OSHPD

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Standard Geotechnical Report Review Comments
Based on the 2016 California Building Standards Code, (2016 CBSC)
Applicable to OSHPD 1 Projects received after January 1, 2017.

(G1) Geotechnical/Geohazard Standard Comments

The text of standard structural comments for Geotechnical and Geohazard report review can be found in the attached list. The standard structural comments for Geotechnical and Geohazard report review are called out on the review letter by "2016 (G1)" etc.

The comments are based on the California Building Standards Code, 2016 (2016 CBSC).

In order to facilitate the back check, please respond in writing to each comment. Your response shall preferably be in the form of a revised Geotechnical/Geohazard report(s) with changes tracked, but a letter, a supplement, or an addendum to the Geotechnical/Geohazard report(s) is also acceptable. Three (3) copies of your responses with the attached revised Geotechnical/Geohazard report(s) shall be submitted to the OSHPD region where the plans are being reviewed.

OSHPD approves the Geotechnical/Geohazard report(s), CGS is OSHPD's consultant for this review. All correspondence/inquiries shall be directed to OSHPD; contact with CGS is discouraged unless specifically requested by the OSHPD reviewer.

Changes made to Geotech/Geohazard reports during OSHPD's review shall be brought to the attention of the Office in writing by submission of revised reports/supplements identifying those changes. Failure to give such notice may void any subsequent approval given to the construction documents and/or Geotechnical/Geohazard reports.

Changes made to Geotech/Geohazard reports after approval of the project shall be considered to be Amended Construction Documents (ACDs) and shall be submitted to OSHPD for approval.

If you have any questions, please do not hesitate to call the reviewer listed below:

_____
(Name)

_____
(Phone)

Reference: 2016 CBC Sections 105, 107, and 2016 CAC Section 7-125(c).

(G2) Project Description

Provide project description as required by the 2016 CBC Section 1603A.2 (See Appendix B).

Reference: 2016 CBC Section 1603A.2.

(G3) Geohazard Report

Provide geohazard report as required by the 2016 CBC Section 1803A.6.

Reference: 2016 CBC Section 1803A.6.

(G4) Foundation Bearing Capacity

The factor of safety for soil bearing values, including deep foundation axial capacity as limited by the soil properties, shall not be less than the overstrength factor, Ω_O, of the structure supported.

a. The geotechnical engineer shall specify allowable/ultimate bearing capacity and the corresponding factor of safety.
b. If the Registered Design Professional (RDP) in responsible charge fails to provide complete information in accordance with the CBC 2016 Section 1603A.2, including the maximum overstrength factor for the structure, the Geotechnical Engineer of Record (GEOR) shall use a minimum factor of safety of 3.0, which is the maximum overstrength factor for systems listed in ASCE 7-10 Table 12.2-1.

Reference: 2016 CBC Section 1605A.1.1.

(G5) Lateral Soil Loads

Please verify that lateral soil loads satisfy the 80% limit in the 2016 CBC Section 1807A.2.2.

Reference: 2016 CBC Section 1807A.2.2.

(G6) Friction Coefficient and Passive Soil Resistance Values for Shallow Foundation

Clarify whether the friction coefficient and passive soil resistance values provided are allowable or ultimate and provide associated factor of safety.

Reference: 2016 CBC Section 1605A.1.1.

(G7) Deep Foundation Uplift Capacity

The factor of safety for uplift capacity of single deep foundation elements shall be in accordance with the CBC 2016 Section 1810.3.3.1.5.

Uplift capacity of grouped foundation elements shall be in accordance with the CBC 2016 Section 1810A.3.3.1.6.

Reference: 2016 CBC Sections 1810A.3.3.1.5 and 1810A.3.3.1.6.

(G8) Allowable Frictional Resistance for Deep Foundation Elements

Allowable frictional resistance for deep foundation elements shall not exceed 500 psf. unless a greater value is established by test.

Reference: 2016 CBC Section 1810A.3.3.1.4.

(G9) Micropiles

Micropiles shall not carry any horizontal loads (therefore, use of battered micropiles is prohibited). Axial capacity of micropiles shall be established by at least two project specific preproduction tests for each soil profile, size, and depth of micropile. At least two percent of all production micropiles shall be proof tested.

Reference: 2016 CBC Section 1810A.3.10.4.

(G10) Helical Piles

Helical Piles shall not carry any horizontal loads (therefore, use of battered Helical Piles is prohibited). Axial capacity of Helical Piles shall be established by at least two project specific preproduction tests for each soil profile, size, and depth of micropile. At least two percent of all production Helical Piles shall be proof tested.

Reference: 2016 CBC Section 1810A.3.1.5.1.

(G11) Deep Foundation Design for Lateral Loads

Provide lateral load analysis for piles and all relevant parameters for the design of the piles. These design parameters shall specify the condition of the pile head, fixed or free.

Reference: 2016 CBC Section 1810A.2.4.

(G12) Group Effects for Deep Foundation Design

The group effects shall be included in the analysis of deep foundation element groups where the center-to-center spacing of the element is less than 8 times the least horizontal dimension of the element for lateral behavior and where the center-to-center

spacing of the element is less than 3 times the least horizontal dimension of the element for axial behavior.

Reference: 2016 CBC Section 1810A.2.5.

(G13) Shallow and Deep Foundation Elements Supporting Same Structure

Combinations of shallow and deep foundation elements shall not be used to support a single building/structure, unless an analysis of foundation elements is performed to determine the effect of subgrade deformation on superstructure, including story drift.

Reference: 2016 CBC Section 1808A.2.

(G14) Earth Retaining Shoring

Provide recommendations for earth retaining shoring in the Geotechnical report. Geotechnical recommendations shall be in accordance with the CBC 2016 Sections 1810A and/or 1812A.

Reference: 2016 CBC Sections 1810, 1812 and 104.11.

(G15) Vibro Stone Columns (VSC)

Provide recommendations for Vibro Stone Columns (VSC) in the Geotechnical report as required by the CBC 2016 Section 1813A.2.

Reference: 2016 CBC Section 1813A.2.

(G16) Alternative Soil Improvement Methods

Soil improvement methods in the 2016 CBC are limited to use of compacted fills, Controlled Low-Strength Materials (CLSM), and Vibro Stone Columns (VSC). If soil improvement methods not explicitly permitted by the 2016 CBC are proposed, an Alternate Means of Compliance (AMC) shall be submitted prior to back-check submittal of the Geotechnical/Geohazard report(s) with verification that alternative proposed is equivalent to a system explicitly permitted by the 2016 CBC.

Reference: 2016 CAC Section 7-10 & 2016 CBC Sections 1803A.5.8, 1803A.5.9, 1804A.5, 1804A.6, 1809A.2, 1813A, & 104.11.

(G17) Lateral Pressure due to Earthquake Motions

Provide design lateral pressure on foundation walls and retaining walls due to earthquake motions.

Reference: 2016 CBC Section 1803A.5.12.

(G18) One Story Light Frame Construction less than 4000 sq.ft.

Geotechnical reports are not required for one-story, wood-frame and light-steel-frame buildings of Type II or Type V construction and 4,000 square feet or less in floor area, not located within Earthquake Fault Zones or Seismic Hazard Zones as shown in the most recently published maps from the California Geological Survey (CGS). Allowable foundation and lateral soil pressure values may be determined from Table 1806A.2.

Reference: 2016 CBC Section 1803A.2 and ASCE 7-10 Section 11.8.1.

(G19) Voluntary Seismic Improvements (VSI)

Voluntary Seismic Improvements (VSI) using Incidental Structural Alterations do not require geotechnical/geohazard report(s) unless additional geotechnical information is required by OSHPD for analysis, evaluation, or design of foundation elements.

Voluntary Seismic Improvements (VSI), when not using Incidental Structural Alterations, do not require Geohazard reports; however, Geotechnical reports in accordance with the CBC 2016 Section 1803A.7 (except Item # 12) including seismic parameters used in the design are required. Therefore, the exemption for VSI that involve minor or major alterations covers only:

1. Site Geology.
2. Evaluation of the known active and potentially active faults, both regional and local
3. Ground-motion parameters, as required by Sections 1613A and 1616A, and ASCE 7 (No site specific ground motion investigations are required for fixed base buildings, containing no base isolation or damping devices, in Seismic Design Category D).

Reference: 2016 CAC Sections 7-117, 7-1111, and 2016 CBC Sections 1803A.6 (exception), 3412A, & 3413A.

(G20) Design for Expansive Soil

Recommendations for design of foundation on expansive soil or removal/stabilization of expansive soil are required.

Reference: 2016 CBC Section 1808A.6.

(G21) Design Flood Elevation

Design flood elevation and lowest floor elevation are required to assess the effect of flood on design and construction.

Reference: 2016 CBC Sections 1603A.1.7, 1612A, 1804A.4, 3403A.2, 3404A.2, and 3405A.5.

(G22) Driven Deep Foundation Elements Installed by means other than a Pile Hammer.

Provided testing requirements for driven deep foundation elements installed by means other than a pile hammer in accordance with the CBC 2016 Section 1810A.3.3.1.2.

Reference: 2016 CBC Section 1810A.3.3.1.2

Appendix A

Site-specific Response Spectra in the 2016 CBC/ASCE 7-10 for Hospital Buildings

Required steps:

1) Develop site-specific MCE response spectrum based on provisions of the 2016 CBC Sections 1803A.6 and ASCE 7-10 Section 21.2. In accordance with ASCE 7-10 Section 21.2.3, this is typically the lesser of the spectral response accelerations from the risk-targeted probabilistic MCE_R of ASCE 7-10 Section 21.2.1 and the deterministic MCE_R of ASCE 7-10 Section 21.2.2.

2) The design response spectrum is taken as 2/3 of the site-specific MCE response spectrum in accordance with ASCE 7-10 Section 21.3. However, the site-specific design spectral response acceleration at any period shall not be taken less than 80 percent of S_a determined in accordance with ASCE 7-10 Section 11.4.5.

   ASCE 7-10 Section 11.4.5 describes construction of a general design response spectrum. The general design response spectrum is constructed using mapped values of S_S and S_1 modified to S_{DS} and S_{D1} in accordance with Sections 11.4.3 and 11.4.4 of ASCE 7-10.

   If the site-specific design spectral response acceleration is less than 80 percent of the general design response spectrum at any period, then scale the site-specific design spectrum to meet this requirement. It is acceptable to scale only that portion of the site-specific design response spectrum that is less than 80 percent of the general response spectrum.

3) Back-calculate the design acceleration parameters using ASCE 7-10 Section 21.4 such that:

   S^*_{DS} = Max of S_a at 0.2 sec and 90% of peak S_a at any period > 0.2 sec
   S^*_{D1} = Max of S_a at 1.0 sec and 2 x S_a at 2.0 sec

   Where S^*_{DS} and S^*_{D1} are the site-specific values of the seismic parameters. The following condition must also be met:

   $S^*_{MS} = 1.5\ S^*_{DS}$ $\qquad$ $S^*_{M1} = 1.5\ S^*_{D1}$

   $S^*_{DS} \geq 80\%\ S_{DS}$; $S^*_{D1} \geq 80\%\ S_{D1}$; $S^*_{MS} \geq 80\%\ S_{MS}$; $S^*_{M1} \geq 80\%\ S_{M1}$

   S^*_{MS} and S^*_{M1} are the site-specific values. It may be necessary to scale the **entire** site-specific design spectrum to meet this condition,

4) For use with the Equivalent Lateral Force Procedure, the site specific spectral acceleration, S_a at T shall be permitted to replace S_{D1}/T in ASCE 7-10 Equation 12.8-3 and $S_{D1}T_L/T^2$ in Equation 12.8-4. The parameter S^*_{DS} calculated in accordance with Item # 3 shall be permitted to be used in Equations 12.8-2, 12.8-5, 15.4-1, and 15.4-3 to

substitute for S_{DS}. The mapped value of S_1 shall be used in Equation 12.8-6, 15.4-2, and 15.4-4.

5) Where site specific response spectra are required by the CBC 2016 Section 1616A.1.3 or ASCE 7 Section 11.4.7, site specific seismic design parameters (S^*_{DS}, S^*_{D1}, S^*_{MS} and S^*_{M1}) determined in Item # 3 shall be used for scaling base shear in accordance with the CBC 2016 Sections 1616A.1.13 and 1616A.1.29.

6) Site specific seismic design parameters **may** be used in lieu of the mapped values (ASCE 7 Section 11.4.7/CBC 2016 Section 1616A.1.3) for any structure, except as required in item # 7 below.

7) Determination of seismic design category in accordance with the CBC 2016 Section 1613A.3.5 shall be on the basis of mapped spectral response parameters.

Appendix A

Ground Motion Time History in the 2016 CBC/ASCE 7-10 for Hospital Buildings

Required steps:

8) Where site is more than 5 km from an active fault, each pair of motions shall be scaled (in accordance with ASCE 7-10 Section 16.1.3.2) such that in the period range from 0.2T to 1.5T, the average of the SRSS spectra for each period from all horizontal component pairs does not fall below the corresponding ordinate of the design response spectrum used in design, determined in accordance with ASCE 7-10 Sections 11.4.5 or 11.4.7.

   Scaling can be based on period matching (acceleration scaling) or spectral matching. MCE ground motion time history shall be taken as 1.5 times the design earthquake ground motion time history.

9) At sites within 3.1 miles (5 km) of an active fault that controls the hazard, each pair of components shall be rotated to the fault-normal and fault-parallel direction of the causative fault, and shall be scaled so that average of the fault-normal components is not less than the Risk-Targeted Maximum Considered Earthquake (MCE_R) response spectrum for period range from 0.2T and 1.5T (in accordance with ASCE 7-10 Section 16.1.3.2).

   Scaling can be based on period matching (acceleration scaling) or spectral matching.

   Where period matching is used, same scalar multiplier shall be used in both fault normal and fault parallel direction.

   Where spectral matching is used, fault normal component shall be scaled as described above and fault parallel component can be scaled either to the same MCE_R or to a separate MCE_R developed for fault parallel components.

   Design earthquake ground motion time history shall be taken as 2/3rd of the MCE_R ground motion time history obtained above.

10) For seismically isolated structures (and for structures with damping systems), where response history procedures are used, ground motions shall consist of pairs of appropriate horizontal ground motion acceleration components developed in accordance with Items # 8 or # 9 above except that 0.2T and 1.5T shall be replaced by $0.5T_D$ ($0.5T_{1D}$) and $1.25T_M$ ($1.25T_{1M}$), respectively, where T_D and T_M are defined in ASCE 7-10 Section 17.5.3 (in accordance with ASCE 7-10 Section 17.3.2).

Appendix B

Project Information for Geotechnical and/or Geohazard Report/Site Data Report Review

Facility and Project

Project #: _____ Project Name: _____

Facility #: _____ Facility Name: _____

OSHPD Building #: BLD - _____ Building Name: _____

Facility Type: ☐ Acute Psychiatric Hospital ☐ General Acute Care Hospital
☐ Correctional Treatment Center ☐ Skilled Nursing or Intermediate Care Facility
☐ Licensed Clinic

CBC 2016 Section 1603A.2

1603A.2 Site Data Reports. *Geotechnical and Geohazard reports for review by the enforcement agency shall be accompanied by a description of the project prepared by the Registered Design Professional (RDP) in responsible charge, which shall include the following:*

1. *Type of service such as General Acute Care Facility, Skilled Nursing Facility, Intermediate Care Facility, Acute Psychiatric Facility, Central Utility Plants, etc.*
2. *Construction materials used for the project such as Steel, Concrete. Masonry, Wood, etc.*
3. *Type of construction such as new, addition, alteration, repair, etc.*
4. *For existing buildings, extent of construction such as incidental, minor, major, and/or voluntary seismic improvements as defined in Sections 202 and 3402A.*
5. *Seismic Force Resisting System used for each structure in the project.*
6. *Foundation system that will be used for each structure in the project such as spread footing, drilled piers, etc.*
7. *Analysis procedure used and basis of design such as ASCE 7 Equivalent Lateral Force Procedure, ASCE 41 Nonlinear Dynamic Procedure, etc.*
8. *Building characteristics such as number of stories above and below grade, foot print area at grade, grade slope on site, etc.*
9. *Special features such as requirement for shoring, underpinning, retaining walls, etc.*

Description: _____

Type of Service in the Building or Structure for the Project

- ☐ OSHPD 1(Acute Care Facility and/or multi-storied/non-light frame SNF or Intermediate Care Facility)
- ☐ OSHPD 2 (Single story light frame SNF or Intermediate Care Facility)
  - ☐ A capacity of 50 or more resident patients
- ☐ OSHPD 3 (Licensed Clinic)

Construction Materials Used for the Project

- ☐ Superstructure Gravity System _____
- ☐ Superstructure Lateral Force Resisting System _____
- ☐ Basement _____
- ☐ Foundation _____

Type of Construction

- ☐ New
- ☐ Addition
  - ☐ Structurally Independent
- ☐ Alteration
- ☐ Repair
  - ☐ New acute care building expansion (seismically separate)
  - ☐ New SNF or Intermediate Care building expansion (seismically separate)
  - ☐ Addition to an existing SNF or Intermediate Care Facility (structurally connected)
  - ☐ Addition to an existing SPC-1 or SPC-2 building (structurally connected)
  - ☐ Addition to an existing SPC-3 to SPC-5 building (structurally connected)
  - ☐ Alteration or repair to an existing SNF or Intermediate Care Facility
  - ☐ Alteration or repair to an existing SPC-1 or SPC-2 building
  - ☐ Alteration or repair to an existing SPC-3 to SPC-5 building
  - ☐ Seismic Upgrade from a nonconforming building to an SPC-4D building
  - ☐ Seismic Upgrade from SPC-2, SPC-3, or SPC-4 to an SPC-5 building
  - ☐ Non-building structure (on ground)
  - ☐ One story wood frame or light steel frame (stud wall), Type V, 4000 sf or less not located in an earthquake fault zone or seismic hazard zones published by CGS.

Extent of Construction for Existing Buildings ONLY

- ☐ Incidental
- ☐ Minor
- ☐ Major

Seismic Force Resisting System

☐ Conventional (code approved)

Description of Seismic Force Resisting System: _____

_____

☐ Conventional with Base Isolation System

☐ Conventional with Damping System (not part of the base isolation)

☐ Alternative System (requires Seismic Design Criteria)

Foundation System that will be Used for the Project

Note: Checkmark all systems that are applicable to the project only.

☐ Shallow spread footing

☐ Mat foundation

☐ Drilled piers or driven piles

☐ Micropiles for vertical loads only

☐ Helical piles for vertical loads only

☐ Auger-cast piles

☐ Prestressed rock and soil foundation anchors

☐ Alternative foundation systems (requires Structural Design Criteria)

- ☐ Tubex piles
- ☐ Torque down piles
- ☐ Others: _____

_____

☐ Ground improvement using code based compaction techniques

☐ Ground improvement using Vibro Stone Columns (VSC)

☐ Alternative ground improvement systems (requires Structural Design Criteria)

- ☐ Grouted stone columns
- ☐ Deep soil mixing
- ☐ Others: _____

_____

Structural Analysis Procedure for Seismic Force Resisting System

☐ New or existing hospital building using CBC 2016 Chapters 16A or 34A based on ASCE 7:

- ☐ Equivalent Static Analysis
- ☐ Modal Response Spectrum Analysis
- ☐ Linear Response History Analysis
- ☐ Nonlinear Response History Analysis (requires Structural Design Criteria)
- ☐ Alternative analysis procedure not in ASCE 7 (requires Structural Design Criteria)

☐ SPC-4D building using the CBC 1980:

- ☐ Equivalent Static Analysis
- ☐ Dynamic Analysis

☐ Existing hospital building using CBC 2016 Chapters 34A based on ASCE 41:

- ☐ Linear Static Procedure
- ☐ Linear Dynamic Procedure
- ☐ Nonlinear Static Procedure
- ☐ Nonlinear Dynamic Procedure (requires Structural Design Criteria)
- ☐ Alternative analysis procedure not in ASCE 41 (requires Structural Design Criteria)

Building Characteristics

☐ Number of stories above grade _____

☐ Number of stories below grade _____

☐ Basement or building provides lateral support for walls retaining earth
- ☐ Earth not at same level on all four sided, creating min 6 feet of unbalanced soil pressure

☐ Grade slope on site: _____

☐ Footprint area at grade: _____

Special Geotechnical and/or Geohazard Features

☐ Building site plans/elevations showing special features included

☐ Retaining walls greater than 6’ in height

☐ Shoring for earth retention supporting or impacting new or existing OSHPD buildings
- ☐ Permanent
- ☐ Temporary (less than 1-year)

☐ Slope stabilization _____

_____

Prepared By: _____ Date: _____

Organization: _____ Email: _____

Phone: _____ Ext.: _____