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Strengthening Electrical Safety Practices through Legislation

Presented By

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Organized by:



Contents



- The Energy Commission
- Legal Framework
- Safety Functions
- Statistics of electrical accident cases
- Electrical installations & Maintenance of Installations
- Regular inspection by a Competent Person
- Competent Person to work and operate installations
- Protection relays and RCD
- Conclusions

THE ENERGY COMMISSION (ST)



Roles

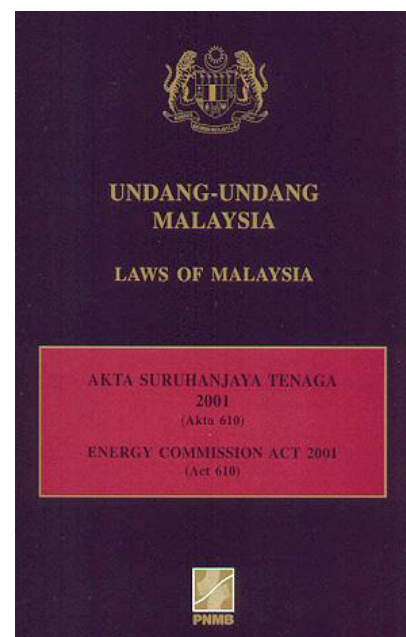
The Energy Commission is the regulator for the electricity and gas supply industry. It's key role is to regulate the energy industry based on the provision provided under Energy Commission Act (2001) and other related Acts of Malaysia.

The Commission aims to balance the needs of consumers and providers of energy to ensure safe and reliable supply at reasonable prices, protect public interest, and foster economic development and competitive markets in an environmentally sound manner.

With regards to **Safety**, to protect person from dangers arising from the generation, transmission, distribution of supply and the use of electricity as provided under the electricity supply laws, and supply of gas through pipelines and the use of gas as provided under the gas supply law.

Legal Framework

- Energy Commission Act 2001
- **Electricity Supply Act 1990**
- Gas Supply Act 1993
- **Electricity Regulation 1994**
- Licensee Supply Regulations 1990
- Efficient Management of Electrical Energy Regulations 2008
- Licences' terms and conditions
- Grid Code and Distribution Code
- Circulars and Guidance
 - www.st.gov.my



FUNCTIONS ON SAFETY



Electrical safety regulations, focusing on:

- Safe working and operation of electrical installations;
- Safe use of electricity & electrical equipment;
- Safety of personnel;
- Competency of electrical engineers, supervisors and workers;
- Safety standards of electrical installations & equipment.

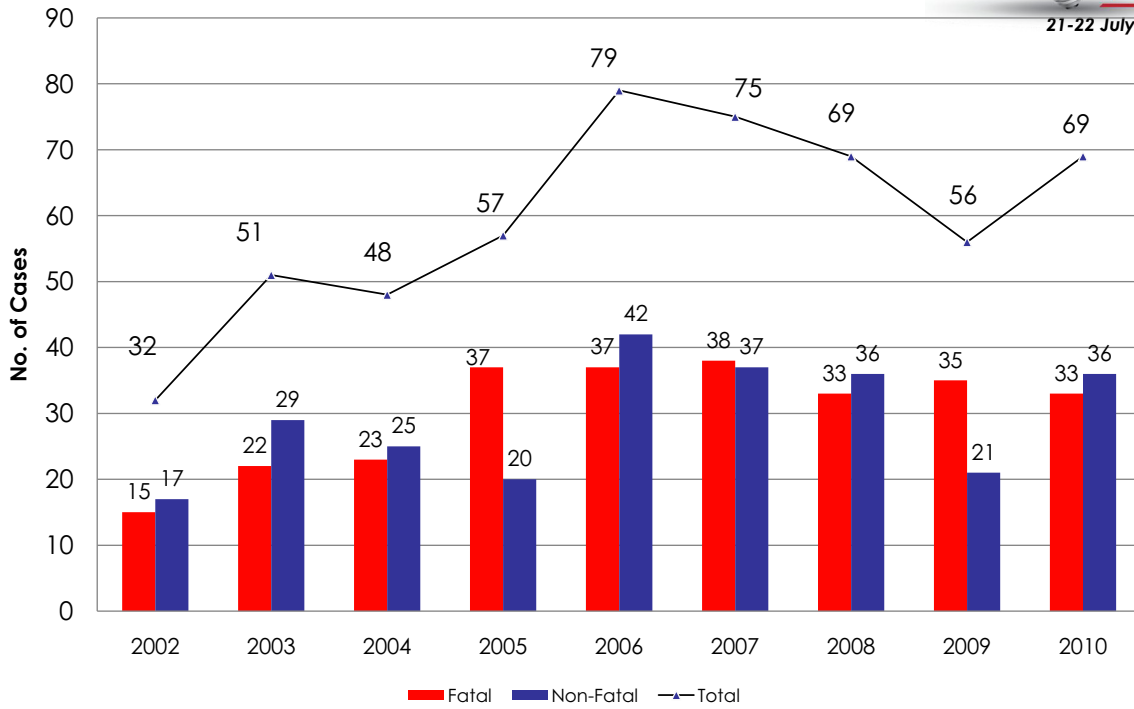
What are the causes of Electrical Failure



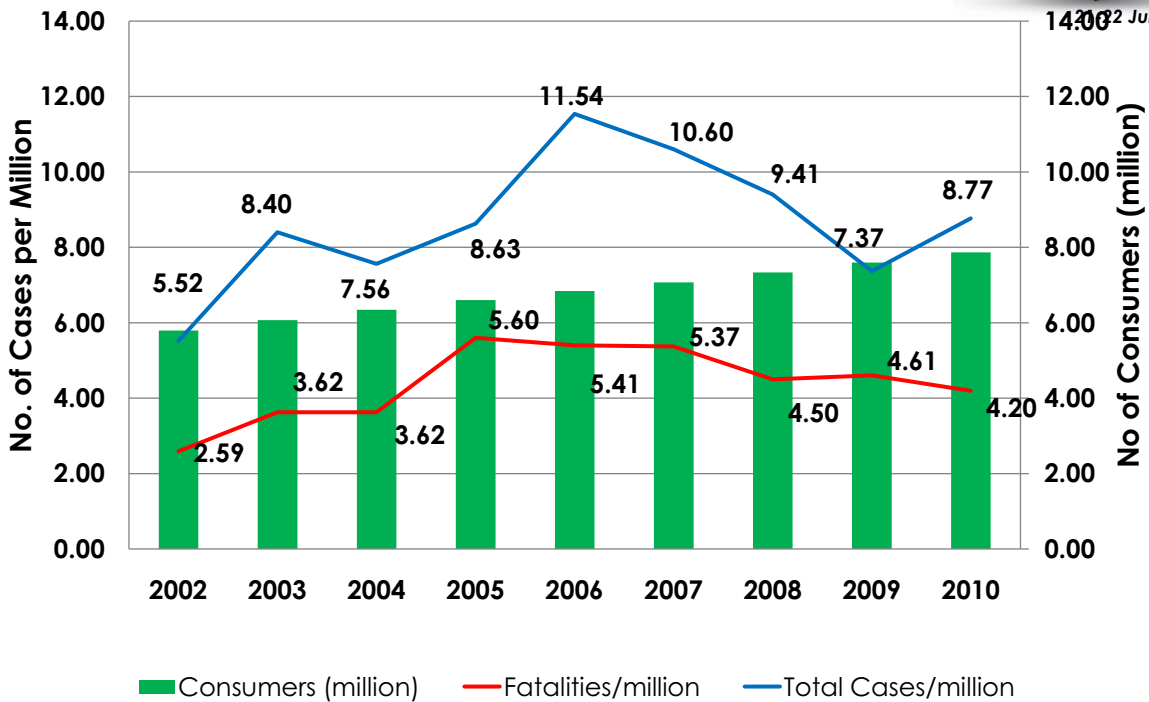
- Many studies and electrical safety books have listed some reasons of electrical failure; such as,
 - Failure at design stage
 - Failure at manufacturing stage
 - Transporting and storing of equipments
 - Improper installation
 - Improper operation
 - Lack of maintenance; and
 - others eg. third party intervention ; vandalism

**MEASURES OF SAFETY - NUMBER OF ELECTRICAL ACCIDENT CASES
MAY BE ONE OF THE INDICATOR.**

No. of Electrical Accident Cases (2002 - 2010)



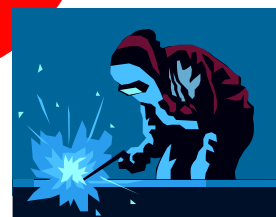
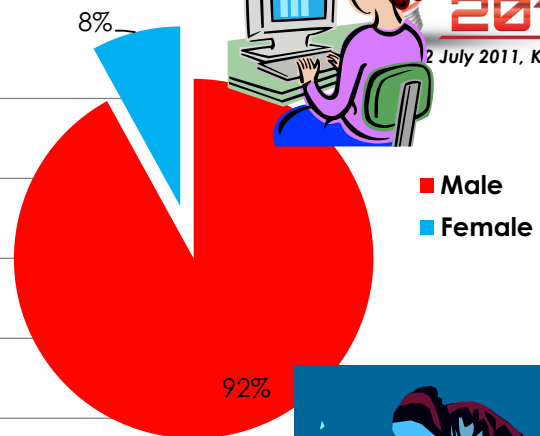
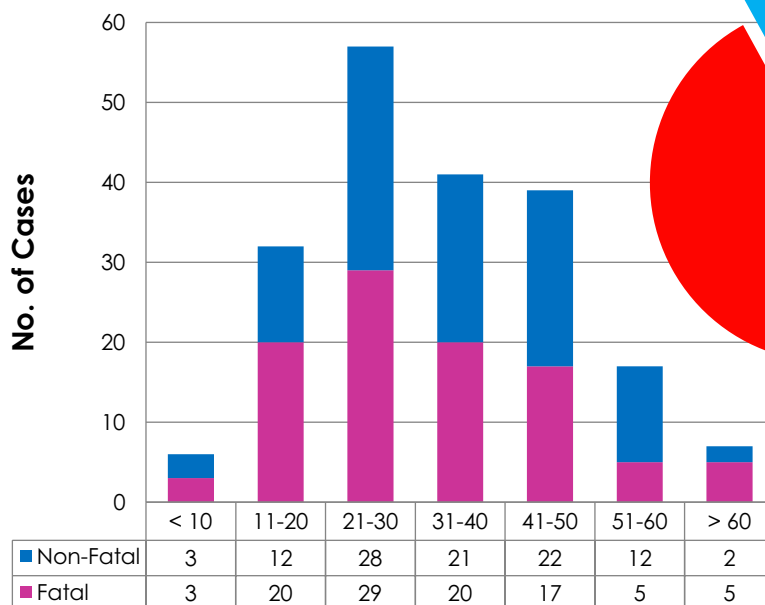
Number of Electrical Cases/ Million Consumers



Comparisons of electrical accident cases with other countries.

	Juta	Kes	Persejuta	Kes	Persejuta
	Penduduk	Kemalangan	Penduduk	Maut	Penduduk
Jepun (2007)	128	136	1.062	14	0.120
Singapura (2008)	4.8	3	0.62	2	0.410
U.Kingdom (2005)	59	3272	55.45	46	0.780
Malaysia (2010)	28	69	2.464	33	1.178
Korea (2007)	48	617	12.84	68	1.410
Perancis (2007)- Domestik	60	4100	68.4	100	1.700
Spanyol (2007)	44	5012	113.37	162	3.620
Data dari persidangan FISUEL .					

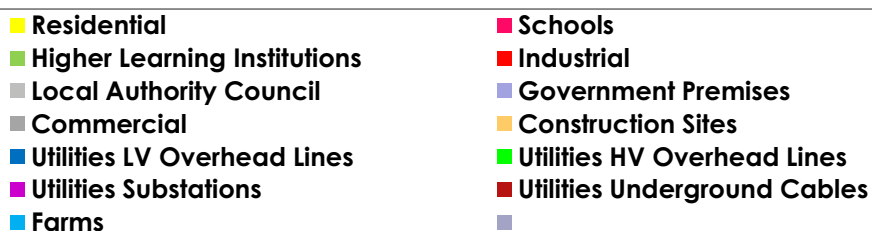
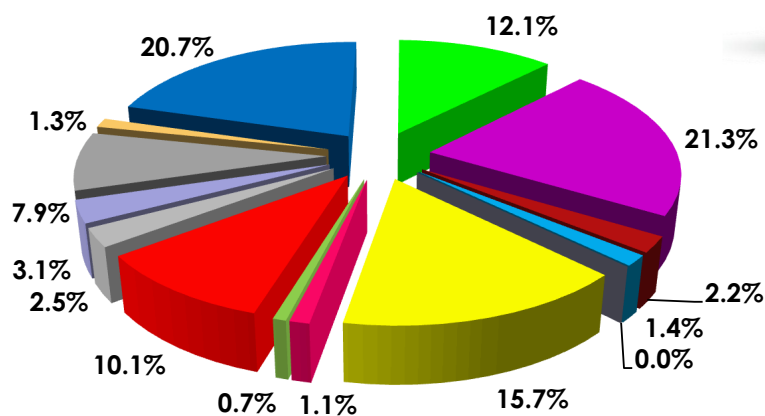
No. of Cases Vs Age Group



LOCATION OF ELECTRICAL ACCIDENTS (2002 – June 2011)

LOCATION	No. of Cases	Percentage
Residential	87	15.7%
Schools	6	1.1%
Higher Learning Institutions	4	0.7%
Industrial (Kilang)	56	10.1%
Local Authority Council	14	2.5%
Government Premises	17	3.1%
Commercial	44	7.9%
Construction Sites	7	1.3%
Utilities LV Overhead Lines	115	20.7%
Utilities HV Overhead Lines	67	12.1%
Utilities Substations	118	21.3%
Utilities Underground Cables	12	2.2%
Farms	8	1.4%
Total	555	

Locations of Electrical Accidents





Utility Installation

Galah besi cetus pancaran arka



PEKEBUN sawit disaran menggunakan galah jenis fiber bagi mengelakkan kejadian rontatan elektrik berulang.

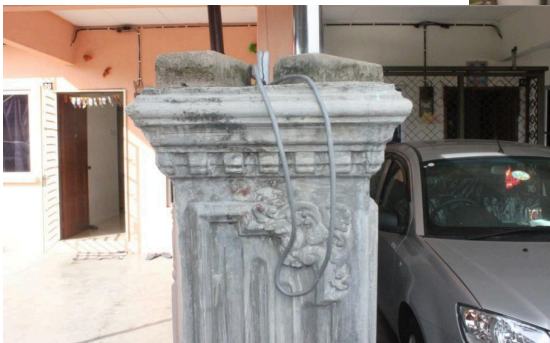
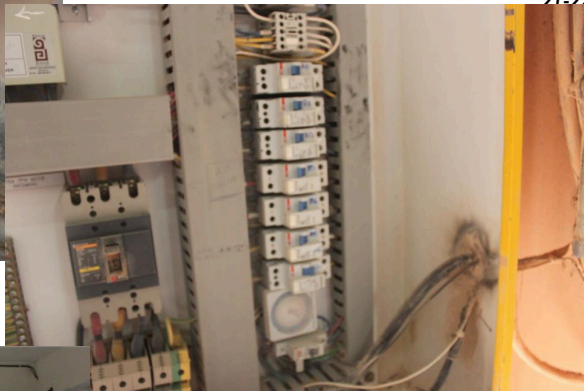
PENGARAH Jabatan Kawal Selia Keselamatan Elektrik, Suruhanjaya Tenaga, Abdul Rahim Ibrahim berkata, sepanjang tahun lepas, terdapat 55 kes kemalangan elektrik berlaku di negara ini dan 34 kes daripadanya membawa kepada kematian. Antara punca utama kemalangan itu ialah pemasangan atau penyenggaraan yang tidak sempurna dan kegagalan mematuhi prosedur kerja yang selamat. Abdul Rahim menjelaskan kemalangan elektrik yang berpunca daripada penggunaan galah besi seperti yang dialami Muhammad Hairuman telah berlaku beberapa kali sebelum ini. Katanya, galah besi atau aluminium yang digunakan di ladang-ladang sawit kebiasaannya dibawa secara menegak. "Ketinggian galah tersebut boleh memecah talian bertegangan tinggi yang merentasi ladang-ladang kelapa sawit. "Jika bersentuhan atau menghampiri talian, pancaran

arka mungkin berlaku dan mangsa boleh mengalami kebakaran serius. "Pemilik ladang sawit dicadangkan supaya menukar penggunaan galah besi atau aluminium ini kepada jenis fiber yang mempunyai penebatan yang tinggi dan lebih selamat," katanya. Abdul Rahim turut menyeru orang ramai supaya mengambil iktibar akan kejadian yang menimpa Sazila. "Lazimnya hujan akan didahului dengan ribut yang kadangkala menyebabkan pokok tumbang dan menimpa talian elektrik, sehingga talian itu terputus dan jatuh ke tanah. "Talian yang jatuh itu adakalanya masih bertegang. Sekiranya terjatuh ke dalam lopak atau kawasan berair, pengaliran elektrik boleh berlaku dan sentuhan pada air boleh menyebabkan kejutan elektrik. "Orang ramai dinasihatkan supaya sentiasa menganggap talian itu masih bertegang dan berbahaya, serta segera menghubungi pihak berwajib," katanya.

Palm oil plantation

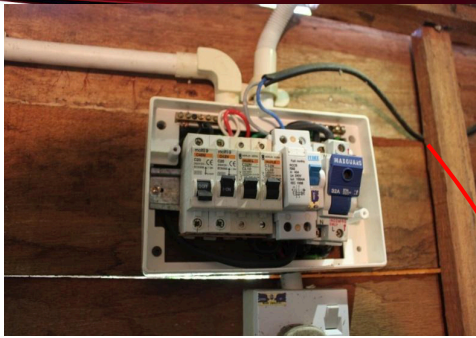


Industrial electrical accident case



Mangsa dipercayai terjerut dengan wayar tersebut ketika cuba menarik tuala yang tertanggal pada ketika itu menyebabkan mati ditempat kejadian.

Domestic accident related to electrical work



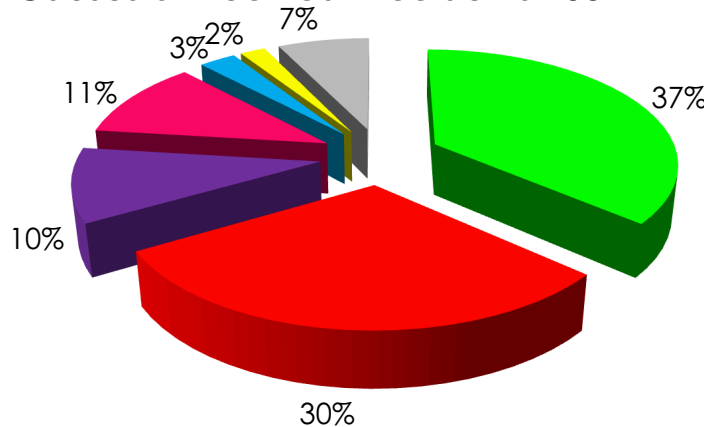
Supply connected to a fish farm fence



Wrong termination - Live and Earth



Causes of Electrical Accidents 2002 - Mid 2011



- Improper installation/maintenance
- Work safety procedures not complied
- Trespass in electrical installation
- Public work activities nearby electrical installations
- Misuse of wiring system
- Defects in electrical equipment
- Other causes

CAUSES OF ELECTRICAL ACCIDENT (2002 – June 2011)



	Cause of Accident	Percentage (%)	Total cases
1	Failure to maintain installations	37	202
2	Non-compliance with safe working procedures	31	168
3	Trespassing of utility substations	10	57
4	Activities nearby transmission/distribution lines	11	61
5	Misused / Unsafe wiring installation	3	16
6	Defects on electrical equipment/tools	2	11
7	Others causes	7	40
	Total Cases	100	555

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Electrical Installation in Buildings



- Reg. 75 - Electrical installation work can only be carried out by a Registered Electrical Contractor
- Reg. 12 – Wiring works shall be done under immediate supervision of a wireman. Upon completion the wireman shall certify a **Supervision and Completion Certificate & Test Certificate**.
- No installation shall receive electricity until the Supervision and Completion Certificate and Test Certificate has been submitted by the owner or management of the installation to the licensee.
- Reg. 13 – For installations operating at higher than low voltage, the installations shall be tested by an Electrical Services Engineer.
- **Guidance of wiring installations : MS/IEC 60364 - “WIRING INSTALLATION IN BUILDINGS” - www.st.gov.my**

Maintenance of installations



Reg. 110(1) An installation shall be maintained in good and working order and safety precautions shall be observed at all times to prevent danger.

Reg. 110(2) The responsibility to maintain the installation in the manner required in subregulation (1) shall be with the owner, management, licensee or occupier of the installation, his servant or agent, as the case may be.

Reg. 110 (3) An installation, other than a domestic installation, shall be checked and tested by a competent person at least once in every five years, or at any time as directed by the Commission.

Reg111 - Competent person to undertake electrical (maintenance) work.

No person, except a competent person or a person acting under the control of a competent person, shall undertake to carry out any repair, replacement, servicing or cleaning of any equipment which forms part of an installation.



No. of Competent Person 2010



CATEGORY	TOTAL
Electrical Services Engineer	202
Competent Electrical Engineer	1,031
Electrical Supervisor	183
Chargeman	32,002
Wireman	45,099
Cable Jointer	213
GRAND TOTAL	78,730

Sec 21 of Electricity Supply Act 1990 Registration of Installations

Before the completion of a new installation, the owner thereof shall forward an application for registration.

The Commission shall cause inspection and tests to be made. If the installation satisfies the requirements the Commission shall issue a Certificate of Registration.

No person shall possess or operate an installation, unless the installation is registered on a valid Certificate of Registration.

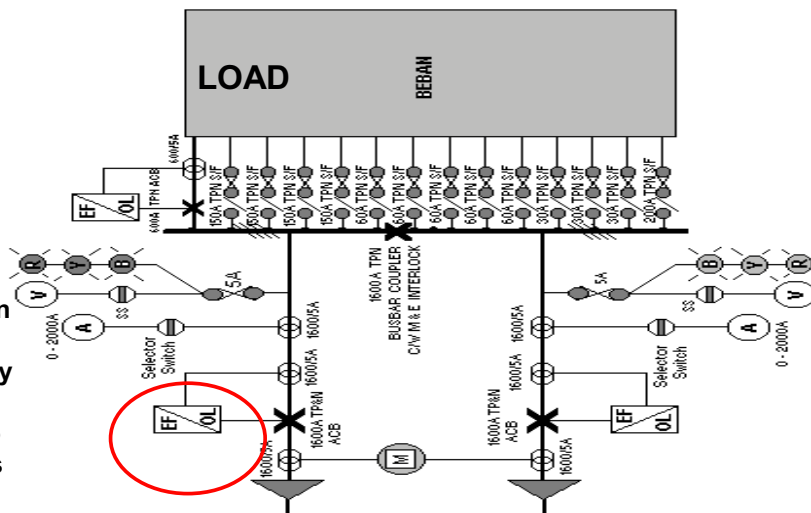
Installations need to be visited and inspected by a competent person. Frequency of visit and inspection are as follows:

- Regulation 67(2)
- (a) for an installation not exceeding 600 volts and receiving electricity via a switchgear rated at or above **100 amperes**, the minimum number of visits for the purposes of inspection per month shall be **one** visit;
- (b) for an installation exceeding 600 volts but not exceeding **11,000 volts**, the minimum number of visits for the purpose of inspection per month shall be **two** visits; and
- (c) for an installation exceeding 11,000 volts but not exceeding **132,000 volts** the minimum number of visits for the purpose of inspection per month shall be **four** visits:

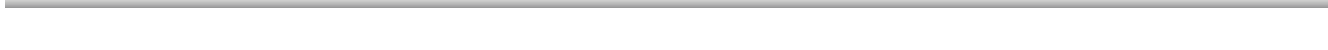
After each visit the competent person has to produce a report on the status of the installations to the owner and provide advice accordingly. A copy of the reports has to be sent to the regional office of Energy Commission.

Maintenance of installations

Reg. 110(4) Any protective relay and device of an installation shall be checked, tested and calibrated by a competent person at least once in every two years, or at any time as directed by the Commission.



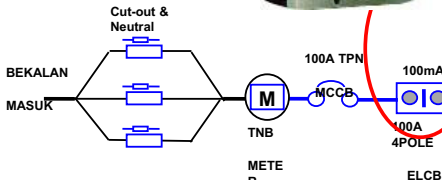
protective relays and devices of an installation shall be checked, tested and calibrated by a competent person (Electrical Services Engineer) at least once in every two years, or at any time as directed by the Commission.



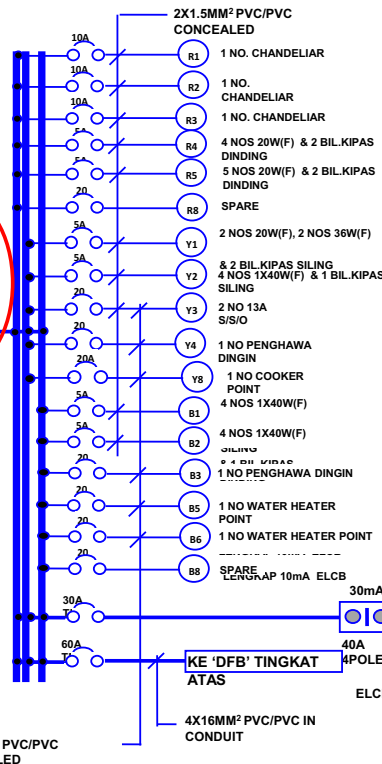
Domestic / Final Sub-Circuit



RCD with Residual operating current 100 mA

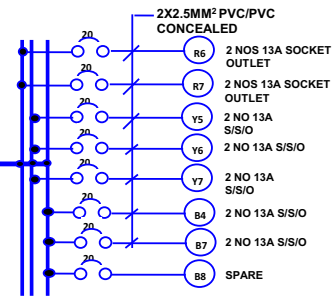


Regulation 36 (3), Electricity Regulation 1994, Protection against earth leakage current shall be afforded for any final circuit, either individually or in a group, by a residual current device having a rated residual operating current not exceeding 100 milliamperes



Additional RCD

**Instant Water Heater (10 mA)
Handheld tools (30 mA)**

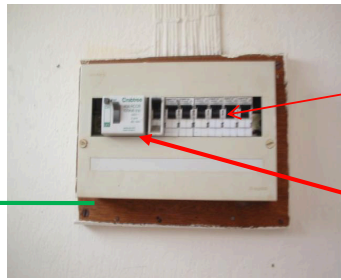


Protection Against Earth Leakage Current



- **Regulation 36 (4), Electricity Regulation 1994,** Protection against earth leakage current shall be afforded for any final circuit, either individually or in a group, by a residual current device having a rated residual operating current not exceeding **100 milliamperes**
- **Regulation 36 (3)** For an installation where hand-held equipment, apparatus or appliance is used or is likely to be used not exceeding **30 milliamperes**. (eg. Electric hand tools)
- **Regulation 36 (2)** For an installation in a place where the floor is likely to be wet or where the wall or enclosure is of low electrical resistancenot exceeding **10 milliamperes**. (eg. installing water heater in a bathroom)

PROTECTION AGAINST EARTH LEAKAGE CURRENT AND OVERCURRENT



MINIATURE CIRCUIT BREAKER



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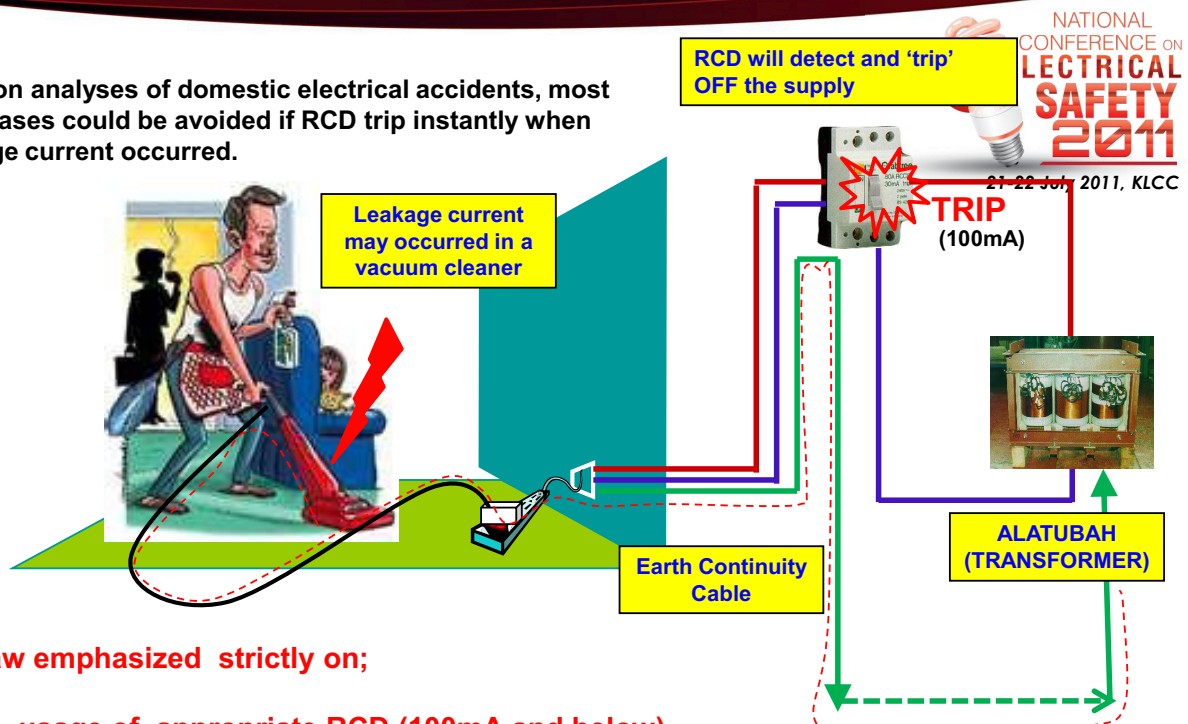


Earthing System

RCCD with residual current of 100 mA and below.



Base on analyses of domestic electrical accidents, most fatal cases could be avoided if RCD trip instantly when leakage current occurred.



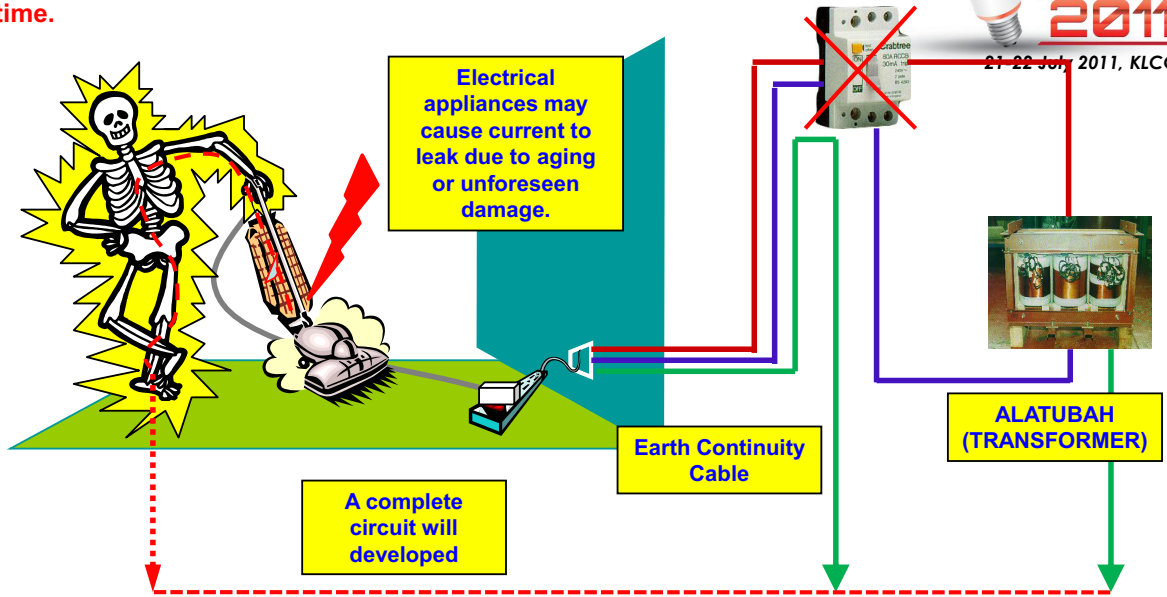
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the law emphasized strictly on;

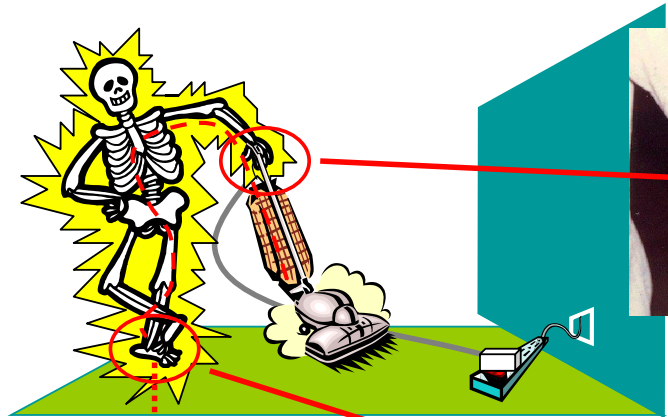
1. The usage of appropriate RCD (100mA and below)
2. Regularly test on the functioning of RCCD
3. The use of only approved electrical appliances.



Sometime the RCD fail to detect leakage current due to mechanism failure or no maintenance or no observation for a long period of time.



In many domestics electrical accident cases, it is found that RCD has failed to detect leakage current. As a result the leakage current flow through human body and form a complete circuit to cause electrocution.



A typical effects of electrocution is a burn mark can be seen at the point of entry (hand) and at the point of exit (foot)

Effects of Electric Current in the Human Body	
Current	Reaction
1 mA	Perception level. Just a faint tingle.
5 mA	Slight shock felt; not painful but disturbing. Average individual can let go. However, strong involuntary reactions to shocks in this range can lead to injuries.
6-25mA (women)	Painful shock, muscular control is lost.
9-30 mA (men)	This is called the freezing current or "let-go" range.
50-150 mA	Extreme pain, respiratory arrest, severe muscular contractions.* Individual cannot let go. Death is possible.
1.0 – 4.3 A	Ventricular fibrillation. (The rhythmic pumping action of the heart ceases.) Muscular contraction and nerve damage occur. Death is most likely.
10.0 A	Cardiac arrest, severe burns and probable death.



<http://www.hobbyprojects.com/electrical-hazards/effects-of-electric-current-in-human-body.html>

Conclusions



1. Electrical works shall be carried out by / under the supervision of a competent person.
2. The electrical works shall be carried out in accordance with rules and safety regulations and best working practices
3. All installation shall be maintained in good working order and safety precautions shall be observed at all times to prevent danger.
4. Appropriate protective devices (RCD) shall be used in protecting against earth leakage at the final circuit.

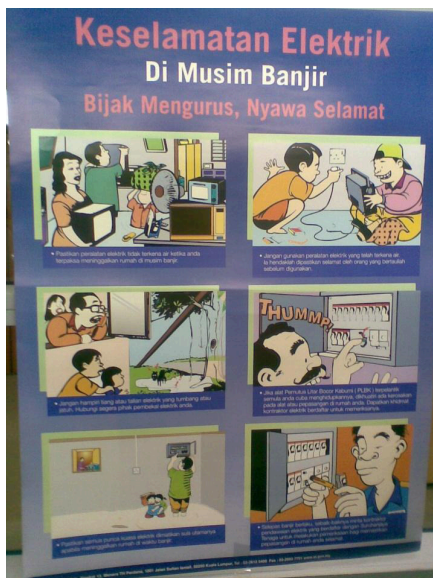
Safety awareness programme



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