Guidance on the presence and operation of portable self-energised electrical/electronic devices in potentially explosive atmospheres

EI Guidelines Project S1710

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Background

- Explosive atmospheres are a key hazard across a wide range of sites and workplaces.
- Increase in the availability of non ex-certified portable electrical and electronic devices.
- Management of these devices as ignition sources is a key issue.
- Two new technical research documents from the EI:
  - *Investigation of the possible ignition risks arising from the presence and operation of button cell energised devices in potentially flammable atmospheres associated with transport fuels.*
  - *Investigation of the possible ignition risks arising from the presence and operation of lithium-ion (rechargeable) button cell energised devices in potentially flammable atmospheres associated with transport fuels*
- Need for a practical guidance for use by site personnel.

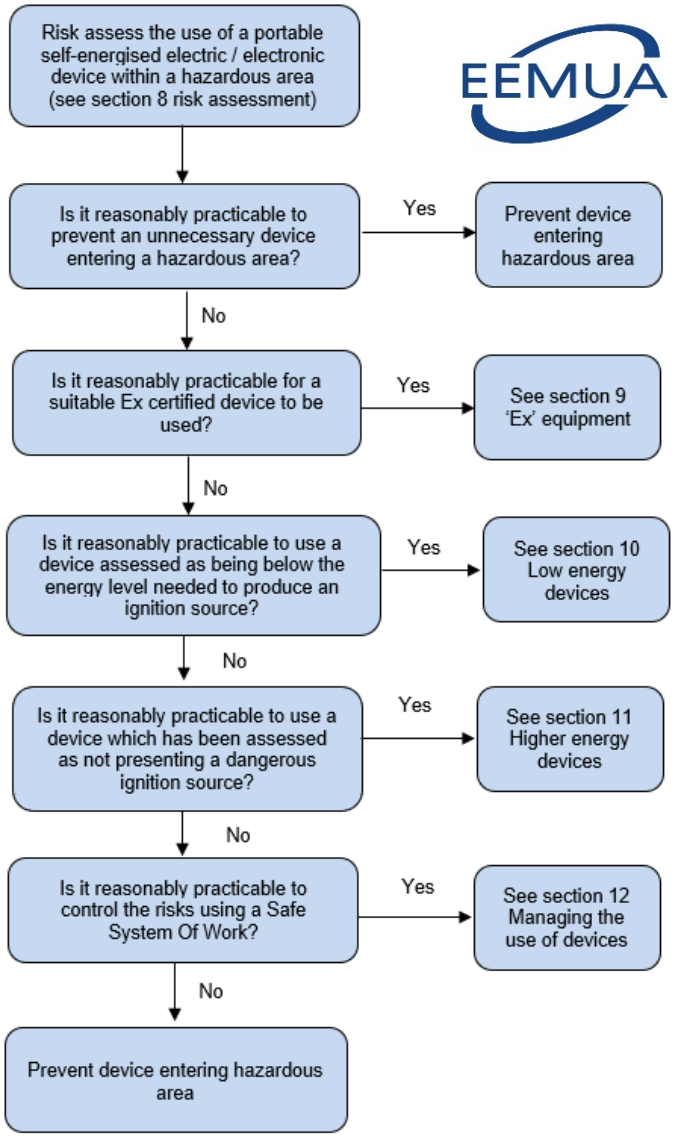
Working Group

The guidance document was developed and reviewed by a broad working group including:

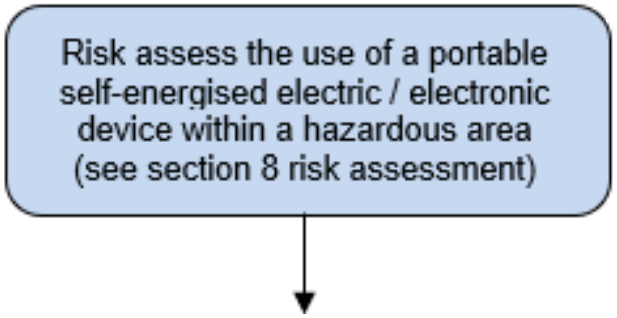
Toni Needham	Energy Institute	Guy Bertrand	SGN
Nandish Velani	EEMUA	Stuart Walker	Exxonmobil
Barrie Salmon	Tank Storage Association	Dibyendu Bhattacharya	BP
Jamie Walker	UKPIA	Agshin Yusifzada	Shell
Tony Brown	FPS	John Isherwood	Wincanton
Peter Evans	HSE		

Flow Chart

- New guidance is based around a hierarchical flow-chart.
- Does not aim to provide new technical research.
- Does not provide detailed list of devices that can and cannot be used.
- Aims to help guide the practical management of devices.
- Aims to be accessible for a wide range of personnel.



Risk Assessment



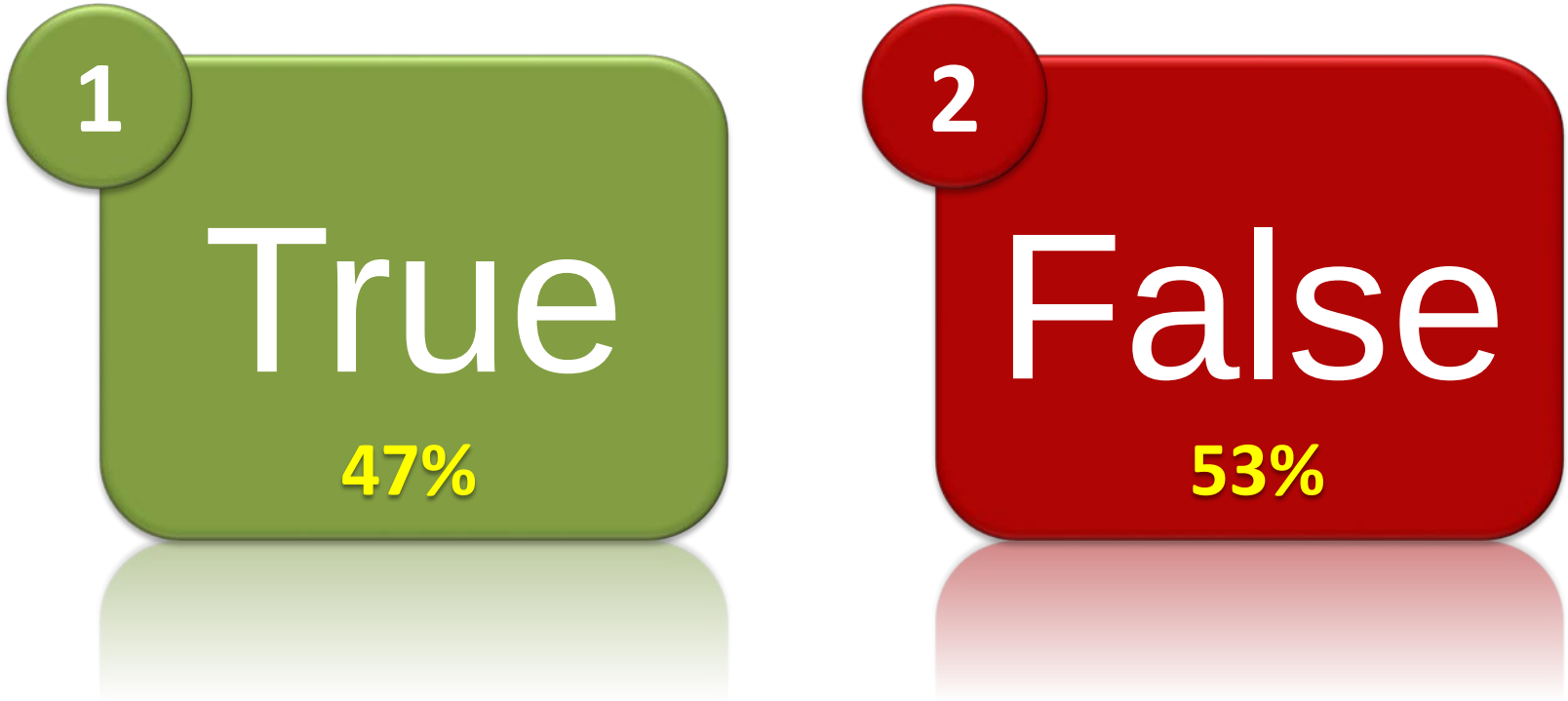
- Duty for employers to carry out a suitable and sufficient risk assessment.

- Risk assessments should consider:
  - the devices themselves;
  - whether they have the potential to present an ignition risk;
  - whether there are sufficient control measures and mitigation measures in place such that the risks are as low as is reasonably practicable.

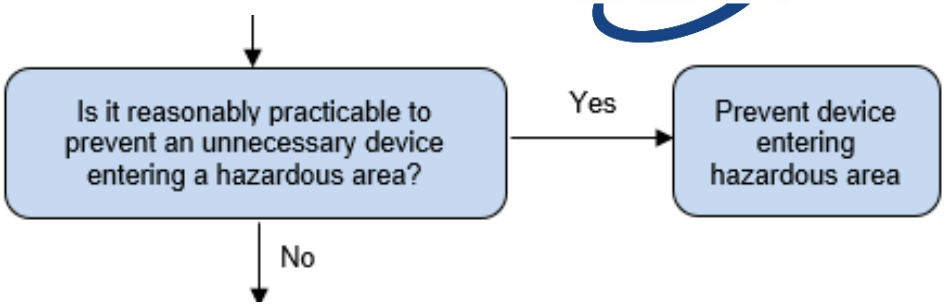
- This guidance proposes that this assessment considers the issues in an order of priority.

Polling Question

All battery powered devices have the potential to produce a dangerous ignition source?



Prevent unnecessary devices entering area

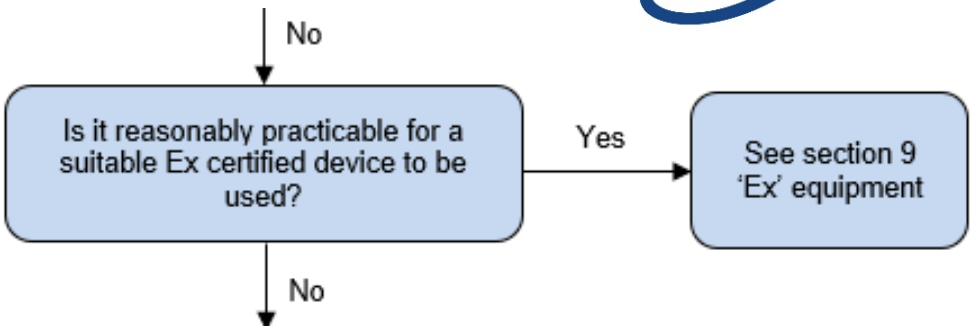


- Initially consider the need for the device.

- Consider the reduced risk if the device is prevented from entering the hazardous area. This risk reduction may be:
  - relatively small e.g. if the device is powered by a single non-rechargeable button cell.
  - relatively large e.g. if the device is powered by a rechargeable lithium-ion battery.

- Also consider the potential benefits. These benefits could be:
  - relatively large e.g. if the device is necessary for the work being carried out, or if it would enable individuals with medical devices to carry out the work.
  - relatively low if there was little benefit to the work/individuals e.g. allowing vaping equipment.

Ex certified equipment

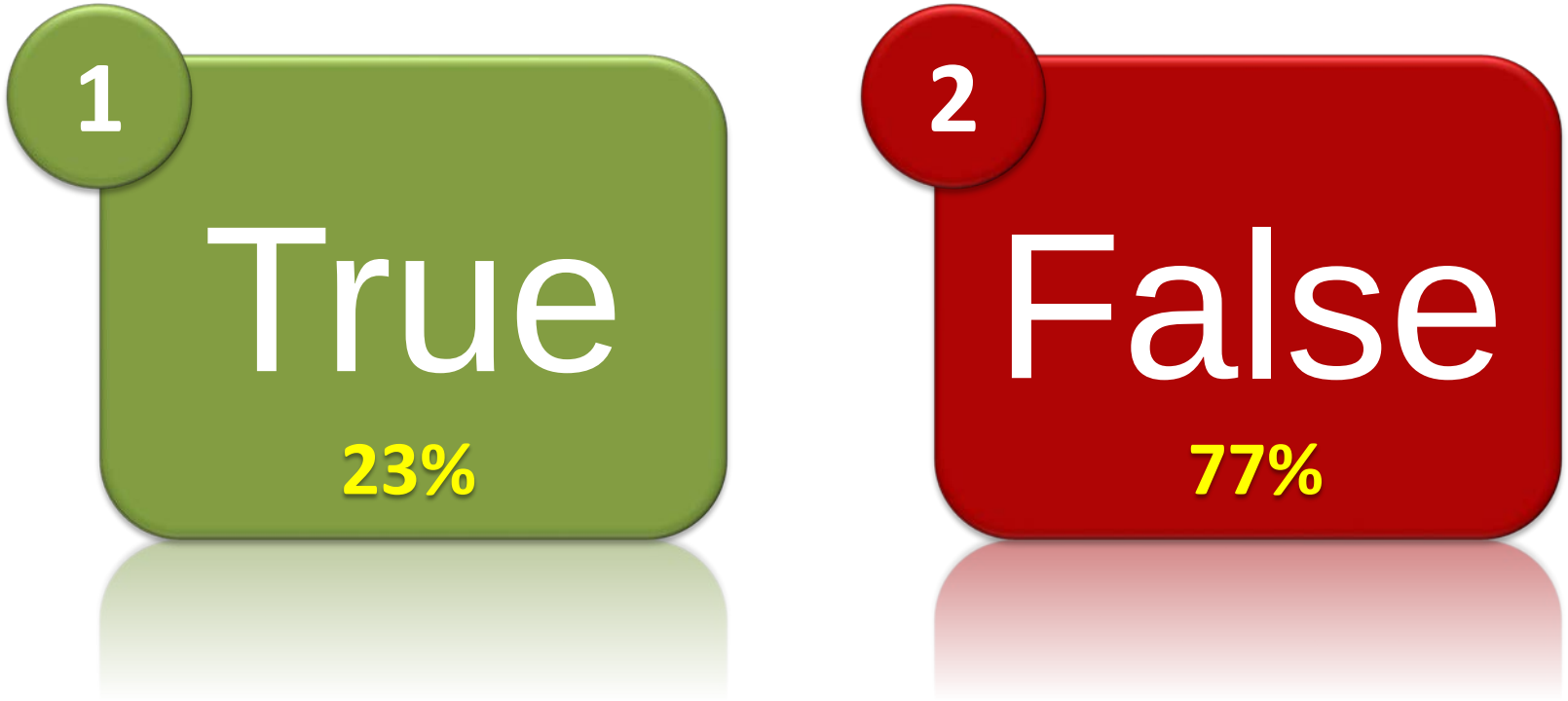


- If a device is required then they should be selected on the basis of the requirements set out in the *Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations,* unless a risk assessment finds otherwise.

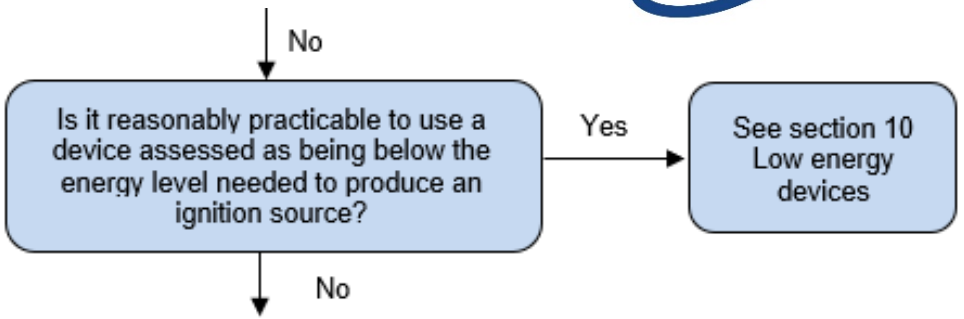
- ie wherever reasonably practicable the device should be Ex certified for the appropriate zone.

Polling Question

Ex certified devices can always be used in a hazardous area?

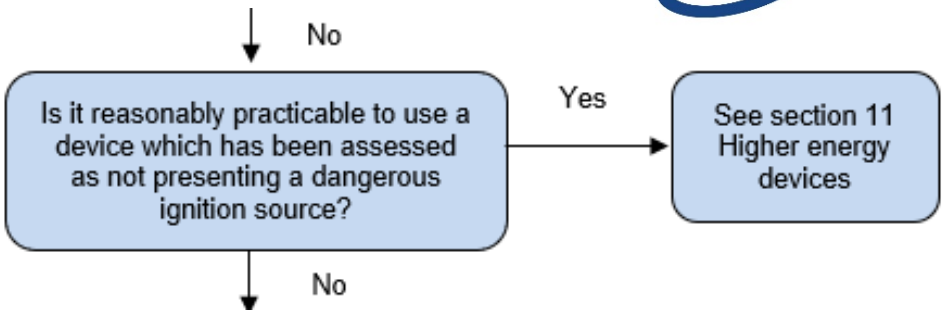


Lower energy devices



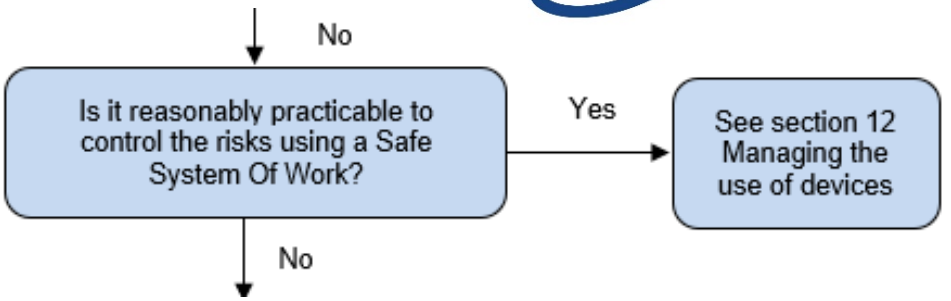
- Not always reasonably practicable to use an Ex certified device, e.g. suitable device not available.
- Consider devices that have been assessed as being below the energy level needed to produce an ignition source.
- EI Research Report concluded that devices powered by one or two button cells are unlikely to create an ignition source.
- But need to consider other ignition risks such as button cells being changed within hazardous areas, and dropped metal cased devices etc.

Higher energy devices



- It may not be reasonably practicable to use a lower energy device. E.g. the device may need to be powered by a lithium-ion rechargeable battery.
- EI Research Report concludes that non-Ex devices incorporating rechargeable lithium-ion batteries **could** produce a dangerous ignition source.
- But it also concludes that not all of these devices **will** present a dangerous ignition source, such as implanted medical devices like pacemakers.
- Therefore the assessment needs to consider whether these higher energy devices will present a dangerous ignition source based on the circumstances of their use.

Managing devices capable of producing a dangerous ignition source

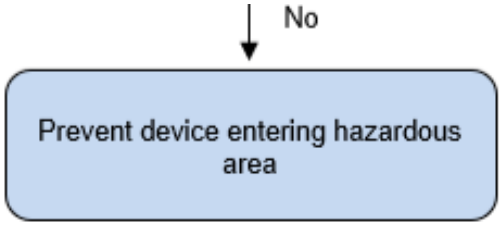


- Where the assessment concludes that the use of the device is capable of producing a dangerous ignition source then its use must be managed with an appropriate SSOW.
- This is a defined way of completing the job, task or process, which takes into account the hazards likely to be encountered and reduces the risks to a level which is as low as is reasonably practicable (ALARP).
- In order to identify appropriate controls for managing the use of the device the SSOW must be based on an assessment of the circumstances of the work.

SSOW considerations

The Devices	The Personnel	The Environment	The Materials
• how it is energised; • its physical characteristics (eg casing); • the planned use; • possible abnormal use; • how device could produce ignition source; • possible damage; • need for recharging / changing batteries; • etc.	• using the devices (employees, contractors, visitors, public) • other personnel in the vicinity; • competence (task, the use of the equipment, potentially explosive atmospheres); • knowledge of the devices; • awareness of the hazards and risks; • etc.	• physical location of the work; • hazardous zones; • ambient conditions (temperature etc.); • weather (wind, rain); • areas that the device will pass through; • potential for incidents to escalate to other areas; • potential for the work area to be impacted by incidents in other areas; • etc.	• hazardous substances (such as flammable liquids); • oxygen; • oxidising substances; • etc.

Controls



- No set list of prevention and mitigation controls.
- But a SSOW may include controls such as:
  - initial gas testing against defined limits and the issuing of a gas-free certificate/permit;
  - continuous gas test monitoring to ensure the work place remains ‘gas-free’;
  - use of a ‘fire-watch’ to monitor any potential ignition sources;
  - use of flame retardant clothing;
  - etc.
- Once controls have been identified the risks should be assessed again to confirm that the risks are now ALARP.
- If the risks are still not acceptable then the device should be prevented from entering the hazardous area.

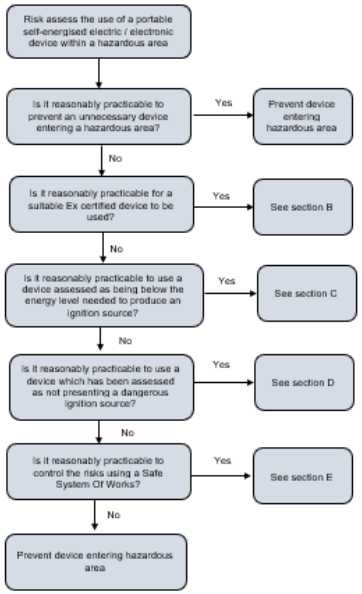
Other supporting considerations

- Document also provides guidance on a range of issues to help with the management of the devices:
  - competence;
  - human failures and human factors;
  - supervision and monitoring;
  - inspection and maintenance;
  - management of change;
  - emergency situations;
  - example case study.

Two-page summary

Handout for managing the presence and operation of portable self-energised electrical / electronic devices in potentially explosive atmospheres (gas and dust)

A. Flow chart for the categorisation of types of portable self-energised electrical and electronic devices



B. Ex certified devices

Any portable self-energised electrical or electronic device taken into hazardous areas should be selected on the basis of the requirements set out in the *Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996*, unless a risk assessment finds otherwise. Wherever reasonably practicable to do so Ex certified equipment should be used within hazardous zones and this equipment should be suitable for the zone that it will be used within:

Zone	Equipment category
zone 0 or zone 20	category 1 equipment
zone 1 or zone 21	category 1 or 2 equipment
zone 2 or zone 22	category 1, 2 or 3 equipment

For further information see section 9 of the main report.

C. Non-Ex certified devices assessed as being below the energy level needed to produce an ignition source

Some non-Ex devices may be fall below the requirements of IEC 60079. Energy Institute research concluded that:

- The use of devices powered by one or two non-rechargeable button cells (e.g. some wrist watches) is unlikely to create an ignition source.
- The radio frequency energy emitted by key fobs energised by one or two button cells is considered not to cause an ignition source.
- The chemistry of rechargeable lithium-ion batteries is sensitive to user mal-treatment and therefore could produce an ignition source.
- Consideration should also be given when assessing the device to other ignition hazards such as mechanical ignition sources.

For further information see section 10 of the main report.

D. Non-Ex devices assessed as being above the energy level needed to produce an ignition source but not presenting a dangerous ignition source

Some non-Ex devices may be assessed as not presenting an ignition source. Energy Institute research concluded that:

- A risk assessment should consider the specific circumstances including the device, individual, work activity, how the device is used/secured etc.
- Implanted medical devices embodying their own energy source do not constitute an ignition risk under normal or abnormal conditions.
- Worn medical devices powered by one or two non-rechargeable button cells (e.g. most hearing aids) are unlikely to create an ignition source within a potentially explosive atmosphere.
- Worn medical devices incorporating rechargeable lithium-ion batteries could produce an ignition source if exposed to an explosive atmosphere unless they are Ex certified.

For further information see section 11 of the main report.

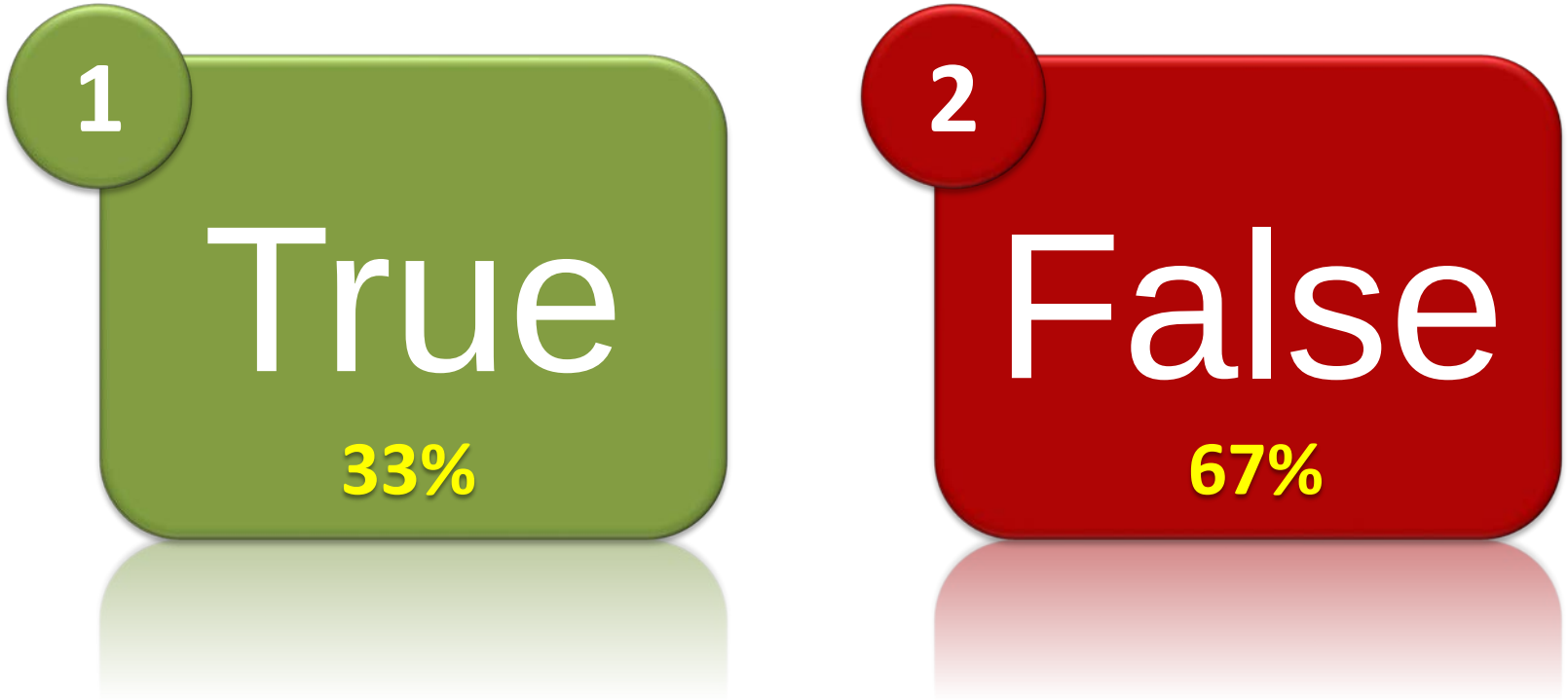
E. Non- Ex certified devices assessed as being above the energy level needed to produce an ignition source and capable of presenting a dangerous ignition source

Some non-Ex devices may be assessed as being capable of presenting a dangerous ignition source. These should only be used if the risks have been assessed and controlled using a safe system of work such that the risks are as low as is reasonably practicable. It is highly unlikely that the risks of using such devices on a frequent basis (such as daily) would be considered to be as low as reasonably practicable and it would be expected that suitable Ex certified devices should be used.

For further information see section 12 of the main report.

Polling Question

Devices with the potential to produce a dangerous ignition source can never be used in a hazardous area?



Questions

Any questions?