

Post-Installed Concrete Anchors

The intent of this bulletin is to clarify that the use of power actuated fasteners and drop-in anchors to attach building components, services, and equipment, shall not be used to resist suspended tension loads in combination with seismic forces, regardless of their listing.

Power Actuated Fasteners and Drop-in Anchors

Drop-in inserts have been used by the construction industry as common practice for suspending loads such as mechanical equipment and piping. Sentence 4.1.8.18.(8)(d) of the VBBL identifies that the use of power actuated or drop-in anchors is not appropriate in this application.

The clarifying appendix note to Article 4.1.8.18., makes reference to the NBC 2010 Structural Commentaries (Part 4). Commentary J, Article 4.1.8.18.(8) (ref. item 233.), identifies a specific concern that power actuated fasteners (such as nails, bolts, and shallow “drop-in” anchors) are unable to withstand cyclic tensile loading. Consequently, it remains the City of Vancouver’s position that drop-in anchors are not to be permitted for suspended loads that could impact occupant safety.

Background

The City of Vancouver is in a high-risk seismic zone and the suitability of post installed anchors has been questioned due to the risk of failure when subject to seismic loads. The BC Building Code Interpretation Committee has previously provided an interpretation stating that power-actuated fasteners and drop-in anchors are not permitted to be used for seismic tensile loading. Similarly, the VBBL and its reference documentation also prohibit the use of power actuated fasteners for the suspension of building components, but is noted that there are some differences in the specific requirements within the referenced standards.

Since, sprinklers and sprinkler piping are typically installed below building services and equipment within the floor areas; the proper function of the sprinkler system may be jeopardized by the complete or partial collapse of building services located above the sprinklers either in, or following a seismic event. As these are essential life safety systems, it is essential that they remain functional. Therefore, a consistent policy to harmonize the performance requirements of the means of attachment of suspended building components below concrete construction is required.

Post-installed Anchors

Where post-installed anchors are utilized, designers are required to review the adequacy of the proposed support system for not only for the specified gravity loads; but also the differential movement and vibration of equipment and services in accordance with good engineering practice. While this consideration applies to building equipment and services identified in items 11 through 21 of Table T-4.1.8.18. of the VBBL, designers are still required to consider the adequacy of the form of attachment of other suspended building elements. Special attention is required for suspended ceilings, light fixtures, and other attachments in building exits, post-disaster buildings, and public buildings with designated post disaster functions (wherein which the failure of the suspended ceiling may affect the ability of the building to perform its intended function).

The potential failure of the selected method of attachment must be considered in the specification of appropriate means to attach building elements, equipment, services, and non-structural components. This is described in the 2014 VBBL, Appendix A-6.2.1.3., which identifies that designers should provide appropriate consideration of the movement and vibration of the installed mechanical components and services through compliance with the CSA A23.3 standard. Consequently, the installation of supports for mechanical or electrical components or systems should not fail in a manner that would result in an unacceptable impact on the performance of fire suppression system components.

Consequently, post-installed anchors used to resist load combinations which include earthquake loads and/or effects imposed by seismic response should be qualified for earthquake loading in accordance with the requirements of ACI 355.2/ACI 355.2R for mechanical anchors or ACI 355.4M for adhesive anchors in accordance with good engineering practice and as permitted by the appropriate reference standards.

Registered professionals who complete a Schedule B for structural capacity (including anchorage and seismic restraint - all disciplines) and contractors must ensure that the proper fasteners and anchors are being used and that they comply with Part 4 of the VBBL (or provide an alternative design that demonstrates an equivalent level of performance). These anchors and fasteners shall be inspected, listed (e.g. sprinkler), and field reviewed where required.

For additional clarification see also BOABC's code interpretation committee's bulletin:
<http://boabc.org/wp-content/uploads/2015/10/201403191335.pdf>

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