ZIPPER STAIRS - a new type of stairway using Nylon-Cement

by **Thinkenstein** on July 31, 2009

Table of Contents

intro: ZIPPER STAIRS - a new type of stairway using Nylon-Cement

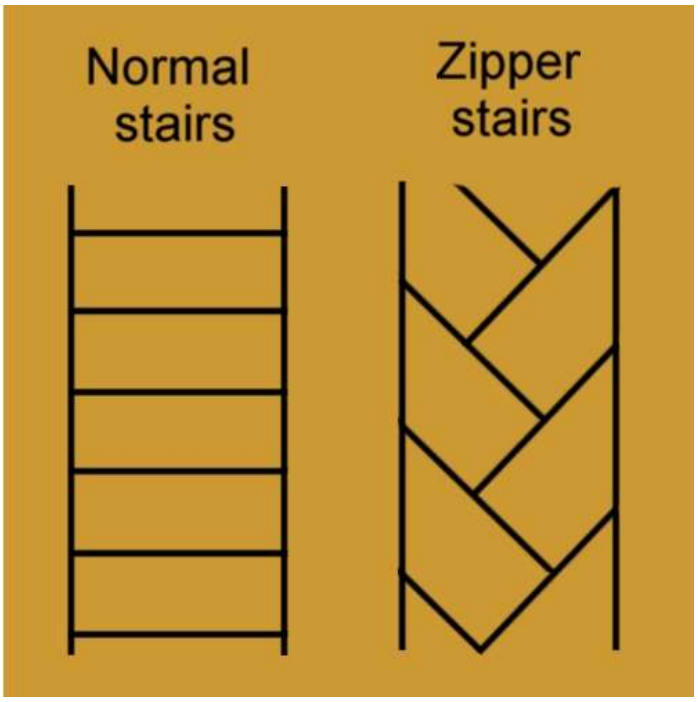
Stairways have been a part of architecture for thousands of years. **Zipper Stairs are a new type of stairway.**

My inspiration for zipper stairs came from a visit to Mesa Verde National Park, where the Anasazi Indians had carved hand and foot holes in the rocks to climb up to their cliff dwellings. Their holes were small, and were probably chipped out with much difficulty using crude tools. If one were to expand the holes until they touched each other, something they did not do, the end result would be similar to zipper stairs.

Stairs are used to climb an inclined plane. They have a vertical face and a horizontal face. As the inclined plane gets steeper, the vertical face gets higher and the horizontal face gets narrower. The higher the step, the harder it is on one s knees. As the horizontal face gets narrower, one s foot eventually doesn t fit on the step, unles the foot is placed sideways, which is awkward. Going up and down traditional steps becomes more dangerous the steeper they get.

Using zipper stairs on the same slope, there are more steps, so the vertical rise for each one is shorter and more comfortable for one s knees. Also, by turning the steps at an angle to each other, one gets the diagonal distance of the rectangle for one s foot, which is longer than the short distance provided by normal stairs. Zipper stairs are more comfortable and safer for steep slopes than are traditional stairs.

This instructable will show some of the zipper stairs I have made over the years and follow one stairway project from beginning to end.



step 1: The Project Begins

This is the work site at the beginning of the project. There are two basic problems; the stairway, and water drainage, which has gouged out a ravine next to where the stairs will go. This instructable covers only the stairway.

The slope is steep, a perfect place to use zipper stairs.

After the stairs are carved into the dirt, and the ravine is filled, everything will be covered by a layer of nylon-cement. Nylon-cement is a combination of nylon fishnet and cement, a material I developed many years ago, and have built my whole house out of. You can see one project I have done with it on my road repair instructable, http://www.instructables.com/id/ROAD-REPAIR-with-NYLON-CEMENT/

Think of nylon-cement as you would a layer of fiberglass. The fishnet replaces the glass cloth, and the cement replaces the resin.

step 2: The Inclined Plane

Stairs are basically flat areas on an inclined plane where you can put your feet. On a steep plane, such as this one, zipper stairs are safer and much more comfortable to use than are traditional stairs.

With traditional stairs, as the slope increases, each step becomes more difficult. Higher steps are harder to make for people with weak knees and hips. Traditional stairs also have narrow steps on steep slopes, with no way but sideways to place your foot.

With zipper stairs there tend to be more steps that work into the pattern, and each step has a lower and more comfortable height. Since sipper stairs are set at an angle there is more distance on each step for one to place the foot.

I think that zipper stairs are probably safer for small children to climb up and down than are traditional stairs. With traditional stairs, a body starts rolling and keeps rolling to the bottom. With zipper stairs, a child would tend to bounce from side to side, and soon come to a stop.

On lower slopes, there is nothing wrong with traditional stairs. As the slope increases, however, the traditional stairs should morf into zipper stairs. Zipper stairs are not always at 90 degree angles to one another. There is an angle to fit just about any situation.

step 3: Carving the Steps

This is a sculpture moment. Always keep water runoff in mind.

The basic tools I used to carve the hillside were a hoe and a machete. I am fortunate to not have granite here, as far as carving goes. We have a lot of clay, and a semi-hard rock called "tosca", which is like hard clay.

I started at the top. From above, you can look down and imagine at what depth the next step will be. A long-handled hoe will let you stand where you are and carve out the step below it. Then you can stand on the new step and carve out the following one. It is fairly safe to carve on a slope this way, and most of the excavation dirt slides down the inclined plane to the bottom.

After roughing out the design, you can tweak it with the machete, sharpening up the edges of the steps for example.

step 4: Splatter Coat

The splatter coat is a quick step that locks down loose particles of dirt and make plastering easier.

I usually do this step in the late afternoon, so the cement has the cool and moist night time for hardening up well. If cement dries out before it cures, it hardens up less. Thin layers dry out faster, so I prefer to work after the heat of the day.

When doing the splatter coat, wear old clothes, eye protection glasses, and a hat if you get really messy. Doing the stairs, it was mostly my feet and lower legs that got splattered.

Mix a bucket of water and cement, without sand, and stir it up. You get a slurry that we call "lechada." The mix consistency is like watery paint. Use a big brush, the kind cement workers use, to fling the lechada.

To test the consistency, fling some on the ground. If you can see the color of the ground showing through, the mix is too thin. Add more cement. If the mix becomes too thick, it becomes harder to fling. Anything more than the minimum needed to cover the earth is probably wasting cement.

The splatter coat usually hardens up enough overnight that by the next afternoon one can walk on it and continue with the next step.

step 5: The First Coat

Ideally you want the fishnet to be in the middle of the layer of cement, not at the bottom. Plaster the steps once, put down the netting and then plaster it again. Use the normal 3 to 1 mix of sand and cement.

If it was more convenient to work on the sides of the project, I would normally put down the fishnet and the finish coat right away, while the bottom layer is still fresh. This difficult terrain calls for a two-step process, putting down the first layer and letting it harden so that one can then walk on it to do the net and finish layer. If the first layer of cement stays clean, the second layer should adhere to it well.

Sweep the steps after the cement hardens up a little bit, to knock off any rough spots that might make the following steps more difficult.

step 6: Laying down the Fishnet

By the following afternoon, you should be able to walk on the splatter coat layer without damaging it too much. Lay down the fishnet. Because of all the angle changes, the net will probably have to be cut some to make it conform to the shape. Fishnet is very flexible, however, and can stretch to fit without cutting a lot of times. To cut it, I use a sharp machete.

I made the biggest recycling score of my life when I got my fishnet free as waste from the tuna fishing industry. This is the last of my supply, however, and no more is available locally. New fishnet is not cheap. Some chemist should figure out a way to recycle our waste plastic into a mesh material for plastering.

step 7: Top Coat

The top coat of cement can receive a wide variety of textures. Steps can be slippery when wet, or covered with algae. To help improve traction, create an appropriate texture. One of my favorite techniques is to stipple the surface with the strings of a floor mop. One can also brush the surface with a broom head to create parallel lines, or stipple to make rough peaks. Any tool leaves a mark.

If your cement mix is too thick to penetrate the fishnet and adhere to the bottom coat, water down some of it and rub it in with your gloved hand. Put the thicker mix on top of that and create your final texture. For these stairs, I swept the surface with a broom to create the final texture.

When it hardens up enough to spray with water, try to keep it damp during the heat of the day. You should be able to walk on the project in a day or so.

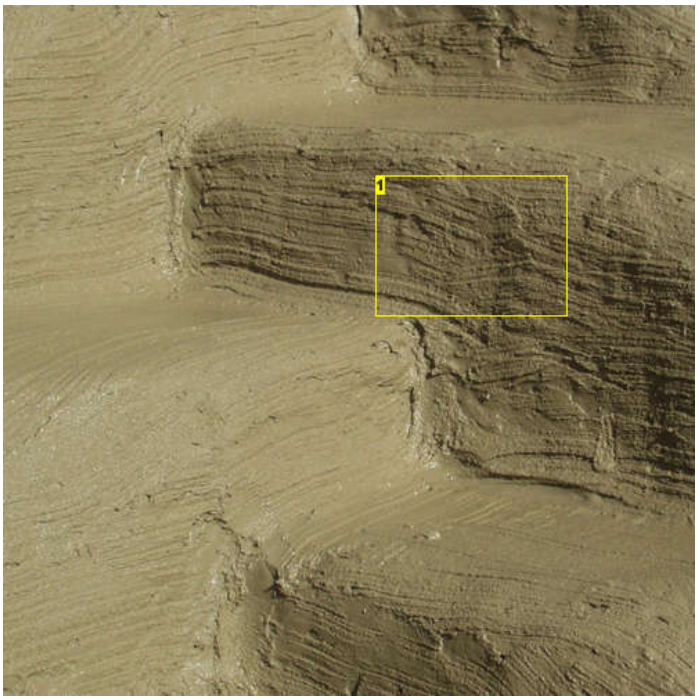


Image Notes
1. The final texture is applied with a broom.

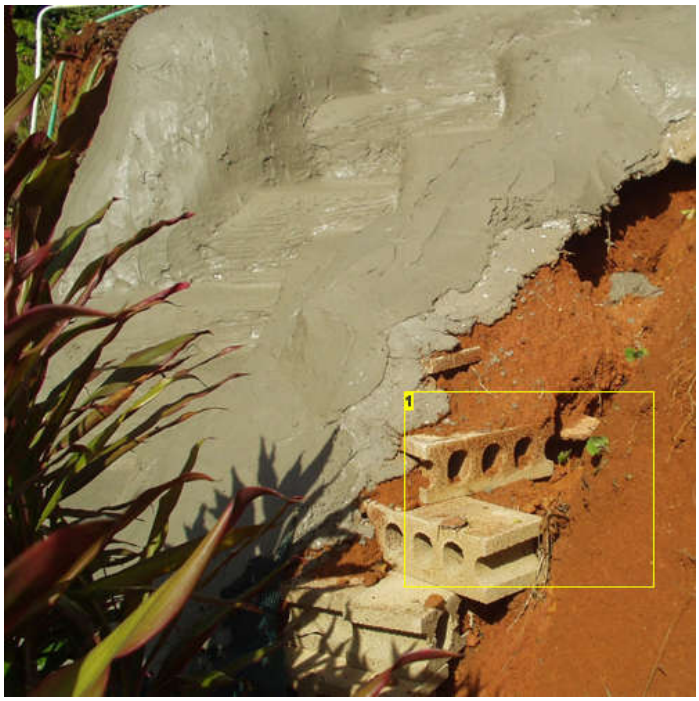


Image Notes
1. This area will be covered with nylon-cement also ... but that will be another project for another day.

Image Notes
1. This area will probably be filled with cement, styrofoam scraps, and empty plastic bottles. The gully will be protected with nylon-cement.

Image Notes
1. Creating the final texture.

step 8: Other Examples of Zipper Stairs - 1

This is the first and only example of a zipper stair in the air that I have ever done. Because of a shortage of fishnet, I did most of this project the traditional way, with ferro-cement. Instead of fishnet, I used three layers of chicken wire to hold the cement. It works, but nylon-cement is so much more user-friendly I hated to go back to the old technology.

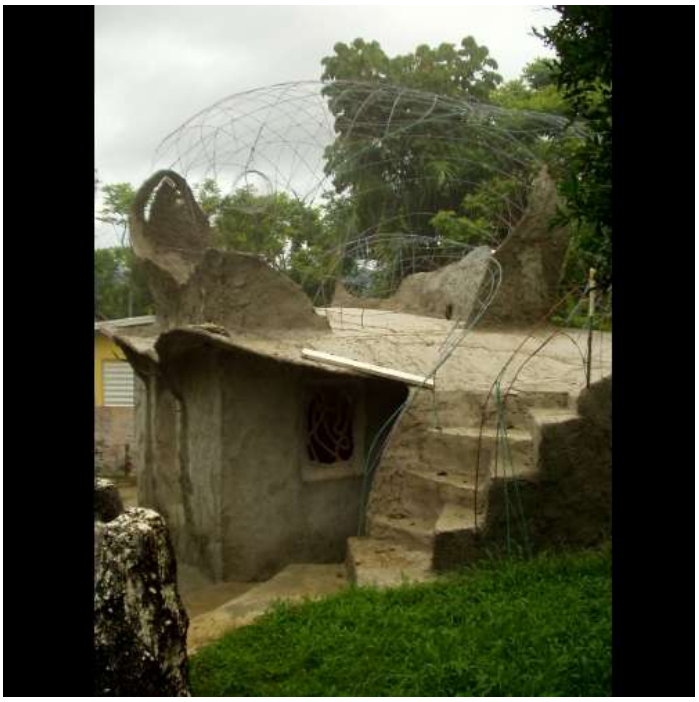


Image Notes
1. The shape of the stairs is first made with iron rebar.

Image Notes
1. Because I am running out of fishnet, I used traditional ferro-cement technique here. Three layers of chicken wire take the place of one layer of fishnet. Fishnet is much easier to work with.

Image Notes
1. This is the under side of the stairway.

step 9: Other Examples - 2

These photos show some of the zipper stairs I made back in the 1980's. Trying for the minimum thickness, I only did the splash coat and top coat. The stairs and walkways held up pretty well considering how thin the material was, about 1/4 inch thick. Made thicker by having a first coat underneath the nylon, I'm sure they would have held up better. Erosion was controlled, at least. We get a lot of rain here and dirt steps don't last long.

As you can see, cracks do form, and weeds do grow in the cracks. A string trimmer takes care of most of the weeding.

People tend to step on the edge of steps, instead of in the middle of the step. The steps tend to get damaged on the front face of them because of that. I make the front faces thicker now when I make steps. Also, tree roots can grow under the thin layer of cement and break the step as the root grows. If roots rot away under the cement, they cause hollow areas, which can cause the nylon-cement to break and sink in under the weight of a person.

Image Notes
1. These were my first curving zipper stairs.

Image Notes
1. Tree roots can break up the nylon-cement, but the fishnet helps to hold the pieces in place.

Image Notes
1. This area is carved dirt made to look like rock. One can climb the "rocks" as though they were steps. The idea grew out of zipper stairs. You might call this an invisible zipper stairway.

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