

ON LIFE AND WORK:
THE REDSTONE GUIDE TO HARDSCAPING

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PREFACE

This is a beginners introduction to the core concepts of hardscaping. Some of the information may not be relevant depending on your location. I work with sandstone because we have an abundance of it in Colorado, some of the techniques I describe only apply to sedimentary stone.

This book is primarily geared towards those who are interested in doing stonework for a living, but any homeowner could use it if they're serious about transforming their land. Hardscaping is a physically demanding career which makes it niche, which means there's good money to be made if you're dedicated to the craft.

In chapter one I discuss recommendations for lifestyle choices and fitness standards at length. These are my opinions from seven consecutive years of experience. Preventive care should always come first, there's no sense in working your life away just to spend the money on hospital bills. My strategies for longevity can be applied to any labor job and modified as needed.

Chapters two through four cover the basics of building patios, steps, and retaining walls from your first trip to the hardware store to the finished product. Learning to work with your hands from a book has limits, the best way to learn anything is by doing. The purpose of this book is to offer guidelines that any beginner can use to navigate their first project.

I only cover hardscaping here. For all things concrete I suggest browsing the playlist section of "Mason the Mason" on youtube. "The Essential Craftsman" (youtube) is also a good resource, he covers a wide variety of topics related to building and trades.

I PREPARATION

I.0.1 MINDSET

Hardscaping demands mental and physical endurance. There are no shortcuts. If you half-ass one step you'll work twice as hard on the next. This is the most important lesson. If you take nothing else from this guide remember, no short cuts.

Money is important but if your only goal is money you might burn out quickly. There's a reason why many blue collar workers are alcoholics. Why do you want a physical career? Consider the benefits and drawbacks.

People love to say that labor jobs are hard on the body but they're not worse than any other job. Being a tattooer is taxing, staring at a computer is taxing. People develop back problems from sitting all day. Their backs are weak, they're not used to moving so when they do have to move or God forbid exert themselves they're not ready and they get injured.

I've heard the phrase "threw my back out" all my life. Bro, like what do you mean?? Did a nerve get pinched, slipped disk or pulled muscle? People fear what they don't understand. The average gym goer obsesses over lifting with perfect form. Think about the movements of a Greco-Roman wrestler, do they have perfect form? No, their backs get rounded when they're trying to force each other to the mat. Getting strong in awkward positions will bulletproof your body. Lifting heavy strengthens increases tendon strength and bone density.

Be single minded if you dedicate yourself to stonework. Every aspect of your life will revolve around your body, around destruction and restoration. Act as if you were going to battle. There's only time to eat, sleep, and fight.

Warriors don't underestimate the enemy, powerlifters don't underestimate the weight. Respect is necessary but the singular goal is domination. This is the appropriate attitude to have toward the stone, healthy respect but not so much that you fear it. If you respect the weight too much you're not in the mindset to dominate it.

Your projects will look better as your strength and mental fortitude develop. Once the physical challenge is secondary you'll be free to think creatively.

1.0.2 PPE (PERSONAL PROTECTIVE EQUIPMENT)

Clothing is important, I recommend wearing cotton, linen or some other natural, breathable fabric in the summer. No poly blends unless you want to survive yourself. Thin, loose fitting button down shirts let the breeze in and keep the sun off. Some of my favorite shirts have been threadbare Van Heusens from the thrift store. As of writing this my favorite brand is Noble Outfitters. Collared long sleeves are better than sunscreen, they protect you all day and won't clog your pores. Wear pants that you can move in. You want to be able to squat ass-to-grass without resistance. Cargo jeans are good, extra pockets and hammer loops can be useful. Always keep extra socks in the truck.

Gloves can be necessary depending on the season. I suggest growing calluses but that takes longer than burning yourself on a hot stone. The most durable type I've found are belay gloves by Metolius. They're affordable, breathable in the summer and insulating in the winter. Black Diamond sells a belay gloves that are nearly identical, they don't fit me as well but your mileage may vary. Expect to go through one or two pairs a season or more depending on how frequently you wear them.

Another good option for cold weather is to buy a pack of woven cotton gloves and use them like hand socks. Put the cotton glove on first while you're in the hardware store then put a mason glove over it, generally one size larger. Mason gloves are synthetic woven gloves designed to protect your hands from mortar. The palm side and finger tips are dipped in nitrile or polyurethane. The double glove technique keeps your hands warm and dry in cold weather. If they do get damp you can just change your "socks".

Use of safety glasses, respirators, and earplugs should go without saying but here it is. My preferred brand is 3M. I like the silicone earplugs that come on a string because they're hard to lose and easy to clean. Foam plugs get dirty quick, not good. My preferred "safety glasses" have historically been prescription glasses, this is dumb and reckless. Don't blame me if you try this and find yourself picking shrapnel from your cornea.

I got a big dollop of mortar in my eye once, it arched over my prescription glasses and hit dead center. The grit was excruciating and the chemicals made my eyeball swell up. It was dry and sensitive for the rest of the day and all night. My vision was blurry for a while after it happened. I'm lucky it didn't cause permanent damage.

If you're struggling to breathe through a respirator it needs new filters. Change them frequently, it's hard to notice how clogged they are until you're breathing threw a new pair. Buy a mask from the welding section of the hardware store, a painters respirator is not necessary.

Do not cut stone or mix concrete without a respirator. Silica is a toxic mineral found in all stone. Dust from stone and concrete will get stuck in your lungs and build up over time. Masonry is on the top 25 most dangerous jobs list (death and chronic illness from exposure). For comparison, police officer doesn't even make the list.

Shoes that cover the ankle are recommended. You don't want to take a digging bar square on the ankle bone. I'm not a steel toe absolutist but remember that if you don't wear them you're taking a risk like driving with no seatbelt, it's comfortable but one day you might eat the windshield and 40 feet of asphalt. Either way, you're grown so it's your choice.

If you're clumsy think about starting with work boots. The steel toe can be used as a tool for setting flagstone. My favorite brand is Georgia Boot, they're waterproof and built like tanks. My pair cost about \$150 in 2023. They're the most durable boot I've ever owned.

1.0.3 ON FOOTWEAR

I have strong opinions about footwear. I started with steel toe cowboy boots because they're easy to slip off at the end of the day. After a few months I developed a bump on the back of my heel from constant rubbing, not ideal but it didn't cause me pain. A year later I was feeling pain in my knees every day. I was an avid powerlifter at the time so the obvious conclusion would be over use, likely a contributing factor but not the whole story.

Please note: the following is personal experience not medical advice.

Modern shoes mutilate our feet. Toes are meant to be spread wide not crammed into a point. Elevated heels shrink tendons, soft insoles and arch support cause muscle atrophy. People who never wear shoes have wide flat feet. If "fallen arches" were a bad thing all of these people would have joint issues and back pain. Repairing the damage to your feet could potentially take years but don't get all depressed, it is possible.

I started wearing "barefoot" or "zero-drop" shoes to fix my knee issues. They're designed to fit the shape of the foot and have no cushion or heel like a moccasin. For clarity I will refer to them as "ergonomic" shoes. My favorite brand/ model is the Xero Denver, unfortunately they don't come in steel toe. The first pair I bought were canvas and I patched them with old jeans and shoe goo until they were more patch than shoe. The Denver II model are all leather, a significant improvement.

I've heard that switching to ergonomic shoes can exacerbate pre-existing issues so proceed with caution and listen to your body. Don't push yourself if you experience pain. Check in with your back, hips, knees and ankles frequently. Some people need time to acclimate so they wear ergonomic shoes during a workout or a walk then switch back to their every day shoes. Walking and lifting barefoot helps with proprioception.

You'll have to learn how to walk again. Literally. Modern shoes are cushioned so we get used to slamming our heel into the pavement. Try this with ergonomic shoes and the consequences are immediate. It doesn't take long to adjust your stride, you'll be gliding like a panther in no time. What does take time is the gradual transformation of your feet, this is the biggest hurdle. If you stick with ergonomic shoes for long enough you'll notice that your toes will spread out and your feet will become wider.

Make time to massage your feet and ankles, become familiar with all the little muscles and tendons. Massage gently between the bones, spread your toes and stretch briefly in the morning and after workouts. Do not become a habitual stretcher. Never stretch before lifting heavy, always perform a thorough warm up with light weight.

I wear ergonomic shoes daily. If I wear boots my knees start to hurt again. I believe the reduction in movement and raised heel are both contributing factors. I attempted to mitigate this by filing down the heels of my boots. This must be done with caution, you could develop back and hip problems if one heel is shorter than the other.

My preference for all shoes is custom insoles because they last much longer. I remove the stock insoles and use them as a template to cut my own out of 8th inch leather. A friend gifted me a pair that he made with two layers of pig leather and wool sandwiched in the middle. They're ideal for winter and actually keep my feet warm, not just less cold. During summer I prefer solid leather because it absorbs less moisture and dries faster.

1.0.4 CALORIES AND HYDRATION

Sun delirium is real. Drink a liter of water minimum before you leave the house and bring a gallon to the job site. Always keep salt with you and something with natural sugar like fruit or honey. Avoid processed sugar and energy drinks, you don't want to crash. Sport drinks are overpriced sugar water contaminated with microplastics. Take a pinch of salt and a gulp of honey with your water or make yourself a lemonade with salt.

Hydrate before you experience fatigue, headache, brain fog or confusion. 32oz bottles of Ambrosia honey can be purchased online or at Walmart for \$15. Buy salt from the earth, all sea salts are contaminated. Earth salt does contain heavy metals but in my opinion it's the lesser evil compared to microplastics and radiation.

I want to emphasize this point - drink a liter of water minimum before leaving the house. Hydrate first thing in the morning and wait 20 minutes then drink your coffee. Carry water in your stomach not your canteen. This is old world wisdom that I learned from the book "Outdoor Survival Skills" by Larry Dean Olsen. If you neglect to hydrate properly you'll be playing catch up all day and go home with a splitting headache.

I'm no stranger to the dirty bulk but try to eat well. If all you can get is eight Whopper Jr's then by all means chow down but it's better to think ahead and pack a few lunches. Some of my favorite high calorie snacks are sunflower seeds (shelled and roasted), pitted dates, baked corn tortillas, home made beef jerky, and frozen mango chunks with salt and lime juice.

1.0.5 GPP (GENERAL PHYSICAL PREPAREDNESS)

Strength and endurance are important because the chance of injury increases as you become fatigued. Take time to learn how to train. Hire a personal trainer if you can, if not I recommend reading "The Westside Barbell Book of Methods" by Louie Simmons and "Solitary Fitness" by Charlie Bronson. Take what's enjoyable and make it part of your daily life.

There is no excuse for weakness. If you neglect strength training you'll get hurt eventually and you'll be physically and psychologically exhausted every day. In my opinion the absolute minimum strength level you should have before starting is 10 wide grip pullups (strict, no cheating), 20 pushups (elbows in) and 50 bodyweight squats (all the way down). If you have access to a barbell you should be able to deadlift twice your body weight with good form and no belt on any day of the week.

Endurance is equally important. You may get lucky and the terrain will be flat enough to load a wheelbarrow or dolly. When this isn't possible you'll be carrying stone by hand and gravel in buckets. One five gallon bucket full of gravel weighs about 60 pounds. You'll fill two at a time and walk them from the staging area to your project. During these grind days you'll need the ability to shift into four-low so to speak and go until it's time to stop. Moving two tons of gravel in 60 to 90 minutes shouldn't be a problem. You should be able to unload a whole palate of stone without stopping.

Patios look better with big slabs of flagstone. The stronger you are the better your work will be. Don't be tempted to buy inch thick flagstone, the slabs will break while setting and they'll make for an inferior patio that won't last. Two inch thick is the minimum for a patio to set well. Vertical palates have larger flagstone than horizontally stacked palates. Stacked flagstone breaks more often during transportation. Use caution while unloading a vertical palates, watch your fingers and never trust the wooden frame. I've never had a palate frame break but that doesn't mean it couldn't happen.

1.0.6 RECOVERY

Again, nothing I've written should be taken as medical advice. This is my personal experience which does not, and could not account for every single person. Every individual is responsible for knowing their own body. I could never know you as well as you know yourself.

You must recover. If you don't rest and recover you will develop an overuse injury or worse. Think about the daily life of a lion for a moment. In the blink of an eye the lion goes from rest mode to overdrive to catch his dinner. There is no stop watch, no breaks between sets. He runs until he eats or goes hungry. Cats stretch briefly in the morning or after a nap, this is enough. Over stretching primes the body for injury. The only thing that yoga is good for is doing more yoga, and maybe meeting some crystal girls with a lot of silly ideas bouncing around their heads. Which is fine if that's what you're into.

After a successful chase, the lion gorges himself until he falls asleep. It's okay if you don't keep a strict eating schedule as long as you're staying hydrated. Part of hydration is sodium and glucose so keep honey and salt on hand. Let yourself be hungry at work, then eat and stop before you get full. Digesting food takes water and energy. Overeating before work causes fatigue, being chronically underfed also causes fatigue. This can be challenging to regulate but you'll figure it out eventually. Don't overthink, just listen to your body.

Lions sleep. All cats sleep, a lot. Don't be surprised if you want to sleep for nine or ten hours sometimes. This is normal. When I was recovering from a significant illness I slept between nine and twelve hours a night for weeks. Don't shame yourself for it and don't force yourself to wake up when you want to sleep. That being said, be responsible and go to sleep on time or early if you're tired.

Guys who never get a full night of sleep end up half crippled. If you're a thickboy and think there's a sliver of a chance you have sleep apnea get it fixed immediately. You will die of a stroke or heart attack or a brain aneurysm. If your neck is over 20 inches in circumference or you snore or benching is your favorite exercise there's a high probability that you suffer from sleep apnea.

Ignore massage therapists when they tell you that you're tense. Muscles will be harder when you lift heavy, it doesn't mean there's something wrong with you. Massage therapists are used to kneading doughy slug people so they think it's normal to be soft. If you hear a little snap crackle pop in your muscle tissue that's normal too. Hard massage is good but don't go too hard for too long.

If you feel pain in your muscles that's sharper than usual pay more attention to that area, especially if there's any swelling. Massage the area gently and more frequently. This is the time to stretch more but still don't over do it, focus on movement and mobility. If the swollen area is discolored or very tender when you press down on it with moderate force or it gets worse over a few hours or a day it's time to see a doctor.

If you drink alcohol or smoke weed or do pills or kratom or research chemicals or whatever other dumb shit people are forgetting their problems with these days, stop reading this immediately and do something else. Go coom or socialize on Discord and Reddit until you decide to be trans. This is not for you. You probably don't even realize that you're not actually sleeping and you'll end up dead or half dead or crippled or addicted by the time you're 50. This world does not need more weak old men. We need strong old men with old man strength and wisdom. No more geriatric toddlers.

2 EQUIPMENT

2.0.1 TOOLS

I'll cover the bare minimum here. Start with the basics and buy more if you need to. I suggest avoiding wooden handles because they splinter and break. Avoid soft rubber grips, they degrade quickly. If you need more padding wear gloves. Hard rubber grips are fine.

You might want a lock box. I keep my truck toolbox on site because it's easy to move. I drilled two holes on the inside and ran a chain through to lock it up. Truck boxes are cheaper and much lighter than job site boxes.

Long:

- Square Shovel
- Spade Shovel
- Bow Rake
- Digging Bar - 12 or 16 lb, one side is chisel shaped and the other side is a flat disk which is useful for tamping
- Outdoor Broom - stiff bristles
- Tamper - 8 or 10 in

Hand:

- Sledge Hammer - 2 or 3 lb (preference is Estwing 3 lb)
- Heavy Flat Head Mason Chisel - square point, 2 in
- Medium Flat Head Mason Chisel - triangle point, 1 in
- Pointed Mason Chisel (looks like a pencil)
- Garden Pick (looks like a pick axe with a fork on one side for pulling weeds)
- 53 oz Dead-blow Hammer (preference is Estwing)
- Bench Broom (HDX is fine - Home Depot generic brand)
- Pointing Trowel (medium or large depending on your forearm strength)
- Flat Pry Bar (hand-held)

CHAPTER 2. EQUIPMENT

Hauling:

- Five Gallon Buckets - 9 to 13 (one for tools the rest for gravel and dirt)
- Dolly with Solid Rubber Wheels
- Wheel Barrow and Tire Inflator (you should have a tire inflator for your truck anyway)

Power:

- Grinder with Sanding Wheel - 80 grit (for honing tools)
- Two Stroke Chop Saw with 14 in Blade, Gas Can (one gallon), 50:1 Engine Oil
- Saw Maintenance Parts - Air filter, Fuel filter, Spark Plug, Feeler Gauges, O rings (for hose mount)

Measuring:

- 30 ft Tape
- 100 ft Tape
- Mason Line (braided not twisted)
- Chalk Line with Blue Chalk (look for one with a thick line)
- Carpenters Pencil
- Line Levels (3 minimum)
- Stakes (rebar or something straight and metal)
- 8 ft Level
- 4 ft Level
- 2 ft Level
- 6 in Level

Miscellaneous:

- Tough Hose (Gorilla brand is good)
- Coupler - hose to chop saw (buy two in case one breaks or gets lost)
- Garden Hose Nozzle (with mist setting)
- Bucket Caddy (tool organizer)
- Pocket Knife
- Tin Snips (for cutting metal palate binders)
- Duct Tape (bucket handle repair)
- Construction Spray Paint
- Wire Brush
- Feeler Gauge

2.0.2 MAINTENANCE

Chisel tips should be honed regularly, rounded tips are less effective and it's harder to restore the angle once the tip gets blunted. Shovels get deformed quickly, they work better when the shape is maintained. I grind both shovels machete sharp before starting every job. Same for the rock bar, it should be about as sharp as an axe.

You'll know the chop saw blade is dead when it stops cutting and sparks more than usual. Keep an extra one on hand so you don't have to make a trip to the hardware store. Some brands are more expensive than others and prices fluctuate so shop around. The Makita Diamond blade from Home Depot and The Hercules diamond blade from Harbor Freight are both very good.

Make sure you know the proper starting procedure for your saw. If it won't start make sure it's not out of gas first then check the air filter. If the filter is caked with dust and you don't have a replacement you can tap some of it off and blow on the side that faces the engine to make sure no dust stuck to it. Never use compressed air to clean a filter.

If the saw has gas and a clean filter but won't start check if the spark plug is loose and crank it down or replace it if it's dirty. The gap on a new spark plug may need to be adjusted, that's what the feeler gauges are for.

Replace the fuel filter if it's dirty. Filters and spark plugs should be changed on schedule, check the manual for the maintenance information.

If you checked everything and the saw won't start there may be an issue with the engine. There should be a few small engine mechanics in every town, make sure they're reputable and ask for an estimate for cost and time.

If you have to rent a saw, ask them to start it for you to prove that it's in working condition and double check it yourself to make sure that it's not missing any parts.

3 PLANNING

3.0.1 VISUALIZATION

Visualize the end result before starting. The first step of any project is to stare at the land you plan to transform. Consider your options. What do you want to create? How will you get there? Walk through every step of the project in your mind's eye as if you were walking through your childhood home. Or somewhere more peaceful if you prefer. Imagine yourself performing every step of the project from start to completion.

Visualization helps a lot, it'll keep you from feeling lost or overwhelmed half way through. It's helpful to imagine different ways of executing the same project, you might find that your first idea has a logistical problem or there's a more efficient way to build something.

3.0.2 MEASUREMENTS

Take photos from every angle and detailed notes on what you plan to build. If the project is complex or has several parts it can be helpful to draw a simple diagram of the property while you're there.

Patios are straight forward, measure the length and width. Measure diagonally to create a perfect square or rectangle. Both diagonal measurements should be equal. This works for other shapes too, if you want a hexagon patio simply make a pentagram with line. All five lines of the pentagram should be equal and the distance from each point to the one next to it should also be equal.

A patio trench needs to be 6 inches deep to accommodate the 4 inch gravel foundation and 2 inch flagstone. Patio foundations should be about a foot wider than the patio for stability. A wider foundation is not necessary if you build a block border for the patio, the block will hold the gravel in place.

Retaining Walls should be started below ground level on a gravel foundation. The depth of the trench depends on the density of the earth and the height of the wall. Minimum depth for the trench is 12 inches – 4 inches for the foundation and 8 inches for the first course of block.

You might run into bedrock while trenching, in this case you'll have to dig wide enough to fit your saw into the trench to cut and chisel away until it's not an obstruction. You could also rent a jack hammer or maybe drill into it and use a handful of M8os, I've never tried either one.

If the trench runs parallel to a slope then one side needs to be deeper than the other to keep it level. For example, the trench might be 12 inches deep at the bottom of the slope and 18 inches deep at the top. In this case your wall might be 5 feet tall at the bottom of the slope and 4.5 feet tall at the top if you measure from ground level.

Let's say the slope is even steeper and the trench would be 3 feet deep at the top and 12 inches deep at the base. This is impractical and unnecessary. Instead, to keep the trench level you can step it up as you go up the hill. To use the step up technique you need to dig the trench as you build the first course of the wall. For example: dig 12 feet of trench, set 6 feet of block, then fill the remaining 6 feet with gravel up to the height of the block and continue the first course by placing the next block on top of the gravel.

Retaining walls taller than 5 feet should be built with cinder block, rebar, and mortar on a concrete footer. This approach is more affordable and much stronger than a dry stack wall. If your client wants the aesthetic of a stone wall you can build it with cinder block, slap some veneer on the side top it with cap stones.

Staircases require careful measurement. Sometimes you need to shape the land to fit the staircase, other times you need to modify the staircase to fit the land. All steps should be the same height, don't build four steps that are 7 inches tall and one step that's 3 inches tall because you screwed up the measurements.

Laser measuring tools are available but they're a luxury so I'll explain how to do it with line and a level. The objective is to measure the rise (height) and run (length) of the hill so you can determine how many steps are needed.

I use pavers and strip stone to build steps, standard paver dimensions are 18 inches long by 24 inches wide and 2 inches thick. The strip stone needs to be custom ordered to 4 inches long by 24 inches wide and 5 inches thick. This makes a step that measures 14 inches long and 7 inches tall, the standard height for stairs.

Let's say your client has a small hill on their property and they want steps. The rise is 42 inches and the run is 84 inches. Divide 42 by 7 and 84 by 14, both equal 6 so you need six steps. This would be an ideal situation.

Say the rise is 45 inches and the run is 104 inches, this means 3 extra inches of rise and 20 extra inches of run, so you'd have to dig down 3 inches at the top of the hill if you want six steps. You have 20 extra inches of run so you might think add another step to cover 14 inches but you'd be 4 inches higher than the top of the hill. This might be okay if you're building a patio at the top but not if it leads to a dirt road or some area where you couldn't easily raise the level.

You want the top step to be level with the ground, otherwise it's a trip hazard. For this scenario let's say you dig down 3 inches on top and split the staircase in two. You have three steps at the base, then a run of 20 inches (small landing area/ divider built with flagstone) and another three steps to finish off the staircase.

Now let's say you have the opposite problem, the rise and run are both 84 inches. This means you need twelve steps but each step would only be 7 inches deep. This would be hazardous, especially when descending so you'd have to figure out how to decrease the slope. If you start the staircase 2 feet back from the base of the hill then you just gave yourself 2 extra inches per step. You would have to border the sides of the steps so the gravel doesn't spill out. You could potentially decrease the slope by trenching from the top of the hill, you could also build a switchback (zig zag) staircase but this would be challenging for a beginner project.

If you add walkways between steps make sure they're evenly spaced. For example, three steps + 3 foot walkway, three more steps + 3 foot walkway. Make every section match the last one so it's not awkward to walk on – three steps up, two strides, three steps up, two strides. You don't want your client to think about how they're walking – five strides, two steps, three strides, four steps, etc. This is poor craftsmanship. You should be able to run up and down the steps without giving it a second thought.

CHAPTER 3. PLANNING

The following is one method for measuring rise and run without using a laser level:

1. Put a stake down at the top of the hill.
2. Tie the line to the stake at ground level.
3. Put the line level in the middle of the line.
4. Walk to the bottom of the hill.
5. Hold the line up to your 8 foot level. Make sure the 8 foot is plumb and the line is level.
6. Mark the 8 foot with a crayon and mark the line with a knot or a flag of some sort (tape, plastic, string, whatever).
7. Measure the line from the stake to the mark and the 8 foot level from the end to the mark.

Now you have the measurements for rise and run. You may have to do this several times depending on how tall the hill is.

Detailed instructions on measuring can be found on the youtube channel “Essential Craftsman”. You’ll find visual demonstrations on what I’ve covered here. I recommend starting with the video titled “Using String Like a Pro” <https://www.youtube.com/watch?v=cv6BdwMe56o>

4 EXECUTION

4.1 PATIOS

4.1.1 EXCAVATION

The first step is trenching for the foundation. Mark the perimeter with stakes or spray paint, square it up with something close by like the side of the house, the road, a fence or some trees.

Start digging with the spade and finish with the square shovel. The spade is good for penetrating the earth, the square is good for scraping dirt. Use the digging bar if the dirt is too hard to penetrate with the spade. Some people might prefer a pickaxe, I think the digging bar is faster and requires less effort. The pickaxe needs to be lifted over head and swung down, it goes deep into the ground but the hole is narrow. When you attempt to pry with it, the pick might lift a small amount of dirt or it might get stuck.

The digging bar is held with a mix grip (back hand supinated, front hand pronated) and slammed into the ground. It penetrates about half as deep as the pickaxe but never gets stuck and lifts more dirt when you pry it up. You can use it to chop roots and it's easier to pry rocks from the dirt. If you hit a rock square with the pickaxe it will send a shock wave through the handle into your hands which can be very painful. It's much easier to dig with the spade once you break through the top layer of dirt with the digging bar.

Once the trench is dug the next step is to make sure it's level. The trench should be at least 6 inches deep, 4 inches for the gravel and 2 for the flagstone. It doesn't have to be perfectly level but there should be no slope.

The most accurate way to measure the level of the trench is to set stakes in the corners and run a line around them. Put the line level in the middle of the line and adjust as needed. Once the line is level measure from the dirt to your line. Measuring every 3 feet on each side should give you a good idea of how level the trench is around the perimeter. Next run two lines diagonally and measure from each corner to the center of the trench.

If you're working on a slope you'll need to build a retaining wall on the deep side, this makes the project look finished and prevents dirt from eroding onto the patio. This can be done with block or 6 - 18 inch boulders.

CHAPTER 4. EXECUTION

4.1.2 FOUNDATION

Once your trench is flat and root free it's time to haul gravel. The gravel should be angular, 3/4 inch is standard. Don't use river rocks for the foundation. Buy the cheapest type unless the client has a color preference. Use 3/4 or 1/4 inch gravel, nothing bigger or smaller.

Some masons set on sand which is easier but inferior for hardscaping. Sand retains water so freeze thaw cycles will cause the stone to shift. Weeds can grow in sand and may sprout through the cracks. Roadbase should be avoided for the same reasons. Sand is good for setting unilock pavers or bricks because they're meant to be set flush. There's no room for seeds to germinate and each brick is held in place by the bricks around it.

Spread the gravel with the rake once the trench is filled, then screed with the 8 foot level. The foundation doesn't need to be perfectly level but there should be no slope. You can check the level as you screed with the 8 foot. After screeding and leveling, give the foundation a thorough pass with the tamper so it moves less under foot.

Don't overfill the trench, it's better for the foundation to be slightly lower than you need it to be. It's easier to add gravel during the setting phase than it is to remove it. Removing gravel during the set is more work but adding lots of gravel during the set is also not ideal. If you have to add lots of gravel under each stone during the set you'll spend more time leveling the patio.



foundation for path and retaining wall



foundation for square patio with block border

4.1.3 ASSEMBLY

Flagstone can be staged around the foundation or carried directly from the palate, it's a matter of personal preference. I usually move it directly from the palate and place it on the foundation. If a slab doesn't fit or I don't want to use it yet, I put it aside until there's a spot for it. Precision is not the goal at this stage. It's okay if some pieces overlap and others are six inches apart.

Your assembly style will depend on how your mind works so I won't go into great detail about how you're "supposed" to do it. You'll learn from experience what works best for you. I think of assembling patios like building a spider web. Each web is different and each spider builds a different style of web.

During this phase it's okay to drop slabs flat on the gravel with some force. This will test each stone for hairline cracks, give the foundation some extra tamp, and keep your back from getting fatigued. Just remember to watch your toes. Take a wide stance and push the stone down as if you were slamming a deadlift – push it down as it's falling. The goal is to drop it flat so it slaps the gravel, if the slab falls on its edge you'll just be making more work for yourself. This takes some practice but once you get good it's a very effective technique.

Visualize every cut as you place the slabs. You can cut each slab right after you place it, place a few then cut them, or cover the whole foundation then cut all the slabs. Experiment with different workflows, you might find that one technique works better for patios and another is better for walkways.

If two slabs fit together naturally leave them as they are. Cuts should be made conservatively and only when necessary. Train yourself to assemble patios in a way that creates the least waste possible. It's better to cut a slab in half than cut large chunks off the side. If you're struggling to find a place for an oddly shaped slab you might have better luck finding places for both of its halves.

Flagstone should be equally distributed by size. You don't want to start with all the large slabs on one side and be left with only small ones to finish. Think of the large stones as your center pieces, they should be scattered evenly across the foundation. The medium stones next to the large ones and the smallest ones to fill in the gaps. Size distribution is important for all stonework projects.

Always use naturally straight edges to border the patio, cut edges should never be facing out. If you build a block perimeter the same rule applies, never place the cut edge of a slab next to a block. Find naturally straight edges to pair with blocks. Cuts should never be fit with natural edges. Natural with natural, cut with cut.



walkways and steps



path, setting and cleanup cuts

CHAPTER 4. EXECUTION

4.1.4 CUTTING

Cuts can be made dry or wet (with a hose attached to the saw). Dry cutting creates a lot of dust and wears the blade down faster but you may have to if there's no spigot close by, if there's a water restriction or if your client has a well. In this case you must wear a respirator.

There's several ways to mark flagstone for cuts. You can use a carpenters pencil, a chalk line, a chisel or another piece of stone. For beginners I suggest using a pencil because graphite doesn't wash away as much. Chalk or etched marks will disappear if you cut wet and fade from the whirlwind of the saw blade if you cut dry. This isn't a big deal once you gain experience. After you make the initial cut, the saw will move straight as long as you're holding it upright.

To mark a slab, press the four foot level against it firmly and trace the line, or place a cut slab on top of the one you intend to cut and use it as a straight edge. Don't attempt to cut curves because the saw blade will bind. Two stroke engines are powerful, the saw will buck if you bind the blade.

You can use a hammer and chisel to make curved edges but I don't recommend it, the shock wave from striking the chisel will damage your joints overtime. I built a hand chiseled patio in the middle of December and despite wearing gloves I still experienced significant pain and tingling in my hands.

Cuts should be started about three inches away from the edge of the slab. Press the blade down gently on top of the mark you made. The saw will attempt to move forward, resist it until you cut all the way through. Once you make it through, gently guide the saw forward and hold it upright as you follow the mark.

The blade should stay in the gravel the entire time you're making a cut. Finish the cut, then turn around and cut through the remaining inches on the side you started from. You don't want to start cutting from the edge because it's harder to stay on course. You'll bind the blade if you attempt to course correct after starting the cut. If you don't bind the blade the cut will look sloppy. It's important to make cuts deliberately because even small changes in the angle of the blade will be noticeable on the slab.

Most of your slabs will end up with four or five sides. Seven or eight sides is fine but generally not practical or necessary. You'll end up using triangles too which is fine, they'll be your smaller gap filling stones. Don't cut points that are under 30 degrees because they frequently break when setting. If the flagstone has a hairline crack it'll break no matter what so look out for them and cut that part off or make your cut parallel to the crack and use both halves.

When assembling stones all the points should come together. If one point is offset from another it's difficult to build around. In this case it's better to cut both points off so you have another flat edge to work from. In other words, try and make the gaps as simple as possible. You don't want a bunch of zig-zagging gaps unless it's a stylistic choice and you're already proficient with cutting and assembling. Think of stonework as a chess game. Try to win with the least moves possible. Less cuts means less waste and less work.

The gaps between stone should be between 1/2 inch and 1 inch. Any bigger and your work looks sloppy. Any smaller and the breeze won't fit in the gaps. Breeze (also known as crusher fines) is stone dust mixed with gravel. It's used to fill gaps because it looks nice and prevents weed growth. Overtime it solidifies but still lets moisture pass through and won't crack like mortar.

4.1.5 SETTING

At this point the patio is cut and assembled but all the flagstone is lop sided. There is no way to avoid this, you can only minimize it by leveling and tamping the foundation thoroughly.

Before starting you'll need some extra gravel, maybe 12-24 buckets depending on how well you prepared the foundation. If you have 3/4 inch gravel left over use that. If not buy 1/4 inch gravel if it's available at your local aggregate distributor. 1/4 inch is slightly easier to set on but not so much that it's worth going out of your way.

Start leveling from the highest point. It's important to be mindful of where you want to direct water. Patios should have a gentle slope but not so much that you notice while standing on them. Pick up the first slab and lean it against a gravel bucket. Pour some gravel out from another bucket, spread it around, tamp the area, and set it back down.

To pick up a slab, wedge the pry bar in the gap and pry it up, then stick the garden pick under the slab and lift it far enough to fit something under it (a 2x4 or whatever, just not your fingers). If you're wearing steel toe you can rest the slab on your boot, this makes enough space to get a grip on it. You can use the garden pick to lower it back into place, just be careful not to let it slip. Keep your back straight and your core tight as if you were deadlifting.

Check the slab you just set with the two foot level. If it's level take the dead-blow hammer and tap it into place with moderate force. Don't hit too close to the edge because you risk breaking corners off. Check the level again, if it changed then repeat the process until it doesn't budge. If it sinks more than 1/2 inch you need to tamp the foundation harder.

Make sure the first slab you set is perfect because it will be your template for the rest of the patio, your keystone. Repeat the setting process with the slabs around the keystone. Check the level of each one individually. Once you have a few set, measure across all of them. Use the four foot level to measure in several places. They should all be level individually and together.

This is the first stage of setting so don't worry too much about getting the level perfect, just keep setting until you've done the whole patio. Final micro adjustments are done with breeze but don't overuse it. Too much breeze causes the slabs to wobble and shift. Even if they're solid when you first set them, it won't stand the test of time.

When doing micro adjustments pry the slab up, scoop some breeze with the trowel, distribute it evenly under the perimeter of the stone, and tap it into place with the dead-blow hammer. Slabs should not move at all once they're set.

Make adjustments as needed until the patio is flat. At this point no slab should be higher or lower than the one next to it. You can use the eight foot level to measure but don't rely on it too much. Flagstone isn't perfectly flat, it has ridges and bumps so you might end up with a false read. The line level technique can be used on finished patios also.

CHAPTER 4. EXECUTION

4.1.6 FILLING GAPS

You're past the hardest part, now all that's left to do is fill the gaps. One hundred square feet of patio requires about a dozen buckets of breeze. Grab a bucket, the trowel, the bench broom and the medium chisel. Use the trowel to pour breeze into the gaps and tamp it down with the chisel, then sweep the excess into the gap and tamp again. Fill the gaps to the brim, the breeze will sink over time. Mist the breeze thoroughly after all the gaps are filled. At this point the breeze is still fresh and needs time and sun to harden, saturating it with water will expedite the process.



foundation for path extension



setting and filling gaps

4.1.7 CLEAN UP

Gently sweep the patio once the breeze is completely dry. You can rinse the leftover breeze dust from each stone with the mist setting or another gentle shower setting. You may want to take pictures for your portfolio when everything is wet because it makes the colors more brilliant. Make sure everything is wet but not soaked, it looks bad if there's dry spots or too much water.

Gather all the stone scraps into buckets to be disposed of or reused for backfill. You may want to break them into smaller chunks so they're easier to transport. If you plan to use the scraps for backfill then breaking them down is necessary, nothing bigger than fist sized chunks. Break each piece with the sledge in the dirt. Don't go crazy on a pile of scraps because your knuckles will pay the price.

4.2 DRY STACK RETAINING WALLS

4.2.1 EXCAVATION AND FOUNDATION

We've already discussed excavation and foundation in the patio chapter, most of the same principles apply for walls. The difference for a wall foundation is that you'll be digging one long trench instead of a square or rectangular one.

I like to start by setting a line to use as a guide so I don't veer off course. Measure from some landmark to both ends of the line. The wall should be parallel to whatever you're building it in front of. The trench should be wider than the block, the width of the square shovel is usually wide enough. Make sure the tamper fits in the trench before filling it with gravel. Dig the trench 1 or 2 feet deep, fill it with 4 to 8 inches of gravel and tamp it. Measure the foundation with the 8 foot level and screed with the square shovel. If you plan to build the wall with curves or corners pay special attention to those areas when measuring level.

4.2.2 FIRST COURSE

The heaviest blocks should be used for the first course and the longest blocks should be used for the last course (the top of the wall). Long blocks look nice on top, they're also heavy enough to hold the middle courses in place.

The first course must be perfectly level. If the level is off even slightly it'll get worse as the wall gets taller. Place your first block on the side you wish to start from. Push dropping is only recommended if you're comfortable with the technique. You don't want to be slamming corners of block down and compromising your foundation or hitting the block that you just set. Measure the block lengthwise with the two foot level. If one side is higher it can be wiggled into place by pushing down on the block and working it down into the gravel.

Next measure from back to front (the width) with the six inch level. This measurement is the tilt of the wall. Retaining walls should tilt back slightly to compensate for the weight of the backfill. If the wall is plumb (perfectly vertical) the weight of the backfill will push it forward which compromises the strength and integrity of the wall. The bubble on your level should be no more than half way across the first line.

Make sure each block is solid on the foundation by hitting them with the dead-blow hammer, they shouldn't move at all once they're set. You can really smack blocks, they won't break like flagstone.

Use the level of the first block as a guide for the next. Place each block flush against the last. Check the level of each block individually and against the last one. If you need to raise one side of a block higher simply dump some gravel in front or behind it, pick it up and wiggle it back into place. Smack it with the dead-blow again and push on the corners and edges to make sure it's solid on the foundation.

Once the first course is finished it's time to backfill. Fill both sides of the trench with with a 50/50 mixture of dirt and gravel, then tamp with the flat side of the digging bar. Tamp firm but not so aggressively that you shift the first course. The front side of the trench should be filled to ground level. The back side should be filled to the top of the first course.

CHAPTER 4. EXECUTION

4.2.3 MIDDLE COURSES

Now you have one course that's perfectly level and tilted appropriately. The next challenge is two fold, make sure the wall stays level and overlap every vertical gap in the last course. Think of a red brick wall, every brick sits directly over the gap of the two bricks below it, this is aesthetic and structurally sound. Every block in a dry stack wall should overlap the gap below it. They can't be perfectly centered like a brick wall but the vertical gaps must be overlapped.

Find a block that's shorter or longer than the first block in the first course and place it on top. Push down on all four corners to check for movement. If the block wobbles try rotating it, flip it over, or set it aside and try another block. It's common for a few blocks on every palate to be uneven, these can be used for tiebacks or split in two if they have a weak layer. Check the level every time you set a block.

Next find a block that's about the same height as the last one or two blocks that can be stacked together to match the height of the last block. If no blocks match just pick one that's about two thirds the height of the last one and expect to build around it later. This is common and puzzle piecing walls together is a skill that takes practice just like assembling patios. Be patient with yourself and don't expect perfection, just do the best you can with every step.

Inspect every block for hairline cracks and weak layers. Some layers in the sandstone are weaker than others, usually they're lighter in color and thicker than other layers. They can be tested by chiseling along the length of the layer. If there's a crack then chisel the length of it until the block breaks in two. Use this technique if you need a shorter block or you need to flatten the top of an uneven block.

Backfill to the brim and tamp every time you finish a course. This keeps the backfill compacted, keeps shims in place and provides structure for tiebacks.

4.2.4 SHIMS

Sometimes you'll have to fill gaps in the wall with shims. Shims are thin, flat pieces of stone that are wedged between horizontal gaps to keep the block level. They're set in the backside of the wall so the backfill holds them in place. If a block has a low corner or a slight wobble you can wedge a shim in the gap and tap it into place with your sledge.

Shims can be obtained by splitting blocks. Usually when a block splits you'll get a few pieces of thin, shale like, flakes. You'll notice these flake type inconsistencies on the face of blocks too, they should be chiseled off to make the block as flat as possible. You'll probably end up with more than you need from splitting and cleaning up blocks.

Don't use shims as a crutch, over use will compromise the integrity of your wall. It's better to look for blocks that fit together well. Take the time to rotate each block, flip it over, rotate again, and try another. Measure the level every time you use a shim to make sure it didn't throw off the tilt.

Thin pieces of block are shim like but the use is different. It's perfectly acceptable to cram an inch thick block in an inch wide gap to fill it. Thin blocks should extend across the whole width of the wall (from back to front).

4.2.5 TIEBACKS

Tiebacks are blocks that are set perpendicular to the length of the wall. They should be installed about every six feet starting from the second course and stopping three to five courses down from the top. You don't need tiebacks in the foundation and you don't need to add them all the way to the top. Installing them in the top third of the wall is excessive and could cause your top course to shift, especially if the backfill is an area that will be walked over.

The purpose of tiebacks is, as the name suggests, to tie the wall back into the dirt, they function as a stabilizer for the wall. Every time you finish a course you should backfill it to accommodate the tieback. If the backfill is too low the tieback will tilt backwards. Backfill should be tamped firmly enough to be a solid resting place for the tieback but not so aggressively that it shifts the course that you just finished.

Put the uneven blocks aside to be used as tiebacks. Some blocks may taper drastically, some will be too difficult to chisel. You'll find that some layers will refuse to split, it's better not to fight them.



garden wall with tiebacks



retaining wall tiebacks

4.2.6 LAST COURSE

Do your best to save the longest blocks for the top course. Ideally they will all be similar in height and in a perfect world, your penultimate course will be just as flat as your first course. Long blocks look really good on the top, they're heavy enough to sandwich down the middle courses, and they won't move around as much if someone bumps into them. Backfill the last course with only gravel instead of gravel mixed with dirt, it makes the project look finished.

CHAPTER 4. EXECUTION



multi level patio



80 foot retaining wall



terraces and wall



path and wall

4.3 STEPS

4.3.1 WORKFLOW

Steps are easy if you measure accurately, much easier than patios or retaining walls. Start by making a foundation for the first paver. The paver should be set at ground level, a landing area for the base of your steps. Next place the strip stone flush with the back of the first paver. Check the level of the strip stone with the six inch level, it should match the level of your step. If it doesn't match try rotating the strip stone, flip it over or grab another one.

Sweep the dust from the paver and the strip stone and apply a bead of glue to the paver about one inch away from the edge. You must thoroughly dust the stones or the glue won't stick. Don't over do it with the glue, use too much and it'll seep out onto the paver which is ugly and hard to remove. If this happens you can scrub it off with a wire brush before it dries but it'll still leave a ghost mark. Press down on the strip stone to ensure that it's on the paver, not sitting on top of the glue.

Remove 4 - 6 inches of dirt from behind the strip stone and replace it with gravel. Tamp the gravel firmly, brace your toes against the strip stone so it doesn't move. Place the paver on top of the gravel, it should hang over the strip stone by about 1 inch. Check the level of the paver and add more gravel if necessary. Dust the stones, apply a bead of glue to the strip stone and press the paver into the glue. Continue this process until you finish.

Each step should have a slight tilt so they don't pool water, the bubble on your level should be no more than one third across the line. They should be tilted forward towards the edge of the step, not backward towards the strip stone.

You'll need to border each step with stones so the gravel doesn't spill out the sides. If you find enough stones during excavation use those, otherwise you can buy "rip rap" from your local aggregate distributor, anything between 4 and 12 inches should work. You can also forego the rip rap border and use strip stone to retain the gravel.

4.3.2 MATERIALS AND STYLE

Pavers and strip stone are not ideal if you're working with a very gentle incline. Flagstone can be placed behind a block as long as it's tall enough to be a step and heavy enough to retain the backfill. Use 8 inch wide block instead of 4 inch wide strip stone if you plan to set slabs behind them.

Glue is not strictly necessary but I recommend using it for steps. My favorite brand is "Loctite PL 500 Landscape Construction Adhesive". Don't cheap out and buy Liquid Nails or some other brand. I worked for a boomer who built prefab columns for suburban neighborhood developers. We glued cinder block together with PL 500 instead of using mortar then decorated the exterior with stone veneer. We'd glue rebar between blocks in the middle of the column, hook a chain to it, pick it up by the chain with a forklift, lift it onto a flatbed trailer and transport the columns to the site. Since then I've never used anything else.



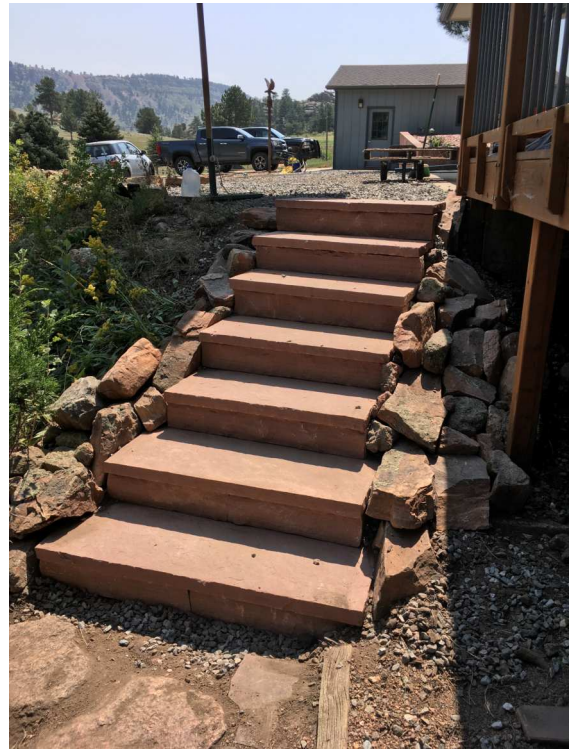
steps and walkways



steps to patio behind retaining wall



4 foot steps



tapered steps

5 CONCLUSION

Thank you for reading. This is the first book I've ever written and it's been a learning process. I don't consider myself a writer, I'm sure some of the prose could've been better but I figured anything was better than nothing. I plan to add more photographs and illustrations in subsequent editions. If you have any feedback or questions feel free to email. umar@redstonemasonry.com

