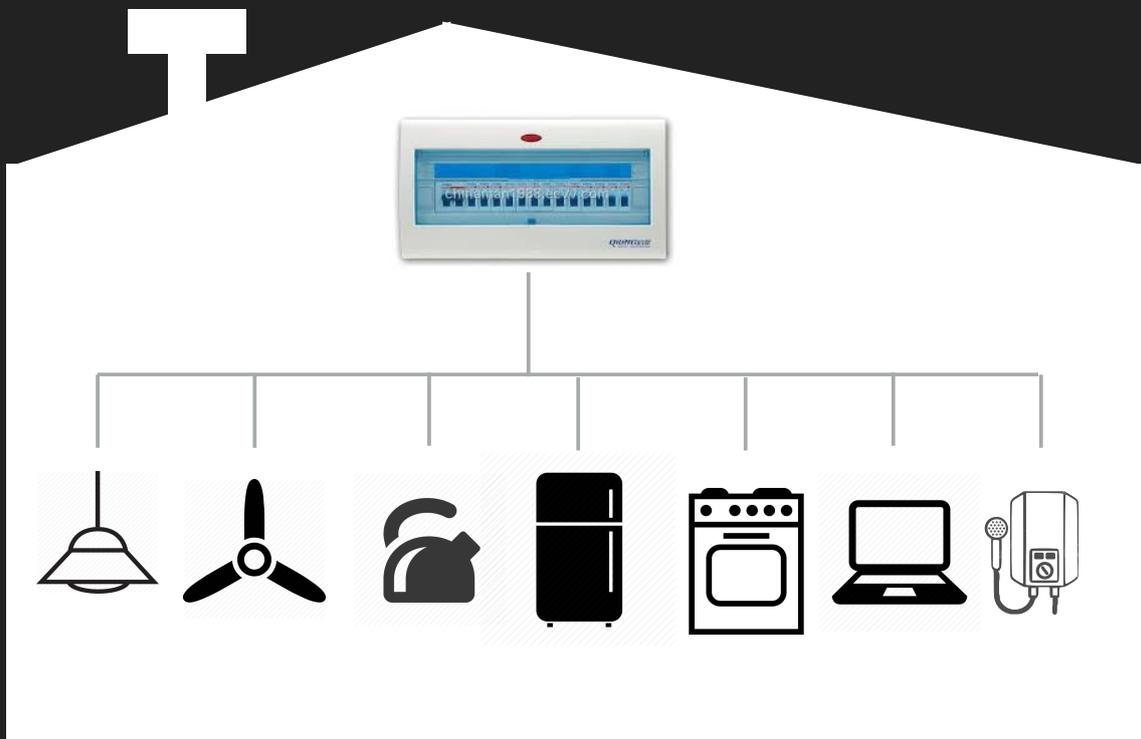


INSTALLATION & MAINTENANCE OF WATER HEATER FOR DOMESTIC USE

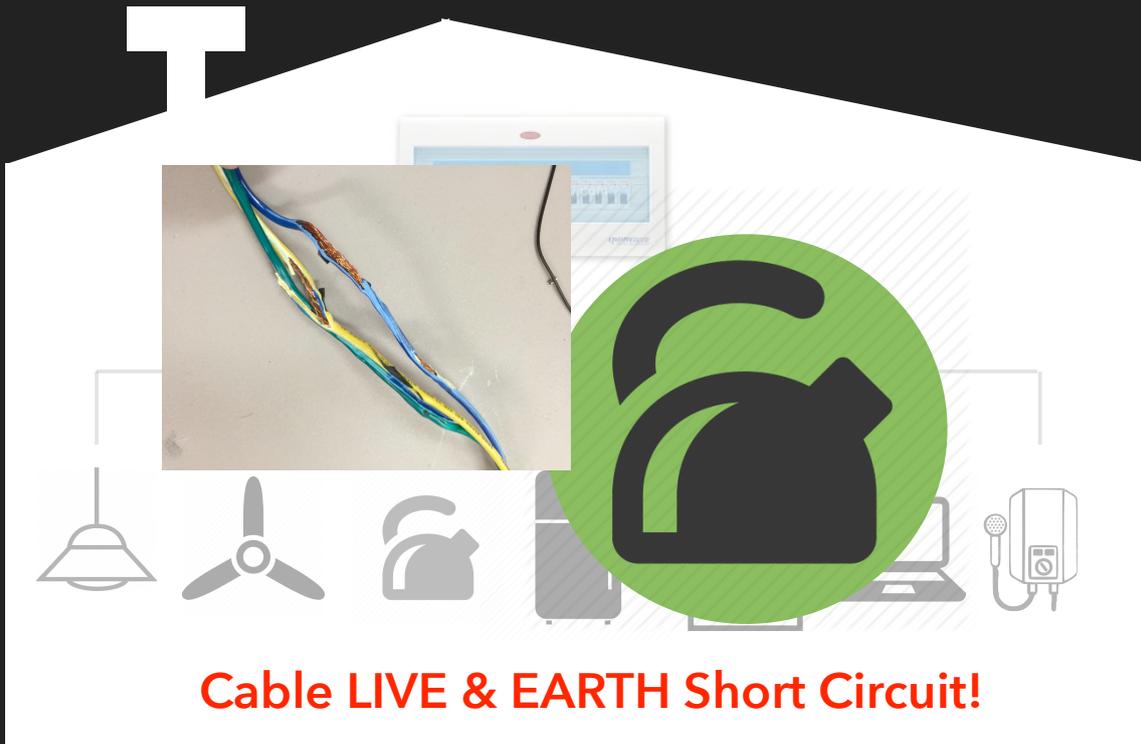
BY TEE TONE VEI

Water heater expert committee, International Electrotechnical Commission
Chairman, Heating Appliances Safety Standard Working Group, SIRIM & IEC TC 61

INSTALLATION & MAINTENANCE OF WATER HEATER FOR DOMESTIC USE

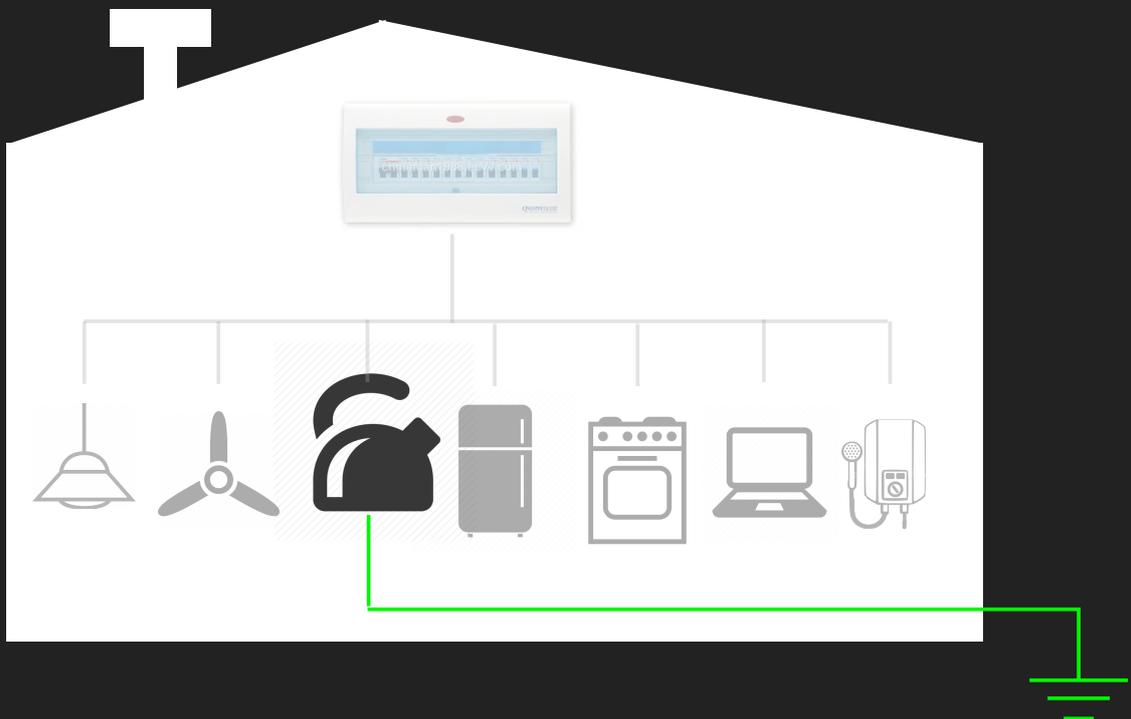


INSTALLATION & MAINTENANCE OF WATER HEATER FOR DOMESTIC USE



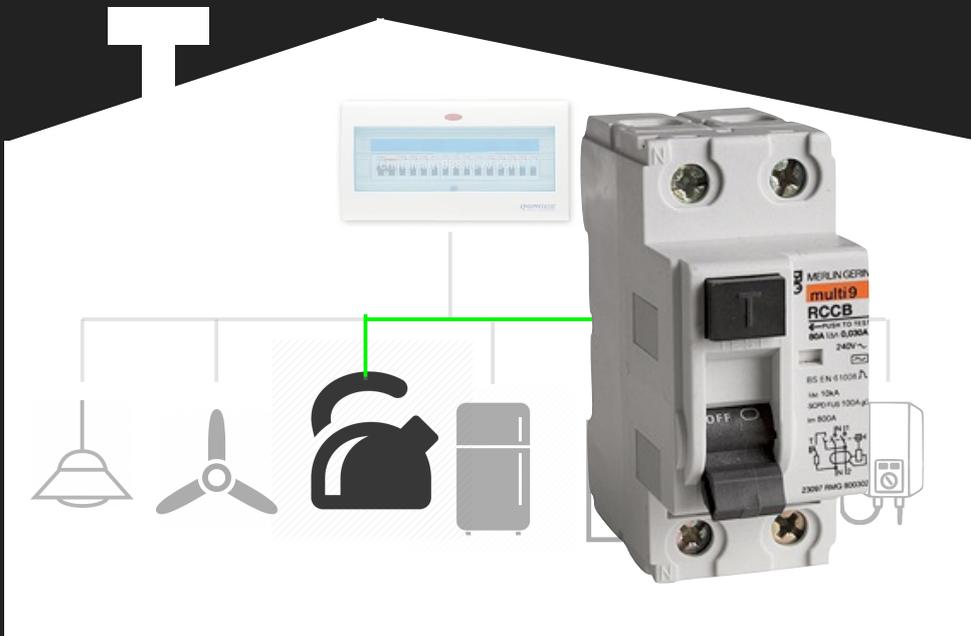
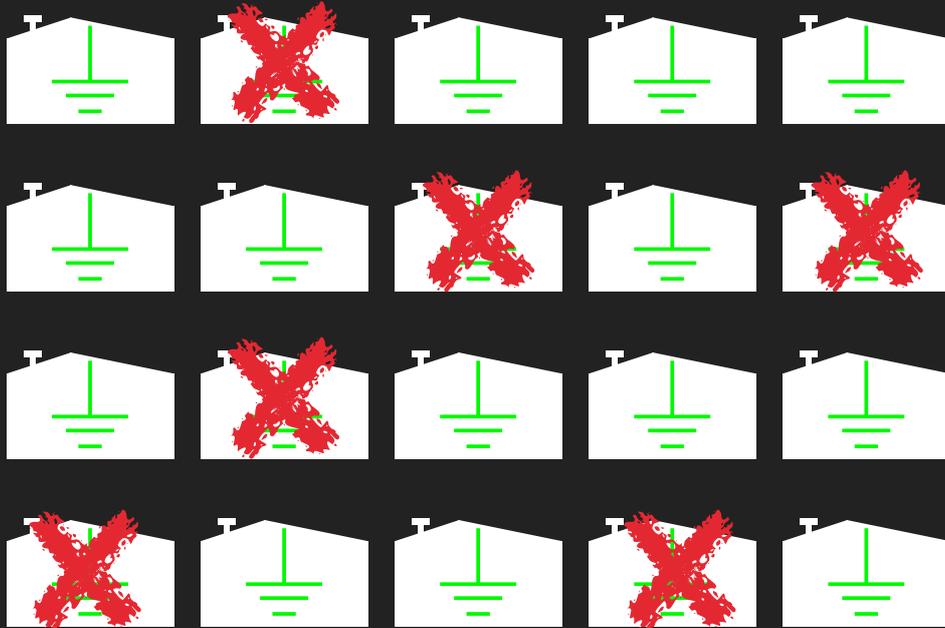
3

INSTALLATION & MAINTENANCE OF WATER HEATER FOR DOMESTIC USE

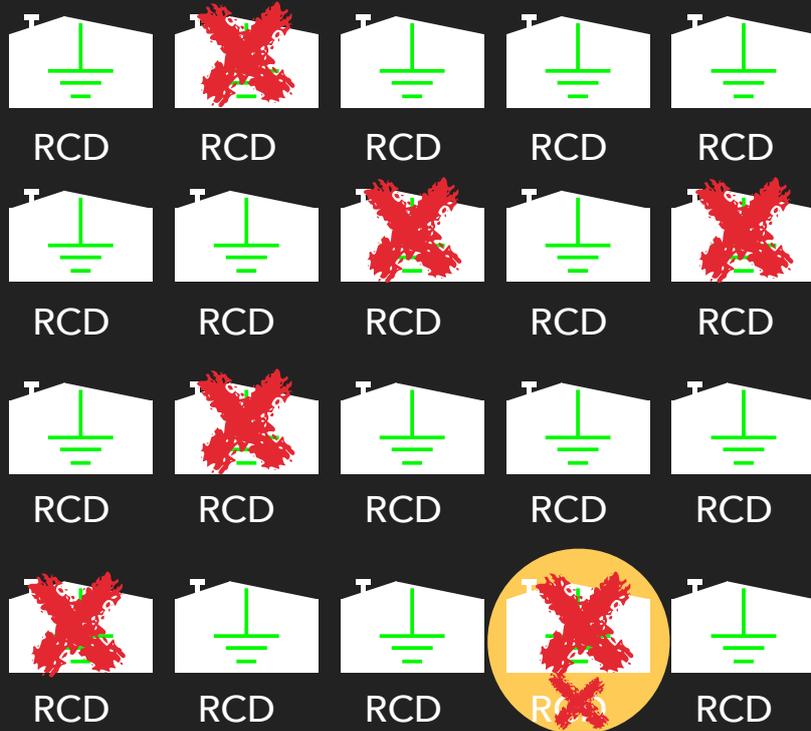


4

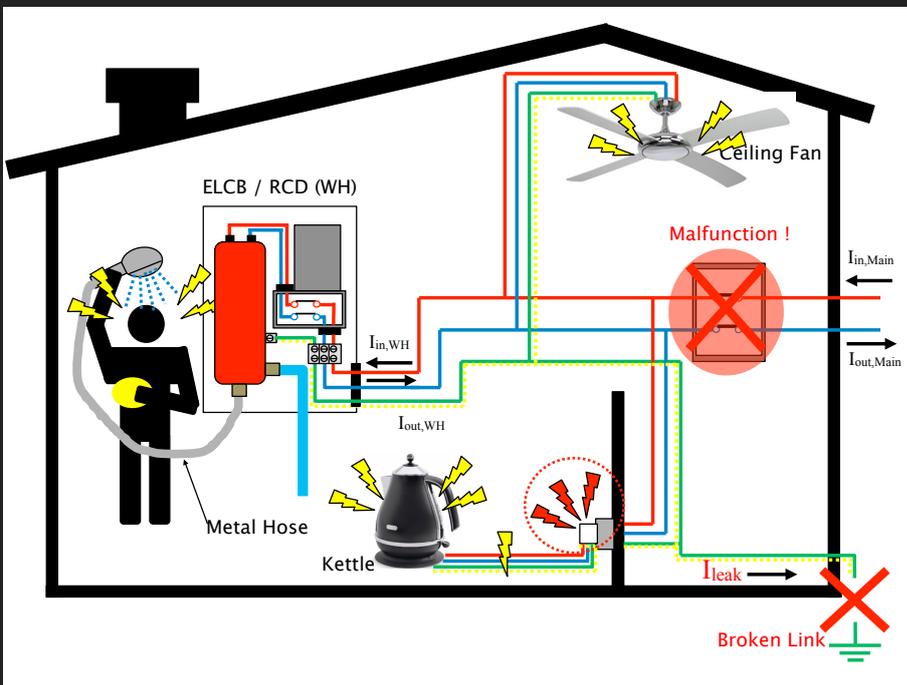
HOUSE EARTHING CONDITION



EARTHING & RCD CONDITIONS



EARTH & RCD FUNCTIONS



**Broken Earth + RCD
malfunction +
Metallic hose
= SURE DIE!**

STATISTICS

8 reported cases within past 7 years :

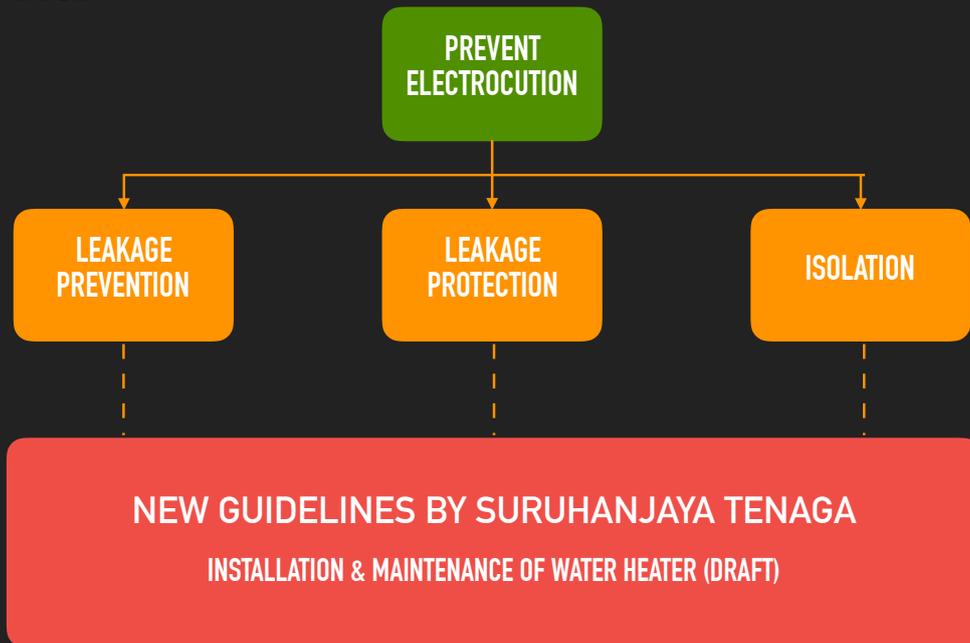
- All main RCD not functioning
- All cannot find fault in the water heater, including built-in RCD
- 1 case with undersize incoming cable
- The rest all has electrified earth wire, leakage from somewhere else, killed through water heater

STATISTICS

8 reported cases within past 7 years :

- All has metal hose
- Were dead holding on to the shower head
- Has burnt hand and/or body parts

STRATEGIES



LEAKAGE PREVENTION

CABLE CONNECTIONS AND SIZING

CABLE SIZING

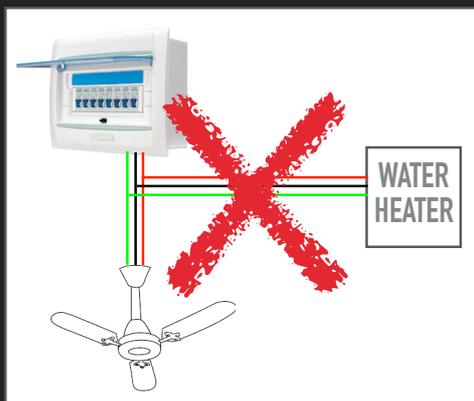
▶ Clause 4.1.4.4; MCB & Cable Size

Water Heater Rating @ 230V	Load	MCB / RCD (Min)	Live	Neutral	Earth
≤ 2,856 W	12.4 A	16A	4mm ²	4mm ²	4mm ²
> 2,856 W to ≤ 3,570 W	15.5 A	20A	4mm ²	4mm ²	4mm ²
> 3,570 W to ≤ 4,462 W	19,4 A	25A	4mm ²	4mm ²	4mm ²
> 4,462W to ≤ 5,711 W	24.8 A	32A	4mm ²	4mm ²	4mm ²
> 5,711W to ≤ 7,139 W	31 A	40A	6mm ²	6mm ²	6mm ²
> 7,139W to ≤ 8,924 W	38.8 A	50A	10mm ²	10mm ²	10mm ²

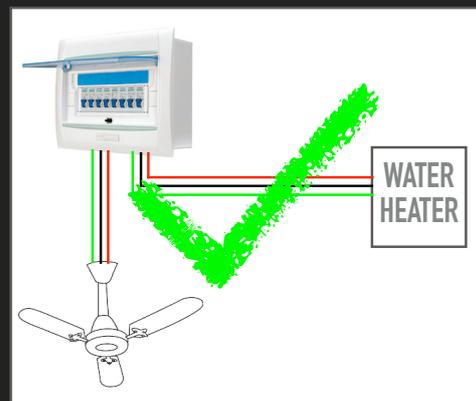
13

CABLE CONNECTION AND SIZING

▶ COP clause 4.1.4.2;



WRONG

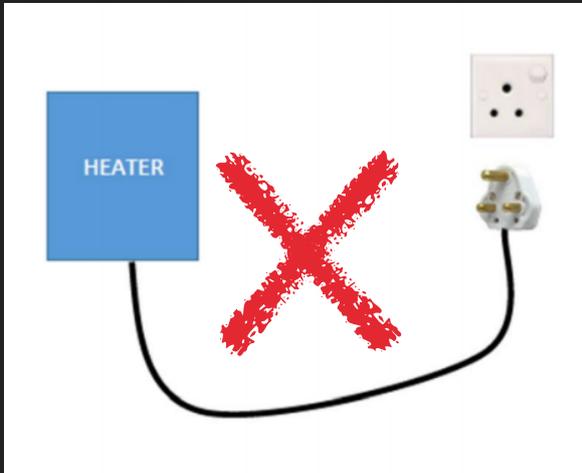


CORRECT

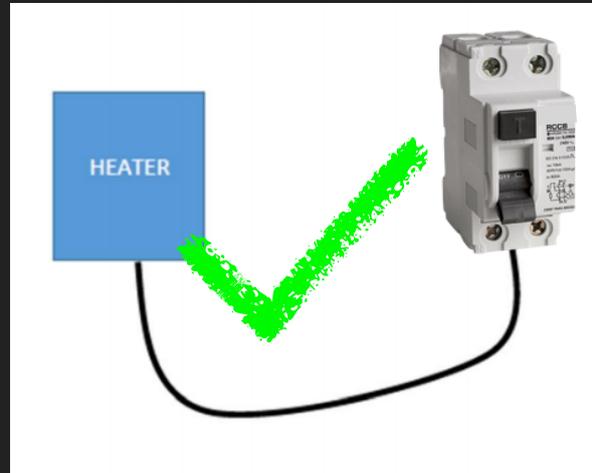
14

CABLE CONNECTION AND SIZING

- ▶ Clause 4.1.4.5;



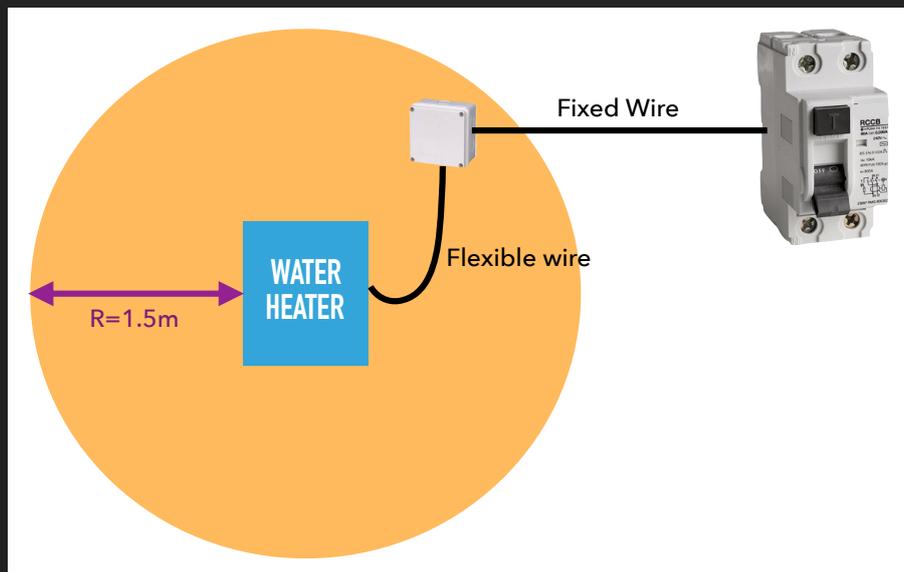
WRONG



CORRECT

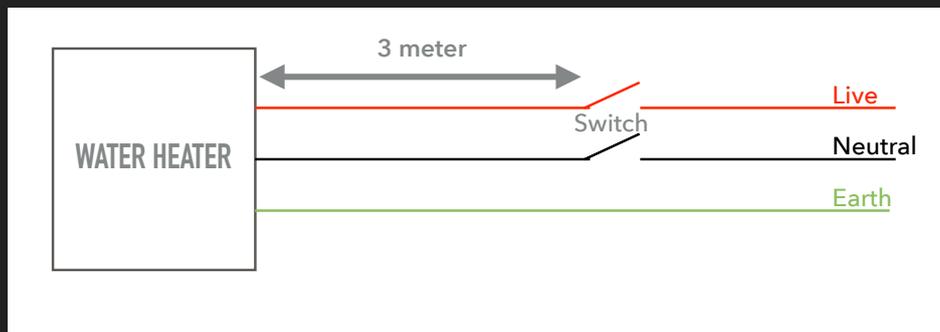
CABLE CONNECTION AND SIZING

- ▶ Clause 4.1.4.5; (optional connection)



WATER HEATER LOCATION

- ▶ Clause 4.1.4.6, switch maintenance disconnecter shall be within 3 meters from water heater



LEAKAGE PREVENTION

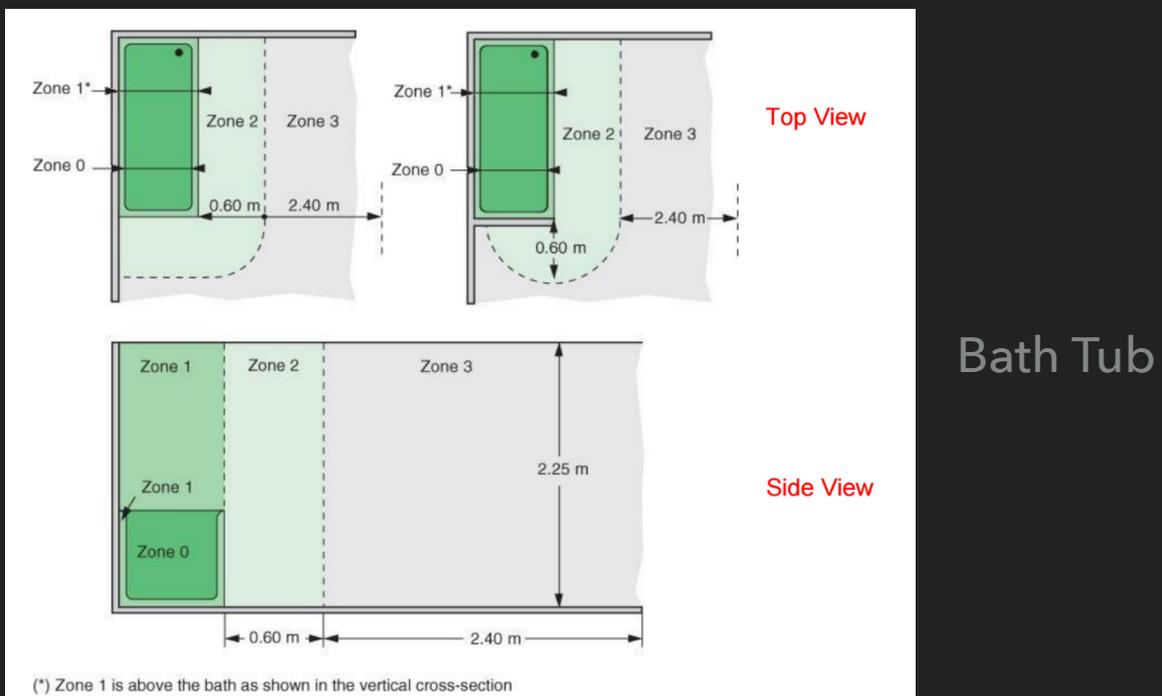
WATER HEATER LOCATION

WATER HEATER LOCATION

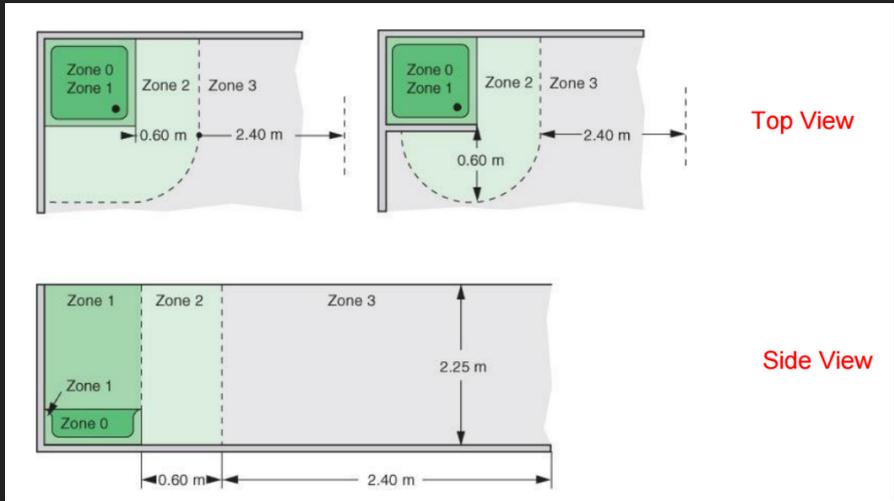
▶ Clause 4.1.4.5,

- Water heater & connections in Zone 1 & within the shower cubicle shall be at least IPx5

WATER HEATER LOCATION



WATER HEATER LOCATION

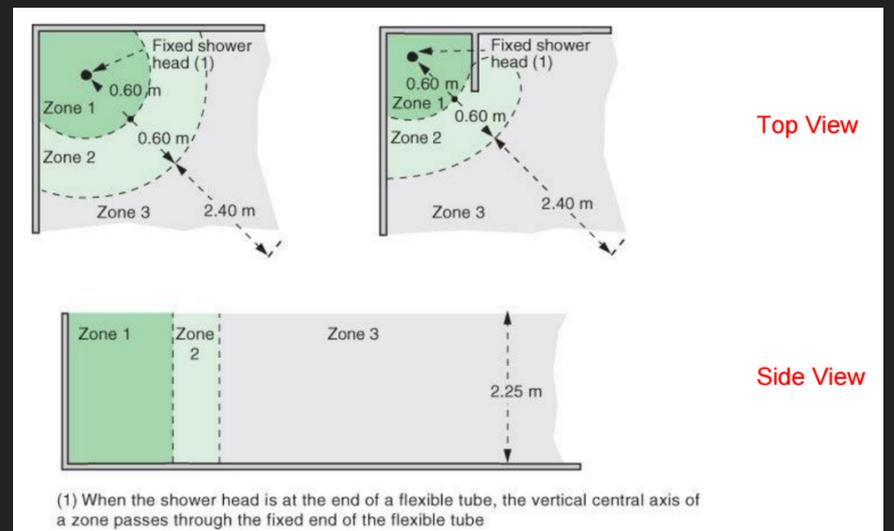


Top View

Shower with basin

Side View

WATER HEATER LOCATION



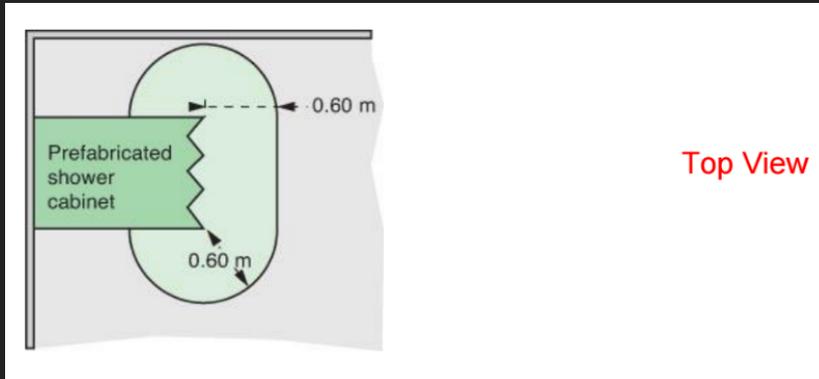
Top View

Shower without basin

Side View

(1) When the shower head is at the end of a flexible tube, the vertical central axis of a zone passes through the fixed end of the flexible tube

WATER HEATER LOCATION



Top View

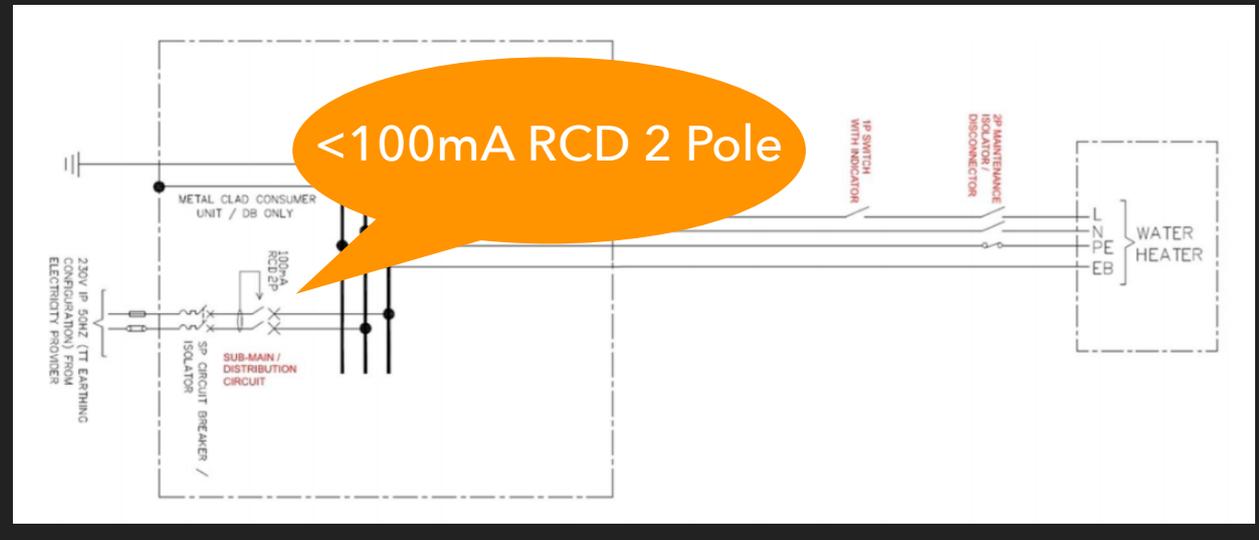
Shower cabinet

LEAKAGE PROTECTION

REDUNDANT RCD

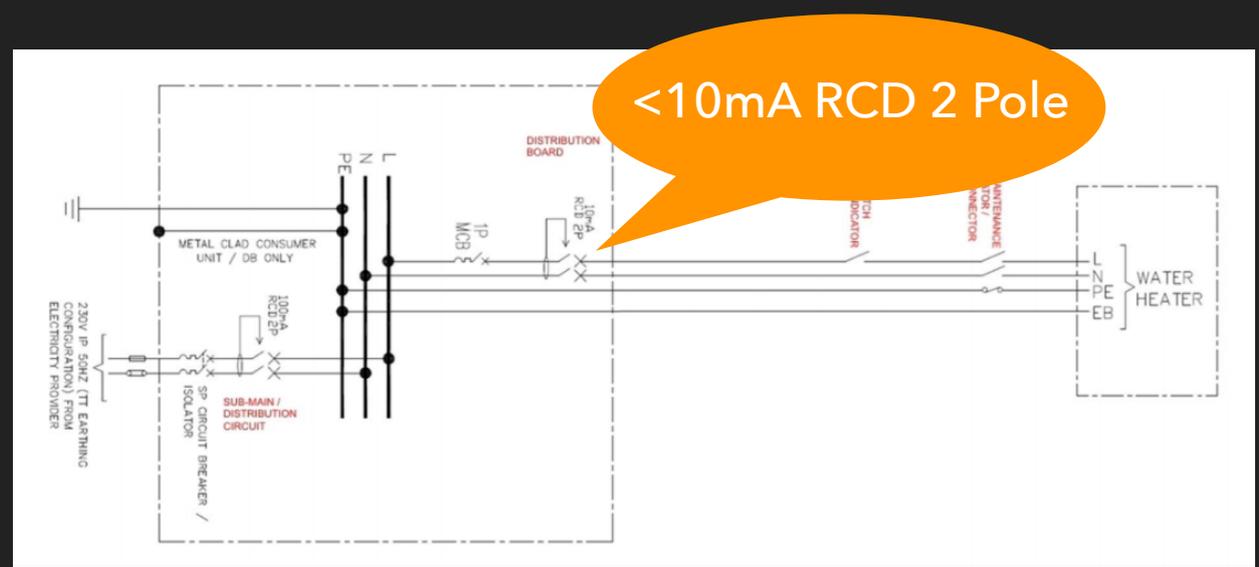
REDUNDANT RCD

- ▶ Clause 4.1.4.1, Final DB incorporate with series RCD with sensitivity $< 100\text{mA}$



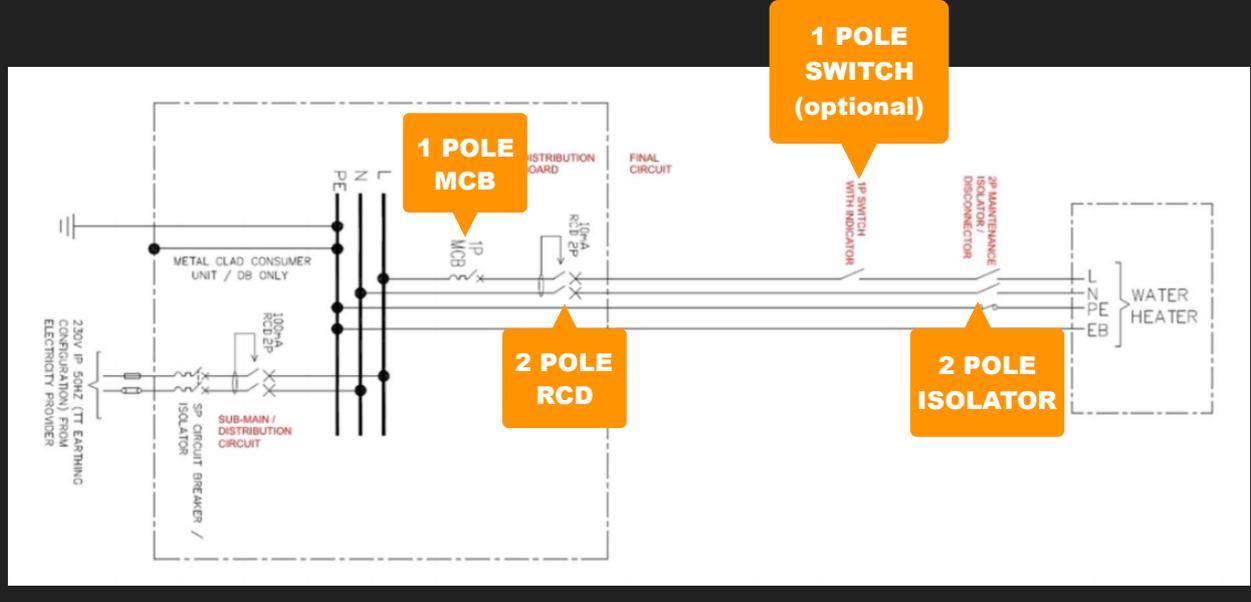
REDUNDANT RCD

- ▶ Clause 4.1.4.3, RCD Sensitivity $< 10\text{mA}$ dedicated for water heater



REDUNDANT RCD

- ▶ Clause 4.1.4.3, Disconnection scheme



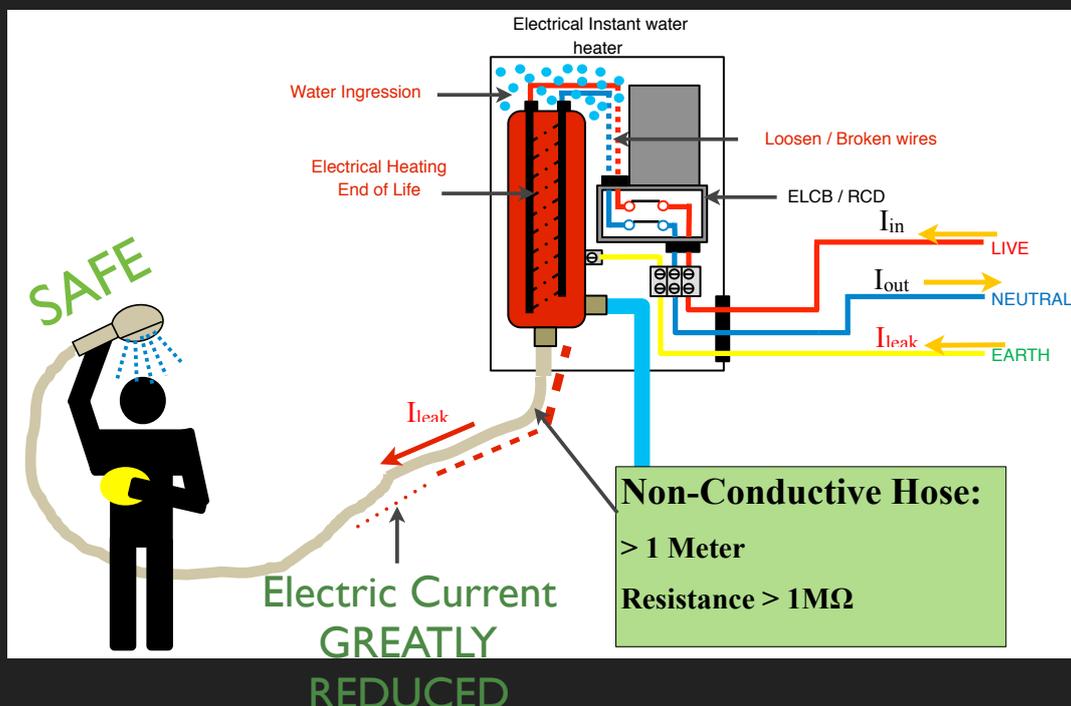
ISOLATION

WATER CONDUCTIVITY

- ▶ Pure water is non-conductive
- ▶ Dissolved salt increases water conductivity
- ▶ Conductivity reduce with smaller cross section area and longer in length

	Electrical Conductivity (S·m-)
Copper	59.6×10^6
Aluminium	37.8×10^6
Sea water * An average salinity of 35 g/kg	5
Drinking water	0.0005 to 0.05
Deionized water	5.5×10^{-6}

NON CONDUCTIVE HOSE / ISOLATION BARRIER (CLAUSE 4.1.7 & 4.2)



NON CONDUCTIVE HOSE / ISOLATION BARRIER (4.1.7 & 4.2)

1m non-conductive pathway reduces current to $< 0.005 \text{ A}$

Non Conductive Hose
MS1597-2-35:2010



Isolation Barrier
Latest MS 1597-2-21:2015

WATER HEATER USERS:

**CHANGE TO NON-CONDUCTIVE HOSE /
ADD ISOLATION BARRIER TODAY!**

IT MAY SAVE YOUR LIFE.

CHECK MAIN RCD TODAY!!!

(AND ON A QUARTERLY BASIS)

IT MAY SAVE YOUR LIFE.

33

THANK YOU!

TEE TONE VEI

Thermo Hygro Consultants Sdn Bhd
tee.tv@thermohygro.com

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