

Build your own custom sized heavy duty batteries

This build is based off of the standard heavy duty batteries that you find and buy off the shelf at your local stores and they can be built for pennies on the dollar. All materials are common, safe and non toxic. The raw materials can be stored indefinitely ready for use during any emergency situation.

I came up with this build after being inspired by all of the Youtube videos where people are building and experimenting with homebrew batteries made from alternate materials. I wanted something that would be ready to use as soon as it was assembled without the need to charge it first so I went online and studied technical papers and even some older patents that were online that pointed me in the right direction to be able to build a heavy duty battery that worked correctly. I then gathered up all of the materials needed and built up a test jig and just start experimenting until I came up with a good build.

Below is a simple description of the materials used in this build along with their basic function.

Zinc (Negative anode current collector)

Graphite Rod or Plate (Positive cathode current collector) (Do not use metals for the cathode)

Manganese Dioxide (Positive cathode and catalyst)

Carbon (Used to hold moisture and to set the correct mix ratio for the manganese dioxide)

Salt (This is part of the electrolyte mixture that lets the battery deliver current) **See special notes.*

Citric Acid (This too is part of the electrolyte mixture and this allows the voltage to develop)

Thick Brown Paper: (Used between the zinc neg anode and the pos manganese/carbon mixture)

Container for the battery (This can be anything from PVC pipe or any small suitable container)

Special notes:

Ammonium Chloride (This is used in professional battery production and it will deliver a higher output current if you choose to use this for your battery. For this build we are using common table salt but I will include the information where to purchase the ammonium chloride along with the correct mixture ratios if you do decide to use this in the build instead of the table salt.

The quantities, ratios and mixtures in this build are for a very small test battery that's a bit smaller than a AAA battery demonstrated in the online video. The battery's power rating can easily be scaled up for larger C and D cell sized batteries or anything in between that you can imagine. You can just customize the battery build for your needs. These batteries are 1.5 volt batteries so if you have a device that requires 3 volts, you would build 2 batteries and wire them in series. If your device required 6 volts you would build 4 batteries and wire them in series.

Zinc (We will use common roofing zinc that is 99.9% pure and very cheap)

Manganese Dioxide (Not only used in batteries but many other things too like pottery hobbies)

Carbon (Used in filtering and cleaning systems along with being used in batteries)

Salt (Used in the electrolyte mixture. This is an alternative to using ammonium chloride.)

Ammonium Chloride (Used in professional battery production.)

Citric Acid (Used in canning but in our case it's used in the electrolyte mixture)

Materials used continued

Use the ratios listed below and follow the directions when you mix everything together.

The ratios needed are all broken down and listed by their actual weight

When designing the battery I made all measurements on two sets of digital scales for accuracy. I will include a list of exactly what I used for the build including where to purchase materials and how to process and mix everything together so that the battery works the first time for you. Keep in mind that if you choose to scale up the build you simply scale up the individual measurements listed below.

Zinc: (We will custom cut this to the required size of our battery we are building.)

Graphite Carbon Rod (We will custom trim or cut this to size to fit our battery we are building)

Brown Thick Paper: (We will custom trim this to the needed size and shape for our battery)

Manganese Dioxide: (3.5 Grams)

Carbon (5.35 Grams)

Salt (1.98 Grams)

Citric Acid (1.33 Grams)

Ammonium Chloride (1.12 Grams)

Distilled Water (Approx 3.8 grams. The mixture needs to be wet enough for the battery to function correctly but not so wet that water runs out of it. If you are using a more refined powdered carbon like carbon made from coconut shells this will be a very fine powder and it will require a bit more water to get the correct consistency when mixing everything. This is something you will learn by trial and error.

If you are using a course produced carbon the first thing to do is to prepare the carbon by crushing it into a powder then sifting it through a small handheld kitchen screen strainer. Only make up what you need until you learn the process. I also use a mortar and pestle to grind things down to a bit of a finer powder but don't overdo it. Put the powdered carbon into a small mason jar with a lid so that it's ready to use when you need it. If you're using a ultra refined powdered carbon you can skip this step.

(1) In a small plastic cup mix the carbon with the manganese dioxide and dry stir it a few times. then using a mortar and pestle grind down the mixture bit but do not overdo it. Put this back into the small plastic cup and set it aside.

(2) In a small cup take you're salt or the ammonium chloride and mix it with your citric acid then use the mortar bowl and grind both ingredients down but once again, do not overdo it. Once you have the mix ground it down, add this to the carbon/manganese dioxide mixture cup and dry stir it to mix everything together until you feel that everything is mixed together well enough

(3) We are now ready to add the water which will activate the chemical mix. Add approx 3.8 Grams of water to the mixture and gently but thoroughly mix everything together. You will also need a small dropper like you would see used in a medicine or vitamin bottle so we can fine tune the water in our mixture. If you try to do this with a spoon you will almost always use too much water and make a mess. We want the mixture to be very moist but not dripping wet. Cover the mixture to protect it from evaporating until we use it for the next step which will be the actual construction of the battery itself.

Prepping the paper spacer for the battery

Prepping the paper spacer is a simple straightforward process which we will be doping the paper with either a liquid salt solution or a liquid ammonium chloride solution depending on what you pick when you are constructing your battery.

You will need the following items for the process:

1. Thick brown paper cut to the sizes you will be using for your battery
2. A regular sandwich baggie.
3. 1 teaspoon of salt or 1 teaspoon of ammonium chloride
4. Approx 1 /4 cup of warm tap water.

Take your sandwich baggie and fill it with your warm water then add either the salt or the ammonium chloride to the water and gently shake or agitate the mixture until the salt or the ammonium chloride is dissolved into the solution.

Once everything is dissolved, put the paper into the sandwich baggie and seal it and once again gently shake or agitate the solution until the brown paper is saturated and wet.

Remove the paper and allow it to dry and once it's dried it's ready to use and the extra paper can be stored away in a new dry sandwich baggie until you need it again.

Making the electrolyte gel for the battery

The next step is to make our electrolyte gel and once again this is an ultra simple process. This gel will start out as a neutral mix until you dope it. You will need the following for this process:

1. 1 teaspoon of CMC powder
2. A regular sandwich baggie
3. approx 1/4 cup of warm water

Take your sandwich baggie and fill it with your warm water then add 1 teaspoon of CMC powder to the mixture and gently massage the mixture and it will immediately start to gel. Mix it to remove any dry patches and if it's too thick just add a bit more water until you reach a consistency of petroleum jelly but with a bit thinner texture. As it sits it will get very clear with the exception of bubbles in the paste. At this time the paste is neutral and before we use it we will scoop a teaspoon out into a plastic cup and dope it by adding either a tiny bit of salt or sodium chloride or potassium chlorate to it so that it becomes conductive. You dope it with whatever you base your battery build on. The way the electrolyte paste is applied is directly to the thick brown paper where the negative zinc anode can be placed on top of it and the paper folded around the negative anode. The electrolyte paste aids in keeping the battery from drying out along with aiding in the conduction of current in the battery.

Conclusion for building the battery

The simplest way to build the battery is to use this write-up as a guide and a resource for where to make purchases for the raw materials to construct the battery along with saving a copy of the Youtube link or better yet, downloading the video for safe keeping on a device should things get bad or even should the internet decide to go down for any period of time.

If you have any questions or comments I'm more than glad to reply back to you and to try to answer any of your questions that you may have on this topic or this build.

If you are technical and especially if you have ever worked in a professional battery construction environment and can offer any information or improvements on this build I would really love to hear from you with any information you can offer me.

This battery build is NOT perfect by any stretch of the imagination but it does work. When I researched this topic I realized that even with the cheapest batteries on the market that the companies really hold their cards close to their chest on their raw materials so you are pretty much in the dark to a lot of the processes involved in making quality homemade zinc carbon batteries.

I also recently learned that they don't just use standard Manganese Dioxide like pottery makers use in their field but instead they use what is called a refined activated Manganese Dioxide which makes it so that it's very stable when used in battery construction.

All of the materials used in commercial battery construction are highly refined even with the cheapest batteries on the market because these companies can afford those building materials so please keep this in mind when building these batteries and remember these are for emergency use only but mainly they are for an educational experience in how these types of batteries work.

Typical battery construction layout.

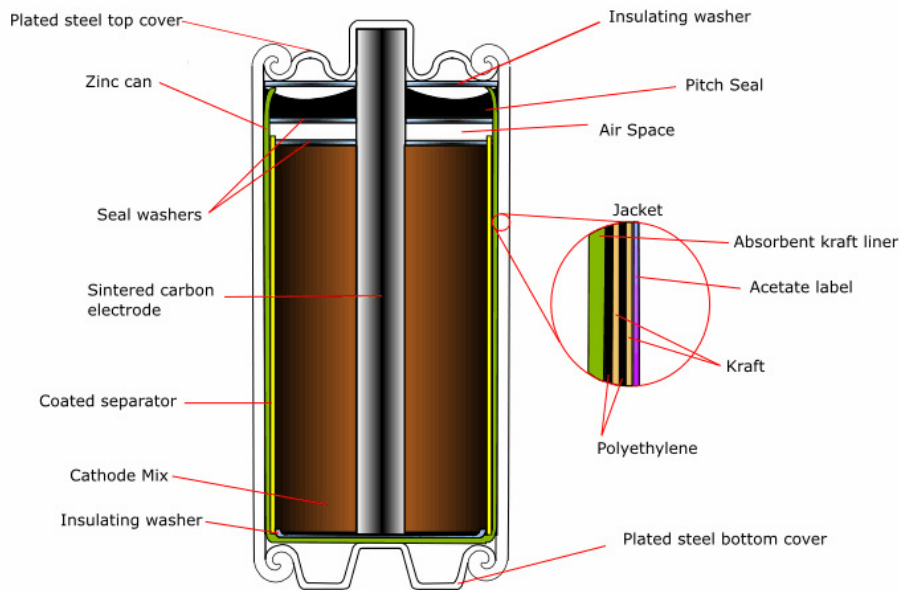
This is a basic block diagram illustration of how a battery is constructed

Write-up and photo illustration courtesy of University of Cambridge website.

The zinc serves as both the container and the anode. The manganese dioxide/carbon mixture is wetted with electrolyte and shaped into a cylinder with a small hollow in the centre. A carbon rod is inserted into the centre, which serves as a current collector. It is also porous to allow gases to escape, and provides structural support. The separator is either ce-real paste or treated absorbent kraft paper (the kind of brown paper used to make large envelopes or grocery bags).

Below is how most zinc carbon batteries are constructed but you can customize emergency batteries building them inside of small medicine bottles or custom cut pieces of PVC pipe or they can be laid out as a flat cell in the arrangement of stacking the materials like you would do when making a sandwich. You could use two flat plastic plates or even a small plastic box to accomplish a flat cell build. As long as you understand the basics of how the battery works and is constructed, you can build the batteries to any size and shape that fits your needs.

Structure of a Zinc/Carbon Cell



Below are how the materials are layered and would wire to a load.

Carbon Rod current collector (+ Connection)
Carbon/Manganese Dioxide paste layer
Doped paper separator
Zinc current collector (- Connection)



Basic list of materials and where to find them

This is a basic list of what you need to construct your batteries with

This is a video that I've been wanting to put together for a while now. This information will allow you to build custom sized batteries for an emergency or even for educational purposes that work. I have listed a download links along with a description where to find the materials you will need to build the batteries.. If you have any questions just reach out to me @ flash001@rocketmail.com and I'll try to help.

Table salt without iodine (This generates a stable working current for the battery)
Purchase at Walmart or pretty much any grocery store.

Citric Acid powder (This generates a stable working voltage for the battery)
Purchase at Walmart or pretty much any grocery store.

Distilled Water (If your water is loaded with minerals)
Purchase at Walmart or pretty much any grocery store.

Ammonium Chloride link (Optional: We are using common table salt as a substitute)
https://www.amazon.com/dp/B004V9UQ14?psc=1&ref=ppx_yo2ov_dt_b_product_details

Zinc 99.9% (This used for our battery NEG anode current collector)
https://www.amazon.com/dp/B07QFYH4C1?psc=1&ref=ppx_yo2ov_dt_b_product_details

Carbon/Graphite rods for electronics or graphite powder if you are making your own custom positive current collectors.
(This used for our battery POS cathode current collector)
You will find these all over eBay and the graphite can be purchased anywhere online. Just do a Google search.

Activated Carbon
Purchase from Walmart or from your local pet store or search for it online.

Thick brown paper or cut up a paper bag
This is for the spacer between the carbon/manganese mix and the zinc anode.

Manganese Dioxide (This is the heart of the battery. It is the catalysis for the battery)
<https://www.ebay.com/itm/201969588667>

CMC powder (This makes our electrolyte paste for the battery)
https://www.amazon.com/dp/B09SGJDR45?psc=1&ref=ppx_yo2ov_dt_b_product_details

Cheap multi meter (Needed for checking the battery function)
These can be found anywhere these days

Mortar and Pestle (This is an option for grounding down some of the materials)
https://www.amazon.com/dp/B08MWJWGL5?ref=ppx_yo2ov_dt_b_product_details&th=1

Small 7 oz plastic cups and plastic spoons and plastic stir sticks
Used for mixing and prepping your raw materials.

Paper towels and disposable gloves
Use for keeping your hands and work area clean