

# California Geological Survey — Note 48

## Checklist for the Review of Engineering Geology and Seismology Reports for California Public Schools, Hospitals, and Essential Services Buildings

February 3, 2003

Note 48 is used by the California Geological Survey (CGS) to determine adequacy and completeness of consulting engineering geology, seismology, and geotechnical reports that are prepared under California Code of Regulations, Title 24, California Building Code. CCR Title 24 applies to California Public Schools, Hospitals, Skilled Nursing Facilities, and Essential Services Buildings. The Building Official for public schools is the Division of the State Architect (DSA). Hospitals and Skilled Nursing Facilities in California are under the jurisdiction of the Office of Statewide Health Planning & Development (OSHPD). The California Geological Survey serves under contract to these two state agencies for engineering geology and seismology review purposes. www.conservation.ca.gov/cgs

Project Name: \_\_\_\_\_ Location: \_\_\_\_\_  
 OSHPD or DSA File # \_\_\_\_\_ Review by: \_\_\_\_\_  
 Date Reviewed: \_\_\_\_\_ California Certified Engineering Geologist # \_\_\_\_\_

<b>Checklist Item or Parameter within Consulting Report</b>	Adequately Described; Satisfactory	Additional Data Needed; Not Satisfactory
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### Project Location

1. Site Location Map, Street Address, County Name, Plot Plan with Building Footprint		
2. Adequate Number of Boreholes or Trenches - one per 5,000 ft <sup>2</sup> , with minimum of 2 for any one building		
3. Site Coordinates (latitude & longitude) -correctly plotted on a 7½-minute USGS quadrangle base-map		

### Engineering Geology

4. Regional Geology and Regional Fault Maps — concise page-sized illustrations with site plotted		
5. Geologic Map of Site — detailed (large-scale) geologic map with proper symbols and geologic legend		
6. Subsurface Geology at Site — engineering geology description summarized from boreholes or trench logs		
7. Geologic Cross Sections - several detailed geologic sections showing pertinent foundations & site grading		
8. Active Faulting & Coseismic Deformation Across Site — Alquist-Priolo Earthquake Fault Zones for active faults; excavation of fault trenches; 50-foot setbacks from fault plane		
9. Geologic Hazard Zones — Seismic Hazard Zone Maps (liquefaction & landslides) Provide page-sized extract of official map showing liquefaction and landslide zones from California Geological Survey (as applicable) and any pertinent geologic map from the Safety Element of the local agency (city or county).		
10. Landslides - both on-site & on adjacent hillslope property (above or below); debris flows & rockfalls		
11. Geotechnical Testing of Representative Samples — broad suite of appropriate geotechnical tests		
12. Expansive Soils -- Clay Mineralogy of the Geologic Subgrade Classify by Table 18-1-B & remediate		
13. Geochemistry of Geologic Subgrade - Soluble Sulfates and Corrosive Soils Specify either Type II or Type V portland cement. Typical soluble sulfates include gypsum and jarosite.		
14. Flooding & Severe Erosion - discuss FEMA Flood Zones; show site plotted on official map (if applicable)		

### Seismology & Calculation of Earthquake Ground-Motion

15. Evaluation of Historic Seismicity — significant earthquakes that affected the site in the past 200 years		
16. Probabilistic Seismic Hazard Analysis ( PSHA ) Evaluation of Earthquake Ground-Motion		
17. Upper-Bound Earthquake Ground-Motion — 10% chance of exceedance in 100 years- cite & use		
18. Design-Basis Earthquake Ground-Motion — 10% chance of exceedance in 50 years - cite & use		
19. Characterize and Classify the Geologic Subgrade – from Table 16A-J of Code; shear-wave velocity		
20. Near-Source Coefficients and Distance to Nearest Active Fault — if applicable: $N_a$ , $N_v$ , $C_a$ , $C_v$		
21. Peak Ground Acceleration for UBE and DBE levels of ground-motion - summary PGA values		
22. Normalized Spectral Acceleration - Site-specific spectral acceleration is required for dynamic analysis for irregular and tall buildings. Use $\zeta \equiv 5$ percent viscous damping for both UBE and DBE ground-motion.		
23. Seismic Zone 3 or 4 — determine appropriate zone from Figure 16A-2 and Section 1629A.4.1		
24. Scaled Time-Histories of Earthquake Ground-Motion - as applicable for base-isolated structures		

Checklist Item or Parameter within Consulting Report	Adequately Described; Satisfactory	Additional Data Needed; Not Satisfactory
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### Liquefaction Analysis

25. Geologic Setting for Occurrence of Seismically-Induced Liquefaction: <ul style="list-style-type: none"> <li>◆ applicable to any ground-water surface &lt;50 ft. depth; for calculations use historic-highest ground-water</li> <li>◆ low-density alluvium, typically SPT <math>N &lt; 35</math>, composed of sands or silty sands with non-plastic fines</li> <li>◆ moderate earthquake ground-motion, typically <math>PGA_{UBE} &gt; 0.1g</math>.</li> </ul>		
26. Liquefaction Methodology — NSF/MCEER treatise on liquefaction by Youd, Idriss, and 19 others, Oct. 2001 issue of ASCE <i>Journal of Geotechnical &amp; Geoenvironmental Engineering</i> & CGS Special Publication 117		
27. Liquefaction Calculations — based on detailed geologic cross-section and Safety Factor $SF < 1.3$		
28. Seismically-Induced Vertical Settlement - total & differential - must be calculated; no estimates		
29. Seismic Settlement of Low-Density Alluvium or Colluvium <i>above</i> the Ground-Water Surface Applies to "dry" settlement <i>above</i> the potentially liquefiable layers - use UBE ground-motion for input PGA		
30. Lateral Spreading due to Liquefaction — when near a free-face (river bank, canal, cut-slope)		
31. Remedial Options for Liquefaction — several appropriate options to remediate liquefaction effects		
32. Acceptance Criteria for Liquefaction Remediation - needed for subsequent remediation contract		

### Unusual or Exceptional Geologic Hazards or Site Conditions

*These exceptional items are not applicable on a statewide basis but may be pertinent to a particular site. Use prudent and careful analysis for all CCR Title 24 sites to avoid complicated and expensive delays in construction of public school and hospital sites. This list of exceptional geologic hazards will help to avoid misunderstandings and back-checks when additional information is required by the reviewing agency.*

33. Phase I & II Environmental Site Assessment Work — ASTM Test E-1527 & Test E-1903 for toxics		
34. Hazardous Materials — methane gas, hydrogen sulfide gas, tar seeps, high-pressure gas pipelines, etc.		
35. Ground-Water Quality — safe drinking water supplies for rural or suburban campuses		
36. On-Site Septic Systems — for rural or suburban campuses, evaluate septic leach-field system		
37. Non-Tectonic Faulting and Hydrocollapse of Alluvial Fan Soils — due to anthropic use of water		
38. Regional Subsidence — due to sustained withdrawal of fluids (ground-water extraction & petroleum)		
39. Volcanic Eruption — only near active volcanic centers; refer to USGS Bulletin 1847 (Miller, 1979)		
40. Tsunami or Seiche — only for low-lying sites close to California coastline or large lakes and reservoirs		
41. Asbestos — in formations associated with serpentine and tremolite. Refer to CGS Special Publication 124.		
42. Radon-222 Gas — typically within organic-rich marine shales of the California Coast Ranges.		
43. Other Geologic Hazards — use professional judgment for complicated or unusual geologic hazards		

### Grading-Plan Review & Foundation-Plan Review

44. Areas of Cut & Fill, Preparation of Ground, Depth of Removals and Recompanction		
45. Geologic & Geotechnical Inspections and Problems Anticipated During Grading — called inspections for CEG or RGE (removal & recompaction; canyon clean-out; shear-key for buttress fill)		
46. Subdrainage Plans for Ground Water and Surface Water— show details of planned subdrains		
47. Cut — Fill Prisms — seismic compression & incoherent ground-motion across the cut — fill line of hillside pads.		
48. Deep Foundations, Structural Mat Foundations (only as applicable) — piles, belled caissons, etc.		
49. Retaining Walls, Engineered Fill Buttresses, Soil-Nailed Walls, Geosynthetics, Gabions, etc.		

### Report Documentation

50. Geology, Seismology, and Geotechnical References — current & adequate published citations		
51. Engineering Geology report signed by Certified Engineering Geologist with CEG seal or number		
52. Geotechnical Engineering report signed by Registered Geotechnical Engineer with RGE seal		

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