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Electrical Safety Experts Symposium

5 minimum requirements for electrical safety in an electrical installation

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Some clarification

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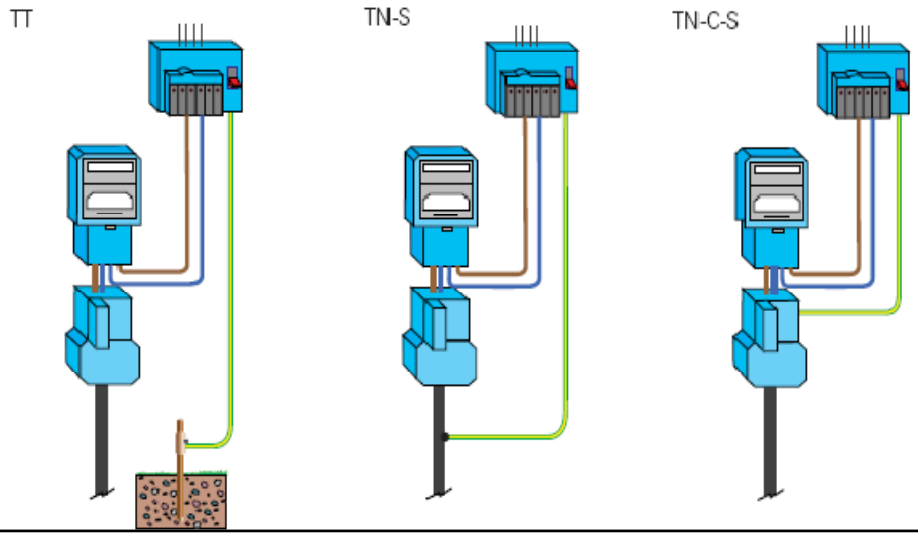
These are general safety requirements; there may be national requirements for specific reasons.

There are some differences in the inspection points for TN and TT systems, which we will come to:-

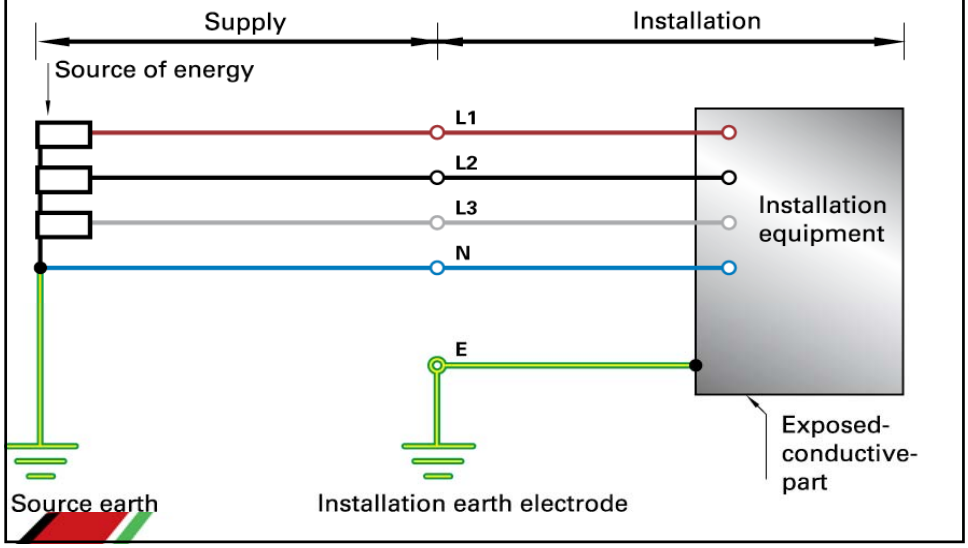
A TT system has a consumer's earth electrode.

A TN system has a metallic path back to the neutral of the transformer.

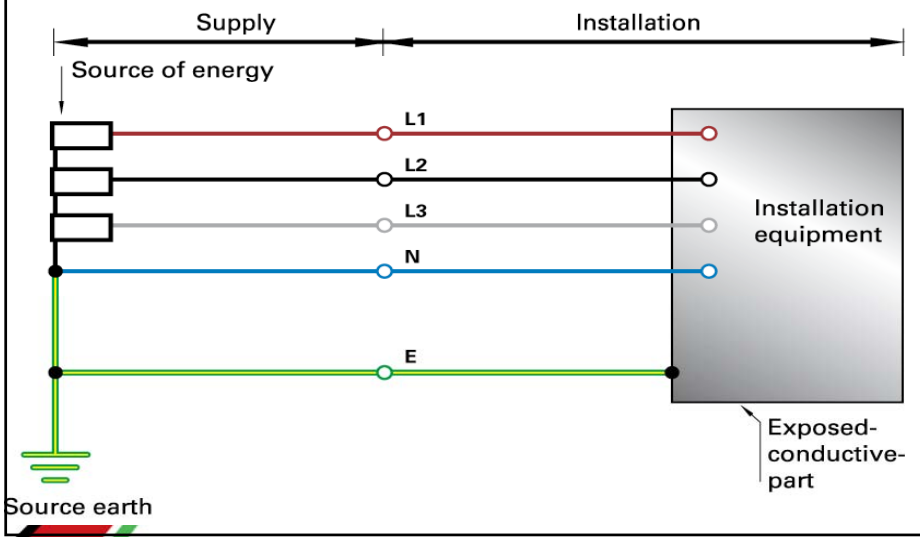
Supply Types



TT systems explained



TN systems explained



5 minimum requirements for electrical safety in an electrical installation

Based on recommendations in FISUEL's two Manuals, on inspection of new and existing installations in dwellings

Addressing these basic requirements does not ensure compliance with National Standards

Useful for countries seeking to set up an inspection scheme or to simplify an existing scheme

First requirement
At the intake position

- Is there a main isolator (disconnector)?
- Is it an Isolator (gaps, security, manual)?
- Can it switch the load?
- Is it accessible
- For TT systems, is there a Residual Current Device (RCD)

– Not needed for a TN system

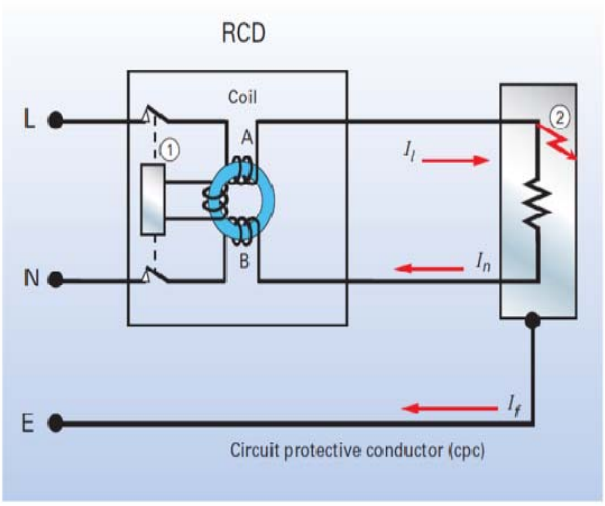
REASON: To allow work to be done on the installation or to switch off at a known point during an incident

RCD's Explained

L = Line
N = Neutral
E = Earth

I_l = Line current
I_n = Neutral current
I_f = Earth fault current

① = Trip Relay
② = Earth fault



Second requirement

Insulation, barriers and enclosures

Are live parts insulated or enclosed?

- Is the insulation mechanically protected?
- Are the enclosures strong enough?
- Are any openings finger proof (IP2X or IPXXB)?
- Can covers be removed without the use of a tool?
- If they can be, are there barriers behind the covers?
- Is there any damage?

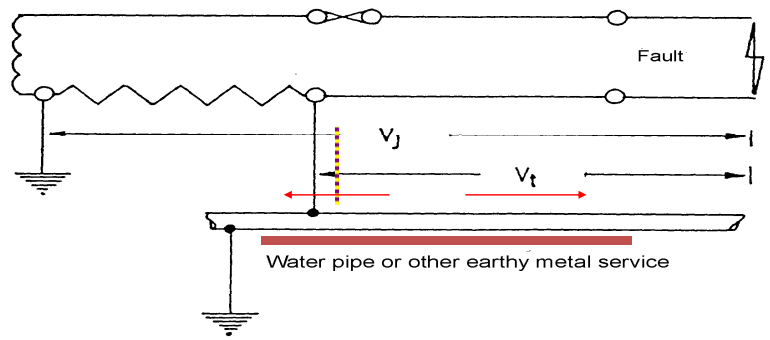
Can fuse carriers be removed without risk of contact with live parts during removal or after the carrier is removed?

REASON; Touching live parts (direct contact) can be dangerous!!

Third requirement

Earthing

- Is there main bonding in place?
- Is there a protective conductor in each circuit connected to the exposed-conductive-parts
- TT Systems Is there an earth electrode in good condition
  - No need to measure EFLI
  - Must be an RCD somewhere in the circuit but not necessarily a 30mA device and not for shock
- TN Systems Is there a low impedance path back to the neutral of the transformer?
  - MUST measure EFLI in every circuit
  - No need for an RCD



Typical Touch voltages

TT 5V

TN 110V

Requirement 4

Overcurrent

- Is there a fuse or circuit-breaker in every circuit?
- Is its rating suited to the load and the conductor?
  - This is a complicated requirement

    Overload $I_b \leq I_n \leq I_z$

    $I_2 \leq 1.45 \times I_z$ *

  * MCBs to IEC 60898 and RCBOs to IEC 61009 will comply; fuses to national standards may not.
- Does it provide short circuit protection (It will if it complies with the above)

REASON; Uncontrolled short-circuits and persistent overcurrent will degrade cables and lead to faults

Requirement 4 Cont'd
Overvoltage

- Not needed if less than 25 thunderstorm days per year.
- If more:-
  - Presence of a surge diverter co-ordinated with impulse withstand of equipment, in a suitable position
  - Properly installed
  - In working order

REASON; Overvoltages may break down the insulation of equipment leading to fires

Requirement 5
Locations containing a bath or shower

- Is there supplementary equipotential bonding of every metallic part which either encloses conductors (exposed-conductive-part) or is earthed (extraneous-conductive-part)
- Are there metallic conduits?
- Are any/all socket-outlets protected by a 30mA RCD?

Requirement 5 Cont'd

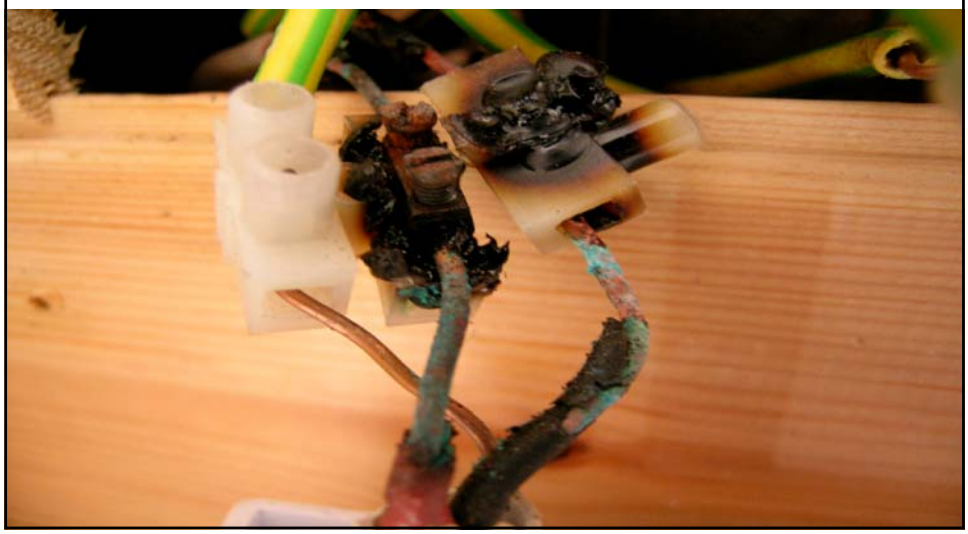
Locations containing a bath or shower

- Is all the equipment suited to the zone in which it is located (this includes luminaires, switches and sockets)

REASON; Body resistance is low when you are wet so you are at risk at lower touch voltages and the wetter you are the more you are at risk.

Dangers of Electricity

Dangers of Electricity



Dangers of Electricity

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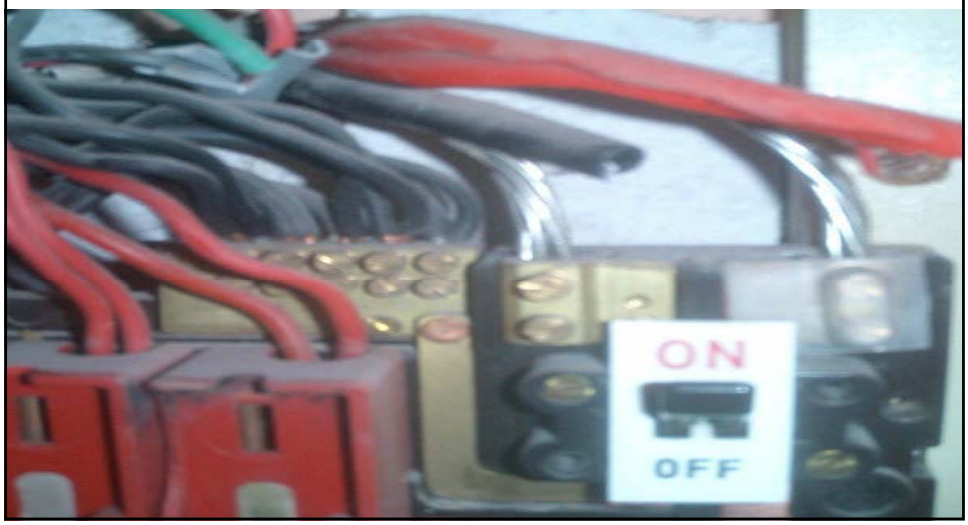
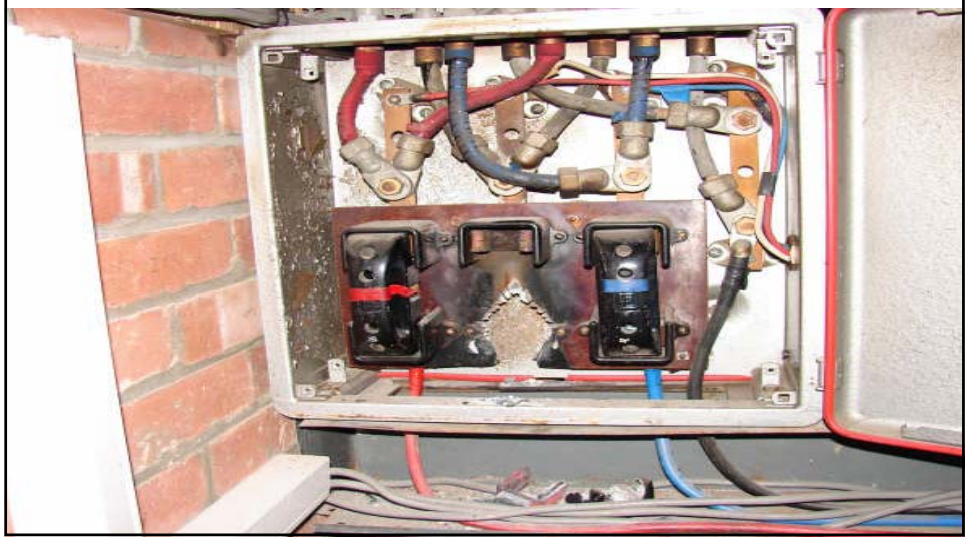


Dangers of Electricity



Dangers of Electricity

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SUMMARY

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The subject of inspection needs 4-8 hours for full coverage; we have 15 minutes.

We have only touched on the problem, but an inspection at this level is better than no inspection at all.

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THANK YOU

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