

# Flagship Design Guides

## - General -

### 1. Pre-building and design

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## Short content

The 'Flagship Design Guides - General - 1. Pre-building and design' explains all the things you need to do and take into account before the building can start.

It includes matters such as obtaining land, country specific building permit concerns and requirements, financing a project, design and pre-building planning like how to organise volunteers or start a self sustainable way of living as soon as possible.

It has been mainly developed based on the research done by Flagship Belgium and know how and experiences found amongst the projects and volunteers found within the EEBU-community.

It is a common introduction to several series to follow that will address how to design and built a specific model.

### **Series in development:**

1. Flagship Design Guides - Euro-model
2. Flagship Design Guides - Euro-U-model
3. Flagship Design Guides - Strawship model



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# Introduction

Building a self sustainable building, inspired using the concepts of an earthship, can be quite a challenge and not always easy to accomplish. Not that the building itself is such an extraordinary task. The problem lies elsewhere. Like earthships or any other self sustainable out of the ordinary building, often simply do not fit within the know box of rules and regulations. And even if they do they still are somewhat strange buildings to the general public and the people you have to deal with to get a permit.

So before even considering on buying land to build on it is wise to first check out what the possibilities on building one in your region of choice are.

There are for example those countries in Europe who do not allow you to build with tyres. But if they do, that doesn't automatically mean every municipality in the country will give you a permit to build one.

It is best to first check a few things to determine where best to buy the land before actually buying it. It will save you the disappointment of investing in land to later find out you are not allowed to build your self sustainable home.

## Goals

Our main goal is to bring self sustainable building and all the know how involved back to people in a way they can do the whole process themselves and with the help of others. We call it Open Source Earthship Building (OSEB)

To achieve this goal we focus on certain requirements to make it possible:

- Use as much as possible local available materials (preferably re-use of local available waste materials)
- Avoid industrial produced materials you need to buy as much as possible (ultimate goal is to completely eliminate them)
- Incorporate local climate and circumstances into the building design
- Try to make each and every part of the building be something you can make yourself and/or repair yourself with local available materials, for real self sustainability
- Obtain the highest possible degree of self sustainability (measured in amount of money still needed for air, water, food and energy, once the building is finished, the less need for money, the higher the degree of self sustainability)
- Make all this available to the public domain in a way everybody can freely use it without the involvement of money

Aiming for these goals means that there are quite some parts of the building models presented that need to be further researched for new materials to replace industrial produced ones. Also more experiments need to be done on the behaviour of these newly implemented materials.

This is ongoing work and we do not claim we are there yet. So in the series you will still find industrial produced and new to buy materials for the simple reason we don't have a better alternative yet. Ideas and suggestions are always welcome.

## ***This manual***

In this manual we will do our best to give an as good as possible overview on the situation in the different European countries. This will be an incomplete overview, simply because we do not have a complete overview, although we have invested loads of time to find out.

What we know we will share here and as time advances this manual will probably get more detailed and more complete on that matter. So if you happen to know how these matters are

arranged in your country please share it with us, so we can add it to the manual to the benefit of others.

We will also discuss design matters for specific climates and other pre-building matters, like organising funds, volunteers and setting up a self sustainable living as soon and as far as possible.

Design will help you get insight on what in general to take into account for a self sustainable building, whether it is an earthship, like the Euro model or an on earthship concepts inspired building like the Strawship.

We will also try to indicate what models work best in what situation. For this we need research and feedback of models explained in this series. If you do build one based on one of the series do contact us, so we can discuss this matter.

Details on the specific design of a model can be found in the series about that model and will not be dealt with in this part.

## ***The series***

In the series on the models we will work with a small basic model that explains all materials and techniques used. Combined with the design part and the software tools we are developing this should enable you to design and build the model of choice in a Do It Yourself way with help of volunteers.

Any further ideas and contributions are welcome.

Willy Raets,  
Chairman Earthship Belgium vzw  
Initiator behind Earthship Europe, EEBU, EECO and EECN

# Building in Europe

First thing to figure out if you would like to build an earthship or other type of self sustainable building is if you are allowed to use the planned materials as a building material. Like when building with tyres you might be up for some resistance. Although EU has rules about tyres, what you can actually do with them depends on the country you are in and sometimes even what part of the country you are in.

Then there is the building permit issue. This too will depend on several factors depending the country you want to build. Much depends on what governmental level building permits are handed out. Is it the municipality who decides or is it on a more regional, provincial or higher level?

Some countries are stuck in building codes that do not incorporate self sustainable ways of building, others have more flexible rules and are more open to experiments. There is a lot of factors involved.

For example in some countries you might be able to get a permit for building in one municipality, but that does not automatically mean the neighbouring municipality will give you one. So best to look at it very country and region specific.

So this part of the manual is intended to try and gather all information on the different European countries and give people who want to build a good overview on what might be possible in the different countries of Europe.

In creating this overview we also get to see what obstacles there are and maybe other countries where there are no such obstacles can contribute by doing research on specific obstacles to get rid of them in other countries.

This overview is far from complete because we simply can not know how all is arranged in different countries. So if you see a lack of information on your country, maybe it is time to find out and share with us so others can benefit from the information.

## ***Albania***

Situation unknown. More information needed.

## ***Andorra***

Situation unknown. More information needed.

## ***Austria***

### **General:**

A detailed description of the major construction laws is not possible, because in Austria there is not one, but nine different building regulations. Each province has its own building regulation. But the various building regulations are based on a common policy published by the Austrian Institute of Construction Engineering (<http://www.oib.or.at/> - German language).

There is a building material list, that determines whether a material may be used or not.

### **Tyre based building:**

There is no permission to build with tires, but it's not forbidden. Because there is no building with tyres in Austria, tyres are not on the material list. A building with tyres is not assessable at the moment and a permit will not be granted.

One idea is presenting the first earthship as a research project. Studies on the earthship could show, that tyres meet the requirements. Once the requirements are met permits should be granted.



## ***Belgium***

### **Flanders**

#### **General:**

Building permits are dealt with at the level municipality. Flanders knows a system of zones for building, zones for agriculture, zones for industry and so on. Building is only allowed in zones for building. Rules are on regional level. Law dictates you need to be connected to the grid (water, electricity, sewage).

#### **Straw based building:**

This should not be such a problem as several have been built with building permit.

#### **Tyre based building:**

In Flanders you are not allowed to use tyres as a building material. The governmental organisation that deals with this matter is called OVAM.

Reasons:

- Waste tyres are not on the list of waste materials that eligible for use as secondary raw material and/or building blocks and/or soil
- Potential adverse effects from leaching of environmentally hazardous substances such as zinc and mineral oils
- The waste tyres are not necessary for the thermal mass of the living room: it is mainly the thickness of the walls that provides the necessary storage and release of heat, the tyres therefore are used only as a construction material, for which alternatives exist
- The existence of multiple processing techniques for waste tyres for which the material chain is well closed (eg granulation)
- Building a wall can not be regarded as a form of recovery of waste tyres. If the tyres after demolition of the tyre building must be reprocessed, they are full of mud and soil, which endeavoured to problems in the various processing channels

Since building with tyres is not allowed in Flanders you will never get to a building permit. Replacing the tyres with for example sand bags to create thermal mass will open up possibilities concerning the building permit.

### **Wallonia**

#### **General:**

Building permits are dealt with at the level municipality.

#### **Tyre based building:**

As far as we know building with tyres is not an obstacle in Wallonia. More information is welcome.

## ***Bosnia and Herzegovina***

Situation unknown. More information needed.

## ***Bulgaria***

Situation unknown. More information needed.

## ***Croatia***

Situation unknown. More information needed.

## ***Cyprus***

Situation unknown. More information needed.

## ***Czech Republic***

Situation unknown. More information needed..

## ***Denmark***

Situation unknown. More information needed.

## ***Estonia***

### **General:**

Situation unknown. More information needed.

### **Building with tyres:**

As far as known building with tyres is no obstacle in Estonia. An earthship has been build there.

## ***Finland***

Situation unknown. More information needed.

## ***France***

### **General:**

Steps to apply for a permit in France is to check the land you buy for the following points :

- The land need to be "buildable". Means it has to be appointed as buildable land;
- You need to apply for a CU "Certificat d'Urbanisme"(Urban certificate) with a map of your land with all the sizes and the position of your future building and a explanation of what you want to build and for what use. You need to put add a sketch of the building;
- Administration take 6 weeks to said yes or no to your project;
- If yes you could start the process of a building permit with (or without) an architect (up to 180m<sup>2</sup>, you need one);
- When the building permit is approved you need to set up an announcement of it in city hall AND on your land;
- If no neighbour or anybody else disputes or opposes it for 8 weeks, you can begin to build.

### **Tyre based building:**

Building with tyres should not be a problem in France since there have been two build in different regions all with building permits.

## ***Germany***

Situation unknown. More information needed.

## ***Greece***

Situation unknown. More information needed.

## ***Hungary***

Situation unknown. More information needed.

## ***Iceland***

Situation unknown. More information needed.

## ***Ireland***

Some information to follow.

## ***Italy***

### **General:**

It will probably be hard to get any license for a building that is out of the ordinary and doesn't fit in the general picture. A lot of Italian rules concern aesthetics. So making it fit amongst the other buildings might give you a challenge

### **Tyre based building:**

As far as known to us building with tyres is not allowed and getting a building license will be nearly impossible.

## ***Kosovo***

Situation unknown. More information needed.

## ***Latvia***

Situation unknown. More information needed.

## ***Liechtenstein***

Situation unknown. More information needed.

## ***Lithuania***

Situation unknown. More information needed.

## ***Luxembourg***

Situation unknown. More information needed.

## ***Macedonia***

Situation unknown. More information needed.

## ***Malta***

Situation unknown. More information needed.

## ***Moldova***

### **General:**

More information needed.

### **Tyre based building:**

Building with tyres is no obstacle in Moldova.

## ***Monaco***

Situation unknown. More information needed.

## ***Montenegro***

Situation unknown. More information needed.

## ***Netherlands***

### **General:**

The Dutch building code requires all buildings to be connected to the grid (water, electricity, sewage). Earthship Zwolle is not off grid but in the planning for the 23 earthships in Olst they seem to have prevented parts of the requirements.

They did prevent being connected to the sewage by using compost toilets and thus not creating any back water. Also water will be pumped up from underground and purified to drinking water quality. So the only connection to the grid is for electricity, although they will produce their own energy and deliver the surplus to the grid and in times of need take power from the grid.

More information is always welcome.

### **Building with tyres:**

Although building code does not permit the use of tyres, earthship Zwolle has been built with building permit. Also in Olst 23 earthships will be build with building permit. More details needed on how they managed to arrange this.

## ***Norway***

Situation unknown. More information needed.

## ***Poland***

### **Building with tyres:**

In general building with tyres in Poland is not allowed. Obstacles unknown.

Although there is a possibility that one could use tyres to strengthen an earth slope and then build a house using it. As far as we know a building permit is obtained this way and the

building of the first earthship in Poland should have started in 2011.

## ***Portugal***

### **General:**

It is advised to, before even thinking of getting land, find out if the municipality is willing to give a building licence.

### **Building with tyres:**

There seem to be no obstacles in building with tyres in Portugal.

## ***Romania***

### **General:**

Situation unknown. More information needed.

### **Building with tyres:**

As far as known building with tyres is no obstacle in Romania.

## ***San Marino***

Situation unknown. More information needed.

## ***Serbia***

Situation unknown. More information needed.

## ***Slovakia***

Situation unknown. More information needed.

## ***Slovenia***

Situation unknown. More information needed.

## ***Spain***

### **General:**

Laura (Project Cuevas de Sol) is working on detailed information on building permits in Spain (Andalucia). More information to follow as soon as finished.

### **Building with tyres:**

Building with tyres is not a problem in Spain as long as you meet one requirement:

- An architect must demonstrate that the tyre walls load bearing capacity meet the criteria of the Spanish Building Regulations. For this you need a special report signed by the architect explaining the system and taking responsibility.

Project Cuevas de Sol (Andalusia, Spain) stated "So far, in all our permits to build, there has been no questions regarding use of tyres beyond their structural use."

## ***Sweden***

### **General:**

Situation unknown. More information needed.

### **Building with tyres:**

Building with tyres should not be a problem in Sweden since there have been 3 built in different regions. Those building with tyres in Sweden had no problem nor obstruction obtaining them. Just visit a local tyre supplier.

Although building with tyres is no obstacle that doesn't mean you will get a permit for doing so in every municipality. So a good advice is to first find a municipality that will give permission and then buy your land within its borders.

## ***Switzerland***

Situation unknown. More information needed.

## ***United Kingdom***

### **England**

#### **General:**

Situation unknown. More information needed.

#### **Building with tyres:**

In England you need a license to use waste materials (like tires). More information to follow. Earthship Brighton and research done there, has made it possible to get building permits on earthships in England. More information to follow.

### **Wales**

Situation unknown. More information needed.

### **Scotland**

#### **General:**

In Scotland there are 3 phases to planning permission:

- Outline permission - Whether a building is allowed in that location. This is usually only refused if the area is 'green belt' or other conservation or remote area. This is usually a very quick decision.
- Full Planning permission - This confirms that the size and basic design of the building would be acceptable in the location.
- Building Warrant - This is the approval of the structure. It is scrutinized for engineering, environmental impact, disabled access, fire regulations and other legal requirements. This takes the longest time to process, especially if the structure is unusual.

#### **Building with tyres:**

In Scotland you need a license to use waste materials (like tyres). The Scottish Environmental Protection Agency is the authority that can provide this licence. According to Ann McKillop (Project Manager on the Greenhead Moss earthship, Scotland) they were very helpful in getting them the licence to obtain the needed tyres.

### **Northern Ireland**

Situation unknown. More information needed.

## ***Vatican City State***

Situation unknown. More information needed.

## **Land and funding**

Once you find the country to build in where tyres or other alternative building materials used are allowed and building permits should be possible, you get to the next step, acquiring land to build on.

### ***Location of the land***

In general it is best not to just buy some land before checking the municipality if they would allow the building of your earthship inspired building. Because the fact that you can build them in a country does not automatically mean every municipality will approve them. A self sustainable earthship inspired building is somewhat of an oddity to mainstream decision makers and not always appreciated.

Like for example in Sweden. There are municipalities who approved the building of an earthship, but there are those who disapproved a permit to build.

Best way to approach this is to make sure there is a clear understanding on what a self sustainable earthship inspired building is. You could do a presentation for the municipality to get them acquainted to the concepts of your building.

Besides that there are factors that should be pointed out like:

- It complies with most National and International climate change targets for CO2 emissions from buildings.
- The use of volunteers to build the structure can give such a project in the municipality lots of positive political status.
- The uniqueness of an earthship inspired project in most countries will place the municipality on the map in a positive way and profile them as an ecological community.

If the municipality does agree, it might be wise to also do an information meeting in your possible future neighbourhood and tell them about your plans and explain a bit what it is all about. This to make the unknown, known to the neighbourhood to get them involved instead of opposed against the project.

If all this goes well, you can consider buying land, maybe even with the support of the municipality and neighbourhood.

### ***Funding of the land***

If your aim is to live self sustainable you probably will try to buy the land without any mortgage. For those with enough savings in their bank this should be no problem. But for those with little or no savings this might turn out to be a problem.

We have some suggestions you might want to try:

- Try to look for cheap land. In general the more remote the cheaper the land. Of course there are exceptions.
- Form a group of people to start a community to buy land together. In general buying big plots of land is often cheaper than buying small plots. This often means that the contribution for each person turns out way lower than buying a smaller individual plot.
- When going for the community concept you might want to form a non profit organisation, with goals such as ecological experimental building and living, research on those matters and so on. This might clear the way for some fund-raising or grants from government institutions for the ecological project.



- Another possible way of funding is Crowd funding<sup>1</sup>. For example, 'investors' could get a return in the form of food grown in the community, once it's set up.

## ***Ownership of the land***

If you are with a group of people you might consider forming a non profit organisation with the group and have the organisation be owner of the land. Members of the organisation could for example be all the main inhabitants of each self sustainable inhabited building on the land.



**Illustration 1: Blue print for a self sustainable community**

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<sup>1</sup> See [http://en.wikipedia.org/wiki/Crowd\\_funding](http://en.wikipedia.org/wiki/Crowd_funding) for more information on Crowd funding.

## Design considerations

Of course you also need a design for your project. We'll try to give as much as possible directives you need to take into account when designing a self sustainable on earthship concepts based building. Detailed design issues will depend on the model you plan to build. These general directives should apply to all designs you do with nature.

In some countries law states that you need an architect doing the plans of the building. So these guidelines might be useful as well for the architect that does your drawings, because designing for self sustainability is different than conventional design and often unknown terrain to many architects.

### *Design for local conditions*

The very first thing you need to take in account are the local conditions. The land, the climate, the sun, the rainfall and so on. These are your starting points for doing a design on a building where you want to include the natural phenomena to a maximum.

And when designing using nature for water supply, energy needs and so on you need to design for worst case situations instead of working with averages. Because getting through the worst case scenarios will get you through all other scenarios as well.

### **The land**

When designing a house as part of nature you need to observe the land you are going to build on, preferably over the period of a year, so you have had a look at all seasons.

This will provide you with valuable information, like how the water makes it's way over the land in a very rainy period. Where the sun shines on the land in summer and winter, how high ground water levels tend to be in the wettest period, how wind makes it's way over the land and so on.

All this is valuable information to take into account, because designing for self sustainability is about adding up all the small factors to make it work. So observe all these factors to determine the optimum location of the building on the land, but also for planting food and other things related to self sustainability.

If for example you want to make use of wind energy you might notice that some places on the land might be more windy all year around than other spots. This might be because of where trees are standing or a neighbouring building and so on. This more windy place should be the spot to put your windmill for optimum gain of energy when using wind energy.

Another example is the use of solar energy. Probably some places on the land will be in the sun all year round, other spots might only see sunshine in summer or hardly any sun. So when designing for solar gain, find a sunny spot all year round to place the building, solar panels and other systems relying on solar gain.

In the wettest period dig a hole in the ground on the spot you want to place the building to determine how deep you can go before getting to water. Always good to know how high the ground water levels are in a wet period. Make sure your building stays at least 50 cm above this highest ground water level. The more you stay above this level the better. because some years tend to be wetter than others.

Also determine the type of ground, how much clay does it contain? How well can it be used for earth plastering. Are there different types of ground on your land? How deep is the stable ground?

One more thing that needs to be determined is the stability of the underground. There are those places (like earthship Zwolle and the 23 earthships in Olst, both in The Netherlands) that have no stable underground. These things are important to know before designing because it

will create an extra challenge to deal with and it will increase your costs.

Not everybody will have the luxury to observe the land over the period of a year. Most of you probably will want to start building as soon as possible. In such circumstances at least observe as long as possible and talk to people living nearby who might be able to tell you some more on these issues. Just try to make the best of it with the information you obtain.

Some things can be calculated, like what spots have sun all year, but not all of it can be dealt with this way. So take at least some time to get more acquainted to the land you will built on.

## The climate

Climate is a very important part of self sustainable design. When living self sustainable you really need to calculate the climatic extremes into your design. Climate often plays an important role in a big part (if not all) of the energy gain.

Important issues that have an influence on the design are humidity, minimum and maximum temperatures possible (go for the extremes since you need to survive those conditions as well), amount of sun in winter, amount of rainfall, length of dry periods, length of wet periods, maximum amount of rainfall in extreme situations, wind speeds (minimum and maximum).

So let's see how these factors can influence the design.

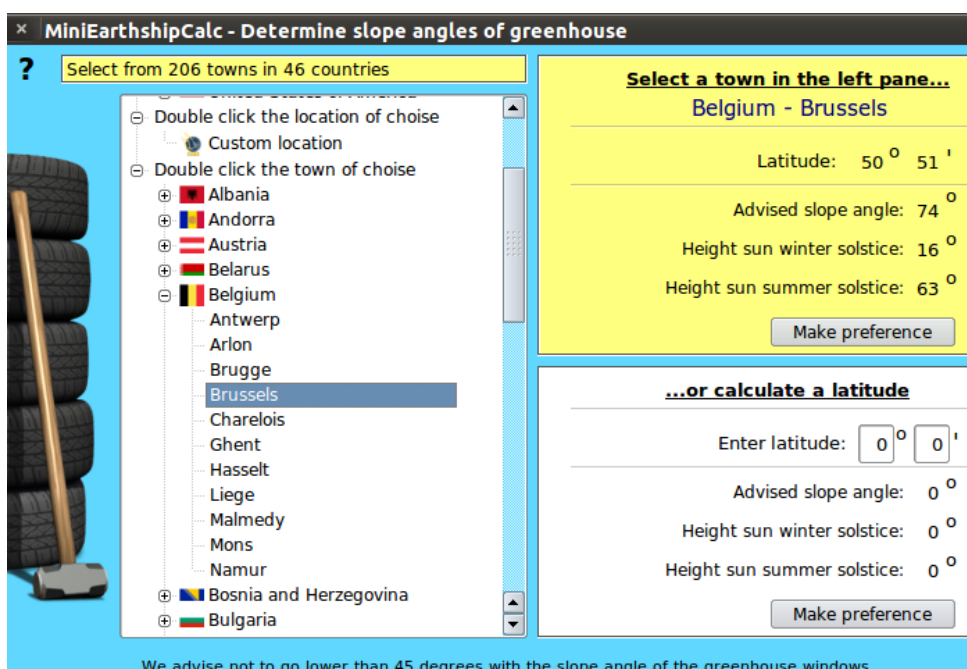
## The sun

In a self sustainable situation the sun is an important factor in energy gain and design.

Using passive solar concepts like thermal mass and water heating makes you want to take in all factors related to your energy source (being the sun) to make it work as good as possible. A thorough study of the solar circumstances in the different seasons will make for a better understanding of how the design needs to be for optimal performance.

One factor of influence is the spot you pick on your land (as discussed earlier). Is it all year round in the sun or just in summer time? That will make for a great difference.

The solar position throughout the year is a second factor to take into account. How many hours of sun light will you have in deep winter and where will the sun be? This will have an influence on the position of your windows but also of your solar panels (if using them).



**Illustration 2: Screenshot of solar angle calculations in MiniEarthshipCalc**

MiniEarthshipCalc<sup>2</sup> helps you determine solar angles for your given situation<sup>3</sup>. It also allows for solar panel calculations based on insolation (irradiation) values. In future releases it will also help you calculate the amount of windows versus the amount of thermal mass for your given situation and more.

For the most northern climates with very short days in winter, the thermal mass concept definitely needs more research to see what is possible and if you can get it to work. Question is, will the gain make up for the heat lost through the windows in winter time. Both Earthship Belgium and Sweden are doing some serious research into this matter to see what is possible.

Sunlight is also influenced by the amount (in time) of clouds that block direct sunlight. With the newest solar panels you will still have energy gain, but for the passive solar concept like heating water with the sun and thermal mass you will experience a negative influence that might stop it from working at all.

So like heating water in some climates might work all year round, in others you will have to plan for backup systems during certain periods of the year. The more north you are, the more difficult design for solar gain will be. Energy gain here will need to be relying less on solar and more on other means of energy production on demand like for instance Jean Pain concept of methane production for added energy production in winter season.

## **The rainfall**

Rainfall is an essential way of getting water collected, for both human consumption and plants.

When implementing water catchment into the design of a building for human consumption (meaning more than drinking water, but also to wash and so on) you will need to have a good idea on how much water falls out of the sky. For this you can work with averages to make some general calculations on how much water catchment surface you need and how much water storage. But averages do not tell you the extremes.

Important is to figure out if there are years with longer periods of no rainfall (although according to the averages you might have a certain rainfall in certain months in reality some years you might not have any rain in those months). These factors need to be calculated into the water catchment and water storage scenario to make things work in a self sustainable situation<sup>4</sup>.

Another influence of rainfall (combined with amount of sun and temperature) is the air humidity. This will have influence on the design of the ventilation system, because when ventilating with a high humidity outside you aren't getting rid of humidity inside.

Rainfall or their after effects (like melting snow in spring) can also have a great influence on ground water levels.

So make sure you understand rainfall and how water flows on your land, especially in extreme dry and wet conditions.

## **The wind**

Wind has a great influence on climate. The direction it comes from and time of year often determines if it will be warm, or cold, wet or dry.

Wind can be a useful way of producing part of the energy needed. This will all depend on where you are and how the wind circumstances are. The way trees and building stand can have an influence on wind speeds. In what ways these hot spots can be determined and/or calculated is a matter of further research.

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2 MiniEarthshipCalc is an application to help you with all kinds of calculations when designing an earthship. It is freely available in a GNU General Public License for use. It is built for Linux systems. You can download the latest version at ['EEBU'](#)

3 The article '[Determine the slope angles for the windows](#)' can help you determine slope angles for your situation in case you aren't able to use MiniEarthshipCalc because you do not have a Linux OS.

4 The article '[Rainwater harvesting in Belgium](#)' can help you determine water calculations needed for the design.

Further detailing on this matter is needed.

## ***Design with local materials***

For self sustainable living you do not only need to be able to build yourself but also to maintain and repair it if needed. Working with local available materials will make life easier in such cases.

Relying on local<sup>5</sup>, rather than global availability has a lot more advantages. It decreases the amount of energy used in transporting the materials, when global networks crumble materials will still be available and it is simply better for our planet and our people.

Local available materials can vary from waste materials to natural available materials. What we aim to avoid is newly industrial produced materials as much as possible, since they will always create a form of dependency that requires money and a global functioning financial economical system. Something not very reliable.

Another argument is that we people have taken enough from the planet and in return produced a lot of waste. Forcing ourselves to avoid newly produced goods with newly mined raw materials, will make us think more on how to reuse the things we already have and now often turn into waste.

## **Waste materials**

To use or not to use waste materials is often a matter of personal choice. Important when using waste is finding out if it is a safe material to use and what its long term qualities as a material are.

So safety wise concerns effects on environment and human health, but also safety of integrity of the material for the purpose used. This isn't always easy to determine as a lot of the research on a lot of materials is never done.

An advantage of waste materials is the local availability and a good chance of it being for free or very cheap.

Waste materials can be used in many aspects, from building material to part of a self built wind mill or methane installation. There is a lot of ways and means to reuse parts in a self sustainable way.

So always try and see waste as something that might have a possible good use instead of just waste.

## **Used materials**

Some materials that have been used aren't treated as waste but find their way to a second market. It is reuse for a cheaper price than newly produced and makes the material more durable simply by giving it a second life.

A lot of building materials can be obtained this way, like windows from torn down buildings. Or wooden beams and frames. In some countries or situations you might be lucky by knowing someone who tears down buildings for a living and who has access to a lot of those materials for free.

## **Natural available materials**

Materials that are largely available in the local environment, that are not endangered by depletion and that are harvested in a sustainable way can be a good source of often not too

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<sup>5</sup> Local here doesn't mean materials produced elsewhere and sold in the local store but really locally available and produced materials without the use of imported parts.

expensive materials.

This all depends on where you are and sources could be wood, clay, rock, straw, lime, hemp and so on.

### ***Design with all conditions in mind***

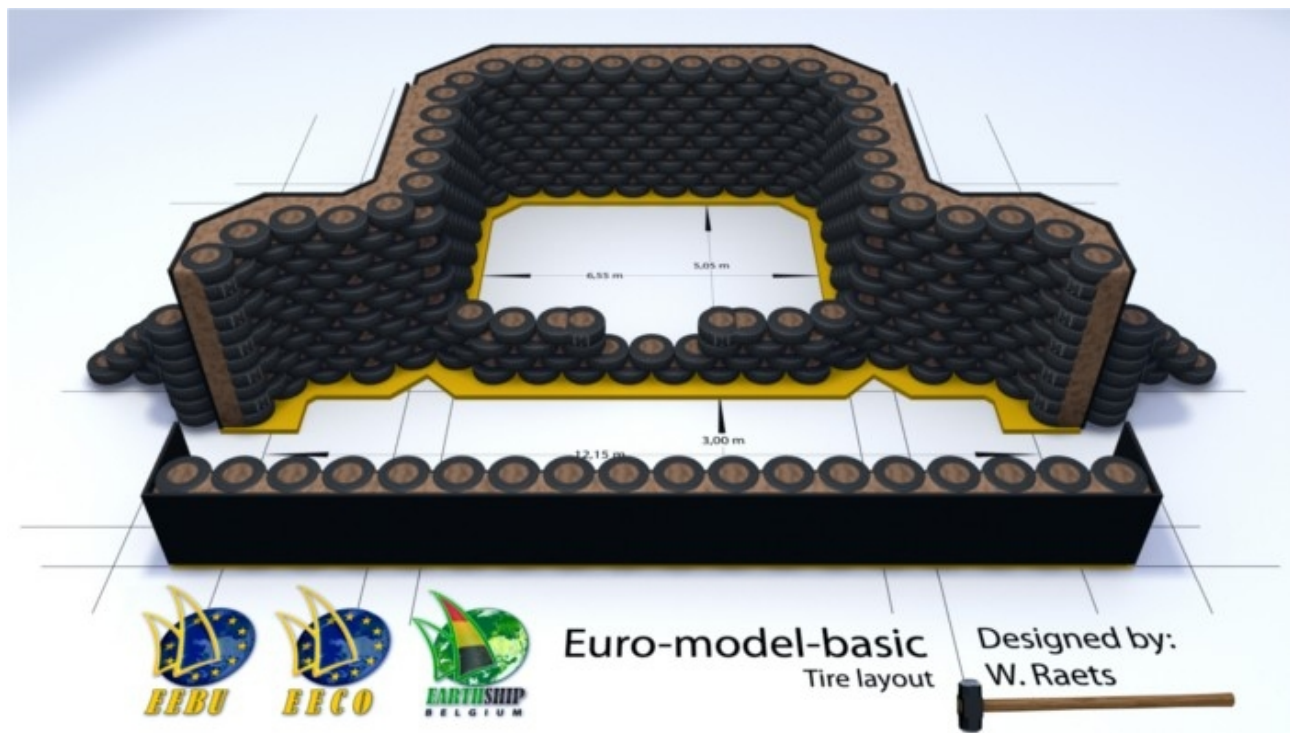
After determining local conditions, observing the land and studying the climate, investigating the local available materials you start thinking of designing your home.

What model best suits your needs is up to you and greatly determined by the factors mentioned above. If it is one of the models presented in the series, a combination of those or a complete new design is up to you.

The models we will explain in more detail in separate series are:

- Euro model: Tries to solve the problems occurring with the Reynolds Global model in European climates
- Euro U model: Same as Euro model but implemented to U modules
- Strawship: From scratch implementation of earthship concepts for a Scandinavian climate

More models might be added as time passes.



**Illustration 3: Euro model**

## **Pre-building planning**

Before starting building there are a lot of things to take into account. Keep in mind that, when building, you will probably have some or lots of volunteers running around.

You will have to deal with several things:

- Do they have a proper place to camp?
- Are there some facilities to wash?
- Are there toilets for them?
- Is there some facility to eat with a roof above the head?
- Can you feed them?
- Are there enough tools for all people?
- Are there enough building materials to keep them at work?
- Is there enough work?
- Do they have the skills to do the job or do they need coaching?
- How to organise work with a group?

A lot of questions that need answering and a lot of work that can be done ahead.

## **Food**

Even before land is acquired you can already start build up a supply of food that can be kept well for quite a while. This can be done in a very low budget way by every time you go shopping, simply buying a few things you do not need for the moment and store them for later use.

There are a lot of good organic things you can buy and store this way. You will be amazed how much food you can get stored in this way without even noticing it. This provision can then later be used in the building period to feed the volunteers and of course feed yourself.

Try to store things in such a way that you only need to buy the small additional fresh things to prepare a complete meal. For example: Store peeled tomatoes, pasta and other storable stuff that goes into making a spaghetti. When preparing it you will probably only have the costs of a few fresh vegetables you want to add.

You will notice that this process will start creating an awareness of the composition of a meal and make you think about how suited it is for long time storage.

Once land is acquired, building hasn't started yet and the season is right for it, you might as well start with planting and growing as much as possible food. This will be a first step to self sustainability that might help drop the costs of feeding the volunteers and yourself drastic.

## **Shelter**

As long as the sun is shining most volunteers won't mind eating outside, but for a rainy day you probably need some form of shelter where people can sit while it rains to eat or just spend time waiting for the rain to pass.

Most countries allow the building of a temporary shelter for such purposes, that will be removed once the building is finished. So these shelters do not need to be of a hightech design, but can be done very simple as they are not permanent.

Maybe you have an old caravan that can be put on site for this purpose. Adding a roof in front of it would make for even more room. Or maybe you just build a simple support with a roof on



it yourself.

Whatever you build as long as it serves the purpose it should do.

## ***Water***

When you have grid connected neighbours, you might be able to make some deal to provide you with water during the building period. But when living remote, you'll have to work otherwise.

Drinking water could be brought in in bottles or jerry cans, but to bring in all water needed might turn up to be a lot of work. If your design is planned with water catchment you will probably need filters and pumps. And if you need to build a temporary shelter for the volunteers you might as well set up a form of water catchment using the roof of the shelter and some basic filters you will need anyway.

This way you could provide (non drinkable) water for the volunteers to wash themselves and for other needs and do some small scale experimenting with water catchment, filtering and storage.

## ***Energy***

Same goes for energy, if you planned for some solar energy gain using panels or some wind energy gain, you might as well set up a small part of it to give you some energy on location during the building period.

You could build some sort of wooded box with a roof and place batteries, converter and so on in there and mount some solar panels on top of the box and maybe place a wind mill as well.

This will create a point where you can tap energy for electrical tools used during the building.

## ***Camping***

It would be nice to clear a spot and make it suited for people to place their tents during their stay. Try to find a place that is comfortable to put a tent.



**Illustration 4: Central point of the European Expedition 2011 - The fireplace**



An area to make an open fire to cook and relax in the evenings is an plus for most volunteers. It could also be used as a cooking area. Take into account that during the summer period (or dry period) in some countries fires might be temporarily banned because of the extreme risk of bush fires!

## ***Toilets***

A compost toilet is probably the easiest solution here. Again you would need to build a temporary building that serves as toilet. This can be of very simple design as it is not meant to stay there.

Or maybe when you are starting a community you have planned for a separate public toilet building. You might as well start with building this building first so you have some facilities on site.

## ***Tools***

When a group of volunteers arrives you will notice they will be of little use if you have a lack of tools for them to use. But then again buying a lot of tools for the building period will leave you with a lot of tools you have many of but only need one of after the building period.

Earthship Belgium and Sweden have already decided to budget for buying tools. The idea is that both organisations will have a set of tools in their country that projects can lent for free during the building period. If you damage a tool you simply replace it when returning the tools.

The tool set will also be of great use when going on building expeditions. We can arrive with a group of volunteers and take tools needed for the volunteers along.

Another idea is that when a project invested in a lot of tools and has no use for them they pass them on to another project for a small amount of money. This way you get some refunding of tools bought and no longer needed and the other project can get tools for a lower price and make good use of them.

Tools could be passed from project to project this way and will have a second, third, fourth and so on life.

## ***Building materials***

Depending on your design you will need to make some calculations on materials needed. And when getting a group of volunteers on site you better make good use of them being there by having enough building materials to keep them going during their stay.

This means you need to make estimates on how much work they might do during their stay and based on that make sure you have the needed materials available on site. This of course all depends on the stage you are building and the skills of the volunteers.

Make sure to give this some thought so you do not end up with people sitting around because of a lack of building materials.

These calculations and estimations will also help you determine the number of volunteers needed in any given part of the project. Make sure not to plan for too many volunteers in any given stage of the building.

Like when building an earthship, only the tyre building stage needs a bigger number of volunteers, most other stages need smaller numbers to a maximum of 5 or 6 volunteers.

## ***Coaching volunteers***

Make sure to have a talk with all volunteers on arrival. Tell them the work that has to be done and do an inventory on their skills and experience in self building.

This will help you to determine what volunteers need coaching and what volunteers don't.

Make sure, especially in the first days of new volunteers, to take some time to coach them on the spot. Explain and demonstrate how things need to be done. Let them do it and observe them doing it. Tell them how to improve their technique and what to watch out for.

You will experience that in the first few days of new volunteers you yourself will probably be less productive in building because of the coaching. But it is an important part, that needs attention.

After a few days the volunteers will need a lot less attention and productivity will go up as skills improve. And you will have your hands free to do some work yourself.

If you have volunteers that come back regularly and know the job and how to do it, they could be useful in assisting newly arrived volunteers as well.

## ***Organise work***

Organising work is very depending on the stage of building you are in. In some stages of the building different jobs can be done on different places of the project, with volunteers doing all kinds of work. In other stages of the building one job can be done and all volunteers are doing the same kind of work. In some stages of the building you might be dealing with 20 volunteers. In other stages of the building you might be dealing with 3 volunteers.

So some stages of the building might be easy to organise others might prove a challenge. There is no real one way of advising things as a lot depends on the design. When tyre works are part of your building process the article 'Hints for building with tyres'<sup>6</sup>. might prove useful.

As time passes we hope projects will share their experiences so this part will be further extended with usable hints on how to take care of things.

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6 The article '[Hints for building with tyres](#)' can help you get some insights in organising tyre works.

## What next?

From here it is up to you to see what design you would like to do. It can be a from scratch design based on your specific location or one of the models presented in the Flagship Design Guides, or even a combination of both.

Other guides and series we plan on offering (some currently in development) are:

- Flagship Design Guides – General
  - 2. Design and build energy systems
  - 3. Design and build water systems
  - 4. Design and build for indoor food production
  - 5. Design for balanced outdoor food production
  - 6. Create and run a self sustainable community
- Flagship Design Guides – Euro-model
  - 1. Design of the Euro-model
  - 2. Foundation, insulation and wall build up
- Flagship Design Guides – Euro-U-model
  - 1. Design of the Euro-U-model
  - 2. Foundation, insulation and wall build up
- Flagship Design Guides - Strawship model
  - 1. Design of the Strawship model

More series and guides might follow as time passes and more adapted models get developed.

If you gained any experience using this manual that could be useful to others as well and are willing to share, please let us know so the manual can be further improved.

