💧 Off-Grid Independence: My 2,200-Gallon DIY Rainwater Catchment & Purification System

> For the past 4 years, I have been completely off city tap water. By switching to a 100% self-sufficient rainwater harvesting system, I've saved **$100 a month on my water bill (~$4,800 saved so far)**, eliminated my dependency on municipal infrastructure, and produced water that tastes far superior to city water. Living in Oklahoma means engineering a system that can survive brutal winter freezes while maintaining strict purification standards—especially with growing concerns around airborne "forever chemicals" (PFAS). Here is the exact blueprint of my system, from catchment to the kitchen counter.

🏗️ Part 1: Storage & Structural Infrastructure

To survive Oklahoma cold snaps, the entire reservoir system is housed inside a dedicated, winterized shed built to heavy insulation specifications.

- **Massive Storage Capacity:** 2,200 gallons total, utilizing eight 275-gallon IBC totes piped together in a manifold system using 3/4-inch plumbing.
- **Heavy-Duty R-11 Insulation:** The reservoir shed is insulated from the inside out to prevent freezing:
  - One layer of 1/2-inch wood.
  - One layer of 10-mil greenhouse sheeting acting as a vapor barrier.
  - One layer of 1-inch Owens Corning 703 rigid fiberglass boards.
  - Tight wrap in 4-oz nonwoven landscape fabric with seams stapled and T-Rex taped to keep fiberglass from becoming airborne.
  - One layer of white styrofoam.
  - A final protective layer of 26-gauge low-rib metal panels.
- **Freeze Backup:** This insulation profile is so efficient it easily handles extreme cold snaps with just three 300W light bulbs running as a backup heat source.

🌧️ Part 2: Catchment & Pre-Filtration

Clean drinking water starts with a clean, well-managed collection process to safeguard downstream components.

- **The Catchment Area:** Water collects from a 2,200 sq. ft. clean metal roof via 7 downspouts routed around the house.
- **The 30-Minute Roof Wash Rule:** This is my number one defense against atmospheric pollution. I allow the rain to flush the roof for 30 minutes before opening the tote lids. This manually washes away dust, pollen, bird droppings, and concentrated airborne PFAS that settled on the roof during dry spells.

- **Mechanical Pre-Filtration:** As water enters the totes, it passes through 400-mesh stainless steel sieves fitted to each tote's 6-inch opening. This strains out fine physical debris down to 37 microns, preserving filter element lifespan.

⚡ Part 3: Pumping & Pressure

To deliver water from the storage shed to the house with strong, reliable residential-grade pressure, the system utilizes a high-utility dual-tank layout:

- **Pump & Primary Tank:** A 1.6 HP shallow well pump connected to a 5-gallon built-in pressure tank factory set at 30 PSI ON / 50 PSI OFF.
- **Secondary Expansion Tank:** A large, secondary 44-gallon pressure tank ensures steady water pressure across the property without cycling the pump constantly, drastically increasing motor lifespan.

🍳 Part 4: The 4-Stage Drinking Water Purification Routine

While the water in my main totes is structurally clear, drinking and cooking water requires a rigorous multi-stage purification train to guarantee absolute safety from biological pathogens and microscopic chemical contaminants.

Stage 1: Annual Surface Maintenance

Once a year, I power wash the front roof catchment section to keep the surface completely clean and free of organic material buildup.

Stage 2: Biological Neutralization (The Solo Stove Boil)

I pump water from the main reservoir and boil it in 15-gallon batches on my outdoor Solo Stove for 5 minutes. This thermal shock completely eliminates any potential living biological pathogens (bacteria, viruses, and cysts).

Stage 3: The Intermediate Settling Barrel & Maintenance

Once boiled, I transfer the water via a dedicated 5-gallon bucket into a 55-gallon blue, food-grade open-head barrel.

- **The Elevated Draw:** I mounted the output garden valve 2 inches from the bottom of the barrel. This creates a 2-inch settling zone where fine micro-ash or microscopic particles can naturally drop to the bottom undisturbed.
- **Sanitation Access:** Because this barrel features a removable full circular lid with a large metal circular clamp, I can easily unclamp it and power wash the entire interior once or twice a year to keep it spotless.

Stage 4: Micro-Filtration & Chemical Removal (The Berkey)

Once the water has cooled completely to room temperature inside the staging barrel, I pour it into my 2.5-gallon gravity filtration system for daily household use.

- The system uses Black Berkey elements operating at a 0.024-micron pore size.
- Because the water has been completely pre-filtered, boiled, and gravity-settled, the input water is free of heavy sediments, preventing the carbon from clogging prematurely.
- The proprietary carbon composite matrix focuses entirely on its main job: trapping heavy metals, organic compounds, and adsorbing over 99.9% of PFAS ("forever chemicals") for pristine, crisp-tasting drinking water.
