DSA IR PC-1

PRE-CHECK (PC) DESIGN CRITERIA FOR FREESTANDING SIGNS, SCOREBOARDS, AND BALL WALLS: 2022 CBC

Disciplines: All

History: Revised 11/09/22 under 2022 CBC
Issued 04/09/20 under 2019 CBC

Division of the State Architect (DSA) documents referenced within this publication are available on the DSA Forms or DSA Publications webpages.

PURPOSE

This Interpretation of Regulations (IR) clarifies requirements relating to pre-check (PC) submittals to promote uniform statewide criteria for code compliance in the design and plan review of freestanding signs, scoreboards, and ball walls for projects under DSA jurisdiction. The PC Design Criteria documents were created by DSA as a means for the responsible engineer to demonstrate code compliance when developing and submitting construction documents for DSA review.

The provisions of this IR are intended to be a tool to identify and highlight the common and unique, critical and/or overlooked code requirements that must be considered and incorporated into the design, as applicable, to provide a complete and consistent set of construction documents accepted at all DSA regional offices. Other methods proposed by design professionals to solve a particular issue may be considered by DSA and reviewed for code and regulation compliance, subject to concurrence of DSA Codes and Standards Unit. For methods not specifically prescribed in the code, see California Building Code (CBC) Section 104.11.

Appendix A below is provided as a guide to assist design professionals and DSA plan reviewers when preparing and reviewing site-specific project applications that incorporate PC freestanding signs, scoreboards, or ball walls designed in accordance with this IR.

SCOPE

The provisions of this IR apply to 2022 PC plans for new freestanding signs, scoreboards, or ball walls submitted to DSA under the 2022 CBC. Freestanding signs, scoreboards, and ball walls are defined as exterior self-supported structures with steel cantilever columns and independent foundation systems. They are not attached to nor supported by other structures. Freestanding signs, scoreboards, and ball walls are nonbuilding structures without an occupancy classification.

As noted in Bulletin (*BU) 18-01: Applicability of Pre-Check (PC) Design Criteria for Non-PC Projects*, these provisions shall also be considered and incorporated in site-specific submittals for structures of the same project type, even if the submittal is not part of a PC application.

BACKGROUND

The PC approval process is intended to streamline DSA plan review by providing a procedure for approving the design of commonly used structures prior to the submittal of plans to DSA for construction projects. The PC approval process allows designers to incorporate designs for structures that have already been “prechecked” by DSA into their plans for actual site-specific construction projects. The design criteria provided in this document are neither regulations nor law and are not appropriate for verbatim inclusion in project specifications. The design professional in responsible charge is responsible for specifying and detailing requirements for each project. Additional information regarding the design and site application of PC structures can be found in *Procedure (PR) 07-01: Pre-Check (PC) Approval* and *Policy (PL) 07-02: Over-the-Counter Review of Projects Using Pre-Check (PC) Approved Designs*.

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1. GENERAL

1.1 Pre-Check Submission Requirements

Refer to PR 07-01 for a detailed list of items that are required for all PC submittals. The documents required to be submitted for PC approval are listed on form *DSA 3: Project Submittal Checklist*. Site-specific information is not necessary as that information will be provided when a specific construction project is submitted for DSA review.

1.2 Cover Sheet and General Notes

1.2.1 In accordance with PR 07-01 Section 2.4 the first sheet(s) of the PC drawings shall include a design information section that defines the basis of the PC design. Refer to PR 07-01 Appendices B and C and the remainder of this IR for required content of the design information section.

1.2.2 The PC construction documents shall include complete and comprehensive general notes and/or specifications as required for construction and inspection. It is common for PC construction documents to consist of drawings only without a book specification or project manual. Refer to PR 07-01 Appendix B, Footnote 6. In this case, the PC drawings shall include information that might otherwise be communicated in a project manual or book specification. For each primary material or group of the materials, the following information shall be specified in the construction documents when applicable:

1.2.2.1 Required material properties, including compliance with American Society for Testing and Materials (ASTM) specifications when applicable.

1.2.2.2 Proprietary products name, manufacturer, and evaluation report number. Refer to Section 1.12 below.

1.2.2.3 Quality control performed by the supplier.

1.2.2.4 Standards for the execution of the work, including associated tolerances. References to recognized standards are acceptable.

1.2.2.5 Required qualifications of personnel performing the work for each applicable trade.

1.2.2.6 Product and material finishes where required for weather protection or safety.

1.2.2.7 Quality assurance tests and frequency requirements, including citation of ASTM standards when applicable, not covered by Section 1.3 below.

1.3 Structural Tests and Special Inspections

Provide example form(s) *DSA 103: Listing of Structural Tests and Special Inspections* on the drawings. See PR 07-01 Section 2.5 for additional information.

1.3.1 Example form(s) DSA 103 will be used as a guide to develop a site-specific form DSA 103 for the site-specific project. Example form(s) on the PC drawings will be crossed out when the site-specific form DSA 103 is provided with the site-specific application.

1.3.2 The example form DSA 103 will include both in-plant and on-site testing and inspection requirements. Manufacturers shall be involved in the coordination of in-plant testing and inspection with the project inspector, Laboratory of Record (LOR), and owner of the site-specific project application using the PC design prior to commencing fabrication.

1.3.3 Only the site-specific form DSA 103 can identify exemptions from the required structural tests and special inspections; therefore, the Appendix of the example form(s) DSA 103 shall not be included on the PC drawings. Applicability of exemptions may be considered during plan

review for site-specific applications, shall be justified by the project design professional, and is subject to DSA review and approval. Refer to Appendix A below for additional information.

1.4 Options and Variations

The PC drawings shall provide checkboxes of options and variations if there is more than one configuration or design criteria. See PR 07-01 Section 3 for more information, including the maximum number of options permitted.

1.5 Design Parameters

The PC drawings shall provide on the cover sheet (and subsequent sheets as necessary) design information as defined in PR 07-01 Section 2.4 and Appendix B. If the PC includes design variations for multiple tiers or levels of the same design parameter(s), all or part of the design information should be presented in a checklist format and provide general direction to future users (design professionals and plan reviewers) for the application of the PC to site-specific projects. Additionally, refer to and coordinate with PL 07-02 Section 3, which summarizes common site-specific parameters to be verified at Over-the-Counter (OTC) plan reviews.

1.6 Risk Category

The PC drawings shall indicate the maximum Risk Category (RC) the structure is designed for in the design information section on the cover sheet. In addition, if the PC drawings include designs for multiple RC, the checklist shall include a note requiring the design professional of the site application to determine and designate the RC of the PC structure as it applies to the site in accordance with CBC Section 1604A.5.

1.7 Flood Zone

The PC design shall comply with CBC Section 1612A and *PR 14-01: Flood Design and Project Submittal Requirements*.

1.7.1 The design information section shall include a note stating that when the site-specific project is located in a flood zone other than Zone X, a letter from a geotechnical engineer (bearing his/her stamp and signature) is required to validate the applicability of the allowable soil values listed on the PC drawings.

This note may include an exemption for the validation letter for projects located in Zone D (undefined) if a geotechnical report written for improvements on the same campus and in accordance with the current CBC is provided that either (1) confirms the site is not in a flood hazard zone or (2) acknowledges the flood hazard but confirms it does not result in a reduction of soil capacity values.

1.7.2 The location of electrical components shall conform to the American Society of Civil Engineers Standard 24: Flood Resistant Design and Construction (ASCE 24) Section 7.2.

1.8 Geohazard Reports

It is recommended the design information section include a note indicating that geohazard reports are not required for nonbuilding structures. See *IR A-4: Geohazard Report Requirements* for additional information.

1.9 Weather Protection

The PC drawings shall specify the type of weather protection selected for all weather-exposed steel members (i.e., structural steel and cold-formed steel) in accordance with CBC Section 2203A.1.

1.9.1 Structural steel shall comply with one of the following:

1.9.1.1 Hot dip galvanized, minimum ASTM A123 or A153 Class D, as applicable.

1.9.1.2 Painted with zinc-rich primer (undercoat and finish coat) or equivalent paint system.

1.9.2 Cold-formed steel members shall be 55 percent aluminum-zinc alloy coated per ASTM A792/A792M standard in accordance with the American Iron and Steel Institute (AISI) S240 Table A4-1, CP 90 coating designation.

1.9.3 All exposed steel fasteners, including cast-in-place anchor bolts/rods, shall be stainless steel (Type 304 minimum), hot dip galvanized (ASTM A153, Class D minimum or ASTM F2329), or protected with corrosion-preventive coating that demonstrated no more than 2 percent of red rust in minimum 1,000 hours of exposure in salt spray test per ASTM B117. Zinc-plated fasteners do not comply with this requirement. Examples of proprietary coatings that do comply with the 1000-hour requirement include but are not necessarily limited to Quik Guard by Simpson, Kwik-Cote by Hilti, Stalgard by Elco, vistaCorr by SFS intec, etc.

1.9.4 Post-installed anchors used for exterior exposure shall comply with the requirements of the evaluation report.

1.10 Sheet Index

The PC drawings shall include a sheet index. When a PC includes multiple major options such that not all sheets are applicable to a given site-specific project application based on the option being used, the sheet index shall include check boxes. When the PC drawings are incorporated into a site-specific application, the submitted sheets will be identified by marking the check boxes (i.e., it is not necessary to strike out sheets that are not applicable). See PR 07-01 Appendix E for additional information.

1.11 Stamps

The PC drawings shall include the following:

1.11.1 2022 CBC PC Stamp per PR 07-01 Section 6.1.

1.11.2 Two blank areas on each PC sheet title block as indicated in *PR 18-04: Electronic Plan Review for Design Professionals of Record*, Section 1: one for the PC Identification Stamp and one for the future site-specific Identification Stamp.

1.12 Structural Product Acceptance

All manufactured structural products such as board or panel connection clips/brackets shall meet the requirements set forth in *IR A-5: Acceptance of Products, Materials, and Evaluation Reports*. Code-based engineering calculations to substantiate the adequacy of a manufactured product will be considered by DSA.

1.13 California Green Building Standards Code and California Energy Code

The PC design shall comply with the mandatory measures of the California Green Building Standards Code and the California Energy Code. Provide sign controls to reduce lighting by 65 percent during nighttime hours. Refer to California Energy Code Sections 130.3 and 140.8 for additional requirements.

2. COMPONENTS AND ACCESSORIES

2.1 Information Required on the Drawings

The following shall be clearly delineated in the design information section of the PC drawings.

2.1.1 Note stating that the manufacturer's data for the boards, boxes, and equipment to be mounted on the structure, including weights and dimensions shall be submitted with the site-specific application.

2.1.2 Maximum weight of each signage and/or scoreboard component accounted for in the PC design.

2.1.3 Maximum and minimum dimensions of each signage and/or scoreboard component accounted for in the PC design.

2.1.4 Dimensions defining the location of each component accounted for in the PC design relative to the primary supporting structure.

2.1.5 Any limitations on the quantity, combinations, and/or combined weight of the components applied to a single supporting structure.

2.1.6 If the PC design includes multiple options of combinations and/or locations of components (refer to Section 1.4 above), the design of the supporting structure shall be demonstrated as adequate for the most critical loading condition resulting from all potential options.

2.2 Component Construction and Connections

2.2.1 It is the responsibility of the manufacturer to design pre-manufactured score and display boards, signs, electrical equipment and light fixtures in accordance with the CBC. The internal framework and enclosure of such components will be accepted as "black box" and not reviewed by DSA.

2.2.2 Mounting requirements, including fasteners, for such components shall be designed and shown on the PC drawings as required by the American Society of Civil Engineers Standard 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7) Chapter 13 and CBC Section 1617A.1.18. Supporting calculations shall substantiate the design for gravity, wind and seismic loads.

2.2.3 Custom designed architectural components (e.g., decorative frameworks, beams, trusses) shall be justified by calculation or recognized testing and be a part of the PC design, either as a typical or an optional detail.

3. GRAVITY LOAD DESIGN

3.1 Eccentricities of Loads

Often scoreboards or signs are mounted on arms or other components that extend substantially from the column. The structural analysis and design shall explicitly consider the effects of the load eccentricities created by these configurations.

3.2 Framing Between Columns

The structural calculations shall demonstrate the adequacy of framing and connections for gravity, seismic and wind loads, including torsion and biaxial bending as applicable. The unbraced length of beams shall be accounted for in the design, recognizing there is typically not a traditional diaphragm nor lateral bracing.

3.3 Snow Load

If the structure is designed for snow load, it shall be stated in the design information section according to CBC Section 1603A.1.3. The effective seismic weight shall include snow load as required by ASCE 7 Section 12.7.2.

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4. LATERAL LOAD DESIGN

4.1 Seismic Load Criteria

4.1.1 The seismic design criteria upon which the PC design is based shall be stated in the design information section of the PC drawings in accordance with PR 07-01 and CBC Section 1603A.1.5.

4.1.2 If the design is based upon the maximum S_S and S_1 values (as defined by ASCE 7 Section 11.3) occurring in the state of California, the PC can be used at any site in the state. The PC design may be based on other S_S and S_1 values but doing so will limit the site locations where the PC can be used.

4.1.3 Limiting the S_{DS} value in accordance with ASCE 7 Section 12.8.1.3 is not permitted. This provision does not apply to nonbuilding structures designed in accordance with ASCE 7 Chapter 15.

4.2 Ground Motion Hazard Analysis

The 2022 CBC adopts ASCE 7 with Supplement 3, which modifies Section 11.4.8. Due to the site-specific ground motion hazard analysis requirements of ASCE 7 Section 11.4.8, the seismic load criteria selected for the PC design per Section 4.1 above for Site Class D and E shall consider the Exceptions of ASCE Section 11.4.8, Items 1 and 2.

4.2.1 The PC option for Site Class D shall include a note in the design information section the same or similar to the following: “Unless a site-specific ground motion hazard analysis is performed, the S_{M1} value increased by 50 percent shall be less than the design criteria stated herein.”

4.2.2 The PC option for Site Class E shall state in the design information section whether or not the PC design complies with the conditions of Exception 1 of ASCE 7 Section 11.4.8, Item 2.

4.3 Seismic Force Resisting System

Typical cantilever column systems shall be designed as nonbuilding structure type “Signs and Billboards” per ASCE 7 Table 15.4-2 for nonbuilding structures. Seismic response parameters are as follows:

4.3.1 Response Modification Coefficient: R = 3.

4.3.2 Overstrength Factor: $\Omega_0 = 1.75$.

4.3.3 Deflection Amplification Factor: $C_d = 3$.

4.3.4 A redundancy factor of 1.0 shall be used for both directions per ASCE 7 Section 15.6 Exception.

4.4 Direction of Seismic Loading

For structures with horizontal cantilevers or otherwise sensitive to vertical ground motions, the design shall include the directional load combinations required by ASCE 7 Section 15.1.4.1.

4.5 Wind Load Criteria

The PC design shall demonstrate compliance with wind loads in accordance with ASCE 7 Section 29.3.1, including substantiation of cases A, B, and C as defined by ASCE 7 Figure 29.3-1. In additional to all signage, scoreboard, ball wall, and framing components, the PC design shall include wind load on the following:

4.5.1 Projected area of column.

4.5.2 Projected area of any unsheathed or uncovered architectural framing and decorative elements.

4.6 Column Design

Built-up columns shall comply with American Institute of Steel Construction (AISC) 360 and AISC 341 for structural steel, or American Iron and Steel Institute (AISI) S100 and AISI S400 for cold-formed steel. Built-up columns of different materials shall not be permitted unless approved as an alternate design with supplemental full-scale testing.

4.6.1 Columns must be designed for P-Δ (first order) effects of the ½" displacement of the foundation if two times the lateral bearing pressure is used per CBC Section 1806A.3.4. See Section 5.2 below.

4.6.2 The PC design shall demonstrate the adequacy of the column subject to weak axis bending when applicable.

4.6.3 The weights, heights, and horizontal offsets of all equipment and fixtures attaching to the columns shall be explicitly accounted for in the column design.

4.7 Drift

Components and their mounting to the structure shall be protected from damage resulting from drift between the upper and lower framing levels. Protection may be provided in the detailing of framing connections, detailing of the component mounting, or another approved means.

5. FOUNDATION

5.1 Vertical Allowable Soil Pressure

The PC design shall be based on the presumptive allowable soil bearing pressure corresponding to Class 5 soil in CBC Table 1806A.2 unless justified by a site-specific geotechnical report. In order to use values greater than those stated for Class 5 soil, a statement requiring a site-specific geotechnical report at the time of site application must be included in the design information section of the PC drawings.

An allowable stress increase in the presumptive load-bearing value is not permitted when using the allowable stress design load combinations per ASCE 7 Section 2.4. An allowable stress increase is permitted when using the alternative allowable stress design load combinations per CBC Section 1605A.2 that include wind or seismic loads.

5.2 Lateral Bearing Pressure

The PC design shall be based on presumptive lateral bearing pressure corresponding to Class 5 soil in CBC Table 1806A.2 unless justified by a site-specific geotechnical report. In order to use values greater than those stated for Class 5 soil, a statement requiring a site-specific geotechnical report at the time of site application must be included in the design information section of the PC drawings

When justified in accordance with Section 4.6.1 above, the presumptive lateral bearing pressure may be increased in accordance with CBC Section 1806A.3.4. This increase is not permitted to lateral bearing values determined by a site-specific geotechnical evaluation. The design information section of the PC drawings shall clearly state if the lateral bearing pressure value used in the design has been increased per CBC Section 1806A.3.4.

5.3 Foundation Design Load

Foundation elements shall be designed in accordance with the load combinations defined in ASCE 7 Section 2.3. The design of foundation elements, including cast-in-place deep

foundations (drilled piers) and shallow spread footings, for nonbuilding structures in accordance with ASCE 7 Chapter 15 does not require use of load combinations including the overstrength factor.

5.4 Cast-in-place Deep Foundation (Drilled Pier)

5.4.1 The PC design shall comply with CBC Section 1810A.3.9 if the column anchors to the top of the drilled pier (i.e., with base plate and anchor rods) or is partially embedded. See Sections 5.12 and 5.13 below. *BU 09-06: Minimum Reinforcement of Concrete Piers and Caissons Embedded with Steel Poles* can be applied if the steel column is fully embedded (i.e., to within six inches of the bottom of the drilled pier).

5.4.2 In accordance with CBC Section 1810A.2.4, the depth of the drilled pier is permitted to be designed per CBC Section 1807A.3.2 when the drilled pier is assumed to be rigid.

5.4.2.1 The drilled pier may be assumed to be rigid if the ratio of the specified depth (not the minimum depth required by CBC Section 1807A.3.2) to diameter is equal to or less than 8 and the California Geological Survey (CGS) does not otherwise require analysis per Section 5.4.2.2 below.

5.4.2.2 When the drilled pier does not comply with Section 5.4.2.1 above, the design, including reinforcing, shall consider the nonlinear interaction of the drilled pier and soil (i.e., L-pile analysis or equivalent) per CBC Section 1810A.2.4 with consideration of group effects as required by CBC Section 1810A.2.5.

5.4.3 For drilled piers with partial column embedment or a base plate and embedded anchor rods, transverse reinforcing shall comply with CBC Section 1810A.3.9.4.2 and American Concrete Institute (ACI) 318.

Exception: The transverse reinforcement (i.e., tie or spiral) spacing need not be less than listed in the subsections below when the drilled pier is assumed to be rigid per Section 5.4.2 above and the factored axial force is less than 10 percent of the specified concrete compressive strength multiplied by the gross area of the concrete section (i.e., $P_u < 0.10f'_cA_g$). This exception is only applicable to drilled piers supporting freestanding signs, scoreboards, or ball walls. This type of structure is lightly loaded and has a low ductility demand. These exceptions may not be extended to other types of structures.

5.4.3.1 For drilled piers in soil categorized as Site Class A, B, C or D, provide transverse reinforcement spacing not to exceed the smallest of the following in the top 3d of the drilled pier (where “d” is the drilled pier diameter). Refer to Figures 5.4A and 5.4C below.

5.4.3.1.1 One quarter the drilled pier diameter: d/4.

5.4.3.1.2 Six times the least Grade 60 longitudinal bar diameter: $6d_b$.

5.4.3.1.3 Five times the least Grade 80 longitudinal bar diameter: $5d_b$

5.4.3.1.4 Six inches: 6”.

5.4.3.2 For drilled piers in soil categorized as Site Class E, provide transverse reinforcement spacing not to exceed that required by Section 5.4.3.1 above in the top 7d of the drilled pier (where “d” is the drilled pier diameter). Refer to Figures 5.4B and 5.4D below. In consideration that 7d is 88 percent or more of the overall pier depth and the requirement of Section 5.4.3.4 below, it is recommended this transverse reinforcement spacing requirement simply be extended over the full depth of the drilled pier.

5.4.3.3 For drilled piers in soil categorized as Site Class A, B, C, D, or E provide transverse reinforcement spacing not to exceed the smallest of the following in the remainder of the drilled

pier except as required by Section 5.4.3.4 below. Refer to Figures 5.4A, 5.4B, 5.4C, and 5.4D below.

5.4.3.3.1 One half the drilled pier diameter: d/2.

5.4.3.3.2 Twelve times the least longitudinal bar diameter: $12d_b$.

5.4.3.3.3 Twelve inches: 12”.

5.4.3.4 For drilled piers in soil categorized as Site Class A, B, C, D, or E, transverse reinforcement spacing shall comply with Section 5.4.3.1 above at all depths within 7d above and below (where “d” is the drilled pier diameter) interfaces between hard/stiff and soft strata as required by ACI 318 Section 18.13.5.5.

5.4.3.5 For drilled piers with partially embedded columns, the transverse reinforcement spacing shall not be greater than that required by Section 5.12.1 below.

5.5 Allowable Frictional Resistance and Uplift Capacity

The allowable frictional resistance and uplift capacity used in the design of cast-in-place deep foundations (drilled piers) shall be included in the design information section. When a site-specific geotechnical report is not available, CBC Section 1810A.3.3.1.4 can be used to obtain allowable frictional resistance value assuming Class 5 soils as noted in Sections 5.1 and 5.2 above.

5.6 Ground Surface Condition

When CBC Section 1807A.3.2 is utilized, asphalt pavement does not constitute a “constrained” condition and does not justify the use of CBC Equation 18A-2 or 18A-3 to determine the required pier depth. Where the constrained condition is used with concrete pavement, the reaction shall be adequately resisted and justified by calculations. The construction necessary to resist this reaction shall be clearly detailed on the PC drawings.

5.7 Shallow Foundations

Shallow spread footings shall be designed per CBC Chapter 18A and for stability in accordance with CBC Section 1605A1.1. The structure shall not be supported by a combination of deep foundation element(s) (e.g., drilled pier) and shallow spread footing(s).

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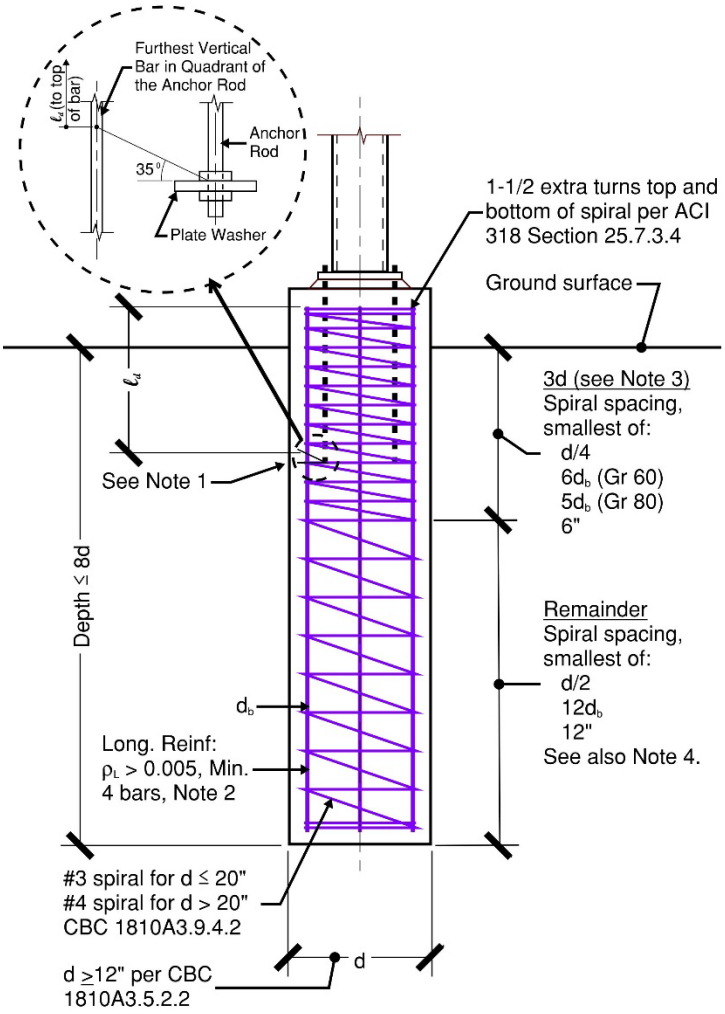

The prescriptive requirements shown in this detail may be used when the pier depth to diameter ratio is less than or equal to 8. If this ratio is exceeded, the pier must be analyzed and designed as required by CBC Section 1810A.2.4.

Note 1: Development length of vertical reinforcing steel that engages the anchor rod, ℓ_d, must meet ACI 318 Section 25.4. It is measured from the top of vertical bar to the point shown in the enlarged detail. Alternatively, the embedment depth of the anchor rod may be determined as the development length of the vertical bar plus one quarter of the pier diameter (ℓ_d + d/4).

Note 2: The total longitudinal reinforcing steel area (A_s) shall be enough to transfer the loads from the total required anchor rod area ($A_{rod\text{-}req}$) taking into account relative yield stress, as follows: $A_s \geq A_{rod\text{-}req} \times (f_{y\text{-}rod} / f_{ys})$
However, if the spacing between vertical bars is 6" or less, the steel area (A_s) need not exceed 33% more than that required to resist the column design moment in the pier section.

Note 3: When a site-specific geotechnical report requires lateral bearing resistance be neglected over a specified depth from the ground surface, the 3d dimension shall start where the lateral bearing resistance starts, and the tighter spacing shall be extended through the neglected zone.

Note 4: At all depths in the remainder of the pier that are 7d above and below interfaces between hard/stiff and soft soil strata the spiral spacing shall be reduced to match that required in the "3d" region. Refer to ACI 318 Section 18.13.5.5.

Figure 5.4A: Spiral Reinforcing in Site Class A, B, C, or D

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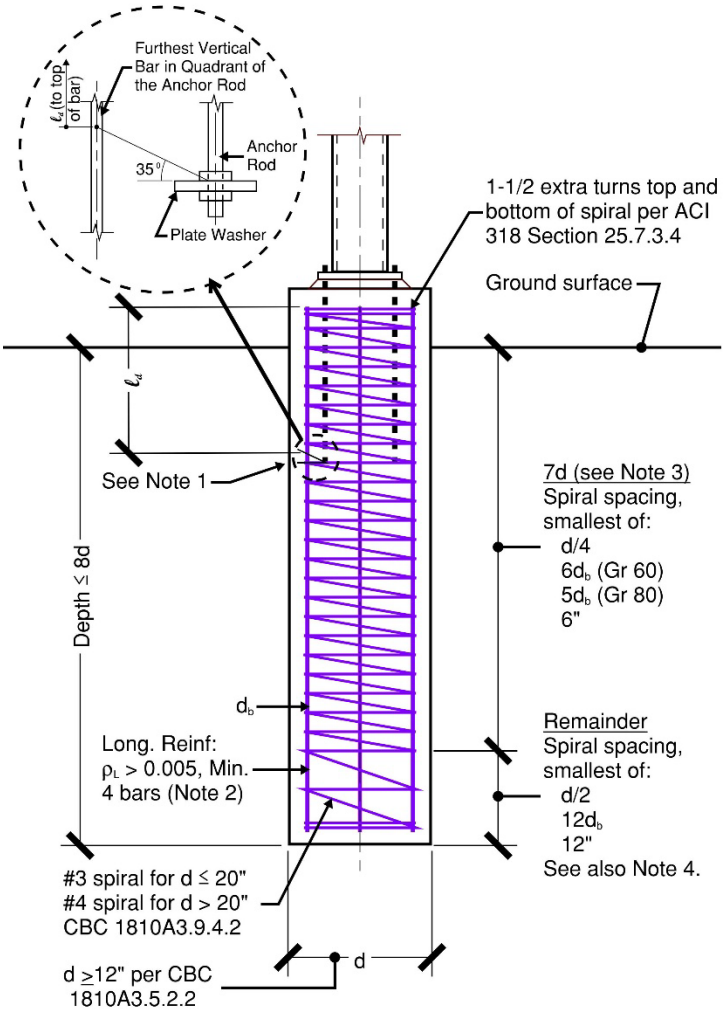

The prescriptive requirements shown in this detail may be used when the pier depth to diameter ratio is less than or equal to 8. If this ratio is exceeded, the pier must be analyzed and designed as required by CBC Section 1810A.2.4.

Note 1: Development length of vertical reinforcing steel that engages the anchor rod, ℓ_d, must meet ACI 318 Section 25.4. It is measured from the top of vertical bar to the point shown in the enlarged detail. Alternatively, the embedment depth of the anchor rod may be determined as the development length of the vertical bar plus one quarter of the pier diameter (ℓ_d + d/4).

Note 2: The total longitudinal reinforcing steel area (A_s) shall be enough to transfer the loads from the total required anchor rod area ($A_{rod\text{-}req}$) taking into account relative yield stress, as follows: $A_s \geq A_{rod\text{-}req} \times (f_{y\text{-}rod} / f_{ys})$
However, if the spacing between vertical bars is 6" or less, the steel area (A_s) need not exceed 33% more than that required to resist the column design moment in the pier section.

Note 3: When a site-specific geotechnical report requires lateral bearing resistance be neglected over a specified depth from the ground surface, the 7d dimension shall start where the lateral bearing resistance starts, and the tighter spacing shall be extended through the neglected zone.

Note 4: At all depths in the remainder of the pier that are 7d above and below interfaces between hard/stiff and soft soil strata the spiral spacing shall be reduced to match that required in the "7d" region. Refer to ACI 318 Section 18.13.5.5.

Figure 5.4B: Spiral Reinforcing in Site Class E

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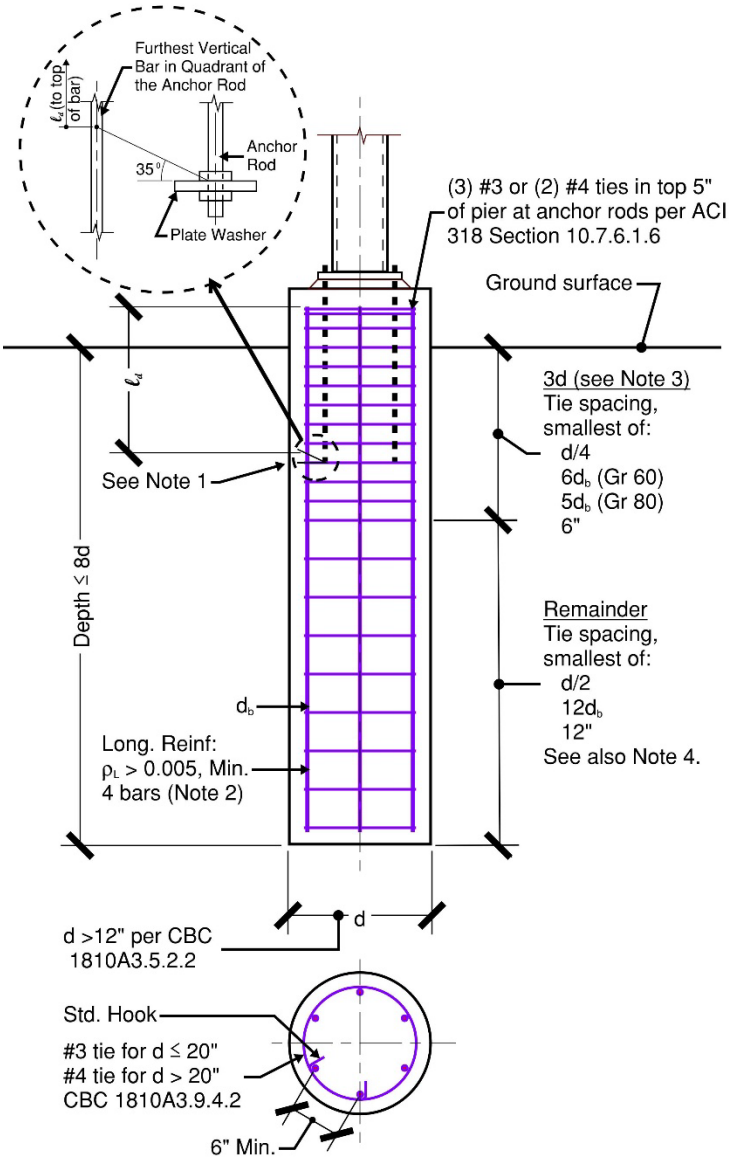

The prescriptive requirements shown in this detail may be used when the pier depth to diameter ratio is less than or equal to 8. If this ratio is exceeded, the pier must be analyzed and designed as required by CBC Section 1810A.2.4.

Note 1: Development length of vertical reinforcing steel that engages the anchor rod, ℓ_d, must meet ACI 318 Section 25.4. It is measured from the top of vertical bar to the point shown in the enlarged detail. Alternatively, the embedment depth of the anchor rod may be determined as the development length of the vertical bar plus one quarter of the pier diameter (ℓ_d + d/4).

Note 2: The total longitudinal reinforcing steel area (A_s) shall be enough to transfer the loads from the total required anchor rod area ($A_{rod\text{-}req}$) taking into account relative yield stress, as follows: $A_s \geq A_{rod\text{-}req} \times (f_{y\text{-}rod} / f_{ys})$
However, if the spacing between vertical bars is 6" or less, the steel area (A_s) need not exceed 33% more than that required to resist the column design moment in the pier section.

Note 3: When a site-specific geotechnical report requires lateral bearing resistance be neglected over a specified depth from the ground surface, the 3d dimension shall start where the lateral bearing resistance starts, and the tighter spacing shall be extended through the neglected zone.

Note 4: At all depths in the remainder of the pier that are 7d above and below interfaces between hard/stiff and soft soil strata the tie spacing shall be reduced to match that required in the "3d" region. Refer to ACI 318 Section 18.13.5.5.

Note 5: Ties shall comply with ACI 318 Section 25.7.2.4.1 including: (a) ends overlap by at least 6", (b) ends terminate with a standard hook engaging a longitudinal bar, and (c) overlaps of adjacent ties are staggered around the perimeter.

Figure 5.4C: Tie Reinforcing in Site Class A, B, C, or D

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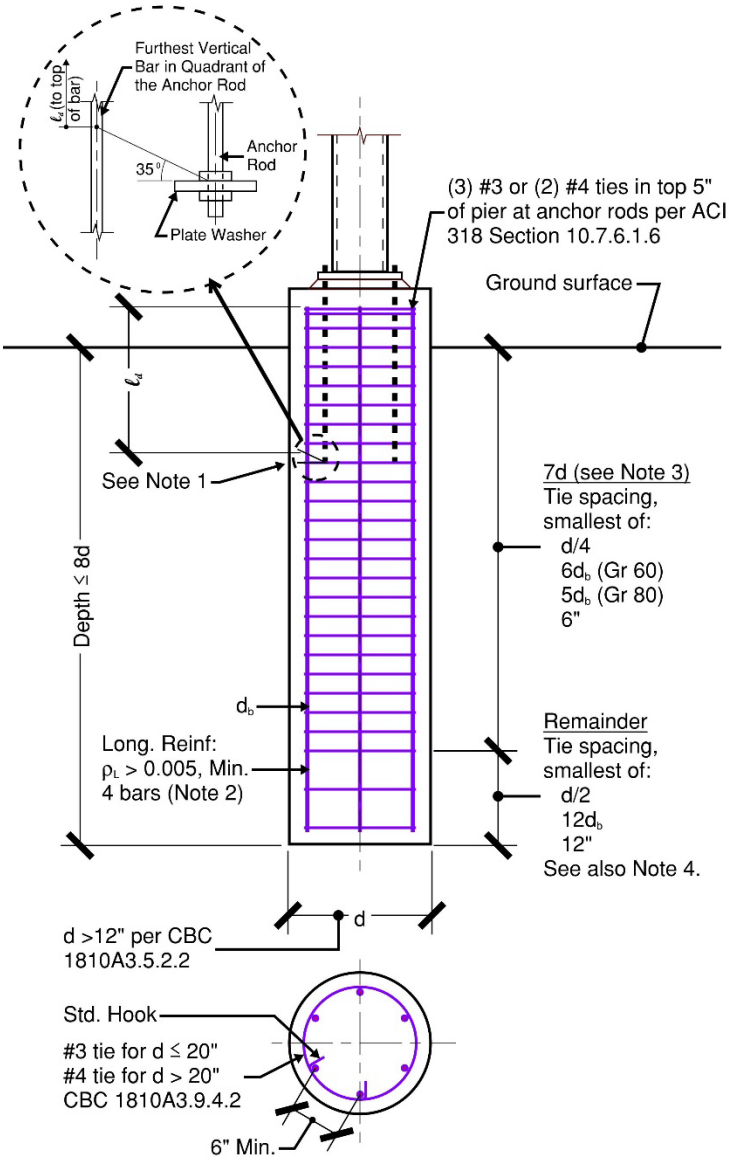

The prescriptive requirements shown in this detail may be used when the pier depth to diameter ratio is less than or equal to 8. If this ratio is exceeded, the pier must be analyzed and designed as required by CBC Section 1810A.2.4.

Note 1: Development length of vertical reinforcing steel that engages the anchor rod, ℓ_d, must meet ACI 318 Section 25.4. It is measured from the top of vertical bar to the point shown in the enlarged detail. Alternatively, the embedment depth of the anchor rod may be determined as the development length of the vertical bar plus one quarter of the pier diameter ($\ell_d + d/4$).

Note 2: The total longitudinal reinforcing steel area (A_s) shall be enough to transfer the loads from the total required anchor rod area ($A_{rod\text{-}req}$) taking into account relative yield stress, as follows: $A_s \geq A_{rod\text{-}req} \times (f_{y\text{-}rod} / f_{ys})$
However, if the spacing between vertical bars is 6" or less, the steel area (A_s) need not exceed 33% more than that required to resist the column design moment in the pier section.

Note 3: When a site-specific geotechnical report requires lateral bearing resistance be neglected over a specified depth from the ground surface, the 7d dimension shall start where the lateral bearing resistance starts, and the tighter spacing shall be extended through the neglected zone.

Note 4: At all depths in the remainder of the pier that are 7d above and below interfaces between hard/stiff and soft soil strata the tie spacing shall be reduced to match that required in the "7d" region. Refer to ACI 318 Section 18.13.5.5.

Note 5: Ties shall comply with ACI 318 Section 25.7.2.4.1 including: (a) ends overlap by at least 6", (b) ends terminate with a standard hook engaging a longitudinal bar, and (c) overlaps of adjacent ties are staggered around the perimeter.

Figure 5.4D: Tie Reinforcing in Site Class E

5.8 Adjacent Slope

PC drawing shall specify minimum setback limits (values are required) of the structure relative to slopes per CBC Section 1808A.7. Alternatively, when delineated on the approved PC drawings, the required depth of the cast-in-place deep foundation (drilled pier) can be increased in accordance with Figure 5.8 below.

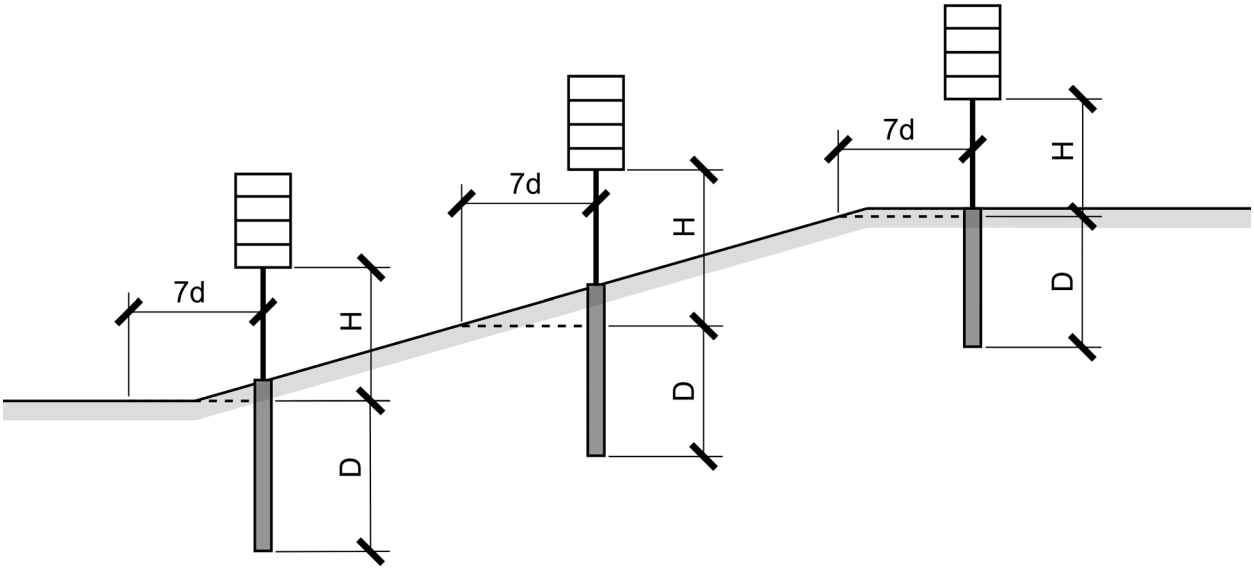

Figure 5.8: Sloped Sites

The pier depth shall be increased such the depth required by analysis (i.e., “D” designated in Figure 5.8) is provided below a horizontal plane projected from a horizontal distance seven times the pier diameter (i.e., “7d” designated in Figure 5.8). Additionally, design parameters dependent on column height shall be determined based on a theoretical column height starting from the same horizontal plane (i.e., “H” designated in Figure 5.8). If the setback limits are smaller than the CBC requires, a site-specific geotechnical report is required.

5.9 Liquefiable Soil or Site Class F

PC designs will not be approved with an option for construction on sites with liquefiable soil and/or categorized as Site Class F. If the site is not in a mapped liquefaction hazard zone, it may be presumed that no liquefaction hazard exists on that site unless a site-specific geotechnical report identifies such hazard. Refer to IR A-4 Section 4.

5.10 Concrete Mix

In addition to those requirements dictated by the PC design, the concrete mix used in the foundation elements shall comply with the durability requirements of ACI 318 Section 19.3. The PC drawings shall account for the dependency of these durability requirements on site-specific characteristics.

5.10.1 When the PC drawings do not require a site-specific geotechnical report that quantifies sulfate content in the soil, the PC drawings shall require a concrete mix complying with one of the following per ACI 318 Table 19.3.2.1.

5.10.1.1 Maximum water/cement ratio of 0.45; minimum compressive strength of 4,500 pounds per square inch (psi); Type V cement plus pozzolan or slag cement complying with Footnote 7; and prohibition of admixtures containing calcium chloride.

5.10.1.2 Maximum water/cement ratio of 0.40; minimum compressive strength of 5,000 psi; Type V cement complying with Footnote 8; and prohibition of admixtures containing calcium chloride.

5.10.2 When the PC drawings require a site-specific geotechnical report that quantifies sulfate content in the soil, the PC drawings shall clearly state the exposure class for each category (i.e., F, S, W and C) or combination thereof the PC design is approved for. The maximum water/cement ratio, minimum compressive strength, cementitious material requirements, and admixture limitations shall be stated on the PC drawings for each approved case.

5.10.3 Both approaches given in Sections 5.10.1 and 5.10.2 above can be included on the PC drawings as alternate options in accordance Section 1.4 above.

5.10.4 The PC drawings shall include a note requiring that concrete exposed to freezing-and-thawing cycles be air entrained per ACI 318 Section 19.3.3.

5.11 Conduits in Foundation

The PC drawings shall clearly show the size and number of conduits adjacent to or penetrating the foundation elements (e.g., drilled pier, shallow footing, etc.). The drawings shall include an elevation showing the location of the conduits relative to the foundation element and its reinforcement.

5.11.1 The presence of conduits may require the portion of the foundation above the conduits to be disregarded. The impact of conduits on the foundation strength, effective column height, and foundation depth shall be justified by calculation.

5.11.2 The base plate design shall also consider holes or notches for conduits. Details of holes and notches in the base plate shall be included on the PC drawings.

5.12 Partially Embedded Columns

When cantilevered columns are partially embedded into a cast-in-place deep foundation (drilled pier), BU 09-06 is not applicable.

5.12.1 The load transfer mechanism of partially embedded columns shall include the design of both the column and drilled pier ties or spiral. The transverse reinforcement size and spacing shall be sufficient to the transfer the required force based on a rational method and accepted principles of engineering mechanics.

5.12.2 The minimum column embedment depth into the drilled pier shall be the greater of the following:

5.12.2.1 Seven times the least dimension of column section.

5.12.2.2 Minimum development length of the longitudinal drilled pier reinforcing.

5.12.3 All embedded columns into pier footings shall have a mechanical connection to resist uplift. AISC 360 Section I6 provides an acceptable criterion for demonstrating the adequacy of the load transfer from the partially embedded column to the drilled pier.

Exception: For steel columns embedded into the drilled pier 4 feet or more, it is permitted to assume an allowable bond stress of 25 psi between the steel column and concrete. The upper 12 inches of the column embedment must be disregarded and no increase in this allowable bond stress is permitted for wind or seismic loads.

5.13 Column Base Connection

5.13.1 The embedment depth of the anchor rods shall be sufficient to lap with the longitudinal drilled pier reinforcement, when applicable. The lap length shall be based on developing the longitudinal reinforcement beyond the projected failure plane of the anchor rod heads. Refer to Figures 5.4A, 5.4B, 5.4C, and 5.4D above and ACI 318 Figure R17.5.2.1a. The lap length is not permitted to be reduced based on providing reinforcement beyond that required for the applied loads.

5.13.2 Anchor rods shall be designed for combined shear and tension. If the maximum grout thickness between the top of the foundation and bottom of the base plate exceeds two times the anchor rod diameter, the anchor rods shall be designed for bending in combination with tension and shear. Refer to Telecommunications Industry Association (TIA) 222-H Section 4.9.9 and AISC *Design Guide 1: Base Plate and Anchor Rod Design*. When oversized holes are used in the base plate the design shall comply with CBC Section 2204A.4.

6. ACCESS COMPLIANCE REQUIRMENTS

Freestanding signs and scoreboards may affect protruding objects and vertical clearance in circulation paths; refer to CBC Section 11B-307. Appropriate details shall be provided on plans to assure compliance with all applicable code requirements.

7. FIRE AND LIFE SAFETY REQUIREMENTS

7.1 Post-Mounted Objects

Post-mounted objects including marquees and scoreboards shall comply with CBC 1003.3.2.

7.2 Special Construction Requirements for Freestanding Signs and Scoreboards

Freestanding signs and scoreboards shall comply with the special construction requirements of CBC Sections 3106 and 3107.

7.3 Underground Raceways

Electrical conduit or other raceways supplying power to freestanding signs and scoreboards shall comply with California Electrical Code (CEC), Article 300.5 and Table 300.50.

7.4 Electrical Disconnects

Freestanding signs and scoreboards shall be provided with a means of disconnect per CEC Article 600.6.

7.5 Electrical Grounding and Bonding

Freestanding signs and scoreboards shall be grounded and bonded per CEC Article 600.7.

REFERENCES:

2022 California Code of Regulations (CCR) Title 24

Part 2: California Building Code (CBC).
Part 6: California Energy Code
Part 11: California Green Building Standards Code.

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APPENDIX A: SITE-SPECIFIC APPLICATION GUIDE

The following notes are provided as a guide to assist design professionals and DSA plan reviewers when preparing and reviewing site-specific project applications that incorporate PC structures designed in accordance with this IR. This Appendix is not intended to be an all-inclusive list of design and submittal requirements, but rather is an aid to identify aspects of the design criteria described in this IR of particular interest to its site application.

- ☐ Verify site-specific suitability of the PC including all parameters in PL 07-02 Section 3.
- ☐ Verify site-specific requirements of PL 07-02 Section 4 are met.
- ☐ Review the site-specific form DSA 103 in comparison with the example form DSA 103 and for any exemptions from the required structural tests and special inspections. Refer to Section 1.3 above for additional information.
- ☐ Verify Risk Category (RC) of the site-specific design is compliant with the Design Information section of the approved PC. Refer to Section 1.6 above for additional information.
- ☐ If the site is located in a flood zone other than Zone X, verify a validation letter from a geotechnical engineer is provided. Refer to Section 1.7 above for additional information.
- ☐ Verify the weight, dimensions and location of all signage and scoreboard components specified in the site-specific drawings comply with the limits defined on the PC drawings. Verify the quantity and combination of components also comply with the limits defined on the PC drawings. Refer to Section 2.1 above for additional information.
- ☐ If the site is classified as Site Class D or E, verify if the Exception of ASCE 7 Section 11.4.8 is met or if a site-specific ground motion hazard analysis is required. Refer to Section 4.2 above for additional information.
- ☐ If drilled pier foundations are used and the constrained ground surface condition option is applied, verify the site-specific drawings comply with the ground surface requirements defined on the PC drawings. Note: Asphalt concrete is not acceptable. Refer to Section 5.6 above for additional information.
- ☐ Verify the site-specific application does not mix deep foundation elements (e.g., drilled piers) and shallow spread footings. Refer to Section 5.7 above for additional information.
- ☐ If structures are sited on or adjacent to a slope, verify the site-specific drawings comply with the setback and/or pier embedment requirements defined on the PC drawings. Refer to Section 5.8 above for additional information.
- ☐ Verify no part of signs, marques, etc. obstructs the required width or vertical clearance of designated fire lanes.