

BST Basic Technology- Made Easy JSS 3



A Standard Text On The UBE Scheme As Prepared By The Nigerian Educational Research and Development Council (NERDC) For Measurement And Evaluation. A Result Of Thorough Research Into The General Principles Of Basic Technology

For Junior Secondary Schools JSS 1.

(A Combined Text And Workbook for the Hard Copy Version)

BST Basic Technology Made Easy
Making Learning Fun

By
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This edition is published by Made Easy with the assistance of

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PREFACE

This e-series has been designed to reflect the 2014 Nigerian Educational Research and Development Council (NERDC) National Basic Technology for Junior Secondary School year 1, 2 and 3.

While preparing this edition, I ensured that where appropriate, review questions that contain emerging national and global issues such as is available in engineering, health, information technology and entrepreneurship.

The book has been divided into three broad parts, each showing the scheme for the term and scaled into lessons for the student and teacher for easy access plus practical videos for demonstration on geometrical construction-where applicable.

I have retained popular features, such as lesson objectives and exercises . In addition, this edition contains a most interesting and new feature-the first of its kind in Nigeria-where the student and teacher has access to practical **videos on Geometrical Construction** as contained in the curriculum.

While preparing this edition, I made sure I retained the style and rigour of imputing illustrations and images in each lesson. Again, at the end of the text book, there are more than 200 objective test questions for the student and teacher to revise with.

I wish to express my appreciation to my students I have taught over the past fifteen (15) years who encouraged me to put up a material like this for them. I also appreciate a number of teachers far and near, who encouraged me with their appreciation through the edited copy of this material.

I wish in particular to express my gratitude to Mrs. Adebimpe Delano, the amiable principal of Fountain Heights Secondary School, for her advice and helpful guidance.

P.S. I must state that this edition is subject to upgrading as time passes. This is to meet national and global standard as the curriculum changes especially now that Basic Technology has been fused into Basic Science and Technology (BST) by NERDC.

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DEDICATION

*This book is dedicated to **ALMIGHTY GOD, JEHOVAH** for HIS mercies upon me and my lovely family.*

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PART 3

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GENERAL REVISION FROM JSS1 TO JSS 3

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LESSON- 1.1

PROCESSING OF MATERIALS

(Timber)

OBJECTIVES: At the end of this lesson, the student should be able to:

1. define wood felling.
2. state at least two main areas where wood can be felled in Nigeria.
3. explain wood conversion.
4. define wood seasoning
5. explain at least five reasons why wood is seasoned
6. calculate moisture content of wood
7. state what veneer is
8. state at least 3 methods used for producing veneers.
9. write short notes on how to produce at least 3 types of manufactured boards.
10. state what wood preservation is
11. explain at least four types of wood defects.

Definition of Timber

Timber can be defined as a part of a tree cut for the production of technological products like furniture, toys, etc.

Timber Production: Timber is produced when a tree is cut or felled. A tree has to grow to maturity before it is felled, converted, seasoned and treated.

Growth of a Tree: Every single tree plant must grow as a standing timber in two ways:

- i. **Vertical Growth:** A tree grows vertically downward through the root and shoots and upward through the stem, branches and leaves. The root draws water and mineral salts from the earth, which is then transported to the leaves through the stem by photosynthesis.

- ii. **Horizontal Growth:** This is the process where the cambium layer produces new layers of cells annually as the tree hardens outwardly to form the bark. This growth increases the diameter of the tree to become the trunk.

Qualities of a Good Timber

A number of factors affects the quality of timber. The following constitutes what to look out for when considering a quality timber:

- i. The fibers of a quality timber should be straight.
- ii. Its colour should be uniform. E.g. a dark colour indicates strength and durability.
- iii. A quality timber should smell sweet.
- iv. It should have a silky bright luster.
- v. A timber with good quality should be free of knots, shakes and other defects.

Wood Felling: This is the process of cutting down trees in the forest either manually or mechanically. A felled tree is referred to as log.

Timber Conversion

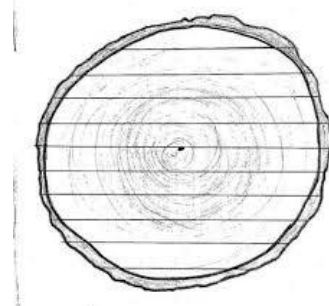
Wood conversion is the process of splitting log into smaller commercial sizes either at the sawmill or at the forest.

Methods of Timber Conversion

1.Plain Sawn: This is the method of cutting log linearly or flatly in a horizontal manner to produce planks e.g.



Plain sawn method



Advantages of Plain Sawing

i. It is quick and the waste generated is quite few.

Disadvantages of Plain Sawing

- i. Plain sawn timbers are prone to cupping, twisting and bowing.
- ii. Boards from plain sawn do absorb moisture and become distorted with time.

2. Quarter Sawn: This is the method of splitting log angularly along the grains on the log. It is usually more technical to split wood using this method. E.g.



Quarter sawn method

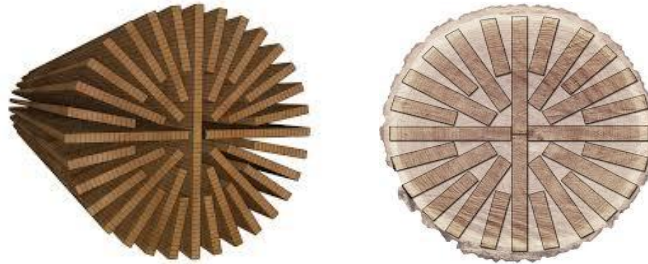
Advantages of Quarter Sawing

- i. In quarter sawn boards, there is a naturally decorative pattern which is not noticed with plain sawing.
- ii. Boards produced using quarter sawing are more stable than plain sawn boards, since they release atmospheric moisture naturally.

Disadvantages of Quarter Sawing

- i. This method leaves a lot of wasted timber.
- ii. Quarter sawn timbers are more expensive than plain sawn due to production of much scrap.

3. Rift Sawing: This is a technique of cutting log along a radius so that the saw cuts at a right angle to the log's growth ring. In this technique, the board has the same original grain pattern. E.g.



Rift Sawing

Advantages of Rift Sawing

- i. Rift sawn timbers are the most stable of the three methods used.

Disadvantages of Rift sawing

- i. Rift sawn boards (planks) are typically the most expensive than the other methods.
- ii. This method produces large triangular wastes generated between boards.

Wood Seasoning

This is the process reducing the moisture or water content of wood. Since sawn timber contain some amount of water, it must be seasoned before using them.

Reasons for Wood Seasoning

- (i). Seasoning makes the wood stronger.
- (ii) It makes the wood lighter in weight.
- (iii) It makes wood to take (absorb) preservatives easily.
- (iv) Seasoning makes wood more stable when being used for furniture work
- (v) It makes wood more durable.
- (vi) Seasoning makes the wood take polish easily.

Calculating Moisture Content

Moisture content is calculated as a percentage respecting the wetness or dryness of any wood. The general formulae used in calculating moisture content is given as:

$$\frac{\text{Wet weight} - \text{Dry weight}}{\text{Dry weight}} \times \frac{100}{1}$$

Example: If a sample of wood weighs 60gm before and 40gm after drying, what is the percentage moisture content?

Solution:

Given that $\frac{\text{wet weight} - \text{Dry weight}}{\text{Dry weight}} \times \frac{100}{1}$

$$= \frac{60\text{gm} - 40\text{gm}}{40\text{gm}} \times 100$$

$$= \frac{60 - 40}{40} \times \frac{100}{1}$$

$$= \frac{20}{40} \times \frac{100}{1}$$

$$= \underline{\underline{50\%}}$$

Defects in Timber

Defects are faults or irregularities in wood caused either naturally or during processing of the wood which reduces the value or quality of the timber.

1. Natural defects: These are defects which occurs during growth of a tree. They include the following names:

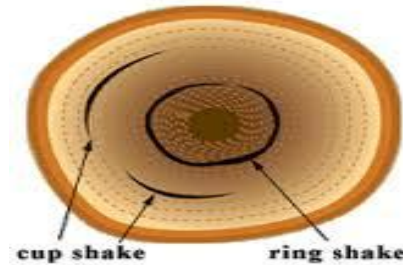
(a).Knots: A knot is a defect that occurs at the branch of a tree. If a branch falls from a tree it may leave a knot hole on the tree e.g.



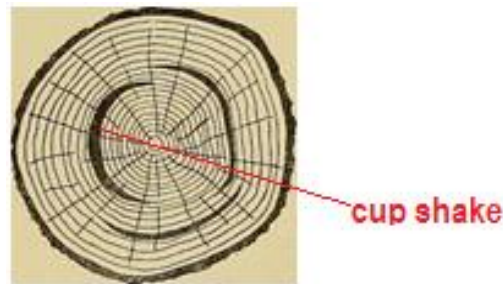
(b).Shakes: This is the complete separation of parts of a stem in a living tree. it occurs because of stress variation in the stem. There is the ring shake, cup shake, star shake and the heart shake.

(i). Ring Shake: The split in this case occurs right around the growth ring. E.g.

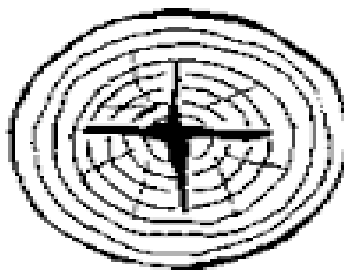
Ring & Cup shakes



(ii). Cup Shake: This is a visible split that goes half round the growth ring. E.g.

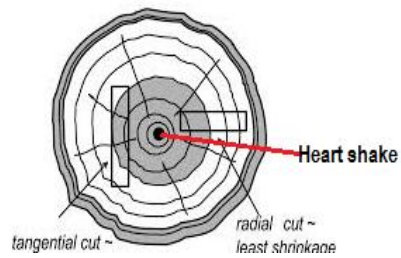


(iii). Star Shake: This is split that is extending from the pith to the outer section of a log in a star form. E.g.



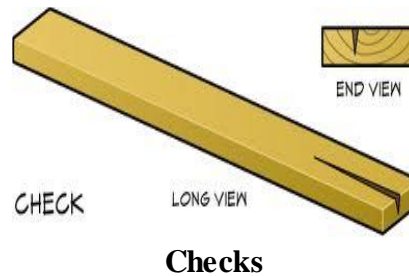
Star shake

(iv). Heart shake: This is a split that is restricted to the pith or centre of a tree. E.g.



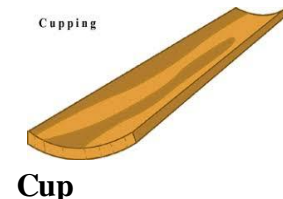
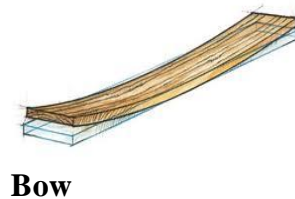
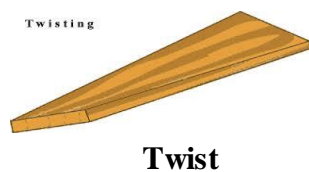
2. Artificial defects: This is also referred to as processing defects. It includes checks and warps.

(a) Checks: This is a defect which creates a separation of wood grain along the grain board. E.g.

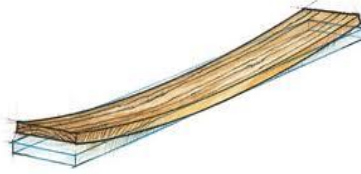


Checks

(b) Warps: Twists in timber are called warps. They may be caused by improper seasoning procedure. E.g.

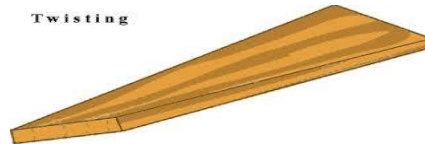


(c) Bow: This is a curvature that occurs along the length of a plank. It could be concave or convex curvature. E.g.



Bow

(d). Twists: This is a spiral distortion in a plank. Wrong stacking method may cause this twist. E.g.



Twist

Timber Preservation

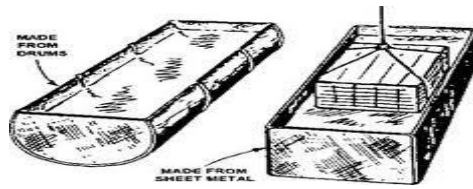
Wood preservation is the process treating wood with solutions so as to make it poisonous for insects and fungi. The solutions used for this purpose is referred to as preservatives.

Classes of Preservatives

- 1. Tar Oils:** The distillation of coal tar with kerosene gives birth to a blackish-yellow solution called creosote. It smells like carbolic acid. It is used on wood surfaces to protect it against insects and fungi.
- 2. Water-borne preservatives:** These are preservatives made from dissolving toxic chemicals in water. It prevents termites and fungi from attacking timber.
- 3. Solvent preservatives:** This type of preservative is obtained when toxic chemicals are mixed with non-aqueous solvents (solvents that do not contain water), like spirit (thinner) or petrol.

Methods of Applying Preservatives to Timber

- i. Open Tank Method:** This method involves an open tank or drum containing the heated preservative to a high temperature of 200⁰F and the wood soaked into it. E.g.



Open tank method

- ii. **Cold Immersion:** This method is slightly different because in this case the solution is not heated. The wood can be fully immersed or only the butt ends. E.g.



Cold immersion

- iii. **Brushing method:** This method involves the brushing of the preservative on the surface of the wood. Penetration is very minimal using this method. As such it is least effective. E.g.



A furniture maker brushing

- iv. **Spraying method:** This is the use of a spraying machine to apply preservatives in the form of pigments of stable metallic oxides in paints to the wood surface. E.g.



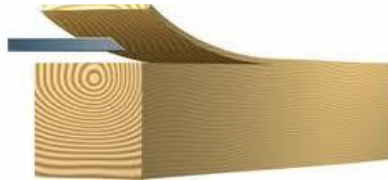
Spraying method

Veneer

A veneer is a thin sheet of wood used in the manufacture of boards. It is usually sliced from log.

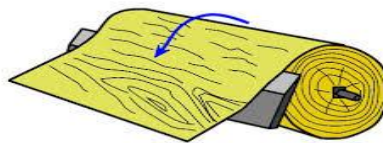
Methods Of Producing Veneers

- (i) **Slicing Method:** The method of using slicing blade to cut off thin leaves from a particular log. E.g.



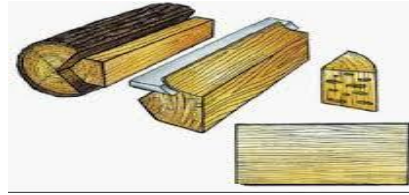
Slicing method

- (ii) **Reeling method:** This is the method of peeling log in a continuous rotary fashion mounted on a machine. The log is usually softened through steaming first. E.g.



Reeling method

- (iii) **Eccentric or Sawing Method:** In this method the log is cut into quarters. It is this quarter that is then sliced to veneer. E.g.



Eccentric method

Manufactured Boards

Manufactured boards are man-made boards made from multiple veneers, using adhesives, sawdust, etc. In Nigeria, the size of common boards is 2440mm by 1220mm.

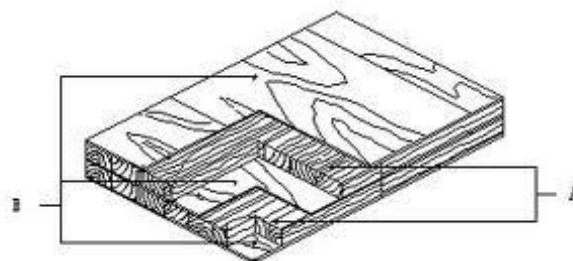
Types of Manufactured Boards

(i). Plywood: These are boards made from multiple veneers glued together with adhesives. The veneers are usually arranged so that the grains criss-cross each other. They are used for partitioning. E.g.



A set of Plywood

(ii). Block boards: This board looks like a flush door. The inner part of this board contains a strip of timbers forming the core and covered with two layers of veneers. They are used for flooring and doors. E.g.



Block board

(iii). Laminated boards: These are boards used for high class veneer furniture. It contains a thinner strip of timber forming the core and glued together. The surface is glossy. They are used for high-class furniture work. E.g.



Set of Laminated boards

(iv). Particle boards: These are boards made from wood chippings glued together and compressed under heat. It is used for paneling and kitchen furniture work. E.g.



Particle board

(v). Hard boards: These boards are made from the combination of wood waste (sawdust in Nigeria) and bonded together under high temperature and compression. They are used for making cabinets. e.g.



Hard board

Advantages of Manufactured Boards

- (i).** Using a manufactured board produces various large flat sheets of timber.
- (ii).** Manufactured boards do not check nor warp.
- (iii).** Manufactured boards can be worked on easily.

REVIEW QUESTIONS

- 1. Define timber felling.**
- 2. State at least two main areas where wood can be felled in Nigeria.**
- 3. Explain wood conversion.**
- 4. Define wood seasoning**
- 5. Explain at least five reasons why wood is seasoned**
- 6. Calculate moisture content of wood**
- 7. State what veneer is**
- 8. State at least 3 methods used for producing veneers.**
- 9. Write short notes on how to produce at least 3 types of manufactured boards.**
- 10. State what wood preservation is**
- 11. Explain at least four types of wood defects.**

LESSON-2.1

PICTORIAL DRAWING

(One-Point Perspective Drawing)

Introduction

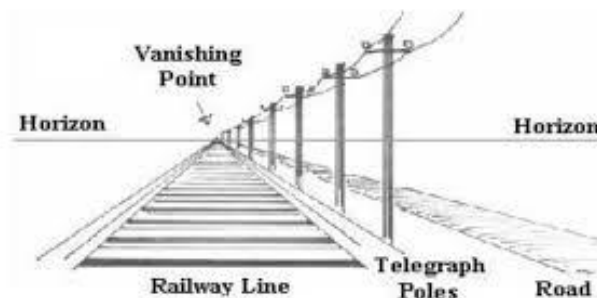
In the last lesson, you learned about how to draw oblique blocks and their angles of projection.

In this lesson, you are going to learn about perspective drawing. At this stage, you will only be exposed to one-point perspective.

OBJECTIVES: At the end of this lesson, the student should be able to:

1. Define perspective drawing and state the different types of perspective drawing.
2. Use the internal structure of a room as viewed from an angle to explain one-point perspective drawing.
3. Construct a one-point perspective of a major road.

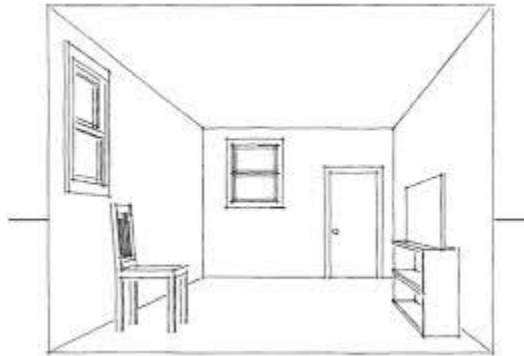
Definition: This is a drawing that gives the distant part of an object, like a building or road. The drawing tapers to a point called the vanishing point (VP), as it appears to an observer of an object. This makes the outlook of the distant object smaller than the real size. E.g.



One-Point Perspective of a Railway Line.

Types of Perspective Drawing

- i. **One-Point Perspective Drawing:** In this type of drawing, the projection lines converge at a particular point known as the vanishing point. e.g. Like the one shown above or the one below:



One-point perspective of a room

- ii. **Two-Point perspective Drawing:** This type contains two vanishing points and the two appear to end at a point in two directions. E.g.



Two-Point Perspective

[For demonstration, see the downloaded Video Titled, " PERSPECTIVE DRAWING" A.](#)

[Perspective Video B \(Click to Download\)](#)

REVIEW QUESTIONS

1. Define perspective drawing and state the different types of perspective drawing.
2. Use the internal structure of a room as viewed from an angle to explain one-

point perspective drawing.

3. Construct a one-point perspective of a cube.

[TO OBTAIN THE COMPLETE TEXTBOOK AND THE FULL VIDEOS, CLICK HERE](#)