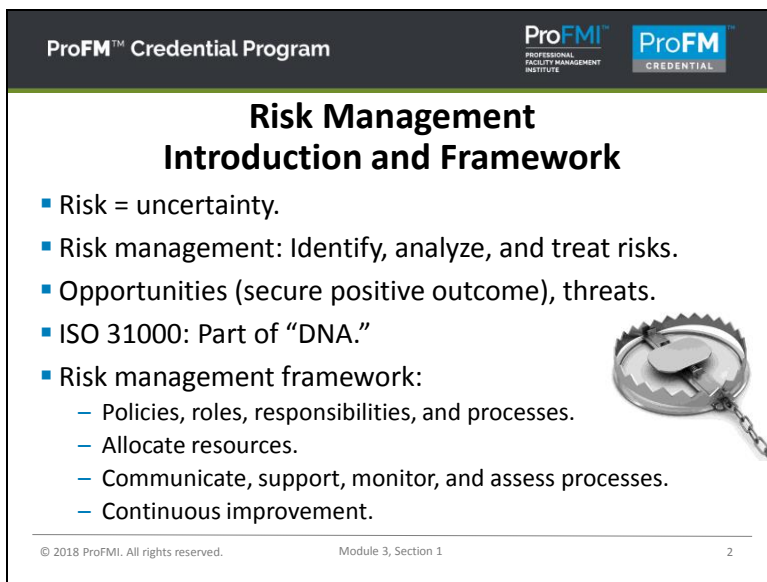


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# Module 3: Risk Management

## Section 1: Introduction to Risk Management



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## ISO 31000 Risk Management Principles

Effective Risk Management:	Comments
Creates and protects value.	Essential tool for achieving objectives.
Is integrated into strategy, structure, policies, systems, and culture.	A step in design of all of these; a factor in all decision making.
Employs a consistent structure.	Measurability and comparability.
Can be customized.	Universally applicable but tailored to need.
Includes all stakeholders.	Better risk identification, communication.
Is dynamic.	Repeated periodically to keep relevant.
Uses the best available information.	Decreases effect of bias and assumptions.
Accommodates human and cultural factors.	Perceptions matter.
Commits to continuous improvement.	Improves framework to detect and treat.


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## Risk Management Process

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### Discussion Question

In addition to geographic location risks and the nature of the industry, what else can shape the organization's risk appetite and risk tolerance?

- a) The organization has mission-critical processes.
- b) Stakeholders have expectations for certainty.

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### Identifying Sources of Risk

- Categories to focus search
  - Financial
  - Operational
  - Reputational
  - Legal
  - Strategic
- Multiple perspectives and stakeholders
- Risk controls
- Risk register

**Internal FM risks**

- Slips and falls
- Key system failure
- Assets stolen
- Operations interrupted

**External FM risks**

- Long drought
- Severe storm damage
- Regulatory change

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## Analyzing and Prioritizing Risk

**Weigh risk:**

- Likelihood and impact
- Speed if unfolds
- Complexity (domino effect)
- Currently controlled
- Controllable
- Information reliability

**What to do:**

- Maintain current treatment.
- Do nothing.
- Select appropriate treatment.
- Monitor situation for change.

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## Selecting Risk Management Tactic

**Risk avoidance**  




**Risk transfer**  


**Risk prevention**  


**Risk acceptance**  


**Risk mitigation**  


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## Implementing, Monitoring, and Reviewing

**Incorporate treatment in FM plans, budgets.**



- Assign ownership.
- Elaborate on tactics:
  - Workable, effective
  - How to measure, gather data, report, monitor
  - Schedules
  - Supplies
  - Service providers
  - Training

**Review framework, strategy periodically.**

- Framework implemented?
- Working?
- Communications?
- Risk mindset?
- Different risks now?
- Profile, appetite, and tolerance still correct?

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## Benefits of Risk Management

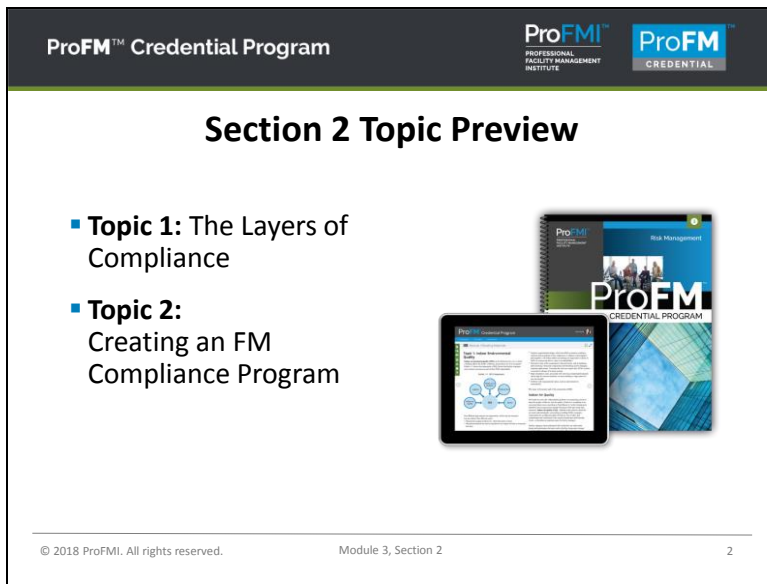
- Increased likelihood of achieving strategic goals
- Uniform goals and practices
- Better awareness and understanding of risk
- Stakeholder interests served
  - Financial performance
  - Ethics
  - Regulators see good faith
- Operations interruptions less disruptive
- Resilience

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## Section 2: Compliance and Standards




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## Compliance and Standards

- Internal processes to ensure fulfillment of applicable:
  - Laws.
  - Regulations and any standards they reference.
- Agency guidance.
- Compliance also an ethical requirement:
  - Commitment to values.
  - Strength of ethical culture.
- Essential to operations:
  - Sets expectations.
  - Everyone's responsibility.



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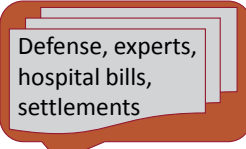
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## Objectives and Benefits of Compliance

- Objectives:
  - Minimize business risk.
  - Control cost of compliance.
- Financial and reputation:
  - Avoid prosecution, fines, business closure, litigation.
  - Regulator relationships.
  - Operations: Maintenance cheaper than correction.
  - Healthy, safe, productive.
- Marketing advantage to clients.
- Organizational management maturity.



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## FM's Role in Compliance

Facility manager as responsible person

- Duty of care
- Degrees of responsibility
  - Absolute responsibility
  - Reasonably practical
- Vicarious liability

Safeguarding physical, human, financial, and reputational assets

- Aware of requirements
- Policies in place
- Workers know policies
- Culture of compliance
- Audit compliance
- Report violations
- Document efforts

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## Layers of Compliance

**External**

- Laws
- Standards
- Contracts

**Internal**

- Risk management framework
- Ethical guidelines

How heavily regulated is the industry?

What are the sources of regulations?

How are regulations enforced?

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## Laws, Standards, and Contracts

<b>Laws</b> <ul style="list-style-type: none"><li>International<ul style="list-style-type: none"><li>CFCs, HCFCs</li></ul></li><li>Federal<ul style="list-style-type: none"><li>HR, data, environmental</li></ul></li><li>Sub-federal<ul style="list-style-type: none"><li>Employment, building</li></ul></li><li>Local<ul style="list-style-type: none"><li>Building, permitting, land</li></ul></li></ul>	<b>Standards</b> <ul style="list-style-type: none"><li>Regulatory standards<ul style="list-style-type: none"><li>Support laws</li><li>How to comply</li><li>OSHA, HSE</li></ul></li><li>Voluntary consensus standards<ul style="list-style-type: none"><li>Consensus</li><li>ISO</li><li>IBC, ASHRAE, NFPA</li></ul></li></ul>	<b>Contracts</b> <ul style="list-style-type: none"><li>Legally binding</li><li>Leases, services, unions</li><li>Legal fees, penalties, strikes</li><li>Regulatory responses</li><li>Expectations</li><li>Legal review</li></ul>
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## Discussion Question

What is a factor that would reduce challenges in compliance with laws and standards?

- a) Use of vendors or contractors
- b) Industry or local subject matter experts
- c) Progress of technology and business
- d) Different layers of government adding layers

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### Risk Management Framework and Ethics

- Risk management framework
- Well-defined code of conduct
- Ethics programs
- Standard operating procedures (SOPs)
- Employee handbooks

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### Applying PDCA to Compliance

Identify compliance obligations and risk.

Set strategy.

Continuously improve to eliminate noncompliance cases.

Implement and monitor controls, measures.

Review program and controls.

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## Understand Compliance Environment

**External factors**

- Regulated industry?
- Intensity? Inspections?
- Key regulatory bodies
- Impending laws, trends
- Key regulatory stakeholders and interests

**Internal factors**

- Compliance officer or department?
- Compliance history
- Leader commitment
- Penalties/rewards for compliance record?
- FM SOPs? Staff knows?



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## Identify and Analyze Noncompliance Risk Sources

**Compliance documentation**

**Adequacy of existing controls**

**Ethical and legal compliance?**

**Prioritize risks by impact**

- Operational
- Legal
- Financial
- Reputational

- Indoor environmental quality
- Food service
- Construction and remodeling
- Procurement
- Worker safety, vehicles
- Hazardous materials
- Digital security

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## Develop Controls, Monitor, and Review Strategy

- Develop, then revise compliance controls: residual risk.
  - Awareness and education.
  - Industry publications and conferences.
  - Hotlines, whistleblower protection.
- Monitor and report program efficiency, effectiveness.
  - Audit programs and benchmark against agency reports.
  - Track compliance cost and benchmark.
- Review compliance management strategy.
  - Controls work; noncompliance detected, reported, corrected.
  - New laws and standards reflected and communicated.


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## Questions?



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## Section 3: Environmental Health and Safety

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**3** Risk Management

Section 3: Environmental Health and Safety

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### Section 3 Topic Preview

- **Topic 1:** Indoor Environmental Quality
- **Topic 2:** Hazards from Substances in the Facility
- **Topic 3:** Workplace Hazards
- **Topic 4:** Hazards from Fire in the Facility



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## Environmental Health and Safety (EHS)

### EHS areas

- Comply with environmental regulations and protect community from emissions and waste.
- Create safe and healthful workplaces at low risk of workplace hazards, accidents, and fire.

### Costs of EHS failures

- Financial loss
  - Sickness and premiums
- Loss of human capital
- Loss of reputation
  - Investor confidence
  - Recruitment issues
  - Social media
- Failure of ethical values

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## Risk Management Approach to EHS

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graph LR
    A[Top leader commitment.] --> B[Identify and analyze risks.]
    B --> C[Assess controls adequacy.]
    C --> D[Manage risks.]
    D --> E[Set policy and goals.]
    
```

### Top leader commitment

- Avoiding environmental damage
- Supporting health and safety
- Time and resources
- Communicating EHS issues and listening

### Identify and analyze risks

- Laws, regulations, standards
- Noncompliance areas
- Hazard inspections
- Occupant surveys
- Work observation
- Illness and accident logs
- Hazardous items inventory
- Insurance input and tools

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## Managing EHS Risks

Create or revise policies.	<ul style="list-style-type: none"><li>• Cleaning standards</li><li>• Restricted products or recommended equipment</li></ul>
Make structural or cultural changes.	<ul style="list-style-type: none"><li>• EHS officers</li><li>• Health and safety committees</li></ul>
Revise practices.	<ul style="list-style-type: none"><li>• Cleaning focused on health risk vectors like mold and dust</li></ul>
Create control tools.	<ul style="list-style-type: none"><li>• FM new-hire orientation or equipment audit checklists</li><li>• Construction site dust controls</li></ul>
Improve facility's preparedness.	<ul style="list-style-type: none"><li>• Health and safety equipment and training</li><li>• Location and inventory of hazardous materials</li></ul>

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## Indoor Environmental Quality (IEQ)

- How facility affects health, well-being, and productivity
- Costs of poor IEQ
  - Poor productivity = poor revenue (less output, more sick days)
  - Recruitment, retention, relations, and shareholder value
  - Reduced asset value, required replacement, or redesign
  - High contaminant remediation cost
  - Conflict with values (sustainability)



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## Indoor Air Quality

Fresh, odor-free, and contaminant-free air, properly conditioned and humidified

Design	Maintenance	Economic
<ul style="list-style-type: none"> <li>Effect of HVAC design on air quantity and quality</li> <li>Changes in occupancy levels</li> </ul>	<ul style="list-style-type: none"> <li>Backlog or improper maintenance</li> <li>Broken dampers</li> <li>Mold and particles</li> </ul>	<ul style="list-style-type: none"> <li>Cost of conditioning fresh air</li> <li>Cost-efficient</li> </ul>

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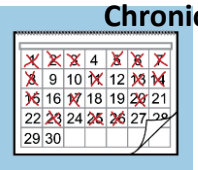
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## Effects of Poor IAQ on Occupants

Discomfort	Acute	Chronic
 <ul style="list-style-type: none"> <li>Calls/surveys</li> <li>Root cause?</li> <li>Complaints                             <ul style="list-style-type: none"> <li>- Hot/cold</li> <li>- Drafty</li> <li>- Humid/dry</li> <li>- Smelly</li> </ul> </li> </ul>	 <ul style="list-style-type: none"> <li>Within 24 hours</li> <li>When/where began?</li> <li>Symptoms                             <ul style="list-style-type: none"> <li>- Eyes, nose, throat</li> <li>- Headache/dizziness</li> <li>- Fatigue or lethargy</li> </ul> </li> </ul>	 <ul style="list-style-type: none"> <li>Extensive or repeated</li> <li>Cancer, heart, respiratory disease</li> <li>Pollutants                             <ul style="list-style-type: none"> <li>- Asbestos</li> <li>- Benzene</li> <li>- Radon</li> <li>- Tobacco smoke</li> </ul> </li> </ul>

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## Sick Buildings versus Building-Related Illness

<b>Sick building syndrome (SBS)</b>	<b>Building-related illness (BRI)</b>
<ul style="list-style-type: none"><li>▪ Symptoms correlate with time in building.<ul style="list-style-type: none"><li>▪ Headache, lethargy, distraction</li><li>▪ Irritated eyes, nose, throat, skin</li></ul></li><li>▪ Dissipate if elsewhere.</li><li>▪ No specific illness or cause found.</li><li>▪ Absenteeism and morale.</li></ul>	<ul style="list-style-type: none"><li>▪ Flu-like symptoms<ul style="list-style-type: none"><li>▪ Legionnaires', humidifier fever, hypersensitivity pneumonitis</li></ul></li><li>▪ Identifiable cause<ul style="list-style-type: none"><li>▪ Chemical root cause (e.g., formaldehyde)?</li><li>▪ Wet or moist surfaces</li><li>▪ Cooling tower issues</li><li>▪ Poor filters or drains</li><li>▪ Water-damaged material</li><li>▪ Humidification issues</li></ul></li></ul>

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## Sources of Poor IAQ

- Improper air temperature
  - 72°F ± 2°F (21°C ± 2°C)
  - ASHRAE thermal comfort standard for summer and winter
- Unhealthy humidity levels
  - ASHRAE Standard 55: 30% to 65% humidity
  - Low: Static electricity and dry skin and lips
  - High: “Sticky” and mold likelihood
- Inadequate airflow
- Pollutants (external and internal)

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## Sources of Poor IAQ: Airflow

**Velocity**

- Feet/meters per minute in duct
- Number of turns
- Chilly vs. stuffy
- Contaminant build-up

**Volume**

- Cubic feet/meters per minute
- Low pressure: outside air infiltration
- Stratification

**Ventilation**

- Stale with fresh
- Pollutant removal
- ASHRAE 62: minimums per space type
- Measure CO<sub>2</sub> (<700 ppm)

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## Sources of Poor IAQ: Internal Pollutants

Pollutant	Source(s)
Asbestos	Building materials, insulation, millboard, textured paint, tiles
Bacteria, fungi, mold	Cooling towers, humidifiers, condensers, duct insulation, mites
Carbon monoxide	Kerosene, gasoline, furnace, water heater
Combustion	Furnace or generator
Fibers, particles	Carpeting, furniture fabric, paper products, insulation
Formaldehyde	Plywood, particle board, fabric, fiberboard, furniture
Lead	Paint, dust, water, water pipes, gasoline
Cleaning supplies	Solvents, disinfectants, pesticides, fungicides
Radon	Foundations, building materials, well water
VOCs	Wax, paint, stain, lubricant, plastic, toner, furnishings, adhesive

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## Improving IAQ: Profiling Process

#	Step	Details
1	Review existing records.	<ul style="list-style-type: none"> <li>Review design, construction, and operating documents.</li> <li>Compare HVAC maintenance records against equipment list.</li> <li>Check complaint records.</li> </ul>
2	Perform walk-through building inspection.	<ul style="list-style-type: none"> <li>List responsible staff/contractors.</li> <li>Review housekeeping and pest control schedule/process.</li> <li>Identify IAQ risk areas.</li> </ul>
3	Gather details.	<ul style="list-style-type: none"> <li>Determine HVAC condition.</li> <li>Identify pollutant sources and pathways, and get SDSs.</li> <li>Gather occupancy information by room type, use, and air supply.</li> </ul>
4	Use risk management.	<ul style="list-style-type: none"> <li>Analyze risk and determine best management tactic.</li> </ul>
5	Develop IAQ management plan.	<ul style="list-style-type: none"> <li>Operate and maintain HVAC to standards.</li> <li>Manage occupants, communicate, educate.</li> <li>Identify parts of projects with IAQ impact.</li> </ul>

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## Improving IAQ in Design and Construction

- Design without IAQ in mind = IAQ problems.
- Integrate IAQ into design conversations.
- Help each functional area realize its impact on others.
- Commissioning includes IAQ requirements.
- Influence HVAC system selection to reach desired IAQ.
- Train O&M on importance of IAQ and alignment with design standards; extends system and facility life.

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## Improving IAQ in Operations and Maintenance

O&M Area	IAQ Improvement Behavior
Equipment operating schedule	<ul style="list-style-type: none"> <li>Occupied/unoccupied equipment schedule vs. actual flow</li> <li>Air flush prior to renewed occupation</li> </ul>
Controlling odors and contaminants	<ul style="list-style-type: none"> <li>Pressure differential between high/low contaminant areas</li> <li>Local exhaust; pollutants segregated from occupants; SDSs</li> </ul>
HVAC maintenance schedule	<ul style="list-style-type: none"> <li>Manufacturer's recommended schedule</li> <li>Inspection with HVAC checklist, especially areas contacting water</li> </ul>
Building maintenance schedule	<ul style="list-style-type: none"> <li>Odor- or dust-producing maintenance done in off hours</li> <li>Time for full ventilation prior to occupation</li> </ul>
Ventilation quality and quantity	<ul style="list-style-type: none"> <li>Ventilation system analysis for outdoor contaminants; outdoor air quality vs. local building codes</li> <li>Ventilation, filters, and air cleaning system analysis</li> </ul>
Purchasing	<ul style="list-style-type: none"> <li>SDSs of new chemicals compared to SDSs of those already in area</li> </ul>

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## Improving IAQ in Housekeeping and Pest Control

<h3>Housekeeping</h3> <ul style="list-style-type: none"> <li>Must remove dust/dirt</li> <li>Cleaning schedule versus occupation time</li> <li>Chemical purchasing                         <ul style="list-style-type: none"> <li>Time of use and toxicity</li> </ul> </li> <li>Staff uses SDS in use and storage (segregate)</li> <li>Disposal (pests)</li> </ul>	<h3>Pest control</h3> <ul style="list-style-type: none"> <li>Killing and deterrence</li> <li>Pesticides when unoccupied</li> <li>Ventilation period after</li> <li>Low toxicity pesticides if frequency same</li> <li>Higher ventilation to control airflow elsewhere</li> </ul>
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## Improving IAQ in Occupant Relations and Remodels

**Occupant relations**

- Educate occupants on effects of behavior on IAQ:
  - Non-designated areas
  - Cigarette butts
  - Aromatic foods
  - Perfume/cologne
  - Desk fan dust issue
  - Blocking vents if drafty



**Renovating and remodeling**

- Dust, emissions, and odors while facility occupied
- Contractors: IAQ is goal
- Products and processes that minimize emissions and VOCs
- Pre-purchase chemical review
- Unoccupied hours for high emissions; ventilation after
- Block return air registers

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## Lighting Impact and Lighting Terminology

**Productivity and health**

- Lighting and energy use well understood
- Occupant impact subtle
- Poor lighting
  - Low productivity
  - Eye strain, headaches, fatigue
  - Sick building syndrome factor
  - Accidents or crime



**Lighting terminology**

- Glare (discomfort or risk)
- Brightness, or luminosity
  - Reflectance value 1.0 main task, 0.6 ceiling, 0.3 to 0.8 walls, 0.2 to 0.3 floors
  - 400 to 500 lx (700 lx for detail work), 20 lx in hall
- Distribution
- Diffusion




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## Measures to Improve Lighting

- Natural daylight benefits health and productivity:
  - Clerestories, daylighting systems, and light shelves for less glare
  - Distribute fairly, not just to management offices
  - Desks near windows at right angles for less glare
  - Curtains or blinds and dimmers for control
- Color rendition (mimic natural light)
- Light, matte finish colors on walls, cubicles, ceilings
- Desk lamps with less than 5:1 contrast from background
- Easy-to-find light switches
- Emergency lighting and testing
- Cleaning and scheduled/condition-based replacement



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## Effects of Noise on Occupants

- Logarithmic decibel (db) scale
  - Each 10 db 100% louder
- Loud conversation required?
- Temporary or permanent loss
  - Tinnitus
  - Communication difficult
- Industrial printers, demolition, heavy loads, leaf blowers, facility core systems, traffic
- UK: > 85 db-A requires mandatory protection or mitigation
- US: > 90 db for 8-hour period regulated

dB	Activity
40	Hushed conversation
50	Conversation at home
60	Conversation in office
70	Vacuum cleaner
80	Garbage disposal
90	Power mower
100	Jackhammer
110	Live rock concert
120	Chainsaw or thunderclap
150	Jet from 80 feet below

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## Noise Management Tactics for FM

- Troubleshooting: Shut down one thing at a time
- Ear plugs and safety ear muffs
- Soundproofed vehicle cabs
- Minimum distance or required job rotation
- Noise absorption materials, carpeting, and door insulation
- Sound transmission class ratings of walls/ceilings in designs
- Noise “refuges”
- Noise cancellation or white noise
- Replacement of noisy equipment with alternatives
- Inspect/repair systems contributing noise (e.g., ductwork)



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## Discussion Question

A contractor responsible for floor polishing complains about loss of sensation in fingers and less grip strength. What should be done?

- a) Provide access to well-being initiatives.
- b) Upgrade floor polisher to reduce vibration.
- c) Require that no gloves be worn for task.

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## Ergonomics and Health

- Designing objects, places, and processes for productivity
- Ethical, productivity, and liability imperative
- Musculoskeletal disorders (MSDs)
  - Single event or repeated stress, especially at unnatural angles
  - Keyboarding, mouse, assembly line, vibrating equipment
- Negative health of too sedentary at work even if exercise later



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## Managing Musculoskeletal Disorders

Injury logs

Walk around and observe work behavior

Rubbing sore wrists or joints?      Self-supplied wrist braces, etc.?

<p><b>Reengineer workplace</b></p> <ul style="list-style-type: none"> <li>▪ Optimal height and distance of screens, keyboards, counters</li> <li>▪ Stand/sit desks</li> <li>▪ Treadmill work-stations</li> <li>▪ Floor gel pads</li> </ul>	<p><b>Implement policies</b></p> <ul style="list-style-type: none"> <li>▪ Breaks or job rotation for posture or activity</li> <li>▪ Lifting restrictions</li> <li>▪ Requiring lifting equipment</li> <li>▪ Equipment/lifting training</li> <li>▪ Elimination of repetitive motion</li> </ul>	<p><b>Issue PPE</b></p> <ul style="list-style-type: none"> <li>▪ Vibration-resistant gloves</li> <li>▪ Weight belts</li> <li>▪ Ergonomic keyboards, mice, chairs</li> </ul>
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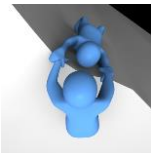

## Stress

**Impact on people and firm**

- Adverse reaction to pressure or environment
- Stress as risk factor
  - Absenteeism/morale
  - Productivity drain
- Breach of duty to fail to assess or prevent?
  - Counseling service
  - Well-being initiatives
  - Reasonable training or accommodation

**HSE seven risk factors**

- Culture
- Demands
- Control
- Relationships
- Change
- Role
- Support/training

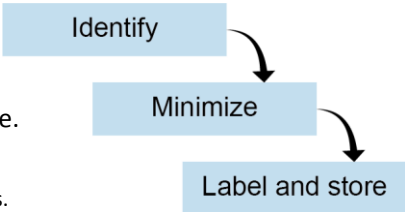




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## Hazardous Materials Management

- Solids, liquids, gasses, or infectious agents that can harm environment, people, and animals.
- Reduce use to extent feasible.
- FM organization can:
  - Respond efficiently to incidents.
  - Decrease risk of injuries or death.
  - Avoid or minimize facility damage.
  - Protect the environment.





```

graph TD
    A[Identify] --> B[Minimize]
    B --> C[Label and store]
            
```

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## Identify

- Purchased
- Inspect to align with purchases
- Chemical or trade name
- Hazard classifications
- Location stored
- Amount that can be stored and amount on hand (opened/unopened)
- Special notes about handling

Hazard Classes	
Physical	<ul style="list-style-type: none"> <li>• Combustible dust, fibers, liquids</li> <li>• Fireworks</li> <li>• Flammable cryogenics</li> <li>• Oxidizing cryogenics</li> <li>• Explosives</li> <li>• Flammable gasses, liquids, combined liquids, solids</li> <li>• Inert gasses</li> <li>• Organic peroxides</li> <li>• Oxidizer gasses</li> <li>• Oxidizers</li> <li>• Pyrophoric materials</li> <li>• Unstable (reactive)</li> <li>• Water-reactive</li> </ul>
Health	<ul style="list-style-type: none"> <li>• Corrosive</li> <li>• Toxic</li> <li>• Highly toxic</li> </ul>

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## Minimize, Label, and Store


- Minimize number and volume to reduce cost and risk.
- Dispose of or recycle unused chemicals.
- Sustainable products reduce exposure, PPE need, and spill-response requirements.
- Legible labels with full chemical product names/hazards.
- Nonhazardous labeled as such.
- Segregate incompatible substances.
- Seal appropriately.

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### Discussion Question

FM staff wear well-fitting and well-maintained gloves, splash goggles, respirators, aprons, and boots while working in a room with high fumes from rusted solvent drums that are hard to seal. What needs addressing? (Select all that apply.)

- a) Engineering controls
- b) PPE
- c) Containers
- d) Training

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### HAZMAT Emergency Response Plan

- Joint local authority plans
- FM roles, organizational chart, and training/communication plan
- Safe distances and shelter
- Evacuation procedures and routes
- Security and control
- Decontamination
- Emergency plans and alerts
- PPE
- Spill kits
- Eye-wash stations
- Safety showers
- Absorbent booms
- Nonreactive absorbent material
- Alarm system
- Communication system
- Fire suppression/control
- Emergency shutoffs

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## Hazardous Waste Disposal






Category	Description
Ignitability	<ul style="list-style-type: none"> <li>• Flammable liquids with low flash point (e.g., gasoline, acetone)</li> <li>• Solids that spontaneously combust</li> <li>• Compressed gasses or oxidizers</li> </ul>
Corrosivity	<ul style="list-style-type: none"> <li>• Hydrochloric acid</li> <li>• Nitric acid</li> <li>• Sulfuric acid</li> <li>• Battery acid</li> <li>• Rust removers</li> </ul>
Reactivity	<ul style="list-style-type: none"> <li>• Unstable with potential to violently change without detonating</li> <li>• May create toxic gas when mixed with water</li> </ul>
Toxicity	<ul style="list-style-type: none"> <li>• Items that can poison ground water</li> </ul>

Not in regular trash; cradle-to-grave philosophy

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## Asbestos Management

- Asbestos banned or severely restricted but still found in facilities
- Leave in place or safely remove?
- In an emergency
- Naturally occurring material with long flexible fibers
- In order of toxicity:
  - **Chrysotile**—long and curly fibers
    -  White Floors, drywall, gaskets, boiler seats...  Pipe insulation
  - **Amosite**—short and straight fibers
    -  Brown Insulating boards, thermal insulation, cement sheets...  Roofing, ceiling tiles, vinyl tiles
  - **Crocidolite**—less heat-resistant; very thin fibers; most toxic
    -  Blue Steam engines, spray-on coatings, plastics, cement, battery casings...

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## Asbestos Diseases, Responsibilities, and Plans

- Asbestos linked as cause to:
  - Asbestosis.
  - Fibrosis of lungs.
  - Lung, ovarian, and laryngeal cancers.
  - Malignant mesothelioma.
- 15 to 60 years from exposure to onset.
- Identify, manage, and mitigate asbestos.
  - Current with legal/regulatory requirements.
  - Avoid/reduce exposure to occupants.

- Asbestos management plan
  - Details on asbestos-containing material, with prioritized documents and timelines
  - Responsible parties
  - Training plan and uncontrolled maintenance prevention
  - Free access to information
  - How to monitor material
  - How to keep plans up to date

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## Asbestos Management Strategies

Removal/ Abatement	Leave in Place	Manage Contact	Monitor and Reinspect
<ul style="list-style-type: none"> <li>• Certified asbestos inspector</li> <li>• Site preparation and removal</li> </ul>	<ul style="list-style-type: none"> <li>• No fraying</li> <li>• Acceptable?</li> <li>• Sealable?</li> <li>• Repairable?</li> <li>• Disturbance likelihood</li> <li>• Disturbance mitigation</li> </ul>	<ul style="list-style-type: none"> <li>• Minimization of contact</li> <li>• FM staff controls (know where asbestos is; color coding)</li> <li>• Permit-to-work policy</li> <li>• Asbestos register</li> </ul>	<ul style="list-style-type: none"> <li>• Minimum annual reinspection</li> <li>• More for high traffic areas</li> <li>• Comparison of photos over time</li> </ul>

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## Asbestos Incidents

1. Immediately stop work.
2. Put all contaminated clothing/effects in bags.
3. Secure and close off area.
4. Close off HVAC.
5. Recommend shower, scrub for 15 minutes.
6. Document events.
7. Have asbestos specialist confirm exposure/contamination.
8. Contact internal individuals.
9. Notify insurance provider.
10. Update asbestos register.
11. Notify all who were exposed.
12. Contract with specialized decontamination firm.

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## Contaminated Water

- Potable water
  - Not contaminated (e.g., 84 contaminants in US Safe Water Drinking Act).
  - Use municipal supply unless unavailable.
- Chlorine treatment
  - Prevents dysentery, cholera, pathogenic bacteria.
  - Odor or health complaints or concerns.
  - Cannot kill viruses or protozoa. (But NSF Std. 53 filters remove.)
- Indicator organisms (*E. coli*).
- Lead from supply or internal system. (Investigate >15 ppb.)
  - Inexpensive, so test regularly at various locations, hot and cold.
- Local or national government water quality tests.
  - Boil-water orders, water use restrictions/prohibitions.

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## Legionellosis

- Inhale Legionella bacteria in water droplets, not by ingestion or person-to-person contact.
- HVAC is primary system, but all others tested, too.
- Chills, high fever, muscle pain, and headache after 2 to 10 days; dry cough or pneumonia later.
- Men (three times more likely than women); 40 to 70 years; immune system, kidney, or lung issues; smokers; alcoholics.
- 12% mortality.
- Bacteria likes 20 to 45°C (68 to 113°F), aerosol or spray, stagnating water, algae, iron, sludge, or organic matter.

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## O&M Tactics for Legionellosis

- Do a risk assessment and document bacteria/conditions.
- Trained professional sampling. (Presence is just risk factor.)
- Clean water and HVAC in commissioning, after disuse, and regularly. (Disinfect, drain, clean, disinfect.)
- Replace aging chillers with antimicrobial/sloped units.
- Fully enclose hot and cold water systems (seals, screens).
- Keep water below 20°C or above 50°C (scalding risk).
- Plumb cold water to avoid heat sources (or insulate).
- Avoid stagnant water areas (e.g., tanks in parallel) and design in sludge removal.

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## Mold

### Causes

- Food source (surface material), 16 to 27°C (60 to 80°F), and moisture
- Relatively high humidity
- Undetected leaks
- Infiltration through building envelope

### Control tactics

- Use eyes and nose to detect growth, dampness, condensation.
- Adjust humidity level.
- Maintain HVAC drip pans.
- Check unimpeded airflow.
- Unclog vents.
- Humidity system ventilation.
- Grade around foundation.


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## Remediating Mold

- “How can we protect the health of occupants?”
  - Temporary relocation or negative pressure containment.
- Staff and contractors need PPE.
- Mold mitigation professionals.
- Address dampness first; then remove mold.
  - Cannot remove all mold spores in air.
- Dry off wet vacuum and hoses after using.
- Wipe or scrub surfaces and dry.
- Remove and bag porous surfaces (carpet, dry wall, insulation) and used HEPA vacuum filter.



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## Workplace Hazards and Culture of Safety

- Unavoidable versus faulty procedures, procedures not followed, carelessness, errors in judgment?
- Ethical, economic, productivity, and legal implications.
- Habitually include safety as a consideration?
- Leadership and safety policies and goals.
- Safety committees and safety program:
  - Assess facility-specific risks. (Classify to ensure completeness.)
  - Review existing safety protocols.
  - Address gaps using a safety program and strong leadership.
  - Institutionalize the program into the culture, and improve.

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## When Accidents Occur

- Render first aid; call ambulance, if needed.
- First aid kits, AEDs, and CPR/AED training.
- Investigate and interview parties as soon as possible.
- Photographs, evidence, notes.
- Accident log, risk assessments, O&M logs, training.
  - Evidence of best intentions to create a safe space.
- Police and health and safety regulators have right to enter and gather evidence from undisturbed scene.
- Must report fatalities, unconsciousness, electrocution, breaks, chemical burns, eye injuries, hospitalization, crime injuries, or injuries requiring long absence.



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### Discussion Question

A contractor is authorized to service a cooling tower using a permit-to-work system. He takes a subsystem to his shop for an overhaul but is injured when it falls on his foot. Who is likely liable?

- a) The contractor is liable.
- b) The organization is liable even if it has a written safety plan.
- c) The organization is liable only if it has no safety plan.

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## Slips and Falls

- Slipping, falling, and tripping form one-third of all major accidents, especially given smartphone distraction.
- Address overcrowding by rerouting some traffic.
- Assess lighting and handrails.
- Flooring should not have low friction values even to meet other objectives.
  - Carpets, non-slip strips, or other appropriate response.
  - Maintain floors that get wet due to weather.
  - Cordon off spills and clean up.
  - Clean regularly, but test cleaners for slippery residue.
  - Address cable and power cords or other bumpy surfaces.

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## Confined Spaces

- Inherent risk for entering because enclosed or unstable
- Often only one way in or out
- Construction or as part of O&M
- Prohibited entry if any reasonable alternative (e.g., drone, spray arm)
- Permit to work
- Access and egress, including communication methods
- Testing and safety procedures and safer tools (e.g., non-sparking)

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## Vehicle and Equipment Hazards

- Roads and parking sight lines, visible signage, speed bumps, bright but low glare, no need to back up.
- Proper licenses and insurance, drug testing.
- Don't use poorly maintained or broken equipment.
- Use only equipment that is best for the given task.
- Ensure enough tools to go around so no one improvises.
- Contractor tool maintenance records.



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## Maintenance Guidelines

### Power equipment

- Emergency cutoff
- Safety guards
- Power supply damage?
- Unplugged, etc.
- Cool to touch
- Dangerous or flammable substances removed
- Lubricated or tightened
- Proper surface

### Non-road vehicles

- Risks
  - Right vehicle?
  - Back up or near people
  - Overturning
  - Tight spaces
- Requirements
  - Parking brake and no keys
  - Key storage
  - Certified to use
  - Drug test after accident

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## Electrical Shocks

- Primary method: Prohibit all work on energized circuits.
- Technical and practical knowledge.
- Most injuries and deaths are construction or O&M.
  - Inadequate training or grossly underestimated risks.
  - US NIOSH: Of 5,348 deaths, 33% were low voltage, 66% high.
    - Direct contact, energized equipment, boomed equipment, improper grounding, conductive equipment (ladders).
- Flows like water, following path of least resistance.
  - Risk factors: Water, damp ground, sweat.
  - Both hands: Down one arm, through heart, out other arm.

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## Electrical Terminology

- Voltage (volts, V) is quantity of current that can pass a fixed point per unit of time.
  - Like water pressure in hose.
  - Voltage exists even when current not flowing.
- Amperage (amps, I) is strength of current.
  - Like bandwidth. (Thicker wires can carry more current.)
- Ohm's law: Resistance (ohms, R or Ω), power (watts, W).

**Intensity**

Tissue damage directly proportional to resistance.

$$R = \frac{\text{Volts (V)}}{\text{Amps (I)}}$$

$$W = \text{Volts (V)} \times \text{Amps (I)}$$

DC: Hurl away  
AC: Muscle contractions

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## Mitigating Electrical Injuries

Electrical burn

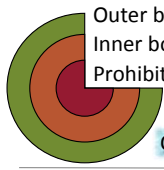
- Current through human organs.
- Properly rated non-conductive gloves, tools.

Thermal burn

- Surfaces of hot electrical equipment.

Arc flash burn


- Arc flash event: Current leaves intended path, through air, to conductor or ground.



Outer boundary: Full protection  
Inner boundary: Limited approach  
Prohibited approach: Same as direct contact

**Dust, corrosion**    Incorrect installation  
**Condensation**    Dropped tools, accidental touching

**Lockout/tagout**

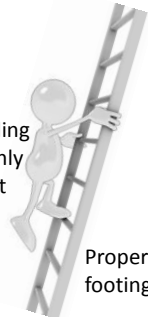


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## Working at Height

- Falling objects
  - Hard hats, safety glasses
  - Pass-through shelters
  - Guard rails and toe boards
- Falls from any height
  - Work from ground (e.g., forklift)
  - Guard rails rated for occupants/equipment
  - Plan, assess risk, and approve in advance
  - Scaffolding, fragile surfaces, work positioning, personal fall protection, rope access, fall arrest systems, collective fall safeguards
  - Procedures for window cleaning, roof repair...



Freestanding ladders only when best choice

Proper footing

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## Construction Project Accidents

- Falling from height, electrocution (e.g., painters on ladders), confined space collapse
- Site and project risk assessment
- Plans for health and safety systems, safety mindset
- Skilled, trained, certified workers and trainers
- Right tools and equipment for job
- Site fencing, reinforcements, etc., in place/inspected
- Damage to wiring, scaffolding, etc., reported and fixed
- Specialists for specific hazards (asbestos)
- Full compliance, health and safety file, accident log

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### Hazards from Fire

- Any type of building
- Cooking, electrical or mechanical malfunction, carelessness, intention

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### Stages of Fire Development

Ignition Smoldering Flame Ignition of gasses High heat

Better, faster detection Mitigation

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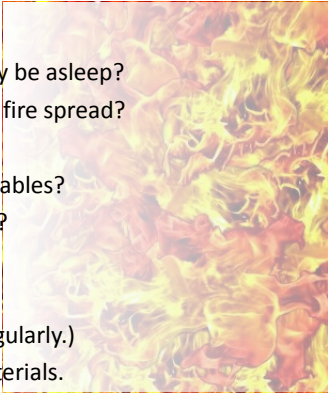
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## Fire Risk Management: Facility Design

- Primary goal: Prevent death and injury.
- How quickly can occupants exit? Will they be asleep?
- How much time is needed? How fast can fire spread?
- Occupancy levels by time/area.
- Occupancy areas segregated from flammables?
- Escape routes segregated from gas pipes?
- Can elevators be used, or only stairs?
- Signage visible in low light.
- Routes and doors not blocked. (Check regularly.)
- Building code fire resistance level for materials.



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## Fire Risk Management: Facility Policies

- Occupant education (e.g., smoking, heaters)
- Internal fire brigades
- Fire defense equipment audits
- Fire risk inspection (e.g., clutter, flammables)
- Fire drills by area or entire facility (enforcement?)
- New occupant emergency procedure training

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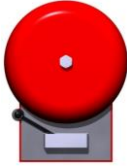
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## Emergency Management Systems

**Activating emergency response plan (fire scenario):**

- Sound alarm system.
- Quickly assess situation (control versus evacuate).
- Shut off ventilation systems, gas and oxygen supply, utilities.
- Reentry only after authorities indicate it is safe.
- Be alert for smoke or heat (re-ignition).



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## Fire Detection Systems

- Areas of high/low priority or specific fire risks?
- Need for early warning (e.g., sick or elderly, old facility)?
- Occupant clustering or diffusion.
- Facility complexity and number of occupants determine if automated or manual system is needed.
- Retrofit feasibility in existing structure (e.g., radio signal).
- Integration with HVAC, elevators, etc.
- Insurer requirements.
- Zoned systems (2,000 square meters maximum, one floor only, not divided by tenants).

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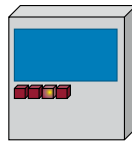
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## Fire Detection System Components

### Control panels

- System controller
- User interface
- Report location
- Periodic testing and faults
- Easy emergency access



### Alarms


- Sirens
- Voice recordings
- Strobe lights
- Bed shakers
- Louder if sleeping occupants

### Detector Types

- Smoke
- Heat
- Flame
- Fire-gas

### Call points

- Manual trigger





### Cabling

- Fire-resistant
- Moisture-resistant

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## Comparison of Fire Detector Types

Detector Type	Advantages	Disadvantages
Smoke: ionization	Early detection of fast-moving fires	Dust, humidity false alarms
Smoke: photoelectric	Low-heat, smoldering	Regular dust removal
Heat: fixed temperature	Dust-tolerant, for kitchens and boiler rooms	Slower response than smoke detectors
Heat: rate-of-rise	Dust-tolerant, faster reaction than fixed temperature	Slower response than smoke detectors
Flame: UV	Accurate in dusty areas, fast reaction	False alarms if high ambient radiation level
Flame: IR	Accurate in dusty areas, fast reaction	False alarms in presence of flickering IR light sources
Flame: UV/IR	Reduces false alarms	Sensor window cleaning
Fire-gas	Gasses before lethal levels	False alarms

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## Fire Suppression: Extinguishers and Sprinklers

### Fire extinguishers

- Add evacuation time
- Near exits
- Water: Ordinary combustibles (furniture)
- Chemicals (dry or wet): Combustibles, flammable liquids, electrical fires
- Gasses (CO<sub>2</sub>...): Combustibles, electrical

### Sprinkler systems


- Wet-pipe sprinklers
  - Heat melts plug for immediate flow
  - Freezing protection
- Dry-pipe sprinklers (gas-filled; deluge valve)
  - Deluge (open sprinklers)
  - Pre-action (fire detection system opens heads; for property damage risk)

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## Discussion Question

Which fire suppression system would be best for a data center that must have alarms to help occupants exit quickly?

- a) Wet risers
- b) Dry risers
- c) Gas or chemical suppression systems
- d) Fire blankets


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## Section 4: Security

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### Section 4 Topic Preview

- **Topic 1:** Physical Security
- **Topic 2:** Workplace Violence
- **Topic 3:** Cybersecurity



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### Scope of Responsibility

- Security of occupants, visitors, and staff
- Security of facility assets
- Protection of organizational information




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### Security Audit



Information system security

Macro-environment risks

Micro-environment risks

Facility's major system vulnerabilities

Existing security policies, procedures, controls

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## Security Team

Key attributes for outsourced security provider:

- Specialized experience to fit need
- Appropriate infrastructure to support need
- Licensing by role-based responsibility
- Reputable staff



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## Physical Security

- **Physical security** is protection of data, equipment, occupants, visitors, systems, and other organization assets.
- Physical threats include:
  - Unauthorized access.
  - Aggressive actions.
  - Sabotage.
  - Damage.
  - Theft.




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### Access Control Systems

- Two purposes:
  - To prevent unauthorized persons from entering facility
  - To track who enters facility
- Access control cards:
  - Magnetic stripe cards
  - Proximity cards
  - Smart cards




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### Design and Site Considerations

- Natural deterrents
- Structural deterrents
- Security lighting:
  - Continuous
  - Standby
  - Movable
  - Emergency



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## Tagging Property or People

- Two common types:
  - Bar coding
  - Radio frequency identification (RFID)
- Common RFID types:
  - Passive low-frequency
  - Passive high-frequency
  - Passive ultra high-frequency
  - Active microwave tags



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## Workplace Violence

**Workplace violence** involves threats or acts of physical violence, intimidation, harassment, or other behavior that is disruptive in the workplace.



- Criminal
- Client/customer
- Employee on employee
- Domestic or personal

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## Managing Risks of Workplace Violence—Policies

Create policies and procedures based on:

- Threat of violence.
- Workplace violence.

**Workplace Violence Policy**

- Make sure it is brief and easy to understand.
- Use simple language.
- Avoid absolute terms.
- Avoid narrow definitions.
- Use legal review.

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## Managing Risks of Workplace Violence—Preparation

Behaviors that may indicate tendency toward violent behaviors:

- Inappropriate and aggressive behavior
- Direct or indirect threats
- Conflicts with management or coworkers
- Sharing thoughts regarding acts of desperation
- Alcohol or drug abuse
- Drastic changes in behavior
- References to using firearms in confrontational manner
- Bringing firearm onto grounds or into facility



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## Managing Risks of Workplace Violence—Prevention

Physical protection includes:

- Physical barriers.
- Alarm systems or panic buttons.
- Surveillance cameras/closed-circuit television.
- Visible uniformed security staff.
- Bright lighting on grounds and in parking lots.
- Bulletproof glass.
- Limiting public access to facility.
- After-hours escort service for employees.
- Metal detectors at entry points to facility.



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## Discussion Question

What types of physical protection does your facility employ?

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## Managing Risk of Workplace Violence— Responding to Threats

- Time is critical.
- Periodic drills and training are beneficial.
- When responding, at minimum:
  - Thoroughly investigate all reported incidents.
  - Hold private interviews with all parties involved.
  - Follow the organization's policies regarding disciplinary actions.




**Run**

- Have escape route and plan in mind.
- Leave your belongings behind.
- Keep your hands visible.



**Hide**

- Hide in area out of assailant's view.
- Block entry to hiding place, and, if possible, lock door and turn off lights.
- Silence your cell phone.



**Fight**

- This should be last resort, only when your life is in imminent danger.
- Attempt to incapacitate assailant.
- Act with physical aggression and throw items at assailant.

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## Managing Effects of Incidents

After-action review analyzes:

- What happened (step-by-step).
- Whether response to situation was appropriate.
- Outcome.
- Lessons to be learned.
- Details appropriate to share with employees and victim's family.

**Manager Actions**

- Be present and available.
- Disseminate correct information.
- Dispel rumors.
- Alert crisis management team of need for crisis response professional.
- Hold informal conversations.
- Keep work groups and teams together.
- Encourage conversation between team members.
- Act as buffer for those directly involved in incident.
- Assist employees in facing fears of places or people.

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## Cybersecurity

**Cybersecurity** is the technology, practices, and processes used to protect an organization’s internal networks, computers, and data programs from an attack.

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## Cybersecurity Base Standards


Confidentiality	Integrity	Availability
<ul style="list-style-type: none"> <li>• Privacy</li> <li>• Controls on who can access data</li> <li>• Limitations on who can modify or delete data</li> </ul>	<ul style="list-style-type: none"> <li>• Trustworthiness of data</li> <li>• Reliability of storage of data</li> <li>• Authenticity of results generated from data</li> </ul>	<ul style="list-style-type: none"> <li>• Accessibility of systems when needed</li> <li>• Association with other business functions</li> </ul>

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 **Discussion Question**

What types of cybersecurity practices does your facility employ?

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**Types of Cyber Attackers**

Bot-network operators	Criminals	Hackers
Insiders	Nations	Phishers
Spammers	Spyware/malware creators	Terrorists

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## Cyber Vulnerabilities

- Internet of things (IOT)
- Uncontrolled physical access
- Uncontrolled user access
- Poor user computer “hygiene”
- Weak firewalls between systems

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## Managing Cybersecurity Risks

**Goal:**

- Identify risk or potential cyber threat.
- Analyze potential threats, including types of threats and vulnerabilities.
- Manage or mitigate risk through design of appropriate safeguards.
- Monitor and control current and future impacts of risk.




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## Defensive Measures

- Firewall
- Building management system (BMS)
- Stand-alone digital subscriber line (DSL)
- Robust cybersecurity policy



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## Cybersecurity Checklist

Yes/No	Risk
<input type="checkbox"/>	Has a review of the types of data the organization has stored on different systems been conducted?
<input type="checkbox"/>	Is the data on the organization's system encrypted?
<input type="checkbox"/>	Are sensitive (e.g., payroll, point of sale) and routine services (e.g., email, internet) performed on different machines?
<input type="checkbox"/>	Do employees and vendors have access only to the systems they need?
<input type="checkbox"/>	Has the organization purged "old" accounts from the system or closed them?
<input type="checkbox"/>	Is the data on the system backed up on a routine basis?
<input type="checkbox"/>	Are the firewall, anti-virus software, and security patches updated on a routine basis?
<input type="checkbox"/>	Have employees been trained on cybersecurity?
<input type="checkbox"/>	Have all of the default passwords been changed on all devices?
<input type="checkbox"/>	Is there a cybersecurity policy?

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# Questions?



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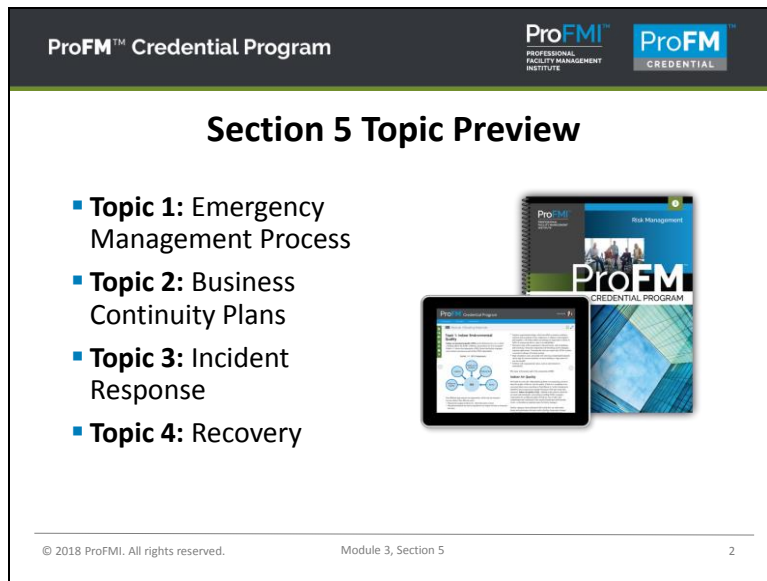
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## Section 5: Emergency Management



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## Emergency Management

- **Emergency management** refers to facility management's preparation for and recovery from adverse occurrences.
- An **emergency** is a human-made technological or natural event that constitutes a threat to organizational personnel, property, operations, or the environment.



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## Emergency Management Plan

Emergency Management Plan	Incident Recovery Plan
<ul style="list-style-type: none"> <li>Address/location and procedures of organization's emergency control center</li> <li>Roles and responsibilities of key emergency coordinators and managers</li> <li>Communications process to follow during emergencies</li> <li>How to interact with authorities and identify them after arrival and where critical support locations will be set up</li> <li>Routes to and safe locations or alternates for the facility's workforce and how to identify employees</li> <li>General safety instructions</li> <li>Media management protocols</li> </ul>	<ul style="list-style-type: none"> <li>Contact and process information</li> <li>Information aiding the emergency manager in decision making, identifying the right courses of action</li> <li>An escalation process with command and control roles identified</li> <li>A list of questions to ask</li> <li>Building information, including floor plans; electrical panel and fire alarm locations; locations of hazardous or flammable materials; gas, water, and electrical mains and shut-off switches or valves</li> <li>How to review and audit the above</li> </ul>

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## Developing Emergency Response Plan

1. Assemble cross-functional team from various departments and community.
2. Develop team purpose and identify facility risks/vulnerabilities.
3. List all mission-critical activities.
4. Conduct risk assessment and identify needed internal and external resources.
5. Create business case around emergency response and recovery plan and budget request for funding.
6. After approval, develop emergency management procedures.
7. Communicate plan to organization and ask for volunteers or assign roles.
8. Train, practice, and conduct drills. Hold drill review meetings to cover what did and did not go well and how to improve.
9. If needed, execute incident response, business continuity, and recovery plans.
10. Periodically review and update plans and communications.

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## Common Facility Risks

Top disruptions include:

- Power outages.
- Extreme cold weather.
- Floods.
- Hurricanes.
- Catastrophic building system failures.


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 **Discussion Question**

Certain types of facility risks are more prevalent in some areas than in others. What are the risks common to your specific area?

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**Emergency Management Plans**

- Types of emergency management plans:
  - Partial or full evacuations
  - Taking shelter within structure
  - Business continuity
  - Recovery
- Escalating levels of readiness



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## Factors Requiring Directed Attention During Emergencies

- Controlling access
- Protecting property
- Full or partial evacuation
- Controlling traffic
- Emergency medical training
- Providing security
- Coordinating activities with local responders



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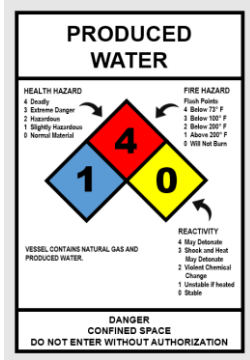
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## Hazardous Materials

1. Insert hazardous material risk mitigation into new construction designs and plans.
2. Prevent accidents and hazards by following codes and best practices and ensuring proper training.
3. Restrict the size or area of risk.
4. Limit access.
5. Mark hazardous material containers and ensure their proper working order.
6. Place neutralizing agents nearby.
7. Communicate risks internally and to public as required by law.



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## Business Continuity

- **Business continuity** is “the capability of the organization to continue delivery of products or services at acceptable predefined levels following a disruptive incident.”
- Typical organizations experience a major disruption once every four years.

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## Business Continuity Planning



```
graph TD; A[1. Determine scope and assign reasonable resources to complete it.] --> B[2. Perform business impact analysis and risk assessment.]; B --> C[3. Create business continuity strategy.]; C --> D[4. Set up and execute business continuity procedures.]; D --> E[5. Test, communicate, and conduct training on procedures.];
```

1. Determine scope and assign reasonable resources to complete it.
2. Perform business impact analysis and risk assessment.
3. Create business continuity strategy.
4. Set up and execute business continuity procedures.
5. Test, communicate, and conduct training on procedures.

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## Business Impact Analysis



- Helps organization understand, plan for, and mitigate vulnerabilities for disruption.
- Top three resources to protect are:
  - People.
  - Property.
  - Vital records.

**Vital Records Samples**

- Finance and accounting data
- Master document files
- Local area network files
- All archived records
- Board, top management, and other critical meeting agendas and minutes
- Real estate and all legal documents
- Correspondence for organization
- Customer information

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## Contingency Plan Development

- Goals:
  - Define trigger points and responsibilities for activating plan.
  - Define succession in key positions.
  - Limit scope.
  - Provide continued access to current business records.
  - Develop “what-if” operations strategies.
  - Establish means to ensure necessary staffing levels.
  - Contract for delivery of necessary supplies, outsourcing of services, and provision of contingency sites and equipment.
- Plan must be reasonable—plan for incidents likely to happen locally.

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## Incident Response

Facility manager responsibilities during an incident:

- Coordinate organization's efforts and resources.
- Offer shelter.
- Execute evacuation plans (as needed).
- Lead FM's portion of response efforts.
- Use emergency management plan.
- Act as organization's first responder.
- Advise and inform top managers.
- Provide facility security and limit access to site.
- Direct organization's response (if called upon).

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## Emergency Operations Center

- Must contain:
  - Nonperishable food, water, and PPE.
  - Several reliable computer workstations and communications equipment.
  - Essential documents.
  - Designated situation room with facility plans, maps, and writing boards.
- Emergency manager directs response activities until authorities with prior jurisdiction arrive.



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## Emergency Communication Plan

**Emergency communication plan should include:**

- Scripts developed for emergency and potentially emotional situations.
- Fact sheets about organization/facility and emergency response methods.
- Announcements to building occupants with information on emergency and expectations/directions.
- Notices to employee families on what happened, who to contact, support, and plan going forward.
- Assurances to customers about organization's preparation, response, and recovery and how emergency might affect them.

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## Evacuation Procedures

FM tasks during evacuations:

- Know evacuation protocols and routes.
- Erect barricades safe distance from facility.
- Assist with evacuating disabled.
- Respond to communications.
- Engage locksmith to unlock doors for rescue workers.
- Ensure that fire alarm technician or electrician is on standby.
- Spread word of all-clear and help evacuees get back to designated areas.

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## Shelter-in-Place

- Typically in areas without windows
- May include specially constructed areas
- FM responsibilities:
  - Maintain communication.
  - Direct staff from other buildings.
  - Monitor communications to give updates.
  - Apply organizational procedures.



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## Human Needs

- FM personnel should have these skills:
  - First aid
  - Cardiopulmonary resuscitation (CPR)
  - Automated external defibrillator (AED) certification
- Communication is critical.
- Mental health and well-being of employees is key concern in aftermath of traumatic incidents.



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## Incident Response Debriefing

- Helps capture what worked, what didn't, and ways to improve
- Identifies needed updates
- Documents internal and external response times
- Allows needed decompression
- Acknowledges loss
- Encourages focus on recovery

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## Recovery



Two stages:

- Short-term
- Long-term



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## Damage Assessment and Documentation



- Damage assessment team requires expert individuals.
- Team needs:
  - Facility “as-built” plans marked with renovations
  - Photographs of facility before damage
  - Prescribed safety equipment or PPE
  - Engineering devices
  - Preventive and predictive maintenance records
  - Manufacturers’ recommended operating specifications
  - Machinery/equipment survey and inspection checklists
  - Other equipment

**Immediate Assessment Questions**

- Are there any casualties?
- How extensive is the damage?
- Are utilities available?
- Is the site expanding or growing?
- Is collapse or explosion imminent?
- Should the surrounding areas be evacuated?
- Is standing water a factor?
- Are important organization records and documents accessible?
- What support is required?
- What caused the situation?

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## Implementing Recovery Plans

1. Notify insurance company.
2. Coordinate efforts of fire, police, inspection, or other officials.
3. Begin creating facility recovery plan.
4. Arrange for, coordinate, and communicate results of air quality inspections.
5. Evaluate structural integrity.
6. Arrange for or conduct condition survey.
7. Access business continuity plan and begin to execute it.

8. Contact contractors that specialize in restoring kind of damage caused.
9. Complete facility recovery plan.
10. Brief facility and property management staff and any regular contractors on their duties.
11. Initiate salvage operations.
12. Conduct inventory of all undamaged equipment, parts, supplies, and materials.

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## Implementing Recovery Plans (*continued*)

- 13. Schedule and coordinate FM site clean-up and regular duties.
- 14. Update facility designs to take advantage of new opportunities.
- 15. Ensure that hazardous materials and other debris are handled according to environmental regulations and ordinances.
- 16. Identify and catalog all costs associated with recovery.
- 17. Facilitate restoration of life-safety, environmental, security, and panic systems and alarms.
- 18. Coordinate repair and testing of all ventilation, electrical, gas, sanitation, and water systems.
- 19. Manage cleaning and inspection of mechanical and electrical rooms.
- 20. Ensure that boilers are repaired and tested.
- 21. Provide support to IT, telecommunications, and other technical infrastructure systems.


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## Questions?



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