

**NCEES Principles and Practice of Engineering Examination
 CIVIL–TRANSPORTATION CBT Exam Specifications**

Effective Beginning January 1, 2022

- **The exam topics have not changed since April 2015 when they were originally published.**
- The exam is computer-based. It is closed book with electronic references. The NCEES *PE Civil Reference Handbook* is included in the exam along with the design standards shown on the last two pages.
- Examinees have 9 hours to complete the exam, which contains 80 questions. The 9-hour time includes a tutorial and an optional scheduled break. Examinees work all questions.
- The exam uses both the International System of units (SI) and the U.S. Customary System (USCS).
- The exam is developed with questions that will require a variety of approaches and methodologies, including design, analysis, and application.
- The examples specified in knowledge areas are not exclusive or exhaustive.

	Number of Questions
1. Project Planning	4–6
A. Quantity take-off methods	
B. Cost estimating	
C. Project schedules	
D. Activity identification and sequencing	
2. Means and Methods	3–5
A. Construction loads	
B. Construction methods	
C. Temporary structures and facilities	
3. Soil Mechanics	5–8
A. Lateral earth pressure	
B. Soil consolidation	
C. Effective and total stresses	
D. Bearing capacity	
E. Foundation settlement	
F. Slope stability	
4. Structural Mechanics	5–8
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	
5. Hydraulics and Hydrology	6–9
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)	
6. Geometrics	3–5
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)	
7. Materials	5–8
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	
8. Site Development	4–6
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)	
9. Traffic Engineering (Capacity Analysis and Transportation Planning)	10–15
A. Uninterrupted flow (e.g., level of service, capacity)	
B. Street segment interrupted flow (e.g., level of service, running time, travel speed)	
C. Intersection capacity (e.g., at grade, signalized, roundabout, interchange)	
D. Traffic analysis (e.g., volume studies, peak hour factor, speed studies, modal split)	
E. Trip generation and traffic impact studies	
F. Accident analysis (e.g., conflict analysis, accident rates, collision diagrams)	
G. Nonmotorized facilities (e.g., pedestrian, bicycle)	
H. Traffic forecast	
I. Highway safety analysis (e.g., crash modification factors, <i>Highway Safety Manual</i>)	

10. Horizontal Design	3–5
A. Basic curve elements (e.g., middle ordinate, length, chord, radius)	
B. Sight distance considerations	
C. Superelevation (e.g., rate, transitions, method, components)	
D. Special horizontal curves (e.g., compound/reverse curves, curve widening, coordination with vertical geometry)	
11. Vertical Design	3–5
A. Vertical curve geometry	
B. Stopping and passing sight distance (e.g., crest curve, sag curve)	
C. Vertical clearance	
12. Intersection Geometry	3–5
A. Intersection sight distance	
B. Interchanges (e.g., freeway merge, entrance and exit design, horizontal design, vertical design)	
C. At-grade intersection layout, including roundabouts	
13. Roadside and Cross-Section Design	3–5
A. Forgiving roadside concepts (e.g., clear zone, recoverable slopes, roadside obstacles)	
B. Barrier design (e.g., barrier types, end treatments, crash cushions)	
C. Cross-section elements (e.g., lane widths, shoulders, bike lane, sidewalks)	
D. Americans with Disabilities Act (ADA) design considerations	
14. Signal Design	3–5
A. Signal timing (e.g., clearance intervals, phasing, pedestrian crossing timing, railroad preemption)	
B. Signal warrants	
15. Traffic Control Design	3–5
A. Signs and pavement markings	
B. Temporary traffic control	
16. Geotechnical and Pavement	4–6
A. Sampling and testing (e.g., subgrade resilient modulus, CBR, R-Values, field tests)	
B. Soil stabilization techniques, settlement and compaction, excavation, embankment, and mass balance	
C. Design traffic analysis and pavement design procedures (e.g., flexible and rigid pavement)	
D. Pavement evaluation and maintenance measures (e.g., skid, roughness, rehabilitation treatments)	
17. Drainage	2–4
A. Hydrology (e.g., Rational method, hydrographs, SCS/NRCS method), including runoff detention/retention/water quality mitigation measures	
B. Hydraulics, including culvert and stormwater collection system design (e.g., inlet capacities, pipe flow, hydraulic energy dissipation), and open-channel flow	
18. Alternatives Analysis	1–3
A. Economic analysis (e.g., present worth, lifecycle costs)	

**NCEES Principles and Practice of Engineering Examination
 TRANSPORTATION Design Standards**

Effective Beginning with the January 2022 Examination

In addition to the NCEES *PE Civil Reference Handbook*, the following codes and standards will be supplied in the exam as searchable, electronic pdf files with links for easy navigation. This NCEES [YouTube video](#) shows how standards will be presented on the exam. 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.

The handbook and design standards will be available the entire exam, though design standards are not needed for the breadth portion.

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.

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 GDHS-7	<i>A Policy on Geometric Design of Highways and Streets</i> , 7th edition, 2018 (including October 2019 errata), American Association of State Highway & Transportation Officials, Washington, D.C., www.transportation.org .
AASHTO GDPS-4-M	<i>Guide for Design of Pavement Structures</i> , 4th edition, 1993 with 1998 supplement, American Association of State Highway & Transportation Officials, Washington, D.C., www.transportation.org .
AASHTO GPF-1	<i>Guide for the Planning, Design, and Operation of Pedestrian Facilities</i> , 1st edition, 2004, American Association of State Highway & Transportation Officials, Washington, D.C., www.transportation.org .
AASHTO HSM-1	<i>Highway Safety Manual</i> , 1st edition, 2010, with 2014 Supplement (including September 2010, February 2012, and March 2016 errata), American Association of State Highway & Transportation Officials, Washington, D.C., www.transportation.org .
AASHTO MEPDG-2	<i>Mechanistic-Empirical Pavement Design Guide: A Manual of Practice</i> , 2nd edition, August 2015, American Association of State Highway & Transportation Officials, Washington, D.C., www.transportation.org .
AASHTO RSDG-4	<i>Roadside Design Guide</i> , 4th edition, 2011 (including February 2012 and July 2015 errata), American Association of State Highway & Transportation Officials, Washington, D.C., www.transportation.org .
FHWA HIF-12-026	<i>Hydraulic Design of Highway Culverts</i> , Hydraulic Design Series Number 5, 3rd edition, April 2012, U.S. Department of Transportation, Federal Highway Administration, Washington, D.C., www.fhwa.dot.gov .



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HCM *Highway Capacity Manual* (Volumes 1–4), 6th edition, 2016, Transportation Research Board, National Research Council, Washington, D.C., www.mytrb.org.

MUTCD *Manual on Uniform Traffic Control Devices for Streets and Highways*, 2009, including Revisions 1 and 2 dated May 2012, U.S. Department of Transportation, Federal Highway Administration, Washington, D.C., www.mutcd.fhwa.dot.gov.