

Chapter 4

Safety Measures Against the Indirect Effects of Electric Current

4.1. Fires

Electrical fires can have devastating consequences, including loss of life and property damage. Understanding how to prevent these fires is crucial for maintaining safety measures against the indirect effects of electric current.



4.1.1. Prevention Strategies:

1. Regular Inspections:

- Conduct regular checks by qualified electricians to identify potential hazards such as frayed wires or overloaded circuits.

2. Proper Installation and Maintenance:

- Ensure all electrical systems are installed correctly and maintained regularly to prevent faults.

3. Safety Devices:

- Install protective devices like circuit breakers, surge protectors, and Ground Fault Circuit Interrupters (GFCIs) to quickly interrupt power during faults.
4. **Safe Practices:**
- Promote safe practices such as avoiding DIY repairs unless qualified, keeping cords away from heat sources, and unplugging appliances when not in use.
5. **Emergency Planning:**
- Develop an emergency plan that includes evacuation procedures and training on using fire extinguishers designed for electrical fires.

4.1.2. Levels of Protection

Protection against electrical fires can be implemented at different levels:

1. **Building Level:** Implement comprehensive safety measures across entire facilities.
2. **Room Level:** Focus on specific areas with high-risk equipment.
3. **Base Level:** Protect individual pieces of equipment with localized safety devices like fuses or surge protectors.

By implementing these strategies, the risk of indirect effects from electric current-related fires can be significantly reduced. For specific regulations or standards applicable in your region (e.g., NEC in North America), it is advisable to consult local authorities or relevant documentation.

4.2. Harmful materials

When dealing with electrical systems, it's crucial to consider not only direct electrical hazards but also the indirect effects related to harmful materials. These materials can include hazardous substances in electronics and chemicals that may be ignited by electrical sources.

4.2.1. Hazardous Substances in Electronics:

1. **RoHS Restricted Substances:**
 - The Restriction of Hazardous Substances (RoHS) directive limits the use of substances like lead, mercury, cadmium, hexavalent chromium, PBBs, PBDEs, and certain phthalates in electronic equipment.

- These restrictions aim to protect human health and the environment by reducing waste toxicity.

2. Safety Measures for Handling Hazardous Materials:

- Ensure proper disposal and recycling processes are followed for electronic waste.
- Use protective gear when handling devices containing these substances.

4.2.2. Electrical Ignition Hazards:

1. HAZMAT Environments:

- Electricity can ignite flammable gases or vapors in hazardous material environments.
- Implement engineering controls such as explosion-proof enclosures or intrinsically safe systems to prevent ignition sources.

2. Precautions in HAZMAT Areas:

- Follow guidelines like those outlined in the National Electrical Code (NEC) for managing electricity near hazardous materials.
- Immediately cut power during emergencies involving HAZMATs until confirmed safe by authorities.

3. General Safety Practices:

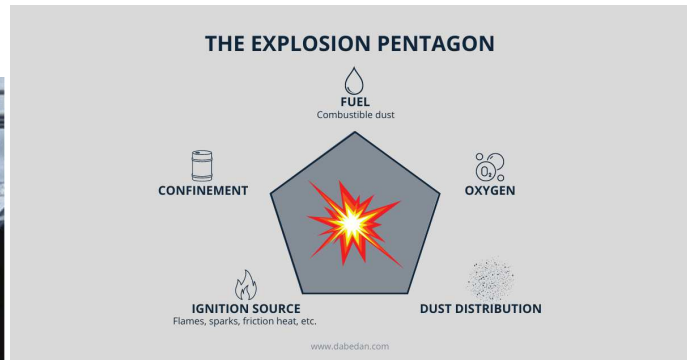
- Regularly inspect electrical equipment for signs of wear or damage.
- Avoid using damaged cords or tools that could lead to arcing or sparking

4.3. Explosions

Explosions can be a severe indirect effect of electric current, often resulting from electrical arcs or sparks igniting flammable substances. Here are some safety measures to prevent such incidents:

4.3.1. Causes of Electrical Explosions:

- **Electrical Arcs and Sparks:** These can ignite flammable gases, vapors, or dusts.
- **Overheating Equipment:** Malfunctioning equipment can generate excessive heat that ignites nearby combustible materials.



4.3.2. Prevention Strategies:

1. Proper Grounding and Bonding:

- Ensure all equipment is properly grounded to prevent static electricity buildup and reduce the risk of sparks.

2. Use Anti-Static Equipment:

- Implement anti-static measures like grounding straps for personnel working with potentially explosive materials.

3. Safe Wiring Practices:

- Regularly inspect wiring for damage or wear; ensure it is installed according to safety standards.

4. Hazardous Area Classification:

- Identify areas where explosive atmospheres may exist (e.g., near chemicals) and implement appropriate safety measures such as explosion-proof enclosures.

5. Training and Awareness:

- Educate workers on recognizing potential hazards and taking preventive actions against electrical ignition sources.

6. Regular Maintenance:

- Regularly inspect electrical equipment for signs of wear or malfunction that could lead to overheating or arcing.

4.4. Noise and vibrations (Definition, standards and techniques for noise control).

4.4.1. Definitions:

- **Noise:** Unwanted sound that can be defined as pressure variations resulting from vibrating air particles. It is measured in decibels (dB) and frequency in hertz (Hz).
- **Vibration:** Mechanical oscillations or the intermittent motion of a particle or body around its equilibrium position. Vibration can be desirable or undesirable.

4.4.2. Standards:

- Various countries have standards for acceptable noise levels to protect workers' hearing. For example, OSHA guidelines in the U.S. require employers to implement measures when noise exceeds certain thresholds.
- The European Union also has directives regulating noise exposure at work.

4.4.3. Techniques for Noise Control:

1. Source Reduction:

- Modify machinery design or operation to reduce inherent noise generation.
- Specify low-noise equipment during purchases.

2. Path Interruption:

- Use barriers like acoustic enclosures to block sound transmission.
- Install silencers on ducts and pipes.

3. Receiver Protection:

- Implement administrative controls such as limiting exposure time or providing personal protective equipment like earplugs.

4. Vibration Damping/Isolation:

- Use vibration damping materials on metal panels to reduce vibration-induced noise.
- Isolate motors from structures using pads to prevent vibration transmission.

5. Acoustic Lagging:

- Wrap pipes with acoustical materials for effective noise reduction without full enclosures