

MATERIALS TESTING AND TEMPLATES

V.Ryan © 2000 - 2016

On behalf of The World Association of Technology Teachers

W.A.T.T.



World Association of Technology Teachers

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NAME: _____

MATERIALS TESTING AND RESEARCH

You are to carry out tests on the materials listed below. Record and describe your findings in each section of the table.
Photograph your work at the end of the lesson.

HELPFUL LINK - http://www.technologystudent.com/despro_fish/matsres1.html

ALUMINIUM

STEEL

PLYWOOD

OAK

<p>How well does the material cut and shape with a fretsaw?</p>		<p>NOT SUITABLE</p>		
<p>How easy is the material to cut with a coping saw?</p>	<p>NOT SUITABLE</p>	<p>NOT SUITABLE</p>		
<p>How easy is the material to drill and countersink?</p>				
<p>What happens to the surface of the material when it is centre punched? How much damage?</p>				
<p>How does the edge of each piece of material finish/smooth with a file?</p>				
<p>How does the edge of each piece of material finish/smooth with glasspaper or wet and dry paper?</p>				

NAME: _____

MATERIALS TESTING AND RESEARCH

SHEET 2

You are to carry out tests on the materials listed below. Record and describe your findings in each section of the table.

Photograph your work at the end of the lesson.

HELPFUL LINK - http://www.technologystudent.com/despro_flash/matsres1.html

PINE

MDF

PERSPEX

HIPS

How well does the material cut and shape with a fretsaw?				
How easy is the material to cut with a coping saw?				
How easy is the material to drill and countersink?				
What happens to the surface of the material when it is centre punched? How much damage?				
How does the edge of each piece of material finish/smooth with a file?				
How does the edge of each piece of material finish/smooth with glasspaper or wet and dry paper?				

NAME: _____

MATERIALS TESTING AND RESEARCH**SHEET 1**

You are to carry out tests on the materials listed below. Record and describe your findings in each section of the table.

Photograph your work at the end of the lesson.

HELPFUL LINK - http://www.technologystudent.com/despro_flash/matsres1.html

	ALUMINIUM	STEEL	PLYWOOD	OAK
How well does the material cut and shape with a fretsaw?	<i>Aluminium can only be cut on a fretsaw with a special expensive blade</i> NOT SUITABLE	NOT SUITABLE	<i>Plywood is a little resistant to cutting and shaping, it is a harder material than 'natural woods'.</i> MODERATE DIFFICULTY	<i>Oak cuts quite easily. More difficult than pine and especially MDF. The grain makes accuracy difficult.</i> MODERATE EASE
How easy is the material to cut with a coping saw?	NOT SUITABLE	NOT SUITABLE	<i>Plywood is more difficult than expected to cut by coping saw. Plywood is quite a resistant material.</i> MODERATE DIFFICULTY	<i>Oak can be cut and shaped by a coping saw, although the grain can make cutting accurately difficult.</i> MODERATE DIFFICULTY
How easy is the material to drill and countersink?	<i>Centre punch first and aluminium can be drilled easily. Use a hand vice. Avoid touching swarf.</i> WITH EASE - CARE TAKEN	<i>Centre punch first and drill very slowly. Do not touch swarf as it is very sharp. Use a hand vice / machine drill</i> MODERATE DIFFICULTY	<i>Can be drilled and countersunk easily. Clamped in a vice or with a G clamp.</i> WITH EASE	<i>Can be drilled and countersunk easily. Clamped in a vice or with a G clamp.</i> WITH EASE
What happens to the surface of the material when it is centre punched? How much damage?	<i>Quite a soft metal. Easy to indent. Could be damaged easily if something is dropped on to its surface.</i> EASY TO INDENT	<i>A hard metal. Requires more force to indent compared to aluminium. Will resist indents to its surface.</i> FORCE REQUIRED	<i>Very easy to indent. Little force required. Surface can be damaged easily.</i> WITH EASE	<i>Very easy to indent. Little force required. Surface can be damaged easily.</i> WITH EASE
How does the edge of each piece of material finish/smooth with a file?	<i>Files quite easily as it is a soft metal. Produces quite a smooth finish.</i> EASY TO FILE	<i>A hard metal. Files quite well but takes longer than aluminium. produces reasonable finish.</i> FORCE REQUIRED	<i>Very easy to file but tends to splinter when filing across the edge.</i> WITH EASE - CARE NEEDED	<i>Files easily and produces quite a good finish. Can splinter when filed across the edge.</i> WITH EASE
How does the edge of each piece of material finish/smooth with glasspaper or wet and dry paper?	<i>Good finish achieved with wet and dry paper. Smooth.</i> VERY GOOD FINISH	<i>A hard metal. Smooth finish achieved with wet and dry paper, but requires more time than aluminium</i> GOOD FINISH	<i>Glasspapers well. Sooth finish achieved after short time.</i> GOOD FINISH	<i>Very good finish achieved with glasspaper. Grain displays well giving good natural finish.</i> VERY GOOD FINISH

NAME: _____

MATERIALS TESTING AND RESEARCH**SHEET 2**

You are to carry out tests on the materials listed below. Record and describe your findings in each section of the table.

Photograph your work at the end of the lesson.

HELPFUL LINK - http://www.technologystudent.com/despro_flash/matsres1.html**PINE****MDF****PERSPEX****HIPS**

How well does the material cut and shape with a fretsaw?	<i>Pine cuts quite easily but the grain sometimes makes cutting exactly to the line a little inaccurate. MODERATE DIFFICULTY</i>	<i>MDF cuts and shapes really easily. It can be cut accurately and to the line WITH EASE</i>	<i>Perspex is a little resistant to cutting and shaping because it is a harder material than 'woods'. MODERATE DIFFICULTY</i>	<i>HIPs is only 1mm thick and cuts very easily. I had to cut really slowly because the material is quite soft. WITH EASE</i>
How easy is the material to cut with a coping saw?	<i>Quite easily but the grain made it difficult to keep to the line. Requires practice for accuracy DIFFICULTY</i>	<i>MDF cuts and shapes relatively easily. It can be cut accurately and to the line if care is taken. QUITE EASY</i>	<i>Perspex is very difficult to cut with a coping saw and masking tape must be applied to the surface'. VERY DIFFICULTY</i>	<i>Even more difficult to cut than perspex because it is so thin. even when in a vice it flexible. VERY DIFFICULT</i>
How easy is the material to drill and countersink?	<i>Pine drilled easily and countersinking was the same WITH EASE</i>	<i>MDF was even easier to drill and countersink as pine. An ideal materials for these techniques. VERY EASY</i>	<i>Perspex is easy to drill but masking tape must be used to protect against shattering. Consequently, takes longer. MODERATE EASE</i>	<i>Care must be taken because HIPs is so thin. Masking tape is also applied to the surface. CARE REQUIRED</i>
What happens to the surface of the material when it is centre punched? How much damage?	<i>Pine can be indented easily. The surface can be damaged if something is dropped on to it. EASILY DAMAGED</i>	<i>MDF takes a little more force before it is indented. The surface can be damaged quite easily. QUITE EASILY DAMAGED</i>	<i>Perspex must be centre punched before drilling. More resistant than 'woods' to damage. MODERATE EASE</i>	<i>HIPs must be centre punched before drilling. Same as perspex. Difficult because it is so thin. CARE REQUIRED</i>
How does the edge of each piece of material finish/smooth with a file?	<i>The edge finishes quite well. Care must taken filing across the edge, as it can split. QUITE SMOOTH</i>	<i>MDF files easily along the edge but tends to split easily when filing across. QUITE SMOOTH</i>	<i>Perspex files well with 'through' filing and 'draw' filing. Quite smooth SMOOTH</i>	<i>HIPs files well but it is difficult at times because it is so thin. SMOOTH</i>
How does the edge of each piece of material finish/smooth with glasspaper or wet and dry paper?	<i>Very good finish achieved with glasspaper. Easy to smooth. Grain shows through well. VERY GOOD FINISH</i>	<i>Smooth finish achieved with glasspaper. Easy to smooth. No natural texture to finish. GOOD FINISH</i>	<i>Perspex produces a semi polished finish with wet and dry paper. VERY GOOD FINISH</i>	<i>Good smooth finish but it is difficult at times because it is so thin and flexes in the vice. VERY GOOD FINISH</i>

NAME: _____

HELPFUL LINK - http://www.technologystudent.com/despro_f1sh/matsres1.html

ALUMINIUM

STEEL

PLYWOOD

OAK

PINE

MDF

PERSPEX

HIPS

NAME: _____

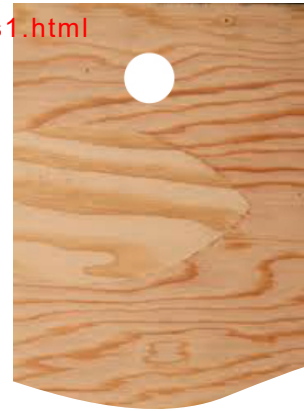
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ALUMINIUM



STEEL



PLYWOOD



OAK



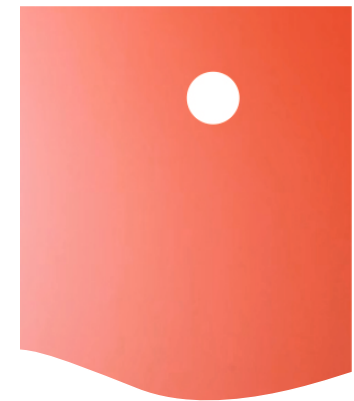
PINE



MDF



PERSPEX



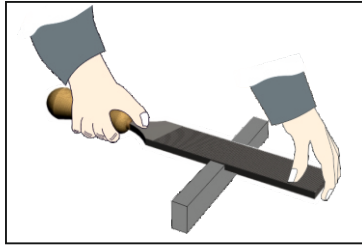
HIPS

NAME:

MATERIALS TESTING - SUMMARY SHEET

SHEET

FILING TEST



The steel was the hardest to file and required a lot of effort. The finish was relatively smooth although teeth marks could be seen.

The pine filed easily, although it did not produce a good finish.

The aluminium filed easily as well. The finish was quite good. Teeth marks could be seen.

The perspex filed easily and the finish was reasonably smooth.

CENTRE PUNCH TEST - SUMMARY

MATERIAL	RESULT	DESCRIPTION
PERSPEX	FAIR	MEDIUM SURFACE DAMAGE
PINE	FAIR	DEEP INDENT MINIMUM SURFACE DAMAGE
ALUMINIUM	GOOD	MINIMUM SURFACE DAMAGE
STEEL	GOOD	MINIMUM SURFACE DAMAGE

All these materials are suitable for my product, as they will resist knocks and drops sufficiently.



I carried out hardness tests on the range of materials, using a centre punch and an engineers hammer.

I started apply the same weight of blow to the hammer for each material, then slowly increased the weight/force on harder materials.

In order of hardness - steel, aluminium, perspex and pine.

[HELPFUL LINK - http://www.technologystudent.com/despro_fish/matsres1.html](http://www.technologystudent.com/despro_fish/matsres1.html)

DRILLING TEST

I drilled each sample with a 4mm bit, using a bench drill.

The most difficult to drill was the steel, as it created sharp swarf.

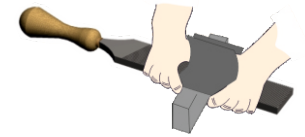
The perspex had to be protected with masking tape, in case it shattered. It drilled relatively easily, but care was still required.

The pine drilled easily but the MDF created dust. this would be a health hazard on a factory production line.



MATERIAL	RESULT	DESCRIPTION
PERSPEX	MODERATE	TENDENCY TO SPLIT, IF MASKING TAPE NOT USED
PINE	EASY	EASY TO DRILL, DUST/CHIPPINGS CREATED
ALUMINIUM	MODERATE	SOFT METAL, EASY TO DRILL WITH CARE
STEEL	DIFFICULT	DIFFICULT TO DRILL, CREATES SHARP SWARF

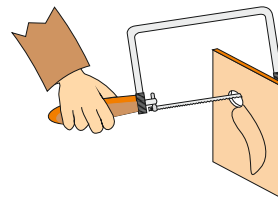
SMOOTHING / FINISH TEST



I used wet and dry paper / glass paper to finish a side of each sample. All produced a good finish, smooth to the touch. The hardest material to smooth was steel, because it took longer than the other materials. Steel will rust if the surface is not protected with paint or lacquer.

Any of these materials will give the finish I need for my project. Some may need a protective finish to prevent corrosion.

COPING SAW AND FRETSAW TEST - SUMMARY



The natural woods were more difficult to cut and shape with a coping saw, than the manmade boards. The grain of the natural woods, made it difficult for me to keep to the line.

When using the fretsaw, all the materials were easier to cut and shape, although again the manmade boards were the easiest. They cut smoothly and it was easy to keep accurately to the line.

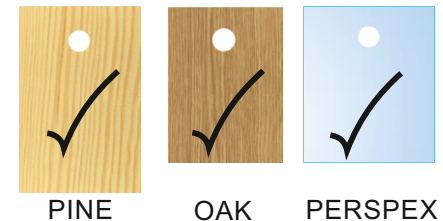
OVERALL SUMMARY OF MATERIALS TESTING

All these materials could be used during the manufacture of my product.

I am more likely to use natural woods as they can be cut and shape quite easily. They are sustainable and can be reused or recycled.

Some of the components, such as screws, are manufactured from steel. they will be strong enough to hold my project together, until the end of its life cycle.

As a result of my tests, the materials I am most likely to use are pine or oak and perspex.



PINE

OAK

PERSPEX

MATERIALS TESTING

Materials testing is a very important aspect of research. When designing a product, an understanding of the properties of materials will help determine if a material is suitable for the manufacture of a product, including any product you are designing.

At some point, there will be a need to test materials yourself, or you may need to rely on the data produced by researchers.

Below are a range of simple material tests, that can be carried out in a school workshop.

	PLYWOOD	OAK	
ADD A DESCRIPTION IN YOUR OWN	<p><i>Plywood is a little resistant to cutting and shaping, it is a harder material than 'natural woods'.</i></p> <p>MODERATE DIFFICULTY</p>	<p><i>Oak cuts quite easily. More difficult than pine and especially MDF. The grain makes accuracy difficult.</i></p> <p>MODERATE EASE</p>	COMPARE AGAINST OTHER
	<p><i>Plywood is more difficult than expected to cut by coping saw. Plywood is quite a resistant material.</i></p> <p>MODERATE DIFFICULTY</p>	<p><i>Oak can be cut and shaped by a coping saw, although the grain can make cutting accurately difficult.</i></p> <p>MODERATE DIFFICULTY</p>	INCLUDE A KEY WORD / PHRASE AT THE BOTTOM OF EACH SECTION - VERY EASY, QUITE EASY, MODERATE DIFFICULT ETC....

NAME: _____

			
ALUMINIUM	STEEL	PLYWOOD	OAK
			
PINE	MDF	PERSPEX	HIPS