

ABB Singapore, Raymond Koh

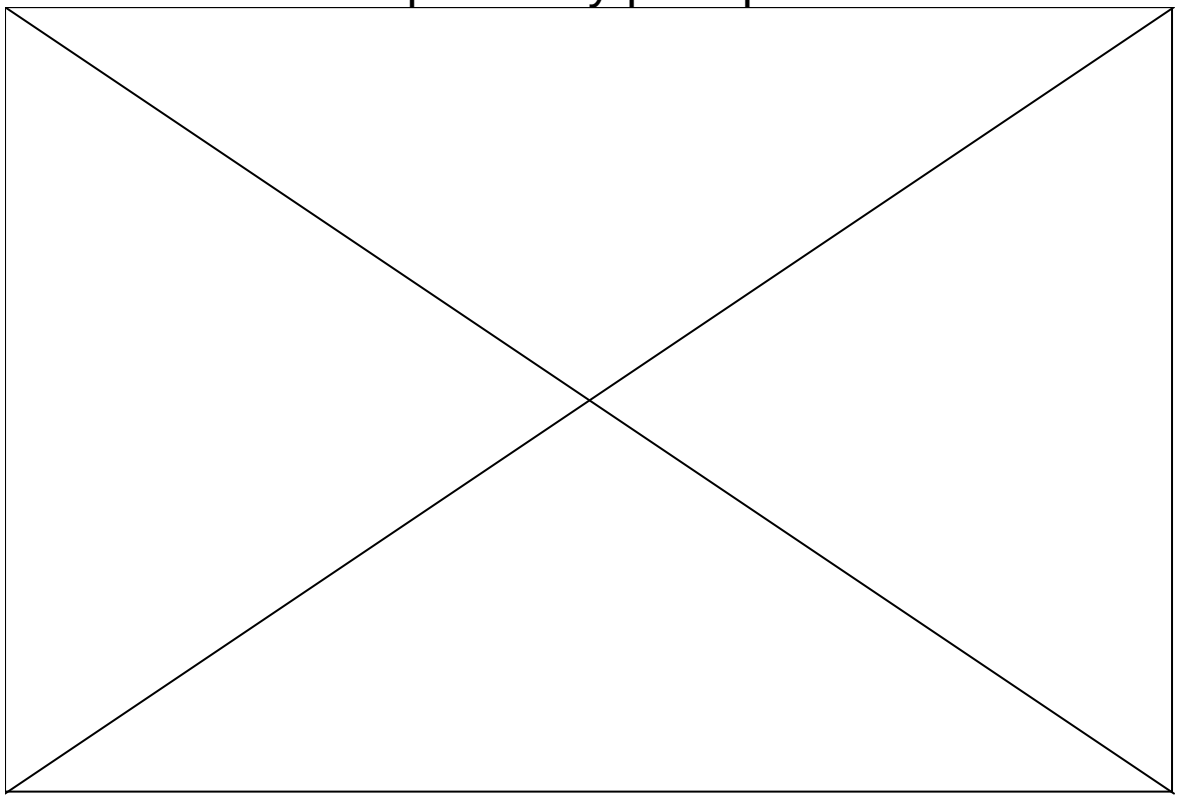
Critical Applications

Power and productivity for a better world™

Critical Applications

Clockwork Gears

- Everything working in place
- Need a full halt to replace any pieceparts

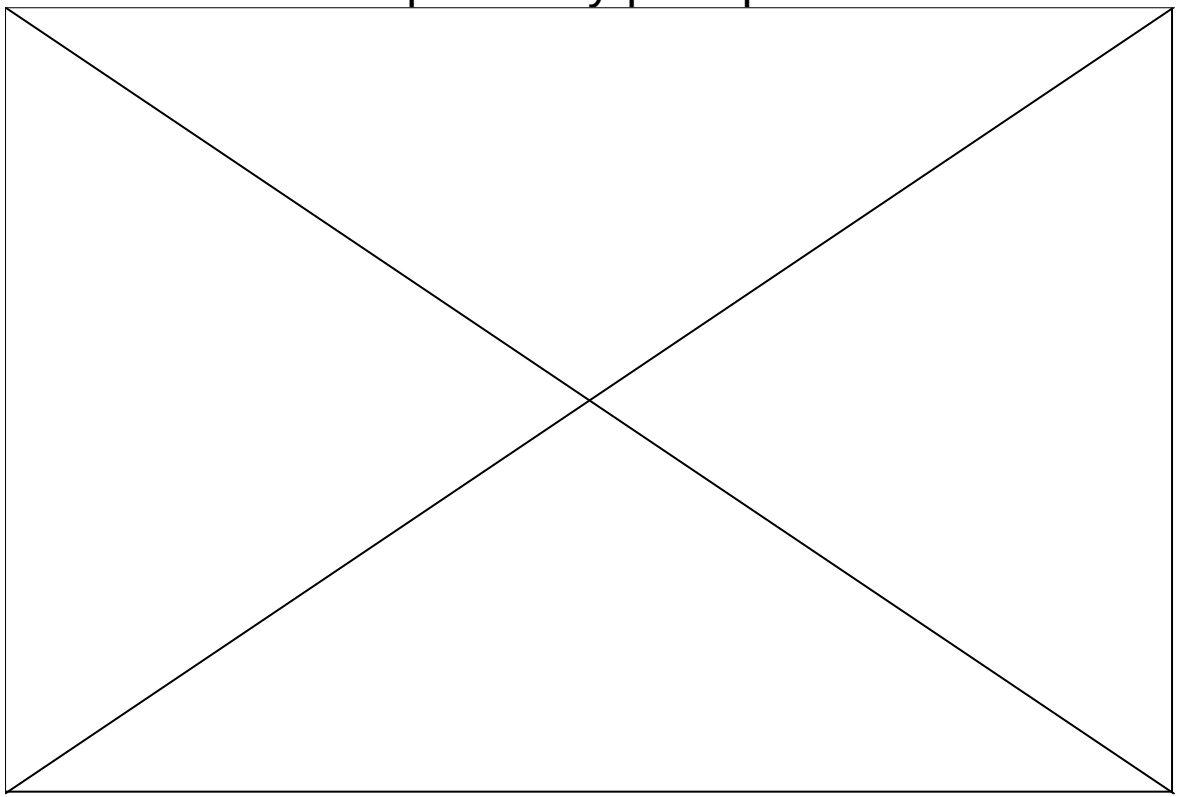


https://www.youtube.com/watch?v=5WbBlApQRNg

Critical Applications

Water fountain Show

- Everything working in place
- Need a full halt to replace any pieceparts



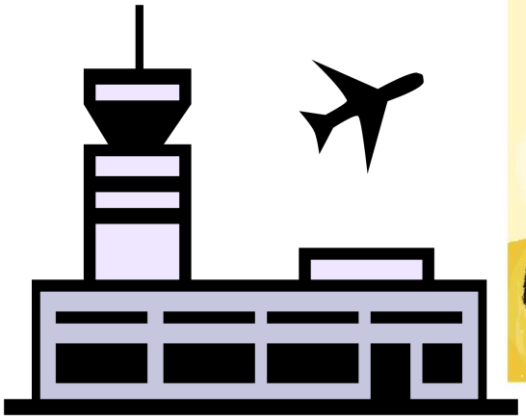
https://www.youtube.com/watch?v=uU-Eda6pI0M

Critical Applications
Considerations in Critical Installation

- What is the criticality?
- Where should it be critical?
- How each criticality relate to the recommended electrical design?
- Oxford describes Safety-critical system in which any failure or design error has the potential to lead to loss of life.
- Critical is described as something which having potential to become disastrous outcome.

Critical Applications

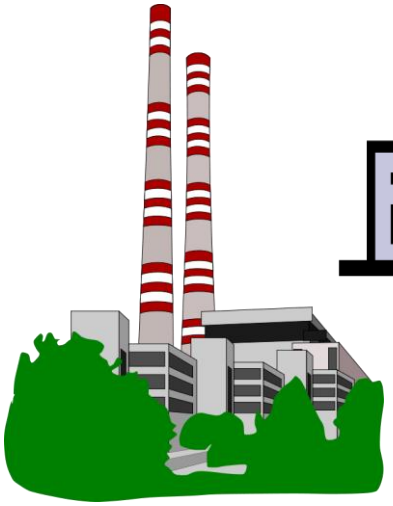
What is critical?



Transportation



Medical Facilities



Power Station



IT center





Critical Applications
PAS-55 in Power Generation

PAS-55 is the British Standards Institution's (BSI) Publicly Available Specification for the optimized management of physical assets

1. Select reliable equipment/installation (when reliability improved, cost of equipment life cycle is reduced.
2. Optimization of equipment usage (to reduce cost of stoppage)
3. Equipment which do reduce downtime, or which do not incur downtime (lowest possible failure occurrence and recurrence.)

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Critical Applications
PAS-55 in Power Generation

PAS-55 is the British Standards Institution's (BSI) Publicly Available Specification for the optimized management of physical assets

5. Asset management: The right preventive maintenance
6. Avoid interruptive operation
7. Assume capability in handling equipment

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Critical Applications
RCM in Aviation Maintenance

RCM Reliable Centered Maintenance analysis is based on a detailed Failure Modes and Effects Analysis (FMEA) and includes probabilities of failure and system reliability calculations. It is used to determine appropriate maintenance tasks to address each of the identified failure modes and their consequences.

Criticality considerations

1. Safety and environment
2. Production Stoppage
3. Repair expense

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Critical Applications
RCM in Aviation Maintenance

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Criticality considerations

4. Redundancy deployment
5. Analysis in maintenance requirements of equipment.

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Critical Applications
Considerations in IEC Electronic Equipment

IEC 62368-1 deals with the safety of electrical and electronic equipment within the field of audio, video, information and communication technology, and business and office machines with a rated voltage not exceeding 600V.

Safeguard considerations based on Energy model

1. Equipment safeguards (enclosures, trunking, cable-tie etc)
2. Installation safeguards
3. Personal safeguards (PPE, remote control, etc)

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Critical Applications
Considerations in IEC Electronic Equipment

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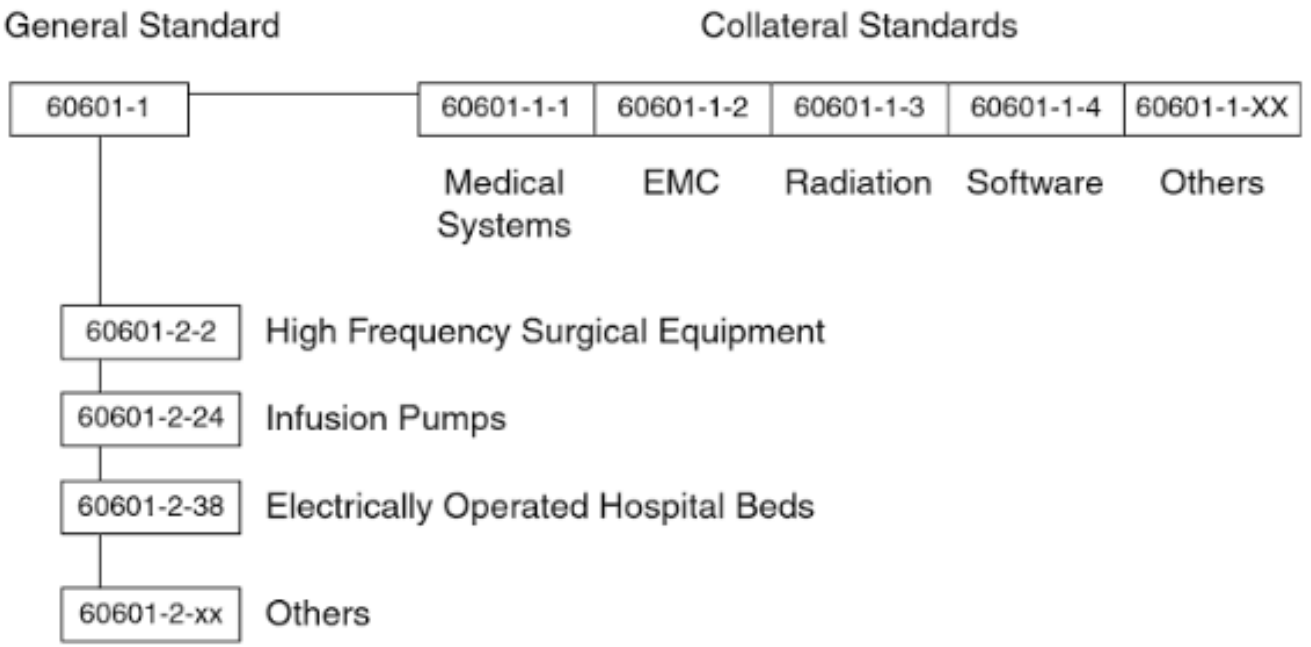
Safeguard considerations based on Energy model

4. Behavioral safeguards
5. Ordinary/instructed/skilled person – service safeguards

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Critical Applications
Considerations in IEC Medical Electrical Equipment

IEC 60601-1 contains requirements concerning basic safety and essential performance that are generally applicable to medical electrical equipment.



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Critical Applications
Considerations in IEC Medical Electrical Equipment

IEC 60601-1 contains requirements concerning basic safety and essential performance that are generally applicable to medical electrical equipment.

Safety-critical considerations

> Medical equipment is highly regulated by all countries, and held to a higher level of safety than nearly all other equipment on the market. The main reasons for this are that medical equipment may be used on patients who are not able to respond to hazardous conditions or pain; an actual electrical connection between the equipment and patient may exist; patient treatment may be based on the output of the medical device; and certain types of medical equipment function as life support, the failure of which could result in the death of the patient.

1. Risk analysis and Risk management file (clear identification of hazards and risk…)
2. Markings and documentations (visibly clear)
3. Insulation coordination (creepage Vs clearance)

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Critical Applications
Considerations in IEC Medical Electrical Equipment

IEC 60601-1 contains requirements concerning basic safety and essential performance that are generally applicable to medical electrical equipment.

Safety-critical considerations

4. Vibration and noise (if equipment vibrates)
5. Hand and foot controls (ingress level IP level, guard level)

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Critical Applications
Considerations in General Equipment

IEC 60204-1 Safety of machinery - Electrical equipment of machines Part 1 General requirements

Safeguard considerations

1. Supply disconnecting device (Isolator, Plugin, or Pluggable means)
2. Insulation to the live parts
3. Protective devices against Surges.
4. Overcurrent Protective devices
5. Clearances, Insulation resistances & Barriers between conductors
6. Isolating devices

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Critical Applications
List goes on

Generally, in every design

1. IP level – prevent equipment downtime due to expected environmental effect.
2. Insulation resistance level – prevent equipment downtime due to surge
3. Isolation – prevent a branch of equipment from disturbing the others (terminal the electrical connection and disconnection of which can be effected without displacing the conductors of the corresponding circuit.)
4. Disconnecting device – enabling faulty branch to be serviceable.

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Critical Applications
List goes on

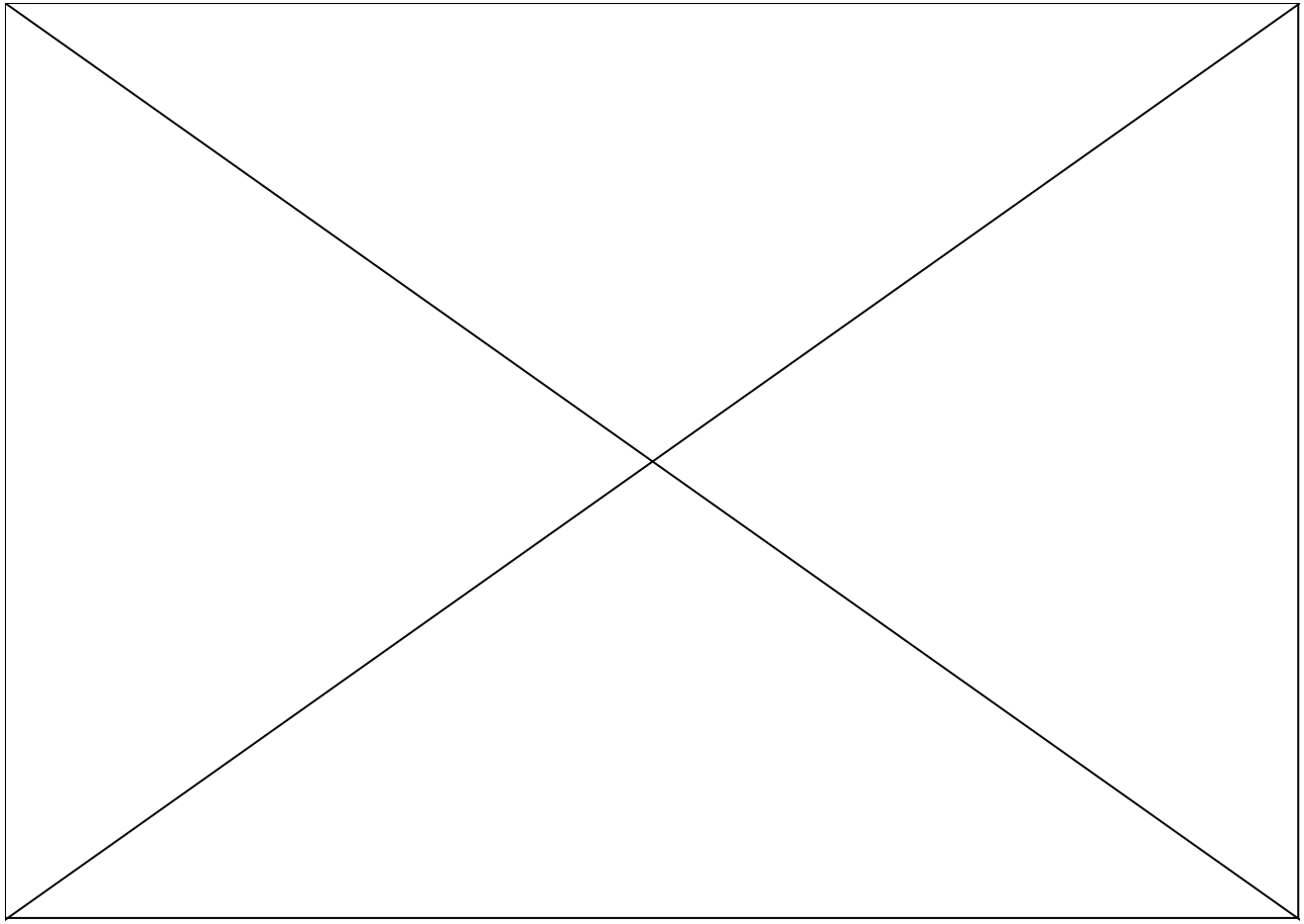
Generally, in every design

5. Overcurrent and leakage current protective devices – line protection and human protection.
6. Protection against behaviour – reduce behaviour related failure/ downtime
7. Resistance against vibration – prevent equipment downtime due to mechanical dynamic stress load.
8. Cable management in clearance provisioning – prevent equipment downtime due to wrong identification

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Critical Applications

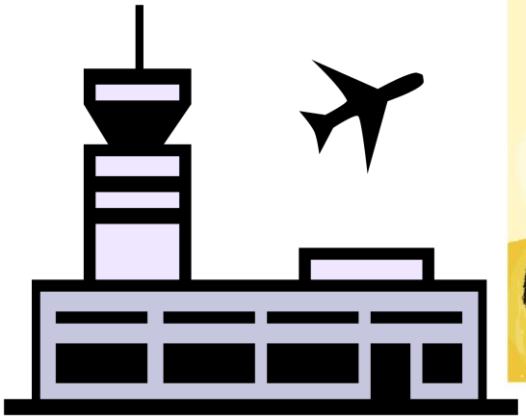
Critical to everyone



https://www.youtube.com/watch?v=7f-aExAWsOs

Critical Applications

What is critical?

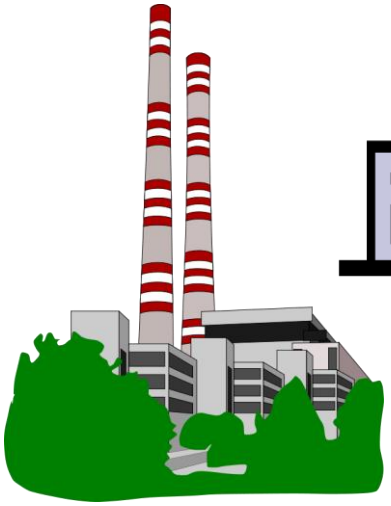


Transportation



Medical Facilities





Power Station



IT center



Financial Institutions

Power and productivity
for a better world™

