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Engineering

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Memorandum

From: TJC and Associates, Inc.

Date: March, 2014

Subject: Seismic Anchorage Submittals Checklist

The following information is provided to assist the Contractor's Design Engineers as they develop Seismic Anchorage Calculations for the project. This information should not be viewed as a complete and definitive list. However, it is a list of Code requirements that TJCAA's experience shows are often overlooked by supporting documentation submitted with deferred submittal items:

General:

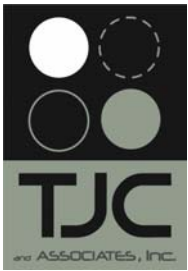
- Proper Code was used for basis of design.
 - a. The current governing design code for California is the **2013 California Building Code (CBC)**, ACI 318-11, Appendix D, and **ASCE 7**, specifically Chapter 13 for nonstructural components (e.g., mechanical and electrical equipment) and Chapter 15 for nonbuilding structures (e.g., tanks).
- Proper project specific design requirements are used for basis of design.
 - a. Confirm the submitted calculations address any project specific design criteria, seismic and wind, which are typically presented within the Project Specifications.
- Calculations are stamped/signed by a Professional **Civil** or **Structural** Engineer licensed within the State of California.
- Distribution of loads to anchorage considers the center of gravity of the equipment in question and spacing/location of the anchor bolts.
- Proper elevation of equipment has been identified. Specifically, z/h , the height of the equipment divided by the height of the building (ASCE 7 Eqn. 13.3-1), has been properly determined.
 - a. The design Engineer should confirm location of equipment.
- Section 1605 of the CBC has been addressed.
 - a. This Section includes load combinations which require a reduction in the design Dead Load when considering uplift loads caused by wind and seismic forces.
 - b. Concurrent vertical seismic force $\pm 0.2S_{DS}W_p$ has been included.

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- Appropriate Importance Factor has been used for the design of anchorage.
 - a. Most Water and Wastewater treatment plants will require a seismic importance factor of 1.25 or 1.5 when designing structural components.
 - b. The calculations need to include the project specific parameters. Therefore, verify requirement in specifications and drawings with what is provided in the anchorage calculations.
 - c. See ASCE 7 Section 13.1.3, for the latest requirements. In general, the Code requires a seismic Importance Factor =1.5 for anchorage of equipment in Occupancy Category IV structures, anchorage of life safety equipment and anchorage of hazardous materials. Otherwise, Code indicates I=1.0 for nonstructural components.

- Appropriate anchorage has been selected.
 - a. Post installed expansion and undercut anchors meet the assessment criteria of ACI 355.2; and post installed adhesive anchorage systems meet the assessment criteria of ACI 355.4.
 - b. Some projects require stainless steel anchorage regardless of type of anchor or exposure.
 - c. Some projects require cast in place anchor bolts for anchorage of vibratory equipment.

- Cracked concrete shall be assumed, unless uncracked concrete is demonstrated through analysis (ACI 318, Section D3.3.4.4)

- If ductile failure is not assured then the appropriate overstrength factor (Ω_o) has been applied as listed in ASCE 7, Table 15.4-2 for nonbuilding structures or ASCE 7 , Supplemental No. 1, Tables 13.5-1 or 13.6-1.for nonstructural components.

- Application of the appropriate reduction factor(s) to account for base-plate stand-off and/or grout pad.