" Be Energy Smart - Safety Starts with You "

NATIONAL

Enhancing Compliance To MS IEC 60364 – Standards for Residential Wiring

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

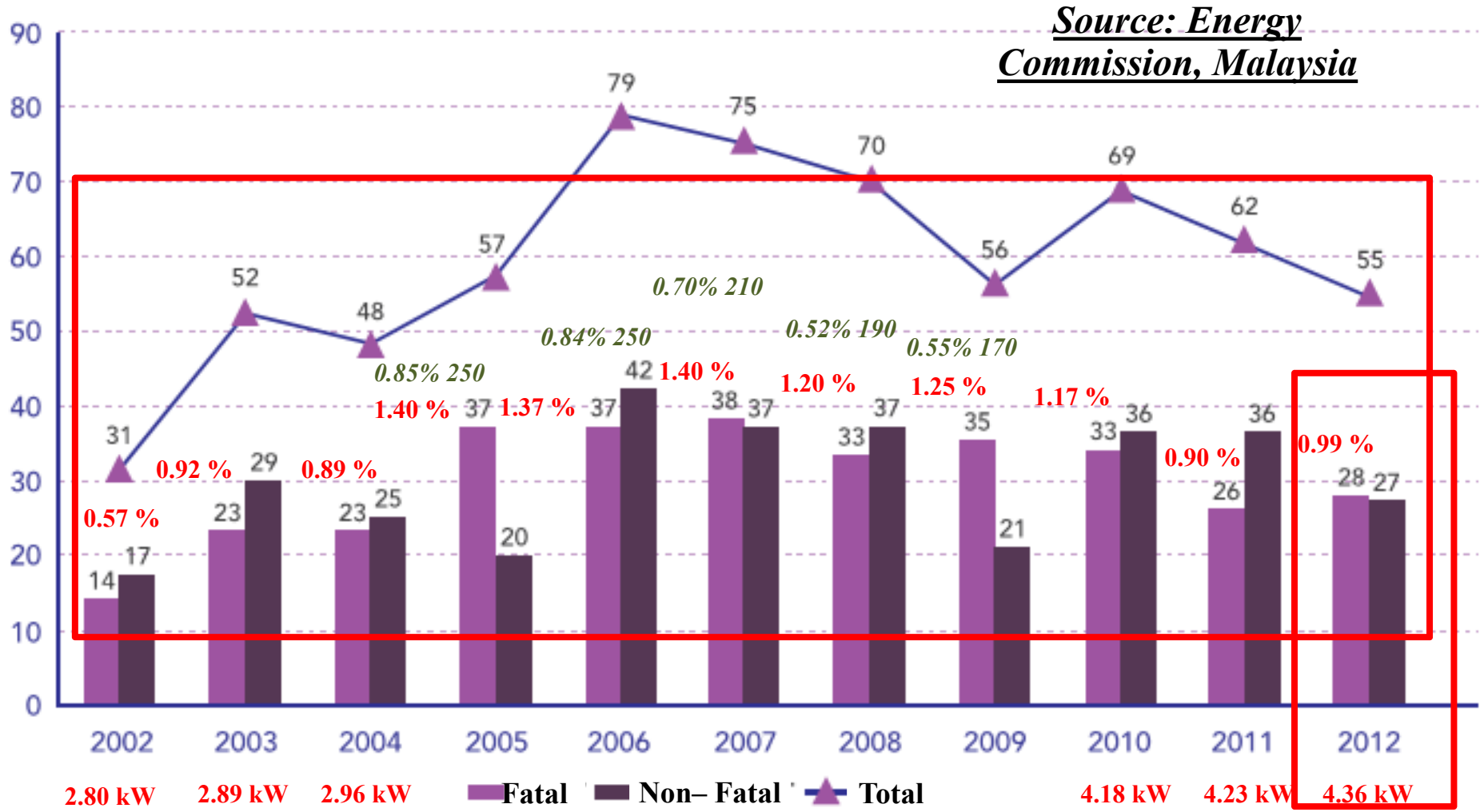
The Institution of Engineers, Malaysia

(9th November 2015: 3:00 pm to 3:45 pm)

DATE
9 NOVEMBER 2015

VENUE
DEWAN TUN HUSSEIN ONN, LEVEL 2,
PUTRA WORLD TRADE CENTRE,
KUALA LUMPUR, MALAYSIA

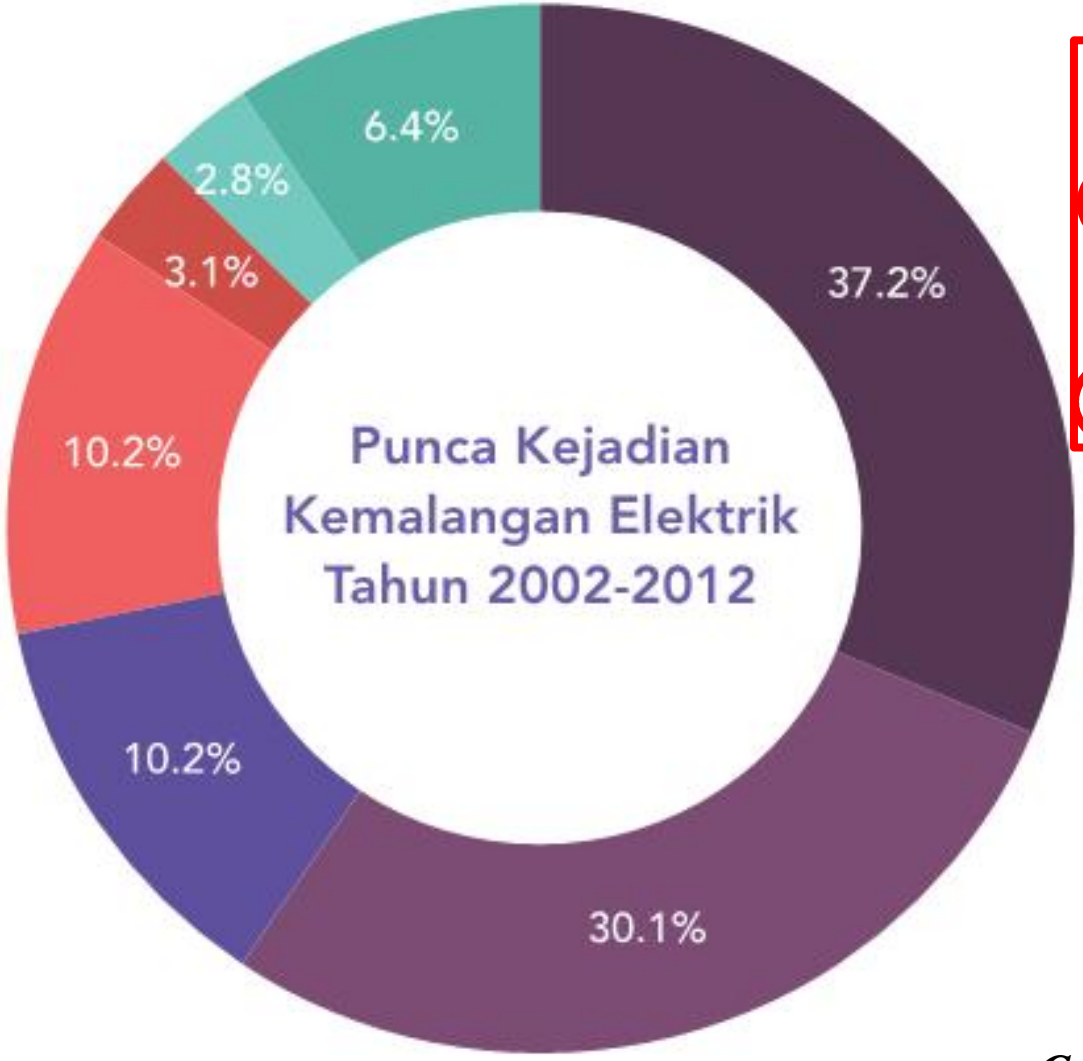
Electrical Accidents in Malaysia



Gr een = Electrical Accident Fatalities USA

Source: Electrical safety Foundation International (ESFI), USA

Causes of Electrical Accidents



77.5% ***Total***

37.2% **Lack of Maintenance**

30.1% **Safety Procedures Not Complied with**

10.2% **Illegal Modification**

Working Near Electrical Installation

Unauthorized Works on Electrical Installations

Use of Defective Electrical Equipment

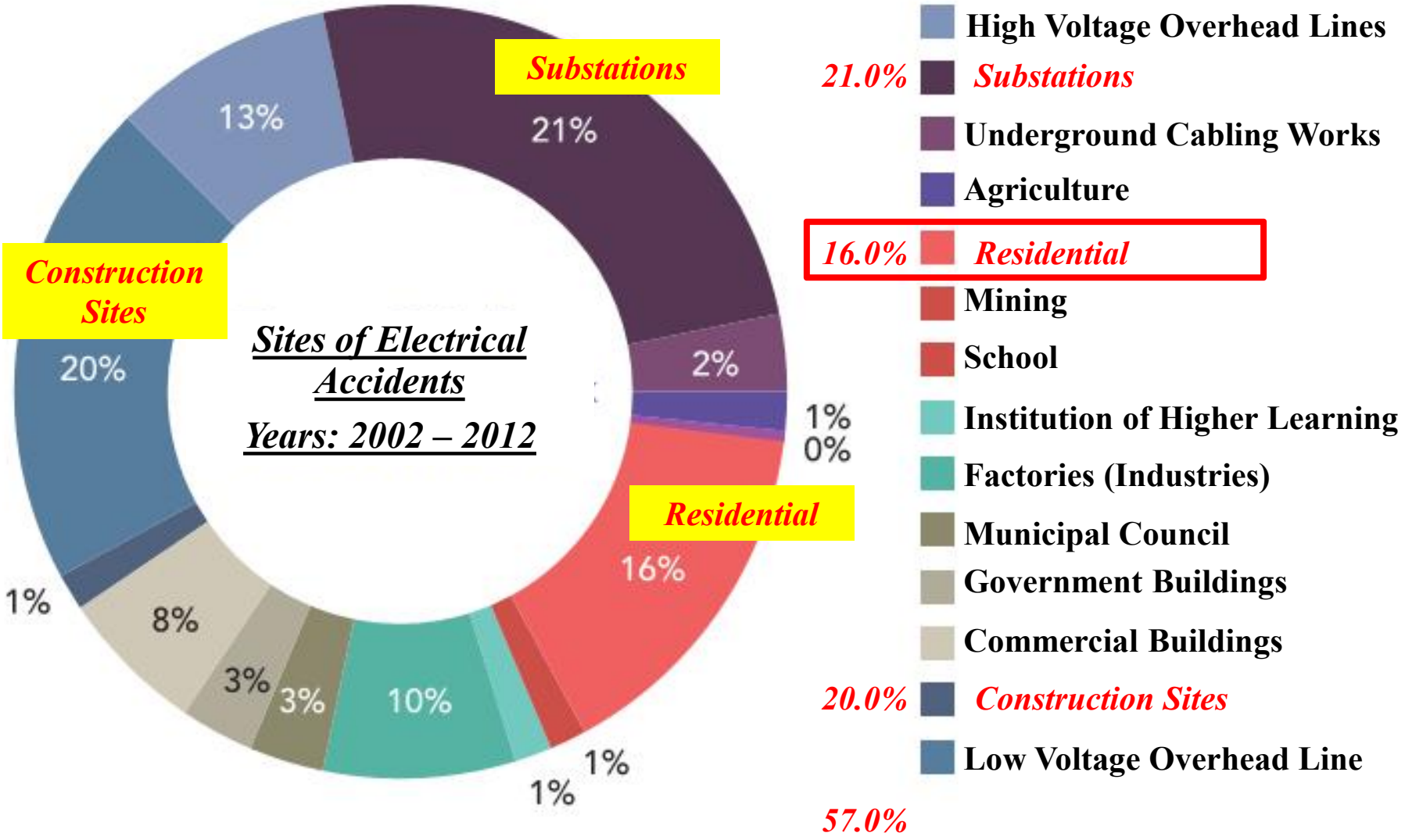
Others

Source: Energy Commission, Malaysia


RCCB
save life
Test me!
www.testrccb
RCCB
save life
Maxguard
SAFE AND SAVE
Good
Faulty
nock
you!
Have You Ever Test RCCB
in Your House ???

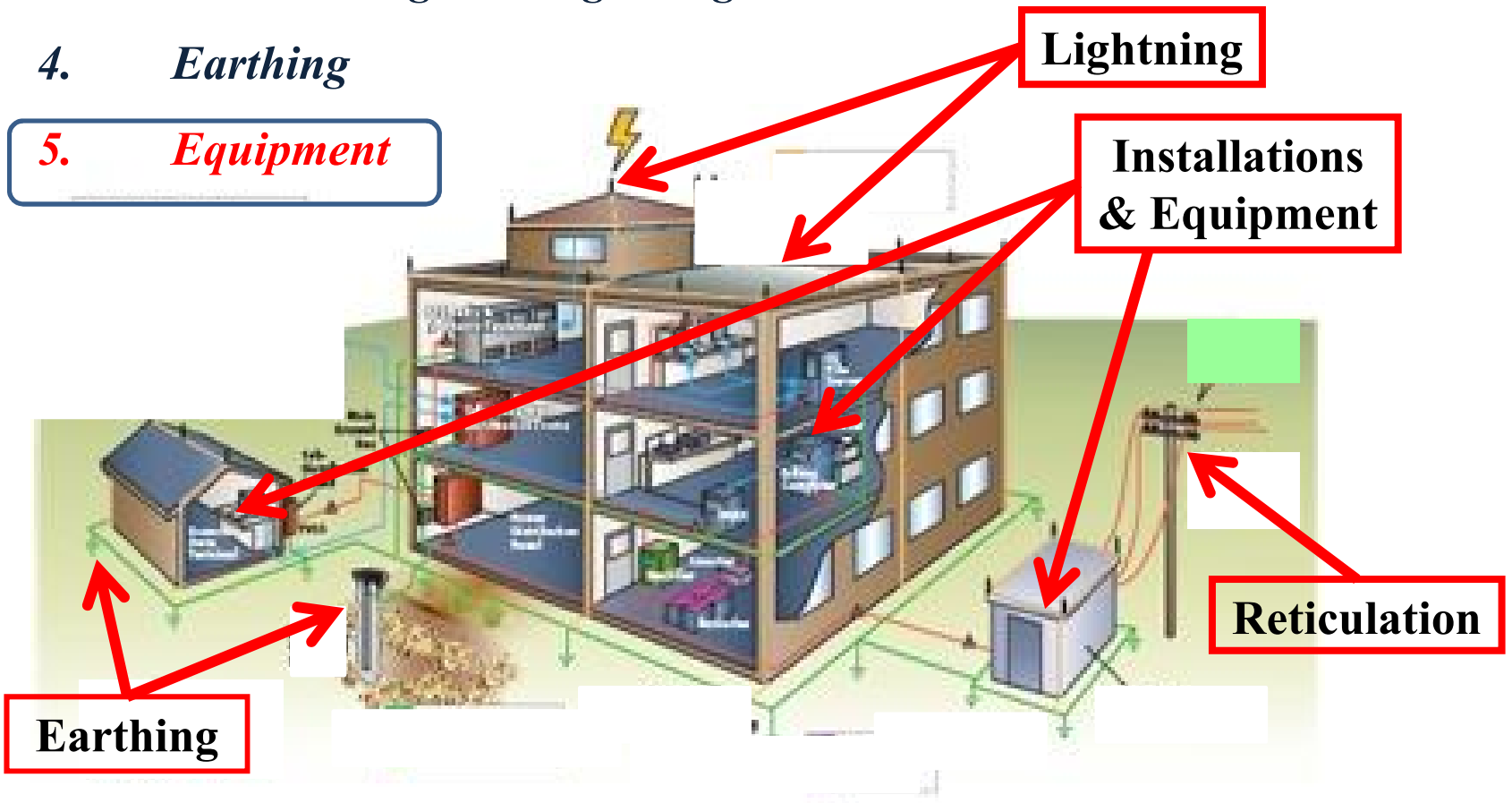
Locations Electrical Accidents Occur

Source: Energy Commission, Malaysia

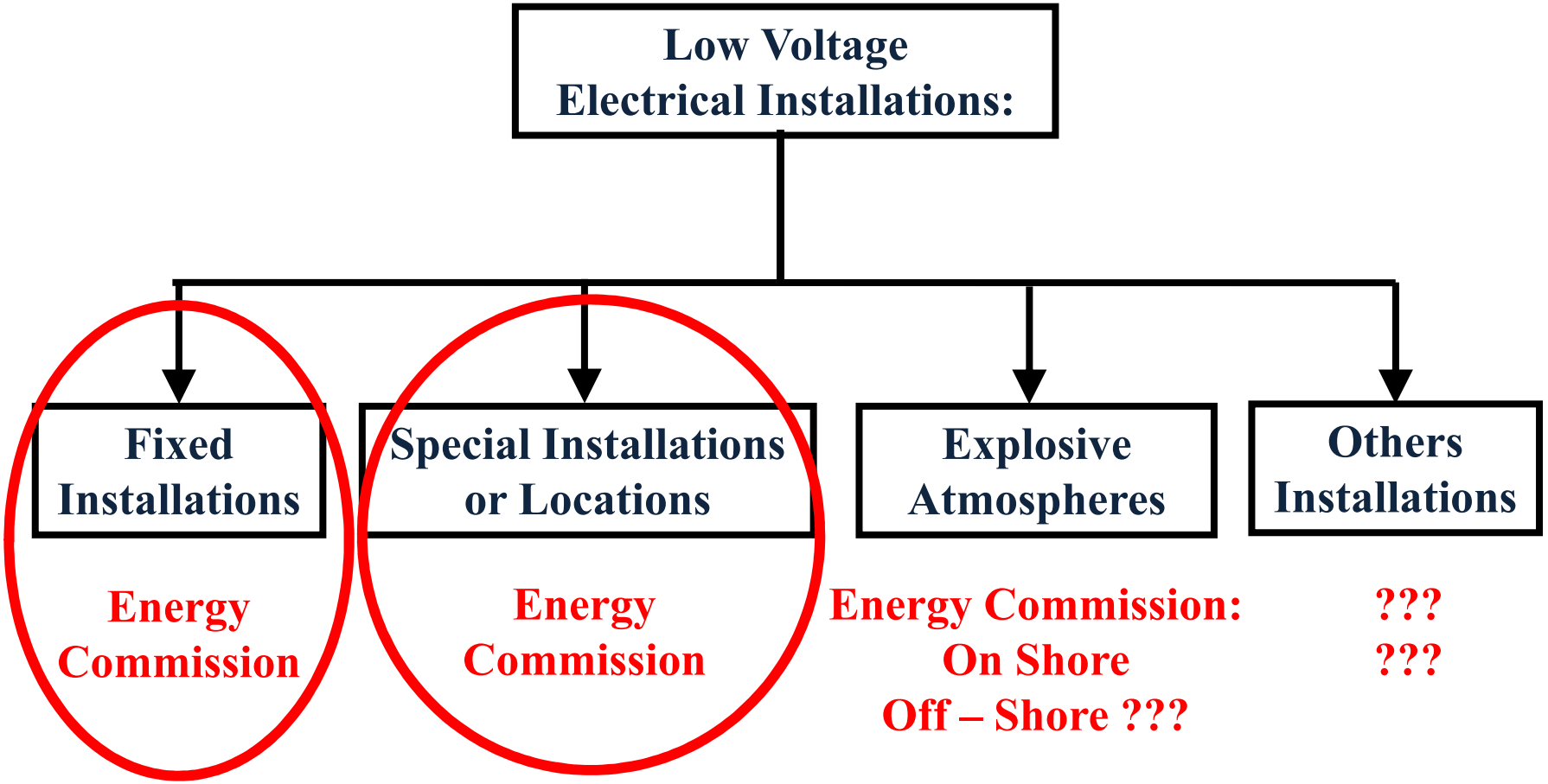


Main LV Electrical Systems of Fixed Buildings

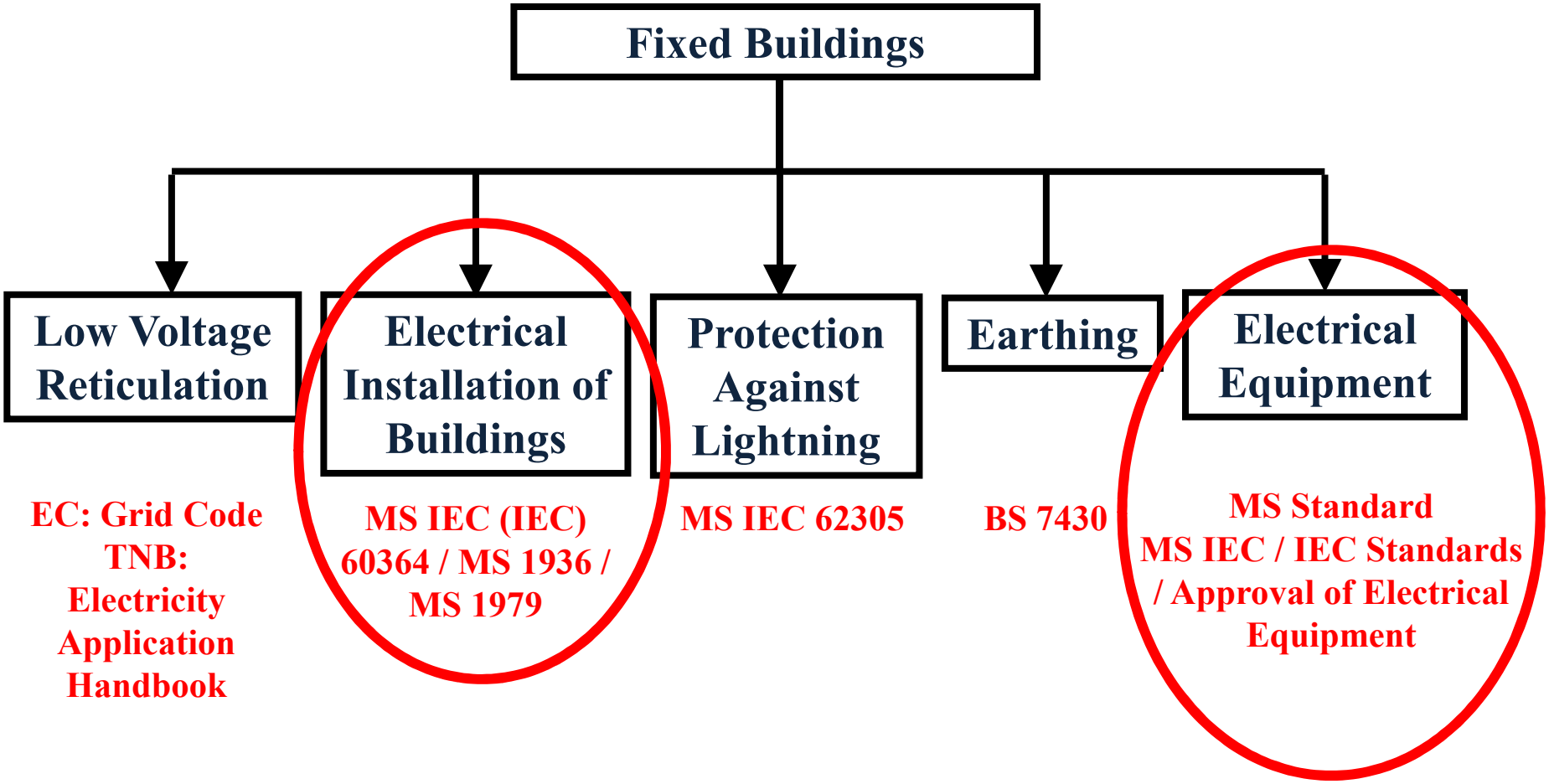
1. *Electricity supply reticulation*
2. *Electrical installations of buildings: MS 1979*
3. *Protection against Lightning*
4. *Earthing*
5. *Equipment*



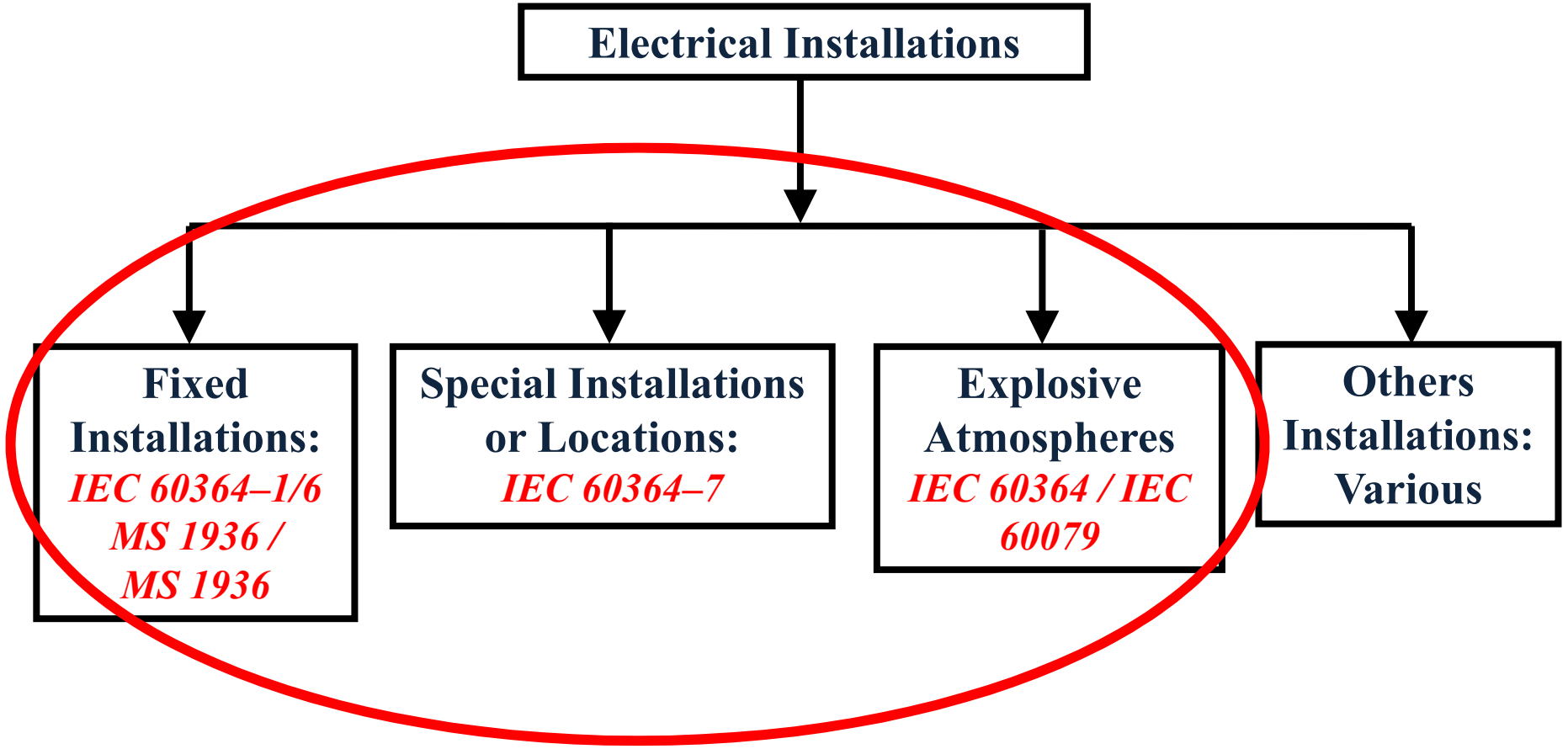
Regulatory Bodies



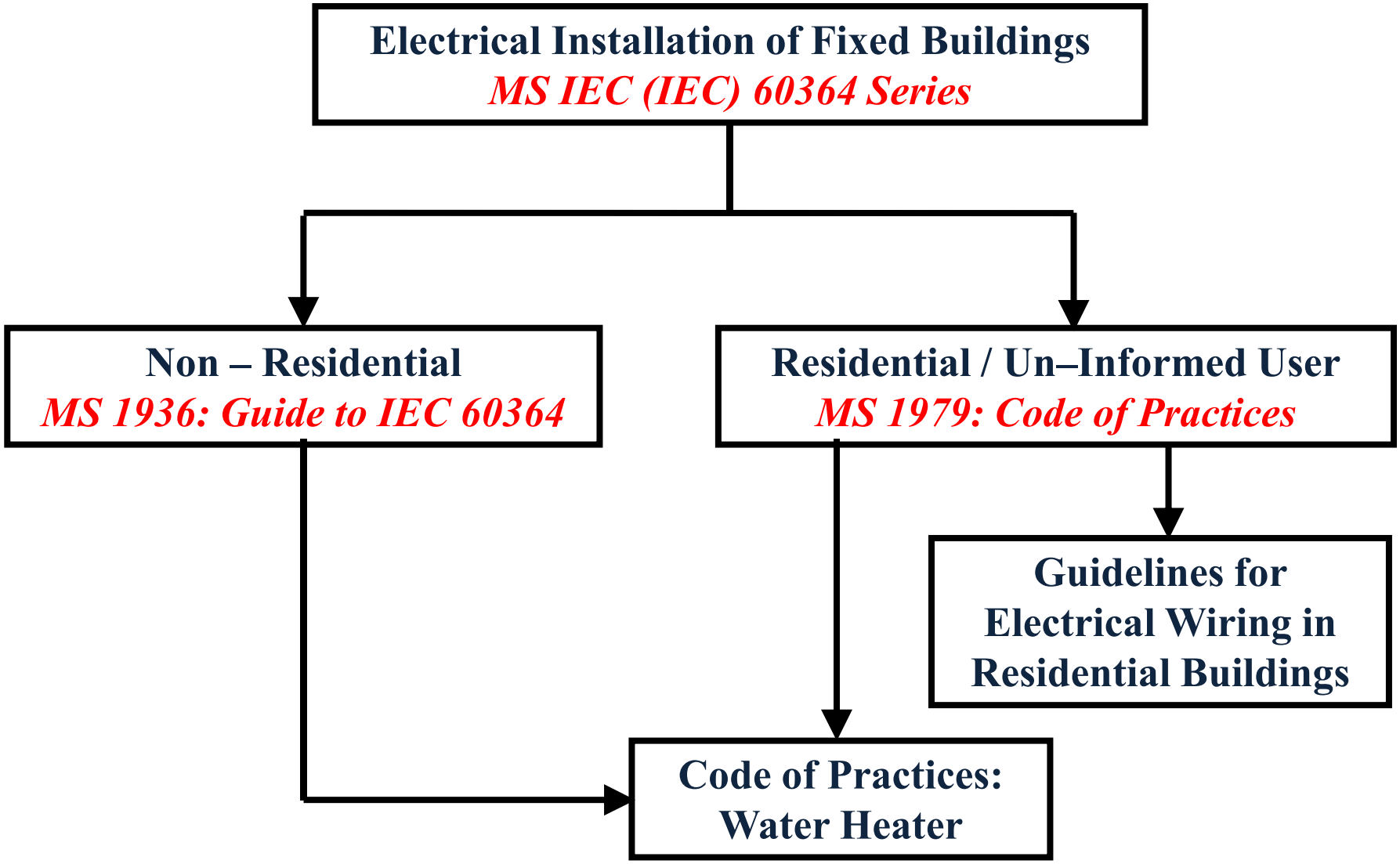
Standards


Fixed Buildings
Low Voltage Reticulation
Electrical Installation of Buildings
Protection Against Lightning
Earthing
Electrical Equipment
EC: Grid Code
TNB: Electricity Application Handbook
MS IEC (IEC) 60364 / MS 1936 / MS 1979
MS IEC 62305
BS 7430
MS Standard
MS IEC / IEC Standards / Approval of Electrical Equipment

Categorization of Electrical Installations



Electrical Installations of Fixed Buildings



Fixed Buildings: MS IEC 60364 / MS 1936/79

Commercial Buildings

Outdoor: Carpark / Guard House

Factories

Fixed Buildings

Condominiums

Schools

Residential

Special Installations or Locations: IEC 60364–7

Hospitals
MS IEC 60364–7–710

Masuk Sakit, Keluar Mati

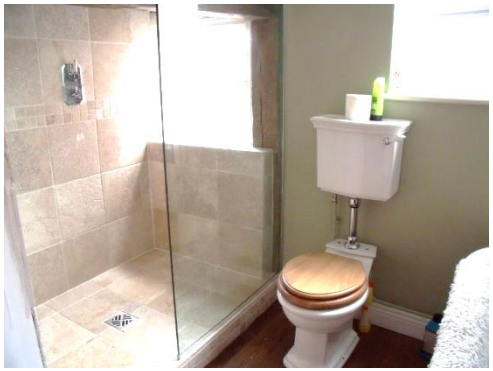
Masuk Lebih Kurang Mati, Keluar Sahat

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

Explosive Atmospheres: IEC 60364 / IEC 60079

Tank Farm

Chemical Complex

Explosive Atmospheres

Oil & Gas Platform

Chemical Store

Oleo Refinery

Grain Silos

Others Installations

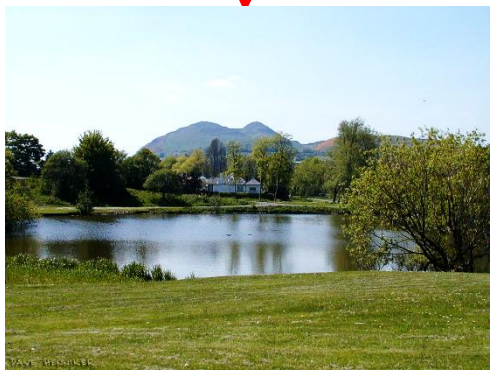
Ships: *IEC 60092*

Assembly Equipment:
MS 60364 / MS 1936 / MS IEC 60204

Aviation & Aerospace

Others Installations

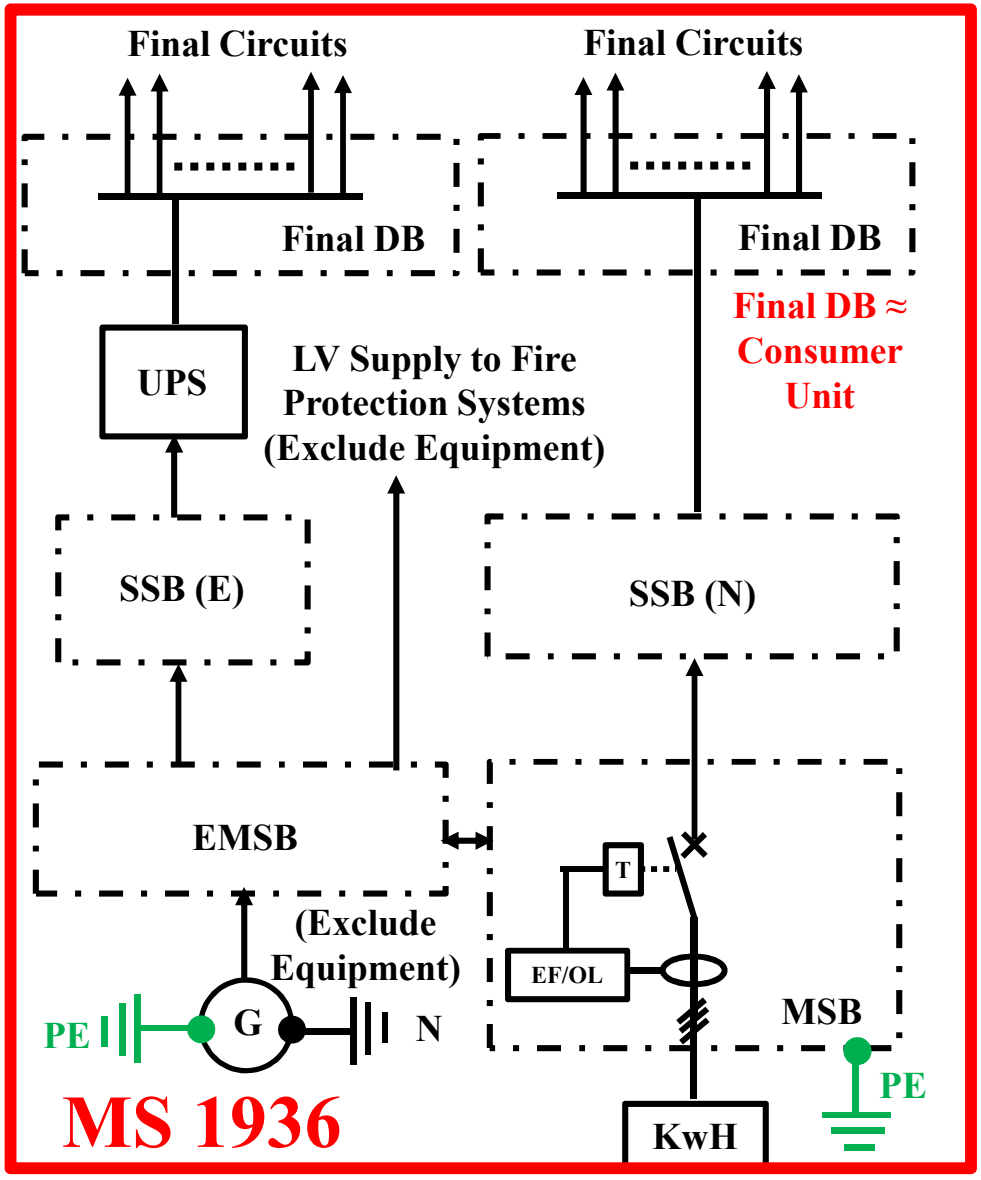
Illegal Settlements:
MS IEC 60364

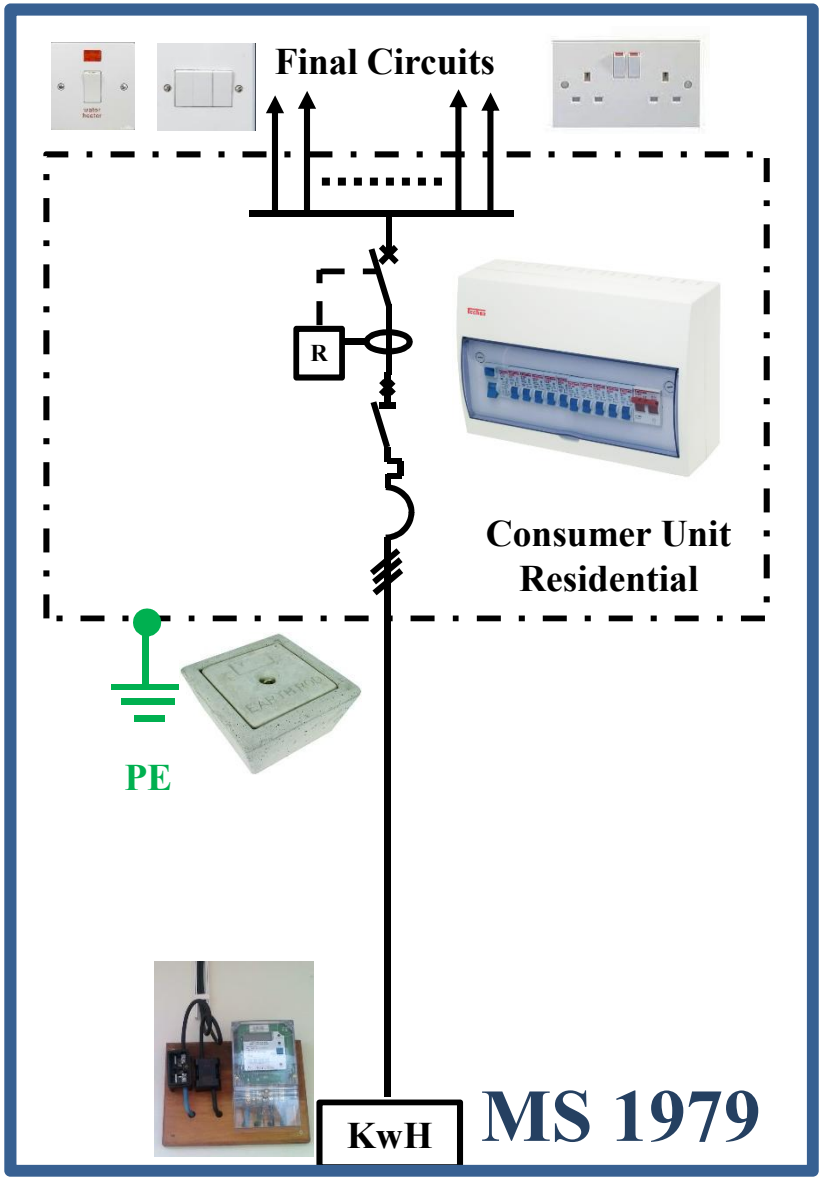


Ponds, Rivers, Seas & Oceans

Military

Scope of MS 1936 and MS 1979





Residential Buildings: MS IEC 60364 / MS 1979

Apartments

Fishing Villages

Residential Buildings

Condominiums

Illegal Settlements

Rural Houses

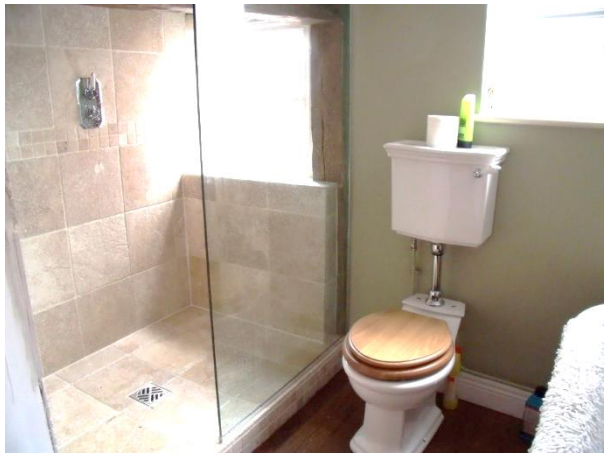
Residential

Residential Buildings: MS IEC 60364 / MS 1979

Residential Solar PV:
IEC 60364–7–712

Guard House:
MS IEC 60364

Water Heater: *Code of Practice*



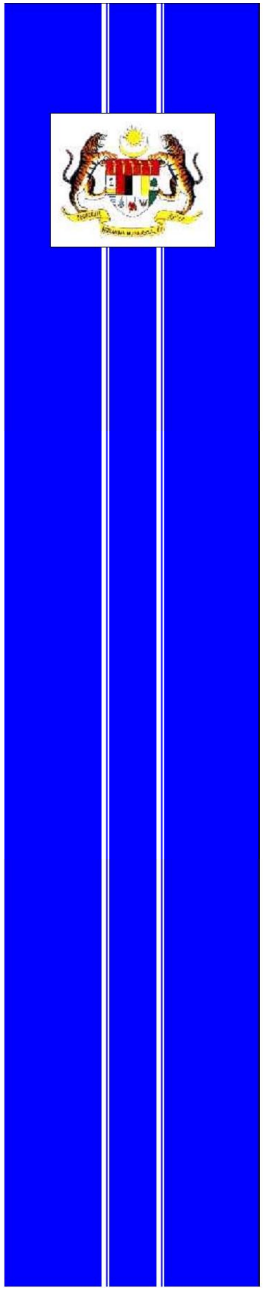
Bathroom: *IEC 60364–7–701*

Residential Buildings

Fountain: *IEC 60364–7–702*

Electric Vehicle Charging:
IEC 60354–7–722

Fish Tank:
IEC 60364–7–702



MALAYSIAN STANDARD

MS 1979:2007

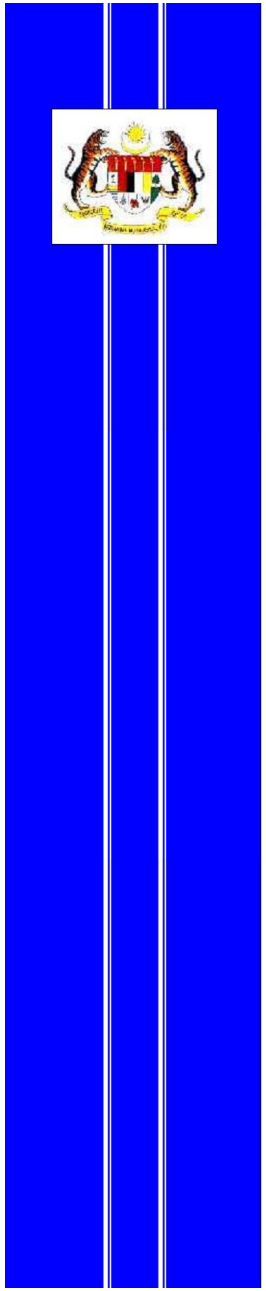
ELECTRICAL INSTALLATIONS OF BUILDINGS - CODE OF PRACTICE

Rm.20–00

ICS: 91.140.50, 29.020

Descriptors: practices, electrical installations, buildings, residential houses, dwellings

DEPARTMENT OF STANDARDS MALAYSIA



MALAYSIAN STANDARD

MS 1979:2011 (BM)

PEMASANGAN ELEKTRIK DALAM BANGUNAN - KOD AMALAN

Rm.20–00

ICS: 91.140.50; 29.020

Perihal: amalan, pemasangan elektrik, bangunan, rumah kediaman, tempat tinggal

DEPARTMENT OF STANDARDS MALAYSIA

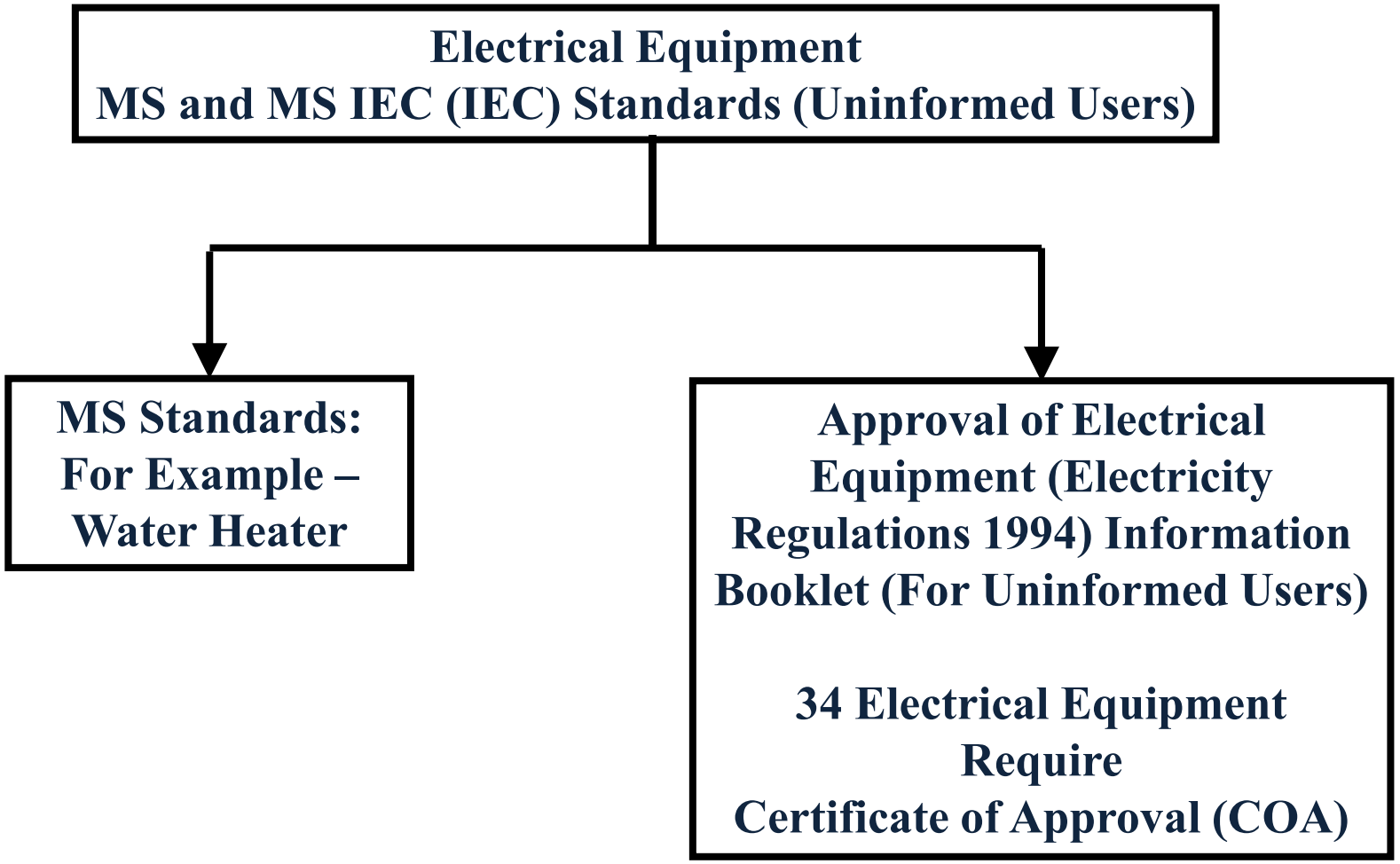
Suruhanjaya Tenaga

GUIDELINES FOR ELECTRICAL WIRING IN RESIDENTIAL BUILDINGS

Free Download:
Energy Commission

2008 EDITION
www.st.gov.my

Electrical Equipment: Standards and Information Booklet



Approval of Electrical Equipment

(Target: Un–informed Users)

APPROVAL OF ELECTRICAL EQUIPMENT
(ELECTRICITY REGULATION 1994)

2014 Edition: 34 COA Equipment

Free Download: Energy Commission

Information Booklet
2014 Edition

Suruhanjaya Tenaga
Energy Commission

Energy Commission, Malaysia
Established Under Energy Commission Act 2001 [Act 610]

Approval of Electrical Equipment: Cable / Wire

34	**WIRE / CABLE/ CORD (non-armoured) 0.5mm^2 to 35mm^2**	• is unscreened and flexible ; • is designed for use at low voltage ; • consists of two or three elastomer or PVC insulated cores of multistrand construction ; • has a cross-sectional area of each conductor from 0.5mm^2 not exceeding 35mm^2	Polyvinyl chloride (PVC) Insulated flexible cord and cable	MS 2112-5:2009	BS EN 50525-2-11:2011 or IEC 60227-5:2011
			Rubber insulated cord and flexible cables	MS 140:1987 or MS 2127-4	BS EN 50525-2-11-2011 IEC 60245-1:2008 IEC 60245-4:2011
			PVC-insulated cable (non-armoured) for electric power and supply: - non-sheathed	MS 2112-3:2009	IEC 60227-3:1997
			PVC-insulated cable (non-armoured) for electric power and supply: - sheathed	MS 2112-4:2009	IEC 60227-4:1997

Approval of Electrical Equipment: Cable / Wire

Suruhanjaya Tenaga	PEKELILING SURUHANJAYA TENAGA BIL. 03/2012 PENGGUNAAN KABEL KUASA BERSAIZ 1.5MM^2 JENIS KUPRUM BAGI TUJUAN PENDAWAIAN LITAR LAMPU	NO. RUJUKAN ST/IP/PK/JKKE/ Pk.03/2012

TUJUAN

Pekeliling ini adalah bertujuan untuk menjelaskan kepada semua konsultan, kontraktor elektrik, orang kompeten, pengilang dan pengimport kabel, dan semua pihak lain yang terlibat dalam mereka bentuk dan memasang sistem pendawaian pepasangan elektrik, mengenai keperluan penggunaan kabel kuasa bersaiz sekurang-kurangnya 1.5 mm^2 jenis kuprum (Copper) bagi sistem pendawaian litar lampu di bangunan.

LATARBELAKANG

2. Kaedah pemasangan sistem pendawaian bagi litar lampu bersaiz 1.5 mm^2 jenis kuprum telah ditetapkan dalam Garis Panduan Pendawaian Elektrik di Bangunan Kediaman yang telah dikeluarkan oleh Suruhanjaya Tenaga (ST). Garis panduan tersebut telah dibangunkan selaras dengan kehendak-kehendak Standard Malaysia;

i. *MS IEC 60364 - Electrical Installations of Buildings*
ii. *MS 1936:2006, Electrical Installations of Buildings- Guide to MS IEC 60364 dan*
iii. *MS 1979:2007 - Electrical Installations of Buildings- Code of Practice.*

Garis panduan ini juga telah pun dimandatorikan melalui pekeliling ST Bil. 2/2008 bertarikh 1 Julai 2008.

3. Bagaimana pun ST mendapati bahawa masih wujud penggunaan kabel kuasa bersaiz kurang dari 1.5 mm^2 bagi tujuan pendawaian litar lampu di bangunan-bangunan. Sehubungan itu, ST juga mendapati terdapat pengilang

Suruhanjaya Tenaga	PEKELILING SURUHANJAYA TENAGA BIL. 03/2012 PENGGUNAAN KABEL KUASA BERSAIZ 1.5MM^2 JENIS KUPRUM BAGI TUJUAN PENDAWAIAN LITAR LAMPU	NO. RUJUKAN ST/IP/PK/JKKE/ Pk.03/2012

kabel tempatan yang masih mengeluarkan kabel-kabel bersaiz 1.25 mm^2 jenis kuprum bagi tujuan pendawaian tetap.

TINDAKAN YANG PERLU DIAMBIL

4. Konsultan, kontraktor elektrik, orang kompeten dan semua pihak lain yang terlibat hendaklah memastikan kabel pendawaian bersaiz sekurang-kurangnya 1.5 mm^2 jenis kuprum sahaja digunakan bagi pendawaian tetap litar lampu.

5. Sumber maklumat dan pengenalan berikut boleh digunakan untuk mengenalpasti sama ada kabel yang digunakan adalah mematuhi standard ditetapkan;

i. maklumat mengenai kabel di label pada bungkusan kabel;
ii. tanda *emboss* pada kabel yang mencatitkan saiz, standard dan makmal ujian kabel berkenaan yang diiktiraf; dan
iii. pemeriksaan fizikal secara terus ke atas keratan rentas kabel yang menunjukkan bilangan lembar pengalir (*cable strands*), jenis pengalir dan penebatnya.
iv. Standard bagi kabel yang digunakan untuk tujuan pendawaian tetap ialah MS 2112:2009.

6. Penggunaan kabel kuasa bersaiz sekurang-kurangnya 1.5 mm^2 jenis kuprum bagi tujuan pendawaian litar lampu adalah bagi mengelak daripada berlakunya kepanasan lampau, susutan voltan atau kecacatan pada penebat kabel.

Approval of Electrical Equipment: Cable / Wire

SuruhanjayaTenaga	PEKELILING SURUHANJAYA TENAGA BIL. 03/2012 PENGGUNAAN KABEL KUASA BERSAIZ 1.5MM^2 JENIS KUPRUM BAGI TUJUAN PENDAWAIAN LITAR LAMPU	NO. RUJUKAN ST/IP/PK/JKKE/ Pk.03/2012

7. Sistem pendawaian litar lampu menggunakan kabel bersaiz sekurang-kurangnya 1.5 mm^2 jenis kuprum tersebut perlu dipasang secara berterusan (dari komponen fius (MCB) di papan agihan hinggalah ke poin lampu) tanpa sebarang sambungan.

TINDAKAN PENGUATKUASAAN

8. Semua konsultan, kontraktor elektrik, orang kompeten, pengilang dan pengimport kabel, dan semua pihak yang terlibat dalam mereka bentuk dan memasang sistem pendawaian pepasangan elektrik adalah diingatkan supaya sentiasa mematuhi Pekeliling ST Bil. 2/2008 dan pekeliling ini. Tindakan tegas boleh diambil terhadap mana-mana pihak yang gagal mematuhinya.

Sekian, terima kasih.

(**Datuk Ir. Ahmad Fauzi bin Hasan**)
Ketua Pegawai Eksekutif
Suruhanjaya Tenaga

Tarikh: 6 Ogos 2012

s.k Pengarah
Jabatan Penguatkuasaan & Penyelarasan Kawasan

Semua
Ketua Pejabat ST Kawasan, Suruhanjaya Tenaga

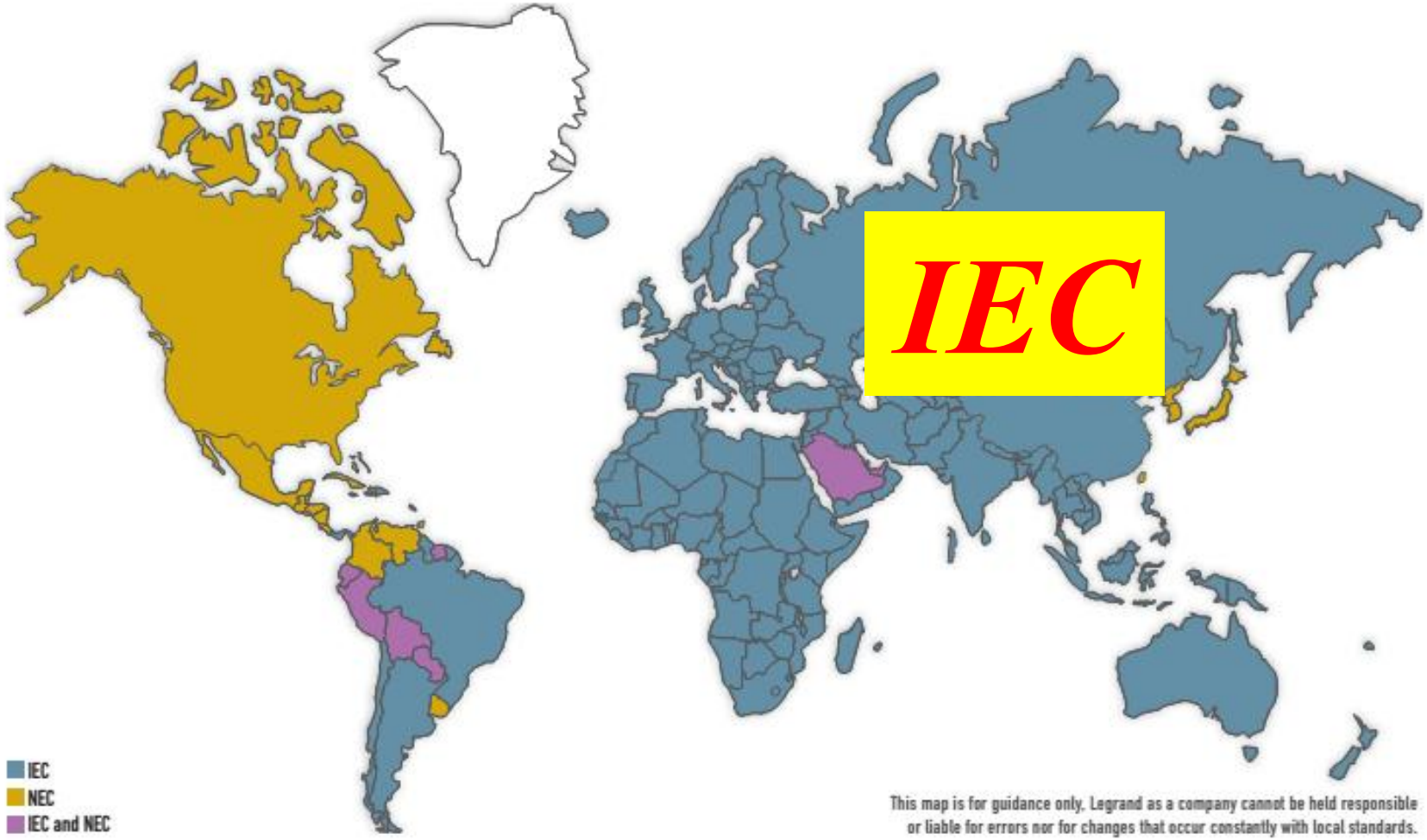
3

Case Study 1:

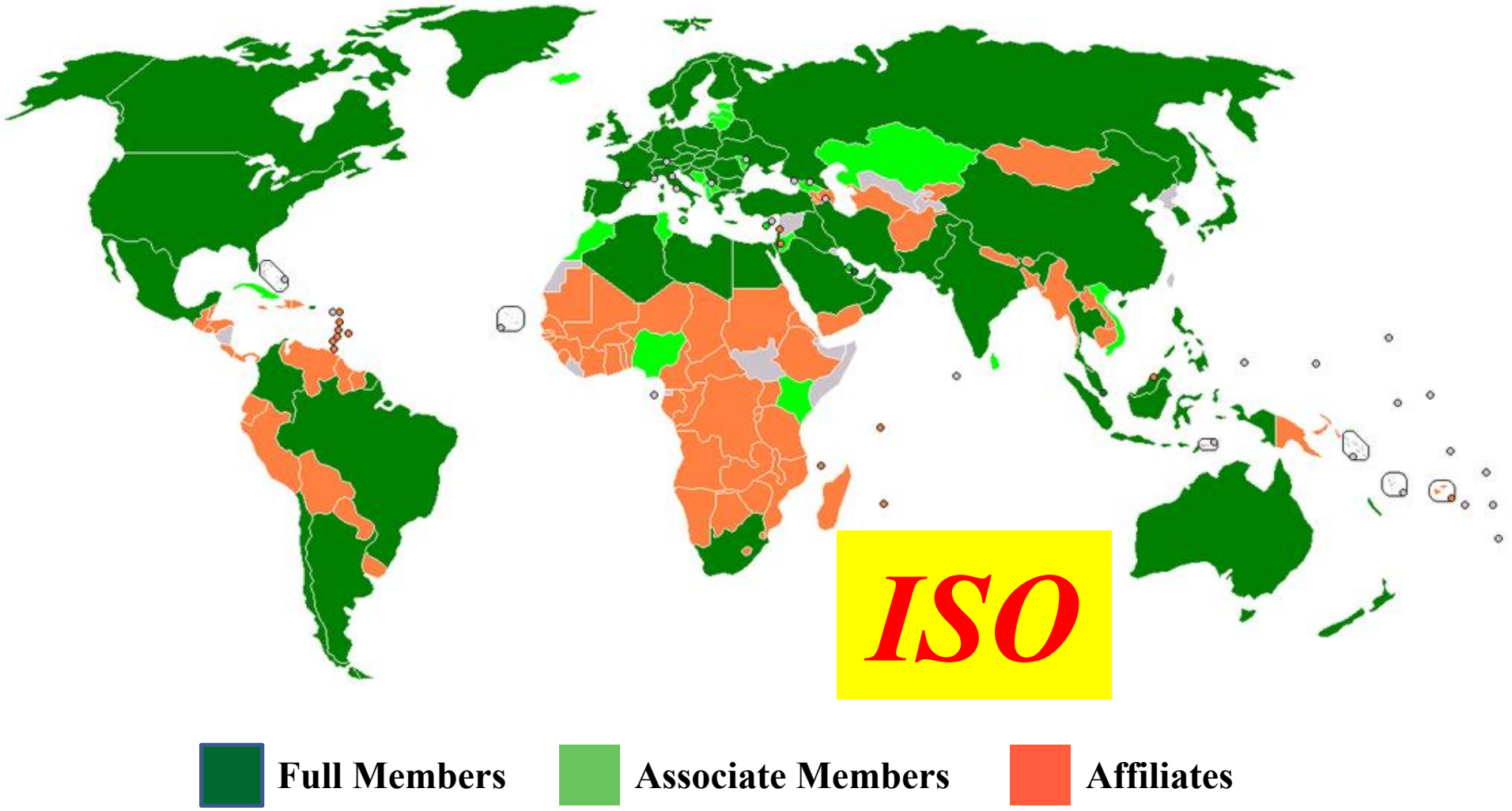
Adoption of International Standards

International Standards Harmonization:

LV Electrical Installations of Buildings



IEC Standards Users



Adoption of International Standards and Best Practices

- ***Malaysia adopts IEC & ISO standards as reference standards***
- ***Adoption, national deviations, guides and code of practices***
  - Documented in MS 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 2979: Electrical Installations of Buildings: Code of Practice: Residential buildings
    - Code of practice for water heater

Other International & National Standards

- ***IEE Wiring Regulations and BS 7671: Requirements of Electrical Installations***
  - Unique electrical standards for Malaysia
  - IEE Wiring regulations and BS 7671 can be used prior to year 2008 for new buildings
  - Sarawak still uses IEE Wiring Regulations and BS 7671
- ***Elements of standards commonly used in Malaysia today***
  - IEE Wiring Regulations and BS 7671;
  - National Electrical Code (NEC);
  - JIS (Japan), GB (China), EN (European Union)

Residential Building Standards Timeline

Time Line	(Malaya), Peninsular, FT's & Sabah	The State of Sarawak
Up to year 1991	IEE Wiring Reg. 1st – 15th Ed. ***BS 6651 / BS 7430***	IEE Wiring Reg.1st – 15th Ed ***BS 6651 / BS 7430.***
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***

Case Study: 2

Low Voltage (LV)

Electricity Act and Regulations,

and

Electrical Safety Standards

Act and Regulations: Electrical

LAWS OF MALAYSIA

REPRINT

Act 447

ELECTRICITY SUPPLY
ACT 1990

Incorporating all amendments up to 1 January 2006

Free Download:
Energy Commission

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

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

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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: 3

Risk Management (Analysis)

Moving Electrical Equipment: Motors

2/3 Consumed by Electric Motors

1 Hp motor can kill a person

Act & Regulations: Safety and Health

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

Free Download: DOSH Malaysia

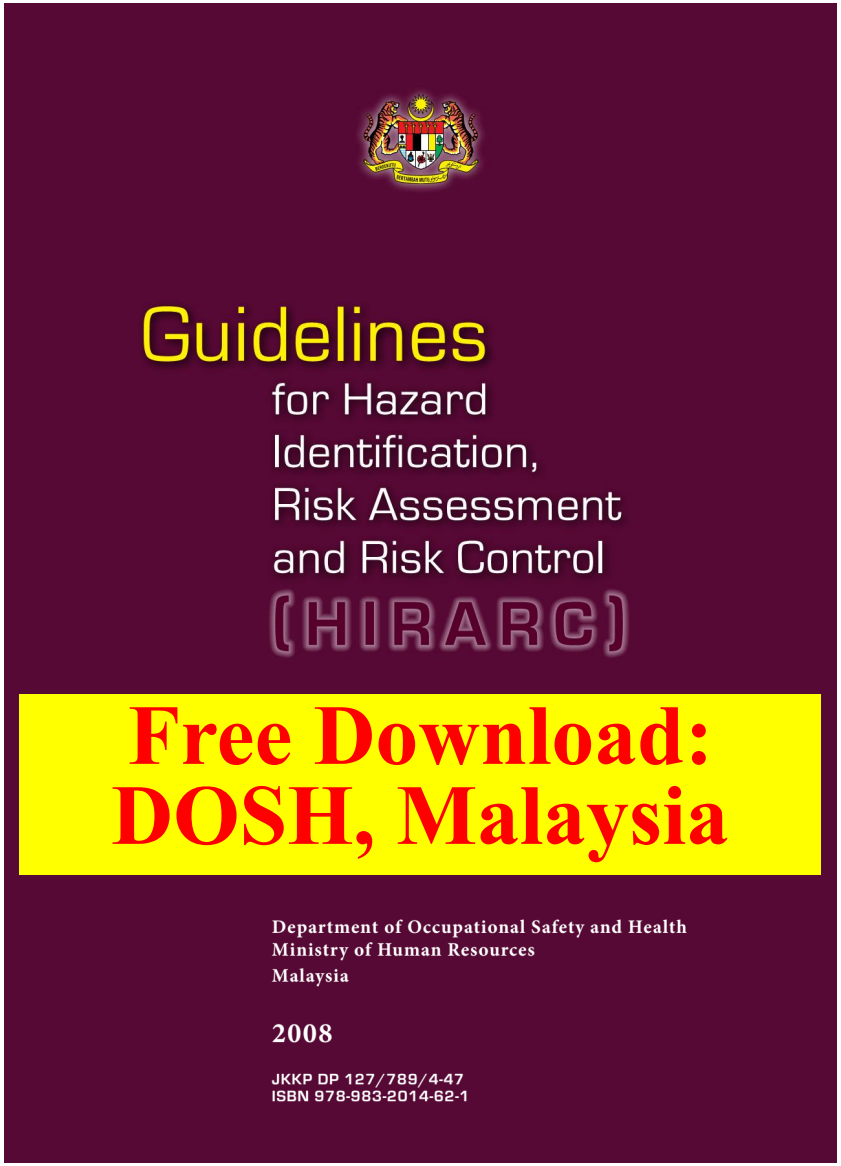
PART

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.

DOSH Guidelines & COP: Safety and Health

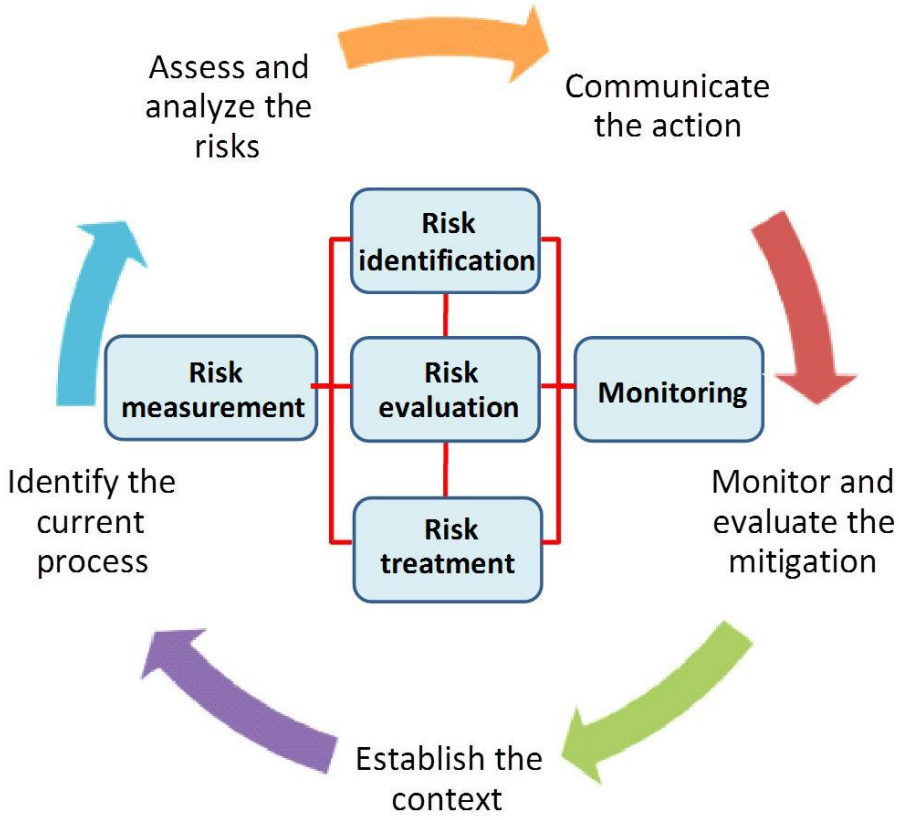


ISO 31000 standard recognized as national risk management standard, worldwide

G31000

DOSH, Malaysia, Others

ISO 31000




MALAYSIAN STANDARD
MS ISO GUIDE 73:2010
RISK MANAGEMENT - VOCABULARY
(ISO GUIDE 73:2009, IDT)
Rm. 20-00 only
ICS: 03.100.01
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DEPARTMENT OF STANDARDS MALAYSIA


MALAYSIAN STANDARD
MS ISO 31000:2010
RISK MANAGEMENT - PRINCIPLES AND GUIDELINES
(ISO 31000:2009, IDT)
Rm. 40-00 only
ICS: 03.100.01
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DEPARTMENT OF STANDARDS MALAYSIA


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
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DEPARTMENT OF STANDARDS MALAYSIA

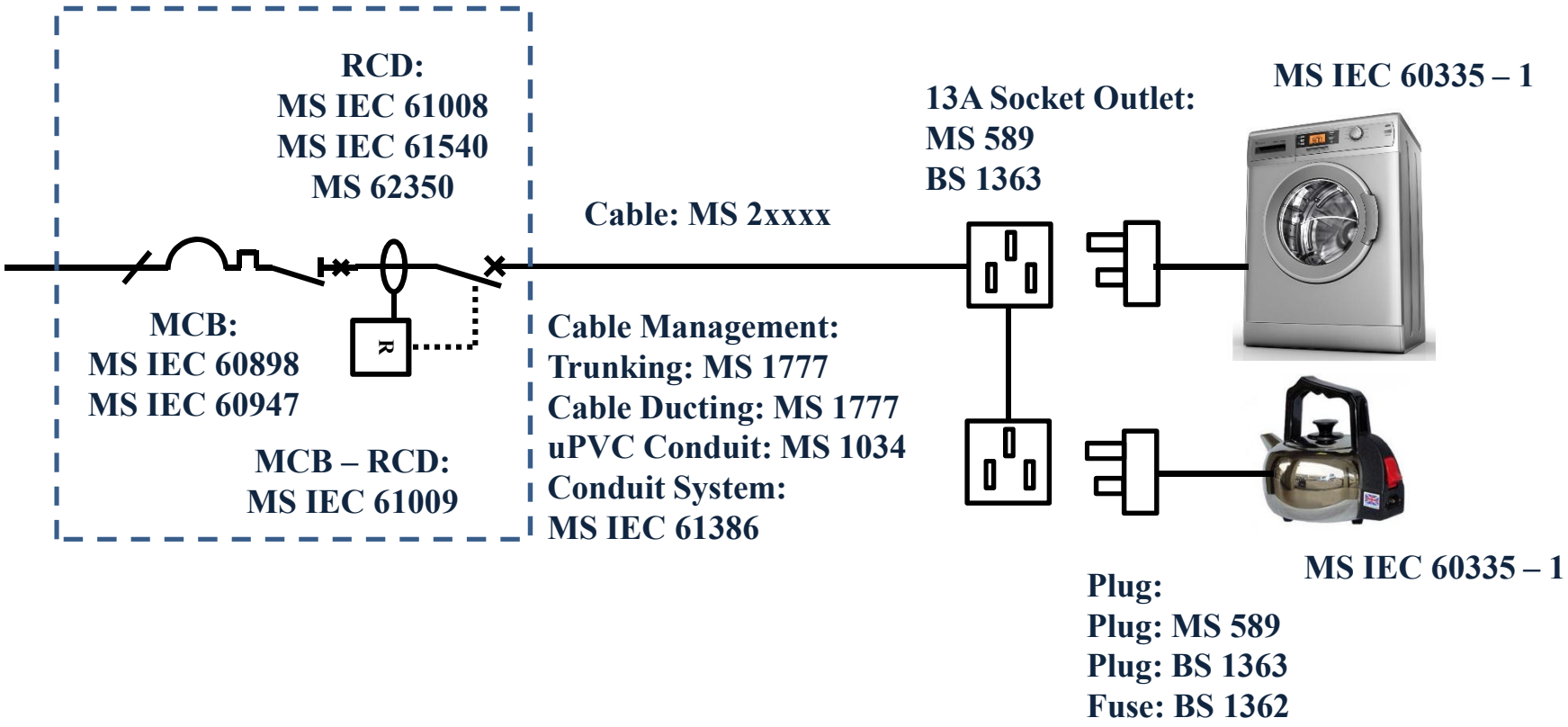
Case Study: 4

Compliance with Standards

and

Requirements of Standards

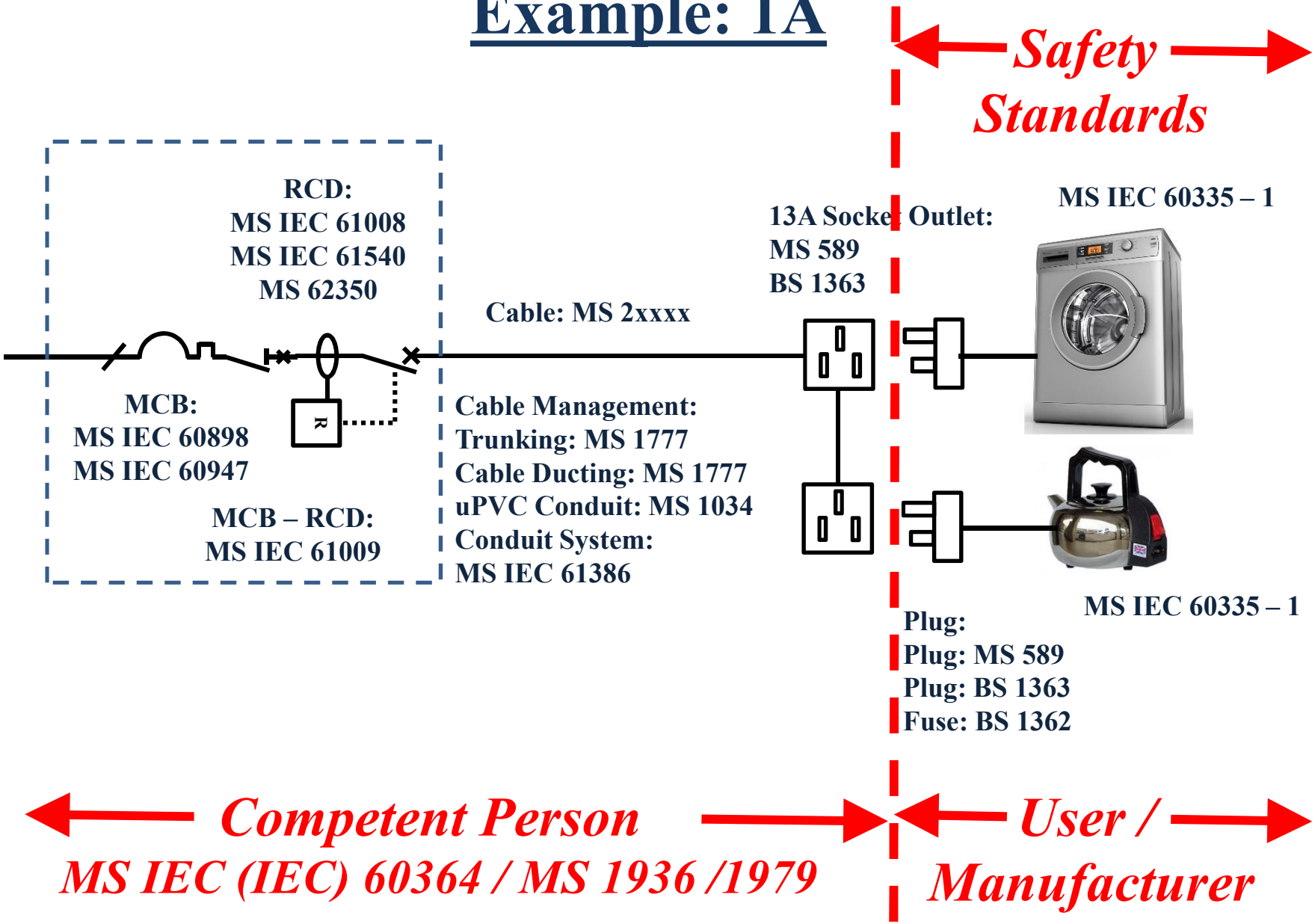
Example: 1



Comply with Acts and Regulations

Comply with Standards

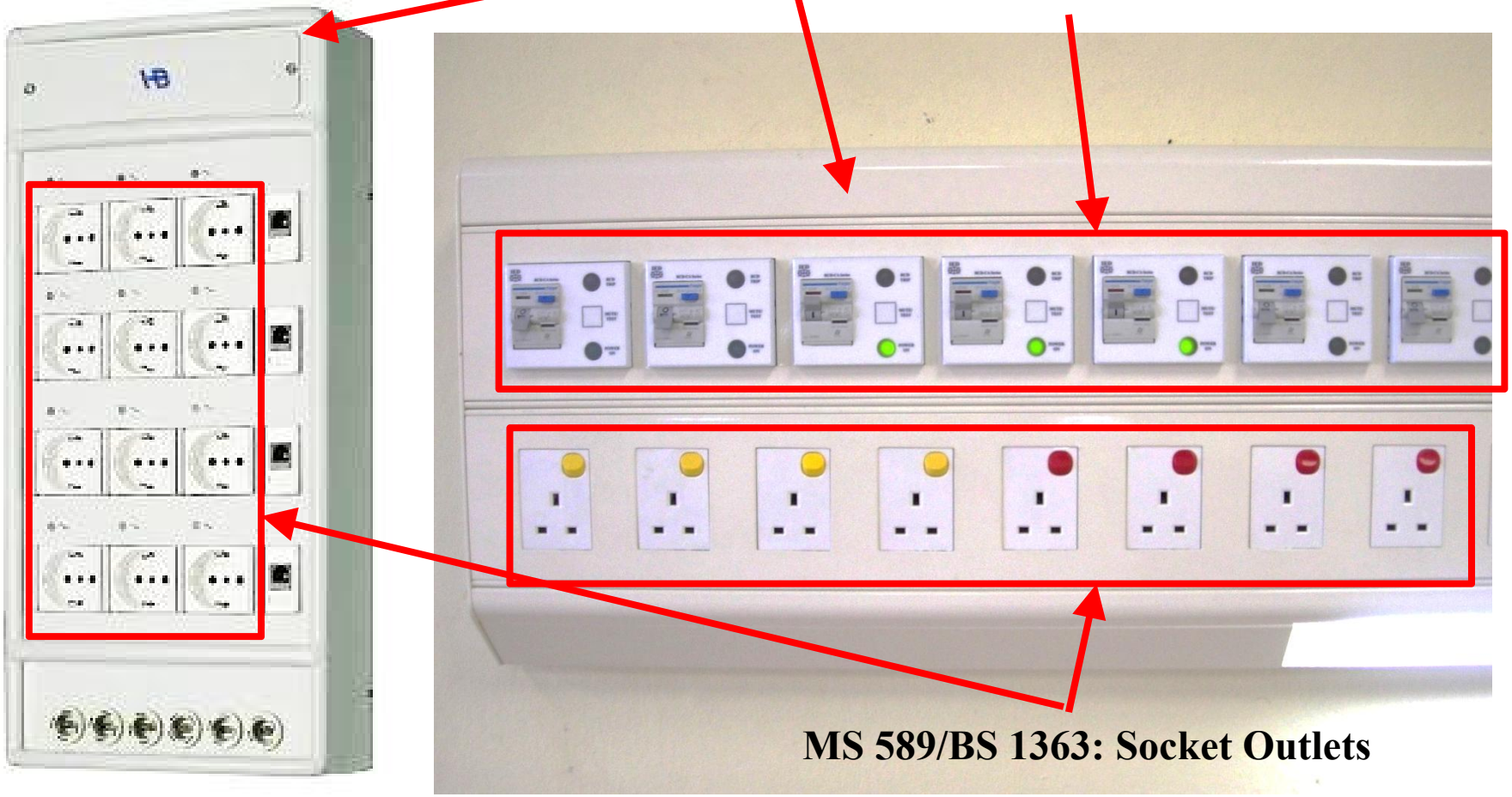
Example: 1A


Safety
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
13A Socket Outlet:
MS 589
BS 1363
Cable Management:
Trunking: MS 1777
Cable Ducting: MS 1777
uPVC Conduit: MS 1034
Conduit System:
MS IEC 61386
MS IEC 60335 – 1
MS IEC 60335 – 1
Plug:
Plug: MS 589
Plug: BS 1363
Fuse: BS 1362
Competent Person
MS IEC (IEC) 60364 / MS 1936 /1979
User /
Manufacturer

Example 2: Hospital: Pendant/Bedhead Trunking

IEC 61534: Power Track Systems

MS IEC 61008: RCD's



MS 589/BS 1363: Socket Outlets

Case Study 5:

Protection Against

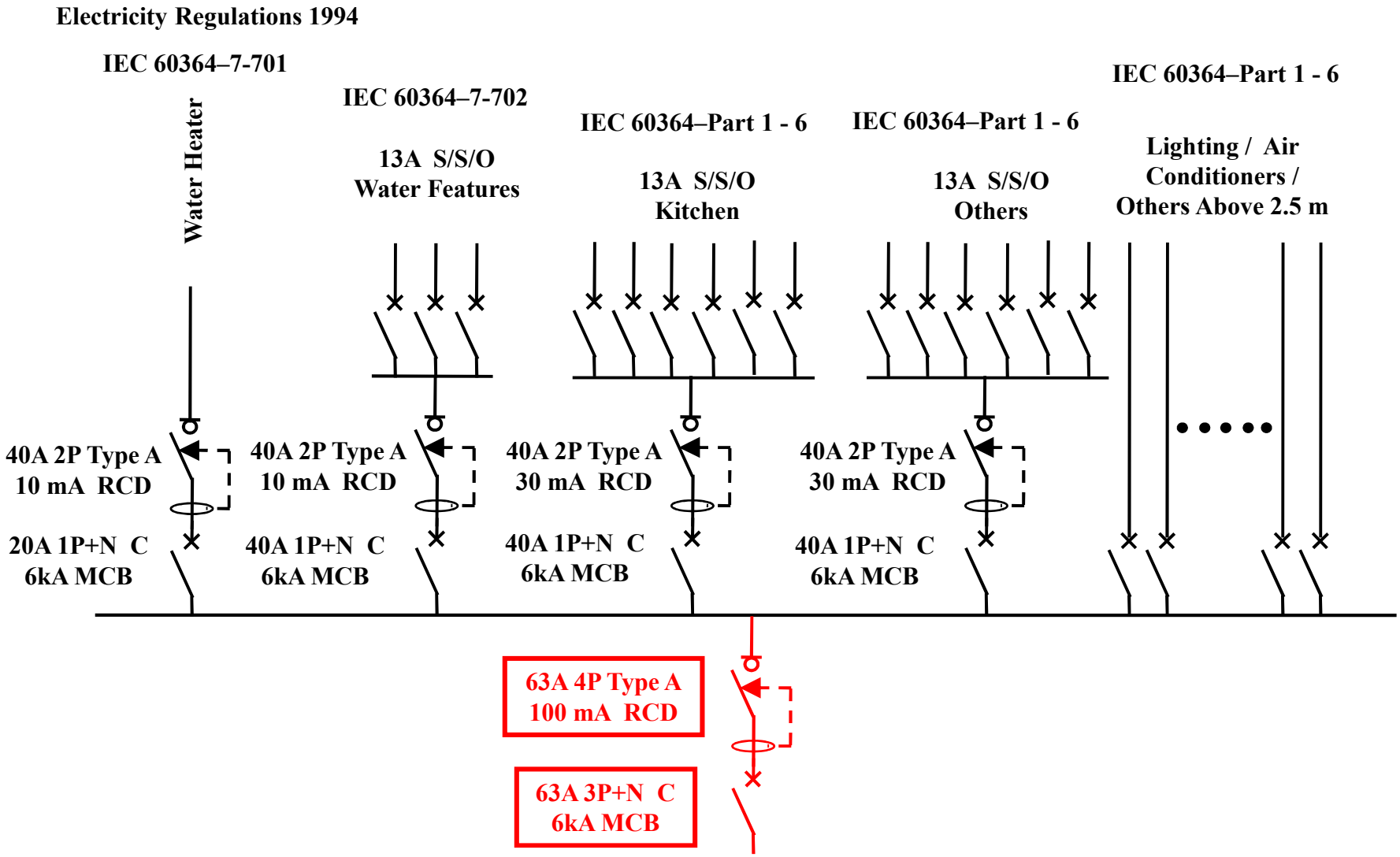
Electric Shock and Fire

at

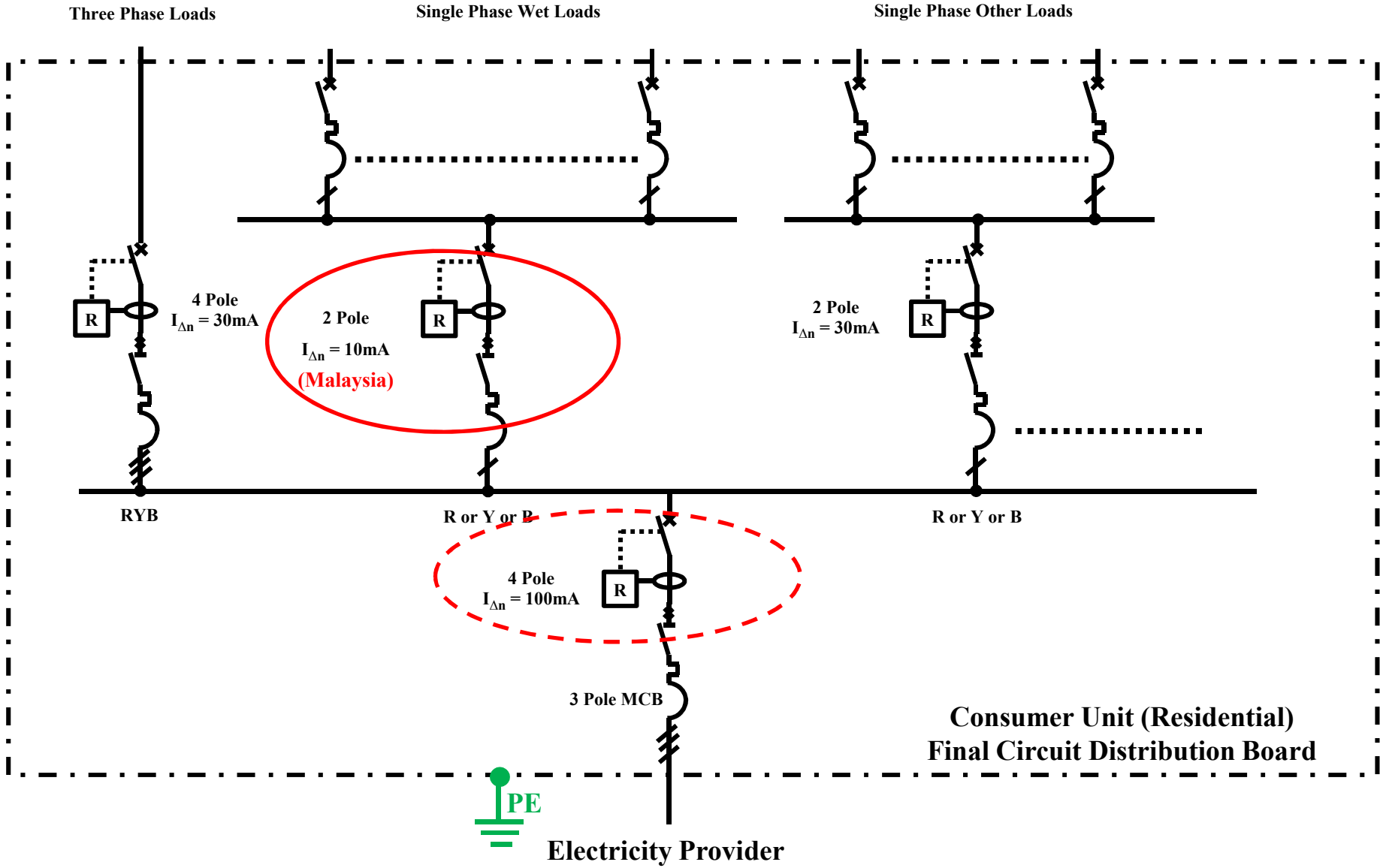
Final Distribution Board / Consumer Unit

By Residual Current Device (RCD)

Example: 1


Electricity Regulations 1994
IEC 60364–7-701
Water Heater
IEC 60364–7-702
13A S/S/O
Water Features
IEC 60364–Part 1 - 6
13A S/S/O
Kitchen
IEC 60364–Part 1 - 6
13A S/S/O
Others
IEC 60364–Part 1 - 6
Lighting / Air
Conditioners /
Others Above 2.5 m
40A 2P Type A
10 mA RCD
40A 2P Type A
10 mA RCD
40A 2P Type A
30 mA RCD
40A 2P Type A
30 mA RCD
20A 1P+N C
6kA MCB
40A 1P+N C
6kA MCB
40A 1P+N C
6kA MCB
40A 1P+N C
6kA MCB
63A 4P Type A
100 mA RCD
63A 3P+N C
6kA MCB

Example: 2


Three Phase Loads
Single Phase Wet Loads
Single Phase Other Loads
4 Pole
$I_{\Delta n}$ = 30mA
2 Pole
$I_{\Delta n}$ = 10mA
(Malaysia)
2 Pole
$I_{\Delta n}$ = 30mA
R
RYB
R or Y or B
R or Y or B
4 Pole
$I_{\Delta n}$ = 100mA
3 Pole MCB
Consumer Unit (Residential)
Final Circuit Distribution Board
PE
Electricity Provider

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

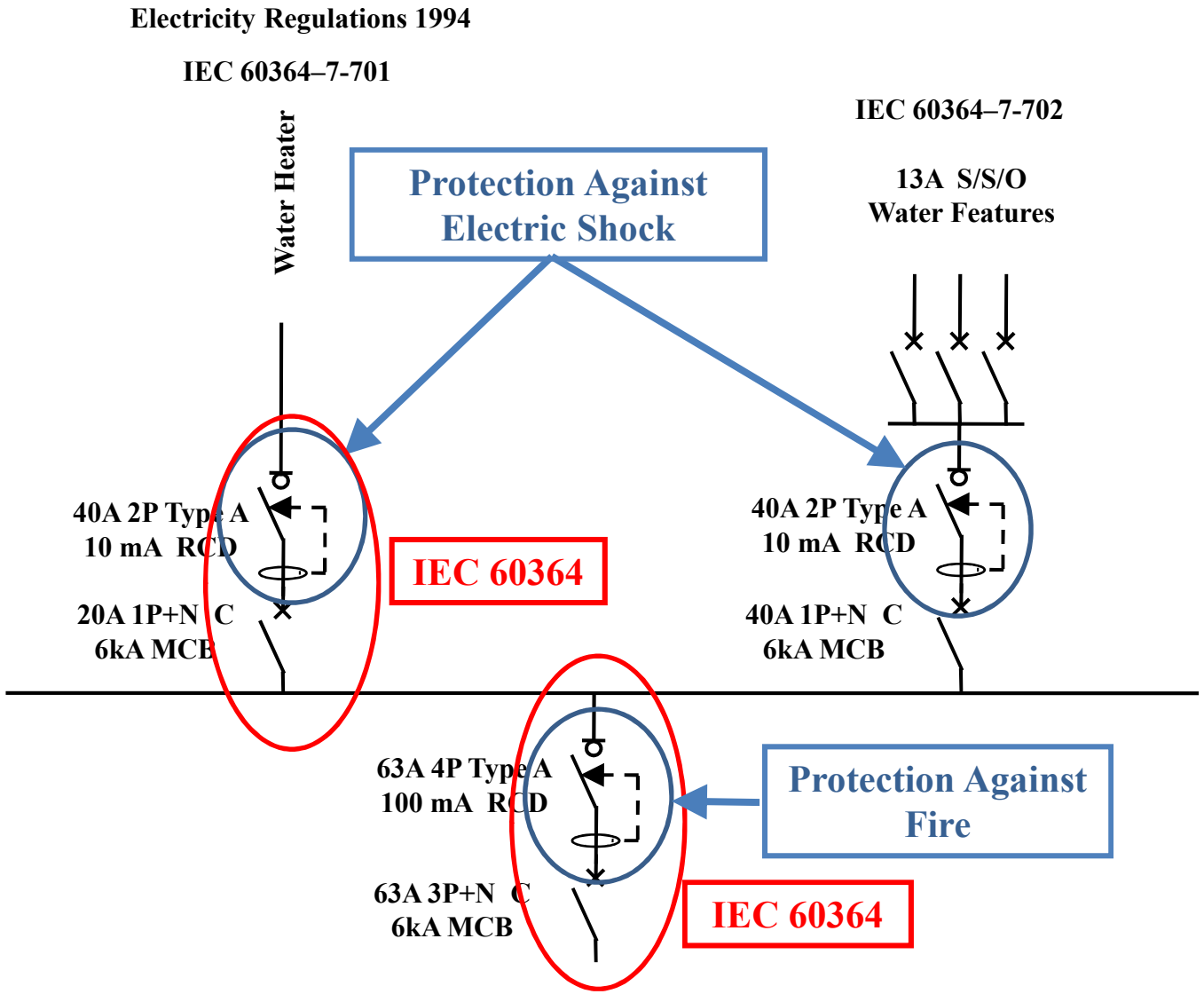
Notes:

"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



RCD Standards

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

RCD Standards

4. *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)*
5. *IEC 62350: Guidance for the correct use of RCDS for household and similar uses*
6. *IEC 60364: Electrical installations of buildings*

Open Source References

Case Study 6:

Protection Against Overcurrent

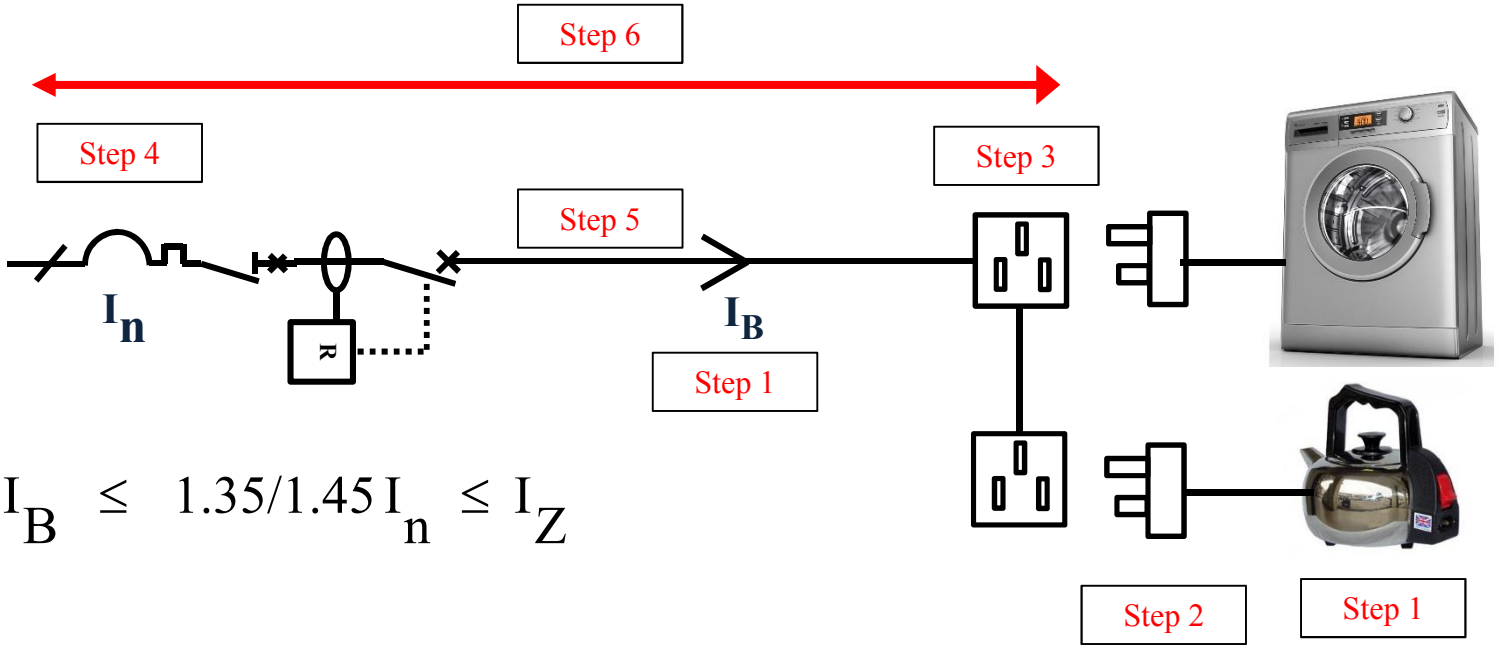
For Final Circuits

Sizing of Conductors

Protection and Sizing of Conductors

- ***Phase conductors (MS 1936 & MS 1979)***
  - To size with coordination with circuit breakers
- ***Neutral conductors (MS 1936 & MS 1979)***
  - Similar to phase conductor
- ***Protective earthing conductors***
  - By calculation; (MS 1936)
  - 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

Overload Protection & Sizing of Cables



- ***Step 1: Determine the characteristics of load & Calculate I_B***
  - V, kVA, power factor, inrush current;
  - Maximum demand and diversity factor: Refer to Tables A & B of Electricity Regulations 1994
  - Calculate I_B: The current for which the circuit is designed

Overload Protection & Sizing of Cables

- ***Step 2: Sizing protective BS 1362 fuse***
  - 1, 2, 3, 5, 7, 10, 13A

- ***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.

Conductors in Parallel

- ***Not permitted***

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)

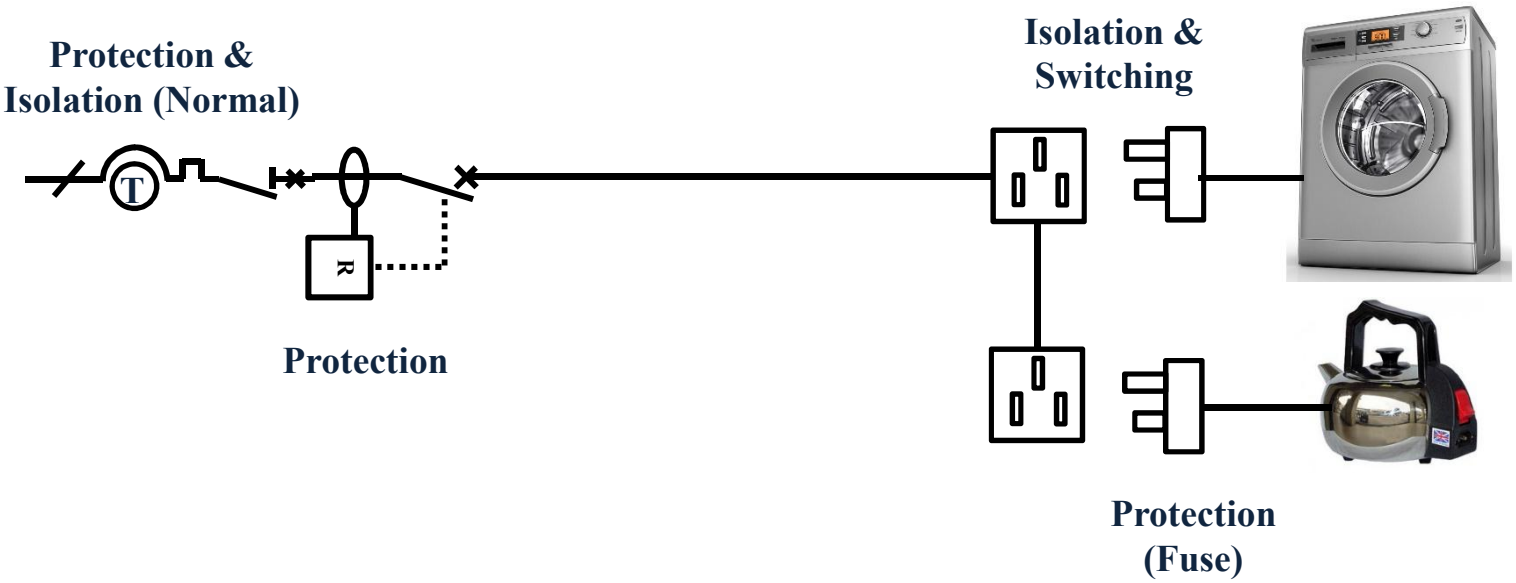
Connecting	Sheathed or Mechanically Protected	Not Mechanically Protected
Two (2) Exposed–conductive– parts	≥ ½ of the smaller protective conductor connecting to the exposed–conductive–part	≥ 4 mm^2
Exposed–conductive–part to extraneous–conductive–part	≥ ½ of the smaller protective conductor connecting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

Case Study 7:

Isolation, Switching and Control

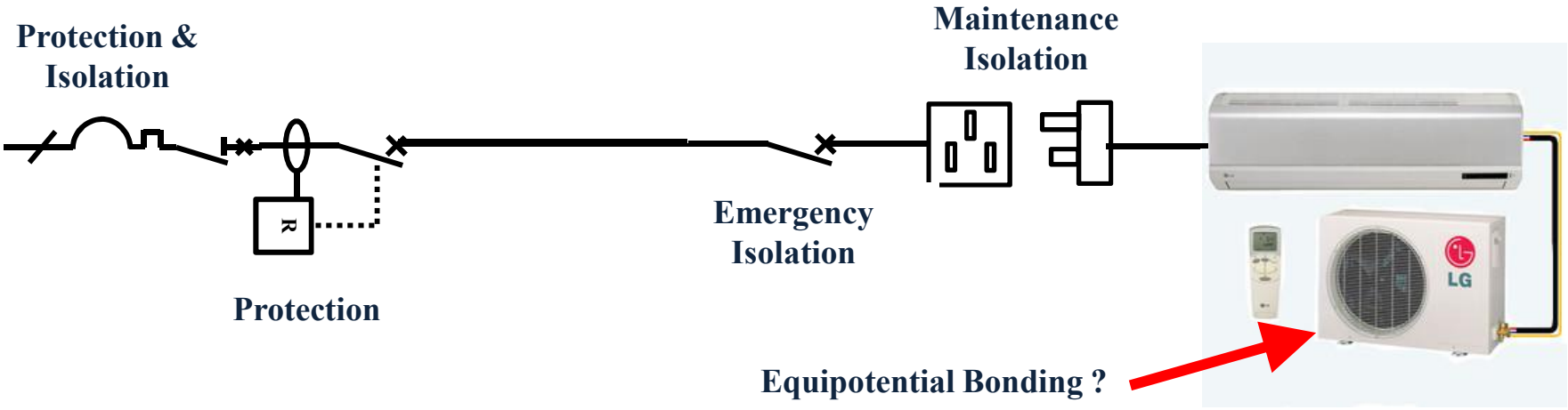
Isolation, Switching and Control

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

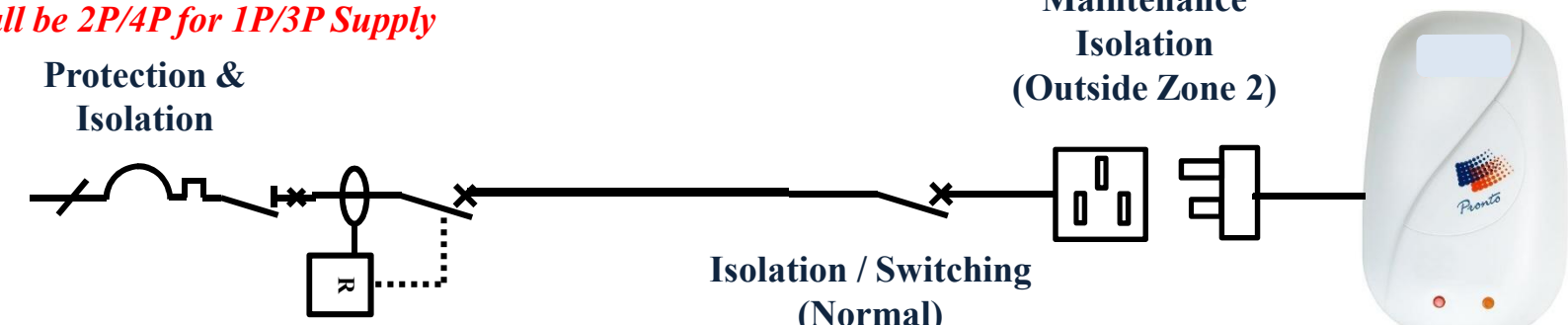


Isolation, Switching and Control

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

Protection & Isolation

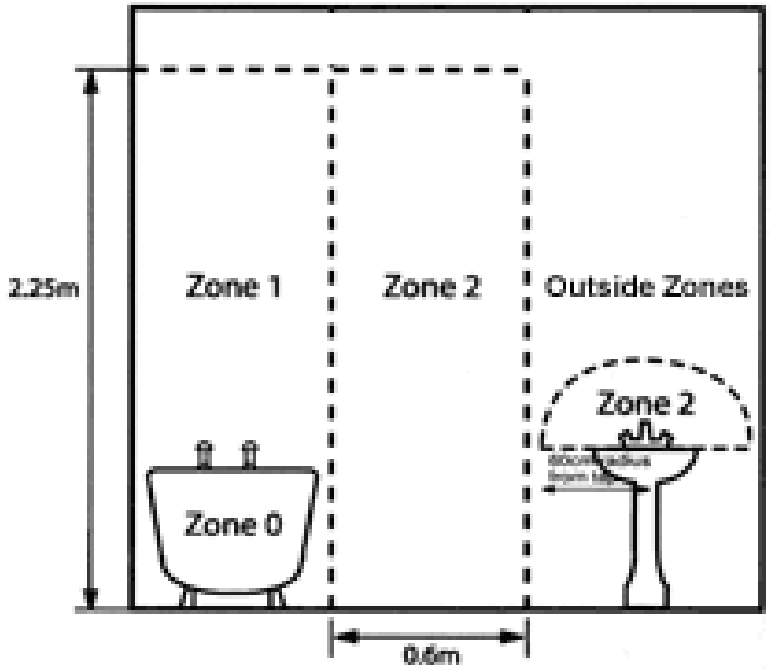
Maintenance Isolation (Outside Zone 2)

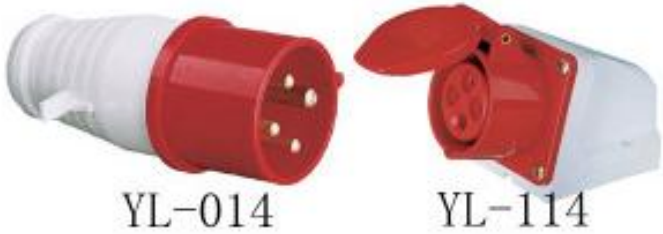


Protection

Isolation / Switching (Normal) (Outside Zone 2)

Outgoing: Equipotential Bonding





Isolation, Switching and Control

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

Public Awareness and Training, Workshops and Seminars

Target Audience Focus

Energy Commission

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Energy Commission – UMPEDAC

REGISTRATION FORM

I would like to attend the ONE (1) day Workshop on *Inspection and Testing of Low Voltage Electrical Installation in Compliance to IEC 60364/BS 7671 Chapter 6* on **7th December 2015** at **Auditorium, Suruhanjaya Tenaga, Putrajaya.**

Name & Designation:

……

……

Organization:

……

Correspondence Address:

……

……

Tel:…… Fax: ……

Email:……

Crossed Cheque No. & Bank:

……

FEE & PAYMENT METHOD

- **Fees: RM450.00** (inclusive of GST) per participant.
- The fees include course materials and meals only.
- All payment can be made via Crossed Cheque payable to **"GLOBAL INSIGNIA SDN. BHD."** at UMPEDAC, Level 4, Wisma R&D, Jalan Pantai Baharu, University of Malaya, 59990 Kuala Lumpur.
- Payments can also be made by Bank Transfer to account **CIMB Bank Berhad 80-0129617-9** and submit the proof of payment to Pn. Attisa at attisa@um.edu.my
- Complete participation forms and full payments must be made before **16th November 2015.**
- Kindly contact 03-22463251 (Pn. Liyana) for more information.

IEM001

ORGANIZER

UMPEDAC

UM Power Energy Dedicated Advanced Centre (UMPEDAC) was established in 2000 as a research laboratory in University of Malaya to specialize in power and energy related fields. Founded by Prof Dr Nasrudin Bin Abd Rahim, UMPEDAC has grown rapidly over the years. From 2009, UMPEDAC has been consistently recognized as a Higher Institution Centre of Excellence (HICoE) by the Malaysian Ministry of Higher Education. UMPEDAC is also the first HICoE in Engineering Cluster. The core businesses of UMPEDAC include conducting high impact research (covering fundamental research, development of lab-scale prototype and commercializing the final product), offering consultancy services to the power and energy industry, organizing technical courses and trainings in engineering skills, conducting Postgraduate Programs (PhD, MPhil, and taught courses), and also offering Specialist Research Facilities in Solar Energy. This course will be organized by UMPEDAC through its spin-off company, Global Insignia Sdn. Bhd.

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Suruhanjaya Tenaga
Energy Commission

The Energy Commission is a statutory body established under the Energy Commission Act 2001. The Energy Commission is responsible to regulate the energy sector, in particular the electricity supply and piped gas supply industries. The Energy Commission ensures that the supply of electricity and piped gas to consumers is secure, reliable, safe and at reasonable prices.

SUPPORTING ORGANIZATION

Cu International Copper Association Southeast Asia
Copper Alliance

Headquartered in New York, and with over 35 offices around the world, the International Copper Association (ICA) is a not-for-profit organization dedicated to promoting the correct application and efficient usage of copper, mostly used for its high electrical conductivity. ICA is also a knowledge partner for the upgrading of standards and skills of professionals in industry.

Approved CPD hours

Inspection and Testing of Low Voltage Electrical Installation in Compliance to IEC 60364/BS 7671 Chapter 6 (IEE Wiring Regulations)

Venue: Auditorium, Suruhanjaya Tenaga, Putrajaya

Date: 7th December 2015

SIRIM: Public Comments

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

ORGANISED BY: mosti STANDARDS MALAYSIA

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.

IN THE PROCESS TO GET CCD AND CDP/ PDP POINTS

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- Contractors
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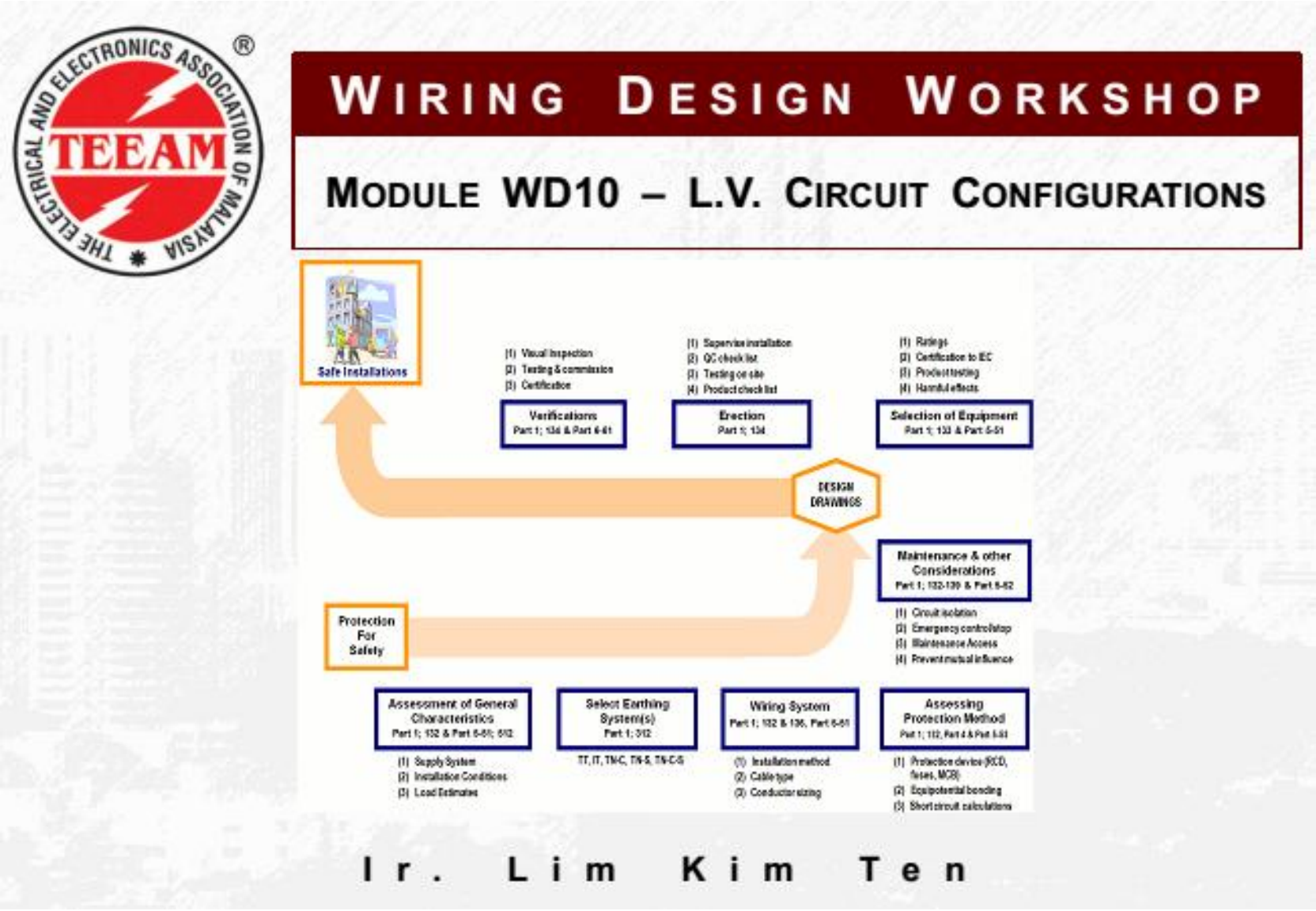
MANAGED BY: SIRIM BERHAD

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

TEEAM


THE ELECTRICAL AND ELECTRONICS ASSOCIATION OF MALAYSIA
TEEAM
WIRING DESIGN WORKSHOP
MODULE WD10 – L.V. CIRCUIT CONFIGURATIONS
Safe Installations
(1) Visual Inspection
(2) Testing & commission
(3) Certification
Verifications
Part 1; 134 & Part 6-61
(1) Supervise installation
(2) QC check list
(3) Testing on site
(4) Product check list
Erection
Part 1; 134
(1) Ratings
(2) Certification to IEC
(3) Product testing
(4) Harmful effects
Selection of Equipment
Part 1; 133 & Part 5-51
DESIGN DRAWINGS
Maintenance & other Considerations
Part 1; 132-139 & Part 5-52
(1) Circuit isolation
(2) Emergency control/stop
(3) Maintenance Access
(4) Prevent mutual influence
Protection For Safety
Assessment of General Characteristics
Part 1; 132 & Part 5-51; 512
(1) Supply System
(2) Installation Conditions
(3) Load Estimates
Select Earthing System(s)
Part 1; 312
TT, IT, TN-C, TN-S, TN-C-S
Wiring System
Part 1; 132 & 136, Part 5-51
(1) Installation method
(2) Cable type
(3) Conductor sizing
Assessing Protection Method
Part 1; 132, Part 4 & Part 5-53
(1) Protective device (RCD, fuses, MCB)
(2) Equipotential bonding
(3) Short circuit calculations
Ir. Lim Kim Ten

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1 DAY COURSE ON "RCDs"

Organised by:
Electrical Engineering Technical Division

BEM APPROVED CPD/PDP HOURS: 6.5
IEM15/HQ/384/C

Date: **13th November 2015 (Friday)**
Time: 9.00am to 5.30pm
Venue: CS & TUS Lecture Hall, 2nd Floor, Wisma IEM, PJ

SYNOPSIS

This course will focus on all the relevant IEC/MS standards on RCDs (such like MS IEC 61008 RCCB and MS IEC 61009 RCBO) in design, technology, selection and installation.

SPEAKER'S BIODATA

Mr. Dahari Mat Siran is currently the Marketing Manager of Hager Engineering, an international electrical company based in Germany and France. He graduated with Degree in Electrical Engineering from Monash University, Melbourne, Australia in 1991. He has started his carrier with Schneider Scott & English (Schneider Electric) as a Technical Engineer for 5 years. He has more than 20 years' experience in electrical industry, with good knowledge of sales and marketing function, experienced presenter and trainer. He is familiar with LV electrical protection system, electrical control, wiring accessories and building automation system, especially the European Installation Bus (EIB/KNX). He is also involved intensively in the Working Group and Technical Committee for developing Malaysian Standard (MS) for LV electrical installation, distribution and switching. He also the Chairman for Electrical Safety and Quality Committee, TEEAM.

Ir. Yau Chau Fong
Chairman,
Electrical Engineering Technical Division

PROGRAMME	
09:00-10:30am	1) Standards a. All relevant IEC/MS standards b. ST/SIRIM/JKR requirement 2) RCD range a. All types of RCDs
10:30-10:45am	BREAKFAST
10.45-12:30pm	1) RCCB & RCBO a. Definition and introduction b. Usage 2) Selection guide a. Important parameters of RCCB & RCBO b. Labeling and Marking
12:30 – 1:00pm	LUNCH
1:00 – 3.30pm	Type and class a. Types: AC, A, B & F b. Class: G & S
3:30 -3.45pm	TEA BREAK
3:45 – 5.30pm	Drawing and Symbols 7. Common errors in circuit design 8. Tripping and the solutions 9. Testing methods 10. Conclusion

REGISTRATION FEES (EXCLUDING GST)

IEM Graduate Member	RM 250.00 (Online)	RM 300.00 (Normal)
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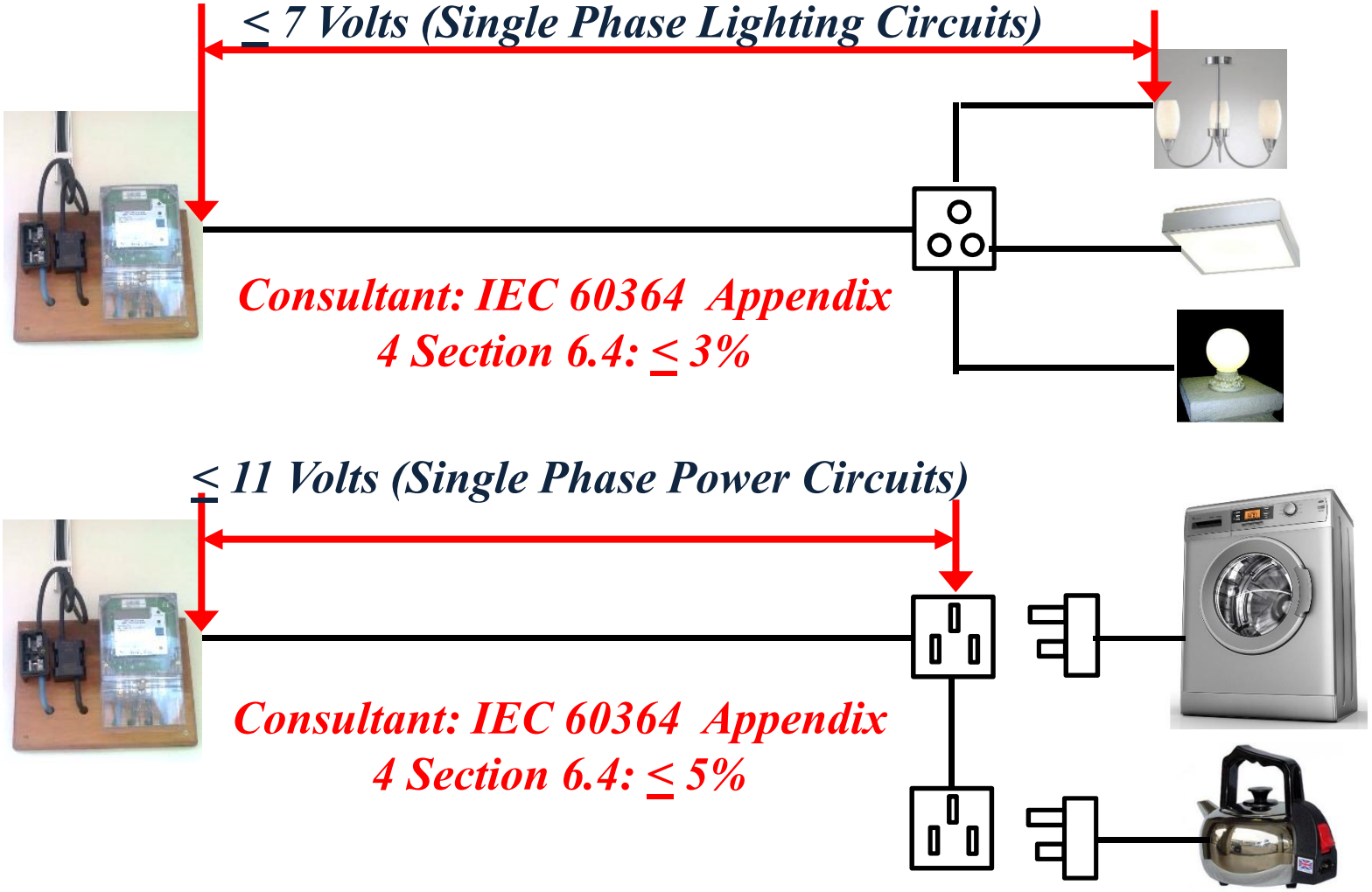
Reply slip (Fax to : 03-7957 7678)
1 DAY COURSE ON " SECURITY SYSTEM"
Chairman, Electrical Engineering Technical Division, IEM
I/We wish to enroll the following person(s) to the Seminar on **13th Nov 2015 (Friday)**

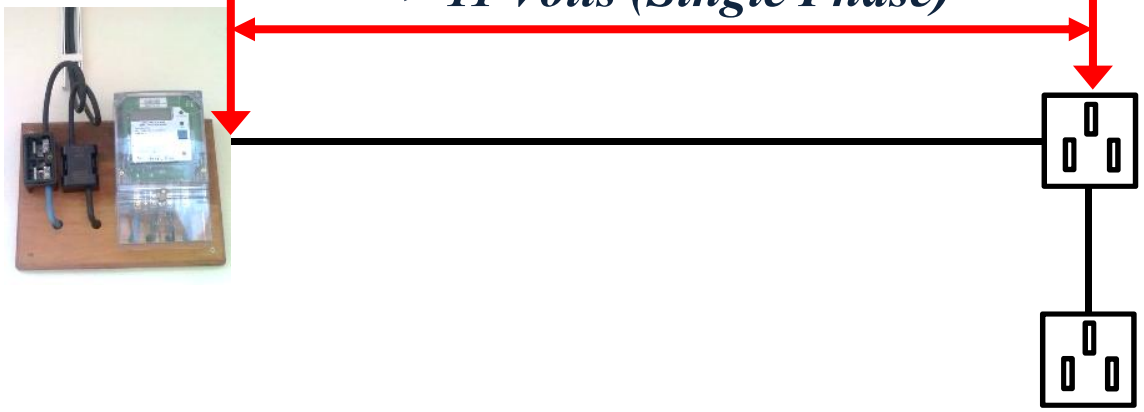
Audience Focus:

Permitted Voltages Drops



Audience Focus:

Permitted Voltages Drops



FIRE

YOU are responsible

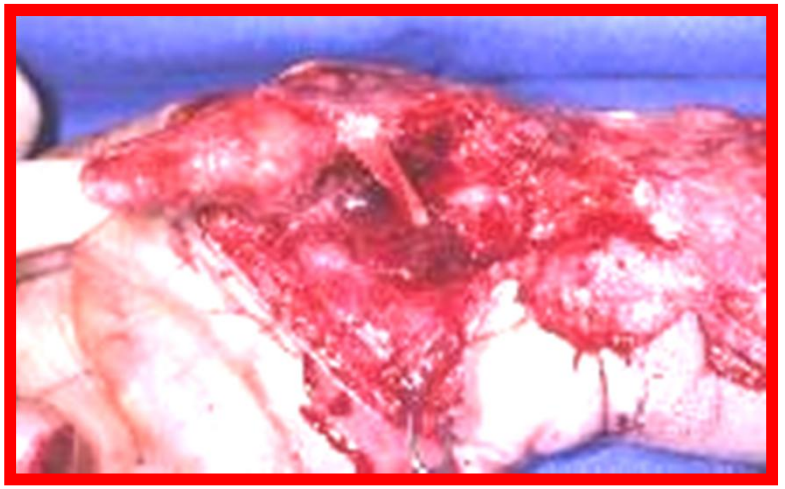
For

your Safety

"Survival" Voltage:

Guinness Book of World Records

- ***Harry F. Mcgrew (Huntington Canyon, Utah, USA***
  - Direct contact with a ***340,000 volt*** transmission line and survived
- ***Brian Latasa (Griffith Park, Los Angeles, USA)***
  - Received a ***230,000 volt*** shock and survived



“Survival” Voltage:

Guinness Book of World Records

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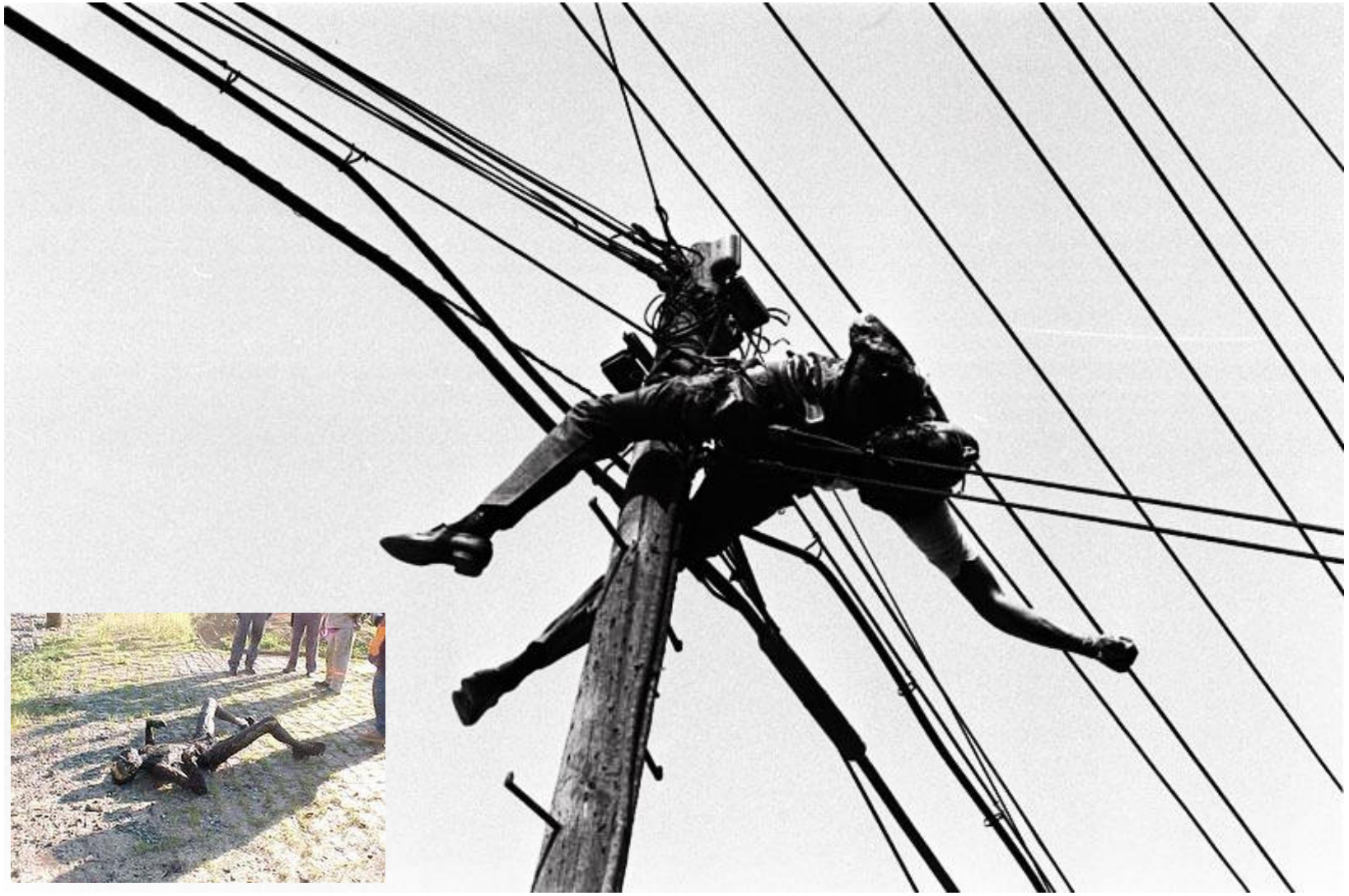

Your Safety Depends on You:

Your Choice

Our Objective?

NATIONAL
CONFERENCE ON

End of

Enhancing Compliance

To

MS IEC 60364 – Standards for

Residential Wiring

Any Questions ?

KUALA LUMPUR, MALAYSIA