

**PLANNING & DEVELOPMENT MEMORANDUM**  
**#09-24**

June 25, 2009

**TO:** Honorable Mayor Kathleen M. Novak and City Council members

**FROM:** William Simmons, City Manager *WMS*  
James Hayes, Director of Planning and Development *JH*

**SUBJECT:** City retaining wall standards

**BACKGROUND:**

At the May 28, 2009 City Council meeting, in response to a citizen inquiry made under the agenda item "Public Invited to be Heard," Council asked for information to be prepared regarding retaining wall standards within the City. Both the zoning ordinance and the City's adopted building codes make reference to retaining walls. The following is a collective response to that inquiry.

The following references, regarding retaining walls, exist within the City's zoning ordinance.

Overall, retaining walls are referenced in two places within the zoning ordinance, the definitions article of Chapter 11, Article 5 Rules of Construction and in Article 34, Fence and Screen Regulations.

Chapter 11, Article 5, Rules of Construction defines a retaining wall as the following:

**Retaining Wall.** Any structure built or designed to retain or restrain lateral forces.

Additionally, within Article 34, Fence and Screen Regulations, the following sections speak to retaining walls regarding design, approval, and maintenance.

**Section 11-34-6. Design of Fences, Screens, and Retaining Walls.**

**(a) Wind load.** All fences, retaining walls, and screens shall be designed in accordance with the requirements of the Uniform Building Code as contained in Chapter 10, Article 2, of the Northglenn Municipal Code.

**Section 11-34-8. Approval of Fences, Screens, and Retaining Walls.**

**(a) Building Permit Required.** A Building Permit is required for any fence or any screen not exclusively consisting of plant material more than 30 inches in height, or for any retaining wall more than 36 inches in height.

**(b) Plans.** Plans showing proposed construction, material, location, and height of the fence, screen, or retaining wall shall be presented to the Building Inspector before a permit is issued. A property survey or plot plan shall be included in or presented with the plans.

**Section 11-34-9. Maintenance and Repair of Fences, Screens, and Retaining Walls.**

(a) All fences, screens, and retaining walls shall be maintained in sound condition and good repair at all times. When a fence, screen or retaining wall is declared by an officer to be dilapidated or hazardous, the officer shall order that the fence, screen or retaining wall to be removed or repaired to a sound condition. Dilapidated shall include but not be limited to fences or screens which have broken or missing planks or portions, or which are out of plumb by more than one inch per foot of height measured at the posts.

[Source: Ord. 1337, 2003]

(b) Areas adjacent to fences, screens, hedges, and retaining walls shall be maintained in a clean, sanitary manner and shall be free and clear of all debris, trash, and weeds.

Similarly, the City's adopted building codes, the 2006 International Building Code & the 2006 International Residential Code, make numerous references to retaining walls regarding materials used, site preparation, and construction techniques. These individual references are compiled and depicted in an attached document (ATTACHMENT A).

**STAFF CONTACT:**

Inquiries regarding retaining walls in the context of the zoning ordinance should be directed to Travis Reynolds – 303.450.8836, [treynolds@northglenn.org](mailto:treynolds@northglenn.org) . Inquiries relating to specific construction of retaining walls in the context of the City's adopted building code should be directed to Rick Davis – 303.450.8833, [rdavis@northglenn.org](mailto:rdavis@northglenn.org) .

## ATTACHMENT A

**2006 International Building Code and 2006 International Residential Code references to retaining walls.**

### **2006 International Building Code References**

#### **SECTION 105**

##### **PERMITS**

**105.2 Work exempt from permit.** Exemptions from permit requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this jurisdiction. Permits shall not be required for the following:

4. Retaining walls that are not over 4 feet (1219 mm) in height measured from the bottom of the footing to the top of the wall, unless supporting a surcharge or impounding Class I, II or IIIA liquids.

#### **SECTION 1610**

##### **SOIL LATERAL LOADS**

**1610.1 General.** Basement, foundation and retaining walls shall be designed to resist lateral soil loads. Soil loads specified in Table 1610.1 shall be used as the minimum design lateral soil loads unless specified otherwise in a soil investigation report approved by the building official. Basement walls and other walls in which horizontal movement is restricted at the top shall be designed for at-rest pressure. Retaining walls free to move and rotate at the top are permitted to be designed for active pressure. Design lateral pressure from surcharge loads shall be added to the lateral earth pressure load. Design lateral pressure shall be increased if soils with expansion potential are present at the site.

Exception: Basement walls extending not more than 8 feet (2438 mm) below grade and supporting flexible floor systems shall be permitted to be designed for active pressure.

#### **SECTION 1802**

##### **FOUNDATION AND SOILS INVESTIGATIONS**

**1802.2.7 Seismic Design Category D, E or F.** Where the structure is determined to be in Seismic Design Category D, E or F, in accordance with Section 1613, the soils investigation requirements for Seismic Design Category C, given in Section 1802.2.6, shall be met, in addition to the following. The investigation shall include:

1. A determination of lateral pressures on basement and retaining walls due to earthquake motions.

## **SECTION 1803**

### **EXCAVATION, GRADING AND FILL**

**1803.1 Excavations near footings or foundations.** Excavations for any purpose shall not remove lateral support from any footing or foundation without first underpinning or protecting the footing or foundation against settlement or lateral translation.

**1803.2 Placement of backfill.** The excavation outside the foundation shall be backfilled with soil that is free of organic material, construction debris, cobbles and boulders or a controlled low-strength material (CLSM). The backfill shall be placed in lifts and compacted, in a manner that does not damage the foundation or the waterproofing or damp proofing material.

Exception: Controlled low-strength material need not be compacted.

**1803.3 Site grading.** The ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than one unit vertical in 20 units horizontal (5-percent slope) for a minimum distance of 10 feet (3048 mm) measured perpendicular to the face of the wall. If physical obstructions or lot lines prohibit 10 feet (3048 mm) of horizontal distance, a 5-percent slope shall be provided to an approved alternative method of diverting water away from the foundation. Swales used for this purpose shall be sloped a minimum of 2 percent where located within 10 feet (3048 mm) of the building foundation. Impervious surfaces within 10 feet (3048 mm) of the building foundation shall be sloped a minimum of 2 percent away from the building.

Exception: Where climatic or soil conditions warrant, the slope of the ground away from the building foundation is permitted to be reduced to not less than one unit vertical in 48 units horizontal (2-percent slope). The procedure used to establish the final ground level adjacent to the foundation shall account for additional settlement of the backfill.

**1803.4 Grading and fill in flood hazard areas.** In flood hazard areas established in Section 1612.3, grading and/or fill shall not be approved:

1. Unless such fill is placed, compacted and sloped to minimize shifting, slumping and erosion during the rise and fall of flood water and, as applicable, wave action.
2. In floodways, unless it has been demonstrated through hydrologic and hydraulic analyses performed by a registered design professional in accordance with standard engineering practice that the proposed grading or fill, or both, will not result in any increase in flood levels during the occurrence of the design flood.

3. In flood hazard areas subject to high-velocity wave action, unless such fill is conducted and/or placed to avoid diversion of water and waves toward any building or structure.

4. Where design flood elevations are specified but floodways have not been designated, unless it has been demonstrated that the cumulative effect of the proposed flood hazard area encroachment, when combined with all other existing and anticipated flood hazard area encroachment, will not increase the design flood elevation more than 1 foot (305 mm) at any point.

**1803.5 Compacted fill material.** Where footings will bear on compacted fill material, the compacted fill shall comply with the provisions of an approved report, which shall contain the following:

1. Specifications for the preparation of the site prior to placement of compacted fill material.
2. Specifications for material to be used as compacted fill.
3. Test method to be used to determine the maximum dry density and optimum moisture content of the material to be used as compacted fill.
4. Maximum allowable thickness of each lift of compacted fill material.
5. Field test method for determining the in-place dry density of the compacted fill.
6. Minimum acceptable in-place dry density expressed as a percentage of the maximum dry density determined in accordance with Item 3.
7. Number and frequency of field tests required to determine compliance with Item 6.

Exception: Compacted fill material less than 12 inches (305 mm) in depth need not comply with an approved report, provided it has been compacted to a minimum of 90 percent Modified Proctor in accordance with ASTM D 1557. The compaction shall be verified by a qualified inspector approved by the building official.

**1803.6 Controlled low-strength material (CLSM).** Where footings will bear on controlled low-strength material (CLSM), the CLSM shall comply with the provisions of an approved report, which shall contain the following:

1. Specifications for the preparation of the site prior to placement of the CLSM.
2. Specifications for the CLSM.

3. Laboratory or field test method(s) to be used to determine the compressive strength or bearing capacity of the CLSM.

4. Test methods for determining the acceptance of the CLSM in the field.

5. Number and frequency of field tests required to determine compliance with Item 4.

## **SECTION 1805 FOOTINGS AND FOUNDATIONS**

**1805.3.1 Building clearance from ascending slopes.** In general, buildings below slopes shall be set a sufficient distance from the slope to provide protection from slope drainage, erosion and shallow failures. Except as provided for in Section 1805.3.5 and Figure 1805.3.1, the following criteria will be assumed to provide this protection. Where the existing slope is steeper than one unit vertical in one unit horizontal (100-percent slope), the toe of the slope shall be assumed to be at the intersection of a horizontal plane drawn from the top of the foundation and a plane drawn tangent to the slope at an angle of 45 degrees (0.79 rad) to the horizontal. Where a retaining wall is constructed at the toe of the slope, the height of the slope shall be measured from the top of the wall to the top of the slope.

## **SECTION 1806 RETAINING WALLS**

**1806.1 General.** Retaining walls shall be designed to ensure stability against overturning, sliding, excessive foundation pressure and water uplift. Retaining walls shall be designed for a safety factor of 1.5 against lateral sliding and overturning.

## **SECTION 2304 GENERAL CONSTRUCTION REQUIREMENTS**

**2304.11.7 Wood used in retaining walls and cribs.** Wood installed in retaining or crib walls shall be preservative treated in accordance with AWPA U1 (Commodity Specifications A or F) for soil and fresh water use.

## **APPENDIX G SECTION G801 OTHER BUILDING WORK**

**G801.4 Retaining walls, sidewalks and driveways.** Retaining walls, sidewalks and driveways shall meet the requirements of Section 1803.4.

## **APPENDIX J SECTION J103 PERMITS REQUIRED**

**J103.1 Permits required.** Except as exempted in Section J103.2, no grading shall be performed without first having obtained a permit therefore from the building official. A grading permit does not include the construction of retaining walls or other structures.

## **SECTION J108 SETBACKS**

**J108.3 Slope protection.** Where required to protect adjacent properties at the toe of a slope from adverse effects of the grading, additional protection, approved by the building official, shall be included. Such protection may include but shall not be limited to:

1. Setbacks greater than those required by Figure J108.1.
2. Provisions for retaining walls or similar construction.

## **2006 International Residential Code References**

### **SECTION R105 PERMITS**

**R105.2 Work exempt from permit.** Permits shall not be required for the following. Exemption from permit requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this jurisdiction.

3. Retaining walls that are not over 4 feet (1219 mm) in height measured from the bottom of the footing to the top of the wall, unless supporting a surcharge.

### **SECTION R403 FOOTINGS**

**R403.1.7.1 Building clearances from ascending slopes.** In general, buildings below slopes shall be set a sufficient distance from the slope to provide protection from slope drainage, erosion and shallow failures.

Except as provided in Section R403.1.7.4 and Figure R403.1.7.1, the following criteria will be assumed to provide this protection. Where the existing slope is steeper than one unit vertical in one unit horizontal (100-percent slope), the toe of the slope shall be assumed to be at the intersection of a horizontal plane drawn from the top of the foundation and a plane drawn tangent to the slope at an angle of 45 degrees (0.79 rad) to the horizontal. Where a retaining wall is constructed at the toe of the slope, the height of the slope shall be measured from the top of the wall to the top of the slope.

### **SECTION R404 FOUNDATION AND RETAINING WALLS**

**R404.1 Concrete and masonry foundation walls.** Concrete and masonry foundation walls shall be selected and constructed in accordance with the provisions of Section R404 or in accordance with ACI 318, ACI 332, NCMATR68–A or ACI 530/ASCE 5/TMS 402 or other approved structural standards.

When ACI 318, ACI 332 or ACI 530/ASCE 5/TMS 402 or the provisions of Section R404 are used to design concrete or masonry foundation walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the jurisdiction having authority. Foundation walls that meet all of the following shall be considered laterally supported:

1. Full basement floor shall be 3.5 inches (89 mm) thick concrete slab poured tight against the bottom of the foundation wall.
2. Floor joists and blocking shall be connected to the sill plate at the top of wall by the prescriptive method called out in Table R404.1(1), or; shall be connected with an approved connector with listed capacity meeting Table R404.1(1).
3. Bolt spacing for the sill plate shall be no greater than per Table R404.1(2).
4. Floor shall be blocked perpendicular to the floor joists. Blocking shall be full depth within two joist spaces of the foundation wall, and be flat-blocked with minimum 2-inch by 4-inch (51mm by 102mm) blocking elsewhere.
5. Where foundation walls support unbalanced load on opposite sides of the building, such as a daylight basement, the building aspect ratio,  $L/W$ , shall not exceed the value specified in Table R404.1(3). For such foundation walls, the rim board shall be attached to the sill with a 20 gage metal angle clip at 24 inches (610 mm) on center, with five 8d nails per leg, or an approved connector supplying 230 pounds per linear foot (3.36 kN/m) capacity.

**R404.5 Retaining walls.** Retaining walls that are not laterally supported at the top and that retain in excess of 24 inches (610 mm) of unbalanced fill shall be designed to ensure stability against overturning, sliding, excessive foundation pressure and water uplift. Retaining walls shall be designed for a safety factor of 1.5 against lateral sliding and overturning.