Insulated Earthbag Foundations for Yurts

by **Owen Geiger** on February 17, 2011

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Intro: Insulated Earthbag Foundations for Yurts

Note: If you're new to earthbag building, first read the introductory **Step-by-Step Earthbag Building** and **How to Build an Earthbag Roundhouse** .

This Instructable includes complete step-by-step instructions on how to make an insulated earthbag foundation. You can use the same process to make insulated foundations for any type of structure – straw bale, earthbag, cordwood, etc.

Yurts or gers are very efficient and practical in harsh, cold climates, as evidenced by centuries of use in Mongolia. Benefits of yurts include affordability, rapid construction, ease of construction, wind resistance, great looks and portability (ability to take your home with you if you ever move). You may even save on taxes since some jurisdictions do not consider yurts permanent homes.

Many people build their yurts on a raised wooden platform to reduce moisture problems. But wood is expensive and building a platform/deck requires a fair amount of tools and carpentry know-how. Wood is vulnerable to fires and prone to rot and insect damage. It also requires regular painting or sealing. And if the wind and snow can blow underneath like most designs, then you'll lose a lot of heat.

In addition to the many other uses for earthbags (retaining walls, domes, rootcellars, houses, etc.), you can build insulated foundations by filling the bags with insulation such as scoria. The benefits of the insulated earthbag foundation system described here include:
- Very low cost, especially if you can locate recycled grain bags from farmers
- Very simple construction using just a few tools most people already have
- Save energy and enjoy a more comfortable home because the floor and foundation are superinsulated (with no wind blowing under the floor to suck heat away)
- No deep footings/excavation required (see Frost-protected Shallow Foundations design guide mentioned below)
- The finished floor can be raised above grade as high as necessary. Deep snow? Flooding? No problem.

For those who live in Canada or similar climates, you might want to follow the **Earth-Sheltered Solar Canadian blog** , who's planning to build an insulated earthbag foundation that's suitable for extremely cold climates.

Building in extremely cold climates uses the same process as outlined in this Instructable, but you will need a deeper trench with additional insulated earthbags below grade to create a **Frost-protected Shallow Foundation (FPSF)** . Combine these two ideas – FPSF and insulated earthbag foundations as shown in this Instructable – and you'll have everything you need to know for free.

The following instructions assume you have cleared and leveled the site, removed topsoil, and positioned scoria around the building site to minimize work.

3D AutoCAD drawings show each step of construction.

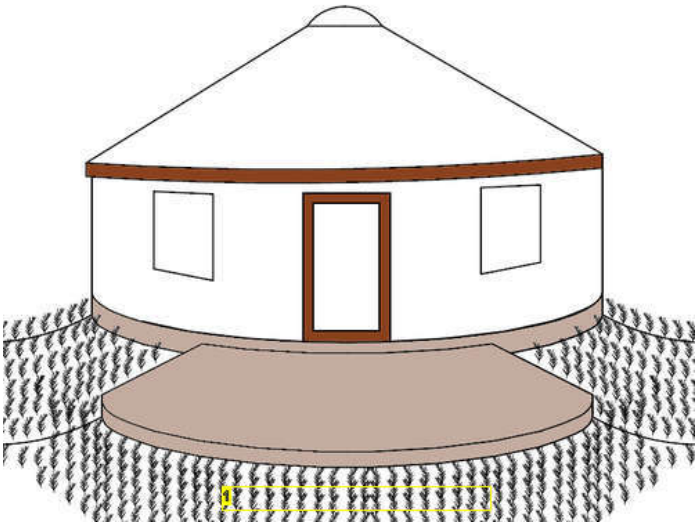


Image Notes
1. Yurt shown on finished insulated foundation with optional deck

step 1: Foundation trench

Dig a foundation trench slightly wider than your earthbags. Use string or twine attached to a center stake to define the radius of the foundation. Install a French drain to remove moisture if needed, and then add 6"-12" of gravel or rubble, depending on climate. The depth of the trench will also vary according to climate. Consult the FPSF guide mentioned above for more details. For instance, the drawing shows how earthbags can be started at ground level ('on-grade') in mild climates. But for cold climates you have to use additional courses of earthbags that start below grade.

Tip: Throw the soil from the trench to the outside. This saves moving the soil later when you berm earth against the sides of the foundation.

Image Notes
1. Rubble trench filled with gravel

step 2: Insulated earthbag foundation

Build the insulated earthbag foundation using bags or tubes filled with scoria or pumice. Other fill materials could be used, but they're still considered experimental. Scoria (lava rock) works perfectly for making insulated earthbag foundations, because it's insulating, rot proof, fireproof, and doesn't attract insects or pests. Scoria is also lightweight and easy to work with. It's almost like handling bags of popcorn. Buy screened ½" scoria for best results. Place the bags or tubes directly on the gravel-filled trench. Check the radius to each bag so the foundation comes out perfectly round.

Use standard earthbag techniques: barbed wire between courses, tamp and level each course (only light tamping required for scoria), angle bag ends toward center and so on.

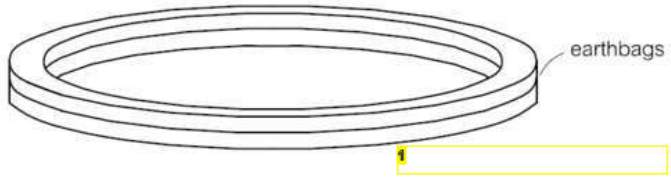


Image Notes
1. Two courses of earthbags filled with scoria (you can add more courses)

step 3: Fill the interior area with insulation

Once the earthbags are stacked, fill the interior area with insulating fill material such as scoria or pumice. It's a good idea to use 6 mil plastic sheeting underneath to prevent wicking of moisture.

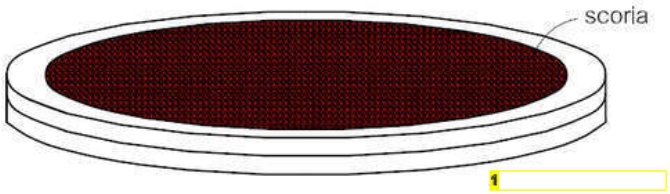


Image Notes
1. Fill interior area with scoria

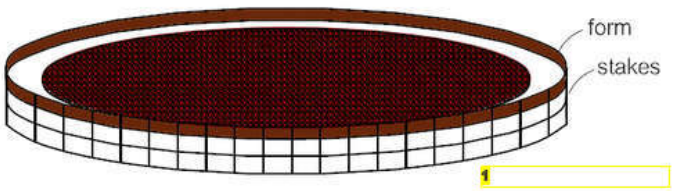
step 4: Pour concrete slab

Pour a concrete slab on top. Adding another layer of 6 mil plastic will prevent concrete from flowing into the insulation. Note: the slab doesn't have to be a full 3-1/2" thick like typical slabs, since it will bear less weight. 2-1/2" to 3" thick slabs should work fine in most cases if you use a proper mix, and pour and work it correctly. Get help with this step if needed and/or research how to pour concrete. Plan ahead and raise the floor 5" above any surrounding decks.

Use half inch plywood or, for tighter radiuses, two layers of ¼" plywood to make the concrete forms. Level the top of forms and tie to the stakes with wire.

You could build the yurt directly on the raised slab after sufficient time for curing. This is a good option for radiant floor heating and/or where building with wood is not practical.

The first drawing shows the formwork and the second drawings shows the completed concrete slab.



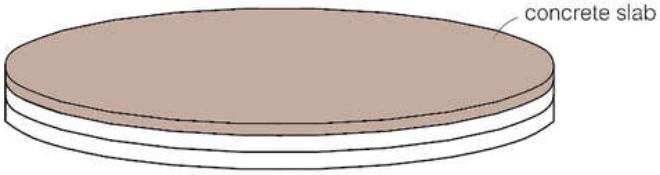


Image Notes
1. Tie concrete form to stakes

step 5: Optional deck

Optional deck. Use the same building method to create decks around the yurt, although they don't need to be insulated. Instead of scoria in the bags and under the floor, you can use gravel. Decks can be any size or shape you want. You're not limited to round shapes, although there are limitations to building high, straight earthbag walls – at some point they'll require additional bracing. But this is not a concern if you build low earthbag foundations of just a few courses and berm the sides with tamped earth.

It's best to integrate the deck foundation and main foundation by overlapping bags where walls join. The overlapping bags should be filled with scoria to prevent thermal bridging.

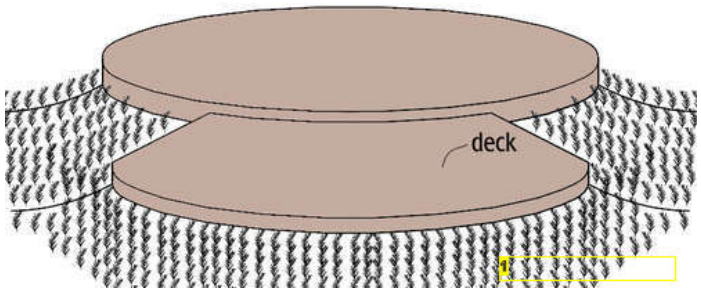


Image Notes
1. Add optional deck

step 6: Build an optional wood floor

The standard floor method for yurts is to build a circular wood platform that is the same size as the yurt and at least 5" above any surrounding decking. This allows the yurt's side cover to hang down and attach to the circular platform. This method provides a weather tight seal around the edges, added space for floor insulation, plumbing and electrical, and makes it easy to install wood flooring.

The drawing shows floor joists set 24" on center and covered with plywood. Construction adhesive and/or deck screws will help prevent squeaks. You can cover the edges of the wood floor with the concrete forms.

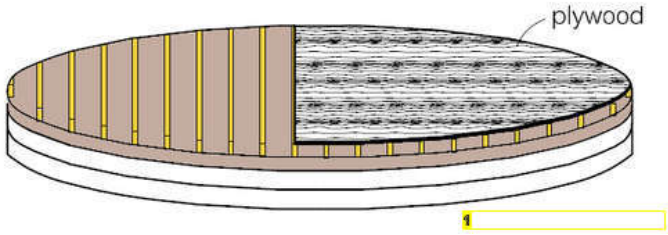


Image Notes
1. Add optional wood platform

step 7: Finishing details

There are two main ways of finishing the sides of the foundation. The quick, easy way is to install 6 mil plastic sheeting around the sides to divert water away. Then berm and tamp earth around the sides and landscape as desired. You could place the plastic sheeting so it goes under the concrete form and slab. The plastic will last for many years if it's not exposed to sunlight. The longer lasting option is to plaster the sides of the foundation, then add plastic sheeting, earth berm and landscaping. Note how no stairs are required in most cases if you a) design the foundation correctly, b) use decks (multiple levels if necessary) and c) berm the sides.

Now you can set up the yurt and enjoy the benefits of an insulated foundation for years to come.

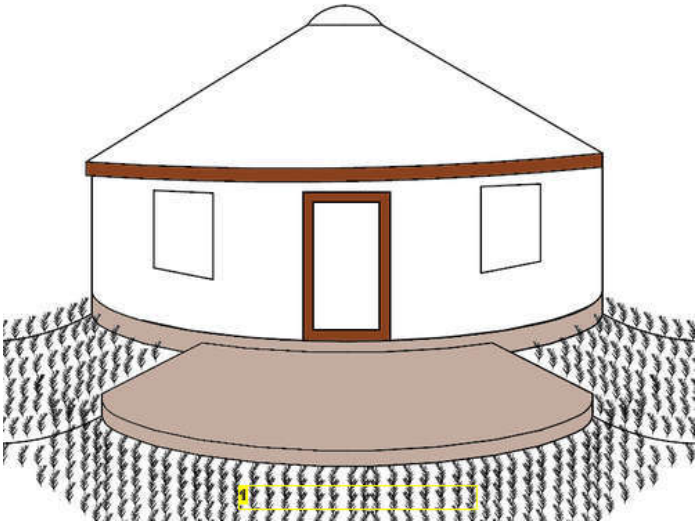


Image Notes
1. Yurt shown with finished insulated foundation and deck

Related Instructables

How to Build an Insulated Earthbag House by Owen Geiger

Step-by-Step Earthbag Building by Owen Geiger

How to Build an Earthbag Dome by Owen Geiger

How to Build an Earthbag Roundhouse by Owen Geiger

How to Build Dirt Cheap Houses by Owen Geiger

How to convert a closet into a mini wine cellar by dedub01