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Office of Statewide Health Planning and Development (OSHPD)
Facilities Development Division (FDD)

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Standard Geotechnical Report Review Comments
Based on the 2010 California Building Standards Code, (2010 CBSC)
Applicable to OSHPD 1 Projects received after July 1, 2011.

(G1) Geotechnical/Geohazard Standard Comments

The text of standard structural comments for Geotechnical/Geohazard report review can be found in the attached list. The standard structural comments for Geotechnical/Geohazard report (AKA Engineering Geologic Report) review are called out on the review letter by "2010(G1)" etc. or circled here.

The comments are based on the California Building Standards Code, 2010 (2010 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. Your responses with the attached addenda, 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 (change orders) 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: 2010 CBC Sections 105,107, and 2010 CAC Section 7-125(c).

(G2) 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 Structural Engineer of Record (SEOR) fails to provide the information listed in attached Appendix A, 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 7-05 Table 12.2-1.

Reference: 2010 CBC Sections 1605A.1.1.

(G3) 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: 2010 CBC Sections 1605A.1.1.

(G4) Deep Foundation Uplift Capacity

The factor of safety for uplift capacity of deep foundation elements shall not be less than three (3), unless the capacity is based on a site-specific uplift test of deep foundation elements.

Uplift capacity of grouped foundation elements shall be in accordance with the CBC 2010 Section 1810A.3.3.1.6.

Reference: 2010 CBC Sections 1810A.3.3.1.5 and 1810A.3.3.1.6.

(G5) Allowable Frictional Resistance for Deep Foundation Elements

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

Reference: 2010 CBC Section 1810A.3.3.1.4.

(G6) 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: 2010 CBC Section 1810A.3.10.4.

(G7) 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: 2010 CBC Section 1810A.3.1.5.1.

(G8) 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: 2010 CBC Section 1810A.2.4.

(G9) 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: 2010 CBC Section 1810A.2.5.

(G10) 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: 2010 CBC Section 1808A.2.

(G11) Earth Retaining Shoring

Provide recommendations for earth retaining shoring in the Geotechnical report. When subject to OSHPD review in accordance with the CBC 2010 Section J106.2.1,earth retaining shoring shall use soldier piles and lagging, unless an Alternate Means of Compliance (AMC) is approved. Geotechnical recommendations shall be in accordance with the CBC 2010 Section J106.2.

Reference: 2010 CBC Sections J106.2 and 104.11.

(G12) Soil Improvements

Soil improvement methods in the 2010 CBC are limited to use of compacted fills and Controlled Low-Strength Materials (CLSM). If soil improvement methods not explicitly permitted by the 2010 CBC are proposed, an Alternate Means of Compliance (AMC) similar to attached Appendix B shall be submitted prior to back-check submittal of the Geotechnical/Geohazard report(s).

Reference: 2010 CBC Sections 1803A.5.8, 1803A.5.9, 1804A, and 104.11.

(G13) Lateral Pressure due to Earthquake Motions

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

Reference: 2010 CBC Section 1803A.5.12.

(G14) 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: 2010 CBC Section 1803A.2 and ASCE 7-05 Section 11.8.1.

(G15) 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 (i.e. Engineering Geologic Reports); however, Geotechnical reports with seismic parameters used in the design are required. Therefore, the exemption for VSI that involve minor or major alterations covers only:
1. Geologic investigation.
2. Evaluation of the known active and potentially active faults, both regional and local
3. Ground-motion parameters, as required by Sections 1613A and 1615A, and ASCE 7 (No site specific investigations are required).

Reference: 2010 CAC Sections 7-117, 7-1111, and 2010 CBC Sections 1803A.6.1.1 (exception), 3412A, & 3413A .

(G16) Design for Expansive Soil

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

Reference: 2010 CBC 2010 Section 1808A.6.

(G17) Design Flood Elevation

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

Reference: 2010 CBC Sections 1603A.1.17, 1612A, 1804A.4, 3403A.2, 3404A.2, and 3405A.5.

(G18) Design of Proprietary or Specialty Deep Foundation Elements

Provide a detailed design methodology, supporting analytical research, full scale in-ground test result reports (for downward, uplift, lateral loads, group affects) and an illustrated construction method and sequence along with a completed Alternate Method of Compliance (AMC) form for OSHPD review. For these deep foundation elements testing requirements shall be at least equivalent to those required for micropiles in the CBC 2010 Section 1810A.3.10.4.

Reference: 2010 CBC Sections 1810A.1.4 and 104.11.

Standard Geotechnical Report Review Comments
The 2010 California Building Standards Code

CALIFORNIA BUILDING CODE, 2010
Appendix A
Draft Amendment to the CBC 2010 Chapter 16A
STRUCTURAL DESIGN
Section 1603A
Construction Documents

1603A.1.11 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 Structural Engineer of Record (SEOR), 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.*
5. *Lateral Force Resisting System used for the project.*
6. *Foundation system that will be used for the project such as spread footing, drilled piers, etc.*
7. *Analysis procedure used and basis of design such as ASCE 7, ASCE 41, 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.*

Appendix B

Vibro Stone Columns (VSCs) for Ground Improvement – Guidelines for Structural Design Criteria:

Please add the following to Section D of the Alternate Method of Compliance form:

Description of Proposal:

1. Design, Construction, Quality Control / Quality Assurance shall comply with the 2010 California Building Standards Code (CCR. Title 24) and OSHPD approved Geotechnical /Geohazard reports in addition to the requirements of this Design Criteria.
2. Vibro Stone Columns (VSCs) for ground improvement shall be in accordance with attached draft OSHPD amendments to the CBC 2010 Appendix J.

Applicable Code Section: The CBC 2010, Section 104.11.

Reason: The CBC 2010 does not address Vibro Stone Columns (VSCs) for ground improvement.

List of Enclosure: Draft of OSHPD amendments to the CBC 2010 Appendix J.

CALIFORNIA BUILDING CODE, 2010
Draft Amendments to APPENDIX J
Grading
Section J112
Vibro Stone Columns for Ground Improvement

J112.1 General. [OSHPD 1 & 4] *The requirements of this section address the use of Vibro Stone Columns (VSCs) for ground improvement using unbounded aggregate materials. Vibro stone column provisions in this section are intended to increase bearing capacity, reduce settlements, and mitigate liquefaction for shallow foundations. These requirements shall not be used for grouted or bonded stone columns, ground improvement for deep foundation elements, or changing site class. VSCs shall not be considered as a deep foundation element.*

Ground improvement shall be installed under the entire building/structure footprint and not under isolated foundation elements only.

Design, construction, testing, and inspection shall satisfy the requirements of this code except as modified in Sections J112.2 through J112.5.

J112.2 Geotechnical Report. *Geotechnical report shall specify vibro stone column requirements to ensure uniformity in total and differential immediate settlement, long term settlement, and earthquake induced settlement.*

1. *Soil compaction shall be in accordance with California Geological Survey (CGS) Special Publication 117A (SP-117A): Guidelines for Evaluating and Mitigating Seismic Hazard in California.*

2. *Area replacement ratio for the compaction elements and the basis of its determination shall be explained. Minimum factor of safety for soil compaction shall be in accordance with SP-117A.*

3. *Depth of soil compaction elements and extent beyond the footprint of structures/foundation shall be defined. Extent beyond the foundation shall be half the depth of the VSCs with a minimum of 10' or an approved alternative.*

4. *Minimum diameter and maximum spacing of soil compaction elements shall be specified. VSC's shall not be less than 2 feet in diameter and center to center spacing shall not exceed 8 feet.*

5. *The modulus of subgrade reactions for shallow foundations shall account for the presence of compaction elements.*

6. *The modulus of subgrade reactions, long-term settlement, and post-earthquake settlement shall be specified along with expected total and differential settlements for design.*

7. *The acceptance criteria for Cone Penetration Test (CPT) in accordance with ASTM D 3441 complemented by Standard Penetration Test (SPT) in accordance with ASTM D 1586, if necessary, to verify soil improvement shall be specified*

8. *The requirements for special inspection and observation by the Geotechnical engineer shall be specified.*

9. *A Final Verified Report (FVR) documenting the installation of the ground improvement system and confirming that the ground improvement acceptance criteria have been met shall be prepared by the Geotechnical Engineer and submitted to the enforcement agency for review and approval.*

J112.3 Shallow Foundations. *VSCs under the shallow foundation shall be located symmetrically around the centroid of the footing or load.*

1. *There shall be a minimum of four stone columns under each isolated or continuous/combined footing or approved equivalent.*

2. *The VSCs or deep foundation elements shall not be used to resist tension or overturning uplift from the shallow foundations.*

3. *The foundation design for the shallow foundation shall consider the increased vertical stiffness of the VSCs as point supports for analysis, unless it is substantiated that the installation of the VSCs result in improvement of the surrounding soils such that the modulus of subgrade reaction, long term settlement, and post-earthquake settlement can be considered uniform throughout.*

J112.4 Installation. *VSCs shall be installed with vibratory probes. Vertical columns of compacted unbounded aggregate shall be formed through the soils to be improved by adding gravel near the tip of the vibrator and progressively raising and re-penetrating the vibrator which will results in the gravel being pushed into the surrounding soil.*

Gravel aggregate for VSCs shall be well graded with a maximum size of 6" and not more than 10% smaller than 3/8" after compaction.

J112.5 Construction Documents. *Construction documents for VSCs, as a minimum, shall include the following:*

1. *Size, depth, and location of VSCs.*
2. *Extent of soil improvements along with building/structure foundation outlines.*
3. *Field verification requirements and acceptance criteria using CPT/SPT.*
4. *The locations where CPT/SPT shall be performed.*
5. *The Testing, Inspection and Observation (TIO) program shall indicate the inspection and observation required for the VSCs.*