Foamcore Skills

Model Building
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Scope This handout describes techniques for creating structures with foamcore. This document will refer to techniques described in the paper skills handout.

Tools Refer to the paper skills handout

Adhesives Refer to the paper skills handout for a discussion of spray glues and tape.

Hot Melt Glue

This will probably be the major way you adhere foamcore. Hot melt glue has the advantages of being quite strong and setting very quickly. This means that you can build your project on the fly, using joints to carry load as you make them. It also means that you will almost never need to clamp a joint as you can easily hold it until the glue sets.

One disadvantage of hot melt glue is that it is messy. Strings or whiskers of glue trail off the gun nozzle and mar your work. The other disadvantage is that the tip of the gun is really hot and can cause painful burns.

A characteristic of hot melt that is both an advantage and disadvantage is that it is thick and fills space. This can be useful when your joint is not precise as the glue will fill the gaps. If your joint is precise, though, the glue can overfill the joint space causing an uneven line and messy appearance.

White Glue

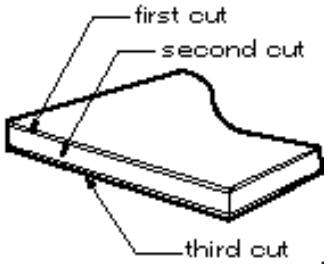
White glue can be used with foamcore, but it requires planning. It is stronger than hot melt, and neater, but it takes time to dry. This means that you will not only have to be organized enough to prepare your foamcore joints before you need them, you will also have to consider ways of supporting and clamping the joints until they are dry.

Basically, you should choose to use white glue only if you have plenty of time, have to have the maximum joint strength possible, or are concerned that your joinery be extremely clean and neat.

Refer to the paper skills handout for a discussion on how to use a straightedge and x-acto knife.

Cutting The only technique particularly relevant to foamcore is that you should cut it by making three passes with your knife. The first through the top piece of paper, the second through the foam, and the third through the bottom sheet of paper.

The foam dulls blades very quickly so be prepared to change blades often. A dull blade will wander or tear the foamcore

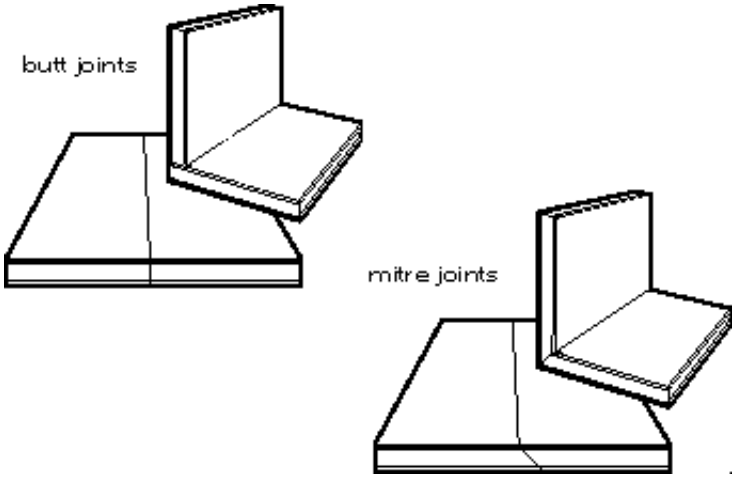


Joints Here we will consider three joints: butt; miter; and the essentially identical lap or dado joint.

Butt Joint

This is the simplest joint. It is also the weakest and least attractive. Therefore it is most appropriate for quick construction or situations where the joint will not show. The technique here is to run a bead of hot melt and push the foam core into it.

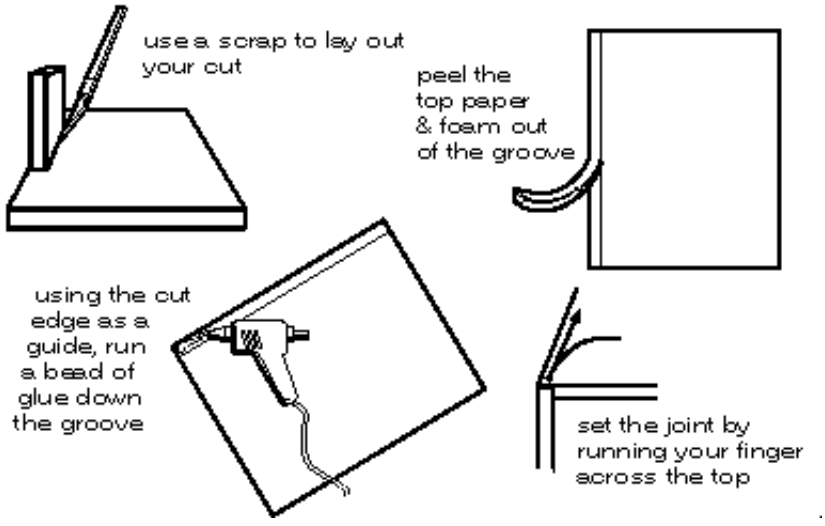
Miter Joint



This is the next step up from the butt joint. It is stronger because there is increased area at the joint. It is also more attractive because there will never be a bare foam edge showing.

There is an important caveat, however. To make this joint successfully you must be able to make perfect 45 degree cuts on the edge of your pieces of foamcore. This turns out to be very difficult to do. In fact, it is so difficult to do, that I would not recommend using this joint.

Lap or Dado Joint



This the best solution for most situations. It takes more time than a butt joint but it is not difficult to do. The resulting joint is strong and attractive. The key to this joint is removing material on one piece so that the other may fit into it. If you remove material at the edge of a piece you are making a lap joint, if you are making a groove in the middle of a piece you are making a dado joint. In either case use a scrap of the foam core to mark the width of your cut.

There are only minor differences between these two joints. Because the lap has a free edge you can use double stick tape as the adhesive and then trim off the excess. This is obviously difficult to do with a dado joint. The other difference is that with the dado joint until the second piece is inserted you first piece will be very weak so you need to take care not to accidentally bend it which will crease the non-joint side of the foam core.

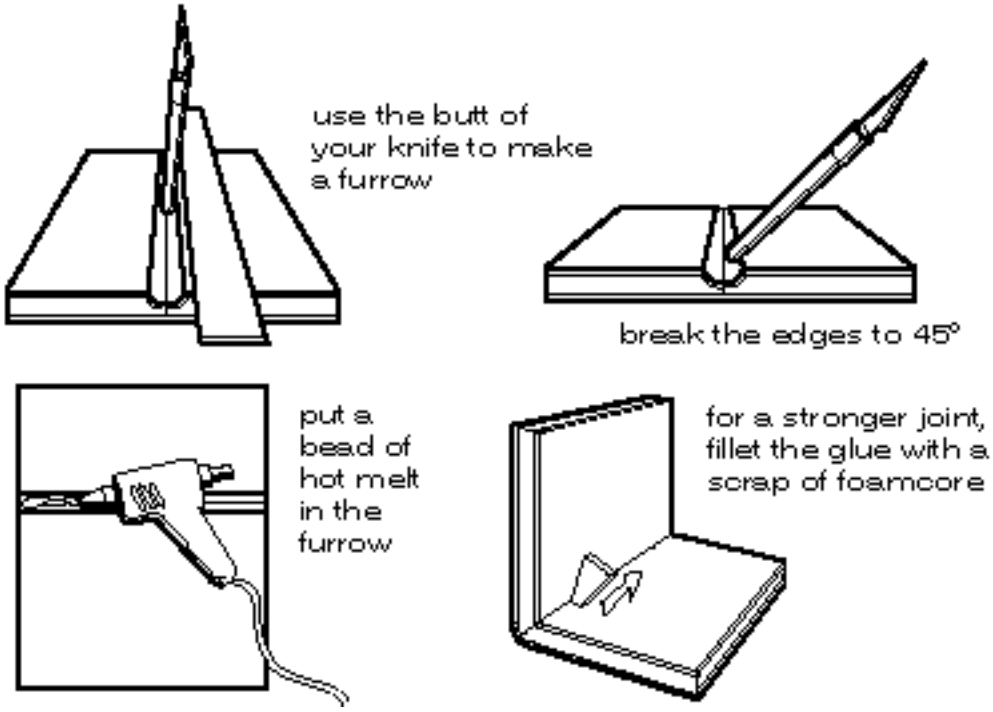
Corners

When you are not joining two pieces of foamcore, but are jointing a single piece you are making a corner. Here we will consider three corners: small radius, sharp and large radius.

Small Radius

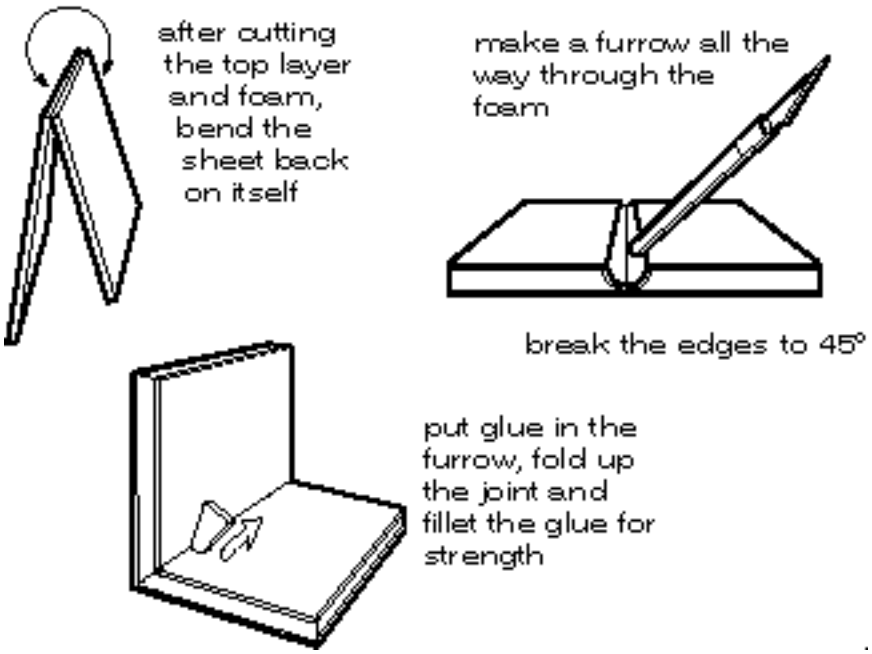
Begin by cutting through the first paper layer, and partly into the foam. Next take the butt end of your x-acto knife, hold it parallel to the axis of the cut and, using your rule as a guide, draw it along the cut line, crushing the foam. You will want to crush down about half of the way to the other side. Use several passes, don't try to crush it all at once. Then shift the knife so that it is perpendicular to the cut axis and break the edges to 45 degrees

Now fold up the joint and check whether you are happy with the radius. You can decrease the radius by crushing the foam a bit more. When you are satisfied, run a bead of hot melt along the joint and hold it until the glue sets.



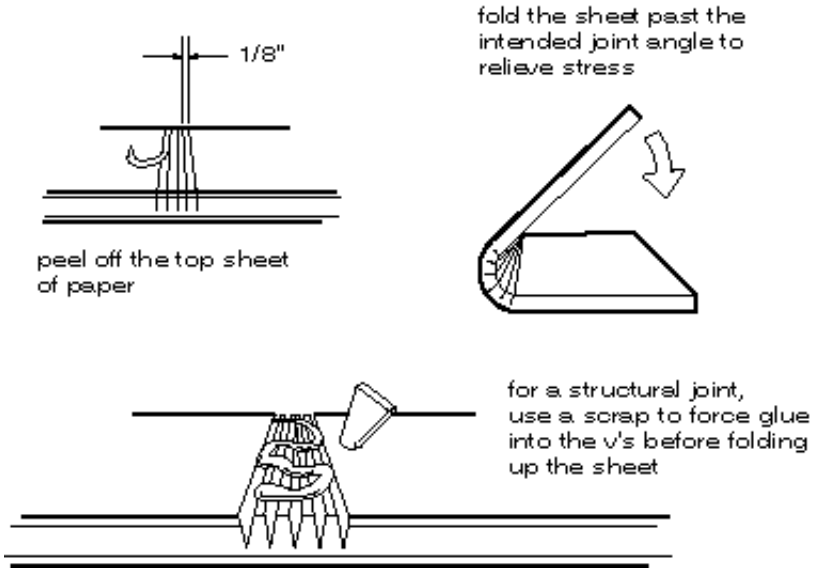
Sharp Corner

This corner is done very much like the small radius. The difference is that after making your initial cut bend the sheet back on itself. Then you crush the foam all the way down to the other side.



Large Radius

Begin this joint by making a series of cuts 1/8" apart along the axis of the corner. These cuts should go through the first layer of paper and halfway through the foam. Next strip off the paper from these cuts which is not so easy to do because the paper delaminates. Take your time and try to avoid damaging the foam. Once the paper has been removed, bend the



joint. This relieves stress on the joint. Let the corner relax and check the radius using a circle template.

If you have a particular radius you want it may take several tries to get it right. Use more or less cuts to change the size. Once you get the correct size you may want to write down the number of cuts for reference.

If the joint will be structural, a good idea is to criss-cross a bead of hot melt over the cuts, use a scrap of foamcore to push the glue into the "v"s, then hold the joint in position until the glue sets. This results in a strong, stiff corner.

Sometimes you may wish to make this joint in reverse so that the cuts show from the outside. In this case you would not peel off the paper, and you might consider spacing the cuts further apart.

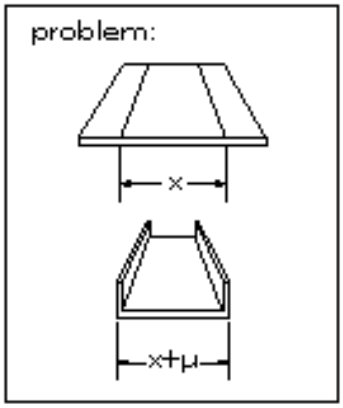
Measuring

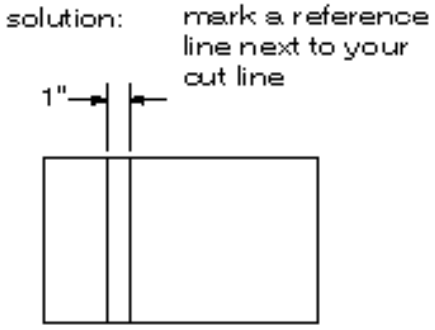
When making structures from paper for all practical purposes you can ignore the thickness of the material. This is not true with foamcore. You must consider the width of the material as you plan your joints and assemblies.

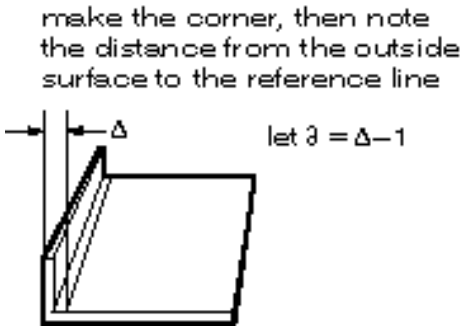
Reference Line Method

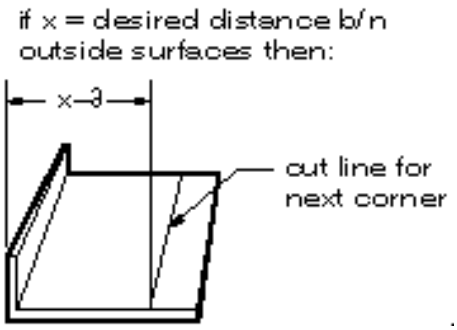
If you mark two parallel lines 12" apart on foamcore, make sharp corners at both lines, then measure the distance between the corners on the outside you will find that they are more than 12" apart. You can avoid this frustration by using a reference line.

Begin by drawing two parallel lines: your cut line and a reference line exactly 1" away. Make your corner using any of the methods above. Measure the distance from the outside wall to your reference mark; the difference between this measurement and 1









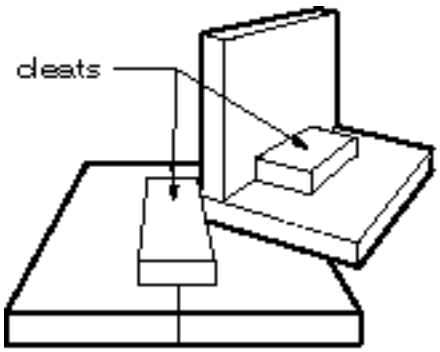
will be your delta. Now measure from the outside surface to your next corner, subtract your delta from this measurement and mark the cut line for the new corner.

Structural Support

An unstable or structurally unsound project is a disappointing project. Things sag, corners won't stay at 90°, and nothing looks crisp. You can reduce these troubles by taking the time to add hidden structural support as you build your model.

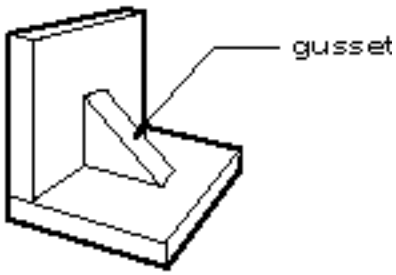
Cleats

Cleats are additional pieces of material that run parallel with the joint axis. They provide additional surface area for gluing as well as increased mechanical support. Common uses for cleats are along the inside of corners or as back ups to butt joints.



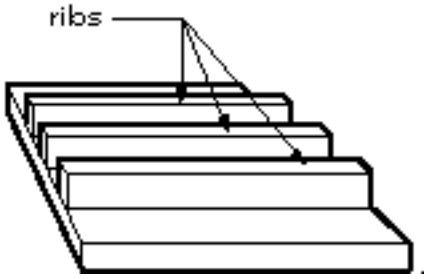
Gussets

Gussets provide support perpendicular to the joint axis. Their main function is to reduce the torsional load placed on joint. They serve to keep the joints at the intended angle.



Ribs

Ribs are similar to gussets in that they are mounted perpendicular to a surface. Their main function is to add stiffness to panels that must span a large distance.



Surface Treatment

In most cases, your best move is to leave the surface alone. The white of the foamcore is both attractive and neutral which means that critical energy can be focussed on the form and structural issues of your model. If you alter the surface you will be drawing attention to that surface and risk distracting attention from other aspects of your model.

If you decide you cannot have a white model, then you must commit to being as careful with the surface as with the rest of the model. The treatment cannot be an after thought, but must exhibit the same level of craft as the rest of the project. Consider using foamcore that already has a colored surface. If you wish to add additional color cut paper may be the best way to go. If you paint, take the time to tape so that your paint edges are crisp.

Although foamcore is extremely versatile, it does have its limits. Don't hesitate to incorporate other materials to perform specific functions. Some examples follow.

Additional Materials

Pins

Pins can be useful for strengthening joints, or holding them until white glue dries. They

can also serve as pivot points.

Dowels
Dowels make good axles for wheels and pulleys. They can also stiffen members which span large distances.

String
Obviously, foamcore cannot replicate the properties of string. Use for transmitting energy via pulleys.

Rubber Bands
Along with falling weights, rubber bands are the primary source of power in foamcore mechanisms.