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► INTRODUCTION

The exterior components of a building work together to provide a weathertight skin, if all the parts are doing their job. Protection against intruders, both animal and human, is also offered by the building skin. Good exteriors are attractive, durable and require little maintenance. Exterior components are often the most neglected parts of a home.

► 1.0 GUTTERS AND DOWNSPOUTS

Function

Gutters and downspouts have two major functions. Firstly, they protect the walls of a building from water which would ordinarily run off the roof. This water can damage the wall surfaces and cause localized erosion at ground level.

The most important function of gutters and downspouts, however, is their contribution towards ensuring a dry basement. Regardless of the type of foundation wall, there is always the possibility for water penetration. Therefore, the less water there is in the soil near the foundation wall, the less likelihood of water penetration into the basement. Gutters should collect all water run-off, and downspouts should discharge the water into proper drains or onto the ground a good distance away from the foundation walls.

Size

On most houses, the gutters are attached to the fascia board at the edge of the eaves. In some houses, gutters are integral to the design of the eaves. The two most common sizes of gutters are four inch and five inch widths. Four inch gutters are acceptable for controlling the run-off from relatively small roof areas; however, five inch gutters are preferred because of their additional capacity. Five inch gutters are also less likely to allow water to overshoot the gutters when the water is draining off a steeply pitched roof.

Leakage

The most common problem with gutters is leakage. Leakage will occur with galvanized gutters as they rust through. Eventually, holes can develop in copper gutters as well. All types of gutters are prone to leakage at the joints. Missing end caps are another common source of leakage. Leakage can cause considerable damage to fascias, soffits and walls below.

Loose

Gutters often become loose and require resecuring. This is normally due to improper fastening during original installation or damage caused by ice during winter months.

Damage

Gutters and downspouts suffer from mechanical damage due to ladders, tree limbs, and the like.

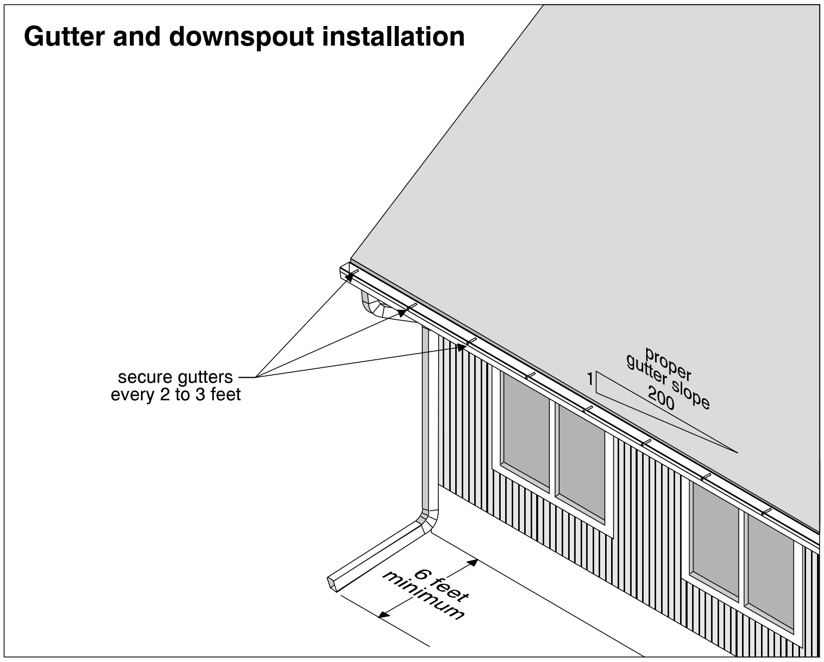
Gutters should slope properly towards downspouts so as not to hold water.

Debris

Gutters often clog with debris. Sometimes, screens are installed to prevent leaves and twigs from getting into the troughs. These do not work well. They become loose and often fall out. They also make proper cleaning very difficult.

Integral or Built-in Gutters

Malfunctioning integral gutters can be very serious. The water leaking out of the gutters usually ends up in the structure, causing rot and other damage.



Downspouts

On many houses, the number of downspouts is inadequate. As a general rule, a downspout should be provided for every forty feet of gutters. Downspouts become disconnected from gutters, or get plugged with debris (particularly at elbows). Special screens are available for the top of downspouts to prevent the entry of debris. These screens must be cleaned regularly.

Downspouts are sometimes not well secured to the wall. They also tend to split open at the seams (from freezing). The seam is usually against the wall.

Downspouts along driveways or sidewalks are sometimes crimped. Galvanized steel downspouts often rust near grade level or where blockages have occurred.

1.1 Materials: Gutters can be made of several materials; however, the most common are aluminum, galvanized steel, plastic and copper. Integral gutters are usually framed in wood, and lined with metals such as lead or copper. There are advantages and disadvantages to the various materials used.

Aluminum

Aluminum gutters do not rust but they dent easily, particularly with tall, heavy ladders. Joints in aluminum gutters are usually riveted together and caulked. The caulking must be renewed every few years. Fortunately, the number of joints required in aluminum gutters is less than with other types of systems, as it is often fabricated on the job site from long rolls of aluminum stock. Aluminum gutter is also pre-finished and, therefore, is low maintenance. Life expectancy is estimated to be twenty to twenty-five years.

Galvanized Steel

Some galvanized steel gutters are also pre-finished but most are not. Galvanized steel requires periodic painting. Joints in galvanized gutters are usually soldered together. This type of gutter has a twenty to twenty-five year life expectancy.

Plastic

Plastic gutters are generally designed for the do-it-yourselfer. Plastic comes in a limited color selection and some types tend to discolor with time. It is usually relatively small in size and some of the earlier systems are prone to cracking during cold weather. Its life expectancy is dependent upon the quality of the kit and the installation.

Copper

Copper gutters are considered to be the best; however, they are very expensive and not common. Copper can last fifty to one hundred years.

Wet *Basements*

1.2 Downspout Discharge: Downspouts take the water from the gutters and discharge it into drains or onto the ground. Underground drains (usually made of clay tile, cast iron or plastic) have a habit of plugging or breaking from frost action. This cannot be determined from a visual inspection. If an underground drain malfunctions, localized water problems will likely develop in the basement in the area of the downspout. If this occurs, there are two options. Exterior digging and repairs can be undertaken; however, it is usually more advantageous to simply disconnect the downspout and redirect it to discharge away from the house.

All downspouts which discharge onto the ground should discharge a good distance away from the house (six feet or more, if possible). The slope of the ground in this area should be away from the house to direct water away from the basement.

On older homes, (pre 1950) downspout drains are often connected to floor drains in the basement. If there is a significant amount of debris in the discharge from the downspouts, it can plug the basement floor drains and cause backup. A more complete discussion of wet basement problems is included in 10.0 of the Interior section.

Onto Roof

Where downspouts discharge from an upper roof onto a lower roof, the section of the lower roof in the path of the water will deteriorate quickly. It is best to extend the downspout along the lower roof to discharge directly into the lower roof gutter.

► 2.0 LOT GRADING

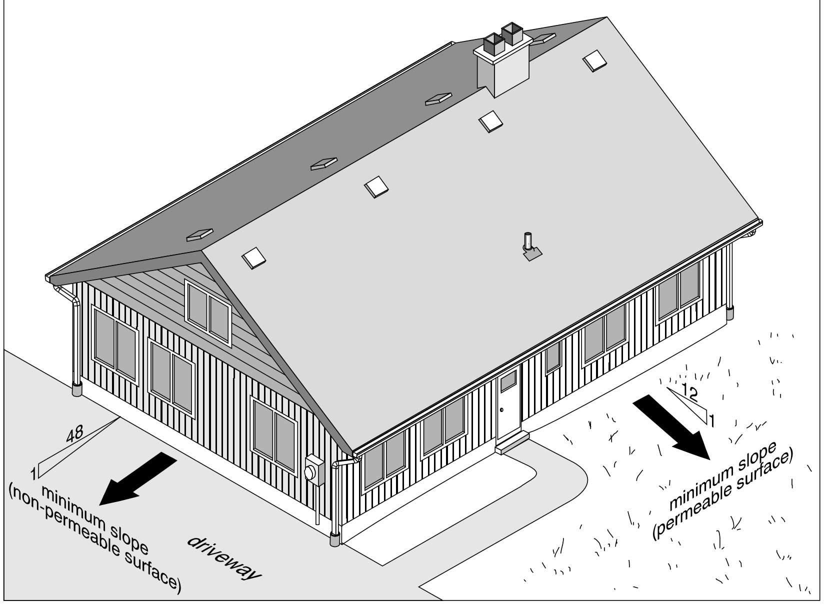
Proper lot grading is an important consideration when dealing with wet basements. No foundation wall system is completely impervious to water. Therefore, the likelihood of water penetration problems into basements and crawl spaces is partially dependent upon the grading of the lot adjacent to the foundation walls.

Wet Basements

The theory is simple. If there is less water in the soil on the outside of the foundation wall, there is less chance of water getting to the interior. While there are exceptions to the rule, it can safely be said that the majority of wet basement problems can be eliminated, or at least reduced to a tolerable level, by improvements to exterior grading and proper performance of gutters and downspouts. The ground immediately adjacent to the foundation wall should slope away from the house at a rate of one inch per foot for at least the first six feet. This can usually be done by adding topsoil (not sand or gravel).

Where the general topography of the lot and surrounding lots is such that water is directed towards the house, further measures are sometimes required. A swale (a shallow ditch with gently sloped sides) may have to be constructed to divert water run off around the house to areas which are lower-lying.

Recommended grading slopes



If the general topography of the neighborhood is such that the house lies in the lowest area, grading improvements may improve the situation; however, further measures may be necessary. See 10.0 of the Interior section for more information on wet basement problems.

Ravine Lots

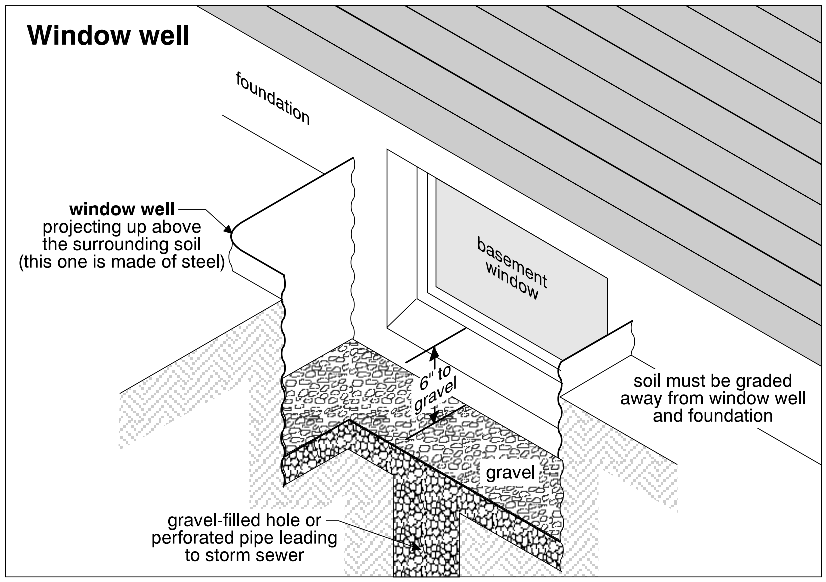
Ravine lots have potential erosion problems which can, in extreme cases, have catastrophic effects. Erosion can compromise the structural integrity of the house if the table land keeps disappearing.

From a one-time visit, it is not possible to determine the rate of erosion (if any); however, the presence of mature trees and heavy vegetation on the steeply sloped portions of the lot are a good sign in that they reduce erosion.

To prevent continuing problems, a soils engineer and/or landscape architect should be engaged to design retaining walls or other systems to hold back the earth, where erosion is noted.

2.1 Window Wells: When regrading, difficulties may be encountered with basement windows. Increased soil height adjacent to the house may partially bury basement windows. Under these circumstances, or with any basement window which is at or near ground level, a window well should be provided. It will prevent water penetration through the window, prevent rotting of window frames, break wood/soil contact and keep the window cleaner.

Window wells should be large enough to allow light in and should allow for easy cleaning of the window and well.



Drainage and Covers

Ideally, the bottom of the window well should contain several inches of gravel to allow water to drain from the well. A drainage pipe, filled with gravel (to prevent it from collapsing, but still allowing water to pass) should extend down to the drainage tile around the perimeter of the footing (if one exists). As an alternative, a clear plastic dome cover can be installed over the window well to keep water and debris out.

Window wells are most often constructed of concrete or a corrugated steel shell. Chemically treated wood can sometimes be used; however, it should be avoided in termite prone areas.

► 3.0 DOOR, WINDOWS AND TRIM

The primary purposes of trim components on the exterior of a house are to protect the structural components from weather, prevent the entry of vermin, and to improve the appearance of the house. Trim is usually found around doors and windows, and at the eaves. The two most common components of the eaves are soffits and fascia. The soffit is installed horizontally, and covers the underside of the eaves. The fascia is a vertical component at the edge of the eaves. Normally, gutters are fastened to the fascia.

Aluminum

Trim components on houses are most commonly made of wood or aluminum. If aluminum components have been properly installed, they are relatively maintenance free. Occasionally, some sections require resecuring.

Wood

Wooden trim components require regular painting, and maintenance. Trim components are often found to be rotted, missing, loose or damaged by vermin. Squirrels, birds and raccoons damage soffits and fascia to gain access to the attic space.

Painting and Caulking

Exterior trim components including those around windows and doors, as well as soffits and fascia, are prone to weathering and to opening up at seams and joints. Improvements to paint and caulking should be considered regular maintenance items with some work typically required annually.

See also 4.16, Doors and Window Flashings in this section

► 4.0 WALL SURFACES

The primary function of wall finishes is to protect the building skeleton and interior from weather and mechanical damage. In some cases, the wall surfaces enhance the structural rigidity of the building (e.g. houses constructed of solid masonry, or log houses) where the exterior components are structural members.

Vines

Vines and other vegetation are often found growing on wall surfaces. The disadvantages include increased levels of moisture held against the wall surfaces, and increased insect and vermin problems in the house. Depending on the type of plant, and the surface, considerable damage can be done. In the majority of cases, extensive damage does not occur. Each case should be examined individually, and if no damage is evident, should simply be monitored.

Vines should be kept away from wood trim around windows, doors and eaves for example, and should not obstruct water flow through gutters and downspouts.

Characteristics

4.1 Brick: The two most common types of brick are clay and concrete. The characteristics of brick vary dramatically. Some brick surfaces are relatively soft, and erode with time. Other bricks are extremely hard. They can be easily damaged by mechanical action, or can crack due to water penetration and freeze-thaw action. Some bricks are extremely porous; others less so. Some bricks have a hard glazed outer surface; others are uniform throughout. Most bricks are not designed to be in contact with the soil, and should be kept six inches above grade.

Spalling

Damage to brick surfaces, whether due to mechanical damage, freeze-thaw action or something else is known as spalling.

Sandblasting

Brick is usually damaged by sandblasting. Brick which has a soft core and a harder crust is common on older houses (the same houses which tend to require brick cleaning). Sandblasting removes the outer crust and makes the brick more prone to deterioration. Once a house has been sandblasted, it is not possible from a single inspection to determine the rate of deterioration. This often requires monitoring over several years to determine if any remedial action is necessary.

Sealing

Sealing the brick with a vapor permeable sealant or paint (to allow the brick to breathe) is sometimes successful. In extreme cases, brick requires replacement or covering with a material such as stucco.

Chemical Cleaning

Chemical cleaning is an alternative to sandblasting which, although more costly, is less likely to damage the brick. The chemicals used are closely guarded secrets, but generally are based on muriatic acid. This is a very strong acid and use by the lay person is discouraged. Even left to the professional, the results are somewhat unpredictable. It is strongly recommended that a small test patch be done first, to ensure a satisfactory end product.

The chemicals are typically applied and allowed to soak for some time before washing off with a high pressure water spray. It is of course, more difficult to clean painted walls than walls which are just dirty. Care should be taken to minimize damage to vegetation at the base of the walls. It is common for some mortar damage to occur during cleaning, and repointing is usually necessary in at least localized areas.

Mortar

Mortar is a mixture of a binder (portland cement, lime, masonry cement), an aggregate (sand), and water. There are a great many types of mortars with a multitude of strengths, colors, and durability. Additives such as calcium chloride can enhance cold weather workability at the expense of strength and durability.

Mortar has several functions. It bonds individual masonry units together and prevents moisture penetration between units. It allows a tight joint between different masonry units despite size variations from one unit to the next. It provides a base for ties and reinforcing, used to secure the masonry wall to a back-up wall, or to enhance the strength of the entire wall. Mortar can form part of the architectural appeal of a masonry wall. Mortar used to secure bricks varies in strength and composition. Mortar deterioration is more common than brick deterioration. Ideally, the strength of mortar should be similar to, but not greater than, the strength of the brick. Sandblasting and high pressure liquid cleaning often damage mortar, and repointing is usually necessary.

A discussion of the many problems with mortars is beyond the scope of this book. Suffice to say that the majority of problems are the result of improper mixes, or careless workmanship.

Efflorescence

The white salty deposit which appears on many masonry walls is known as efflorescence. It is a result of water carrying dissolved salts to the surface of the unit and evaporating, leaving the crystalline salts on the surface. Efflorescence may be caused by low quality mortars or masonry units, or by excessive water penetration into or through the wall. In most cases it is not serious, and will disappear within a few months of new construction or chemical cleaning. Occasionally, efflorescence precedes mortar or masonry deterioration.

4.2 Stone: Many different types of stone surfaces are used in home construction. Some are constructed of extremely hard igneous rock such as granite, while most are constructed of softer sedimentary rock such as limestone, While stone surfaces are generally considered to be more durable than brick, they do suffer the same ills. Stone can crack or erode; however, the rate of deterioration is generally slower than that of brick. The quality and type of mortar used in stone construction varies, and mortar repairs are far more common than repairs to the stone itself.

4.3 Concrete Block: The use of concrete blocks as exterior wall coverings for residential construction is relatively rare; however, concrete blocks can function quite well as an exterior wall surface. Deterioration largely depends upon the configuration of the block (surface texture and shape) and the quality of the concrete. Concrete blocks are relatively porous and some can allow a significant amount of water penetration through the block. Painting the block can reduce water penetration significantly. As with all unit masonry construction, mortar deterioration is a common problem.

Conventional Stucco

4.4 Stucco: Stucco is really the exterior equivalent of plaster, made of cement, lime, aggregate and water. Stucco can be thought of as a thin coat of concrete, with the cement and lime acting as binders, the aggregate providing the bulk and the strength, and the water initiating the chemical reaction. Much like plaster, it requires periodic maintenance as cracks develop. The amount of maintenance required depends largely upon the mix of the stucco, the lath used (if any), and the surface to which the stucco is applied.

Stucco over masonry walls tends to stand up significantly better than stucco over wood-frame construction. The rigidity of a masonry structure allows for virtually no flexing of the stucco, and consequently, less cracking and surface separation is likely to occur. Wood-frame walls expand and contract with changes in temperature and humidity, at a different rate than stucco. This leads to cracking which allows moisture deterioration, and separation of the stucco from the lath. Cracks and bulges often appear near floor levels because wood framing members shrink most in this area. See the discussion of Wood Shrinkage in 6.4 of the Structure section.

Repairs that match in color and texture are difficult to make. Stucco can be painted.

Synthetic Stucco (EIFS)

Exterior Insulated Finish Systems look similar to stucco but are constructed of different materials. Rigid wall sheathing, such as plywood, is covered with foam insulation board. A thin base coat reinforced with fiber-glass mesh is then applied and covered by a thin acrylic finish coat.

Problems

Water gets behind the finish and insulation where it gets trapped. The water ultimately leads to rot of the sheathing and other structural components.

Water Penetration

The water enters the wall system at locations where the stucco meets wall penetrations such as doors and windows. As there is seldom proper flashings at these locations it is imperative that the seams be well caulked. This is an ongoing maintenance issue.

Improved installation methods include the use of building paper between the insulation and sheathing and a drainage path for any water which does get into the wall. Unfortunately, neither trapped water or rot in the wall cavity are visible during a home inspection.

4.5 Wood Siding: There are many different types of wood siding. Problems associated with wood siding include rot and water penetration. Rot will occur wherever wood surfaces are subject to excessive moisture. Therefore, painting or staining is required on a regular basis. Even rot resistant woods such as cedar and redwood are helped by staining. Stain reduces warping, splitting, rot and discoloration. Water penetration and rot problems are most common at joints in the siding. Joints should be designed in such a way as to prevent water penetration. The horizontal joints on clap-board siding, for example, overlap one another; however, most vertical joints on this type of siding do not. Therefore, vertical joints should be caulked.

Ventilation

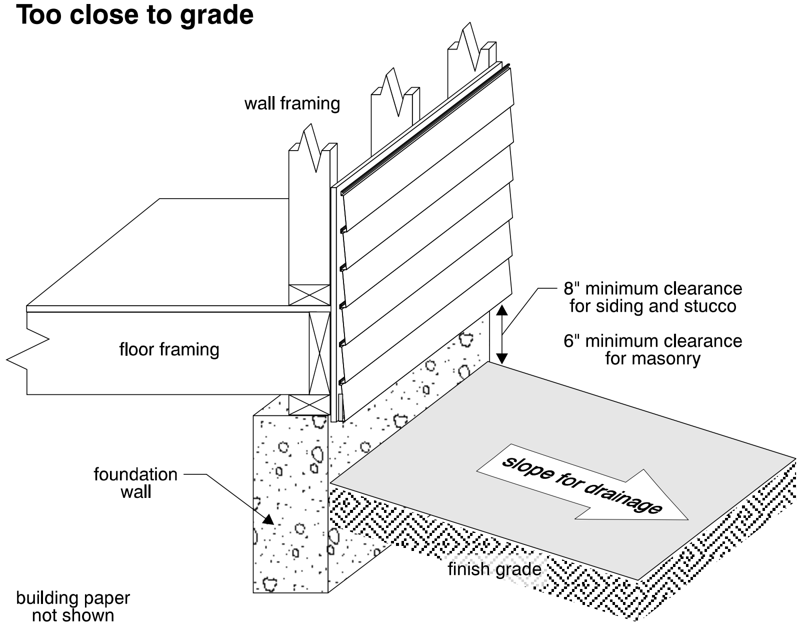
Wood siding holds paint better and lasts longer if the back of the siding has some air circulation. Old siding nails had round heads so that the overlapping piece of siding above would not sit tightly against the lower piece. This allowed some air circulation and broke the capillary joint between the two pieces of wood. This is a practice which has unfortunately disappeared. Where peeling paint is a problem, shims can be driven between the boards to promote drying.

Joints

With panel type wood siding, the majority of the problems occur at horizontal joints, as there is usually no overlap or batten strip. In well executed installations, a flashing is installed at horizontal joints to prevent water penetration.

Many wood siding systems require pieces of wood trim to be installed over the joints. The top surfaces of these pieces of trim are prone to rot. The rotted wood eventually allows water penetration at the joints. Horizontal surfaces should be kept well stained or painted, should be slightly sloped so water will drain off, and should be caulked where they meet vertical surfaces.

Too close to grade



Splitting

Wood siding may split if improperly nailed. Too many nails may prevent natural expansion and contraction. Nailing too close to the edges will result in splitting.

Wood/Soil Contact

Wood/soil contact should also be avoided, as it promotes rot and provides an ideal environment for wood-boring insects. Wood siding should be at least eight inches above the soil.

Paint and Stain

With the exception of cedar, redwood, and pressure treated lumber, all wood used outside should be protected with paint or stain. Painting or staining is usually done every three to five years.

4.6 Metal Siding: A variety of metal sidings is available. Some are installed vertically, while others are installed horizontally. The most common materials are aluminum and steel. Of these, aluminum is used more frequently. Most problems associated with metal sidings are installation defects, rather than deficiencies with the materials themselves. A lack of adequate securing, and a lack of moldings and trim pieces where the siding butts other materials or changes direction are the most common problems. Metal sidings usually have a baked-on enamel finish and, generally speaking, the painted surfaces stand up well. However, some lower quality or older sidings tend to fade and chalk.

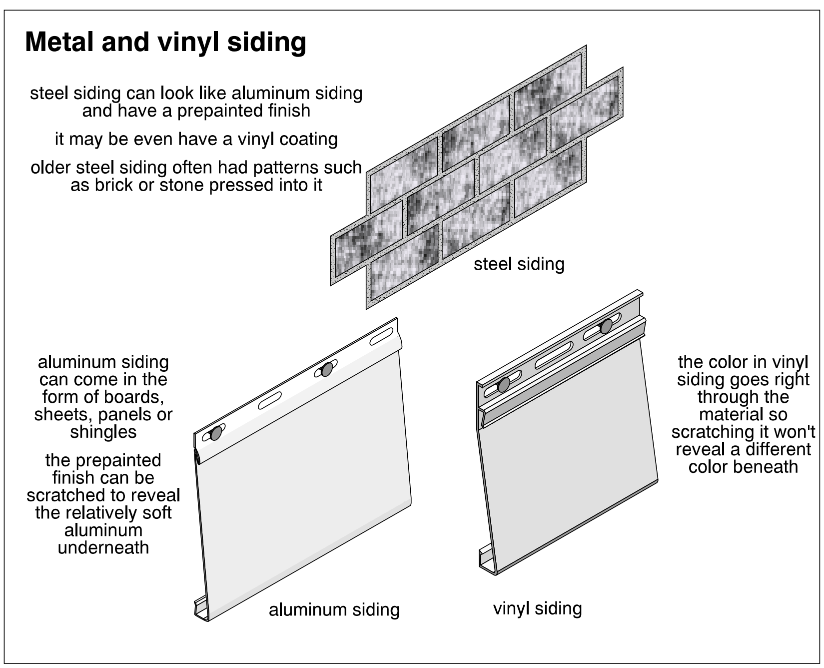
Ventilation

Metal sidings should be ventilated to allow air and moisture pressures to equalize on either side of the metal. Some early sidings did not breathe well and led to moisture problems in walls.

Insulated metal siding is available, although the amount of insulation is very small, typically.

Denting and Buckling

Metal sidings are prone to denting (particularly aluminum). Damaged sections can be replaced on an individual basis. Metal sidings expand and contract with changes in temperature. It is not uncommon to hear expansion noises when sunlight warms a wall of the house. Slots in the siding accommodate the nails. As the siding expands and contracts relative to the substrate, the siding can slide. If the nails are secured too tightly, the siding may buckle.



4.7 Vinyl Siding: Vinyl sidings are similar to metal sidings in that the majority of the problems are associated with installation, as opposed to the material itself. A lack of proper securing, and improper detail work at edges and corners are the most common deficiencies. Some vinyl sidings discolor with age. Most come in a limited color selection. Vinyl siding can become brittle during cold weather, and can be punctured or cracked. Individual pieces, however, can be replaced. Buckling vinyl siding may be the result of shrinking wood framing behind, or securing the siding too tightly to the substrate.

4.8 Wood Shingles: Wood shingles are normally cedar or redwood. Ideally, wood shingles should be stained on a regular basis for aesthetic reasons. Staining can be eliminated; however, the aging process on shingles used as siding is somewhat different than the aging process for wood shingles used as roofing material. Sections which are protected from sunlight and moisture will not age at the same rate. This results in sections which appear to be discolored. This is a cosmetic concern only. With age, wood shingles will lose their resins, and begin to warp and crack. As a general rule, when more than fifteen percent of the shingles require repair or replacement, total replacement is advisable.

Wood shingles can be painted; however paint sometimes peels from wood shingles as moisture escapes from the shingles. Staining is preferred.

4.9 Asphalt Shingles: Asphalt roofing shingles are sometimes used as siding. The biggest problem associated with using shingles in this orientation is that the shingles do not tend to lie flat. Modern shingles are of the self-sealing variety. A tar strip on the upper portion of one shingle is supposed to adhere to the lower portion of the shingle above, and should prevent the shingle from lifting or curling. Unfortunately, this process relies on gravity (the weight of the shingles) and sunlight (to heat up the shingles and soften the adhesive). This process works well on roofing systems; however, it does not work well when shingles are installed vertically. Therefore, shingles tend to lift, curl, and be prone to wind damage. (Shingles which have just begun to lift can be sealed in place.) They are easily patched, but matching colors is sometimes difficult.

4.10 Fiber Cement: Fiber cement siding comes in shingle form. The material has a long life expectancy; however, it is brittle and subject to mechanical damage. Obtaining replacement components of any variety, much less the same color and texture, is difficult.

4.11 Clay Shingles: Clay shingles or tiles were often used on Victorian and turn of the century houses (usually in small areas, such as a gable). These shingles will easily last 100 years; however, they are brittle and subject to mechanical damage. Fasteners (nails) often fail, allowing individual shingles to fall. Replacements are not available. When painted, clay shingles look very similar to painted cedar shingles (which are sometimes used for repairs).

4.12 Slate Shingles: Slate shingles were often used on Victorian and turn of the century houses for siding on small areas, such as dormers and gables. The slates have an extremely long life expectancy; however, the nails which hold them in place tend to rust, causing the slates to slip out of position. Patching can be undertaken; however, it is difficult to match the color of aged slate. The general rule is that if more than ten to fifteen percent of the slates are damaged, an alternative siding material should be considered.

4.13 Insulbrick: Despite its name, insulbrick has very little insulating value. Various types of insulbrick were commonly used during the thirties, forties, and fifties. Insulbrick can be considered the forerunner to aluminum siding.

Insulbrick consists of a fiberboard sheathing coated with tar and sprinkled with granular material. The surface is embossed to look like brick, or sometimes stone. Obtaining replacement pieces is difficult, as the material is no longer made. Insulbrick siding will eventually wear out; however, the majority of the problems occur due to physical damage, and leaking joints. Caulking and resecuring are necessary from time to time.

NOTE: Insulbrick is frowned on by some insurance companies and lending institutions. This is thought to be due to its combustibility, and the fact that to some people, it connotes low-quality construction. Its bad reputation is unwarranted; however, the material can easily be covered with an alternative siding.

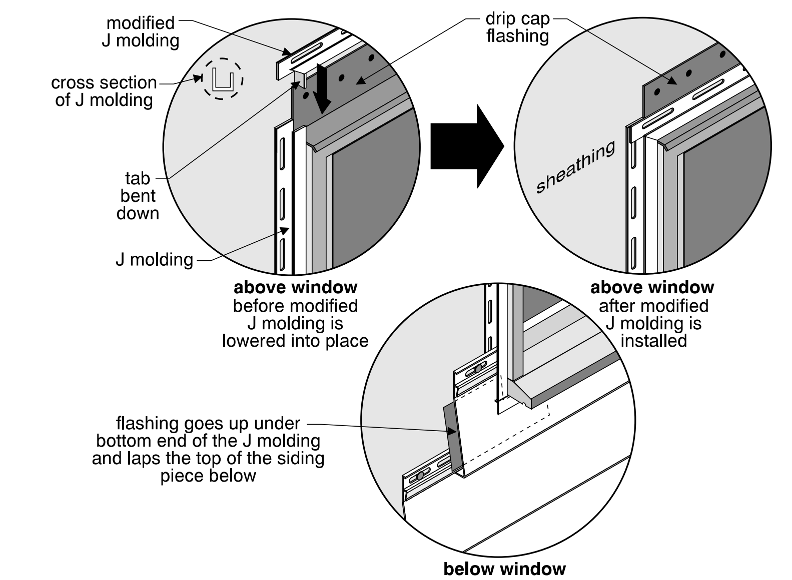
4.14 Artificial Stone: There are two common varieties of artificial stone. One is a brick substitute used on all or a portion of the exterior. The other is a thin veneer-type covering which is less than one inch thick. The former is installed like any other masonry unit. The latter is usually installed by providing wire mesh over the existing wall surfaces and setting the slices in a bed of mortar. The performance of this material is largely dependent upon the quality of the installation. Questions are often asked about how easily the thin slices can be removed. From a visual inspection, this is difficult to tell, as it depends how much damage was done to the original wall surface during the securing of the wire mesh. Also, there is often a considerable amount of mortar bonded to the original wall surface. Removal in this case is very difficult. The material is sometimes painted to change its appearance.

4.15 Hardboard And Plywood: There are a variety of hardboard and plywood sidings on the market. Some simulate wood siding, while others simulate stucco. Depending upon the type of material, the joints are sometimes intended to be covered with pieces of trim. Water penetration behind the trim tends to deteriorate the trim itself, and allow water penetration at the joints. Proper sealing and caulking of the horizontal surfaces of trim are required. Horizontal surfaces of panels which are not designed to be covered with trim should be installed with flashing, unless the joint in the material is specifically designed to prevent water penetration.

Buckling of hardboard siding is a problem caused by expansion of the hardboard when wet. This material expands more than wood when wet and, if it is securely nailed at each stud, it may buckle in or out. Securing the boards with clips or using smaller pieces are alternatives.

4.16 Door And Window Flashings: Some exterior doors and windows are arranged in such a way that the trim projects horizontally from the wall surface. In these cases, water tends to collect on the top of the wood trim, rotting the trim and leaking behind it. Ideally, metal flashings should be provided in these areas. The exposed edge of the metal flashing should be bent out to prevent water from dripping on the surfaces below. The flashing should tuck up under the siding or into a mortar joint in brick construction. (Most windows in masonry houses do not require flashings as the window frames are recessed.)

J moldings around windows



Flashing is not required where the opening is protected by a roof overhang. As a general rule, if the distance from the window or door to the overhang is less than one-quarter of the overhang width, no flashing is needed.

Door and window sills should be sloped so that water drains away from, rather than toward the door or window. The sill should project far enough out so that water can drop off without wetting the area below. Good design incorporates a drip-stop (groove or projection on the underside of the sill), that prevents the water from being drawn back into the siding by capillary action.

4.17 Wood/Soil Contact: Wood/soil contact would be avoided to prevent rot and wood-boring insect infestations. Exterior wood siding material (and any wooden components) should be at least eight inches above the soil.

4.18 Exposed Foundation Walls: On virtually every house, the upper portion of the foundation wall (at least six inches) should be visible from the exterior. If it is not, there is risk of wood rot and/or infestation by wood-boring insects. Even houses with brick on the outside should have exposed foundation walls as there is risk of the sill plate and first floor joists rotting, and risk of deterioration to masonry designed for above grade use only.

Repointing

Foundation walls can be made of stone, brick, concrete block, cinder block, poured concrete, clay tile and wood. Mortar repair (repointing) is often necessary on the above grade portion of unit masonry foundations. Cracks in poured foundations should be patched.

Parging

Sometimes, the exposed foundation wall is parged. This is necessary on porous foundations such as brick or concrete block. It is not uncommon for the parging to separate from the foundation wall and break off. Localized patching of deteriorated parging is easily undertaken. If, however, large scale deterioration or separation has occurred, removal and reparging will be required. Expanded metal lath (of the non-rusting variety) should be secured to the foundation wall to provide a good base for the parging in areas where adhesion is questionable.

The parging should be lime based rather than Portland cement based (permeable as opposed to impermeable). Impermeable parging breaks off in large sections, due to moisture trapped behind it. The impermeable parging also causes dampness to rise up the wall to a level above the parging where evaporation can take place. Evaporation results in efflorescence forming on the wall surface and within the wall itself. This causes spalling brickwork and mortar deterioration. Lime based parging prevents this phenomenon from happening as moisture can pass through it. The parging itself is subject to efflorescence and spalling, but this is treated as sacrifice material.

► 5.0 PORCHES, DECKS, BALCONIES, ENTRANCES AND CARPORTS

5.1 Steps: Steps are commonly made of wood, concrete or masonry. If wood, the steps should be sturdy enough as not to flex with typical pedestrian traffic. One inch to 1-1/2 inches in thickness is normally sufficient. Stringers, the supports for treads, should be close enough together to provide adequate support for the steps.

Rise and Run

Regardless of the material used, all steps should be easy to negotiate. Steps should be at least 9-1/4 inches deep and no more than 8 inches high. They should be arranged in such a way so as not to collect water. Concrete steps should have an adequate footing to avoid settling and frost heaving.

Problems

The most common problems associated with wood steps are rot and attack by insects. Direct wood/soil contact should be avoided to minimize damage by rot, carpenter ants or termites. Carpeting should also be avoided on wooden steps as it retains moisture and promotes rot.

Concrete steps tend to crack or spall. Avoid using salt on these surfaces.

Some steps are constructed of brick. Certain types of brick should not be in contact with the soil as they absorb a considerable amount of moisture and suffer deterioration from freeze/thaw action.

Often, brick or wood steps are replaced with prefabricated concrete units which are relatively inexpensive and maintenance free. They have no frost footings and are allowed to “float”.

Plywood should never be used for steps as the layers of glue tend to trap moisture, creating rot and delamination of the plywood.

5.2 Railings: Railings should be provided wherever there is a danger of falling (when the difference in height is greater than two feet). Railings should be sturdy enough to resist a person’s weight and openings in the railing should be small (roughly four inches or less). Railings should be high enough to provide adequate protection; thirty-two to forty-two inches is common. On wide stairways, railings should be provided on both sides. Railings should not prevent drainage of water off porches, decks and balconies.

The most common problem with railings is their absence in areas where they are needed. Railings are also often loose, rotted or rusted.

5.3 Columns: Porch columns are designed to support a roof and/or a floor system. They can be constructed of wood, metal, poured concrete, or masonry. They must be strong enough to handle the imposed load and must have proper foundations and footings to prevent settling or frost heaving. Footings should be below the frost line, roughly four feet underground in many parts of North America.

The most common problems with porch columns are the result of simple deterioration. Brick columns tend to absorb a considerable amount of moisture, damaging the brick and mortar by frost action. Wood columns rot and are subjected to insect attack. Direct wood/soil contact should be avoided.

It is not uncommon for columns to shift out of plumb. They often require rebuilding from the footings up.

5.4 Beams: Beams should be strong enough to transport the roof or floor loads to a wall or column. They are typically wood, but can also be steel. Beams should be adequately supported and arranged to minimize rot and wood/soil contact.

Problems

The most common problems with porch beams is that they are undersized (overspanned), resulting in sagging. Additional columns can often be added to stiffen a beam. The beam can also be enlarged or replaced.

Porch beams are often poorly supported when columns have been removed or have shifted. The beam should rest on the column or wall support by at least three-and-one-half inches. Its full width should rest on the column. Many porch beams are concealed in a roof structure and are not visible, but years of roof leaks cause these beams to rot and the roof system to sag.

5.5 Joists: Porch or deck joists should be strong enough to carry the load of people, furniture, and snow. They are often overspanned, resulting in a springy floor system. Trapped moisture in a porch or deck structure often rots joists, weakening the structure and providing an ideal environment for termites and carpenter ants. Joists should be well secured to the building. A board, lag bolted to the structure, may support the joists from below. Joist hangers may also be used.

5.6 Floors: Porch floors should be sturdy enough to not flex between joists. If the floor system is constructed of wood, it should be arranged in such a way as to allow water to pass through it or drain off it. Carpeting should not be used as it tends to hold moisture, promoting rot. Plywood or waferboard should not be used for the same reasons.

If the porch floor is concrete, it should be sloped to drain water away from the building.

Some porch floors are covered with metal or canvas. In many cases, these materials have deteriorated and replacement is required. Some porches are covered with roll roofing or roofing felts and are not suitable for regular foot traffic.

5.7 Roof Structures: Porch roofs are often damaged by neglected roof coverings. Structural components should be carefully inspected when reroofing. Porch ceilings are of plaster, drywall, stucco, wood, concrete or metal. They are often damaged by roof leaks and vermin.

5.8 Skirting: Skirting is used around the perimeter of a porch to prevent vermin from getting under the structure. The skirting should allow for ventilation and direct wood/soil contact should be avoided.

► 6.0 WALKS, DRIVEWAYS AND LANDSCAPING

These components are addressed in a home inspection to the extent that they impact on the building.

Walks and driveways may be gravel, asphalt, concrete, stone, or pavers. Regardless of the material, they should be slightly sloped to drain water away from the house, rather than toward it. Improper slopes often cause wet basement problems, and in some cases, erosion and/or frost damage to building foundations. Where walks or driveways pull away from the building, water can accumulate along the foundation wall, again resulting in wet basement problems. In some cases a drain is required to carry surface water away. The drain should be sized to handle the maximum run-off from rains, and from melting snow where applicable. The drain should be arranged to prevent clogging with debris or frost damage to the drain assembly. The pipes leading from these drains cannot be examined during a home inspection.

Landscaping

Shrubs, trees, planters and so on can add to the value of a property, but can also adversely affect the building itself. The effect of vines on wall surfaces is addressed in 4.0 of this section. Shrubs too close to a building can hold water against walls, prevent wood components from drying out and provide pests with good access into the house.

Tree branches can cause mechanical damage to roof and wall surfaces, leaves can clog gutters and downspouts, and roots can clog drainage pipes and in severe cases, dislodge foundations. Raised flower gardens or planters can cause wet basement problems, especially as a result of heavy watering of flowers during the summer months. Where the original grade level has been raised by adding topsoil, there are three concerns. The building wall may be subject to damage if wood components are in contact with the soil. Water leakage into the building may be experienced if the soil is above the top of the foundation wall. The increased load exerted on the foundation wall can push the foundation wall inward, particularly in areas where frozen soil conditions may exist.

► 7.0 BASEMENT WALK-OUT

7.1 Frost Protection: Since the basement walk-out allows frost to go deeper, in northern climates additional protection must be provided. The foundations near the walk-out must be deeper, or insulation must be provided underneath and around the walk-out area to prevent frost penetration. Rigid plastic insulations are most common for this application.

Without proper frost protection, the walls of the house adjacent to the walk-out, can heave. Unfortunately, the components which provide the protection are buried and are not visible. The presence of frost damage to the house usually means that the existing walk-out has to be modified or removed. The options, then, are to abandon the walk-out, fill in the doorway and backfill the hole, or repair the structural damage and rebuild the walk-out. If rebuilding, provision of insulation for the new walk-out is the preferred repair approach as it is less expensive than underpinning the foundation walls.

7.2 Steps: Please refer to 5.1 in this section.

7.3 Railings: Please refer to 5.2 in this section.

NOTE: Railings should be provided on the perimeter of the opening as well as on the steps.

7.4 Drains: A drain at the bottom of a basement walk-out will prevent water accumulation which could eventually end up in the basement.

Drains are often absent or if present, are often plugged with debris. Drain covers should be provided which are designed to catch debris and allow water to flow away freely. A cover or a roof over the basement walk-out may preclude the need for a drain.

7.5 Door Threshold: In the event of a plugged drain, the door threshold should provide some protection against water entry into the basement. Thresholds are often absent, inadequate in height, or not waterproof. Concrete is the best material. They should be a minimum of four inches in height.

7.6 Walls: The side walls of an exterior basement stairwell are essentially retaining walls. Please refer to 9.0 in this section.

7.7 Cover or Roof: Please refer to 1.0 in the Roofing/Flashings/Chimneys section. While some basement walk-outs have legitimate roofs, others have covers, usually made of wood. Covers should be sloped to allow for water runoff and should be kept well painted to prevent rot. Horizontal ledges or other areas where water may collect should be avoided. Wood/soil contact should be avoided. Hinges and hardware should be adequate for the weight of the doors, and designed for outdoor use.

► 8.0 GARAGES

8.1 Detached Garage: People's attitudes and expectations with respect to garages vary dramatically. Normally, the garage is lower quality than the house, and in poorer condition. Consequently, the necessity for repairs is far more subjective.

Garages are similar to houses in many ways. Problems with the garage framing, roofing and siding for example, are addressed the same way as house problems. Detached wood-frame garages, however, commonly have a somewhat unique problem — the absence of foundations and footings. These garages often have wood frame walls sitting directly on or very close to the soil. The garage itself may heave with frost action, but more importantly, the bottoms of the wood walls usually rot and the garage begins to lean. In the early stages this leads to misalignment of the overhead door, and over the long term, to structural failure.

Corrective action includes straightening the structure and replacing the bottoms of the wood wall system, with masonry typically. Depending on the overall condition of the garage, it may be more cost effective to remove and rebuild it.

8.2 Fire or Gas-Proofing: The walls and ceilings of attached garages which abut interior space, must form a fire separation from the house in some jurisdictions. In other areas the walls must only be gas-proofed to prevent toxic automobile exhaust fumes from entering the house. If the walls are constructed of wood studs, they should be covered on both sides with drywall with finished joints to ensure no leakage of fumes. Concrete block walls are considered adequate protection without drywall on the garage side, provided there is an effective vapor barrier on the house side.

8.3 Man-Door: Any door between the house and the garage should have an automatic door closer, should be tight fitting and weatherstripped for fire safety and to reduce the chance of gasoline or exhaust fumes entering the home.

8.4 Combustible Insulation: Additional insulation is often provided in garages. Combustible plastic insulation is very common. It should be removed or covered with a non-combustible surface such as drywall since it presents a fire hazard.

8.5 Floors: Minor cracks in garage floor slabs are common. Serious cracks and/or settling may indicate structural problems, but more commonly indicate an improper base below the concrete. Concrete floors should be a minimum of three inches thick.

Suspended Floors

Some garages are designed with a room below the area where the car is parked. These garages are sometimes of heavy timber construction or the floor slab is of steel and concrete. It is impossible from a visual inspection to determine whether these types of floor systems are properly designed. If they are of concrete and steel construction, salt penetration during the winter months can rust the structural steel and spall the concrete. The problems are similar to those of large multi-story parking garages. A specialist is required to investigate these. Generally, the surfaces of these floors should be treated to prevent moisture penetration into the concrete.

Wood floors (even heavy timber) can rot or decay from wood-boring insects. Mechanical damage and fire damage can also weaken these systems. In any garage with a suspended floor system, a structural engineer should be engaged to determine its safety.

8.6 Floor Drainage: Garage floors should be sloped to drain water out of the garage. If this is not possible, a drain should be provided. Often, drains in garages are neglected and are plugged, broken, or undersized. Settlement of garage floor slabs may affect the drainage so that water will not flow out.

8.7 Vehicle Doors: Garage doors are typically constructed of wood, hardboard, aluminum or steel.

There are a variety of ways in which garage doors can open; however, overhead sectional doors are preferred.

The most common problems with garage doors relate to hardware. Hinges, tracks, springs, and counterweight systems often require adjustment. Garages which have settled, resulting in a door frame which is out of square, contribute to the problem.

The bottom edges of wood garage doors tend to rot while the bottom edges of steel doors rust. The decision to repair or replace is somewhat subjective.

Door Openers

Garage door openers sometimes fail due to misalignment of the garage door or track. Some jurisdictions require that the opener be plugged into an electrical outlet not more than six feet from the opener.

Automatic Reverse – A Safety Issue

All garage door opening devices should have a safety feature which automatically reverses the door if it strikes something while closing. This feature reduces the risk of injury. Garage door openers equipped with this feature have a sensitivity adjustment. It is often set incorrectly.

► 9.0 RETAINING WALLS

Analyzing retaining walls is a tricky business. With most retaining walls, the important components are not visible. Also, determining the rate of movement of a retaining wall is impossible, from a one-time visit. Monitoring is normally required. In some cases, the angle of the wall gives a clue to the performance. Most walls are built with a slight lean to the higher side. If the wall is leaning away from the high side, it has probably moved. Once retaining walls begin to move, they rarely stop, although the movement may be slow and seasonal.

Retaining walls can be constructed of concrete, masonry, stone, wood or steel. There are several different designs.

Gravity Walls

Gravity walls are not very common. They rely on a huge mass (normally concrete) to hold back soil by the sheer weight of the retaining wall. Needless to say, walls of this type are not very economical because of their size.

Cantilevered Walls

Poured concrete retaining walls are more often a cantilever design. Looking at a cross section through the wall, the wall would look like an inverted “T”. The inverted portion of the “T” is buried beneath the soil. The portion of the “T” which extends under the high side of the retaining wall makes use of the weight of the soil sitting on it to resist movement of the wall. The portion of the “T” protruding under the soil on the low side of the retaining wall stabilizes the wall and prevents it from tilting forward. The poured concrete is reinforced with steel to prevent the inverted “T” from breaking at the joint. Cantilevered retaining walls must have their footing below the frost line to prevent heaving.

Pile Walls

Pile walls consist of vertical members which are driven down into the soil to a depth that is sufficient to resist rotational movement caused by the soil on the high side of the retaining wall. Pile walls constructed of steel are often used as a temporary measure; however, small wooden pile walls in sandy soil or gravel can be effective.

Wood Walls

The most common type of residential retaining wall in frost areas is constructed of horizontal wooden members which are tied back into the soil with anchors (tie-backs). The anchors normally consist of a horizontal wood member installed at right angles to the retaining wall, heading back into the soil. Tie-backs are staggered through the entire wall system to provide resistance to movement. In some cases, “dead-men” are attached to the ends of the anchors to help secure the anchors. These horizontal members run parallel to the retaining wall itself. These walls do not extend below the frost line.

Prefab Walls New wall systems consisting of interlocking sections of precast concrete have become available in recent years. These systems also use tie-backs and dead men.

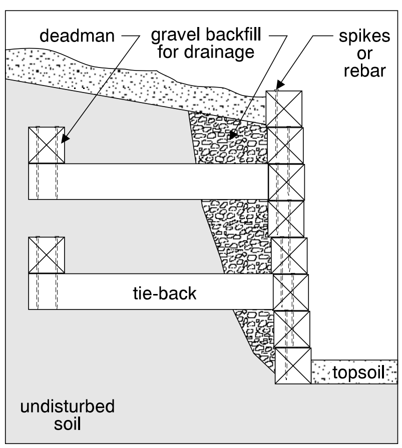
Gabions Gabions are also used as retaining wall systems. A gabion is a rectangular wire mesh basket filled with rock. They are not only used as retaining wall systems; they are commonly seen along river banks to prevent erosion.

Problems The single biggest enemy of retaining walls is water. Saturated soil puts significantly higher pressure on retaining walls. If saturated soil is allowed to freeze, expansion can be significant, which puts even greater pressure on the retaining system. Needless to say, water also promotes rot of wooden retaining wall systems.

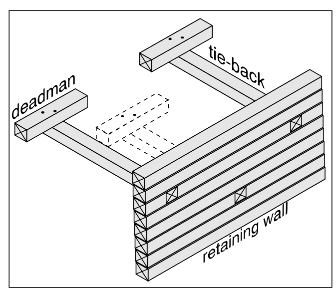
Well constructed retaining wall systems have a vertical layer of gravel behind the wall and drainage holes at the bottom of the wall. The gravel allows water to percolate through it quickly and the drainage holes give the water somewhere to go. Open wall systems, such as wood timbers, have enough natural openings that drainage holes, per se, are not needed.

Minor repairs to retaining walls can be undertaken by the homeowner. Patching cracked concrete retaining walls, for example, is valuable in that it allows for monitoring of future movement. Major retaining wall repairs or modifications should, however, be left to an expert. Retaining walls are often poorly built and can be very expensive to repair or replace.

Wood retaining wall



side view



isometric view