

PRODUCT DEVELOPMENT EXERCISE DEVELOPMENT DESIGN SHEETS 7,8 AND 9

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On behalf of The World Association of Technology Teachers

W.A.T.T.



World Association of Technology Teachers

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PRODUCT DEVELOPMENT EXERCISE

PAGES 7, 8 AND 9

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THE TAPE MEASURE

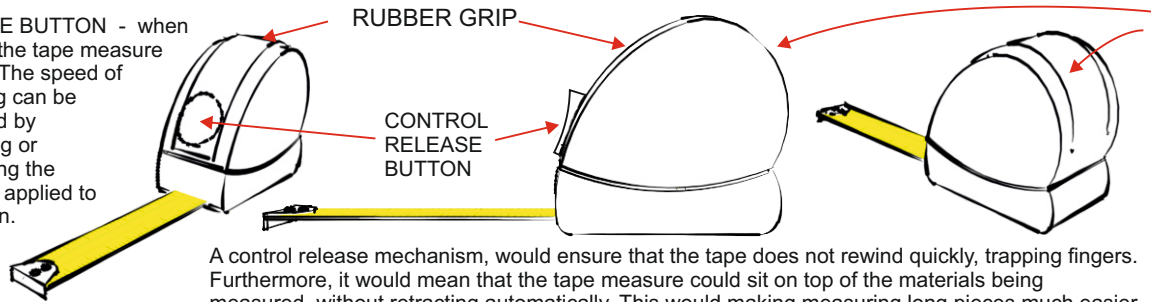
Study the sample development pages (page 2,3 and 4).

How many of the key areas (page 5) have been mentioned these sheets? Place a tick against the areas included.
(See slide three for key areas)

What grade would you give this development sheet?

WHAT AREAS / TECHNIQUES NEED TO BE INCLUDED ON THE FOLLOWING DEVELOPMENT SHEETS?

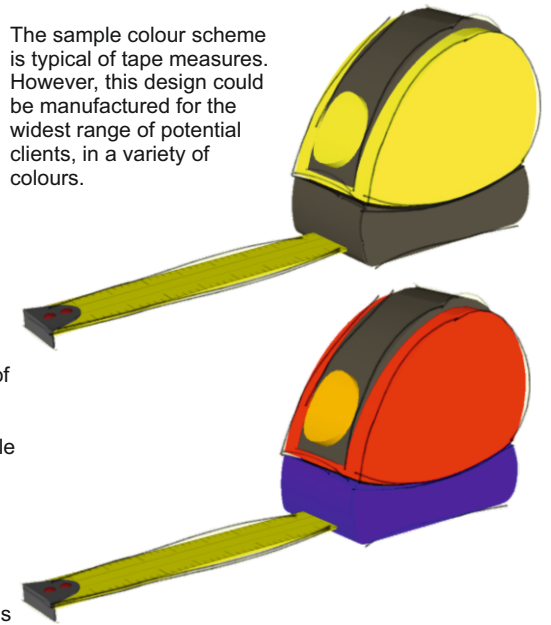
RELEASE BUTTON - when pressed the tape measure retracts. The speed of rewinding can be controlled by increasing or decreasing the pressure applied to the button.



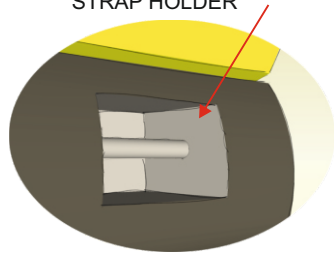
A control release mechanism, would ensure that the tape does not rewind quickly, trapping fingers. Furthermore, it would mean that the tape measure could sit on top of the materials being measured, without retracting automatically. This would making measuring long pieces much easier.

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.

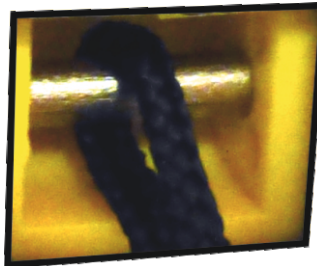


CAD REPRESENTATION OF STRAP HOLDER



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.

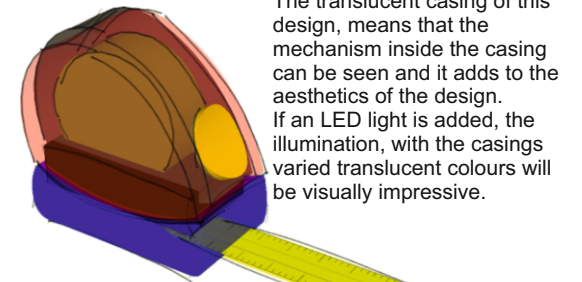
TESTING OF EXISTING / SIMILAR TAPE MEASURES



POTENTIAL WEAK POINT

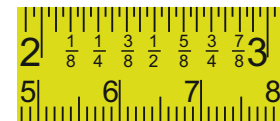
If a tear / split develops on the rubber strap, it will soon fail. However, the overall existing design is very reliable.

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.

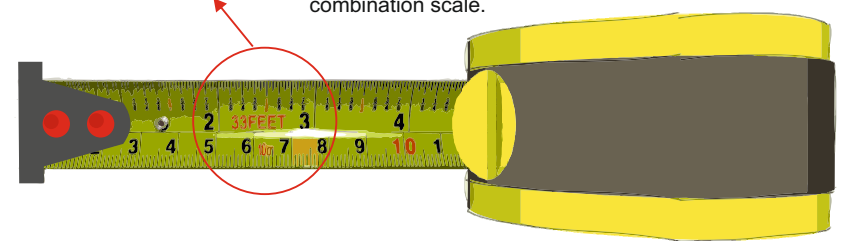


The translucent casing of this design, means that the mechanism inside the casing can be seen and it adds to the aesthetics of the design. If an LED light is added, the illumination, with the casings varied translucent colours will be visually impressive.

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.

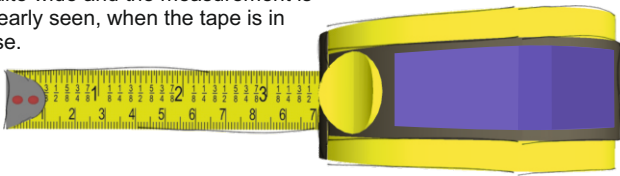


PLAN VIEW OF DEVELOPED TAPE MEASURE

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 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.



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.



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.

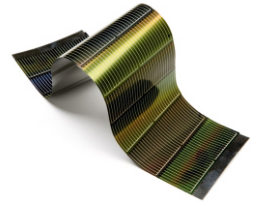
Transparent / translucent panels, illuminated by an internal set of LEDs. This allows the internal mechanism to be seen, adding to the design's aesthetic appeal

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.

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.



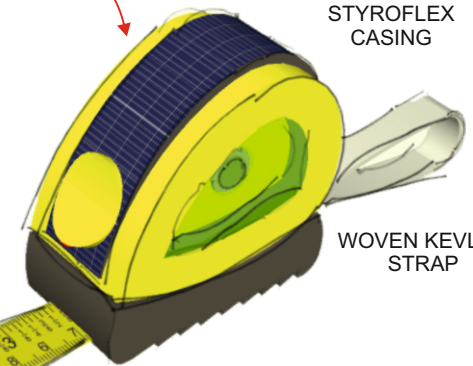
A grip shown on an earlier design has been applied, which helps the user when holding the tape measure. It also helps prevent slipping, when the tape measure is resting on the material being measured.

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.

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.

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



STYROFLEX CASING

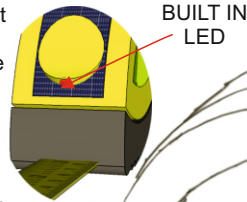
WOVEN KEVLAR STRAP

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.



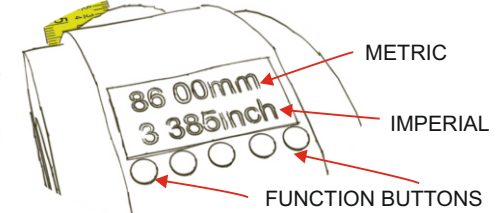
I have developed my clients and potential customers favourite design on this design sheet.

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.



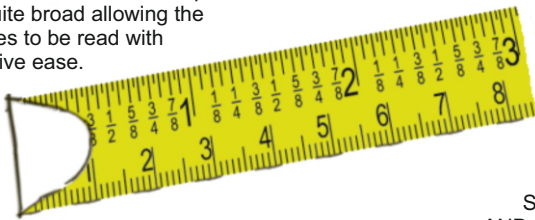
RUBBER BOTTOM GRIP

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.

ANTHROPOMETRICS AND
ERGONOMICS

HEALTH AND SAFETY ISSUES
DISCOVERED AND RESOLVED?

METHOD OF
CONSTRUCTION
MODEL AND REAL PRODUCT

MANUFACTURING
PROCESSES
INJECTION MOULDING ETC...

MATERIALS
PROPERTIES OF MATERIALS

DISASSEMBLY
OF PRODUCTS/
MODELS

CUSTOMER /
CLIENT VIEWS

STYLE / AESTHETICS

DIFFERENT IDEAS
VALID IDEA ?
DEAD END?

EVALUATE IDEAS

FOUND ANY PROBLEMS?
WHILE SKETCHING / MODELLING

PRODUCT DEVELOPMENT SHEETS

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SOLVED ANY PROBLEMS?
WHILE SKETCHING / MODELLING

EVIDENCE
PHOTOGRAPHS IN REAL TIME
AS YOU WORK
VIDEO CLIPS

VIEWS OF OTHERS

MODELS AND PROTOTYPES
2D AND 3D

ONGOING TESTING
EXPERIMENTATION

ENVIRONMENT
LIFE CYCLE
SUSTAINABILITY

COSTS
TO MANUFACTURE
PRICE TO CUSTOMER

REFER
TO SPECIFICATION
REGULARLY
CHECK YOU ARE KEEPING TO
THE SPECIFICATION

SKETCHES
EXPLODED VIEWS
COLOUR RENDERED ILLUSTRATIONS
SECTIONAL VIEWS
ORTHOGRAPHIC
CAD COMPUTER AIDED DESIGN

SIZES
LENGTH, HEIGHT AND DEPTH