Certified Engineering Geologist Examination Test Plan

Effective January 2020

General Definition of Engineering Geology:

"Engineering Geology" means the application of geologic data, principles and interpretation so that geologic factors and processes affecting planning, design, construction, maintenance, and vulnerability of civil engineering works are properly recognized and utilized. (Title 16, CCR 3003)

This area of practice is structured into four primary content areas:

I. Project Planning (15%)

II. Data Collection (25%)

III. Interpretation and Reporting (40%)

IV. Construction (20%)

BPELSG Certified Engineering Geologist-2019	
	Percentage of Questions on the Exam
I. Project Planning **Professional Activities:** **1. Review regional and site-specific geologic conditions that could impact a project based on available published and unpublished geologic and remote sensing (e.g. aerial imagery, LiDAR, InSAR) data** **2. Review provided project documents to identify potential impacts from geologic hazards** **3. Review on- and off-site conditions, history, and usage to identify the potential presence of on-site concerns (e.g., environmental, ecological, cultural, community history, geotechnical, health and safety)** **4. Prepare preliminary geologic models of existing and proposed conditions** **5. Define scope of engineering geologic investigations based on preliminary review of available data and coordination with other project professionals** **6. Perform site reconnaissance to assess topography, access, and hazards** **7. Identify California regulatory requirements for field exploration, monitoring, testing and reporting**	**15%**
Test questions on these professional activities may include one or more of the following:	
A. California regulations pertaining to exploration and sampling of contaminated soil and groundwater	
B. California guidelines for siting, design, construction, and monitoring landfills and disposal sites	
C. California guidelines, laws, and regulations for investigating sites for schools, hospitals, and essential services buildings	
D. Safety hazards and California regulations associated with explorations, excavations, trenches, rockfalls, earthwork, and underground construction	
E. California laws and regulations for permitting, construction, and field exploration	
F. California Building Code related to soils, foundations, structures, and grading with regards to engineering geology	
G. California requirements for seismic hazards investigations and reports	
H. Effects of historical land uses on current site conditions	
I. Sources of published and unpublished remote sensing (e.g. aerial imagery, LiDAR, InSAR) data, historical maps, and geologic and geotechnical information	
J. Interpretation of preliminary grading plans and specifications	
K. Construction methods and sequencing	
L. Chemical hazards from industrial, commercial, and mining operations	
M. Geometric relationship between boreholes, slopes and apparent dips of geologic structures	
N. Field measurement techniques to collect geologic and geotechnical data	

O. Advantages and disadvantages of sampling and testing methods to measure engineering properties of earth materials	
P. Recognition of field evidence of land modifications and past use	
Q. Engineering geologic investigations for surface water impoundments and control structures	
R. Capabilities and limitations of subsurface exploration equipment	
S. Methods to graphically represent engineering geologic conditions	
T. Site conditions regarding topography, access, and geologic hazards	
U. Planning for environmental geologic investigations	
II. Data Collection **<u>Professional Activities:</u>** **1. Collect remote sensing (e.g. aerial imagery, LiDAR, InSAR) data, maps, plans, and sections from published sources, references, field sources, and public networks** **2. Map geomorphology, lithology, geologic structures, geologic and hydrogeologic features** **3. Log subsurface explorations (e.g., trenches, borings)** **4. Log stratigraphy, geologic and engineering properties of earth materials** **5. Characterize hydrogeologic conditions** **6. Collect representative samples of various geologic media (e.g., soil, rock, groundwater, vapor) for physical and laboratory testing** **7. Measure geophysical properties of earth materials** **8. Select laboratory tests for measuring physical, engineering, and chemical properties of earth materials** **9. Identify site specific input parameters for seismic ground motion analyses**	**25%**
Test questions on these professional activities may include one or more of the following:	
A. Methods to characterize adverse soil and rock conditions (e.g., compressible, expansive, collapsible, heave, organic)	
B. Field techniques to collect engineering geologic and geotechnical data	
C. Remote sensing applications (e.g. aerial imagery, LiDAR, InSAR)	
D. Geologic and geomorphic conditions depicted on topographic and geologic maps	
E. Methods to measure, map, and describe geologic structures	
F. Techniques to log exploratory trenches and borings	
G. Methods to characterize engineering geologic properties of earth materials	
H. Standardized engineering soil and rock classification systems	
I. Soil pedogenesis for interpretation of subsurface conditions	
J. Methods to determine the occurrence, distribution, and quality of groundwater	
K. Rock core logging and sampling techniques	
L. Borehole instrumentation for geologic and hydrogeologic information	
M. Geophysical data, methods, and techniques	
N. Siting, logging, and sampling paleoseismic trenches	

O. Field and laboratory tests to evaluate hydrogeologic properties of earth materials	
P. Laboratory tests to evaluate physical and chemical properties of earth materials	
Q. Tests to assess performance and durability of rock and aggregate materials	
III. Interpretation and Reporting **<u>Professional Activities:</u>** **1. Prepare and interpret geologic models (e.g., cross-sections, structure contours, isopach) from available data** **2. Analyze the results of laboratory testing** **3. Assess effects of erosional processes** **4. Assess static and dynamic slope stability** **5. Assess potential ground movement related to construction and natural processes** **6. Analyze remote sensing data (e.g. aerial imagery, LiDAR, InSAR) to identify geologic conditions** **7. Analyze hydrogeologic data** **10. Identify potential volcanic hazards** **9. Identify potential flood and debris flow hazards** **8. Identify earth materials (e.g., asbestos, chert, radon, clay, pyrite) that may be detrimental to projects and/or human health** **11. Identify hazards associated with coastal processes** **14. Perform seismic ground motion analyses** **13. Assess fault surface rupture hazards** **12. Assess seismic hazards** **15. Identify earthwork concepts and considerations (e.g., rippability, volume change, dewatering, drainage)** **16. Recommend installation of geotechnical instrumentation and analysis of associated data**	**40%**
Test questions on these professional activities may include one or more of the following:	
A. Geometric relationship between slope orientation and apparent dip of geologic structures	
B. Interpretation of geologic conditions on cross-sections	
C. Geometry, distribution, and strength characteristics of rock mass discontinuities	
D. Geomorphology pertaining to geologic hazards	
E. Geophysical methods, capabilities, and interpretation	
F. Standardized engineering soil and rock classification systems	
G. Application of rock and soil mechanics	
H. Effects of corrosive earth materials on engineered structures	
I. Physical and chemical weathering processes of rock and soil	
J. Evaluation and methods of mitigation of erosional and depositional processes	
K. Evaluation and methods of mitigation of slope instability	

L. Applicability of various slope stability analytical methods	
M. Stereonet uses	
N. Evaluation and mitigation of rockfall hazards	
O. Landslide types and characteristics	
P. Seismically-induced landslide displacement analysis	
Q. Identification of potential static and dynamic settlement	
R. Identification of potential land subsidence or rebound	
S. Geographic Information Systems (GIS) for engineering geologic purposes	
T. Remote sensing (e.g. aerial imagery, LiDAR, InSAR) data interpretation	
U. California guidelines, laws, and regulations for engineering geology reports for school, hospital, and essential services building sites	
V. California guidelines for engineering geology reports for surface water impoundments and control structures	
W. Evaluation and methods of mitigation of expansive soils and rock	
X. Application and analysis of flood hazard maps	
Y. Engineering properties of earth materials used in construction	
Z. Identification and significance of earth materials that may be detrimental to human health	
AA. Potential for mineral alteration or chemical properties of earth materials to adversely affect engineered projects	
BB. Evaluation and methods of mitigation of bluff instability and erosion along rivers and coastlines	
CC. Deterministic and probabilistic seismic hazard analyses	
DD. Earthquake ground motion analyses	
EE. Identification and analysis of potentially liquefiable soils	
FF. Methods of relative age dating of geologic materials	
GG. Geomorphic and field evidence of fault rupture	
HH. Field evidence of seismic shaking	
II. Methods to assess regional seismicity	
JJ. Seismic hazards and related zones	
KK. Methods for determining relative age of geomorphic features	
LL. Grading and excavation techniques and equipment capabilities and limitations	
MM. The effects of soil and rock properties on excavation methods	
NN. Potential adverse effects of construction to off-site properties	
OO. Geologic factors that affect fill compaction and performance	
PP. Dewatering methods	
QQ. Hydrogeologic properties of earth materials	
RR. Construction and interpretation of geologic structure and groundwater contour maps	
SS. California guidelines for siting, designing, constructing, and monitoring landfills and disposal sites	
TT. Site suitability for on-site storm water and waste water disposal	
UU. Engineering geology aspects of foundation and retaining structure design and construction	

IV. Construction **Professional Activities:** **1. Review grading and development plans for conformance with geologic recommendations** **2. Observe and document conditions during construction for consistency with the geologic report** **3. Identify and report unanticipated field conditions and recommend mitigations** **4. Determine the need for monitoring instrumentation**	**20%**
Test questions on these professional activities may include one or more of the following:	
A. Methods to analyze temporary slope stability	
B. Recognition and methods of mitigation of landslides encountered during construction.	
C. Geologic site conditions that relate to California regulations safeguarding personnel engaged in excavations, trenches, and earthwork	
D. Cut and fill slope construction	
E. Earthwork construction practices and equipment	
F. Methods for ground improvement (e.g., use of geosynthetics, grouting, dynamic compaction, soil cement)	
G. Geologic aspects of foundation and retaining structure construction	
H. Methods to control groundwater (e.g., dewatering, wells, drains, hydraulic barrier)	
I. Recognition and mitigation of soil contamination	
J. California regulations pertaining to grading requirements	
K. Techniques to mitigate bluff instability and erosion along rivers and coastlines	
L. Influence of groundwater on slope stability	
M. Methods to analyze and mitigate rockfall hazards	
N. Methods of rock slope stabilization	
O. Methods to mitigate unstable slopes	
P. Mitigation methods for liquefaction and lateral spreading	
Q. Application of monitoring instrumentation and data evaluation	
R. Methods to mitigate unforeseen adverse soil and rock conditions	
S. California guidelines for constructing and monitoring landfills and disposal sites	
T. Geologic factors that affect various foundation types	
U. Methods and materials to mitigate erosion	
V. Methods to mitigate construction-related ground movement (e.g., differential settlement, subsidence, rebound)	
W. Methods and interpretation of field density tests	