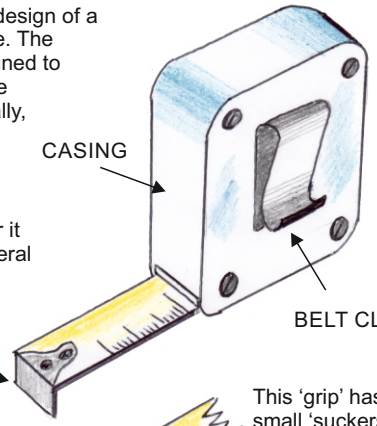
NAME:

PRODUCT DEVELOPMENT

SHEET 1

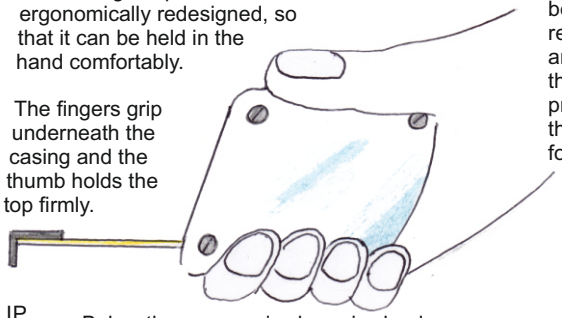
PRESSED STEEL CASING

This is a standard design of a basic tape measure. The clip has been designed to grip a belt. The tape rewinds automatically, but in this case too quickly (health and safety issue).
The tape tends to develop faults, after it has been used several times.



The casing shape has been ergonomically redesigned, so that it can be held in the hand comfortably.

The fingers grip underneath the casing and the thumb holds the top firmly.



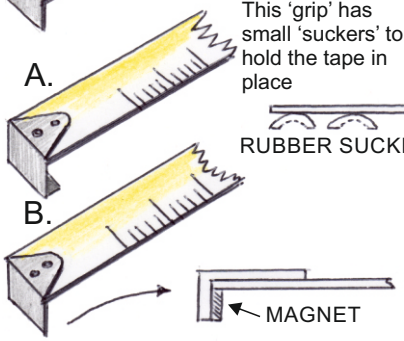
Below the ergonomic shape is clearly seen. The top and underneath have a rubber layer, to make the tape more comfortable to hold. In addition, it provides improved protection against knocks and drops

Ergonomic design, for comfort and ease of use

These are alternative tape measure 'ends'.

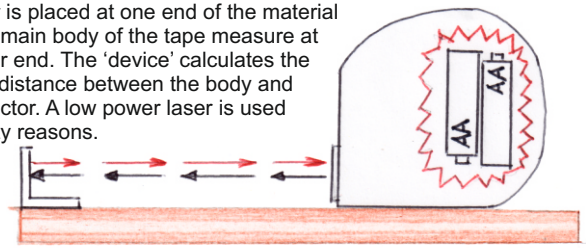
A has a small 'lip' that grips the underneath of the materials being measured.

B has a magnetic end that attaches firmly to steel.



This 'grip' has small 'suckers' to hold the tape in place

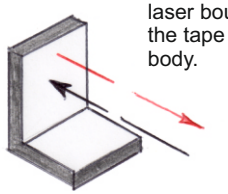
This is a 'radical' developed design, with the steel tape being replaced by a distance sensor. A small reflector is placed at one end of the material and the main body of the tape measure at the other end. The 'device' calculates the precise distance between the body and the reflector. A low power laser is used for safety reasons.



The distance is digitally displayed in a small LCD screen.

A back light allows use in dark spaces or poor light conditions.

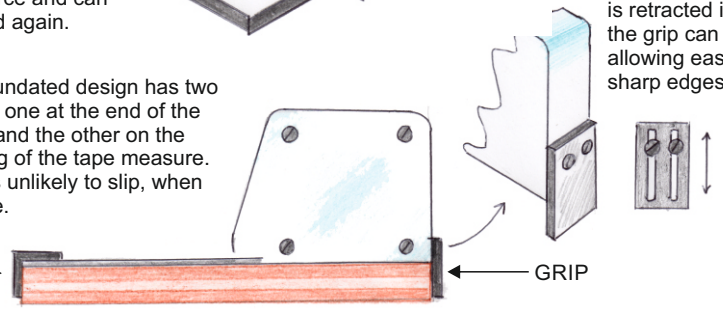
Symbol applied to all these designs. All materials from a recycled source and can be recycled again.



Reflector showing laser bouncing back to the tape measure body.

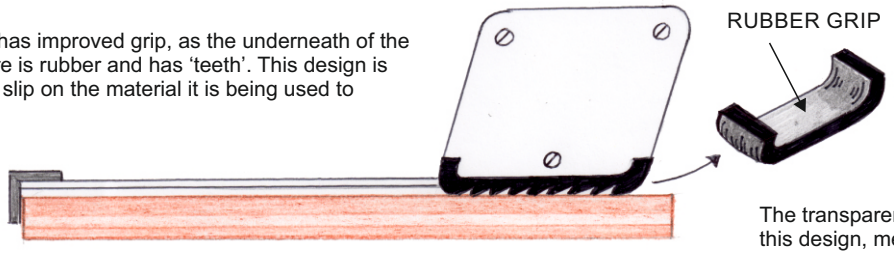
LIFE CYCLE
All designs have a life cycle - a guaranteed for five years.

This undated design has two grips, one at the end of the tape and the other on the casing of the tape measure. this is unlikely to slip, when in use.

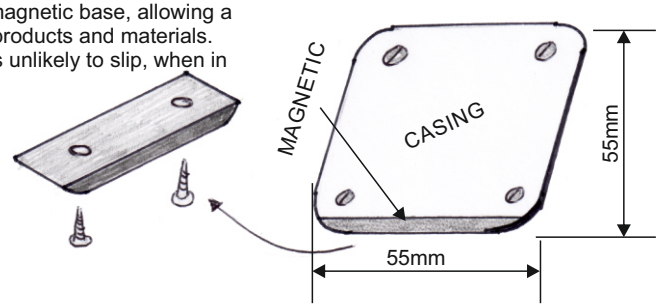


The grip on the casing slides up and down. Once the tape is retracted into the casing, the grip can also be retracted, allowing easier storage. No sharp edges visible.

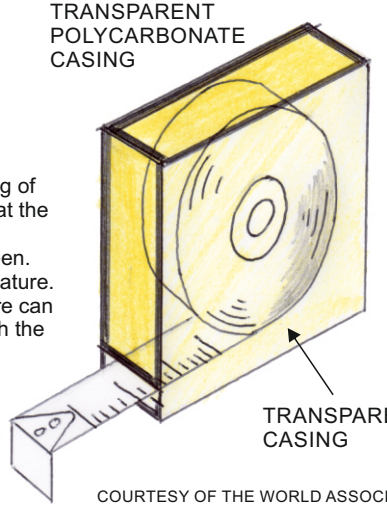
This design has improved grip, as the underneath of the tape measure is rubber and has 'teeth'. This design is less likely to slip on the material it is being used to measure.



This design has a magnetic base, allowing a secure fix to steel products and materials. This means that it is unlikely to slip, when in use on steel.

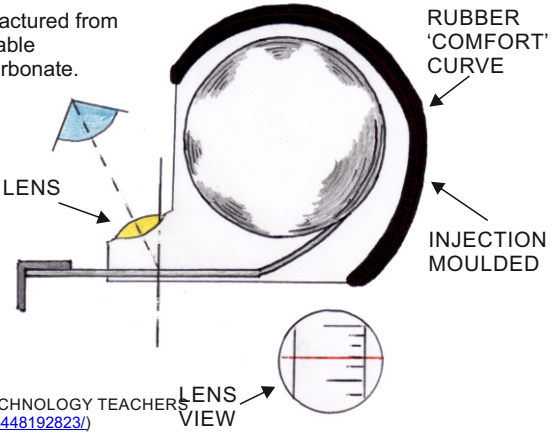


The transparent casing of this design, means that the internal workings / mechanism can be seen. This is an aesthetic feature. Also, the tape measure can be read easily, through the casing.



The transparent body has been developed a little further. It is a more ergonomic design. The body has a built in lens, which magnifies the scale, allowing easy reading of the measurement.

Manufactured from recyclable polycarbonate.



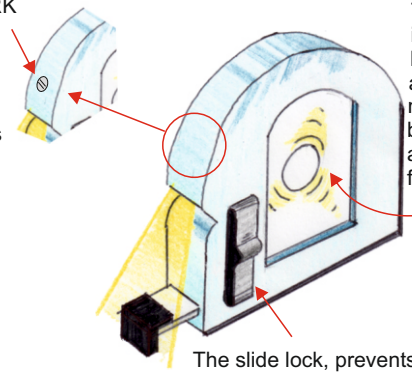
NAME:

PRODUCT DEVELOPMENT

SHEET 2

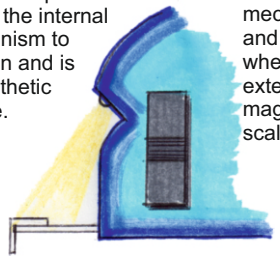
LIGHT/DARK SENSOR

This is a refined design. An LED light illuminates the scale on the tape. As the tape is 'extended' the light is automatically turned on. Alternatively, a light / dark sensor, incorporated in the casing, turns the LED light on, when the light level drops.



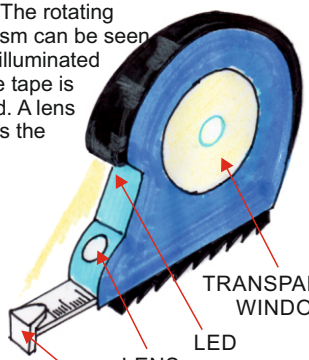
The slide lock, prevents the tape from winding back into the casing.

The clear side panel is illuminated, when the main LED is in operation. This allows the internal mechanism to be seen and is an aesthetic feature.

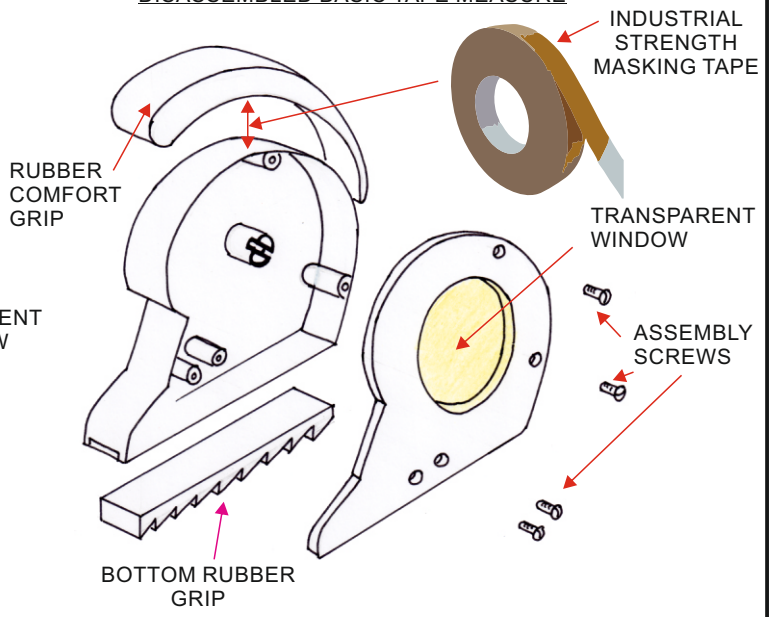


The product can be manufactured in a range of colours. Blue seen above.

This design includes a colourful casing and a circular transparent HIPs window. The rotating mechanism can be seen and it is illuminated when the tape is extended. A lens magnifies the scale.



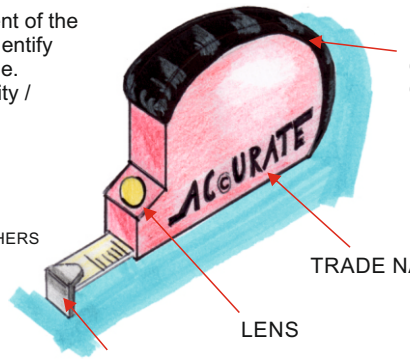
DISASSEMBLED BASIC TAPE MEASURE



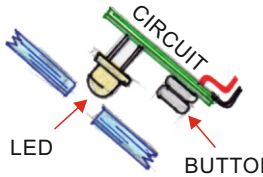
The drawing above, shows the disassembled casing. The two sides are held together by small M4 countersunk screws. This allows for repairs to be carried out and for the coin batteries to be replaced.
Industrial strength double sided tape, permanently holds the rubber bottom grip and the rubber comfort curve, to the casing.

Accurate
Accurate
ACCURATE
ACCURATE

These are an early development of the writing style. This will clearly identify the manufacturer or trade name. The style must reflect the quality / high standard of manufacture.

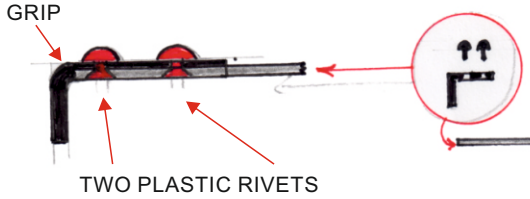


COURTESY OF THE WORLD ASSOCIATION OF TECHNOLOGY TEACHERS
(https://www.facebook.com/groups/254963448192823/)

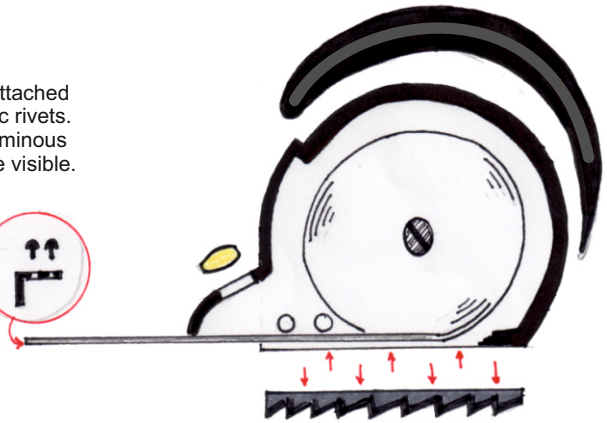


An ultra bright LED will provide enough light to illuminate the scale. The circuit will be powered by two 1.5v button / coin batteries. The batteries will be replaceable.

The grip at the end of the tape, could be attached permanently to the tape by colourful plastic rivets. these will be an attractive feature. Even luminous rivets could be used, making the grip more visible.



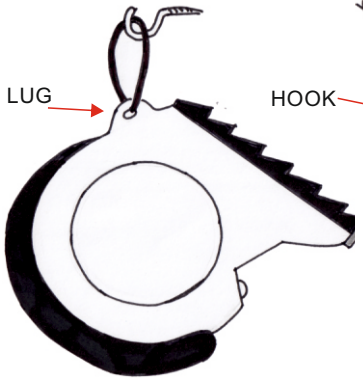
Steel, aluminium and even copper rivets could be used to secure the grip to the tape.



The rubber grip is attached to the base of the tape measure, with either glue or industrial standard, double sided tape. It prevents the casing slipping, when the measure is in use.

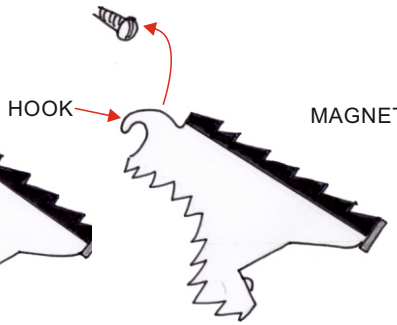
STORAGE HOOKS

A



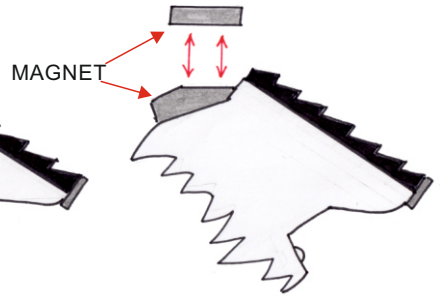
The casing has an additional 'lug', which has been drilled. A small loop of leather / textile material can be used to hold the tape measure, from a standard hook.

B



A hook has been formed, as part of the casing. The hook has been positioned so that the tape measures centre of gravity, allows it to hang securely.

C



A small magnet on the casing, allows the tape measure to be held securely underneath any steel workshop shelf.

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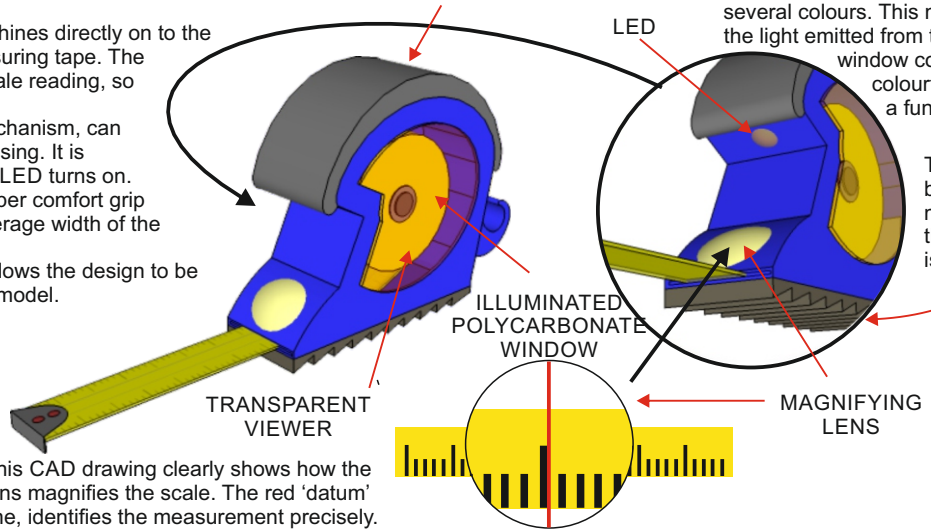
PRODUCT DEVELOPMENT

SHEET 3

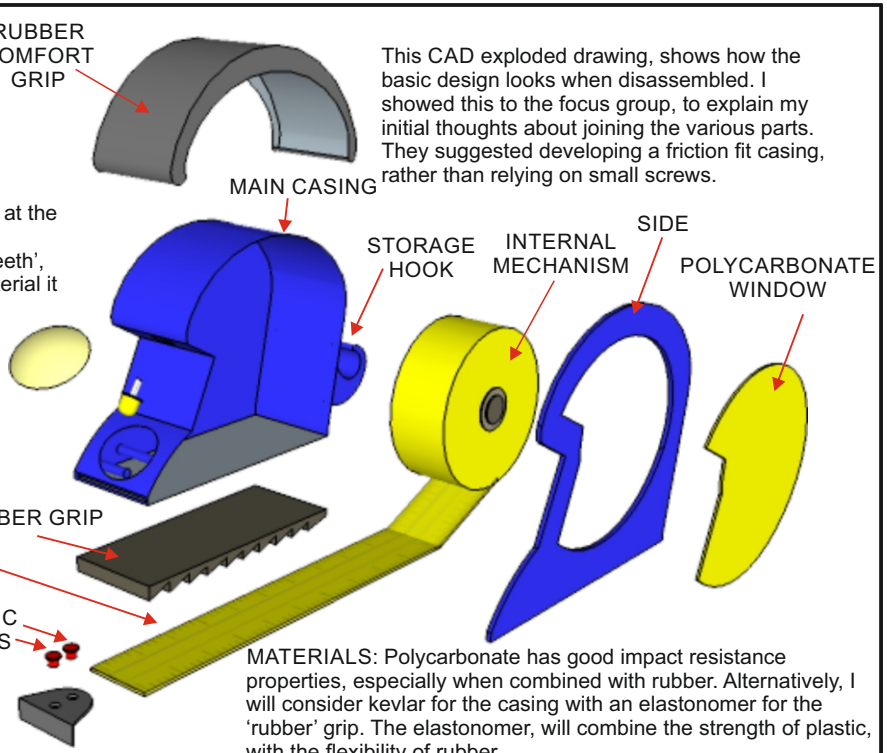
An ultra bright LED shines directly on to the scale portion of measuring tape. The lens, enlarges the scale reading, so that it is easy to read.
The rotating tape mechanism, can be seen inside the casing. It is illuminated when the LED turns on.
The extent of the rubber comfort grip can be seen, the average width of the palm of the hand.
The CAD drawing, allows the design to be viewed as a realistic model.



The LED light could be one of several colours. This means that the light emitted from the clear window could be colourful, as well a functional.

The rubber grip, at the base of the tape measure, has 'teeth', that grip the material it is placed on.

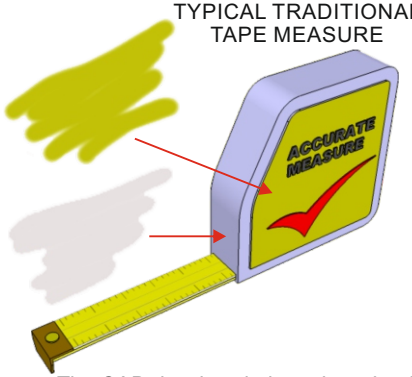
This CAD drawing clearly shows how the lens magnifies the scale. The red 'datum' line, identifies the measurement precisely.



This CAD exploded drawing, shows how the basic design looks when disassembled. I showed this to the focus group, to explain my initial thoughts about joining the various parts. They suggested developing a friction fit casing, rather than relying on small screws.

MATERIALS: Polycarbonate has good impact resistance properties, especially when combined with rubber. Alternatively, I will consider kevlar for the casing with an elastonomer for the 'rubber' grip. The elastonomer, will combine the strength of plastic, with the flexibility of rubber.

TYPICAL TRADITIONAL TAPE MEASURE



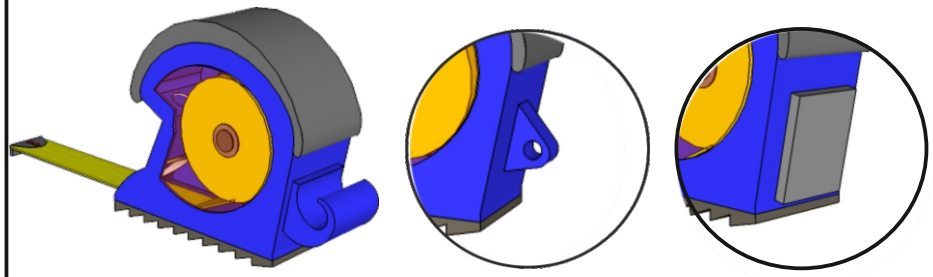
The casing could be manufactured in a range of colours. Four fashionable samples are seen opposite. My design will not be traditional, but will reflected the fact that many tape measures are bought and used by people to carry out DIY at home. The design uses popular colours, not only more traditional colours, used in industry.

SAMPLE FASHIONABLE COLOURS

Vacuum forming the casings for the tape measure, seems a good manufacturing option at this stage. It will certainly work well for the prototypes and models. Both the main casing and the side, could be designed to fit tightly together, forming a friction fit. This would avoid the need for small screws.

My Focus Group, discussed the first design and viewed the CAD model. They quite liked it, especially the ergonomics and the comfortable handling. They suggested that I should develop the circuit, battery replacement, make real models and consider how the parts will be manufactured.

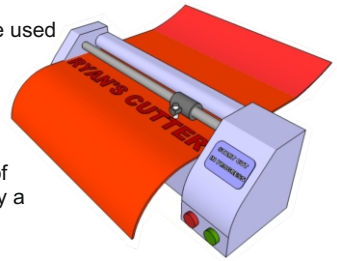
The CAD drawings below, show the different types of storage 'hooks' I am considering. My favourite is the magnet, because of its simplicity and because it will secure the tape to a steel shelf, piece of steel equipment or steel tool box.



IT COULD BE BETTER

A vinyl cutter could be used to manufacture the lettering / logo for the tape measure.

Alternatively, I will consider some form of engraving, possibly by a laser cutter.



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PRODUCT DEVELOPMENT

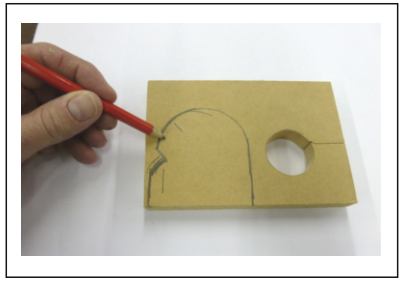
I made a series of basic models, from MDF and High Density Polystyrene. This allowed me to experiment with the initial shape. I changed the shape of idea 1 slightly as a result of cutting the material. See below, compared to the original sketch

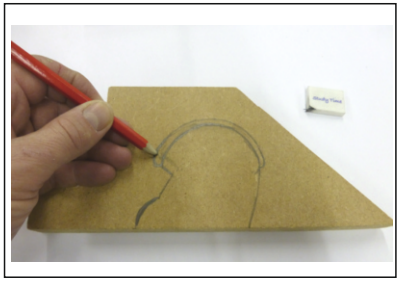
I also changed the proportions of each part of idea 2, when I started to draw the basic design on to the MDF.
I made the idea slightly higher, to accommodate the rubber hand grip. This gave the tape measure a more balanced look.

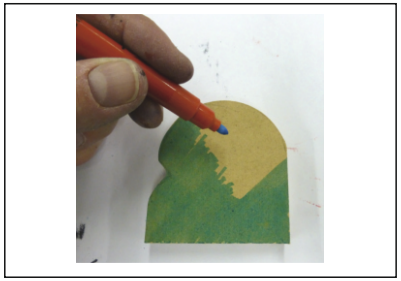
Applying colour and shade to each of the MDF models, allowed me to judge how the colour scheme enhanced to model and how it may look on the full sized product. Brighter, less traditional colours were more appealing.

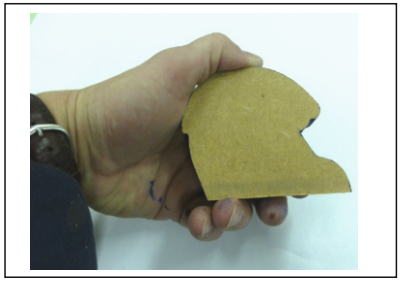
The basic models helped me refine the 'ergonomics'. I handled the models and tried them out, in the normal tape measure holding position.
The first idea was less comfortable than the 'rubber gripped' second idea.

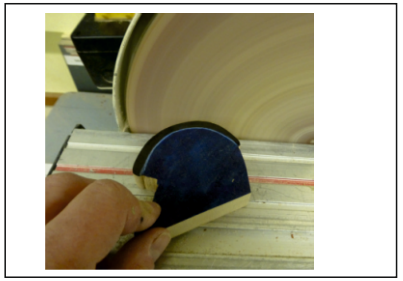
Using the sanding disk, I was able to experiment with the shape of the 'grip', until it felt comfortable. I tried filing by hand, to produce individual finger grips. This added to the time of manufacture and did not feel any more comfortable.

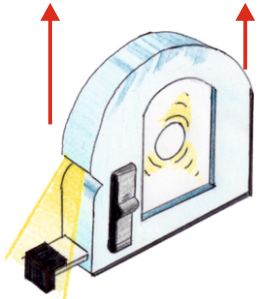




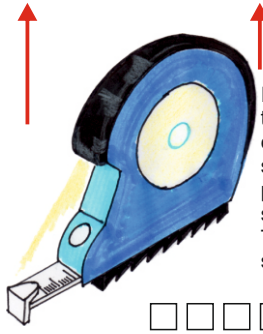




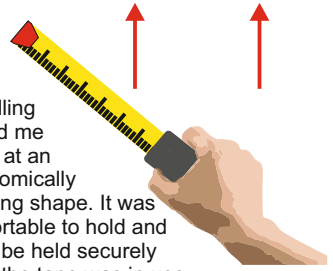




The shape arrived at through modelling, is taller, as the model was more aesthetically pleasing, when altered.

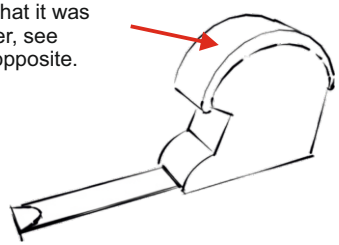


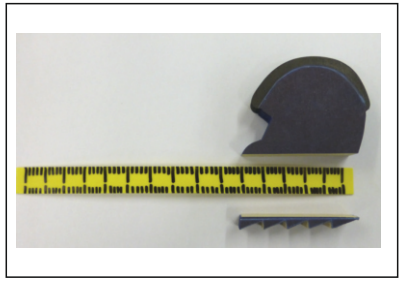
I was able to test each of the colours suggested on previous design sheets.
They are all suitable.

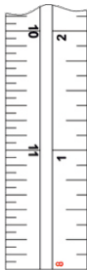


Modelling helped me arrive at an ergonomically pleasing shape. It was comfortable to hold and could be held securely when the tape was in use.

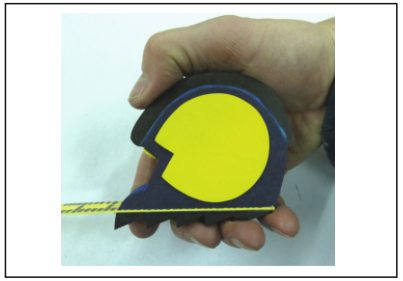
I altered the rubber grip so that it was smoother, see sketch opposite.



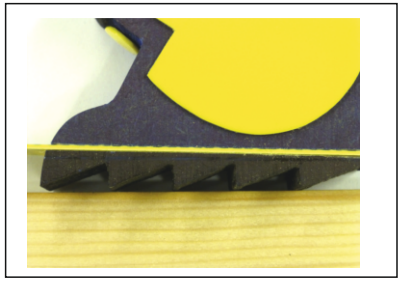




Drawing the scale on to the polystyrene modelling material, made me consider the type of scale that should be used. It is possible to manufacture the tape, so that there are alternative scales (CM, mm, imperial etc...) The customer could choose which scale suited him/her.

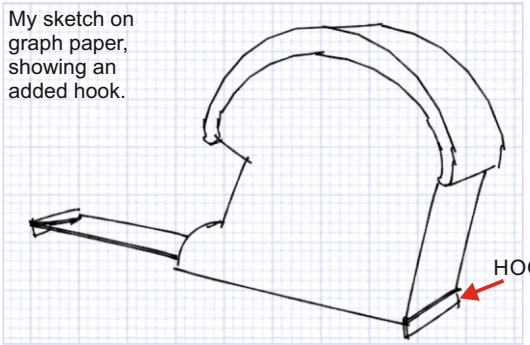


A potential customer tested the completed model. He like the potential for a soft grip and the holding position. However, he felt the bottom grip may not be completely effective, when the tape measure is in use.



The rubber grip at the bottom of the casing looks good, but when tested it tended to slip. This was due to the tape measure being lightweight.
An alteration is sketched opposite.

My sketch on graph paper, showing an added hook.



A potential solution is to add a 'hook' to the bottom of the tape measure casing. This could be used to hook on to the opposite end of the material being measured. The combination of the rubber grip and hook, may ensure the tape measure does not slip when being used.

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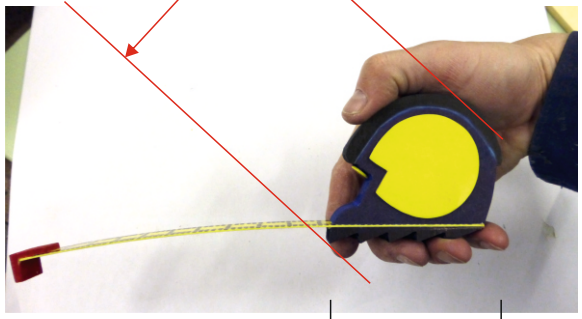
NAME:

PRODUCT DEVELOPMENT

SHEET 5

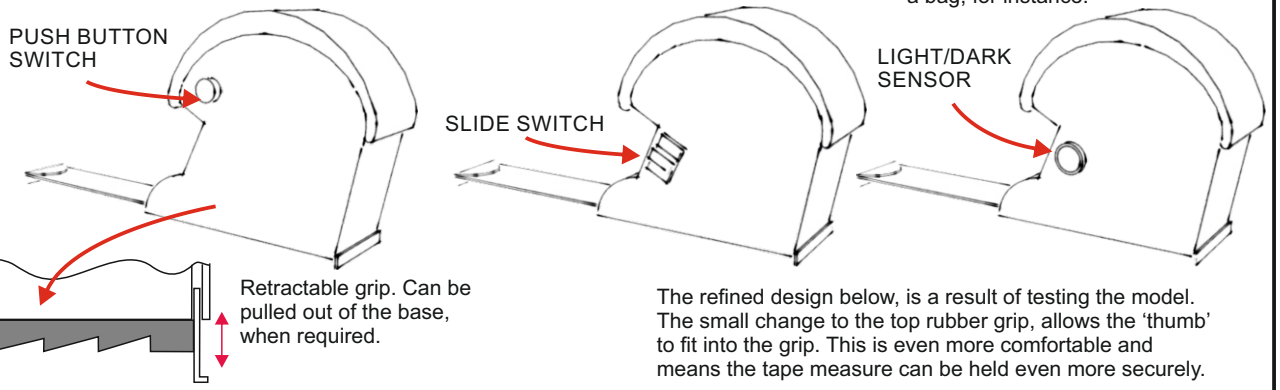
The model tape measure seen in the photograph below gave positive results. The casing felt comfortable in the hand. The rubber top and bottom grips feel comfortable due to the shape.
The position of a sensor or a mechanical switch, to turn on the LED light, will need to be considered. The ergonomic design will need to ensure that the 'switch' can be reached and operated easily.



The tape measure has been modified to include a push button switch. This can be activated easily, by one finger. Easy and simple switching on and off of the LED is the result.
A possible problem, is that the switch could be pressed by accident, far too easily.

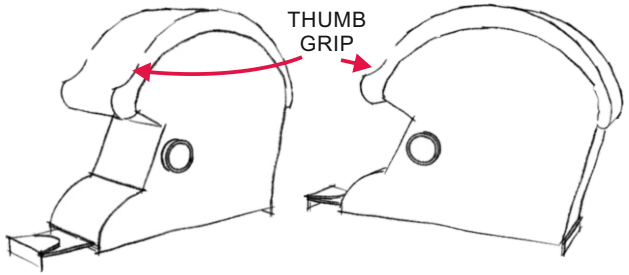
A slide switch requires a positive on and off. This type of switch is likely to be activated by accident.

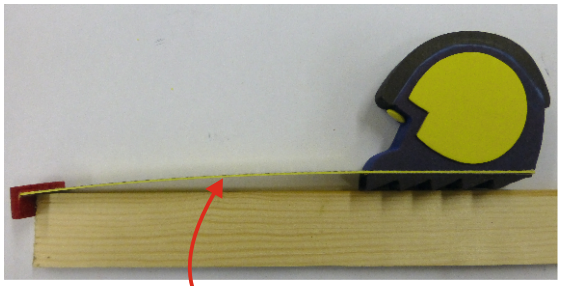
A light / dark sensor could automatically turn on the LED, when illumination is required. However, a 'master' switch will be needed, as the LED will come on when the tape measure is placed in a bag, for instance.



Retractable grip. Can be pulled out of the base, when required.

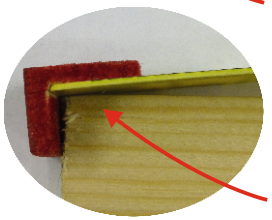
The refined design below, is a result of testing the model. The small change to the top rubber grip, allows the 'thumb' to fit into the grip. This is even more comfortable and means the tape measure can be held even more securely.

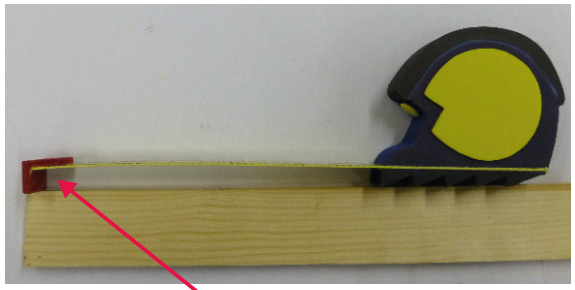




Testing the model highlighted a problem. The tape dis not flat on the surface of the material being measured. It is slightly raised, making the measurement inaccurate.

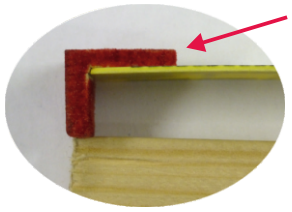
The grip at the end of the tape does its job and allows the tape to be pulled out of the tape measure casing.



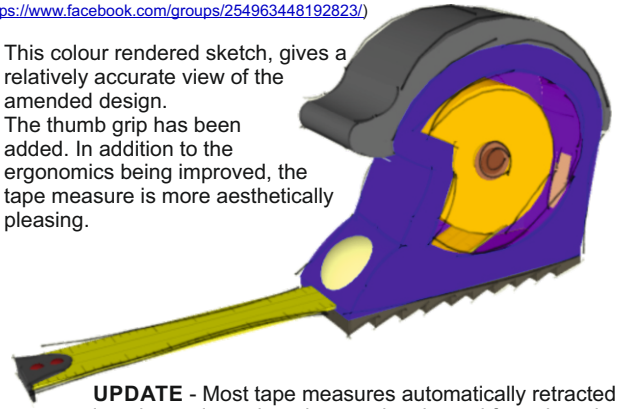


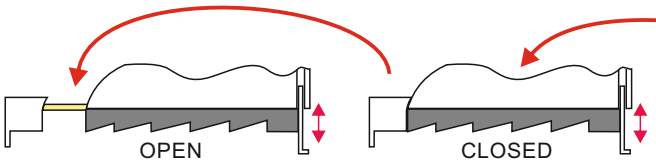
The 'tape' was level, when the end grip 'sat' on top of the material, rather than gripping.

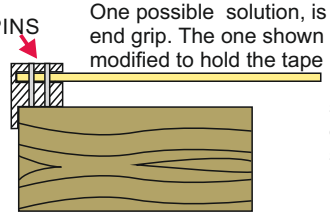
Developing an new type of end grip, that securely sits on top of the material, may be the solution.



This colour rendered sketch, gives a relatively accurate view of the amended design.
The thumb grip has been added. In addition to the ergonomics being improved, the tape measure is more aesthetically pleasing.





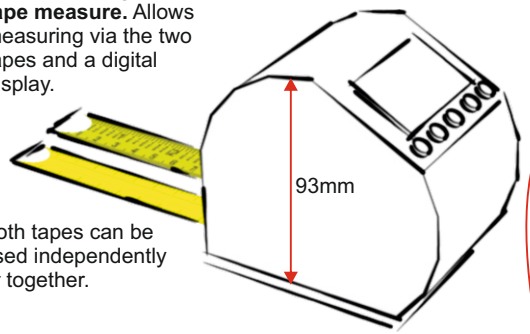


One possible solution, is to redesign the end grip. The one shown below has been modified to hold the tape level with the material and at the same time, grip the end of the material securely.

UPDATE - Most tape measures automatically retracted back into the casing, when the tape is released from the edge of the material. However, the tape measure could be designed, so that the tape stays extended automatically and has to be released by pressing a button (working in the opposite way).

PRODUCT DEVELOPMENT

Metric and imperial tape measure. Allows measuring via the two tapes and a digital display.

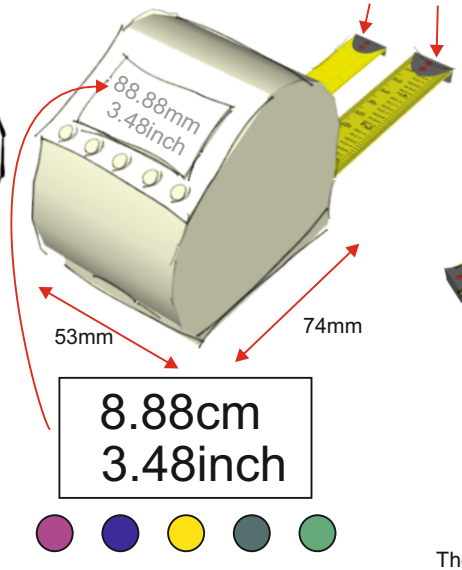


Both tapes can be used independently or together.

GENERAL DESCRIPTION

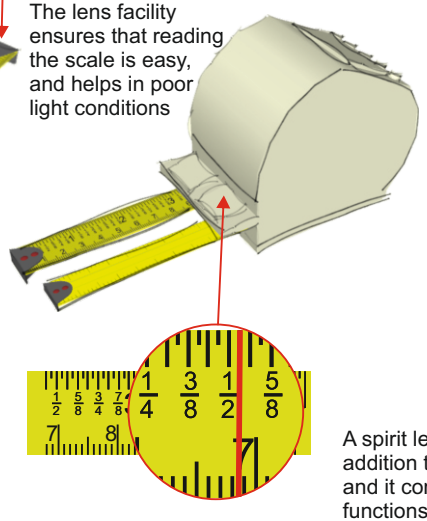
Robust metric and imperial, 5 metre tape measure with digital display. Its digital memory will save up to 99 measurements. The large LCD Display ensures that measurements can be read easily. Measurements can also be read directly from the tape, through the magnifying lenses.
Other functions include; last measurement hold function and auto shut off to save battery power.
Dimensions W x H x D 74 x 93 x 53mm. Tape measure length 5m. Measuring accuracy, 1 hundredth of a mm.

SELECTION OF SCALES



The **function buttons** will allow easy selection of various features.
Each function button will be allocated a dedicated feature.
The buttons have been positioned so that they cannot be 'knocked' accidentally.

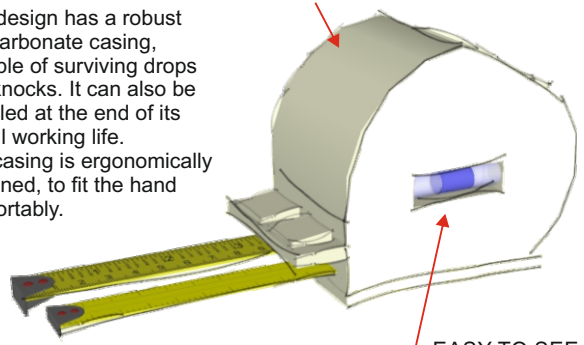
The lens facility ensures that reading the scale is easy, and helps in poor light conditions



The lens has a RED datum line that accurately indicates the correct measurement.
The lens clearly displays both imperial and metric scales.

ERGONOMIC SHAPE

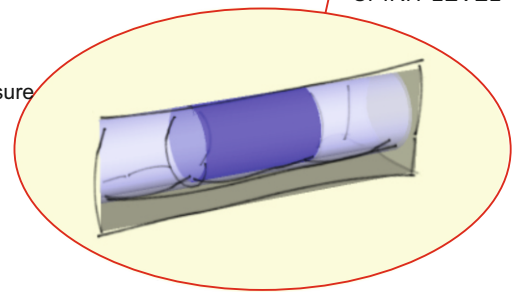
This design has a robust polycarbonate casing, capable of surviving drops and knocks. It can also be recycled at the end of its useful working life.
The casing is ergonomically designed, to fit the hand comfortably.



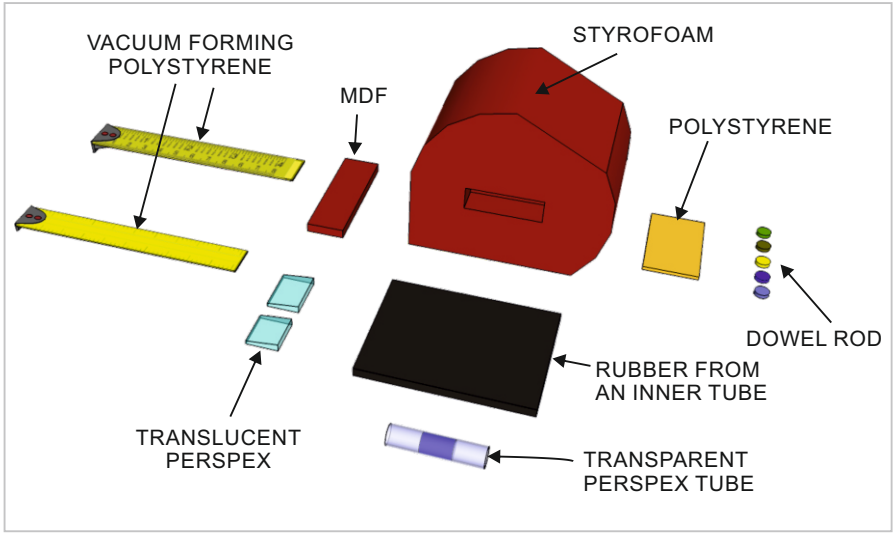
EASY TO SEE SPIRIT LEVEL

A spirit level is a logical addition to the tape measure and it compliments its functions.

It will be used by a range of trades, including builders, joiners and DIY enthusiasts.

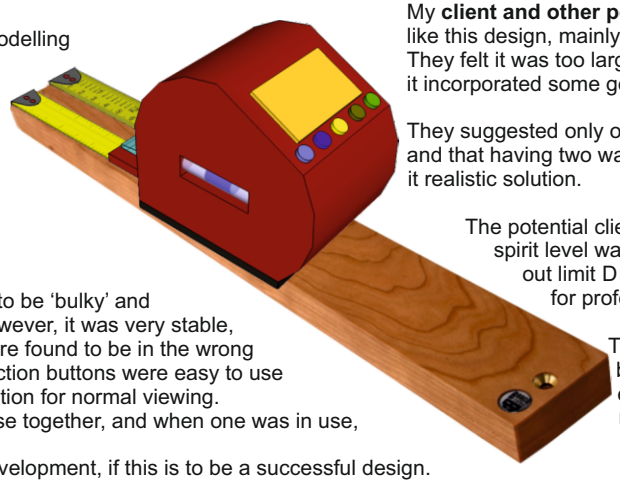


MODEL COMPONENTS



I made a **model** from a variety of modelling materials including:

Styrofoam
Polystyrene
Dowel rod
Rubber
MDF
Translucent perspex
Translucent perspex tube



When tested, the model was found to be 'bulky' and relatively uncomfortable to hold. However, it was very stable, due to its wide base. The lenses were found to be in the wrong position for proper viewing. The function buttons were easy to use and the display was in the right position for normal viewing.
The two scales, were awkward to use together, and when one was in use, the other got in the way.
The overall design needs further development, if this is to be a successful design.
If the design is developed further, the end of life cycle disassembly of the tape measure, in readiness for recycling, will be a priority.

My **client and other potential customers** did not like this design, mainly due to its overall size. They felt it was too large for general use, although it incorporated some good features and functions.

They suggested only one scale was necessary and that having two was more of a 'gimmick' than it realistic solution.

The potential clients also felt that a small spirit level was useful to those carrying out limit DIY, but not accurate enough for professional trades people.

The shape was deemed to be less than a good ergonomic design, as it was not entirely comfortable in the hand.

The 'easy to see' spirit level was referred to as 'difficult' to see and use.

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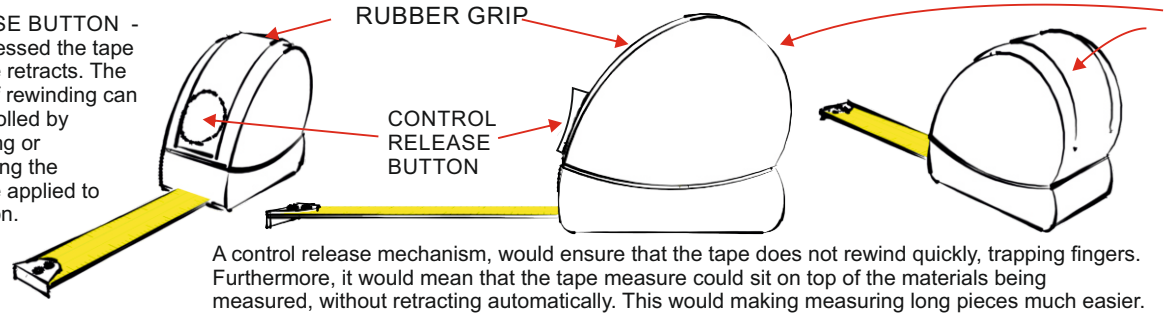
NAME:

PRODUCT DEVELOPMENT

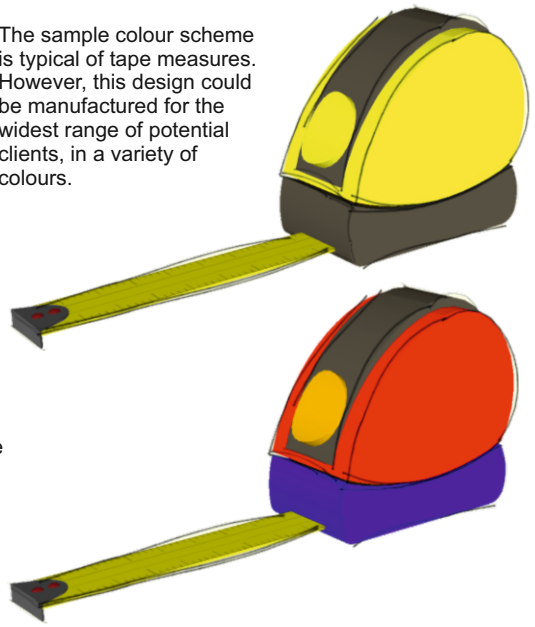
SHEET 7

RELEASE BUTTON - when pressed the tape measure retracts. The speed of rewinding can be controlled by increasing or decreasing the pressure applied to the button.



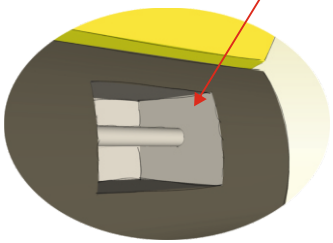
The smooth shape of the casing fits the average hand comfortably. The shape has been designed with ergonomics in mind, allowing for easy reach of the 'control release' button.

The sample colour scheme is typical of tape measures. However, this design could be manufactured for the widest range of potential clients, in a variety of colours.



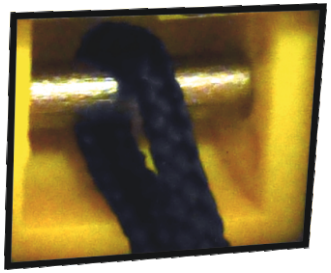
A control release mechanism, would ensure that the tape does not rewind quickly, trapping fingers. Furthermore, it would mean that the tape measure could sit on top of the materials being measured, without retracting automatically. This would making measuring long pieces much easier.

CAD REPRESENTATION OF STRAP HOLDER



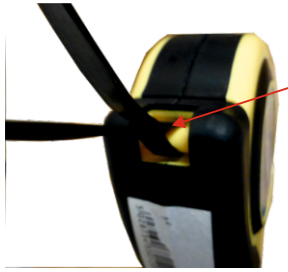
The small slot at the back of the tape measure is for a strap, for looping round a hand, or for hanging up the tape measure.
I looked at two existing tape measures, both used this system, for securing the tape to the hand during use and for hanging up, for storage.

STYROFOAM MODEL



The styrofoam model (left), shows how this type of system can be manufactured easily and initial testing would suggest that the mechanical way in which the strap is secured to the casing, needs little refinement, as it is very strong.
However, some straps are manufactured from rubber or a synthetic rubber material, which is prone to wear and tear. Alternatively, a more reliable woven textile material is used.
Both of these could be replaced by using woven kevlar. This will not break and will resist most forms of extreme wear and tear.

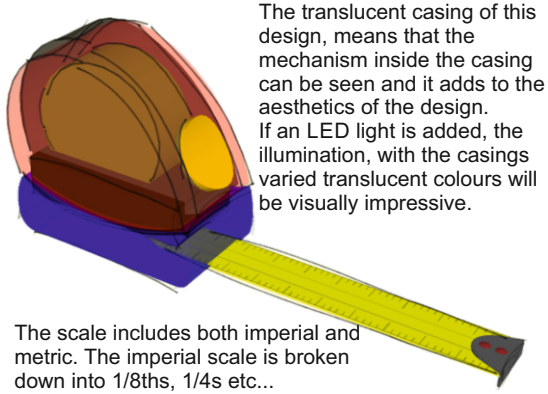
TESTING OF EXISTING / SIMILAR TAPE MEASURES



POTENTIAL WEAK POINT

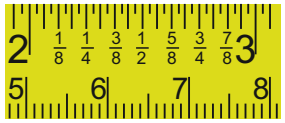
If a tear / split develops on the rubber strap, it will soon fail.
However, the overall existing design is very reliable.

This colour scheme incorporates the use of translucent elastomers. These materials have the combined properties of 'plastic' and 'rubber'. This means that the tape measure should survive everyday knocks and blows.

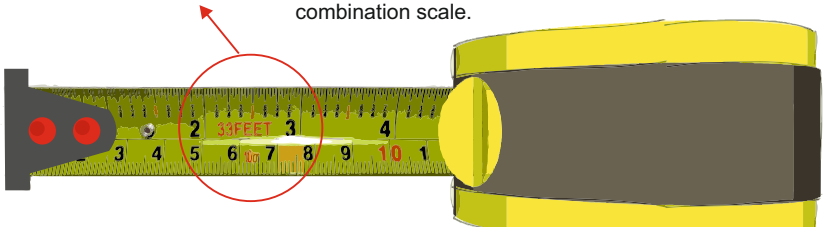


The translucent casing of this design, means that the mechanism inside the casing can be seen and it adds to the aesthetics of the design.
If an LED light is added, the illumination, with the casings varied translucent colours will be visually impressive.

When testing the two types of strap, it was found that it was virtually impossible to break the one made from the woven textile. However, the rubber / synthetic rubber strap could break with ease, if a small tear developed first.
In a working environment, where chisels, craft knives and tools of this nature, may come in contact with the strap, rubber is not a good selection (even though it has a comfortable feel).
A further development could be to make the strap retractable, rather like the tape measure. The strap could retract into the casing, when the tape measure is in use.



The scale includes both imperial and metric. The imperial scale is broken down into 1/8ths, 1/4s etc...
Potential customers could choose between, imperial, metric or a combination scale.



PLAN VIEW OF DEVELOPED TAPE MEASURE

NAME:

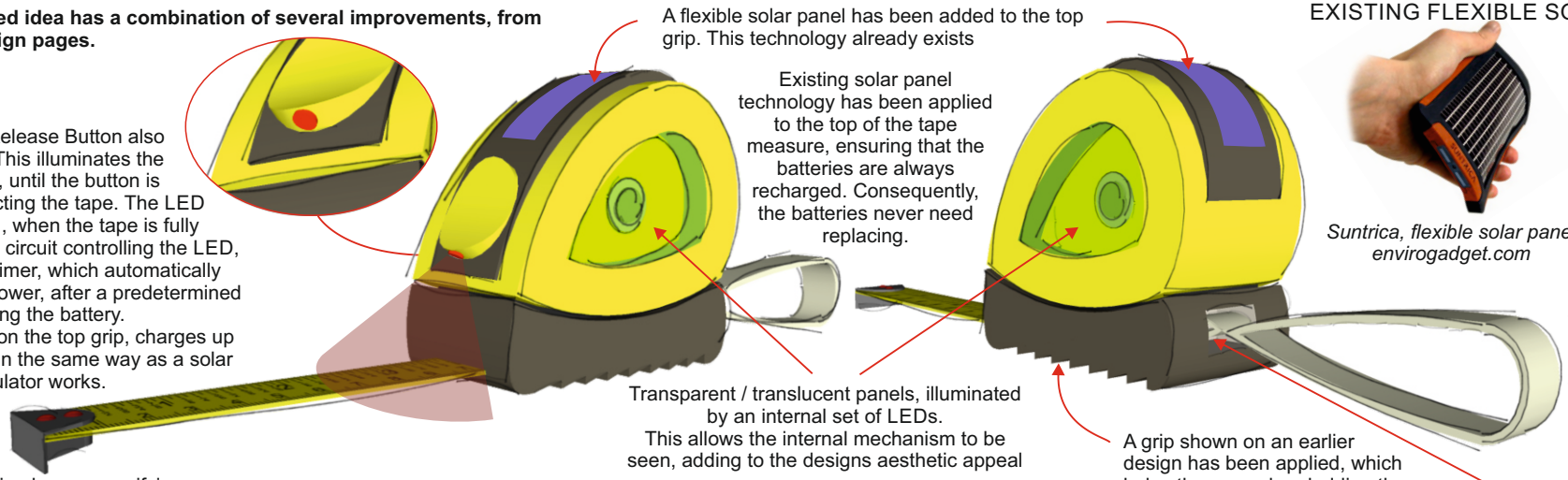
PRODUCT DEVELOPMENT

This developed idea has a combination of several improvements, from previous design pages.

The Control Release Button also has an LED. This illuminates the tape measure, until the button is pressed retracting the tape. The LED will not be ON, when the tape is fully retracted. The circuit controlling the LED, has a built in timer, which automatically turns off the power, after a predetermined time, conserving the battery.
A solar panel on the top grip, charges up the batteries, in the same way as a solar powered calculator works.

A flexible solar panel has been added to the top grip. This technology already exists

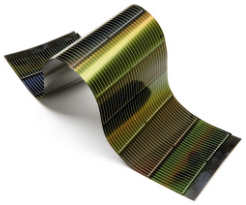
Existing solar panel technology has been applied to the top of the tape measure, ensuring that the batteries are always recharged. Consequently, the batteries never need replacing.



Transparent / translucent panels, illuminated by an internal set of LEDs.
This allows the internal mechanism to be seen, adding to the designs aesthetic appeal

EXISTING FLEXIBLE SOLAR PANEL TECHNOLOGY

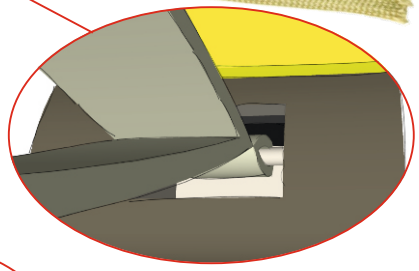
Suntrica, flexible solar panel
envirogadget.com



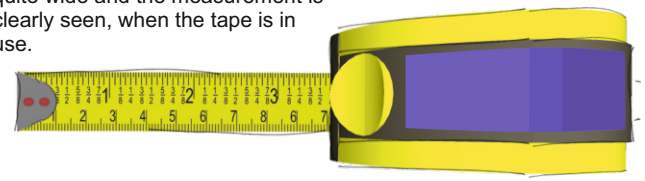
Flexible-Solar-Panel.jpg
cheapsolarpanelsforsale.com

The kevlar strap is secured in a time tested fashion, looped around a steel / aluminium pin, held in place by the two sides of the casing.
Kevlar watch straps already exist.

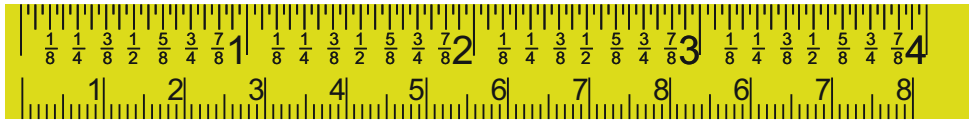
A grip shown on an earlier design has been applied, which helps the user when holding the tape measure. It also helps prevent slipping, when the tape measure is resting on the material being measured.



A previous design has a magnifying lens, to help view the scale. This has been dropped as the tape is quite wide and the measurement is clearly seen, when the tape is in use.



A scale including imperial and metric measurements has been included. This will satisfy the requirements of most potential customers.
Although the metric system dominates most industries, the imperial scale is still used.



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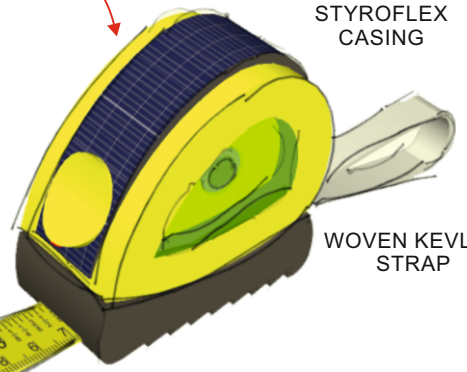
This sketch shows that developed idea, with a flexible solar panel.

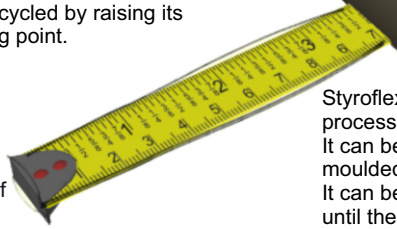
The casing material will need a combination of mechanical properties including; toughness, high wear resistance and a certain amount of elasticity. THERMOPLASTIC ELASTOMERS (TPE) will meet these properties.

STYROFLEX CASING



WOVEN KEVLAR STRAP

The main material for the casing will be the elastomer, Styroflex because of its physical properties.
It has good tensile strength and are tear resistance.
It resists chemicals and ink / paint.
It has good properties of flexibility and resistance to compression.
After bending, it tends to return close to its original shape / form.
It can be reprocessed / recycled by raising its temperature above melting point.



Styroflex can be reformed during the melting process, unlike many other forms of plastics.
It can be extruded, blow moulded and injection moulded.
It can be remoulded, if the temperature is raised until the TPE becomes soft and pliable.

I made a detailed model and carried out some initial tests, to confirm that the design was worth developing further. Although not a 'working' model, results from the basic testing, suggested that the design had promise.

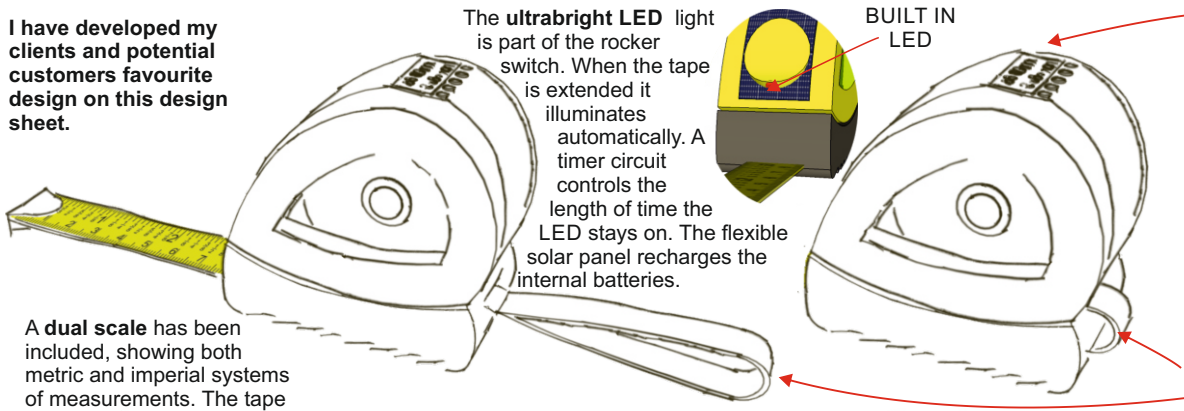
The casing will be manufactured through either vacuum forming of injection moulding.

NAME:

PRODUCT DEVELOPMENT

SHEET 9

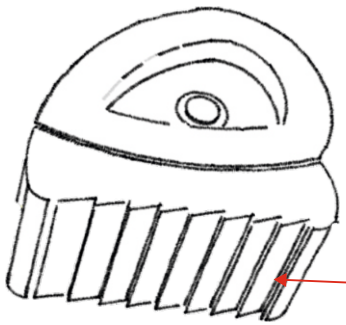
I have developed my clients and potential customers favourite design on this design sheet.



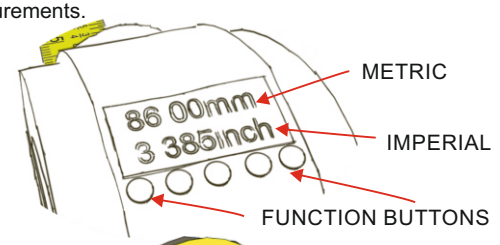
The **ultrabright LED** light is part of the rocker switch. When the tape is extended it illuminates automatically. A timer circuit controls the length of time the LED stays on. The flexible solar panel recharges the internal batteries.

BUILT IN LED

A **digital display** has been included, allowing the user to view the measurement directly from the tape or the display. Although the display shows both metric and imperial measurements, it can be set to display the users preferred system.
The buttons control a range of features, including last measurement recall and a memory capable of storing 99 measurements.



RUBBER BOTTOM GRIP

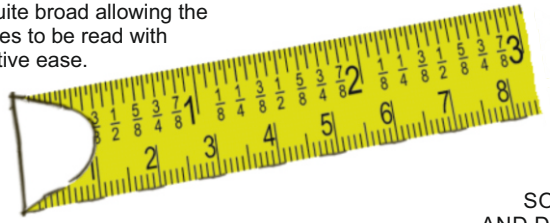


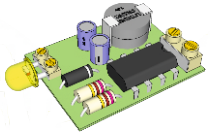
METRIC

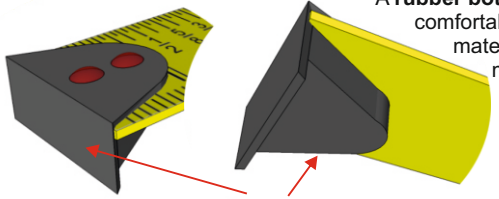
IMPERIAL

FUNCTION BUTTONS

A **dual scale** has been included, showing both metric and imperial systems of measurements. The tape is quite broad allowing the scales to be read with relative ease.

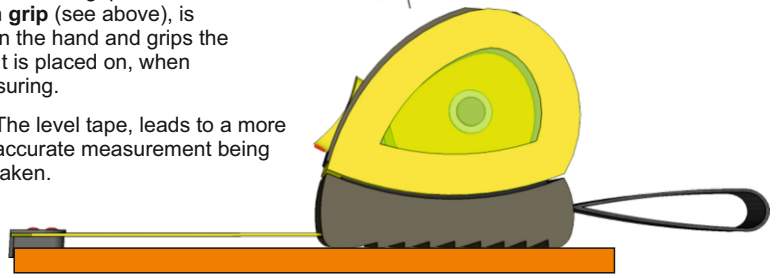






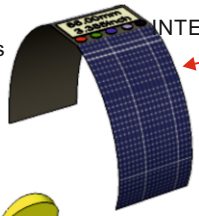
The **kevlar strap** is now retractable, housed inside the styroflex bottom grip.
A **rubber bottom grip** (see above), is comfortable in the hand and grips the material it is placed on, when measuring.

The level tape, leads to a more accurate measurement being taken.



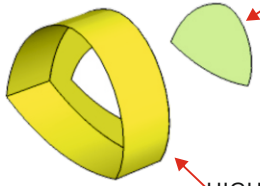
An **improved tape end** means that the tape is level when being used.

A **disassembled version** of the tape measure is below. This shows the major parts, as an exploded view.



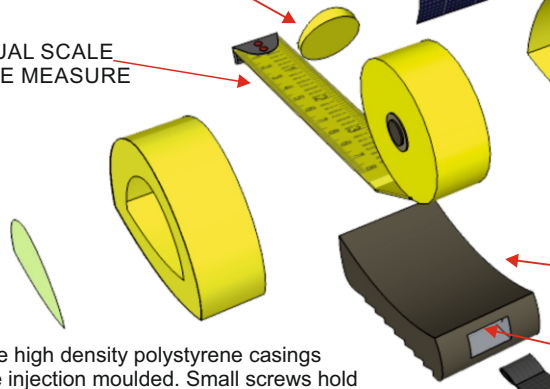
SOLAR PANEL AND DIGITAL DISPLAY INTEGRATED WITH STYROFLEX

TRANSLUCENT SIDE PANEL



ROCKER SWITCH WITH INTEGRATED LED

DUAL SCALE TAPE MEASURE



HIGH IMPACT (HIGH DENSITY) POLYSTYRENE CASING

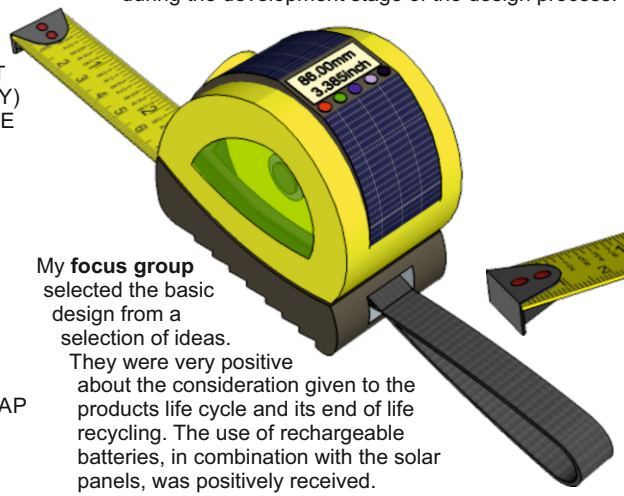
STYROFLEX BOTTOM GRIP WITH INTEGRATED STAINLESS STEEL STRAP PIN

KEVLAR STRAP

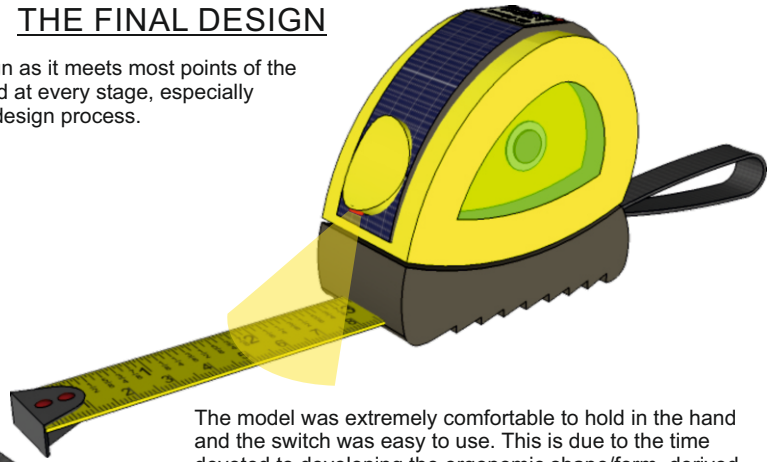
The high density polystyrene casings are injection moulded. Small screws hold the two sides together, allowing them to be disassembled, for recycling after many years of use.
The tape measure is designed to be affordable, tough and accurate. It is also ecologically sound, having been carefully designed and manufactured from recyclable materials.

THE FINAL DESIGN

My client is very happy with this design as it meets most points of the specification. The client was consulted at every stage, especially during the development stage of the design process.

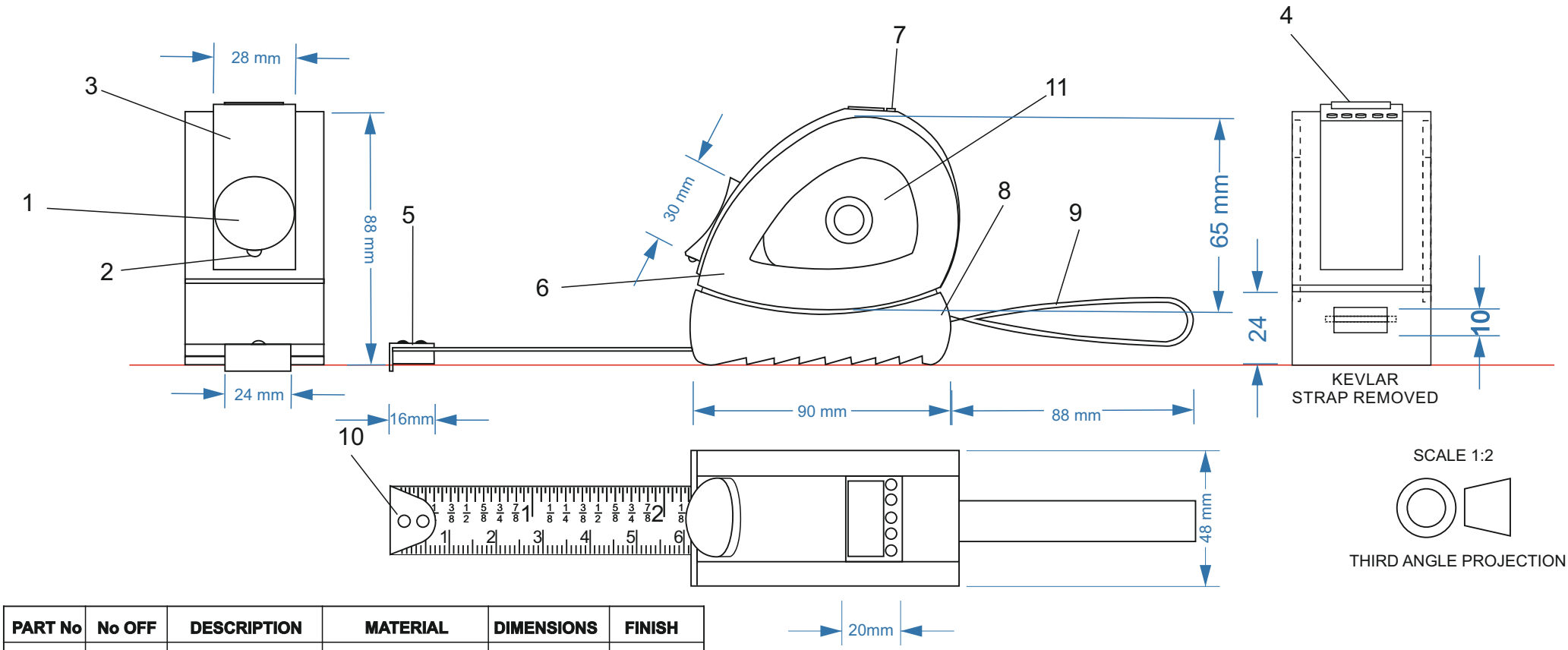


My **focus group** selected the basic design from a selection of ideas.
They were very positive about the consideration given to the products life cycle and its end of life recycling. The use of rechargeable batteries, in combination with the solar panels, was positively received.



The model was extremely comfortable to hold in the hand and the switch was easy to use. This is due to the time devoted to developing the ergonomic shape/form, derived from anthropometric data.
My client liked the combined use of styroflex and the flexible solar panel. The rechargeable batteries should never need replacing and this also applies to the ultra bright LED.

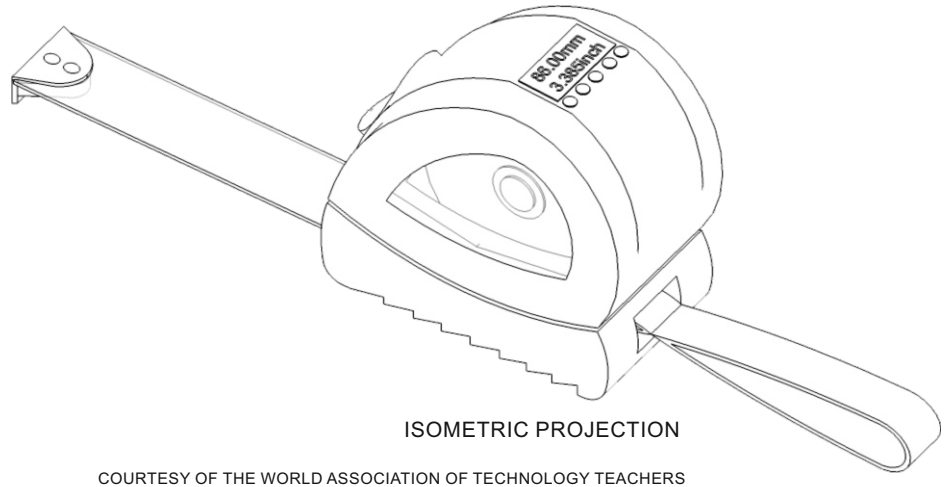
PRODUCT DEVELOPMENT



SCALE 1:2

THIRD ANGLE PROJECTION

PART No	No OFF	DESCRIPTION	MATERIAL	DIMENSIONS	FINISH
1	1	ROCKER SWITCH	PVC	30x26x10mm	POLISHED
2	1	ULTRA BRIGHT LED	ELECTRONIC COMPONENT	Dia.5x10xmm	N/A
3	1	FLEXIBLE SOLAR PANEL	ELECTRONIC COMPONENT	110x28x3mm	N/A
4	1	LCD - DISPLAY	ELECTRONIC COMPONENT	15x25x5mm	N/A
5	1	END GRIP	ALUMINIUM	16x8x24mm	BRUSHED
6	2	CASING	POLYETHYLENE	65x90x24mm	POLISHED
7	5	FUNCTION BUTTONS	STYROFLEX	Dia.4x8mm	TEXTURED
8	1	BOTTOM GRIP	SYNTHETIC RUBBER	90x24x48mm	TEXTURED
9	1	WRIST STRAP	KEVLAR	88x26x2mm	WOVEN
10	2	PAN HEAD RIVETS	ALUMINIUM	DIA3x15mm	PLANISHED
11	2	TRANSLUCENT WINDOW	POLYETHYLENE	40x35x2mm	POLISHED



ISOMETRIC PROJECTION

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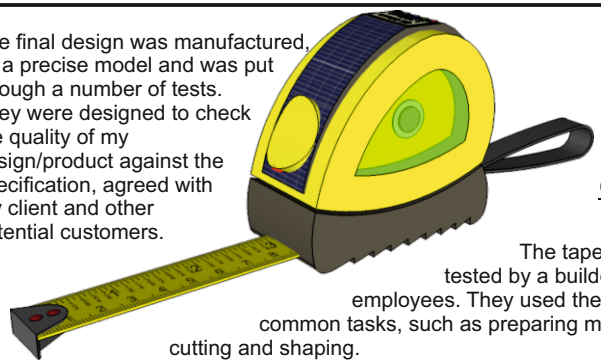
TESTING OF FINAL DEVELOPED IDEA

SHEET 1

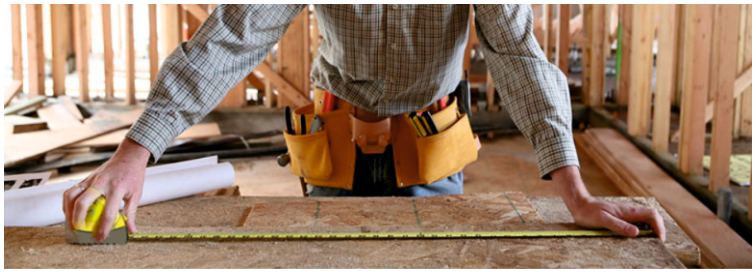
The final design was manufactured, as a precise model and was put through a number of tests. They were designed to check the quality of my design/product against the specification, agreed with my client and other potential customers.



GENERAL TESTING

The tape measure was tested by a builder and his four employees. They used the tape on common tasks, such as preparing materials for cutting and shaping.

Their all agreed that the tape measure had potential for future development. Four of the five workers said it was comfortable to use, especially when held in the hand, as shown below. One suggestion was that two versions should be developed, one with an LED light and one without.



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ERGONOMICS TESTING

PHOTO A

PHOTO B

An ergonomics test, was one of the most important aspects of the testing and evaluation, of the final tape measure design. It was tested in two 'dimensions';

A - Holding the tape, as it would normally be held for setting up for measuring.
B - Holding the tape measure and operating the LED rocker switch.

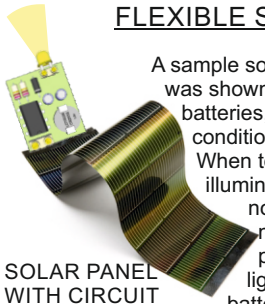
A Focus Group composed of ten people were asked to test the ergonomics. Seven members found the ergonomics to be 'very good', three found the ergonomics to be 'good'. Overall, I am pleased with the general findings of the focus group, as the specification stated that good ergonomics was a priority.

GROUP MEMBER	VERY GOOD	GOOD	FAIR	POOR
1	✓			
2		✓		
3	✓			
4	✓			
5		✓		
6	✓			
7	✓			
8	✓			
9		✓		
10	✓			
SUMMARY	7	3	0	0

SCALE - READABILITY TEST

The builders carrying out the general test, agreed that the scale was very useful, especially the imperial scale. The imperial scale has been used less and less, over the years, due to the metric system becoming dominant. When used by builders, the fact that the imperial divisions were clear and easy to read, was a plus. This meets one of my specification requirements.

FLEXIBLE SOLAR PANEL TEST

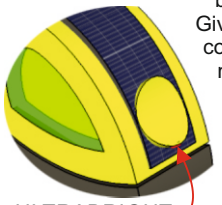


SOLAR PANEL WITH CIRCUIT

A sample solar panel was tested and it was shown capable of recharging the batteries, in normal lighting conditions, in one hour.

When tested for discharge, it illuminated the LED for 10 minutes nonstop use. The manufacturers claim that the panel collects 90% of ambient light, efficiently charging the batteries.

Given that the LED will not be constantly used and that the tape measure would normally be in room level lighting conditions - the conclusion is that this illumination system will be successful.

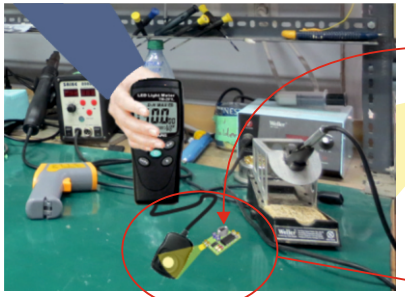


ULTRABRIGHT LED

The environmental aspect of my specification has been partly met.

TM-201L LUX/FC LED LIGHT METER

I used the light sensor to find the LED white light Luminous Intensity Measurement.



The circuit was tested, outside the casing, shining the LED light directly at the light meter. The LED achieves 1270 lux, providing enough light to view the scale in darkness.

LED LIGHT TEST

A general test and a scientific test were carried out.

The tape measure was used in a shaded place, to test the illumination of the LED and the ability of a user to view the measuring scale.
A light meter was used to measure the light intensity of the ultra bright LED

The use of an LED to illuminate the tape, helps meet the specification requirement 'ease of reading' and aids accuracy.

All members of the focus group found the LED illumination very useful, when measuring in poor light conditions.
One suggestion was that the LED could be used as a general light source.

NAME:

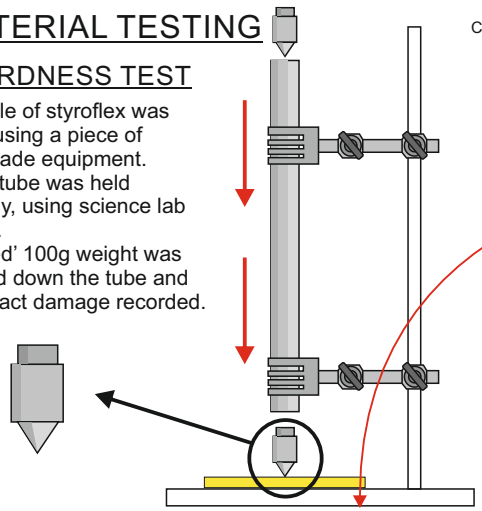
TESTING OF FINAL DEVELOPED IDEA

SHEET 2

MATERIAL TESTING

HARDNESS TEST

A sample of styroflex was tested using a piece of homemade equipment.
A steel tube was held vertically, using science lab clamps.
A 'turned' 100g weight was dropped down the tube and the impact damage recorded.



The styroflex sample had a 'dint', where the impact took place, but it had not cracked. Overall, very little deformity took place.

The equivalent size and thickness of a piece of HIPS High Impact Polystyrene was tested, in exactly the same way. The piece cracked from the impact area outwards and a small piece broke away at the impact point.

Conclusion: the Styroflex was the most appropriate material to select for the casing of the tape measure. Survival of knocks and drops from everyday use was more likely. Styroflex fits the material properties outlined in my specification.

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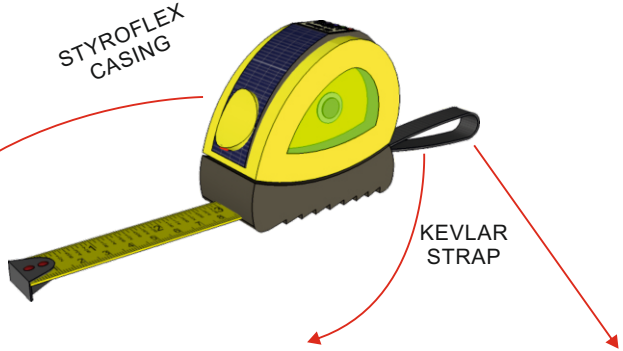
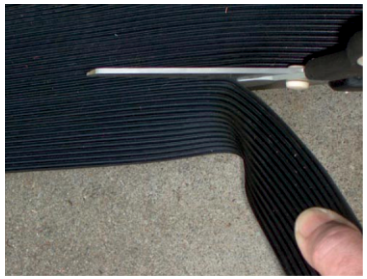




TESTING KEVLAR

When testing a sample of kevlar, with a scissors, I found that it was extremely difficult to cut and after a short time the scissors became blunt.

TESTING RUBBER

When testing rubber, it cut extremely easily with a scissors. Very little effort was required.

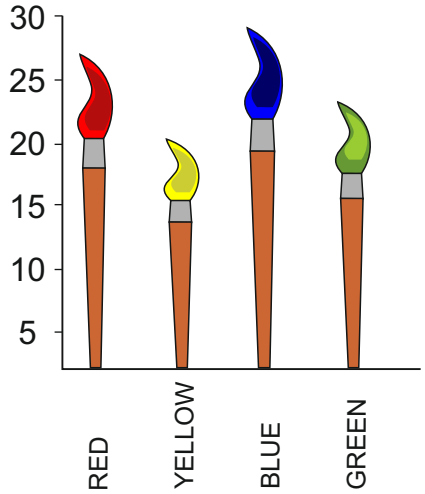
Kevlar is the best choice for the strap, as it will withstand cutting, unlike the rubber which will fail, if it becomes torn or damaged in any way. Kevlar fulfils the material properties outlined in my specification.

COLOUR SELECTION

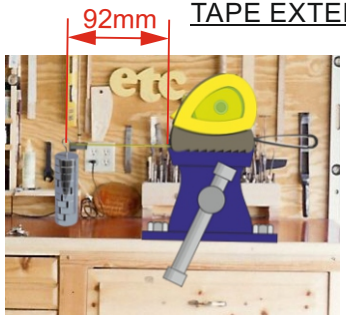
I showed one hundred construction students at the local college, the range of colours on offer. The selection of colours was well received, with blue being the most popular.

When asked if the colour scheme was the most important factor or the operation / functions, 92 said that the tape measures operation/functions were the priority.

My specification states that the colour scheme will be important. However, the survey suggests function before aesthetics in of greater importance.



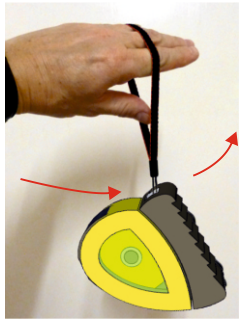
TAPE EXTENSION TEST



The tape was extended stage by stage and a weight of 50 grammes attached. The tape stayed level until it was extended by 92mm, it then lost its shape.
The focus group agreed that this was acceptable, as most tapes they had used, failed even at a light touch. This fulfils a specification requirement.

Tape extension is very important as a 'weak' tape, that loses its shape, leads to a loss in accuracy and infuriates the user. The specification refers to this aspect of the design being important.

SWING TEST



The kevlar strap of the model was put under stress, by swinging the tape measure round at speed. Although not scientific, it is a realistic test, as this may happen during its lifetime. The strap survived and showed no sign of fatigue. This was repeated fifty times.

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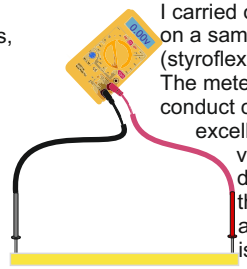
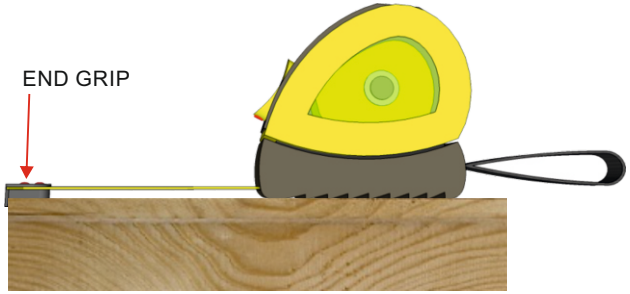
CONDUCTIVITY TEST



I carried out a simple conductivity test on a sample of casing material (styroflex).
The meter showed that it did not conduct current at all, making it an excellent insulator. Although the low voltage batteries do not carry a direct health and safety risk, the styroflex, will prevent an accidental short circuit, which is a potential fire hazzard.

END GRIP TEST



A standard problem emphasised in the specification, is that the tape end grip tends to slip off the material. This usually happens, just when it is time to read the scale. An improved design was specified.

The redesigned end grip worked well when tested. In 9 out of 10 tests, the end grip remained in position whilst the tape was being used, on a typical measuring task.

The metallic tape remained straight and level when in use, allowing a more accurate measurement.