

**NCEES Principles and Practice of Engineering Examination
 CIVIL–WATER RESOURCES AND ENVIRONMENTAL 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 page.
- 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 US 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. Analysis and Design	4–6
A. Mass balance	
B. Hydraulic loading	
C. Solids loading (e.g., sediment loading, sludge)	
D. Hydraulic flow measurement	
10. Hydraulics–Closed Conduit	4–6
A. Energy and/or continuity equation (e.g., Bernoulli, momentum equation)	
B. Pressure conduit (e.g., single pipe, force mains, Hazen-Williams, Darcy-Weisbach, major and minor losses)	
C. Pump application and analysis, including wet wells, lift stations, and cavitation	
D. Pipe network analysis (e.g., series, parallel, and loop networks)	

11. Hydraulics—Open Channel	4–6
A. Open-channel flow	
B. Hydraulic energy dissipation	
C. Stormwater collection and drainage (e.g., culvert, stormwater inlets, gutter flow, street flow, storm sewer pipes)	
D. Sub- and supercritical flow	
12. Hydrology	6–9
A. Storm characteristics (e.g., storm frequency, rainfall measurement, and distribution)	
B. Runoff analysis (e.g., Rational and SCS/NRCS methods)	
C. Hydrograph development and applications, including synthetic hydrographs	
D. Rainfall intensity, duration, and frequency	
E. Time of concentration	
F. Rainfall and stream gauging stations	
G. Depletions (e.g., evaporation, detention, percolation, and diversions)	
H. Stormwater management (e.g., detention ponds, retention ponds, infiltration systems, and swales)	
13. Groundwater and Wells	3–5
A. Aquifers	
B. Groundwater flow	
C. Well analysis—steady state	
14. Wastewater Collection and Treatment	5–8
A. Wastewater collection systems (e.g., lift stations, sewer networks, infiltration, inflow, smoke testing, maintenance, and odor control)	
B. Wastewater treatment processes	
C. Wastewater flow rates	
D. Preliminary treatment	
E. Primary treatment	
F. Secondary treatment (e.g., physical, chemical, and biological processes)	
G. Nitrification/denitrification	
H. Phosphorus removal	
I. Solids treatment, handling, and disposal	
J. Digestion	
K. Disinfection	
L. Advanced treatment (e.g., physical, chemical, and biological processes)	
15. Water Quality	3–5
A. Stream degradation	
B. Oxygen dynamics	
C. Total maximum daily load (TMDL) (e.g., nutrient contamination, DO, load allocation)	
D. Biological contaminants	
E. Chemical contaminants, including bioaccumulation	

16. Drinking Water Distribution and Treatment

5–8

- A. Drinking water distribution systems
- B. Drinking water treatment processes
- C. Demands
- D. Storage
- E. Sedimentation
- F. Taste and odor control
- G. Rapid mixing (e.g., coagulation)
- H. Flocculation
- I. Filtration
- J. Disinfection, including disinfection byproducts
- K. Hardness and softening

17. Engineering Economics Analysis

1–3

- A. Economic analysis (e.g., present worth, lifecycle costs, comparison of alternatives)

**NCEES Principles and Practice of Engineering Examination
WATER RESOURCES AND ENVIRONMENTAL 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

TSS 2014 *Recommended Standards for Wastewater Facilities, 2014, Great Lakes—Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers.*

WATER 2018 *Recommended Standards for Water Works, 2018, Great Lakes—Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers.*