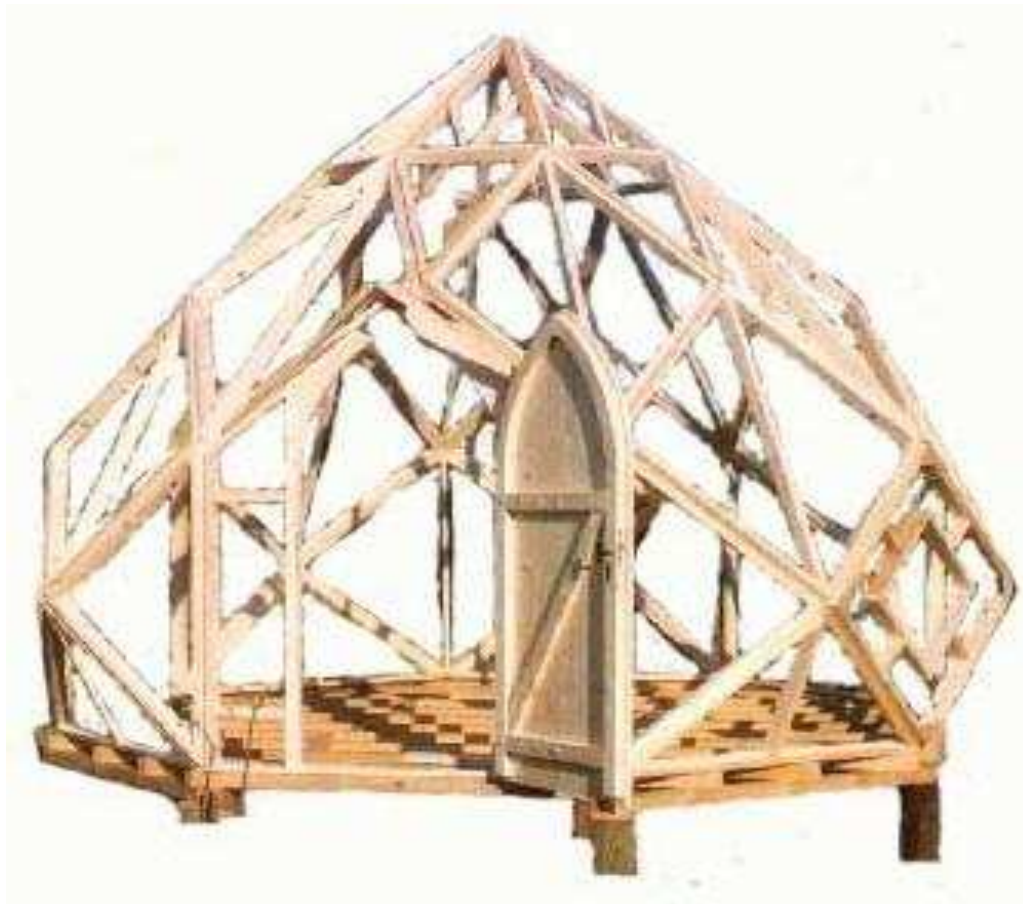




Kali Ji Institute



Building Zome And Dome With Pallet

build a Model
structure Production
preparation of the ground
the structure provide
roofing of

Zome Concept - Dome Design

Zome concrete application of geometry

Zome are geometric volumes composed of lozenges arranged in a double spiral. This family of shapes, of which one find traces in sacred architecture, has a relationship with the laws that govern the living world.

Zome are geometric volumes composed of lozenges arranged in a double spiral. This family of shapes, of which one find traces in sacred architecture, has a relationship with the laws that govern the living world.

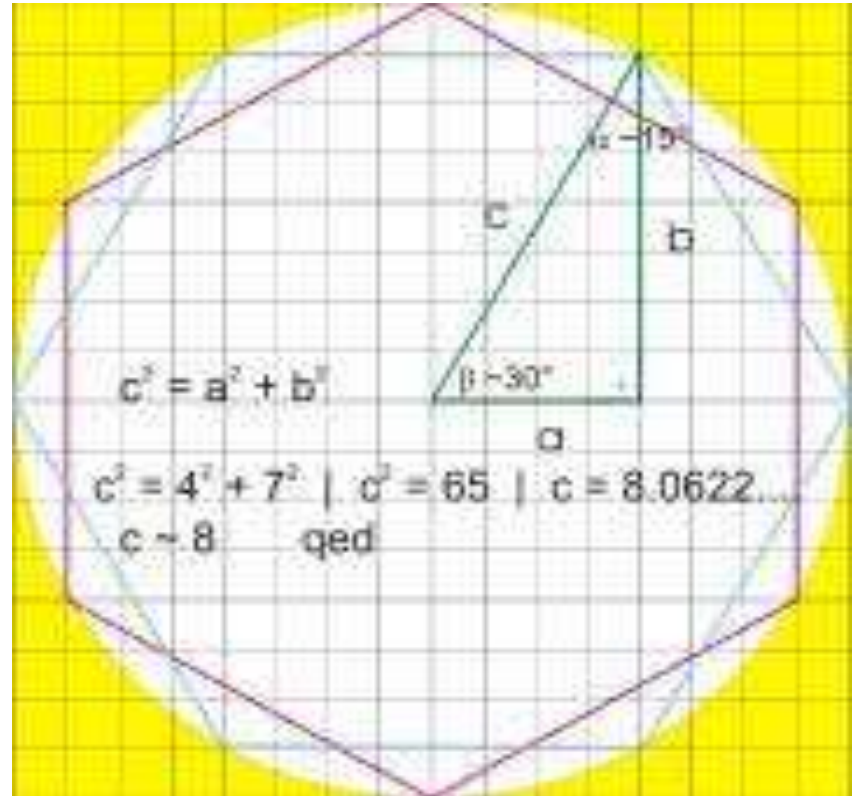
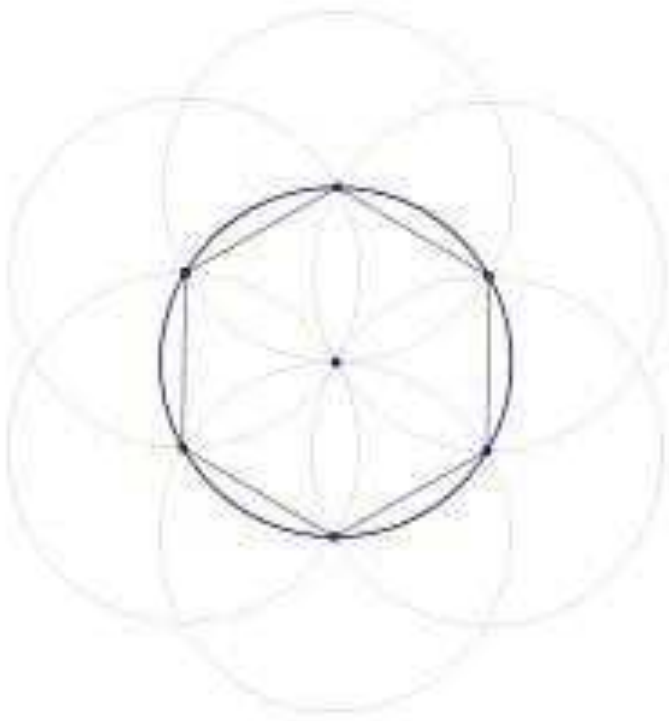
We find these shapes in numerous natural forms such as crystals, honeycombs, and certain plants (pineapples, pine cones, artichokes, etc.).

The term **Zome** is used in several related senses. A Zome in the original sense is a building using unusual geometries

(different from the standard house or other building which is essentially one or a series of rectangular boxes).



We show you the building of a rhythmic hexagon Zome.



**It is neither too simple or too complicated, not too large or too small,
in order to become finished thereby:
a model, for a short view of the world of the Zome.
The suggested method is: classically, gradually and educationally,
... you see a hut, an enclosure, a habitation,**

first The model

-around the volume to understand the facets

- to decide, where to use the door and the windows

This Is the model

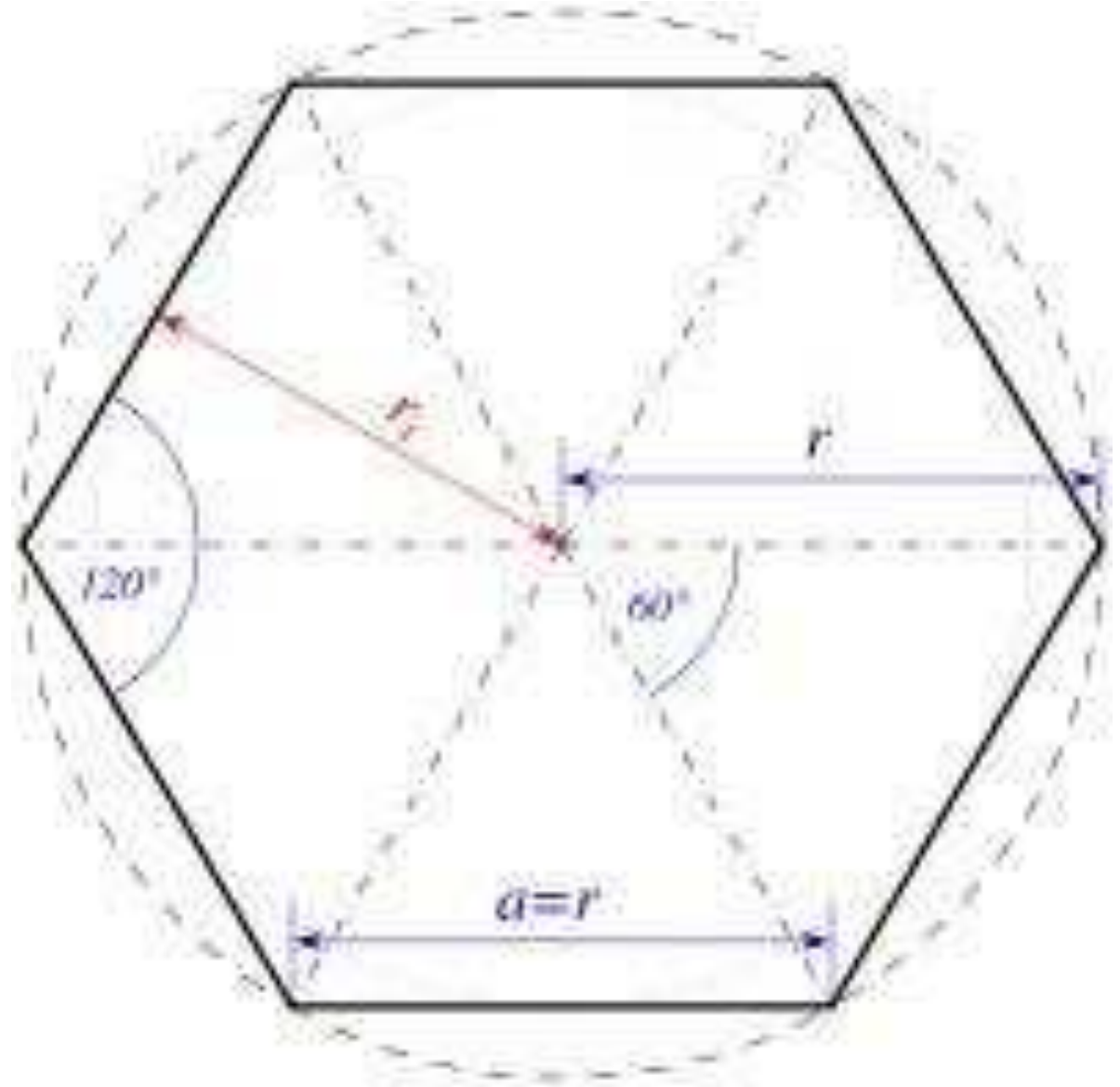
The necessary need:

Which draw and cut,

strong cardboard or

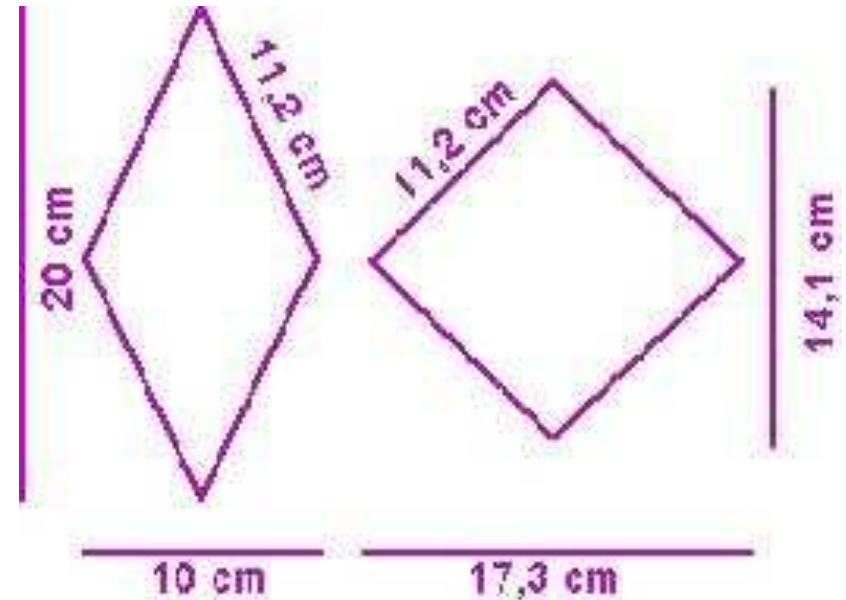
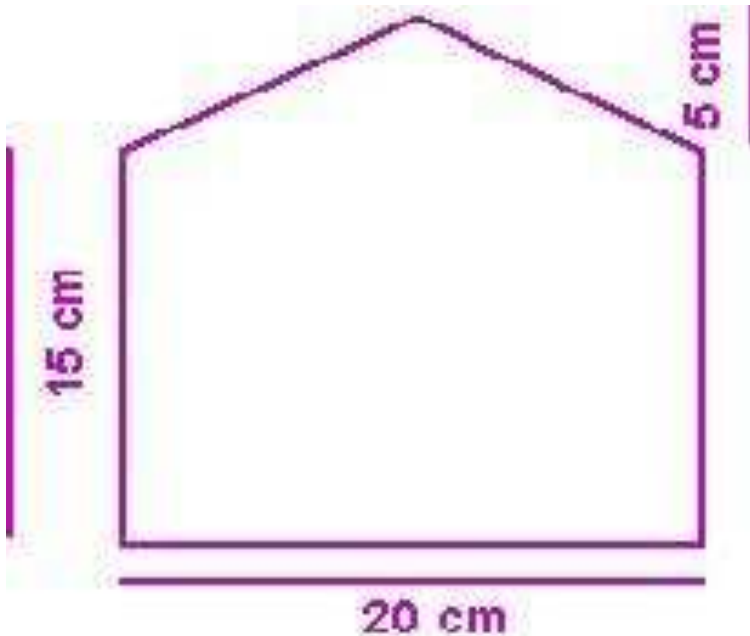
plywood 3 mm

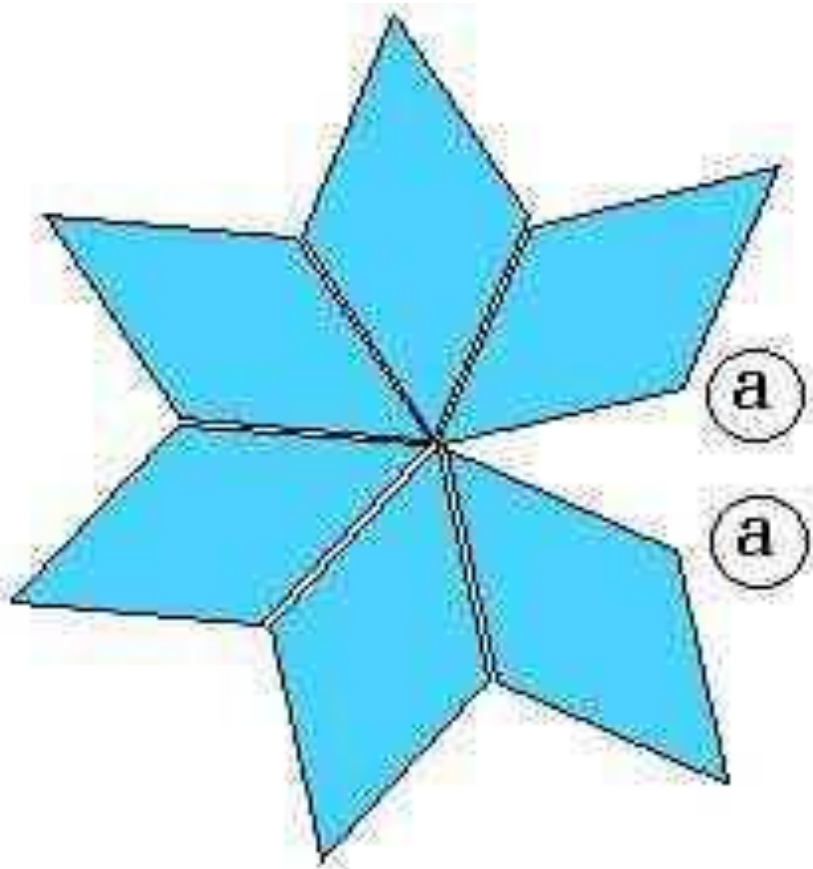
some Scotch or adhesives.



Method

Draw on the cardboard 6 lozenges (even square) of the type 1 (the oblong) and 6 lozenges type 2 draw also the 6 five-angular illustrations (walls) as shown. Then cut out, edges brought together and with Scotch or adhesives the 6 lozenges type 1 together add.





You receives a cone:
the summit of the Zome
If you set now the lozenges

fig. -2 right above between them
(the lozenges -2 in -1),
then one receives the dome
of the Zome.

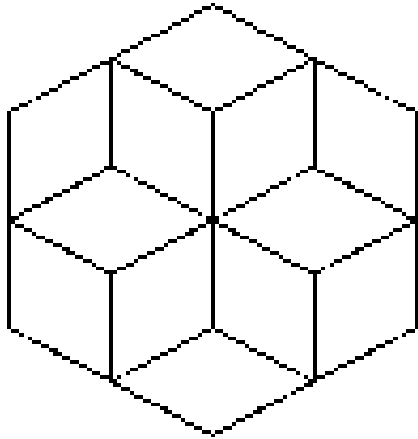
Positioning and Scotched it now
each wall between the 2 lozenges

-2: thus one receives the finished
Zome.

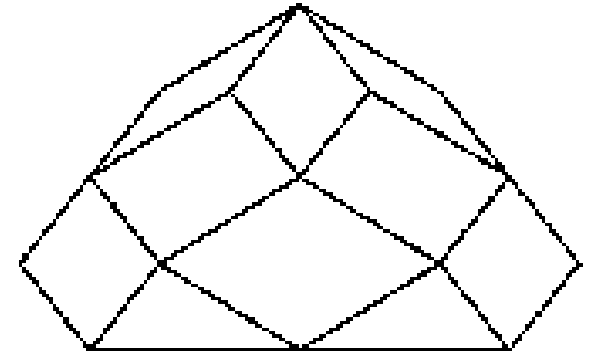
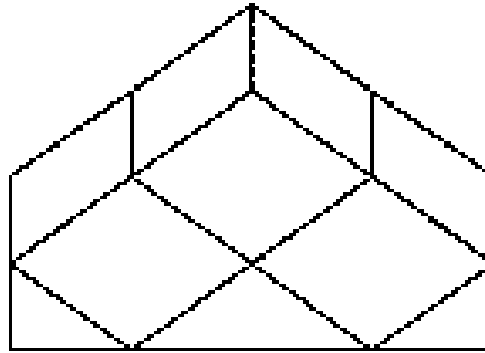
built, your first Zome as model



The Zome 6 - the draft and simulation



Opinion from above
20m2 surface
ground



4m height - 6.5 m diameter Maxi -
number of form 1,618

3DSimulation



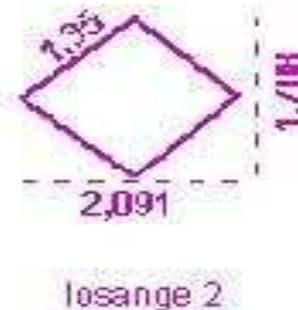
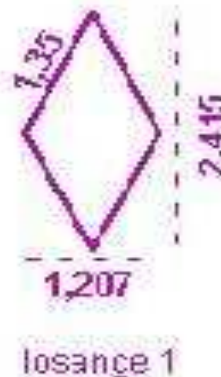
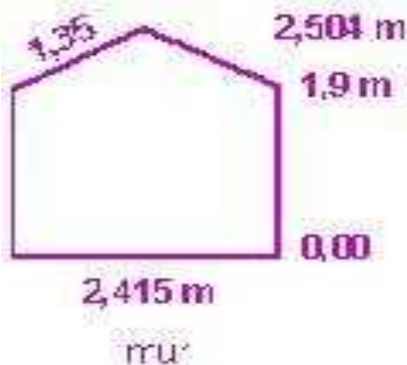
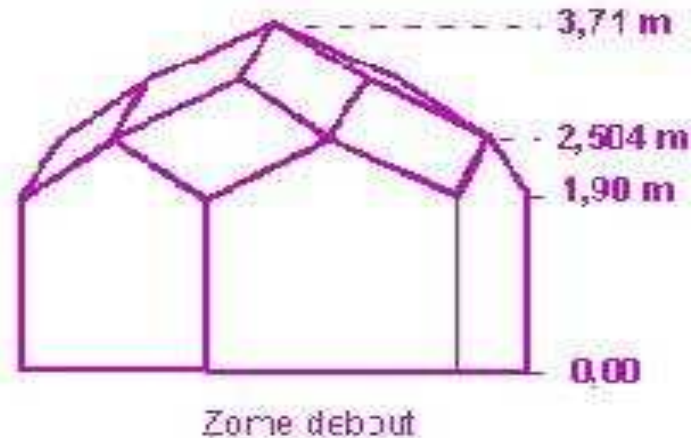
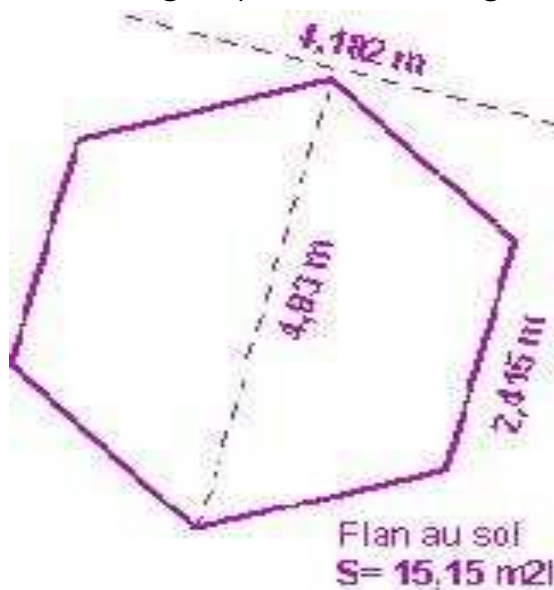
Production of the structure

Dimensions:

We propose the evident dimensions

Those are theoretical dimensions within one Zome. If these dimensions do not fit, and if you mean that the Zome is too largely or too small, too low or too high, change them.

- For change of a length (diameter, edge or side)





Dimensions:

I propose the evident dimensions Those are theoretical dimensions within one Zome. If these dimensions do not fit, and if you mean that the Zome to large or to small is, to low or to highly, change you them.

Here, you work in full size:

You must know that a Zome, like each construction, needs Time and little money.

Our goal is it, to reduce the whole to a minimum.

The structure is important.

For the remainder you can take yourselves freedom, above all,

If you have already experience in the self building.

You made a model and enough thereby played with?

Make further now in full size! You have to work exactly,

what your project is to become:

A hut or a cover, perhaps a residential element?

That becomes, which presuppose details for the construction.

Most decides more for a habitat, so you should make certain that the durability and the comfort (isolation,...!) is guarantees.

With a hut you can be, indulgently at least with the lagging.

computes the relationship of new length former length again.

-A multiplying all lengths (by exception of the height of the walls 1,9m) from this report

- to removing , which pleases you to 1,9m after more highly or lower, replace

The material

Tools: We must measure lengths and angles, cut out and install we can with handicraft witnesses: Saw, hammer, hand screwdriver: Circular saw, drill press, accumulator nut runner or more heavily: Circular saw on the table.

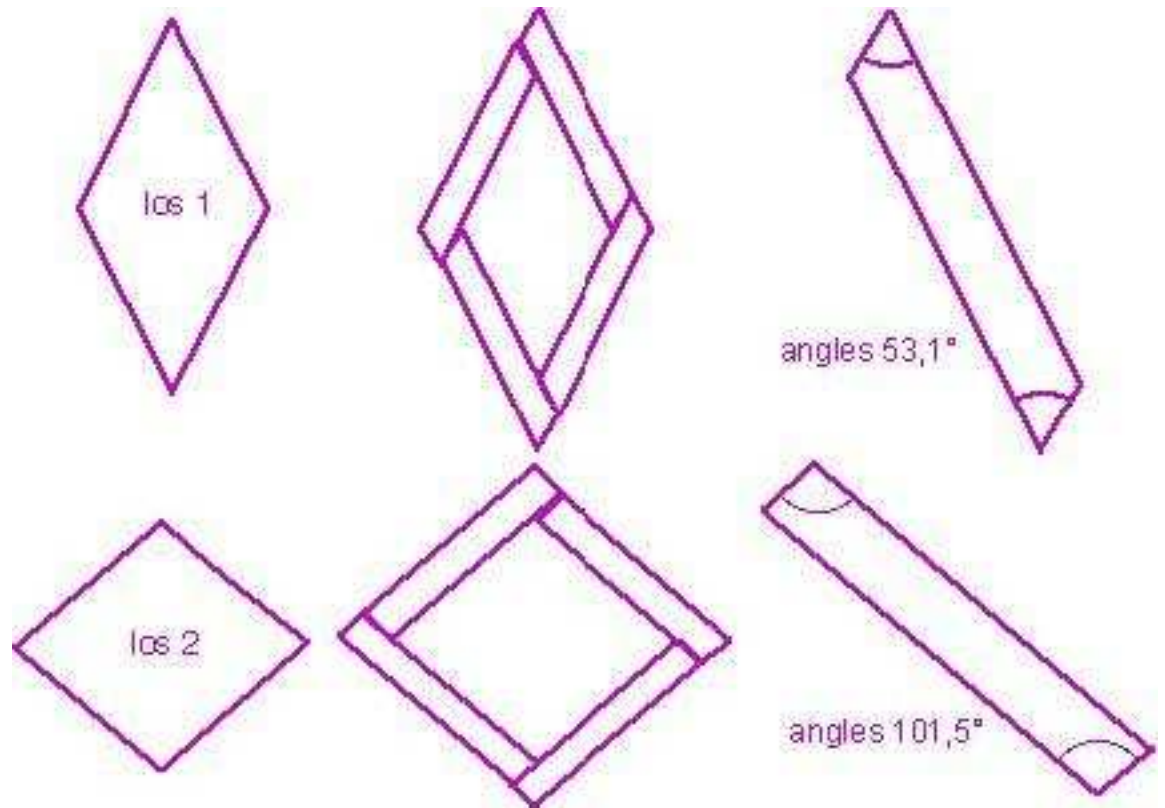
Or a combination of these instruments, depending upon which you has.

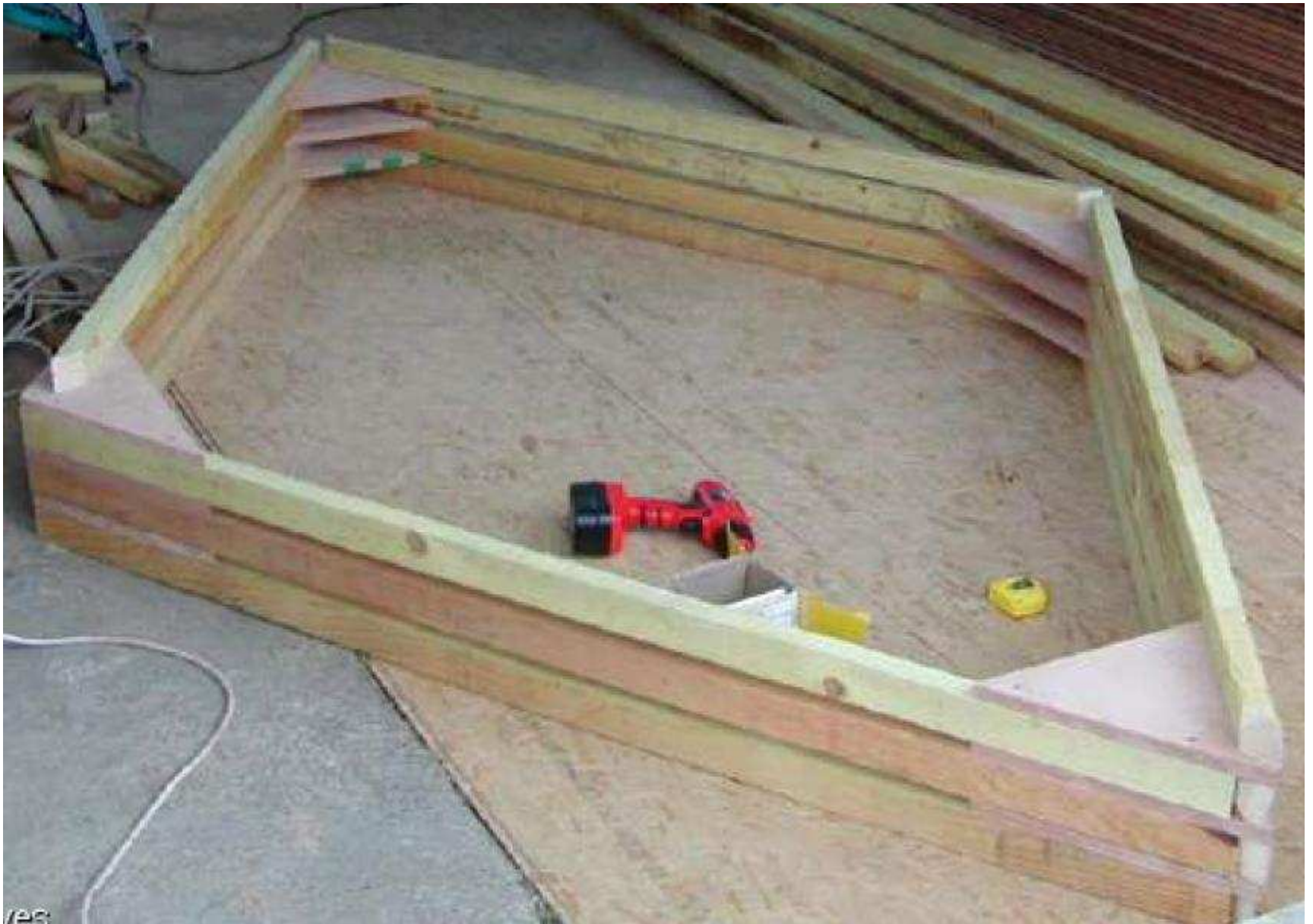
Wood: Select a wood easily, softly and firmly: Jaw is tidy, jaws north or Douglas is better. Selected size: 110 x 32 (mm) - important: all woods equal are and the same dimensions have if the wood drying are not, may you not wait.

The organization the props and frameworks

-See like the props are
arranged

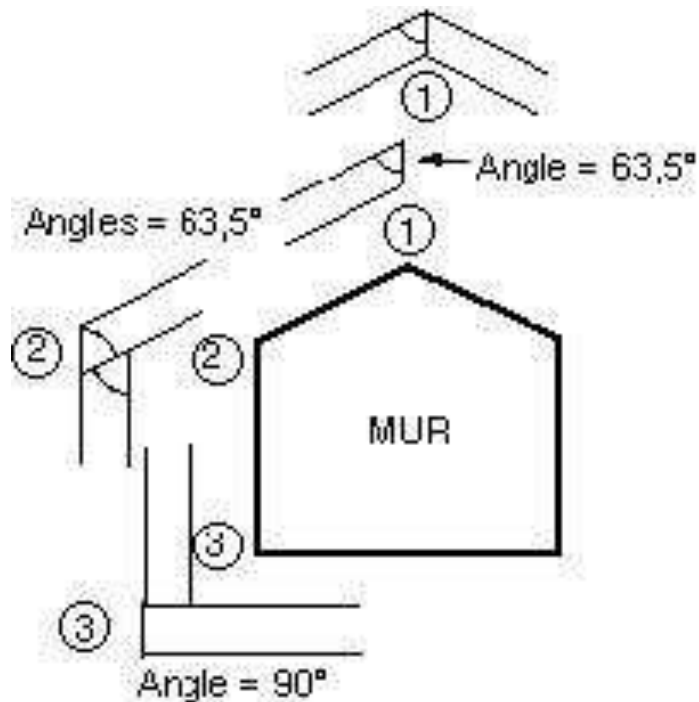
-For each kind of the
lozenges, there is a same
length and the same angle
Actual dimensions with this
structure thick and
arrangement (32 mm).





Please consider:

-The width of the structure was selected, in order to take up the isolation - the dimension does not change you can selecting another up to 60 cm down for a model or a small hut - the thickness changes dimension and is suitable from 25 mm to 40 mm depending upon which wood, you finds (110 x 32ist usually).



1 mur

1 montant bas

2 montants verticaux

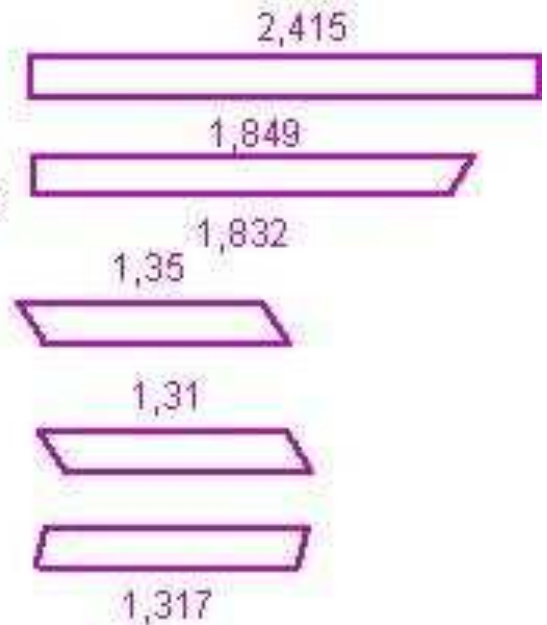
2 montants hauts

1 losange 1

4 montants

1 losange 2

4 montants



***** If the same thickness takes (32mm), other dimensions of the Zome, changes not the differences between the theoretical and actual dimensions.**

If you take another thickness, computes one the following and makes corrections at the theoretical dimensions.

Lozenge height of 1:1,25 x e

Lozenge height of 2:1,02 x e

perpendicularly to the wall: 2.12 x e and 1.62 x e



That sounds a little complicated?
A Zome is mathematical and if you liked another model, than I suggest,
you must make some calculation

Example:

**I would like a diameter of 5.555 m and the same height of the walls with at least (1.90 m)
and I have wood of 38 mm of thickness**

**If you take the same thickness (32mm),
but other dimensions of the Zome, do not change the differences between the
theoretical and actual dimensions**

**If you take another thickness,
computes the following and makes corrections at the theoretical dimensions.**

Lozenge height of 1:1,25 x e

lozenge height of 2:1,02 x e

perpendicularly to the wall: 2.12 x e and 1.62 x e

The yardstick coordinates would be:

1,1501 thus 1.150 and results in the new theoretical dimensions

-A length of the edge (lozenges length and wall height) $1.35 \times 1.15 = 1.553$ m

-a Zome side of 2,777 m

from the real dimensions:

-Edge of the lozenge 1:1,553 - $1.25 \times 0.038 = 1.553$

-0.0475 = 1.5055 is 1.505 or 1.506 m

-Edge of the lozenges 2:1,553 - $1.02 \times 0.038 = 1.514$ m

**-Perpendicular to the wall: $1,900 - 2.12 \times 0.038 = 1.819$ m and $1.900 - 1.62 \times 0.038 = 1.838$
m - not more complicated than that.**



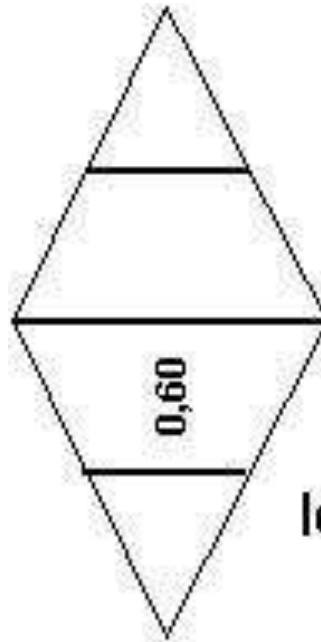
Between lying bracings and reinforcement

Lozenges diagonal becomes triangle, which will strengthen the lozenges. The other elements between we use the Lozenges 2 over the isolation on increase to hold and the cover.

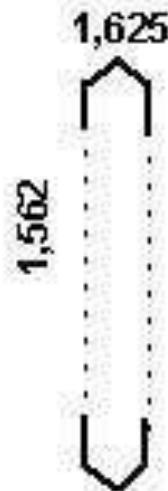
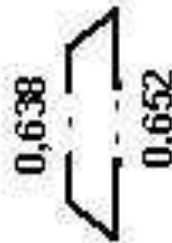
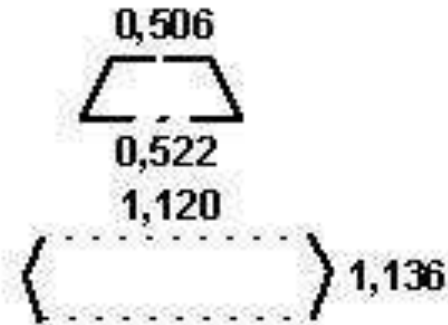
The distance amounts to about 60 cm.

Solid walls (without opening)
For the upward gradients, the reinforcement play the same role, but is not enough to make stable around them, (one sees later in the detail).

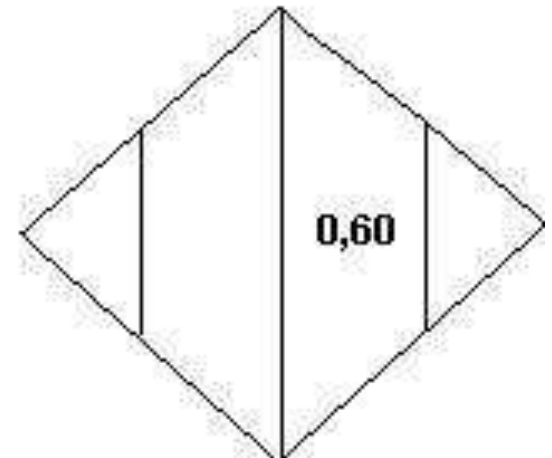
Walls with openings
(Door or window) It is at the time, the situation of the openings, their number and their size and the intermediate measures to be in detail specified, they finish the building.



losange 1



losange 2





cut and assembly

The dimensions are in mm

and angles of 1/10 degree exactly.

The material wood and your tools don't permit this precision. Only one error of 2 or 3 mm in the length is permit or 1 or 2 degree for the angle.
(more, if it is to become a hut)

**Cut all lengths and arrange
it after categories.**

60 lengths of 2m 31 lengths of 2,50m

24 lengths for frameworks of the lozenges

1 and 6 diagonals

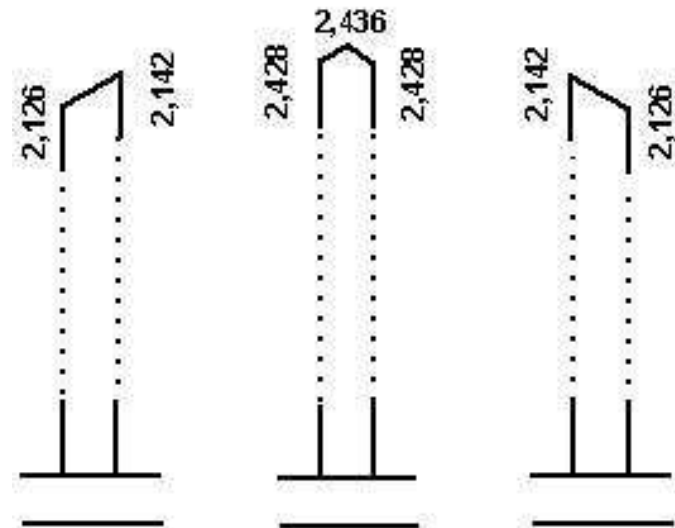
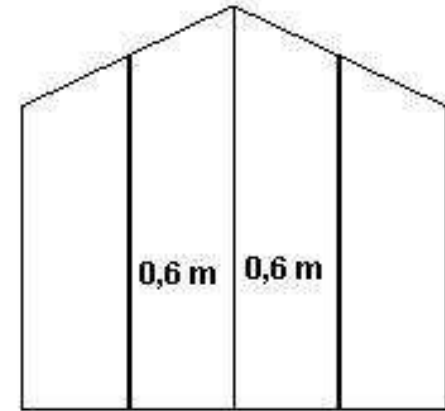
24 lengths for frameworks of the lozenges 2
and 6 diagonals and 12 connections

6 lengths keels for the walls and

12 lengths for frameworks of the walls

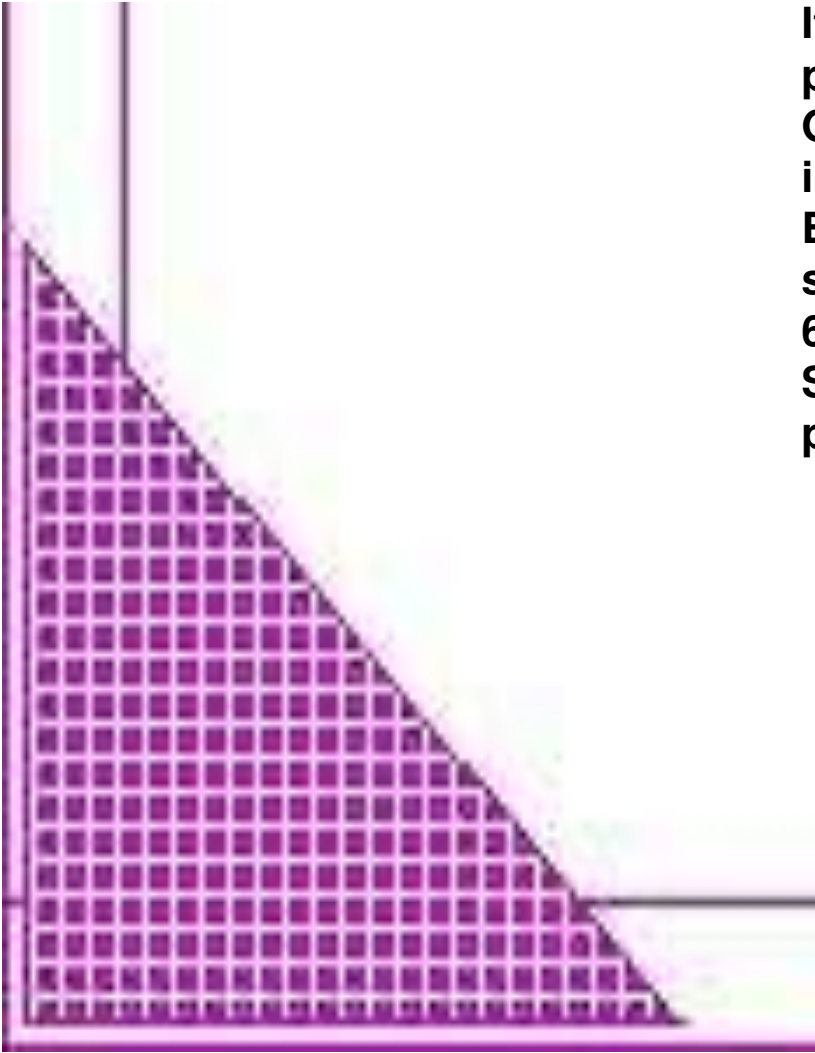
12 lengths for the upper frameworks and
1 large length and 2 shorter for each filled
wall.

Mur Plein





Select a flat ground, to the assembly!



If your ground is a little inclined, lay in two plates plywood or OSB.
One can draw on it and nail mounting plates, in order to set all lighter together.
Build the height up of the framework and screw (or nail) it the angles (nails of 70-80 or 60 mm boring it if necessary also forwards).
Stops, it everything well at its place with this procedure.

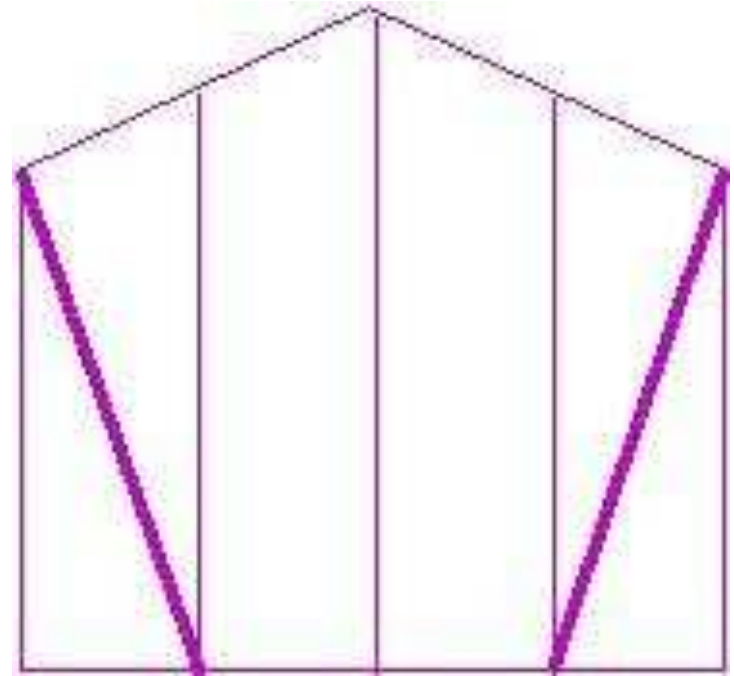
Guarantee, that the theoretical dimensions ok, the outside framework are right and that there are no errors in, set then the diagonal for the gaps and fasten them also.



For the walls, screws it after examination of the angles in each angle a rectangle from plywood or OSB of 30 cm edge length for instance 5mm inward, thus they do not disturb later when general assembling.

**These elements are later removed, if the outside coating provides for stability.
If you do not fasten the internal lengths on at least 2 walls OSB plates.**

**For the walls with openings,
Install the frameworks, cut and install the necessary lengths as used: It is advisable to take a broad to the length more or double the measures and to leave little play (5 to 10 mm in the height and width). Besides: you can make a broad framework flat around the windows, which will hold water at the exterior and will thus prevent a seeping, or to procure you something in the trade: (Bases broadly with isolation). For the door, the location and the height plan, the lower frameworks cuts out, if the Zome is fastened to the ground.**



I do not advise to vitreous elements on the roof. Questionable are the difficulties with the sealing. If you liked, buy rather a small glass roof in the trade, for the comfort in the summer.

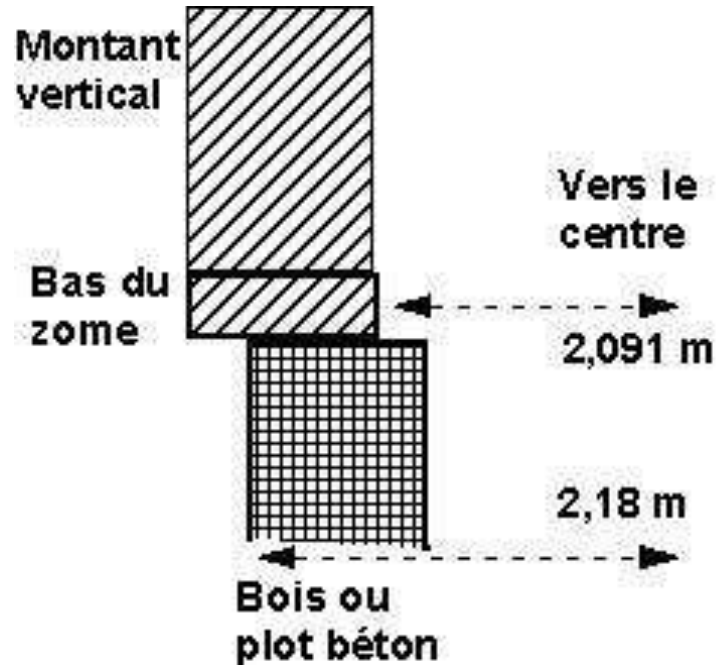
Proceed for the lozenge as for the walls.

**Make thus, all these lozenges and walls,
place reliably the fact that their firmness are contently placing and stores them.**



Preparation of the foundation

You must select now a place, you are better suitable than I to make this decision. If you have the choice, rather a sunny location, with the openings southward protected against strong hoists, with the shade in the summer, a beautiful prospect... These recommendations are surely super intelligent. The only requirement of the Zome is to be on an even surface. Arrange thus corresponding.



Place

Select the center of the Zome and plant a marking bar: That becomes your reference. Make a circle of approx. 2.80 m to 3 m therefore; Smooth briefly the reason as required. The underground of the Zome becomes Platform from wood or a concrete plate.

It positions itself with structure projected from 2 cm for the derivative of the water.



Flatly from wood

Consider the measures specified above.

The posts can be old telephone post for the center and the points of the hexagon.

The level examining and if necessary support.

Over it one nails planks, approx. 10 x 10, over the round and connects the whole with the center for the supporting of the floor.

If you must isolate, you nails from downside something plywood (better metal sheet to the protection against rodents) the isolation is later attached.

Concrete cover

Termination of the Zome the situation,

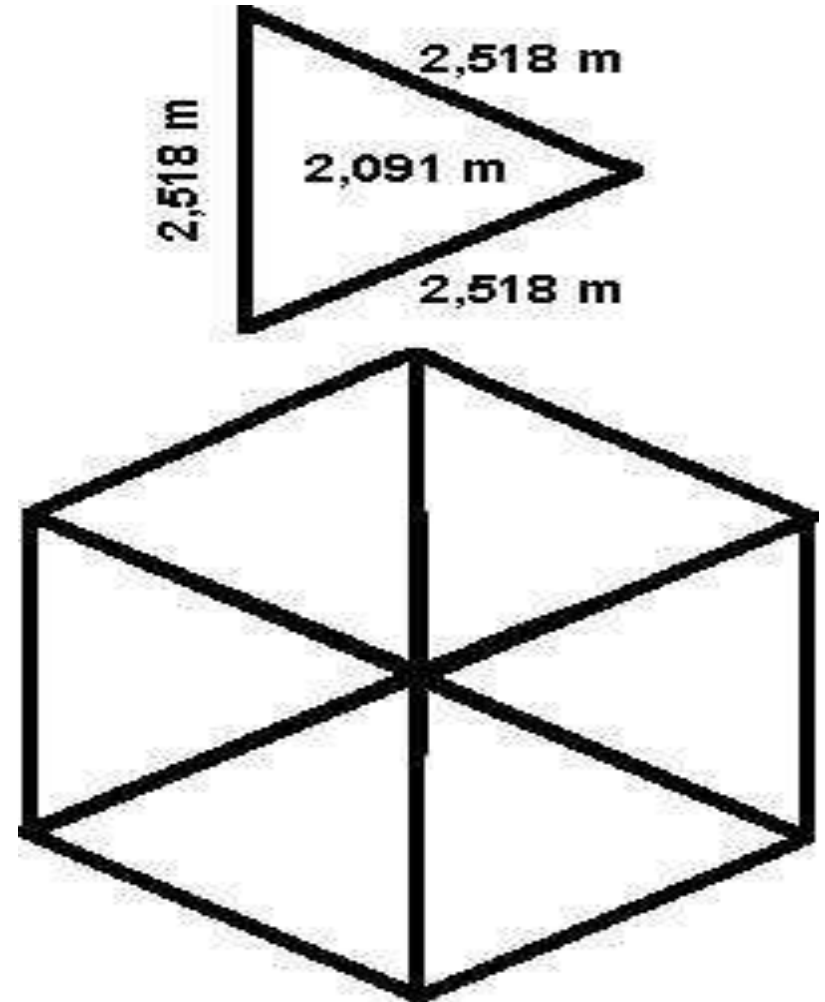
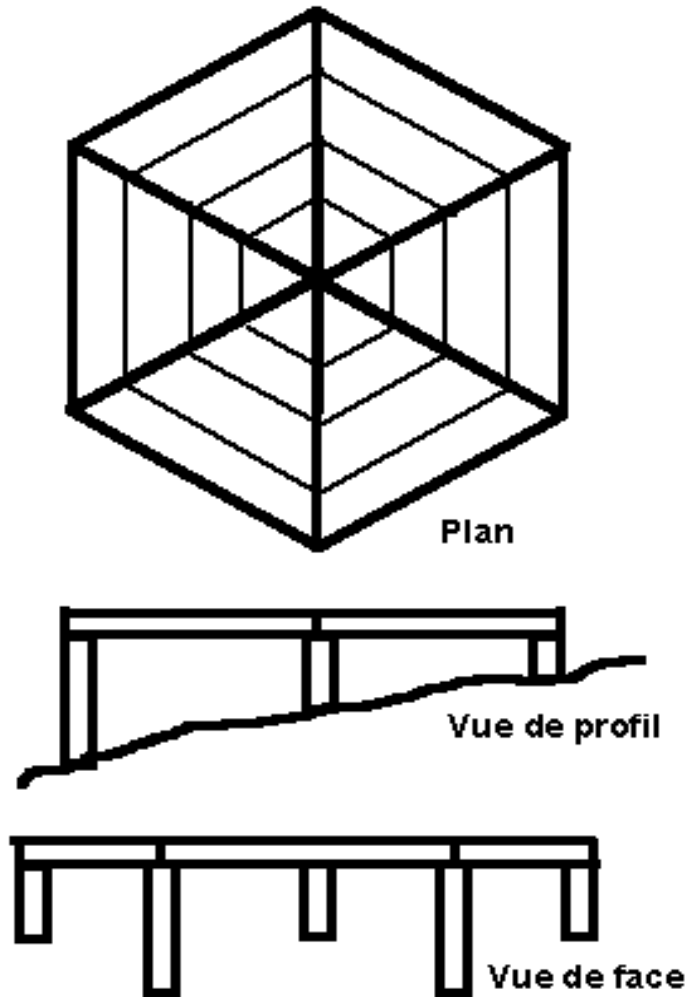
dig foundation ditches and a reason from reinforced concrete cast in.

Again measure around hexagon to determine, as down shown,

Structural steel in the vertical angle use, with a cord connect and then.... Cement



Cement the rows from concrete (10 cm to 20 cm broad) examine the level at the insides of cords, thereby. You know the foundation plate to pouring, but if she is finished, the assembly becomes more comfortable.

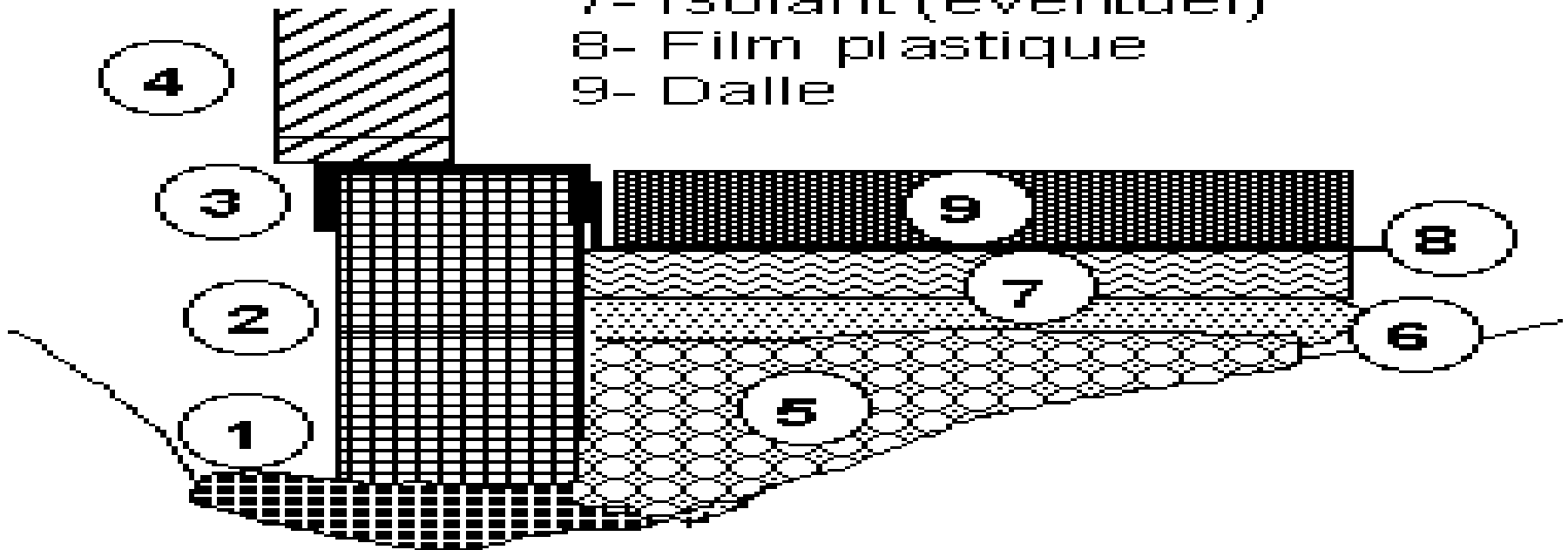




An isolation for the foundations plate is good for a habitat,
it should at least 60 cm be thick.

The plate is from concrete cement (classical), but better is natural lime + sand,
or rammed earth, or lightweight concrete with wood chips, or hemp, or clay,
that would be at the same time isolation.

- 1- Fond de béton
- 2- Blocs de béton
- 3- Feutre bitumé
- 4- Montants du zome
- 5- Gravier
- 6- Sable
- 7- Isolant (éventuel)
- 8- Film plastique
- 9- Dalle





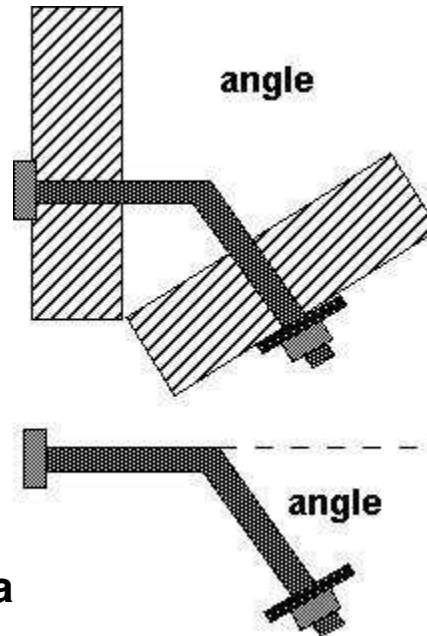
Assembly of the structure

Here the ardently expected moment, at which you provides the area, at this time gives a little fear and much being astonished. But must patience, we still another little tinker, before you invite your friends for the setting up.

Preparation of the connecting pieces

the necessary parts for it are screws 8 mm in the cross section.

They will need in 78 of it:
42 of 14 cm length and 36 of 12 cm, and exactly the same many nuts and spreads wearing parts (and perhaps still a little more, one loses when assembling).
You must rotate the screws, on the place of mounting dependently, in a certain angle, best are , to pout the screws in a vice with 2 metal tubes to bend pliers by hand.
Here you can work with an inaccuracy of +/- 10 degrees.



Here the angles:

18 times 14/er screws around 60 degrees rotates (connection between the walls)

24 times 14/er screws around 52 degrees rotates (connection high walls at the end of the lozenges 1 down on lozenges

24 times 12/er screws around 23 degrees rotates (connection of the upper end of the lozenges 2

12 times 12/er screws around 29 degrees rotates (connection of the upper end of the lozenges 1 between them)

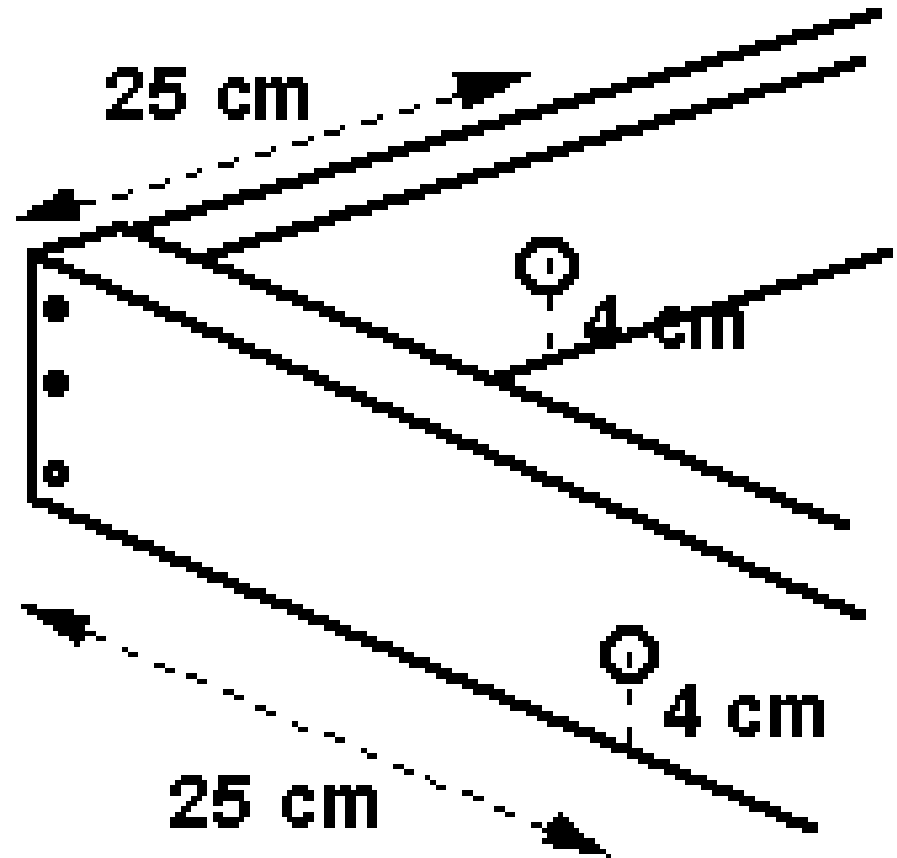
In practice 2 series: long much bent short the few.



Pre-drill the structure

Holes von 12 or 14 mm of 4 cm of lower edge (one can make a template for it).

In all vertical walls 3 drillings 10, 100 and 180 cm at the end of the wall (outside of the plates) Into the lengths of the walls 25 cm of each corner Into all lengths in the lozenges 25 cm on both sides of the individual points





install the walls

For all the assemblies need you leaders or a small stand (it does not become very high), Hammer, 13er key, the drill for changes, and ferrules, at least still two persons more, goes faster

Set two of the wall of fields vertically next to each other place and with 3 very curved screws install, the holes of the upward gradients toward building inside: it holds then already from alone. One wearing part, a mother with 1 or 2 rounds turns, but do not bolt on.

Perhaps one must hammer the screws into the holes, or pout these screws first into a wall to set and then second attach, somehow one will be rightfully.

Extend with the other walls sharpen, to the circle.

Now look for the center of the Zome and sets everything at its place:

Each angle must within 2,415 m of the center standing and

down should the walls still approx. 2 cm over the plate (or platform).

If not trims it everything to the best one. It remains fastening these on the walls:

With peg for concrete or wood screws.



Set the lozenges

The same technology one only works on the stand or with leaders.

Put a lozenge -2 into the formed corner of two walls, everything hold alone if only once to screw are inserted, you could hang themselves on it if it.

Make with all elements

-2 so further, then begins you with the lozenges

-1 and pushes you into the corner of lozenge

-2 building it lozenge -1 in lozenge -2 and -1 in

-2 up to the end away.

Bringing in the last lozenge gives the final firmness and stability.

Perhaps this last crown one must force a little, so that the holes fall together, from here to pull, from there presses par would bolt with the mallet to give,
in the worst case you use a few ferrules,

if you still none nuts-tightened and everything altogether is still more flexible and loose is. The Zome finished rounds (if everything without measuring errors is).

Last end: Vibrate once the entire structure well through, and them find their best place.

Then again from downside,

Now everything firmly screws and the elements adaptation from the center to the summit.

That is everything, this will take one day to you, but no more.

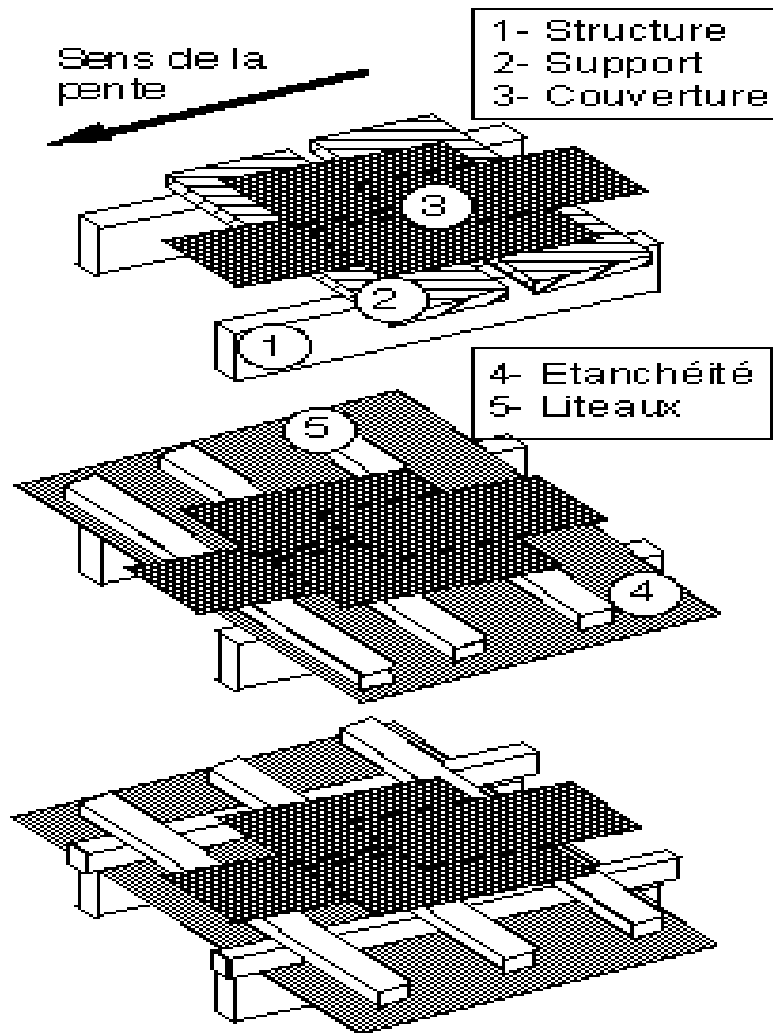
Finally climbing it lively up to the summit.

If the Zome does not break together, you can into the future confidence,
everything that comes in the consequence to it is useful still only with the consolidation



The covers structure

The goal: is not only to protect but also to guarantee that you look Zome from the beautiful outside;



The beauty of the Zome comes particularly of its roof, the composition of the plates altogether. This is a specific problem with the Zome, the inclination of the plates, do not permit the simple use of channel bricks.

One must about the tightness worry and must equally of the lagging think.

For the roof, here 3 materials and 3 different Techniques are planned.

If you plans an isolation, it is better, you closes the boxes of the structure outward, either with a micro-perforated film (umbrella), or with a plate from OSB.

Thus we have first seal.

The coating is carrier-fastened on one: it can be this OSB, and or perhaps also boards/slats.

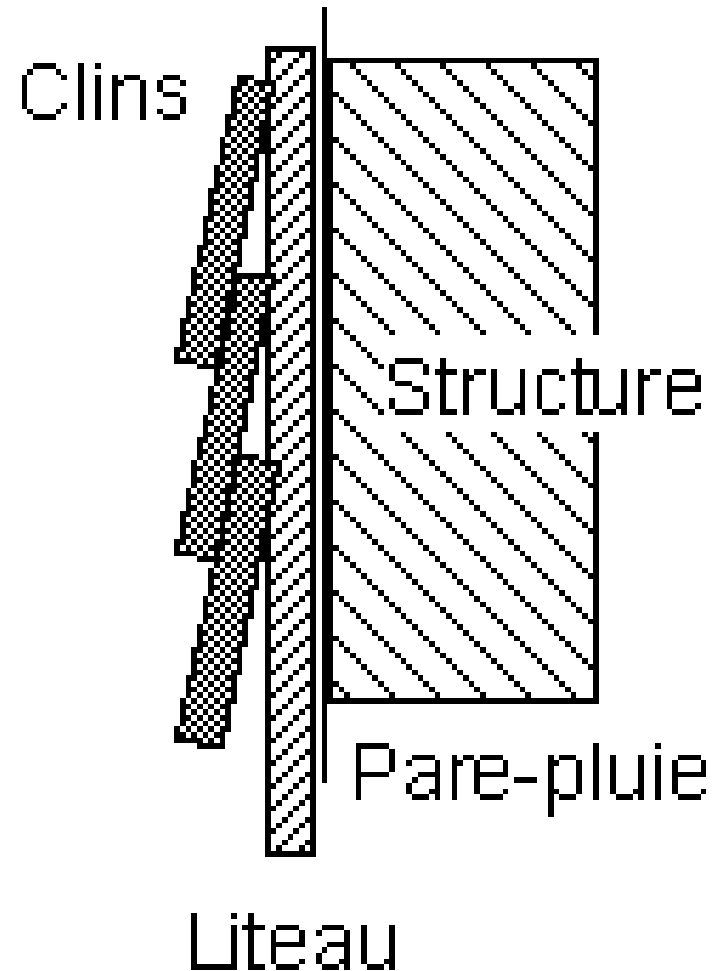




Covering vertical walls

Simplest Covering is with wood, plates to the horizontal coverage (Trapezoidal profile) or also vertically, or wood fronts lining of the trade.

On the structural fittings nailed wooden strips ensure for a natural ventilation for a hut, we do not need borders or an active screen, we nail directly on the structure





Covers of the rhombuses

You can...

**Cover directly to the structure to create
a wooden strips and determine around a ventilation**

**In order having a ventilation
(it is better for the longevity of the Material
and the comfort in the summer).**

- a- Booklets the micro-perforated film: you uses the free space
between the housing for the isolation,
and if necessary that triangles from plywood,
in the corners above and laterally the lozenges
(firmness guarantees).**
- b- Nail the slats (3 x 3cm or 3 x 4cm) on the structure toward the
downward gradient and some end edges of the lozenges.**
- c- Then you nails on these borders a OSB or a second layer of
horizontal borders.**



Materials for the covering of the rhombuses

Select a light material in elements, which take themselves off or connect with each other. It must be ensured that one can cut the segments at the edges.

They cover sign after and provide for it, that covering rises up out over the end of the lozenges of edges and over the wall thus three material is possible, from free to more expensive (and more beautifully)

A. Metal from recycled lithographic printing plates easy, free of charge or not expensively, flexibly, to cut easily, self folding. Not very beautifully, but you can paint them.

B. Asphalt, to nail on OSB different colors, (green good, but not very ecologically).

C. And wood slats for good appearance must

You nails the slats in a distance of $\frac{1}{3}$ of the length on, so it is to be brought beautifully and pleasantly, they are easy to cut.

In France manufactured or from Canada, a little expensively thus caution, with the transfer., you needs approx. 24 to 25 m².

Nails with galvanized points 50 or 60 mm ensures a good stop.

(Double to the first row!!!).

That was it already finished is the Zome





3v Dome only with Pallet

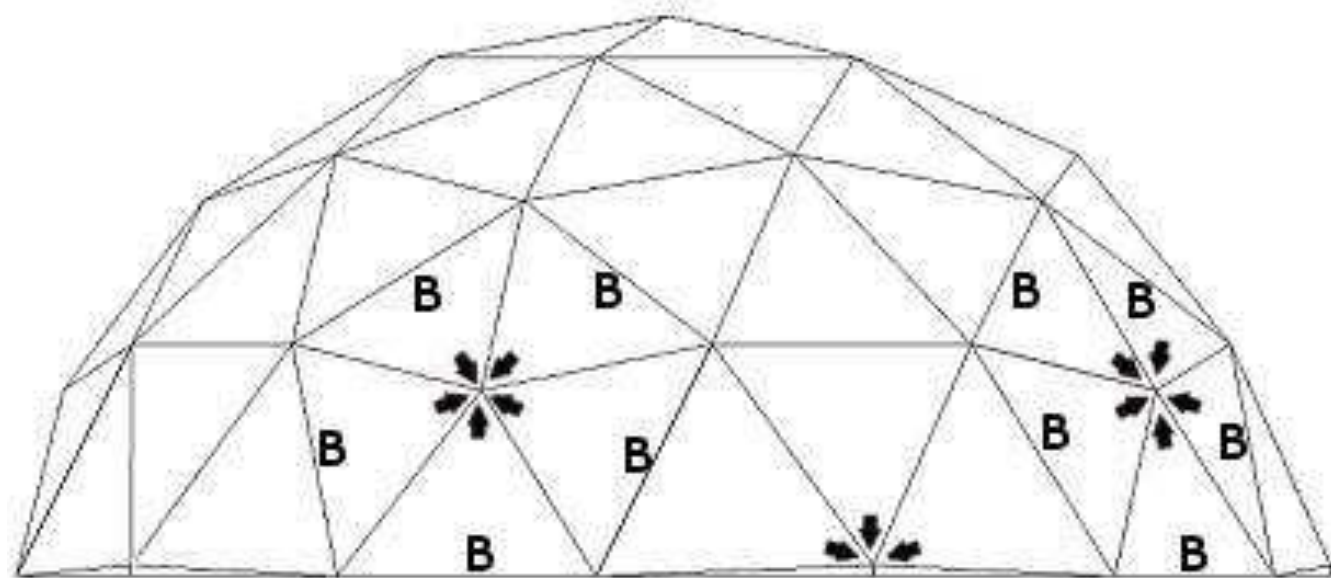
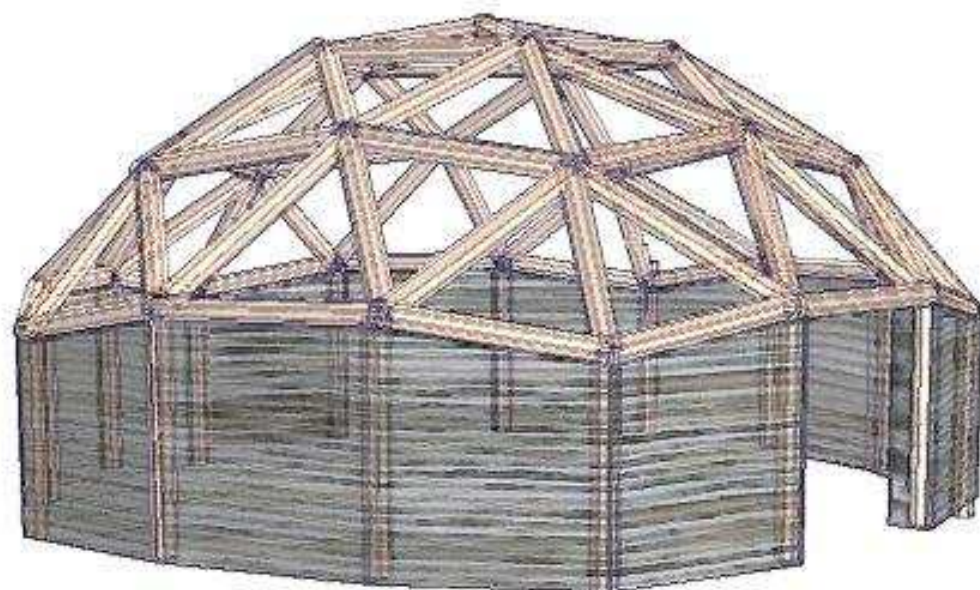


Pallet 120 / 80 cm



Diameter : 4.50
Surface area : 31.81
Floor area : 15.64
Circumference : 13.91







Hub and strut construction

To build a 3v geodesic **PALLET** dome framework
you will need:



Pallet 120 / 80 cm

Strut 'A' length :
0.78

Strut 'B' length :
0.91

Strut 'C' length :
0.93

**30 lengths of 'A' size
struts**

**40 lengths of 'B' size
struts**

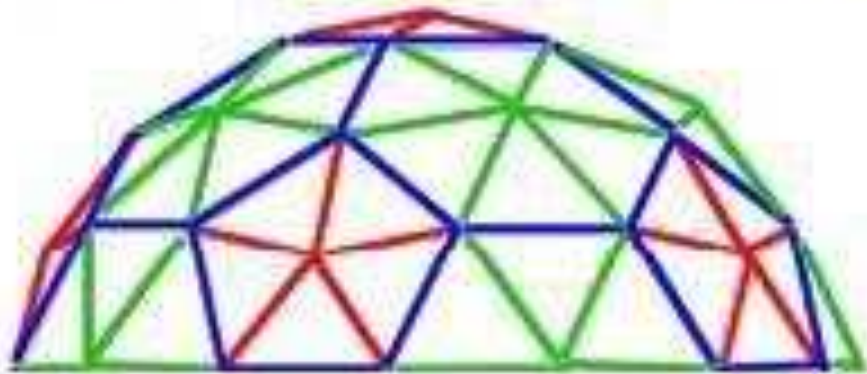
**50 lengths of 'C' size
struts**

Strut 'A' - Red lines

Strut 'B' - Blue lines

Strut 'C' - Green lines

Use the diagram below
to assist with assembly



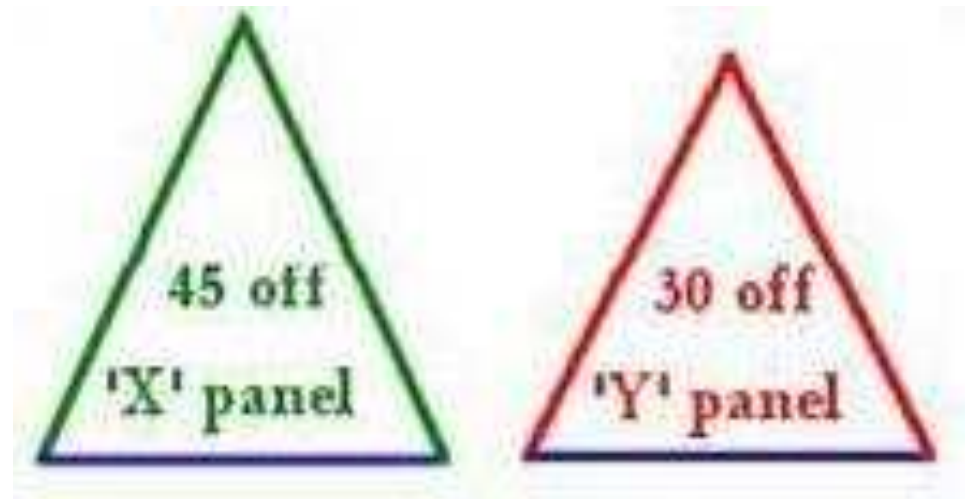
Panelized construction



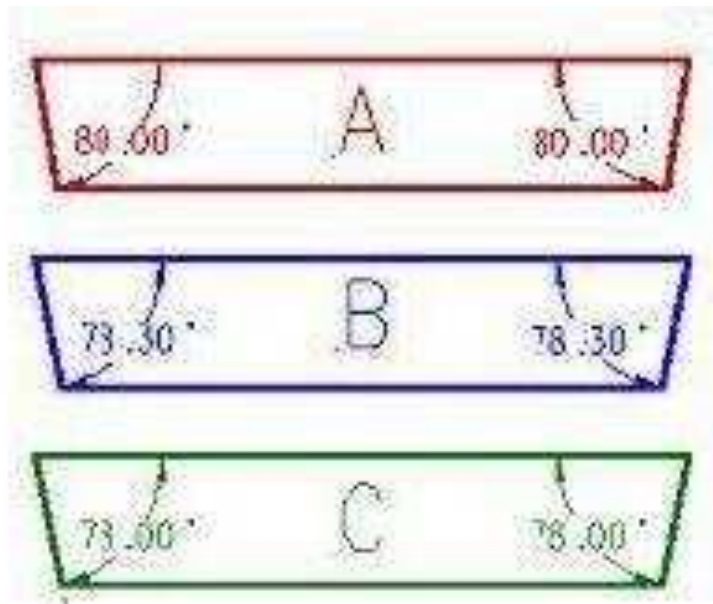
To build a 3v geodesic dome using panels you will need:

45 'X' panels - see diagram below.

30 'Y' panels - see diagram below.



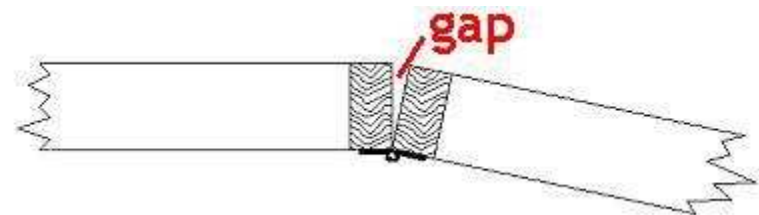
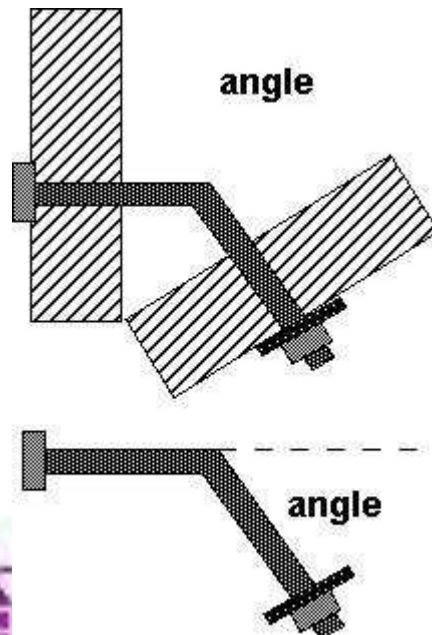
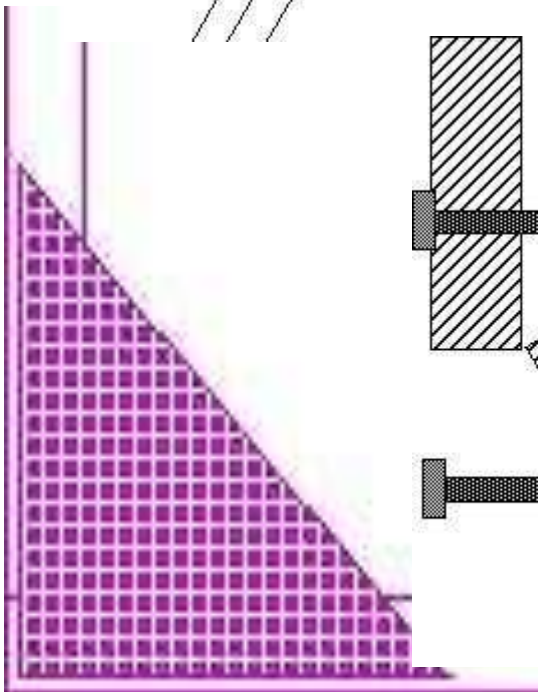
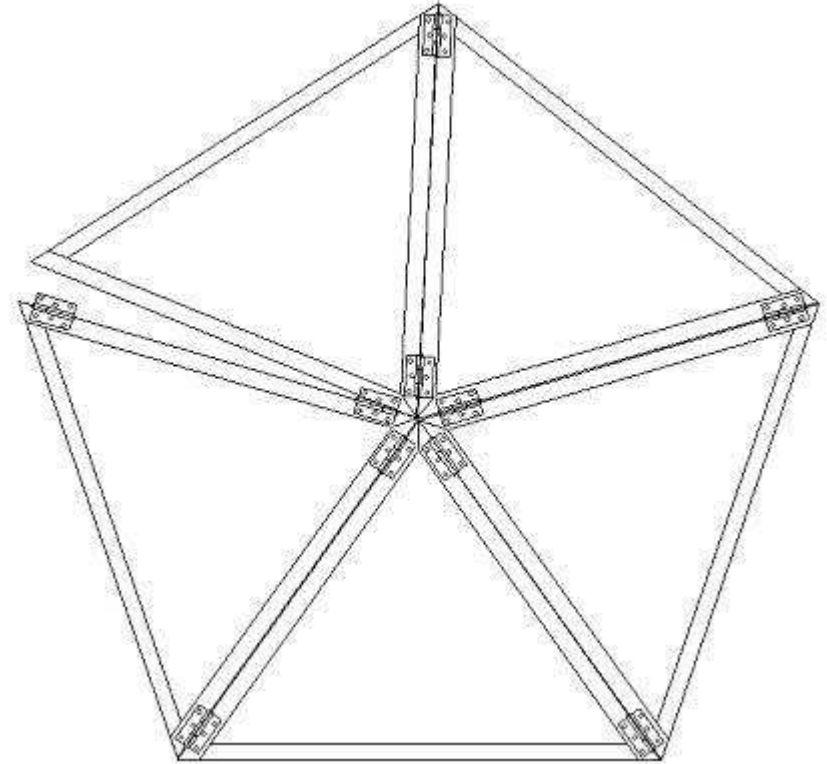
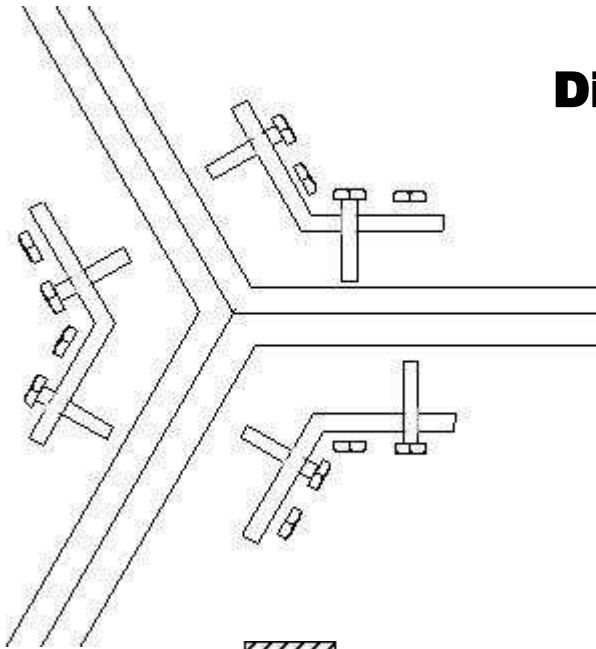
The plan below shows all the panels and struts color coded to assist with



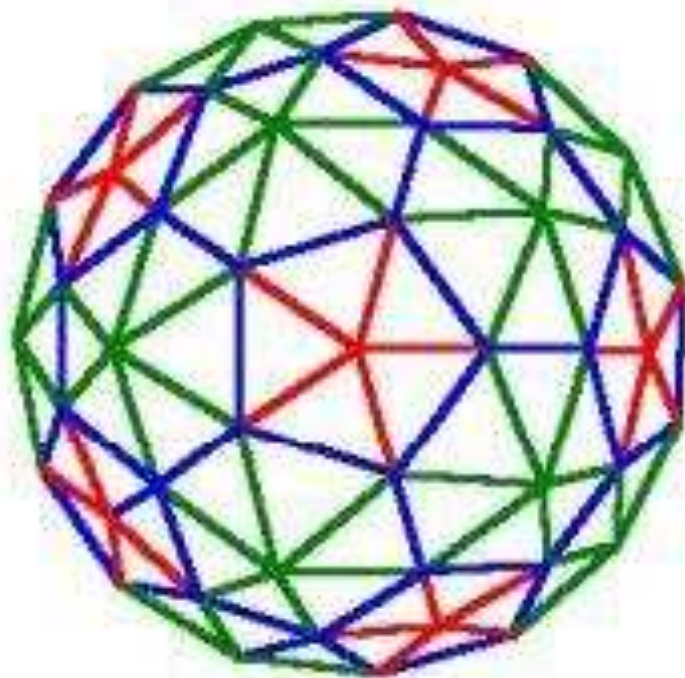
If you are building a 3v geodesic dome using hub and strut construction the color coded diagram below shows the angles you will need to cut each beam. The angles have been rounded up/down to the nearest half degree, which is more accurate than most miter cutting saws.



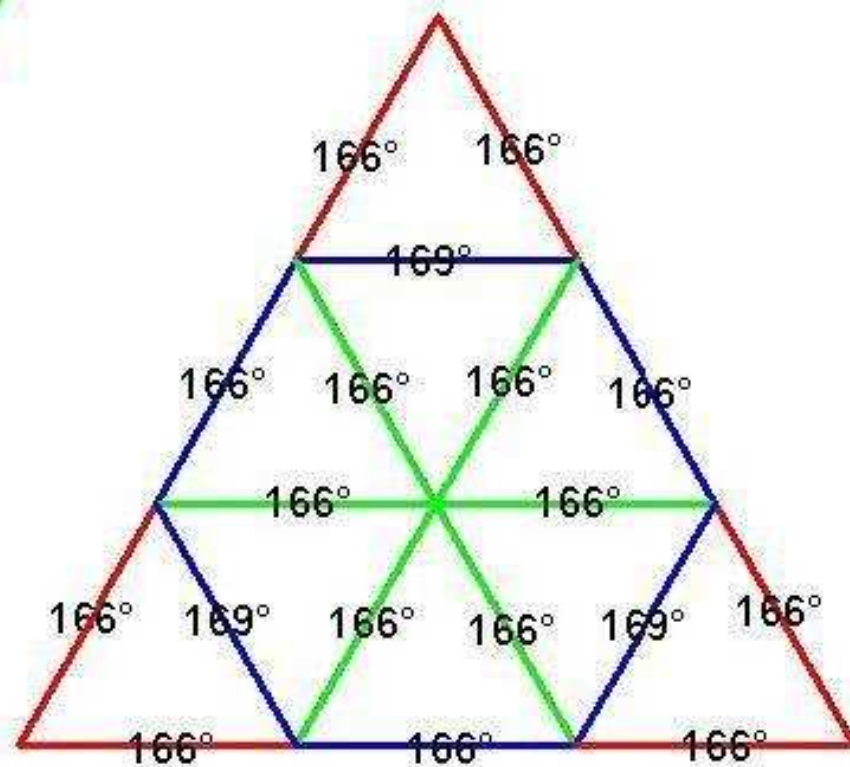
Different assembly of the structure



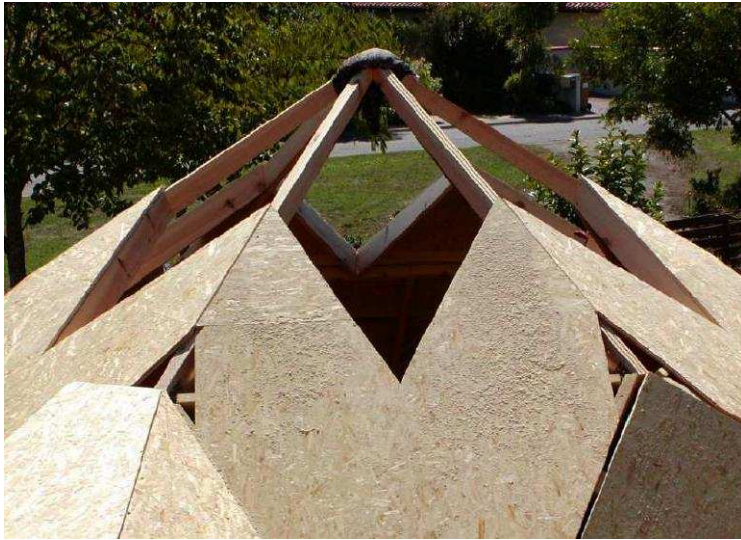




3V Dihedral angles







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