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INSTALLATION & EDUCATION

Complete Installation Guide for Concrete and Clay Paver Walkways

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For this segmental paver project, we needed to install a sidewalk from an existing retaining wall staircase and a clay paver patio/house entrance. The clay pavers were overlaid on top of a concrete slab. Since the homeowner picked a concrete paver color/pattern from Borgert Products in St. Joseph, Minnesota, we needed a way to tie the two pavement types together. The decision was made to install a soldier course around the concrete pavers in the same Pine Hall Old Towne clay pavers that were used on the house entrance. First, the local utility companies were contacted to come out and mark the job site.

Next, the excavation area was marked with inverted orange paint. The base needs to extend the edge of the pavement by at least the same amount as the depth of the compacted base material. For a residential pedestrian pavement, 4" is the minimum depth of the compacted "3/4 minus", limestone or granite, base. Base material has different names around the country, but ¾ minus means that the base material is composed of particle sizes that range from ¾" diameter all the way down to fine dust and a mix of all sizes in between. For this project, with the soil being mainly clay, the compacted base depth was specified to be 6". This required a total excavation of 9" from top of pavement (6" base, ¾" of bedding sand after compaction and 2 3/8" for the paver).

Most of the excavation can be done with a skid steer loader, such as a bobcat. Always use a sharp, smooth bucket on the bobcat, especially in clay soils. Many people think that a bucket with teeth is the best solution, but in fact a sharp bucket is always the best solution. When digging in clay soil, dig down and then level the bucket as the machine is driven forward at an even pace. The soil should roll in to the bucket like ice cream. When using a tooth bucket, the bucket will tend to pop out of the ground. Keep in mind that utilities sometimes aren't found by the local utility company, so dig carefully.

On this project, the bobcat hit an electrical line. Fortunately, it was an old one that no longer served a purpose. Always hand dig within 24" of

a marked utility line. For small projects such as this one, or when a skid steer can't be used, the job will need to be dug out by hand. Use a flat shovel to be able to "skim" the soil. The final excavation should be smooth and flat which is difficult to achieve with a round shovel. Keep an eye out for things like sprinkler lines and other unusual things in the ground.

This house had some sort of an old concrete drain line that may still be needed. Always consider future needs.

Since there may be a need to run a utility (electricity, sprinkler line, etc) to or from the house, a pvc sleeve was run under the base material. This will allow the homeowners to get under the pavement without having to tear up part of the pavement if needed. Schedule 40 pvc was used and the ends were caped with threaded ends.

Always try to dig clean, 90 degree edges around the excavation. If the edges are not square, the final compacted base will give a false edge of excavation and the paver edge restraint may be spiked too close to the edge of the excavation.

This project had one edge that was laid against an existing asphalt driveway which was not a smooth straight edge. A chalk line was snapped on the asphalt, following the edge of the existing clay patio. Since there was not much asphalt to cut off, a 4" x 4" board was used to help guide the hand-held saw along the chalk line.

After cutting through the edge of the driveway, the asphalt and soil below was removed. Now that the soil has been excavated, it needs to be compacted. Using a compactor with a minimum of 5000 lbs centrifugal force is required. This first compaction will compact the loose material from the excavation.

If any areas were excavated to deeply, do not put soils back in to fill the low spots. Fill these areas with base material and then compact. In order to make sure that the pavement moves uniformly during freeze thaw cycles and under loads, a consistent base thickness is required.

After the soil has been compacted, now is the time to install a woven geotextile fabric if required. Woven geotextile fabrics (not geogrid or weed fabric) are good insurance for clay soils and when dealing with new construction. In clay soils, it prevents the clay from pumping up into the ¾" minus base material and degrading the strength.

On new construction jobs, it can help prevent future settling. Only use woven geotextile fabrics between the soil and the base. Laying it under the bedding sand will not help at all and laying it between the bedding and the pavers will harm the integrity of the project. When laying the fabric in the bottom of the excavation, start at the bottom of the slope and work up.

Overlap, or shingle, the layers 12” – 18” over each section. Be sure the run the layers of the fabric up the walls and out of the excavation (don’t just line the bottom). By creating this “bowel” of fabric, when stretched tightly, it will provide a safety net in case the sub-soil settles. The fabric will support the weight of the base, bedding sand, pavers and the traffic on top of the pavers.

Once the fabric has been laid, the first “lift” of base material can be spread. The thickness of the lift (layer) of loose base material is determined by the type of compaction equipment being used. When choosing the compaction equipment, never look at the horsepower of the engine, it doesn’t tell the whole story. Always inquire about the centrifugal force of the machine. A 5000 lbs centrifugal force forward traveling plate compactor will effectively compact about 3” of loose base material. When doing driveways or other pavements that have a thicker amount of base required, a 12,000 lbs or greater, reversible rammer compactor is much more efficient. These compactors are capable of 6” lifts of loose material. Estimate that you will achieve a compacted base layer of 2” for every 3” lift of loose material. Moisture is very important for the proper compaction of base material.

Water works as a lubricant to move the base particles together. Too little water and compaction will add air to the base and fluff it up. Too much water and the base will act like jello. The simple test for moisture content is the squeeze test. Pick up a hand full of the base material on the job site and squeeze it together. If it falls apart when you open your hand, it is too dry. If it stays clumped together, there is enough moisture. If water runs out, there is too much water.

When spreading loose base material, use a baserake or another rake with a smooth, solid head. If spreading loose material with a landscape rake or other rake with teeth, the fines will have a tendency to drop out and the base will not compact properly. A rake with teeth will be needed to rough up any high spots when checking for final grade.

Compact the first lift by starting around the outside and work in circles toward the center. Always overlap each pass by half the plate compactor's width. Repeat this a second time, again starting on the outside. After the second compaction is complete, start compacting back and forth and diagonally.

In order to help see where the final lift should stop, measure 3" down from top of final pavement. Make a mark on the side of the excavation with a line using a marker or a carpenter crayon.

Then draw a "v" above the line, this will help to judge where the level line is without digging down to see the line. 3" is used because the 1" bedding sand will be approximately ¾" after compacting the pavers plus the 60 cm thickness of the pavers (2 3/8").

The interlocking concrete pavement institute (icpi) recommends that the base is within +/- 3/8" over 10'. Take a carpenters pencil and try to slide the thin side under the pipe or board. If it can not slide under, you are within proper tolerances. If the pencil fits, but there is no room to move the pencil up and down, the base is at the maximum tolerance. If there is any room for play, there is either a low spot or two high spots.

Move the pipe or board around the area checking for deviations to determine which one it is. In areas that transition slopes quickly, there are exceptions to this rule.

Once the base is done, next the bedding sand needs to be screeded. The bedding sand should be a course, washed concrete sand. The best way to screed sand is with 1” outside diameter metal pipes. Some contractors prefer to use 1” x 1” rails, but if sand get under one side of the rail, the bedding sand depth will be greater than 1”. Using a pipe, there is only one point of contact. Start by placing the 1” pipe directly on top of the compacted base. Then cover the base with piles of sand to prevent the pipes from moving and sand from getting under.

Next use a flat shovel to scrape the sand off the top of the pipes to obtain a visual idea of how much sand will be needed between the pipes for screeding.

Fill the area between the pipes. The screed board is pulled across the top of the pipes to strike off the sand. In order to maintain a true straight edge on the screed board, it is best to use aluminum or magnesium screed boards or a sandpull pro.

If this is a homeowner installed project, a 2” x 6” or 2”x 8” wood board should be used. The problem, for the professional, is that wood is never truly straight to begin with, plus it warps when it gets wet. After reaching the end of the screed pipe, slide the pipe across the top of the base and repeat the above screeding instructions until reaching the end of the pavement. Do not screed all the bedding sand for the job if the job can not be completed that day. Only screed as much sand as can be covered that day. If the bedding sand is not covered by pavers, rain or other disturbances can disrupt the bedding sand, requiring it to be re-screeded the following day. After removing the screed pipes, the voids from the pipes will need to be filled.

Without walking on the sand, fill the void in the sand with a shovel (only use as much sand as necessary, no more). The sand in the voids will need to be leveled with either a trowel or a sandpull. If using a trowel, touch-up the sand as the pavers are laid. When using a sandpull,

larger areas can be fixed because of the long 6' handle. The sandpull is the correct weight and width to allow it to float on top of the screeded sand and screed off the pipe void fill. The sandpull is also very useful for fixing small areas after animals or people walk into the screeded bedding sand. Once the bedding sand for the day has been screeded, it is time to start laying pavers.

Starts by laying your "soldier" course, then follow with laying the "body" pavers. On this project, the body pavers were laid until they reached the approximate edge of pavement. When laying pavements that are curved, it is best to install the paver edge restraint first.

Since the pavers need to be cut, setting the edge restraint first will help create a smooth curve and is also a good time for the homeowner to approve the design. PAVE TECH's PAVE EDGE RIGID & FLEXIBLE edging was used on this project. On straight edges and gradual curves, PAVE EDGE rigid is the perfect edging. It provides superior strength on straights with minimal spikes and provides enough resistance to help create a smooth flowing curve. Normally, for straight edges on residential applications, PAVE EDGE rigid is spiked in every 2 – 3 feet using 10" long x 3/8" diameter steel landscape spikes. In the case of "flexing" PAVE EDGE rigid, it is spiked once every foot as the edging is gradually flexed more after each spike goes in. Don't pound the spikes all the way down until the curve is complete in case there is a flat spot and adjustments need to be made.

Pave edge rigid & flexible both use the same ¾" connector pipe for attaching sections together. This connector pipe comes in long pieces and it is cut into 8" pieces and inserted into the end of the edging. It is critical that the connector pipe is used to ensure continuous strength from section to section.

When laying out multiple pieces of PAVE EDGE flexible to create a smooth curve, it helps to drive two 1 ¼" sheetrock screws through the back support into the connector pipe. This will keep the pieces tight together as the edging is

moved around on the base material.

When installing PAVE EDGE, it must always be spiked in directly on the base material, never on top of the bedding sand. Before starting a curve, start straight for 2 – 3 feet, then curve. In this case, the sand was over-screeded slightly past the expected top of pavement. This allows for full pavers to be used to minimize cutting. The bedding sand needs to be pulled away from the edge of pavement so the edging can be installed. Use a trowel and cut straight down along the soldier course and pull the sand back. Do not scrape up the base material in this process.

Starting at one end, place the edging flat on the base and start sliding the lip under the bedding sand until the back support is tight to the pavers. Spike the edging in with a slight toe-nail to help draw the edging tight to the pavement. When spiking PAVE EDGE flexible, regardless of the pavement application, always spike every back support (13 back supports on a 10’ piece). The back supports slide, so space them out evenly before spiking.

Make sure to maintain a smooth curve as the edging is spiked in.

Now that the edging is set, it is time to continue laying pavers. The goal of each work day is to complete the section of pavement laid. This means that the bond lines are straight, body pavers cut, soldier course laid, edging spiked in place, pavers compacted and joints filled with joint sand. It is important to monitor progress as the work day continues.

String lines are pulled across the pavement in both directions to make sure that all the bond lines are straight. Make sure the bond lines are straight before any pavers are marked and cut.

Anytime after the base installation and compaction is complete, the excess geotextile fabric can be trimmed off. Use a utility knife to cut the fabric off at the top of the base material. After trimming, if there is still fabric showing between structures, carefully use a propane torch to melt down the visible fabric.

When it comes to marking and cutting pavers, there are many tools that make this easier. Since all the body pavers on a curve need to be cut, lay as many full body pavers up to the edge restraint. Then using a quickdraw, set the opening the same size as the soldier course paver. In this case, it was 8 inches for the clay paver.

Then rest the guide on the edge restraint and mark the body pavers. Make sure to go back and put an “x” on the half of the paver being cut off.

If you don’t have a quickdraw, you will need to hold a soldier course paver over the top of the body pavers and mark the cut.

Start pulling the marked pavers up and take them to the table saw. Use a tub style table saw, available in both electric and gas, with a good quality diamond blade. Many saws on the market today can cut pavers wet or dry. Wet cutting eliminates the dust, but make sure that the pavers are rinsed well after cutting. If the slurry is allowed to dry on the pavers, it will stain them. Also, never cut wet or dry on top of the paver pavement. If cutting dry without a dust collection system, make sure to watch where the dust is blowing. Always wear eye and hearing protection when cutting and wear a dust mask if cutting dry. Pay close attention to where your fingers are when pushing the paver through the blade.
There are some pavers that are laid against the retaining wall that need to be cut. Using the paverscribe, it is easy to transfer the angle of the cut to the paver.

After the paver is cut, it is glued in place with a special masonry adhesive called superwet type 3. It is a foaming polyurethane adhesive that performs best when moisture is present. If the conditions are very dry, wet the surfaces to be glued before applying superwet. As with all adhesives, make sure that all dirt and debris is cleaned off the surfaces to be glued.

These pavers were glued directly to the existing retaining wall steps before the bedding sand was screeded. Since the retaining wall steps were sloping back to the pavement slightly, the back of the pavers needed to be shimmed so water doesn't puddle at the step. Then another moisture curing adhesive, ultrawet type 4, was used to help seal the gap between the pavers and the retaining wall block to prevent bedding sand from migrating out.

When marking body pavers along the retaining wall, we used a tool called a flexmarker. It has cleats that slide onto the joints and a flexible pole is velcroed to the cleats, 8 inches away from the wall. Then a marker is used to trace along the pole. After the body pavers have been marked and cut, the soldier course can be put in place.

Now that all the pavers have been cut and installed, it is time to do the first compaction on top of the pavers. First place a little sand between the soldier course pavers and the edging if there are any gaps. For larger gaps, such as by the retaining wall block edges, fill the void with a little base material. Then place a little sand between gapped soldier course pavers to prevent them from twisting during the initial compaction.

Finally, sweep of the entire pavement and start compacting. The first compaction of the pavement starts the interlock process and ensures a smooth surface. Any height deviations from paver to paver will be removed from the top of the pavement at this time (most appreciated during the winter months when the pavement needs to be shoveled). If this project only had concrete pavers, the 5000 lbs centrifugal force compactor could be run directly on top of the pavers.

Since this project involved clay pavers, a rubber mat was attached to the bottom of the plate compactor to minimize chipping and cracking. A rubber mat is also a good tool when running the compactor on top of textured surface concrete pavers. There are also roller attachments available for this same purpose.

Always start compacting the pavers along the outside edging, allowing the plate to hang over the edge of the pavers. Then make circles around the pavement working toward the center. Always over lap each pass by 1/3 of the plate width. Make 3 – 4 passes around the entire pavement and the first compaction is complete.

Next, it is time to fill the joints with a course, washed concrete sand. This sand takes more time to get into the joints, but is also more difficult to wash out. Do not use silica sand or mason sand. There are joint sand stabilizers on the market, such as SANDLOCK, which help to bind the joint sand together. This will further improve washout resistance and make it more difficult for ants to push the sand out. If SANDLOCK is to be used, all the sand used to fill the joints must be mixed with SANDLOCK. A final top coat will not work. SANDLOCK is an organic joint sand stabilizer additive that is mixed on the job site. It can be mixed in a wheel barrow by hand, but this is very time consuming and the SANDLOCK may not be thoroughly mixed in. Using a concrete/mortar mixer is faster and ensures proper mixing. Depending on the sand used for the joints, SANDLOCK is mixing in 2 – 5 pounds per 100 pounds of sand. This 100 pound mix with SANDLOCK will cover approximately 170 – 200 square feet (depending on paver size, thickness and joint width). Once the sand and SANDLOCK have been mixed, spread a thin, even layer across the top of the pavement.

Warning: SANDLOCK is a water activated product. Do not spread the mixture over a wet pavement or if it looks like it will rain soon.

With the layer of joint sand spread, run the plate compactor again in the same method as the first compaction. If there is another person to help, have them continue to spread the sand around

the pavement with a push broom as the compactor is run. If there is no sand over the joint, it is a wasted pass with the plate compactor. Be careful not to leave piles of sand for the plate compactor to run over. The pavers under the piles will be pushed down further into the bedding sand than the rest of the pavement.

Continue sweeping and compacting until the joints are full. Stop the compactor and spot check the pavement with a 2” putty knife. Push straight down with the knife, if the sand pushes down, continue sweeping and compacting. Once the joints are full, thoroughly sweep off the entire pavement.

If SANDLOCK was used with the joint sand, it can be shoveled into sealable pails to be used later on future projects.

Next use a leaf blower to blow off any remaining sand and SANDLOCK from the surface. This is also the time to help contour the tops of the joints. The joint sand should be at the bottom of the chamfer (the rounded top edge of the paver), not the top of the paver.

Once blown off, it is time to activate the SANDLOCK with water. Do not mist the surface; flood it with as much water as possible. Set the hose sprayer to “shower” and thoroughly wet the pavement. Once activated, the surface is safe to walk on, but it best to let it dry for at least a few hours before opening the pavement to traffic. Depending on temperature and

humidity, the joints will take 1 – 3 days to completely dry.

In some markets, SANDLOCK premix is available in 50 pound bags. This is proper joint sand premixed with SANDLOCK and is ready to be emptied from the bag and spread for compaction into the joints. Clean-up and activation is the same as with SANDLOCK additive.

Now that the pavement is complete, it is time to cover the base extension with black dirt. Compact the dirt with your feet and fill to the top of the pavers. Then go back and cover the dirt with sod and water thoroughly for the next couple weeks to ensure the sod takes root.

Congratulations! You have completed a paver pavement that will last for many years to come.