



# Arc Flash

Sub header

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# What is arc flash

- When faults occur in systems our protection devices are in place to prevent damage to equipment and people.
- Arc Flashes can occur because of;
  - Protection devices not operating (or haven't been set correctly),
  - System design did not consider Arc Flash
  - Workers creating short circuits,
  - Build up of conductive material,
  - Fires,
  - Vermin gaining access
- When Arc's occur you 'typically' get ;
  - Blast Wave (Sound waves over 135dB)
  - Up to 20,000°c molten metal ejecting out
  - Ultraviolet radiation from the flash
  - A cloud of super heated gas (Partly as plasma)



# What is arc flash

## Confined Flash



## Open Flash



# Videos

[Re-strike 1](#) (slight delay before video starts and then in 'small screen')

[Test 1](#)

# Myths & lack of understanding

**“We can’t enter the room with energised equipment.”** - overly conservative  
Equipment is not likely to spontaneously combust. Must perform Risk Assessment

**“We don’t have arc flash in our equipment.”** – ‘Internal Arc Containment’ rated equipment is more commonly used in Europe, Who installed/serviced/maintained it ?

**“This is not a low voltage issue – only HV.”** – US MSHA -> 84% of arc flash injuries at less than 600V.

**“We don’t work equipment when it’s energised.”** – In the real world it happens and HSE are happy with that.

**“Nobody has ever died while wearing Level 2 PPE.”** unfortunately they do. Its not a super suit

# Energy behind the Fault



Big transformer = Potential for a big arc flash ?



Small transformer = Small arc flash ?



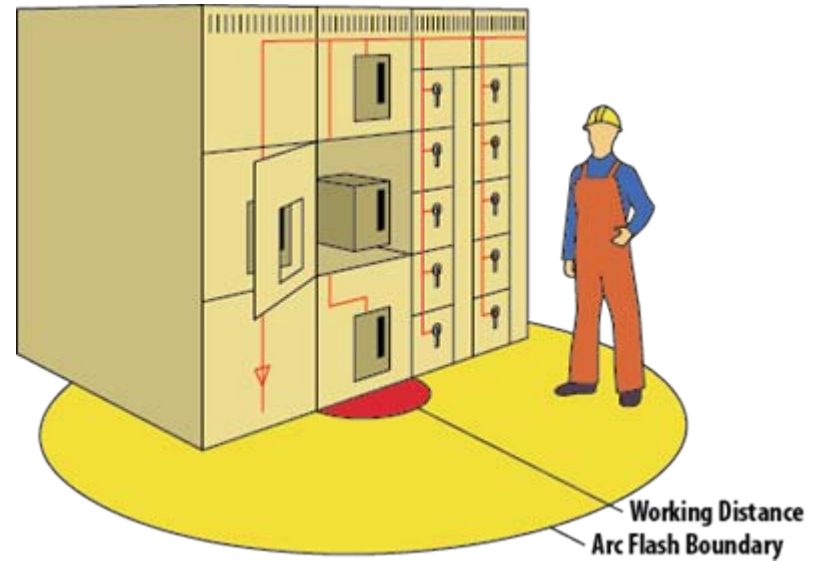
Generators and Motors can add to the fault level.  
What if we only had the generators for our supply ?

# Energy dispersed/contained

Door opened/closed

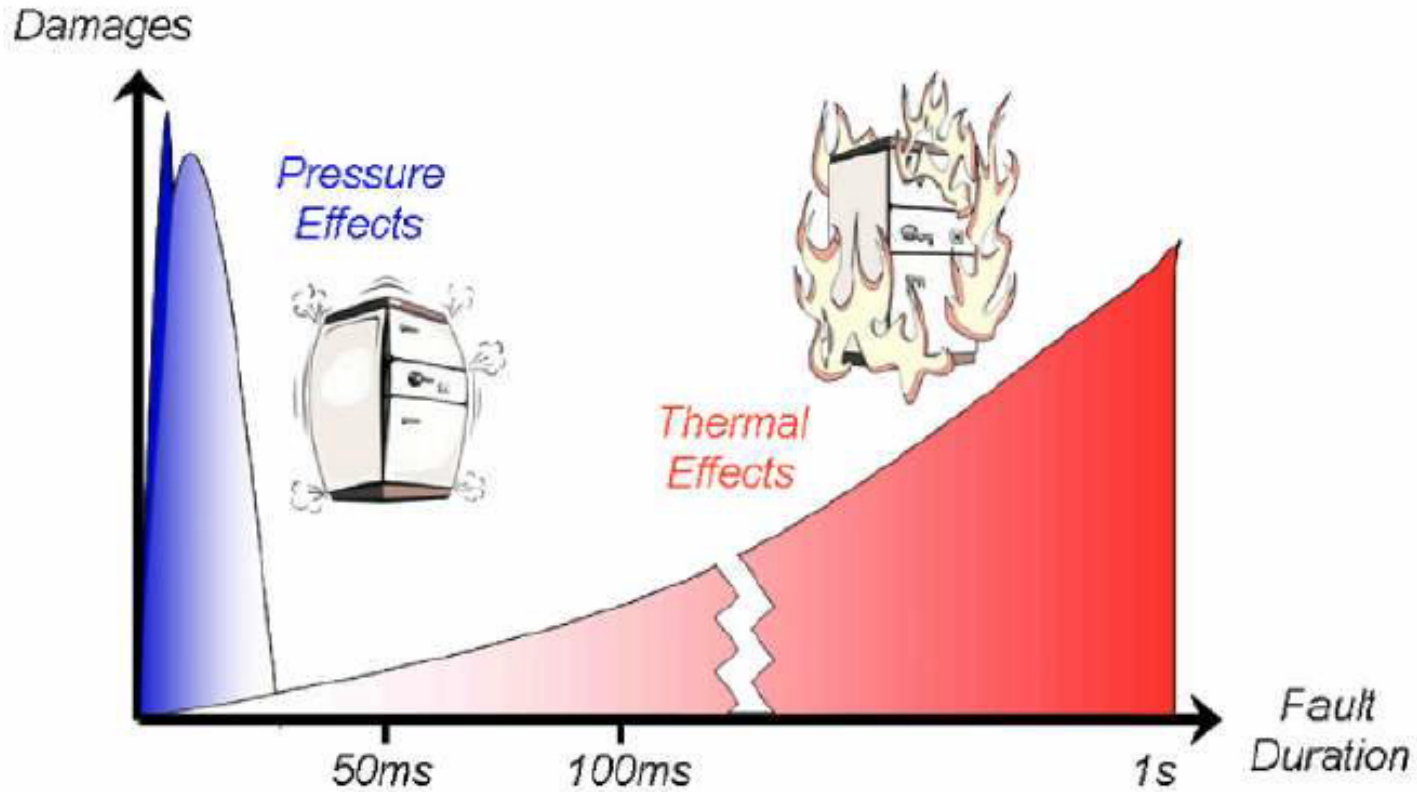


Distance from arc source



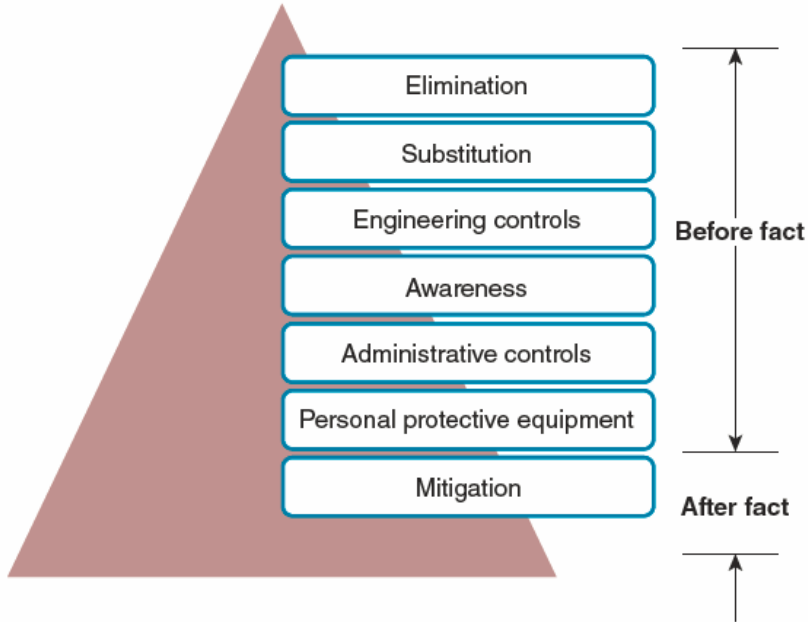


# Time – The critical factor





# Assessing the risks and applying controls



**Elimination** :- Can we do this? customer disruption

**Substitution** :- Not possible in reality

**Engineering controls**:- product or design solutions

**Awareness and Administrative Controls** :- Training Programs & Work Practice updates.

**Personal Protective Equipment** :- Does it protect sufficiently ?

**Mitigation** :- Changing the protection settings or re engineering the location/equipment

# Schneider offer UK

- Consultants to calculate the Arc Flash risk and safe distances for working and people
- Circuit breaker remote control features (Umbilical or remote devices)
- Equipment Designed to protect the Field Service Representative at the front
- Masterpact MW and NT breaker protection modules can lower arc flash potentials.
- Vamp relay to 'See' the fault and send a very fast signal to trip the circuit breaker
- NSX Breakers Limit downstream let-through current by operating very quickly



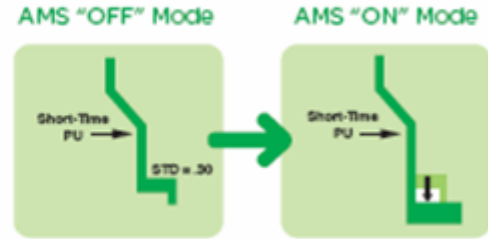
# Schneider offer UK – next steps

- Introduce maintenance switch to change protection settings group (depending on protection type)



## AMS Switch Features

- Reduces the arc-flash incident energy hazard through the elimination of intentional short time delays when activated
- Maintains existing electrical system coordination when in use



- Remote Open/Close & Racking solutions



# Why we did this

- There are no regulations that require us to use arc flash PPE specifically.
- Our customers in Ireland and some of the regional electricity companies have adopted the NFPA 70E considerations from north America
- As a leader in equipment manufacture, sustainability and services we must be ambassadors of safety to our customer base
- We must always protect our employees, particularly as they are our main touch points to the customers.

## We aim to be

No 1 in Products

No 1 in Services

No 1 in Safety

# UK considerations

- Key aims in the UK were to;
  - Make the Arc Flash requirements simple to follow
  - Ensure that the PPE is comfortable
  - The PPE should be easily identifiable as Arc Flash protection
  - Give the managers clear information on who needs it and what they need

# Who needs arc flash PPE

- Customers may specify that all persons working within their substations must be wearing arc flash protection
- The UK policy requires that it should be worn based on the activity to be undertaken and the fault rating of the equipment.
- If you undertake the following you will more than likely need arc flash PPE
  - Switching
  - Fault diagnosis of distribution equipment
  - Testing of live equipment (except Primary current injection and HV insulation testing)

# The PPE

- The current UK offer for Cat 2.



- The current UK offer for Cat 4.





# The Policy

- Rather than expect our FSR's to undertake the Arc flash Calculations we use a what to wear based on activity. A sample is shown below.

Task Performed on Energised Equipment	Hazard/Risk Category	Insulating Gloves (I) or Arc Rated Gloves (A)	Insulated and Insulating Hand Tools
<b>Metal Clad Switchgear rated 1 kV to 52 kV manufactured to IEC62271-201</b> Parameters: Maximum of 35 kA short circuit current available Maximum of up to 0.2 seconds (10 cycle) fault clearing time	–	–	–
Perform infrared thermography and other non-contact inspections	3	A	N
CB or fused switch operation with enclosure doors closed	2	A	N
Reading a panel meter while operating a meter switch	-	-	N
Electrical measurement, calibration, fault finding	4	I	Y
Electrical measurement, calibration, fault finding on control circuits with energised electrical conductors and circuit parts 120 V or below, exposed	2	I	Y
Electrical measurement, calibration, fault finding on control circuits with energised electrical conductors and circuit parts >120 V exposed	4	I	Y
Insertion or removal (racking ) of CBs from cubicles, doors open or closed	4	A	N
Application of safety earths, after voltage test	4	I	N

# The Policy

<b>Arc Resistant Switchgear IEC62271 -201 (For clearing times of &lt; 0.5 sec with a perspective fault current not to exceed the Arc Resistant rating of the equipment)</b> <b>Parameters:</b> Maximum of 35 kA short circuit current available Maximum of up to 0.2 seconds (10 cycle) fault clearing time	<b>Hazard/Risk Category</b>	<b>Insulating Gloves (I) or Arc Rated Gloves (A)</b>	<b>Insulated and Insulating Hand Tools</b>
CB operation with enclosure door closed	2	A	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2	A	N
Insertion or removal of CBs from cubicles with door open	4	A	N
Work on control circuits with energised parts 120 V or below, exposed	2	I	Y
Insertion or removal (racking) of ground and test device with door closed	2	A	N
Insertion or removal (racking) of voltage transformers on or off the bus door closed	2	A	N

A man with glasses on his head, wearing a light purple shirt, is smiling and looking to his left. He is sitting at a desk with a laptop in front of him. In the background, there is a blue filing cabinet and some office supplies. The text "THANK YOU." is overlaid in white on the image.

THANK YOU.