INTRODUCTION

The interior of a home provides clues to structural issues and is often the area where water leakage is first noted. The interior finishes themselves reflect the overall building quality, and their condition indicates the level of maintenance.

Each room should have an adequate heat supply and sufficient electrical outlets. Doors and windows should operate properly. Home inspectors focus on function rather than appearance, and emphasis is placed on whether the room will work as it was intended. The home inspector does not comment on cosmetics.

1.0 Major Floor Finishes

DESCRIPTION Floors provide a durable surface for foot traffic and furniture. Good floors are level, have an even surface, and are low maintenance. Floors can be an architectural feature of the home. Some floors are water resistant; some are soft to walk on; some require no sealing or waxing; some are quiet; some are particularly long lasting.

1.1 Concrete

DESCRIPTION Concrete floor finishes are typically only used in basements and garages. The floor should slope down to a floor drain in basements and other areas where water may accumulate.

In modern construction, a four to six inch gravel base below the 3-inch thick floor slab allows water below the slab to drain away. Moisture barriers (plastic sheets) may also be provided under the slab, and in energy efficient construction or slab-on-grade construction, rigid insulation may be used below the floor.

In older construction, concrete floor slabs were as thin as 1/2 inch. These are prone to impact damage, heaving and break-up. This is a cosmetic issue and may be a trip hazard.

Most concrete floors are not part of the structure. Basement floors are typically installed after the home is completed, and their main function is to keep our feet out of the mud.

Concrete basement floors can be overlaid with finished flooring. Since almost every house with a basement has water on the basement floor at some point, water-resistant floors make sense.

In slab-on-grade construction, the concrete floors provide a substrate for floor finishes.

1.2 Hardwood

DESCRIPTION Hardwood floors are traditionally oak, although other woods such as cherry, walnut, birch, beech, mahogany, elm and maple, are also used. Bamboo is not technically wood, but is also used as flooring. Hardwood flooring may be in the form of strips or parquet, which often consist of six inch squares with each square made up of six one-inch strips. The squares are laid with the grain in adjoining squares at right angles, giving a checkerboard effect. Parquet flooring may be nailed or glued down. There are several different types and installation techniques. Parquet flooring can also be made up of a combination of rectangles, triangles and lozenges and can be very decorative and very expensive.

Strip flooring is typically tongue and groove, secured with nails driven diagonally through the tongues into the subfloor. Hardwood flooring in modern construction is typically 3/8 inch to 3/4 inch thick and may be pre-finished or finished on site.

Hardwood flooring is a high quality and durable floor system. It can be mechanically damaged, attacked by termites, rot and fire, or damaged by water. Wood flooring is not ideally suited to kitchen and bathroom areas, since it is susceptible to water damage. Nonetheless, hardwood flooring is regularly found in kitchens. Individual boards can be replaced, but matching can be tricky.

Worn 3/8 inch thick hardwood flooring can be sanded once to provide a new wood surface. 3/4 inch hardwood flooring can be sanded several times before the tongues are exposed. Wood flooring can be covered with carpeting or other flooring materials.

1.3 Laminate and Engineered Wood

LAMINATE In recent years, laminate flooring has become very popular, especially among do-it-yourselfers. Laminate floor planks (or tiles) have several layers. The top layer is generally a clear laminate that is bonded to a decorative layer below, often creating the look of a wood floor. These layers are bonded to a wood- or fiber-based core. The bottom layer may be a paper or melamine backing. The product is similar to resilient countertops. A complete floor is created by either snapping planks together with specially-designed fasteners along the edges, or by gluing planks together along traditional tongue and groove edges.

Laminate flooring is not secured to the subfloor beneath it. Instead, it is installed as a floating floor, allowing it to expand and contract. A sheet of cushioning foam is installed between the laminate flooring and the subfloor. There may also be a sheet of plastic below the foam to act as a moisture barrier and to allow the floor to slide as it expands. A gap is required between the flooring and the walls to allow for expansion. This gap is covered by trim.

Laminate flooring cannot be sanded, stained, or otherwise refinished, although damaged planks can be replaced. Laminate flooring is resistant to small amounts of water, such as quickly wiped-up spills, but precautions should be taken in kitchens or bathrooms including applying a sealant around the perimeter. This is not visible during a home inspection. Laminate flooring should not be installed in damp basement areas.

ENGINEERED WOOD Engineered wood is similar to laminate flooring, except the thin top layer is actually hardwood that is bonded to a base that may be hardwood, plywood, or high-density fiberboard. The hardwood layer is usually pre-finished. The floor may be sanded and refinished, depending on the thickness of the hardwood layer.

Engineered wood flooring may be installed as a floating floor, or it may be glued, stapled, or nailed in place.

1.4 Softwood

DESCRIPTION Pine is the most common softwood flooring. Fir and cedar are also used. Pine floors were typically used as a subfloor or as finish flooring in a 1x4 tongue-and-groove configuration. When used as a subfloor below hardwood, the softwood was typically laid in 1x4 or 1x6 planks, perpendicular or diagonal to the floor joists. The boards were typically separated slightly to allow for expansion.

Softwood subflooring used under linoleum or other thin kitchen floor coverings was usually tongue-and-groove and tightly fit to provide a smooth, continuous surface to support the flexible flooring system. Modern construction often includes 1/4 inch plywood underlayment between the subfloor and finish flooring to provide a smooth surface for the finishing material.

1.5 Carpet

DESCRIPTION Carpet may be synthetic or natural fibers like wool. Synthetic carpeting is the most common and is a good choice in areas where the carpeting may become wet. Common materials include polypropylene, nylon and acrylic. Where the backing material is not moisture resistant, synthetic carpet will be quickly damaged if wet. Jute-backed carpets, for example, should be kept dry. Many types of synthetic carpet can be cleaned more easily than wool carpets. Synthetic carpeting is available in a wide variety of colors, weights and weaves.

Wool is an expensive material favored for its look, feel and durability. As synthetic products have improved and remain less expensive, wool is becoming rare. It is sometimes blended with a synthetic material. Wool is a natural product and is less resistant to water damage than synthetics. It also has less resistance to stains than some synthetics.

The quality of a carpeted floor depends upon the type, weight and construction of carpeting, the type of underpad, and the installation work.

1.6 Resilient

DESCRIPTION Resilient floor coverings include vinyl-asbestos, solid vinyl, vinyl faced, rubber, cork, asphalt and linoleum. It is installed in sheets or tiles. More expensive products include a cushioned backing material and a no-wax surface.

In modern construction, these materials are typically applied over a 1/4 inch plywood underlayment. These thin, flexible materials will show through any irregularities in the floor surface.

1.7 Ceramic/Quarry Tile

DESCRIPTION Generally considered high quality, ceramic or quarry tiles are hard, fired-clay products that may be glazed or unglazed. These materials stand up well to heat, water and normal wear and tear, and have good resistance to stains and cuts. These brittle floor systems will crack if not well supported. A conventional wood flooring system often has too much flex to support ceramic or quarry tile. Better installations include a concrete base for the tile, typically one to five inches thick. Tiles may be pressed into the concrete while it is setting. Joints are then grouted. Tiles are typically 1/16-inch to 1-inch thick and are commonly from 1 inch by 1 inch to 24 inches by 24 inches. Many shapes, colors, patterns and finishes are available.

In modern construction, a thin mortar base or adhesive is used over a thick subfloor. If well installed, this can be satisfactory. Again, joints have to be appropriately grouted. It is common for ceramic or quarry tile floors to be cracked where floor joists deflect, or in heavy traffic patterns. Tiles can be damaged by dropping tools, pots, pans or other heavy objects.

Traditionally, ceramic tile floors were used in bathrooms and vestibules, because of their natural resistance to moisture. Ceramic or quarry tile floors are used in kitchens, for the same reason, although they are unforgiving if one drops glass on them, and they are also more tiring to stand on because of their hard surface. Wet floors can be slippery.

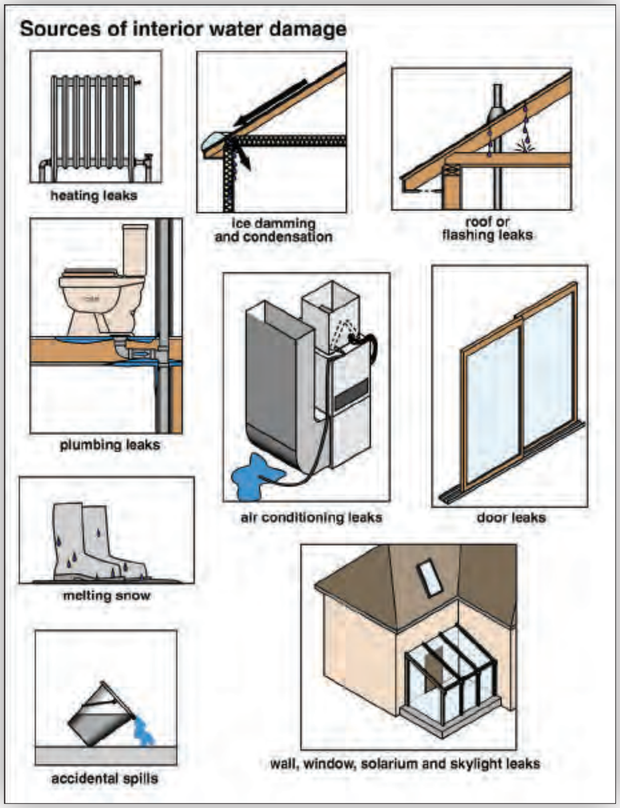
1.8 Stone Floors – Slate, Granite, Limestone and Marble

DESCRIPTION These are natural materials cut into flooring tiles. Terrazzo is made of marble chips set in concrete, usually laid in squares defined by lead beading. The surface is polished to give a smooth floor. Terrazzo is more common in commercial buildings, hospitals and schools than in homes.

Stone and terrazzo are good flooring materials because of their strength, appearance and durability. Installation considerations are similar to ceramic and quarry tile, in that the weight of the material itself may deflect conventional flooring systems. Joints on stone floors are grouted.

Common Problems with Floor Finishes

WATER DAMAGE/ STAINS Common sources of water damage include leaks from roofs, windows, doors and skylights, plumbing leaks (especially toilets and showers), leaks from hot water heating systems, and condensation. Aquariums, room humidifiers or dehumidifiers, over-watering of plants, melting snow and ice from boots, etc. can all cause water damage.



Wood-based floors may discolor, cup, buckle, warp or rot as a result of exposure to water. Carpet may develop mold. Flooring may be stained by water, food spills, improper cleaning, dirt, sunlight, or other factors.

MECHANICAL DAMAGE AND WEAR When softwoods such as pine, fir or cedar are used as finish floorings, they can be damaged by high heeled shoes, for example. Furniture marking and denting is another common problem with softwood and resilient floors.

Softer materials, such as resilient flooring and carpet, will eventually wear out in high traffic areas. Sharp objects and furniture dropped or dragged across flooring may also damage the surface.

CRACKED OR BROKEN The most common problem with brittle floor tiles is cracking. This is usually the result of a floor system that is not stiff enough to support the tile. Tiles can also be cracked by impact damage. Heavy items dropped on the tiles will sometimes crack or break them. Replacing individual tiles is not difficult, although color, style and grout matching may be a problem.

A cracked and broken concrete floor may only be a problem if it is not safe to walk across, or if there is moisture coming up through the floor. Since it is not a structural component, replacement of this floor is rarely a priority item.

LOOSE, TRIP HAZARD Loose or missing sections of flooring should be replaced. These areas may present a trip hazard. Carpet with ridges and buckles can be pulled tight to lie flat again by a carpet installer.

IMPROPER APPLICATION Some ceramic tiles are intended for wall use only. When used on floors, they will wear quickly. Carpet may not be laid flat. Wood flooring may not be well secured. Tile and stone may not be set properly. Grout may be poor quality or an incorrect type.

SQUEAKY FLOORS Squeaky wood floors are a nuisance, not a structural problem. A floor usually squeaks when walked on because the flooring finish or subfloor is not tightly secured. The subfloor may not be well-secured to the joists, or the finished flooring material (e.g. hardwood) may not be tightly fastened to the subfloor.

Flooring that is not tightly secured sits just above the support in some spots. When someone steps on the flooring in this area, it is pushed down onto its support. When the foot is taken off the floor, it springs back up. The squeaking is usually the result of the nails sliding in and out of the nail holes, or adjacent wood surfaces rubbing.

POOR SLOPE A concrete basement or crawl space floor that does not slope down to a floor drain can lead to water accumulation on the floor and resulting damage. Adding more concrete to an existing slab to improve the drainage slope is difficult, since new concrete does not usually bond well to old concrete. A better solution may be to add another floor drain. This is expensive, because it requires breaking up some of the concrete floor. Replacing a deteriorated floor may be more cost effective than trying to repair or re-slope the floor.

BURNS Most types of flooring are susceptible to burns, with the exception of stone, terrazzo, ceramic and quarry tile.

2.0 Major Wall Finishes

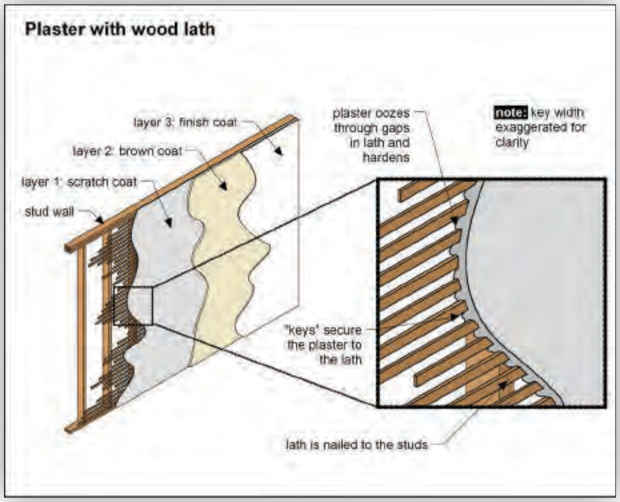
DESCRIPTION Wall finishes provide a decorative skin to conceal building components including structural members, insulation, ductwork, pipes, and wires. Good wall finishes are plumb and straight. Surfaces may be smooth or textured and better wall finishes are durable. Some wall finishes are versatile, taking decorative finishes such as stain, paint or wallpaper readily. Walls may make a decorating statement, or may be simply background. In some cases, the combustibility of wall finishes may be an issue. In kitchens and bathrooms, resistance to water damage is an asset.

2.1 Plaster/Drywall

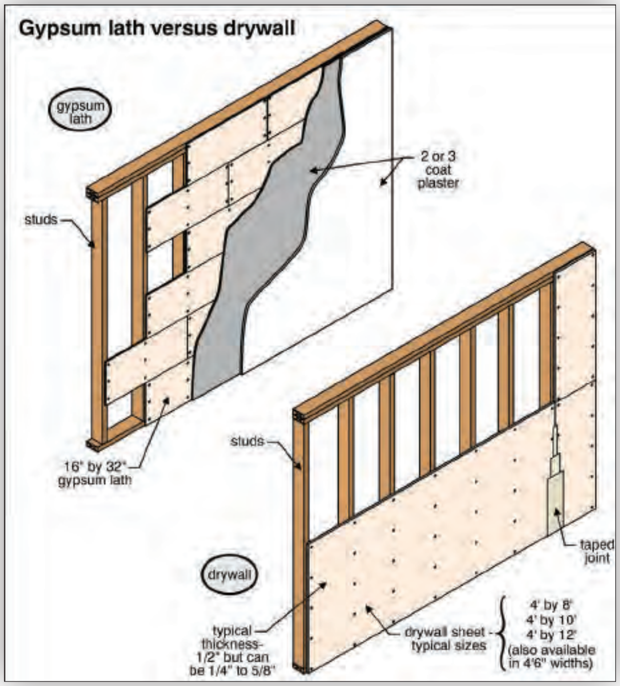
DESCRIPTION Plaster and drywall are essentially the same material. Drywall is manufactured while plaster is mixed and applied by trowel on site. Plaster and drywall are made largely of gypsum, a common mineral (calcium sulphate hydrate).

These interior finishes are very common because they are inexpensive, relatively easy to apply, stable and afford good fire resistance.

WOOD LATH Older plaster systems employ a wood lath, comprised of boards roughly 1 inch wide by 1/4 inch thick. These “yardstick” type boards were nailed to the studs or strapping horizontally, with roughly 1/4 inch spaces between each board. The plaster was then troweled on in two or three coats. The first coat of plaster would ooze through the spaces between the wood lath, sag, and harden to form a “key” which held the plaster onto the lath. This first layer is called a “scratch” coat. Where a three-step process is used, the second coat is called the “brown” coat and the third is a “finish or putty” coat. In a two-step process, there is still a scratch coat and a brown coat, but they are applied one immediately after the other. The finish coat is applied after the brown coat has set.



GYPSUM LATH In the 1930s, gypsum lath became popular. These manufactured plaster sheets replaced wood lath because they were quicker and less expensive to install. The gypsum lath was paper covered, similar to drywall. It came in various sizes, but was typically 16 inches by 48 inches. The gypsum lath was covered with one or two coats of plaster and the total thickness of the system was 1/2 to 5/8 inch. The lath itself is typically 3/8 inch thick.



WIRE LATH Wire mesh lath was sometimes used where reinforcing was necessary, for example, on door frames and corners. Wire lath was also used in some bathroom areas where ceramic tile was to be provided.

DRYWALL Drywall became popular in the early 1960s, and is used almost exclusively today. There is very little difference between properly executed drywall and plaster jobs. Poor drywall work is usually identified at the seams. Sections of drywall are typically 4 feet by 8, 10, 12, or 14 feet sheets. Drywall is typically available in 3/8 inch, 1/2 inch and 5/8 inch thicknesses. Special drywalls, more resistant to water or fire, are available.

Drywall is typically nailed or screwed onto framing members. The seams between boards are taped and filled with drywall compound (also called joint compound, drywall mud and taping compound). The joints are sanded when they dry to create a homogeneous wall surface. If the taping and finishing work is poor, the seams are noticeable.

Drywall is also called wallboard, sheetrock, plasterboard and gyprock.

2.2 Paneling

DESCRIPTION Paneling may be veneered plywood, asbestos-cement board, veneered particle board, fiberboard or solid wood. It is available in many forms and appearances, from a simple and inexpensive 1/8 inch sheet of 4x8 plywood, to an intricate, highly finished hardwood system, found in dining rooms and libraries of high quality homes.

Paneling is often more durable than a plaster or drywall finish, although wood materials move more than drywall as a result of expansion and contraction. These finishes can be considerably more expensive than drywall. In some applications, the combustibility of this material may be an issue. Most paneling does not take paint or wallpaper as readily as drywall or plaster. Redecorating paneling can be difficult without removing it. Some paneling is difficult to patch without leaving any evidence.

2.3 Brick/Stone

DESCRIPTION These are not common interior wall finishes in homes. Some work on old homes includes removal of original plaster to expose brick on walls. This brickwork was usually not intended to be viewed, and may show a large number of small, damaged or off-colored bricks. Mortar joints may be quite irregular.

Removing plaster from the inner face of an exterior brick wall reduces the insulating value of the wall slightly, and can make the room less comfortable in cold climates. Removing plaster from an interior brick wall does not pose the same problem, although it does reduce the acoustic insulating properties of the wall. This may be an issue, for example, on attached homes with a common brick wall. Sealing exposed brick walls helps control the dust from the bricks and mortar.

Thin slices of brick or stone roughly 1/2- inch thick, or imitation brick can be applied to a wall using an adhesive or embedding the brick in mortar. They may be individual pieces or larger panels. Slices are sometimes used around fireplace openings to create the effect of solid masonry. Full bricks are not used because their weight would require strengthening the floor below.

2.4 Concrete/Concrete Block

DESCRIPTION These materials are associated with unfinished walls, typically in a basement. They can be painted to provide a more finished appearance. Concrete is strong and these walls are unlikely to be damaged as a result of normal usage.

2.5 Stucco/Textured

DESCRIPTION Interior stucco is essentially plaster, and is typically installed in a two or three coat process. The finish is often sculpted or worked to provide a decorative appearance. The texturing is done with trowels, sponges, brushes, or other tools to give the desired effect.

Common Problems with Wall Finishes

WATER DAMAGE/ STAINS Water damage is one of the most common problems on interior finishes. It is helpful to know a) the source of the water, b) whether the problem is still active, c) whether there is any concealed damage, d) the cost to correct the water problem if needed, e) and the cost to repair the damaged building materials.

Common water sources include roof leaks, flashing leaks, ice damming, window and skylight leaks, plumbing leaks, leaks from hot water heating systems, and condensation. Water damage may also result from such things as aquariums, room humidifiers or dehumidifiers, over-watering of plants, spills, melting snow and ice from boots during wintertime, etc.

Water damage often looks more serious than it is. Short term exposure to water will not harm most building materials. Plaster and drywall however, are easily damaged by water. Stains appear quickly and persist after the problem is solved. The material that can be easily seen is the first material to deteriorate. Mold can develop on the front or back surface of plaster or drywall if it is chronically wet. Mold will not disappear but will go dormant if the moisture source is removed.

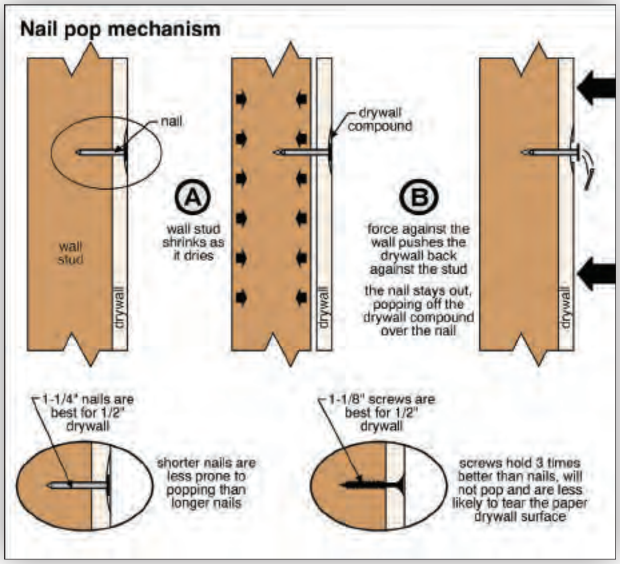
CRACKS Most cracks on interior surfaces are cosmetic. They usually suggest incidental movement of the structure. In a few cases they suggest ongoing significant structural movement. If there is concern about structural movement, it is a good idea to take photographs of cracks with a reference point such as a ruler indicating crack size. This is a great way to monitor cracks to determine whether there is enough structural movement to worry about. A series of dated photographs can be very useful to a specialist.

DAMAGE Both plaster and drywall can be readily patched where small damaged areas are noted. Drywalling over old plaster or drywall is sometimes done where large areas are damaged.

Localized repairs to any textured surface are usually noticeable because the texturing is difficult to match. Cleaning and painting textured surfaces is more difficult than flat surfaces, and wallpapering over textured finishes is usually not possible. The strength and durability of textured surfaces is similar to plaster or drywall, although small projections are easily worn off the surfaces, if people or animals brush against the wall.

LOOSE Large sections of walls or ceilings may become loose where plaster has lost many of its keys due to vibration and wear and tear. Where there is danger of plaster falling, this should be corrected promptly so people won't be hurt by falling plaster.

NAIL POPPING IN DRYWALL This minor cosmetic issue is common in new construction. As wood studs shrink, nail heads 'pop' out from the drywall surface, causing a bump or blemish on the wall or ceiling. This usually happens only on new work, and only one time. Repairs are straightforward.



3.0 Major Ceiling Finishes

DESCRIPTION Ceiling finishes provide a decorative skin to conceal building components. Ceiling finishes hide structural members, insulation, ductwork, pipes, and wires. Most good ceiling finishes are flat and straight. Surfaces may be smooth or textured and better ceiling finishes are durable. Some ceiling finishes are versatile, taking decorative finishes such as stain, paint or wallpaper readily. Ceilings may make a decorating statement, or may be simply background. In some cases, the combustibility of ceiling finishes may be of interest. Below roofs, kitchens and bathrooms, resistance to water damage is an asset.

3.1 Plaster/Drywall

See Section 2.1 for a description of plaster and drywall.

3.2 Acoustic Tile

DESCRIPTION These tiles, typically made of fiber board and perforated to improve their acoustic performance, have been popular since the 1950s. Typically, they are 12 inches by 12 inches and are stapled or nailed to strapping. This type of ceiling tile was often installed when finishing a basement, or was installed over a damaged plaster ceiling.

The tiles have better acoustic properties than plaster and drywall, although they are subject to mechanical damage and water damage, similar to drywall or plaster. Repairs are easy if matching tiles can be found. The tiles can be painted, with some loss of acoustic performance.

3.3 Suspended Tile

DESCRIPTION Suspended tile became popular in the 1960s, and can be made of fiber board or fiberglass, for example. Some have a plastic coating. Combustible plastics, such as polystyrene, should not be used as ceiling tiles. This system utilizes a metal T-bar grid supported by wires from above. Advantages include relatively good acoustic properties, ease of removal to access things above the ceiling, and individual tiles can be replaced readily. On the downside, suspended tiles lower the ceiling at least two to three inches.

3.4 Metal

DESCRIPTION Metal ceilings were typically tin and most often in kitchens, during the late 1800s and early 1900s. Their design was often a decorative square pattern intended to simulate ornate plaster ceilings. This was a fairly durable ceiling system and in some areas has become fashionable again. The metal is normally painted.

3.5 Stucco/Textured/Stipple

DESCRIPTION Interior stucco is essentially plaster, and is typically installed in a two- or three-coat process. The finish is sculpted or worked to provide a decorative appearance. The texturing is done with trowels, sponges, brushes, or other tools to give the desired effect.

In modern construction, a sprayed on one-coat stipple finish is often used over drywall. This textured finish is inexpensive and quick to apply. It does not, however, cover poor drywall work, as flaws will show through. It is not used in kitchen or bathroom areas since the irregular surface is difficult to clean. Localized repairs are usually noticeable because the texture is difficult to match. Painting is more difficult than a flat surface, and wallpapering is usually not possible. The strength and durability is similar to plaster or drywall.

Common Problems with Ceiling Finishes

WATER DAMAGE/ STAINS Water damage is one of the most common problems on interior finishes. It is helpful to know a) the source of the water, b) whether the problem is still active, c) whether there is any concealed damage, d) the cost to correct the water problem if needed, e) and the cost to repair the damaged building materials.

Common water sources include roof leaks, flashing leaks, ice damming, window and skylight leaks, plumbing leaks, leaks from hot water heating systems, and condensation. Water damage may also result from such things as aquariums, room humidifiers or dehumidifiers, over-watering of plants, melting snow and ice from boots, etc.

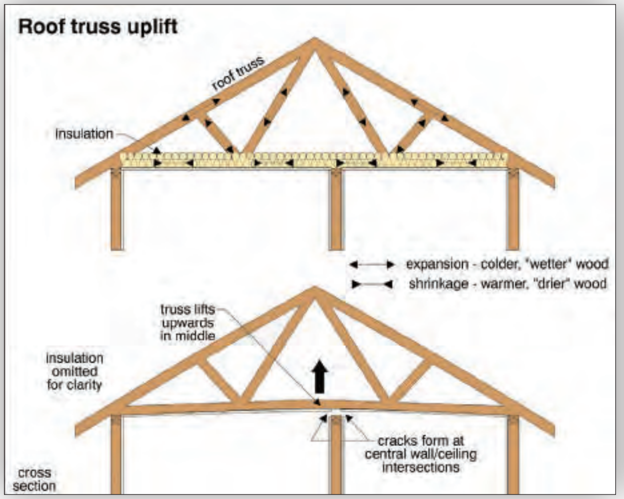
Water damage often looks more serious than it is. Short term exposure to water will not harm most building materials. Plaster and drywall however, are easily damaged by water. Stains appear quickly and persist after the problem is solved. The material that can be easily seen is the first material to deteriorate. Mold can develop on the front or back surface of plaster or drywall if it is chronically wet. Mold will not disappear but will go dormant if the moisture source is removed.

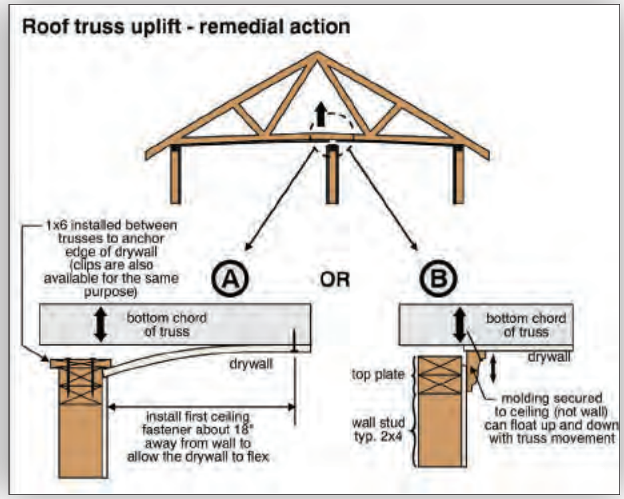
DAMAGE Both plaster and drywall can be readily patched where small damaged areas are noted. Drywalling over old plaster or drywall is sometimes done where large areas are damaged.

LOOSE/SAG Large sections of ceilings may become loose where plaster has lost many of its keys due to vibration and wear and tear. Where there is danger of plaster falling, this should be corrected promptly. People can be seriously hurt by plaster falling, especially from a ceiling. A sagging ceiling might indicate that the plaster or drywall is about to fall.

CRACKS Most cracks are cosmetic. Patching and monitoring makes sense. Where cracks are accompanied by sagging, at least partial ceiling replacement may be necessary.

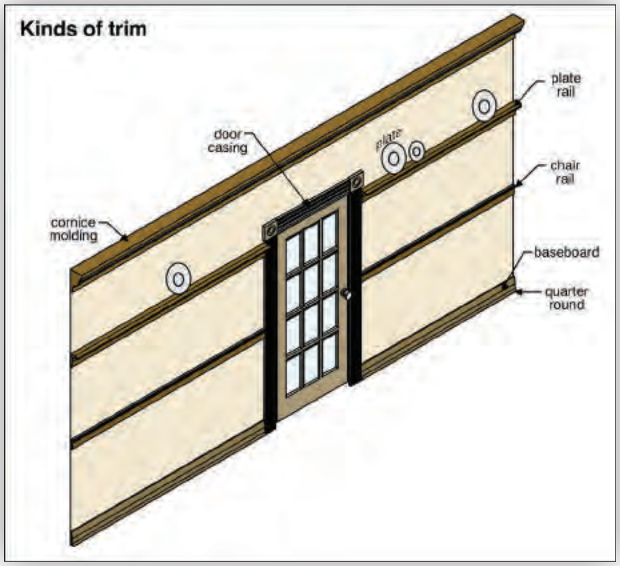
TRUSS UPLIFT This cosmetic problem in homes in cold climates with roof trusses may result in significant cracks between interior walls and ceilings, or between interior walls and floors. The cause is upward bowing of the roof trusses to which the ceilings are attached. The cracks typically open in the winter and close in the summer. They can be very alarming, but are not a structural issue.





4.0 Trim

FUNCTION Most houses have interior trim including baseboard, quarter round and door and window casings. These trim details protect and conceal joints, corners and changes in material. They add architectural appeal to a home, and better quality moldings and trim may indicate better quality construction.



4.1 Baseboard and Quarter Round

DESCRIPTION Baseboard and quarter round are usually wood (or wood fiber) components installed at wall/floor intersections. Baseboard protects the bottom of the walls from things like feet, brooms and vacuum cleaners, and provides a clean joint at walls and floors. Baseboard can be anything from a two-inch high piece of plain lumber to an intricate two or three piece architectural molding, 10 or 12 inches high. Quarter round is usually relatively small (approximately 3/4 inch radius) and covers the joint between the floor and the baseboard. It may be the same material as the baseboard. Some architectural treatments omit quarter round, and occasionally baseboard is omitted as well.

WOOD ALTERNATIVES Tile or marble may be used for baseboard. This is an expensive treatment, of course. Other materials include vinyl and rubber. A commercial treatment occasionally found in homes is broadloom flooring turned up the wall a few inches to form a carpet baseboard.

4.2 Casings

DESCRIPTION Door and window casings provide a finished look to the junction of a wall and door or window opening. Casings are most often wood.

4.3 Moldings

CORNICE MOLDINGS Moldings at wall/ceiling intersections are referred to as cornice moldings. They may be made of wood, plaster or foamed plastic.

MEDALLIONS OR ROSETTES Ceiling medallions or rosettes are decorative wood, plaster or foamed plastic details on ceilings around light fixtures. These details were common in principal rooms such as living rooms or dining rooms. They can be fabricated on site although most are pre-manufactured.

Common Problems with Trim

MISSING/LOOSE/DAMAGED Trim can be missing, damaged or loose. Replacement of decorative trim with a matching system may not be practical. Custom millwork is expensive. Also, some of the woods used in the past are not available today. It may be more cost effective to replace the entire trim in a room.

Quarter round is often removed and not replaced when wall-to-wall broadloom is installed. New quarter round is often provided when broadloom is removed.

Plaster trim such as cornice moldings and ceiling medallions are difficult to repair. Rebuilding or repairing a damaged molding is time consuming and expensive. Replacement with a manufactured system is often practical.

WATER DAMAGE/STAINS/ROT Water damage from leaks can stain or damage trim. Wood rots and plaster deteriorates quickly with exposure to water.

5.0 Cabinets and Countertops

CABINET DESCRIPTION Cabinets may be installed anywhere but are most common in kitchens and bathrooms. Cabinets may be built of wood, although many today are veneer-covered fiberboard. Shelves and doors are commonly solid wood, veneered fiberboard or glass. The quality of cabinets is a function of the materials, assembly techniques and hardware used on doors and drawers.

COUNTERTOP DESCRIPTION Countertops can be made of many materials. Laminated plastic surfaces applied to fiberboard are common because they are inexpensive, water resistant, available in a huge selection of colors and patterns, and are easy to clean. They are difficult to repair if cut by knives, chipped or burned. These are referred to as laminate countertops.

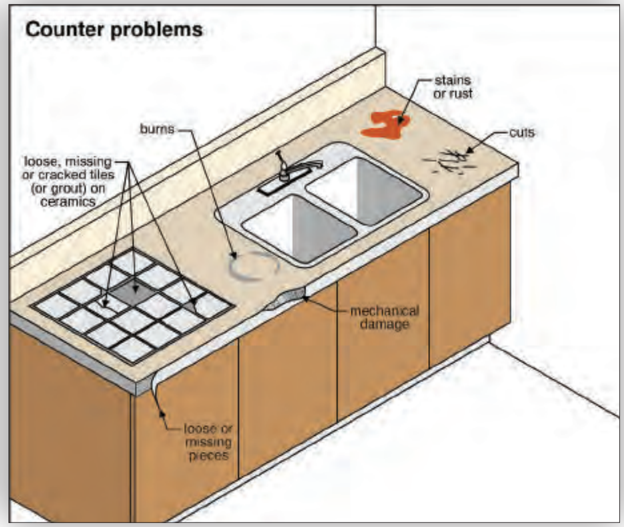
Other materials include granite, marble, stainless steel, ceramic tile, concrete, hardwood (butcher block), soapstone and a number of manufactured products including engineered stone and other solid surface materials. The ideal countertop won't burn, crack, chip or break, is easy to clean, non-porous, and is resistant to rot, water damage, stains and knives.

Problems with Cabinets and Countertops

DRAWER AND DOOR OPERATION Cabinet problems may include improper operation of doors and drawers. Sticky drawers and doors that will not stay closed are common. Hardware may be missing, worn or inoperative.

UPPER CABINETS NOT WELL SECURED/ DAMAGE More serious problems include poor attachment to walls. Loose cabinets may fall and injure people. Joints may be separating and shelves may be poorly supported. Cabinets may be damaged or deteriorated due to wear and tear. Cabinets, doors and drawers may be mechanically damaged or worn. Knobs may be loose, missing or broken. Many of these are cosmetic or nuisance issues. The decision to replace cabinets and countertops is subjective.

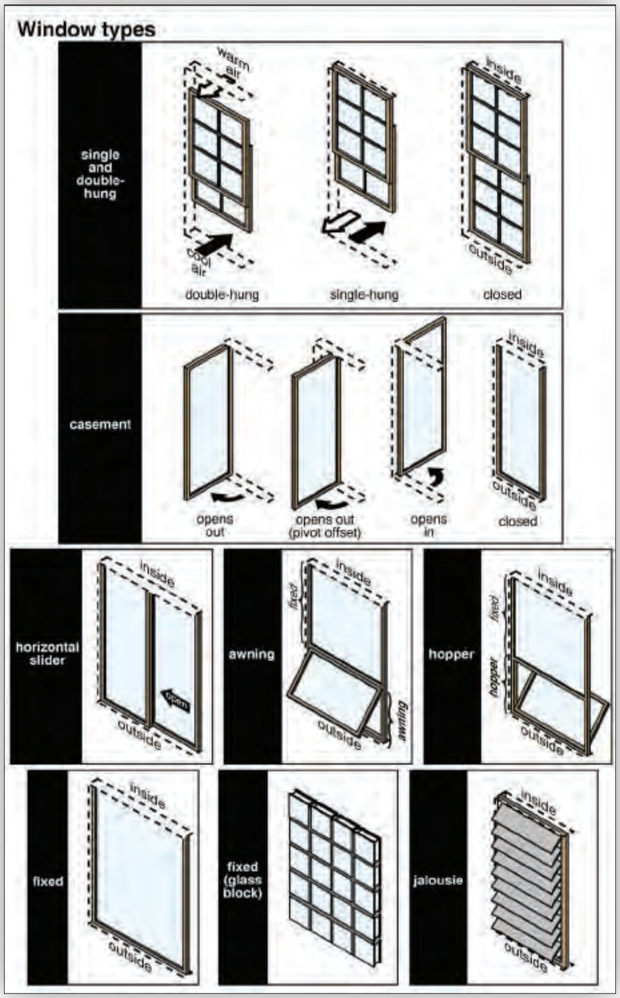
COUNTERTOP DAMAGE Countertops may suffer cosmetic damage, and fiberboard countertops often rot, especially around sinks and faucets. Burns and mechanical damage are common on laminate countertops. Cracked tiles and missing grout are common on ceramic tile countertops.



6.0 Windows

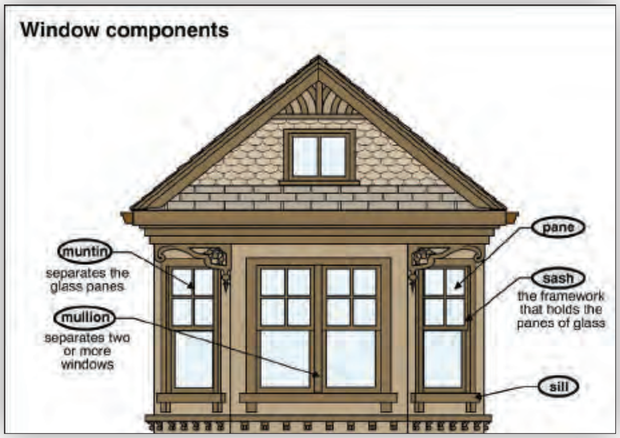
DESCRIPTION Windows provide light and ventilation for homes, at a cost in heating climates – windows let more heat escape than walls. Windows are an interruption in the weather tight skin of the building created by the siding. Windows allow air leakage, and may allow water through or into the walls if poorly installed or maintained. Well-designed windows add to the aesthetic appeal of a home. Windows increase cooling load in air conditioning climates.

Windows may be fixed or operable. Operable windows may slide up and down, slide side to side, or swing in or swing out. Swinging windows may be hinged at the side, top, or bottom. There are many different styles and shapes of windows, as can be seen in the illustration.

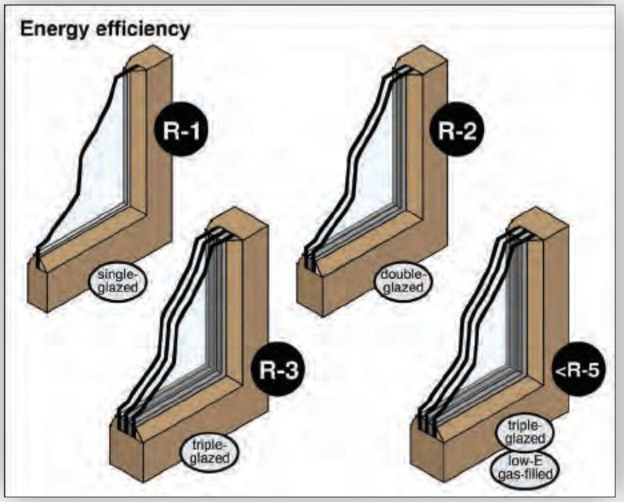


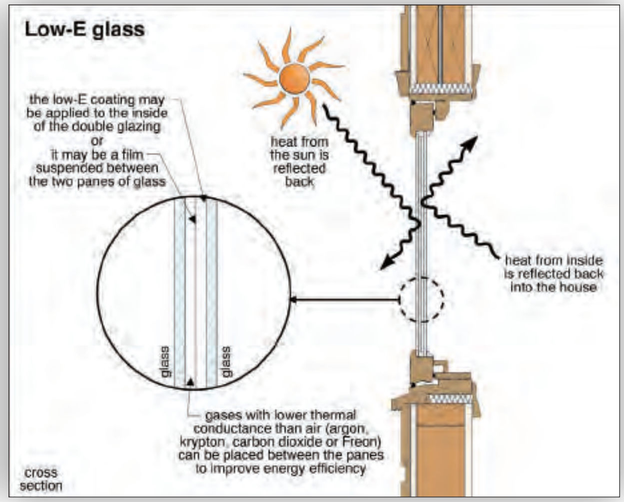
6.1 Anatomy

DESCRIPTION The pieces of glass in a window are called panes, glazing or lites. The panes are held in a sash, which may move as the window is opened. When the window within the sash is divided up into several small panes, the dividing pieces are muntins.



GLAZING Single-pane windows have a single sheet of glass. Windows with two or three panes of glass (double glazed or triple glazed) have improved energy efficiency and reduced sound transmission. These are common in colder climates. Further improvements in energy efficiency can be gained by filling the space between the glass panes with an inert gas (e.g. argon), or the addition of a low-e coating on the glass.





STORM WINDOWS The efficiency of single-pane windows can be enhanced with storm windows. These may be self-storing storms, or they may require removal in the spring and installation in the fall.

SAFETY GLASS/ TEMPERED GLASS Glass may be strengthened by tempering. Fully tempered glass is made three to five times stronger than ordinary glass by heating it and then cooling it very quickly. Tempered glass is also safer than ordinary glass because it breaks into small rectangular pieces, less likely to cut people. Tempered glass is used in sliding doors, bathtub and shower doors and skylights, for example. Laminated glass or plastic is also used where more strength and safety are needed.

REPLACEMENT WINDOWS Windows are complex and can suffer several problems. Where difficulties are experienced with several windows, it may make sense to replace all the windows. However, this is rarely cost-effective. Replacement windows are expensive and rarely pay for themselves in reduced heating costs over several years. Replacement windows may provide benefits of improved appearance, reduced maintenance and ease of operation. Some improvement in room comfort and energy consumption may also be enjoyed, although these items rarely justify the cost of new windows.

Common Problems with Windows

DIFFICULT TO OPERATE/ INOPERABLE Inoperable windows are very common and may be the result of paint or dirt in the operating mechanisms or tracks. Building settlement or swelling of wood components may also result in inoperative windows. Jammed, broken or missing hardware may also prevent easy operation.

HARDWARE Window hardware may be missing, broken or inoperative, making it difficult to open, close or lock the windows. In many cases, it is cheaper to replace hardware rather than repair or clean heavily painted hardware.

SASH CORDS Sash cords or chains on single or double hung windows are often broken or missing. The pulleys at the top of the jamb are often inoperable because they have been painted. Sash cords, incidentally, should not be painted; nor should the window guides in the frame. While cotton sash cords can last for many years, some people prefer to replace them with nylon or metal sash cords. The chain sash cords are somewhat noisier, of course.

SPRINGS The spiral spring hardware used to hold up some single and double hung windows is prone to jamming, particularly if the hardware is painted. It is also common for the springs to break or become detached from either the window or the jamb.

ROT Rot attacks wood windows, usually due to water leaks or trapped water due to poor drainage. Rotted wood windows may have to be replaced, an expensive problem. Metal or vinyl-clad wood windows may have concealed rot that goes undetected for some time.

GLASS ISSUES Panes of glass may be missing, broken or cracked. Glass may be heavily covered with several layers of paint on older houses. Removing this paint often scratches the glass, impairing visibility. Older glass has more bubbles and distortions, although this may not be considered a defect. Manufacturers' flaws include discoloration, clouding and rust streaking of the windows. In some cases, distortion may also be a problem.

SAFETY GLASS Safety glass is used on skylights, sliding doors and in shower and bathtub doors for example, where there is a risk of people falling into or through the glass. People may fall out windows that extend down within 18 inches of the floor and safety glass is often used here. Windows along stairs and at stair landings are often safety glass.

LOST SEAL Double or triple glazed windows are typically sealed with dry air or gas between the panes. These windows may lose their seal, resulting in intermittent or permanent condensation or clouding between the panes of glass. It may not be possible to identify a failed seal during a home inspection. The corrective action for these problems is replacement of the glass. Unless the glass is missing or broken, replacement of the glass is not a priority item.

GASKET MOVEMENT The gaskets on double or triple glazed windows sometimes pull away from the sash, reducing energy efficiency and moving into the field of the glass. The glass and gasket unit has to be replaced.

PUTTY The putty or glazing compound holding a window in place may be deteriorated, loose or missing. This is normally improved when repainting.

MUNTINS Muntins between panes of glass may be rotted, broken or cracked. Rotted wood usually has to be replaced. Loose muntins should be re-secured. Where the muntins are decorative lead (typical of homes built in the first half of the 20th century), the panes may bulge inward or outward. This is thought to be a result of impact or the thermal expansion of the lead, and may be related to the addition of storm windows. Depending on severity, this can sometimes be repaired by a glass specialist, although the window may have to be replaced. Specialty shops can reproduce leaded glass windows, at significant costs.

SASH DAMAGE/ ROT Wood sashes may be deteriorated as a result of mechanical damage, rot, or failed joints. It is not unusual to find the stiles and rails of wood double hung windows coming apart. This is often a result of people opening the window by lifting up on the top rail. Hardware attached to the bottom rail should be used for opening and closing double hung windows. Where this hardware is missing, it should be replaced. Metal and vinyl sashes may also fail, but this is less common than on wood.

On some horizontal sliding windows, it is common for the vinyl sashes to be pulled away from the glass. This is often because the sash is used to pull a window closed. It is better practice to push a horizontal slider closed than to pull on it, even though manufacturers may provide pulling hardware.

Rot often starts on the exterior, although it may appear on the interior, especially if there is chronic condensation.

CONDENSATION – WATER DAMAGE/ ROT Sashes and frames on older metal windows are susceptible to condensation problems. Because metal is a good thermal conductor, the inside face of the metal can be very cold, promoting condensation on the inside surface. Warm moist house air contacting cold metal cools quickly, losing its ability to hold moisture. This causes the condensation. Modern systems have a thermal break, which keeps the inside metal surface warmer. Vinyl frames can suffer similar problems.

All windows can suffer condensation. Condensation is more likely to occur with extremely cold outdoor temperatures, high indoor humidity levels and leaky, low-quality or single glazed windows. Double or triple glazed windows or windows with storms are less likely to have condensation problems.

SILL PROBLEMS Sill assemblies can be loose, rotted or improperly sloped. All these lead to water damage at the windows and walls.

DRAIN HOLE ISSUES Window systems with a primary and a storm window typically have drain holes below the outer pane so that any water between the inner and outer panes can escape. In some cases, these windows are installed backwards, with the drain holes on the inside and the sill sloping into the house. This results in damage to the walls below the sills on the inside of the house. Blocked drain holes are a related problem, but these are easily cured by removing the obstructions.

LEAK AT SILL/ JAMB A common problem with manufactured window systems is a poor connection at the sill/jamb intersection. Rain or condensation accumulates on a window sill. Although the sills should be sloped to drain water, and there should be drain holes, imperfections in this system (or a sudden build up of water) will pond water on the window sill. If the corners of the sill are not tightly sealed to the bottom of the windows, water will leak through. It is common to see water staining or wall damage below the corners of windows inside the home. Sometimes caulking this joint is adequate, although, in severe cases, the window has to be taken out and replaced or reassembled. Concealed wall damage around and below leaky windows is a common problem.

LEAK AT TOP Windows and wood frame walls tend to be installed close to the outer surface of the wall. Flashings at the top of the window help prevent water getting into the window assembly. Windows may leak at the top if the flashings are missing, poorly installed, or deteriorated.

CASING ISSUES Interior window casings or trim may be loose, missing or damaged. While this is largely a cosmetic problem, some additional air leakage and resulting heat loss may occur where the trim fit is poor.

CAULKING MISSING/ DETERIORATED Caulking of windows is done for two different reasons. Caulking on the outside helps prevent water penetration. Caulking on the inside helps prevent air leakage into or out of the house. There are several types of caulking suitable for each application, and the manufacturers' recommendations or the recommendation of a specialist should be followed when choosing a caulking. Caulking is not a lifetime material and modest quality caulkings have to be replaced every year or two.

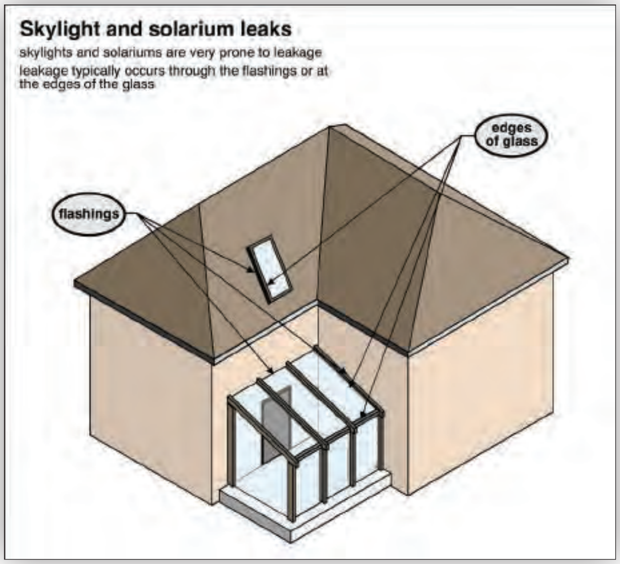
SCREEN PROBLEMS Window screens may be aluminum, steel, bronze, fiber glass or nylon, for example. Metal screens may be rusted and all screens can be torn or loose. Missing screens should be replaced.

6.2 Skylights

DESCRIPTION Skylights or roof windows typically use tempered glass or acrylic panes and may have flat or curved glazing. Acrylic is very sensitive to scratching damage from abrasive cleaners or tree branches, but is more impact resistant than glass. Single, double and even triple glazed skylights are available. Older units or special-use skylights may have wired glass to increase strength. Some skylights are operable for ventilation. Some skylights have an integral curb to help with installation. Others are designed with no curb and are installed flush with the roof surface.

Skylights installed on at least 4 inch high curbs perform better than lower skylights. It is easier to make a good roof/skylight connection with flashings where there is a curb.

A HOLE IN THE ROOF Skylights are often installed after original construction, and installation can be tricky. In addition to cutting a hole in the roof, (and the structural considerations involved) leakage must be prevented around the skylight. The skylight should have a flashing detail that makes a good watertight connection between the roof and the skylight. Poor installations are common.



Common Problems with Skylights

LEAKS Leakage is a common problem, often a result of poor installation rather than a poor quality fixture. It may be difficult to identify the leakage source without dismantling the system. Low quality and poorly installed skylights are very common and most skylights leak at some point.

OTHER PROBLEMS Skylights have the same issues as windows with respect to cracked panes, lost seals, condensation, rot and mechanical damage.

6.3 Solariums

DESCRIPTION Solariums have walls and a roof made mostly of glass. They are also called sun rooms, Florida rooms, plant rooms and greenhouse rooms. The framing for the solarium may be wood, metal, vinyl, or a combination, and the glazing may be glass or plastic. Glass used in anything other than a vertical plane should be strengthened by tempering or laminating. Glass used in roofs may have to withstand a falling tree branch or hailstones, for example.

Solariums are inherently difficult to heat and cool, due to the large glass area and absence of insulation. Comfort issues are common in solariums.

Common Problems with Solariums

LEAKS Solariums are complicated sets of interconnected windows. Water leakage problems are very common. Even high quality solariums will leak around the roof and windows if not perfectly installed. Leakage is most common at the bottom of the glass roof areas, where good flashing details are difficult to achieve, and where water may collect.

OTHER PROBLEMS Skylights have the same issues as windows with respect to cracked panes, lost seals, condensation, rot and mechanical damage. Rotted wood framing members in solariums is common, often caused by leaks or condensation.

7.0 Doors

DESCRIPTION Doors provide a way to get into and out of the house, and can add to the architectural appeal of homes. Many doors have windows associated with them. Doors may have panes of glass in the door. Sidelights are fixed windows on either side of the door. Transom lights or fanlights are fixed windows above the door. Some doors add natural light and ventilation (e.g. sliding glass doors) to a home.

Doors are typically a security weak spot in most houses, especially if they have glass in the door or in the sidelights beside the door. Wood doors are a source of heat loss in cold climates, since they are not typically as well insulated as walls. Doors and windows are holes in walls and inherently susceptible to leakage. Air and water leakage around door openings is common.

Doors may be hinged, opening into the house typically. They may be single, or arranged in pairs (French doors). Doors may also be sliding (patio doors). These are typically all-glass doors.

SAFETY GLASS See Section 6.1 in this chapter for a brief description of safety glass.

7.1 Types

SOLID WOOD Traditional exterior doors are solid wood. These doors can be made of many wood species including oak, mahogany, walnut, hemlock, pine, cherry and alder. Wood has some modest insulating properties, although the heaviest wood door does not provide as much insulation as a poorly insulated wall.

From a security standpoint, a solid wood door is relatively good, depending on the amount of glass area and, of course, the hardware quality and condition.

METAL (INSULATED CORE) Insulated core steel or aluminum doors are common in modern construction. They are cost effective, durable and low maintenance. With a metal exterior skin and insulating material (polystyrene or polyurethane) inside, this makes a good insulating door. Some metal doors have concealed wood stiles around the perimeter, to provide rigidity and support for hinges and handles. These also allow for trimming and fitting the door in the opening. Steel doors use magnetic weather stripping to create a good air seal around the perimeter. Metal doors are susceptible to denting.

FIBERGLASS DOORS Fiberglass doors have an insulated core, much like metal doors. They are relatively low maintenance, again, much like metal doors. Fiberglass doors can be much more energy-efficient than wood doors. Fiberglass doors do expand and contract with changes in temperature more than wood or steel doors. Many feel that fiberglass doors are more durable than wood or steel doors. Fiberglass doors do not dent as easily as steel doors.

ALUMINUM-CLAD AND VINYL-CLAD DOORS These doors are generally considered high-quality. They combine the low maintenance exterior of metal or vinyl with the strength of wood. These are common on patio doors, both French style and sliding.

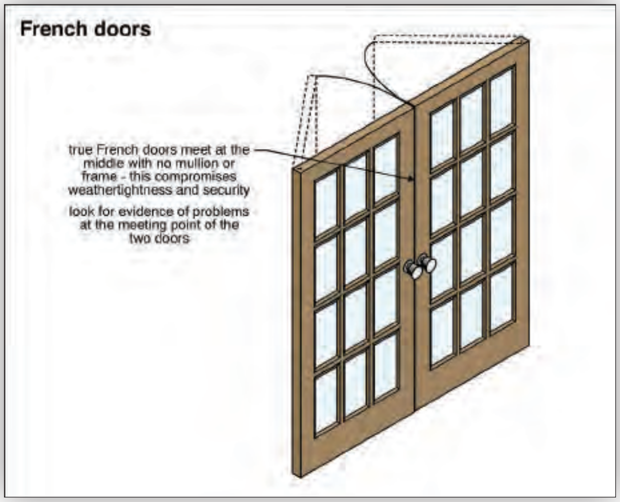
SLIDING GLASS DOORS (PATIO DOORS) Sliding glass doors have been popular since the 1950s. They provide a large glass area with good visibility. Sliding glass door frames are available in wood, metal and vinyl or a combination thereof. Metal-clad wood and vinyl-clad wood frames for sliding doors and windows are common.

A common problem with the early sliding doors in cool climates was condensation and ice on the inside of the metal frame. The condensation can damage interior floor surfaces and building components below. Modern doors include a thermal break between the inner and outer halves of the metal frame. This keeps the inside metal part of the frame warmer, and reduces condensation and icing problems.

Sliding doors typically have a fixed sash and a movable sash as well as a screen. The glass may be single, double or triple glazed.

Better quality sliding glass doors are distinguished by more expensive operating and adjusting hardware. The locking system on early generation and inexpensive sliding glass doors can be easy to defeat. Better quality doors have more secure locking systems.

FRENCH DOORS (PATIO DOORS) French doors are a double door system with the hinges on the outside edges. They close together in the middle. French doors are typically mostly glass, often broken up into several small panes by muntins. These doors can be wood, metal, fiberglass, or aluminum- or vinyl-clad wood.



STORM DOORS Storm doors in cold climates are popular where the main door is solid wood. Most storm doors are metal, although wood storms are also available. Many include a removable glass pane that can be replaced with a screen. Others have a self storing storm and screen system, similar to conventional storm windows. No matter how weather tight a single exterior door is, a storm door usually improves the situation. The second door, if properly fit, will reduce air leakage around the single door. Most storm doors are equipped with a self closer that should be adjusted to close the door tightly, for a snug fit.

Common Problems with Doors

DAMAGE, HARDWARE, OPERATING PROBLEMS Functional problems with doors include damage to the door material (rotted wood, buckled metal, etc.). Damaged or poorly installed hinges make doors difficult to open and close and, if not corrected, will lead to damage of the door and the frame. Warped doors may be difficult to operate and may be very leaky when closed. Defective latching and locking mechanisms impair security.

SLIDING DOOR DAMAGE Damage to the frame is common on sliding doors. This is often caused by excessive force used in opening and closing the door, resulting from damaged or poorly adjusted hardware, or a dirty track. Where the guides or rollers have been mechanically damaged, the door will not ride freely.

WEATHER-STRIPPING INEFFECTIVE If the door is not properly weatherstripped, excess heat loss is experienced. Where the door frames are damaged or out of square, the doors may be difficult to operate and there may be considerable heat loss around the doors. Weatherstripping on early sliding doors was often low quality.

DOOR THRESHOLD PROBLEMS Loose or damaged door thresholds are unsafe and should be repaired or replaced as necessary. Thresholds that are not sloped properly to drain or are not well sealed may lead to water damage to the home.

STORM DOOR Storm doors that do not close properly are ineffective from an energy efficiency standpoint, and may be damaged in strong winds. Many storm doors have inexpensive hardware resulting in operating problems over the long term. Auto-closers are often ineffective.

In some cases, the door frame has to be straightened or the door re-hung. Damaged glass should be repaired for safety, security, and heat loss reasons. Damaged screens and storm doors can also be safety concerns and should be repaired or replaced promptly.

SLIDING DOOR – HARDWARE Sliding doors may not operate easily because the track is damaged or dirty, or because the rolling hardware is defective. Sometimes cleaning and adjustment can solve the problem. In other cases, replacement parts are needed. Problems with latching and locking mechanisms are common.

SLIDING DOOR – WATER DAMAGE On older sliding doors in cold climates, the damage to the building interior can be significant as a result of condensation and ice build-up. The absence of a thermal break in the metal frame leads to a very cold interior metal surface. The cold metal cools the warm moist house air and condensation develops as droplets on the metal frame. The water runs onto the floor, or forms ice temporarily and as it thaws, melts and runs onto the floor. This damages the door sill, floor boards, subfloor and, in severe cases, the joists and header below. The preferred solution is, of course, to replace the sliding door system.

SAGGING HEADER (LINTEL) When sliding glass doors are installed in a new wall opening, a substantial header is required above the opening to carry the load of the wall above around the opening. If this is not done well, the header may sag, interfering with door operation.

THRESHOLD TOO CLOSE TO GRADE All doors in cold climates should have at least a six inch step up to the door sill from outside. Where this step is not done, snow accumulation may result in leakage through the bottom of the door. Where no six inch step-up is noted, good maintenance (including snow clearing) is needed to prevent water damage.

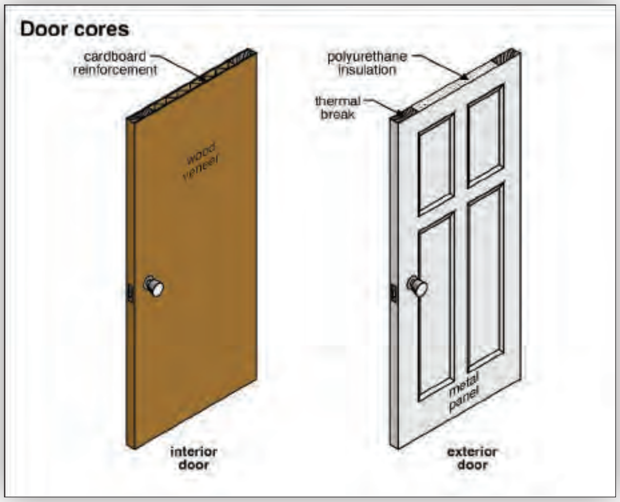
LOST SEAL CLOSE TO GRADE The loss of a seal between double glazed panes on doors is common. This results in a clouding of the glass that may be permanent. The condition is primarily cosmetic, and only a small reduction in energy efficiency occurs. Many people replace the panes because of the unsightly appearance of the clouded glass, although this is a discretionary improvement.

SAFETY GLASS Safety glass (tempered or laminated) or plastic is used on sliding doors and at shower and bathtub doors for example, where there is a risk of people falling into or through the glass. People may fall out windows that extend down within 18 inches of the floor and safety glass is often used here.

ROT AND INSECT DAMAGE Wood doors are susceptible to all of the things that attack wood-based products including rot and insect damage. Wood doors are not maintenance free, requiring regular painting or staining.

INAPPROPRIATE DOOR Hollow wood doors are generally not for exterior use. They don't stand up well to weather and do not provide great security.

DOORS INTO GARAGES They should protect the house from a fire in the garage and exhaust fumes entering the house. Good weatherstripping and automatic closers are needed. There are several types of vehicle doors. They should operate freely and auto-reverse if they meet an obstacle.



DENTED METAL DOORS Some metal doors are easily dented. This is not a functional problem, although many people object to the appearance.

PLASTIC MOLDINGS DEFORM Metal doors often have decorative plastic moldings on the surface. Problems have been experienced when a storm door is added to an insulated metal door. The space between the doors can become overheated, and the plastic moldings may deform. In the worst cases, the metal door panel may even buckle. Many manufacturers recommend against the use of storm doors with insulated core metal doors.

8.0 Stairs

Stairs and stairwells are an integral part of most homes. Structural issues related to stairwell openings are addressed in the Structure chapter.

8.1 Components

DESCRIPTION Stairs are made of stringers, treads and risers. The stringers are the long diagonal supports for the stairs that rest on the floor of the lower story and are usually secured to the side of a floor joist on the upper story. The stringers are commonly wood (e.g. 2x10s), although they can be metal. There are usually two stringers, although there can be one stringer or three. The treads are what people step on and the risers are the vertical members at the back of each tread. Again, treads and risers are most often wood. Open staircases have no risers.

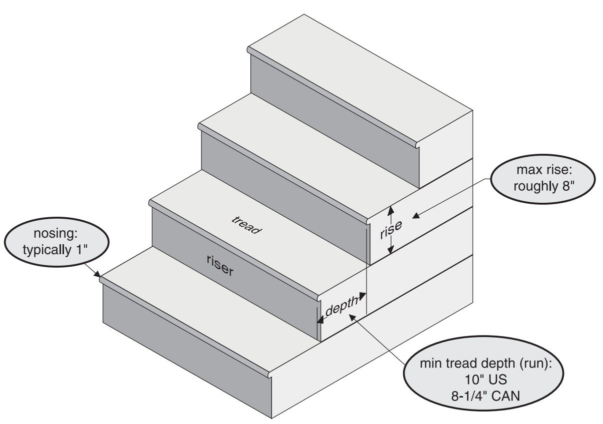
8.2 Rise and Run

RISE AND RUN Stairwell terminology is not consistent but includes "rise and run". For our discussion, the tread depth or run is the horizontal distance from the leading edge of one tread to the next. The rise is the vertical distance from the top of one tread to the top of the next. The rise and run for each step should be the same in any staircase to minimize the risk of tripping on the stairs.

NOSING The front of the tread typically extends roughly 1 inch beyond the riser below. This extension is called a nosing.

MINIMUMS AND MAXIMUMS Well-designed stairs are easy to climb. They have a maximum rise of about eight inches, and a minimum run or tread depth of 10 inches (US) or 8 1/4 inches (Canada). Generally speaking, the lower the rise and the wider the tread, the easier the staircase is to use. Dimension rules are often broken on basement and loft stairwells. It is difficult and expensive to rearrange a poorly built staircase and, in most cases, the occupants simply live with it.

Rise, tread depth (run) and nosing



8.3 Width and Headroom

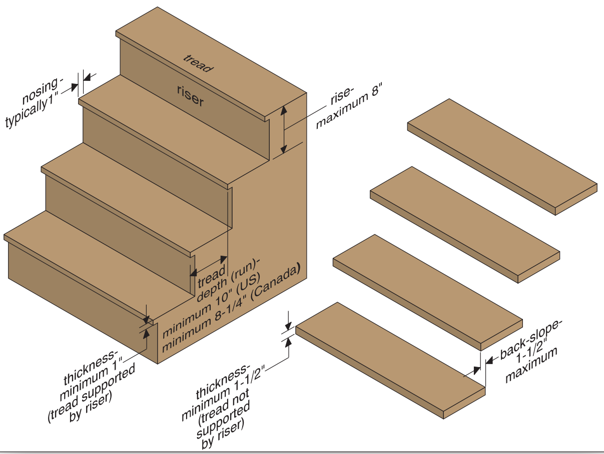
DESCRIPTION A stairwell should be at least 36 inches wide. Wider stairs are more pleasant and make it easier to move furniture. The headroom above each tread should be about 6 1/2 feet. More is better, but less is common on basement stairs. Again, it is difficult and expensive to change the stairwell head room.

8.4 Doors and Landings

DESCRIPTION Where there is a door at the top of the set of stairs, it should open away from the stairs unless there is a landing so that someone coming up the stairs won't be knocked down by another person opening the door.

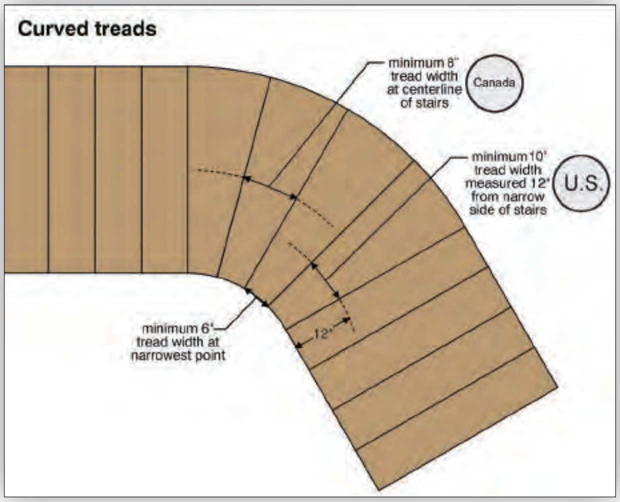
We often find the situation where a storm door has been added. The original front steps come up to a door that opened into the house. The storm door opens outward, creating a slightly unsafe situation. Ideally, the stairs should be rebuilt with a landing. Many people live with this condition.

Stair dimensions (straight stairs)



8.5 Curved Stairs/Winders

DESCRIPTION Curved stairs or stairs with winders are not as safe as straight stairs. The treads get narrow on one side. Tread runs on curved stairs can be as narrow as six inches in some cases. Winders are pie-shaped treads that shrink to a point at the inside edge. Spiral staircases are built entirely of winders and, in many areas, are not permitted as the only way to get from one floor to another. These staircases are dangerous in a fire situation because they are difficult to get down quickly.

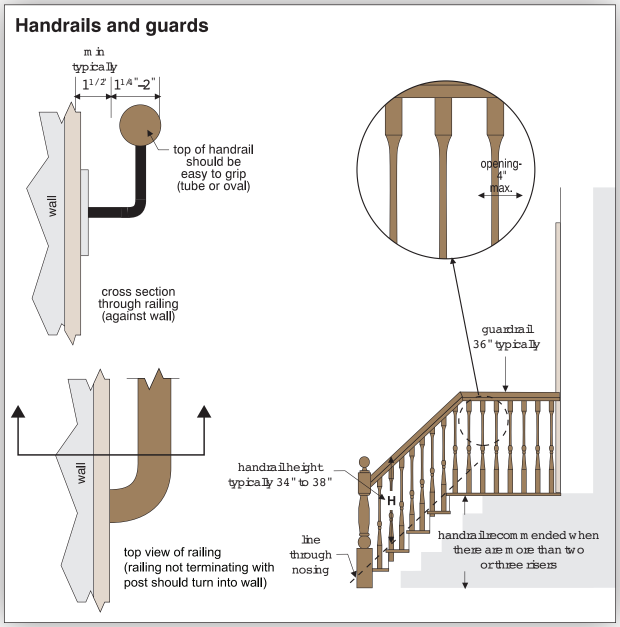


8.6 Railings

HEIGHT Railings are usually provided on at least one side of any staircase with more than two risers. Railings on stairs in new construction are usually 34 to 38 inches high, depending on the area. Railings around the top of open stairwells are typically 36 to 42 inches high. On older homes, railings are often lower and, rather than rebuilding an elegant railing, most people live with the lower one. Where child safety is an issue, a higher temporary railing is sometimes added.

OPENINGS AND CLIMB-ABILITY Openings in railings are ideally no larger than four inches in diameter, so small children will not fall through them. Good railing design avoids horizontal members that allow children to climb the railing and fall over.

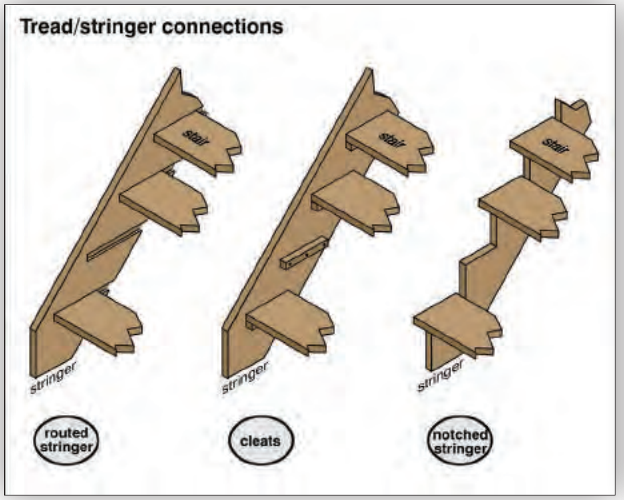
Handrails should be easy to grab. They should be set out from the wall, and small enough to get one's hand around easily. A 2x4, for example, does not make a good handrail. Handrails should end at a post or wall so clothing does not get caught on the end of the rail, creating a fall hazard.

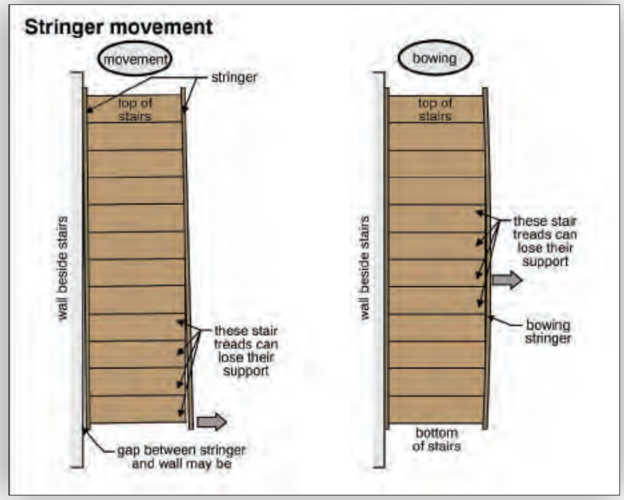


Common Problems with Stairs

DAMAGE AND ROT Stairs may be damaged by mechanical impact or wear and tear. Damaged, loose or poorly supported treads are dangerous. Rot is common at the bottom of stringers, particularly on basement and exterior stairs. This may lead to instability of the staircase.

POOR SUPPORT Stairs may be poorly supported if the floor system is weak or if the stringers are poorly designed, fastened, damaged or have shifted. Where a stringer has pulled away from the treads, the treads may lose their support and fall out.

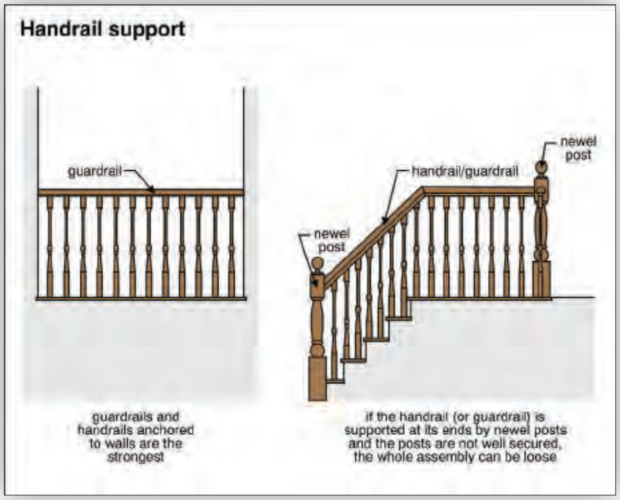




UNEVEN STAIRS – SAFETY PROBLEMS The rise on every step should be the same, and the treads should all be the same width. Stairwells that do not follow size or uniformity guidelines are more difficult to use and may lead to an accident. Imperfect staircases are common in older homes and may not be cost-effective to rearrange.

RAILING ISSUES Missing, weak, loose, damaged, rotted or poorly arranged railings are a safety concern. Railings with large openings or horizontal members that make it easy to climb are safety issues.

WIDTH AND HEADROOM Narrow stairwells make moving furniture difficult. Stairwells with inadequate headroom are a safety concern. The low headroom should be marked if the stairs cannot be rearranged.



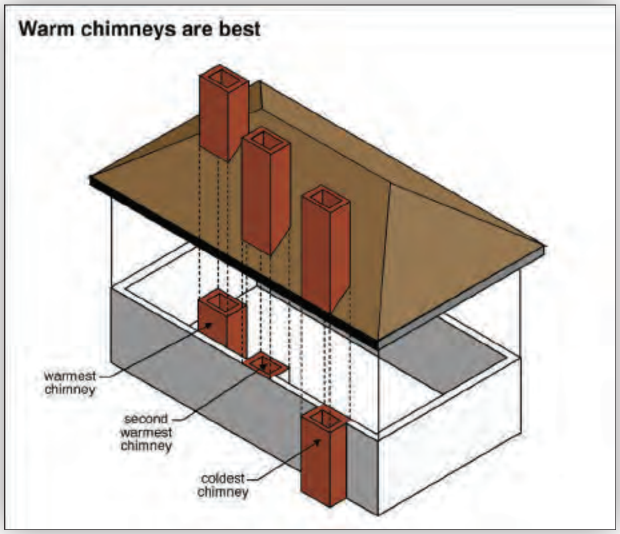
9.0 Fireplaces and Wood Stoves

DESCRIPTION Fireplaces were used historically for heating homes and preparing food. Today, fireplaces are primarily recreational. Most fireplaces use more heat than they provide and in this sense, are a luxury item. How can this be? Fireplaces provide radiant heat into a room, but consume warmed house air for combustion and draft. The warmed house air that goes up the chimney typically represents more heat loss than the radiant heat gain from the flames. A roaring fire can draw 300 to 400 cubic feet of air out of a house every minute. Warm air circulators, glass doors and outside combustion air intakes help reduce the heat loss.

Wood stoves are enclosed units and are somewhat more energy efficient than fireplaces. Although they may be used recreationally, they are often important sources of heat for the home.

INSPECT BEFORE USING! All fireplaces and wood stoves should be inspected by a specialist before the first use, and at least annually thereafter.

CHIMNEY DRAW There are many types of fireplaces, each with their own advantages. It is tough to know which fireplaces will draw well and which will be problems during the home inspection. Some draw well most of the time, but are troublesome under certain wind conditions. Chimneys that are exposed to cold outdoor weather sometimes have trouble establishing a good draft. Interior chimneys tend to be warmer and often draw better. Home inspectors do not light fires in fireplaces and do not evaluate draw.



SAFETY Fire safety is a much greater concern than the quality of draw. Fireplace, stove and chimney systems may be unsafe because of poor construction or installation, building settlement, improper usage or poor maintenance. Many safety-related items are not visible. Where there is reason for doubt, it is best to engage a fireplace specialist. In any case, fireplace and chimney systems should be inspected (and cleaned if necessary) before use when taking possession of a house, and at least annually.

Combustible clearances are a big issue with wood-burning fireplaces and stoves. If these are not maintained, there is a fire hazard. Creosote (a tar-like substance) buildup in chimneys is also a significant fire hazard. This product of incomplete combustion has tremendous energy content, and a fire in a chimney with heavy creosote deposits can create very high temperatures and cause a lot of damage.

9.1 Fuel

DESCRIPTION **9.1.1 Wood:** Wood is the traditional fuel for fireplaces and stoves. Wood fires can be roaring blazes or slow smoldering burns. There are several variables, including the design and shape of the fireplace or stove and chimney, the amount of air available, the type, size and moisture content of wood used, the amount of wood in the firebox, and how the wood is arranged in the firebox.

DESCRIPTION **9.1.2 Gas:** Many fireplaces installed in the late 19th and early 20th century were designed for use with natural gas or manufactured gas. These systems typically employ a very small firebox and often have decorative marble, cast iron or ceramic borders around the fireplace opening. These are generally not suitable for conversion to wood-burning fireplaces without major improvements.

Modern natural gas fireplaces are also available, some of which do not even require a chimney. Natural gas fireplaces or logs are often inserted into a masonry fireplace. In some cases, a chimney liner is necessary.

DESCRIPTION **9.1.3 Coal:** Coal-burning fireplaces were common in the 1800s and early 1900s. They typically employed cast iron grates with a pull-out drawer in the bottom to remove the ashes. Most units had two dampers and the firebox was both narrow and shallow. Some units had slotted, heavy, cast iron covers available to put over the entire opening. These fireplaces are often used for burning wood, although most specialists recommend that this not be done without a careful examination of the fireplace and chimney system. These fireplaces are invariably old and should always be inspected by a specialist prior to using them, even for burning coal.

9.2 Fireplace Type

MASONRY FIREBOXES

9.2.1 Masonry (Wood Burning):

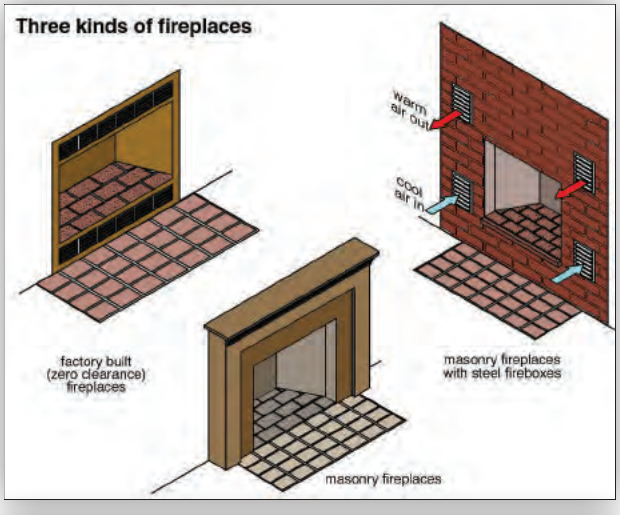
There are three types of wood burning fireplaces – masonry firebox, metal firebox and zero clearance (all metal). We'll start with masonry fireplaces.

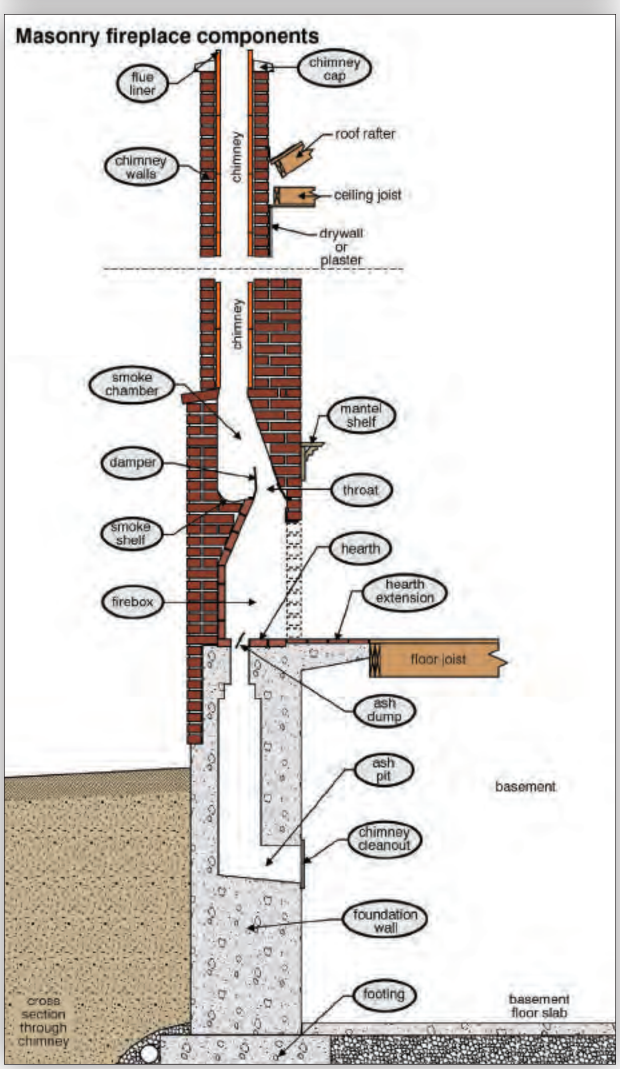
The firebox walls are usually brick, stone or concrete block with a firebrick liner. The mortar joints in the firebrick should be a special refractory mortar and should be as thin as possible. No mortar is required in the firebrick on the hearth, since the bricks are not likely to move out of position.

Some early masonry fireplaces did not include a special fire-brick liner. Ordinary brick eventually breaks down and has to be replaced.

METAL FIREBOXES

Some masonry fireplaces have a manufactured metal firebox. In these cases, the walls of the firebox are steel plate, surrounded by masonry. These can be satisfactory, although some fail by bowing or buckling. This is usually a result of inadequate clearance between the metal and the masonry. (A metal fire-box, incidentally, should not be confused with a zero-clearance fireplace or a fireplace insert. These are discussed later in this section.)



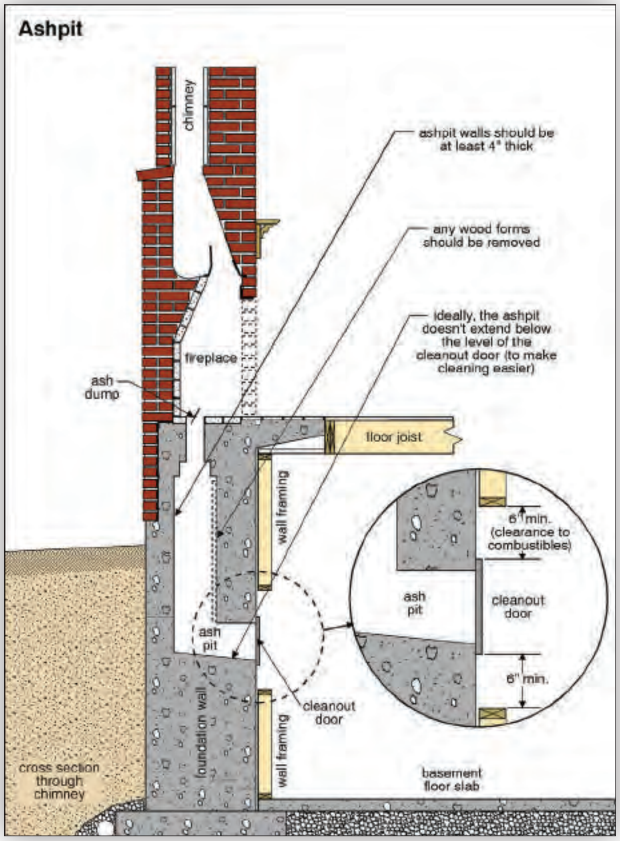


DAMPERS Masonry fireplaces have a metal damper that is usually just above the firebox. The damper may be operated from a handle on the mantle face, or a lever located inside the firebox. Dampers are closed when the fireplace is not in use to minimize heat loss. Dampers must be open for fireplaces to operate.

CHIMNEY The chimney itself is usually made of the same masonry unit as the fireplace and, since approximately 1950, 5/8 inch thick clay tile liners have been provided on the inside of the chimney. Liner sections are usually two to three feet long and the joints are mortared together.

MANTLES Mantles for wood burning fireplaces should not have combustible materials within six inches of the fireplace opening. As a guideline, where there is combustible material around the fireplace opening, and it projects 1-1/2 inches or more out from the surface of the mantle, it should be at least 12 inches above the opening. Many wood mantle shelves break this rule and may be subject to overheating.

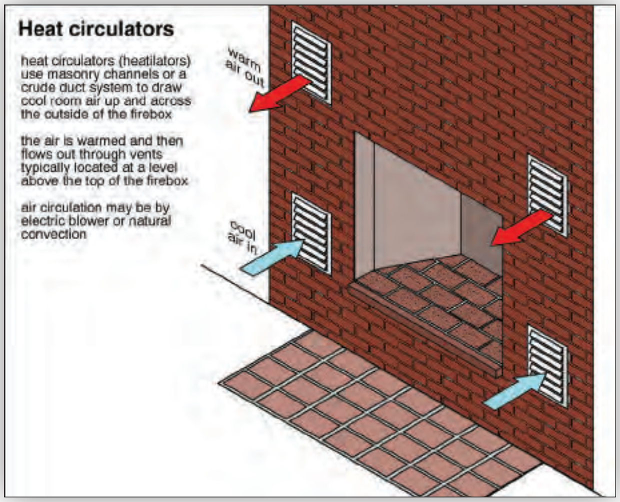
ASH PIT (ASH DUMP) An ash pit is a covered opening in the fireplace floor for disposing of ashes. There is typically a clean out at the bottom of the chimney in the basement below. Ash pit covers prevent hot embers accumulating in the ash pit and igniting nearby combustible materials.

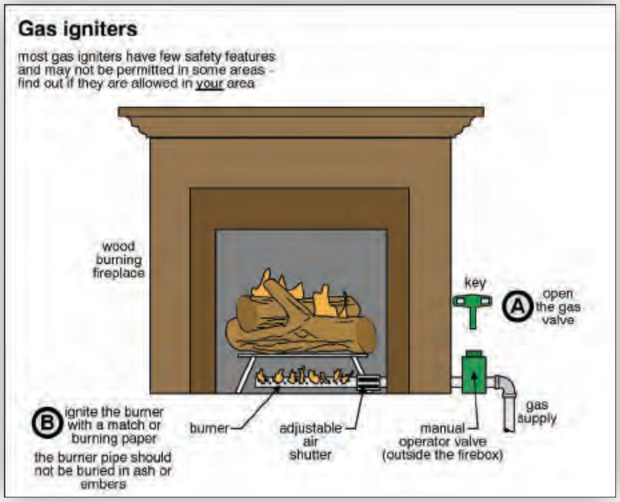


OUTSIDE COMBUSTION AIR Some fireplaces bring combustion air from outside, so that warm house air will not be wasted. Glass doors are often used to prevent house air from being drawn into the fireplace.

HEAT CIRCULATING SYSTEMS Some fireplaces allow house air to be drawn in to pick up some heat from the outside of the firebox to help heat the home. These systems may operate by natural convection or with a fan to help move the air.

GAS IGNITERS Some wood burning fireplaces have gas igniters. These are typically controlled by manual valve just outside the firebox. They are turned on when lighting the fire and then turned off. These are not permitted in all areas.



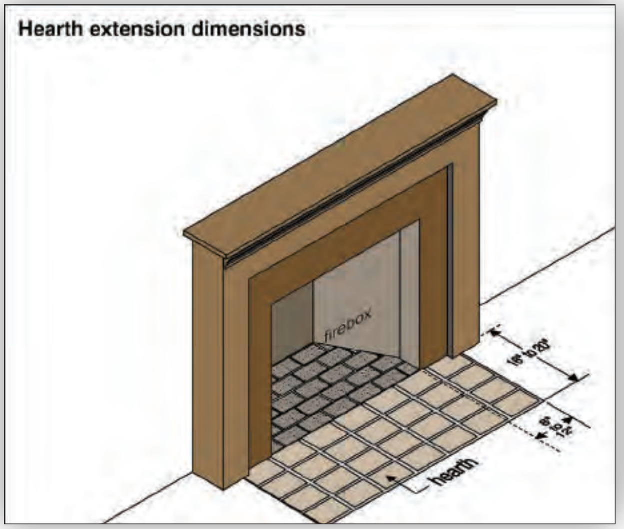


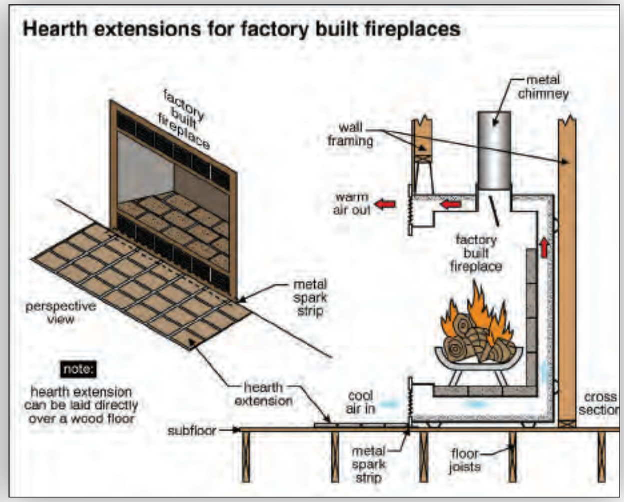
Common Problems with Masonry Fireplaces

UNSAFE Fireplaces may be unsafe for a number of reasons. Common problems include cracked hearths (often a result of building or fireplace settlement), deteriorated firebrick, inadequate clearance from combustibles (walls, mantles, lintels, etc.), openings in the fireplace or chimney (as a result of building settlement, poor construction technique or deterioration of materials) and dirty chimneys coated with creosote. Wherever safety related problems are suspected, a specialist should be engaged.

UNDERSIZED HEARTHS

Many wood burning fireplace hearths are undersized. They should project 16 to 20 inches out in front of the firebox and 8 to 12 inches beyond either side. Improvements may or may not be cost-effective, although with small hearths, close attention should be paid to sparks and embers.





POOR DRAW (THE FIREPLACE SMOKES)

Poor draw on a wood-burning fireplace may be the result of a chimney that is too short, a flue that is too small, a fireplace opening that is too large, a poorly shaped firebox, a damper that is too small, too low or too far back, a rough surfaced or poorly shaped smoke chamber, an excessive offset in the chimney flue, the absence of a smoke shelf, or inadequate combustion air. As you can see, analyzing chimney draw is complex.

Another simple cause for a smoking fireplace is the fire being too close to the front of the fireplace. Moving the fire back sometimes solves a smoking problem. If the fireplace is too shallow to permit this, the fireplace may have to be rebuilt.

A dirty chimney can result in a smoking fireplace because it is difficult to fully open the damper, or the accumulation of debris on the smoke shelf will change the direction of air movement in the chimney.

Most fireplaces break at least some guidelines of good design. The trick is not to create the perfect fireplace, but to correct the most serious flaws as economically as possible. Generally speaking, simple solutions should be tried first and more substantial work only undertaken if the inexpensive approaches are unsuccessful.

Straightforward solutions include reducing the fireplace opening size (for example, by adding more firebrick on the hearth), extending the chimney height, or adding glass doors. In some cases, adding a rain cap on the chimney top prevents down-drafts and cures the problem. Adding combustion air may solve a smoking problem while reducing heat loss. Where these do not work, a specialist should be engaged and more extensive work may required.

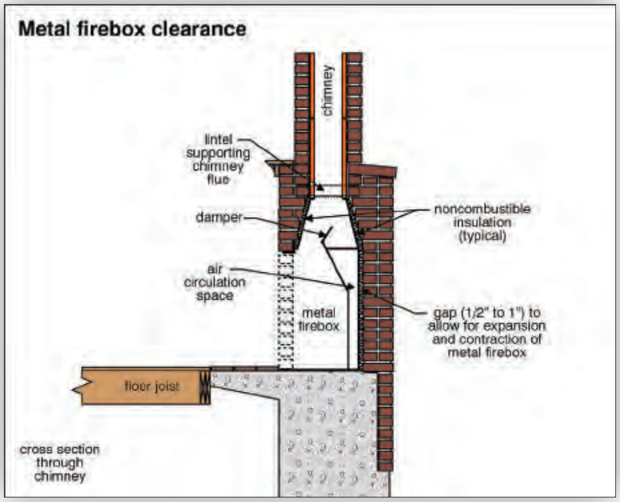
DAMAGED/ DETERIORATED BRICK

Deteriorated brick or mortar in the firebox may be a safety concern. This should be checked and corrected as necessary promptly.

BUCKLED/ DAMAGED/ RUSTED METAL FIREBOXES

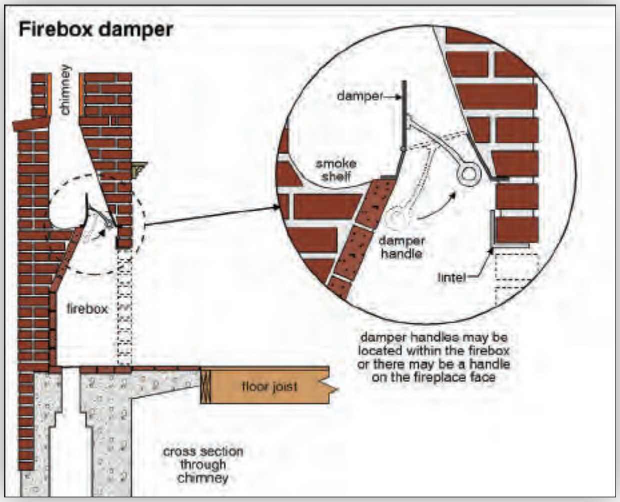
Metal fireboxes should be kept 1/2 inch to one inch away from masonry. The gap should be filled with noncombustible insulation. Where this gap is not provided, the metal firebox may buckle as it expands during a fire. In some cases, the masonry will crack. The metal and/or masonry may have to be replaced, depending on the advice of a specialist.

Rusted fireboxes may be caused by chimney or roof leaks. Rust can weaken the metal and make the fireplace unsafe. Where rust is noted, a specialist should be engaged to investigate further.



DAMPER PROBLEMS

Dampers may be rusted, damaged, jammed or misaligned. Perhaps the most serious problem is a missing damper. It is fairly expensive to install a damper where none was allowed for on original construction. Glass doors may be an acceptable alternative. Dampers installed too low may lead to a smoking fireplace.

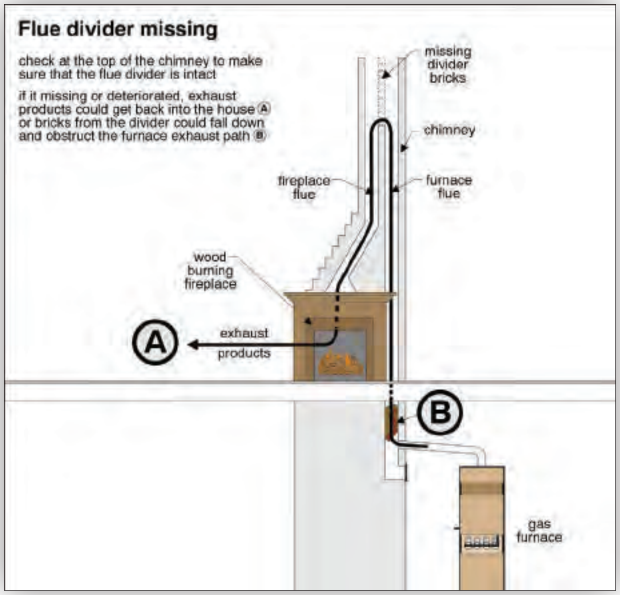


SHARED FLUES

A wood burning fireplace should not share a chimney flue with any other appliance, including another fireplace. There is a danger that products of combustion will enter the house through the idle appliance flue. Some older houses were built with shared flues, and in these cases, one of the two appliances should be abandoned. Specialists may be able to provide alternative solutions.

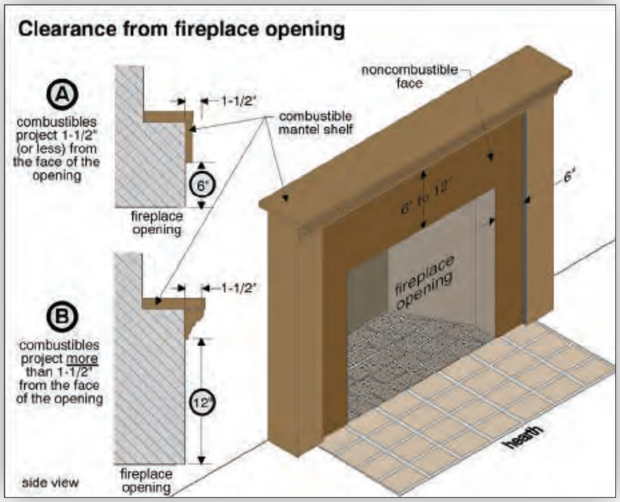
Shared chimneys are found in many attached houses, where back-to-back fireplaces in adjacent homes share a chimney flue. This can be an awkward arrangement to detect initially, and to resolve amicably.

A furnace in the basement may share a flue with a fireplace in the living room above, and a second floor parlor fireplace directly above the living room. Often the chimney will have two flues for the three appliances. These situations require assistance from a specialist.



FACADE/ MANTLE MOVEMENT A common problem on modern fireplaces is a masonry facade pulling away from the wall with the mantle leaning out into the room. There may be a gap visible between the top of the facade and the wall. The cause is usually a floor system sagging under the weight of the concentrated masonry load. In most cases, the problem is not serious, but where the tightness of the firebox is compromised, repairs are necessary. If the masonry is at risk of falling, there is a safety concern. Repairs may include re-supporting from below.

COMBUSTIBLE CLEARANCES Combustibles should be at least six inches away from the sides of the fireplace and six inches above. Where combustibles project out more than 1-1/2 inches from the wall, they should be at least 12 inches above the opening. There may be evidence of overheating on the underside of mantle shelves.

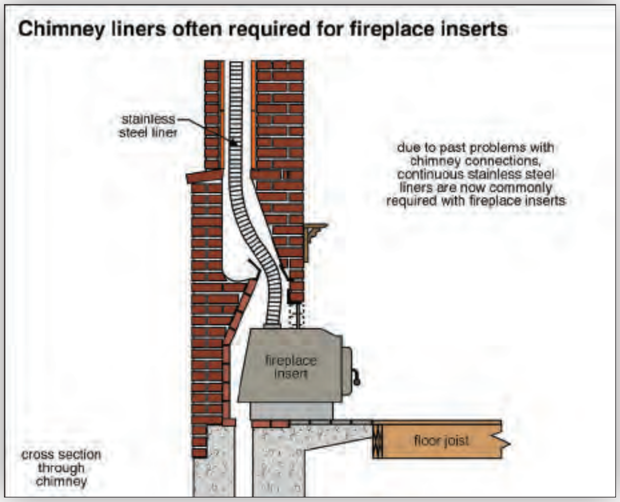


DESCRIPTION **9.2.2 Zero Clearance, Prefabricated or Factory Built Fireplaces (Wood Burning):** Zero clearance fireplaces have been popular since the 1970s. These are insulated metal units that weigh much less than masonry fireplaces. They can be located almost anywhere in a house, since no foundation is required. Despite the name, care must be taken during installation to ensure appropriate clearances from combustibles, as recommended by the manufacturer. These clearances cannot be verified once construction is complete.

CHIMNEYS These fireplaces are typically connected to metal chimneys specially designed for this use. Chimneys typically include a rain cap and a spark arrestor screen. A safe installation depends on a good connection between the fireplace and chimney, good connection of the chimney sections, and proper extension of the chimney above the roof. The system should be well secured and combustible clearances for the chimney should be maintained.

DAMPERS AND GLASS DOORS Zero clearance fireplaces have a damper, but usually have no smoke shelf. Many include a built-in warm air circulator system and some are approved for use with glass doors. Only the glass doors specified by the manufacturer may be used. In some cases, glass doors are required.

DESCRIPTION **9.2.3 Fireplace Inserts (Wood Burning):** Many conventional masonry fireplaces have a metal insert added to increase energy efficiency. These usually include a door and operate much like a wood stove. The units are more energy efficient than open fireplaces.



A Problem Unique to Fireplace Inserts

POOR CONNECTION TO CHIMNEY Many difficulties have been experienced with poor connections between the insert and the original chimney. This cannot be checked without pulling out the insert , which is not done during a home inspection. This should be done by a specialist when the system is serviced annually. A continuous chimney liner connected to the top of the insert is a good solution.

Problems Specific to Zero Clearance Fireplaces

These fireplaces have most of the same issues as masonry fireplaces. Problems with the firebox, damper and hearth are common. Combustible clearances can be an issue.

SAFETY CONCERNS Unsafe zero clearance fireplaces are common due to poor connections, missing insulation, provision of insulation where none is allowed, dirty chimneys coated with creosote and inadequate clearance from combustibles. (Even zero clearance fireplaces need some clearance.)

MISSING/ UNDERSIZED HEARTH The absence of a hearth in front of the fireplace is a common problem with these systems. Other hearth problems include undersized or poorly installed hearth systems. It is often difficult to see these problems once the system has been installed.

DESCRIPTION **9.2.4 Gas Fireplaces and Gas Logs:** Although these are primarily decorative appliances, some gas fireplaces provide heat for rooms. Some contain a heat exchanger to help transfer heat into the house air.

Gas fireplaces and gas logs may be standalone or installed in existing wood burning fireplaces. Gas fireplaces designed to fit into masonry fireplaces are often referred to as fireplace inserts.

GLASS DOORS Some systems have glass doors which cannot be opened. Others have operable glass doors. Some glass door systems have been problematic and there have been recalls. Identification of product recalls is not within the scope of a home inspection.

COMBUSTION AIR Combustion air for these devices may be taken from house air or from outside.

REMOTE CONTROLS Remote controls are available to turn the fireplace on and off and to control circulating fans. Fans may be manual or thermostatically controlled.

Problems Specific to Gas Fireplaces

INOPERATIVE Inoperative gas fireplaces may be the result of a defective gas valve, thermocouple or igniter, an electrical problem, or the gas may be shut off. Diagnosing fireplace problems is not within the scope of home inspection.

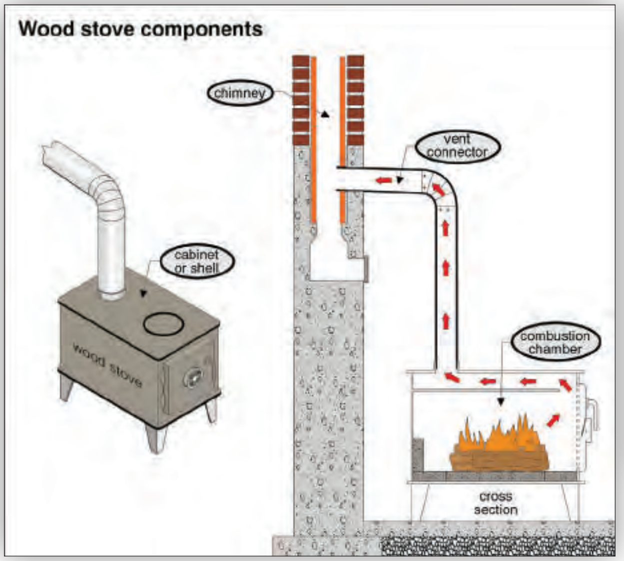
BEDROOM OR BATHROOM In many areas, gas fireplaces must be approved for use in bedrooms or bathrooms, or must meet certain requirements to reduce the potential for exhaust gases entering the home. A common requirement is that the fireplace be direct-vented.

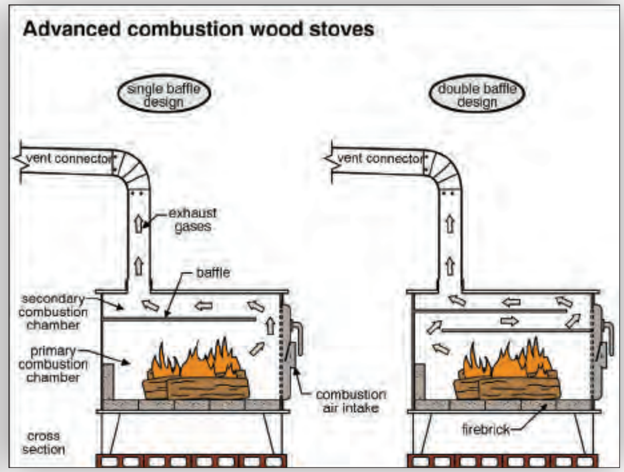
DAMPER CLOSED Where gas logs are installed in an existing fireplace, the fireplace damper must be permanently opened or removed so that the exhaust can go up the chimney. If the damper is accidentally closed, the combustion gases cannot leave the home, creating a health hazard.

GLASS DOORS Some glass door systems have overheated and may present a safety concern. We recommend checking with a specialist during regular servicing to ensure there has been no recall or problem with the glass doors on the gas fireplace.

9.3 Wood Stoves

DESCRIPTION A well-manufactured and properly installed wood burning stove can be a safe and energy efficient system. Poorly installed or maintained stoves have caused some fires, and some insurance companies will not provide insurance for homes with wood stoves.



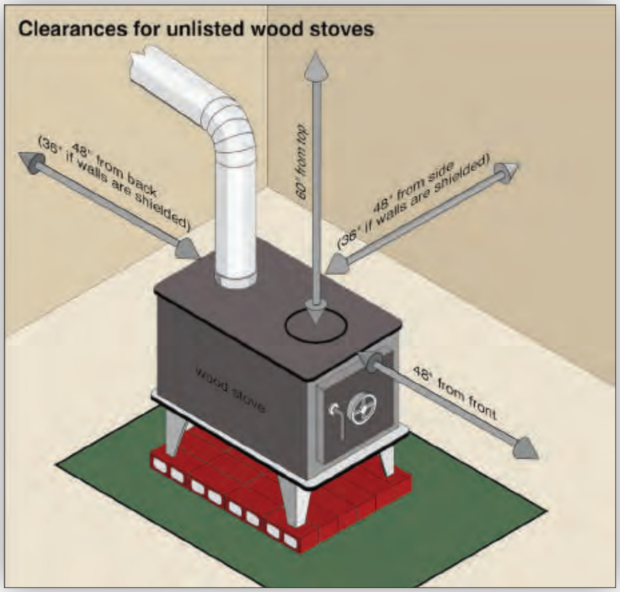


LISTING Wood stoves may be listed by several agencies. Installation clearances are set out in the listings for individual stoves. Where a listing cannot be found on a unit, the following guidelines are typically used.

FLOOR PROTECTION Wood stoves typically sit on a concrete floor or a protected wood floor. The wood floor should be protected with a noncombustible pad (sheet metal, for example), extending 18 inches beyond the stove door and eight inches beyond the other sides. On top of this should be eight inches of hollow masonry. Usually, two courses of four-inch units are used, arranged to allow air circulation. Stoves that sit off the floor can rest on special metal plates with spacers and the masonry units can be omitted.

COMBUSTIBLE CLEARANCES Unlisted stoves should be 48 inches from combustibles (including walls, even if covered by plaster or drywall) on all sides and 60 inches above. Clearances can be reduced if special protection is provided, or if the unit is designed for reduced clearances. Side clearances can be as small as 18 inches.

Side and rear clearances can be reduced by two-thirds if the wall is protected by metal sheets spaced out one inch from the wall. A reduction of one-half is acceptable if brick or ceramic is spaced out from the wall one inch.

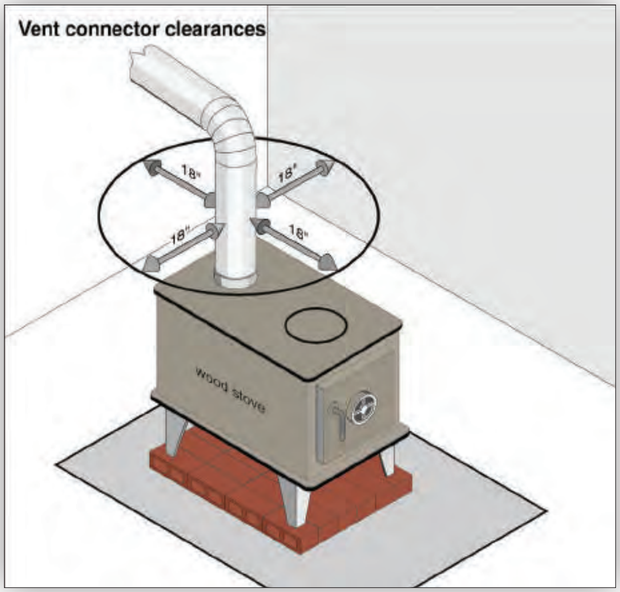


Many installations will not meet the clearances indicated above. The original installation instructions may have called for less clearance. Standards have become more strict in recent years.

FLUE PIPE Single wall flue pipes should be kept at least 18 inches from combustibles, including wood-frame ceilings and walls, even if covered with plaster or drywall. Flue sections should be fit together so that condensing creosote running down the chimney will not leak out at seams. Adjacent sections should overlap by at least one to two inches and should be secured with three screws.

Flue pipes should be black steel, stainless steel or enameled steel; not galvanized steel.

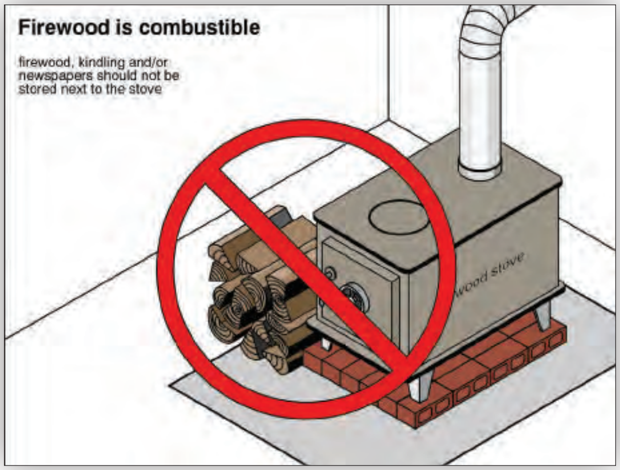
CHIMNEY A masonry chimney or a metal chimney specially designed for solid fuels should be used. Under normal circumstances the stove should not share a flue with any other appliance. Under no circumstances should a stove share a flue with an appliance on a different story.



Common Problems with Wood Stoves

COMBUSTIBLE CLEARANCES Proper clearances from combustible materials are described above, although individual units may have been tested and approved for installation with lesser clearances. This information is usually found on the stove itself. Inadequate clearances are a significant fire safety issue, since long-term exposure to high temperatures will reduce the auto-ignition temperature of combustibles. Eventually, the combustible materials may spontaneously ignite.

Many stoves are installed properly, but homeowners store their firewood, kindling and newspaper adjacent to the stove, defeating the combustible clearance requirements.



PELLET STOVE Some stoves burn compressed wood or biomass pellets rather than wood.

FLOOR PROTECTION Inadequate floor protection is a fire hazard, especially when sparks or embers drop out of the open door.

FLUE PIPE PROBLEMS Flue pipes or breechings (the pipes that join the stove to the chimney) should have no more than ten feet of horizontal run, no more than two 90-degree elbows, supports every three feet, and should have joints that allow condensate to drain into the stove. Joints have one sleeve that fits inside another, with the lower sleeve outside the upper sleeve. The minimum flue slope up from the stove to the chimney is 1/4 inch per foot. The flue/chimney connection should be tightly made with a thimble or flue ring. The exhaust flue pipe should not extend into the chimney flue opening.

Rust is a significant problem with metal flue pipes and chimneys.

SAFETY INSPECTIONS Many insurance organizations are concerned with wood stove safety, and may insist that a specialist inspect a wood stove installation. Others may refuse to offer insurance if the home has a wood stove. Because of the controlled and relatively slow burn of a wood stove, creosote deposits in chimneys can be a problem. All chimneys should be cleaned regularly, but special attention should be paid to wood stove chimneys.

10.0 Basement Leakage (Including Crawlspaces)

DESCRIPTION Basement leakage is one of the most common problems found in houses; almost all basements will leak at some point during their life. (We use the word basement in this section to include basements and crawlspaces.) While structural damage caused by leakage is very rare, water in the basement can be a major inconvenience and often causes damage to interior finishes and storage. In addition, mold has become a significant health concern.

Unfortunately, we cannot determine how often a basement may leak and how serious the problem might be during a one-time home inspection. There may or may not be clues that indicate a history of basement dampness. These clues usually do not give an indication of the severity or frequency.

Section 10.1 lists some of the clues that suggest basement dampness. They can be misleading. For example, efflorescence (white salt crystals) forms on basement walls as water migrates through and evaporates, leaving minerals behind. Most people assume that the greater the efflorescence, the more severe the problem. In reality, more deposits come from drier air in the basement, greater rates of evaporation and hence, more mineral deposits. Strangely, a de-humidifier in the basement can increase the amount of efflorescence.

Rust, mold and mildew can be caused by moisture penetration into the basement, but can also be caused by condensation forming on foundation walls as hot, humid summer air comes in contact with the cool walls.

Moisture problems are intermittent. In some houses, water penetration will occur after virtually every rain. In other houses, it will occur only after periods of prolonged rain, and in still others, it will only happen with wind driven rain from a certain direction or during a spring thaw. In most cases however, the resultant damage gives no indication of frequency.

10.1 Identification of Problems

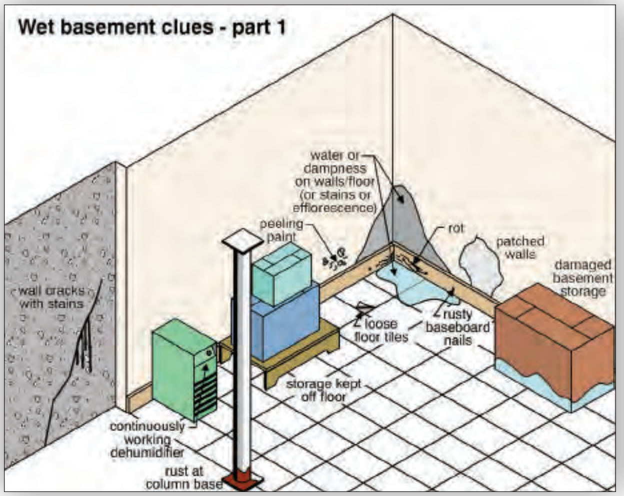
WALL REPAIRS Repairs noted on the exterior that may suggest wet basement problems include patching with tar-like materials, cement parging, or any one of a myriad of waterproofing products. Freshly excavated areas may also indicate recent repairs. New sod along the edge of a house also suggests recent exterior work.

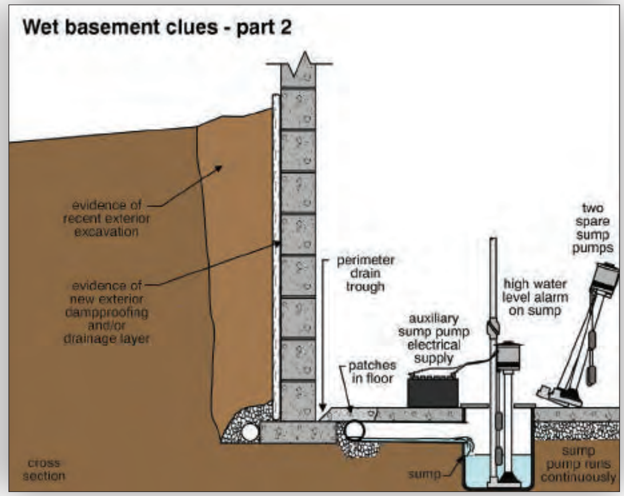
On the interior of poured concrete walls, plugged holes may indicate that cracks have been filled with epoxy or polyurethane for example. Patching or a trench around the perimeter of the floor may indicate an interior drainage system has been added.

EFFLORESCENCE Efflorescence is a whitish mineral deposit often seen on the interior of foundation walls. Efflorescence indicates moisture penetration, although it does not indicate the severity or whether the problem is active. As water passes through a wall, salts in the masonry, concrete or mortar are dissolved, so that when the water arrives at the wall surface, it contains salts in solution. As water evaporates from the wall surface, a crystalline salt deposit, known as efflorescence, is left. This may be the result of outside water passing through the wall, condensation, or water wicking up through the wall by capillary action.

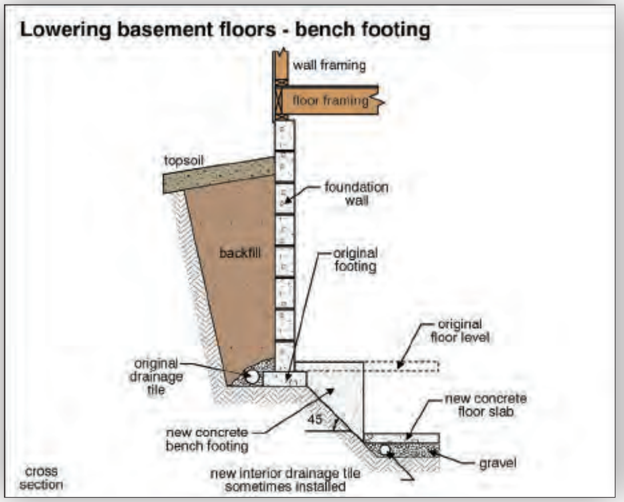
RUST Rusty nails in baseboards or paneling, rusted electrical outlet boxes or rusted metal feet on appliances may indicate wet basement problems.

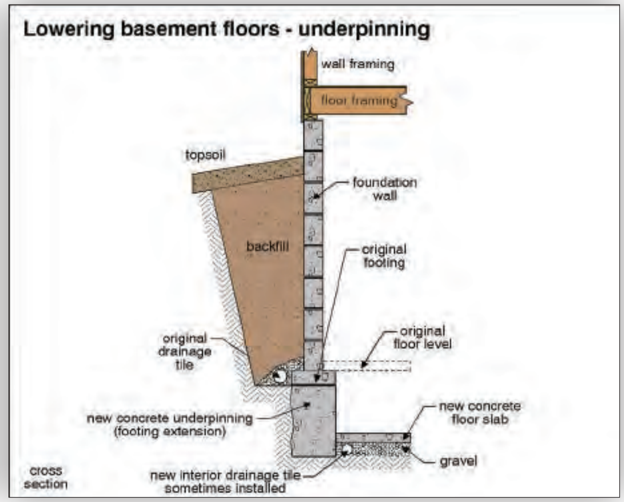
MOLD/STAIN/ DAMAGED STORAGE/ETC. Other indicators include mold; water stains; odors; sagging cardboard boxes stored on the floor; crumbling plaster or drywall; lifting floor tiles; rotted or discolored wood at or near floor level; storage on skids or boards raised off the floor; dehumidifiers; peeling paint; and crumbling concrete.





LOWERED BASEMENT FLOORS When basements are lowered, the exterior drainage tile around the perimeter of the home becomes largely ineffective, because it ends up above the floor level. Houses with lowered basements are much more prone to leaking basement problems. This is anticipated in some cases, and interior drainage tile may be provided below the new basement floor.





WATER SOURCE When a wet basement problem is identified, the first step is to make sure the source is not from within the house. A leaking plumbing system, water heater, washing machine, or hot water heating system, may all be confused with basement leakage. Sewers may back up through floor drains, causing basement flooding. During the summer months, condensation on cold water piping can make a localized section of a basement surprisingly wet. Condensation on cool foundation walls can also be mistaken for leakage. This often results in a damp basement odor. These issues require specific action.

10.2 Approach

DESCRIPTION Basement leakage clues do not indicate the severity or frequency of leakage. Since virtually all basements leak at some point, the question is not, "Will the basement leak?" but, "When?" With a few exceptions, wet basement problems can be cured or significantly reduced inexpensively.

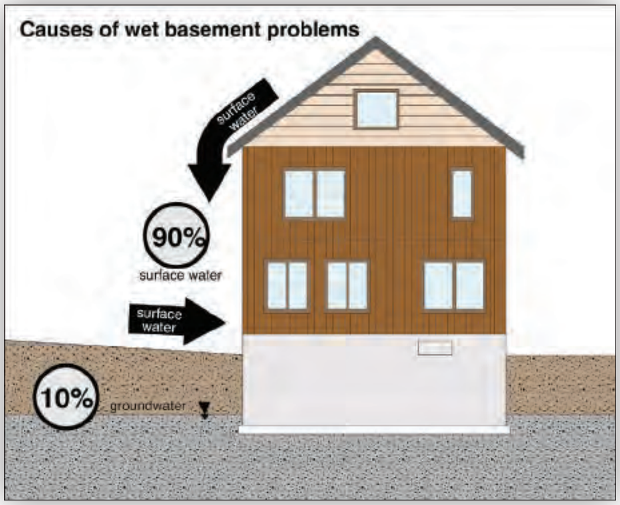
Most contractors asked to solve wet basement problems are not prepared to bear this responsibility. They do not want to suggest solutions that usually work, but not always, even if those suggestions save the homeowner a lot of money. Many contractors offer solutions that minimize the risk of future problems and complaints. These solutions tend to be the more disruptive and expensive.

If one cannot afford to experiment (because, for example, the basement is going to be rented out, or is about to be finished), the higher cost but lower risk approach makes sense. However, a less radical and more systematic approach will usually yield a far less expensive solution.

90% OF PROBLEMS ARE FROM SURFACE WATER Less than 10% of basement leakage problems are caused by ground water (underground streams and high water tables). Since more than 90% of wet basement problems are caused by surface water (rain or snow) collecting around the building, the surface water issues should be addressed first.

Two things have to happen for a basement to leak:

1. There is water outside the basement.
2. There are flaws in the basement wall that allow water through.

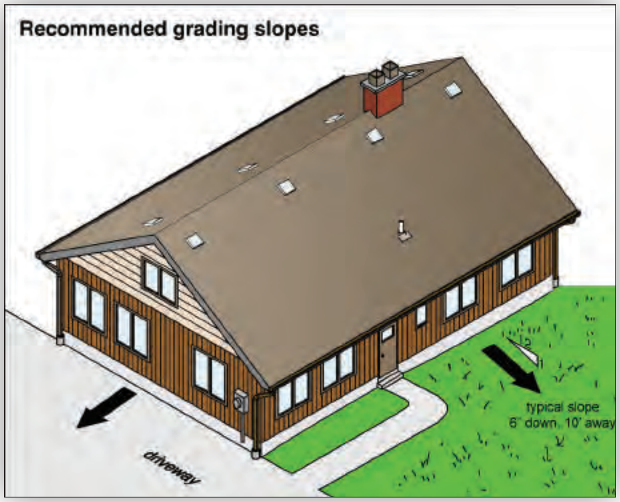


SOLVE PROBLEM AT THE SOURCE

Rather than trying to make a basement or crawl space into a perfectly watertight vessel, it makes sense to keep water away from the building. It's difficult and expensive to turn a house basement into a boat. Even houses with leaky foundation walls will be dry if the water from rain and melting snow flows away from the house and does not accumulate in the soil around the building.

KEEP WATER AWAY FROM FOUNDATION

Rain water and water from melting snow accumulates in the soil outside the building from two sources – the roof and the ground around the building. We can keep the soil around the building dry if we drain the roof water into gutters and downspouts, and slope the ground around the building so water naturally drains away.



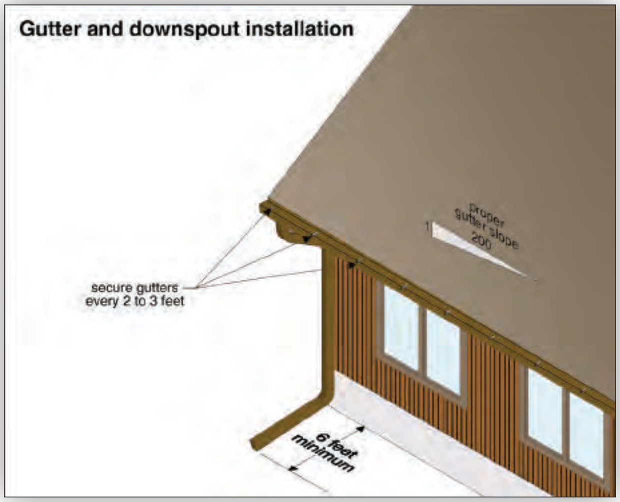
Once the source of the water has been eliminated, that is usually the end of the problem. As a precaution, obvious cracks and holes in foundation walls can be addressed, if needed. Large scale digging, dampproofing, drainage membranes and drainage tiles are a last resort after improving gutters and downspouts to control roof water, improving grading to drain surface water away, and correcting obvious points of water penetration.

The following step-by-step process solves most basement dampness problems relatively inexpensively.

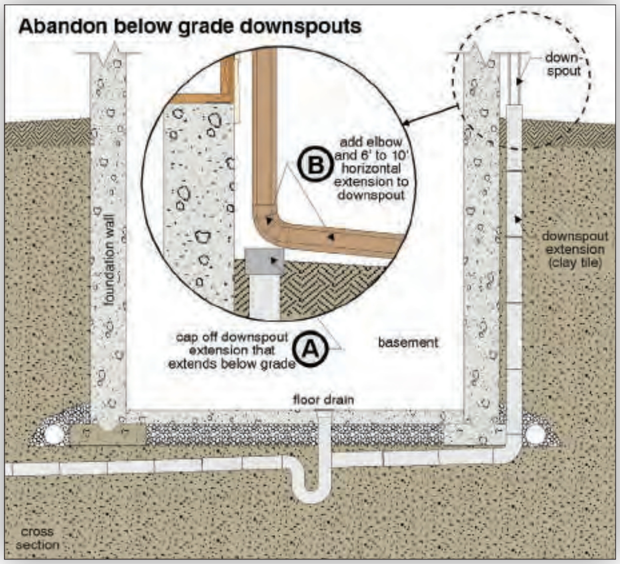
10.3 Gutters and Downspouts

DESCRIPTION

The key to keeping any basement/crawlspace dry is eliminating or minimizing the source of outside water. The gutters and downspouts have to do their job, collecting all the water from the roof. The downspouts should either discharge into a drainage system below ground, or preferably, above grade at least six feet away from the building, depending on land slope, soil porosity, etc.

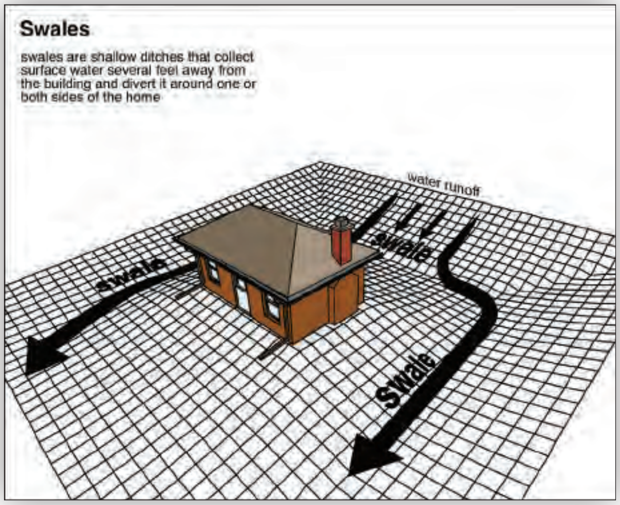


ABANDON UNDERGROUND DOWNSPOUTS It is common for downspouts that discharge into an under ground waste plumbing system to become obstructed or broken below grade level. This collects water outside the foundation wall, resulting in leakage. Excavating and repairing this pipe is expensive. It's much easier to cap the downspout where it goes below grade, and add an elbow and downspout extension to discharge water onto the ground several feet from the building.



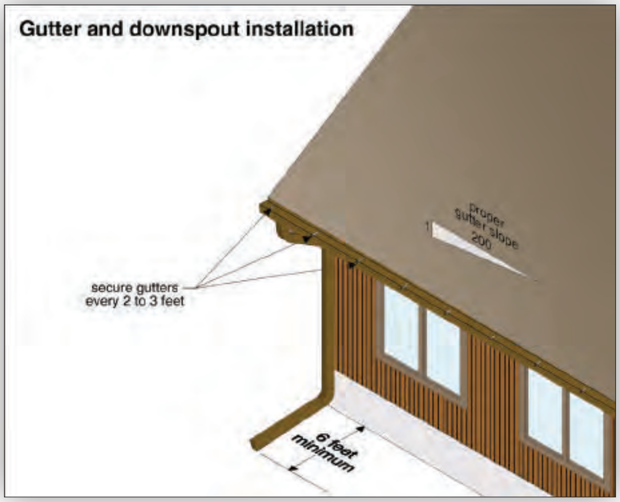
10.4 Grading Improvements

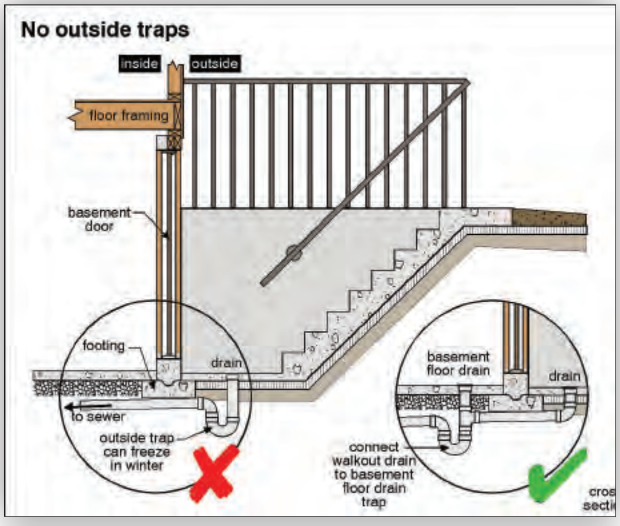
DESCRIPTION Re-grading the exterior to drain water away from the building is one of the most effective solutions to wet basement problems. The ground should slope down away from the house at a minimum rate of one inch per foot for at least the first six feet out from the building. Hard surfaces like asphalt driveways can slope less, with almost any positive slope being effective. In some cases, the yard is re-sloped creating gentle valleys or swales to direct water away.

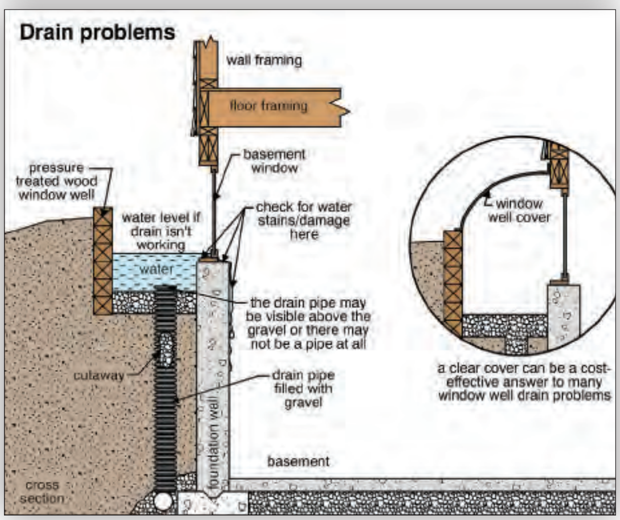


This work can be expensive where driveways, patios or sidewalks have to be lifted, although in lawn and garden areas, adding some inexpensive topsoil works fine. Sand and gravel are not effective materials, since water will flow through these easily. Well compacted soils that force most of the water to run across the surface are better.

BASEMENT STAIRWELLS AND WINDOW WELLS Localized low areas that collect water, including open basement stairwells and window wells, should have drains to remove the water. There are usually no traps in these drains in freezing climates. If necessary, these openings can be covered to prevent water accumulation. There are clear plastic dome covers, for example, available for basement window wells. These do allow light into the basement, although, of course, ventilation is cut off. Grading should be well sloped to direct surface water away from these openings.

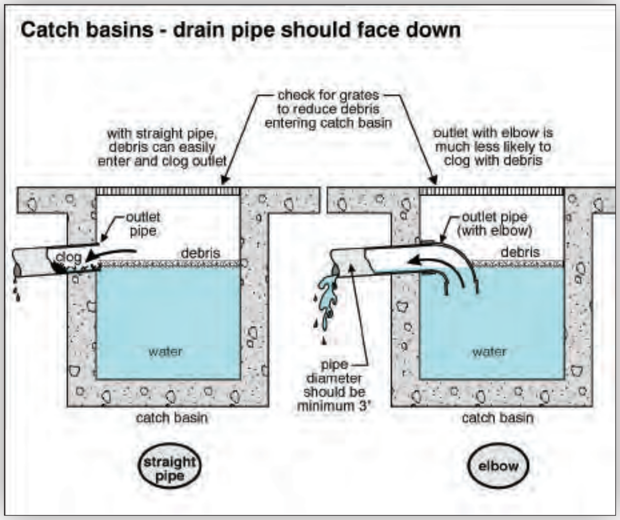






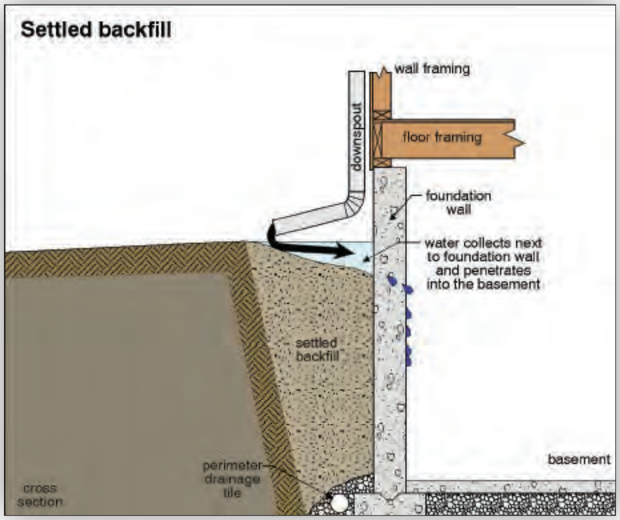
CATCH BASINS Even if there is no evidence of leakage, good drainage should be ensured during any landscaping or driveway work. Where good grading cannot be achieved, catch basins are used. Water is directed into basins that carry water to a drainage system. Catch basins are prone to clogging and frost heaving. Good maintenance is necessary to ensure a dry basement.

Where the grading problem is from an adjacent property, the local building authorities can help if neighbors are not cooperative. City building departments are generally aware of the importance of good grading.



Where drainage cannot be away from the building for six feet or so (because of a neighbor's house, for example) the best compromise is a low area between two buildings that directs water along a trough to a point away from both buildings. If this is not possible, a catch basin may be the answer.

BACKFILL SETTLING AROUND NEW HOMES Poor grading is a common problem on newer houses. The backfill around new houses is often not well compacted (for fear of damaging new foundation walls). Over the first few years, the soil settles, and the ground around the building slopes toward the foundation. The solution is to add material to re-slope the grade.

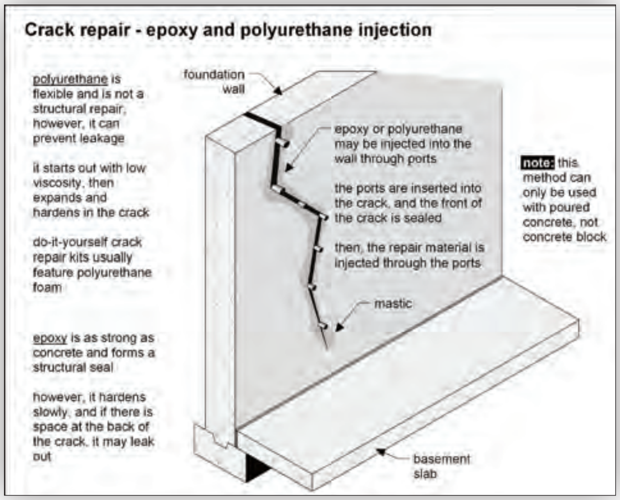


10.5 Patching Cracks

FROM INSIDE Cracks in poured concrete basement walls can sometimes be successfully repaired from the inside. There are several products available in building supply stores. We suggest only accomplished technicians perform this work.

EPOXY AND POLYURETHANE

Epoxy and polyurethane can be injected into the crack until the crack is filled. Epoxy is usually installed by a contractor and is considered by some to be the best patch material for poured concrete walls. It is, however, only as good as the person who mixes and installs it. Epoxy is different than most patching materials in that it does have structural integrity. A properly installed epoxy patch will never crack again. The wall will fail elsewhere first. If the forces that caused the crack are still present, a new crack may develop. For this reason, some contractors prefer polyurethane injection, as it stays flexible.

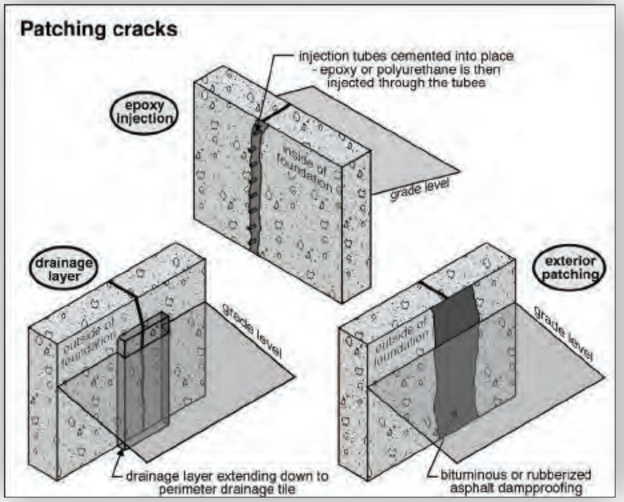


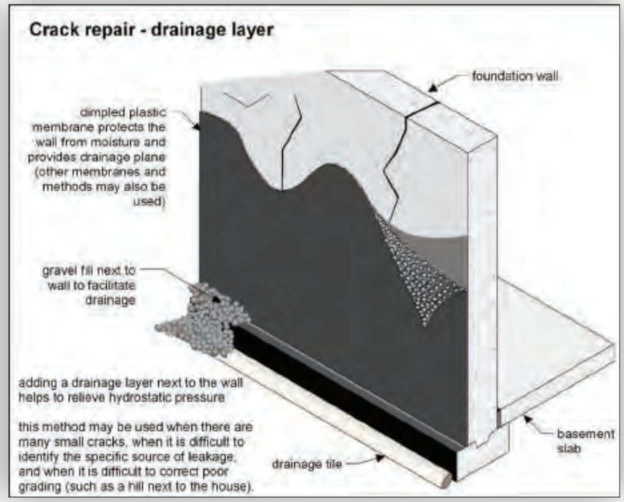
FOR MINOR PROBLEMS ONLY

Patching cracks on poured concrete walls does not remove the water problem; it only traps it outside the basement. Patching cracks is usually only successful for minor, occasional problems. In many cases, the water will simply find another way in. It is better to prevent water accumulating outside the basement, than to try to turn the basement wall into a dam, holding the water back. The big appeal of patching cracks inside the basement is that it is inexpensive. Interior patching is not effective for hollow block walls since the water has too many paths it can follow.

OUTSIDE PATCHING BETTER

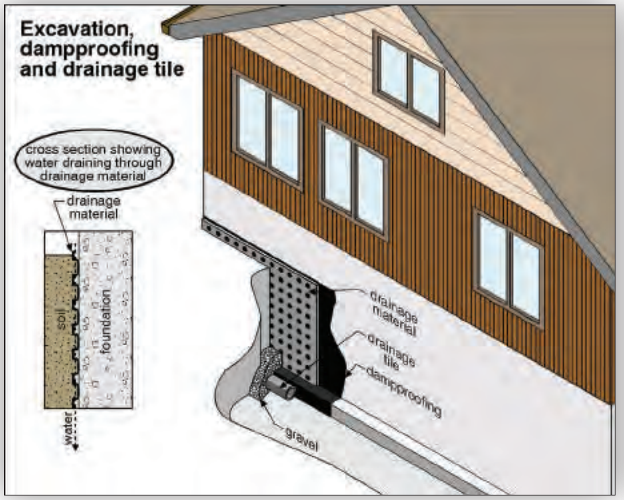
Patching from the outside is more expensive, but may be more successful. Covering a patch with a good draining material, (there are several drainage membranes designed for below grade use) will protect the patch and keep water away. If the basement is only wet where there are cracks, patching may be a practical approach.

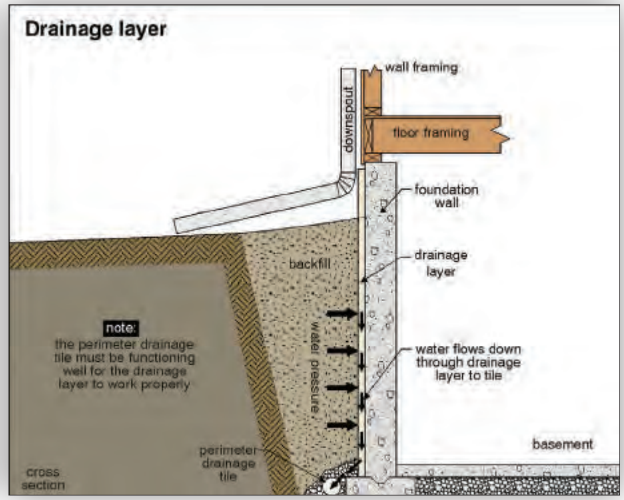




10.6 Excavation, Dampproofing and Foundation Drainage

DESCRIPTION When basement leakage cannot be controlled by managing roof water and surface water or by patching, there may be a need to excavate on the building exterior, dampproof the outside walls, provide a drainage membrane against the wall and add or replace the perimeter drainage tile system.





DRAINAGE TILE Perimeter drainage tile systems for basements were introduced to residential construction in the early 1900s. They did not become popular until some time after this. On an older house, even if they are present, they are often obstructed or collapsed. This drainage tile system was traditionally a four-inch clay tile pipe. The piping was laid outside the footing around the perimeter of the house, below the basement floor level with roughly a 1/4-inch space left between each section of pipe. This allowed water to run into the piping if the soil was saturated. The joints were covered at the top with building paper to prevent soil and other debris from getting into the piping system.

The pipes were surrounded and covered with gravel to allow water to penetrate quickly to the pipes and be carried away. In older homes, the piping system would discharge into the combination sewer.

This approach was somewhat effective, although over the long term tree roots and debris inevitably found their way into the pipe.

MODERN PERIMETER DRAINAGE TILE

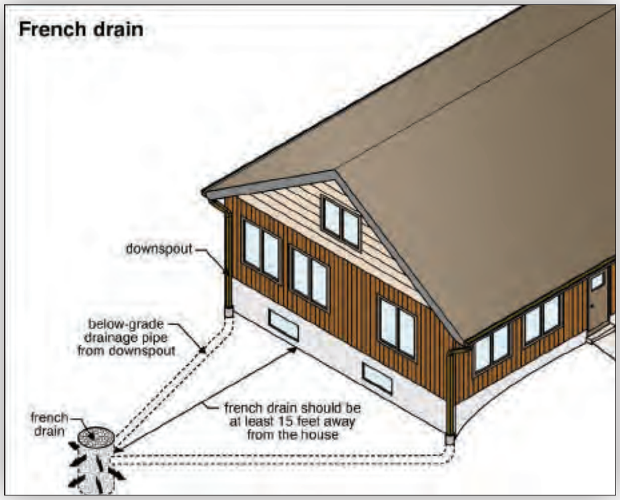
In modern construction, the piping used is perforated plastic, and it is arranged to discharge straight into a storm sewer. The perforated plastic piping that has replaced the clay tile piping is corrugated and very flexible. The perforations are in half of the diameter of the pipe only. The piping is laid with the holes down.

The top of the drainage pipe is below the bottom of the floor slab. The pipe is covered on the top and sides with at least six inches of gravel or crushed stone. Geotextile fabric wrapped around the pipe will hold back soil, but allow water to pass, helping to prevent clogging.

The work is expensive and disruptive. If the basement is only wet along one or two walls, it makes sense to address just those walls, rather than the entire foundation perimeter.

WHERE DOES THE WATER GO?

The drainage system ideally discharges into a storm sewer. Where no sewer is available, the discharge point can be above grade well away from the house. Where permitted, the foundation drain can discharge into a dry well. This is a gravel pit, typically located below the foundation drainage system, at least 15 feet from the building. This is also called a French drain, and is only suitable with good draining soils. The water table, of course, must be below the bottom of a dry well.

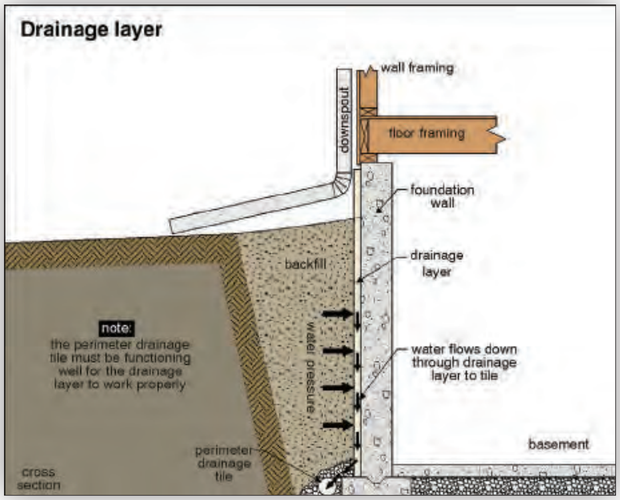


Where none of these approaches is practical, the water can be collected in a sump and pumped onto the ground a good distance away from the house.

DAMPPROOFING

The dampproofing on the exterior typically involves parging concrete block walls with a 1/4 inch layer of mortar extending down to the footing. (Parging is not required on poured concrete.) The foundation/footing joint is coved (sloped) to seal this joint and direct the water into the drainage tile. Next, a dampproofing layer, which may be an asphalt or plastic material, is applied to the wall.

DRAINAGE LAYER/ MEMBRANE A drainage layer can be placed against the exterior walls below grade. This often takes the form of a dimpled plastic membrane that holds the soil away from the foundation, creating an air gap to allow water to flow freely into the drainage tile.

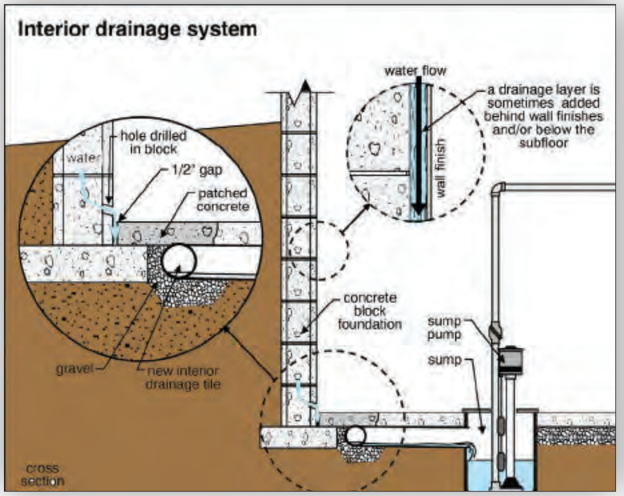


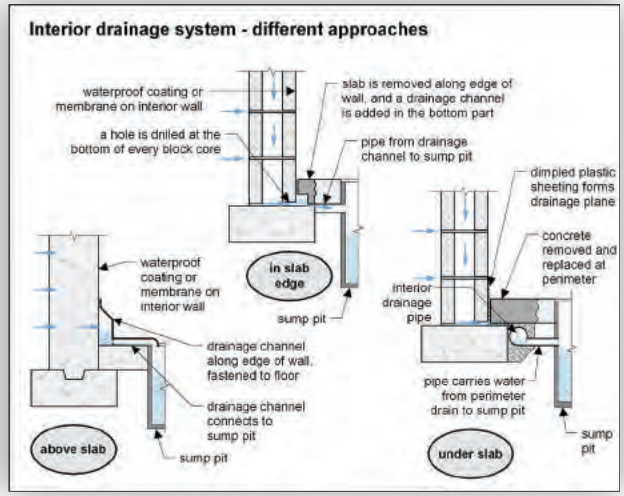
EXTERIOR BASEMENT INSULATION Another approach is the use of exterior basement insulation. Rigid fiberglass insulation board designed for use below grade provides good insulation and helps keep the basement dry. Water entering the insulation flows quickly down through it to the drainage tile.

INTERIOR BASEMENT INSULATION Sprayed foam is sometimes used on the interior of foundation walls to control basement leakage and to reduce basement heat loss.

10.7 Interior Drainage Systems

DESCRIPTION Because excavating on the exterior is expensive and disruptive, an interior drainage system sometimes makes sense. A strip of the concrete floor is broken up around the perimeter of the foundation wall. A drainage system is installed below the basement floor inside the footings. The water can then flow into a waste sewer system, if gravity permits, or a sump with a pump. This approach is more practical and less disruptive if the basement is unfinished.



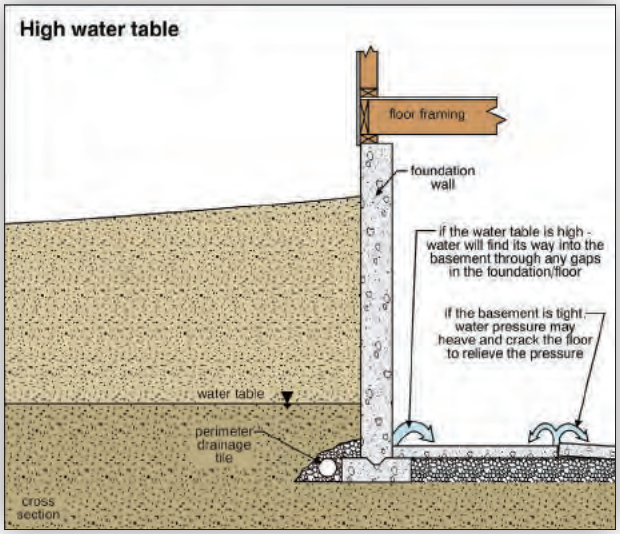


This approach is somewhat less desirable than the exterior approach, since water leaks through the exterior walls before it is carried away by this interior drainage system. The water, of course, must pass through the foundation or footing system, or go under the footing to reach this pipe. In some cases, holes are drilled through the foundation wall just above the footing to allow water to drain into this perimeter footing drain.

The cost of this approach is typically one-third to one-quarter of the cost of exterior work, depending on the difficulties encountered on the outside. There are many cases where this proves satisfactory, although on a case-by-case basis, it is very difficult to know whether it will work.

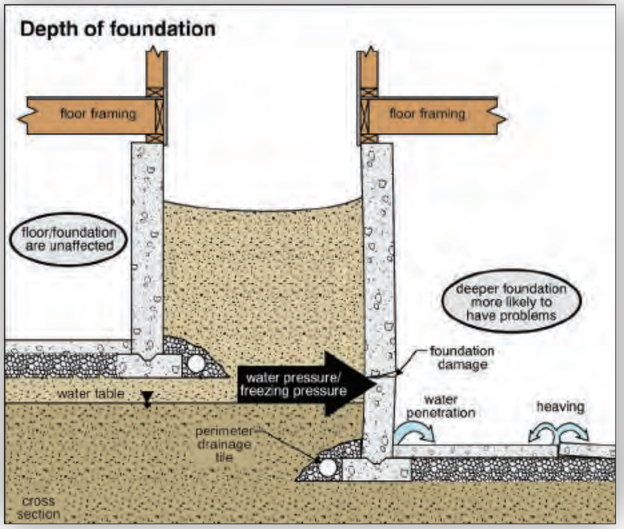
10.8 Ground Water Problems

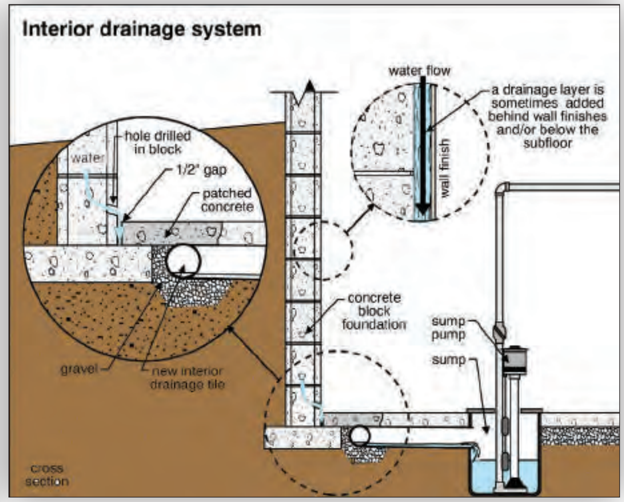
DESCRIPTION In the very few cases where the problem is ground water rather than surface water, more extensive solutions are required. Normally, houses are not built below the water table. However, the water table may rise intermittently in areas with heavy seasonal rainfall. Changes in neighborhoods as development increases may raise the natural water table. Underground streams are also an issue in some areas.



DRAINAGE SYSTEM AND PUMP Where the basement floor is below the water table, there may be chronic basement moisture problems. A drainage system and a sophisticated pumping system, sometimes with dual pumps, is often used. Since the water is constantly present, and pumps are susceptible to either mechanical or electrical failure, a house with this arrangement is always vulnerable to wet basement problems. High water alarms and battery backup systems are sometimes used.

Where the water table is higher than a normal basement floor, buildings without basements are common. Slab-on-grade construction is more suitable.





10.9 Basement Floor Leakage

DESCRIPTION Water leakage up through a basement floor slab is usually a result of saturated soil in and around the foundation. This is often accompanied by leakage through the foundation walls. In severe cases, the hydrostatic pressure can cause the floor slab to heave.

DRAINAGE SYSTEM, SUMP AND PUMP, AND NEW FLOOR SLAB The corrective actions for basement wall leakage are also appropriate for water penetration through a floor slab. Ideally, the source of the water is eliminated. If this is not possible, the water has to be collected in a sump. The existing basement floor is often removed. Gravel fill, four to six inches thick, is added before the new slab is poured, and a waterproof membrane (often plastic) may be laid under the new floor. The gravel allows water to move freely under the slab to the sump.

10.10 Summary

STEP-BY-STEP Once the problem is identified as exterior water penetration, the process is as follows.

1. Provide or improve gutters and downspouts as necessary.
2. Re-slope exterior grading so surface water drains away from the building.
3. If problems persist, patch any obvious cracks or gaps from the interior, if the foundation is poured concrete.
4. If problems continue, excavate and patch the foundations where leakage is localized. Drainage tile may have to be provided, repaired or replaced.

INTERIOR OR EXTERIOR DRAINAGE SYSTEM

5. Engage a professional to consult on whether an interior drainage system below the basement floor may be appropriate, or whether excavation, dampproofing and an outside foundation drainage system is better. The system may require a sump and pump, depending on local drainage characteristics.

LOCAL RESEARCH – WHEN ALL ELSE FAILS

If chronic flooding is a problem, contact the city and neighbors to determine whether the problem is area wide. Where the problem is a neighborhood situation, the city will often make efforts to improve surface drainage or to control storm water.

City officials and neighbors can often advise whether the problem is related to surface water or ground water. Areas of high water tables are often well known to the city authorities. (High water table areas, of course, make it difficult for utility people to lay water supply and sewer lines below grade level.)

11.0 Smoke and Carbon Monoxide Detectors

DESCRIPTION

Smoke detectors should be provided in all sleeping areas of a home and on each floor of a home.

Carbon monoxide detectors should be in every room with a wood burning appliance and are ideally located on every level of the home.

Detectors should be tested monthly and batteries should be replaced annually. Detectors should be replaced every 10 years.