

National Council of Examiners for Engineering and Surveying
Principles and Practice of Engineering
Vertical Forces (Gravity/Other) and Incidental Lateral Component of the
Structural BREADTH Examination

Effective Beginning with the April 2011 Examination

The 4-hour **Vertical Forces (Gravity/Other) and Incidental Lateral** breadth examination is offered on Friday morning and focuses on gravity loads.

	Approximate Percentage of Examination
I. Analysis of Structures	30%
A. Loads	10%
1. Dead	
2. Live	
3. Snow, including drifting	
4. Moving (e.g., vehicular, pedestrian, crane)	
5. Thermal	
6. Shrinkage and creep	
7. Impact (e.g., vehicular, crane, and elevator)	
8. Settlement	
9. Ponding	
10. Fluid	
11. Ice	
12. Static earth pressure	
13. Hydrostatic	
14. Hydraulics (e.g., stream flow, wave action, scour, flood)	
B. Methods	20%
1. Statics (e.g., determinate, location of forces and moments, free-body diagrams)	
2. Shear and moment diagrams	
3. Code coefficients and tables	
4. Computer-generated structural analysis techniques (e.g., modeling, interpreting, and verifying results)	
5. Simplified analysis methods (e.g., influence lines, portal frame method/cantilever method)	
6. Indeterminate analysis methods (e.g., deflection compatibility)	
II. Design and Details of Structures	65%
A. General Structural Considerations	7.5%
1. Material properties and standards	
2. Load combinations	
3. Serviceability requirements	
(a) Deflection	
(b) Camber	
(c) Vibration	

	Approximate Percentage of Examination
4. Fatigue (for AASHTO concrete and steel)	
5. Bearings	
6. Expansion joints	
7. Corrosion	
B. Structural Systems Integration	2.5%
1. Specifications, quality controls and coordination with other disciplines	
2. Constructability	
3. Construction sequencing	
4. Strengthening existing systems: reinforcing methods	
C. Structural Steel	12.5%
1. Tension members	
2. Columns and compression members	
3. Base plates	
4. Beams	
5. Plate girders—straight	
6. Plate girders—curved	
7. Trusses	
8. Beam-columns	
9. Connections—welded	
10. Connections—bolted	
11. Moment connections	
12. Weld design	
13. Composite steel design	
14. Relief angle (e.g., masonry support angle, facade support angle)	
15. Bridge piers	
16. Bridge cross-frame diaphragms	
D. Light Gage/Cold-Formed Steel	2.5%
1. Framing	
2. Connections	
3. Web crippling	
E. Concrete	12.5%
1. Flexural members (e.g., beams, joists, bridge decks, and slabs)	
2. Design for shear	
3. Columns and compression members	
4. Two-way slab systems	
5. Pre-tensioned concrete	
6. Post-tensioned concrete	
7. Attachment of elements and anchorage to concrete (e.g., inserts, attachment plates, dowels)	
8. Bridge piers	
9. Crack control	
10. Composite design	
11. Slab-on-grade	

	Approximate Percentage of Examination
F. Wood	10%
1. Sawn beams	
2. Glue-laminated beams	
3. Engineered lumber	
4. Columns	
5. Bearing walls	
6. Trusses	
7. Bolted, nailed, and screwed connections	
G. Masonry	7.5%
1. Flexural members	
2. Compression members	
3. Bearing walls	
4. Detailing (e.g., crack control, deflection, masonry openings)	
H. Foundations and Retaining Structures	10%
1. Use of design pressure coefficients (e.g., active, passive, at rest, bearing, coefficient of friction, cohesion)	
2. Selection of foundation systems (e.g., based on geotechnical information, boring logs, settlement, and groundwater table)	
3. Overturning, sliding and bearing	
4. Combined footings/mat foundations	
5. Piles (concrete, steel, timber)	
6. Drilled shafts/drilled piers/caissons	
7. Gravity walls	
8. Anchored walls	
9. Cantilever walls	
10. Basement walls for buildings	
11. Effect of adjacent loads	
12. Use of modulus of sub-grade reaction	
III. Construction Administration	5%
A. Procedures for Mitigating Nonconforming Work	
B. Inspection Methods	

Notes

1. The examination is developed with questions that will require a variety of approaches and methodologies including design, analysis, and application.
2. The knowledge areas specified under 1, 2, 3, etc., are examples of kinds of knowledge, but they are not exclusive or exhaustive categories.
3. The breadth (AM) exam contains 40 multiple-choice questions. Examinee works all questions.
4. Score results are combined with depth exam results for final score of this component.