

**NCEES Principles and Practice of Engineering  
 ARCHITECTURAL ENGINEERING Exam Specifications**

**Effective Beginning with the April 2010 Examinations**

- The exam is an 8-hour open-book exam. It contains 40 multiple-choice questions in the 4-hour morning session, and 40 multiple-choice questions in the 4-hour afternoon session. Examinee works all questions.
- The exam uses the US Customary System (USCS) of units.
- The exam is developed with questions that will require a variety of approaches and methodologies, including design, analysis, and application.
- The knowledge areas specified as examples of kinds of knowledge are not exclusive or exhaustive categories.

	<b>Approximate Number of Questions</b>
<b>I. Building Systems Integration</b>	<b>14</b>
A. Aspects of building performance that affect human comfort (e.g., vibration, noise, lighting, climate control)	
B. Building envelope analysis	
C. Impact of one system on another (e.g., lighting load on air-conditioning system capacity)	
D. Life safety systems (e.g., generators, batteries, exit lighting, fire alarms)	
E. Systems efficiencies (including calculations for energy usage and costs such as life cycle, material)	
F. Sustainability (e.g., energy efficiency, renewable energy, indoor air quality, water conservation)	
G. Applicable standards, codes, and regulations (e.g., NFPA; ASHRAE; ICC; ADA requirements )	
H. Design and construction issues associated with commissioning process, including testing and balancing	
<b>II. Electrical Systems</b>	<b>20</b>
A. Electrical power systems analysis, including load flow	
B. Short circuit analysis	
C. Grounding principles	
D. Electrical construction methods and materials (new and existing systems)	
E. Overcurrent protection methods and device coordination	
F. Branch circuit and feeder conductor sizing	
G. Power distribution for building systems and equipment	
H. Voltage drop calculations	
I. One-line diagram	
J. Fire alarm device layout	
K. Light source selection considering elements such as type, color, life, cost, efficiency, and application	
L. Lighting calculations (e.g., lumen method, light at a point)	

- M. Lighting control
- N. Receptacle layout
- O. Equipment and component selection

### **III. Mechanical Systems**

**20**

- A. Fan laws
- B. Pump laws
- C. Flow and riser diagrams
- D. Static pressure calculations (air and water)
- E. Materials and methods (e.g., new and existing ductwork, piping materials, and insulation)
- F. Piping for specialty systems (e.g., fuel oil, natural gas, medical gas)
- G. Pipe expansion (e.g., expansion joints, loops, anchors)
- H. Heat gain and loss calculations
- I. Psychrometrics
- J. Hydronic and steam systems
- K. Equipment selection (e.g., pumps, air handling units, chillers, boilers)
- L. HVAC system analysis and selection (e.g., air cooled/water cooled, all air, heat pumps, split systems)
- M. Fire protection sprinkler and standpipe classifications
- N. Ventilation
- O. Indoor air quality
- P. Air distribution
- Q. Domestic water systems (routing, sizing)
- R. Stormwater systems
- S. Sanitary waste and vent systems (routing, sizing, slope)
- T. Sequences of operation for building controls

### **IV. Structural Systems**

**20**

- A. Types of construction (e.g., structural steel, timber, concrete, masonry)
- B. Components (e.g., tension, compression, bending, shear)
- C. Structural load effects on overall electrical, mechanical, and structural systems (e.g., seismic, wind, thermal, vibrations)
- D. Connections (e.g., bolted, welded, base plates, brackets)
- E. Loads (e.g., gravity, lateral, temperature, settlement, construction)
- F. Analysis of frames and shear walls
- G. Analysis of construction systems (e.g., new and existing staging, bracing, and loads)
- H. Analysis of stability
- I. Analysis of deflection
- J. Foundations (e.g., piles, shafts, spread)
- K. Materials characteristics (e.g., strength, stiffness, hardness, environmental concerns, fatigue concerns) of steel, concrete, masonry, and timber

### **V. Project Management and Construction Administration**

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- A. Discovered site conditions
- B. Change orders
- C. Alternates
- D. Request for information
- E. Architectural supplemental information (e.g., RFI response, clarification in construction documents, bulletins)

- F. System conflict resolution
- G. Scheduling of design tasks, sequence of activities, CPM
- H. Progress reports
- I. Quality control
- J. Contract administration
- K. Legal issues (e.g., contracts; impact of decisions that may result in lawsuit; errors and omissions)
- L. Construction safety
- M. Submittal processes