

**NCEES Principles and Practice of Engineering Examination  
 CIVIL BREADTH and STRUCTURAL DEPTH Exam Specifications**

**Effective Beginning with the April 2015 Examinations**

- The civil exam is a breadth and depth examination. This means that examinees work the breadth (AM) exam and one of the five depth (PM) exams.
- The five areas covered in the civil examination are construction, geotechnical, structural, transportation, and water resources and environmental. The breadth exam contains questions from all five areas of civil engineering. The depth exams focus more closely on a single area of practice in civil engineering.
- Examinees work all questions in the morning session and all questions in the afternoon module they have chosen.
- The exam is an 8-hour open-book exam. It contains 40 multiple-choice questions in the 4-hour AM session, and 40 multiple-choice questions in the 4-hour PM session.
- The exam uses both the International System of Units (SI) and the US Customary System (USCS).
- The exam is developed with questions that will require a variety of approaches and methodologies, including design, analysis, and application. Some problems may require knowledge of engineering economics.
- The knowledge areas specified as examples of kinds of knowledge are not exclusive or exhaustive categories.
- The specifications for the **AM exam** and the **Structural PM exam** are included here. The **design standards** applicable to the Structural PM exam are shown on the last page.

**CIVIL BREADTH Exam Specifications**

	<b>Approximate Number of Questions</b>
<b>I. Project Planning</b>	<b>4</b>
A. Quantity take-off methods	
B. Cost estimating	
C. Project schedules	
D. Activity identification and sequencing	
<b>II. Means and Methods</b>	<b>3</b>
A. Construction loads	
B. Construction methods	
C. Temporary structures and facilities	
<b>III. Soil Mechanics</b>	<b>6</b>
A. Lateral earth pressure	
B. Soil consolidation	
C. Effective and total stresses	
D. Bearing capacity	
E. Foundation settlement	
F. Slope stability	

<b>IV. Structural Mechanics</b>	<b>6</b>
A. Dead and live loads	
B. Trusses	
C. Bending (e.g., moments and stresses)	
D. Shear (e.g., forces and stresses)	
E. Axial (e.g., forces and stresses)	
F. Combined stresses	
G. Deflection	
H. Beams	
I. Columns	
J. Slabs	
K. Footings	
L. Retaining walls	
<b>V. Hydraulics and Hydrology</b>	<b>7</b>
A. Open-channel flow	
B. Stormwater collection and drainage (e.g., culvert, stormwater inlets, gutter flow, street flow, storm sewer pipes)	
C. Storm characteristics (e.g., storm frequency, rainfall measurement and distribution)	
D. Runoff analysis (e.g., Rational and SCS/NRCS methods, hydrographic application, runoff time of concentration)	
E. Detention/retention ponds	
F. Pressure conduit (e.g., single pipe, force mains, Hazen-Williams, Darcy-Weisbach, major and minor losses)	
G. Energy and/or continuity equation (e.g., Bernoulli)	
<b>VI. Geometrics</b>	<b>3</b>
A. Basic circular curve elements (e.g., middle ordinate, length, chord, radius)	
B. Basic vertical curve elements	
C. Traffic volume (e.g., vehicle mix, flow, and speed)	
<b>VII. Materials</b>	<b>6</b>
A. Soil classification and boring log interpretation	
B. Soil properties (e.g., strength, permeability, compressibility, phase relationships)	
C. Concrete (e.g., nonreinforced, reinforced)	
D. Structural steel	
E. Material test methods and specification conformance	
F. Compaction	
<b>VIII. Site Development</b>	<b>5</b>
A. Excavation and embankment (e.g., cut and fill)	
B. Construction site layout and control	
C. Temporary and permanent soil erosion and sediment control (e.g., construction erosion control and permits, sediment transport, channel/outlet protection)	
D. Impact of construction on adjacent facilities	
E. Safety (e.g., construction, roadside, work zone)	

## CIVIL–STRUCTURAL DEPTH Exam Specifications

	Approximate Number of Questions
<b>I. Analysis of Structures</b>	<b>14</b>
A. Loads and load applications	4
1. Dead loads	
2. Live loads	
3. Construction loads	
4. Wind loads	
5. Seismic loads	
6. Moving loads (e.g., vehicular, cranes)	
7. Snow, rain, ice	
8. Impact loads	
9. Earth pressure and surcharge loads	
10. Load paths (e.g., lateral and vertical)	
11. Load combinations	
12. Tributary areas	
B. Forces and load effects	10
1. Diagrams (e.g., shear and moment)	
2. Axial (e.g., tension and compression)	
3. Shear	
4. Flexure	
5. Deflection	
6. Special topics (e.g., torsion, buckling, fatigue, progressive collapse, thermal deformation, bearing)	
<b>II. Design and Details of Structures</b>	<b>20</b>
A. Materials and material properties	5
1. Concrete (e.g., plain, reinforced, cast-in-place, precast, pre-tensioned, post-tensioned)	
2. Steel (e.g., structural, reinforcing, cold-formed)	
3. Timber	
4. Masonry (e.g., brick veneer, CMU)	
B. Component design and detailing	15
1. Horizontal members (e.g., beams, slabs, diaphragms)	
2. Vertical members (e.g., columns, bearing walls, shear walls)	
3. Systems (e.g., trusses, braces, frames, composite construction)	
4. Connections (e.g., bearing, bolted, welded, embedded, anchored)	
5. Foundations (e.g., retaining walls, footings, combined footings, slabs, mats, piers, piles, caissons, drilled shafts)	

<b>III. Codes and Construction</b>	<b>6</b>
A. Codes, standards, and guidance documents	4
1. International Building Code (IBC)	
2. American Concrete Institute (ACI 318, 530)	
3. Precast/Prestressed Concrete Institute (PCI Design Handbook)	
4. Steel Construction Manual (AISC)	
5. National Design Specification for Wood Construction (NDS)	
6. LRFD Bridge Design Specifications (AASHTO)	
7. Minimum Design Loads for Buildings and Other Structures (ASCE 7)	
8. American Welding Society (AWS D1.1, D1.2, and D1.4)	
9. OSHA 1910 General Industry and OSHA 1926 Construction Safety Standards	
B. Temporary structures and other topics	2
1. Special inspections	
2. Submittals	
3. Formwork	
4. Falsework and scaffolding	
5. Shoring and reshoring	
6. Concrete maturity and early strength evaluation	
7. Bracing	
8. Anchorage	
9. OSHA regulations	
10. Safety management	

# CIVIL—STRUCTURAL Design Standards<sup>1</sup>

*These standards apply to the Structural afternoon module of the PE Civil exam.*

## Effective Beginning with the April 2017 Examinations

*Revisions are shown in red.*

<b>ABBREVIATION</b>	<b>DESIGN STANDARD TITLE</b>
<b>AASHTO</b>	<i>AASHTO LRFD Bridge Design Specifications, 7<sup>th</sup> edition, American Association of State Highway &amp; Transportation Officials, Washington, DC.</i>
<b>IBC</b>	<i>International Building Code, 2012 edition (without supplements), International Code Council, Falls Church, VA.</i>
<b>ASCE 7</b>	<i>Minimum Design Loads for Buildings and Other Structures, 2010, 3rd printing, American Society of Civil Engineers, Reston, VA.</i>
<b>ACI 318<sup>2</sup></b>	<i>Building Code Requirements for Structural Concrete, 2011, American Concrete Institute, Farmington Hills, MI.</i>
<b>AISC</b>	<i>Steel Construction Manual, 14th edition, American Institute of Steel Construction, Inc., Chicago, IL.</i>
<b>NDS<sup>3</sup></b>	<i>National Design Specification for Wood Construction ASD/LRFD, 2012 edition, and National Design Specification Supplement, Design Values for Wood Construction, 2012 edition, American Forest &amp; Paper Association, Washington, DC.</i>
<b>OSHA CFR 29 Part 1910</b>	Occupational Safety and Health Standards Subpart A, General, 1910.1–1910.9, with Appendix A to 1910.7 Subpart D, Walking-Working Surfaces, 1910.21–1910.30 Subpart F, Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms, 1910.66–1910.68, with Appendix A–Appendix D to 1910.66
<b>Part 1926</b>	Safety and Health Standards for Construction Subpart E, Personal Protective and Life Saving Equipment, 1926.95–1926.107. Subpart M, Fall Protection, 1926.500–1926.503, Appendix A–Appendix E. Subpart Q, Concrete and Masonry Construction, 1926.700–1926.706, with Appendix A. Subpart R, Steel Erection, 1926.750–1926.761, with Appendix A–Appendix H.
<b>PCI</b>	<i>PCI Design Handbook: Precast and Prestressed Concrete, 7th edition, 2010, Precast/Prestressed Concrete Institute, Chicago, IL.</i>
<b>TMS 402/602<sup>4</sup> (ACI 530/530.1)</b>	<i>Building Code Requirements and Specifications for Masonry Structures (and related commentaries), 2011; The Masonry Society, Boulder, CO; American Concrete Institute, Detroit, MI; and Structural Engineering Institute of the American Society of Civil Engineers, Reston, VA.</i>

**Notes**

1. Solutions to exam questions that reference a standard of practice are scored based on this list. Solutions based on other editions or standards will not receive credit. All questions are in USCS units.
2. Appendix C does not apply to the Civil Structural examination.
3. Examinees will use only the (Allowable Stress Design) ASD method for wood design.
4. Examinees will use only the ASD method, except strength design Section 3.3.5 may be used for walls with out-of-plane loads.