The Self-Draining Stone Foundation

A complete, build-it-yourself chapter — free sample from Medieval Wisdom: Build It Yourself

> **Why you're holding this.** Across hundreds of comments on the channel, the same line keeps coming up: *"You show me the concept — but you never show me how to actually BUILD it. The ratios. The depths. The sources. A-to-Z."*
>
> Fair. So here's one full chapter — not a teaser — so you can judge the rest of the book before you spend a cent. This is the foundation a medieval mason would recognize and a modern building inspector can be talked into. By the end you'll know what it is, when it works, when it doesn't, exactly how to build it, and the one safety step the videos always skip.

The idea in one sentence

A foundation made of **loose, washed stone in a trench** instead of poured concrete — because the real enemy of a foundation isn't cold, it's **water that freezes**, and stone gives the water nowhere to sit.

This is old. Frank Lloyd Wright used "dry-wall footings" for roughly 50 years and called the result "perfectly static." Vitruvius described the principle two thousand years ago. In 1984, builder Elias Velonis wrote it up for *Fine Homebuilding* and a generation of owner-builders ran with it. Today the same physics lives in the building code as **Frost-Protected Shallow Foundations (FPSF)**, and more than a million homes in Scandinavia sit on shallow stone beds — some with seventy-plus years of winters behind them.

The "why" — so you can adapt it, not just copy it

Frost heave is what cracks foundations in cold climates. People blame the cold. The cold is only one of **three things that must happen at the same time** for heave to occur:

1. **Freezing temperatures** reach the soil.
2. **Water-holding soil** (silt, clay) is present.
3. **Capillary action** wicks groundwater *up* into that soil, where it freezes into expanding "ice lenses."

Take away any one of the three and there is no heave. Water expands about **9%** when it freezes and can exert enormous pressure as it does — more than enough to bend concrete. And concrete is strong in compression but **weak in bending**: heave bends it, so it cracks.

The rubble trench kills **#3, the capillary path.** Loose, clean stone has large gaps between the pieces. Water can't climb through those gaps — it simply drains down and out to daylight. No standing water under the house → no ice lenses → no heave → no cracking. You didn't fight the frost. You removed its fuel.

> **The mental model:** a poured footing *resists* heave and eventually loses. A rubble trench *refuses to give heave anything to push on.*

Is this right for your site? (read before you dig)

Honesty first — this is not a universal foundation. It shines in some conditions and is wrong in others.

Good candidates

- Sheds, workshops, cabins, garden walls, small homes, additions.
- Sloping or well-drained sites where you can run the drain to **daylight** (a downhill outlet).
- Soils that drain reasonably (sand, gravel, loam).

Stop and get an engineer — or choose another method — if:

- Your soil is **expansive clay** (it swells and shrinks with moisture; this system won't save you).
- You're in a **high seismic zone** (the simple prescriptive version is limited to lower seismic categories).
- You can't create a drainage outlet and the water table is high.
- You're building a heavy, multi-storey, or code-critical structure without design help.

The one number that decides depth: your local **frost line** (frost-penetration depth). It varies enormously — roughly **12–18 in** in warm regions to **36–48 in** across the northern US and colder. Your trench bottom goes *below* it. Look yours up with your county building department or a local NOAA/IRC frost-depth map before anything else — every dimension below keys off it.

What you'll need

Materials

- **Clean, washed, angular crushed stone**, roughly **¾–1½ in** ("washed" matters — fines and dust reinvite capillary action; angular locks better than round river rock).
- **Non-woven geotextile (filter fabric)** to wrap the stone and keep surrounding soil from migrating in and clogging it.
- **4-in perforated drain pipe** (rigid is better than flex for slope control).
- **Concrete + reinforcing steel** for the grade beam on top (see Step 5).
- Optional: a drainage outlet fitting or a sized **dry well** if you have no daylight slope.

Tools

- Excavator or strong backs and a mattock; a builder's level or laser; a plate compactor; wheelbarrow; and — non-negotiable for deep trenches — **trench shoring** (see Safety).

Before you dig — two checks worth the money

- A **soil bearing check** (a geotech can confirm ≥ ~1 ton/ft²; typically a few hundred dollars). Don't guess on a structure.
- A **utility locate** (free in most regions — call before you dig).

The build, step by step

Step 1 — Lay out and dig the trench. Dig a continuous perimeter trench under every load-bearing wall — *not* a single big pad (one continuous perimeter trench is the standard answer; a full mat is a different, engineered system). Typical width is **18–24 in**. Depth goes **below your frost line** (so 36–48 in in much of the cold-climate US). Keep the walls clean and the bottom firm and undisturbed.

Step 2 — Slope the floor of the trench. The trench bottom must fall toward your outlet at a **minimum of 1 in per 8 ft** (about 1%). This slope is what makes the system *self*-draining. Plan where the water leaves — a daylight outlet downhill is ideal; otherwise a sized dry well or approved storm connection.

Step 3 — Line it and set the drain. Line the trench with non-woven geotextile, leaving enough overhang to fold over the top later. Lay your **4-in perforated drain pipe** along the bottom on the same ~1-in-per-8-ft slope, holes down (water enters from below as it drains). Bed it in a few inches of the washed stone.

Step 4 — Fill with washed stone, in lifts. Fill the trench with the clean ¾–1½-in stone, compacting in **~8-in lifts** with a plate compactor as you go (loose-dumped stone settles later and takes your wall with it). Bring it up to the planned top of the stone bed. Then **fold the geotextile over the top** and seam it — this "burrito wrap" keeps soil out for the life of the foundation.

Step 5 — Pour the grade beam (the part that carries the wall). On top of the compacted stone you form and pour a **reinforced concrete grade beam**, typically **8–12 in wide × 6–8 in deep**, with **#4 (½-in) rebar**. This beam spreads the building's load evenly across the stone bed and gives you a level, code-friendly surface to build on. **Concrete strength, rebar spacing, cover, and lap lengths should be confirmed by an engineer** (a common spec is 2,500–3,000 psi concrete, but this is exactly the kind of number you size to your structure, not copy from a book).

Step 6 — Build normally above. From the top of the grade beam up, you build like any conventional foundation — stem wall, sill, framing. The clever part is all below grade and invisible forever.

⚠ The safety step the videos skip

Almost every video on this topic shows people standing *inside* a 3-to-4-foot trench with vertical walls. **An unshored trench can collapse without warning and a cubic yard of soil weighs over a ton.** This is, statistically, the single most dangerous part of the whole job — far more than any tool.

- For trenches deeper than roughly **4 ft (some authorities say 5 ft)**, use **shoring, sloping, or a trench box** — do not work in a vertical-walled deep trench unprotected.
- Keep spoil piles back from the edge.
- Never work alone in a deep trench.

If you remember one thing from this free chapter, make it this one. The full book gives the shoring options in detail for each depth.

Code, permits, and the inspector conversation

Crushed-stone footings are **not** fringe — they're a recognized footing type. In the International Residential Code (IRC), exterior walls are allowed to bear on "continuous solid or fully grouted masonry or concrete footings, **crushed stone footings**, wood foundations, or other approved structural systems" (**§R403.1**), with crushed-stone footing depths addressed in **Table R403.4**, and the frost-protected approach standardized in **§R403.3 / ASCE 32**.

The honest catch: the *prescriptive* (copy-the-table) path is limited — mainly lower seismic categories and standard soils. Outside that, your rubble trench becomes an **"alternative system,"** which usually means an **engineer's stamp**. That's not a dead end; it's a conversation. Walking into the building department with the IRC section, the ASCE 32 standard, the Velonis *Fine Homebuilding* article, and the HUD/NAHB test-home data (cold-climate test houses that came through a brutal 1993–94 winter with no heave) is how owner-builders get this approved. Also budget for the softer friction: appraisers, lenders, and insurers may ask questions a poured footing never gets.

What it costs

- **Conventional poured frost footing:** roughly **$4,000–$15,000**, and a heave repair later runs **$1,500–$10,000+**.
- **Rubble-trench materials:** roughly **$800–$3,000** — about **40–60% cheaper**, using on the order of **80% less concrete**.

The savings are real, but the honest version is: you trade dollars for labor, planning, and (often) an engineering fee. For the right site and builder, it's one of the best value-per-dollar foundations there is.

What this chapter didn't have room for

This is one chapter. To take it all the way to a permit-ready build, you still want: a **frost-line lookup table by climate**, **outlet vs. dry-well sizing**, the **geotextile spec** (oz/yd²), the **grade-beam rebar layout** (spacing, cover, laps), how to **spot expansive clay** before you commit, and the full **engineer-stamp playbook**. Those live in the complete book — alongside thirteen other techniques, each taken to the same level of "actually buildable."

This guide is educational. Foundations are life-safety structures: confirm frost depth, soil bearing, drainage, seismic category, and grade-beam design with your local building department and a licensed engineer before building. Dimensions and specs here are representative ranges, not a substitute for a stamped design.