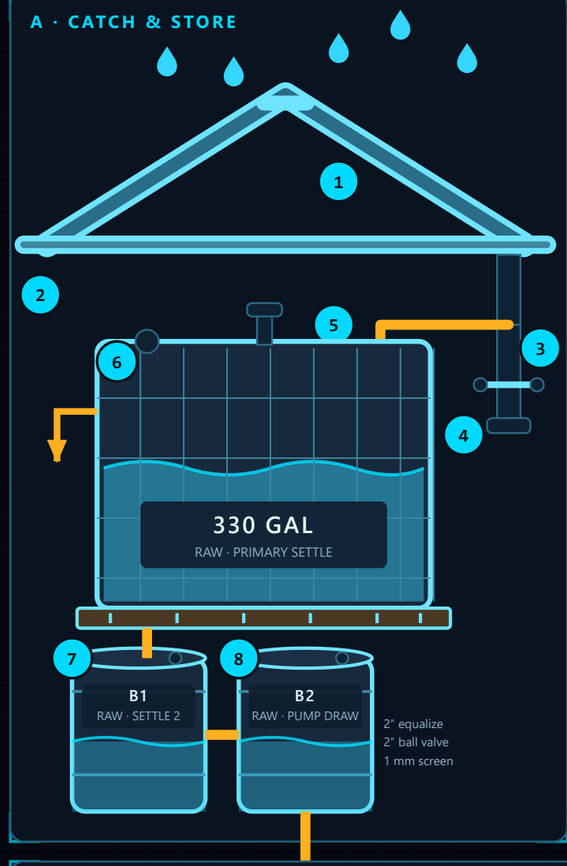
CORE
ADAPTIVE TECHNOLOGIES

RAINWATER → POTABLE WATER

roof → 330-gal IBC → 6 × 55-gal barrel bank → filtration · RO · UV → 4 × 5-gal dispensers

A · CATCH & STORE



B · YOUR 11 VESSELS — ONE JOB EACH

VESSEL	JOB IN THE SYSTEM	WATER
IBC · 330 gal	Raw primary — the big settle. Inlet screened, overflow screened.	RAW
Barrel 1	Raw settle #2 — catches what the IBC stirs up on refill.	RAW
Barrel 2	Raw draw — the pump pulls here and never from the IBC.	RAW
Barrel 3	RO reject buffer → garden, toilet, washdown, fire reserve.	REJECT
Barrel 4	Wash water — dishes, hands, tools, pets. Filtered, not disinfected.	FILTERED
Barrel 5	Potable bulk A — sealed, dosed 0.5 ppm, drawn through 0.2 µm.	POTABLE
Barrel 6	Potable bulk B — the rotation pair, so one can be cleaned.	POTABLE
4 × 5 gal	Dispensers — counter spigots, filled at the station, dated.	POTABLE

THE 4 DISPENSERS — HOW TO KEEP THEM SAFE

- Fill at the station, cap it, and write the date on the cap. Drink within **7 days** — or dose to 0.5 ppm chlorine and get 30 days.
- Two jugs in service, two clean and ready. Never top off a part-full jug: empty → wash → rinse → refill.
- Draw from the spigot, never dip a cup. Wipe the spigot before and after.
- If a jug will sit more than a week, run it through a 0.2 µm carbon spigot filter.

Food-grade HDPE with a screw spigot cap — not a reused motor-oil or detergent jug.

WHAT THAT INVENTORY HOLDS

440 gal — raw storage
330 IBC + 2 × 55 barrels
27 days for 4 people at 16 gal/day · 110 days at drinking-only 4 gal/day

130 gal — potable storage
2 × 55 barrels + 4 × 5 gal jugs
32 days of drinking + cooking for 4 people, rationed at 1 gal/day

2 : 1 — RO reject ratio
every gallon made costs 2 gallons of raw
B3 is only a buffer — a full run makes ~290 gal of reject. Garden, never the drain.

THE BOTTLENECK IS THE MEMBRANE, NOT THE STORAGE

A 100 GPD RO makes ~4 gal/hour. Refilling 110 gal of potable takes 26 hours of runtime — so run it in batches overnight, not on demand. Size the membrane first.

440 gal raw at 2:1 = 147 gal of potable per full bank, with 293 gal of reject.

RULES FOR EVERY VESSEL

✕ Never a drum that held chemicals, oil, fuel or anything with a hazard label.

✕ Never clear or translucent — light grows algae. Opaque, painted or shaded.

✕ Never an unscreened opening. 1 mm mesh on every vent and overflow.

✓ Label every vessel in marker: RAW · FILTERED · POTABLE · REJECT.

✓ Equalize the raw vessels at mid-height with 2" bulkheads; keep tops level.

✓ Block them so they cannot roll, and keep potable away from reject.

A vessel with no job is a vessel that grows something. Keep one dry and empty.

C · PUMP, FILTER, DISINFECT, DISPENSE



LEGEND

- raw
- filtered, not disinfected
- potable
- optional
- reject, never drink

24 · TEST KIT — TDS · pH · turbidity
chlorine · bacteria · 1 mL dosing syringe

ORDER OF OPERATIONS — DO NOT REORDER THESE BLOCKS

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catch → first flush → IBC → B1 → B2 → pump → 20 µm → 5 µm → carbon → [softener]
→ RO → permeate → remineralize → UV → 0.2 µm → fill station → jugs + B5/B6
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CARBON BEFORE RO — free chlorine >0.1 ppm destroys a TFC membrane. The carbon block is the bodyguard.

UV IS NOT A FILTER — it needs clear water: <1 NTU and 5 µm ahead of it, or the lamp does nothing.

BIOLOGY vs CHEMISTRY

UV + 0.2 µm handle biology. RO handles chemistry.
Drop the RO and you still have safe (hard) water.
Drop the UV and nothing downstream is trustworthy.

Dose: 2 mL of 5–6% bleach per 55 gal = 0.5 ppm.
That is 0.2 mL (4 drops) per 5-gal jug.

THE PARTS LIST — 1 TO 24

EVERY COMPONENT IN BUILD ORDER — WHAT IT IS, WHAT TO BUY, WHY IT EXISTS

roof **1** → gutter **2** → downspout **3** → first flush **4** → inlet **5** → IBC **6** → B1 **7** → B2 **8** → pump **9** → pressure **10** → sediment **11** → carbon **12** → RO **14** → permeate **15** → remin **16** → UV **17** → 0.2 µm **18** → station **19** → jugs **20** + B5/B6 **21**

#	COMPONENT	SPEC / WHAT TO BUY	WHY IT IS IN THE SYSTEM
1	**Roof catchment**	Standing-seam or painted metal, concrete or clay tile. 300–1,000 ft² usable, 3–12° slope, no trees overhanging.	The bigger the roof, the more water per storm. The material decides what dissolves into it — lead flashing and bare copper are out.
2	**Gutter + leaf screen**	5″ seamless aluminium, 1 mm stainless mesh over the full run, hangers every 24″, fall 1″ per 10 ft.	Keeps leaves and droppings out before they rot in the tank. A screened gutter is half your pre-filtration.
3	**Downspout**	3″ minimum, clean-out cap at the bottom, first section removable.	The vertical run into the diverter — and the place you clean when it blocks.
4	**First-flush diverter**	10–20 gal (1 gal per 100 ft², never under 10). Float-ball auto-dump, or a manual ball valve you open after each rain.	Dumps the dirtiest water first — feces, dust, pollen. The biggest single cut in filter load you can buy for $40.
5	**Inlet screen + calmed fill**	400–1,000 µm stainless basket at the IBC inlet; elbow or diffuser pointing down into the water, not at the floor.	Catches the last debris and stops incoming water from stirring the sludge layer back into suspension.
6	**IBC · 330 gal**	Food-grade HDPE, shaded or sleeved — translucent is fine, you read the level through the wall. Flat pad, strapped. 2″ bulkhead at mid-height to B1; 1 mm screened vent; screened overflow to daylight.	The big settle and the main buffer. Draw from 6″ above the sludge, never off the bottom.
7	**Barrel 1 · raw settle 2**	55-gal food-grade drum with a screw lid. 2″ bulkheads at mid-height to the IBC and to B2; 1 mm screened vent; 1″ drain at the low point.	Second settling stage. What the IBC stirs up on refill drops out here instead of in your cartridges.
8	**Barrel 2 · raw draw**	Same drum, plus a 1″ outlet 4–6″ above the bottom feeding the pump strainer. This is the pump's only source.	The cleanest raw water you have. Drawing straight from the IBC drags sediment through every filter downstream.
9	**Transfer pump**	1/2–1 HP shallow-well jet or transfer pump, 3–5 GPM at 40–60 psi, self-priming; 100-mesh pre-strainer; float low-water cut-off.	Pushes water through the filters. RO is pressure-driven — no pressure, no permeate. The cut-off saves the pump when B2 runs dry.
10	**Pressure tank + switch**	2–4 gal bladder tank, 30/50 psi switch, check valve.	Stops the pump short-cycling every time a tap or the ice-maker opens.
11	**Sediment filters**	Two 20″ big-blue housings in series: 20 µm pleated, then 5 µm spun. Change at a 10 psi drop.	Mud, grit and rust. Cheap cartridges protecting the expensive carbon and the membrane behind them.
12	**Carbon block**	20″ 5 µm carbon block, NSF/ANSI 42, every 3–6 months, always before the RO.	Taste, odour and VOCs — but the real job is stripping chlorine, which destroys a TFC membrane.
13	**Softener** (conditional)	Cation-exchange or salt-free cartridge if hardness >150 mg/L as $CaCO_3$, or iron >0.3 ppm.	Hard water scales the membrane and halves its life. Skip it only if your water is soft.
14	**RO membrane**	TFC 75–100 GPD, 2:1 high-efficiency membrane, auto shut-off valve, check valve. Feed must be <0.1 ppm free chlorine.	Removes dissolved salts, heavy metals, nitrate and PFAS. 2:1 runs a 33% recovery, so the concentrate is stronger — keep the softener in. At 100 GPD it makes ~4 gal/hour: batch it overnight.
15	**Permeate tank**	3–4 gal bladder tank, usually supplied with the RO kit.	Holds finished water at pressure so the tap actually flows.
16	**Remineralizer**	Calcite/corosex cartridge, after the permeate tank and before the UV.	RO water is acidic and flat. Minerals and pH come back here; it also stops the water attacking metal.
17	**UV sterilizer**	NSF/ANSI 55 Class A, 254 nm, ≥40 mJ/cm², 5–12 GPM, quartz sleeve, lamp-life meter. Lamp is a 12-month consumable.	Kills whatever got through. Needs power, clear water and a clean sleeve — cloudy water makes it decorative.
18	**0.2 µm absolute filter**	PES or hollow-fibre capsule, absolute rated, after the UV.	The last physical barrier — and the filter you drink through when the power is out.
19	**Fill station**	Wall tap over a drip tray or bench, 3/8″ line from the 0.2 µm, plus a hose bib for the bulk barrels.	One place to fill a jug or a drum — so nothing ever gets filled from a garden hose.
20	**4 × 5-gal dispensers**	Food-grade HDPE with a screw spigot cap, opaque or sleeved, one per 2 people.	The point of use — the vessel that actually touches your glass. Keep it the cleanest thing in the system.
21	**Potable bulk · B5 + B6**	Two 55-gal food-grade drums, sealed lids with a 0.2 µm vent, dosed to 0.5 ppm, drawn through the station.	110 gal of reserve = 27 days of drinking for 4 people. Rotate one against the other so one can be cleaned.
22	**Reject barrel · B3**	55-gal drum, open top, labeled REJECT, on the RO reject line.	RO dumps 2 gal for every gallon made — still ~290 gal on a full bank. Garden, toilet, washdown; never the drain, never a glass.
23	**Wash barrel · B4**	55-gal drum with a spigot, fed from a tee after the carbon block.	Filtered but not disinfected: dishes, hands, tools, pets. Keeps you from burning potable water on chores.
24	**Test kit + dosing**	TDS meter, pH pen, turbidity, free-chlorine strips, bacteria plates, and a 1 mL dosing syringe.	You cannot taste Cryptosporidium. 2 mL of 5–6% bleach per 55 gal = 0.5 ppm; 0.2 mL per 5-gal jug.

EXTRAS, BANK PLUMBING & BUILD ORDER

THE SIX SUPPORTING ITEMS, HOW THE THREE RAW VESSELS CONNECT, DOSING, INSTALL SEQUENCE AND INTERVALS

#	ALSO REQUIRED	SPEC / WHAT TO BUY	WHY IT IS IN THE SYSTEM
A	**Pad + anchoring**	4″ compacted gravel or concrete under the IBC and barrels; straps or anchor bolts; block every drum so it cannot roll.	2,700 lb of water moves. A tipped IBC is a flood plus 330 gal of lost supply.
B	**Insulation + shade**	Rigid foam and shade cloth; heat tape and pipe insulation in a freeze climate.	A frozen housing cracks and floods the room; a hot tank grows algae.
C	**Backflow preventer**	RPZ or dual-check on any municipal tie-in; air gap where possible.	Never let stored rainwater siphon back into a city main.
D	**Chemicals**	Unscented 5–6% bleach, food-grade citric acid, a 1 mL syringe, and pH/chlorine test strips.	Tank shock, barrel dosing and filter descaling — the maintenance you will actually do.
E	**Spares**	2 full filter sets, 1 UV lamp + sleeve + O-rings, 1 RO membrane, 1 float switch, spare drum lid + gasket, silicone grease.	Nothing fails conveniently. Spares on the shelf are the difference between a week and a day.
F	**Tools**	Strap wrench, 2″ hole saw for bulkheads, tubing cutter, 20 ft of 3/8″ tubing, hose clamps, TDS pen, logbook.	You will service this at 2 a.m. in the rain. Make it easy.

BANK PLUMBING — JOINING IBC + B1 + B2

2″ bulkheads at mid-height — one to the IBC, one to each drum, linked with 2″ hose or PVC, a removable 1 mm strainer inside each and a 2″ ball valve at each end. The three then act as **one 440-gal settling body** that levels itself, and you can shut one off to scrub it.

Keep the tops level to within an inch, or put a float valve in B1 so a full IBC cannot overflow it. Check with a hose before the first rain.

Draw from B2 only, 4–6″ above its bottom. Fit each drum with a 1″ low-point drain, and shim them so they tilt toward it. Clean **one vessel at a time** — the other two carry the system.

INSTALL — FOUR WEEKENDS

1 · Catch & bank — pads, IBC, B1, B2, bulkheads, gutter mesh, first flush, inlet basket. Fill with a hose, check the three vessels level and leak-free.

2 · Move water — strainer, pump, pressure tank, switch, low-water cut-off, valve to B3/B4. Confirm 3–5 GPM at the far end.

3 · Filter — sediment 20/5 µm, carbon, softener, RO, permeate, remineralizer. Flush every cartridge 10 minutes before anything is drunk.

4 · Disinfect & prove — UV, 0.2 µm, fill station, jugs, B5/B6. Shock the bank, then a bacteria test and a lab panel **before** you call it drinking water.

DOSING & ROTATION

B5 / B6 (55 gal): 2 mL of 5–6% unscented bleach = 0.5 ppm. Mix in a jug of water first, pour in, lid on, wait 30 min.

5-gal jugs: 0.2 mL (about 4 drops) = 0.5 ppm, or leave undosed and drink within 7 days.

Rotation: one potable barrel in service, one sealed and resting. Swap every 30 days; empty, scrub, refill. Date the lid in marker.

Never dose a barrel you have not cleaned, and never top off a part-full vessel — empty it first.

REPLACEMENT INTERVALS

First-flush water	after every rain event
Sediment 20 / 5 µm	3–6 months, or at 10 psi drop
Carbon block	3–6 months — never past 6
RO membrane	2–5 years (TDS tells you)
Remineralizer	6–12 months
UV lamp	12 months / 9,000 h — it dims before it dies
UV quartz sleeve	clean quarterly, replace 2 years
Barrels + jugs	scrub + shock every 30 days (potable), 6 months (raw)

COMMISSIONING CHECKLIST — SIGN OFF BEFORE THE FIRST GLASS

- ☐ IBC + B1 + B2 level, linked, screened, labeled.
- ☐ First flush diverts ≥10 gal and dumps freely.
- ☐ Pump draws from B2 only, 4–6″ off the bottom.
- ☐ Filter order is 20 → 5 µm → carbon → RO.
- ☐ Free chlorine at the RO feed is 0.0 ppm.
- ☐ UV lit, sleeve clean, lamp date written.
- ☐ Reject runs to B3, not the drain.
- ☐ Bacteria test negative (two samples, 24 h apart).
- ☐ Every vessel labeled; logbook started.

RULES, TESTING & FAILURE MODES

THE EIGHT RULES, THE TEST SCHEDULE, WHAT BREAKS FIRST, AND WHAT TO DO WHEN THE GRID IS GONE

THE EIGHT RULES

1. **Assume the roof is contaminated.** Bird and rodent feces carry E. coli, Salmonella, Campylobacter, Giardia and Cryptosporidium. Every stage on sheet 1 exists because of that sentence.
2. **Never skip the first flush.** It is the cheapest filter in the build and removes 80–90% of solids before they reach a cartridge.
3. **Carbon before RO, always.** Free chlorine above 0.1 ppm destroys a TFC membrane in weeks. The carbon block is the membrane's bodyguard — this is the most common build mistake.
4. **UV is not a filter.** It only works on clear water: under 1 NTU, pre-filtered to 5 µm. Cloudy water hides pathogens from the light and the lamp does nothing.
5. **Draw from the last raw vessel.** The pump pulls from B2, never from the IBC. Every shortcut there puts sludge straight into the cartridges.
6. **A vessel that touches potable water is a potable vessel.** Food-grade, opaque, labeled, sealed, dosed, and never shared with reject or wash water.
7. **RO water is aggressive.** Low pH, no minerals. Remineralize before drinking long-term, and never store it in bare aluminium or unlined steel.
8. **Test, don't trust.** TDS, pH and turbidity weekly; bacteria monthly; a lab panel once a year. A system you cannot test is a system you cannot trust.

TEST SCHEDULE

Weekly	TDS at the RO outlet (should be ≤10% of feed), pH 6.5–8.5, turbidity <1 NTU, smell every vessel.
Monthly	Bacteria (HPC or Petrifilm), filter pressure drop, UV lamp hours, torch inside the IBC and B1.
Quarterly	Clean the UV sleeve, flush the first-flush chamber, scrub and re-dose the potable barrels.
6 months	Shock the raw bank (50 ppm), replace sediment and carbon, replace first-flush water.
Annually	UV lamp + sleeve, RO membrane test, lab panel (metals, nitrate, PFAS if near industry).

WHAT BREAKS FIRST

Flow drops at the tap	Sediment cartridge loaded — replace it, and check the first flush is dumping.
Earthy or plastic taste	Carbon spent, or biofilm in a barrel — shock it, new carbon block.
TDS climbing after RO	Membrane breached or bypass open — replace the membrane, check the ASO valve.
UV alarm / no glow	Lamp end of life or failed ballast — replace the lamp, write the date on it.
Rotten-egg smell	H_2S / sulphur bacteria — shock with chlorine, add KDF/GAC, keep the vessel dark and cool.
Slimy jug spigot	Hand contamination — wash the spigot, re-shock the jug, stop dipping cups.

WHEN THE POWER IS GONE — THE NO-POWER PATH

The pump and the UV need electricity. If the grid is the thing that failed, the train stops with it — but your **130 gal of stored potable water** does not.

- **Four 5-gal jugs + B5/B6** are your supply: 32 days of drinking for 4 people, no power needed.
- **0.2 µm gravity filter** or ceramic + carbon gravity filter — the same barrier as stage 18.
- **Chlorine dioxide tablets** (Aquamira / Potable Aqua) — the only field chemical that reliably handles Cryptosporidium.
- **Rolling boil, 1 minute** (3 minutes above 6,500 ft) — the universal fallback.
- **12 V pump + 100 W panel + battery** runs the whole train; 12 V RO units exist at 50–100 GPD.

DO NOT

- ✕ Drink from any raw vessel because the water "looks clear".
- ✕ Chlorinate before the carbon and call it treated.
- ✕ Run the UV on cloudy water — it does nothing.
- ✕ Put RO reject on the garden and then drink from that garden's hose.
- ✕ Store potable water in a drum that held anything else.
- ✕ Fill a jug from a garden hose (lead, phthalates).
- ✕ Cross-connect to a municipal main without a backflow preventer.

TARGET NUMBERS — WHAT GOOD LOOKS LIKE

6.5–8.5	< 500	< 1	0.0	< 150	< 10	0
pH	TDS ppm · RO < 50	TURBIDITY NTU	FREE Cl AT THE RO	HARDNESS mg/L	NITRATE mg/L	COLIFORM / 100 mL

WATER LOG — COPY THIS PAGE AND KEEP IT WITH THE KIT

T1 = raw (B2 outlet) · T2 = after carbon · T3 = after RO · T4 = after UV / at the tap. Log every filter change and every dose.

DATE	SAMPLE POINT	TDS PPM	PH	TURBIDITY NTU	FREE CL PPM	BACTERIA	ACTION TAKEN