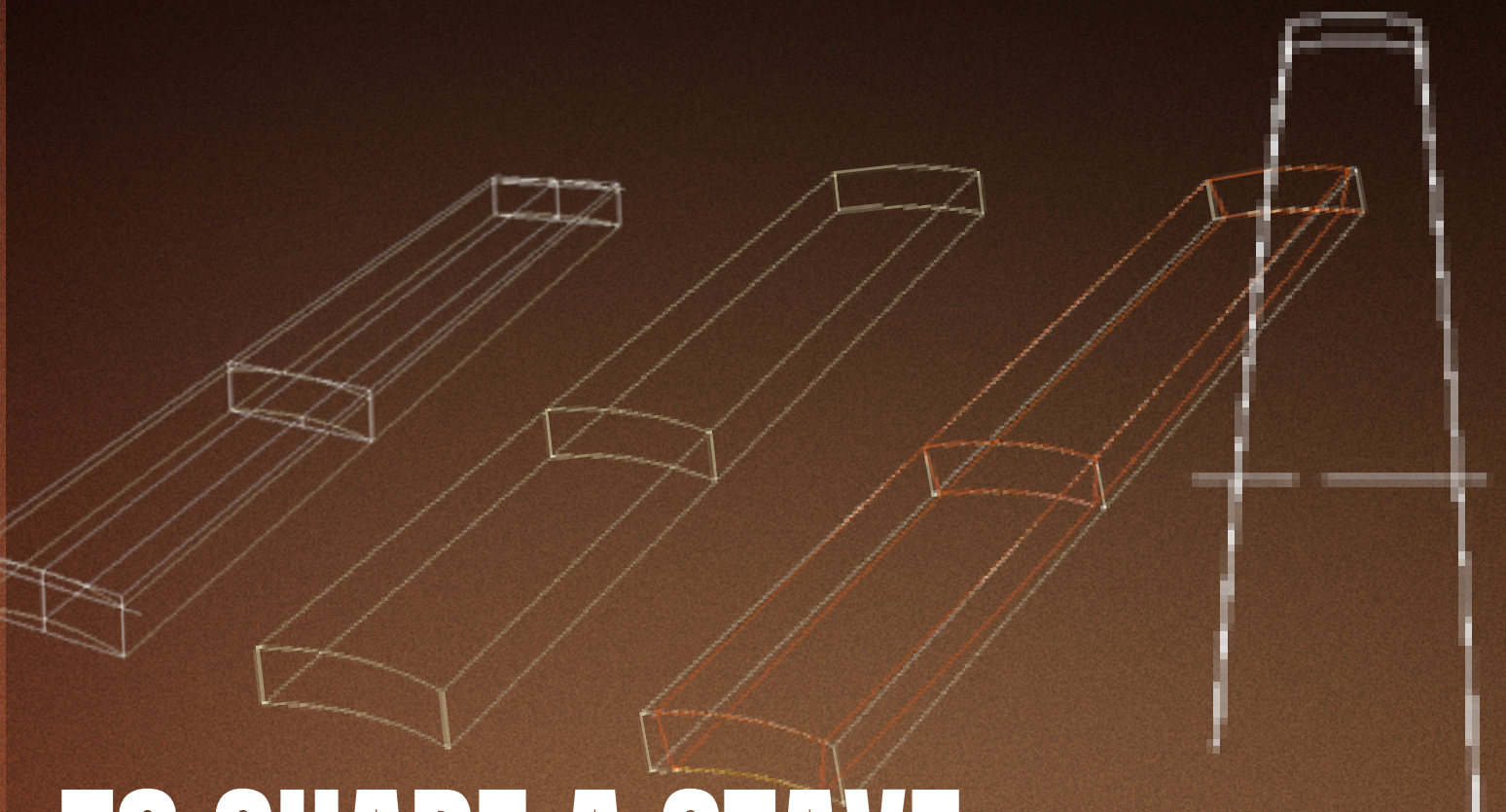
LIGNUM.
MARIAUD CONSULTING



TO SHAPE A STAVE

BACKING • HOLLOWING • JOINTING

Our PROGRAM

01 Introduction

02 Shortening

03 Backing

04 Hollowing

05 Jointing

To shape a stave

01 Introduction

🪵 Introduction to Shaping the Stave from the Plank
Manual Method & Mechanical Method

Shaping is the process of transforming a merrain—a split and dried oak plank—into a stave, the curved, trapezoidal piece that will form the barrel.
This work follows a precise, logical, and progressive order.
Each step prepares for the next. Each operation influences the watertightness, shape, and aromatic quality of the final barrel.

👉Two approaches exist today:

- The manual method, which is traditional and based on the cooper's experience, precise movements, and adapting piece by piece. (Cooperage CAP Version)

- The mechanical method, used in semi-industrial or industrial cooperage, with specific machines that automate part or all of the process. (Company Version)

Manual Method (CAP version)

EDJE Machining Center, used in industrial cooperages.

01 Introduction

🔸 Manual Method (CAP)

Each operation is performed by hand, using specific tools:

- **Shortening**

→ The cooper **measures** and **marks the usable length** according to the barrel's format.
→ They systematically add a **+5 mm oversize** on each side. (This can vary)
→ The cut is made with **a circular saw** or **by hand.**

- **Backing:**

→ The stave is **securely clamped** in a **cooper's horse** or a **guillotine** (a wooden or metal vise).
→ The cooper uses **a straight drawknife** to **plane the outside** of the piece.
→ The dolage involves **thinning the edge**s of the stave while keeping **a greater thickness in the center,** thus creating a **convex profile.**

📏 *The quality of the dressing is checked with **a gauge** (curvature template) that the cooper places on the stave to ensure regularity.*

- **Hollowing:**

→ The stave is **clamped** in a cooper's horse or a guillotine.
→ The cooper uses a **hollow drawknife**, a tool with **a reverse curve**, suited for working on the interior.
→ The action consists of **removing the central material** of the stave while keeping more thickness on the edges.

- **Jointing:**

→ Work with the colombe, a demanding tool.
→ Three essential actions:

- **Assembly angle:** to close the barrel according to its shape.
- **Head/bilge proportion**: to create the desired curvature (bulging or straight).
- **Balancing:** symmetrical staves = well-distributed curvature.

01 Introduction

🔸 Mechanical Method

- **Shortening:**

→ The stave blank is positioned on **an infeed station with an adjustable stop**.
→ The machine is preset according to the barrel format + **the trimming oversize**.
→ A circular saw makes the clean cut.
⚙ *Formats are often coded in series (Bordeaux, Burgundy, half-hogshead...), and the lengths are predefined in the system.*

- **Backing:**

→ The backing is done by **a dressing machine** equipped with tool holders whose radius is adapted to the desired shape.
→ Generally, **these radii are averaged** to suit several barrel formats (228 L, 300 L, etc.), which allows for standardizing the series.
→ The curvature profile is set **according to the barrel format.**

- **Hollowing:**

→ The hollowing is done by **a hollowing machine** equipped with tool holders whose radius is adapted to the desired shape.
→ The hollow is precisely calibrated for each series of staves. 27mm / 22 mm / with heels / without heels.

01 Introduction

- **Jointing :**

Jointing is performed on machines equipped with a compass with tool holders (milling cutters or knives) to bevel the edges of the staves.

→ Jointing is performed on machines equipped **with a compass with tool holders.**

▶️ **With Cam or Template**

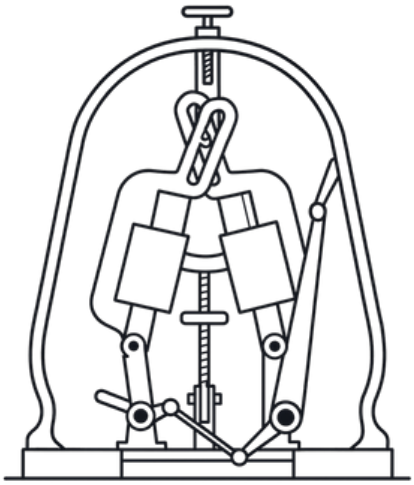
- A cam or a template controls the rise/fall of the stave in the compass.
- It is therefore the stave that moves during machining to create the head/bilge proportions and the angle progression.

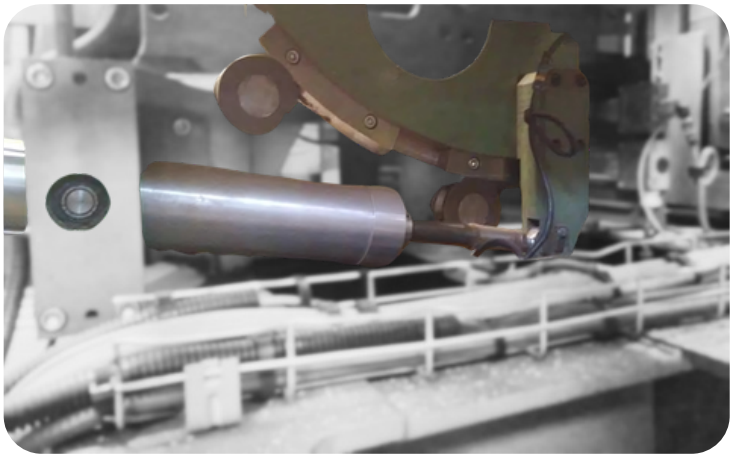
▶️ **Without Cam – Programmed System**

- The compass is numerically controlled.
- It is the compass itself that moves during machining to reproduce the profiles, without a cam or template.

⚠️ **In both cases:**

- The correct centering of the stave in the machine is essential to guarantee a good balancing.





02 Shortening

• Shortening

Reference Length

- The **barrel format** is used as the basis
- A **+5 mm oversize** is added for future finishing trimming.

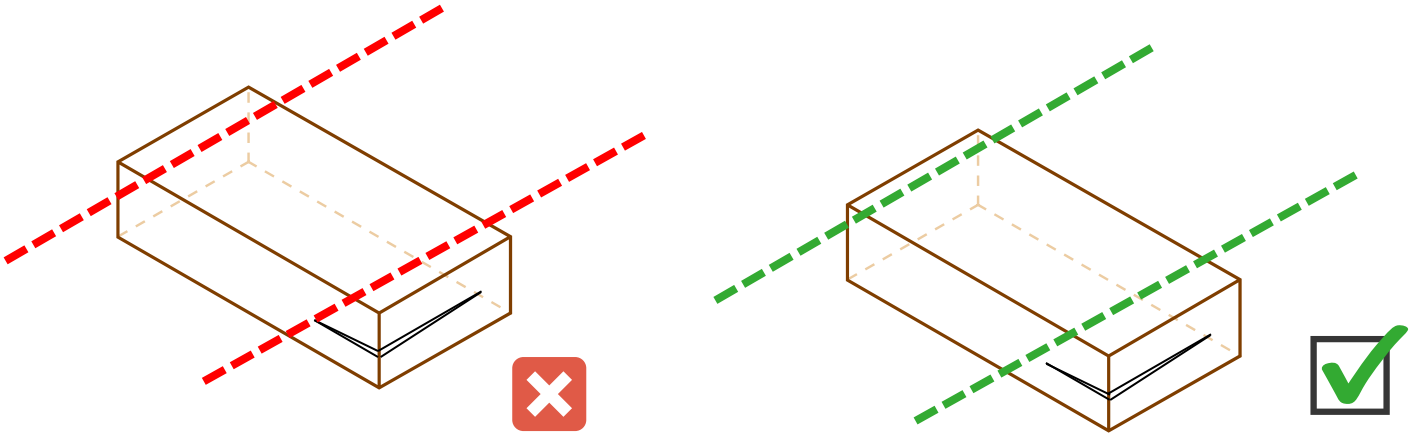
Wood Observation

Before cutting, the ends are inspected for:

- splits,
- checks,
- knots

Cutting Decision

- If a defect is visible on one end, **more is shortened from that side.**
- The goal is **to center the sound part of the stave** blank while respecting the usable length.

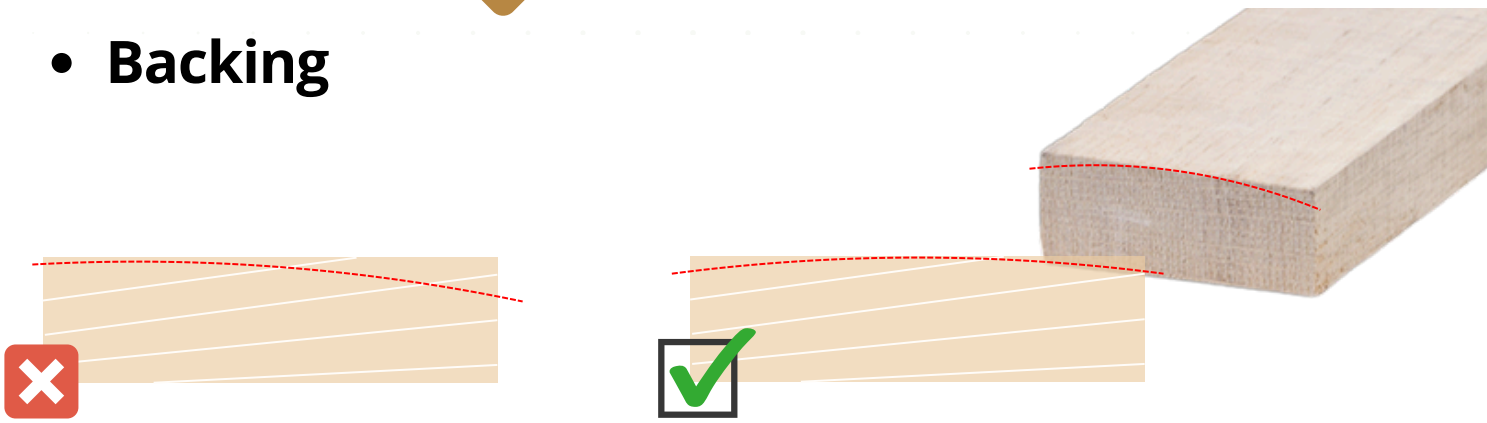


🧠 Key points

- Shortening is a compromise **between the quality of the wood and the required length**.
- A well-thought-out cut helps **reduce waste and avoids working on a stave that is already condemned.**
- The cooper **decides where to cut** based **on the defect, not on symmetry.**

03 Backing

- **Backing**



Consequences of a Misaligned Backing:

❌ **Bung Staves**: Offset between staves during "mise en rose" (raising of the cask).
❌ **Poor Jointing**: The reference surface is distorted → incorrect angle.
❌ **Out-of-Round Barrel**: The shape is unbalanced → open joint when the head is installed → risk of leakage.

Leave a Flash of Raw Wood in the Center

🪵 During backing, it is recommended not to completely work the center of the stave, but to leave **a slight "flash" of raw wood.**

This has Several Advantages

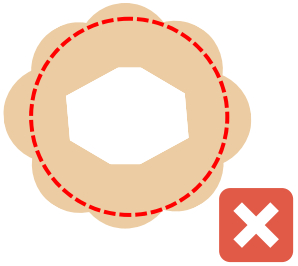
- ✅ Material Savings: Only what is necessary to achieve the desired curve is removed.
- ✅ Preservation of Central Thickness: This is useful for structural balance.

It's Better to Have a Backing That's Too Flat

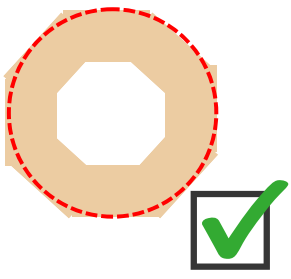
📐 **A slightly flat** backing is preferable to one that's too curved. Why?

✅ During finishing, a slight flat spot is easy to fix; a curve that's too pronounced is more difficult to correct.

More waste

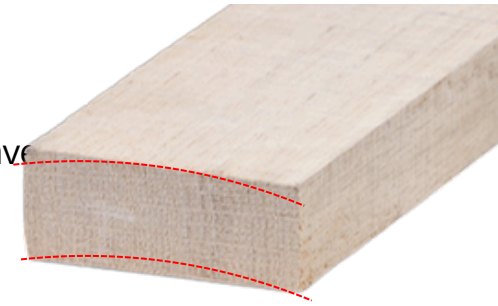


Less waste



04 Hollowing

• Hollowing



Hollowing consists **of slightly carving the inner face** of the stave according to **a concave profile**, in order to:

✅ **Facilitate bending,**
✅ **Reduce internal tensions** in the piece,
✅ **Remove raw**, irregular, or rough wood,
✅ Lighten the center while keeping material at the ends (head and bilge),
✅ Ensure a regular thickness, **to avoid:**

- **off-sets** between staves inside the barrel,
- the long-term build-up of tartar and deposits

✅ Hollow with Heel

Hollowing with a heel means leaving a flat, uncarved area at the ends of the stave.

🎯 Advantages and Uses

- Allows for more material to be kept at the head.
- Useful for **technical jointing,** such as the Bordeaux jointing where a mustache or heating witness is formed.
- Permits **a deeper hollowing** in the bilge area (central zone) without weakening the piece.

✅ Hollow without a Heel

Hollowing without a heel means the hollow extends from the top to the bottom of the stave. There is no flat area at the ends.

🎯 Advantages and Uses

- Allows **for continuous** and perfectly regular hollowing over the entire length.
- Recommended for thin staves, for example **22 mm**, where it is difficult to hollow too much.

Marking – Preparing for Jointing

Marking is used **to rough out the proportions** of the stave before jointing. It reduces the width at the ends and **gives a guide for the angle.**

The Role of Marking

Marking serves to:

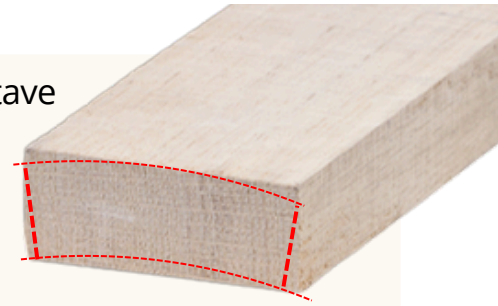
- Prepare the stave to receive **the final joint.**
- **Get the inclination of the edges close to the correct angle.**
- Guide the **bulging shape** of the barrel (proportions).

Jointing then finishes and confirms the angles and proportions.

Methods

Manual: Using a drawknife, working symmetrically on both sides.
Mechanical: Using a bandsaw, often upstream from a jointing on a spindle moulder.

05 Jointing



Jointing consists **of trimming the lateral edges** of each stave at a precise angle to allow for:

- A **leak-free assembly.**
- A **circular closure** of the barrel ("mise en rose").
- **Adherence to the desired shape** (round, bulging, oval).
- **A regular** and balanced **curve**.

The jointing angle is always a radiant angle, meaning it is oriented towards the center of the barrel. It varies depending on the width of each stave: the wider the stave, the more open the angle. To get this angle with precision, a jointing key is used. This tool, (presented in the dedicated course), allows for tracing the exact angle based on the width of the piece at the head.

Two Types of Jointing: Centered and Round

1- Centered jointing

During **centered jointing,** a central ridge naturally appears on the stave. This is what's called the **"noyau" (core)**.
This core is the structural pivot point where the slope of the edge changes.

⚠️ Why It's Important

- If all the cores are aligned on the same axis, **the bending surface becomes too weak.**
- This concentrates the stress in the same spot, which leads to:
  - **Breaks during the heating process.**
  - **Warped staves.**
  - **An unstable assembly.**

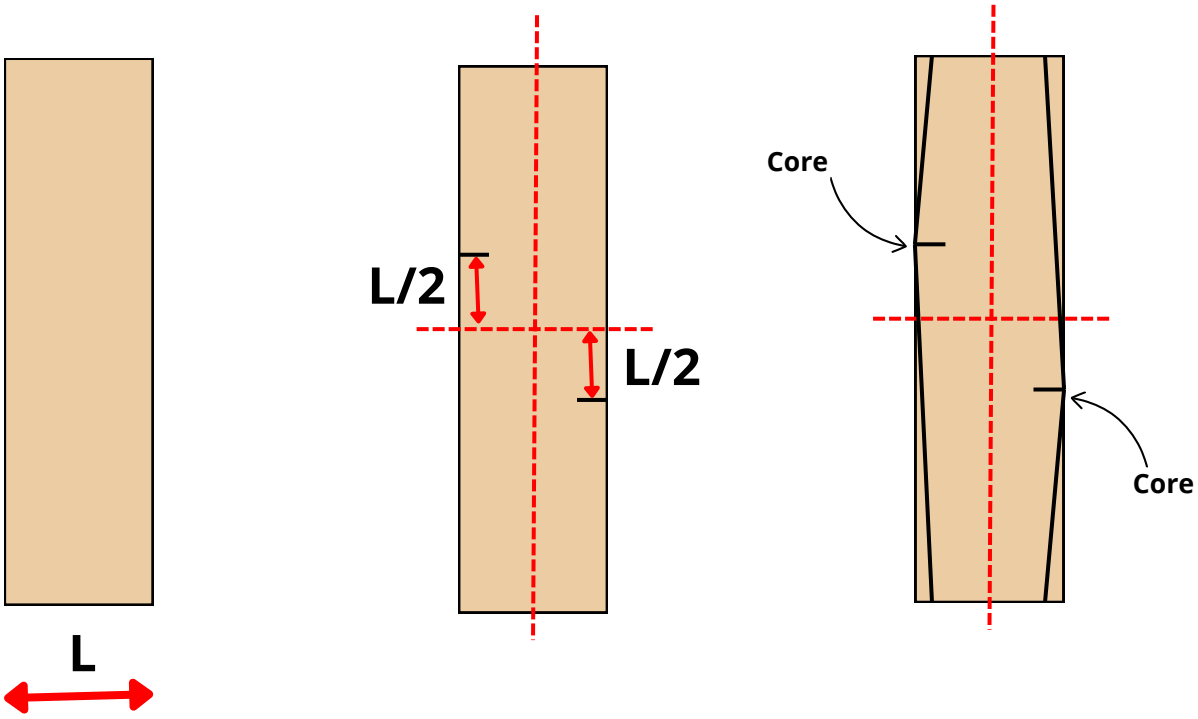
05 Jointing

✅ The Solution: "Le Trait Carré"

Le trait carré (literally "the square line") is a simple marking method used to distribute the bending surface of each stave in a balanced way.

🔧 Principle:

- The width of the stave is divided into **two equal parts**.
- This measurement is then marked **on each side of the stave's center**.
- This displaces the core **outward**, **which widens the useful bending zone**.



Practical Tips for Marking Cores

- Group the staves by width:
→ Find the average width for each group.
→ Mark the cores based on this common measurement.

This saves time and avoids measuring each stave individually.

- Place all cores at the same height:
→ This is a quick method used by some coopers.
→ It results in a barrel that is visually uniform.

2- Round Jointing

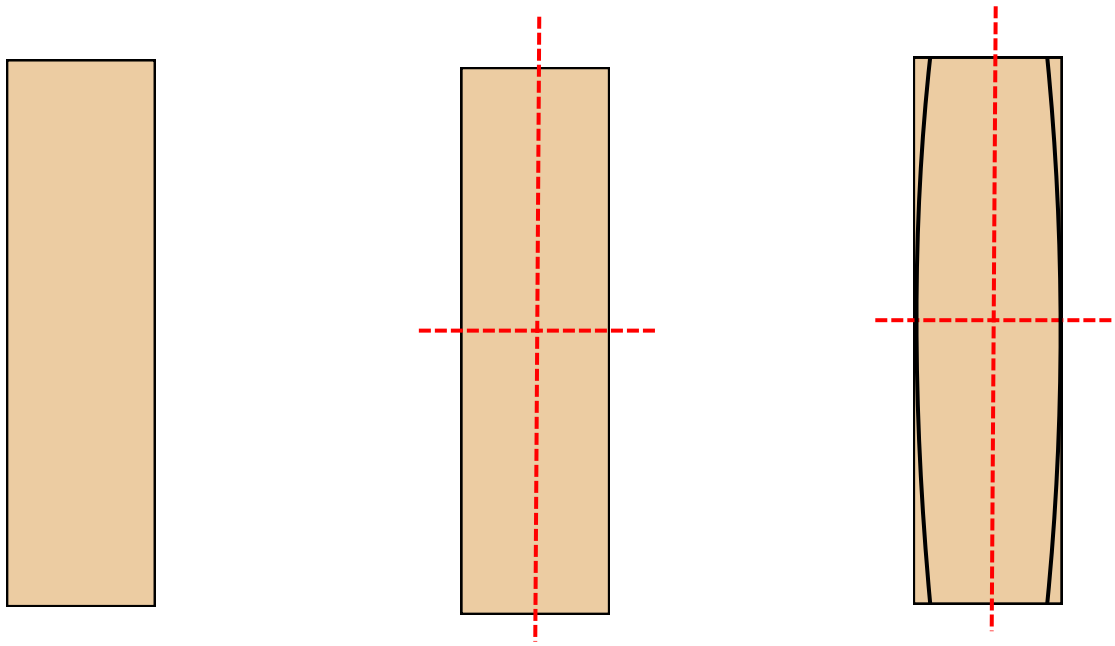
Round jointing is a type of jointing performed by **a machine**, where the **proportions change continuously along the entire length** of the stave's edge, following **a regular curve.**

The slope gradually varies from the top to the bottom of the stave, with no breaks or flat spots.

🎯 The Result

- The stave will **bend along its entire length.**
- The bend is **distributed evenly.**
- The shape of the barrel is **regular.**

⚙️ This type of jointing is often used in **semi-industrial or industrial cooperage.**



Wood is a noble material because it comes from a long cycle. It's up to us to respect it.

LIGNUM.