

Advanced Diploma in Construction Safety (ADCS)

FIRST SEMESTER

Paper I: Safety Management I

(Code: ADCS- I)

Total Marks: 75

Section-A

Marks: 30

1.1 Introduction to H&S, Welfare & Environment

Syllabus - Basic definitions of Health, Safety, Welfare and Environment; Need for maintaining good standards of health, safety welfare and environment: legal, humanitarian, economic and social considerations.

Peculiarities and nature of the construction industry with regard to safety and health parameters governing safety and health in the construction industry e.g. Site Planning, Layout, Safe Access / Egress; Financial aspects of safety-Cost of accident: Direct cost and indirect cost

Section-B

Marks: 30

1.2 Principles of Accident Prevention & Risk Management

Syllabus - Definitions of Event, Incident, Accident, injury. unsafe acts, unsafe conditions, dangerous occurrences, Theories of Accident Occurrences-H.W.Henrich, Frank bird & Multiple Causation theories of accident occurrences, Models of accident prevention, Principles of accident prevention.

Managing & Controlling Hazards in Construction activities

Section-C

Marks: 15

1.3 Organizational Behaviour and Safe Project Management

Syllabus - Stages of Construction Project- Briefing, design, procurement, construction, commissioning Health and Safety Culture; Enforcing good health, safety, welfare and environment through procurement and contracts- methods of contracting, health, safety, welfare and environment in contract document, contractor prequalification and selection; Human Factors contributing to accidents-Attitude, Aptitude, Perception, Motivation Human Failures-Human errors, violation; Occupational stress and its Management

Module wise Weightage of Marks

Paper No	Name of the Subject	Sub module	Name of the Module	Weightage of Marks
Paper- I	Safety Management- I	1.1	Introduction to H&S, Welfare & Environment	30
		1.2	Principles of Accident Prevention & Risk Management	30
		1.3	Organizational Behaviour and Safe Project Management	15

			TOTAL Marks	75
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Paper II: Safety Management II

(Code: ADCS- II)

Total Marks: 75

Section-A

Marks: 30

2.1 Safety Education and Training

Syllabus - Training for Safety: Assessment of needs, Design & development of training programme. Training methods and strategies; Training of managers ,supervisors& workers. Induction for new entrants; Evaluation of training programmes; Communication-importance, barriers to communication, methods of communication; Safety Promotion & Publicity: Safety suggestion schemes, Safety competitions,Safety incentive Schemes, Audio Visual Publicity, other promotional methods.

Section-B

Marks: 30

2.2 Safety Organization

Syllabus - Organisation structure and safety department Division of responsibility in the organisation Duties of Employer and employees; Duties of Architects, Project Engineers and Designers Health and Safety Policy; Health and Safety plan-essential elements of health and safety plan Role, responsibility, authority & qualification of safety officer; Safety Committee-Structure and Function

Section-C

Marks: 15

2.3 Management Information System

Syllabus - Sources of information on Safety , Health, and Environment; Compilation, Processing retrieval and analysis of information; Status and future scope of computer utilization in Safety; Introduction to National & International SHE Management Systems QMS,EMS,OHMS

Module wise Weightage of Marks

Paper No	Name of the Subject	Sub module	Name of the Module	Weightage of Marks
Paper II	Safety Management II	2.1	Safety Education and Training	30
		2.2	Safety Organization	30
		2.3	Management Information System	15
			TOTAL Marks	75

Paper III: Construction Safety Engineering-I

(Code: ADCS-III)

Total Marks: 75

Syllabus:

Section-A

Marks: 15

3.1 Manual Handling of Materials

Syllabus - Basic principle of correct lifting and handling of materials, Avoidance of excessive muscular efforts.

Maximum loads that may be carried; Lifting and carrying of objects of different shape, size and weight, safe use of accessories for manual handling; Ergonomics consideration.

Section-B

Marks: 15

3.2 Mechanical Handling of Materials

Syllabus - Lifting machinery, Lifts and hoists, conveyors; Slings and sling attachments; Safety in design and construction; Operation/Signals; Testing, Inspection and maintenance; Safety features, safe working load; Competent persons

Section-C

Marks: 15

3.3 Stacking, Storage and Handling Construction Materials

Syllabus - General considerations for stacking and storage-Planning for storage Layout, protection against atmospheric agencies, protection against fire and other hazards; Stacking, storage and handling with respect to materials such as cement, limes, stones, bricks, tiles, aggregates, fly ash, timber, steel, roofing sheets, pipes, glass, paints, varnishes, thinners, Bitumen, Bituminous emulsion and road tar; Storing of materials with identifiable batch lot, documents of incoming certificates; In-house checking and documentation of input materials, semi-processed materials, finished materials, quality assurance plan, documentation and management issues, statistical aspects of acceptance criteria.

Section-D

Marks: 20

3.4 Safety in use of Construction Machinery and Equipment

Syllabus - Working function, hazards involved and safety devices/measures to be taken for

Cement Concrete Plant Operation

Mixer m/c(concrete truck mixer, highway transit mixer); Batching plant; Transportation of concrete; Concrete pump & truck mounted concrete pump; Slip form paver; Concrete buckets (pneumatic & mechanically operated); Tip up buckets in builder hoist; Concrete compaction tools & equipment (plate & column vibrator; Cement concrete block production

Hot mix Asphalt plant operation

Asphalt cement(compost/mastic asphalt Asphalt melting equipment; Rolled asphalt concrete; Mobile asphalt layers and finishes Asphalt pavers (wheel type); Asphalt plate compactor ; Asphalt recycler equipment

Earth moving machinery & allied equipments

Construction tractor & trailer; Bulldozer(crawler etc.); Excavator(trench hoe, clamshell, dragline,dipper or power shovel, skimmer; Pipe layers,brick layers, concrete layers, asphalt layers; Excavators implements;

Trencher & plate type trench compactor; Construction ripper,rooter; Back hoe/pay loader,skid steer loader;

dredger(clamshell & bucket); Construction road graders; Wheel tractor-scrapers(open bowl elevatine, auger pull tandem/push-pull types); Articulated hauler; Cable & grapple skidder(track & wheel types); Construction dumpers; Landfill compactors; Road roller(static & vibratory);Crushers(jaw & hammer mill) for concrete aggregates(gravels/stones); Jack hammer/breaker(compressed air powered); Hammer drill; Drilling equipment(pneumatic & electrical); Scarifier; Tunnel boring machine

Cranes

Jib Crane; Mobile crane(crawler & wheeled Gantry Crane; Derrick Crane; Tower Crane; Goliath Crane;Overhead travelling crane

Other supplementary machinery & their outfits

Cable ropeway for load carrying buckets Bucket elevator; Hoist & lift, Scissor lift, Aerial(Sky/Arm) lifts etc. Conveyors (Belt, chain, slat, flight, aerial); Forklift truck and platform truck; Winch rn/c; Air compressor and receiver; Oxy acetylene gas cutting & welding Electric welding(tig, mig etc.); Dry grinding of metals(hazards and safety of abrasive wheels Pile driver & extractor machiner & its Accoutrements

Section-E

Marks: **10**

3.5 Hand Tools, Portable & Hydraulic Tools

Syllabus - Common causes of accidents, safe practices; Inspection, maintenance and repair of tools, detectable causes of tool failures. Redressing of tools; Hand tools-Safe use of Hammers , Hand Saw, Chisels, Axes and Hatchets, punches and pins, snips, screw driver, hand planes, plumb bob, crow bar ,Cutting hand tools - rod and bar cutters, bolt cutters, manual rebar shear, wrenches, pliers, pipe wrench,clamps, vises etc. Power tools- type of injuries, earthing , use of RCCB, ELCB, double insulated tools, electric cord and plugs, safe use of electric drill, drill presses, power saw, portable grinder, electric/hydraulic shear and cutter, electric/hydraulic benders etc.

Module wise Weightage of Marks

Paper No	Name of the Subject	Sub module	Name of the Module	Weightage of Marks
Paper III	Construction Safety Engineering-I	3.1	Manual Handling of Materials	15
		3.2	Mechanical Handling of Materials	15
		3.3	Stacking, Storage and Handling Construction Materials	15
		3.4	Safety in use of Construction Machinery and Equipment	20
		3.5	Hand Tools, Portable & Hydraulic Tools	10
			TOTAL Marks	75

Paper IV: Construction Safety Engineering II

(Code: ADCS- IV)

Total Marks: 75

Section-A

Marks: 10

4.1 Housekeeping

Syllabus Safety and good housekeeping, Need for planning and follow-up, Typical accidents due to poor housekeeping, Disposal of scrap and other trade wastes, Prevention of spillage, Marking of gangways and other locations, Use of colour as an aid for good housekeeping, Clean-up campaigns, Cleaning methods, employee assignment, Inspection and check-list. Result of good housekeeping.

Section-B

Marks: 10

4.2 Industrial Lighting

Syllabus - Purpose of lighting. Advantages of good illumination. Lighting and safety. Lighting and the work. Sources and types of artificial lighting. Principles of good illumination. Recommended minimum standards of illumination. Design of lighting installation. Maintenance. Lighting and colour.

Section-C

Marks: 15

4.3 Ventilation and Heat Control

Syllabus - Purpose of ventilation. Classification of Ventilation as General Ventilation (Natural and Mechanical Ventilation modes). Local Exhaust Ventilation; Effects of excess heat/heat stress; control measures for heat stress; PPE; signs & symptoms of heat related illness; first aid etc.

Section-D

Marks: 15

4.4 Electrical Safety

Syllabus - Definition, Electrical hazards, Safe limits of amperages, voltages, Safe distance from lines, etc., Joints and connections, Overload and Short circuit protection, Earthing standards and earth fault protection, Earth Insulation and continuity tests. Protection against voltage fluctuations, Effects of shock on human body, Hazards from Borrowed neutrals, Electrical equipment in hazardous atmosphere, Portable electrical apparatus. Flame proof electrical equipments, Criteria in their selection, Installation, maintenance, Control of hazards due to static electricity

Section-E

Marks: 15

4.5 Fire Safety

Syllabus - Basic Physics and Chemistry related to Fire - Definition of Matter and energy, Physical properties of matter like Density, specific gravity, Relative density, Vapour density, Melting & Boiling point, flammable limits, latent heat, etc, Effects of density on behavior of gases, Basics of oxidizing and reducing agents, Acids. Flammable liquids classification and types of tanks, Dust and Explosion, Liquid and Gas Fires, LPG. UCVE, BLEVE, Slope over, Boil over, Gas laws, PV-T relation for perfect gas.; Anatomy of Fire: Definition of Combustion, Elements of Combustion,

Products of Combustion, Heat of reaction and calorific value, Flash point, Fire point, Ignition temperature and spontaneous combustion. Fire Triangle, fire tetrahedron, fire pyramid, source of heat,(Chemical, mechanical, Electrical, Nuclear etc.), Classification of fire and method of fire extinguishment, oxygen and its effects on combustion, Mode of heat transfer(Conduction, Convection & Radiation).; Statutory provisions regarding fire safety. Factors contributing towards fire. Classification of fires. Common causes of industrial fires. Determination of fire load. Fire resistance of building materials. Design of building plant, exits, etc. for fire safety. Prevention of fire. Portable extinguishers. Water systems, carbon-di-oxide systems. Foam extinguisher system. Dry chemical extinguishing system. Industrial fire detection and alarms. Sprinkler systems. Special precautionary measures in handling/processing flammable liquids, gases, vapours, mists and dusts.

Section-F

Marks: **10**

4.6 Environmental Pollution

Syllabus - Causes, Effects and Control measures of air pollution, water pollution, soil pollution
Name of the

Module wise Weightage of Marks

Paper No	Name of the Subject	Sub module	Name of the Module	Weightage of Marks
Paper IV	Construction Safety Engineering II	4.1	Housekeeping	10
		4.2	Industrial Lighting	10
		4.3	Ventilation and Heat Control	15
		4.4	Electrical Safety	15
		4.5	Fire Safety	15
		4.6	Environmental Pollution	10
			TOTAL Marks	75

Paper V: Appraisal, Analysis, Inspection and Control Procedures

(Code: ADCS-V)

Total Marks: 75

Syllabus:

Section-A

Marks: 20

5.1 Construction site and Equipment Safety Appraisal & Control Techniques

Syllabus - Introduction to Safety Checklist, Site Safety Inspection, Safety Tag System, Safety Audit Report Objective of safety audit, type of audit, Audit team, Elements of safety audit, Method of audit, audit steps, concept and lay out of audit report; Safety observation, Safety Sampling, Safety Surveys, Job Safety Analysis, Safety Inventory System, Product Safety, Permit to work systems, Safety Signs and signals, Emergency Action Plan

Section-B

Marks: 20

5.2 Hazard Identification Techniques

Syllabus - HAZARD: Introduction to Hazard, Causes, Identification, Evaluation & Control of Hazard; HAZOP Analysis, Sources for Information on Hazard Evaluation. Methodology, Advantages of HAZOP Study, Limitation of HAZOP study

RISK ANALYSIS: Definition of Risk, Risk Analysis, Introduction to Failure Mode & Effect Analysis (FMEA), Fault Tree Analysis (ETA), Event Tree Analysis (ETA); Quantitative risk analysis-Out line of methodology.

Section-C

Marks: 20

5.3 Accident Investigation Reporting and Analysis

Syllabus - Purpose. Identifying the key factors and the causes. Writing reports and report forms. Corrective action. Standard classification of factors associated with accident. Method of collecting and tabulating data. Keeping the records

Section-D

Marks: 15

5.4 Measurement and Control of Performance

Syllabus - Lost time accident, Disabling injury, Reportable Accidents, Frequency rate, Severity rate, Incidence rate and man days lost. Temporary disablement and permanent disablement. Partial and total disablement. Time charges scheduled in Employee's Compensation Act and the Indian Standard.

Module wise Weightage of Marks

Paper No	Name of the Subject	Sub module	Name of the Module	Weightage of Marks
Paper V	Appraisal, Analysis, Inspection and Control Procedures	5.1	Construction site and Equipment Safety Appraisal & Control Techniques	20
		5.2	Hazard Identification Techniques	20
		5.3	Accident Investigation Reporting and Analysis	20
		5.4	Measurement and Control of Performance	15
			TOTAL Marks	75

Paper-VI: OSH & Statutory Provisions

(Code: ADCS-VI)

Total Marks: 75

Section-A

Marks: 30

6.1 OSH Indian Statutory Provisions

Syllabus – National Building Code-Provisions on Construction safety ; Special publication of Indian Standards on Construction Safety; OSH Code; National policy; BOCW(ROE&COS) Act,1996; W.B BOCW(ROE&COS) Rules,2004; BOCW(ROE&COS) Central Rules,1998; BOCW Cess Act,1996; Factories Act,1948 and West Bengal Factory Rules,1958 Indian Explosive Act,1884 & I.E Rules,1983 Indian Electricity Act,2003& I.E.Rules,1956 ; Gas'Cylinder Rules,2004; Environment Protection Act,1986 & Rules

KMC Act,1980 and KMC Building Rules,2009; Employees Compensation Act,1923 & Employees Compensation Rules,1924 Employers Liability Act,1938; Personal Injuries(Compensation InsuranceAct,1963,CompensationInsurance Scheme,1965 & Compensation Rules,1965; Contract Labour(Regulation & Abolition) Act,1970 & Contract Labour(Regulation & Abolition) W.B Rules,1972; Public Liability Insurance Act,1991 and Public Liability Insurance Rules,1991; Social Accountability 8000 with criteria 3.1(Safety & Health) including ISO 26000 & IS 16001 Rules regarding Women Employment-Migrating workers; Motor Vehicle Act and Rules

Section-B

Marks: 25

6.2 OSH International Standards and References

Syllabus – Including but not limited to – Relevant ILO OSH standards; Occupational Health Safety Acts of USA, UK, OSHA, HSE-UK; ETC.

Section-C

Marks: 20

6.3 OSH Other Relevant Standards/Legislations

Syllabus – Indian Boilers Act and Regulations. Petroleum Act and Rules. Petroleum Act and Rules, MSIHC Rules, CIMAH Rules, Radiation Protection Act and Regulations. Static and mobile pressure vessels rules. The Dock workers (Safety, Health & welfare) Act & Regulations. Provisions regarding transportation of dangerous Cargo under Central Motor Vehicle Act and Rules, The insecticides Act and Rules. Environmental Protection Act 1986, Air(Prevention and control of pollution)Act, Water (Prevention and control of pollution) Act and Rules, Important court cases, judgments.

Module wise Weightage of Marks

Paper No	Name of the Subject	Sub module	Name of the Module	Weightage of Marks
Paper VI	OSH & Statutory Provisions	6.1	OSH Indian Statutory Provisions	30
		6.2	OSH International Standards and References	25
		6.3	OSH Other Relevant Standards/Legislations	20
			TOTAL Marks	75