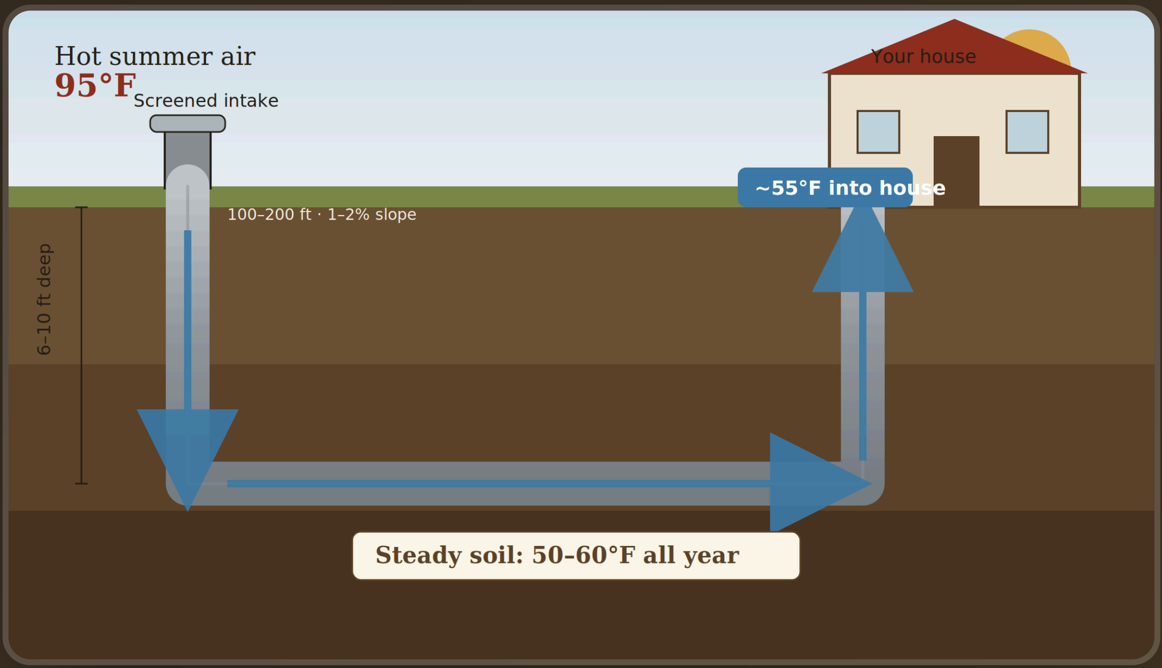
The Earth Tube *Build Files*

Cool your home with the steady 55°F of the ground. The complete $300 build — in plain language, with your numbers, and the honest truth about what it can and can't do.

✓ Your-house calculator | ✓ Real build, step by step | ✓ Honest about the limits



Read it in an afternoon · Build it in a weekend · **Saves you 30–60% on cooling, for decades**

📱 This is the offline PDF. The live interactive calculator and any updates live at oldwaysrestored.com/earth-tube-guide

YOUR COOLING LIBRARY — JUMP TO ANY GUIDE

WHAT YOU'LL LEARN

You can learn what an earth tube *is* from a ten-minute video. What you can't get there is the part that actually matters: **will it work at your house, how do you size it, what do you buy, and what will it really save you?** That's this guide.

Here's the whole idea in one breath: a few feet underground, the soil stays around 55°F all year. Run a pipe through it, pull your home's air through that pipe, and the ground cools the air before it reaches you — no electricity, no refrigerant. It's the oldest trick in building, and in the right house it quietly takes a third to a half off your summer cooling bill.

> *"You're not making cold. You're borrowing a temperature the planet already keeps for free."*

Everything in this guide is honest. Earth tubes are not magic, they don't fit every house, and people who install them badly end up capping them off. We'll show you exactly how to be one of the people they work for — and how to know, before you dig, whether that's you.

01

DO THIS BEFORE YOU SPEND A DOLLAR

Is this even right for your house?

Before you buy a single length of pipe, answer three questions. They decide whether an earth tube will quietly save you money for decades — or become an expensive hole in your yard. If you answer "no" to any of them, this is the wrong project, and learning that right now is the most valuable thing this guide can do for you.

The 3 questions that decide everything

The question	You're good if...	Why it matters
1. Do your summer nights cool down?	Nights drop below ~70°F	The ground gives up the day's heat at night. Cool nights "recharge" the soil so it's ready to cool again tomorrow. Warm, muggy nights never let it recover — so it quits right when you need it most.
2. Does your ground drain well?	No flooding, no high water table	A buried pipe in wet ground fills with water, stops cooling, and grows mold. If your yard stays soggy or your water table is high, this alone rules it out.
3. Is your radon low?	A $15 test reads below 4.0 pCi/L	Radon is a natural gas that seeps from soil, and a buried pipe can pull it into your home. You must test first — every time, no exceptions.

IN PLAIN WORDS

If your nights are cool, your yard drains, and your radon is low, you are an excellent candidate — build with confidence. If your summers stay hot and sticky all night, or your yard floods, this is not your method, and that is completely fine. Section 8 points you to better options for your climate.

Three more checks before you dig

Check	What you want
Can you dig deep enough?	6–10 ft, with no rock shelf or buried utilities in the way. Call 811 first — it's free and the law.
Do you have room?	Space for 100–200 ft of pipe — a straight run or a gentle curve across the yard.
Is there a shaded intake spot?	A shaded place (ideally the north side) to pull air in, so you're not feeding it pre-heated air.

THE HONEST GO / NO-GO

GO if all three core questions pass and you're in a dry or temperate climate — an earth tube can take 30–60% off your cooling for a few hundred dollars in materials.

NO-GO if any fail. Hot-and-humid with warm nights, high radon, or a flooding yard means it'll cause more problems than it solves. Keep your weekend and your money.

02

NO ENGINEERING DEGREE REQUIRED

How it works — explained simply

Walk into a basement or a cave on a 95°F day and it's cool down there. Nobody installed air conditioning in a cave. That cool is the earth itself — and it's the entire secret behind an earth tube.

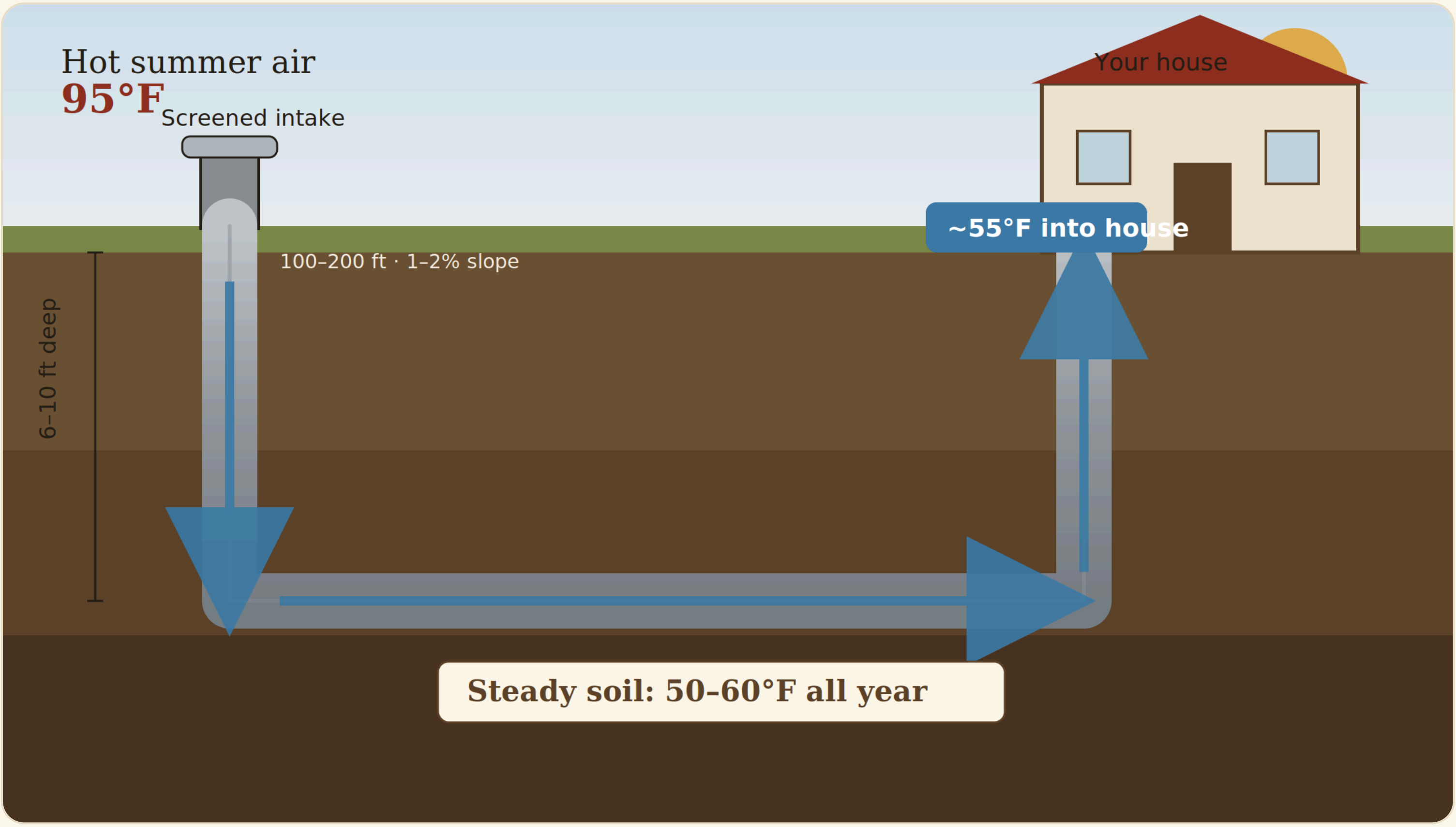
Why the ground is a free air conditioner

The sun heats the surface of the ground by day, and the surface cools off again at night. But that daily heating and cooling only reaches down so far. Each foot deeper you go, the swing between hot and cold shrinks. By about 8 feet down, the soil has stopped noticing day and night, or even summer and winter — it just sits at a steady temperature all year long, somewhere around 52–62°F across most of the United States.

THE SIMPLE VERSION

Dirt soaks up heat and lets it go very slowly — like a giant battery you never have to charge. Eight feet down, that battery sits at about 55°F, winter and summer, year after year. An earth tube simply borrows that steady cool.

Here's how the borrowing works, step by step. You bury a long, smooth pipe down in that steady-temperature soil. A small fan — one that sips less power than a household light bulb — pulls hot outside air in one end of the pipe. As that air travels the length of the buried pipe, the cool earth pressed all around it draws the heat out of the air, the entire way along. By the time the air reaches the far end and flows into your house, it has dropped 20–30°F from the temperature it started at.



Hot air goes in one end, travels through the cool buried pipe, and arrives in the house 20–30°F cooler. No compressor, no refrigerant — just the steady temperature of the ground doing the work.

Why it's a "pre-cooler," not a replacement for AC

This is the single most important idea in the whole guide, because it's exactly where people's expectations go wrong and where disappointment comes from. An earth tube does not *manufacture* cold the way an air conditioner does. It takes the *edge* off — it hands your home air that's already much cooler, so whatever cooling you still run works far less hard and far less often. In a dry climate, that edge can be most of your comfort on most days. In a humid climate, it's a helpful boost. Either way: think of it as a powerful head start, not the finish line.

> *"You're not making cold. You're borrowing a temperature the planet already keeps for free."*

Why old houses used this everywhere

Before electricity, people leaned on the ground constantly. Root cellars kept food cold straight through summer. Spring houses were built over cool running water to chill milk and butter. In hot, dry regions, homes were built with buried air channels that did exactly what an earth tube does today. The instinct to let the earth handle the temperature is as old as building itself. It faded for one reason only: cheap air conditioning arrived and made it unnecessary to think about. The physics never stopped working — we just stopped using it.

> **WHERE THESE NUMBERS COME FROM**
>
> Ground temperatures: the National Renewable Energy Laboratory (NREL) and the US Department of Energy / Oak Ridge National Laboratory. Measured cooling performance — air entering above 90°F and leaving in the mid-50s to low-60s — comes from DOE field studies and monitored Passive House buildings. Every savings figure in this guide stays inside that documented, real-world range. We never inflate it.

03

YOUR HOUSE, YOUR NUMBERS

Your numbers (the calculator)

This is the part no video can give you: **your** house's actual numbers. Tell it your climate and what you can realistically build, and it shows your expected temperature drop, the share of your cooling bill it can erase, and the dollars that adds up to each year.

Your climate	Temp drop	Air into house	Cooling cut	Saved/yr*
Hot-Dry	−23°F	81°F	**62%**	$496/yr
Hot-Humid	−15°F	80°F	**26%**	$211/yr
Mixed / Temperate	−25°F	67°F	44%	$352/yr
Cold / Temperate	−26°F	62°F	62%	$496/yr

Mountain / High-Desert	−26°F	64°F	**62%**	$496/yr
Marine West	−19°F	63°F	51%	$406/yr

**On an $800 season, for a good DIY build: 150 ft pipe, 6 in, 8 ft deep, gentle airflow. Your own numbers depend on your build — use the live calculator to model exactly your length, depth, and bill.*

HOW TO READ YOUR RESULTS

A bigger

TEMPERATURE DROP

means cooler air arriving in your house. A bigger

COOLING CUT

means more of your AC bill erased. The two choices that move them the most are simple: a

LONGER PIPE

and a

GENTLER AIRFLOW

. A 150-foot pipe at a slow, gentle speed beats a 90-foot pipe at full blast every single time.

▶ USE THE INTERACTIVE VERSION

This PDF shows the calculator as a lookup table. For the **live slider version** — where you drag your pipe length and watch your numbers change — open oldwaysrestored.com/earth-tube-guide#calculator on your phone or computer.

04

SEE IT WORK — AND WHERE IT DOESN'T

Three real builds

Two of these are documented, real-world systems. The third is an honest look at the hard case. Together they show you exactly what to expect — the wins and the warning.

WORKS GREAT

The Minnesota build that cools an entire building

Dry climate | Cold nights | Full cooling load

A documented earth-to-air system in Minnesota meets its **entire summer cooling load** from the ground alone — no mechanical air conditioning needed in summer. And in winter it runs in reverse, pre-heating brutal incoming air from −29°C up to −4°C before it ever reaches the furnace. The recipe: a dry climate, genuinely cold nights to recharge the soil, and a careful, well-sealed design. This is the best case, and it is completely real.

WORKS WELL

The Passive House with twin 100-ft tubes

2 × 100 ft pipe | Sealed joints | Sloped to drain

A Passive House builder installed two 100-foot, 8-inch sealed pipes, each sloped to drain condensation away from the house, feeding his ventilation system. The sealed joints kept radon out; the slope kept moisture moving and draining. Years later it's still working — precisely because every careful detail was done right. The lesson worth tattooing on your shovel: **the careful details are the whole game.**

THE HONEST HARD CASE

The humid-climate homes that got capped off

Warm nights | Heavy condensation | Abandoned

In hot, humid climates with warm nights, plenty of earth tubes have been installed and later sealed up and abandoned. Two things killed them: the ground never got a cool night to recharge, so the cooling faded, and the humid air condensed heavily inside the pipe, risking mold. **This is the classic failure pattern — and it's almost always avoidable.** It happens to people who skipped the three questions in Section 1. If your nights stay muggy, believe this guide and choose a different method. That's not a limitation of the guide; it's the guide protecting your money.

THE PATTERN ACROSS ALL THREE

Earth tubes succeed when the climate fits and the build is careful. They fail when people force them into the wrong climate or cut corners on slope, sealing, and drainage. After reading this guide, you'll know exactly which group you're going to be in — before you spend a dollar.

05

THE SIMPLE RULES ENGINEERS AGREE ON

Designing your run

Two things do almost all the cooling: **how long the pipe is** and **how deep it's buried**. Everything else exists to keep the system healthy and the air moving slowly enough to give up its heat. Here are the rules, in plain language.

Choice	The rule	Why (in plain words)
Length	100–200 ft	A longer pipe gives the air more time pressed against cool soil, so it comes out colder. Under about 80 ft, the cooling drops off fast.
Depth	6–10 ft	Deeper soil is steadier and cooler. Six feet works; eight to ten is better. Go as deep as your soil and budget reasonably allow.
Diameter	4–6 inches	A smaller pipe puts more of the air in contact with the cool wall, which cools better. Six inches is the sweet spot for a home.
Airflow	Gentle (2–4 mph)	Slow-moving air has more time to shed its heat. A gentle fan genuinely beats a powerful one here — more speed means warmer output.
Slope	1–2% downhill	So the water that condenses inside always runs to one low point and drains out, instead of pooling. This one is non-negotiable.

THE ONE RULE TO REMEMBER

A

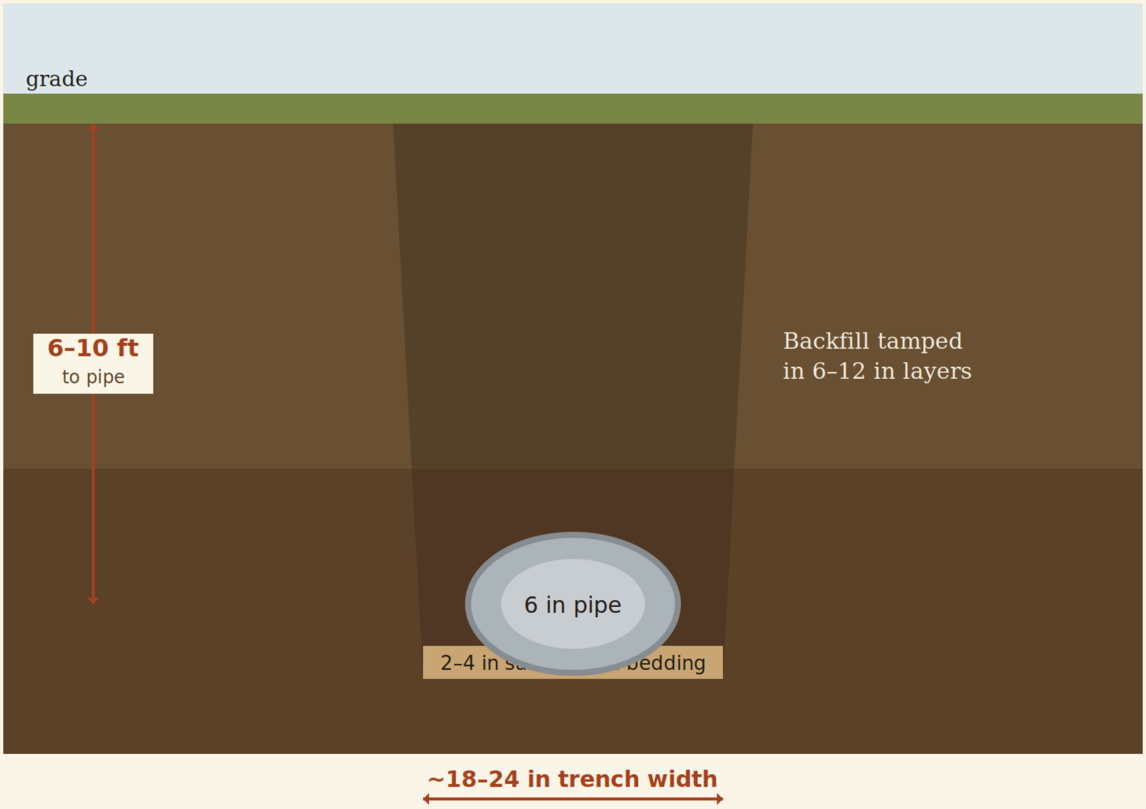
LONGER, SMALLER PIPE, BURIED DEEPER, WITH GENTLE AIRFLOW

beats a short, fat, fast one every time. That's the entire design philosophy in a single sentence — and it comes straight from the engineering studies.

How deep, and how the trench looks

Picture the finished trench in cross-section: the pipe rests on a few inches of sand or fine gravel, sits 6–10 feet down in steady cool soil, and has earth packed firmly all around it so the ground and the pipe are in tight contact. That tight contact matters — air gaps act like insulation and steal your cooling.

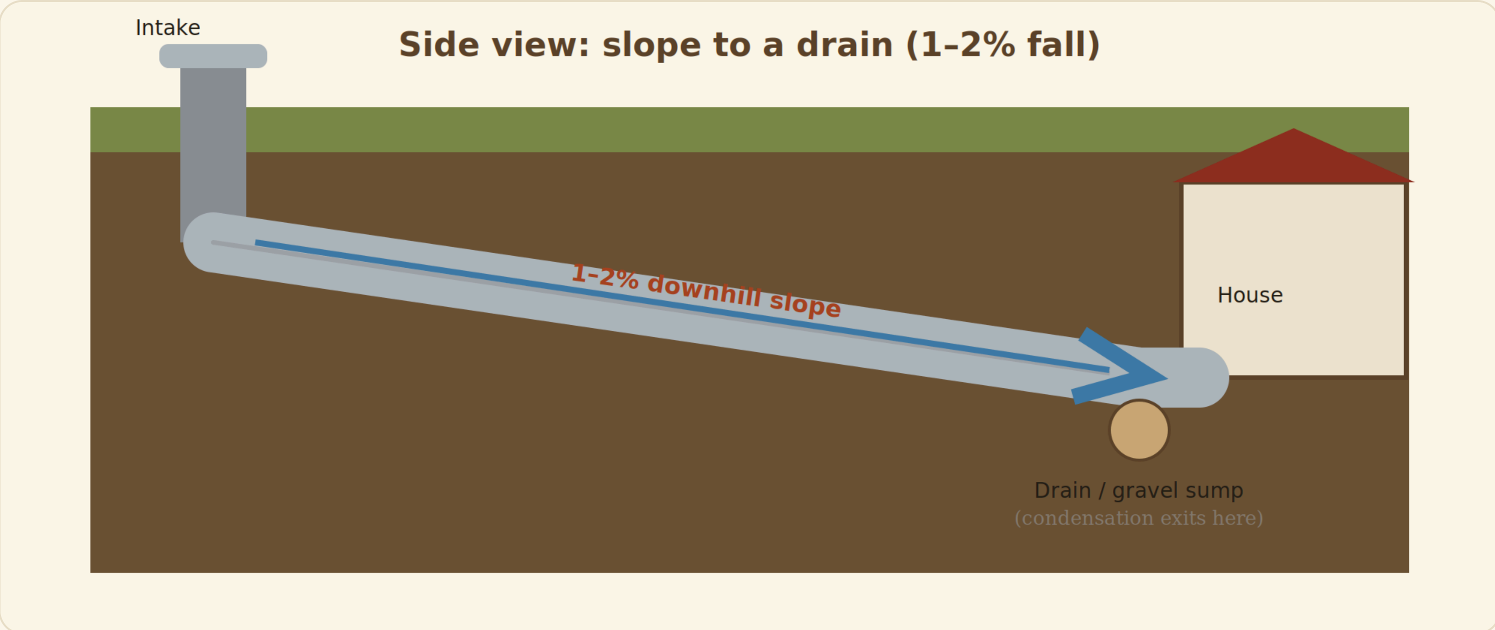
Trench cross-section (looking down the pipe)



The trench in cross-section: smooth pipe bedded on 2–4 inches of sand/gravel, buried 6–10 ft deep, with backfill tamped firmly in layers so the soil hugs the pipe.

The slope that keeps it dry

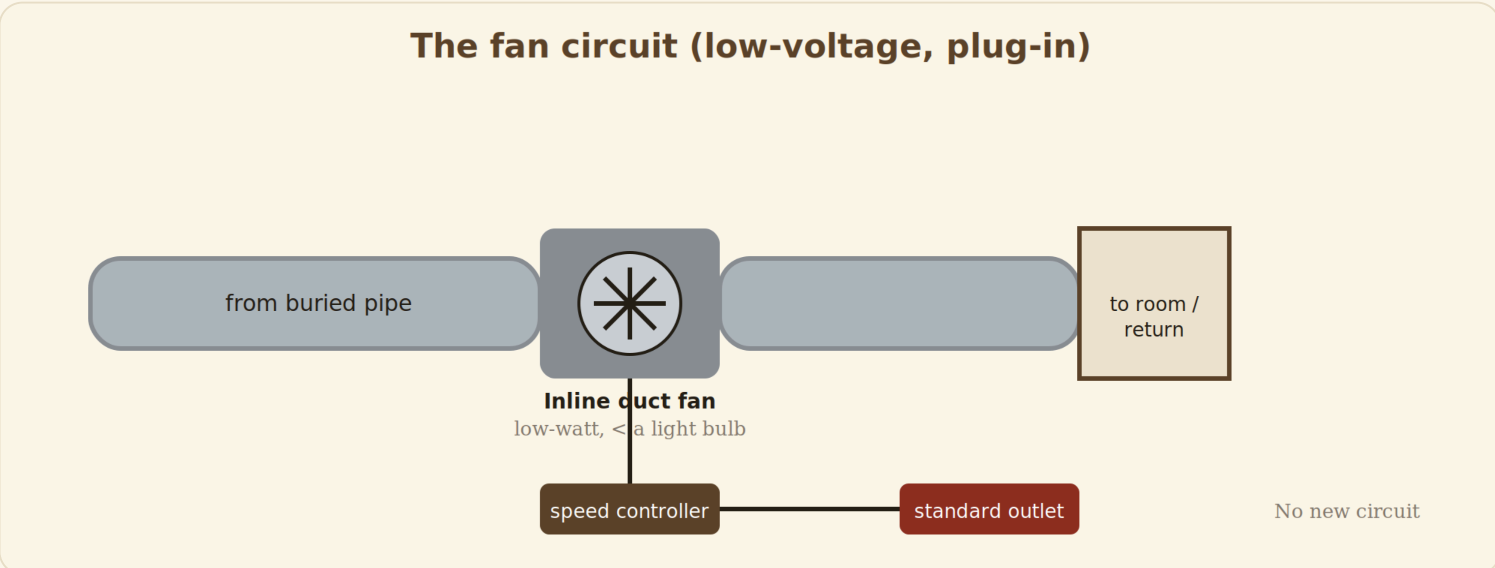
Warm summer air meets the cool pipe wall and water condenses inside — this is normal and unavoidable. The entire design answer is to make sure that water always has somewhere to go. Slope the whole run gently downhill, 1–2%, to a single low point with a drain or a gravel sump. Sloping it down and away from the house also helps keep radon out.



Side view: the full run falls 1–2% to a drain or gravel sump at the low point, so condensation always exits and never pools in the pipe.

The fan: where the (tiny) power goes

You don't need a new electrical circuit or an electrician for the basics. A low-watt inline duct fan, on a simple speed controller, plugged into a standard outlet, is all it takes to move the air gently. It draws less power than a light bulb.



The fan circuit: a low-watt inline duct fan on a speed controller, plugged into a standard outlet. The speed controller lets you slow the air down for more cooling.

THE SMOOTH-PIPE RULE — DO NOT SKIP THIS

Use **smooth-walled** rigid pipe, never ridged or corrugated drain pipe. The ridges trap water in every single groove and breed mold — it's the number-one reason earth tubes fail. Smooth pipe lets condensation run cleanly downhill and out. This one choice decides whether your system is healthy or a problem.

ONE PIPE, OR SEVERAL?

For most homes, one well-sized 100–200 ft run is plenty. If you need more airflow — a larger house, or feeding a whole-house ventilation system — the better move is **two or three smaller pipes side by side** rather than one big fat one, because smaller pipes cool the air more effectively. Keep parallel pipes about 3 ft apart so they don't warm each other's soil.

06

THE COMPLETE SHOPPING LIST

What to buy (with real prices)

Everything you need for a 150-foot DIY build, with honest current price ranges. The single biggest variable is the digging — see the note below the table.

Item	Cost	What to get & why
Smooth-wall pipe (6 in × 150 ft)	$130–220	Smooth interior only — never corrugated. Rigid HDPE or sealed PVC. Some homesteaders find it near $1/foot at farm-supply outlets.
Inline duct fan (6 in, low-watt)	$45–85	An efficient, low-wattage model — it should sip less than a light bulb. Don't oversize it; a gentle mover cools better.
Fan speed controller	$15–30	Lets you dial the airflow down for maximum cooling.
Intake hood + screen + cap	$25–55	Keeps out rain, leaves, insects, and rodents. Mount it raised off the ground on the shaded side.
Indoor grille + filter	$20–40	A basic filter at the indoor end keeps both your air and the pipe interior clean.
Couplers, foil tape, sealant	$30–50	To seal every joint airtight. Leaks let warm, moist air — and radon — bypass the system.
Drain / gravel sump	$15–30	At the low point, so condensation always leaves the pipe.
Radon test kit	$15–30	Use it in Section 1, before anything else.
YOUR MATERIALS TOTAL	**$300–500**	**if you dig it yourself**

Rented trencher / excavator (optional)	$250–500/day	This is the one thing that pushes a build past $300.

THE HONEST BUDGET

The famous "$300" is real **only if you provide the labor and hand-dig**, or already own equipment. Materials alone land at $300–500. Rent a machine or hire the digging and you're looking at $700–1,200 all-in — still a fraction of a new central AC system, but you deserve the real number before you commit.

Tools you'll want on hand

- A sturdy shovel, and/or a rented trencher or mini-excavator for the deep trench
- A line level or laser level to set the gentle 1–2% slope accurately
- A hand tamper to pack the backfill firmly in layers
- A cheap probe thermometer to measure your temperature drop when it's done
- The radon test kit (used back in Section 1)

07

FROM CALLING 811 TO FIRST COOL AIR

Building it, step by step

Read all twelve steps through once before you start — a couple of choices, like the slope and the intake spot, are hard to change once the trench is open. Each step below has the full how-to, a "do it right" tip, and the mistake to avoid.

1 Call 811 and plan the route

⏱ 1 day wait · 🔧 Easy

Before any shovel touches dirt, call 811 (or visit call811.com). It's free, it's the law in the US, and within a couple of business days a locator comes out and paint-marks every buried gas, power, water, and cable line on your property. This single call prevents the kind of accident that kills people every year.

*While you wait for the locate, walk your route. You're looking for the longest straight-ish run you can fit between a **shaded intake spot** (north side is ideal) and the wall where the air will enter the house. Flag the path with landscape stakes. Avoid big tree roots, septic fields, and anywhere water already pools.*

> ✓ DO IT RIGHT
>
> Sketch the route on paper with rough distances. You want 100–200 ft. If you can only fit 80–100 ft, that's okay — just expect a gentler result and check the calculator.

> ⚠ WATCH OUT
>
> Do not dig before the locate marks are down, even if you 'know' where your lines are. Buried lines move and get added over the years.

2 Mark the trench line and set your grade stakes

⏱ 2–3 hrs · 🔧 Easy

Drive a stake at the intake end and one at the house end, and run a string line between them. This is your centerline. Then plan your slope: the whole pipe must fall steadily toward one low point so water always drains. A 1–2% grade means the pipe drops about 1–2 ft over 100 ft — roughly ¼ inch per foot at minimum.

Decide which end is the low point. Usually it's the intake end (so condensation drains out to daylight, away from the house) — but it can be the house end if you build an indoor drain. Mark the target depth at each stake: e.g. 8 ft at the high end, 8.5–9 ft at the low end to create the fall.

> ✓ DO IT RIGHT
>
> Tie a string between the stakes with a line level on it. As you dig, measure down from the string to the trench bottom — that's how you keep the grade honest the whole way.

> ⚠ WATCH OUT
>
> Don't eyeball the slope. A trench that looks 'downhill' to your eye can have belly-dips that trap water and grow mold. The string-and-line-level keeps it true.

3 Dig the trench (the hard part)

⏱ 1–2 days · 🔧 Hard

Dig down 6–10 ft along your line. This is 80% of the whole job. For 100–200 ft at that depth, almost everyone rents a **trencher or a mini-excavator** for a day ($250–500) rather than hand-digging — a machine turns a brutal week into an afternoon. Keep the trench bottom smooth and to your marked grade as you go.

Keep the spoil (dug-out dirt) piled on one side, a couple feet back from the edge, so it doesn't cave back in. Save the topsoil separately if you want to restore the lawn nicely afterward.

> ✓ **DO IT RIGHT**
>
> 6½–8 ft is the practical sweet spot most rented trenchers can reach. Deeper is colder and steadier, but even 6½ ft gives stable temperatures. Go as deep as your machine and soil allow.

> ⚠ **WATCH OUT**
>
> A trench over 5 ft deep with vertical walls can collapse and bury a person — this is a real, documented killer. If you must enter a deep trench, the walls must be sloped back or shored. When in doubt, keep the trench narrow, don't get in it, and work from the surface.

4 Lay the gravel bed and lock in the slope

⏱ 2–4 hrs · 🔧 Medium

Shovel 2–4 inches of crushed gravel (¾ inch or smaller) or coarse sand along the trench bottom. This bedding does two jobs: it cushions the pipe so backfill rocks can't crack it, and it gives any water a path to the drain. Rake it to match your slope exactly — this is your last easy chance to perfect the grade.

Re-check with the line level as you rake. The gravel surface, not the raw dirt, is what the pipe will actually rest on — so the gravel is what has to be at the right fall.

> ✓ **DO IT RIGHT**
>
> At the low point, dig a slightly deeper pocket and fill it with extra gravel to act as a small sump where condensation collects before it drains out.

> ⚠ **WATCH OUT**
>
> Don't skip the bedding and lay pipe straight on rocky soil. A single sharp stone under backfill pressure can puncture or crack the pipe years later, where you'll never find it.

5 Lay the smooth pipe

⏱ 2–4 hrs 🔧 Medium

Roll out and lay your **smooth-wall** rigid pipe (6-inch is the home standard) along the gravel bed. Smooth-wall is non-negotiable — corrugated/ridged pipe traps water in every groove and is the #1 cause of mold failure. Keep the pipe straight and fully supported on the gravel so it can't sag between high spots.

*If your run needs to change direction, use **long sweeping bends**, never sharp 90° elbows — tight turns double the air resistance and choke your airflow. A gentle curve across the yard is fine; a hard right angle is not.*

✓ **DO IT RIGHT**

Work downhill, laying from the high end toward the low end, so each section seats naturally into the last.

⚠ **WATCH OUT**

Watch for sags. A low belly in the pipe collects standing water no matter how good your overall slope is. Support any soft spots with extra gravel as you go.

6 Join and seal every connection airtight

⏱ 2–3 hrs 🔧 Medium

Connect your pipe sections with proper couplers, then seal every single joint airtight with foil tape and a quality sealant rated for the pipe material. This step is quietly the most important one for both performance and safety: sealed joints stop warm, moist air (and radon) from leaking in and bypassing all your hard-won cooling.

Also seal the joint where the pipe will pass through the house wall, and any cleanout fittings. Think of the whole run as needing to be one continuous, sealed tube from intake to indoor grille.

✓ **DO IT RIGHT**

Install a **cleanout access** (like a capped sewer cleanout tee) near one end now. Years from now it lets you run a cloth through the pipe to clean it without digging.

⚠ **WATCH OUT**

A single unsealed joint is a radon entry point and a humid-air leak. Don't rush this — go joint by joint and check each one.

7 Backfill in tamped layers

⏱ 3–5 hrs 🔧 Medium

Cover the pipe by hand first — shovel 6 inches of fine soil or sand directly over and around it, with no big rocks. Then backfill the rest in **6–12 inch layers**, tamping each layer firmly before adding the next. The goal is for the earth to hug the pipe with zero air pockets, because trapped air acts as insulation and steals your cooling.

Tamp around the sides as well as the top so the pipe is fully embedded. In clay soil especially, pack it firmly — you want solid soil-to-pipe contact for the best heat transfer.

> ✓ DO IT RIGHT
>
> A hand tamper is fine for a DIY run; rent a plate compactor if you've got a long trench and want it done fast and even.

> ⚠ WATCH OUT
>
> Don't just push the whole spoil pile back in loose. Loose backfill leaves air gaps against the pipe (less cooling) and settles into a sunken trench line across your yard later.

8 Build the air intake

⏱ 2–3 hrs 🔧 Medium

At the far (intake) end, build a vertical riser that brings the pipe up above ground to a capped, screened intake hood. Mount it on the **shaded side**, raised at least 1–2 ft above the ground (higher in snow country) so it can't suck in splashing rain, snow, leaves, or critters.

Fit a fine insect screen plus a coarse debris grid, and a rain cap on top. A removable furnace filter at the intake is a cheap, smart add — it catches dust before it can enter and feed mold in the pipe.

> ✓ DO IT RIGHT
>
> Position the intake away from driveways, dryer vents, trash areas, and anything else that would feed it hot or smelly air. Clean, cool, shaded air in = clean cool air out.

> ⚠ WATCH OUT
>
> A low or unscreened intake is how mice, wasps, and rainwater get into your pipe. Raise it and screen it properly the first time.

9 Bring the pipe into the house and mount the fan

⏱ 2–4 hrs 🔧 Medium

At the house end, bring the pipe through the wall (or rim joist) into the room or central return you're cooling, and finish it with an indoor grille and filter. Mount your **low-watt inline duct fan** in the line near this end, on a speed controller, plugged into a standard outlet. No new electrical circuit is needed for a basic single-room setup.

*Seal the wall penetration airtight, inside and out, with sealant and an escutcheon/trim plate. Putting the fan so it **pushes** air through the pipe (positive pressure) helps force moisture and radon out rather than drawing them in.*

✓ DO IT RIGHT

A speed controller is worth the $20 — dialing the fan slower usually gives you cooler air, because the air spends more time against the cool pipe wall.

⚠ WATCH OUT

Don't oversize the fan thinking 'more air = more cool.' Too much airflow gives you a lot of barely-cooled air. Gentle wins. And if you tie into central HVAC ductwork, have an HVAC pro confirm it's done safely.

10 Finish the condensation drain

⏱ 1–2 hrs 🔧 Medium

At your low point, finish the drainage so condensation always has an exit. The common approach: the last few feet of pipe sit in gravel with a small perforated drain line (in a fabric sock to keep soil out) running to daylight on a slope, or into a gravel sump/dry well. Water that condenses inside the pipe runs downhill and leaves the system here.

If your low point is at the intake end draining to daylight on a hillside, that's ideal — it also keeps any radon path pointed away from the house.

✓ DO IT RIGHT

Add a fabric 'sock' over any perforated drain pipe so fine soil can't clog it over the years.

⚠ WATCH OUT

Honest caveat: on a very gentle slope, condensation doesn't always race down the pipe — it can cling to the walls. That's exactly why you built a real slope, a sump, and a cleanout. Don't rely on a near-flat pipe to self-drain.

11 Test it on a hot day and measure

⏱ 1 hr 🔧 Easy

Pick a hot afternoon, switch on the fan, and let it run. Hold a probe thermometer at the outdoor intake, then at the indoor grille, and compare. A good run shows a clear, steady drop — often 15–30°F depending on your climate, length, and depth. Write the number down; it's your baseline.

Pour a bucket of water into the intake and confirm it runs out the drain at the low point. This proves your slope and drain actually work before you forget how it's all built.

> ✓ **DO IT RIGHT**
>
> Re-measure after a solid week of heat. That tells you how your soil holds up under sustained load — and whether it's carrying the day or just assisting.

> ⚠ **WATCH OUT**
>
> If you measure almost no drop: check for air leaks at the joints, a fan running too fast, or a run that's too short/shallow for your climate. Section 9 (troubleshooting) walks through each cause.

12 Re-test radon, then enjoy it

⏱ 3–5 days (kit) 🔧 Easy

Run a radon test on the air now that the system is live and pulling from underground — even if your pre-build test was low. You want to confirm the finished, sealed system isn't bringing radon indoors. If it reads at or above 4.0 pCi/L, stop using it until you address sealing or add mitigation.

Assuming radon is clear and your temperature drop looks good, you're done. Set a phone reminder for the simple seasonal checks in Section 11 and let the ground do the work.

> ✓ **DO IT RIGHT**
>
> Keep your baseline temperature-drop number somewhere safe. Each summer you can re-measure and compare — a slowly shrinking drop is an early warning of a sag holding water.

> ⚠ **WATCH OUT**
>
> Radon is the one result you never skip or assume. Test the finished system, full stop.

A REALISTIC TIMELINE

Most DIY builds happen over **two weekends**: one to dig the trench and lay the pipe, a second to backfill, fit the intake and fan, and test. The digging is roughly 80% of the total effort — everything after it goes quickly and feels like reward.

08

EXACTLY WHAT TO DO WHERE YOU LIVE

Climate-by-climate playbook

The same earth tube behaves very differently depending on where you live. Find your climate below and follow the specific advice — including when the honest answer is "use something else."

Dry with cool nights — Mountain West, high desert

Best case. Build it with confidence. Dry air means almost no condensation to manage, and genuinely cool nights fully recharge the soil every evening. Go long (150–200 ft) and deep, and an earth tube here can carry most of your daytime cooling. This is the climate where it comes closest to replacing air conditioning outright.

Temperate — Midwest, Mid-Atlantic, parts of the South

Strong assist. Build it, and pair it with night ventilation (open the house up on cool evenings to dump the day's heat). Expect it to handle ordinary days easily and take a real bite out of the hot ones. Your slope and drain matter most during your handful of humid weeks — get those right and you'll be very happy.

Hot and humid — Gulf Coast, Deep South, Florida

Assist only — proceed with caution. Warm nights barely recharge the soil, and the humid air condenses heavily inside the pipe. If you build at all, keep the run shorter, slope it aggressively, and treat it strictly as a modest supplement. Be honest with yourself: in this climate, the shade-and-night-flush methods usually return more comfort per dollar. Don't force an earth tube to be something your climate won't let it be.

Mild marine — Pacific Northwest, coastal California

Good fit, but you may not need much. Your summers are already mild, so the dollar payback is naturally smaller — simply because your cooling bill is smaller to begin with. It works fine; just run the calculator honestly against your actual bill before you commit to the digging.

THE RULE ACROSS EVERY CLIMATE

The drier your air and the cooler your nights, the better this works. The more humid and warm-at-night your summers, the more you should lean on other methods instead. The calculator in Section 3 already builds this in — so trust what it tells you for your zone.

09

THE PART THE HYPE SKIPS

The honest truth & the skeptics

Plenty of smart, experienced builders are skeptical of earth tubes — and you deserve to hear their case before you spend a dollar, not after. Here's the real debate, presented fairly.

What the skeptics say

Some respected building-science experts argue that even a *well-built* earth tube saves so little that it's hard to justify the cost of all that digging — and that poorly-built ones (the majority, in their view) get capped off and abandoned because of condensation and mold. That is a fair and honest criticism. It's also exactly why this guide spends so much time on the three questions, the smooth pipe, and the slope: those are precisely the things that separate the systems that work from the ones that get abandoned.

THE HONEST TAKEAWAY

The skeptics are right about

BAD

earth tubes. They're wrong that

ALL

earth tubes are bad. The entire difference is climate fit and build quality — the two things this guide exists to get right for you. If you're in a humid climate, take the skeptics seriously and probably choose another method. If you're in a dry or temperate one and you build it carefully, the savings are real and they last for decades.

When to walk away — honestly

- Your summers are hot **and** humid with warm nights → skip it; use shade and night-flushing instead.
- Your yard floods or has a high water table → skip it.
- You have high radon you can't properly mitigate → skip it.

- You can't dig at least 6 ft, or can't fit at least 100 ft of pipe → the math won't work in your favor.

There is no shame in any of these outcomes. An honest "this isn't right for my house" is a far better result than a moldy pipe you abandon in two years. That honesty — telling you when *not* to buy in — is the difference between this guide and the hype that just wants you to dig.

10

THE THREE YOU CAN'T SKIP

Safety: radon, mold & water

These three are non-negotiable. Get them right and an earth tube is safe and lasts 30–50 years. Ignore even one and you've buried a problem in your yard. Here's exactly how to handle each.

Radon — test, seal, slope away

Radon is a natural radioactive gas that seeps up from soil. A buried pipe can become an easy path for it into your home — one homeowner's air test came back at a level the inspector compared to smoking several packs of cigarettes a day. The fix is simple and proven: **test before you build, seal every joint airtight, and slope the pipe down and away from the house to daylight** — never toward it. Do that and radon has no easy path inside. Then re-test once the system is running, just to confirm.

Mold — smooth pipe, good slope, keep air moving

Mold needs standing water to grow. Smooth pipe (not corrugated), a proper downhill slope to a working drain, and steady airflow together mean water never sits long enough to grow anything. A stagnant pipe stews; a moving, draining pipe stays dry. The indoor filter at the outlet catches dust before it can settle and feed mold.

Water — drain it at the low point

Condensation is normal and unavoidable: warm summer air hits the cool pipe and water forms. The entire job is making sure that water always runs to one low point and exits. That's why slope is the rule we repeat more than any other. Once a year, pour a bucket through and confirm it still drains cleanly.

BEFORE YOU DIG — EVERY SINGLE TIME

1) Test radon. 2) Check your water table. 3) Call 811 to locate buried utilities (free, and required by law). 4) Talk to a local building pro who knows your soil and code. Four steps, and they're the entire difference between a system that lasts decades and one you come to regret.

11

ABOUT 20 MINUTES A YEAR

Keeping it running for 30+ years

An earth tube has no compressor to burn out and no refrigerant to leak. With a little seasonal attention, it quietly lasts 30–50 years. Here's the entire maintenance calendar.

When	Do this	Why it matters
Early spring	Clear leaves, nests, and debris from the intake screen and cap.	Winter debris blocks airflow right before cooling season begins.
Early spring	Pour a bucket of water in and confirm it drains out the low point.	A blocked drain is the #1 cause of mold. Catch it before summer heat.
Start of summer	Replace the indoor filter; run the fan and check the airflow feels right.	A clean filter keeps your air and the pipe interior clean.
Mid-summer	On a hot day, measure the temperature drop (outdoor vs. the vent).	This is your benchmark. A drop that falls year over year signals a problem to investigate.
Fall	Cap or close the intake if you won't run it through winter.	Keeps pests and weather out during the off-season.
If you ever smell must	Clean the pipe interior — many run a cloth "pig" through on a string — and re-check the slope.	A musty smell means moisture is sitting somewhere; find and correct the low spot.

> *"The old ways worked. Most of them still do — and now you know how to make this one work for you."*

12

THE HONEST FAQ

Questions people ask

Q Will this replace my air conditioner?

In most homes, no — it's a pre-cooler that makes your AC work far less. In a dry climate with cool nights and a long, deep run, it can come close. Set your expectation at "a real cut in the bill," not "no more AC," and you'll be delighted rather than disappointed.

Q Is the air actually healthy to breathe?

Yes, when it's built right: sealed joints, smooth pipe, good slope, a working drain, and an indoor filter. Every health concern (radon, mold) comes from skipping one of those steps — which is exactly why Section 10 exists.

Q How long does it last?

30–50 years with the simple yearly upkeep in Section 11. There's no compressor or refrigerant to fail — it's fundamentally just a buried pipe and a small fan.

Q Does it help in winter too?

Yes — it works in reverse, pre-warming bitterly cold incoming air toward the ground's 55°F before it reaches your heating system. The Minnesota example pre-heats from −29°C to −4°C. The same buried pipe earns its keep in both seasons.

Q Can I really do it myself?

Yes — the build itself is genuinely simple. The only hard part is the trench. If you can dig (or rent a trencher) and seal pipe joints, you can build this over two weekends.

Q What if I can't dig a full 8 feet?

Go as deep as you can — 6 ft still works, just a little less powerfully. If you hit rock or can't get past about 5 ft, the payoff shrinks enough that you should run the calculator honestly before committing.

Q Do I need a permit?

Sometimes — it varies by location. Always call 811 before digging (free, required), and check with your local building office about permits for the trench and the wall penetration. This is part of "verify with a local pro."

Q Why did these disappear if they work so well?

Cheap air conditioning made them unnecessary to think about, and building codes reorganized around the machine. Earth tubes were out-competed on convenience, not on physics. The physics never stopped working.

13

EVERY TERM, SIMPLY DEFINED

Plain-English glossary

Earth tube

A buried pipe that cools (or warms) the air passing through it using the steady temperature of the ground. Also called an earth-air heat exchanger.

Mean earth temperature

The steady temperature deep soil holds all year — about 52–62°F in most of the US. The resource an earth tube borrows.

Pre-cooler

Something that takes the edge off the air before your main system finishes the job. That's what an earth tube is — not a full air conditioner.

Soil saturation

When the ground around the pipe warms up after days of heavy use and cools the air less. A cool night recharges it.

Condensation

Water that forms when warm, moist air touches the cool pipe wall. Normal — the design job is to drain it away, not prevent it.

Radon

A natural radioactive gas that seeps from soil. Managed by testing first, sealing joints, and sloping the pipe away from the house.

Slope (grade)

The gentle 1–2% downhill tilt of the whole pipe run, so condensation always drains to one low point.

Form factor

The ratio of pipe length to diameter. Higher (longer and thinner) generally cools better — the reason "longer and smaller wins."

Night-flush

Opening the house on cool evenings to dump the day's heat — the free partner method to an earth tube.

811

The free "call before you dig" service that marks buried utility lines. Required by law in the US before any digging.

You've got the whole method

Check your three questions, run your numbers, and if it's a fit — build it this season.

Open the live calculator →

Watch on YouTube