

# PRE-CHECK (PC) DESIGN CRITERIA FOR FREESTANDING SIGNS AND SCOREBOARDS: 2019 CBC

**Disciplines:** All

**History:** Issued 04/09/20

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 design and plan review of freestanding signs and scoreboards 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 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 or scoreboards designed in accordance with this IR.

## SCOPE

The provisions of this IR apply to 2019 PC plans for new freestanding signs or scoreboards submitted to DSA under the 2019 CBC after January 1, 2020. Freestanding signs and scoreboards 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 and scoreboards are non-building structures without an occupancy classification.

As noted in *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 the following documents:

- Procedure *PR 07-01: Pre-Check Approval*

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- Policy *PL 07-02: Over-the-Counter Review of Projects Using Pre-Check Approved Designs*

### 1. GENERAL

**1.1 Pre-Check Approval Requirements:** See PR 07-01 for a more detailed list of items that are required for all PC submittals (e.g., design information on coversheet, example form *DSA 103: List of Required Structural Tests and Special Inspections* on the drawings, PC sheet index, etc.). 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 Design Information on Coversheet:** See PR 07-01 Section 2.4 and Appendices B and C. Require a note in the Design Information section requiring cut sheets of the boards, boxes and equipment to be mounted on the structure, including weights and dimensions.

**1.3 Structural Tests and Special Inspections:** Provide example form(s) DSA-103 on the drawings. Example form DSA-103 will be used as a guide to develop a site-specific form DSA-103 for the site-specific project. Example forms on the PC drawings will be crossed out when the site-specific form DSA-103 is provided during plan review. See PR 07-01 Section 2.5.

**1.3.1** A qualified representative of Laboratory of Record (LOR) or approved Special Inspector shall verify all steel identification per CBC Section 2202A.1 and *IR 17-3: Structural Welding Inspection*, Section 3.2.3.

**1.3.2** Only the site-specific form DSA-103 can incorporate exemptions from the required structural tests and special inspections in accordance with the Appendix of form DSA-103. Applicability and consideration of exemptions may be discussed during plan review for site-specific applications and shall be justified by the applicable project design professional for DSA review and approval. Refer to Appendix A for additional information.

**1.4 Options and Variations:** Provide checkboxes of options and variations if there is more than one configuration or design load criteria. See PR 07-01 Section 3 for more details, including the maximum number of options permitted in a single PC.

**1.5 Design Parameters:** Provide on the coversheet (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:** PC drawings must indicate the maximum Risk Category (RC) the structure is designed for in the Design Information section on the coversheet. In addition, if the PC drawings include designs for multiple RC, the checklist shall include a note requiring the DSA reviewer of the site application to verify the RC of the PC structure as it applies to the site in accordance with CBC Section 1604A.5.

**1.7 Flood Zone:** Design shall comply with CBC Section 1612A and procedure *PR 14-01: Flood Design and Project Submittal Requirements*.

**1.7.1** Provide a note in the Design Information section indicating when the site-specific project is located in a flood zone other than Zone X, a letter stamped and signed from a geotechnical

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engineer is needed to validate the allowable soil values specified in the PC drawings are still applicable.

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 reduction of soil capacity values.

**1.7.2** Location of electrical components shall conform to the American Society of Civil Engineers (ASCE) 24 Section 7.2 as required by PR 14-01 Section 1.2.1.

**1.8 Geohazard Reports:** Provide a note in Design Information section indicating that geohazard reports are not required for non-building freestanding sign and scoreboard structures. See *IR A-4: Geohazard Report Requirements*.

**1.9 Weather Protection:** PC drawings shall specify the type of weather protection selected for all weather-exposed steel members (structural steel and cold-formed steel) in accordance with CBC Section 2203A.1.

**1.9.1** Structural steel shall be one of the following:

- Hot-dip galvanized, minimum American Society for Testing Materials (ASTM) A123 or A153 Class D, as applicable
- 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 to 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. Example 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 PC Sheet Index:** Provide a PC sheet index. See PR 07-01 Appendix E.

**1.11 DSA ID Stamp and PC Stamp:** Provide 2019 CBC PC Stamp per DSA PR 07-01 Section 6.1.

Provide two blank areas on each PC sheet title block as indicated in procedure *PR 18-04.BB18: Electronic Plan Review for Design Professionals of Record Using Bluebeam 2018*, Section 1.2.2.2: one for the PC ID stamp and one for the future site-specific DSA Identification Stamp. See policy *PL 18-02: Record Sets of DSA-Approved Construction Documents*.

**1.12 Structural Products 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 support a manufactured product will be considered.

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**1.13 Signage and/or Scoreboard Components:** The following shall be clearly delineated on the PC drawings.

**1.13.1** Maximum weight of each signage and scoreboard component included in the PC.

**1.13.2** Maximum and minimum dimensions of each signage and scoreboard component included in the PC.

**1.13.3** Dimensions defining the location of each component included in the PC relative to primary supporting structure.

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

**1.13.5** 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.

### 1.14 Component Construction and Connections

**1.14.1** 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.

**1.14.2** Mounting requirements, including fasteners, for such components shall be designed and shown on the PC drawings as required by ASCE 7 Chapter 13 and CBC Section 1617A.1.18. Supporting calculations shall design for gravity, wind, and seismic loads.

**1.14.3** 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.

### 1.15 CALGreen/Energy Code Requirements

Design shall comply with the mandatory measures of the California Green Code (CALGreen) and the California Energy Code (Energy Code). Provide sign controls to reduce lighting by 65% during nighttime hours. See Energy Code 130.3 and 140.8 and PR 07-01 for additional requirements.

## 2. GRAVITY LOAD DESIGN

**2.1 Eccentricities of Loads:** Often the scoreboards or signs are mounted on arms or other components that extend well out from the column; analysis and design must address eccentricities of loads.

**2.2 Framing Between Columns:** 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.

**2.3 Snow Load:** If the structure is designed for snow load, add notes to the Design Information section according to CBC Section 1603A.1.3.

Effective seismic weight shall include snow load per ASCE 7 Section 12.7.2.

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### 3. LATERAL LOAD DESIGN

**3.1 Seismic Load Criteria:** State minimum seismic criteria on the PC drawings in accordance with PR 07-01 and CBC Section 1603A.1.5.

**3.2 Maximum: Seismic Force:** If the design is based upon the maximum  $S_S$  value for the state of California (ASCE 7-16 data), the PC can be used at any site in the state. Other  $S_S$  values are permitted, but will limit the applicable site locations for the PC.

**3.3 Maximum  $S_{DS}$  Value Value:** ASCE 7 Section 12.8.1.3 does not apply to non-building structures designed in accordance with ASCE 7 Chapter 15.

**3.4 Ground Motion Hazard Analysis:** Due to the site-specific ground motion analysis requirements of ASCE 7 Section 11.4.8, PC designs shall be based on the short period seismic response parameter  $S_{DS}$  and ASCE 7 Equations 12.8-2 and 12.8-5. Where a PC design is provided for Site Class E, the short-period site coefficient as required by ASCE 7 Section 11.4.8 Exception 1 shall be used. Alternatively, if the PC design is not based on the short period seismic response parameter  $S_{DS}$ , the PC design shall comply with the requirements of ASCE 7 Section 11.4.8, and the Design Information section shall state the fundamental period of the structure(s) and include notes alerting the site-specific user of the PC to the conditions requiring a site-specific ground motion hazard analysis.

**3.5 Redundancy Factor:** A redundancy factor of 1.0 shall be used for both directions per ASCE 7 Section 15.6 Exception.

#### 3.6 Seismic Force Resisting System

**3.6.1** Typical cantilever column systems shall be designed as non-building structure "Signs and Billboards" per ASCE 7 Table 15.4-2 for non-building structures. Seismic response parameters are as follows:

**3.6.1.1** Response Modification Coefficient:  $R = 3$

**3.6.1.2** Overstrength Factor:  $\Omega_0 = 1.75$

**3.6.1.3** Deflection Amplification Factor:  $C_d = 3$ .

**3.6.2** Columns must include  $P-\Delta$  (first order) effects of the  $\frac{1}{2}$ " displacement of footings if two times the lateral bearing pressures per CBC Section 1806A.3.4 is used.

**3.6.3** Built-up columns shall comply with AISC 360 and 341, or AISI S100 and AISI S213. Built-up columns of different materials shall not be permitted unless approved as an alternate design with supplemental full scale testing.

**3.6.4** The weights, heights, and horizontal offsets of all equipment attaching to the columns shall be included in the column design.

**3.7 Column Design:** Check weak axis bending of the columns if not square or round tubes.

**3.8 Direction of 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.

**3.9 Wind Load Criteria:** Design shall demonstrate compliance with wind loads in accordance with ASCE 7 Section 29.3.1.

**3.9.1 Cases A, B and C:** All three cases must be checked per ASCE 7 Figure 29.3-1.

**3.9.2 Column Design:** Design shall include wind load on the projected area of column.

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

### 4. FOUNDATION

**4.1 Allowable Soil Pressure and Bearing:** Maximum soil pressure and bearing values shall be in accordance with Class 5 soil in CBC Table 1806A.2 unless justified by a site-specific geotechnical report. In order to use values above stated maximums 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 on the PC drawings.

An allowable stress increase is not permitted for Basic Allowable Load Combinations, including footings per CBC Section 1605A.3.1. An allowable stress increase may be permitted with Alternative Basic Load Combinations per CBC Section 1605A.3.2.

**4.2 Lateral Bearing Pressure Increase:** Allowed per CBC Section 1806A.3.4.

If two times the tabular value is used under Design Information section, list the tabulated soils lateral bearing pressure value used in the design and indicate if this value has been increased per CBC Section 1806A.3.4 for pole footing design.

**4.3 Foundation Design Load:** The design of the foundation elements (both pier footings and shallow spread footings) for nonbuilding structures in accordance with ASCE 7 Chapter 15 is not required to include the overstrength factor overstrength factor. Footings shall be designed in accordance with load combinations defined in CBC Section 1605A.

### 4.4 Pier Footing

**4.4.1** Comply with CBC Section 1810A.3.9 if the column anchors to the top of the pier or is partially embedded. See Sections 4.7, 4.13 and 4.14 below. See also *BU 09-06: Minimum Reinforcement of Concrete Piers and Caissons Emedded with Steel Poles*, which can be followed if the steel columns are embedded to within six inches of the bottom of the pier.

**4.4.2** See Section 4.8 below for pier footings used in combination with shallow spread footings.

**4.4.3** In accordance with CBC Section 1810A.2.4, the depth of pier footing is permitted to be designed per CBC Section 1807A.3.2 when the pier footing is assumed to be rigid. The pier footing 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 eight (8). Otherwise, the pier footing design including its reinforcing shall consider the nonlinear interaction of the pier and soil (e.g. L-pile analysis including group effects as required by CBC Section 1810A.2.5).

**4.4.4** Maximum pier embedment depth for the purpose of computing lateral pressure ( $S_1$ ) is 12 feet per CBC Section 1807A.3.2.1.

**4.5 Allowable Pier Footing Frictional Resistance and Uplift Capacity:** The allowable frictional resistance and uplift capacity used in the design 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. Presume Class 5 soils as noted in Section 4.1 above. For uplift capacity per CBC Section 1810A.3.3.1.5, a Factor of Safety of 3 shall be applied to the frictional resistance value obtained in CBC Section 1810A.3.3.1.4; where uplift is due to wind or seismic loading, a Factor of Safety of 2 can be used.

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**4.6 Unconstrained vs. Constrained 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 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.

**4.7 Pier Reinforcing:** For piers with partial column embedment or a base plate with anchor bolts, tie reinforcing shall comply with CBC Section 1810A.3.9.4.2, except the tie spacing need not be less than the following where  $P_u < 0.10f_c A_g$  (see Figures A through D below). These exceptions are only applicable to steel cantilevered column structures supporting freestanding signs and scoreboards. This type of structure is lightly loaded and has a low ductility demand. These exceptions may not be extended to any other types of structure.

**4.7.1 Site Class A – D:** For the top 3d of the pier (where “d” is the pier diameter) provide the smallest of d/4,  $6d_b$  (where “ $d_b$ ” is the diameter of the longitudinal bars), and 6”. For remainder of section provide smallest of d/2,  $12d_b$  and 12”. Refer to Figures A and C.

**4.7.2 Site Class E:** For the top 7d of the pier (where “d” is the pier diameter) and 7d above and below the interface of each soil stratum, provide the smallest of d/4,  $6d_b$  (where “ $d_b$ ” is the diameter of the longitudinal bars), and 6”. For the remainder of section ,provide smallest of d/2,  $12d_b$  and 12”. Refer to Figures B and D.

**4.7.3** For partially embedded columns, the ties shall be designed for the transfer force based on a rational method and accepted principles of engineering mechanics.

**4.8 Shallow Spread Footing:** Shallow spread footings shall be designed per CBC Chapter 18A and for stability in accordance with CBC Section 1605A1.1.

If the structure is supported by a combination of pier footing(s) and shallow spread footing(s), all steel columns within the structure shall have the same column heights/lengths unless the column stiffness is accounted for in design.

**4.9 Adjacent Slope:** PC drawing shall specify minimum setback limits (values are required) of the structure per CBC Section 1808A.7.

Alternatively, the depth of required pier embedment can start from an elevation that corresponds with a horizontal clear distance of seven times (7x) the pier diameter that intersects with the slope (daylighting). If setback limits are smaller than CBC requires, a site-specific geotechnical report is required. If the pier is lowered per the above requirements, then the design height of the column for the purpose of calculating pier depth and moment must be increased to the theoretical top of the required pier embedment depth.

**4.10 Liquefiable Soil or Site Class F:** PC options shall not include liquefiable soil. If the structure is to be located in an area with liquefiable soil or Site Class F, OTC submittal is not allowed and site-specific project submittal is required. 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.

**4.11 Concrete Mix**

**4.11.1** Unless concrete exposure is classified per the American Concrete Institute (ACI) 318 Section 19.3.1.1 whereby the concrete mix design can comply with ACI 318 Section 19.3.2.1, concrete mix shall consist of Type V cement with a minimum compressive strength of 4,500 psi and maximum water/cement ratio of 0.45.

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**4.11.2** If ACI 318 Section 19.3.2.1 is used for concrete mix design, the PC shall clearly indicate the exposure levels applicable in the Design Information section. This may be tabulated for multiple categories or limited to specific exposure categories with conservative values.

**4.11.3** Concrete exposed to thaw and freeze cycles shall be air entrained per ACI 318 Section 19.3.3.1.

**4.12 Conduit in Piers:** The PC drawings shall clearly show the size and number of the conduits adjacent to or penetrating through the pier. Provide elevation showing the location of the conduits relative to the piers. The presence of conduits may cause the portion of pier above the conduits to be disregarded. The impact of conduit on the foundation strength, effective column height, and depth of embedment for these affected piers shall be justified by calculation.

Base plate design must also consider holes or notches for conduits. Details of holes and notches in base plate must be included in the PC drawings.

**4.13 Partially Embedded Columns:** When cantilevered columns are partially embedded into concrete foundation piers, BU 09-06 is not applicable.

**4.13.1** The load transfer mechanism of partially embedded columns shall include the design of both the column and concrete pier ties. Minimum column embedment depth into concrete pier shall be the greater of the following:

- Seven times the least dimension of column section.
- Minimum development length of the longitudinal pier reinforcing.

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

Exception: For steel columns with minimum 48" embedment into concrete, an allowable bonding stress of 25 psi between steel columns and concrete is permitted to be utilized. The first 12" of embedment must be disregarded and no increase in this allowable bonding stress value is permitted for wind or seismic loads.

### 4.14 Column Base Connection

**4.14.1** Embedment depth of the anchor rods shall be sufficient to lap with the longitudinal pier reinforcement. The lap length shall be based on developing the longitudinal pier reinforcement beyond the projected failure plane of the anchor bolt heads. Refer to Figures A through D and ACI 318 Figure R17.4.2.9. The lap length is not permitted to be reduced based on providing reinforcement beyond that required for the applied loads.

**4.14.2** Anchor rods shall be designed for combined shear and tension. If the maximum grout thickness between the top of footing and bottom of 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 American National Standards Institute/Telecommunications Industry Association (ANSI/TIA) 222-H Section 4.9.9 and *Design Guide 1: Base Plate and Anchor Rod Design* published by AISC. When oversized holes are used in the base plate the design shall comply with CBC Section 2204A.4.

## 5. ACCESS COMPLIANCE REQUIREMENTS

**5.1 Protruding Objects in Circulation Areas:** Protruding objects such as column-mounted equipment shall comply with CBC Section 11B-307.



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**5.2 Vertical Clearance in Circulation Areas:** Vertical clearance to supporting structures, scoreboards or marquee signs shall comply with CBC Section 11B-307.4.

### **6. FIRE AND LIFE SAFETY REQUIREMENTS**

**6.1 Post-Mounted Objects:** Post-mounted objects including marquees and scoreboards shall comply with CBC 1003.3.2.

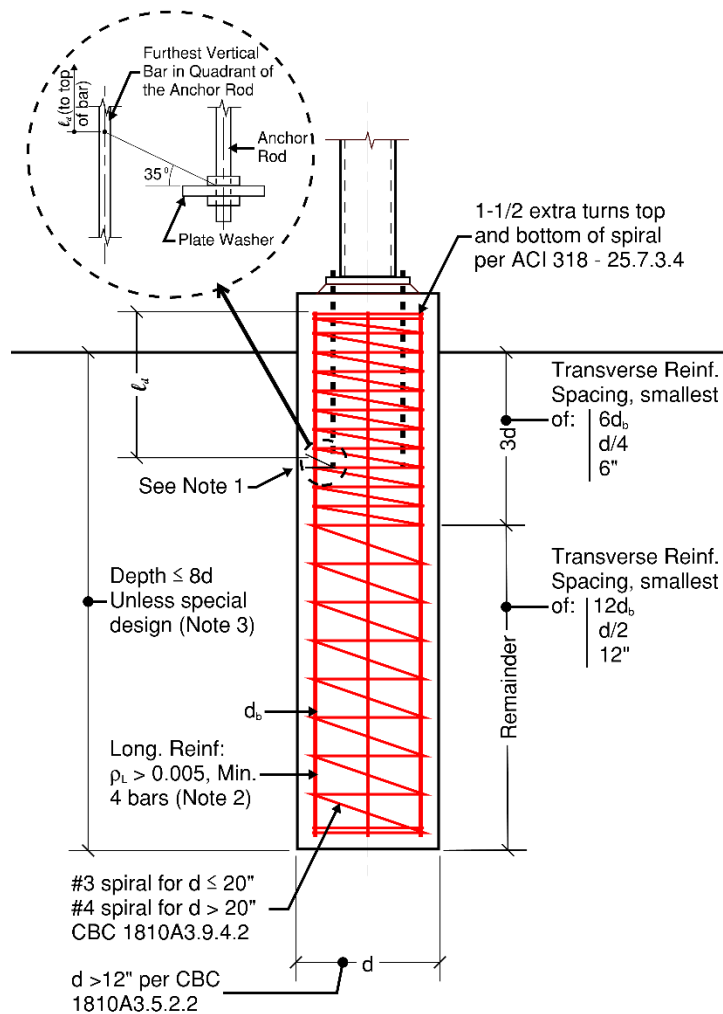
**6.2 Special Construction Requirements for Freestanding Signs and Scoreboards:** Freestanding signs and scoreboards shall comply with the special construction requirements of CBC Sections 3106 and 3107.

**6.3 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.

**6.4 Electrical Disconnects:** Freestanding signs and scoreboards shall be provided with a means of disconnect per CEC Article 600.6.

**6.5 Electrical Grounding and Bonding:** Freestanding signs and scoreboards shall be grounded and bonded per CEC Article 600.7.

# Figure A



**Note 1:** Development length of vertical reinforcing steel that engages the anchor rod,  $\ell_d$ , 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 ( $\ell_d + d/4$ ).

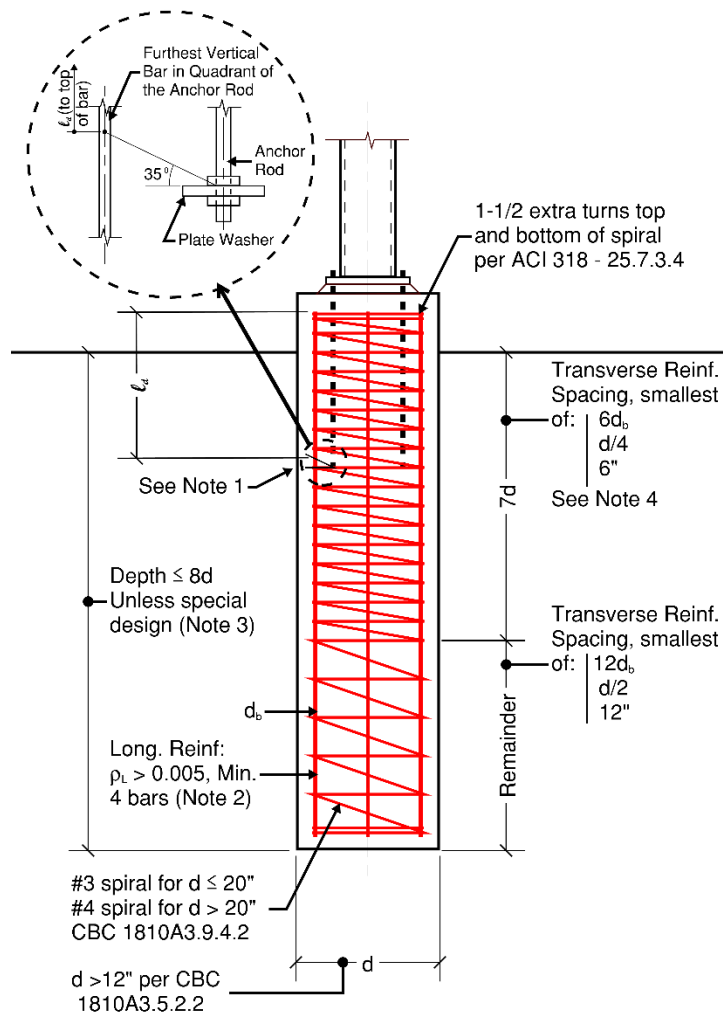
**Note 2:** The total longitudinal reinforcing steel area ( $A_s$ ) shall be enough to transfer the loads from the total required anchor rod area ( $A_{rod-req}$ ) taking into account relative yield stress, as follows:  $A_s \geq A_{rod-req} \times (f_{y-rod} / f_{ys})$ . However, if the spacing between 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:** The prescriptive longitudinal and transverse reinforcing requirements shown may be used when the embedded pier depth to diameter ratio  $\leq 8$ . If this ratio is exceeded, the pier must be analyzed and designed as required per CBC Section 1810A.2.4.

## Spiral Reinforcing in Site Classes A-D

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# Figure B



**Note 1:** Development length of vertical reinforcing steel that engages the anchor rod,  $\ell_d$ , 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 ( $A_{rod-req}$ ) taking into account relative yield stress, as follows:  $A_s \geq A_{rod-req} \times (f_{y-rod} / f_{ys})$ . 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.

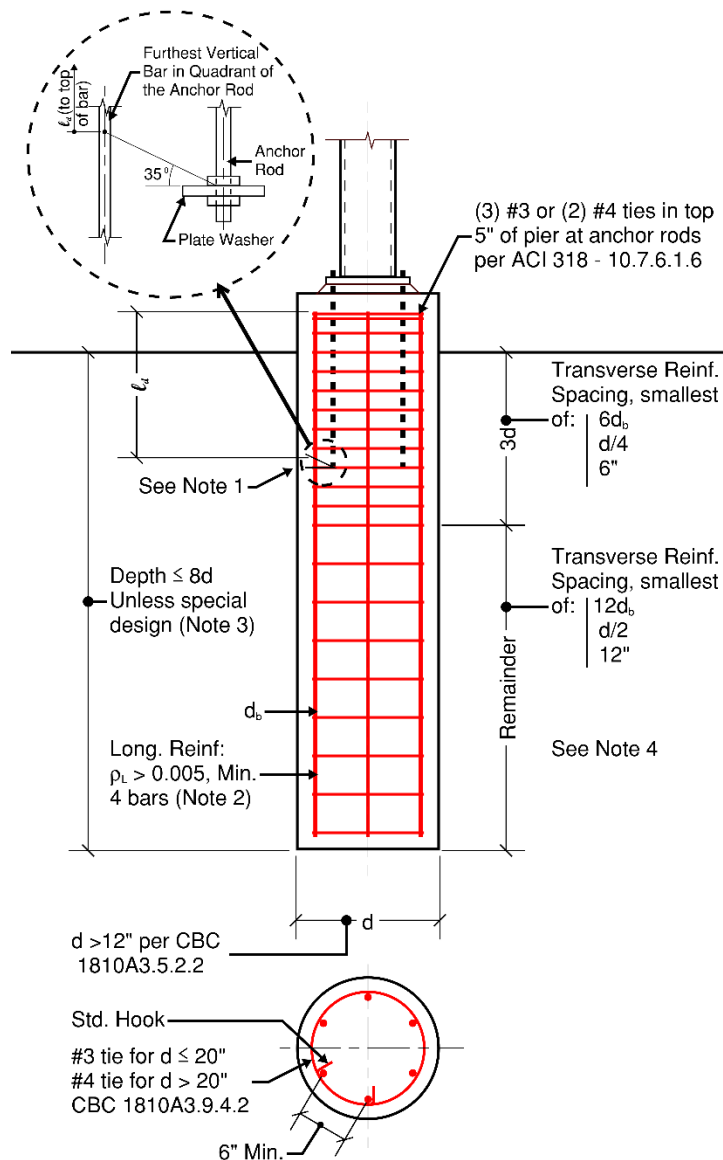
**Note 3:** The prescriptive longitudinal and transverse reinforcing requirements shown may be used when the embedded pier depth to diameter ratio  $\leq 8$ . If this ratio is exceeded, the pier must be analyzed and designed as required per CBC Section 1810A.2.4.

**Note 4:** The  $7d$  distance is also required above and below soil strata identified as liquefiable or hard or stiff as required per CBC Section 1810A.3.9.4.2.2.

## Spiral Reinforcing in Site Class E

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# Figure C



**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 ( $A_{rod-req}$ ) taking into account relative yield stress, as follows:  $A_s \geq A_{rod-req} \times (f_{y-rod} / f_{ys})$ . 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.

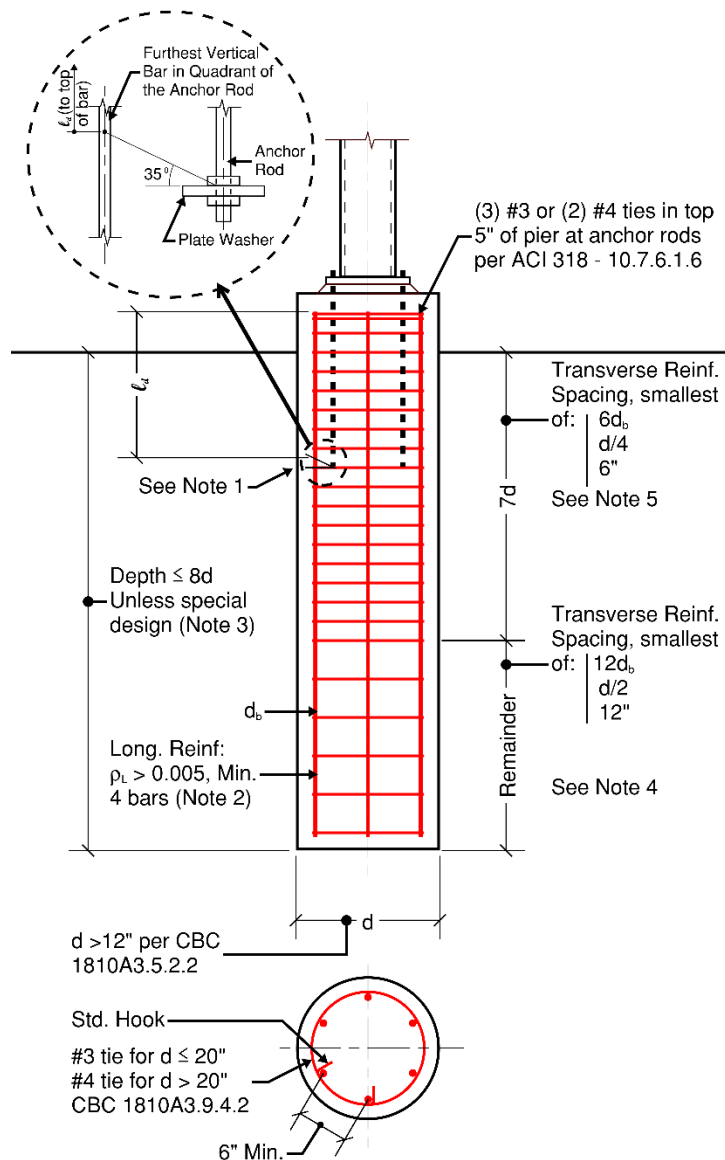
**Note 3:** The prescriptive longitudinal and transverse reinforcing requirements shown may be used when the embedded pier depth to diameter ratio ≤ 8. If this ratio is exceeded, the pier must be analyzed and designed as required per CBC Section 1810A.2.4.

**Note 4:** 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.

## Tie Reinforcing in Site Classes A-D

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# Figure D



**Note 1:** Development length of vertical reinforcing steel that engages the anchor rod,  $\ell_d$ , 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 ( $A_{rod-req}$ ) taking into account relative yield stress, as follows:  $A_s \geq A_{rod-req} \times (f_{y-rod} / f_{ys})$ . 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:** The prescriptive longitudinal and transverse reinforcing requirements shown may be used when the embedded pier depth to diameter ratio  $\leq 8$ . If this ratio is exceeded, the pier must be analyzed and designed as required per CBC Section 1810A.2.4.

**Note 4:** 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.

**Note 5:** The 7d distance is also required above and below soil strata identified as liquefiable or hard or stiff as required per CBC Section 1810A.3.9.4.2.2.

**Tie Reinforcing in Site Class E**

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### REFERENCES:

2019 California Code of Regulations (CCR) Title 24

Part 2: California Building Code (CBC), Sections 104.11, 1003.3.2, 11B-307, 1603A, 1603A.1.3, 1604A.5, 1605A.1.1, 1605A.3.1, 1605A.3.2, 1806A, 1807A, 1808A, 1810A, 2202A.1, 2203A.1, 2204A.4, 3106, 3107.

Part 3: California Electrical Code (CEC), Articles 300.5, 600.6 and 600.7.

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This IR is intended for use by DSA staff and by design professionals to promote statewide consistency for review and approval of plans and specifications as well as construction oversight of projects within the jurisdiction of DSA, which includes State of California public schools (K–12), community colleges and state-owned or state-leased essential services buildings. This IR indicates an acceptable method for achieving compliance with applicable codes and regulations, although other methods proposed by design professionals may be considered by DSA.

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## PRE-CHECK (PC) DESIGN CRITERIA FOR FREESTANDING SIGNS AND SCOREBOARDS: 2019 CBC

### APPENDIX A: SITE-SPECIFIC APPLICATION OF FREESTANDING SIGNS AND SCOREBOARDS

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 freestanding signs and scoreboard 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.

Refer also to *PL 07-02: Over-the-Counter Review of Projects Using Pre-Check Approved Designs*

1. Verify site-specific suitability of the PC including all parameters in PL 07-02 Section 3.
2. Verify site-specific requirements of PL 07-02 Section 4 are met.
3. Review the Appendix of the site-specific DSA 103 for any exemptions from the required structural tests and special inspections. Applicability and consideration of exemptions may be discussed during plan review for site-specific applications and shall be justified by the applicable project design professional for DSA review and approval. Refer to Section 1.3 above for additional information.
4. 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.
5. 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.
6. 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 1.12 above for additional information.
7. If the site is classified as Site Class D or E and the seismic design of the PC is not based on the short period seismic response parameter  $S_{DS}$  as indicated in the Design Information section of the PC drawings, verify if a site-specific ground motion hazard analysis is required. Refer to Section 3.4 above for additional information.
8. 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 4.6 above for additional information.
9. If the foundation of shade structure contains both drilled piers and shallow spread footings, verify all columns are the same height unless differing column heights are specifically allowed by the PC drawings. Refer to Section 4.8 above for additional information.
10. If structures are placed 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 4.9 above for additional information.