

Cob Ingredients - Soil, Sand, and Straw

Cob can't be purchased in bags at the hardware store so you have to process the materials and make it yourself. Your first step in making cob will be to find good ingredients.

You will need four basic ingredients to make cob:

1. Soil
2. Sand
3. Straw
4. Water

All of these materials are readily available throughout the United States, Canada, the UK, Australia, New Zealand, Europe, and pretty much all over the world. There is a good reason that people have built with earthen materials throughout the world since the dawn of civilization.

Soil

Cob is made from the soil right beneath your feet. Excavate the subsoil right beneath the thin layer of topsoil and this is the main ingredient for cob. The topsoil is the thin layer of dark dirt that contains mostly organic matter. The subsoil beneath has very little organic material and is where you'll find the clay-rich soil suitable for cob.

Many people have the misconception that you need to have *clay* to make cob. This is true, but you only need a soil that is roughly composed of 15-25% clay content. This is considered clay-rich soil. The rest of the soil is made up of sand, silt, and other aggregates. Using a pure clay would require you to add back in the 75-85% aggregate. It would not be practical and would require buying more sand to adjust it to the correct ratio. A heavy amount of clay in the soil is actually less desirable because it shrinks and cracks when it dries out and is unsatisfactory for earthen construction.

Soil for cob is generally easy to find in abundance and can generally be found all around the world. One good way to acquire the soil you need is to use what's

excavated from your foundation trenches. You can also look at construction sites where this excavated soil is considered a 'waste product' and is hauled off to be dumped in a landfill. This costs them a lot of money and they might just be happy enough to deliver it to you for free!

The clay is a binder and its purpose is to hold the sand (aggregate) together. The clay is composed of microscopic platelets that act as suction between the aggregate particles when they're made wet.

Something important to understand is that clay expands when it's made wet and it contracts when it's dried out. This is why you can't build a house out of pure clay. It needs the aggregate and straw fibers to give it stability and to prevent cracking. This is also why, in reality, a cob house is more like a giant sand castle that is bound together in a unified mass by clay particles.

In the next video I'll discuss how to identify appropriate soils. Let's take a look at sands now.

Note: Some grassland areas of the Midwestern United States and sandy areas of the Florida peninsula have a lack of clay in their soils. These soils can be too loose and crumbly for optimal cob. This does not mean that you can't find appropriate soils in these regions, but you may have to look harder than most.



Sand

The terms sand and aggregate can be used interchangeably, but most people refer to this ingredient as sand. Its also easier to talk to people about purchasing sand.

The majority of your cob mixture is actually composed of sand and other aggregates found in the soil. It usually hovers somewhere around 80%. The other 20% is your clay. This ratio will differ depending on where you get your subsoil from though, and that's why the vast majority of times its going to be essential to add additional sand into your cob mixture. There are some rare areas that you will find soil that naturally contains the right amount of aggregate-to-clay ratio to make cob, but this is not usually the case.

One of the main guidelines for choosing sand for your cob mixture is to use a rough and coarse sand that has many different particle sizes included in it. A rough-edged sand helps the particles to lock together better and will prevent serious cracking. Rounded sand that is found on beach shores is not appropriate for cob because the particles don't bond together with any strength. Its like trying to stack a bunch of beach balls on top of each other, but they just keep rolling away.

If you live in the United States you will find sand for sale under many different names. Some common sands that you might encounter are masonry sand and concrete sand. These are typically used as ingredients for cement and are widely available. Sometimes they fall under different names by region of the country though.

Concrete sand is a great choice for cob. It is rough and holds a variety of particle sizes even including some small pebbles. Using this sand will help prevent serious cracking.

Masonry sand is a finer version of concrete sand and I've found that its usually a bit too finely sifted for large cob constructions because it tends to not bind as well leaving large cracks in walls.

You can buy sand rather inexpensively in large quantities by the truck load. You might spend a few hundred dollars for a truck load of sand plus the cost to transport it to your site, but considering that sand can be one of the main ingredients in cob the cost is still comparatively very low. The actual delivery charge can easily cost you more than the sand itself so it's a good idea to order in bulk. You may have extra sand left over depending on what you're building, but you can always use the extra sand for other projects. If you're building a small cob house of a couple hundred square feet you might as well get a full dump truck load,

which is usually 10 cubic yards. Anything larger will most likely require more than one truck load.

You can purchase sand at landscape supply depots and gravel yards. There is usually at least one for every small town or city in the United States so these businesses are easy to find.



Straw

Straw is the component of cob referred to as the fiber. It acts as a natural rebar like the metal rebar would function in cement. It adds tensile and shear strength to cob walls and holds a cob structure together as a single monolithic piece.

Use straw that is fresh and not brittle or rotten. Make sure that it has been kept dry before purchasing it too. Sometimes a bale of straw might look okay on the outside, but it's a good idea to examine some of the stock for mold or mildew by opening up a bale to see the inside portions.

Look for bales of straw that have long strands. Six to twelve inches is an appropriate range. If its too short you are losing out on the benefits of this ingredient for cob.

Test the quality of straw by taking a strand in your hands and bending and pulling it to check its strength or brittleness. You can also take a couple more strands, put them all together, and try to tug the pieces of straw apart. Straw is much stronger when put together and it should be very difficult to break them with your own strength.

Many people are worried that the straw will rot inside of their cob walls over time. Straw and other similar fibers have been used in cob and there are many buildings that have lasted for hundreds of years without any decomposition of the fibers inside. Even after this much time, its still yellow and strong because there is very little oxygen or moisture available inside of dried cob for microorganisms to cause rotting and the straw is thus preserved inside.

Another important point to make here is that you should never use hay as a substitute for straw. They are very different things. Hay is a pre-harvest food product such as grass, alfalfa, or clover for livestock animals to eat. Straw is the post-harvest 'waste product' that does not contain any food value. It is the stem left over usually from oats, wheat, or barley.

Wheat stems are hollow and have great tensile strength. On the other hand, hay has lower tensile strength and will decompose. Hay has seeds in it and is still living whereas straw is just the left over chaff and has no food value to it. Hay is prone to sprouting and could make your cob walls look like a giant chia pet! It is also prone to rotting. As they say, hay is for horses. Don't use it for cob!

Wheat straw is a great option for your fiber ingredient. Its widely available in the United States and many other countries. It usually costs between \$3 to \$5 for a bale. Oat and rye straws also make for strong cob mixes.



You can find straw at farm feed stores, farmers, or sometimes at local home improvement stores such as Lowes or Home Depot. It's also a good idea to search online for people selling straw bales. Craigslist is a good site to find these deals.

Always try to store straw indoors if possible. It's risky to store it outdoors for any length of time. If you do keep it outdoors, store it up off the ground and keep it well ventilated. Covering your straw with tarps is good, but tarps usually leak and build up condensation underneath them. Store it underneath some leak-proof roofing material if you have it available. If you have sheets of plywood or steel roofing you can lay that on top to cover it. Its very important to keep the straw dry to maintain its integrity.

Water

Water is the final ingredient that you will need for making cob. There's nothing particularly special about the kind of water that you use though. If you're getting it from your water lines then you have nothing to worry about. But if you're collecting it from a pond or open body of water then just make sure that you remove any leaves or other organic matter from it first.

The water is a crucial ingredient in cob because it is what turns your soil, sand, and straw into a goeey, thick building material. You may also remember that the clay

first needs to be made wet in order to coat the aggregate particles and create the suction and binding.

Note:

Cob is a very forgiving building material in many ways. Don't feel overwhelmed at the need to get the perfect and ideal ingredients in every way. Use what you have available to you in your local area. Chances are high that what you have will make an adequate cob mixture. It doesn't have to be perfect.

What you can do now:

- Find a good source of clay-rich soil
- Find a rough, sharp sand aggregate source
- Find a good source of straw
- Get price lists for any of these materials that you may have to buy