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Textbook: Industrial Safety and Health Management, 5<sup>th</sup> Edition C. Ray Asfahl. Prentice Hall, Inc., New Jersey, 2004, ISBN 0-13-142392-4.

Course Description: Principles of industrial accident prevention; accident statistics and costs; appraising safety performance; recognizing industrial hazards and recommending safeguards. Includes a study of the Occupational Safety and Health Act.

Course Objectives:

- To develop an awareness of the need for industrial accident prevention and safety procedures.
- To develop an understanding of the factors which contribute to and cause hazardous conditions in industrial plants, shops, and laboratories. Safety factors in machine and equipment design.
- To develop an understanding of industrial accident analysis procedures in the investigation of accidents.
- To develop an understanding of the essential elements of effective safety organizations.
- Familiarize the student with activities and practices which are used to develop safe work procedures and habits.

Grading: The course grade will be based on:

Test 1	100 points	90-100=A
Test 2	100 points	82-91=B
Test 3	50 points	72-81=C
<u>Terms Test</u>	<u>50 points</u>	<u>60-71= D</u>
Total	300 points	Below = F

Test 1 (Midterm) consists of multiple choice and true/false questions worth 100 points.

**Due: Oct. 17, 2008**

Test 2 (Final) consists of multiple choice and true/false questions worth 100 points,

**Due: Dec. 5, 2008**

Test 3 (Comprehensive Problem) consists of several comprehensive problems covering the OSHA Log 300 (including the computation of incident rates), PEL and TWA problems worth 50 points. **Due: Dec. 5, 2008**

The terms & definitions test is a matching test involving fifty of the terms and definitions contained in this syllabus worth 50 points. **Due: Sept. 19, 2008**

All tests are closed book. Test 3's comprehensive problem will include all the material needed by the student to answer the questions successfully to include tables, charts, etc.

Either the Site Coordinator or the site Faculty member schedule tests. It is suggested the student plan ahead and schedule his tests in advance of the deadlines thus avoiding an Incomplete grade for the course.

**TEACHING METHODS:** This is a non-weekend-formatted course or independent study course consisting of reading assignments, exercises, and written tests. The instructor will provide assistance and guidance via email or phone as needed.

**STUDENT RESPONSIBILITIES:** It is suggested the student begin the course by first reading the appropriate chapters and outlining points of interest and importance. Second, after reading the chapters, use the test review questions (included in the course material) as a guide to "focus" a review of testable material. Third, before taking Test 2, it is suggested the student prepare and take the Terms Test. Finally, after taking the Terms Test the student should read the appropriate chapters and review questions for Test 2. In addition the student should review the materials contained in the appropriate chapters and information provided in this CD or file to complete the OSHA Log 300 and the PEL and TWA exercises. These exercises will prepare the student to take the comprehensive problem portion of Test 2.

These are suggestions only. The student may prepare for the test utilizing any methodology that he finds acceptable. The only requirement made by the Instructor is that all three tests are taken in a timely manner.

**LECTURE NOTES:** The instructor's lecture notes are included in this CD or file. These notes are not a substitute for the text, however they represent the salient topics of the material covered in the text.

Also contained in the CD or file is a folder named "Safety exercises and answers." Contained in this folder are quiz questions with answers, answers to end-of-chapter questions for several chapters, and a ".pdf" file with instructions on how to complete the OSHA Log 300.

**CLASS POLICY:** Incomplete Grades: In accordance with written university policy contained in the Undergraduate Catalog, an INCOMPLETE GRADE will be allowed when, for reasons beyond control, students engaged in PASSING WORK are unable to complete all class assignments within the assigned schedule established by the instructor. If after 6 months the grade is still incomplete the instructor will compute a final grade using grades for completed work.

### Course Outline

Test 1 covers Chapters 1 – 9.

Test 2 covers Chapters 10 – 18.

Test 3 are comprehensive problems involving the OSHA Log 300 criteria, TWA & PEL limits.

The Terms Test is a matching test constructed from the terms and definitions contained in this syllabus.

COURSE CONTENT: The course materials student receives when enrolled in this course should include the following. (download from base web page or contact base coordinator for files)

1. This syllabus (IT305 Safety IS Syllabus.doc).
2. Lecture notes (5thEDSafetyLectureNotes.doc ).
3. Independent Study OSHA Log 300 exercises (IS Log 300 exercises.doc).
4. Independent Study TWA and PEL exercises (IS TWA and PEL exercises.doc).
5. Answers to End-of-Chapter questions (Safety exercises and answers folder).
6. Quizzes for selected chapters (Safety exercises and answers folder).
7. OSHA Log 300 with Instructions (contained in 4 “.pdf” files).
8. Mid-term review (IT305 mid-term review sheet.doc).
9. Final review (IT305 final review sheet.doc).
10. There are several OSHA Log 300 forms (OSHA 300 recordkeepingforms.xls and STUDENTLog300.xls )

#### DEFINITIONS FOR TERMS TEST

##### Legal

Liability- an obligation to rectify or recompense any injury or damage for which the liable person has been held responsible.

Strict liability- growing concept that a manufacturer of a product is liable for injuries due to defects without a necessity for plaintiff to show negligence or fault.

Negligence- failure to exercise a reasonable amount of care or to carry out a legal duty so that injury or property damage occurs to another.

Contributory negligence- when an injured person's care for his own safety was less than reasonable for a prudent man under existing conditions, he is considered negligent and the defendant will not be held liable.

Assumption of risk- a person who is aware of a danger and its extent, and knowingly exposes himself, assumes all risks and cannot recover damages even though he is injured through no fault of his own.

Ultra-hazardous operations- any person who conducts an operation that involves abnormal risk to others is strictly liable for injury or damage that results, even if these operations were conducted with care

Foreseeability reasonable care- a man may be held liable for actions that result in injury or damage only when he was able to foresee dangers and risk that could be reasonably anticipated

Slight care- that degree of care less than that which a prudent man would exercise.

Exercise of due care- every person has the legal duty to exercise due care for the safety of others and avoid injury to others if possible.

Master servant relationship applied to a guest- a master is liable for any negligence of his servant acting within the scope of his employment.

Gross negligence- conduct involving failure to use even slight care, a complete lack of regard for the safety of others, or intentional failure to perform a required and apparent duty regardless of the severity of the consequences of his act.

Willful or reckless conduct- outrageous and reckless disregard for other's rights or well-being and of possible consequences. Indicates not only a complete lack of care such as could be considered gross negligence, but an intention to exercise no care at all.

Damages, compensatory- compensation to an injured person for the loss he has suffered and may continue to suffer.

Damages, punitive- awards made in some states to compensate an injured party for intentional, malicious, or outrageous misconduct by the defendant, usually made so that the latter will not repeat the offense.

Safe premises- it is the duty of an owner or user of land to keep his premises in a condition that is reasonably safe for those lawfully there.

Foreseeability applied to premises- an owner, lessor, or other party responsible for premises must anticipate to foresee all possible risks to which the public might be subjected during their use, to maintain them in a safe condition, and to provide warnings of any unsafe or unusual condition.

Foreseeability applied to rescue- any foreseeable act that places a rescuer in the same danger as in an injured person the rescuer is attempting to aid is considered negligence by the person who committed the initial act.

Fright without physical contact- at one time it was considered that a plaintiff could not recover damages unless injury was due to physical contact. The principle has been modified or repudiated over the years by many states to permit a plaintiff to collect damages for neurological or emotional disturbances that occurred without physical injury.

Tort- a wrongful act or failure to exercise due care for which civil legal action may result.

Categories of persons sometimes not covered under workers compensation in some states.

Agricultural workers- at one time none of these workers were covered; now 38 states, Puerto Rico, and the virgin Islands have some laws that provide at least some coverage. Fifteen more permit voluntary coverage by employers.

Domestic workers- all state and Puerto Rico have coverage for workers in domestic service but some states have minimum requirements for hours worked or earnings.

Casual employment- in general, this is occasional, incidental, and not considered employment occurring at regular intervals. It has sometimes been defined by the number of days of labor, cost of labor, or not in the course of the employer's business.

Hazardous employment- Some states indicate that the workers compensation laws cover only employment listed as "hazardous" or "extra hazardous". however, the lists have broadened in many of these states, so many occupations not ordinarily considered especially hazardous are now included.

Employees of charitable or religious organizations- Persons whose work is irregular, for short term periods, or temporarily outside the regular activities the scope of the regular activities of the employer are covered in only 10 states and under the Longshoreman's and harbor workers compensation acts.

Railroad and maritime workers- most of these workers are not covered by state workers compensation laws. railroad workers in interstate commerce and maritime workers are covered by the Federal Employers Liability Act. This is not a workers compensation law but denies the employer the right to plead any common law defenses in any negligence action an employee may institute because of an injury.

Contractors and subcontractors- Independent contractor are not covered by the insurance of any one for whom they are performing services. An independent contractor is one who agrees to do a specific piece of work in accordance with his own capabilities and for which he will be paid an agreed reimbursement. The contractor will do the work without being subjected to another's orders. If the contractor is not truly independent, and the party for whom the services are being provided actually does direct the work, the contractor may not be independent, but an employee.

### Miscellaneous Terms

Costs- the economic quantification of safety and of actual or potential accident losses, and which generally include outlays required to produce safer equipment or operations.

Risks- judgements between economic cost evaluations of two or more alternatives, such as whether an accident preventive measure should be taken or which of several preventive measures should be chosen.

Benefits- (a) indicates the excess between how much an employer might be liable and how much might be gained or lost if no action or a different action is taken. (b) for both workers and employers, the lessened amounts in accidents, injuries, deaths, or other considerations, due to reductions in mishaps, and savings in injuries, deaths, and monetary losses.

Hazard- condition with the potential of causing injury to personnel, damage to equipment or structures, loss of material, or lessening of the ability to perform a prescribed function. When a hazard is present, the possibility exist of these adverse effect occurring.

Danger- expresses a relative exposure to a hazard. A hazard may be present, but there may be little danger because of the precautions taken.

Damage- severity of injury or the physical, functional, or monetary loss that could result if control of a hazard is lost. ie. The hazard (possibility) and danger (exposure) of an accident can be the same. The difference would be in the severity of the damage. (10 foot fall vs. 300 foot fall)

Safety- frequently define as "freedom from hazards." However, it is practically impossible to completely eliminate all hazards. Safety is therefore a matter of relative protection from exposure to hazards: the antonym of danger.

Risk- expression of possible loss over a specific period of time or number of operational cycles. It may be indicated by the probability of an accident time the damage in dollars, lives, or operating cost.

### Engineering Terms

Interlocks- are the one of the most commonly used safety devices, especially with electrically operated equipment. Some interlocks themselves prevent action or motion; other send signals to other devices which prevent initiating the source of the action or motion.

Sequential controls- actions must be performed in the proper sequence or operation is inhibited.

Timers and time delays- operation of the equipment can take place only after a specific length of time has passed.

Photoelectric devices- interruption or presence of light on a photoelectric cell generates a signal which can stop or initiate action.

Mercury switches- mercury provides the path between two metal contacts through which current passes. the path can be broken by tilting the switch in which the mercury and the contacts are sealed so that the mercury flows away from one contact and breaks the path for the current.

Tripping devices- action releases a mechanical block or triggering device which either permits or stops motion.

Key interlock- inserting and turning a key in a mechanical lock permits action.

Motion interlock- motion of the mechanism being guarded against prevents a guard or other access from being opened.

Magnetic or electromagnetic sensing- presence of a magnetic material stops or initiates operation of the equipment.

Ultrasonics- senses the presence of nonporous materials.

Standard water pressure- in the United States, one cubic foot of water weighs 62.4 pounds, which works out to be 4.33 psi.

Vacuum- is the measure of pressure less than that of the standard atmosphere.

Stored pressure energy- the expansive energy contained in a fluid.

Pump- a device to increase the pressure of a fluid. A blower does the same for a gas.

Pressure regulator- a device to maintain a constant pressure or flow rate from a source whose pressure must be limited and which might change.

Standard atmospheric pressure- 14.7 psi

Absolute pressure (psia)- is measured from the point at which no particles of any fluid exist to create a pressure. Absolute pressure is that of the atmospheric pressure plus that indicated on a gage

Gage pressure (psig)- is that shown on a meter.

Static pressure- is pressure when the fluid is quiescent and the force it exerts is only that due to the gravitational weight of the liquid. Dynamic pressure is pressure exerted due to kinetic force movement of a fluid.

Pressure relief valve- a device which permits discharge of fluid from a system if it exceeds a set value.

Rupture disc- a thin membrane which prevents flow in a fluid system until the membrane breaks because its designed rating is exceeded, permitting discharge of the fluid.

Ullage- the amount a cylinder lacks being full, usually the amount of gas left to prevent any excessive increase because of a temperature rise.

Explosion- sudden and violent release of large amounts of gas. Damage may result from the rupture and fragmentation of a container, a shock wave, heat or fire, or release of toxic gas.

Deflagration- consist of a rapid reaction during which heat is transferred progressively from a reacting material to another nearby whose temperature is then raised to a point at which it, too, reacts. The rate at which deflagration take place is high but less than the speed of sound. Large amounts of hot gas are produced, but unless they are confined, no shock wave (blast) will be generated. If the gasses are confined, the resultant pressure due to the hot, expanding gases may cause a sudden rupture of the container.

Detonation- if the velocity of reaction through the reacting material reaches sonic or supersonic speed, the explosion is a detonation. A shock wave (blast) will occur even where there is no container. Some detonation velocities are: hydrogen-oxygen, 9200 fps; TNT, 22,800 fps; nitroglycerin, 26,200 fps.

Permissible explosive- mining regulations stipulate that explosives used must not be capable of igniting methane, thus limiting the temperatures of the explosion products. Explosives that meet the requirement are permissibles.

TNT equivalence- weight of trinitrotoluene (TNT) which will produce the same effect as that generated by the explosion of another material. The common measure used for comparison is the peak overpressure (maximum instantaneous pressure produced in a shock wave). Nitroglycerin has a TNT equivalency of 1.42, ammonium nitrate, 0.57.

Explosive reactions- a deflagration is generally a combustion reaction in which a fuel combines with an oxidizer. In some instances, as with black powder, there is also a dissociation reaction first. With black powder, which in its elementary form consist of carbon, sulfur, and sodium nitrate, the sodium nitrate decomposes to provide the oxidizer necessary for combustion. Most high explosive reactions involve highly energetic exothermic dissociations in which a complex molecule breaks down into simpler molecules, principally gases that expand rapidly because of the large amounts of heat generated.