

Structure Failures: Retaining Walls

Author: Timothy A. Roda, PE, StS2 – Project Engineer, Bracken Engineering

Retaining walls can be constructed of cast-in-place concrete, concrete masonry, wood timbers, or sheet piles (steel, aluminum, or vinyl) and are designed to resist the load of the retained soil. The most important item to note is that if the retaining wall is part of or connected to a structure, that retaining wall is to be designed and permitted.

FBC, Building §102.2 Building. The provisions of the Florida Building Code shall apply to the construction, erection, alteration, modification, repair, equipment, use and occupancy, location, maintenance, removal and demolition of every public and private building, structure or facility or floating residential structure, or any appurtenances connected or attached to such buildings, structures or facilities.

When not properly designed, constructed or maintained, retaining walls fail. The original design of a retaining wall can be deficient if it does not incorporate an appropriate drainage system behind the wall. Failure can also result from overloading due to unanticipated loads. Overloading often occurs when loads such as other structures, trees, vehicles, or additional fill soils are placed atop the retained side of the wall. Deterioration of a wall can result from either deterioration of wood components or corrosion of steel components. Wood components in retaining walls deteriorate and lose structural capacity as they are exposed to long-term wetting and drying. Steel components, including embedded reinforcement, steel sheet piles, and steel tie-back anchors will experience corrosion and loss of cross-section over time due to environmental conditions.



FBC, Building §1806.2 Design. Retaining walls shall be designed to resist the design lateral soil loads in Section 1610, including both dead and live load surcharges to which such walls are subjected, and to ensure stability against overturning, sliding, excessive foundation pressure and water uplift.

Failure of a retaining wall is typically manifested within the wall by leaning of the wall, pulling through of the tie-back anchors, and/or depressions within the soil on the retained side of the wall. If left unchecked, the failure of a retaining wall that is part of or connected to a structure will result in vertical and lateral displacement of the structure not to mention loss of bearing and ensuing cosmetic damages. If a retaining wall evidences any of these conditions and is suspected of failing, it is recommended that a structural engineer be consulted to identify the condition causing the failure and recommend the appropriate repair measures.

If you have a question about a new or existing retaining wall, you can contact Tim Roda, PE at troda@brackenengineering.com.

Code Updates: What's New?

Author: Gary D. Pailthorp, PE, CBO – Senior Project Engineer, Bracken Engineering

Usually this topic brings up a list of new and more restrictive requirements that have been enacted as a part of the code process. For this issue we would like to take an alternate view and present the areas where code requirements have been altered or relaxed to allow the design professional and owner some additional flexibility in their designs. The bottom line is that building codes do not always become more restrictive.

Sections 505.2 and 505.4 provide under certain conditions the allowable area of a mezzanine may be increased from 1/3 to 1/2 of the area of the room in which it is located. In occupancies other than Groups H and I that are not more than two stories above grade plane and equipped throughout with an automatic sprinkler system a mezzanine having two or more means of egress need not be required to be open to the room in which it is located.

In section 708.1 they have eliminated the need for a one (1) hour rated tenant separation wall between mini storage units where a sprinkler system meeting the requirements of Ordinary Hazard Group II as defined in NFPA 13 is installed employing quick response heads.

In section 1013.3 the guardrail opening limitation now includes a spacing limitation for balusters along the sides of stairs in Groups R-2 and R-3 occupancies slightly larger than that in other locations and occupancies. The general rule that the spacing be such that a 4" sphere cannot pass through is modified in R-2 and R-3 occupancies to require that a 4.375" sphere not be able to pass through.

In each of the cases above and in numerous other code revisions the codes have relaxed slightly in recognition of the effectiveness of sprinklers or fire retardant materials. In some cases, like the change in baluster spacing, it has to do with the required tread length and a desire to allow a spacing that would result in two balusters per tread and a uniform spacing with readily available materials. The Codes are constantly changing and constantly improving. This improvement is due to our Building Code Officials, who do an excellent job of responding to new and changing technologies, and needs.

If you have a question about a building code issue, you can contact Gary Pailthorp at gpailthorp@brackenengineering.com.