

# INSTALLING TILE AND STONE FLOORING

Congratulations on choosing to install tile as your new flooring! Tile comes in a multitude of types, colors and styles and has been a choice for flooring for centuries. This guide is designed to help you prepare for and install tile in your home or office.

✓ **TIP:** If reading online, click on any item in this contents list or any grey text in the document to jump to a specific section.

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## INSTALLATION OPTIONS

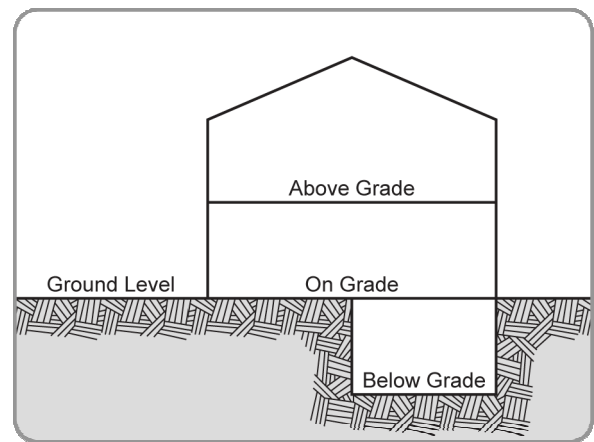
Understanding all your installation options is the first step in your tiling project. In this section, we'll discuss:


- **Types of Tile and Stone**
- **Suitable Subfloors and Substrates**
- **Radiant Heat System Considerations**
- **Types of Mortar and Grout**

### *Types of Tile and Stone*

There are three different flooring grades to consider when installing tile or stone flooring:

- **Above Grade:** Flooring installed on a second floor of a home or above.
- **On Grade:** Flooring installed on the ground level of a home.
- **Below Grade:** Flooring installed below the ground level of a home (such as basements).



 **NOTE:** If the soil that surrounds the home is 3 or more inches above the floor on any level, that level is considered Below Grade.

Tile and stone can be used indoors and outdoors as well as on any grade level in a home. While tile or stone is usually a good option for wet areas such as patios or bathrooms, follow all the manufacturer's recommendations for moisture prevention. Some tile and stone products may still absorb moisture. Your manufacturer may recommend sealing the floor to prevent moisture issues.

## Types of Tile

When most people think of tile, they think of ceramic tile. Thus ceramic tile has come to mean any type of non-stone tile. However, technically speaking, ceramic tile is one of the four main types of tile used in residential and commercial buildings today.

Tile comes in a variety of types and finishes. Additionally, some tile goes through a process called glazing during which the tile is fired at extremely high temperatures to make it strong. The table below compares the four main types of tile.

Type of Tile	Durability	Finish	Sealer Recommended?
<b>Ceramic</b>	Durable	Glazed and unglazed	No
<b>Clay – terra cotta, Saltillo/Mexican</b>	Fragile	Unglazed	Yes
<b>Porcelain</b>	Hard and Durable	Glazed and unglazed	No
<b>Quarry – bricks and pavers</b>	Extremely Durable	Unglazed	Yes

## Tile Grading

All tile in the United States is graded on a scale of 1 to 5 based on the tile's strength and durability.

Grade	Application	Installation Areas
<b>Grade I</b>	Very poor grade; should not be used as flooring in a residence or business	Walls only.
<b>Grade II</b>	Light traffic residential areas	Bathrooms, closets, guest rooms
<b>Grade III</b>	Any type of residential area Light traffic commercial areas	Kitchens, entry ways, living rooms Reception areas
<b>Grade IV</b>	Any type of residential area Any type of commercial area	Kitchens, entry ways, living rooms Lobbies, offices, grocery stores, banks
<b>Grade V</b>	Commercial areas with heavy use and possible exposure to chemicals	Shopping malls, airports

You should try to choose a tile grade that matches the amount of use in the installation area. Installing a low tile grade in an area with heavy use could result in excessive cracking and damage. Unfortunately, tile grades are not stamped on the packaging, so you must ask (and trust) the retailer who is selling your tile.

## Tile Sizes

Tile comes in a variety of sizes ranging from mosaic-sized (less than 2 inches) to 4" x 4" squares to 24" x 24" squares. Other shapes and sizes such as rectangles, octagons and hexagons are also available in some styles and colors. Most often floor tile is ½" to ¾" thick.



**NOTE:** Ceramic and porcelain tile is most often 3/8" thick.

## Stone Tile

Natural stone can be used in a number of different applications in both homes and businesses. For the purpose of this guide, we'll only be focusing on stone cut to be tile flooring (as opposed to stone block or slab flooring).

There are five main types of stone tile used in homes and businesses:

- Granite
- Limestone
- Marble
- Slate
- Travertine

Stone tile can be installed on any grade level (below, on or above) in your home.



**NOTE:** While stone can be a good option for wet areas such as bathrooms or kitchens, follow all the manufacturer's recommendations for moisture prevention. Some types of stone may absorb moisture more than others.

## Stone Tile Finishes

Stone tiles come in a variety of finishes. Be sure to follow the manufacturer's recommendations for cleaning and care.

Type of Finish	Description
<b>Acid-Washed</b>	Glossy, etched finish.
<b>Brushed</b>	Simulated natural stone finish.
<b>Flamed</b>	Rough, unrefined finish.
<b>Honed</b>	Flat, matte or satin finish.
<b>Polished</b>	Glossy, mirror-like finish.
<b>Saw-Cut Refined</b>	Matte finish.
<b>Split-Faced</b>	Rough finish.
<b>Tumbled</b>	Smooth, slightly etched finish with broken, rounded edges and corners.


## Stone Tile Sizes

Stone tile comes in a variety of sizes ranging from mosaic-sized (less than 2 inches) to 4" x 4" squares to 24" x 24" squares. Other shapes and sizes such as rectangles, octagons and hexagons are also available in some stones and finishes. Most often, stone tile is ½" to ¾" thick.


## *Suitable Subfloors and Substrates*

Having a sturdy based upon which to install your tile is one of the most critical aspects of any tile or stone installation. Installing tile on an unstable subfloor can result in cracked tiles and loose grout. Tile can be installed on cement subfloors, wood subfloors or over existing tile or vinyl.

- **Cement subfloors** – Existing, stable concrete slabs make an excellent subfloor for tile. You do not have to install any additional support surfaces or moisture barriers. Prior to installing tile over a concrete slab, you must make sure the slab is clean and level and that all cracks and holes have been filled.
- **Wood subfloors** – Wood subfloors require a cement backer unit (CBU) board underlayment for support and as a moisture barrier. Some wood floors may also require polyethylene mats as an additional moisture barrier.
- **Existing tile** – You can install your tile directly on top of existing tile. You do not need any additional support surfaces or moisture barriers.


 **NOTE:** Existing tile must be able to bond with the setting mortar. Some tile (such as tile or stone that is highly polished) may not have a rough enough surface texture to bond with the mortar.

- **Existing vinyl (either sheet or tiles)** – Existing vinyl that is installed over concrete or a stable wood subfloor does not have to be removed. Tile can be installed directly on top of the existing vinyl with a modified mortar. However, some professionals recommend removing all vinyl to avoid issues down the road. If removal is not an option (because of asbestos issues), you can install CBU board over the existing vinyl then install your tile as you would for a wood subfloor.

 **NOTE:** Many professionals install a mortar or mud bed over the subfloor to ensure the subfloor is completely level. A mortar bed consists of roofing felt, wire mesh and mortar. While very strong, slightly flexible and stable, installing a mortar bed takes a high degree of skill and practice and may not be a good choice for non-professional installers.

You should **NOT** install tile over the following:

- **Plywood and Particle Board** – Plywood and particle board are more affected by moisture. Thus, the American National Standard Specifications discourages installing tile over any type of particle board, composite panels or soft wood plywood because of moisture related expansion and contraction issues.
- **Metal, Painted Surfaces, Acrylic or Fiberglass** – These materials may not provide the stability need to prevent cracks and chips in the tile. Additionally, traditional mortars and grouts may not adhere to these types of surfaces.
- **Other types of flooring.** –Do not install over other types of flooring unless specifically approved by your manufacturer.

 **TIP:** Be aware of asbestos if you are removing existing flooring. Some older flooring products contain asbestos which can contaminate your home or office if removed. If you find asbestos in your existing flooring, do not remove it. Follow all federal, state and local guidelines for containment.

## Using Cement Backer Unit Board

If you are installing tile over a wood subfloor or existing vinyl, you should install an additional substrate (surface) above the subfloor to help support the tile floor and provide protection against moisture. The most common substrate is cement backer unit (CBU) boards. CBU boards are composed of a concrete core surrounded by fiberglass sheets on either side. These lightweight boards are used above wood subfloors to help stabilize and support the floor once tile is installed. Since CBU boards are able to withstand prolonged exposure to moisture, installing them in bathrooms or kitchens is a good choice.

✓ **TIP:** Stagger CBU joints so that they overlap wood subfloor joints for added stability and moisture protection.

CBU board comes in  $\frac{1}{4}$ ",  $\frac{1}{2}$ " and  $\frac{3}{4}$ " depending on how much height you want to add to your floor. Boards typically come in a couple different sizes to help minimize the amount of cutting you need to do. Additionally, each side of CBU board has a different texture. One side is smooth while the other side is rough. When installing CBU board over a subfloor, always install with the smooth side down. This provides a rough surface for the mortar to adhere to.

CBU board is installed with thin-set mortar then nailed or screwed down every 8-10 inches. Look for galvanized CBU board screws that are threaded to the top of the screw. This helps you tightly countersink each screw. Or you can use galvanized roofing nails.

## ***Radiant Heat System Considerations***

Tile can be installed over a variety of radiant heat systems. Radiant heat systems heat homes from beneath the flooring. There are three main types of radiant heat systems:

- **Radiant air** where air heats the flooring. Because air is a poor conductor of heat, this method is not very cost effective for most homes.
- **Electric radiant** where electric currents provide the heat. These types of systems usually come as mats that are laid beneath or embedded into the subfloor.

✓ **TIP:** Electric radiant heat mats are the easiest to work with when doing a remodel. Since the matting is thin, it is laid on the subfloor then covered with thinset mortar.

- **Hydronic radiant systems** (also called liquid systems) where heated water is pushed through tubing or piping laid in a concrete slab or below a subfloor.

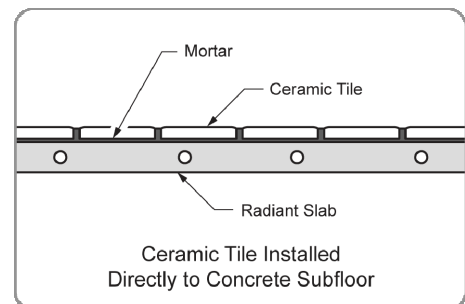
Each of these systems can be installed by two different methods:

- **Wet** installation where the piping is installed directly in a concrete slab or in lightweight concrete above the subfloor.
- **Dry** installation where the piping is installed between two layers of plywood or attached directly below the subfloor. When installed between layers of plywood, aluminum diffusers are often used to distribute the heat evenly across the subfloor. When installed below a subfloor, reflective insulation may be used to direct heat upward into the floor.

Most often tile is installed over wet installations of Hydronic or electric radiant systems. **Always check with your retailer or manufacturer to ensure the type of tile you choose can be installed over a radiant heat system.** Radiant heating affects the temperature, moisture and humidity of the tile. Over time, these factors can cause problems if your tile or stone was not designed to be installed over a radiant heating system.

In addition to your flooring manufacturer's instructions, you should also keep these things in mind:

- Always follow your manufacturer's temperature recommendations both before and during your installation.
- Keep the subfloor surface temperature below 82° F.
- The overall temperature of the room must not vary more than 15° F during the year. The relative humidity should stay between 35% and 65% year round.





## *Types of Mortar and Grout*

Mortar is the adhesive substance you'll apply to the subfloor. Your tiles get laid on top of this mortar. For CBU board and concrete slabs, many professionals use a thinset mortar. When installing tile over existing tile, many professionals opt for a multi-purpose mortar. Always follow your manufacturer's recommendations when choosing a mortar for your tile and subfloor.

Grout is the adhesive substance you'll be applying in between each tile after it has been set in the mortar. There are two types of grout: sanded or unsanded grout.

Sanded grout is used for ceramic, porcelain and other types of tiles that have grout joints that are larger than 1/8". Sanded grout uses sand as the filler and is generally cheaper than unsanded grout. Some sanded grout is "polymer-modified" meaning acrylic latex has been added which helps improve the grout's flexibility once it dries. You can also purchase unmodified sanded grout then add an acrylic latex mixture instead of water to achieve the same flexibility.

When installing stone tile, you'll generally use unsanded grout. Unsanded grout is easier to install in small grout joints (usually 1/8" or less) typical of stone tile installations. Additionally, unsanded grout will not scratch or damage your stone tiles.

## PLANNING YOUR INSTALLATION

Planning is an essential step in any flooring project. During your planning phase, you will be:

- **Determining Your Floor Layout**
- **Allowing for Expansion and Movement**
- **Factoring in Waste**
- **Estimating Installation Time**
- **Choosing Your Underlayment**

### *Determining Your Floor Layout*

One of the great things about installing a tile floor is that there are practically limitless possibilities for floor layouts. You can choose to install tile that is square with the room or diagonal. Or you can mix and match tile sizes, colors and materials to create any number of patterns and designs.

When determining your room layout, decide how thin or wide you want your grout joints. Typically, stone tile is installed with thin grout joints (1/8" or less) while ceramic, porcelain and other types of tile have slightly wider grout joints (more than 1/8"). Next choose your grout color. Grout can either contrast or coordinate with your tile depending on the "look" you want.

✓ **TIP:** Use a contrasting grout color (either lighter or darker) to make the grout lines stand out. Use a grout color that is close to the tile color to make grout lines less noticeable.

Remember when choosing your grout, it may not be the exact same color when you get it home and apply it. Temperature, humidity and room lighting conditions can make the grout look differently installed than when you viewed it in the store. Additionally, because lighting varies between rooms, you may notice some color variations from room to room.

## *Allowing for Expansion and Movement*

Like most natural materials, tile expands and contracts based on environmental conditions. While more critical for exterior installations, the Tile Council of North America (TCNA) recommends expansion perimeters and/or expansion joints for all tile flooring.

For small rooms that are not in direct sunlight, the TCNA recommends leaving a ½" perimeter around the room for the tile to expand and contract into. Don't worry; you won't be able to see this perimeter as it will be covered by baseboard and molding.

For larger rooms, the TCNA recommends having movement joints at set intervals. A movement joint is an area in the tiled floor where flexible caulk made from polyurethane, neoprene, polysulfide or silicone is used instead of grout. The flexible caulk allows the tile floor to expand and contract into the movement joint without cracking or chipping the surrounding tile and grout.

Many professional installers recommend leaving a ½" expansion perimeter and adding ½" movement joints every 20 to 25 feet in all directions. However, always follow your tile manufacturer's recommendations for your installation. Some tile products or installation areas may have different expansion requirements.

If you are installing tile in an exterior area (patios or enclosed sunrooms) or an interior room with direct sunlight, you should add a ½" expansion perimeter and 3/8" expansion joints every 8 to 12 feet in all directions. Tile in these installation areas goes through much more expansion and contraction because it is exposed to greater variations in temperature and humidity.

## *Factoring in Waste*

Waste is a part of any tiling job. Waste can be due to:

- Odd shapes in the room that you must work around.
- Broken or cracked tiles.
- Installation mistakes.
- Type of tile installation (horizontal, diagonal or a pattern)

Non-professional installers should account for a waste factor of between 10%-15% for standard, horizontal installations. For diagonal or other complex designs, factor in 20% or more because of the different types of cuts required. Consider using the Advanced Estimator tool on FindAnyFloor.com to help you determine how much tile you'll need to complete your room.

Be sure to factor waste into your original purchase. Retailers continually add and discontinue the types of tile and stone they offer. There is no guarantee that your flooring retailer will carry your exact tile or stone in the future. And remember, **you should always end up with extra tile at the end of your project.** Over the life of the floor you may need to replace tiles that get damaged from use.

## Chipped and Cracked Tile

You should expect to find some chipped or cracked tile when you open each box during installation. This is a normal occurrence. If you accounted for adequate waste in your initial purchase, you should still have enough tile to complete your flooring project. While you may be tempted to do so, don't throw away any of this damaged tile. During the course of your installation, you may find areas where you can install these broken tiles, such as when you reach walls or are working around vents or other objects.

## *Estimating Installation Time*

Installing floor tile should be the last step in your remodeling or tiling job. When tiling multiple surfaces in a room, use these guidelines to install in the correct sequence:

- Tile ceilings before walls.
- Tile walls before floors.

There is no hard and fast rule for installing or completing any tile project. Factors that affect installation time vary widely and include:

- **Experience level:** If this is your first time installing tile or stone, it may take you longer than a non-professional who has already done one or more installations.
- **Room complexity:** Simple rooms and patterns usually take less time than large areas and complex designs.
- **Assistance available:** If you are the only one working on the project, it will probably take longer than if you have help. Although, too much assistance can also slow you down.
- **Amount of planning:** The more planning you do, the less time your tile or stone project will take. Planning helps you identify where you might run into problems so you can figure out how to deal with those areas before you get to them.

Rarely do home improvement projects go smoothly. Even professionals have bad days or run into unexpected problems. Remember:

- **It's going to take longer than you expect.** This is especially important when installing tile as specialized cuts can take extra time. Additionally, mortar and grout setting times vary and can be affected by environmental conditions.
- **You're going to make mistakes.** Don't worry; that's part of what you factored in for waste. When possible, use your mistakes to your advantage. If you cut a piece of tile incorrectly, maybe it will work in another area of your floor later in your installation.

## *Choosing Your Underlayment*

Unlike wood flooring products such as hardwood or laminate, most tile installations do not require an additional underlayment unless specifically recommended by your tile manufacturer. However, adding an underlayment can extend the life of your tile floor as well as provide some sound dampening (which may be required in condos or apartments).

There are two main types of tile underlayments available including:

- **Crack Isolation Membranes** – These underlayments are thin flexible membranes that are installed between your subfloor and your tile. Subfloor movement is absorbed by the membrane as it stretches under your tile floor. This helps protect your tile and grout from cracks or other damage. There are two types of membranes on the market. One is a thin, rubbery fabric that is glued directly to a concrete slab. The other is a thick liquid material (much like paint) that is rolled out onto the floor.
- **Sound Abatement Underlayments** – These underlayments absorb and limit sound transfer through the tile. Most often these are recommended or required when installing tile in multi-story residences such as condos or apartments. Sound abatement underlayments can be dense foam sheeting, cork or one of the name-brand products available on the market today. Some name-brand products also include additional moisture barriers to help protect your tile floor. Installation for sound abatement underlayments vary by type and include gluing or using a peel and stick system to secure the underlayment to the subfloor.

Both crack isolation membranes and sound abatement underlayments are manufactured and marketed by a number of different vendors. Each comes with specific installation instructions and recommendations. Be sure to check with your flooring manufacturer to ensure the underlayment you choose is compatible with your tile.

In addition to these underlayments, certain installations require additional moisture barriers between your tile and your subfloor (such as in kitchens or bathrooms). Always follow your tile manufacturer's recommendations when installing additional moisture barriers.

## PREPARING FOR INSTALLATION

Now that you've got your plan in place, it's time to start preparing for your tile installation. During this phase you will be:

- **Inspecting and Leveling Your Subfloor**
- **Choosing a Tile Saw and Blades**
- **Sorting and Using Tile and Stone**
- **Undercutting Door Casings**
- **Removing Molding and Doors**
- **Installing Safely**

### *Inspecting and Leveling Your Subfloor*

A level, or flat, subfloor is one that is free from any peaks and valleys, no matter how small. These imperfections can be caused by a number of things from the concrete slab not being perfectly flat or drywall splatters on the floor that were not scraped up. Whatever the cause, it's your job to fix or remove the imperfections so the floor is completely flat. Unlevel subfloors can cause your new tile floor to crack or chip

Before you begin finding your imperfections, make sure the floor is scraped and swept clean of all drywall mud, paint splatters and any other debris.

### **Finding the Imperfections**

The first step to leveling your subfloor is finding the imperfections. Many manufacturers recommend that your subfloor not have a variance of more than 3/16" over a 10' section of subfloor. An easy way to find imperfections in your subfloor for both concrete and wood subfloors is using an 8-10' piece of straight lumber.

Start at one end of the room and lay the straightest side of the lumber down on the subfloor. From ground level, look to see if there are any gaps between the lumber and the subfloor. Mark those spots with a pencil. Next touch each end of the lumber. Does it rock or tip to one side? If there is any movement, find the high spot that is causing the movement and mark it with a pencil.

Make your way methodically across the room with the lumber, observing and marking the imperfections in the subfloor.

## Leveling Low Spots in Concrete Subfloors

If you found low spots or dips in your concrete subfloor, use a self-leveling compound, or floor patch, to fix them. Self-leveling compounds are like quick-set concrete. DO NOT use regular cement products as they do not set and cure fast enough. Only use floor patch products that indicate they have quick drying times and are made specifically for leveling floors. These can be purchased at many flooring or home improvement stores.

1. Prepare the floor patch together in a bucket following the manufacturer's instructions. Mix the compound outside or in an area where it won't matter if some of the mixture splashes out of the bucket. Always follow the manufacturer's instructions when mixing the floor patch. Some recommend adding the water after the compound is added while others recommend adding water before.

✓ **TIP:** Because these products set so quickly, do not prepare until you are ready to begin using the product on your floor. Mix only small batches so it does not dry in the bucket or on tools before it is all used up.

2. Mix the floor patch using a paddle-type drill attachment which can be purchased at most home improvement stores. The mixture should be similar in consistency to a milkshake.
3. Place your straight piece of lumber at the edge of the place you will be leveling. Pour some of the floor patch on the spot to be leveled. Use a trowel to fill in all the low areas. Quickly after you've spread the compound, move the lumber across the area you just leveled to ensure it is flat. If it is not, add more floor patch. If the area is now too high, quickly scrape away the excess.

✓ **TIP:** This part of the process works best with two people – one person working with the compound and one person working with the straight lumber.

4. Work quickly across the floor filling in all the low spots with floor patch. Use the lumber to ensure each spot is flat.  
If you run out of floor patch, clean up the bucket and tools then mix another small batch.
5. Once all the low spots are filled, take your lumber and re-assess the areas you just leveled to make sure you don't need to add additional floor patch. If you still find low areas, mix another batch and add more to the top of the dried compound.

6. Wait for the compound to dry and cure completely before installing your tile.

## Leveling High Spots in Concrete Subfloors

Use a sander or grinder to level high spots in concrete subfloors. If you don't own one of these machines, rent one from an equipment rental store. When using your sander, always wear a respirator as concrete produces a lot of dust. You can also try wetting the slab before you begin sanding to help control the dust. If you are working on an addition to a home, make sure everything is sealed tightly with plastic sheeting and taped shut. Make sure all AC vents are covered and taped so that concrete particles are not distributed throughout your home through the ventilation system.

✓ **TIP:** Concrete dust will get everywhere (including closed cupboards or drawers) because the particles are so fine. Be sure to tape everything up tightly! Placing a box fan in a window so that the air from inside the home is pulled outward can help disperse the concrete dust.

## Leveling a Wood Subfloor

Before you begin any leveling, you should first walk the subfloor and screw down any loose or squeaky places with coarse-headed screws. You may also want to screw down areas that are in high-traffic areas of the floor to help reinforce it. Once everything is screwed down tightly, you can begin leveling your wood subfloor.

Leveling a wood subfloor can be more difficult than concrete, especially if your wood subfloor is not flat because of high spots over joists (also called crowned joists). If the high spot over a crowned joist is relatively low, you may be able to sand down the area above the joist enough to make it level with surround areas. If the crowned joist is high and there are very low areas between joists, use a self-leveling compound to flatten the floor. All the preparation and application steps are the same as for concrete subfloors.

If your floor has excess sagging, check below the subfloor. Try installing wood supports between the joists to correct some sagging. Once your wood subfloor is level, you can install your CBU board, any underlayment then your tile.



## *Choosing a Tile Saw and Blades*

Tile saws come in two main types – dry and wet. Dry saws work much like saws designed for cutting wood. Wet saws use water to irrigate the surface as the saw scores the tile. The tile can then be broken along this scored line. There are two main types of saws available for cutting tile:

- **Stationary Blade Saws** – Tile is clamped to the table and pushed through the blade to make a cut. These types of saws can be stationary or portable table saws.
- **Rail Saw** – Tile stays stationary while the saw is pulled through the tile.

Once you've chosen your saw, the blade is the next important component. Some tile blades are made of or coated with a number of different abrasive materials that can grind through tile. Other types of blades are made of steel and tipped with diamonds or tungsten carbide. When choosing a blade, follow your tile manufacturer's recommendations.

## **Tips for Cutting Tile and Stone**

Cutting tile can be tricky whether this is your first or fifteenth tile installation. Each type of tile and stone may react differently to a tile saw.

- Take all your tile measurements carefully. Use a pencil or felt-tipped pen to mark exactly where you need to make your cut.
- Use a wet or dry tile saw for straight and diagonal cuts.
- Use a rail saw or nippers to make curved cuts.
- To help prevent tile breakage when cutting, gently direct tile toward the blade. Do not use excessive force or pressure.
- Use a carborundum stone to smooth away sharp edges on cut tile.

## *Sorting and Using Tile and Stone*

Almost all tile and stone has some color and pattern variations. These features help to vary the floor and make it look more natural. During your installation, you should use tile from at least three different cases at a time to ensure the floor has balanced color variations and patterns.



**NOTE:** Professional installers open a number of cases to identify the differences between the darkest and lightest colored tiles. They will then stack similar tiles together in piles and begin installing these shade variations at repeating intervals.

It is important to purchase all of your tile at the same time. Look at each case of tile and find the dyelot and caliber stamp. The dyelot is the color run the tile is from. The caliber stamp indicates the size of the tile. All your tile should have the same dyelot and caliber stamp to ensure the coloring and tile size of each case is the same.

✓ **TIP:** Using tile from different cases is essential when dyelots do not match. Mix tiles from the different dyelots throughout the floor to ensure even and varied coloring. Buying tiles that are the same caliber is equally important. While size differences may not be apparent when in the case, size becomes very important when you are installing the tile. A 1/16" variation can cause spacing issues across your floor.

## *Undercutting Door Casings*

Undercutting door casings is a relatively easy and elegant way to install your tile around doors just like the pros do. You should undercut all door casings that require tile to be installed in or around them before you begin your installation so that you do not have excess wood chips or saw dust in your installation area.

To undercut door casings, you'll need a scrap piece of tile/stone, a piece of cardboard, a pencil and your saw (a handsaw or special saw for cutting door jambs). Always use the finest blade possible when undercutting door casings so that the saw does not split or mar the wood.

NEVER use a saws-all or skill saw as these saws may be difficult to control for these types of cuts.

1. Use the scrap piece of tile/stone to bring your saw up to the right height of the door casing. Use a scrap piece of cardboard to help you estimate the height of the thin mortar bed below the tile. Make sure to account for any other underlayments in the total height.
2. Use a pencil to mark or draw a line at the top of the plank/underlayment. This is how much you'll be cutting off the bottom of the door casing so that the tile/stone will fit underneath it.
3. Use the saw to cut the door casing along the line you drew. Keep your scrap piece of tile/stone in place to help ensure you make a straight cut.

Now when you reach a door casing, you can cut and place tile/stone to fit under the casing and flush with the wall.

✓ **TIP:** Be sure to leave some expansion/contraction room between the cut tile/stone and the wall under the door casing.

## *Removing Molding and Doors*

Remove all molding and baseboards in your installation area with a crow or pull bar. If you plan on reusing the molding and baseboards, take care during removal. Small nicks can be filled, sanded and painted over; however, pieces that are broken or have major damage may need to be replaced. Remove all doors and set aside.

## *Installing Safely*

Follow these guidelines to ensure a safe working environment.

- Read and follow all the manufacturer's guidelines when installing your tile or stone.
- Wear the proper clothing and work boots or tennis shoes.
- Wear OSHA approved safety goggles and/or hearing protection.
- Wear other personal protective equipment such as knee pads, shin guards, gloves and/or respirators, when necessary.
- Do not work under the influence of alcohol, drugs or other medications which can impair your decision making ability.
- Keep your work area clean. Clutter and debris are not only tripping hazards but could scratch and damage your tile or stone.
- Make sure the room has proper ventilation and lighting.
- Make sure the electrical power to the area can support all of your tools.
- Have a first aid kit on hand or know where one is located.
- Use all tools and machinery as intended by the manufacturer with safety guards in place.

## INSTALLING YOUR TILE OR STONE

Installation day has arrived! Prior to beginning your tile job, keep an interior installation area at a constant, comfortable temperature (between 50-70 degrees) with a humidity level of between 45%-65%. Outdoor installation areas should be clean and dry before you install your tile.

### *Tools and Materials*

You will need the following tools and materials:

- 4' or 6' level
- Backer board cutting tool and/or or utility knife
- Backer screws or nails
- Buckets
- Carborundum smoothing stone
- Carpenter's square
- Caulking gun
- CBU board (if needed)
- Ceramic, porcelain or stone tile
- Chalk line
- Dust mask
- Electric drill and mixing paddle
- Felt tipped pen and/or pencil
- Fiberglass tape
- Grout
- Hammer
- Knee pads
- Large sponges
- Notched and/or grooved trowel
- Putty knife
- Rubber gloves
- Rubber squeegee or grout float
- Safety goggles
- Tape measure
- Thin-set mortar
- Tile spacers or wedges
- Wet or dry tile saw and/or rod saw

### *Installing the Underlayment*

Once your subfloor is dry, clean and level you can lay your underlayment of choice. For brand-name sound abatement and moisture barrier underlayments, follow the manufacturer's installation recommendations. When installing CBU board, you can follow the manufacturer's recommendations for installation as well as refer to the section below.

## Installing Cement Backer Unit (CBU) Board

You should install CBU board over all wood subfloors and existing vinyl prior to installing your tile. Working with CBU board is much like working with drywall; however, CBU board is much more difficult to cut. Specialized backer board cutting knives (which are usually carbide-tipped) work well for making the necessary cuts. You can use a regular utility knife; just make sure to have plenty of extra blades on hand. Shortening the blade during cutting also helps to minimize excessive breakage.

CBU board should be installed right up against walls or other structures in the installation area. Remember, you're creating a CBU subfloor on top of your existing subfloor to support the tile. During installation, try to stagger CBU joints so that they do not align directly with your plywood subfloor joints. CBU board is attached to the existing subfloor with the same thin-set mortar you'll use to set your tile. Additionally, you'll nail or screw the CBU board to the subfloor every 8-10 inches.

1. Start from one end of the room and measure the first section where you will be installing CBU board.
2. Using a carpenter's square, use the knife to score a line into the CBU board where you need your cut.
3. Apply pressure around the score marks to break the board at your score line. You may have to cut through the fiberglass on either side of the board.
4. Spread out the thin-set mortar with the flat side of a notched trowel in the area where the CBU board will be installed.

Then use the notched side of the trowel to comb out the mortar.

✓ **TIP:** Use a notched trowel to comb out the mortar into even ridges. This ensures there is good contact between the mortar and the backer board.

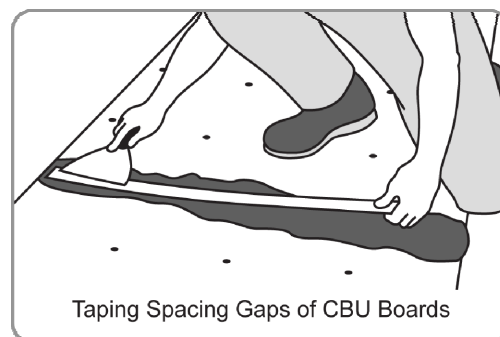
5. Lay the CBU board on the thin bed of mortar rough side up so that it is flush with surrounding walls. Leave a 1/8" space between each piece of CBU board.

Nail or screw the CBU board to the floor every 8-10 inches.

6. Use a taping knife to fill all spacing gaps with mortar.

7. Tape each joint using fiberglass joint tape. Lightly press the tape into the mortar then cover both seams with more mortar.

Scrape away all excessive mortar so that each seam is flat and level with the rest of the floor.



8. Follow the mortar manufacturer's recommendations for setting and curing times before installing your tile.

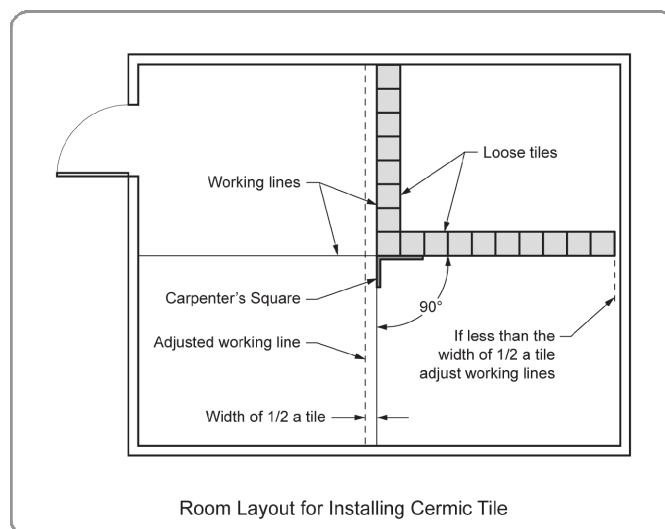
## *Applying Mortar and Setting the Tile or Stone*

When installing tile, you'll begin in the middle of your room and work towards the walls.

1. Snap a chalk line between the center points of each opposite wall. The place on the floor where the chalk lines intersect is the center of the room.

Make sure the quadrants are nearly perfect squares.

2. Layout a row of loose tile in all directions at the intersection point. Use spacers to leave adequate spacing between each tile.



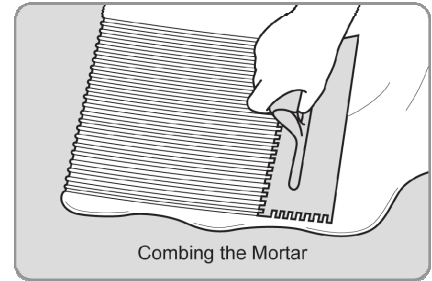
3. Evaluate whether the center intersection point is a good starting place.

If you end up with small cuts along each wall (less than  $\frac{1}{2}$ "), move your starting point down by  $\frac{1}{2}$  a tile width for each wall (if necessary). Re-snap your chalk line and lay out your loose tiles to re-evaluate the tile placement.

4. Once you're satisfied with your center point, divide the main four quadrants into smaller sections. Doing this makes it easier to install straight tile section by section. Snap chalk lines to outline each section within each quadrant.

✓ **TIP:** Sections that are approximately 2' x 3' work well. Each section should take about 15 minutes to install. If you attempt to work with larger sections, your mortar may start to set before you install the tile.

5. Prepare the mortar according to the manufacturer's instructions.
6. Return to the center section of the room and spread out the thin-set mortar with the flat side of a notched trowel. Then use the notched side of the trowel to comb out the mortar. Do not cover your chalk lines. You need these to make sure you are laying your tile straight and square with the room.



✓ **TIP:** Use a notched trowel to comb out the mortar into even ridges. This ensures there is good contact between the mortar and the tile. Do not swirl the trowel as this creates uneven ridge heights.

7. Set the tile into the mortar with a slight twisting motion. Do NOT slide the tile through the mortar. Use spacers to ensure that the spacing between each tile is even.
8. When you complete that section, tap each tile into the mortar with a rubber mallet or a hammer and tapping block. Then lay a level across the newly installed tile. There may be some height differences between each tile. Adjust the tile in the mortar so that the floor as a whole is level.
9. Remove any mortar that is in joints with a putty knife. If mortar gets on the face of the tile, use a damp sponge to clean it off before it sets.
10. Install, level and clean each section before moving on to the next one. Install your tile section by section within each quadrant. Each section grid must be straight with the walls and level so that your whole floor turns out well.

Discard the mortar as it gets tacky (which usually happens after about 30 minutes) and prepare a new batch. **Always work from the unfinished part of the floor and NOT from your newly installed tile.**

11. At the proper intervals for your floor, leave 3/8" expansion joints.
12. When you get close to the wall in each quadrant, cut your tile so that you can leave 1/2" expansion space between the edge of the tile and the wall.

✓ **TIP:** Always install tile along the wall LAST in each quadrant.

13. Let the mortar set and cure according to the manufacturer's recommendations



## *Applying the Grout*

Once your tile is installed and the mortar has set, it's time to grout the joints.

1. Remove all spacers throughout the floor. Vacuum up or sweep away all small particles of mortar that were dislodged with the spacers. Check for and remove any high spots in the mortar between each tile.

✓ **TIP:** Needle-nose pliers work well to remove spacers.

2. Mix the grout according to the manufacturer's instructions. Only mix as much grout as you'll use in 30 minutes. Always wear rubber gloves and any other personal protective equipment as recommended by the grout manufacturer.

📌 **NOTE:** Some grout manufacturer's recommend spraying the tile lightly with water (like from a spray bottle) so that that the tile does not absorb too much water from the grout. Dry grout will not set and cure correctly. Always follow all the manufacturer's recommendations for mixing and applying your grout.

3. Starting from the far corner of the room spread the mixed grout across the face of the tile and force down into each joint with a squeegee or rubber grout float.

✓ **TIP:** To push grout into each joint more efficiently, tilt the grout float to a 45 degree angle. Work at a 45 degree angle to the grout joint.

4. Use the edge of the float to scrape away any excess grout from the surface.

✓ **TIP:** Tilt the float to a 90 degree angle and scrape diagonally across the tile to remove excess grout.

5. Fill all expansion joints with a flexible caulk as you get to them.
6. Work your way across the room applying grout to and cleaning up each joint. Remember to only prepare as much grout as you'll use in 30 minutes. If the grout you've prepared becomes stiff, discard that batch and make a new one.

## *Cleaning Up the Floor*

You may look at your floor after you've applied your grout and think, "What a mess." Now that all the messy work is done, it's time to clean up the floor and see your newly installed tile.

You can begin cleaning up the floor as soon as the grout begins to set, usually 15 to 20 minutes after you've applied it. If you're tiling a large floor, apply all the grout then go back to the beginning and start your clean up.

1. Grab one of your sponges and fill a bucket with clean water.
2. Gently wipe away all grout from the face of the tile. Carefully smooth all grout joints around each tile. Do NOT gouge the grout from the joints. Try to avoid dripping water into the grout joints during cleaning. Excessive water in joints will affect how the grout cures.

✓ **TIP:** If the grout is smearing, stop your clean up and wait for the grout to set longer. If clean up is difficult, you've waited too long to begin clean up. The grout has already started to cure.

3. Wring out and rinse the sponge often. Replace the water as needed.
4. Work your way across the whole floor cleaning all the tile and grout joints. If there are areas that are still dirty or hazy, go back over them once you're done with the whole floor.

## *Letting the Floor Cure*

Your new tile floor needs about 72 hours to completely cure. During this time you should not walk excessively upon or put anything on the newly tiled floor.

If you are applying a sealer, follow all manufacturer recommendations for curing times. Some manufacturer's recommend waiting three weeks before applying the sealer to ensure the floor has cured completely.

## SPECIAL CIRCUMSTANCE INSTALLATIONS

You've got your floor tile installed, but what about those transitions and other tricky areas. In this section, we'll discuss:

- **Tile Transitions and Moldings**
- **Molding Installation Methods**
- **Installing on Tile on Stairs**
- **Using End Molding for Similar Height Floors**
- **Working around Fireplaces and Brickwork**
- **Using End Molding for Carpet Transitions**
- **Using Flush Reducer for Vinyl Transitions**

### *Tile Transitions and Moldings*

Transitioning from tile to another flooring surface can be tricky. Flooring is not always the same height and many homeowners want to eliminate tripping hazards between the two surfaces.

When determining how to handle transitions, you have a couple different options:

- **Bullnose Tile:** Bullnose tile has one edge that is finished and slightly rounded. The rounded edge will usually butt up against the other flooring surface (such as carpet) to provide a smooth transition.
- **T-Molding:** This molding is used to transition a tile floor to another similar level flooring surface.
- **Reducer Strip:** This transition piece is used to join tile floors to flooring that is a different height such as vinyl or carpeting.
- **End (or Threshold) Molding or Square Nose (Universal Edge):** This type of floor trim is used to separate and transition between carpet, fireplaces, sliding doors or any other outside door threshold.
- **Wall Base:** This molding is placed along the bottom of the wall above the flooring to hide the expansion/contraction space as well as to give the room a finished look. Wall base can also be used under cabinets.
- **Quarter Round or Shoe Base:** These moldings are placed along wall base above the flooring to help hide the expansion/contraction space as well as to give the room a finished look. These can also be used under cabinets if wall base is too large or at the bottom of stairs for aesthetics. Since shoe base is not as wide as quarter round it may work better in some installation areas.

Moldings come in a variety of materials and sizes including pre-finished wood, unfinished wood, metal, natural stone and synthetic stone. When choosing your molding, take the rest of the room trim and décor into consideration. Some people use stone or synthetic stone for some areas and wood for others. While other people will match their molding to the other wood they have in that room.

## *Molding Installation Methods*

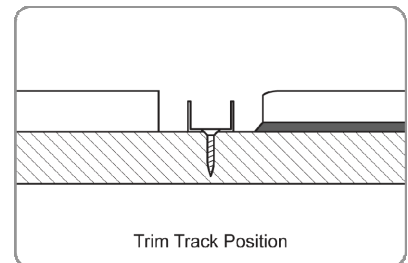
Moldings and trim can be installed two different ways:

- **Using adhesive.** With this method, you glue the transition to the subfloor (or in some cases to the flooring) using a non-water based adhesive.
- **Using trim tracks.** With this method you nail or screw a trim track to the subfloor then slide and lock the molding into place over the track. The following steps provide a basic overview of how to install molding using trim tracks.

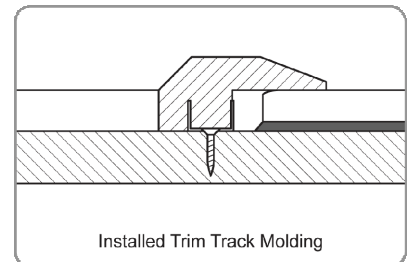
1. Measure your molding.
2. Position the end molding approximately where you want to install it.

Lift the molding straight up and use a pencil to mark the subfloor where the tracks should be placed.

✓ **TIP:** The grooves on the back of the molding indicate where the track will be inserted into the channel.



3. For concrete subfloors, attach the track to the floor using concrete nails or cement adhesive.
4. Working from right to left, position the molding to fit into the track on the floor. Gently push the molding onto each track until the entire molding is installed.



Use a miter saw with carbon tipped blades when cutting wood moldings to ensure you get clean, smooth cuts. When cutting pre-finished moldings, cut into the pre-finished side first to avoid chipping the finish. During your installation always handle your molding carefully (especially pre-finished moldings) to ensure you do not scratch, dent or chip the finish. If you choose to nail molding to the walls or subfloor, most professionals recommend pre-drilling holes to help ensure the molding does not split or crack. Additionally, do not nail too close to the end of the molding to avoid splitting.

### *Installing on Tile on Stairs*

Installing tile on stairs is much like installing tile on your subfloor. When tiling stairs, you must consider the strength and stability of the existing staircase.

Concrete stairs are generally a good choice for tile installations because they are solid and stable. Before installing tile on concrete stairs, make sure the stairs are level and flat. Use a self-leveling compound to fix any high spots or sand down any low spots.

Installing tile on wood stairs can be more complicated. Some professionals feel that tile should not be installed on wood stairs because these structures are not strong enough to support the tile over time. Because wood stairs are more susceptible to vibrations, grout and tile can become dislodged and cracked. If you choose to install on wood stairs, you must lay CBU board or create a mortar bed to level the stairs and provide a solid base. If your stairs have existing nosing, add plywood on the stair tread to make the existing nosing flush with the riser.



**NOTE:** Some professional recommend cutting off existing nosing; however, this method may violate building codes in some areas.

When working on stairs, start at the top and work your way down so that you do not have to work from your newly installed tile. You should always install the tread tiles then the riser tiles. This helps to stabilize the tiles as the downward force of the riser tiles adds pressure to the tread tiles. Some installers use bullnose tile on each tread. The rounded edge gets installed over the riser tile to provide a smooth seam on the edge of each stair. Be aware that using bullnose tile on stairs does not provide an anti-slip barrier.

## Safety Considerations

Safety is the biggest concern when installing tile on stairs. Tiled stairs should not be slippery or slick (when either wet or dry) for both indoor and outdoor installations. Installing highly polished stone is probably not the best choice for stairs. Additionally, you should always add anti-slip nosing on each stair. This type of nosing is usually made of rubber and is installed along the edge of each step to help improve visibility and reduce slipping. Metal nosings are also available; however, metal nosings can be sharp and do not prevent slipping.

During your installation, make sure each tile is set correctly. The edge of the tile should never extend beyond the edge of the stairs. All tile should be securely set in the thin-set mortar and grouted correctly. Inspect your stairs often and correct any defects or wear issues right away.

## Installing Tile on Stairs

Now that you've got the basics down, it's time to install tile on your stairs. You will use all the same mortar, grout and installation techniques as you did for your floor. With that in mind, these instructions only outline the order in which you should install tile on your stairs. For more information about tools and techniques, see **Installing Your Tile or Stone** beginning on page 21.

1. Prepare your stair subfloor as necessary. Make sure the stairs are secure, level and clean.
2. Starting at the top of the staircase lay the mortar then install tile on the first riser. If you have a choice, install full pieces of tile before any cut pieces.
3. Lay the mortar and install tile on the tread. The tile at the edge of the stairs may:
  - Overlap the riser if you're using bullnose tile.
  - Do not overlap the riser if you're using rubber or metal nosing. If installing nosing, follow all the manufacturer's instructions for installation.
4. Lay the mortar and install the tile on the next riser. The riser tile should overlap the back edge of the tread tile for stability.
5. Continue working your way up the stairs until all tile is installed.
6. Wait for the tile to set (usually overnight) then apply the grout.
7. Clean up the tile as you did for the rest of your floor.
8. Wait for the mortar and grout to cure completely. Seal, if necessary.

## *Using End Molding for Similar Height Floors*

End molding (also called threshold molding) is used to transition to a flooring surface that is similar in height to the tile floor (such as hardwood, bamboo or high pile carpet). End molding can also be used around fixed objects like fireplaces and brickwork.

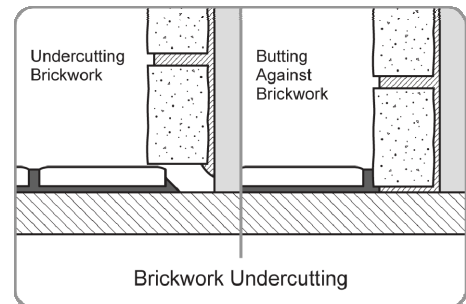
1. Measure and cut your end molding to fit snugly in the door frame.
2. Apply a thin line of adhesive on one side of the end molding.
3. Position and attach the end molding to the subfloor between the tile floor and exterior doorway. The molding should butt up against the exterior doorway and overlap the tile floor by  $\frac{1}{2}$ " to  $\frac{3}{4}$ ".

**△ IMPORTANT:** Do not attach the molding directly to the tile as the floor needs room to expand and contract below the molding.

## *Working around Fireplaces and Brickwork*

There are two ways to install tile around fireplaces and brickwork:

- Installing flush to the brickwork and adding end molding to hide expansion spaces.
- Undercutting the brickwork and using the brickwork to hide any expansion spaces.



## **Installing Flush to Brickwork with End Molding**

Installing tile flush to brickwork is much like installing flooring up to walls or doorways.

1. Measure and cut your end molding to fit snugly along the fireplace or brickwork.
2. Apply a thin line of adhesive on one side of the end molding.
3. Position and attach the end molding to the subfloor between the tile and fireplace/brickwork. The molding should butt up against the brickwork and overlap the tile by  $\frac{1}{2}$ " to  $\frac{3}{4}$ ".

**△ IMPORTANT:** Do not attach the molding directly to the tile as the floor needs room to expand and contract below the molding.

## Undercutting Brickwork

Undercutting brickwork (much like undercutting door casings) provides for a more seamless looking floor.

1. Use the scrap piece of tile to bring your saw up to the right height of the brickwork. Make sure to account for your underlayment (if used) in the total height. Use a pencil to mark or draw a line at the top of the tile. This is how much you'll be cutting off the bottom of the brickwork so that the tile will fit underneath it.
2. Determine how deep to make your cut. You should allow for up to a ½" of tile under the brickwork plus your expansion space.
3. Use the saw to cut along the line you drew.

✓ **TIP:** Consider wearing a respirator while cutting so you do not inhale fine particles of dust.

Now when you reach the brickwork or fireplace, you can cut and place your tile under the brickwork.

## *Using End Molding for Carpet Transitions*

End molding is used to transition between your tile and a carpeted area. Re-tack carpet at all points where it meets your tile for a more professional look and to ensure the carpet does not come loose during use.

1. Measure and cut your end molding to fit snugly along the edge of the carpet (between the carpet and tile).
2. Apply a thin line of adhesive on one side of the end molding.
3. Position and attach the end molding to the subfloor between the tile and carpet. The molding should butt up against the carpet and overlap the tile by ½" to ¾".

⚠ **IMPORTANT:** Do not attach the molding directly to the tile as the floor needs room to expand and contract below the molding.



### *Using Flush Reducer for Vinyl Transitions*

Flush reducer trim is used to transition from tile to vinyl, concrete or any floor that is lower than your tile floor.

1. Measure and cut your flush reducer to fit snugly along the edge of the vinyl (between the vinyl and tile floor).
2. Apply a thin line of adhesive on the bottom edge of the flush reducer.
3. Position and attach the reducer to the subfloor between the tile and vinyl. The molding should butt up against the vinyl and be flush with the tile.
4. Apply painters tape along the full length of the seam between the molding and the tile to hold the molding in place until the adhesive sets completely.

## FINISHING THE JOB

You've reached the home stretch of your installation. All we need to cover now is:

- **Installing Wall Base and Quarter Round Trim**
- **Sealing Your Floor**

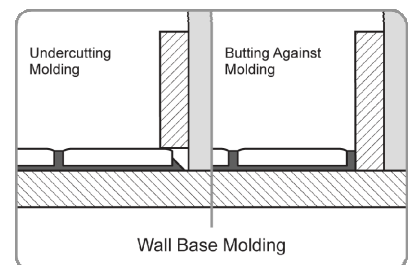
### *Installing Wall Base and Quarter Round Trim*

Installing the wall base and quarter round trim hides the expansion and contraction spaces as well as puts the finishing touches on your newly tiled room. Shoe base molding can be used instead of wall base in areas where wall base will not fit (such as under cabinets).

**⚠ IMPORTANT:** Do not nail or glue the wall base or trim directly to your floor. Trim should fit snugly, but not too tightly, as the floor must be allowed to move freely for expansion.

1. Measure and cut the wall base and quarter round trim for your installation area.
2. Remove the spacers along the walls.
3. Using a construction adhesive, apply a thin, wavy line down the length of the wall base molding.
4. Gently press the wall base molding against the wall. Nail the molding to the wall at an angle every 16".

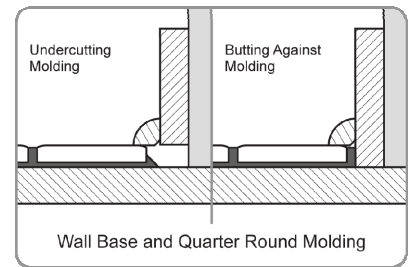
✓ **TIP:** Always nail the wall base to the wall at an angle. If you nail straight into the wall, the nails may not hold well into the drywall.



5. Apply a thin, wavy line down the length of the quarter round (or shoe base) molding.

6. Gently press the quarter round (or shoe base) molding to the bottom of the wall base molding so it fits snugly against the flooring. Nail the molding to the wall at an angle every 16".

✓ **TIP:** Always nail the quarter round or shoe base to the wall at an angle. If you nail straight into the wall, the nails may not hold well into the drywall.



## *Sealing Your Floor*

Ceramic, porcelain and other types of tile should be sealed after installation. Sealing helps protect the grout as well as prevent stains, mildew and mold. Sealing is critical for tile installed in wet areas such a bathrooms, kitchens, or outdoors. Always follow your tile manufacturer's recommendations for when choosing your sealant.

All stone tile should be sealed to help protect the stone as well as make the floor more resistant to stains. Since each stone has different sealer requirements, always follow your manufacturer's recommendations or consult a flooring professional.

Once sealed, you should maintain all areas that are caulked to help prevent moisture damage to your floor.

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