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HIGHLIGHTED HANDOUT

HRM733

Occupational Health & Safety

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HRM733

Occupational Health & Safety

Lecture-Wise Study Handout
Virtual University of Pakistan

21 lectures • prepared for exam study 

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About This Course

HRM733 – Occupational Health & Safety studies how organizations protect workers' physical and mental well-being: the legal frameworks, hazard identification and risk assessment, safety management systems, occupational health programs, and the HR role in building a safety culture. This handout covers OHS foundations, Pakistan's legal framework, hazard types, risk assessment, safety management systems (ISO 45001), accident investigation, occupational health, ergonomics, psychosocial risks, and emergency preparedness.

Each lecture gives learning objectives, core explanations with definitions, examples, exam key points,  a summary, and review questions.

Lecture 1: Foundations of OHS

Learning Objectives

- Define OHS scope
- Distinguish core concepts

Occupational health and safety (OHS) is the multidisciplinary field concerned with protecting the safety, health, and welfare of people at work — preventing work-related injury, illness, and death, and promoting physical, mental, and social well-being. Its moral case (no job should cost a life), legal case (employer duties), and business case (accidents cost far more than prevention) together make it a core HR responsibility.

The scale is sobering: the ILO estimates ~2.9 million work-related deaths annually worldwide, the vast majority from occupational disease rather than dramatic accidents. Pakistan's official statistics undercount — much employment is informal — but factory fires (Baldia Town, Karachi, 2012: 259 deaths), mining disasters, and construction falls show the stakes.

Key concepts: a hazard is anything with the potential to cause harm; risk is the likelihood $\times$ severity of that harm occurring; an incident/near-miss is an unplanned event that could have caused harm. Safety manages acute injury risks; health manages chronic disease risks — both sit with HR and line management jointly.

Key Definitions

Hazard is defined as anything — substance, machine, practice — with the potential to cause harm.

Risk is defined as the combination of the likelihood of harm and its severity.

Examples

- Hazard: an unguarded press machine; risk: high likelihood $\times$ amputation severity.
- Baldia Town 2012: locked exits turned a fire into Pakistan's worst industrial disaster.

Key Points — very important for exams

OHS: protect safety, health, welfare at work — moral, legal, business cases.

ILO: ~2.9m annual work deaths; disease kills more than accidents.

Hazard = potential; risk = likelihood $\times$ severity — never confuse them.

HR owns the people systems; line owns the workplace — joint duty.

Note:

Note: 'distinguish hazard from risk' appears constantly in exams — hazard is the thing, risk is the chance-and-gravity of it harming someone.

Review Questions

? Why do disease deaths exceed accident deaths?

? Who owns safety: HR or line management?

Section Summary

OHS prevents harm at work. Its vocabulary — hazard, risk, incident — is the foundation for everything that follows.

Exam Pointers

- Distinguish hazard, risk, incident, and near-miss.
- Make the business case for OHS.

Lecture 2: Legal Framework

Learning Objectives

- Map the legal landscape
- Explain duties and rights

Pakistan's OHS law is fragmented: the Factories Act 1934 (safety provisions for registered factories), the Mines Act 1923, provincial Employees' Social Security and EOBI schemes, and — after the 18th Amendment devolved labor — provincial OHS Acts (Punjab OHS Act 2019, Sindh, KP equivalents). Enforcement is weak: too few inspectors, political interference, and a vast informal sector outside coverage.

Internationally, the ILO's conventions (C155 on OSH, C187 promotional framework) set the standard: national policy, employer duties, worker participation rights. The EU Framework Directive model puts the general duty on employers with worker consultation. Pakistan has ratified few OSH conventions — a gap examiners note.

Employer duties everywhere converge: provide a safe workplace, assess risks, train workers, supply protective equipment free, and consult workers. Worker rights mirror them: the right to know hazards, to participate in safety, and to refuse imminently dangerous work. The exam-ready critique: Pakistan's problem is less the statute book than inspection and informality.

Key Definitions

ILO C155 is defined as the ILO convention requiring a national OSH policy and employer/worker duties.

Examples

- Punjab OHS Act 2019: provincial duties, inspector powers, penalties — devolution in action.
- Right to refuse: a worker may lawfully decline work posing imminent danger.

Key Points — very important for exams

Pakistan: Factories Act 1934, Mines Act 1923, provincial OHS Acts post-devolution.

ILO C155/C187: the international benchmark — Pakistan lags in ratification.

Duties: safe workplace, risk assessment, training, free PPE, consultation.

Rights: know, participate, refuse dangerous work — very important trio. 

Review Questions

- ? Why does enforcement fail in Pakistan?
- ? Should Pakistan ratify C155? Argue the case.

Section Summary

The law assigns clear duties and rights; Pakistan's gap is enforcement and the informal sector's exclusion.

Exam Pointers

- Describe Pakistan's OHS legal framework.
- What are employer duties and worker rights?

Lecture 3: Hazard Identification

Learning Objectives

- Classify hazards
- Apply identification methods

Hazards come in families: physical (noise, vibration, heat, radiation, slips/trips/falls), chemical (dusts, solvents, pesticides — via inhalation, skin, ingestion), biological (bacteria, viruses, animal exposures — hospitals, farms, labs), ergonomic (manual handling, repetition, poor workstation design), and psychosocial (stress, violence, harassment).

Each industry has a signature mix: construction — falls and struck-by; textiles — cotton dust (byssinosis), noise, fire; mining — roof falls, dust (silicosis), gases; healthcare — sharps, infections, shift-work fatigue; agriculture — pesticides, heat, machinery.

Identification methods: workplace inspections, job safety analysis (breaking jobs into steps and spotting hazards per step), worker interviews and surveys, and incident/near-miss data. The exam skill: given a workplace (e.g., a garment factory), list its hazard families with specific examples — examiners reward industry-specific answers over generic lists.

Key Definitions

Byssinosis is defined as lung disease from cotton-dust exposure in textile workers — the signature occupational disease of spinning mills.

Examples

- Construction: falls from height — the industry's top killer worldwide.
- Healthcare: needlestick injuries transmitting hepatitis — preventable by safety devices.

Key Points — very important for exams

Five families: physical, chemical, biological, ergonomic, psychosocial.

Each industry has a signature hazard mix — learn two or three.

Methods: inspections, job safety analysis, worker input, incident data.

Exam skill: industry-specific hazard lists beat generic ones.

Review Questions

- ? List the hazards of a coal mine.
- ? What is job safety analysis?

Section Summary

You can't control what you haven't identified: systematically map each workplace's hazard families.

Exam Pointers

- Classify workplace hazards with examples.
- How are hazards identified?

Lecture 4: Risk Assessment and Control

Learning Objectives

- Conduct risk assessment
- Apply the hierarchy

Risk assessment turns hazard lists into priorities: identify hazards, assess who might be harmed and how, evaluate the risk (likelihood × severity, often on a 5×5 matrix), decide controls, record findings, and review. The risk matrix is the workhorse — a high-likelihood, high-severity risk demands immediate action; low-low risks need only monitoring.

The hierarchy of controls orders interventions by effectiveness: elimination (remove the hazard — best), substitution (replace with something safer), engineering controls (guard, ventilate, isolate), administrative controls (procedures, training, signage), and PPE (last resort — it protects the worker, not the workplace, and fails if unworn). The exam mantra: PPE is the last resort, not the first response.

Residual risk — what remains after controls — must be acceptable (ALARP: as low as reasonably practicable) and communicated. Document everything: risk assessments are legal evidence of due diligence. Pakistani SMEs often jump straight to PPE (cheap, visible) while skipping elimination and engineering — the classic error.

Key Definitions

ALARP is defined as the principle that residual risk must be reduced until further reduction is grossly disproportionate in cost.

Examples

- Elimination: stop using a carcinogenic solvent entirely — better than any mask.
- PPE last: giving earplugs instead of enclosing a noisy machine — the SME shortcut.

Key Points — very important for exams

Five steps: identify → who/how → evaluate → control → record/review.

Risk = likelihood × severity; matrix prioritizes action.

Hierarchy: eliminate → substitute → engineer → administer → PPE (last!).

Residual risk must be ALARP and documented — legal due diligence.

Note:

Note: 'PPE is the last resort' is the single most-examined sentence in this topic — pair it with the full hierarchy in order.

Review Questions

- ? Assess the risk of a chemical spill in a warehouse.
- ? Why is PPE the weakest control?

Section Summary

Assess systematically, control hierarchically, and document — that is the legal and practical core of prevention.

Exam Pointers

- Explain the hierarchy of controls.
- How does a 5×5 risk matrix work?

Lecture 5: Safety Management Systems

Learning Objectives

- Describe SMS elements
- Explain ISO 45001

A safety management system (SMS) embeds safety in how the organization runs: policy (leadership commitment), planning (risk assessment, legal compliance, objectives), implementation (roles, training, communication, operational controls), checking (monitoring, audits, incident investigation), and review

(management review, continual improvement) — the Plan-Do-Check-Act cycle.

ISO 45001 (2018) is the global SMS standard: it requires worker participation, leadership accountability, and integration with business processes — certifiable and increasingly demanded by multinational buyers. Pakistan's exporters (textiles, sports goods) face buyer codes of conduct requiring SMS-like systems; SEDEX/SA8000 audits check them.

The HR role is central: competence (training matrices), communication (toolbox talks, safety committees), contractor management (your safety system must cover contractors — Baldia's lessons), and safety culture (below). An SMS on paper without worker participation is a certificate, not a system — auditors and examiners both test for this.

Key Definitions

ISO 45001 is defined as the international standard for occupational health and safety management systems (2018).

Examples

- PDCA: policy → risk assessment → training/controls → audits → management review → improve.
- Buyer audits: European brands requiring ISO 45001-style systems in Sialkot factories.

Key Points — very important for exams

SMS = policy → planning → implementation → checking → review (PDCA).

ISO 45001: worker participation, leadership accountability, certifiable.

Exporters need SMS for buyer compliance (SEDEX, SA8000).

HR owns competence, communication, contractors, culture — paper systems fail.

Review Questions

- ? Audit a factory's SMS: what would you check first?
- ? Why do buyer codes demand safety systems?

Section Summary

Systems beat slogans: PDCA, worker participation, and leadership accountability turn safety into routine.

Exam Pointers

- What are the elements of a safety management system?
- What is ISO 45001 and why does it matter for exporters?

Lecture 6: Accident Investigation

Learning Objectives

- Investigate incidents
- Build reporting systems

Every incident — injury, illness, near-miss — must be reported, recorded, and investigated: immediate care and scene preservation, evidence collection (witnesses, photos, positions), root-cause analysis, corrective actions, and follow-up. Near-miss reporting is the gold mine: for every serious injury there are hundreds of near-misses — free lessons if reported without blame.

Root-cause technique: the '5 whys' (drill past symptoms to system causes) and fishbone diagrams (man, machine, method, material, environment). The goal is never 'worker was careless' — that explains nothing and fixes nothing. Real causes: missing guards, production pressure, poor training, bad design.

Pakistan's reporting gap: incidents go unreported (fear, informality), so statistics mislead and prevention starves. HR's job: build just culture (below) where reporting is safe, investigate deeply, and track leading indicators (training completed, near-miss rates) not just lagging ones (injury counts).

Key Definitions

5 Whys is defined as asking 'why?' repeatedly to drill from a symptom to the underlying system cause.

Examples

- 5 whys: fall → no harness → harness unavailable → purchasing cut → budget pressure — the real cause.
- Just culture: reporting a near-miss earns thanks, not punishment.

Key Points — very important for exams

Report, record, investigate all incidents AND near-misses.

Root causes via 5 whys / fishbone; never stop at 'carelessness'.

Near-misses: hundreds per injury — the cheapest prevention data.

Just culture + leading indicators (near-miss rates, training) beat blame + lagging counts.

Review Questions

- ? Investigate a warehouse forklift collision using 5 whys.
- ? Leading vs lagging indicators: give three of each.

Section Summary

Investigate systems, not people; mine near-misses; and measure what prevents, not just what happened.

Exam Pointers

- How should incidents be investigated?

→ Why are near-misses valuable?

Lecture 7: Occupational Health Programs

Learning Objectives

- Design health programs
- Explain surveillance

Occupational health covers work-related disease: respiratory (silicosis, asbestosis, byssinosis), skin disorders, hearing loss (noise-induced — irreversible), musculoskeletal disorders, cancers (asbestos, benzene), and infections. Health surveillance — periodic medical checks for exposed workers — catches disease early and is legally required for specified hazards.

Program elements: pre-employment baselines, periodic surveillance, exposure monitoring (air sampling, noise dosimetry), fitness-for-work assessments, and record-keeping (exposure records outlive employment — latency means disease appears decades later). Occupational health services may be in-house (large firms) or contracted.

Pakistan's gaps: few occupational physicians, surveillance rare outside multinationals, and diseases misattributed (a miner's silicosis recorded as generic TB). The HR-exam angle: health surveillance is both a moral duty and legal evidence — without baseline and periodic data, neither prevention nor compensation works.

Key Definitions

Health surveillance is defined as periodic medical monitoring of workers exposed to occupational hazards to detect disease early.

Examples

- Audiometry: annual hearing tests for workers in noisy spinning sheds.
- Latency: asbestos exposure causing mesothelioma 30 years later — records must survive.

Key Points — very important for exams

Disease families: respiratory, skin, hearing, musculoskeletal, cancers, infections.

Surveillance: baseline + periodic checks + exposure monitoring.

Latency (decades) demands long-lived exposure records.

Pakistan: few specialists, rare surveillance, misattributed disease.

Review Questions

- ? Design surveillance for pesticide-exposed farm workers.
- ? Why do occupational diseases go undiagnosed in Pakistan?

Section Summary

Health protection is slow medicine: monitor exposures, screen periodically, and keep records longer than careers.

Exam Pointers

- What are the elements of an occupational health program?
- Why does latency matter for record-keeping?

Lecture 8: Ergonomics and Workplace Design

Learning Objectives

- Identify ergonomic risks
- Design controls

Ergonomics fits the job to the worker: manual-handling risks (lifting, carrying — the back-injury epidemic), repetitive strain (typing, assembly), workstation design (seating, screens, lighting), and work-organization (rest breaks, job rotation, shift design). Musculoskeletal disorders are the commonest occupational health complaint worldwide — and largely preventable.

Controls follow the hierarchy: mechanize lifting (hoists, trolleys), redesign workstations (adjustable chairs, screen at eye level), rotate tasks, and train lifting technique (training alone is weak — design first). Office ergonomics matters as much as factory: Pakistan's growing IT/BPO sector faces eye strain, back pain, and sedentary risks.

Workplace design standards: lighting, ventilation, temperature, sanitation, drinking water, rest facilities — the Factories Act's welfare provisions, often ignored. The exam point: ergonomics is productivity-positive — comfort reduces errors and absenteeism, so the business case is direct.

Key Definitions

Ergonomics is defined as the science of fitting jobs, tools, and workplaces to human capabilities and limits.

Examples

- Mechanize: a hoist replaces team-lifting of cement bags — design beats training.
- Office: monitor at eye level, feet flat, breaks every hour — the BPO health package.

Key Points — very important for exams

Risks: manual handling, repetition, poor workstations, bad shift design.

MSDs: commonest occupational complaint, mostly preventable.

Control by design: mechanize, adjust, rotate — train last.

Ergonomics pays: comfort cuts errors and absenteeism.

Review Questions

- ? Ergonomically assess a data-entry workstation.
- ? Why is training the weakest manual-handling control?

Section Summary

Design work for humans: machines lift, chairs adjust, tasks rotate — and productivity follows comfort.

Exam Pointers

- What are the main ergonomic risk factors?
- How should manual-handling risks be controlled?

Lecture 9: Psychosocial Risks and Workplace Well-being

Learning Objectives

- Assess psychosocial risks
- Apply the legal framework

Psychosocial hazards — work-related stress, workplace violence, bullying, and harassment — are the growing frontier: the WHO/ILO recognize burnout as an occupational phenomenon, and Pakistan's Protection Against Harassment of Women at the Workplace Act 2010 creates specific employer duties (internal inquiry committees, penalties).

Stress risk assessment mirrors physical assessment: identify stressors (workload, control, support, role clarity, change, relationships — the HSE management standards), assess, intervene at source (redesign jobs, clarify roles, train managers), and support individuals (counseling, EAPs). Violence prevention: risk assessment for high-risk roles (cash handling, healthcare, late-night retail), de-escalation training, and reporting systems.

HR's central role: psychosocial risks are managed through people systems — job design, management training, grievance handling, and culture. The exam-ready line: mental health is occupational health; stress is a hazard like any other, assessed and controlled the same way.

Key Definitions

HSE management standards is defined as the UK HSE's six stressor domains: demands, control, support, relationships, role, change.

Examples

- HSE assessment: a call center scoring high on demands, low on control — redesign before burnout.
- Harassment Act: mandatory inquiry committee, defined penalties, Ombudsperson appeal.

Key Points — very important for exams

Stress, violence, bullying, harassment: assessed like physical hazards.

HSE six stressor domains guide assessment.

Harassment Act 2010: committees, duties, penalties — know it.

HR owns this: job design, manager training, grievance systems.

Review Questions

- ? Design a stress risk assessment for nurses.
- ? How should a harassment complaint be handled?

Section Summary

The mind is part of the worker: assess psychosocial hazards systematically and manage them through people systems.

Exam Pointers

- What are psychosocial hazards?
- What does the 2010 Harassment Act require of employers?

Lecture 10: Emergency Preparedness

Learning Objectives

- Design emergency plans
- Analyze failures

Emergency preparedness covers fires, chemical releases, natural disasters, and medical emergencies: prevention (housekeeping, maintenance), detection and alarm, evacuation plans with marked routes and assembly points, firefighting equipment and trained teams, first aid, and drills — practiced, not just posted. Baldia Town's locked exits are the eternal warning: evacuation routes must never be obstructed.

Fire safety specifics: the fire triangle (fuel, oxygen, heat — remove one), extinguisher types (water, CO₂, foam, powder — match to fire class), and compartmentation. Chemical sites need spill kits, eyewash stations, and mutual-aid arrangements with civil defense. First aid: trained first-aiders, stocked kits, and hospital linkages — the Factories Act requires first-aid provisions.

Business continuity extends preparedness: backup systems, crisis communication, and recovery plans. For exams: describe an emergency plan's elements and critique a real failure (Baldia: no exits, no alarms, no training) — applied answers score highest.

Key Definitions

Fire triangle is defined as the three elements — fuel, oxygen, heat — whose combination sustains fire; removing any one extinguishes it.

Examples

- Fire classes: electrical fires need CO2, not water — wrong extinguishers kill.
- Drills: quarterly evacuation practice, timed and debriefed.

Key Points — very important for exams

Plan: prevention, alarm, evacuation routes, equipment, first aid, drills.

Fire triangle; match extinguishers to fire class.

Baldia lesson: never obstruct exits; practice, don't just post.

Extend to business continuity: backups, communication, recovery.

Review Questions

- ? Audit a factory's fire safety in ten checks.
- ? Design a chemical-spill response.

Section Summary

Emergencies are managed before they happen: plan, equip, train, drill — and keep every exit open, always.

Exam Pointers

- What are the elements of emergency preparedness?
- What went wrong at Baldia Town?

Lecture 11: Safety Culture

Learning Objectives

- Define safety culture
- Build just culture

Safety culture is the shared values and behaviors around safety: in a mature culture, safety is 'how we do things', reporting is safe, and production pressure never overrides protection. Bradley's curve traces the journey: reactive (safety by instinct — accidents drive action), dependent (safety by supervision — rules enforced), independent (safety by self — personal responsibility), interdependent (safety by teams — looking out for each other).

Just culture is the enabler: honest mistakes and near-miss reports are treated as learning, while recklessness and willful violations are still disciplined — distinguishing error from violation. Without it, reporting dies and the organization flies blind. Leadership behaviors build culture: visible commitment (managers doing safety walks), consistent responses (stopping unsafe work even at cost), and fair accountability.

Measuring culture: safety-climate surveys, reporting rates (rising near-miss reports = healthy), and audit scores. Pakistan's challenge: hierarchical, blame-oriented workplaces where workers fear reporting — HR must deliberately engineer psychological safety before any system works.

Key Definitions

Just culture is defined as a culture where honest errors are treated as learning opportunities while reckless violations are disciplined.

Examples

- Interdependent: workers stopping each other from skipping harness checks — teams owning safety.
- Blame culture: punishing an injury report guarantees the next injury goes unreported.

Key Points — very important for exams

Culture = shared safety values and behaviors.

Bradley curve: reactive → dependent → independent → interdependent.

Just culture: learn from errors, discipline recklessness.

Leaders build it: visibility, consistency, fair accountability.

Review Questions

- ? Assess a firm's culture stage from its behaviors.
- ? How does hierarchy hinder safety culture in Pakistan?

Section Summary

Culture is what happens when no one is watching: build it with justice, leadership, and safe reporting.

Exam Pointers

- What is safety culture? Describe Bradley's curve.
- Why is just culture necessary for reporting?

Lecture 12: Personal Protective Equipment Programs

Learning Objectives

- Design PPE programs
- Avoid common failures

Where PPE is genuinely the last resort's remainder, programs must be rigorous: selection matched to the hazard (right glove for the chemical, right respirator fit-tested), training in use and limits, maintenance and replacement schedules, and enforcement. Free provision is a legal duty — charging workers for PPE is illegal and guarantees non-use.

Common failures: one-size-fits-all (unfitted masks leak), discomfort (workers discard), poor maintenance (expired cartridges), and using PPE instead of engineering (the hierarchy violation). Respiratory protection deserves special care: fit-testing, medical clearance, and cartridge change schedules — a dust mask against solvent vapors is worse than nothing (false confidence).

Hearing conservation programs: noise monitoring, audiometric testing, and engineered quiet first. Eye protection matched to task (grinding vs chemical splash). The exam point: a PPE program is a system — select, fit, train, maintain, enforce — not a purchase order. 

Key Definitions

Fit-testing is defined as testing that a respirator seals to the wearer's face — required because leaks defeat protection.

Examples

- Fit-testing: a bearded worker's respirator leaks — reassignment or powered respirator needed.
- Hearing: 90 dB for 8 hours damages hearing; plugs only work if worn 100% of exposure time.

Key Points — very important for exams

PPE = last resort; where needed, run it as a system.

Select → fit → train → maintain → enforce; free provision is law.

Failures: poor fit, discomfort, expired media, substitution for engineering.

Respiratory and hearing programs need monitoring and testing.

Review Questions

- ? Audit a factory's PPE: what five things do you check?
- ? A worker refuses a helmet — what do you do?

Section Summary

PPE only protects when it's the right gear, fitted, maintained, and worn — a program, not a purchase.

Exam Pointers

- What makes a PPE program effective?
- Why is PPE the last resort?

Lecture 13: Contractor Safety

Learning Objectives

- Manage contractor risk
- Design permit systems

Contractors die disproportionately: they do the most dangerous work (maintenance, construction) with the least site knowledge. Contractor safety management: pre-qualification (safety records, competence), contract terms (safety requirements, right to stop work), induction (site hazards, rules, emergency), supervision and coordination (permit-to-work systems), and performance review.

Permit-to-work is the key control for high-risk jobs: hot work (welding), confined-space entry, electrical isolation, working at height — each needs a written permit specifying precautions, authorization, and handover. A permit is not paperwork; it is the coordination mechanism that stops one team's work killing another's.

Pakistan's relevance: factories routinely outsource maintenance and construction to informal contractors with no safety systems — the principal employer's duty extends to them. The exam-ready rule: you can outsource work, not responsibility — contractor safety is your safety.

Key Definitions

Permit-to-work is defined as a formal written system authorizing and controlling high-risk work (hot work, confined space, heights).

Examples

- Hot-work permit: welding near fuel storage — fire watch, extinguisher, authorization required.
- Confined space: tank entry needs atmospheric testing, attendant, rescue plan.

Key Points — very important for exams

Contractors face the highest risks with the least site knowledge.

Manage: pre-qualify → contract → induct → supervise → review.

Permit-to-work controls high-risk jobs — coordination, not paperwork.

You can outsource work, never responsibility — very important.

Review Questions

- ? Design a confined-space entry permit.
- ? A contractor is injured on your site — who is liable?

Section Summary

Contractor safety is system discipline: qualify, induct, permit, supervise — because their accidents are your accidents.

Exam Pointers

- Why are contractors at higher risk?
- How should contractor safety be managed?

Lecture 14: OHS Training and Competence

Learning Objectives

- Design training systems
- Evaluate effectiveness

OHS training must be systematic: induction (hazards, rules, emergency — before work starts), job-specific (JSA-based safe procedures), periodic refresher, and specialized (first aid, firefighting, permit roles). Training needs analysis identifies who needs what; competence — the ability to work safely unsupervised — is the goal, not attendance certificates.

Methods: toolbox talks (short, job-relevant, daily/weekly), demonstrations and practice (extinguisher drills, not lectures), and e-learning for knowledge refresh. Effectiveness is measured at four levels (Kirkpatrick): reaction, learning, behavior change, and results (incident reduction) — most firms stop at level one.

HR's training responsibilities: maintain the training matrix (who is qualified for what, expiry dates), verify contractor competence, and train managers — supervisors' safety behavior predicts team safety. Pakistan's gap: induction often skipped for daily-wage workers — the most vulnerable get the least training.

Key Definitions

Training evaluation levels is defined as Kirkpatrick's four levels: reaction, learning, behavior, results — for evaluating training effectiveness.

Examples

- Toolbox talk: 10 minutes on today's scaffolding risks — before the shift, at the site.
- Matrix: welder's hot-work authorization expires annually — retrain before expiry.

Key Points — very important for exams

Induction → job-specific → refresher → specialized.

Competence (safe unsupervised work) is the goal, not certificates.

Toolbox talks + practice beat lectures.

Evaluate to behavior and results, not just smilesheets.

Review Questions

- ? Design induction for construction daily-wagers.
- ? Why do certificates not equal competence?

Section Summary

Train for competence: analyze needs, teach practically, verify behavior, and track qualifications like the safety assets they are.

Exam Pointers

- What are the types of OHS training?
- How is training effectiveness evaluated?

Lecture 15: Worker Participation

Learning Objectives

- Build participation mechanisms
- Avoid tokenism

Worker participation is both a right and an effectiveness requirement: workers know the hazards best, and imposed rules without buy-in fail. Mechanisms: safety committees (joint management-worker, regular meetings, inspection and recommendation powers), safety representatives (elected, with inspection and investigation rights), and consultation on risk assessments and new equipment.

Effective committees: management authority present (decisions get made), worker reps elected not appointed, agendas from inspections and incidents, minutes with action tracking. Token committees — management-only, irregular, no follow-up — are worse than none (they prove participation is theater).

Pakistan's law provides for worker involvement, but union density is low and informal workers have no voice. HR can build participation through elected safety reps even without unions, toolbox-talk dialogue, and anonymous reporting channels — the exam point: participation is a control measure in its own right.

Key Definitions

Safety committees is defined as joint management-worker bodies with inspection, recommendation, and follow-up powers on safety matters.

Examples

- Effective: elected reps inspect monthly; actions tracked to closure in minutes.
- Token: manager-appointed 'committee' meeting yearly — participation theater.

Key Points — very important for exams

Workers know hazards best; buy-in makes rules work.

Committees: joint, elected, empowered, action-tracked.

Reps: inspection and investigation rights.

Participation is itself a control measure — engineer it deliberately.

Review Questions

- ? Design a safety committee constitution.

? How can informal workers participate?

Section Summary

Safety done with workers works; safety done to them doesn't — build genuine participation structures.

Exam Pointers

→ Why is worker participation essential?

→ What makes a safety committee effective?

Lecture 16: Construction Safety

Learning Objectives

- Control construction hazards
- Analyze the Pakistani context

Construction is among the deadliest industries: the 'fatal four' — falls, struck-by, caught-in/between, electrocution — cause most deaths. Controls: fall protection (guardrails, harnesses, safety nets — hierarchy: prevent falls before arresting them), scaffolding standards (erected by competent persons, inspected), excavation shoring, crane safety, and electrical safety.

Pakistan's construction reality: largely informal labor, bamboo scaffolding, no fall protection, child labor in brick kilns — and building collapses from poor regulation. The Building and Other Construction Workers' welfare laws exist but barely reach sites. High-rise growth in Karachi, Lahore, and Islamabad makes this urgent.

Sector exam answers apply the general toolkit specifically: JSA for each trade, permits for heights and excavations, contractor management (subcontractor chains), and welfare (drinking water, shelter, first aid on site). The exam-ready statistic pattern: falls dominate — so fall protection is always the first answer.

Key Definitions

Fatal four is defined as OSHA's four leading construction killers: falls, struck-by, caught-in/between, electrocution.

Examples

- Fall protection: guardrails (prevent) before harnesses (arrest) — hierarchy applied.
- Scaffolding: tagged (safe/unsafe), inspected weekly, erected by trained scaffolders.

Key Points — very important for exams

Fatal four: falls, struck-by, caught-in/between, electrocution.

Falls dominate — fall protection is always the first control.

Scaffolds, excavations, cranes: competent persons + inspections.

Pakistan: informality + weak enforcement = urgent reform need.

Review Questions

- ? Plan safety for a 10-story building project.
- ? Why do building collapses happen?

Section Summary

Construction kills predictably — so prevent predictably: falls first, then the rest, with competent supervision throughout.

Exam Pointers

- What are construction's main hazards and controls?
- Why is Pakistani construction especially dangerous?

Lecture 17: Machine, Electrical, and Chemical Safety

Learning Objectives

- Control machinery risks
- Manage electrical and chemical hazards

Machine safety: guarding (fixed, interlocked, presence-sensing — matched to the hazard), lockout/tagout (isolating energy before maintenance — the procedure that prevents the classic 'someone switched it on' death), and safe operating procedures. Power presses, the historic killer, illustrate all three.

Electrical safety: shock, arc flash, and fire risks; controls include insulation, earthing, circuit protection, qualified-persons-only rules, and lockout. Pakistan's factories and construction sites show the failure modes: exposed wiring, overloaded circuits, untrained electricians — electrocution is in the fatal four for a reason.

Chemical safety: the Globally Harmonized System (GHS) of classification and labeling, Safety Data Sheets (SDS) for every hazardous chemical, segregation of incompatibles, ventilation, and spill response. Pesticide safety in agriculture — Pakistan's acute problem — needs locked storage, labeled containers (never drink bottles), and applicator training.

Key Definitions

Lockout/tagout (LOTO) is defined as physically locking energy-isolation devices during maintenance so equipment cannot be started — with tags warning others.

Examples

- LOTO: padlocked breaker + 'do not operate' tag before clearing a jammed conveyor.

■ Pesticides: decanting into unlabeled drink bottles — the classic poisoning route.

Key Points — very important for exams

Machines: guard → lockout/tagout → procedures.

Electrical: isolate, earth, protect, qualify — electrocution is a fatal-four member.

Chemicals: GHS labels, SDS for everything, segregate, ventilate.

Agriculture: pesticide storage and labeling — Pakistan's acute chemical risk.

Review Questions

- ? Design LOTO for a packaging line.
- ? Audit a pesticide store in ten checks.

Section Summary

Energy — mechanical, electrical, chemical — must be contained by design: guard it, lock it, label it.

Exam Pointers

- Explain machine guarding and lockout/tagout.
- What is GHS and SDS?

Lecture 18: Safety Audits and Performance

Learning Objectives

- Conduct audits
- Measure performance

Audits test whether the SMS works: systematic, independent examination against criteria (legal, ISO 45001, company standards). Types: compliance audits (are we legal?), management-system audits (does the SMS function?), and focused audits (contractors, permits). Auditors must be competent and independent of the audited area.

The audit cycle: plan (scope, criteria), conduct (documents, interviews, observations — the triangulation), report (findings graded by severity, with evidence), corrective action (root causes, owners, deadlines), and follow-up (verify closure — unaudited actions decay). Worker interviews reveal what documents hide.

Safety performance measurement: lagging indicators (injury rates — LTIFR, fatalities) tell history; leading indicators (near-miss reporting, training completion, audit closure, safety-walk frequency) predict it. The exam-ready management line: measure leading indicators to manage, lagging to validate — and never bonus purely on lagging (it buys underreporting).

Key Definitions

LTIFR is defined as lost-time injury frequency rate — injuries per million hours worked; the standard lagging benchmark.

Examples

- Triangulation: the permit file says 'compliant'; workers say permits are signed blank — believe the workers.
- Perverse bonus: zero-injury bonuses that collapse the month reporting is audited.

Key Points — very important for exams

Audits: compliance, system, focused — independent and evidence-graded.

Cycle: plan → conduct → report → correct → verify closure.

Leading (near-misses, training) predicts; lagging (LTIFR) validates.

Never bonus on lagging alone — it purchases silence.

Review Questions

- ? Plan an SMS audit for a textile mill.
- ? Design a balanced safety scorecard.

Section Summary

Audit independently, measure what predicts, and reward honesty — that is how systems improve instead of decaying.

Exam Pointers

- What are the types and stages of safety audits?
- Compare leading and lagging indicators.

Lecture 19: Compensation, Rehabilitation, and the Economics of Safety

Learning Objectives

- Explain compensation systems
- Argue the economics

When prevention fails, compensation and care matter: Pakistan's Employees' Social Security (sickness, maternity, injury benefits) and EOBI (pensions), plus the Workmen's Compensation Act 1923 (employer liability for specified injuries). Coverage is thin — informal workers mostly excluded — and benefit adequacy is debated.

Return-to-work programs — modified duties, rehabilitation, phased return — are both humane and economic: they cut disability duration and preserve skills. Disability management: accommodate (adjust the job), rehabilitate, and reintegrate — the alternative (discarding injured workers) wastes

human capital and invites litigation.

The economics of OHS close the course: accidents cost direct (medical, compensation) plus indirect (downtime, retraining, reputation, legal) — the iceberg, with indirect costs several times direct. Cost-benefit analyses consistently show prevention pays; the exam-ready framing: OHS spending is investment with measurable return, not overhead.

Key Definitions

Accident cost iceberg is defined as the pattern where hidden accident costs (downtime, retraining, reputation) dwarf visible ones (medical, compensation).

Examples

- Iceberg: Rs. 1m compensation hiding Rs. 4m in downtime, overtime, retraining, lost orders.
- Return-to-work: a back-injured worker on modified duties returns in weeks, not months.

Key Points — very important for exams

Pakistan: Social Security, EOBI, Workmen's Compensation — thin coverage.

Return-to-work: modified duties cut disability duration.

Accident iceberg: indirect costs multiply direct ones.

Prevention is investment with return — the course's closing business case.

Note:

Note: closing a paper with the iceberg + return-to-work + investment framing turns the whole course into one coherent argument — use it.

Review Questions

- ? Why is informal-sector exclusion the biggest compensation gap?
- ? Calculate a simple ROI for a guarding project.

Section Summary

Care for the injured, bring them back, and remember the economics: safety pays because accidents cost far more than they appear to.

Exam Pointers

- Describe Pakistan's workers' compensation framework.
- Make the economic case for OHS investment.

Lecture 20: Pakistan's OHS Legal Framework

Learning Objectives

- Know the statutes
- Evaluate enforcement

Pakistan's OHS legal landscape: the Factories Act 1934 (the colonial survivor — hours, safety, health provisions), provincial OHS Acts (post-18th Amendment: Punjab OSH Act 2019, Sindh's law — devolution's patchwork), the Mines Act 1923 (mining's special dangers), and international commitments (ILO conventions — C187 promotional framework; Pakistan's ratification gaps). The enforcement reality: inspectors few, penalties weak, informal sector uncovered — the law's promise vs the factory floor.

The 18th Amendment's double edge: provinces can tailor laws (good) but capacity varies wildly (bad) — Punjab leads, others lag. The EU's GSP+ leverage: labor standards as trade conditionality — Pakistan's OHS reforms partly export-driven. Exam point: know the statutes by name, but analyze the enforcement gap — paper laws don't save lives.

Reform agenda: unified OHS authority per province, inspectorate capacity (numbers + training + equipment), meaningful penalties (fines that exceed violation profits), informal-sector coverage (the real frontier — 70%+ of workers), and safety culture over compliance theater. Very important: the exam rewards legal knowledge plus critical evaluation.

Key Definitions

Devolution patchwork is defined as post-18th Amendment provincial OHS lawmaking — tailored statutes, uneven capacity.

Examples

- Punjab OSH Act 2019: the provincial model — if enforced.
- GSP+: European trade preferences as OHS reform leverage.

Key Points — very important for exams

Factories Act 1934, provincial OSH Acts, Mines Act 1923, ILO conventions.

Devolution: tailored laws, uneven capacity.

Enforcement gap: inspectors, penalties, informal sector.

GSP+ as reform leverage; reform agenda listed.

Review Questions

- ? A factory ignores the 1934 Act — why?
- ? Design an inspectorate reform.

Section Summary

Pakistan's OHS law is a patchwork of promise: know the statutes, diagnose the enforcement gap, prescribe capacity.

Exam Pointers

- What are Pakistan's OHS laws?
- Why doesn't the law protect workers?

Lecture 21: Question Bank and the Golden Answer

Learning Objectives

- Drill questions
- Answer systematically

Question bank: Q1. Heinrich vs Reason: accident causation compared. Q2. Hierarchy of controls: apply to a textile dyeing unit. Q3. Risk matrix: score a boiler explosion scenario. Q4. Leading vs lagging indicators: two each. Q5. Permit-to-work: when and how? Q6. Investigate a finger amputation: 5-whys. Q7. Design a safety committee for a 500-worker factory. Q8. PPE program: why it fails, how to fix. Q9. Heat stress: a brick kiln's controls. Q10. Psychosocial: burnout in nurses — assess and intervene.

Q11. Factories Act 1934: key safety provisions. Q12. Emergency plan for a chemical plant: outline. Long Q: 'A garment factory has 3 fires in a year' — investigate (causation models), diagnose (systems failures), prescribe (hierarchy + culture + law), and cost-justify (the business case). Exam technique: OHS answers = hazard → risk → controls (hierarchy order) → system → law — never just PPE.

The golden answer shape: identify hazards systematically (walk the process), assess with the matrix, control via hierarchy (elimination first, PPE last), systematize (SMS, committees, audits), and ground in Pakistani law. Safety is a system — answers must show the system.

Key Definitions

Golden answer shape is defined as hazard → risk → hierarchy controls → SMS → Pakistani law — the complete OHS answer.

Examples

- Q2: dyeing unit — enclose (engineering) before masks (PPE).
- Long Q: investigation → diagnosis → prescription → business case.

Key Points — very important for exams

Twelve questions: models to law.

Long Q: the three-fires factory — full systems response.

Golden shape: hazard → risk → hierarchy → system → law.

Never PPE-only: elimination first, always.

Review Questions

- ? Score a risk matrix for your own kitchen.

? Walk a process and list its hazards.

Section Summary

OHS exams test systems thinking: hazards identified, risks scored, hierarchy applied, law cited — the golden shape every time.

Exam Pointers

- Respond to the three-fires factory.
- Design the chemical plant's emergency plan.

Glossary of Key Terms

Hazard — anything — substance, machine, practice — with the potential to cause harm.

Risk — the combination of the likelihood of harm and its severity.

ILO C155 — the ILO convention requiring a national OSH policy and employer/worker duties.

Byssinosis — lung disease from cotton-dust exposure in textile workers — the signature occupational disease of spinning mills.

ALARP — the principle that residual risk must be reduced until further reduction is grossly disproportionate in cost.

ISO 45001 — the international standard for occupational health and safety management systems (2018).

5 Whys — asking 'why?' repeatedly to drill from a symptom to the underlying system cause.

Health surveillance — periodic medical monitoring of workers exposed to occupational hazards to detect disease early.

Ergonomics — the science of fitting jobs, tools, and workplaces to human capabilities and limits.

HSE management standards — the UK HSE's six stressor domains: demands, control, support, relationships, role, change.

Fire triangle — the three elements — fuel, oxygen, heat — whose combination sustains fire; removing any one extinguishes it.

Just culture — a culture where honest errors are treated as learning opportunities while reckless violations are disciplined.

Fit-testing — testing that a respirator seals to the wearer's face — required because leaks defeat protection.

Permit-to-work — a formal written system authorizing and controlling high-risk work (hot work, confined space, heights).

Training evaluation levels — Kirkpatrick's four levels: reaction, learning, behavior, results — for evaluating training effectiveness.

Safety committees — joint management-worker bodies with inspection, recommendation, and follow-up powers on safety matters.

Fatal four — OSHA's four leading construction killers: falls, struck-by, caught-in/between, electrocution.

Lockout/tagout (LOTO) — physically locking energy-isolation devices during maintenance so equipment cannot be started — with tags warning others.

LTIFR — lost-time injury frequency rate — injuries per million hours worked; the standard lagging benchmark.

Accident cost iceberg — the pattern where hidden accident costs (downtime, retraining, reputation) dwarf visible ones (medical, compensation).

Devolution patchwork — post-18th Amendment provincial OHS lawmaking — tailored statutes, uneven capacity.

Golden answer shape — hazard → risk → hierarchy controls → SMS → Pakistani law — the complete OHS answer.