



Key Learning Points in Prevention of Electrical Fires

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Extracted from presentations at the NFEC Fire Safety Seminar 2015 / 2016
and NFEC Prevention of Electrical Fire Workshop 2014

Scope

- Regulation of Electrical Safety in Singapore
- Good Foundation to Electrical Fire Safety
- Prevention is in the Details
 - Wiring Connections
 - Joints and Connections
 - Power Cords
 - Insulation Failures
- Checking the Electrical Switch Room
- Working with the Electrical LEWs



Regulation of Electrical Safety in Singapore

Electrical Safety in Singapore is governed by:

- The Electricity Act (Cap 89A)
- The Electricity (Electrical Installations) Regulations
- The Electricity (Electrical Workers) Regulations
- Code of Practices:
 - SS CP 5 Code of Practice for Electrical Installation
 - SS CP88 Code of Practice for Temporary Electrical Installations (Part 1: Construction and Building Sites)
 - SS CP88 Code of Practice for Temporary Electrical Installations (Part 2: Festive lighting, trade fairs, mini-fairs and exhibition sites)
- **Anyone found violating the above Act or Regulations can be prosecuted**



Good Foundation to Electrical Fire Safety

- Electrical installations should be designed by Licenced Electrical Worker (LEW) unless exempted by the Energy Market Authority (EMA)
- **Good Workmanship and Selection of Materials**
 - Selection and installation of equipment
 - Sizing of wiring system and protection system
 - Earthing and earth fault protection
- Robust and regular **maintenance, inspection and testing**

Prevention is in the Details

Wiring Connections

Accumulation of dirt or moisture may cause “tracking” between connectors and terminals, leading to fire



Photo Credit: mcmanusboatworks.com

Prevention is in the Details

Wiring Connections

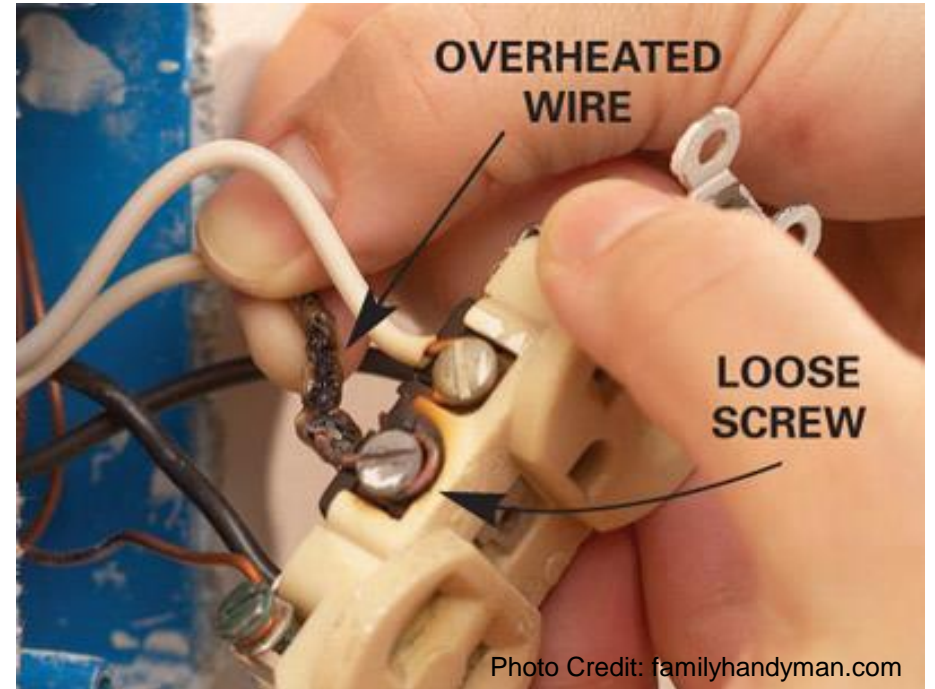
Over-tightened joint causes deformation and poor contact leading to high temperature joint



Prevention is in the Details

Wiring Connections

Loose connection causes high resistance connection which generates localised heat. Heat may deteriorate or burn through wiring insulation



Prevention is in the Details

Joints and Connections

The use of proper joining methods such as clamp-type terminals will prevent deformation of conductor and damage to stranded wires

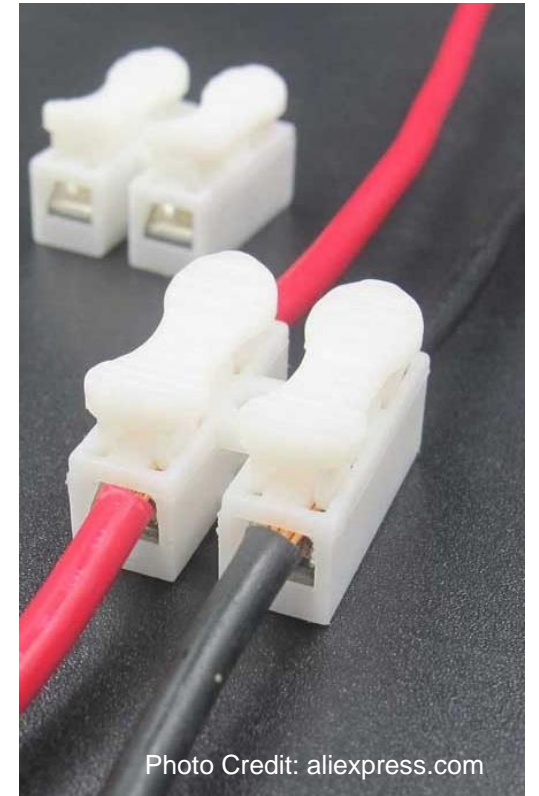


Photo Credit: aliexpress.com

Prevention is in the Details

Joints and Connections

When compression joints are used, crimping tool, lug and cable must be compatible



Prevention is in the Details

Joints and Connections

All terminations and joints must be made within suitable enclosure for good protection



Er. Professor Lock Kai Sang

Photo Credit: thomasnet.com

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CAUTION

Prevention is in the Details

Joints and Connections

Infra-red thermal imaging helps to identify hotspots arising from improper joints

- Dirty or misaligned equipment contacts may give rise to local heating
- Loose or inadequate cable supports may also place mechanical stress on connections leading to overheating



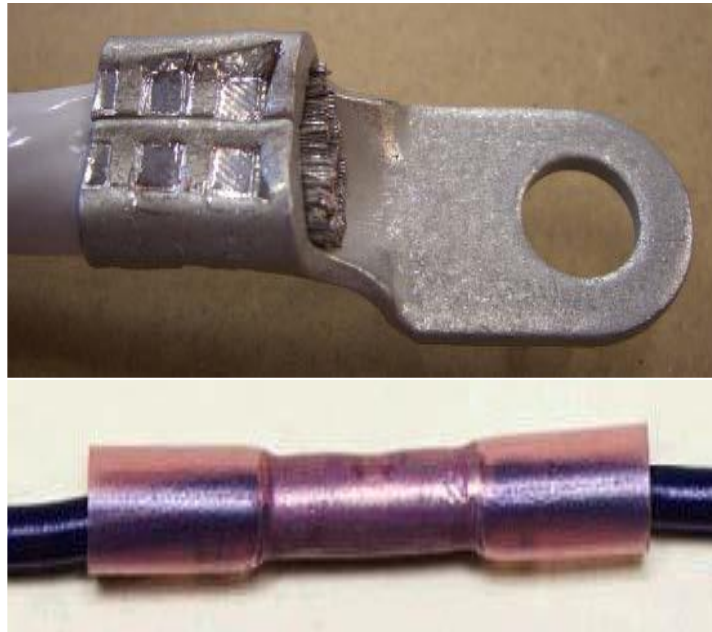
Photo Credit: infraredimagingervices.com

Prevention is in the Details

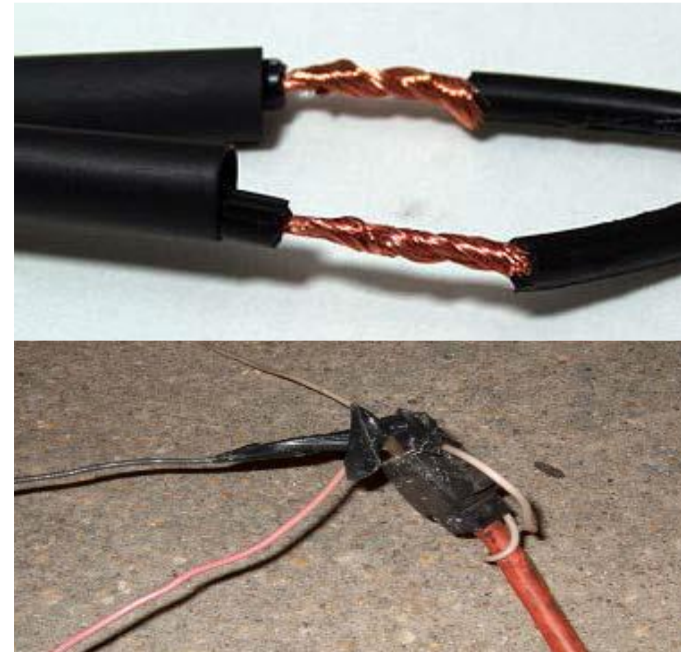
Joints and Connections



Good Joints



Bad Joints



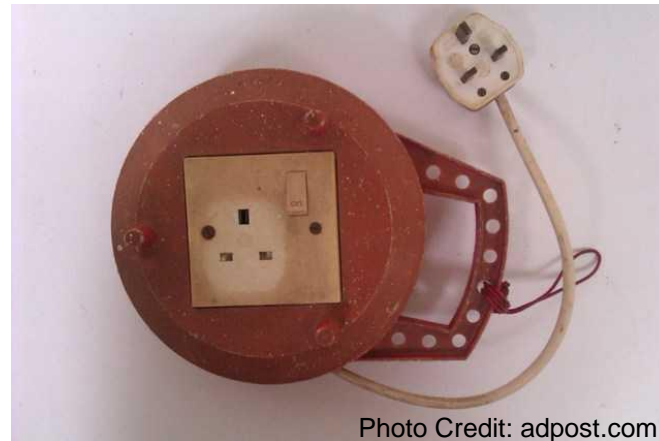
Prevention is in the Details

Power Cords

Damaged power cord may lead to high resistance fault evolving to short-circuit



Rolled-up extension cord may sustain mechanical damage



Multiple outlet power boards may overload due to variable capacity



Prevention is in the Details

Insulation Failures

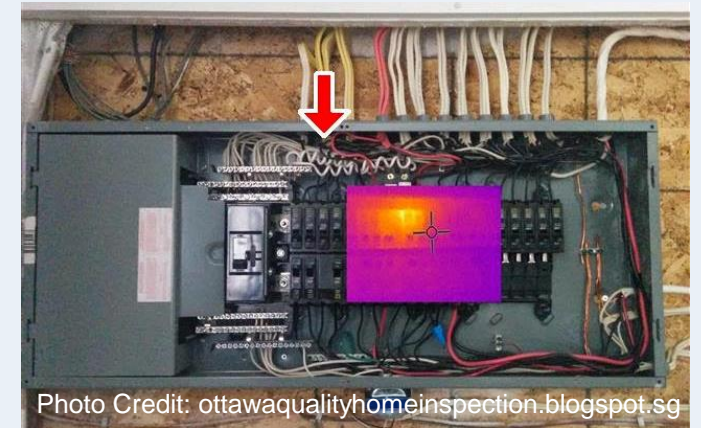
Conduct regular insulation testing and monitoring



Perform partial discharge test on high voltage equipment



Insulation failures are unlikely to cause fire if proper protection systems are in place to automatically isolate the faulty circuit or equipment



Er. Professor Lock Kai Sang

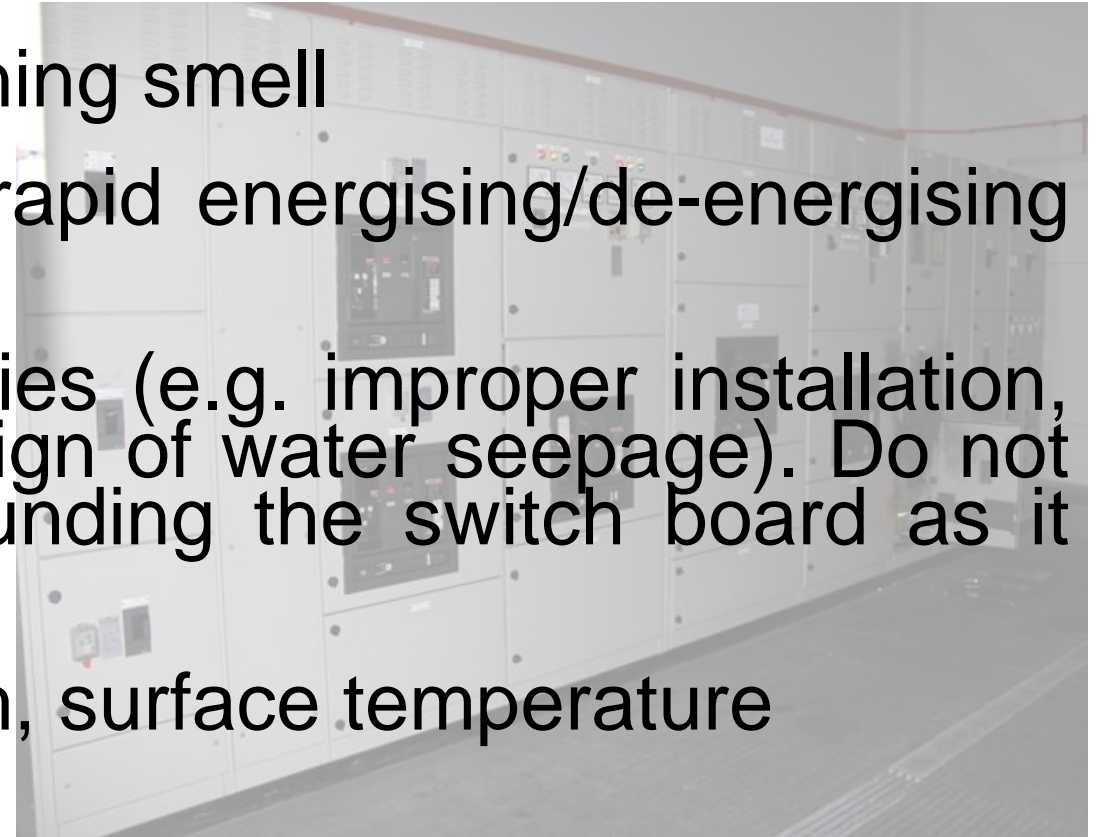
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CAUTION

Checking the Electrical Switch Room

Before Stepping into an Electrical Switch Room:

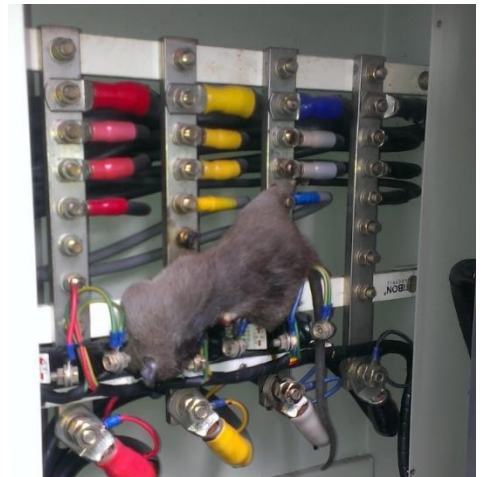
- **Smell** for ionisation, foul or burning smell
- **Hear** for humming, hissing or rapid energising/de-energising of contactors
- **See** and look out for irregularities (e.g. improper installation, broken handle of breakers or sign of water seepage). Do not step or touch the water surrounding the switch board as it could be “live”
- **Feel** the heat in the switch room, surface temperature
- **Touch** for vibration



Working with the Electrical LEWs

Inspection Scope should include:

1. Maintenance Regime (Servicing, inspection etc.)
2. Accessibility / Housekeeping (Cleanliness, Equipment, etc.)
3. Improper Installation
4. Protection Systems
5. Protection Against Spillage / Rodents
6. Instrument and Indicating Lights
7. Protective Relays
8. Readings – Loading / Temperature
9. Signs of Overheating
10. Excessive Humming Noise
11. Fire Extinguishers
12. Any Other Observations



Working with the Electrical LEWs

A Good Inspection Report Must be:

- **Clear (e.g. Refers to Regulations / Photos)**
- **Accurate**
- **Detailed**
- **Timely**
- **Provides Advisory**

Working with the Electrical LEWs

- Inspection reports must be submitted and acted upon by Management on a **timely** basis!
- Always work closely with your LEW to **mitigate any electrical hazards** in your building



Thank You