PaperStone
The Earth's Surface™

PaperStone™
Design and Fabrication Guide

Paneltech International
Manufacturers of PaperStone™
2999 John Stevens Way
Hoquiam, WA 98550
Phone: 360 538 1480
Fax: 360 538 1510

This guide is intended to assist in the design and fabrication of PaperStone™ products.

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DESIGN and FABRICATION

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DESIGN

I.   *PROPERTIES*

Heat Resistant
PaperStone™ is heat resistant to 350°F.

When installed around stove areas, PaperStone™ does not need additional protection due to its high heat resistance. However, a trivet or hot pad is recommended to ensure no damage will be caused by exceedingly hot pots or pans pulled directly out of the oven and purposefully set upon the counter.

Scratch Resistant
PaperStone™ is extremely dense and more durable then wood. The material is resistant to scratches.   However, similar to all surfaces, it can be scratched.   Most scratches are usually light, superficial, and easily removed or repairable.

Stain Resistant
PaperStone™ surfaces resist stains. Similar in nature to all countertop material, there is a remote chance for slight staining.

Most spills and light stains may be cleaned with a damp sponge.

If a stain is stubborn, use a non abrasive household cleaner.

PaperStone™ recommends fabricators finish the surface with sealers to provide a rich polished finish that requires minimum care.

Durable
PaperStone™ is extremely durable. It is stronger than stone or solid surface materials.

PaperStone™is capable of long spans and cantilevers.

The household is its least challenging environment.   PaperStone™ durability is well known in industrial and commercial applications.

Sanitary
Due to its non-porous nature, PaperStone™ does not support the colonization of bacteria and is food safe.

PaperStone™ is awaiting certification by the National Sanitation Foundation (NSF Standard 51) for use with direct food contact in restaurants. The NSF sets standards and certifies food service related products.

Applications
PaperStone™ is frequently used in applications other than countertops such as:
• wainscoting
• windowsills
• stair treads and risers
• cabinet toe kicks
• millwork
• cutting boards
• toilet partitions
• skate board ramps
• industrial tooling

Contact Paneltech International for technical specifications when evaluating suitability for industrial applications.

Compared to Stone
PaperStone™
• is stronger
• is warmer to the touch
• has a softer appearance
• will not damage knives
• will not collect bacteria in under counter areas due to it's non-porosity

PaperStone™ has a slight "yield" so that glass objects will not break when set down hard or dropped, as would happen with a tile or stone counter.

Routed drain boards can easily be cut into a PaperStone™ surface.

The thickness is consistent through the entire PaperStone™ sheet. This distinction is very apparent when using an under mounted sink. The evenness around the sink cutout adds to the beauty.

Compared to Solid Surface
PaperStone™:
• will not melt with heat exposure under 350 degrees.
• is strong enough that seams can be placed exactly in the corners.
• can span and cantilever distances.
• has a natural honed elegance, not the plastic appearance so common in solid surfaces.

II.   *LAYOUT*

Grain Direction
PaperStone™ has a grain "direction".

Consider the effect of grain direction when planning cuts. A crosswise grain direction may appear awkward.

Thickness
The recommended minimum thickness for counter use is 3/4", particularly if cut to install biscuits or splines.

Material thickness less than 3/4" is suitable for vertical use, such as in back splashes or wainscoting.

Strength
PaperStone™ is extremely dense and stable. No underlayment is required for support.

Cantilevers and Spans
PaperStone™ is extremely strong.

Generally a cantilever will remain stable at:

Thickness	Overhang
3/4"	18"
1"	24"
1 1/4"	32"

More distance is possible depending on the customer's expectations of the deflection in the unsupported portion of the countertop.

Inside Corners
Due to PaperStone™ strength and stability, corners can be exactly 90 degrees. There is no need to radius an inside corner.

The best way to do a clean inside corner is to place a seam exactly at the corner.

Cut-outs
Under mounted sinks can be installed in thicknesses of 3/4" or greater.

3/4" PaperStone™ will support a stainless steel sink. Additional support from under the sink is required for farm-style sinks in either porcelain or heavier materials such as soapstone and cast iron. Generally, it is advised to follow the sink manufacture's installation instructions.

Routed Drain Boards
Sloped drain boards can be routed into PaperStone™ counters. Always retain a 3/4" thickness to the material. Consequently, a 1 1/4" thick sheet of PaperStone™ is required to retain 3/4" thickness and cut the desired slope.

Edge Detail
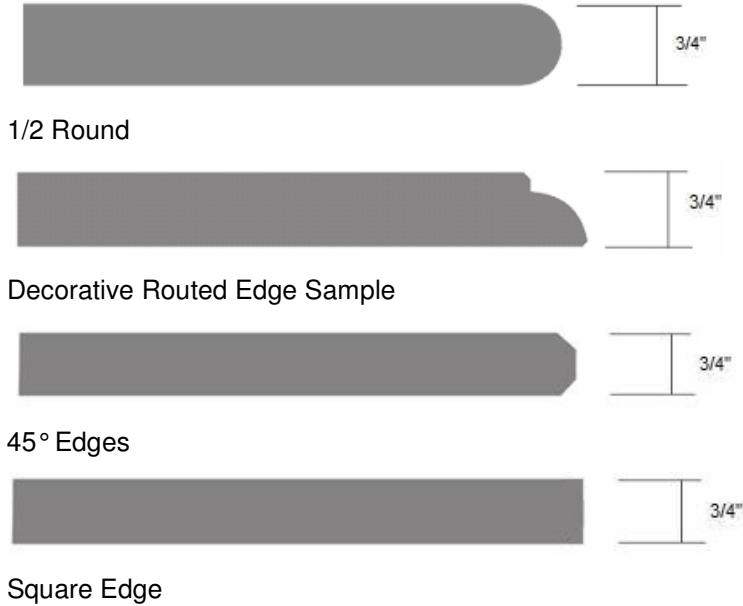Any router bit can be used to create an edge profile.

PaperStone™ can hold a very detailed or sharp edge. It is important to ease sharp edges after routing to avoid being cut by sharp edges.

A deep edge profile will expose more paper layers and show the end-grain effect.

Many different edge treatments can be obtained. Below are examples of some common treatments used.

Drop Down

1/4 Round

1/2 Round

Decorative Routed Edge Sample

45° Edges

Square Edge

Fittings
Faucet fittings can be deck mounted.

Soap dispensers should be located in such a position that soap is not likely to drip onto the counter. Soap dispensers should drip into the sink basin.

Surface Finish
Panels come with a slight texture and will look good as it comes from the plant.

PaperStone™ can be sanded and buffed to achieve an extremely smooth surface texture.

Sealer
Mineral oil adds a soft luster and deeper tone. However, it needs wiping frequently and will need reapplication.

Sealing and finishing the countertop is recommended. We offer an eco-friendly natural wax finish. This finish is a slightly higher maintenance. It contains all natural beeswax, and Carnuba wax. This provides a satin sheen.

When applying a wax finish, apply a generous coat and let sit and soak for a minimum of 20 minutes, an hour or two is recommended. Remove excess wax and buff until it has a hard, smooth and satin finish. Another coat is recommended, only after the first coat is buffed thoroughly. Do not over apply. When buffed correctly the surface will not change if you touch it.

You may also choose a clear, wipe on gel polyurethane. This finish, applied in two thin coats, will give an extremely durable protection layer. It is a non-toxic food safe formula and has a satin sheen. Although not required, a wax coating can be applied over this finish and will add protection to the polyurethane coating.

FABRICATION

III.   EQUIPMENT

This list is for example only. Professional equipment is not required. Most commercially available woodworking tools will work on PaperStone.

Saw Blades

Use carbide tipped blades for circular and table saws. Maximum teeth recommended. The list below is for example only. They should be available at a local hardware store.

- Leitz 10" melamine blade, 80 tooth, negative hook (WK 860-2 / 15001215). It makes a very clean cut.
- Amana 12" blade, 72 tooth, negative hook (512-721-30).
- FS Tool 7.25" x .115" x 5/8" blade, 40 tooth, triple chip negative hook (LH743).

For curve cuts, we recommend a cobalt steel Jigsaw blade such as DeWalt (DW 3750-5 or 6TPI).

Routers

Any router currently on the market will work. The higher the horsepower the easier it will be to obtain the edge you want.

Use a straight solid carbide bit.

Have an assortment of various profiles.

Clamps

Long Bar Clamps.

Dani Clamps.

Gorilla Clamps.

Drills

Larger holes require a bi-metal hole saw or carbide-tipped hole saw.

For small holes use titanium or cobalt bits.

Biscuit Cutter

Minimum 6.5 amps such as DeWalt

(DW 3751-5)

Saws

Sliding Table Saw.

Felder Saw

Joiner

Sanders

Random Orbital Sander

IV.   SUPPLIES

Sikaflex or any high grade construction adhesive recommended for glass or steel

CA 5 or other instant adhesive

Two-Part Epoxies – high strength is recommended

1/4" Splines

Lamello Clamping Plates #K20

Standard #20 Biscuits

Mechanical Joint

Fasteners (Knape & Vogt "The Joint Fastener")

Sandpaper - 80 grit maximum – on down in size for a finer feel and look. Normally, 220 grit will be adequate for most applications. Use medium grit nonwovens if only clean up is required.

V.   SET CABINETS

Verify cabinets are secured to the wall and attached to each other.

Use shims to level the cabinets as required.

Due to the weight of PaperStone™, pay special attention to cabinet strength. If required, re-enforce with a wood or metal bracket or strip. Always follow cabinet manufacture's instructions.

VI.   TEMPLATE

After the design and layout has been established, create a full size template.

The template will serve to verify dimensions when set on the existing counter. The template will also aid in marking and cutting the final product.

VII.   SELECT THE 'A' SIDE

Evaluate both sides of the sheet to determine the more desirable side to use.

The material may have high and low areas, or bumps. This is a natural characteristic. Many of the bumps can be worked around by careful placement of the template pieces.

Those that cannot be avoided require careful attention when sanding.

VIII.   CUT

Trace the template on the PaperStone™ product and execute a rough cut-out of the counter top. Ideally have the rough cut be as close to actual counter size as possible while leaving just enough material to finish with a router or sander. Due to material density the more material left to shave off with a router, the more chatter will be created. Chatter results in a rough edge. Be careful to cut in small progressions so as not to break the router bit or cause material scoring.

Preferable cutting should be completed using a sliding table saw running between 3,450 rpm and 4,000 rpm.

An even rate of speed will prevent burn marks. Any resultant burn marks are superficial and can be sanded out.

Your seam cuts should be run over with a router while using a straight edge. Run between 15,000 rpm and 16,000 rpm.
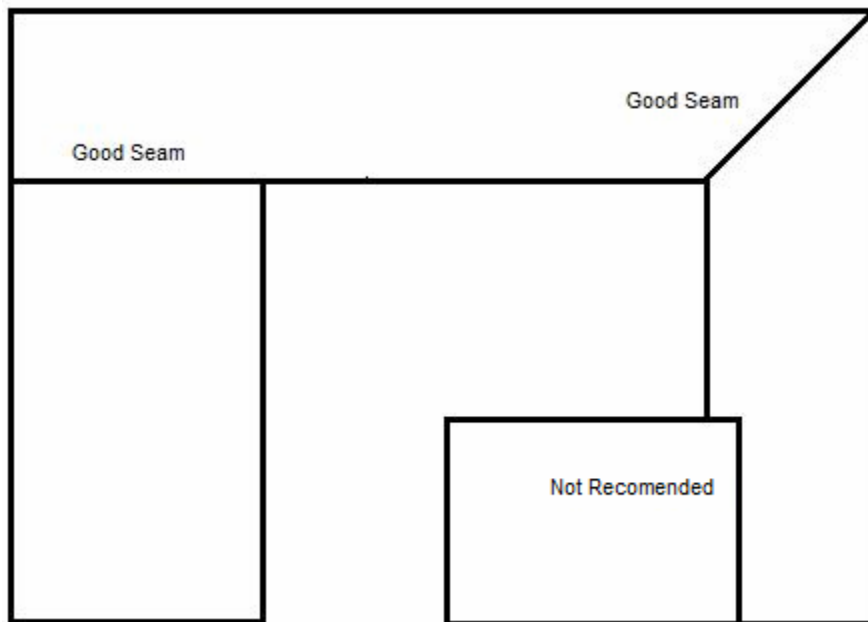
IX.   SEAM

Appearance

Seams will be visible stand out and should be incorporated into the design layout.

For both structural and aesthetic reasons, seams should not be placed at sinks, cut-outs, or other areas where they do not run the full depth of the counter.

Seams can and should be placed at 90 degrees or perpendicular to a corner. Seams look awkward when placed a short distance from a corner.

Seams can be placed diagonally from a corner.

There are times, using solid surface techniques, where seams will virtually disappear, but do not count on it. The success of your seams is solely dependent on the expertise of the fabricator

Structural
Seams should run the entire depth of a counter top to be structurally sound.

Types of Seams
It is important to do a dry fit. If the seam does not dry fit tightly then, it certainly will not be a tight fit when adhesive is used.

Biscuits
Biscuits, dowels or pins are useful in the seams as locators and for additional strength to the adhesives. They are not required, but recommended.

Mirrored - Cut/Joint
When using a mirrored cut or joint, use an instant adhesive to virtually weld together the seam. The instant adhesive is pressure sensitive. It will not start activating until there is pressure from both sides of the seam.

The use of splines, biscuits, or pins, is recommended to assure the location.

Splines
Splines are an excellent choice for strength. Cut so that when installed in the slot, the grain (paper layers) follows the same directing as the direction as the grain in the sheet.

Tight Joint
Use a tight joint in non-structural situations only.

Epoxy Only
Make sure that the joint gluing surfaces are roughed-up with 60 grit sandpaper or less for better glue adhesion. Do not over tighten clamps to keep the glue in the seam.

Mechanical Fasteners
These are acceptable for situations where there is access to install them.

Indexing
Because PaperStone™ is made of recycled paper, an imperfect material, the thickness may very from sheet to sheet or even within the same sheet. The surface on either side of a seam must be indexed from the top and the +/- difference and then sanded out on the underside. Or you can support the underside of the thinner panel to relieve any gaps between the countertop and substrate. If a seam is built and one side of the seam is higher than the other, any aggressive sanding needed to level them may expose several layers of paper, causing white lines to appear.

Dry-fit
Dry-fit all seams prior to applying any glue.

Sand the edge to smooth out marks with 80 to 220 grit sand paper, progression.

Route the edge detail or hand file round over as per client specifications.

Sand the edge detail by hand or with a random orbital sander.

Matching Pieces
Due to the extra weight of PaperStone™ we suggest the use of seaming cups to bring the seam into a perfect position. Any smooth seaming cup may be used similar to Gorilla Grips.

Sanding Process
The best surface finish is achieved by leaving some of the mill finish visible. This allows the surface to hide general wear and tear and scratches. PaperStone™ can be sanded to a higher level of smoothness, but it will show wear and scratches much faster.

Using a random orbital sander with100 grit sandpaper, go over the surface area lightly and evenly. Use just enough pressure to keep the sander on the surface. Remember, PaperStone™ is made with cellulose fibers (layers of paper). If you sand to aggressively in one area for too long, you will create something to the effect of a "topography" map. Use special care to sand lightly around uneven surface areas. Go in progression of 100 - 120 - 150 - 180- 220 - etc. depending on how smooth the feel and the look required by the customer.

Sanding in one area, more than another will create more luster, or look different, than the rest of the panel. Sanding must be consistent over the entire panel.

Special Technique
Sand the length of the sheet first.

Take special care that the panel is sanded evenly and consistently over the entire area. Clean and vacuum and tack cloth or wash off with water and dry.

Make sure there is no sanding dust on the panel before the finish is applied. The dust can be removed by a damp rag or a tack cloth.

If there is an area sanded more than another, the area will have more luster than the rest of the panel.

Machining

The properties of PaperStone™ are consistent through the entire thickness. It is perfectly appropriate as a machined product. Machining does not affect the structural integrity of the material. Be aware that the end grain is usually darker and of a finer texture that the surface. Lines between layers will be exposed by contoured cuts on the surface.

X. SITE WORK

Check the fit, if possible, by laying the counter in place.

Install any under mount sinks. (Consider doing this step at your shop. Pick up the sink from the customer and attach before going to the site.)

If your plans call for an under-mounted sink, there are a few simple guidelines to follow. Birch is good plywood to use for creating a template, as it does not have voids in the core. It is important to have a hard smooth surface for the router bit to follow.

The first thing you want to do is to make a rough cut. The closer your rough cut is to the template, the better off you will be. Your final pass with the router will be smoother and your bit will last longer. The more material the bit has to take out, the more chatter.

After your rough cut you will want to run a 1" pattern bit on a 1/2" shank. You will need something strong enough not to bend.

Depending on how smooth your final pass was with the router, you will either want to start out with a 120 grit or 150 grit sandpaper, then move to 180 grit sandpaper

with a finish sander. If the sink is set back under the PaperStone™, then you will want to ease both edges. If the sink sticks out (like a waterfall), ease only the top edge and leave the bottom edge flat.

A good trick for installing under mounted sinks is to use 3/4" plywood in the sink cabinet as a sub-top built inside the cabinet and flush with the top of the cabinet. Then cut out the sink hole with about 1/4" play on each side. Make sure you rout the thickness of the sink lip (generally 1/16" for stainless steel sinks) so that it is flush with sub-top. If you are installing a cast iron or porcelain style sink, you should put extra support blocks underneath the plywood because you will take out more material when dropping in that type of sink. You may be able to convince the general contractor or cabinet maker to do this for you.

Complete Seams

Apply the epoxy to the biscuits. Make sure you put a minimal amount on the upper part of the seam to reduce the overflow.

Quickly clamp the seam.

Long bar clamps do a great job on long pieces.

If you have a captured installation, raise the seam section to insert the biscuits, then gently press the counter down. Drive wedges at each wall below the splash line to tighten the seam.

Clamp the cabinets as well, using c-clamps.

Check the reveal consistency at the front edge.

Clean excess epoxy with lacquer cleaner, thinner, or acetone.

Tape 020 backer at about 1/4" on either side of the seam to protect the surface area around the seam. Sand as gently as possible and try not to make marks on either side of the seam.

Remove backer and feather seam area into the previously sanded area of the counter top.

Screws or inserts can be used in PaperStone. Pilot holes must be used and they must always be deeper than the screw. The screw will snap off if it bottoms off. If possible test on scraps if you are not experienced with PaperStone.

CNC

I.   *FEED AND SPEED*

Yes, it is true, PaperStone™ may be one of the densest products that your CNC will ever cut.

To begin, identify a PaperStone™ "only" router bit for cutting. This will protect the machine and the safety of the operator. Always refer to your manual guidelines and the experience of your operator. Make certain your blades are sharp and your machine is up to speed.

We offer the following as guidelines only:

When you work with PaperStone™ material 3/4" or thicker, we recommend the following set up:

Rotation speed 16,000 rpm, working speed 4400 mm per minute, and lowering speed to 8000 mm per minute. Use a 1/2" compression 2 flute bit with a cutter length 1/4" longer than the thickness of your PaperStone™ material. A reliable bit to use is a Series 3100 2 flute compression spiral 1/2" diameter, 2" cutter length. Part #3162 from Vortex (1-800-355-7708).

When you work with PaperStone™ material 1/2" or less, we recommend the following set up:

Rotation speed 18,000 rpm, working speed 5,000 mm, and lowering speed 2,000 mm. A reliable bit to use is a 3/8" diameter straight flue. Part #4037, also from Vortex.

II.   *DRILLING*

Set-up rotation 4,000 rpm, lowering speed for 5 mm bit is 1,500 mm per minute. Use a slower speed for larger bits.

III.   *ROUTING*

We suggest that you cut it in steps of 1/4" to 3/8" at a time. Cut the piece 1/64" bigger than it needs to be using the stepping process. Then come back and cut 1/64" off with no step to clean and polish the edge. This will eliminate a lot of sanding time.

Do not cut more than 1/4" material off without the stepping process.

Do not come straight down at the starting point with router bit. You may burn the material. If you start at a spot that won't show, you may come straight down into the material on the starting point. If starting on an edge that will be visible, use a 45 degree head in and out.

If the PaperStone™ part is smaller than the machine can hold down safely, use onion skimming technique. Leave 1/16" short from the table so you can route the part off with a bearing router.

FABRICATOR NOTES

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