07 - Passive Cooler Fridge (Zeer Pot) Build

A zero-electricity evaporative cooler built from two galvanized trash cans, sand, and a water wick. Keeps stored food significantly cooler than ambient garage temperature with minimal maintenance.

What This Is and How It Works

A zeer pot is a passive evaporative cooler that requires no electricity, no refrigerant, and no moving parts. It works by allowing water to evaporate continuously from damp sand packed between two containers. Evaporation pulls heat out of the inner container, keeping its interior meaningfully cooler than the surrounding air.

In a Southern California garage that reaches 90 to 100 degrees Fahrenheit in summer, a well built zeer pot can keep the interior 20 to 40 degrees cooler than ambient depending on airflow and humidity. The drier the air, the better it works. Southern California's low summer humidity makes this one of the better climates in the country for this technique.

The evaporation must be able to escape. This is the most important thing to understand about how a zeer pot works. If the sand is sealed airtight, evaporation stops and so does the cooling. The sand needs airflow across it at all times. This design keeps the sand ring exposed while covering only the center where the food lives.

Materials

- 1 galvanized metal trash can, 32 gallon — outer container
- 1 galvanized metal trash can, 20 gallon — inner container
- Clean sand — enough to fill the gap between the two cans, roughly 2 to 3 cubic feet (play sand, sandbox or any store bought course sand). Do not use backyard dirt.
- 1 mason jar or small bucket — water reservoir for the wick
- Cotton rope, thick cotton cord, or a strip of absorbent fabric — wick material, roughly 18 to 24 inches long
- 1 round piece of wood cut to fit over the inner can opening — wooden cap
- Small blocks of wood, jar lids, or similar spacers — to elevate food containers off the bottom

- Your food storage containers — sealed airtight buckets, mylar bags, or mason jars for rice, beans, and tallow

Do not use a bare galvanized metal lid as the cap for the inner can. Metal conducts heat readily and will absorb warmth from the garage air and transfer it downward into your food storage. Wood insulates naturally and does not require any additional material on top of it.

Why These Can Sizes

A 20 gallon can inside a 32 gallon can leaves approximately 2 to 3 inches of gap between the walls on all sides. This gap is the right width for the sand layer — enough thermal mass to hold moisture and provide consistent cooling, narrow enough that the sand stays uniformly damp from the wick without requiring excessive water.

The 20 gallon inner can provides a usable interior of roughly 20 gallons — sufficient for a meaningful quantity of sealed rice, beans, and tallow for a family of 4.

Build Instructions

Step 1 — Prepare the Outer Can

Place the 32 gallon outer can in the coolest shadiest corner of your garage, away from the garage door and away from south or west facing walls. These walls absorb the most solar heat during the day and radiate it inward. An interior corner is ideal.

The can does not need to be attached to anything. It simply sits on the floor.

Step 2 — Add the Base Sand Layer

Pour clean sand into the bottom of the outer can to a depth of about 2 inches. This elevates the inner can slightly and allows the cooling effect to work from below as well as from the sides.

Dampen the sand thoroughly before proceeding — it should feel like damp sandcastle sand, not waterlogged.

Step 3 — Set the Inner Can

Lower the 20 gallon inner can into the center of the outer can, sitting on top of the sand layer. Center it as evenly as you can so the gap between the two can walls is consistent all the way around.

Step 4 — Pack the Sand Gap

Pour damp sand into the gap between the two cans, packing it down gently as you go to eliminate air pockets. Fill the gap all the way to the top of both cans. Keep adding sand and packing as you go — the sand will settle slightly over the first few days and you may need to top it up once after initial use.

The sand should be damp throughout. Dry sand provides no cooling effect.

Step 5 — Elevate Food Containers Inside the Inner Can

Before loading food, place a small wooden board, a few jar lids, or similar spacers on the bottom of the inner can. This lifts your food storage containers slightly off the bottom so air can circulate underneath them and condensation does not pool directly under your stored goods.

Step 6 — Load Your Food Storage

Place your sealed food containers inside the inner can. Rice, beans, and tallow should each be in their own properly sealed airtight containers — sealed buckets with gaskets, mylar bags in buckets, or large mason jars. The zeer pot manages temperature. Your individual containers manage moisture, oxygen, and pests.

Step 7 — Make and Install the Wooden Cap

Cut a circle of wood to fit over the opening of the inner can. Three quarter inch plywood or a single board of similar thickness works well. The cap should:

- Cover the entire opening of the inner can
- Rest stably on the rim without falling in
- Leave the sand gap around the outside edge fully exposed to air

This is the critical detail of this design. The wooden cap covers only the center — the inner can opening — while the sand ring around it between the two cans remains completely open to airflow. The evaporation happens in that exposed sand ring. The food underneath the wooden cap stays protected from moisture, insects, and debris.

The wooden cap does not need to be airtight or press fitted. A close comfortable fit that a bug cannot walk through is sufficient. Cool air inside the inner can is denser than warm garage air and naturally stays put — it is not trying to escape through a loose fitting lid.

Lift the wooden cap off whenever you need to access your food. That is its only maintenance requirement.

Step 8 — Set Up the Wick Reservoir

Fill a mason jar or small bucket with water. Cut a length of cotton rope, thick cotton cord, or absorbent fabric strip roughly 18 to 24 inches long.

Feed one end of the wick down into the sand at the top of the gap between the two cans, pushing it in a few inches so it makes good contact with the sand. Drape the other end over the rim of the outer can and down into the water reservoir sitting beside it.

Capillary action will slowly draw water from the reservoir into the sand continuously, keeping the sand damp without any manual intervention. The reservoir feeds the sand. The sand feeds the evaporation. The evaporation feeds the cooling.

Check the reservoir once a week and refill when low. In hot dry summer conditions this may be every 5 to 7 days. In cooler months it may be every 10 to 14 days.

Maintenance Summary

Task	Frequency
Refill wick reservoir	Every 5 to 14 days depending on season
Check sand level and top up if settled	Once after first week, then as needed
Access food storage	As needed — lift wooden cap, replace when done

That is the entire maintenance requirement. There is nothing else to do.

What to Expect

In a Southern California garage in summer with ambient temperatures around 90 to 100 degrees Fahrenheit, this setup will realistically keep the interior of the inner can around 60 to 75 degrees Fahrenheit depending on airflow in the garage and humidity on any given day. Marine layer days with higher humidity will reduce the effect somewhat. Dry Santa Ana wind conditions will improve it.

For your three stored items specifically:

- **White rice in sealed containers** — well within safe storage range, no concerns
- **Dried beans in sealed containers** — well within safe storage range, no concerns
- **Tallow** — tallow melts at roughly 90 to 95 degrees Fahrenheit. At 60 to 75 degrees interior temperature the tallow stays solid and stable even on the hottest garage days

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Why Not a Metal Lid

A bare galvanized metal lid conducts heat. Sitting in a hot garage it absorbs warmth from the surrounding air and radiant heat from the walls and ceiling and transfers it directly downward into the inner can, partially working against the cooling effect you are trying to create. Wood does not do this. Wood insulates passively without any additional material needed. Always use the wooden cap, not a bare metal lid.

Placement Tips

- Coolest interior corner of the garage away from the garage door
- Away from south and west facing walls which absorb the most heat
- Away from any heat producing equipment
- A garage with any natural ventilation — even a small gap under the door — improves evaporation performance slightly over a completely sealed garage

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Revision #6
Created 2026-05-02 06:15:00 UTC by Danicus
Updated 2026-05-02 06:23:11 UTC by Danicus