

Retaining Walls That Stand

by Travis Nech

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A Homeowner's Guide to Retaining Wall Repair and Rebuilds

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A Note on How This Book Was Made (AI Disclosure)

This book was written with the assistance of artificial intelligence, working from the field experience, methods, and standards of Travis Nech, a Texas mason and foundation man with decades of hands-on work in Dallas-Fort Worth. AI tools helped draft, organize, and edit the text. The judgments in it — what fails, why it fails, and what a proper fix looks like — are the author's own, drawn from real jobs. On any platform that asks whether this book contains AI-generated content, the honest answer is yes, and that is the answer we give.

Introduction: The Wall That Holds Back the Hill

Every retaining wall is a promise. On one side is a yard, a driveway, a flower bed, or a house that sits where people want it. On the other side is a slope of earth that would very much like to move downhill, spread out, and take the flat ground with it. The wall's whole job is to say no — quietly, for decades, through droughts, downpours, freezes, and the slow push of wet Texas clay.

When a retaining wall is built right, nobody thinks about it. It just stands there doing heavy work in silence. When it is built wrong — or when the water behind it is left unmanaged long enough — the wall starts telling you a story. It leans. It bows. It cracks. Weep holes stain. A gap opens at the top where the soil has pulled away, or the soil behind the wall sinks into a trench. Those are not cosmetic problems. They are the early pages of a failure that gets more expensive every season it is ignored.

I have spent my working life in brick, mortar, and foundations across North Texas, and retaining walls sit right where those trades meet: part masonry, part foundation, all about soil and water. This book teaches you to read your wall the way a professional does, understand the forces working on it, decide honestly between repair and rebuild, and recognize what a proper job looks like when a contractor describes one to you. You do not need to become a mason. You need to become a homeowner who cannot be fooled.

One ground rule before we start: a retaining wall that is leaning badly, bulging, or holding back soil above a walkway, driveway, or street is a safety issue, not a someday project. Walls hold back tons of earth. When they let go, they let go all at once. If your wall is moving, keep people — especially kids — off the slope above it and away from the face below it, and get a professional assessment promptly. Everything in this book is written to help you make good decisions, not to talk you into climbing around on a dangerous structure.

Chapter 1: What a Retaining Wall Actually Does

A retaining wall is a structure that holds soil at an angle the soil could not hold on its own. Loose earth wants to settle into a gentle slope — for most soils, roughly thirty to forty-five degrees from horizontal. Any time you see ground standing steeper than that, something is holding it: bedrock, roots, or a wall. The wall is resisting what engineers call lateral earth pressure — the sideways push of the soil mass behind it.

That pressure is not constant, and understanding what changes it is the key to this entire book.

Dry soil pushes gently. Wet soil pushes hard. Water is heavy — about sixty-two pounds per cubic foot — and soil that is holding water holds all that extra weight. Worse, saturated soil behaves partly like a liquid: its push against the wall can double or more compared to the same soil dry. This is why walls almost always fail in or right after heavy rain, and why a wall can stand for ten years and then move six inches in one wet spring. The wall did not suddenly get weaker. The load suddenly got bigger.

Height multiplies pressure. Pressure at the base of a wall grows with the square of the retained height. A wall holding back four feet of soil is not working twice as hard as a two-foot wall — it is working roughly four times as hard. This is why short garden walls forgive sloppy construction and tall walls do not, and why the rules change completely once a wall gets above about four feet. In most jurisdictions, walls over a

certain height — commonly four feet of retained soil, footing included — require engineered design and a permit. We will return to that in Chapter 10.

Surcharge adds load from above. Anything sitting on the soil behind the wall — a driveway, a parked truck, a shed, a pool, another wall — adds its weight to the push. Masons call this surcharge, and forgotten surcharge is a classic cause of failure: the wall was fine until the driveway was widened over its backfill, or a heavy planter went in right at the top edge.

The wall resists in three ways. A gravity wall resists by sheer mass — it is heavy enough that the soil cannot push it over or slide it forward. A segmental block wall resists by mass plus the friction and interlock of its blocks and the compacted gravel behind it. A cantilevered wall — poured concrete or masonry on a spread footing — resists by leverage: the weight of soil sitting on its wide footing heel holds it down. Different walls, same enemy. And in every design, the real hero is invisible: the drainage system behind the wall that keeps water from ever building the pressure that breaks things.

Hold onto that sentence. If you remember one thing from this book, make it this: **retaining walls rarely die of weak materials. They die of unmanaged water.**

Chapter 2: The Five Ways Retaining Walls Fail

Walk any older neighborhood in Dallas-Fort Worth and you can collect all five of these in an afternoon.

1. Tilting (rotation). The top of the wall leans outward while the base stays roughly in place. This is the classic sign of earth pressure winning at the top — usually water pressure, usually on a wall whose drainage has clogged or was never installed. Tilting starts slow: a half inch you need a level to see. Then it accelerates, because a leaning wall lets the soil behind it shift, which opens a gap at the top, which funnels more rainwater straight down behind the wall, which pushes harder. A tilt you can see with the naked eye from the street is a wall in the late stages of an argument it is losing.

2. Sliding. The whole wall translates forward at the base. You will see the bottom course pushed out over the footing or the ground in front of it, sometimes with the wall still fairly plumb. Sliding means the base friction or the footing key was overcome — common on walls built directly on slippery wet clay with no gravel base and no footing below grade.

3. Bulging and bowing. The face of the wall pushes out in one area, like a belly. On block walls, individual blocks near the bulge may be kicked out of plane. Bulging usually means a local failure: a pocket of saturated soil, a broken drainage path, tree roots, or — on older masonry walls — the ties or bond between the face wythe and the backup failing. A bulge is the wall failing one section at a time, and it is often the most urgent pattern because the face can shed material without much more warning.

4. Cracking and material breakdown. Mortar joints open, blocks crack through, stone spalls, timber rots. Some cracking is the wall reporting global movement — stair-step cracks in a mortared wall mean one part is moving relative to another. Some is simple age: mortar is a sacrificial material with a service life, timber in ground contact rots in a couple of decades in Texas, and cheap landscape block was never meant to hold back a hillside. Cracking matters most as a diagnostic: it tells you where the movement is.

5. Undermining and settlement. The soil in front of or beneath the wall washes out — through a broken sprinkler line, a downspout dumping at the base, or surface runoff finding a path under the footing. The wall settles, rotates toward the hole, or loses its base support entirely. Watch for soil washing out through joints or weep holes, sinkholes at the top, and gaps opening under the bottom course.

Notice what is behind at least four of the five: water. Saturated soil, clogged drainage, runoff, broken pipes. Keep that in mind when a contractor wants to talk only about the wall itself and never about where the water goes. He is proposing to rebuild the victim and leave the culprit in place.

Chapter 3: Reading Your Wall — A Walk-Around Inspection

You can learn most of what matters about your wall in twenty minutes, from the ground, without touching anything structural. Do this once a year — early spring is ideal, after the wet season has made its argument — and again after any storm that drops several inches of rain in a day.

Bring: a four-foot level (a long straight board and a short level works too), a tape measure, a screwdriver, your phone for photos, and a notepad.

Step 1 — Sight down the face. Stand at one end of the wall and sight along its face like you are aiming down a fence line. Your eye is excellent at finding bows and leans in a line that should be straight. Note where the face leaves the line.

Step 2 — Check plumb at several stations. Hold the level vertically against the face every six to eight feet and at every visible crack or bulge. Note the lean in inches at the top of the level. A wall that is out of plumb by an inch or less over its height and has not changed in years may simply have been built that way or moved long ago and stabilized. A wall that is out two inches or more, or visibly increasing, is actively failing. The number matters less than the change — which is why you write it down and date it.

Step 3 — Mark and measure cracks. For any crack in a mortared wall, put a small pencil mark across it with the date. Photograph it with a coin or tape in the frame for scale. In three months, you will know whether it is alive.

Step 4 — Check the top. Look for a gap opening between the wall and the soil behind it, soil sinking behind the wall, and paving or beds tilting toward the wall. A gap at the top is a funnel: every rain pours straight into the worst possible place. It is also one of the cheapest problems to fix when caught early — it usually means the backfill has settled and needs to be regraded so water sheds away, not into, the wall.

Step 5 — Interrogate the water. Where does the roof water go? Where do the downspouts discharge? Is there a French drain, and where does it daylight? Do the weep holes (the small openings at the base of a masonry wall) run after rain, or are they plugged with mulch, soil, or mortar droppings? After the next good rain, walk the wall and look: standing water anywhere near it is evidence. A sprinkler head soaking the wall face daily is a slow-motion flood.

Step 6 — Check the toe. The ground at the base of the wall should be firm and should slope subtly away. Soil piled against the face buries the drainage exit. Erosion channels at the toe mean surface water is working under the wall.

Step 7 — Look at what's above. Note anything heavy near the top edge: drives, parked vehicles, new planters, a hot tub a previous owner installed. Surcharge added after the wall was built is a prime suspect when an old wall starts moving.

Write it all down with dates. A one-page wall log — lean measurements, crack photos, water notes — turns a contractor's sales pitch into a technical conversation, and it turns your own guessing into knowledge. If your inspection finds lean over two inches, a bulge you can see from the street, soil washing out, or a wall holding back soil above a place where people walk, stop inspecting and start calling professionals. That wall has told you enough.

Chapter 4: Water — The Force Behind Almost Every Failure

Let us do the arithmetic that governs your wall's life, in round numbers.

A cubic foot of dry soil weighs roughly 90 to 110 pounds. A cubic foot of water weighs 62 pounds. Soil that becomes saturated can weigh 120 pounds or more per cubic foot — and more importantly, water trapped behind a wall exerts its own pressure in all directions, exactly like water in a tank. Behind a four-foot wall after a week of Texas rain, the difference between drained soil and undrained soil can be hundreds of extra pounds of push per linear foot of wall. The wall was designed — or thrown up — for one of those loads. If it only ever sees the other one in a wet spring, that is the spring it moves.

This is why every properly built retaining wall is really two structures: the wall you see, and a drainage system you don't. The drainage system has four parts:

1. Drainage aggregate. A column of clean, crushed gravel directly behind the wall face — typically at least twelve inches wide, full height. Water moving through soil hits the gravel and falls straight down instead of pressing on the wall.

2. Filter separation. Landscape fabric between the gravel and the native soil, so clay fines cannot migrate in and clog the gravel over the years. The wall that "was fine for fifteen years and then started leaning" very often has gravel that has slowly turned into mud for lack of this ten-dollar detail.

3. A drain pipe at the base. Perforated pipe bedded in the gravel at the bottom of the wall, sloped to daylight — an actual exit where the water leaves, downhill and away. A pipe with no exit is a decoration. In clay country, this pipe is the single most important component in the whole structure.

4. Surface water management. The ground above the wall graded to shed runoff away or into a swale, downspouts piped past the wall, and — on masonry walls — weep holes at the base so any water that reaches the face can get out.

When a wall fails, the post-mortem almost always finds one of these four missing, clogged, crushed, or discharged to nowhere. When you hire a repair, your first questions should be about these four things, not about the wall's face. A beautiful face on an undrained wall is a countdown timer.

There is one more Texas-specific water story: our expansive clays shrink in drought and swell when wet. A wall's backfill

zone rides that cycle every year. Clay that shrinks pulls away from the wall and cracks open at the surface, letting the next rain pour deep into the backfill — then the clay swells, saturated, pushing with both water pressure and soil expansion at once. This shrink-swell pump is the rhythm section behind a great many North Texas wall failures, and it is why the gravel column and the surface grading matter here even more than they do in kinder soils.

Chapter 5: Repair or Rebuild? The Honest Decision

Here is the question every wall owner faces, and here is how a straight shooter answers it. A wall is a candidate for **repair** when all of the following are true:

- The movement is small (roughly an inch of lean or less) and documented as stable, or explained by a fixable water problem.
- The structure and footing are fundamentally sound — no sliding base, no rotten or crushed material, no failed section.
- The drainage problem can actually be corrected — there is somewhere for the water to go.
- The wall is not holding back soil over a place where a failure would hurt someone or destroy something expensive.

A wall needs **rebuild** (full or partial) when any of these hold:

- Lean or bulge is pronounced (two inches or more) or measurably growing season over season.
- The base has slid, the footing is undermined, or whole sections have lost their bond.
- The original construction was never adequate: no footing, no drainage, landscape timbers or thin block asked to hold back four feet of clay.
- The material itself is done — rotted timber, spalling block, mortar that powders out with a screwdriver across most of the wall.

Between those poles sits the honest middle job: **partial rebuild** — tear down and rebuild the failed section on a proper footing with proper drainage, repoint and stabilize the sound sections, and fix the water everywhere. On long walls, this is very often the right call, and it is the one many contractors skip because a full tear-out is a bigger ticket and a face-only patch is a faster one. Both extremes deserve your suspicion.

Two warnings about patches. First: **nobody can push a leaning masonry wall back.** Once a mortared wall has rotated and the soil has shifted into the gap, the geometry is gone. Proposals to jack, winch, or brace a failed wall back to plumb and re-mortar it are selling you a photograph, not a structure. (Segmental block walls are the exception in method, not principle: they can be taken apart and restacked on a corrected base with corrected drainage — which is a rebuild of that section, honestly described.) Second: **surface seals and waterproof coatings on the face do not fix pressure from behind.** They can trap it. Cosmetic face work has its place — after the structure and the water are right.

And a note on timing: repair windows are real. A wall caught at one inch of lean with a clogged drain is often a drainage correction and a monitoring plan. The same wall at four inches of lean is a tear-out. The cheapest day to fix a retaining wall is the day you first notice it moving, and the most expensive is the day after it falls — because now the job includes the slope, the fence, the landscaping, and whatever it landed on.

Chapter 6: What a Proper Repair Looks Like

When the diagnosis says repair, here is the sequence you should hear from your contractor — in this order, because the order is the logic.

1. Fix the water first. Clear or replace the drain pipe, open the weep holes, regrade the soil above so runoff sheds away, and pipe the downspouts past the wall. If a broken sprinkler or plumbing line is feeding the wall, it gets repaired before anything else. Sometimes — more often than contractors admit — this step is the repair, followed by monitoring.

2. Relieve and excavate where needed. For drainage replacement, soil behind the failed section is excavated down to the base, the old clogged material comes out, and a new gravel column, fabric, and pipe go in. Excavation behind a compromised wall is done in short sections so the wall is never left unsupported along its whole length.

3. Structural stabilization of sound sections. Mortared walls get failed joints raked out and repointed with mortar matched to the original in strength and color — mortar that is harder than the masonry around it will damage brick and stone faces as the wall breathes, a point we have made in print before and will keep making: the joint is supposed to be the sacrificial part. Cracked units get replaced, not smeared over. On block walls, displaced blocks in a small area can be

removed, the base and backfill corrected, and the blocks restacked to line with proper gravel behind them.

4. Tie the top together. Many walls benefit from a sound cap — a concrete cap or capstones fully bedded — which sheds water off the top of the wall instead of letting it pour into the core, and visually finishes the structure. A cap that is cracked and open-jointed is a funnel wearing a hat.

5. Restore the surface. Regrade above and below, restore beds and sod, and set the drainage exit so it will not be buried by the next mulch day.

What a proper repair does not include: mortar smeared over live cracks without addressing movement, anchors driven as a substitute for drainage, or any sentence containing "that should hold it for a while" about a structural member. A repair should come with a clear statement of what was wrong, what was done, and what to watch — in writing.

Chapter 7: What a Proper Rebuild Looks Like

A rebuild is your one chance to own a wall that outlives you. Insist on the full anatomy:

Footing. Below frost depth and below the soft surface soil, on undisturbed or properly compacted ground. For mortared masonry and poured walls, a reinforced concrete footing sized to the wall's height and load. For segmental block, a compacted gravel leveling pad — wider than the block, at least six inches deep, with the first course buried below grade. A wall whose base sits at the surface is a wall already sliding in slow motion.

Buried first course. Every system starts below grade. The amount of wall underground is part of its strength against sliding.

Drainage, the full four parts from Chapter 4: gravel column at least twelve inches wide behind the face, filter fabric, perforated pipe at the base sloped to a real daylight exit, and surface grading that keeps roof and yard water out of the backfill.

Reinforcement appropriate to height. Segmental walls above a few feet need geogrid — layers of structural mesh extending back into the slope, turning wall and soil into one mass. Mortared walls of height need vertical and horizontal steel tied to the footing. The taller the wall, the more this stops being optional.

Backfill in lifts. Backfill placed and compacted in layers (lifts) of about eight inches, with the drainage gravel kept clean and separated. Dumped, uncompacted backfill settles, opens the gap at the top, and starts the funnel cycle from Chapter 3.

A finished top and toe. A fully bedded cap, the soil above graded to shed water, and the toe in front firm, drained, and not buried so deep that the base drainage is trapped.

Paper where required. Above roughly four feet of retained height — or any height with surcharge from a driveway, structure, or pool — most cities in our area require a permit and an engineered design. Your contractor should say this before you do. A contractor who waves off engineering on a tall wall is telling you who he is.

Get the rebuild described in writing, in this anatomy, before money moves: footing, drainage, reinforcement, backfill method, cap, and where the drain daylights. If a proposal is one line — "rebuild wall, \$X" — it is not a proposal. It is a number with a wall attached.

Chapter 8: Materials — Block, Stone, Timber, and Masonry

Segmental concrete block (the interlocking, mortarless blocks stacked with a slight setback) is the workhorse of modern residential walls, and for good reason: it flexes slightly with soil movement instead of cracking, drains naturally at its joints, and can be restacked when a section needs correction. Its weaknesses are installation shortcuts — no gravel pad, no drainage pipe, no geogrid on tall walls — and cheap thin blocks used beyond their height rating. A block wall built to the manufacturer's system is an excellent wall. A block wall built "like the video" is a stack of future work.

Natural stone — chopped stone, rubble, or flagstone-faced walls — is the premium face of North Texas and, properly built as a mortared masonry wall on a concrete footing, among the most durable. Stone itself outlasts everything around it; the mortar joints are the maintenance item, on the same repointing cycle as any masonry. Stone veneer over a block or concrete core is legitimate construction when the core is real and the veneer is properly tied and flashed.

Timber (railroad ties and landscape timbers) is the budget wall of the suburbs' building boom, and most of the ones still standing in older neighborhoods are living on borrowed time: ground-contact timber in Texas gives you roughly fifteen to

twenty-five years before rot hollows the structure from inside, often while the face still looks respectable. Poke suspect timber with a screwdriver at the base; if it sinks in, the wall is already a demolition with a date to be announced. Timber is not repairable in any structural sense — it is replaceable, and the honest recommendation is to rebuild in block or masonry.

Poured concrete is the engineer's wall: strong, reinforceable, ideal for tall walls and tight sites. Its enemies are poor drainage (water will find the cracks) and poor forming (a wall out of plumb from day one). It is also the least forgiving of amateur repair — structural concrete work belongs to people who do it daily.

Brick-faced walls deserve a special note for our readers: a brick veneer on a retaining structure is a face, not the structure. The wall behind it — block, concrete, or engineered block system — does the retaining, and the brick must have flashing and weep holes so the cavity between veneer and core can drain. Brick-faced walls that fail usually fail as masonry: rusting ties, blocked weeps, mortar gone soft. The good news is they repair like masonry, once the drainage behind them is honest.

Across all materials, remember Chapter 1: the material is rarely the verdict. The footing, drainage, and backfill decide the wall's life; the face decides how it looks while living it.

Chapter 9: What It Costs and What Drives the Price

Wall pricing is quoted per square foot of wall face — length times exposed height — and your first job as a buyer is to make sure every bid measures the same face and describes the same anatomy. Prices vary by city, access, and season; treat the factors below as the real lesson, and any number any book (including this one) prints as a starting point for a local bid, not a quote.

What drives the number, in order:

1. **Height.** Doubling height more than doubles the work — deeper footing, more reinforcement, more excavation, more drainage, often engineering.
2. **Length and access.** A wall a machine can reach is a different job from a wall every bucket crosses a finished yard to reach. Hand-digging and wheelbarrow work are honest line items.
3. **Tear-out and disposal.** Failed walls full of wet soil, old concrete, and rotted timber have to go somewhere.

Haul-off is real money, and its absence from a low bid means it is hiding in a change order.

4. **Drainage length and exit.** The pipe has to daylight somewhere. A long run to a street or alley adds cost; a wall with no legal, downhill exit is a design problem first and a price second.
5. **Material.** Timber is cheapest to install and most expensive per year of life. Segmental block is the value middle. Mortared stone and poured concrete cost more up front and repay it in decades.
6. **Surcharge and engineering.** Walls under driveways and near structures carry design and inspection costs that a garden wall never sees.

As a rough orientation for North Texas at the time of writing: simple repairs — drainage correction, repointing, regrading — are commonly a fraction of rebuild cost and are priced as discrete jobs; partial rebuilds are priced by the section; full rebuilds of segmental block walls commonly land in a broad per-face-foot range that rises steeply with height and access, and mortared stone or poured work lands above that. Anyone who gives you a firm number without walking the wall, checking the drainage exit, and asking what sits on top of the slope is not pricing your job. He is pricing his afternoon.

The expensive truth of this trade: the drainage system is typically a modest share of a rebuild's price and essentially all of its lifespan. Cut anything else before you cut that.

Chapter 10: Hiring Right — Questions, Red Flags, and Warranties

Ask these, and listen to how the answers sound:

1. "Where does the water behind my wall go, and where will it go when you're done?" — The daylight exit should be a place he can point to.
2. "What's the footing?" — Depth, width, material. Vague here means vague everywhere.
3. "Repair or rebuild — and what did you see that decides it?" — A good contractor argues from evidence: measurements, drainage state, material condition. (You have your wall log from Chapter 3. Use it.)
4. "Does this wall need a permit or engineering at this height?" — He should know your city's threshold and say so unprompted.
5. "What's the mortar spec?" (mortared work) — Matched in strength to the masonry, never harder than the units it joins.

6. "What does the bid include for tear-out, haul-off, and restoring the yard?" — In writing, or it isn't included.
7. "What warranty, on what, in writing?" — Workmanship warranties should name a term and cover the failure modes the job addressed.

Red flags, any one of which ends the conversation:

- A plan to "push it back straight" on a mortared wall.
- No drainage in the proposal, or drainage that "probably isn't the issue" without investigation.
- Pressure to decide today, or a price that expires at the door.
- A one-line bid — no anatomy, no materials, no exclusions.
- Reluctance to put the scope and warranty in writing.

On warranties: a warranty is only as good as the company behind it and the words on the page. Look for transferable terms if you may sell, and read what voids coverage — unapproved loads placed on the slope and altered drainage are common, fair exclusions. Keep your wall log and the job paperwork together; the next owner will thank you, and so will the next contractor.

Appendix: The Seasonal Wall Check (15 Minutes, Twice a Year)

Spring (after the rains):

- Sight the face for new lean or bow; compare with your log.
- Check weep holes and the drain exit — both should have run in the last storm.
- Clear soil, mulch, and debris from the toe; never let mulch bury the base drainage.
- Look for the gap at the top; regrade settled backfill so water sheds away from the wall.

Fall (before the freezes):

- Repoint any open joints on mortared walls, or get them scheduled — water in a joint all winter is a jack.
- Confirm downspouts still discharge past the wall, not behind it.
- Trim roots invading the backfill zone; note trees growing within a wall-height of the face.
- Photograph the wall from your two fixed spots and file it with the log.

Do this twice a year and you will never be surprised by your retaining wall. It will tell you everything — early, cheaply, in a

language you now speak.

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