

**Vertical Forces (Gravity/Other) and Incidental Lateral Component of the
Structural Engineering BREADTH CBT Exam Section Specifications**

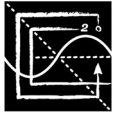
Effective Beginning April 2024

- **The exam section topics have not changed since April 2018 when they were originally published.**
- The exam section is computer-based. It is closed book with electronic references. The NCEES *PE Structural Engineering Reference Handbook* is included in the exam along with the design standards shown on the last page.
- Examinees have 6 hours to complete this exam section, which contains 55 multiple-choice questions. The section will contain scored and unscored (pretest) questions. The 6-hour time includes a tutorial and a scheduled break. Examinees work all questions.
- The exam section uses the U.S. Customary System (USCS) of units.
- The exam section 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.

	Number of Questions
I. Analysis of Structures	15–23
A. Generation of Loads	6–9
1. Dead	
2. Live (e.g., occupancy, roof, pedestrian)	
3. Moving (e.g., vehicular, crane)	
4. Impact (e.g., vehicular, crane, elevator)	
5. Vessel collision	
6. Earth pressure	
7. Differential settlement	
8. Hydrostatic/hydrodynamic	
9. Flood	
10. Snow	
11. Rain (i.e., ponding)	
12. Ice	
13. Thermal	
14. Shrinkage	
15. Load combinations	
16. Wind and other loads on bridges	

B. Load Distribution and Analysis Methods	9–14
1. Static (e.g., determinate and indeterminate, location of forces and moments, free-body diagrams)	
2. Shear and moment diagrams	
3. Code coefficients and tables	
4. Truss analysis methods (i.e., method of sections and/or method of joints)	
5. Approximate beam or truss analysis methods	
6. Approximate frame analysis methods	
7. Influence lines	
8. Computer-generated structural analysis techniques (e.g., modeling, interpreting and verifying results)	
II. Design and Details of Structures	30–48
A. General Structural Considerations	3–5
1. Material properties and standards	
2. Construction administration (procedures for correcting nonconforming work, testing methods, inspection methods, structural observation)	
3. Environmental considerations (e.g., corrosion, frost depth, sustainability)	
4. Serviceability requirements (i.e., deflection, camber, vibration, creep, movement joints)	
5. Fatigue (e.g., AASHTO, AISC)	
6. Bridge bearings	
7. Bridge expansion joints	
8. Bridge barriers	
B. Structural Systems Integration	2–4
1. Specifications, quality controls, and coordination with other disciplines	
2. Constructability	
3. Construction sequencing	
4. Strengthening existing systems	
C. Structural Steel	6–9
1. Tension members	
2. Columns and compression members	
3. Trusses	
4. Flexural members (e.g., beams)	
5. Plate girders—straight	
6. Secondary support systems (e.g., masonry support angles, facade support angles, struts)	
7. Shear in steel members	
8. Combined axial and flexural members	
9. Composite design	
10. Bolted connections	
11. Welded connections	
12. Base plates/bearing plates	
13. Thermal effects	
14. Bridge piers	

D. Cold-Formed Steel	1-3
1. Framing	
2. Connections	
3. Web crippling	
E. Concrete	6-9
1. Flexural members (e.g., beams, joists, bridge decks, one-way slabs)	
2. Two-way slabs	
3. Design for shear (e.g., beam, punching shear, shear friction)	
4. Columns and compression members	
5. Bridge piers/abutments	
6. Walls	
7. Prestressed concrete	
8. Post-tensioned concrete	
9. Composite design	
10. Attachment of elements and anchorage to concrete (e.g., inserts, attachment plates, dowels)	
11. Crack control	
F. Wood	4-6
1. Beams (i.e., sawn, glued laminated, structural composite/engineered)	
2. Columns	
3. Bearing walls	
4. Trusses	
5. Connections (e.g., bolted, nailed, screwed)	
G. Masonry	4-6
1. Flexural members	
2. Compression members	
3. Flexural-compression members	
4. Bearing walls	
5. Attachment of elements to masonry	
H. Foundations and Retaining Structures	4-6
1. Use of design pressure coefficients (e.g., active, passive, at rest, bearing, coefficient of friction, cohesion, modulus of sub-grade reaction)	
2. Buoyancy effects	
3. Retaining walls and abutments	
4. Spread footings	
5. Combined footings/mat foundations	
6. Piles (e.g., concrete, steel, timber)	
7. Drilled shafts/drilled piers/caissons	
8. Restrained walls (e.g., basement, vault)	



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STRUCTURAL ENGINEERING Design Standards

These standards apply to the Vertical and Lateral components of the Structural Engineering exam.

Effective Beginning with the April 2024 Examinations

In addition to the NCEES *PE Structural Engineering Reference Handbook*, the following codes and standards will be supplied in the exam as searchable, electronic pdf files with links for easy navigation. Standards will be provided as individual chapters on the exam, and only one chapter at a time can be opened and searched. This ensures the exam software runs large files effectively.

Solutions to exam questions that reference a standard of practice are scored based on this list and the revision year shown. Solutions based on other standards will not receive credit. All questions use the U.S. Customary System (USCS) of units.

NCEES does not sell design standards or printed copies of the NCEES handbook. The NCEES handbook is accessible from your [MyNCEES](#) account.

ABBREVIATION	DESIGN STANDARD TITLE
AASHTO	<i>AASHTO LRFD Bridge Design Specifications</i> , 8th edition, American Association of State Highway & Transportation Officials, Washington, DC.
IBC	<i>International Building Code</i> , 2018 edition, International Code Council, Falls Church, VA.
ASCE 7	<i>Minimum Design Loads and Associated Criteria for Buildings and Other Structures</i> , 2016 edition, American Society of Civil Engineers, Reston, VA.
ACI 318	<i>Building Code Requirements for Structural Concrete</i> , 2014 edition, American Concrete Institute, Farmington Hills, MI.
AISC	<i>Steel Construction Manual</i> , 15th edition, American Institute of Steel Construction, Chicago, IL.
AISC	<i>Seismic Design Manual</i> , 3rd edition, American Institute of Steel Construction, Chicago, IL.
AISI S100	<i>North American Specification for the Design of Cold-Formed Steel Structural Members</i> , 2016 edition, with AISI S240-15 and AISI S400-15/S1-16, American Iron and Steel Institute, Washington, DC.
NDS	<i>National Design Specification for Wood Construction with NDS Supplement: Design Values for Wood Construction</i> , 2018 edition, American Wood Council, Leesburg, VA.
NDS	<i>Special Design Provisions for Wind and Seismic</i> , 2015 edition, American Wood Council, Leesburg, VA.
TMS 402/602	<i>Building Code Requirements and Specification for Masonry Structures</i> , 2016 edition, The Masonry Society, Longmont, CO.