

ECCE Building Certificate in Sustainable construction



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PARTNERS



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LECTURE 4 : Build in wood and natural materials

General features

Build in wood and natural materials
(Antoine Frouin)



ECCE Building Certificate in Sustainable construction

LECTURE 4 : Build in wood and natural materials

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**Mind map**

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Methodology for building in ecological materials

List the materials available locally
 Make the choice of the main insulation and constructive principles
 depending on the physical constraints, the use of the house, opportunities!



Methodology to build a beam column structure

The different uses of the beam column
 Material
 Equipment
 Workshops



La Colporteuse : the social project

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Reconstitute habitation lac de
constance Unteruhldingen Allemagne

It is essential for the preservation of a healthy land, for our own health as a user of the house, to build in ecological, natural materials.

In order to be part of a coherent approach, this course proposes a methodology of choice of materials and choice of constructive system for this building.

IDEA

Man has always built natural materials -stone-wood-fiber plant-soil to protect himself from animals, climatic elements, and gradually to increase comfort. His approach was initially to use the surrounding materials because the means of transport were inefficient.

This mode of construction prevailed until the 1930s in France and still prevails in many parts of the globe poor, such as the Sahel (land rammed earth), Mongolia (Yurt), or difficult to access.

With the improvement of the means of transport, the appearance of new materials, the dominating weight of multinationals of the building, the regions of manufacture or extraction of these materials have moved away from the place of construction.

The result today: the earth is highly polluted, by the transport of materials, by the creation of products derived from petrochemicals, by the energy expended to produce building materials

...

For example, the manufacture of concrete requires a lot of gray energy (cooking limestone, transport by truck or boat). As another example, the manufacture and use of some insulators require a lot of gray energy, and release solvents into the home atmosphere for many years.



Reconstitute habitation – Constance lake Unteruhldingen Allemagne

This is similar to the methodology formerly used, namely to observe what is available in abundance around the place of construction in terms of materials: natural-biodegradable-recyclable / recycled-

1 ° List the materials available locally:

GROUND	PAVING SLAB	WALLS	ISOLATION	FRAMING	ROOFING
Tires, gravel	Hemp lime slab	Wooden beams poles structure	Pozzolane	Sawn timber, raw wood (round)	Wooden shingles
Stone (cyclopean foundation)	Wooden floor	Contemporary wood frame	Vegetale wool (hemp, wood, linen, cotton)	Brick according to the Andalusian technique	Terracotta tile
Stone and wood pills		Carrier straw	Animal wool (sheep)	Volige board, reed	Schist
Cellular glass / brick		Dirty earth (terre pisée)	Natural straw insulation, wood shavings	Pallet wood	



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2° Make the choice of the main insulation and constructive principles

depending on the physical constraints, the use of the house, opportunities!

In the case here, in Deux -Sèvres, we experience cold and wet winters, and hot, dry summers.

The land on which the cabin is to be built is sloping and rather humid in the winter.

We do not want to transform the biotope of the land too much.

The building must be heated in winter.

The straw boot, in abundance, very cheap and very thermally efficient is the insulation we chose.

Choice of the constructive principles according to the constraints of the ground and the main insulation of the project from Deux-Sèvres

In red, the criteria that we will make the choice

GROUND	GROUND FLOOR SLAB	WALLS	FRAMING	ROOFING
<p>stilt</p> <p>Rise above the humidity of the ground</p> <p>Few digs</p>	<p>Upgraded isolated slab</p> <p>Will allow insulation in the thickness of the structure</p>	<p>Beam poles structure</p> <p>Will allow straw insulation in the thickness of the structure</p> <p>Accredited in France</p> <p>Human expertise available</p>	<p>Carpentry in round wood</p> <p>Do not need special know-how</p> <p>Make it in raw wood if possible</p>	<p>Adapted to the frame</p>

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3° Make the choice in the available materials to execute the chosen techniques

Technical and material choices according to opportunities
In red, opportunities, qualities of materials, human skills available

In red, the criteria
that we will make
the choice

GROUND	Paving slab	WALLS	ISOLATION	FRAMING	ROOFING
<p>Tires / gravel inexpensive, recycling, sustainable</p> <p>Stones in granite (local stone) recovery from municipal services</p> <p>Wood posts Raw or sawn in a fallen tree</p>	<p>Dalle bois sur elevée</p> <p>Sciage d'arbres d'une voisine tombés lors d'une tempête</p>	<p>Wooden beams poles structure</p> <p>Sawing trees of a neighbor fallen during a storm</p> <p>Technical skills from a training center</p>	<p>Straw balls</p> <p>abundance, inexpensive</p>	<p>Reciproque carpentry</p> <p>Chestnut perches</p> <p>Offered and abbatized in a nearby forest</p>	<p>vegetable</p> <p>Only possible cover on the type of frame used.</p> <p>Human skills available</p>

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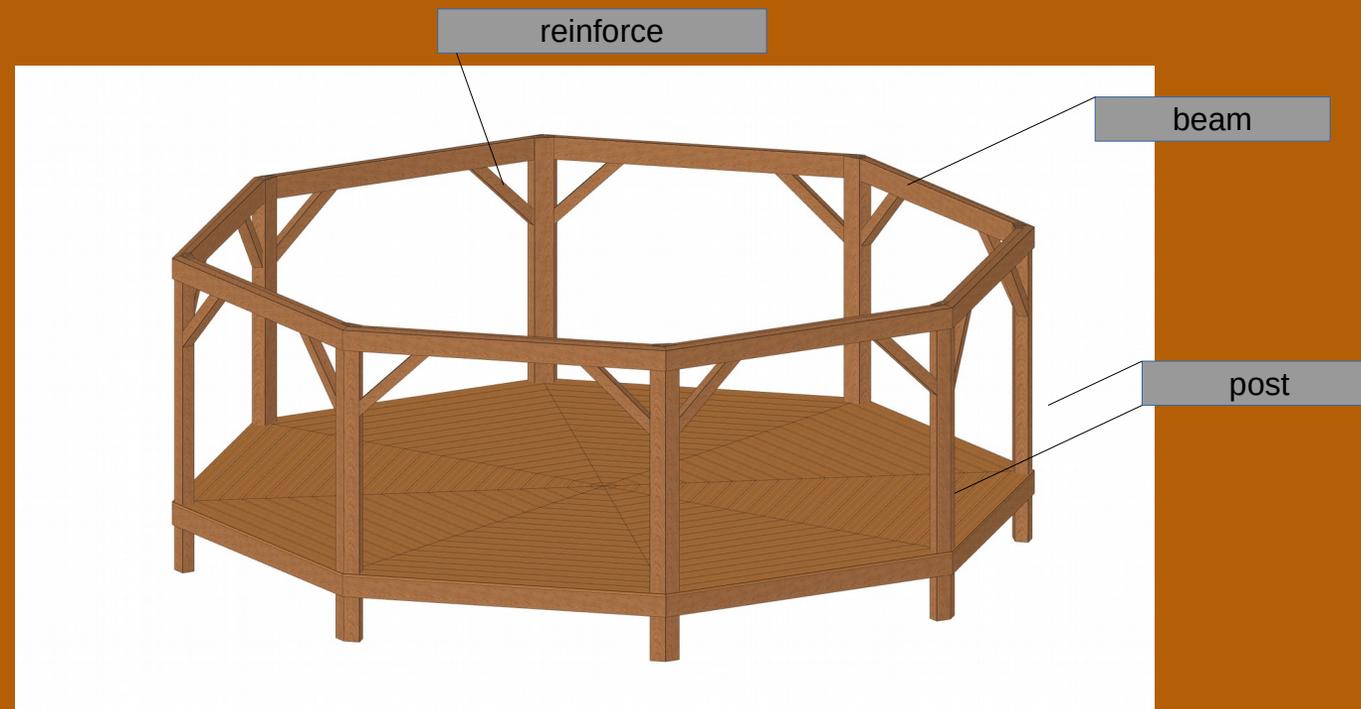
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II. Methodology to build a beam column structure

Definition: The beam column system is a construction technique that consists of connecting vertical columns and horizontal beams with wood / wood or steel / wood connections. This structure is stabilized by pieces of wood called bracing

This construction technique is very old because it allows to adapt to the shape of the wood, so it allows to work with wood recovery.



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1 ° The different uses of the beam column

This technique of construction is very old because it allowed to adapt to the shape of the wood, it thus makes it possible to work with wood of recovery.



Filling in hemp lime



Filling in straw bales



Stilt house

2 ° The methodology to build a braced gantry.

A. Choice of the type of wood:

In the type of wood used, we have the choice between roundwood and squared wood, sawn by a sawmill.

Sciage en
pièces
avivées
Photo:AMIK



Sawn timber is more expensive to buy, but it saves a lot of time in converting assemblies, thus improving profitability



132/5000
Roundwood has a lower cost to buy, but the assemblies require an important know-how and a slower way.

Today the vast majority of works are built of squared timber, so we will study this technique of building a gantry beam column with this type of wood.

In the case of a shelter sheltered from bad weather, we can choose all types of lumber such as: Epicea, Pine, Pine Douglas Fir, Oak, Chestnut ...

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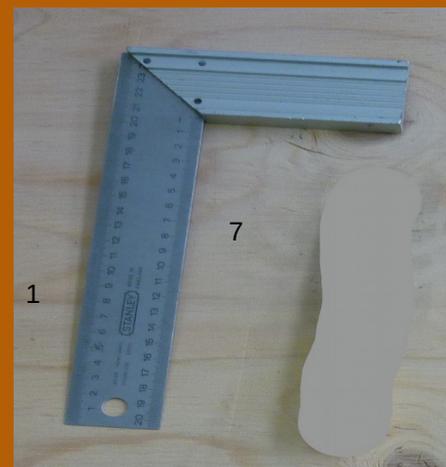
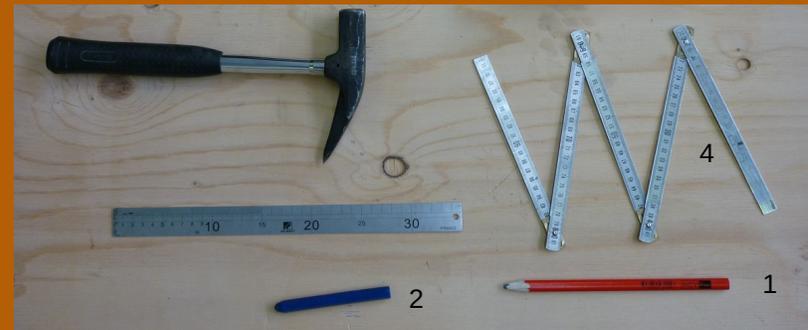
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B. Type of material:

Carpenter's pencil 1
 greasy chalk 2
 Tape Measure 3
 Carpenter's gauge, meter with branches 4
 Greenhouse attached, 5
 Hand saw 6
 Heel square 7
 Spirit level 8
 Satchel size 9



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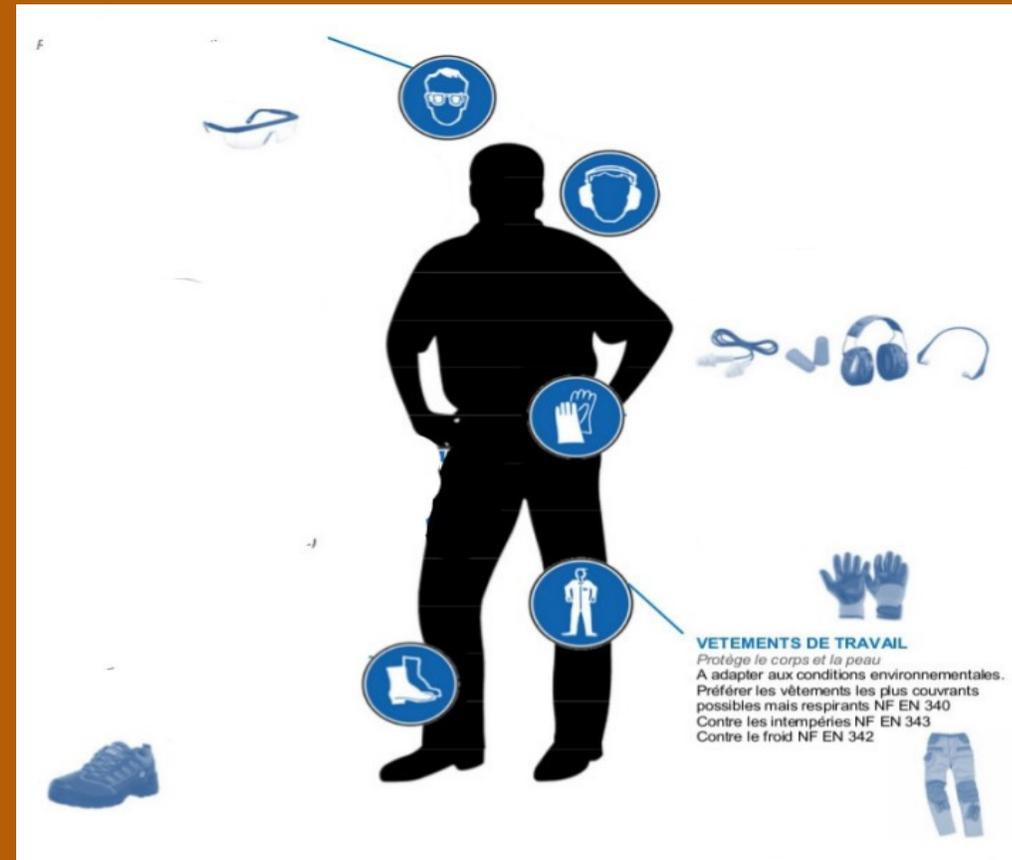
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C. Protective equipment individual

INDICATIVE DATA, see regulations in each country

Protective glasses against projectiles 1
 Hearing protection 2
 Gloves 3
 Workwear 4
 Safety shoes 5





Mind map

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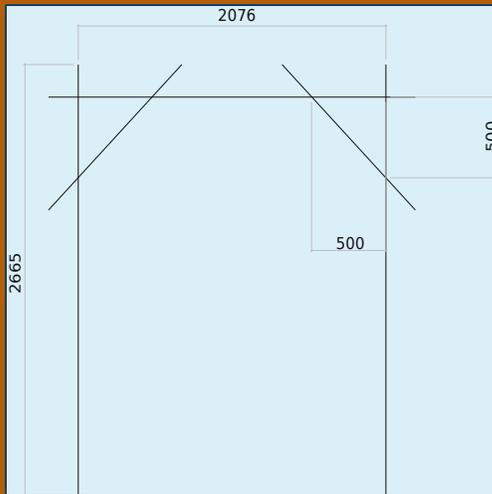
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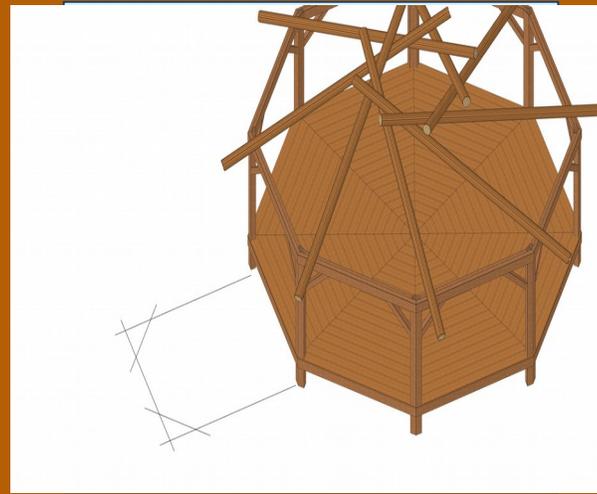
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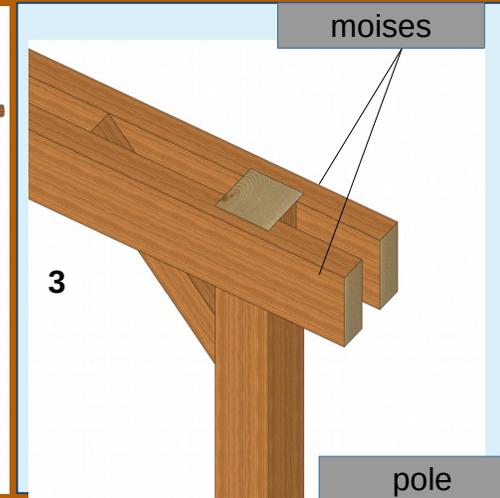
Methodology to build a beam column structure



STEP 1:
Make a drawing at 1 / 10th of our project.



STEP 2:
The simplified design of the portico is drawn directly on the ground. The diagram shows you what this line corresponds to.



STEP 3:
We choose for reasons of convenience to use a vertical beam molded (composed of 2 pieces of wood)



STEP 4:
We cut the joints between the beam and the columns because we know the section of the woods.

STEP 5 : Put on line



STEP 5A:

Once this drawing is done on the ground, we put the wood on it to trace the assemblages.



STEP 5B:

We establish the woods, that is to say that we attribute a number to each piece of wood, which will allow us to find ourselves there at the final assembly!



STEP 5C:

We now place the wooden faces precisely on the lines of the sketch. As a result, the posts and beams are placed squared between them (the outline of the epure is of equerre)

STEP 6 : Drilling assemblies



STEP 6A:
Once the structure of **equerre**, the restraint links placed at the locations drawn according to the plan,



STEP 6B:
the whole is served with greenhouses so that everything stays squared during drilling



STEP 6C:
pierce all the pieces of wood with a structural drill at the same time,



STEP 6D:
to insert structural bolts with a diameter of 12mm to 16mm for example



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STEP 7 : Lifting the structure



STEP 7A:

The principle is to lift an assembled gantry, stabilize it with struts (symbolized in red on the photo), maintained by clamps.

Lift a second portico parallel to the first, stabilize it with struts.

Then connect the 2 gantries with a beam and its bracing links, which are held together with greenhouse joints in a first time



STEP 7C:

Then place the last beam with its bracing links.

When the horizontal parts of the structure are level and the vertical parts are level,

We fix the pieces of wood permanently.

When all the pieces of wood are fixed together, everything is stabilized.

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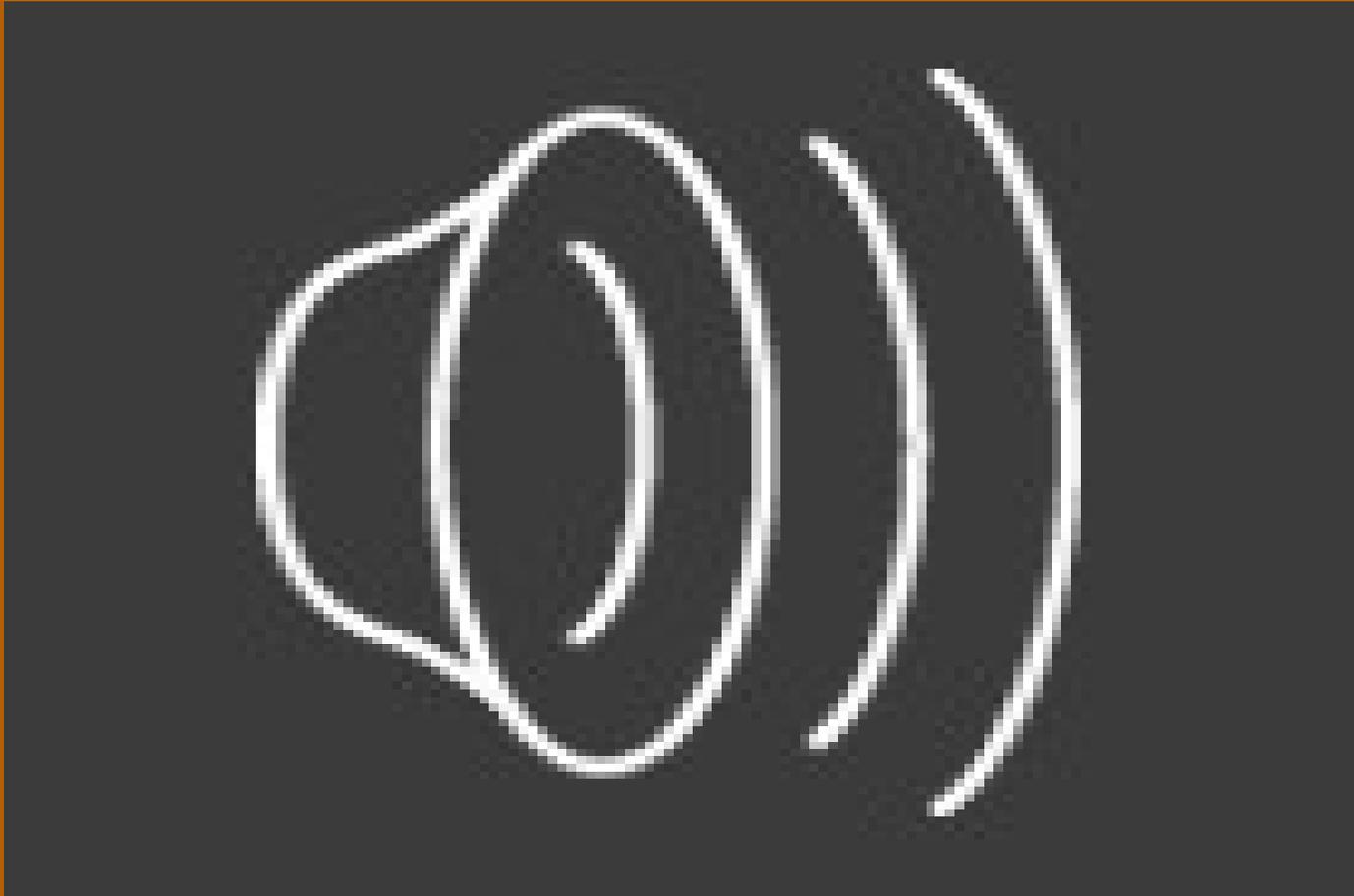


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Video 1 / 2





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« Hello,

My name is Antoine Frouin, I am a carpenter for 10 years, trainer and supervisor of participatory construction site for 6 years.

With the association La colporteuse we organize participatory building sites of traditional framework with various public for 6 years.

Can you detail the construction technique presented in this course?

The technique that we will detail is the technique of construction of wooden beam columns. This system consists of porticos in red on the photo, assembled with traditional assemblages.

The beam post is a construction technique of structural structure called gros en francais, which allows to support other structural elements such as frame, roof, floor.

So we will detail during this course :

In a first part the type of wood that can be used in this technique,

In a 2nd part the type of materials that can be associated with it between the frames

then in a 3rd part the different stages of tracing, machining and lifting.

Part 1. The types of wood chosen in this course are naturally resistant to local insects and fungi: they are the douglas pine, resinous tree the oak, leafy tree; The wood used will be squared wood, sawn in a sawmill, for productivity gains, although this technique can be used with roundwood.

Part 2. Thanks to this technique, we can use various types of ecological materials:

The straw boot, detailed technique in the English part of this course

it is a good thermal and acoustic insulation, and ensures a good regulation of the humidity level in the house



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Hemp concrete (mixture of hemp, sand, lime) sandwiched between the posts good thermal insulation and accoustique, and ensures a good regulation of the humidity rate. This concrete possesses in addition a strong capacity to store heat, what one calls the inertia

Hemp blocks are hemp block having the same properties as hemp concrete with the advantage of prefabrication which allows to accelerate the building site

The mud is an old technique, rather reserved for the internal partitions weak thermal insulation capacities but has a strong inertia, a strong capacity of soundproofing, a very good capacity of regulation of the hygrometry, the humidity rate in the House.

3rd Part. the beam column technique proper:

We will study this technique, in this European project of the supporting structure through the construction of an octagonal structure to receive a reciprocal framework (detailed technique in the part of the country of Wales)

As a first step it is essential to make a layout at 1 / 10th of the project:

In a second step, we draw directly on the ground, with a ruler of several meters or a cordex and a carpenter's pencil, the lines that correspond to the faces of the pieces of wood. We trace the crosses of occupations that mark the location of the pieces of wood.

In our present case, the drawing on the ground, called Epure, consists of 2 vertical lines symbolizing the posts, 1 horizontal line symbolizing the beam, and 2 lines traced at 45 ° symbolizing the bracing links.



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1 ° We draw all the woods according to our 1 / 10th:

2 ° The post and the beam are placed on line, hiding the crosses of occupation. We put bracing links

3 ° Adjustment of the assembly, one observes that all the pieces of wood coincide with the lines

4 ° Drilling of the whole, after having everything to tighten with the attached greenhouse.

5 ° Bolting, and tightening bolts

6 ° Lifting of the whole:

For a simplified demonstration in this course, we will see the lifting of a rectangular structure, then we will see the lifting of the octagonal structure.

The lifting of a beam column responds to different stages:

We take the levels of the points of support of the posts, then one places wedges to compensate for the hollows of the ground. Generally, we placed adjustable posts that can be screwed or screwed to adjust the height of the post.

One raises a portico that one places on the holds, then one contrasts it with 2 pins or scarves, fixed to the post with 2 joined or screwed greenhouses.



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Then we raise the second portico, it is violated again with 2 pins. Then it is tied with a piece of wood called sandpit. The joints can be tightened with greenhouses attached to the spades. The bracing links are then fixed to stabilize the structure.

A lift is finished when all the bracing links are fixed, so the whole structure is braced.

3rd Part: the beam column technique proper:

Concerning the octagonal structure , we lift one jigger that is temporarily bridged with scarves.

It is then tied with a pole and a sandpit, and its bracing links.

And so on until the final result, ready to receive this reciprocal framework. »

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II. La Colporteuse : social project

La Colporteuse is for 11 years a place of experimentation of living together and citizenship.



Our main goal :

to contribute to the improvement of living together, sharing, solidarity, leisure, discovery, fulfillment ... on the scale of our territory : l'Argentonnais



- * our activity is for everyone, regardless of age, nationality or social origin and cultural.
- * as an association of popular education, we rely on a participative pedagogy which favors the taking of initiative, values the commitments of each and unites the forces and intelligences of all.
- * Our project is based on a place of high heritage value: the castle of Sanzay which we ensure animation and restoration.
- * we are now recognized in our expertise in the field of youth projects volunteers and member of the national union Rempart.

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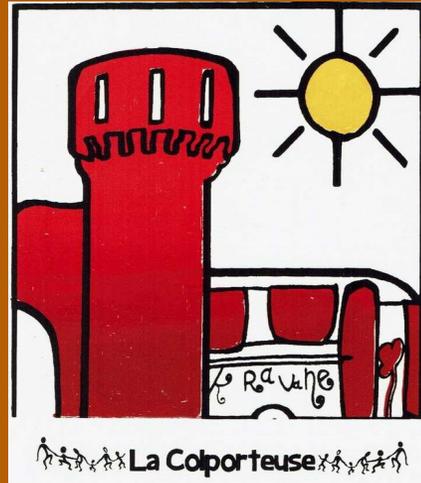
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II. La Colporteuse : social project

THE GREAT
VALUES :

"The right to
dream with
your eyes
open"



"A place
open and
going to"

We often invite
locals to come to
the castle, we also
want to meet the
individuals by
carrying our
animations closer
to the population.

We want to leave
room for the
imagination, to
highlight the
sensitive side of the
individuals who is
one of the **essential
tools of creation**



II. La Colporteuse : social project

THE GREAT
VALUES :

"A breeding
ground for
creative
cooperation"

We want to create
collectives to be
able to immerse
everyone's ideas
and create places
of
collective creations
where everyone in
his place.



"A breeding ground of
expressions,
experiences and
initiatives"

Our work around youth and
openness to the whole
territory will allow us to
become "Birth attendants"
or "project facilitators"
recognized in the territory.
We want accompany young
people and younger to
allow the territory to have
important initiatives of the
local population.
Allow the inhabitants to
realize their project can
make the territory more
attractive, by giving it an
opening image on

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II. La Colporteuse : social project

THE OBJECTIVES :

1. Be attentive to the expectations and individual needs of each person

2. Make the person aware of his and e them



3. Using the site as a support for the transmission of values

4. To offer a comprehensive and diversified support of the person, thanks to the coordinated action of





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1. The construction of a house made of natural materials:

- a) is a recent phenomenon, dating back to the 2000s
- b) is a process that has been used since the dawn of time
- c) which has not been proven for a very long time

2. The gray energy is:

- a) the color of the dust that escapes from a material when it is cut
- b) the energy consumed during use-the life of the material
- c) the energy consumed during the extraction, processing, transportation and recycling of the material

3. The construction methodology in recycled materials is based on:

- a) my certainties and personal knowledge
- b) search for locally available materials
- c) the search for perfection of energy

4. An ecological material is:

- a) a material derived from a recycling stream
- b) a biodegradable material
- c) a material that requires little gray energy and use for use as a building material



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5. When choosing a construction process with recycled or local materials:

- a) the structure adapts to the type of insulation chosen
- b) the insulation adapts to the type of structure
- c) Insulation and structure are determined by the price of materials

6. The beam column technique:

- a) does not require preparatory drawing work
- b) requires drawing a reduced-scale plan
- c) requires a very expensive computer to make the plans

7. Drawings on the wood:

- a) must not be very precise in the case of the beam column
- b) may require training
- c) can be done by a show of hands

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8. The sketch a simplified drawing on the ground:

- a) it is referred to at the beginning of manufacture, then it does not matter anymore
- b) we refer to each step of the work on this route
- c) it can be done in a hazardous way

9. Lifting is a stage of construction:

- a) where it is necessary to secure a maximum of the workspace
- b) the moment to be won over by excitement and joy
- c) the order of assembly is not very important

10. The size of the wood

- a) is a safe activity, wood is a natural material
- b) a minimum of precaution can be useful
- c) is an activity where you must be very attentive and protect each part of the body with appropriate equipment



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Erasmus+

THANK YOU

FOLLOW TO LECTURE