

Backyard Science

>> ACTIVITY <<

by Michelle Moody

Building a House on Permafrost



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Encouragement & Practical Help *Today*

This activity accompanies the *Backyard Science* column in the **Winter 2024** issue of *Homeschooling Today* magazine.
[You can read the article here.](#)

In this project students design and build a model home on **“permafrost,”** then observe how the foundation survives a permafrost melting.

Before starting, go outside and look at the foundation of the home or building you live in. You may want to check out the foundations of homes and buildings in your community as well.

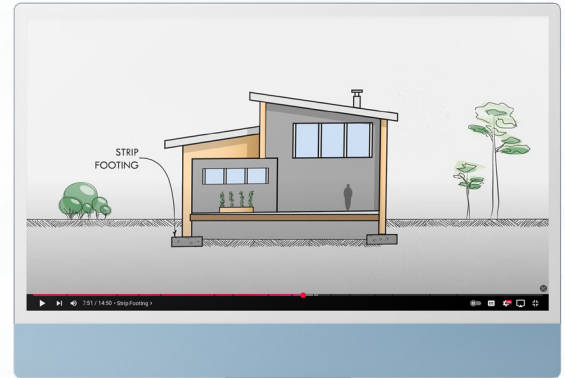
Here is a good video about foundations from Practical Engineering: [Why Buildings Need Foundations.](#)

You may want to review some of the following resources before starting this project.

This video from NOVA explains the issues with melting permafrost and a new invention to help keep permafrost from thawing: [NOVA: Making Stuff Colder | Preserving Permafrost | PBS LearningMedia.](#)

This resource from the Department of Environment and Natural Resources Government of the Northwest Territories has helpful information about building and maintaining a home built on permafrost: [A Homeowner's Guide to Permafrost in the Northwest Territories.](#)

The University of Alaska has a publication that shows the different types of foundations used on homes built on permafrost: [Foundations for Building on Permafrost.](#)



Resource for Grades 8-12

[“Can I Build Here?” Permafrost Presentation](#) from Cold Climate Housing. This is advanced, but it gives students a thorough insight into the issues when building on permafrost. There are lots of images and charts to help students understand the discussion.

In this activity, you will build a permafrost mini-environment using either soil and water or gelatin. If you do not have access to cold storage where you can place the soil and water, or the temperatures are not cold enough to set the soil and water outside, you can use gelatin to mimic the permafrost ground.

Here are the project criteria:

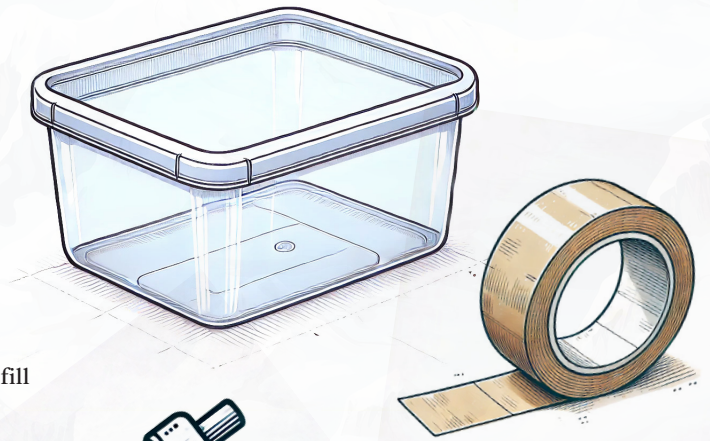
- The structure has to be at least 6” tall.
- The structure has to weigh at least 4 ounces or 100 grams.

Questions to answer before building:

- What do you think is going to be most important in your design?
- Looking at the materials you have to build with, which do you think will be the most helpful in building a sturdy house?

Materials

- Clear storage box or a plastic shoe box
- Small rocks or other items that can be used as small weights (for example, coins, marbles, or washers)
- Soil—Potting soil or soil from your yard
- Gelatin—If you do not have access to cold storage or the outside temperatures are not below freezing, you will need enough gelatin to fill the box about one-third full.
- Water
- Craft supplies—wooden craft sticks, dowels, straws, recyclables, tape, glue, or any other building materials you have handy
- Glue gun and glue (optional)



Directions

1. **If you are using the gelatin method:** Make your gelatin and set it in the refrigerator or outside to congeal.

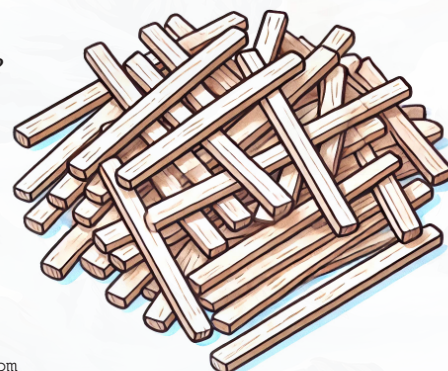
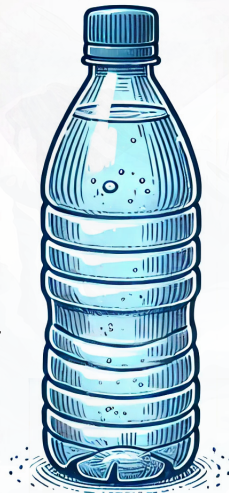
If using the soil method: Fill the clear, plastic box about 1/2 full with soil. Soil from the ground with yard debris works well, but you can also use potting soil.

Depending on the size of the plastic box, add water. We used 4 cups of water (or 2 16-ounce water bottles) for a plastic box that was about 16"x13" and filled halfway with soil.

2. Set in a cold location, well below freezing.
(This is a great wintertime activity!)

Let sit overnight and look at the soil from the top, sides, and bottom. Do you see the white "permafrost" where the water froze?

3. Leave the permafrost soil in cold temperatures and use the craft supplies to start designing a home that will hold up well under the melting permafrost.
4. Start building the design; if the outside temperatures are cold enough, complete the building outside to keep the permafrost cold while you build.
5. Once your building is done, either set it inside where the temperatures are warmer or leave it outside if warmer temperatures are in the weather forecast.
6. Observe what happens as the permafrost warms. How did the structure hold up?
7. Remember, your house will also have people, furniture, and other items adding weight to the house. Add some of the small rocks you collected. How does that affect how well your structure holds up on the thawing permafrost?



What would you do differently to improve your design?