THE NATIONAL COUNCIL OF EXAMINERS FOR ENGINEERING AND SURVEYING
PRINCIPLES AND PRACTICE OF ENGINEERING EXAMINATION

FIRE PROTECTION

EFFECTIVE October 2004

		Approximate Percentage of Examination
I.	**Fire Protection Analysis**	**20%**
	A. Types of Analysis	12%
	1. Hazard analysis techniques (e.g., estimating fire scenario severity)	
	2. Risk analysis techniques (e.g., likelihood, severity)	
	3. Economic analysis techniques (e.g., cost benefit, life cycle)	
	4. Limitations of analyses	
	B. Information Sources for Analysis	8%
	1. Functional use and operation of facility (e.g., industrial processes, occupancy, facility contents)	
	2. Acceptable thresholds (e.g., maximal temperature, heat flux, gas concentration)	
	3. Codes and standards	
	4. Occupancy, hazard and commodity classifications	
	5. Fire test methods (e.g., classification, product or material characteristics)	
	6. Fire test data interpretation techniques	
	7. Exposures (e.g., proximal distance from hazards)	
	8. Technical drawings, schematics, and plans (e.g., contract documents, shop drawings, riser diagrams)	
II.	**Fire Protection Management**	**10%**
	1. Capabilities and limitations of the design	
	2. Facility system impairment procedures	
	3. Inspection and maintenance frequencies	
III.	**Fire Science & Human Behavior**	**15%**
	A. Fire Dynamics	10%
	1. Fire and smoke behavior	
	2. Fire growth	
	3. Combustion	
	4. Plume entrainment and temperature	
	5. Materials properties (e.g., heat of combustion, ignitability, thermal, mechanical, flammable and explosive limits)	
	6. Materials compatibility (e.g., storage arrangements, water reactives)	
	7. Heat transfer from fire and smoke	
	B. Human Response	5%
	1. Evacuation movement	
	2. Human performance capabilities	
	3. Human response to fire cues (e.g., alarm, smoke, and heat)	
	4. Timed egress analyses	

IV. Fire Protection Systems — 35%

A. Water-Based Fire Suppression Systems — 12%

1. Design criteria (e.g., water flow and pressure requirements, densities, design areas)
2. Hydraulic calculation techniques
3. Pipe sizing techniques
4. System types (e.g., wet and dry pipe, pre-action, foam, water mist)
5. System components (e.g., sprinkler types, valves, flow detection, pipe material selection, cross-connection control, bracing)
6. Placement (e.g., obstructions, environmental considerations)
7. Water supply and distribution (e.g., public, private, storage tanks)
8. Fire pumps and controllers

B. Special Hazard Systems — 5%

1. Design criteria
2. Design method (e.g., total flooding or local application)
3. Pipe sizing
4. System types (e.g., CO_2, clean agents, dry chemical)
5. System components
6. Agent storage
7. Personnel safety
8. Controls (e.g., actuation, pre-alarm, release, detection)
9. Collateral damage (e.g., toxic or acid byproducts)
10. System interlocks (e.g., damper, process shutdown)
11. Test methods (e.g., enclosure integrity test, environmental concerns)

C. Fire Detection and Alarm Systems — 9%

1. Design criteria (e.g., sequence of operation, initiating device selection and spacing)
2. System types (e.g., addressable, hardwire)
3. System components
4. Initiating devices (e.g., type, placement, performance)
5. Environmental effects on initiating device placement (e.g., air velocity, temperature)
6. Notification appliances (e.g., type, placement, performance, voice communication)
7. Circuit classification and wiring methods
8. Survivability
9. Power supplies
10. Building control functions and system interfaces (e.g., elevator recall, HVAC, smoke control, door releases)
11. Monitoring (e.g., central station, proprietary)
12. Test methods (e.g., verify sequence of operation)

D. Smoke Management Systems — 5%

1. Design criteria (e.g., objectives, equipment survivability, pressure limits)
2. System types (e.g., pressurized stairwells, zone smoke control, venting)
3. System components
4. Fluid mechanics (e.g., vent flows, plug holing)
5. Environmental effects (e.g., stack effect, wind)
6. Initiating mechanisms
7. Power supplies
8. System interfaces (e.g., fire alarm, HVAC)
9. Test methods (e.g., model code requirements, verify sequence of operation, component performance, safety)

E. Explosion Protection and Prevention Systems 4%

1. Design criteria (e.g., maximum pressure, venting rates, agent concentration)
2. Design method (e.g., suppression, inerting, isolation, venting)
3. Agent types (e.g., gas, dry chemical)
4. Venting (e.g., location, sizing)
5. System components (e.g., enclosure construction, agent delivery, piping, venting configuration)
6. Personnel safety
7. Controls (e.g., actuation, detection, release)
8. Collateral damage (e.g., adjacent structures or exposures)
9. System interlocks (e.g., dampers, process shutdown)
10. Test methods (e.g., other system survivability)

V. Passive Building Systems 20%

A. Building Construction 12%

1. Construction types (e.g., combustible, noncombustible, fire resistive, frame)
2. Construction materials (e.g., roofing, sheathing, insulation)
3. Height and area limits
4. Building separation distance
5. Interior finish (e.g., flame spread rating, critical radiant flux)
6. Structural fire resistance (e.g., calculation methods, substitution rules)
7. Compartmentalization/separation (e.g., fire, smoke)
8. Vertical openings
9. Protection of openings (e.g., penetration seals, joint systems, dampers, doors)

B. Means of Egress 8%

1. Design criteria
2. Exits (e.g., types, remoteness, travel distances, number, capacity)
3. Means of egress components (e.g., exit access, exit, exit discharge)
4. Component details (e.g., stairwells, corridors, doors, hardware)
5. Occupancy types (e.g., assembly, detention, business)
6. Occupant load
7. Emergency lighting
8. Marking of the means of egress

Total 100%

Notes

1. The knowledge areas specified under A., B., C., etc., are examples of kinds of knowledge, but they are not exclusive or exhaustive categories.
2. This examination contains 80 multiple-choice questions. Examinee works all questions.
3. Codes and standards applicable to the exam will be those effective December 31 of the year preceding the exam.