

MAKING MOSAICS

USING THE INDIRECT METHOD



Garden Bench / Canterbury



Koi Sundial / M. Koehl



Stepping Stones by Robt. Warmuth / Canterbury Stained Glass



How to Do Mosaics – The Indirect Method

There are two basic methods to mosaic work - the direct method and the indirect method or sometime called the reverse or stone method. In the direct method, the pieces of material are directly fixed right side up onto a base and then grouted. In the indirect method, pieces are temporarily fixed right side down onto a removable backing which holds the design together. This is then either placed in a mold and filled with cement or pressed into a prepared adhesive bed. Once the cement is set, the stone is turned out from the mold to reveal the design, right side up cast in the cement. In the case of an adhesive bed, the backing material is removed to expose the design, right side up which is then grouted. Another option is to place the prepared design into a mold which is then filled with mortar/cement.

The advantage of the indirect method is you create a very smooth, flat surface. You can also create and assemble the design in one place ahead of time, and then install it in a different location later. The disadvantage is that the design must be assembled face down before applying it to the base or casting in the mold. This often requires extra steps in the design or assembly process.

Selecting Tesserae

Tesserae are the individual pieces of material you will arrange to form your mosaic. Most people think of those little square pieces of tile seen in early Roman mosaics or in swimming pools. Today the term applies to anything pieced together to form a design. When working in the indirect method, you must consider how the depth and shape of some items will affect their appearance in the mosaic. Items that are spherical or have a high relief do not rest flat against the removable backing. When cast in a mold, only the portion that is actually fixed flat to the backing will show unless you take steps to protect the curvature of the object. For that reason, indirect mosaics are generally made with tesserae that have a relatively flat front surface.

Traditional Tile Tesserae

- Vitreous Glass: Known as Venetian glass it is non porous, stain resistant, and frost proof. Common sizes are ¾" (2 cm) or 3/16" (1 cm) squares with a flat top face and a ridged and beveled back. They are available in a wide range of colors.
- Gold and Silver Leafed: Commonly found as ¾" (2 cm) squares. They are made by sandwiching gold, silver, copper or gold-alloy leaf between a clear top layer (sometimes colored) and a colored (generally a transparent yellow, green or blue) base. They have flat or rippled surfaces.
- Smalti: Handmade irregular rectangles of opaque glass. Generally about ¾" in size with a pitted, irregular, and very reflective surface.

Ceramic Tile

- Unglazed: Commonly found as 1" or 3/4" squares stuck to a paper or plastic mesh. The color is uniform throughout the entire tile.
- Glazed: Includes wall and floor tiles, crockery, pottery, tableware and others. The color is a fired surface layer over a clay base. They are a rich source for color, pattern, and texture.

Natural Stone

- Includes everything from beach or river pebbles to marble, granite, slate and modern day stone tiles. They have a wide range of colors, textures and surfaces. Also included are semiprecious stones - turquoise, lapis lazuli, alabaster, quartz and agate.

China & Porcelain

- A finer form of ceramics, they are a good source for interest, pattern and color.

Shells and Mother of Pearl

- Mother of pearl is the lustrous inner surface of shells like oysters and abalone. Commonly used shell forms include spirals, scallops, snails, etc. and cover a wide range of color, luster and size.

Glass

- Includes mirror, colored glass, sea glass, glass nuggets, marbles, and pressed glass jewels

Everything Else

- Bone, metals, buttons... just about anything you want can become tesserae in your mosaic.



This article concentrates primarily on using the mold or 'stone' method. Where applicable, we will include details for the method of applying the design to a paper type backing and setting into a prepared base.

Selecting the Base

You can apply a mosaic to nearly any surface. When opting for the indirect method you want to end up with a very flat, even surface and this generally means the application or location of your mosaic dictates this. Examples include floors, table tops, bird baths, fountains, stepping stones, and counter tops. While gently curving surfaces accommodate this method, like the bowl of a bird bath, surfaces with a tight curves and turns won't allow you to properly seat the design while attached to the removable base. In this case, the direct method is much more accommodating. When selecting a base think about the following:



- Does the base shape or mold fit within the constraints of this method?
- The shape should be suited to the size of tesserae you use. Gentle curves are easier, extreme curves can require very small pieces in order to "bend" the tesserae with the curve and have a smooth result.
- Is it strong enough to hold the combined weight of tesserae, adhesive, and grout?
- Can you find the correct adhesive or cement for the application and use?

Surfaces and items commonly used with the indirect method include but are not limited to:

- Cement: You can add mosaic to pre-made concrete objects like floors, steps, birdbaths, etc.
- Molds: There is a wide variety of sizes, shapes, and uses available today: From stepping stones to planters to benches, bird baths, bricks, doors stops, picture frames, coasters, and the list goes on.
- Wood: Can be cut to shape and size easily, making it ideal for many situations. You can mosaic on most any wood surface, but be aware that no wood is 100% waterproof and wood can sag or warp. Using a high grade plywood (at least ½" thick) will provide a rigid support and help counteract warping. You will want to "tooth" (rough the surface of) and seal the wood before applying the mosaic as added insurance.

Backing Material for Tesserae

The removable backing is what the individual pieces of the design are stuck to. The design is then cast in a mold or applied to the prepared surface of your mosaic base. The backing needs to be able to hold the tesserae securely enough but also allow for easy removal once the design is embedded or cast. Some backing require you apply the adhesive to the tesserae and others are self-stick. Common backing include:

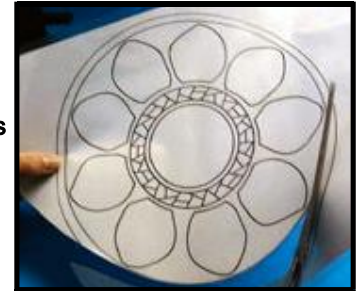
- Paper: The most seen is a strong brown kraft type paper. The tesserae are secured using a water soluble glue or gum. The glue must be completely dried before pressing the mosaic into the prepared base. This method is most often used when the design is being applied to a surface or when the design is being composed in one location and installed at another.
- Self-stick Films: Products like Contact® paper and Mosaic Mount® are a clear plastic sheet with an adhesive surface to stick the tesserae down to. This type product is often the choice when casting in a mold. It holds the design securely in place while filling the mold with wet cement/mortar. A paper backing would not hold up to the wet environment as well. Once cured and released from the mold, the adhesive paper simply pulls off, revealing the mosaic set in a very smooth cement.
- When casting in a mold, you want to a clear film so you can see your pattern or be able to trace your design onto the backing. It is also important to keep your roll of backing from becoming, bent, wrinkled, or creased. Any lines in the backing will show up in the finished product! There are different thicknesses available. The thinner contact paper seems to seat in the mold and stick to the tesserae better, reducing seepage under the tesserae. It does stretch more easily than thicker versions, increasing the chance of wrinkle or curling edges. Try several types to determine which works best for you.
- Brush Away® Paper is a concrete retarding paper that helps cast three dimensional objects like nuggets, rocks, etc. The tesserae are adhered to the paper which is then placed in the mold. After the stone is cast and removed from the mold, the paper is removed and a stiff brush is used to brush away cement from the dimensional objects, exposing more of their surface. You can also set the dimensional objects on a Contact® film, place it in the mold and then fill carefully fill around them with fine grain sand. After the stone is cast and removed, the sand brushes away to show more of the surface if those items. Be aware that the resulting surface will have a grainy texture and appearance.

Let's Get Started

Sizing the Adhesive Backing

It is important for the adhesive backing to fit exactly inside the mold. If it is too large it will wrinkle and cement will seep under; too small and you will have a line in the finished surface. If you frequently use a particular size mold, you may want to make a template. A template also is a valuable sizing guide when designing and laying out a pattern specifically designed for the mold you are using.

- Place the mold on a piece of poster board or similar weight paper and trace around the outside of the mold bottom.
- Carefully cut out just inside the line. The more accurate you are now, the better your finished product will be.
- Fit this template inside the mold and trim as needed so it sits flat inside the mold. This is the size your backing material will be cut.
- You will want to leave at least a 1/4" to 1/2" margin between your tesserae and the stone edge. You may want to mark these borders on your template as a gauge to make sure your pattern will fit in the mold correctly.
- Use this template to trace onto the paper side of the adhesive backing. Cut and double check the fit inside the mold. Make needed corrections now.
- If you are using the paper backing method, you will need a piece of paper large enough to accommodate the design with some extra around the edges for handling. Transfer the installation margins onto the paper.

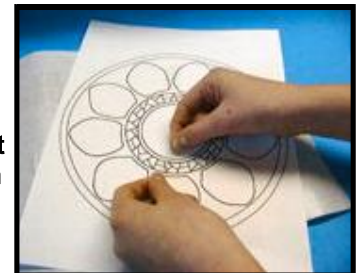


Designs and Patterns

Inspiration comes from everywhere: nature, cities, surfaces, feelings, dreams, pattern books, magazines, and the list goes on. The choice is entirely up to you. You can go from totally abstract to precisely planned. Sketching out a basic cartoon can help you to solidify your idea, as well as to plan for color and movement. You may want to use (or modify) an existing pattern. There are many published patterns already designed to fit a particular shape mold. You can also design your own pattern. Use the template as a guideline for size and margins. Either way, once you have your design finalized, you need to have 3 copies: The original design to use as a reference and layout guide when cutting the tesserae. A second to cut up for pattern pieces. The third will be for assembly in the mold and needs to be the reverse of the original. When creating the pattern copies keep in mind:

- It can be helpful to number the pieces, mark grain directions, color information, etc. on all copies before separating them. This will ensure that your pattern piece has the same number as the layout copy and the assembly copy.
- You are going to be sticking the tesserae onto the adhesive film or paper backing "upside down", that is the front side of the design will be facing the bottom of the mold. You will need to reverse your design in order to assemble the pieces this way. There are a couple of ways to accomplish this.

1. Trace the design onto the film (non-sticky) side of the adhesive paper while it is still attached to the paper backing. Don't forget to mark edge allowances. When you separate the film for assembly, your design will be upside down.
2. When making your final working copies, use tracing paper (or similar translucent paper) for the assembly copy. You can then tape this reversed side up to the film side of your adhesive backing. Your numbers will be backward, but it is still relatively easy to see where pieces go. You will remove this before casting the project in cement



- The pattern piece copy can be made from mylar, tag board, a heavy weight paper, cardstock, etc. What you use depends on personal preference and how durable you want the pattern to be. You can cover paper patterns with clear contact paper to make them stronger and water resistant. You can trace the design onto an opaque contact paper, cut this for your pieces, and then stick them right onto the material you are using. There are different approaches, which you choose depends on construction materials, how many times you plan to make the design, and how many times you want to trace out the pattern.
- The space between tesserae is important. Generally an 1/8" gap is used to allow the cement to flow completely into the space between tesserae. You can have wider or narrower lines, it is up to you. You can cut away the back line width on the pattern using regular scissors or use special three bladed "mosaic" shears, just remember you need enough space between pieces for the cement. From an aesthetic point of view, bigger tesserae can support wider lines, smaller tesserae, thinner lines.

Selecting Colors

Once you have a design, you will need to fill it with color. Choose what you like! Layout your tesserae and play with different combinations. Lay them on your design to see how they work and look. Keep in mind that each unit is a unit of color, texture, size, form and brilliance. How they play off each other will affect your design.

Be aware when choosing tesserae that they are backed by color of the cement. If you are using translucent or clear tesserae, their color will be affected by the color of the cement you are casting the design in. There are reflective tapes that you can apply to the back side of your tesserae to block the back ground cement color and reflect the transmitted light. Follow the manufacturers instructions for applying them to your tesserae.

Remember that the viewers eye will mix the shapes and colors in your design. Instead of covering a large area with the same tile, vary the shades used to add interest (unless the effect you want is a uniform block of color!). Grade (transition) colors into each other by varying the size and shape as they meet each other. Mix pieces of differing colors together. Place opposite colors next to each other for contrast. Make black or gray lines to accent or separate design elements or colors. Take advantage of patterns and colors in your tesserae. Play, experiment, stand back, look, rearrange, change, stand back, look...until you are satisfied. Again, do what you like and once you get started don't be afraid to change or deviate as the project unfolds.

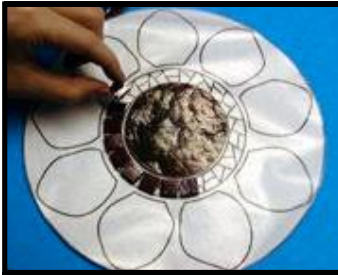
Cutting the Tesserae

With any new technique or tool it is a good idea to practice on scrap materials (before you attack that one piece of really unique glass or china you have). Work in a protected, covered, easy to clean area; you'll be creating shards and stray pieces that can cut. WEAR SAFETY GOGGLES! You can cut all your pieces ahead of time and lay them out on your cartoon or base; or you can work on the fly - cutting and fixing as you go. The choice is yours.

- **Mosaic Nippers:** Hold the nippers with the end of the handles in the palm of your cutting hand and the rounded end of the jaws facing towards you. Using the thumb and forefinger of your other hand to feed the tesserae (face up) into the jaws about 1/4" (6 mm), squeeze the handles together while you press your thumb and forefinger together. Applying equal and opposite pressure will create a straight break. Make diagonal lines by angling the nipper head and aligning your finger and thumb with this direction. Cut curves by removing small bits until you achieve the curve desired. Concave cuts are possible by modifying the applied pressure and a bit of practice!
- **Tile Cutters:** Place the tile on a flat surface and use the cutting wheel to run a score (line) from edge to edge. Center the flared anvil above the score and squeeze the handles gently. If all goes well you will get a clean break along the score line.
- **Hammer:** An ordinary hammer is useful for breaking large pieces or those too thick or too tough for nippers. Hammers are an excellent way to achieve random pieces. To contain the mess, place your pieces in a heavy towel or in a paper or plastic bag before striking.
- **Traditional Hammer and Hardie:** The hardie needs to be secured at a height which is comfortable for your working stance and with the chisel pointing up. Hold the hammer firmly but with a relaxed arm. Hold the tesserae centered on the chisel tip with your thumb and forefinger. Swing the hammer down from above, aiming to align the hammer tip with chisel tip of the hardie. Swing gently! Too strong a swing will cause the tesserae to break more erratically. Only swing as forcefully as you need to. Practice makes perfect.
- **Glass Nippers:** Used similarly to mosaic nippers. Align the wheel with the direction of the cut you want and squeeze. Changing the angle and amount of pressure will create differing curves and pattern shapes.
- **Glass Cutter:** Hold the cutter in your favored hand and place the cutter wheel on the glass about 1/8" (3 mm) in from the edge closest to you. Place the thumb of your other (guide) hand behind the cutter head to prevent it from rolling back. Apply a firm, constant pressure straight down through the cutter onto the glass and roll the cutter wheel away from you all the way across the surface of the glass.
- **Breaking with Hands:** Form both hands into fists and place the glass between your thumbs and index fingers with the score line between your thumbs. Your fingers should be clenched underneath the glass with knuckles touching. Hold the glass firmly at the end of the score. With a quick even snap pull outward and roll your knuckles by spreading your thumbs apart to break along the score.
- **With Breaker-Grozier Pliers:** Form one hand into a fist, placing the glass between your thumb and index finger close to the score line. Position the flat jaw of the breaker-grozier pliers on the top side of the glass with the jaw parallel to the score and as close to the end of the score as possible. Hold the glass firmly in your hand and apply quick, even pressure by first pulling outward, then snap down with the pliers.

Fixing the Design to the Adhesive Film or Backing

Once you have all the tesserae cut, fitted and are satisfied with your layout, you will need to transfer your design onto the adhesive backing, front side down.



LAYOUT THE DESIGN



FINAL LAYOUT



REVERSING THE PIECES

- All tesserae need to be clean and free of dirt, grease, and dust. Allow all pieces to dry thoroughly. Shells need to be soaked in water for several days (changing the water daily), then allowed to dry out over several days. Pebbles need to be soaked overnight and then rinsed until the water runs clear. Allow them several days to dry out as well.
- Separate the adhesive film from its backing and lay into the bottom of the mold, sticky side up. Transfer the pieces to the adhesive, front side down. Now you can see where having a reverse pattern of your design comes in handy! Once you are satisfied with the placement of a tesserae, press down to seat it firmly against the adhesive. If you find you have misplaced a piece, gently pull it up trying not to wrinkle or stretch the adhesive film. Once all pieces are placed, gently slide the adhesive backing with your design out of the mold onto your work surface. (a good test to see if all your pieces are securely held) Again, press and make sure your pieces are firmly held in place by the adhesive film. Some suggest using a rubber float, wide piece of wood, or similar object to help seat the tesserae to the film.
- For the paper backing method: After the design is set, your next step is to fix the design onto the paper. The cut tesserae are adhered face down using a water soluble glue or gum. You want to use enough to hold the piece to the paper flat but not so much that removing the paper later becomes a major chore. Experiment first with the amount of glue and your tesserae can help you determine what that happy medium is.

Preparing the Mold or Mortar Bed

Spray the mold bottom and sides with a release agent. There are several commercially available, check with your supplier. Vaseline® is used by some. Apply liberally with a sponge brush and then use a hair dryer to smooth. You don't want any ridges. Then tip the mold and gently slide the adhesive sheet with your design into position in the mold. Check your tesserae one last time. Also make sure the edge of the adhesive film is lying flat in the mold bottom and not curving up the sides.

Since paper backed projects are pressed into a prepared bed of mortar, you need to prepare the surface and then apply the mortar according to the manufacturers instructions.

Mixing and Pouring the Cement

Mix your cement according to manufacturer's instructions. Generally you combine all dry ingredients in a large enough container to accommodate them and give you room to thoroughly mix them. If you are coloring your cement add the colorant to the dry ingredients and mix well. Take a small sample and mix with liquid to test the color. Color in cement fades as it cures. A general rule of thumb is to mix the color 2 shades darker than the finished color you want. Save a small amount (1/2 cup or so) of the final dry mix to use for filling in any gaps or pinholes you find after you un-mold the project. The liquid is then added to the dry ingredients and mixed. Be aware that as you mix, you want to avoid introducing air bubbles. Check the manufacturers instructions for consistency, some cements are mixed to a medium oatmeal, some more like brownie batter.

It is best if you can pour the concrete into the form in the place you intend to leave it to cure. It is risky on several levels to move a mold filled with cement. Make sure the mold sits level. Start by pouring a thin layer around the edges to help hold the adhesive film down. Cover the bottom with a thin layer and then gently pat the top or tap the mold to release any bubbles and work the cement down between the tesserae. Continue filling the mold until you reach the top or your desired thickness. You don't have to fill the mold to the top but the thinner the concrete, the weaker your project will be.

You want to 'screed' or level the surface by taking a piece of wood or similar item that will span the width of the mold and draw it across the top to level and remove any excess cement. Wipe the edge/lip clean. Again, tap your mold edge and sides gently for a few minutes to release any bubbles. Some people also tap the surface the mold is sitting on. Be careful, this is more apt to dislodge the tesserae from the adhesive backing. Allow the mold to sit undisturbed for the required amount of set time, based on manufacturers instructions.

In a paper backing project, gently press the mosaic into the bed, paper side up. Allow the cement to set enough to hold the design in place so you can remove the paper but not so tight that you can't make any needed adjustments.

Un-molding the Project

You need to now release the project from the mold

- Invert the mold onto several wooden dowels that span width of the mold in a place where your project can sit undisturbed for several weeks. You may need to work your hands around the edges to help loosen it. Hot towels on the bottom or a hair dryer can help by making the plastic mold more flexible.
- Peel off the adhesive film. Check the surface for concrete films, seepage, gaps, pin holes, etc. Wipe or pick away excess cement now, while it is still soft. Mix up a bit of your saved, colored, dry ingredients and rub into any holes or gaps. Let it sit for 10 - 15 minutes and then wipe away the excess.
- Do not move your un-molded stone for at least a week and it is better to let it sit undisturbed for 30 days in order to achieve full strength. It is important to keep it elevated to allow air to circulate around all surfaces.
- If you used the paper backing method, you will now use a cloth or sponge to dampen the paper with. You want to loosen and peel it away from the tesserae without dislodging any pieces. Once removed, you can reset any loosened pieces and then allow the cement to fully cure before grouting and cleaning.



Grouting an Embedded Design

Grouting is the technique of filling in the spaces between your tesserae. If you used the paper fixing method and then set your design into a mortar or cement bed, you will need to fill in the gaps, or grout, between your tesserae after removing the paper backing. Generally, it is desirable to make the grout level with the overall height of the mosaic surface. Grout is just a fine textured version of cement mortar. It unifies the design. Its color enhances the design: and it adds strength.

- The choices of grout color are endless. There are colored sands and pre-mixed grout colors. You can make your own by adding grout pigments or artists acrylics to your colored sand or white grout mix.
- Allow the cement to properly cure according to the manufacturer's recommendations. This will be at least 24 hours for indoor mosaics, 72 hours for outdoor mosaics.
- Mix grout according to the manufacturer's directions following all safety precautions. Add color until you achieve the shade desired noting that it will be slightly lighter when dried. If you are not sure of the color, test it using the piece you used earlier to test the adhesive, or test on a small inconspicuous spot on the actual mosaic piece. You don't have to use the same color throughout the piece.
- Scrape out any excess mortar between your pieces.
- Put on some gloves and spread the grout on the surface using a plastic spatula, squeegee or your hand. Make sure to push the grout down into all spaces and cover the entire mosaic
- The grout needs to partially set before you remove the excess. Refer to the manufacturer's instructions, generally about 15-20 minutes. Use a clean, lint free cloth or a damp sponge to wipe off excess grout. Be careful not to dig into the grout spaces pulling it out.
- Once you have removed the excess grout you will have a haze over the surface. Buff it off using a clean lint free cloth or crumpled newspaper. If you have specks of grout stuck to your tesserae remove them using a non-scratch nylon scouring pad, wooden stick, or similar tool that won't scratch your surface.

Sealing and Protection

Some materials and applications benefit from an application of sealant after the project has cured or the grout is dried and cured. You also want to protect your finished project from the elements.

- After 30 days, you will want to seal the top, sides and bottom of a poured project, no matter where its final placement will be. There are many concrete sealers available for cement. Your supplier can offer suggestions. Apply as directed by the manufacturer to the grout lines, sides, and bottom. Avoid getting it on the tesserae and wipe away any excess.
- Sealing pebbles brings out their true 'wet' color. Other porous materials also benefit from sealing. Sealers are available in a matt or shiny finish. Read the bottle to see if it fits your application.
- Projects placed outside need to be protected from the elements. If your area receives snow or is subject to freeze thaw cycles, you may want to store it indoors to keep it from cracking. If you are creating a walkway, set the stones in a on a sand bed (about 1") to provide drainage and support.



now step back and admire your work!

Resources

There are variations on the technique presented here and many excellent book resources (see below) to help you expand your knowledge and creativity. As you experiment and work with different materials you will discover what methods, tools, and supplies work best for you!

Ancient Mosaics

by Roger Ling Paperback
Princeton University Press
Paperback / 1998 / 144pp
ISBN: 0691004048

The Art of Mosaic Design: A Collection of Contemporary Artists

by J.Locktov - L.P.Clagett
Rockport Publishing
Hardcover / 1998
ISBN: 1564964205

Classic Mosaics

by Elaine M Goodwin
Trafalgar Square Publishing Ltd.
Hardcover / 2000 / 144 pp
ISBN 1570761590

Making Mosaics Mosaics

by Leslie Dierks
Sterling Publishing Co.
Hardcover / 1998 / 128 pp
ISBN: 0806948728

Mosaic Workshop : A Guide to Designing and Creating Mosaics

by Emma Biggs, Tessa Hunkin
Trafalgar Square Publishing, Ltd.
Hardcover / 1999 / 128 pp
ISBN: 1570761493

The Art of Mosaics

by Joaquim Chavarria
Watson-Guptill Publishing
Paperback / 1999 / 160 pp
ISBN: 0823058646

Backyard Mosaics

by Connie Sheerin
Hardcover & Paperback / 2001 / 128 pp
Sterling Publishing
ISBN: 0806929677

Encyclopedia of Mosaic Techniques (Encyclopedia of Art Techniques)

by Emma Biggs
Penguin USA
Hardcover / 1999 / 160 pp
ISBN: 0762404442

by Kaffe Fassett & Candace Bahouth

Taunton Books & Videos
Hardcover / 1999 / 160 pp
ISBN 1561583731

The Mosaic Book : Ideas, Projects and Techniques

by Peggy Vance, Celia Goodrich-Clarke
Trafalgar Square Publishing Ltd.
Paperback / 1996 / 128 pp
ISBN: 1570760608

Mosaic Sundials / M. Koehl

