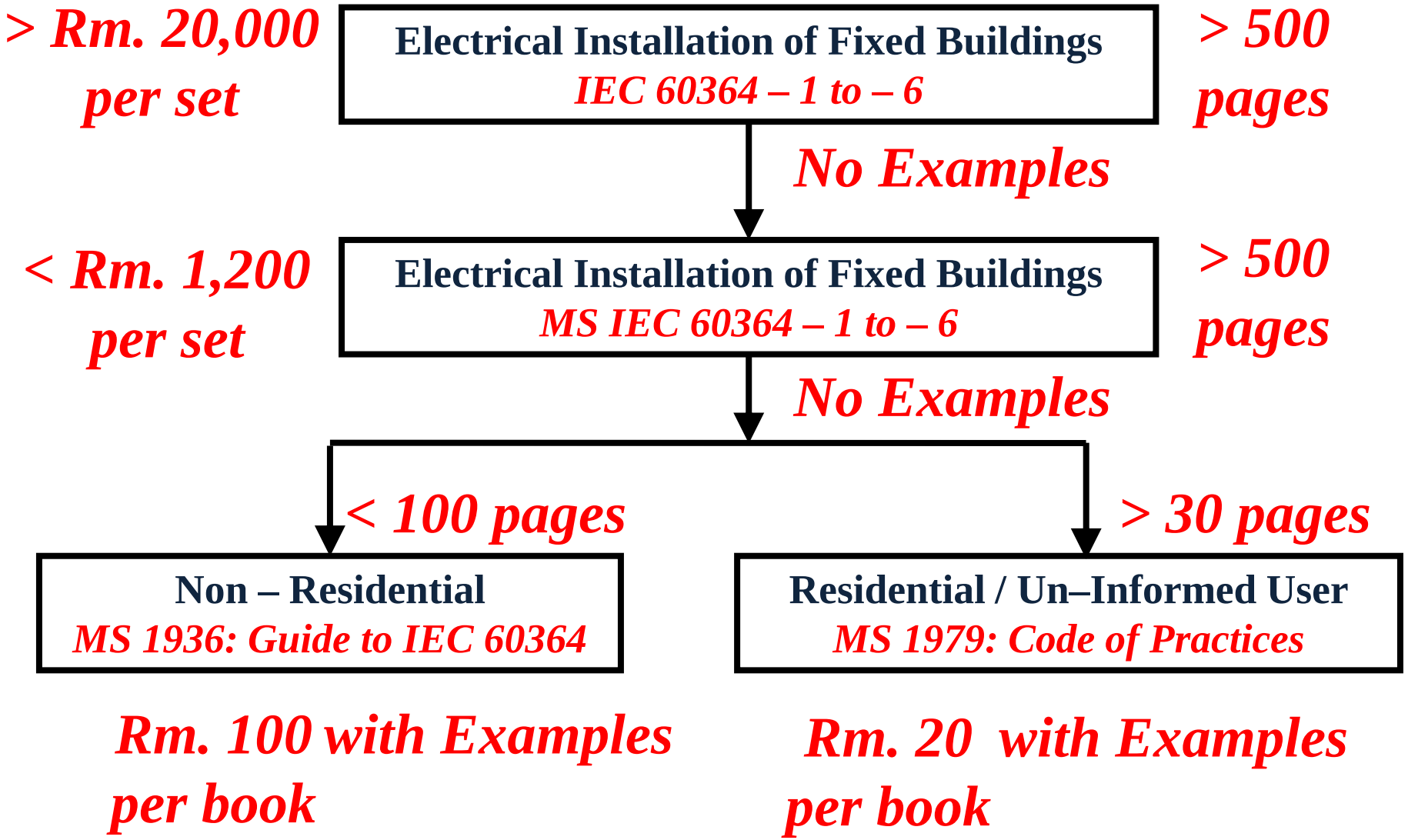
Military

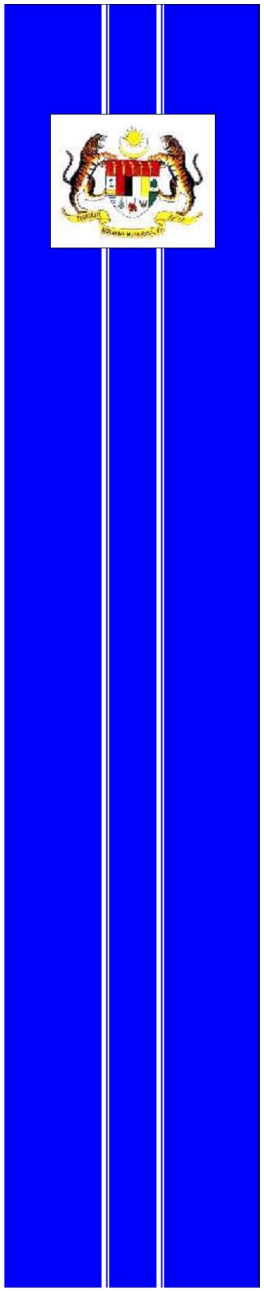
Scope of MS 1936 and MS 1979

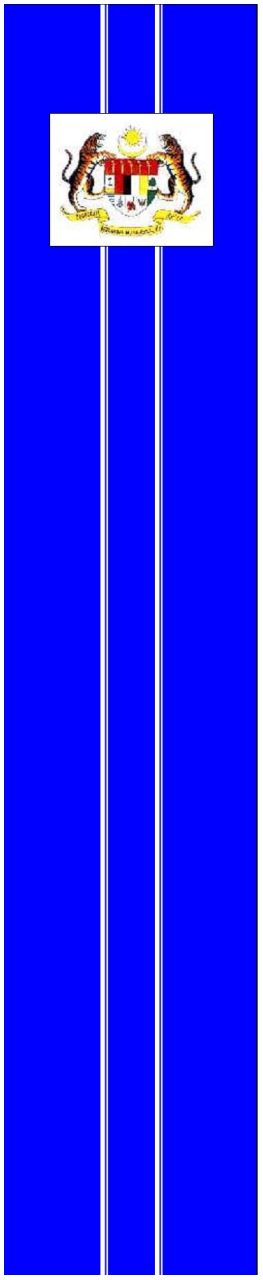




Benefits of Developing MS 1936 & MS 1979




MALAYSIAN STANDARD
MS 1979:2007
ELECTRICAL INSTALLATIONS OF BUILDINGS - CODE OF PRACTICE
Rm.20–00
ICS: 91.140.50, 29.020
Descriptors: practices, electrical installations, buildings, residential houses, dwellings
© Copyright 2007
DEPARTMENT OF STANDARDS MALAYSIA


MALAYSIAN STANDARD
MS 1936:2007
ELECTRICAL INSTALLATIONS OF BUILDING – GUIDE TO MS IEC 60364
Rm.100–00
ICS: 91.140.50, 29.020
Descriptors: guide electrical installation, buildings
© Copyright 2007
DEPARTMENT OF STANDARDS MALAYSIA

GUIDELINES FOR
ELECTRICAL WIRING
IN RESIDENTIAL BUILDINGS

Develop Based on MS 1979 for Un – informed User:

Free Download: Energy Commission

2008 EDITION
www.st.gov.my

Case Study: 1

Low Voltage (LV)

Electricity Act and Regulations,

and

Electrical Safety Standards

Electricity Act and Regulations

LAWS OF MALAYSIA

REPRINT

Act 447

ELECTRICITY SUPPLY ACT 1990

Incorporating all amendments up to 1 January 2006

PUBLISHED BY
THE COMMISSIONER OF LAW REVISION, MALAYSIA
UNDER THE AUTHORITY OF THE REVISION OF LAWS ACT 1968
IN COLLABORATION WITH
PERCETAKAN NASIONAL MALAYSIA BHD
2006

Free Download: Energy Commission

Electricity Regulations 1994

Electricity Regulations 1994

P.U.(A) 38/94

ELECTRICITY SUPPLY ACT 1990 [ACT 447]
P.U.(A) 38/94
ELECTRICITY REGULATIONS 1994
Incorporating latest amendments - 431/ 2003

ARRANGEMENT OF REGULATIONS

Free Download: Energy Commission

Electrical Safety Standards: Generic

1. ***MS IEC 60335*:** Household and similar electrical appliances;
2. ***MS IEC 60065:*** Audio, video and similar electronic apparatus;
3. ***MS IEC 61010*:** Equipment for measurement, control and laboratory use;
4. ***MS IEC 60950:*** Information and communication technology equipment;
5. ***MS IEC 60601*:** Medical electrical equipment;
6. ***MS IEC 60204***: Safety of Machinery
7. ***MS IEC 61508***: Functional safety of electrical / electronic / programmable electronic safety – related systems

- ***IEC 62368 replacing IEC 60065; and IEC 60950***
  - No MS IEC adoption yet

Electrical Safety Standards: Specific

- ***MS 556**: Specification for electrical safety code on private electric generator;*
- ***MS 949**: Code of practice for safety in welding and cutting;*
- ***MS 966**: Playground equipment: Part 2: General safety requirements;*
- ***MS 1597**: Part 2–73:2003 Household and similar electrical appliances–Safety–Part: 2–73: Particular Requirements for fixed immersion heaters (1st Edition);*
- ***MS 1992**: Electronic equipment for use in power installations;*
- ***Etc.,***

Case Study: 2

Adoption of International Low Voltage Electrical Installations Standards

Notes:

Malaysia Does not Develop

National Low Voltage (LV) Electrical Installations Codes or Standards

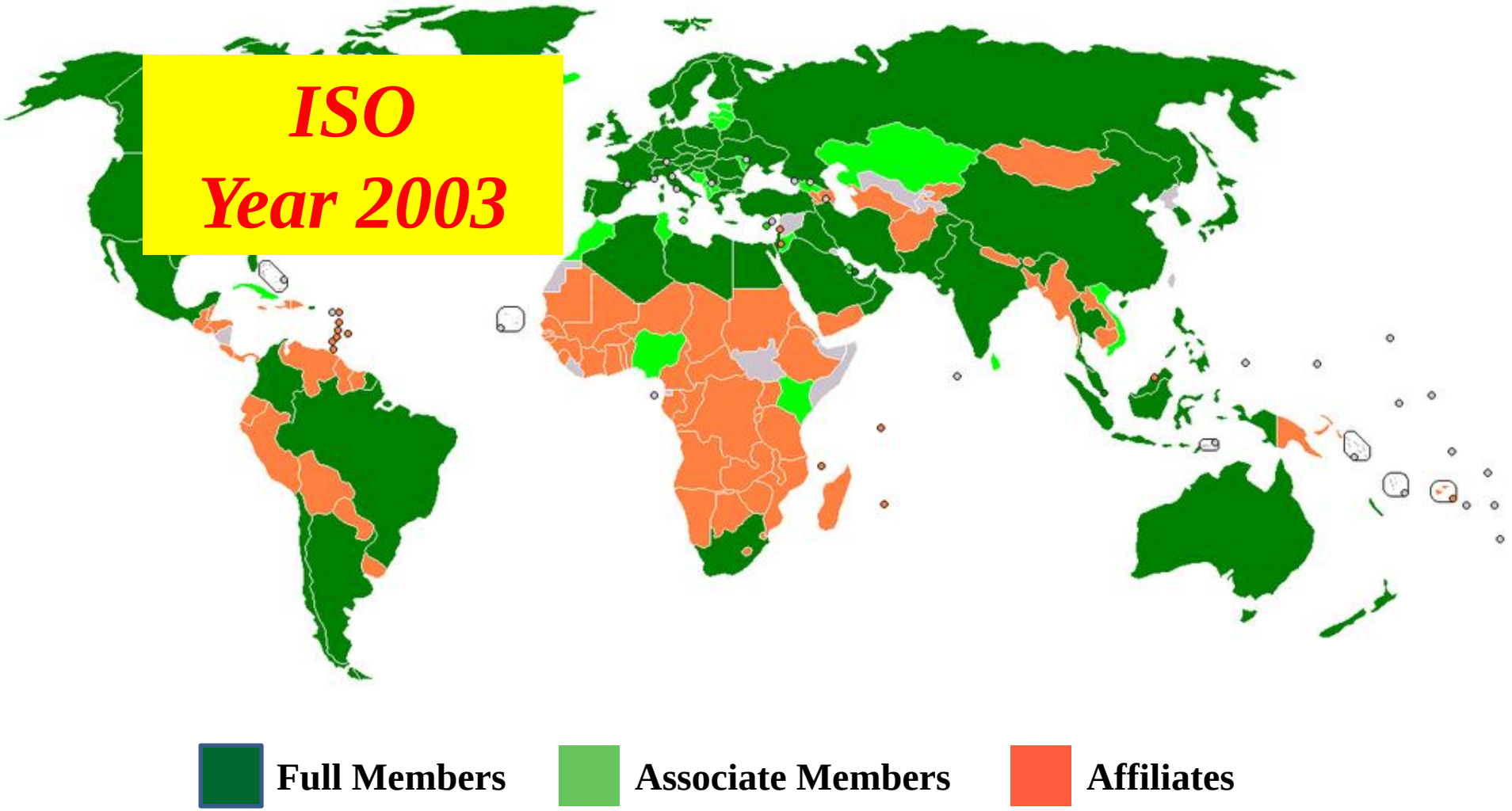
We Adopt Relevant British and/or IEC / ISO Standards

International Standards Harmonization:

LV Electrical Installations of Buildings

IEC
Year 2003

ISO Standards

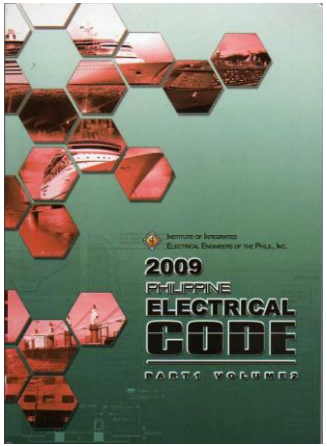


Adoption of International Standards and Best Practices

- ***Malaysia adopts IEC & ISO standards as reference standards***
- ***National deviations document in guides and code of practices***
  - As MS (Malaysian Standard) standards
- ***Example***
  - MS IEC 60364: Electrical Installations of Buildings – Adoption of IEC 60364 with national deviations
    - MS 1936: Electrical Installations of Buildings: Guide to MS IEC 60364: Non–residential buildings
    - MS 1979: Electrical Installations of Buildings: Code of Practice: Residential buildings
      - Code of practice for water heater

Other International & National Standards ??

- ***We adopt requirements that improve, especially, safety and if possible economize our electrical installation practices;***
- ***Elements or whole of standards commonly used in Malaysia today***
  - BS 7671;
  - National Electrical Code (NEC);
  - JIS (Japan), GB (China), EN (European Union);
  - IEEE colour books



British Colony & Malaysia Act 1963

- ***Malaya was a British colony up to 1957***
- ***3 years 8 months under Japanese occupation (No impact on electrical installations)***
- ***Malaysia Act 1963***
  - Malaya (Peninsular Malaysia), Sabah, Sarawak, and Singapore joined as Malaysia in Year 1963
  - Singapore left Malaysia 9th August 1965
- ***Constitution safeguards, includes the supply of electricity and matters related***
  - The State of Sabah (20 points agreement)
    - Harmonized with Peninsula Malaysia
  - The State of Sarawak (18 points agreement)

Fixed Building Electrical Standards Timeline

Time Line	(Malaya), Peninsular, FT's & Sabah	The State of Sarawak
Up to year 1991	IEE Wiring Reg. 1st – 15th Ed.***(Electrical Installations of Buildings)*** ***BS 6651 (Lightning) / BS 7430 (Earthing)***	
Year 1991	IEE Wiring Reg. 1st – 16th Ed.(16th Ed., issued in 1991) ***BS 6651 / BS 7430***	
Year 1992	IEE Wiring Reg. 16th Ed.: Harmonized with IEC 60364 and became with BS 7671:1992 ***BS 6651 / BS 7430***	
Year 1991 – Year 2003	IEE Wiring Reg. / BS 7671 ***BS 6651 / BS EN 62305 (1999) / BS 7430***	BS 7671 ***BS 6651 / BS EN 62305 / BS 7430***
Year 2004 – Year 2007	BS 7671 / IEC 60364 ***/ MS 1979 (2007) BS 6651 or MS IEC 62305:2007/ BS 7430***	BS 7671 ***BS 6651 / BS EN 62305 / BS 7430***
Year 2008 – Now	IEC 60364 / MS 1979 ***BS 6651 / MS IEC 62305 (1 Sep 11) / BS 7430***	BS 7671 ***BS EN 62305 / BS 7430***

IEC 60364 (BS 7671:2008:2008) Part 7:

Special Installations or Locations

Malaysian Standard	IEC 60364–7– (BS 7671 Part 7–Section)
	(700: General)
	–701 (701): Locations Containing a Bath or Shower
	–702 (702): Swimming Pools and Other Basins
	–703 (703): Room and Cabins Containing Sauna Heaters
	–704 (704): Construction and Demolition Site Installations
	–705 (705): Agricultural and Horticultural Premises
	–706 (706): Conducting Locations with Restricted Movement
	–708 (708): Caravan Parks, Camping Parks and Similar Locations

IEC 60364 (BS 7671:2008:2008) Part 7:

Special Installations or Locations

Malaysian Standard	IEC 60364–7– (BS 7671 Part 7–Section)
	–709 (709): Marinas and Similar Locations
MS IEC 6-364–7–710	–710 (710): Medical Locations
	–711 (711): Exhibitions, Shows and Stands
	–712 (712): Solar Photovoltaic (PV) Power Supply Systems
	–714 *(714)*: External Lighting Installations
	–715 *(715)*: Extra Low–Voltage Lighting Installations
	–717 (717): Mobile or Transportable Units
	–718 *(718)*: Communal Facilities and Workplaces
	–721 (721): Electrical Installations in Caravans and Motor Caravans

IEC 60364 (BS 7671:2008:2008) Part 7:

Special Installations or Locations

Malaysian Standard	IEC 60364–7– (BS 7671 Part 7–Section)
	–722 *(722)*: Supplies for Electric Vehicles
	–729 (729): Operating or Maintenance gangways
	–740 (740): Temporary Electrical Installations for Structures, Amusement Devices and Booths at fairgrounds, Amusement Parts and Circuses
	–753 *(753)*: Heating Cables and Embedded Heating Systems

IEC 60364 – 8 – 1 & IEC 60364 – 9 – 1

IEC 60364 – 8 to – 9 / BS 7671 Part 8 & Part 9	
Part 8 – 1	Low Voltage Electrical Installations – Part 8 – 1: Energy Efficiency
Part 9 – 1	Low Voltage Electrical Installations – Part 8 – 1: Installations, Design and Safety Requirements for Photovoltaic Systems (PV) – ***Reject - 2014***

Malaysia is P Member of IEC

Case Study 3:

Total Risk Management

Moving Electrical Equipment: Motors

2/3 Consumed by Electric Motors

1/2 Horse Power motor can kill a person

Primary Acts & Regulations: Safety and Health

Except: Electrical

LAWS OF MALAYSIA

ACT 139
FACTORIES AND MACHINERY ACT 1967 (REVISED - 1974)
Incorporating latest amendment - Act A1268 of the year 2006

First enacted :	1967 (Act No. 64 of 1967)
Date of coming into operation :	1 February 1970 [P.U.(B) 5/1970]
Reprinted :	First: 1977 Second: 2000 Third: 2006
Revised up to :	1974 (Act 139 w.e.f. 1 July 1974)
Date of publication in the Gazette of Revised Edition :	20 June, 1974
Date of coming into operation of Revised Edition:	1 July 1974

ARRANGEMENT OF SECTIONS

Long Title

PART I - PRELIMINARY

Free Download: DOSH Malaysia

Section 7C.Service of list of things seized.
Section 7D. Appointment, powers and duties of a licensed person.
Section 7E. Revocation of licence.
Section 7F. Granting of new licence upon revocation.
Section 8. Obstruction an offence.
Section 9. Confidentiality of information.

PART II - SAFETY, HEALTH AND WELFARE

Section 10. Provisions relating to safety, etc
Section 11. Persons exposed to explosive, inflammable, etc., substances.
Section 12. Lifting of weights.

LAWS OF MALAYSIA

ACT 514
OCCUPATIONAL SAFETY AND HEALTH ACT 1994

Date of Royal Assent:	15 February 1994
Date of publication in the Gazette:	24 February 1994
Date of coming into operation:	25 February 1994

ARRANGEMENT OF SECTIONS

Long Title & Preamble

PART I - PRELIMINARY

Section 1. Short title and application.
Section 2. Prevailing laws.
Section 3. Interpretation.
Section 4. Objects of the Act.

PART

Sectio
Sectio
Sectio

PART

Free Download: DOSH Malaysia

Sectio
Section 9. Membership of the Council.
Section 10. Second Schedule to apply.
Section 11. Powers and functions of the Council.
Section 12. Appointment of secretary to the Council.
Section 13. Committees.
Section 14. Annual report.

PART IV - GENERAL DUTIES OF EMPLOYERS AND SELF-EMPLOYED PERSONS

Section 15. General duties of employers and self-employed persons to their employees.
Section 16. Duty to formulate safety and health policy.
Section 17. General duties of employers and self-employed persons to persons other than their employees.
Section 18. Duties of an occupier of a place of work to persons other than his employees.

Electricity: Primary Acts & Regulations

LAWS OF MALAYSIA

REPRINT

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2006

Electricity Regulations 1994

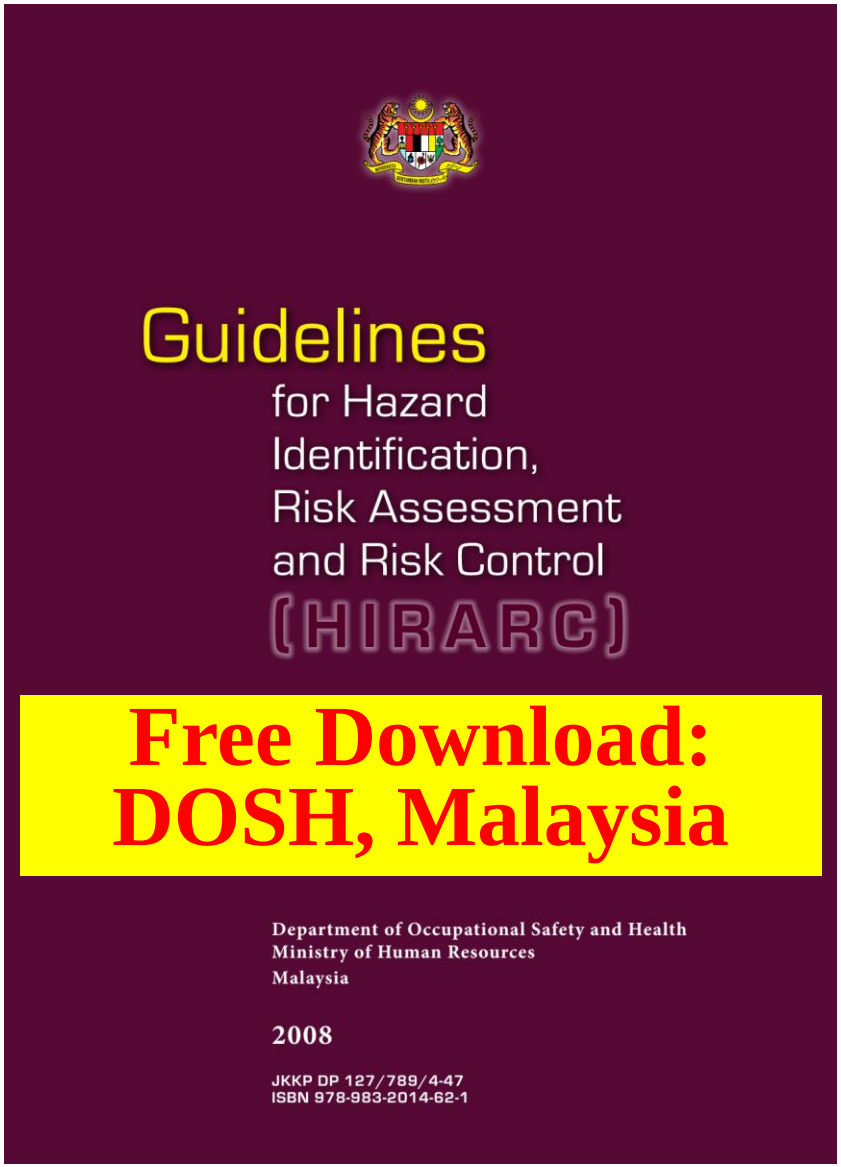
Electricity Regulations 1994

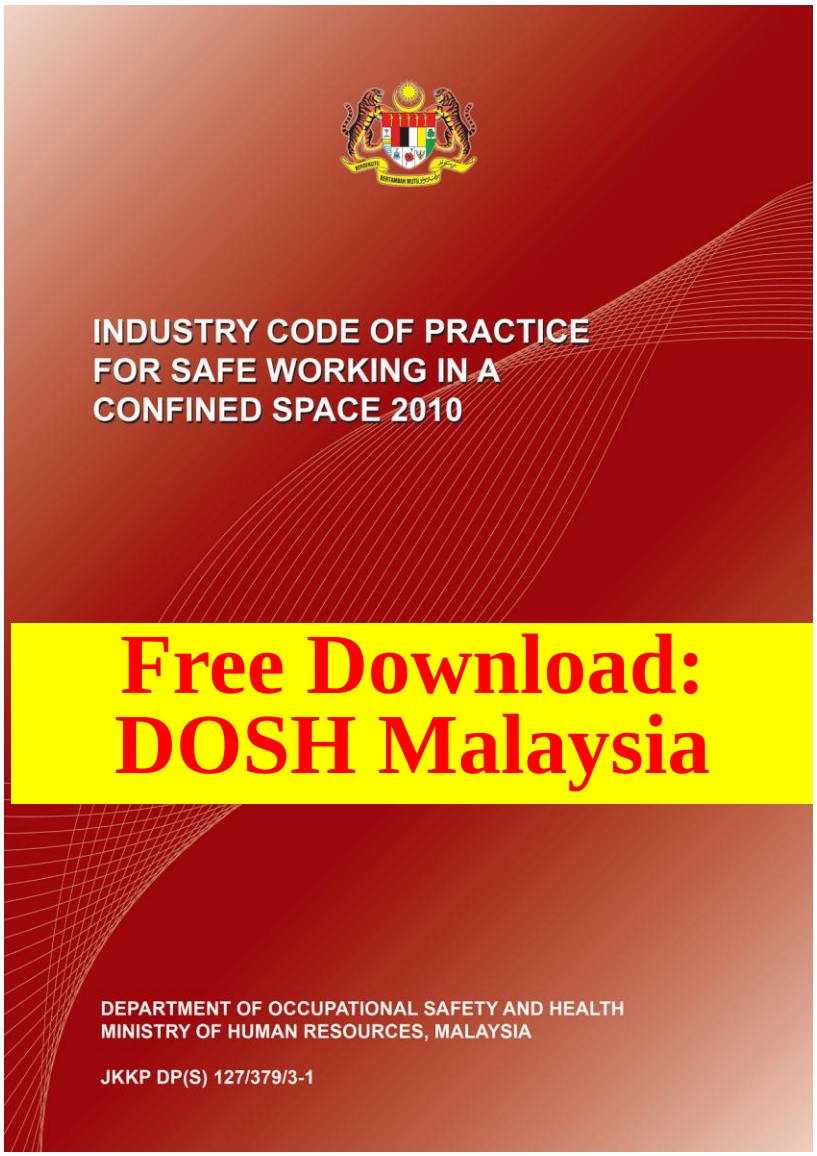
P.U.(A) 38/94

ELECTRICITY SUPPLY ACT 1990 [ACT 447]
P.U.(A) 38/94
ELECTRICITY REGULATIONS 1994
Incorporating latest amendments - 431/ 2003

ARRANGEMENT OF REGULATIONS

DOSH Guidelines & COP: Safety and Health





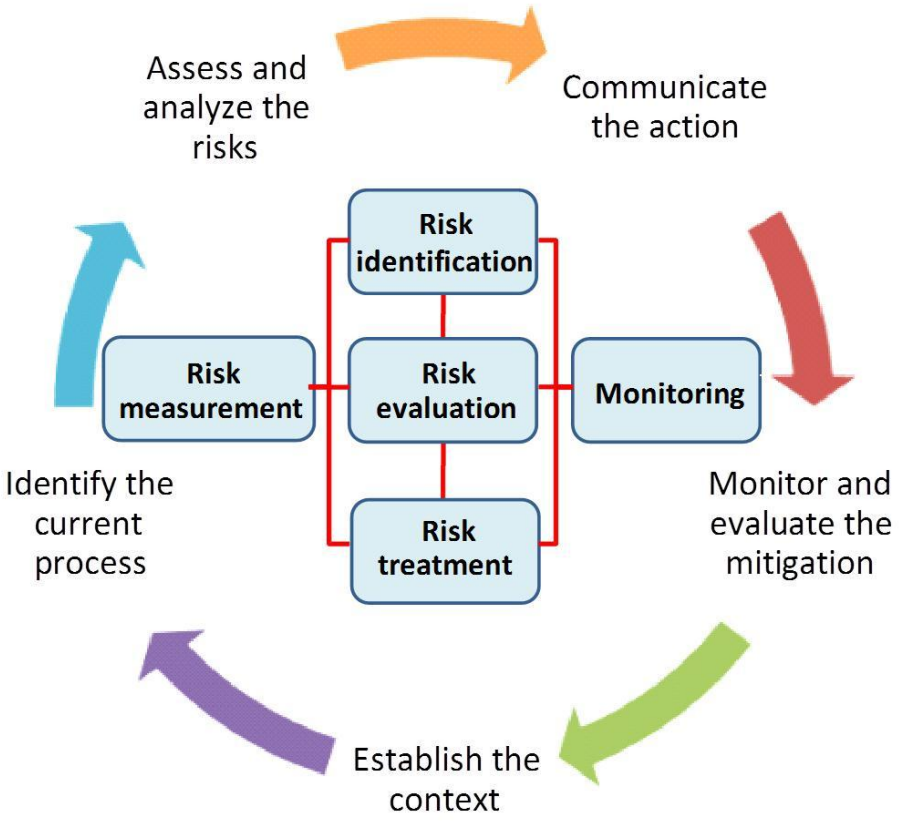
Adoption of International Safety Standards

ISO 31000 standard recognized as national risk management standard, worldwide

G31000

Department of Occupational Safety and Health, Malaysia

ISO 31000



Others


MALAYSIAN STANDARD
MS ISO GUIDE 73:2010
RISK MANAGEMENT - VOCABULARY
(ISO GUIDE 73:2009, IDT)
Rm. 20-00 only
ICS: 03.100.01
Descriptors: risk management, vocabulary
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MALAYSIAN STANDARD
MS ISO 31000:2010
RISK MANAGEMENT - PRINCIPLES AND GUIDELINES
(ISO 31000:2009, IDT)
Rm. 40-00 only
ICS: 03.100.01
Descriptors: risk management, principles, guidelines
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MALAYSIAN STANDARD
MS IEC/ISO 31010:2011
Risk management - Risk assessment techniques
(IEC/ISO 31010:2009, IDT)
Rm.100-00 only
ICS: 03.100.01
Descriptors: risk management, risk assessment, techiques
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DEPARTMENT OF STANDARDS MALAYSIA

Case Study 4:

Compliance with Requirements of Act, Regulations, and Standards

Compliance with Regulations and Standards

RCD:
MS IEC 61008
MS IEC 61540
MS 62350

MCB:
MS IEC 60898
MS IEC 60947

MCB – RCD:
MS IEC 61009

Cable: MS 2xxxx

Cable Management:
Trunking: MS 1777
Cable Ducting: MS 1777
uPVC Conduit: MS 1034
Conduit System:
MS IEC 61386

Maintenance Disconnector

13A Socket Outlet:
MS 589
BS 1363

???

MS IEC 60335 – 1

???

Plug: MS IEC 60335 – 1
Plug: MS 589
Plug: BS 1363
Fuse: BS 1362

MS IEC 60364 / MS 1936 / MS 1979

Equipment

Comply with Acts and Regulations

Comply with Standards

Compliance with Regulations and Standards

RCD:
MS IEC 61008
MS IEC 61540
MS 62350

MCB:
MS IEC 60898
MS IEC 60947

MCB – RCD:
MS IEC 61009

Cable: MS 2xxxx

Cable Management:
Trunking: MS 1777
Cable Ducting: MS 1777
uPVC Conduit: MS 1034
Conduit System:
MS IEC 61386

13A Socket
Outlet:
MS 589
BS 1363

MS IEC 60335 – 1

MS IEC 60335 – 1

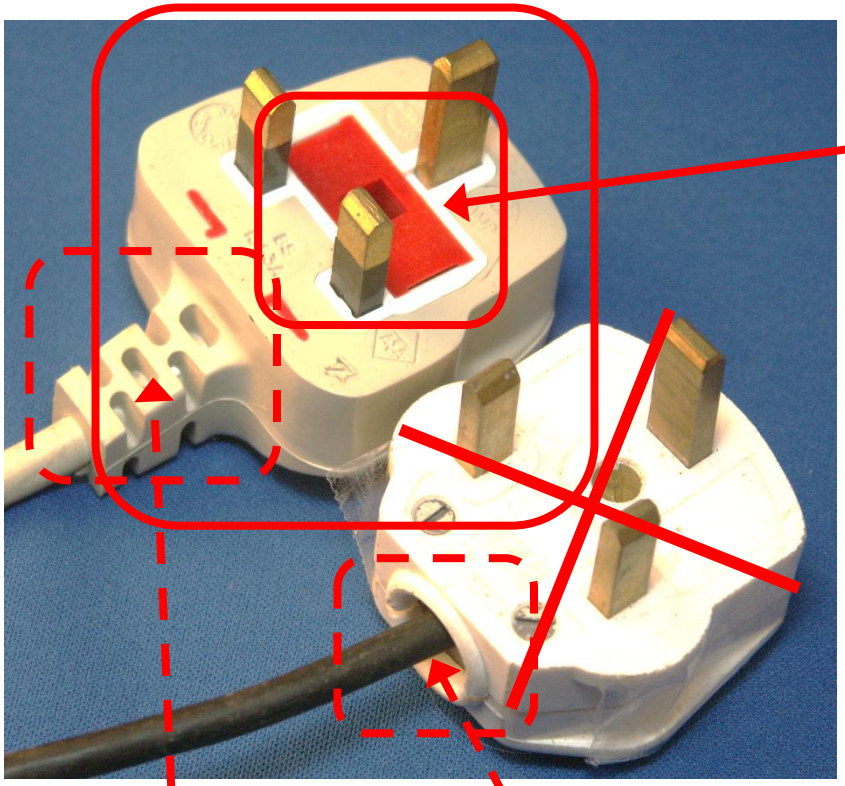
Plug:
Plug: MS 589
Plug: BS 1363
Fuse: BS 1362

Competent Person

User / Manufacturer

Compliance with Regulations and Standards

MS IEC 60364: IP Rating Protection



Cable Stress Relief

No Cable Stress Relief

BS 1362 Fuse:

3A: ≤ 700 W

5A: 700 W – 1,200 W

13A: ≥ 1,200 W

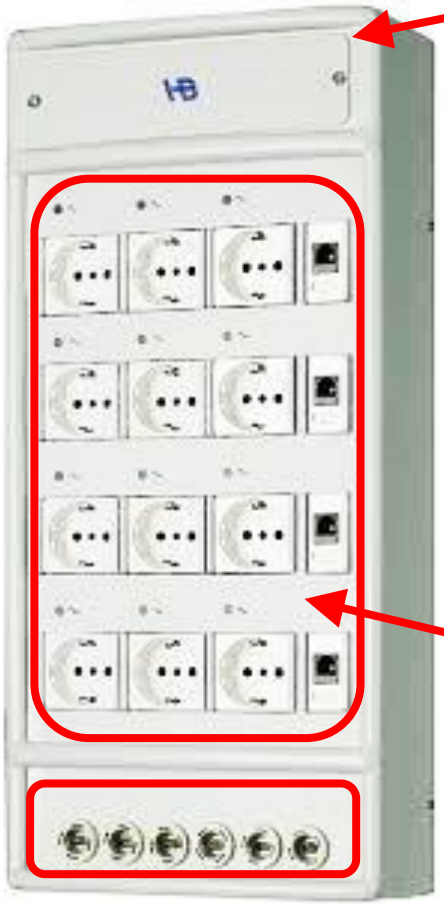
Moulded Cable

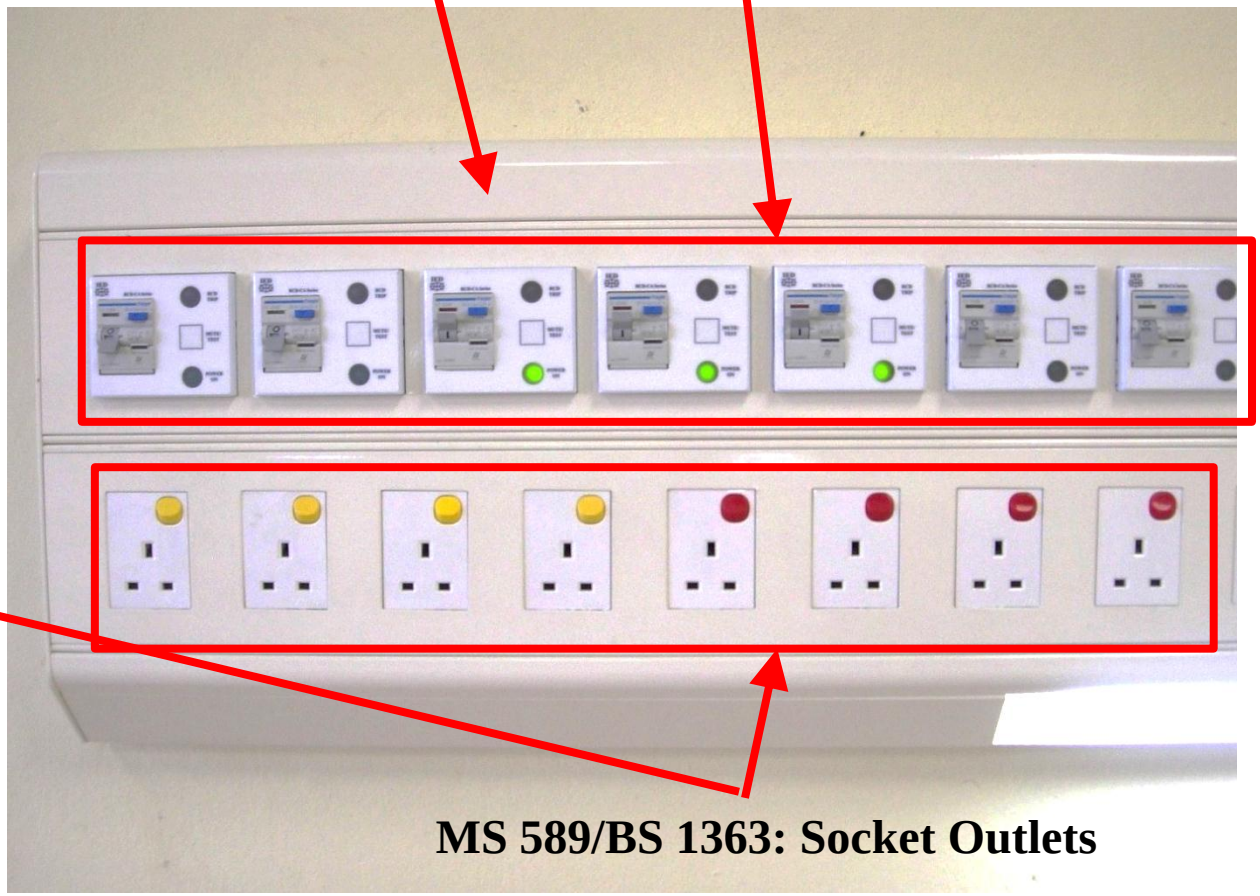
Standard lengths: 2 or 3 meters

Hospital: Pendant/Bedhead Trunking

IEC 61534: Power Track Systems

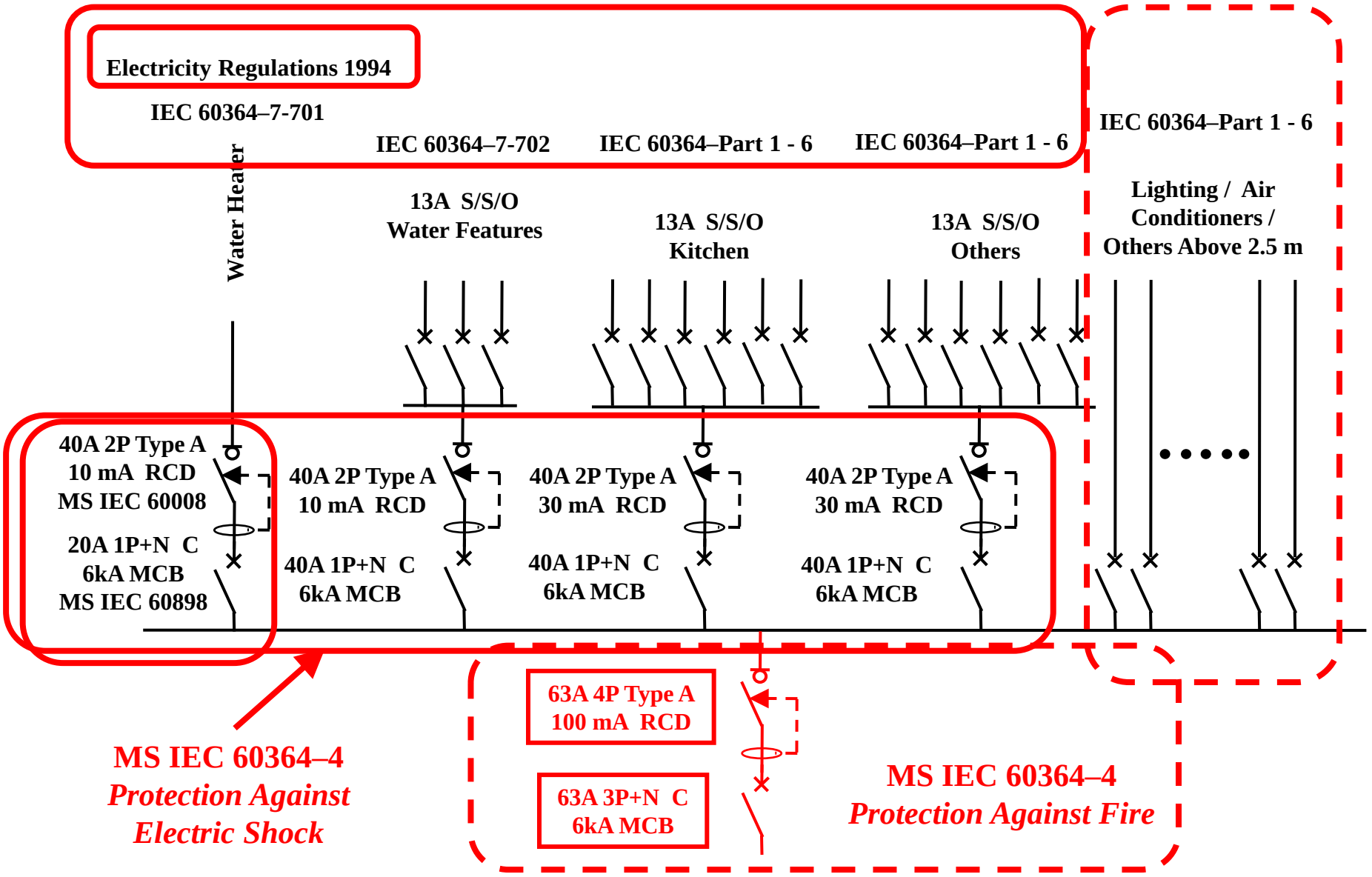
MS IEC 61008: RCD's





MS 589/BS 1363: Socket Outlets

Electric Shock & Fire Protection by RCD



Case Study 5:

Protection for Safety against Electric Shock and Fire at Final Distribution Board or Consumer Unit

Notes:

Electric Shock is the Major Cause of Fatal Electrical Accident

In Malaysia

Notes:

MS IEC (IEC) 60364

RCD for Electric Shock Protection Shall have Sensitivity of 30 mA or less

Notes:

Electricity Regulations 1994

RCD for Equipment such as Water Heater and Portable Equipment Shall have Sensitivity of 10 mA or less

Notes:

Leakage Currents ≥ 260 mA

≈ 300 mA

can cause *Fire*

Notes:

Electricity Regulations 1994

RCD for Fire Protection

Shall have Sensitivity of 100 mA or less

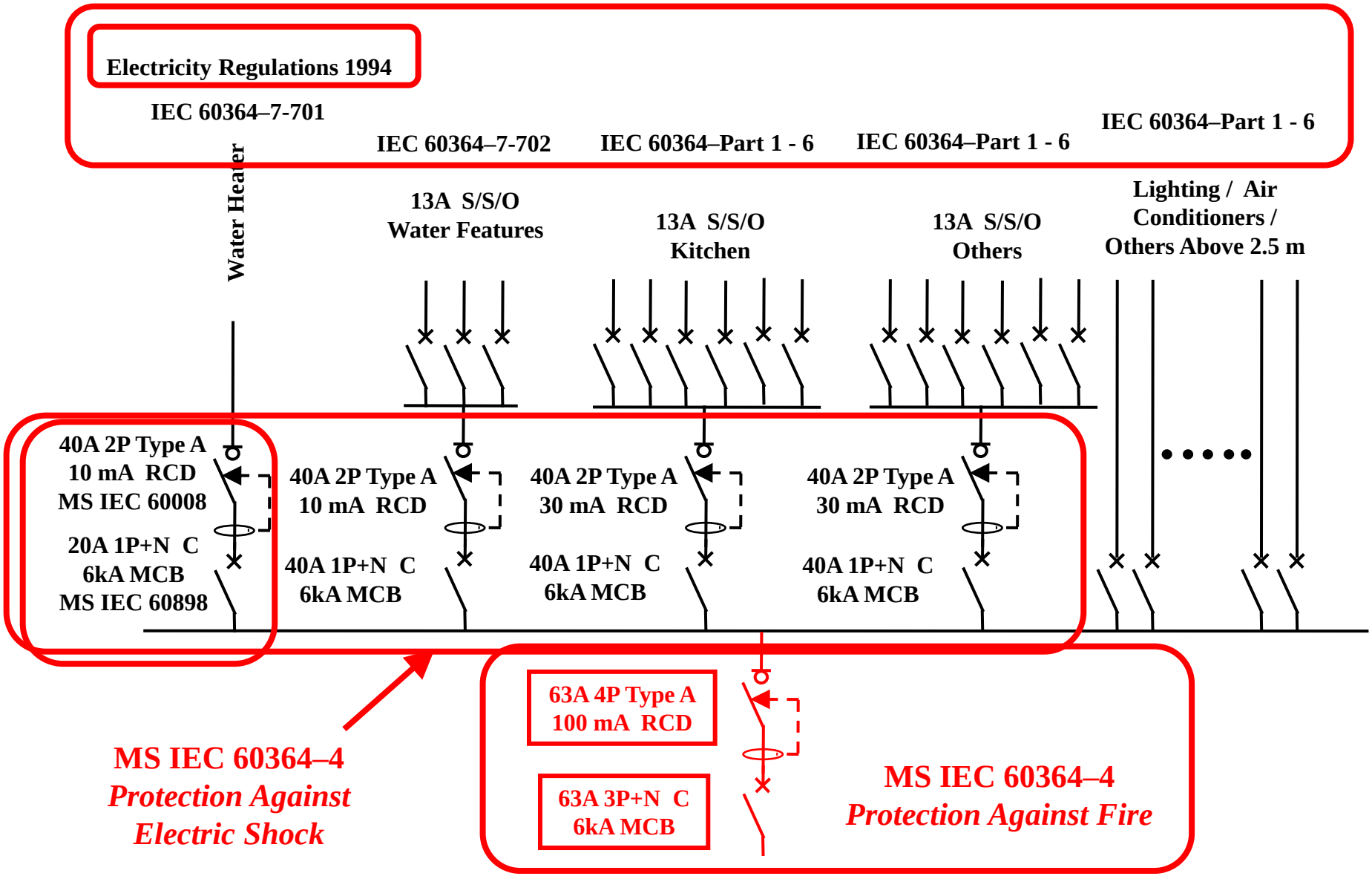
Notes:

"Safe" AC Voltage ≤ 50 V_{rms} at 50/60 Hz

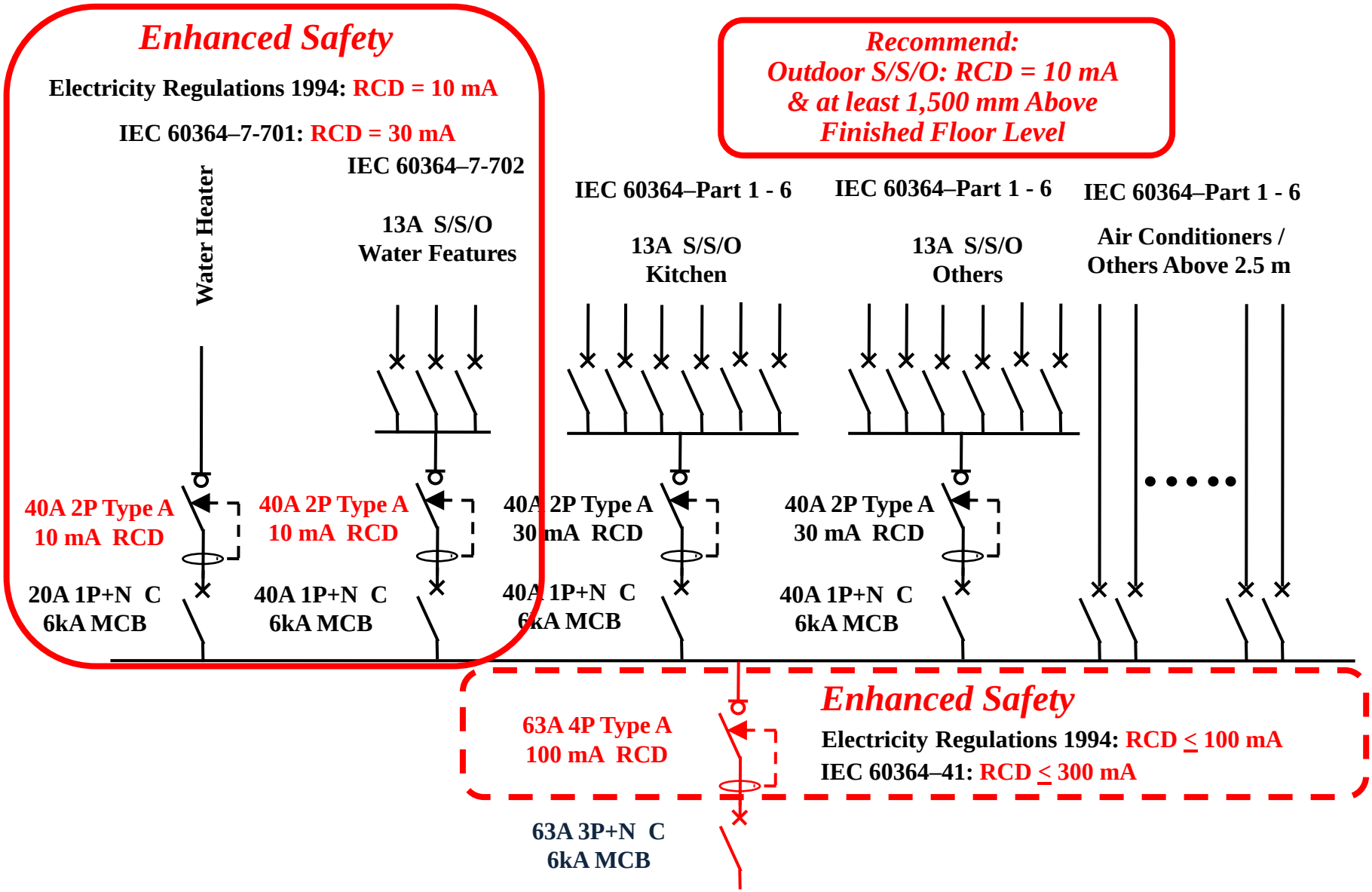
"Safe" DC Voltage ≤ 120 V_{dc} ±10% Ripple

For Normal (Fixed) Installations only

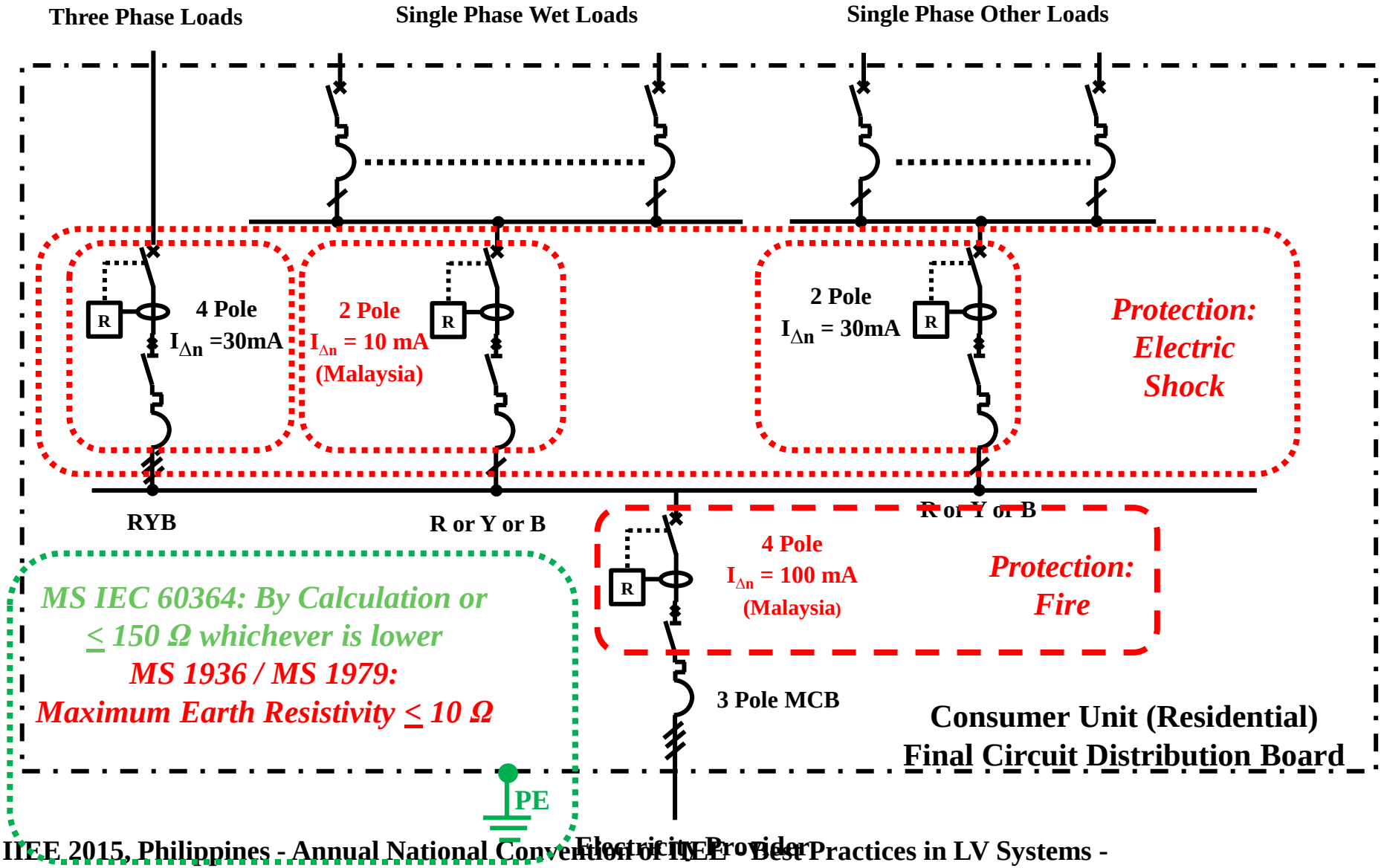
Electric Shock & Fire Protection by RCD



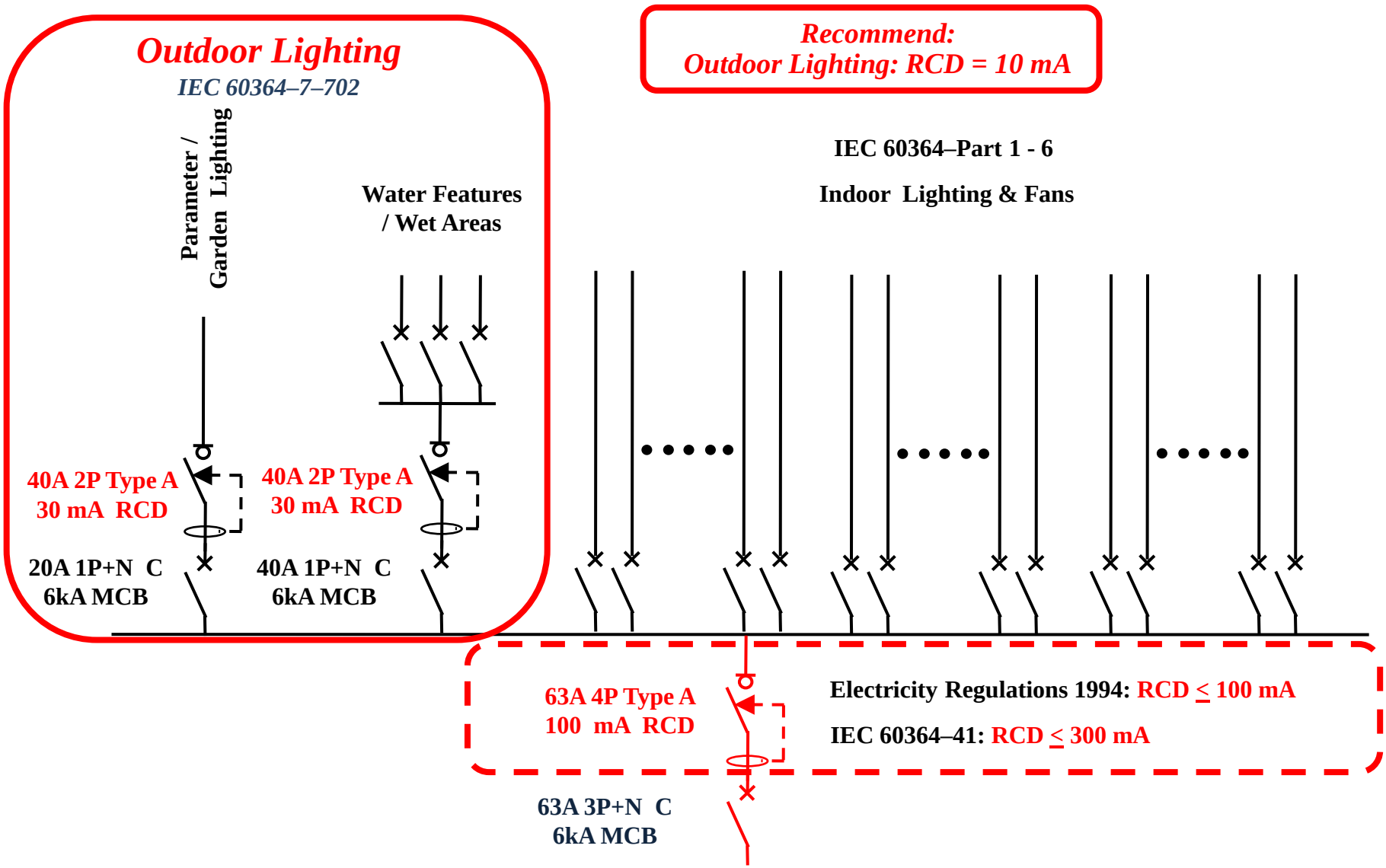
Enhanced Protection for Safety: Power



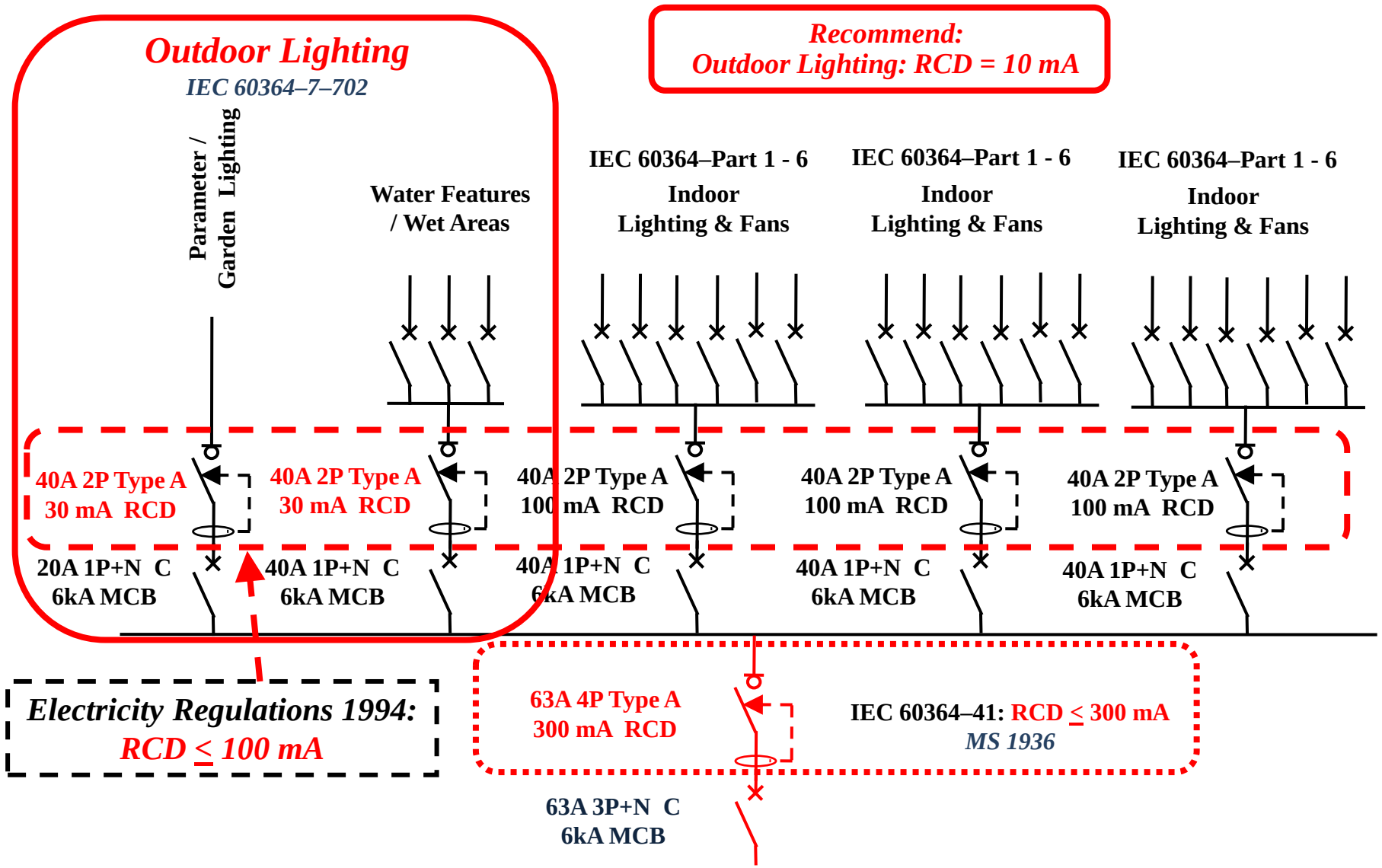
Enhanced Protection for Safety: Power



Protection for Safety: Lighting & Fans



Protection for Safety: Lighting & Fans



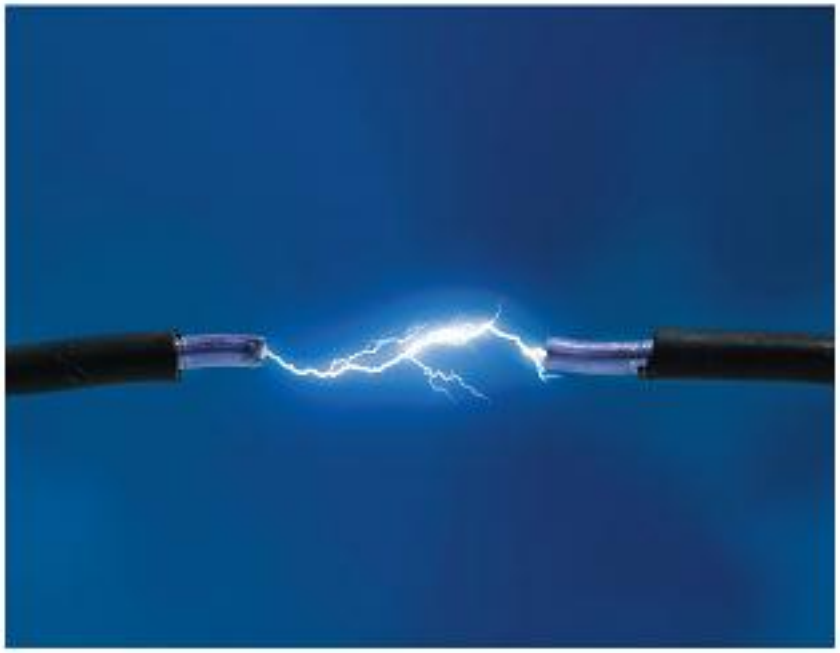
RCD for Electric Shock and Fire Protection at Final Distribution Board

1. ***MS IEC 61008**: Residual current circuit breaker without integral overcurrent protection for household and similar uses (RCCBs)*
2. ***MS IEC 61009**: Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules*
3. ***MS IEC 61540**: Electrical accessories – Portable residual current devices without integral overcurrent protection for household and similar uses (PRCDs)*
4. ***MS IEC 61543**: Residual current–operated protective devices (RCDs) for household and similar uses – Electromagnetic compatibility*

RCD for Electric Shock and Fire Protection at Final Distribution Board

5. ***MS IEC 62423**: Type B residual current operated circuit breakers without integral overcurrent protection for household and similar uses (Type B RCCBs and Type B RCBOs)*
6. ***MS IEC 62350**: Guidance for the correct use of RCDS for household and similar uses*
7. ***MS IEC 60364**: Electrical installations of buildings*

Open Source *FREE* References



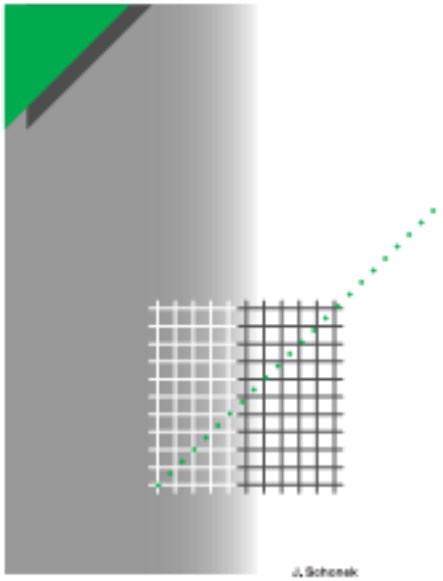
The RCD Handbook

BEAMA Guide to the Selection and Application of Residual Current Devices

September 2010

Cahier technique no. 114

Residual current devices in LV

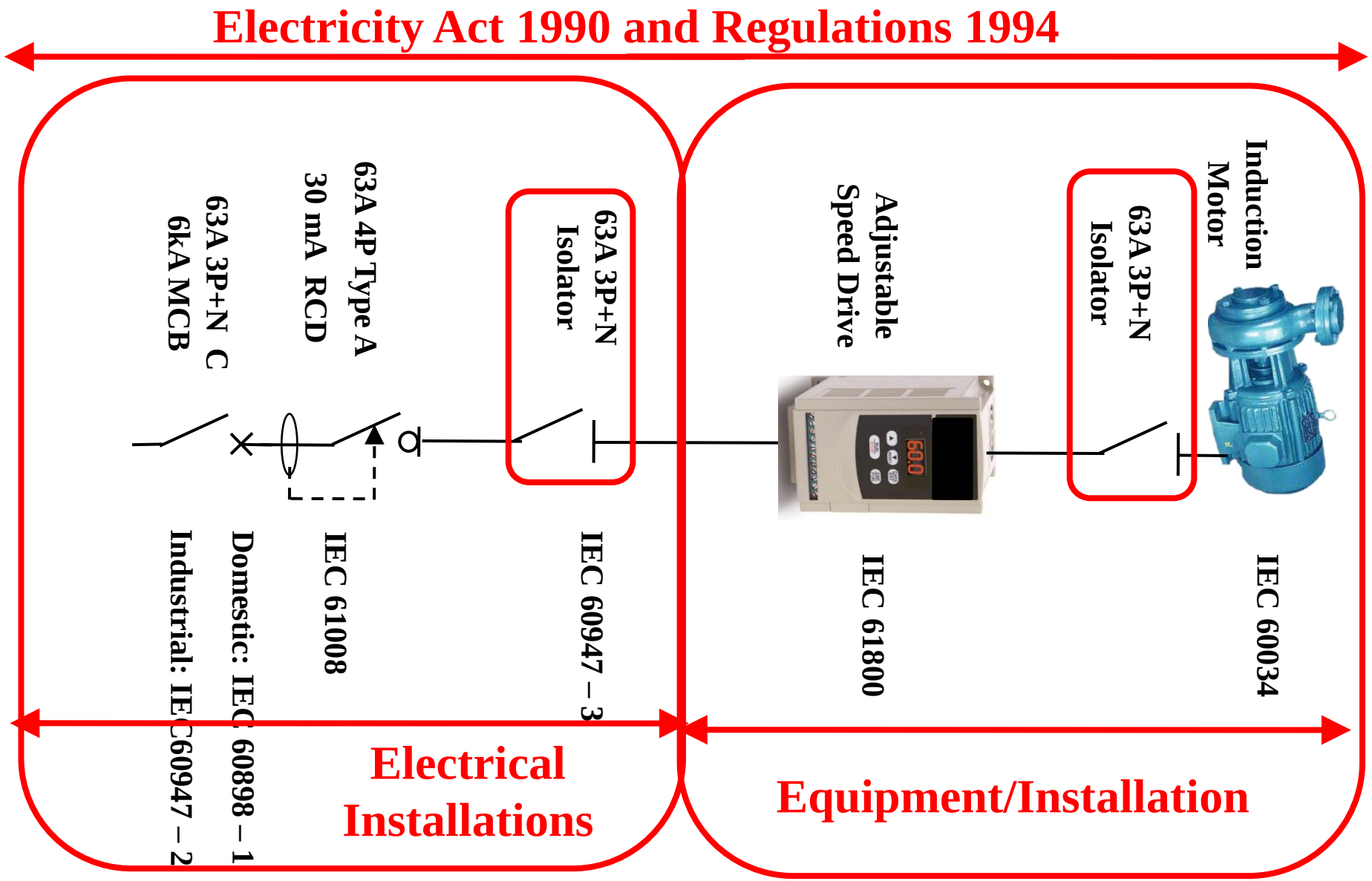


Case Study 6:

Electrical Power Drive Systems

Electrical Power Drives Systems

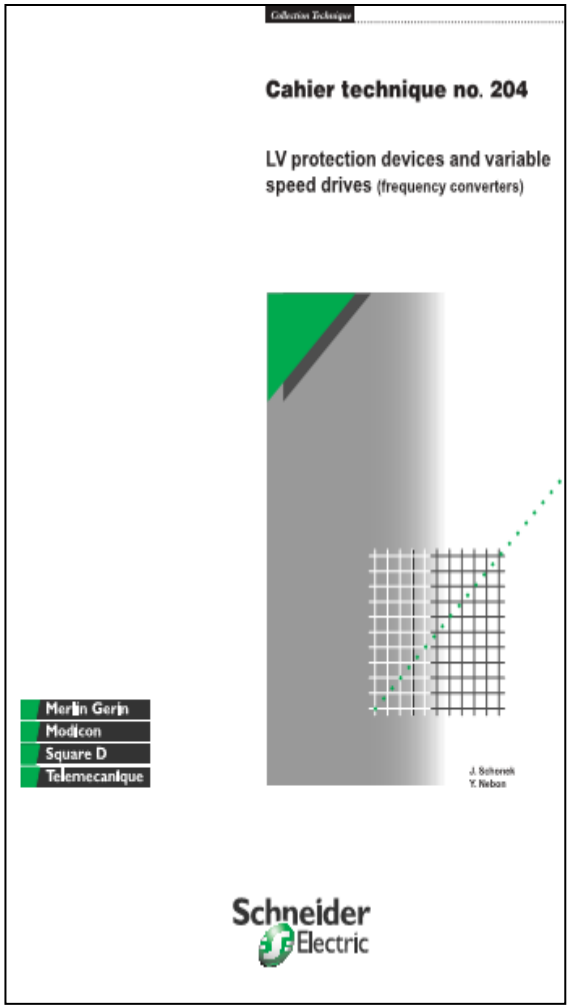
Electrical Power Drive Systems

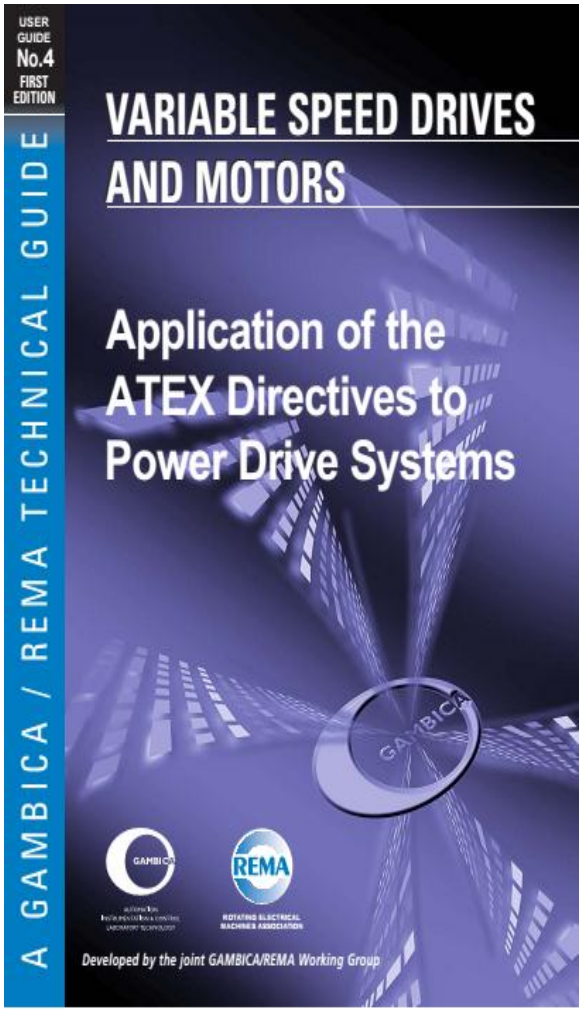


Standards

1. ***Electric Motors: IEC 60034 (MS IEC 60034: Withdrawn in Nov 2015)***
2. ***Power drives systems (Adjustable speed drives): IEC 61800***
3. ***Electrical safety standards***
   - MS IEC 60240
   - MS IEC 61508
   - MS ISO 31000, etc.,
4. ***NEMA 1C53.1: Safety standards for construction and guide for selection, installation and operation of adjustable speed drive systems***

Open Source *FREE* References





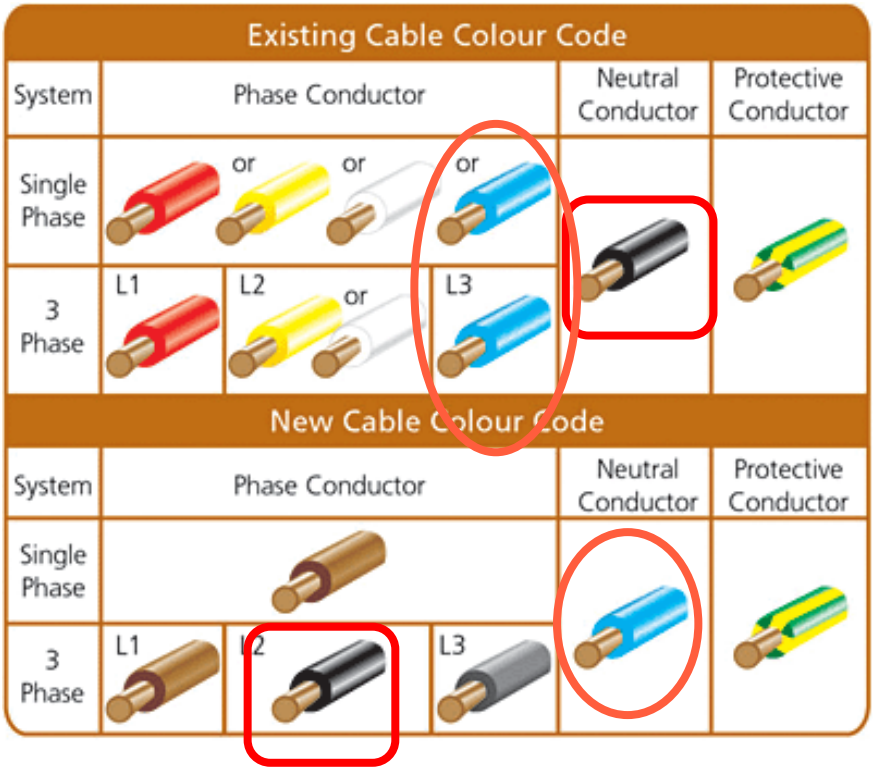
Case Study 7:

Protecting and Sizing of Cables

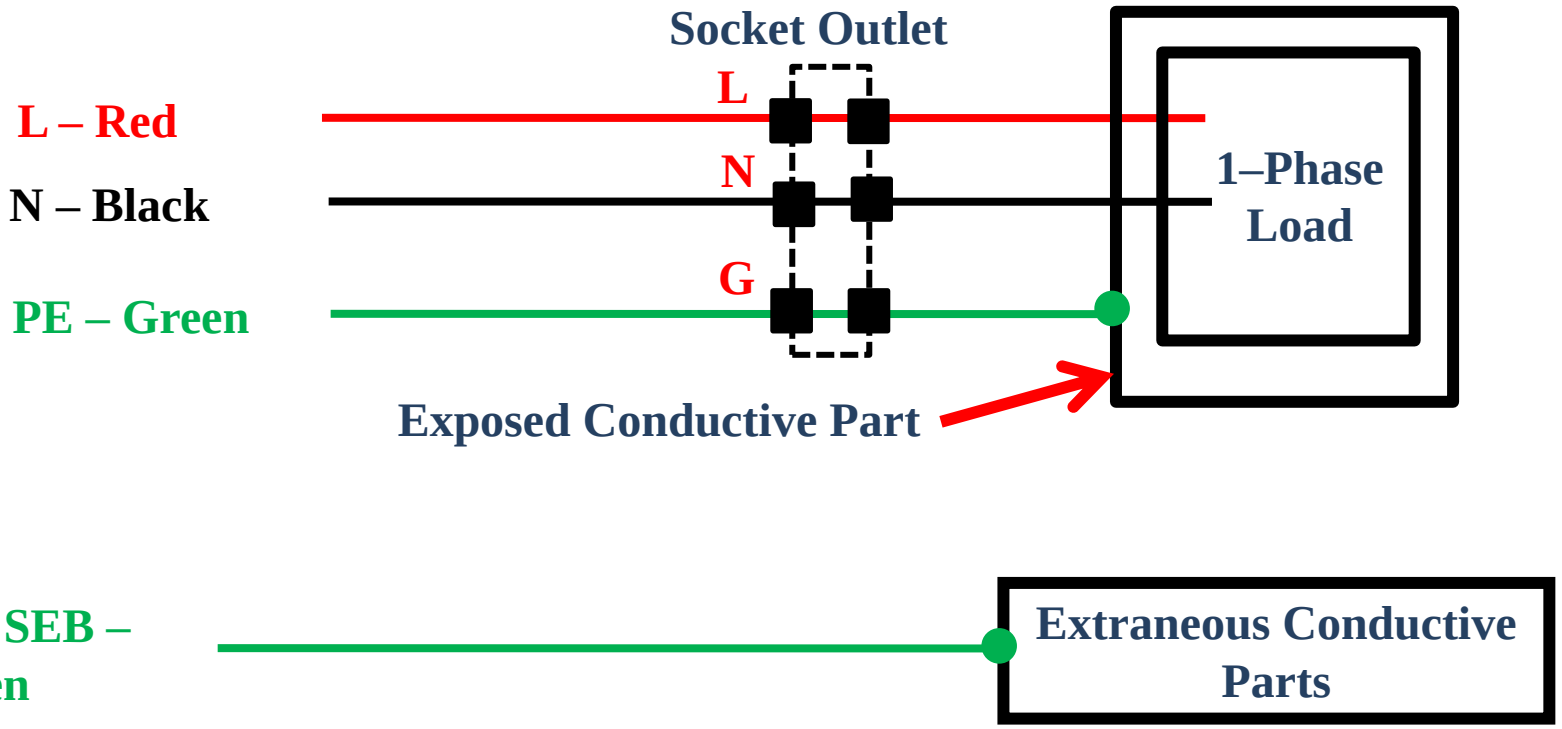
For Final Circuits

IEC 60446: LV Circuit Cable Colour Code

- *IEC 60446: Basic and safety principles for man-machine interface, marking and identification – Identification of conductors by colours or alphanumerics*
- *Malaysia: Considering compliance: No action as on 2015*



Low Voltage Electrical Circuits: Single Phase



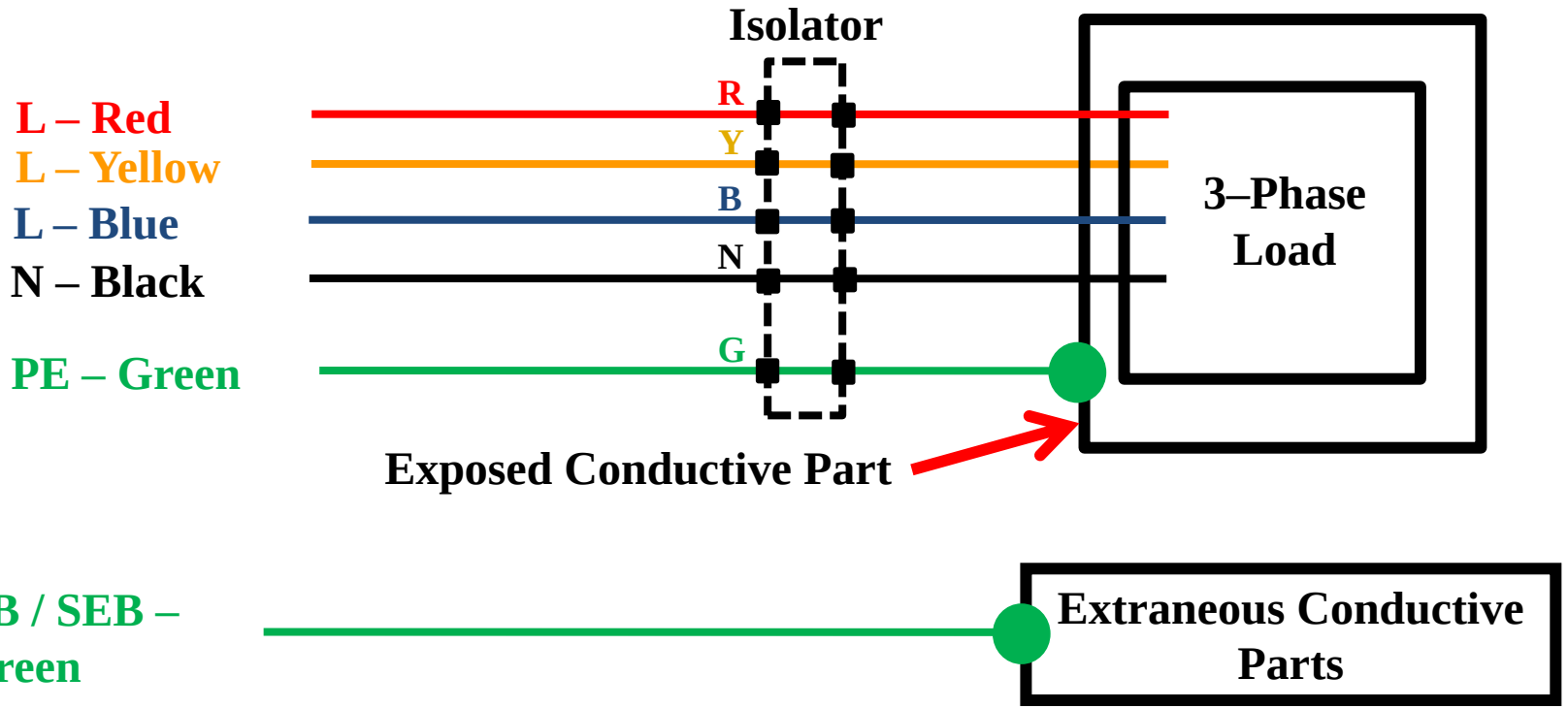
Three (3) or Four (4) Conductors

- ***Three (3) or four (4) conductors***

  1. Live conductor 1: Phase conductor
  2. Live conductor 2: Neutral conductor
  3. Live conductor 3: Protective earth (PE) conductor
  4. ***Equipotential bonding (EB) conductor – Optional for MS 1979***

- ***MS 1979: Equipotential bonding conductor is optional for domestic, residential or similar installations, except***
  - ***Special installation or equipment such as water heater***

Electrical Circuits: Three Phase



Five (5) or Six (6) Conductors

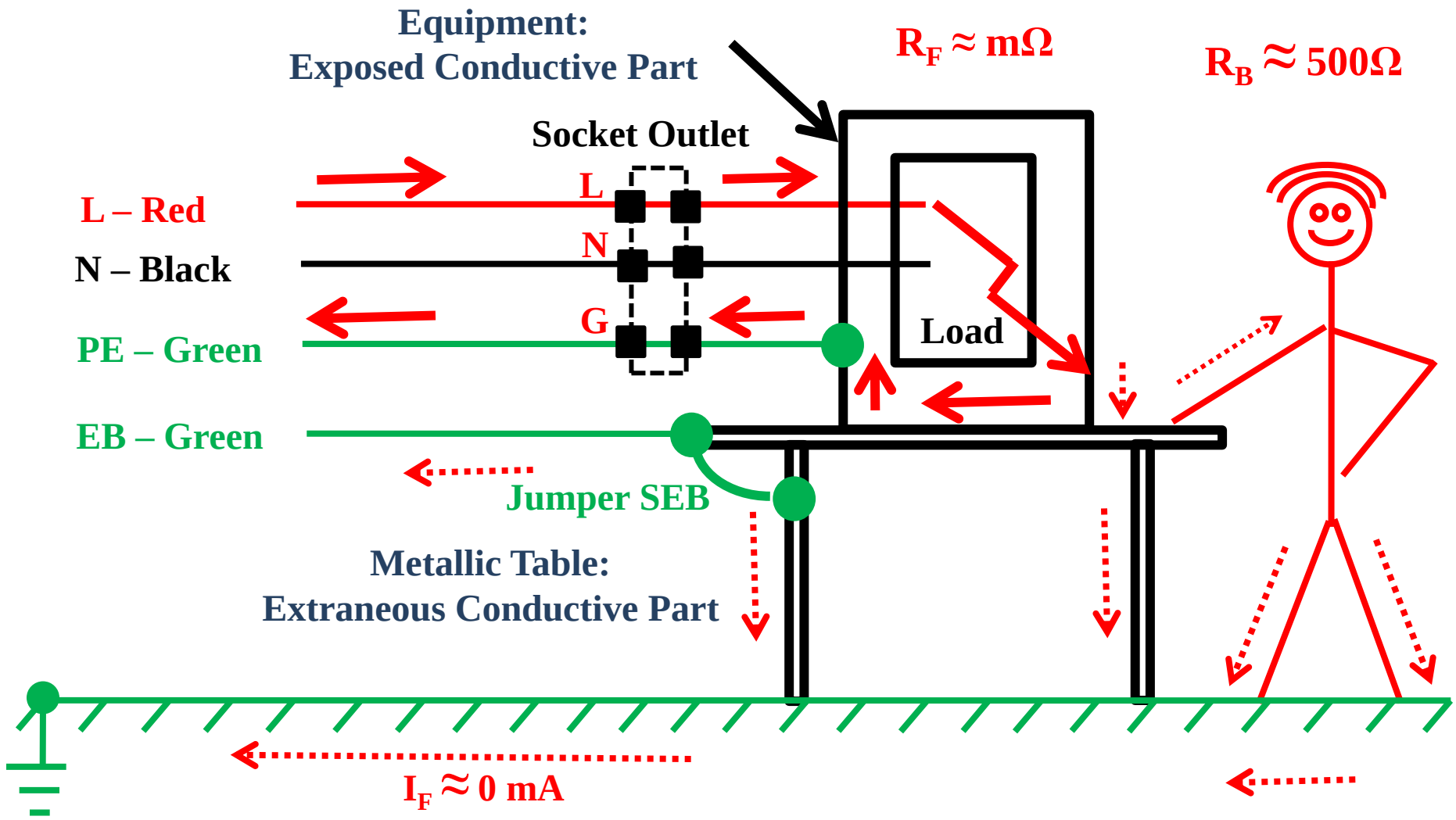
- ***Five (5) or six (6) conductors***

1. Live conductor 1: Phase conductor – Red (L1);
2. Live conductor 2: Phase conductor – Yellow (L2);
3. Live conductor 3: Phase conductor – Blue (L3);
4. Live conductor 4: Neutral conductor
5. Live conductor 5: Protective earth (PE) conductor
6. ***Equipotential bonding (EB) conductor – Optional for MS 1979***

- ***MS 1979: Equipotential bonding conductor is optional for domestic, residential or similar installations, except***
  - ***Special installation or equipment such as water heater***

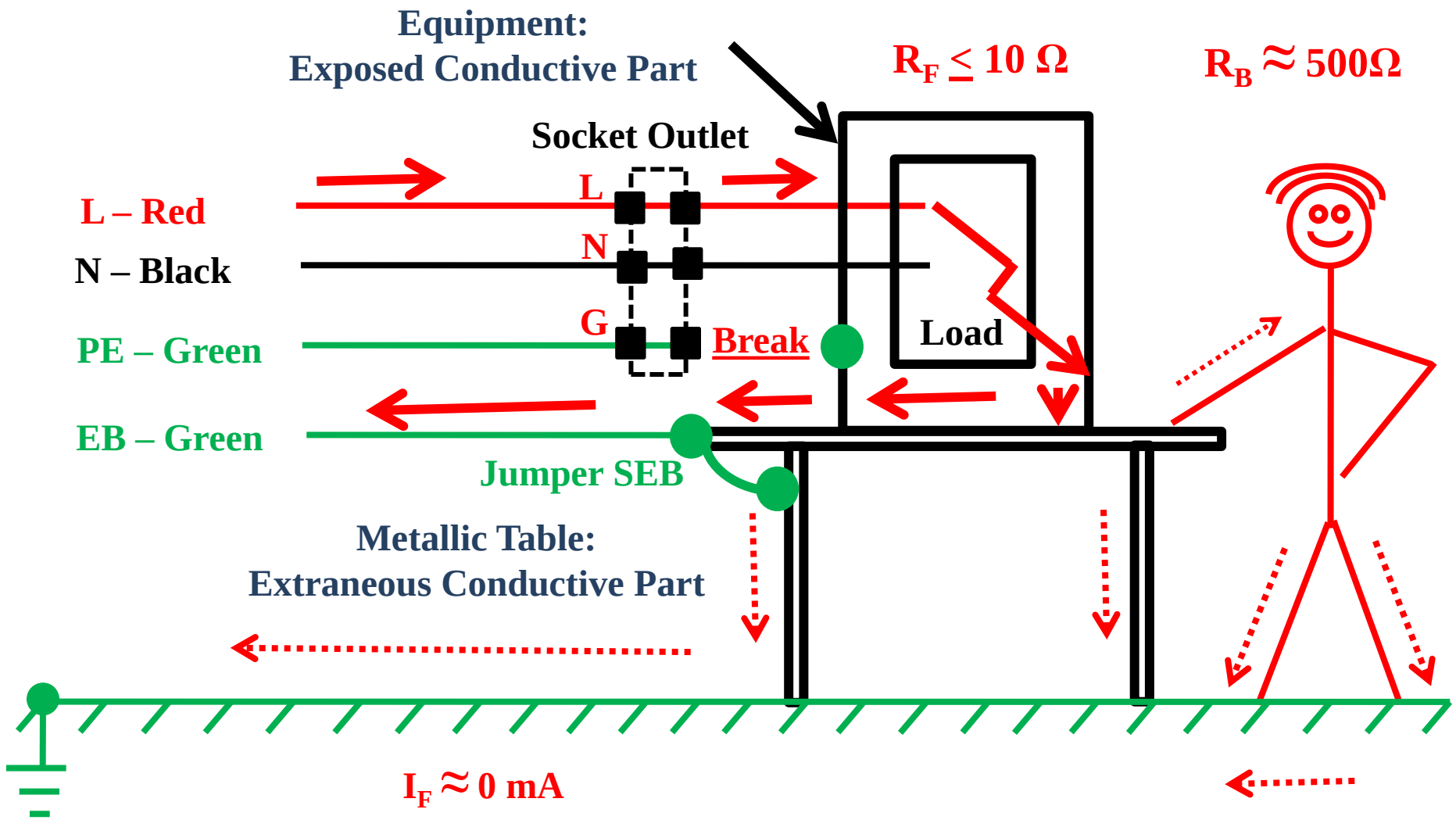
Functions of PE / EB Conductors:

PE – Discharging Earth Fault Current



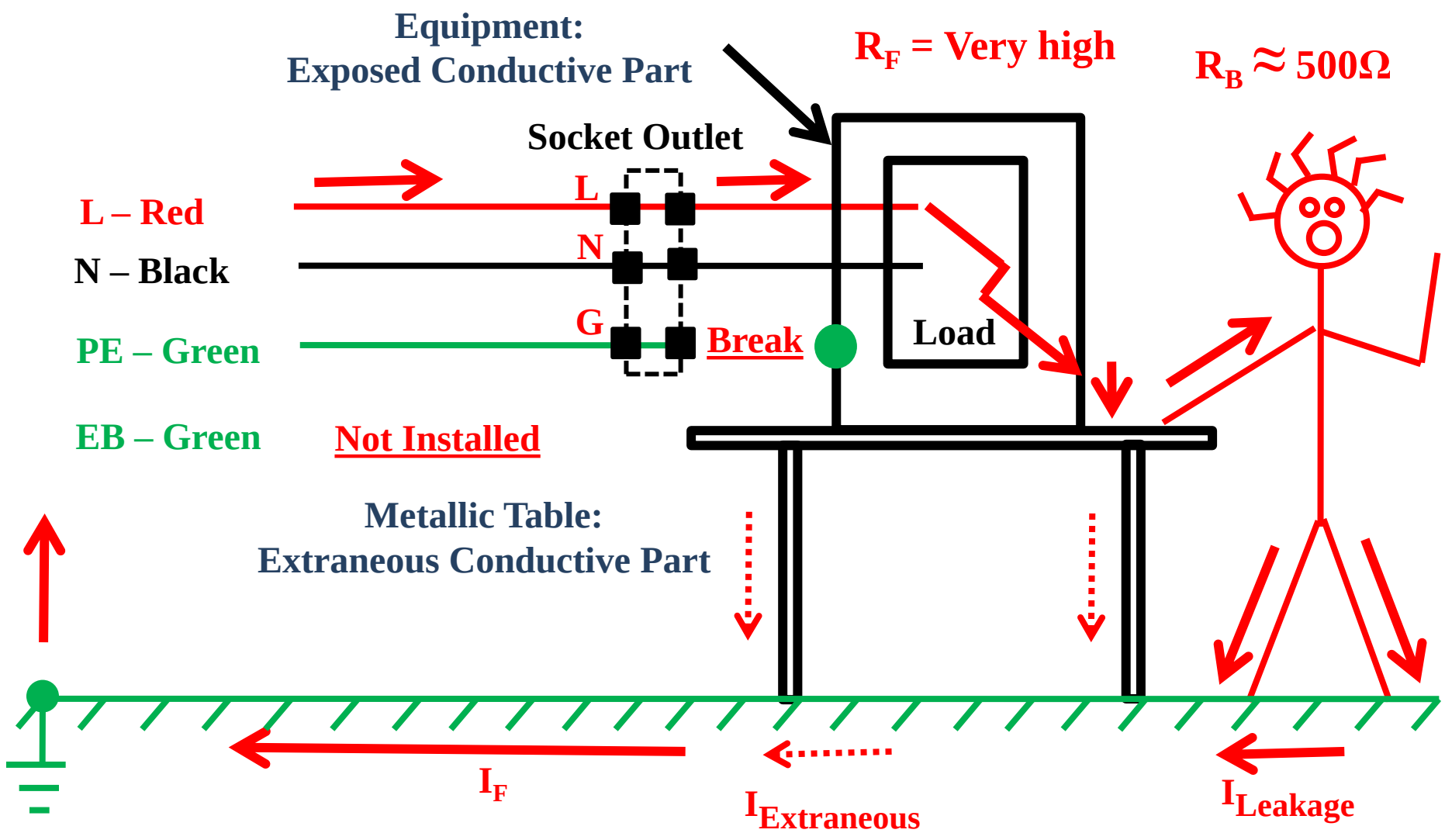
Functions of PE / EB Conductors:

EB – Discharging Earth Fault Current



Earth Fault Current Flowing into Victim

When PE & EB Conductors are Faulty



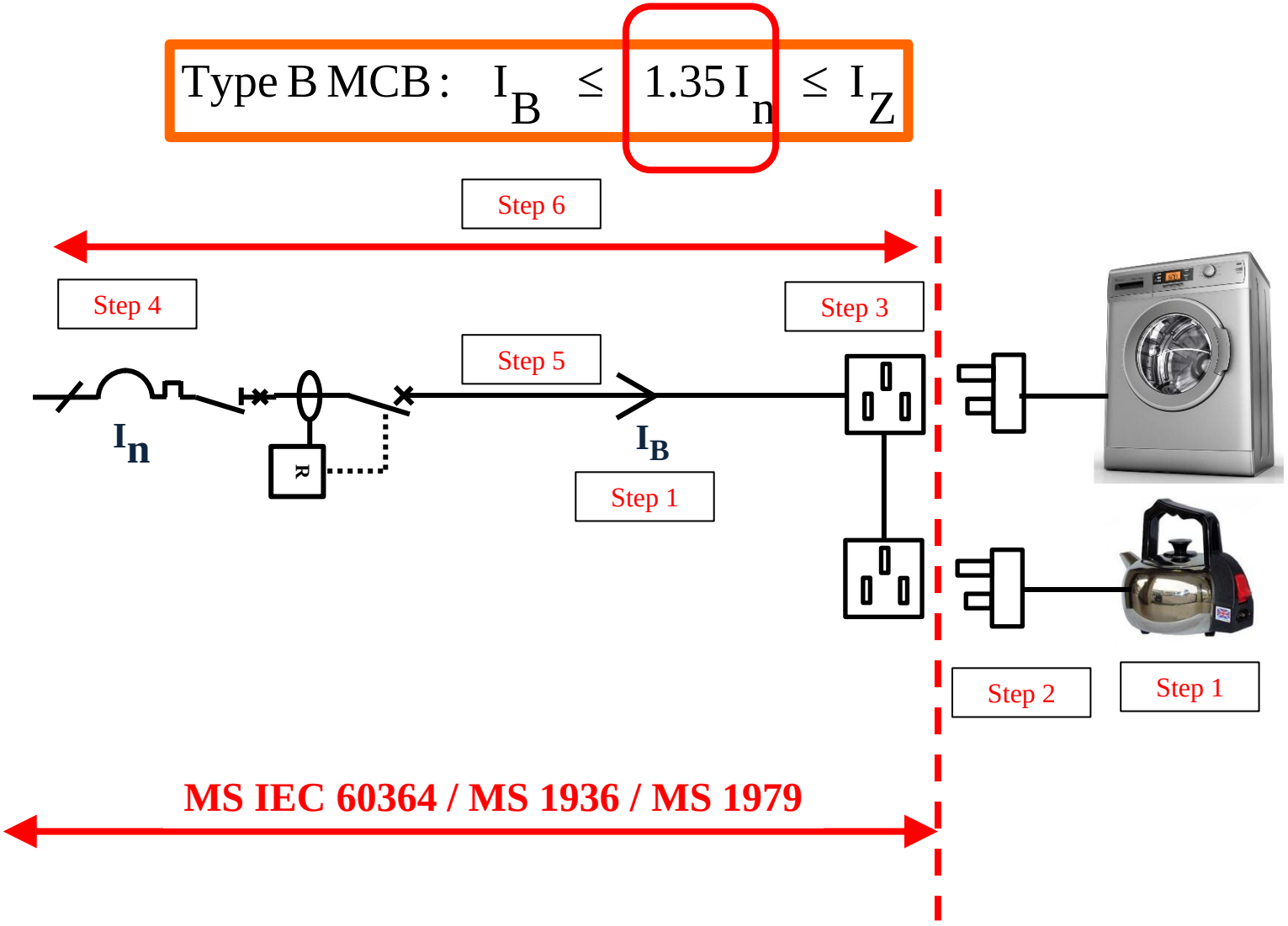
Protection and Sizing Cables

- ***Phase conductors: MS 1936 & MS 1979: TT Earthing***
  - To size with coordination with circuit breakers
- ***Neutral conductors: TT Earthing***
  - MS 1936
    - Similar to phase conductor
    - By calculation: 3 phase only
    - ***MCB or beak alone cable not permitted***
  - MS 1979
    - Similar to phase conductor
    - ***MCB or beak alone cable not permitted***

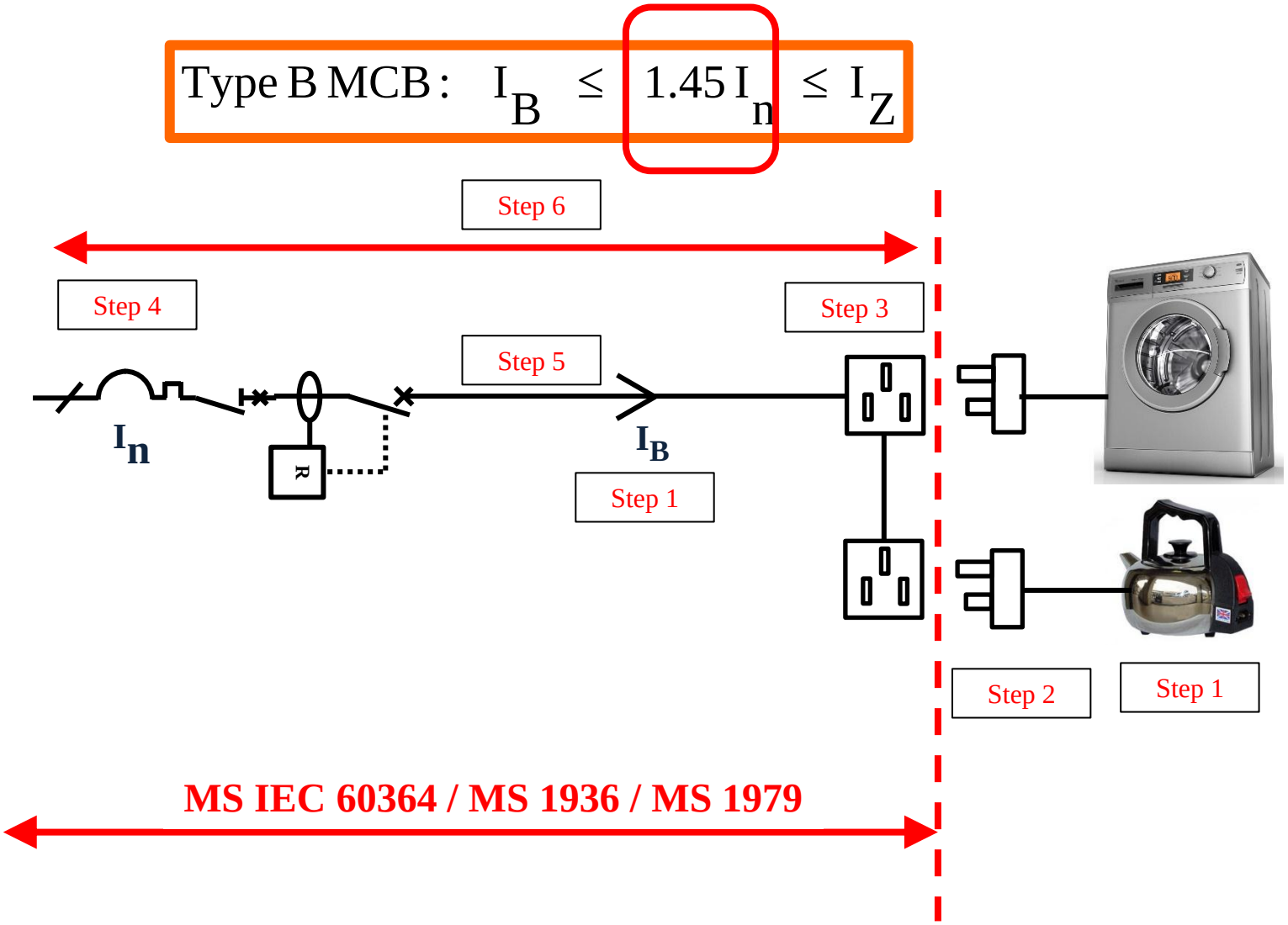
Protection and Sizing Cables

- ***Protective earthing conductors (No MCB or breaks allowed)***
  - MS 1936
    - Selection;
    - By calculation
  - MS 1979
    - By selection
  - ***By selection (MS 1936 & MS 1979)***
    - 1.5 mm2 $\leq$ S $\leq$ 16 mm2 => Phase conductor
    - 25 mm2 < S 35 mm2 => 16 mm2
    - S > 35 mm2 => S/2 mm2
- ***Equipotential earthing conductors (MS 1936 & MS 1979)***
  - By selection ***(No MCB or breaks allowed)***

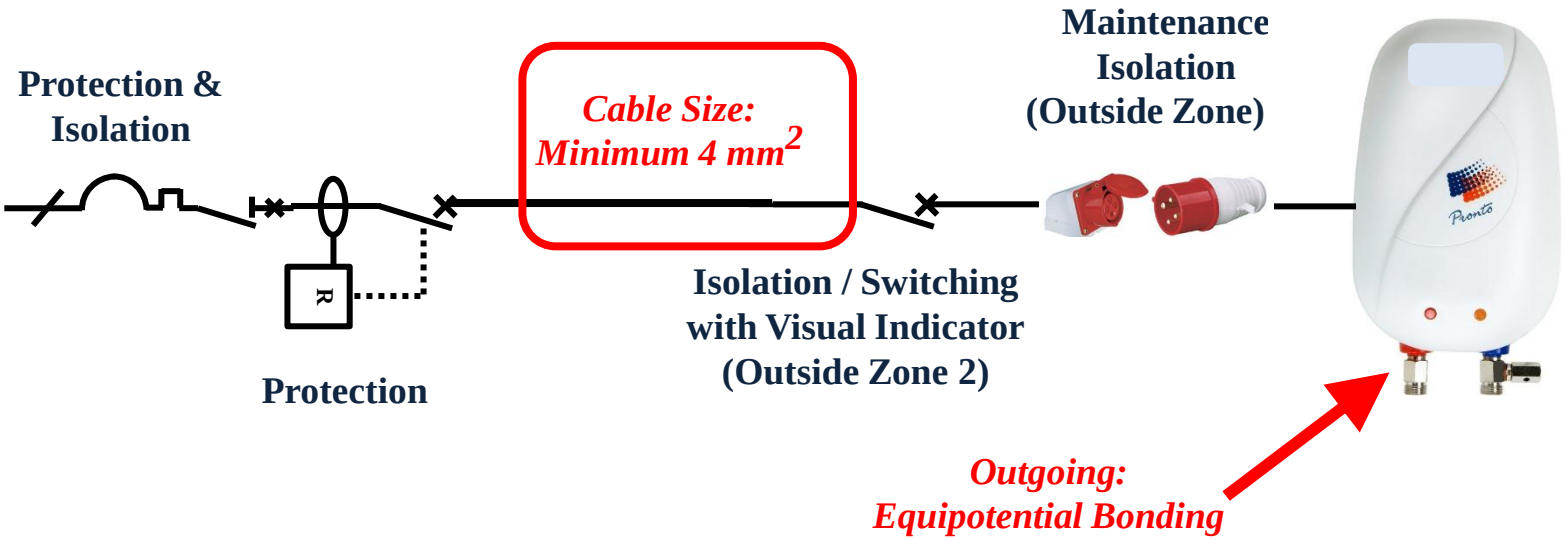
Protection and Sizing of Cables: Type B MCB

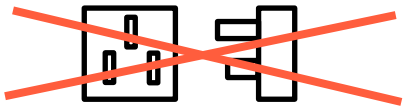


Protection and Sizing of Cables: Type C/D MCB



Special Cases: Water Heaters





13 / 15A S/S/O
Not Permitted

Step 1: Determine the Characteristics of the Load & Calculate IB

1. Comply with equipment / appliance safety standards
2. Obtain the following for the load
   a. Power or lighting load;
   b. Single phase (230 V) or three phase (400 V);
   c. Rated power, kVA or kW;
   d. Power factor; and
   e. Inrush current, A

   2. Maximum demand and diversity factor: Refer to Tables A & B of Electricity Regulations 1994
3. Calculate I_B: The current for which the circuit is designed

Step 2: Plug and Flexible Cords

- ***Cross–sectional area (CSA) of flexible cords***
  - Available CSA: 0.50, 0.75 & 1.25 mm^2
  - Permitted (UK only): 0.22 mm^2
    - (UK only) accepts that some marginal damage to small flexible cords is tolerable under short–circuit conditions, for example where a 0.22 mm2 is used with a 13A BS 1362 fuse
    - ***Not permitted in Malaysia***
- ***BS 1362 fuses***
  - Available sizes: 1, 2, 3, 5, 7, 10 & 13 A
  - Standard size: 3, 5 & 13 A

BS 1363 Plugs and BS 1362 Fuses

- ***Select the fuse rating in accordance with requirements of BS 1362 and/or IET (UK) code of practices***
  - 3A: appliance ≤ 700 W;
  - 5A: Appliance > 700 W and ≤ 1,200 W;
  - 13A: Appliance ≥ 1,200 V and ≤ 2,300 W

BS 1363 Plugs and BS 1932 Fuses

- ***UK Plug and Socket Safety Regulations, 1995***
  - A correctly fused BS 1363 plug, the flexible cable connected to equipment is always fully protected against the effects of overload or small over–currents as follows:
    - 3A fuse protects 0.50 mm^2 flexible cords;
    - 5A fuse protects 0.75 mm^2 flexible cords;
    - 13A fuse protects 1.25 mm^2 flexible cords

Step 3: Plug and Flexible Cords

- ***Step 3: Selecting power outlets***
  - 13A socket outlets (Usually de–rated to 10A load);
  - CEE sockets, MCB, MCCB termination box; etc.,

Overload Protection & Sizing of Cables

- ***.Step 4: Selecting CB: Example MCB***
  - ***Step 4A: Select the nominal current of the CB***

$$I_B \leq I_n$$

I_n = Nominal current of the CB, 6/10/16/20/30/40/50/63 A

I_B = Current for which the circuit is designed, full load current

  - ***Step 4B: Select the type of MCB***
    - Type B: Inrush < 3 x I_n
    - Type C: Inrush < 5 x I_n
    - Type D: Inrush < 8 x I_n

Overload Protection & Sizing of Cables

- ***Step 5: Selecting the cable***
  - ***Step 5A: Determine the continuous current of the cable***

$$1.35 / 1.45\, I_n \leq I_z$$

I_n = Nominal current of the CB

I_Z = Max. continuous current – carrying capacity of cable

Overload Protection & Sizing of Cables

- ***.Step 5: Selecting the cable (Continue)***
  - ***Step 5B: Determine the nominal current of the cable***

$$I_{Z\text{-nominal}} \geq \frac{I_z}{C_a \times C_g \times .....}$$

- C_a = Correction factor for ambient temperature;
- C_g = Correction factor for grouping; etc.,

Table 5. Required space factor for cable management system

Cable Management System	Minimum Space Factor (%)
Conduit	40
Trunking	45
Others	Per Professional Electrical Design Engineer's Instruction

Space factor is defined as follows:

$$\frac{\text{Sum of cross section areas of cables (include insulation)}}{\text{Internal cross section areas of conduits/trunkings}}$$

Overload Protection & Sizing of Cables

- ***Step 6: Voltage drop calculation***

Table 8. Allowable voltage drop

Condition	Lighting	Other uses
Low voltage installation supply directly from a public low voltage distribution system.	3 %	5 %
Low voltage installation supplied from private LV supply (Note 1).	6 %	8 %

NOTES:

1. The voltage drop within final circuit shall not exceed that of 1 %.

2. Where the wiring systems of the installation are longer than 100 m, the voltage drop above may be increased by 0.005 % per meter of the wiring system beyond 100 m without this increase being greater than 0.5 %.

3. The voltage drop is determined from the demand of the current. By using equipment load current, applying diversity factors where applicable, or from the value of the design current (I_B) of the circuit.

Protection Against Short – Circuit Current

- ***Short – circuit is a limiting conditions of overload where***
  - The fault current is relatively high at kA;
  - The short – circuit protective CB shall clear the short – circuit fault within a short time
- ***Overload CB can protect against short – circuit fault provided it has a breaking capacity > perspective short – circuit current of the protected circuit***
- ***Coordination of overload and short – circuit protection shall ensure the let through energy of the short circuit device does not exceed that which can be safely withstood by the overload devices***

Sizing PE and EB Cables

Table 11. Minimum cross-sectional areas of earthing conductors buried in the soil

Type of earthing conductors	Mechanically protected	Mechanically unprotected
Protected against corrosion	2.5 mm^2 Cu 10 mm^2 Fe	16 mm^2 Cu 16 mm^2 Fe
Not protected against corrosion	25 mm^2 Cu 50 mm^2 Fe	

Sizing PE Cables

Table 13. Minimum cross-sectional area of protective conductors

Cross-sectional area of line conductor S (mm^2)	Minimum cross-sectional area of the corresponding protective conductor (mm^2)	
	If the protective conductor is of the same material as the line conductor	If the protective conductor is not of the same material as the line conductor
$S \leq 16$	S	$\frac{k_1}{k_2} \times S$
$16 < S \leq 35$	16	$\frac{k_1}{k_2} \times 16$
$S > x\ \frac{S}{2}$	$\frac{S}{2}$	$\frac{k_1}{k_2}$

where

k_1 is the value of k for the line conductor, selected from table A.54.1 of IEC 60364-5-54 or from the tables in IEC 60364-4-43, according to the materials of the conductor and insulation.

k_2 is the value of k for the protective conductor, selected from Tables A.54.2 to A.54.6 of IEC 60364-5-54 as applicable.

Sizing EB (Supplementary) Cables

Table 12. Minimum CSA of Supplementary Equipotential Bonding Conductor (mm^2)

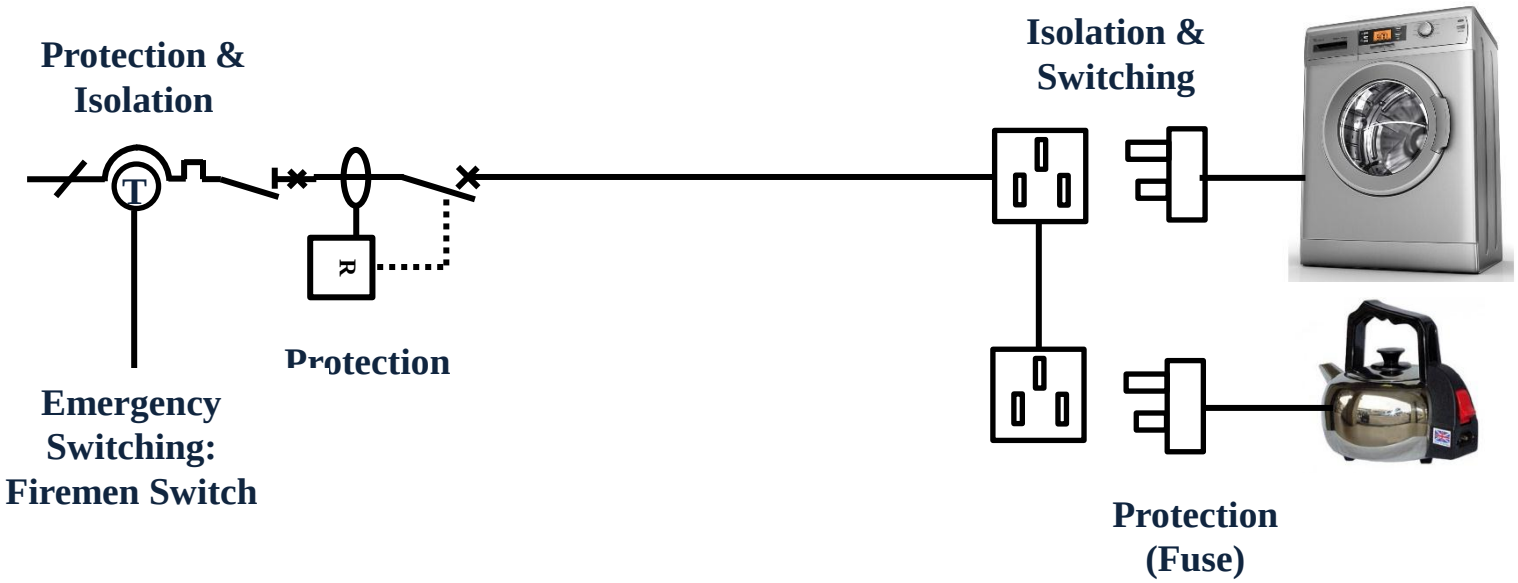
Connecting	Sheathed or Mechanically Protected	Not Mechanically Protected
Two (2) Exposed–conductive– parts	≥ ½ of the smaller protective conductor connecting to the exposed–conductive–part	≥ 4 mm^2
Exposed–conductive–part to extraneous–conductive–part	≥ ½ of the smaller protective conductor connecting to the exposed–conductive–part	≥ 4 mm^2
Two (2) extraneous–parts	≥ 2.5 mm^2	≥ 4 mm^2

Case Study 8:

Selection and Erection of Erection Equipment – Isolation, Switching and Control

Isolation, Switching and Control

Note:
Coupling to Electricity Provider
Shall be 2P/4P for 1P/3P Supply

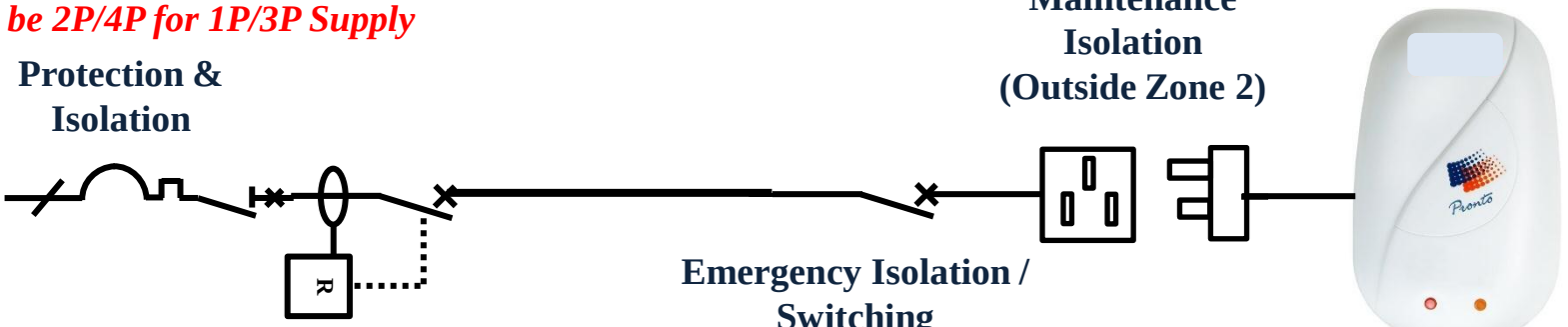


Isolation, Switching and Control

Note:
Coupling to Electricity Provider
Shall be 2P/4P for 1P/3P Supply

Protection & Isolation

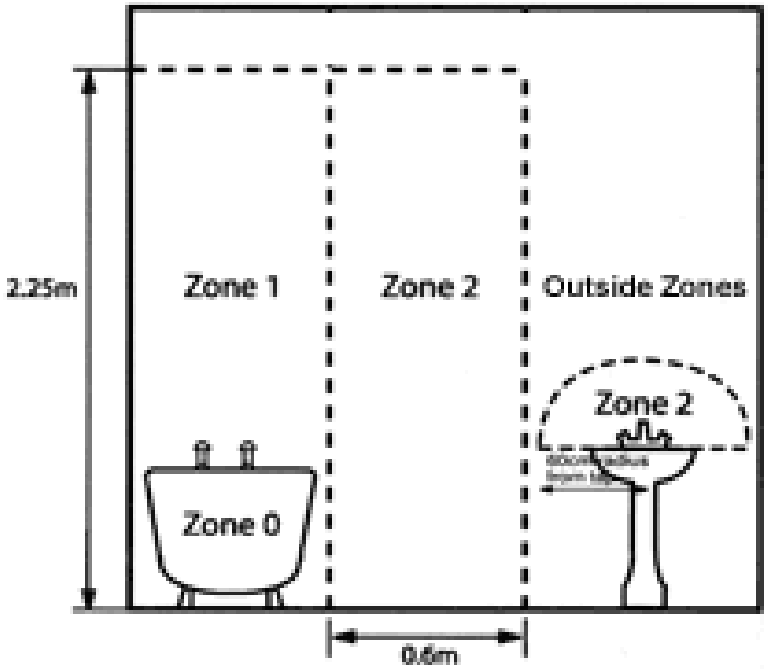
Maintenance Isolation (Outside Zone 2)



Protection

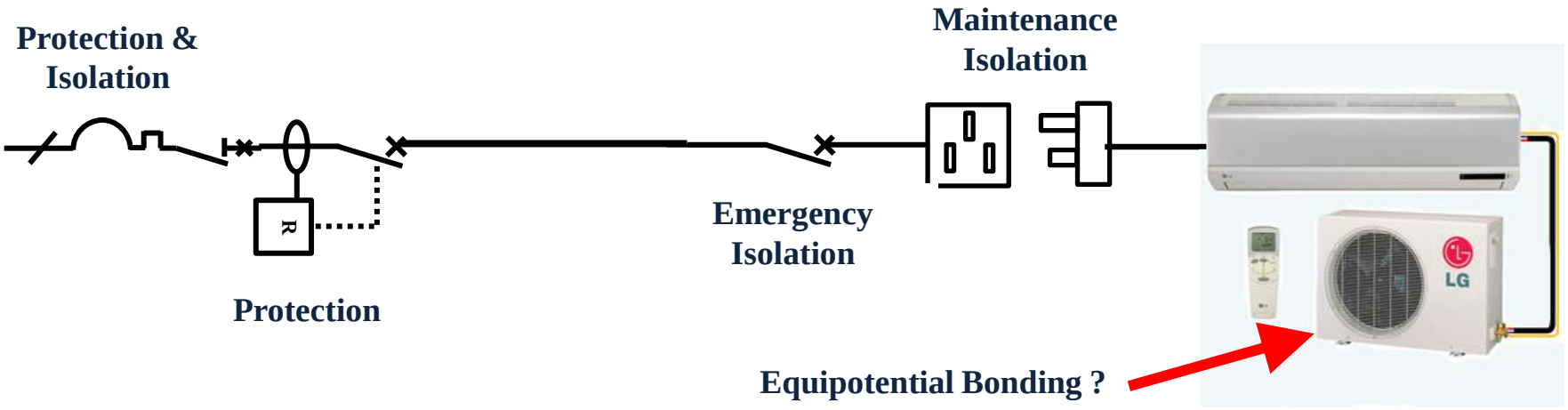
Emergency Isolation / Switching (Outside Zone 2)

Outgoing: Equipotential Bonding



Isolation, Switching and Control

Note:
Coupling to Electricity Provider
Shall be 2P/4P for 1P/3P Supply



Isolation, Switching and Control

Note:
Coupling to Electricity Provider
Shall be 2P/4P for 1P/3P Supply

Case Study 9:

Verification:

Initial and Period Verification

Checklist

ELECTRICAL INSPECTION CHECKLIST

Introduction

Date: _____ Inspector: _____

Location: _____

Comments: _____

Checklist

Checklist 1-1: General Safety Checklist for Electrical Inspections			
✔	Item	Basic Hazard Analysis	Comments
☐	1.	Does the inspection task involve exposed energized conductors or circuit parts?	
☐	2.	Can the risk of exposure to electrical hazards be justified?	
☐	3.	What is the voltage of the equipment that requires inspection?	
☐	4.	Where are the approach boundaries for shock protection?	
☐	5.	Will the inspection involve crossing any of the approach boundaries?	
☐	6.	Has an incident energy analysis been performed for the equipment?	

Case Study 10:

Public Awareness and

Training, Workshops and Seminars

Public Awareness: Electrical Safety Seminar by Energy Commission

Public Comments: MS 1936 & MS 1979

PUBLIC COMMENT CONSULTATION ON MS 1936 & MS 1979 FOR ELECTRICAL INSTALLATION OF BUILDINGS

ORGANISED BY: MOSTI STANDARDS MALAYSIA CREATING QUALITY CULTURE

SUPPORTED BY: TEEAM

SHAH ALAM CONVENTION CENTRE

Introduction

MS 1936:2007 ELECTRICAL INSTALLATIONS OF BUILDING – GUIDE TO MS IEC 60364 and MS 1979: 2007 ELECTRICAL INSTALLATIONS OF BUILDINGS - CODE OF PRACTICE were first published in 2007 and have been cross-referred to in the Technical Instruction 1/2008 for electrical installations on buildings, issued by the Energy Commission (ST). Since their year of publication, MS 1936, MS 1979 and their mother-source MS IEC 60364 have been used as the mandatory standards for electrical installations on buildings in Malaysia. Any design and/or electrical (wiring) installation done by a designer/practitioner referring to other documents than those cross referred to in the ST Technical Instruction 1/2008 could be proven to be unlawful, should it come under the scrutiny of any form of legal or professional practice.

More than 5 years have lapsed and it is now time to review the two Malaysian Standards. The Technical Committee (TC) on Electrical Installation, Protection and Insulation Practice, intends to solicit designers'/practitioners'/stakeholders'/professionals' and parties involved in electrical installations on building in Malaysia. All views are welcomed as it has been recognized that various technical and engineering standards are the result of converged censuses among practitioners/stakeholders and the public.

TC on Electrical Installation, Protection and Insulation Practice which developed the MS referred to in this event was established within the Malaysian Standards Development System under the purview of Standards Malaysia, a government agency under the Ministry of Science, Technology and Innovation (MOSTI). TC on Electrical Installation, Protection and Insulation Practice which developed this Malaysian Standard was managed by The Electrical and Electronics Association of Malaysia (TEEAM) in its capacity as an authorised Standards-Writing Organisation.

Registration

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Contact Us

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Email:

rohayah@sirim.my /asikhin@sirim.my

MANAGED BY: SIRIM BERHAD

IN THE PROCESS TO GET CCD AND CDP/ PDP POINTS

Target groups

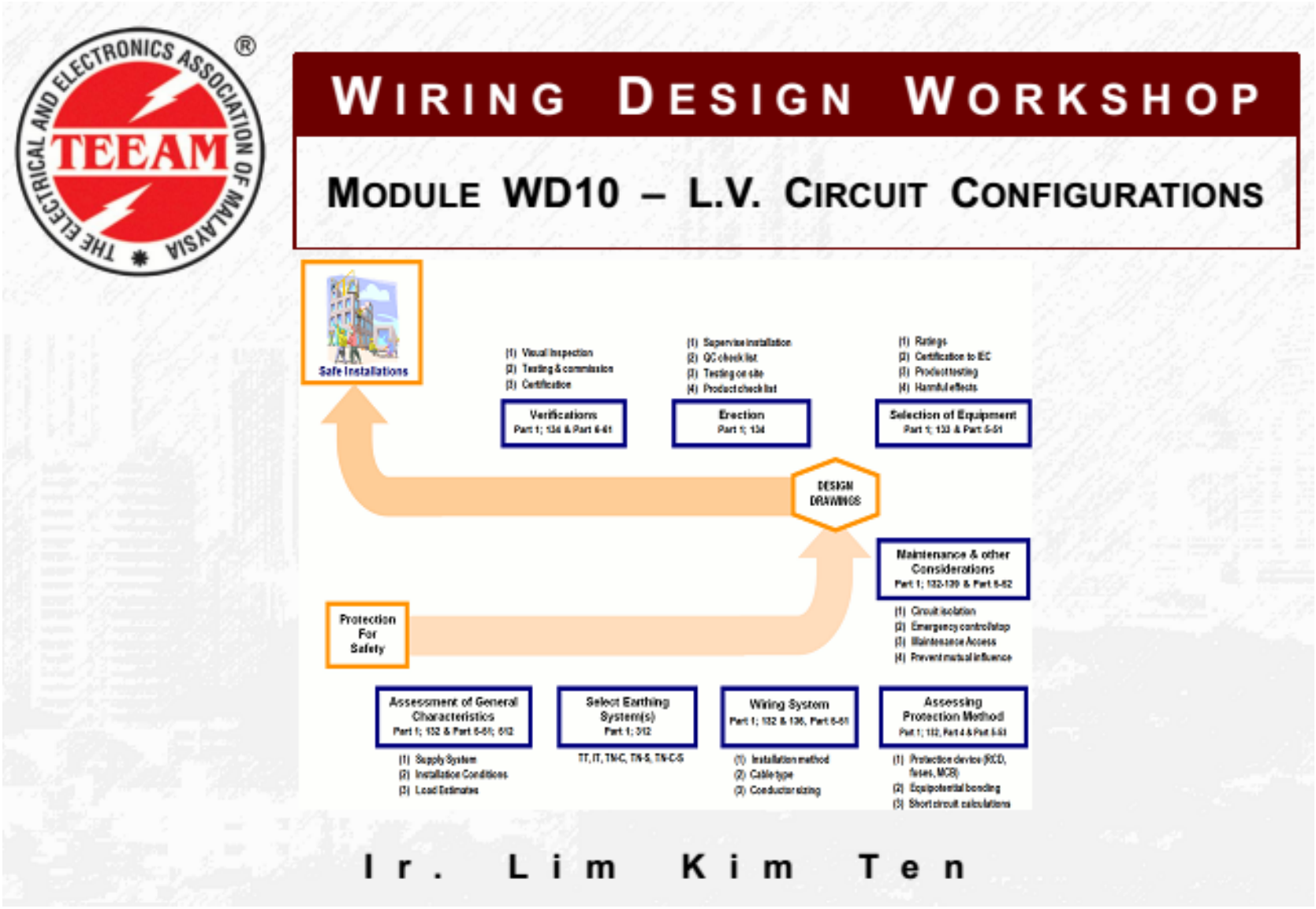
- Contractors
- Engineers
- Wiremen
- Chargemen
- Electricians
- Manufacturers
- Developers
- Academia
- Government agencies
- Local authorities

Tentative Program **16 JUNE 2015**

Time	Activity
0830 - 0900	Arrival and Registration
0900 - 0915	Opening remarks by YBhg. Datuk Fadilah Baharin Director General, Standards Malaysia
0915 - 0945	Overview on the Development/Review of MS 1979 & MS 1936; by Ir Rocky H.T. Wong (Chairman of TEEAM's SWO)
0945 - 1045	Presentation on MS 1979 by Ir Yau Chau Fong and Ir Lee Cheng Pay
1045 - 1100	Morning Tea
1100 - 1145	Continue with presentation on MS 1979 and Q & A session
1145 - 1230	Presentation on MS 1936 by Ir Lim Kim Ten, Dr Che Hang Seng and Ir Lee Yuan How
1230 - 1400	Lunch Break
1400 - 1530	Continue with Presentation on MS 1936 and Q & A session
1530 - 1600	Wrap-up of session by Ir Rocky H.T. Wong
	Tea Break/Networking Session & End

Road Show: Testing RCD

Workshop: Wiring Design Workshop



Annual National Convention of The Institution of Integrated Electrical Engineers of the Philippines (IIEE)

End of

Presentation

Q & A

Any Questions ?