Characteristics

My project is a cabinet with drawer and a native timber trim and is made from untreated pinus radiata (pine), recycled rimu, and MDF (Medium Density Fibreboard). I chose different timbers for their different colours and their availability and for the different places in the cabinet. Untreated pinus radiata is inexpensive and you can get it in wide boards, and it has an attractive grain. This means that it was easier to get the width I needed for my cabinet with less joins. I used MDF for the drawer because it is very stable compared to pine but not the drawer front as I wanted an attractive face. I used recycled heart rimu for the trim colour I needed for the cabinet top and the skirting around the base. It also provides a harder edge for the cabinet top. I used Teflon for the drawer runners because it is so hard and also very slippery for the drawer to slide.

Pinus radiata is less dense than rimu with a density of less than 400 kilograms per cubic metre whereas rimu is 600 kilograms per cubic metre. Pine density doesn’t change much in density throughout the timber but rimu can. Even though they are all softwoods they are not all soft because “softwood” is only a name for a tree type. Some parts of the wood are harder or softer depending on whether they are from the heart of the tree or from the outside or from younger trees. Heart rimu is usually hard and OB rimu is much softer. Softer wood can shrink more than more dense wood so we have to think about that when we build with it. Pine is very permeable, which means it soaks up liquids easily. But my recycled timber is heart wood so it’s denser and not as permeable. That may affect how I put finishing coats on them. Also the denser timbers make much finer dust when sanding and cutting and so does the MDF. MDF also has formaldehyde resins in it which are toxic. Pine and rimu also have knots from where branches were but MDF doesn’t.

Softer woods are easier to work with but can damage easily. I had to consider the grain direction in all of the parts of my project and sometimes this affected what techniques I used. Because MDF has no grain it is better in some places because it won’t split along the grain like pine. MDF does have layers and these can be like weetbix and split apart. It also is very permeable so it can soak up liquids and if it soaks up water it will swell up. I also had to consider the thickness of the wood I used as this can affect how I worked with it or glued it. This is called the cross section and as boards get wider they should get thicker or will twist or warp more. Some of my components had routed profiles on them and this sometimes affected which techniques I used and how I carried them out.

For some machines we have to use for wood, like the band saw, we push the work piece into the blade. If there are knots in the wood or hard and soft areas of grain the wood jumps forward and can endanger our hands. We always keep our hands away from the line of the blade just in case. We should use a push stick if working with small pieces or getting close to the blade.

I followed all of the safety rules in the workshop: I wore covered shoes all the time in case something sharp fell from a bench: I kept my hair tied back and my shirt tucked in to prevent them getting snagged in a rotating machine: I wear covered shoes all the time in case something sharp fell from a bench: I kept my hair tied back and my shirt tucked in to prevent them getting snagged in a rotating machine: I know there is a safety RCD device on all of the power points in the workshop to prevent electric shock in case I accidently cut a cord; I always walk only in the workshop and I never talk to someone when they are using a machine. I make sure I put my safety goggles on when I use rotating machinery to prevent eye injury and I wear earmuffs all the time to prevent getting hearing damage from the loud noise.

Safety

The Health and Safety in Employment Act means we are all responsible for keeping safe and following the safety rules. We have to eliminate, isolate, or minimise hazards in our work. People who don’t can be prosecuted if an accident happens. When we choose a resistant material like MDF we must identify why it is dangerous and whether we can eliminate isolate or minimise the risks. We get the information from Material Safety Data Sheets. MDF dust has more fine particles so is more explosive than larger particles like pine dust so we need to have the dust extractor on where we cut and sand, and avoid any flames. That’s why we have a separate metal work room. We are not allowed to blow down work areas with compressed air as this fills the room up with a hazardous dust.

All dust can be dangerous so dust extractors were turned on whenever I was cutting or sanding. Pine dust has larger particles because it is less dense than rimu or kauri or MDF. Even though pine is not a dangerous dust, rimu and MDF dust are believed to be a cancer causing so I had to take extra precautions when I was working with those. Rimu dust and MDF dust have very fine particles and these are the most dangerous.

Marking out

Marking out on Pine is different to that of Rimu or MDF. While I use the same measuring tools, a tape, a square and a steel ruler, I found that pine was easy to indent with the pencil and leave a clear mark whereas Rimu and MDF it stayed on the surface. I had to be careful what marks I put on the pine as it was hard to sand them out. I used a marking knife across the grain for pine and for Rimu to prevent chipping but the MDF was much too hard, and because it doesn’t have grain I didn’t have to worry about it chipping. While the pine and the rimu both had one side better than the other, the MDF was exactly the same on both sides, so I didn’t have to choose. I marked the face side of the timbers with the “f” face mark.

We cannot use an ink or marker on pine, rimu or MDF as it would soak into the porous material and leave very deep marks which would prevent using clear or stain finishes. All marks have to be removed for those finishes. If it was a non porous material like a metal it would not affect the finish so much.

The pinus radiata had some knots so I was careful to make sure these ended up away from where I had to cut or machine. I didn’t have to worry about that with the MDF as it doesn’t have defects or grain. When you have a knot near the edge it can fall out or chip. Knots are also very dense so the blades and drills can go a little crooked if you are half on a knot and half on normal wood. Knots are very hard to plane as well. This also means that you get more waste from knotty timber than from MDF and I had to allow for that when I was marking out. I was able to mark out the drawer parts from any direction on the sheet of 16mm MDF because it doesn’t have grain and I
got better use of the material. Whereas the pine I had to make sure the grain was running vertically up the sides of the cabinet and sideways across the top. I also had to mark out considering the matching of grain in each piece as I didn’t want different densities when I came to putting on finish coats and showing different colours. And because it was 140mm wide I had to join three together to get the width I needed. Using narrower pieces helps to prevent the finished pieces from warping or cupping. I used a gauge and a bevel to mark out the dovetails on the drawer sides but had to go over the gauge line with aencil because it wasn’t easy to see on the MDF because it has such a hard surface.

Cutting
MDF, pine and rimu can all be cut on the band saw but changes in the density of some pine and rimu means the blade can wander as you cut. Sometimes the blade will follow a soft grain pattern and it is more difficult to be very accurate. To avoid that we can set up a guide fence and keep the wood against it as we cut. This doesn’t happen with MDF as it has no grain.

Pine and rimu often have tension in the wood that is released when we cut it. This can jam blades or change the dimensions of our work. MDF is stable and doesn’t change during cutting.

I set up a router with a 5mm router bit to cut a groove for the drawer bottom. I checked it wasn’t plugged in when I did that. Because MDF has very soft fibres I used a carbide tipped router bit. I would use the same bit for rimu but I could use a high speed steel bit for pine. I set up a guide which will run a parallel groove because the MDF is so straight from the bench saw. I had to set the groove 7mm from the edge of the MDF. If it was pine it could be closer but MDF breaks away because of the layered fibres. I also did another groove for the drawer runners to slide on. These were 8mm deep. I made sure I wore a dust mask as formaldehyde resins can harm our lungs. I wouldn’t wear one using pine but I would with rimu dust as that can cause cancer.

I cut 3 dovetails on both sides of my MDF drawer using a tenon saw and a bevel edge chisel. I used a mallet and the chisel to pare any excess down to the line. The MDF is easy to pare across the layers but you have to be careful not to break away the back fibre layers when the chisel comes out the other side.

To cut the female to the dovetails I traced each set and cut down with a tenon saw. To chisel them out I had to cramp them to the bench and chisel down half way, turn over and chisel from the other side. Otherwise it would have split away the layers. When chiselling pine or rimu you have to cut across the grain first then chisel out along the grain. MDF tends to flake as you chisel down.

To cut the Teflon drawer runners I used the band saw and sanded down the edges. Even though Teflon is hard it still cuts very easily on normal tools. It feels like cutting cheese.

For the trim around three sides of the cabinet top I had to first use the router to profile a length of rimu, then I used a mitre saw to cut the mitres. The splintery grain and the delicate shape of the profile on the rimu meant that I had to always mitre from the face side and only put downwards pressure on the forward stroke. If I did that drawing back it chips away the delicate shape of the wood right on the end and makes it untidy. Ordinary square shapes are not as fragile.

Joining
Gluing techniques
MDF has layered fibres which are compressed very hard but can flake away like weetbix. The glue soaks in very quickly to the ends because the fibres are open. Pine also soaks in quickly to the end grain, because it has a loose grain, but the heart rimu I used had very tight grain, so the ends weren’t as porous. This means for gluing that I had to put more glue on where the MDF joined to the end as it soaked in very quickly which moves the glue away from the two surfaces. This is important as I wanted enough glue for strength but not so much that it squirted everywhere and left ugly glue stains. Harder woods can be joined with thinner glue, which is less viscous.

Mechanical fixing techniques
The layers in a compressed sheet board like MDF just split apart when we try to put a nail or screw into the end. Also nails and screws do not hold as well into the end of MDF as they do into grain of pine or rimu. But screws from the face side of MDF are very strong as they grab across the layers. A hinge screwed across grain of pine will be strong but not into the edge of MDF. But a hinge screwed into the face of MDF will be as strong as or stronger than into pine.

Nails into MDF just make a hole in the fibres and the nail can slide back out, where as in pine and rimu the fibres are pushed apart and they spring back jamming the nail.

For nailing I used thinner panel pins of 25mm x 1.2mm when I pinned the MDF dovetails together. The nails are really just to keep pressure on the glue and force it to penetrate into the wood. For nailing the softer pine I didn’t have to worry about splitting, but with the heart rimu I even had to put a small pilot hole especially if the nail was near the edge.

Because of the permeability of pine, the equilibrium moisture content can change and the wood can shrink or expand. Usually it shrinks as we live in warm dry houses. The top of a cabinet should be fixed down from underneath with screws that have an oversized clearance hole to allow for shrinkage. That stops it distorting the cabinet. Recycled rimu is less likely to do as it is older, denser and more stable. MDF is called dimensionally stable so it won’t shrink, but it may warp if it gets too dry or damp on one side or the other.

Finishing
Timber has grain that has to be considered when we are sanding. Dressing grade untreated pine has marks on the surface, and other construction marks that have to be sanded out. MDF comes with a very smooth face so the face is best just fine sanded. To sand the pine and the rimu I used 100 grit belts on the belt sander but had to be careful to move in long oval patterns to avoid cutting gouges into the very soft parts of the wood. The rimu was much harder and I also wore a dust mask when I was sanding that. I did most of the sanding before I assembled the parts.

When it came to sanding the cabinet top, I had to sand the whole top first, and then go back along the grain of the rimu edging the different hardness’s made it easy to dig too deep into the pine. I used the orbital finishing sander because it has small rings and you can’t see them across the grain lines.

The grain in pine can change density which changes the permeability so stains and other finishing coats can show different colours on the same piece of wood. As well the permeability of pine and rimu means the stain dries very quickly and makes it hard to keep a wet edge. For pine and rimu you have to be careful to keep the edge of the stain wet across the whole piece being stained and not let it dry. This would coat two parts. Grain lines mean that you put the stain on with a cloth in long strokes so the lines match the grain. We don’t do that with MDF as it has no grain. Also on the end grain where the end of the fibres shows they are very absorbent. A special thicker mix of stain slows the absorption, or you can use a gel stain that is already more viscous. Or you can put on a conditioner to partly seal the end grain. Finishing techniques for metals are usually solid colours and there is no grain to worry about. To prevent pine and rimu from warping a sealer coat has to be put on the inside surfaces too.