

Process Safety, Health and Environmental

Topic Name	Objectives
Course Overview	<ol style="list-style-type: none"> 1. Recall industrial accidents and other events in the process industries that have impacted safety, health and the environment. 2. Describe the necessity of occupational safety regulations. 3. Describe governmental agencies and regulations that address safety, health, security and environmental issues including equivalent state agencies. <ul style="list-style-type: none"> • Occupational Safety and Health Administration (OSHA) • Environmental Protection Agency (EPA) • Department of Transportation (DOT) • Nuclear Regulatory Commission (NRC) • Department of Homeland Security (DHS) • Maritime Security (MARSEC) 4. Describe how you can impact safety, health, security and environmental issues. 5. Describe good safety habits 6. Describe safe work practices: <ul style="list-style-type: none"> • Following all procedures • Using proper personal protective equipment (PPE) • Attending training • Performing housekeeping and sanitation • Handling materials properly

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Types of Hazards and their Effects	<ol style="list-style-type: none">1. Identify common types of hazards to health, environmental and safety.2. Explain the various routes of entry that chemical and biological hazards use to enter the human body.3. Describe the short-term and long-term effects that hazards can have on an individual's health and safety.4. Describe security concerns and their potential impact.5. Describe the short-term and long-term effects that hazards can have on:<ul style="list-style-type: none">• an individual's health• safety• environment
Recognizing Chemical Hazards	<ol style="list-style-type: none">1. Identify the various chemical hazards (gases, liquids, and particulates) found in the process industries and discuss potential effects such chemicals have on safety, health and the environment.2. Identify specific categories of hazardous chemicals used in the process industries and describe the potential health and environmental hazards posed by each (e.g., asphyxiates, corrosives, toxins).3. Explain the purpose and function of labeling systems found in local process industries.4. Explain the purpose and components of Safety Data Sheets (SDS).5. Describe the primary governmental regulations relating to chemical hazards (labeling, storage, etc.).

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Recognizing Biological Hazards	<ol style="list-style-type: none"> 1. Identify potential biological hazards in the process industries and discuss their potential effects on safety, health and the environment. <ul style="list-style-type: none"> • Micro-organisms (such as viruses and bacteria) • Arthropods (arachnids and insects) • Poisonous snakes • Plant allergens and toxins • Protein allergens from vertebrate animals 2. Describe how blood borne pathogens can affect the human body. 3. Describe governmental regulations and industry guidelines that address biological hazards.
Equipment and Energy Hazards	<ol style="list-style-type: none"> 1. Discuss the equipment and energy hazards posed by certain activities performed in the process industries. <ul style="list-style-type: none"> • Working with moving or rotating equipment • Working with equipment that is pressurized, has extreme temperatures, or emits radiation • Working with energized equipment (powered by electricity or other power source) 2. Describe governmental regulations and industry guidelines that address equipment and energy hazards. 3. Describe the purpose Energy Isolation (lockout/tag out).
Fire and Explosion Hazards	<ol style="list-style-type: none"> 1. Recognize specific physical hazards present in the process industries and explain the potential safety, health and environmental hazards posed by: <ul style="list-style-type: none"> • Fire • Explosions • Detonation 2. Describe governmental regulations and industry guidelines that address fire and explosion hazards. 3. Describe the following terminology: <ul style="list-style-type: none"> ○ Upper Explosive Limit (UEL) ○ Lower Explosive Limit (LEL) ○ Boiling Liquid Evaporation Vapor Explosion (BLEVE)

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Pressure, Temperature and Radiation Hazards	<ol style="list-style-type: none"> 1. Recognize specific physical hazards present in the process industries and explain the potential safety, health and environmental hazards posed by: <ul style="list-style-type: none"> • Vacuum • High pressure • Compressed gases • Pressure vessels (runaway reactions) • Temperature extremes 2. Recognize the hazards of heat and temperature in the working environment. 3. Understand the effects of ionizing and non-ionizing radiation. 4. Describe governmental regulations and industry guidelines that address pressure, heat and radiation hazards.
Hazardous Atmosphere and Respiratory Hazards	<ol style="list-style-type: none"> 1. Name specific hazards associated with hazardous atmospheres, ventilation, and other respiratory-related issues: <ul style="list-style-type: none"> • Oxygen-deficient atmosphere • Improper use of respiratory protection • Toxins • Explosive atmosphere • Acid / caustic atmosphere 2. Describe the effects of hazardous atmospheres on respiration. 3. Describe governmental regulations and industry guidelines that address hazardous atmospheres and respiration hazards.

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Working Area and Height Hazards	<ol style="list-style-type: none"> 1. Name specific hazards associated with work areas, such as: <ul style="list-style-type: none"> • Working surface (scaffold, railing, slips) • Escape route • Heights (fall protection, falling objects) • Confined spaces 2. Describe governmental regulations and industry guidelines that address working surfaces, means of egress, height and confined space hazards.
Noise and Hearing Hazards	<ol style="list-style-type: none"> 1. Name specific hazards associated with noise generated in a process industry environment. 2. Describe how these variables can impact hearing: <ul style="list-style-type: none"> • Volume of noise (decibel rating) • Length of exposure (TEL- Total Exposure Limit) 3. Describe governmental regulations and industry guidelines that address noise and hearing protection.
Construction, Maintenance and Tool Hazards	<ol style="list-style-type: none"> 1. Name specific hazards associated with construction and maintenance tasks in a process industry environment. 2. Describe how hand and power tools can be dangerous. <ul style="list-style-type: none"> • Improper use of tool • Improper grounding • Broken guards on power tools • Improper use of PPE, etc. 3. Describe hazards associated with maintenance construction activities. <ul style="list-style-type: none"> • Critical Lifts • Excavation • Heavy equipment • Scaffolding • Chemical exposure, etc. 3. Describe governmental regulations and industry guidelines that address construction, maintenance and tool hazards.

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Vehicle and Transportation Hazards	<ol style="list-style-type: none"> 1. Name specific hazards associated with vehicles and transportation used in the process industry environment: <ul style="list-style-type: none"> • Forklifts • Powered platforms • Cranes • Trucks • Trains • Watercraft • Pipeline • Helicopters • Personal vehicle • Bicycles and carts 2. Describe governmental regulations and industry guidelines that address vehicle and transportation hazards.
Natural Disasters and Inclement Weather	<ol style="list-style-type: none"> 1. Name specific hazards associated with natural disasters that could impact the process industries: <ul style="list-style-type: none"> • Hurricanes • Tornados • Floods • Inclement weather (lightening, hail, flood, etc.) • Earthquakes • Extreme temperatures 2. Describe how emergency preparedness plans address natural disasters.

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Site Security	<ol style="list-style-type: none">1. Identify special vulnerabilities, risks, and threats associated with the process industries:<ul style="list-style-type: none">• Terroristic threats or acts from organizations and/or hostile nation-states• Disgruntled employees• Criminal elements (theft, vandalism, computer hacking)• Suspicious activities (unauthorized photos, entry, etc.)• Workplace violence• Industrial espionage (intellectual properties)2. Describe the activities involved with maintaining physical security in these areas:<ul style="list-style-type: none">• Access and perimeter<ul style="list-style-type: none">○ Site Security Plan○ Protecting access badges○ Transportation Workers Identification Credentials (TWIC)• Operations (detecting unauthorized personnel)• Communications (reporting suspicious activities)• Personnel (security)3. Describe the tasks associated with protecting electronic information through sound cyber security practices, including:<ul style="list-style-type: none">• Password protection• Malicious software• Proprietary information4. Describe the governmental regulations that address site security.

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Recognizing Ergonomic Hazards	<ol style="list-style-type: none"> 1. Name certain activities performed in the process industries and discuss the potential ergonomic hazards posed by these activities: <ul style="list-style-type: none"> • Lifting and handling materials • Working at heights • Working in confined spaces • Using repetitive motions 2. Demonstrate proper lifting techniques. 3. Demonstrate proper ergonomics for repetitive motions. 4. Describe governmental regulations and industry guidelines that address ergonomic hazards.
Recognizing Environmental Hazards	<ol style="list-style-type: none"> 1. Explain the EPA (Environmental Protection Agency) regulations that impact the process industries. 2. Identify the various factors that can lead to leaks, spills and releases. <ul style="list-style-type: none"> • Failed gasket • Leaking flange • Pump seal failure • Tank rupture • Overfilling tanks • Incorrect materials of construction • Improper operation of boilers or furnaces • Not following SOP's (Standard Operating Procedures) 3. Describe the potential dangers of leaks, spills and releases in the environment and the community.
Introduction to Hazard Controls	<ol style="list-style-type: none"> 1. Describe the three major types of hazard controls: <ul style="list-style-type: none"> • Engineering • Administrative • Personal Protective Equipment (PPE) 2. Discuss why, when and how these controls are applied.

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Process Safety Management	<ol style="list-style-type: none">1. Describe the purpose of Process Safety Management (PSM)2. Identify the 14 elements of PSM<ol style="list-style-type: none">1) Employee Participation2) Process Safety Information (PSI)3) Process Hazard Analysis (PHA)4) Operating Procedures5) Training6) Contractor Safety7) Pre-Startup Safety Review (PSSR)8) Mechanical Integrity9) Hot Work Program10) Management of Change (MOC)11) Incident Investigation12) Emergency Planning and Response13) Compliance Audits14) Trade Secrets3. Explain the difference between process and personal safety management.

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Engineering Controls: Alarms and Indicator Systems	<ol style="list-style-type: none"> 1. Describe the role of alarms in providing a warning of conditions that can lead to emergencies, leaks, spills and releases, and discuss the dangers of improper responses or failures of alarms. 2. Identify various engineering controls, specifically alarm and indication systems, used by the process industries to minimize and/or eliminate threats to health, safety, and the environment. <ul style="list-style-type: none"> • Fire Alarms and Detection Systems • Toxic Gas Alarms and Detection Systems • Process Alarms (high level, high pressure, deviation, etc.) • Redundant Alarm and Shutdown Devices • Automatic Shutdown Devices • Interlocks 3. Explain actions required by process technicians when alarms occur. 4. Explain the consequences of bypassing or ignoring process alarms
Engineering Controls: Process Containment and Process Upset Controls	<ol style="list-style-type: none"> 1. Recognize various engineering controls, specifically process containment and control systems, used by the process industries to minimize and/or eliminate threats to health, safety, and the environment. <ul style="list-style-type: none"> • Dikes (secondary containment) • Process sewers • Flares 2. Describe various engineering controls, specifically process upset control systems, used by the process industries to minimize and/or eliminate threats to health, safety, and the environment. <ul style="list-style-type: none"> • Emergency shutdown systems • Process safety valves (rupture discs, relief valves) • Flares • Interlocks

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Administrative Controls: Programs and Practices	<ol style="list-style-type: none"> 1. Describe and discuss various administrative controls, used by the process industries, to eliminate and/or minimize threats to safety, health, and environment. <ul style="list-style-type: none"> • operating a noisy machine on the second or third shift when fewer people are exposed, • shifting an employee to a less noisy job once a hazardous daily noise dose has been reached • conducting turnarounds in spring rather than summer to reduce the potential for heat stress related illnesses 2. Participate in safe work observations and provide feedback to co-workers on safe and potentially unsafe work practices. 3. Simulate a site safety inspection and/or audit to identify potential workplace hazards. 4. Describe general procedures for how to safely handle materials. 5. Discuss the impact of government regulations and industry organization guidelines.
Audits, Investigations, and Reporting	<ol style="list-style-type: none"> 1. Describe the auditing processes used in industry. <ul style="list-style-type: none"> • Safety • Housekeeping • Permits 2. Describe incident and reporting requirements for: <ul style="list-style-type: none"> • Spills • Releases • Injuries • Near misses • Process upsets • Security breaches
Work Permitting Systems	<ol style="list-style-type: none"> 1. Describe the function and purpose of permitting systems found in local plants. <ul style="list-style-type: none"> • Work permit • Hot work permit • Entry (enclosed and confined space) • Special (high voltage, excavation, etc.) 2. Given a scenario, conduct a job safety analysis (JSA) and complete a safe work permit to ensure the work environment is safe prior to beginning a job. 3. Demonstrate the use of locks, tags (lockout/tag-out), and blinds to isolate a piece of equipment such as a pump (including all primary and secondary energy sources). 4. Describe governmental regulations and industry guidelines that address permitting.

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Personal Protective Equipment and First Aid	<ol style="list-style-type: none"> 1. Describe basic first aid procedures and responses. 2. Discuss the function and purpose of Personal Protective Equipment (PPE) in the process industries: <ul style="list-style-type: none"> • Respiratory protection • Eye protection • Hearing protection • Head protection • Hand protection • Foot protection • Skin protection 3. Describe the levels of protection and how to select the proper PPE. <ul style="list-style-type: none"> • Level A - To be selected when the greatest level of skin, respiratory, and eye protection is required. • Level B - The highest level of respiratory protection is necessary but a lesser level of skin protection is needed. • Level C - The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying respirators are met. • Level D - A work uniform affording minimal protection: used for nuisance contamination only. 4. Explain the use, care and inspection of personal protective equipment (PPE). 5. Describe governmental regulations and industry guidelines that address medical and first aid responses and PPE: <ul style="list-style-type: none"> • OSHA 1910 Subpart K: Medical and First Aid • OSHA 1910.132 Personal Protective Equipment (PPE) • OSHA 1910.133 PPE: Eye and Face Protection • OSHA 1910.134 PPE: Respiratory Protection • OSHA 1910.138 PPE: Hand Protection

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Monitoring Equipment	<ol style="list-style-type: none"> 1. Explain the function and purpose of testing equipment found in local plants: <ul style="list-style-type: none"> • LEL/O₂ meters • Gas detection equipment • Personal monitoring devices (exposure, radiation, noise) • Detector tubes 2. Describe the use of an LEL/O₂ meter to test a confined space prior to entry. 3. Describe governmental regulations and industry guidelines that address usage and permitting of monitoring equipment.
Fire, Rescue, and Emergency Response	<ol style="list-style-type: none"> 1. Describe the function and purpose of the Emergency Response Team (ERT), typically found in the process industries, when responding to the following: <ul style="list-style-type: none"> • Fires (different types) • Spills • Rescue / retrieval • Escape • Chemical exposure • Gas release 2. Describe or demonstrate the correct use of a safety shower and eyewash station. 3. Demonstrate the proper selection and use of fire extinguishers. 4. Given a scenario, participate in a tabletop drill in preparation for response to a fire, release, or spill for the following roles: <ul style="list-style-type: none"> • Awareness level (operator) • First Responder (ERT) 5. Describe governmental regulations and industry guidelines that address fire protection and emergency response.