



Bruce Barker is the founder and president of Dream Home Consultants LLC and the author of **Everybody's Building Code**, written to help home inspectors understand the International Residential Code. Bruce has been building and inspecting homes since 1987. He currently serves as ASHI Treasurer. He is a certified Residential Combination Inspector and a licensed contractor in Arizona, Florida and North Carolina. To read more of Bruce's articles or if you need a presenter at your next chapter event, go to www.dreamhomeconsultants.com.

nce again, The Word invites you to travel into the dark realm of subjects that may be of interest to home inspectors. The Word hopes you will find this trip informative and maybe a little entertaining.

Our subject this month is **retaining walls**. The Word finds this subject interesting because retaining walls are out of scope of a home inspection, except when they are in scope. There is, therefore, some confusion about when we are required to inspect retaining walls and about how to inspect them when required.

REQUIRED RETAINING WALL INSPECTION

Item 4.1.A.5 of the ASHI Standard of Practice for Home Inspections (SoP; https://www.homeinspector.org/standards-of-practice) requires us to inspect and to report defects in retaining walls *if the wall is likely to adversely affect the building*. Is this clear to everyone? The Word didn't think so. Let's dissect this sentence.

The words *inspect* and *defect* are identified in the SoP. *Inspect* is a defined term that means to visually examine the readily accessible parts of the retaining wall. Readily *accessible* is also a defined term that means we do not have to move things or take things apart to perform the inspection. Defects are identified in SoP item 2.2.B.1 as "...systems and components inspected that...are not functioning properly, significantly deficient, unsafe, or are near the end of their service lives." This leaves us with the question of how to define "adversely affect the building."

OUR SUBJECT THIS MONTH IS: RETAINING WALLS

THE WORD: RETAINING WALLS

By Bruce Barker

The opinions expressed in this article are those of the author only and do not necessarily reflect the opinions or views of ASHI. The information contained in the article is general and readers should always independently verify for accuracy, completeness and reliability.

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Photo 1. Back yard supported by a retaining wall. Note that this places a significant lateral load on the wall.

The Word defines "adversely affect the building" like this: If wall failure would damage the building or would cause an unsafe condition near the building, then inspection of the retaining wall is in scope of a home inspection. This situation requires a judgment call by the inspector based on conditions at the inspection.

Photos 1 and 2 provide an example of a judgment call. Photo 1 is the back yard of a house. Photo 2 is the retaining wall that supports the back yard. Failure of this retaining wall may not directly affect the house, but it would sure be a major problem! The Word reported this retaining wall, with a recommendation for immediate analysis by an engineer. These pictures are also a good example of a lateral load imposed on a retaining wall.

As a practical matter, The Word inspects most retaining walls on the property that are visible from the building being inspected. Clients have an expectation that their inspector will do this. If The Word does not inspect a retaining wall, he disclaims inspection, states the reason why, recommends that someone inspect the retaining wall and warns that the retaining wall may have defects. This limitation statement formula is the one we should use when disclaiming inspection of a system or component.



Photo 2. Retaining wall near failure.

Retaining walls can be installed to terrace a steep hill to create a more aesthetically pleasing appearance and to make the hill easier to maintain.

WHAT IS A RETAINING WALL?

A retaining wall is a structure that is intended to separate an area at a higher elevation from an area at a lower elevation. Retaining walls often are used to create a more useful level surface in front of the retaining wall. When installed near the building, retaining walls may be intended to allow installation of openings, such as a basement door, that would otherwise be below grade. Retaining walls can be installed to terrace a steep hill to create a more aesthetically pleasing appearance and to make the hill easier to maintain. Short retaining walls can be used to make landscaping more visually appealing. These short retaining walls are sometimes called landscape or garden walls.

RETAINING WALL REQUIREMENTS

International Residential Code 2018 (IRC) R404.4 is the only reference to retaining walls in the IRC that The Word knows about. Local jurisdictions and some homeowner associations may have other requirements.

IRC R404.4 requires the following engineering designs for retaining walls:

- not supported at the top (most are not) and at the bottom, and
- retain more than 48 inches of soil, or
- retain more than 24 inches of soil and support a lateral load in addition to the soil; a lateral load would be something like a footing or a driveway (Illustration 1).

IRC R105.2 requires a building permit for retaining walls that are more than 48 inches tall, measured from the bottom of the footing, and for retaining walls that support a lateral load. It is prudent for inspectors to disclaim structural inspection of retaining walls that fall into these categories, to recommend a permit check for these retaining walls and to recommend an engineer evaluation of these retaining walls if the client wants additional information about their condition.



Illustration 1

RETAINING WALL MATERIALS

A retaining wall can be built with just about anything that can support the retained material and anything that has a reasonable service life in a wet environment. Preservative-treated wood is the most commonly used material in many markets, especially for newer walls. It is usually the least expensive alternative. Masonry (concrete blocks and brick) is also a commonly used material. Retaining walls made of stacked natural (rubble) stone have been used for thousands of years. These walls often are limited to 2 or 3 feet tall (Photo 3). Concrete walls can be found in residential applications, but these walls are less common because of high cost and poor aesthetics. Precast interlocking blocks are becoming popular. These block walls are also known as segmented blocks and landscaping blocks. A gabion retaining wall uses rubble stone retained in a wire cage. Gabion walls are uncommon.

Retaining walls should be built to drain water that may accumulate behind the retaining wall. The ideal water management system includes gravel and landscape fabric installed directly behind the retaining wall. The system includes drainage openings (weep holes) or some other way for water to escape. Unfortunately, the ideal water management system is uncommon and is not visible for inspection anyway. The lack of weep holes or other drainage means is a visible defect that should be reported.

Retaining walls should be built to drain water that may accumulate behind the retaining wall.



Photo 3. Typical natural stone retaining wall.

WOOD RETAINING WALLS

Wood retaining walls are usually built using pressure-preservative-treated wood, or using wood treated with creosote or a similar petroleum-based product. Pressure-preservative-treated wood should be rated for ground contact (UC4A or better). There is no way to visually determine the preservative rating of the wood unless the manufacturer's tag is still affixed to it (this is uncommon). The wood should be at least about 3 inches by 5 inches for structural stability and for longer service life, although any ground contact-rated wood is allowed if it is adequately supported at the bottom and laterally. Footings are not specifically required for wood retaining walls, but they are highly recommended, especially for taller walls, walls whose failure would adversely affect the building and walls in cold climates. Compacted crushed stone is the recommended footing material. Compacted sand may be used in some situations. Footings are usually not visible and we are not required to inspect for their presence or adequacy.

Taller wood retaining walls (about 4 feet or more) and those supporting a lateral load should be built using tiebacks and deadmen, or using buttresses, to provide lateral support (Illustration 2). Photo 4 shows an example of a lateral load. Look for the end grain of wood that should indicate the presence of a tieback (Photo 5). We hope there is a deadman attached to the tieback.



Illustration 2



Photo 4. Wood retaining wall with a lateral load. Wood may not be ground contact rated.



Photo 5. Red arrow points to a tieback.

MASONRY RETAINING WALLS

Masonry retaining walls and concrete retaining walls should be supported by a concrete footing. This footing may need to be extra wide and extra deep to help the wall resist rotation. Steel reinforcing bar vertical dowels should be placed in the footings for taller walls to help the wall resist sliding off of the footing. Horizontal reinforcing bars also may be necessary to provide lateral load resistance and the cells of taller concrete block walls should be fully grouted. Grout is concrete with a high water content, which helps it flow into the cells. Of course, none of this is usually visible during our inspection.

INTERLOCKING BLOCK WALLS

Interlocking block walls are built using manufactured concrete blocks. The blocks sold at the big-box retailers may be limited to 2 or 3 feet tall. Other systems may be as tall as the manufacturer or an engineer will allow. Some systems have lips on the bottom to resist lateral movement. Other systems use pins to secure the blocks. Blocks should be installed according to manufacturer's instructions for the system.

Footings made using crushed stone may be acceptable for lower-height walls using some systems. Taller walls may need a concrete footing and reinforcing rods similar to a masonry wall.

GUARDS AT RETAINING WALLS

2018 IRC R312.1.1 states that a guard is required where a walking surface is more than 30 inches above the floor or above grade. The Word interprets this to mean that a guard is required at a retaining wall if the area on the high side of the retaining wall can reasonably be considered a walking surface. Driveways and walkways are walking surfaces. Any area that is regularly used for recreation or that is regularly accessed for maintenance (e.g., lawn mowing) is probably a walking surface. Whether other areas are walking surfaces is subject to interpretation.

Whether and how an inspector reports the lack of a guard at a retaining wall depends on the situation. An inspector should report lack of a guard at a retaining wall as a defect if the inspector determines that the situation qualifies as significantly deficient or unsafe. The inspector may report lack of a guard at a retaining wall as information if the inspector believes that the client may want to consider installing a guard at some point in the future as an upgrade. The inspector may ignore lack of a guard at a retaining wall if the area on the high side of the wall cannot reasonably be considered a walking surface.

TYPICAL DEFECTS

The following are retaining wall defects that inspectors may wish to report.

- ADVANCED DETERIORATION OF WOOD WALLS. Wood retaining walls have an average expected service life of 10 to 20 years. This depends to a significant extent on the wood used, type and level of preservative treatment, climate and drainage provisions. Eventually, wood retaining walls need to be replaced.
- DEFORMATION, INCLUDING ROTATION, BULGING AND SLIDING. The Word is not aware of an accepted standard for how much deformation is too much. Any visible sliding off of the footing is probably too much. Rotation and bulging more than 1 inch in 8 feet may be too much. A possible good rule of thumb: If the deformation is obvious, it may be too much (Photo 6).



Photo 6. This unreinforced concrete block retaining wall has failed. Failure will adversely affect the building.

- CRACKING OF MASONRY AND CONCRETE WALLS. Again, there is no accepted standard. A crack exceeding ¼ inch wide or one that presents out-of-plane displacement may be too much.
- LACK OF TIEBACKS AND DEADMEN IN WOOD WALLS. Wood retaining walls taller than 4 feet should have tiebacks and deadmen installed for lateral support.

 EROSION UNDER THE WALL. Poor water management and improperly installed footings can cause erosion under the wall. This is a potentially serious defect that may require removal and reinstallation of the wall (Photo 7).



Photo 7. This interlocking block retaining wall does not appear to have a footing. Erosion is occurring under the wall. The wall is probably too tall for the material.

- WALL TOO TALL FOR MATERIAL. The solid blocks with lips on the bottom sold at big-box retailers may be limited by the manufacturer to between 2 and 3 feet tall. Walls built using other materials may be taller, but remember that the IRC requires an engineered design for walls taller than 4 feet.
- ABSENCE OF DRAINAGE OPENINGS. Solid walls such as concrete, masonry and interlocking blocks should have drainage openings (weep holes) to allow water to drain from behind the wall. The weep hole should be open (Photo 8).



Photo 8. This wall has no visible drainage openings. Water on blocks indicates a possible water management problem.

- LOOSE COMPONENTS. All components should be stable and should not show evidence of movement out of position.

THE BOTTOM LINE

Retaining walls can be expensive. Wood walls can cost between \$10 and \$15 per square foot or more. Walls made using other materials can cost between \$15 and \$30 per square foot or more. Failure to report a significant retaining wall defect can result in a costly claim, even if the wall may be out of scope. The prudent inspector, therefore, either inspects retaining walls and reports visible defects, or disclaims inspection of the walls in the report. Memo to Gaea, goddess of the earth: The Word does not reside on Mt. Olympus (just at its base) and welcomes other viewpoints. Send your lightning bolts or emails to Bruce@DreamHomeConsultants.com. The thoughts contained herein are those of The Word. They are not ASHI standards or policies.