Hardscape Solutions:
The Stone Deck Advantage

STONEDEKS
SYSTEM

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Purpose and Learning Objectives

Purpose:

A stone deck is a stunning, low-maintenance alternative to a wood or composite deck. This course takes a detailed look at the engineered polymer structural grate support system used in the creation of stone decks. Common issues with wood and composite decks are presented. The installation of the engineered polymer support system in new and retrofit or remodel construction, ground applications, and commercial rooftop applications is discussed.

Learning Objectives:

At the end of this program, participants should be able to:

- Specify a stone deck with a engineered polymer support system by referencing design tables and the local building code.
- Explain how the engineered polymer support system is installed on both the deck area and stairs to ensure a safe and durable installation.
- Identify issues that may be of concern in retrofit applications, and recall the measures that must be taken to prepare the deck for a stone surface.
- List the steps involved in rooftop and ground installations, detailing how they prevent flexing, heaving, and sinking of the pavers.
- Summarize the issues that can occur with wood or composite systems and how they affect safety and performance.

Engineered Polymer Grate System

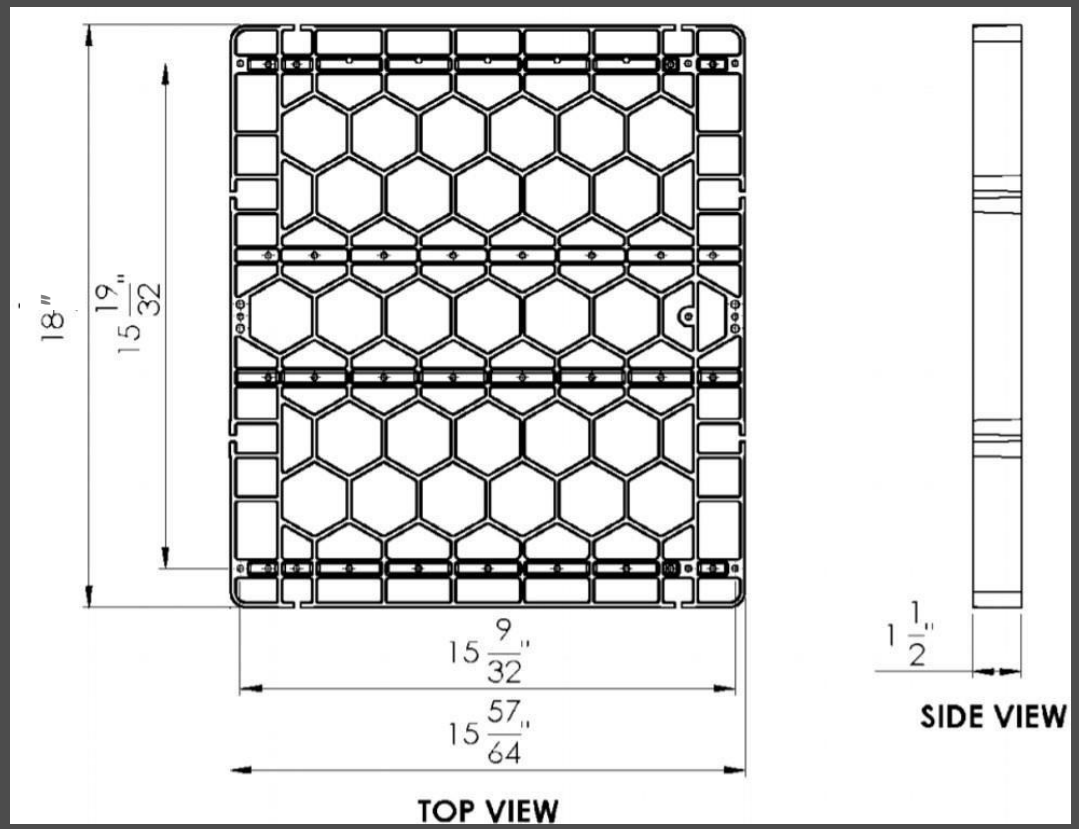
The engineered polymer support system enables the installation of natural stone and concrete pavers, brick, and porcelain pavers on wood or metal floor joists as an alternative to wood, composite, or PVC flooring. The engineered polymer grates in the photo is screwed directly to the top of the floor joists, and its strong hexagonal cells provide a structural support for stone or pavers.

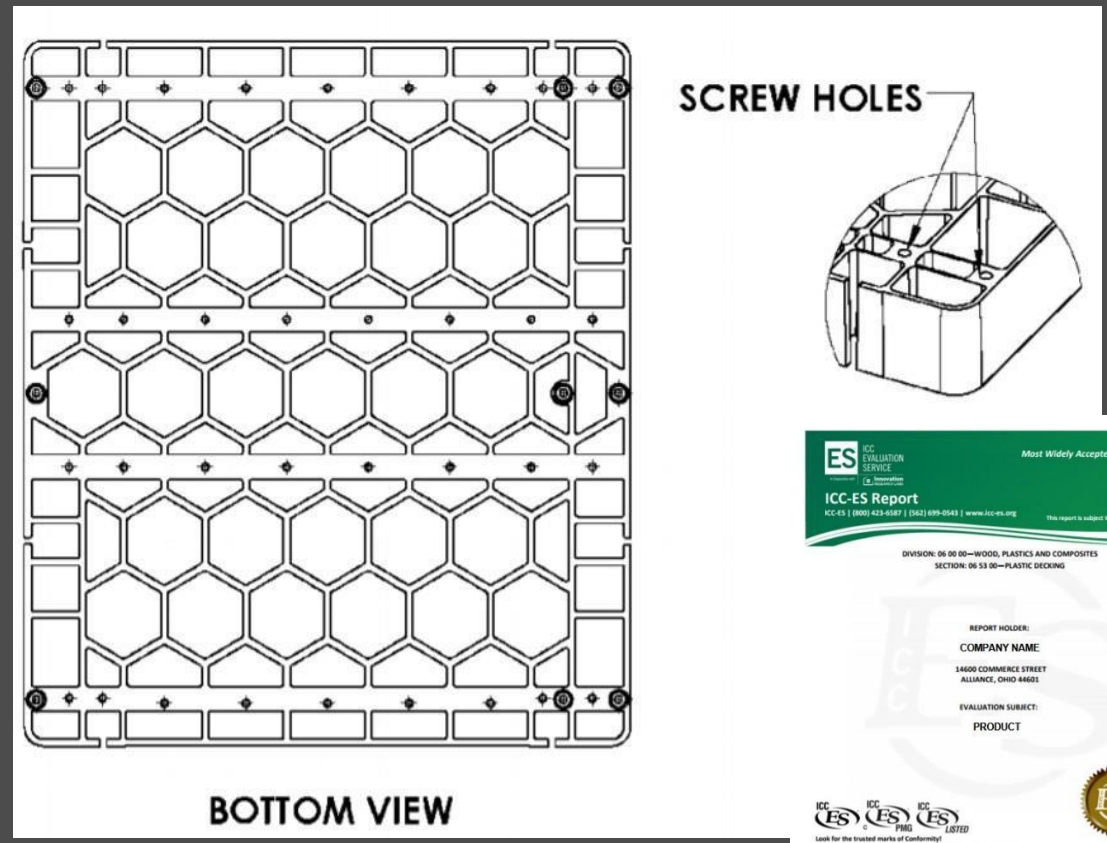
This engineered polymer grate subfloor can be used on top of any wood or metal framing and on pedestals for rooftop applications. Engineered polymer soil grids can be used to provide stabilization to prevent sinking or heaving of stone or pavers when used in ground applications.

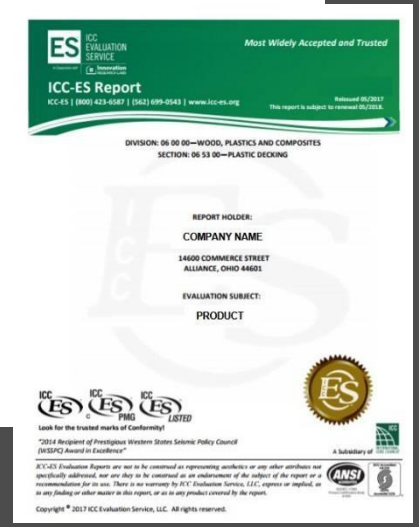
The engineered polymer support system permits creativity in design, as any sizes, textures, and colors of stone or pavers can be used in the outdoor living area applications. Unlike composite decking, design options are not restricted to limited style and color choices.

Engineered Polymer Grates

Engineered polymer grates have been independently evaluated by the International Code Council (ICC) to validate that they meet building code requirements. With the engineered polymer support system, the engineered polymer grate is designed to be installed on either a 16-inch OC joist system or an 8-inch OC joist system.
Each grate measures 16 inches by 18 inches by 1½ inches.





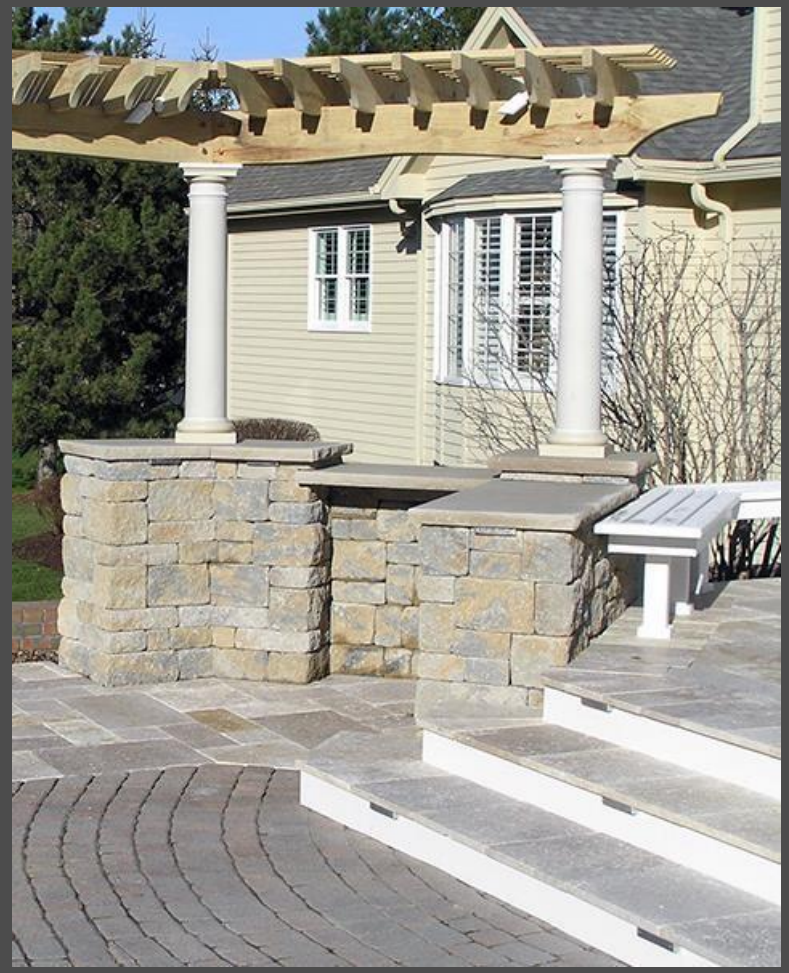


ICC Testing of the Engineered Polymer Grate

More than 500 pounds per grate for 30 days for creep testing.

Benefits of the Engineered Polymer Support System

- Decks last longer because the wood framing is protected by the grate, creating an air gap that keeps the deck frame from molding and rotting.
- The hardscape can be matched to an existing or newly built deck surface, extended up the steps and right onto the deck, and matched to interior finishes to tie indoor and outdoor living spaces together.
- The engineered polymer support system is nonproprietary—any natural stone or concrete, clay, or porcelain paver 1/2 to 3 inches thick can be used. There are thousands of styles and colors of natural stone and pavers from which to choose.
- A stone patio can be positioned on a steep incline without the cost and labor of backfilling and building retaining walls or dealing with settling issues.
- The engineered polymer support system can be used for a variety of applications.
- A properly installed engineered polymer support system can resolve ground-level uplift issues in problematic soil areas.
- The engineered polymer grates are easy to install and easy to cut to size.
- Stone decking eliminates the intense heat, fading, and warping associated with composite decking.
- Stone decks eliminate the problematic maintenance issues of wood decks.



National Average Deck Comparison

400-square-foot deck:
6-foot elevation, 6-by-6-inch posts, 2-inch by 1-foot by 12-foot joists, installed 16 inches on-center.
All materials for deck frame, including labor.*

*Materials included: 6-by-6-inch posts; 2-inch by 1-foot by 12-foot joists (2-inch by10-inch by 12-foot joists can also be used); corrosion-resistant steel joist hangers; deck screws; synthetic butyl deck tape (for joist, hanger, and post protection); concrete mix; labor cost calculated for two laborers, four days of work at $20/hour.

No railing system included; tax not included; cost/labor of grading, if needed, is not included; cost of lighting, if desired, is not included.

Type of Deck	Cost psf
Wood Deck with Pressure-Treated Boards	$15
Composite Deck	$29.55–$35
Stone Deck with Porcelain Paver Plank *(includes recycled rubber underlayment)*	$28.66
Stone Deck with Bluestone, Unguaged *(includes three days labor)*	$26.14
Stone Deck with Bluestone, Guaged	$25.60
Stone Deck with Porcelain Paver *(includes recycled rubber underlayment)*	$25.60
Stone Deck with Standard Paver *(includes sand and geotextile)*	$24.70
Stone Deck with Recycled Granite	$24.70
Stone Deck with Travertine Paver	$21.79
Stone Deck with Clay Red Brick Paver	$19.79

National average based on 2018 National Construction Estimator.

Where Do I Use Engineered Polymer Grates?

The following are examples of areas where you can save on labor and materials as well as offer the homeowner more options for their projects.

- Raised or second-story decks
- Gazebos
- Patios, especially those located on steep inclines where backfill or limited access can make installation difficult or cost prohibitive
- Multilevel or terraced patios, especially where the grade makes installation difficult and expensive to achieve
- Balconies and porches where you can match with the surrounding hardscape
- Water features and bridges
- Docks, piers, or water's-edge walkways and boat houses
- Pool decks for above-ground pools
- Pool decks where the surrounding grade is problematic
- Raised walkways or any location where soil conditions are problematic
- Any area where the deck can be matched to the hardscape
- Whenever the homeowner wants an option other than wood or something that looks like wood
- Any time you want to eliminate settling issues and callbacks

Patios

There are situations where homeowners want a stone patio, but the incline would require retaining walls and large amounts of backfill. Excessive backfill can also cause return trips for repairs due to settling as well as create issues against foundation walls. In situations where access to the job site is limited, using heavy equipment may be difficult and lead to the repair of landscaping and lawns.

These issues can increase labor and material costs, causing you to lose a bid for a project or reduce your profit on the job.

However, with the engineered polymer support system, a wood or metal frame can be built and the retaining wall connected to the frame. Then the surface can be covered in stone or pavers. The fascia can be finished with matching stone or pavers, if desired. This results in significant savings on time and labor compared to heavy grading and using large amounts of backfill.

This homeowner wanted a paver deck. However, access and backfill would have dramatically increased cost. Using the engineered polymer support system solved the problem.

Multilevel or Terraced Patios

Multilevel or terraced patios can be created without the labor and expense of grading, backfill, and compacting. With the engineered polymer support system, framing can be installed, tiers and stairs built, retaining walls installed, and the surface can be finished in stone.

In the following pictures, the deck was built next to a wood-frame structure so backfill could not be used. The terraced patio would have been finished in wood or composite, but using the engineered polymer support system allowed the homeowner to have a terraced stone patio while enabling the contractor to get the job because he did not have the cost and labor of backfill.

The retaining wall is still built; however, backfill is not needed. There is no pressure against the foundation or retaining wall and no callback for settling issues.

This contractor saved money on labor and materials and increased his profits!

Second-Story Decks, Porches, and Elevated Decks

With the engineered polymer support system, it is now possible to put stone of all types on elevated surfaces.

Using stone or pavers opens up a whole new world of design options for second-story or elevated decks.

Second-floor walkway and framed-in deck

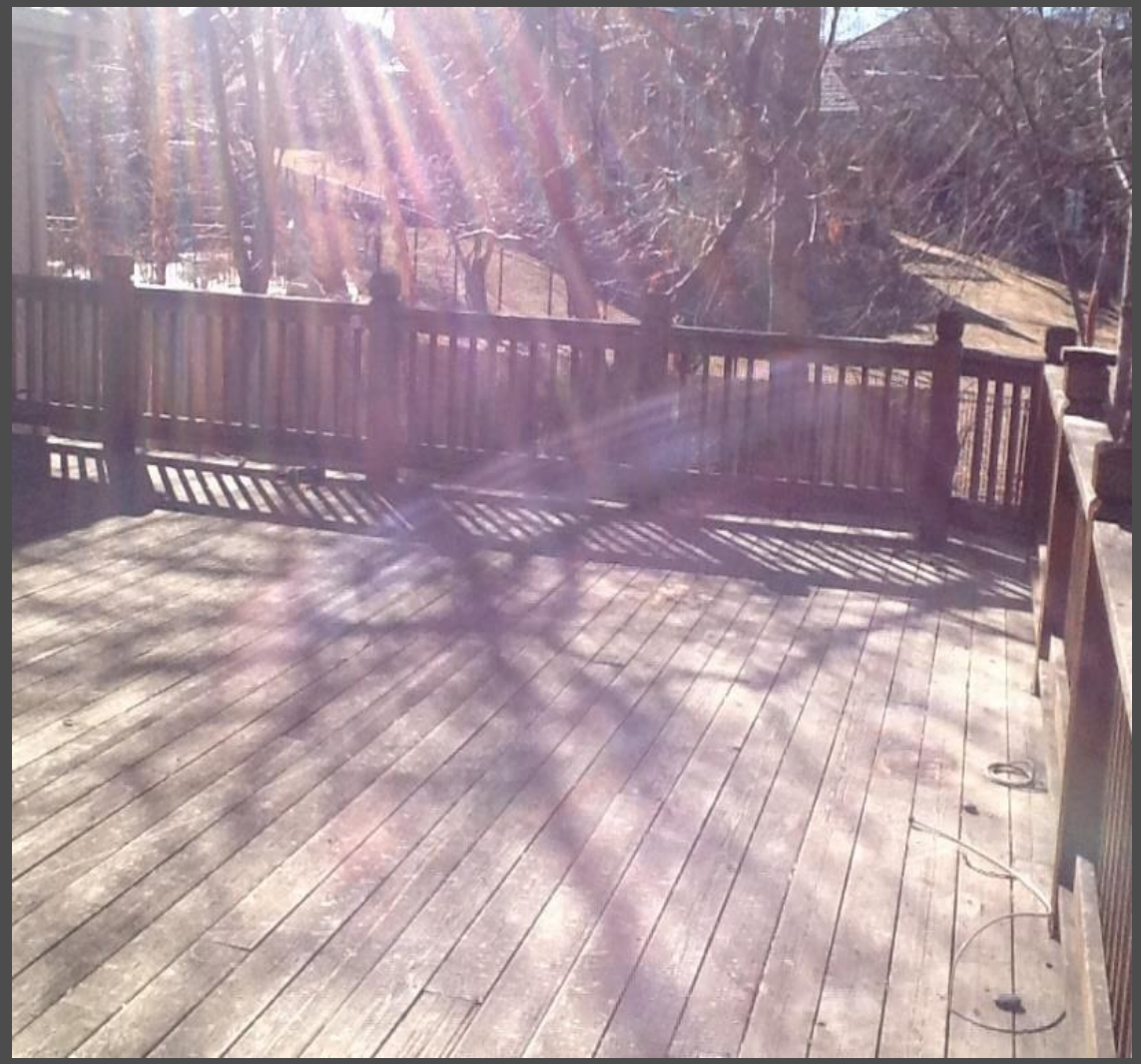
The framing is clad in stone and railings are installed.

Raised or Second-Story Decks with Underdeck Living Space

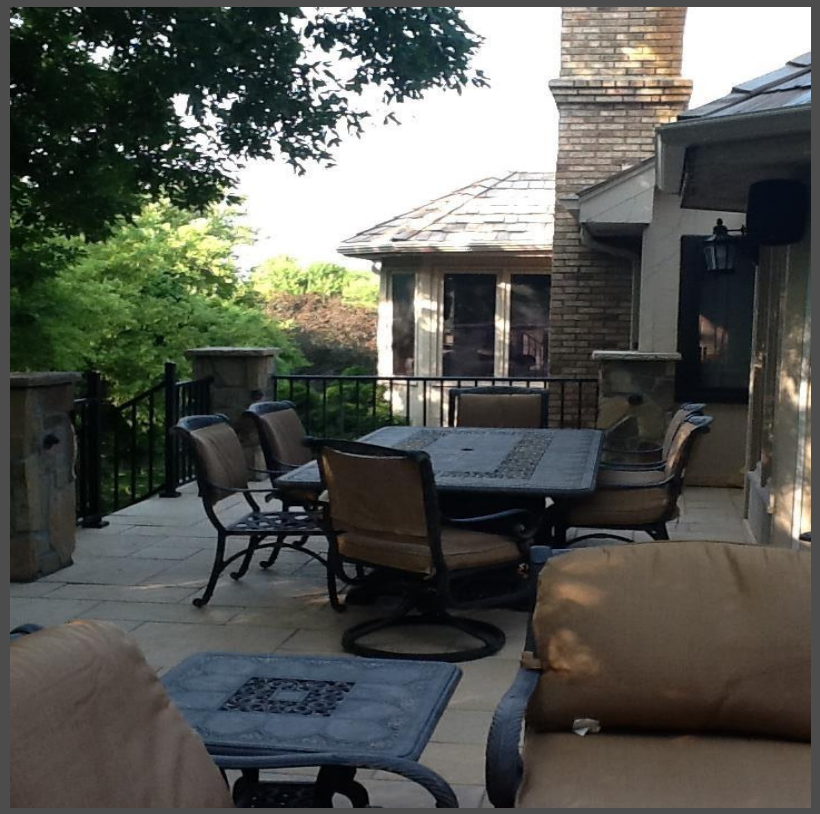
Second-story decks or raised decks that have living or storage space below require a waterproof surface.

The engineered polymer support system is compatible with underdeck drainage systems.

Transforming a simple wood deck to much more:



This stone deck was built with a framed substructure and was clad in stone.
An underdeck drainage system was also installed.



Raised Walkways, Gazebos, and Pergolas

Raised walkways running through the landscape—or gazebos and pergolas—can be constructed on raised platforms and then clad in stone and/or tied in with water features, such as bridges.

Stone and wood can be mixed to create even more design options.

Bridges and Water Features

Foot bridges can be constructed with engineered polymer grates on the horizontal surfaces and then covered in brick, pavers, or stone.

Water features can be constructed using wood or metal framing with engineered polymer grates on the horizontal surfaces.

Flagstone was installed over engineered polymer grates, allowing access to utilities below; but from above, the finished product looks like a natural flagstone installation.

Above

Below

Docks, Piers, Water’s Edge Walkways and Boat Houses

When working near shorelines, soil can be saturated with water, and large amounts of digging and backfill may be needed to stabilize the soil in order to provide a solid base for paver installation.

Instead of installing a retaining wall, pilings and/or posts can be installed with wood or metal frames mounted to them. Once the framing is installed, the engineered polymer support system can be installed with pavers or stone on top to provide a much more durable and attractive product. In these applications, the amount of labor and material is greatly reduced compared to traditional hardscaping.

Soil conditions are poor and water saturated so pilings and bulwark walls are built to support joist systems.

Once the structure is built, the engineered polymer grates are installed.
Then travertine pavers are laid and faux stone is applied to the bulwark walls.

This is a public works project that has been installed and is now in use.

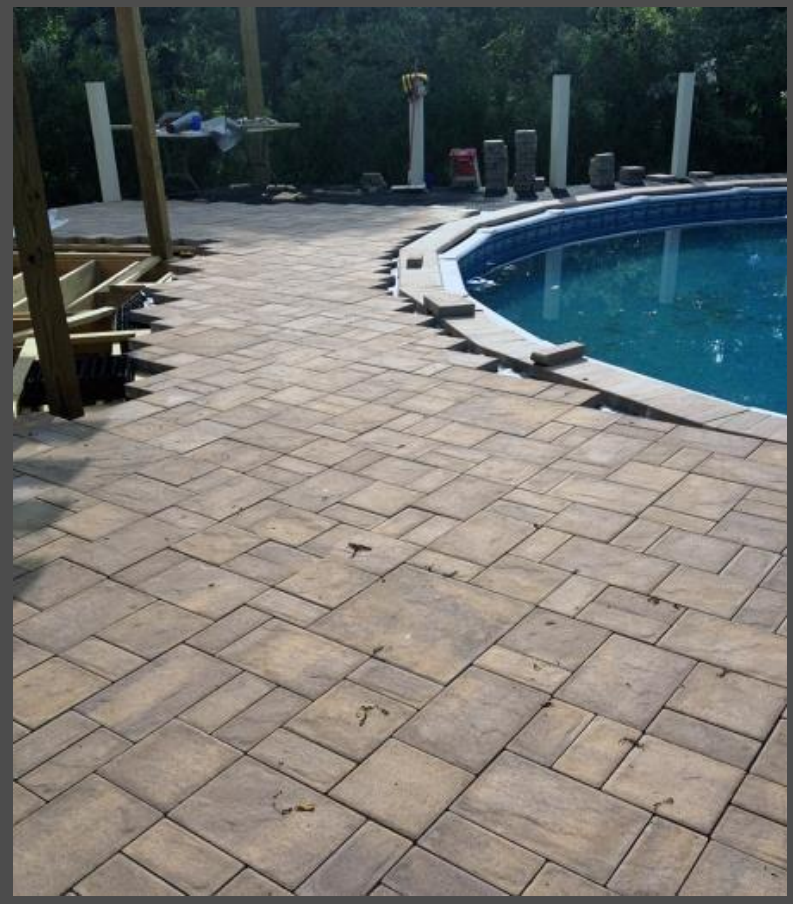
Docks can be finished with a durable, attractive, and slip-resistant stone surface.

Pool Decks

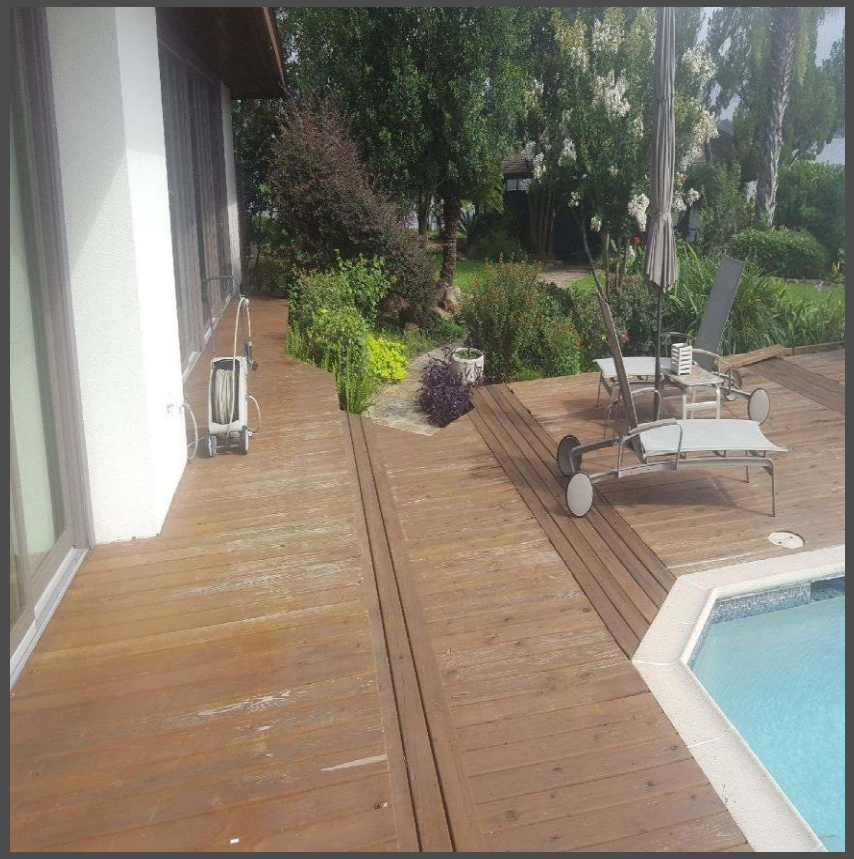
The engineered polymer support system can be used to offer a third choice, rather than wood or composite, for above-ground pool decks or for in-ground pools where the soil is problematic or the homeowner wants to match an existing hardscape.

The engineered polymer support system can be used to feature stone or pavers where it would otherwise have been impossible.

Above-ground pool deck:



Lakeside pool and deck:



Lakeside pool where soil conditions are problematic:

The pool deck is matched to the porch and stairs.

The pool deck is matched to the porch and stairs.

Framing, Flatness, and Pitch of Deck

When installing the engineered polymer support system, it is necessary to first select the size and style of stone in order to determine the correct size of joist necessary to support the weight. The manufacturer can supply a design table (see example below) to help select the correct size joist to support the stone being applied to the surface. If the installation is in an area where heavy snow load occurs, there are additional tables available to reference for reduced joist spacing. An equivalent metal joist can be used with the appropriate metal screws. Treated lumber or metal joists are the standard material used for the engineered polymer support system's substructure.
Always adhere to local building codes.

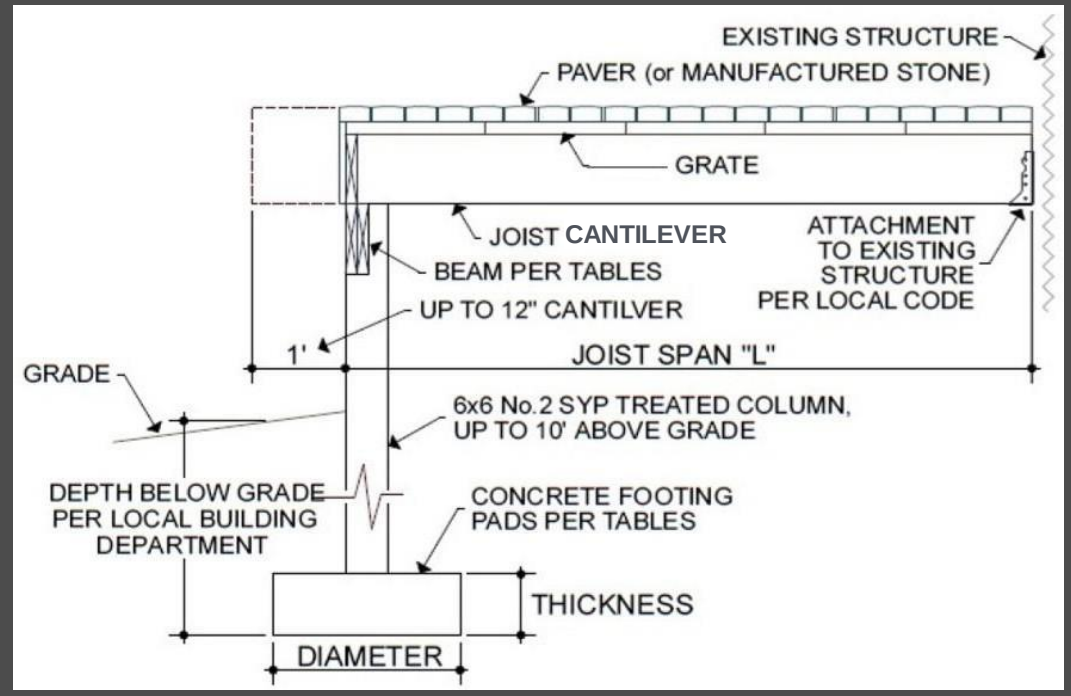
Maximum JOIST spans "L"

when using pavers 3/4" to 3" thickness

Table 1

	Natural stone or manufactured concrete paver thickness				
Joist size	3/4"	1-1/4"	2"	2-1/2"	3"
2x6	8'-9"	8'-5"	7'-10"	7'-5"	7'-2"
2x8	11'-4"	10'-9"	10'-0"	9'-6"	9'-2"
2x10	13'-7"	12'-10"	11'-11"	11'-4"	10'-11"
2x12	16'-0"	15'-2"	14'-1"	13'-4"	12'-10"

1. Joists are 16" o/c spacing.
2. Joists are Southern Pine, No. 2 grade, wet service.
3. Pavers or stone over grate structural subfloor system, grate figured at 2 psf dead load.
4. Live load = 40 psf.
5. Paver or stone dead loads based on material weight of 150 pcf.
6. Deflection criteria: Live load = L/360, Dead load = L/240.
7. Joists may be cantilevered up to 12".



One of the most important things to remember when using the engineered polymer support system is to make sure that the surface of deck joists are flat. When building a deck using wood or composite deck boards, there can be some discrepancy, as boards will bend enough to make up the difference; however, stone and pavers don't bend, and the result of uneven joists will be stone or pavers that rock and shift.

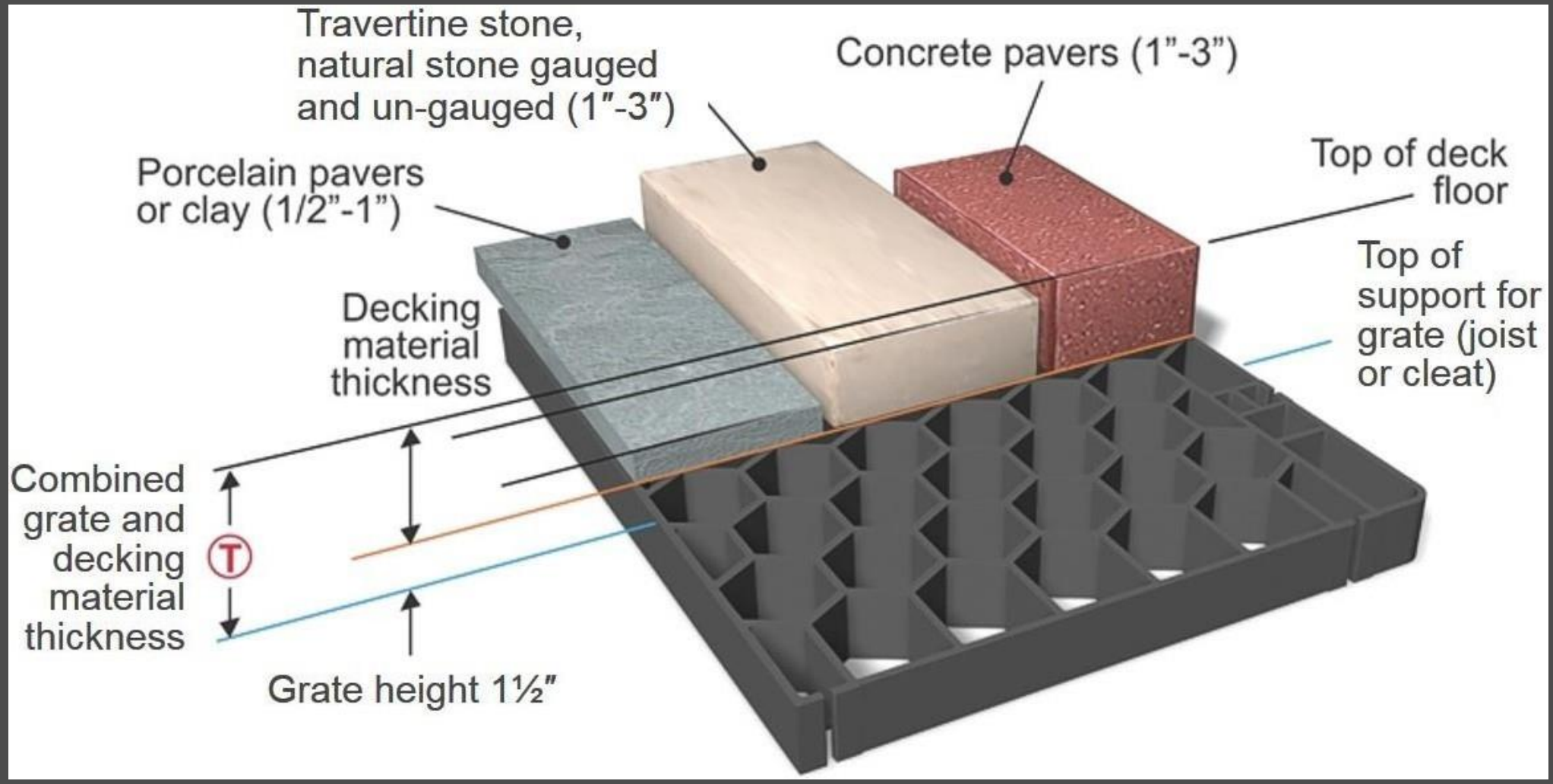
To check the substructure, use a string or a long straight edge or level to verify the joists are level to each other. There can be slope built into the deck to enhance drainage, but the surface across the joists needs to be flat. Use a chalk line to show how much of the crown, if any, needs to be taken down along the top of the joist. A hand planer or electric planer can be used to remove the excess wood. If the joist has a low spot, the grate may need to be shimmed to the correct level.

Correcting Rocking Pavers

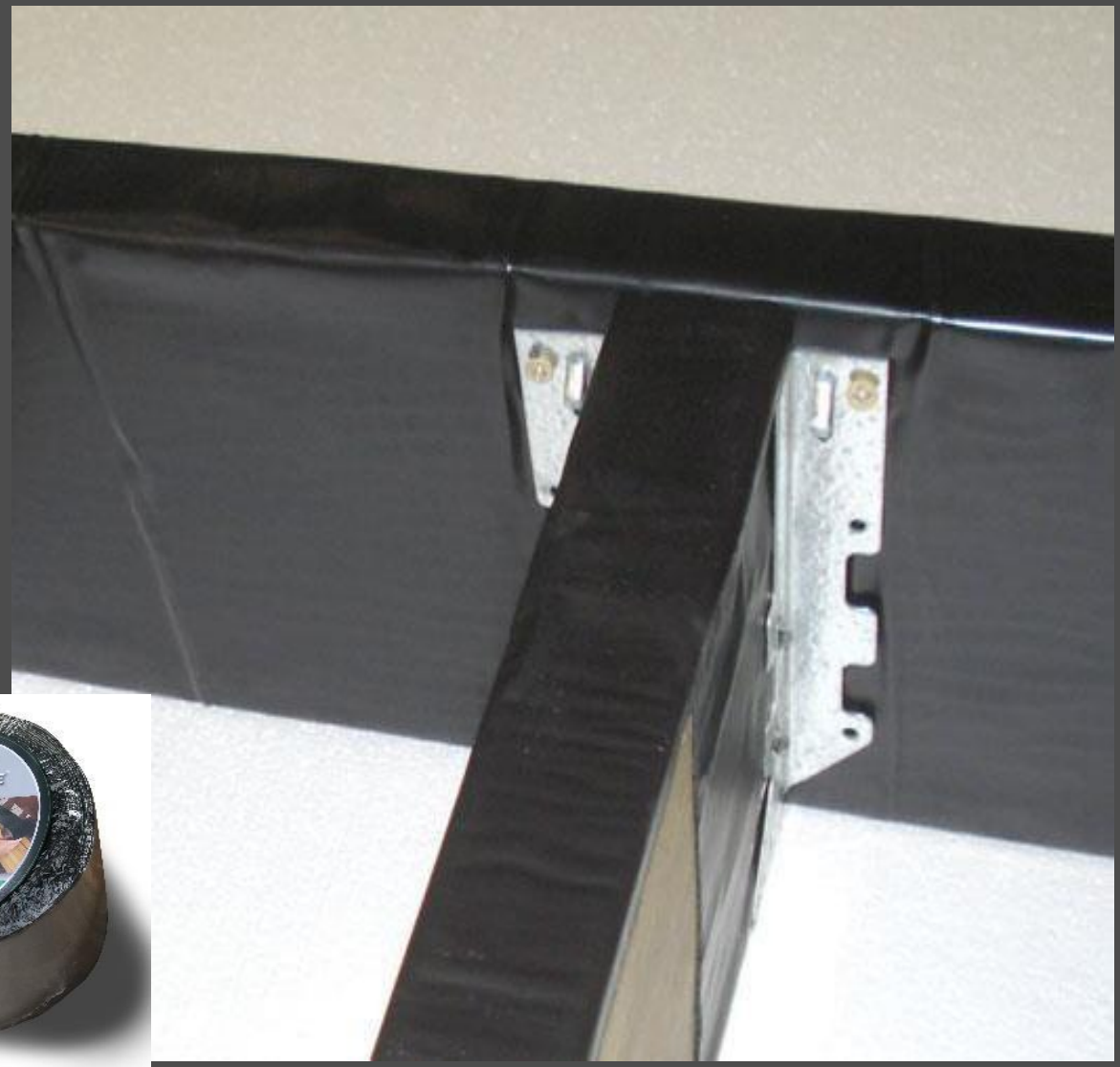
In the case that you have a rocking paver, there are multiple ways of fixing the issue:

1. If you find that the adjacent joist is too high, the best course of action is to remove the engineered polymer grates from around the joist and plane the joist down to the correct height using a hand sander, electric planer, or belt sander.
2. If you find that you have a joist that is too low, remove the grates from around the incorrect joist and shim the grates up to the correct height.
3. If the rocking paver is very slight, it is possible to glue the paver in place using a recommended glue, provided you do not create a trip edge.

Thickness of Stone



Synthetic butyl deck tape is recommended for all horizontal surfaces and between treated lumber and metal surfaces to prolong the life of the deck.



REMINDER!

If you are using polymeric sand with recycled rubber underlayment or a geotextile, your deck should be pitched. The slope can be either a 1/16 inch, 1/32 inch, or 1/64 inch over a foot depending on the depth of your deck.

Since the polymeric sand will reduce the amount of water flowing through your deck, excess water needs to be directed away from the foundation of the home. The slope should be built into the deck to enhance drainage, while the surface across the joists needs to be flat.

For more permeability, a #9 aggregate or granite chips and a joint stabilizer can be used in the joint lines instead of using polymeric sand.

Sizing and Spacing

Sizing and spacing for support beams, posts, and footers are based on the thickness of the stone or paver being used on the surface. The manufacturer can provide design tables (as shown below) to help determine footer depth, post size, and support required. We recommend synthetic butyl deck tape for all posts from 2 inches above ground level down, covering all surface area.

Maximum COLUMN SPACING

3/4" pavers

Table 6

Beam size	Joist span "L" 6'	8'	10'	12'	14'	16'	18'
(2) 2x6	6'-10"	6'-0"	5'-5"	5'-0"	4'-7"	4'-2"	4'-0"
(2) 2x8	8'-9"	7'-7"	6'-10"	6'-2"	5'-10"	5'-6"	5'-1"
(2) 2x10	10'-2"	9'-0"	8'-2"	7'-6"	6'-10"	6'-6"	6'-0"
(2) 2x12	12'-1"	10'-7"	9'-6"	8'-8"	8'-2"	7'-7"	7'-1"
(3) 2x6	8'-11"	7'-10"	7'-1"	6'-7"	6'-0"	5'-8"	5'-4"
(3) 2x8	11'-4"	9'-11"	8'-11"	8'-3"	7'-8"	7'-2"	6'-9"
(3) 2x10	13'-5"	11'-9"	10'-7"	9'-9"	9'-0"	8'-5"	7'-11"
(3) 2x12	15'-7"	13'-9"	12'-4"	11'-4"	10'-6"	9'-11"	9'-3"

1. Beams fully bear on notched 6x6 No. 2 SYP posts, maximum column height = 10'. Splices must occur over support centerline.
2. Beams are Southern Pine No. 2 grade, wet service.
3. Pavers or stone over grate structural subfloor system, grate figured at 2 psf dead load.
4. Live load = 40 psf.
5. ¾" thick paver or stone dead load = 10 psf (based on 150 pcf).
6. Deflection criteria: Live load = L/360, Dead load = L/240.

Footing Pad size

3/4" pavers

Table 6A

Column spacing	Joist span "L" 6'	8'	10'	12'	14'	16'	18'
4'	11x6	11x6	13x7	14x8	15x8	16x8	17x10
6'	13x7	15x8	16x8	18x10	19x10	20x10	21x12
8'	15x8	17x10	19x10	20x10	22x12	23x12	25x12
10'	17x10	19x10	21x10	23x12	24x12	25x12	27x12
12'	19x10	21x10	23x12	25x12	26x12	28x14	29x14
14'	20x10	23x12	25x12	27x12	28x14	30x14	32x16
16'	22x12	24x12	26x12	28x14	30x14	32x16	34x16

1. Sizes are "diameter x thickness", in inches.
2. Table based on presumptive allowable soil bearing capacity of 1500 psf.
3. Concrete compressive strength ≥2500 psi.
4. Pavers or stone over grate structural subfloor system, grate figured at 2 psf dead load.
5. Live load = 40 psf.
6. ¾" thick paver or stone dead load = 10 psf (based on 150 pcf).
7. Consult local building department for footing depth requirements.

Footer Depth

The first step is to dig and remove soil until the necessary size and depth specified on the approved plans is reached. If there are large rocks in the way, removal can be a very strenuous process, but using a 6-foot steel pry bar will help.

A shovel and a post hole digger can be used to excavate the footings by hand. The size of the footing is determined by the amount of weight or load the footing will need to support and the type of soil at the project site. To create a bell at the base, expand the bottom to the required size.

When the holes are finished, clean them out by removing any loose dirt and tamping down the base and sides so that they are solid. Cover the holes to protect them from collapse until after the footing inspection and until they can be filled in with concrete.

Footings must be inspected. Always build to local building codes.

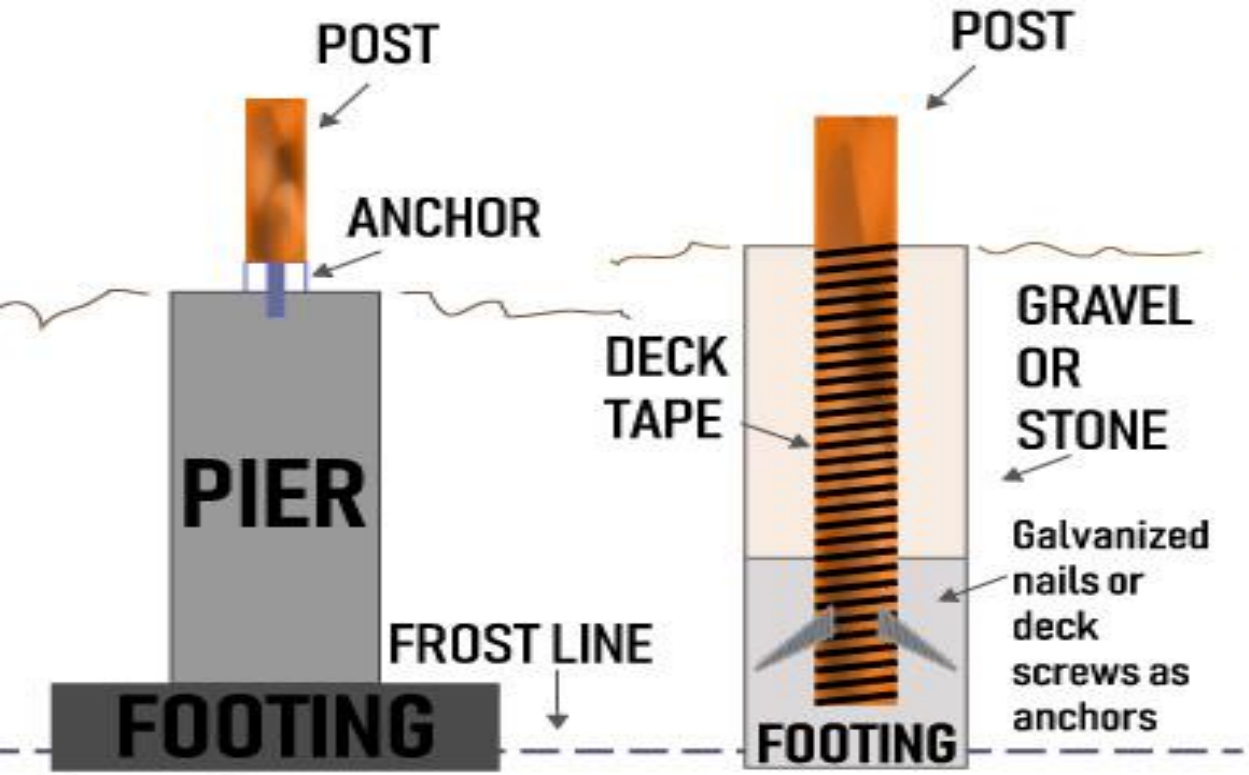
Depending on how the footings will be finished, it may be necessary to haul away the excess dirt. This will prevent any unnecessary damage to the surrounding grass and landscape.

The footings will need to be dug to a depth below the frost line. For example, the footing depth in Atlanta is 24 inches, the depth in New Jersey is 36 inches, and in Minneapolis it is 42 inches. Check local building codes and dig accordingly. The footings can be dug 6 inches deeper than the frost line.

Use a 4-by-4 to compact the soil at the bottom of the hole and then add 6 inches of gravel for better drainage under the footing. Concrete columns made with concrete forming tubes can be used as well. If the cardboard concrete forming tubes will be cut in half with a handsaw, it is recommended to install the uncut end on the top. The forms do not need to be removed.

Suggested Post System Options

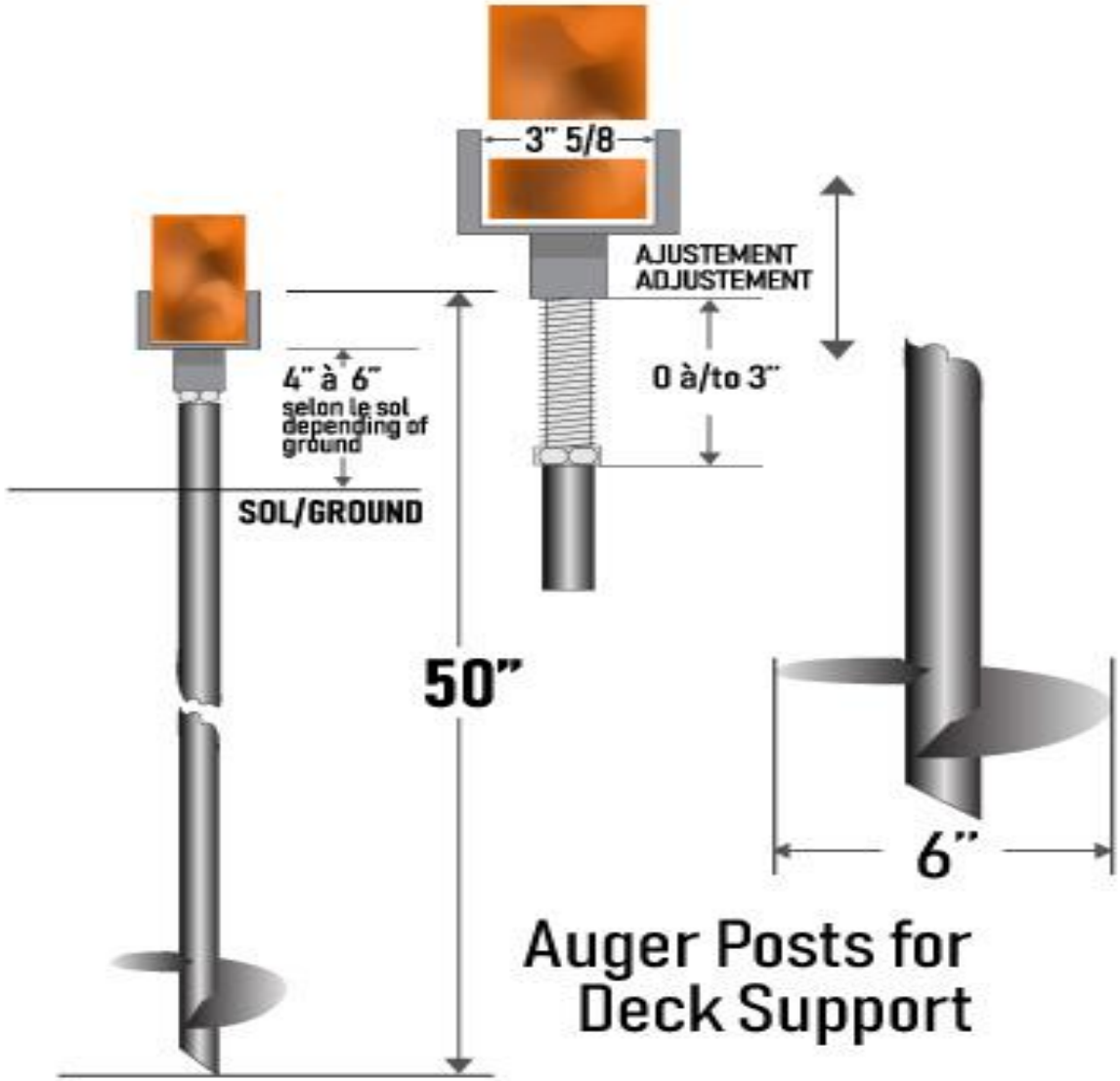
Concrete Footings and Foundations



Poured Concrete Pier and Footing

Post in Poured Concrete Footing

Screw Piles



Auger Posts for Deck Support

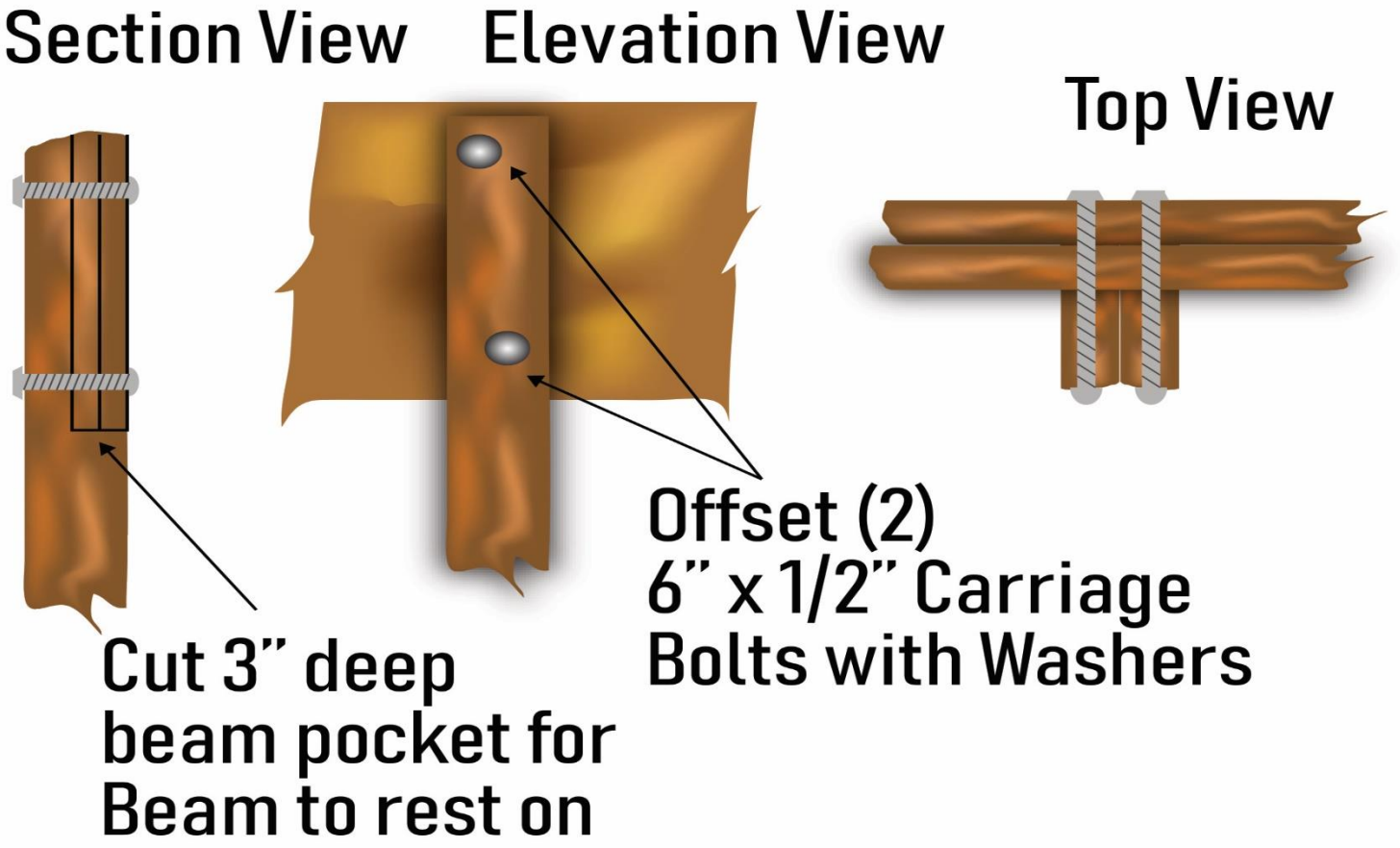
If you feel extra support is needed, it is recommended to switch to 8 inches on-center rather than doubling your joists.

It is also recommended to add additional posts when extra support is needed for fire pits and outdoor kitchen units and, as always, **build to your local building codes.**

For very large objects like hot tubs, we recommend framing and installing the unit and butting the engineered polymer grate and stone up to it. This saves on both material and installation cost and allows the framing to be built to local code.

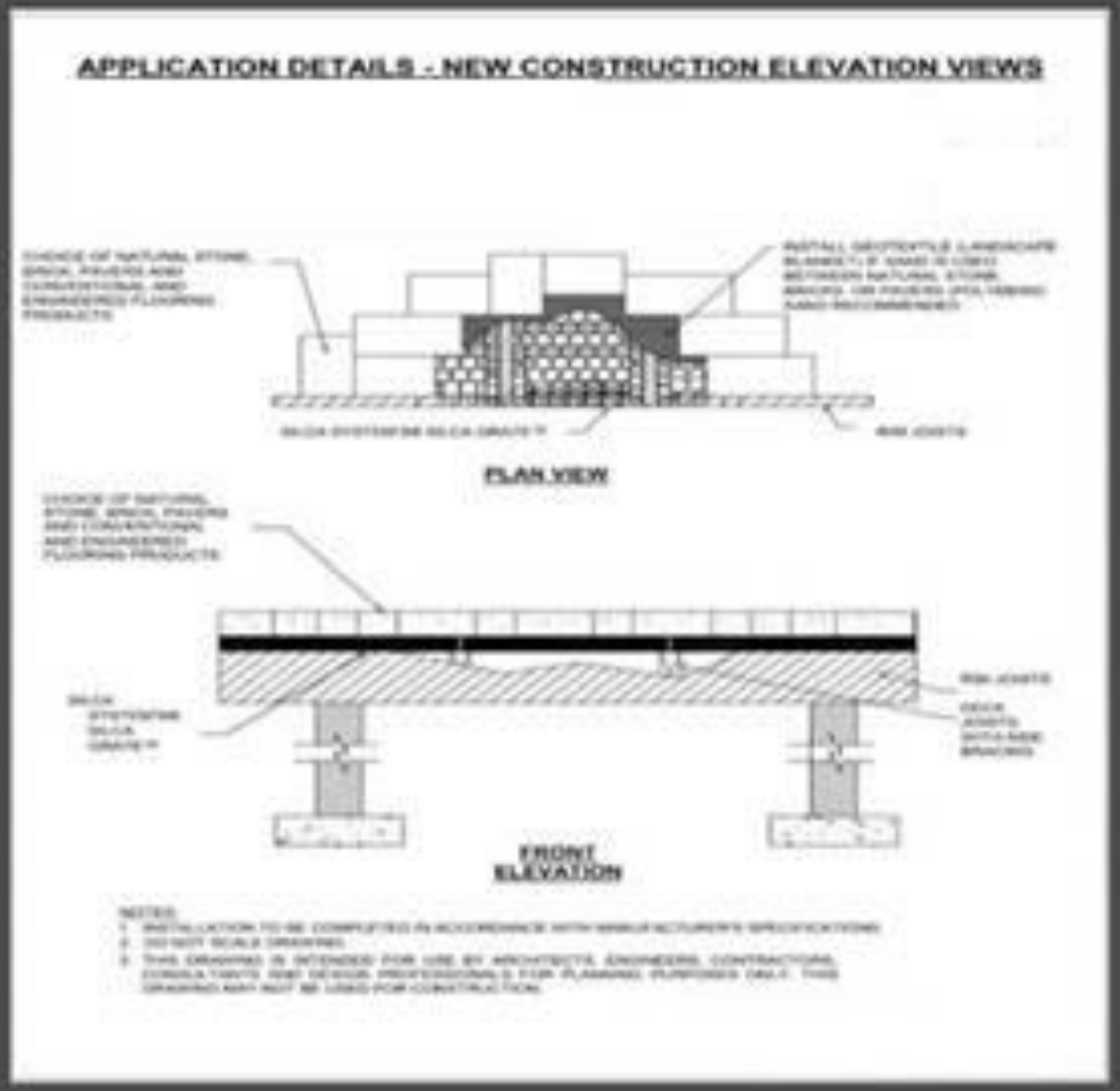
Methods for Tying Into Beams

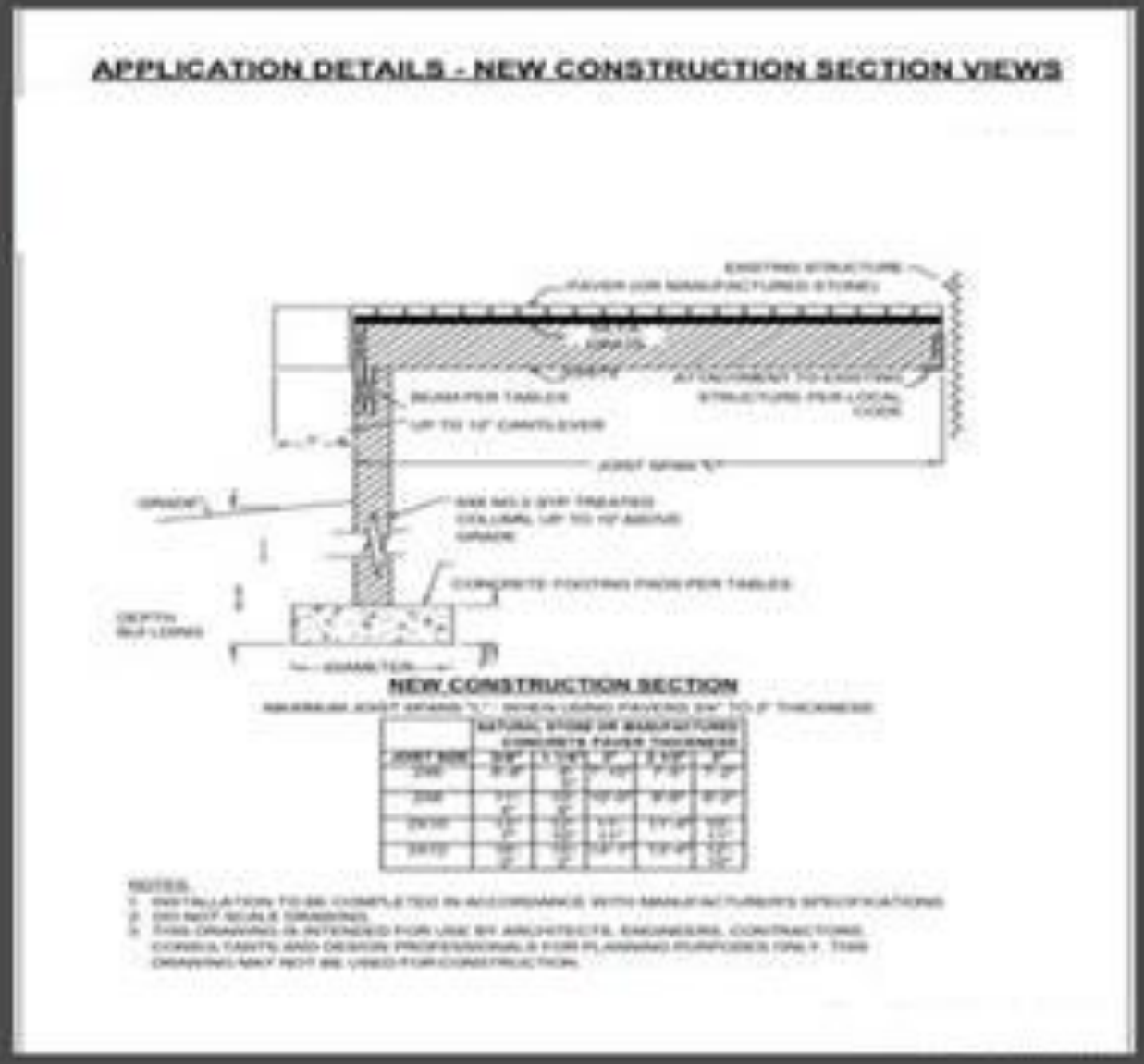
Beam Pocket Cut into a 6-by-6-inch Support Post



Beam Installation Using Corrosion-Resistant Steel Post Cap

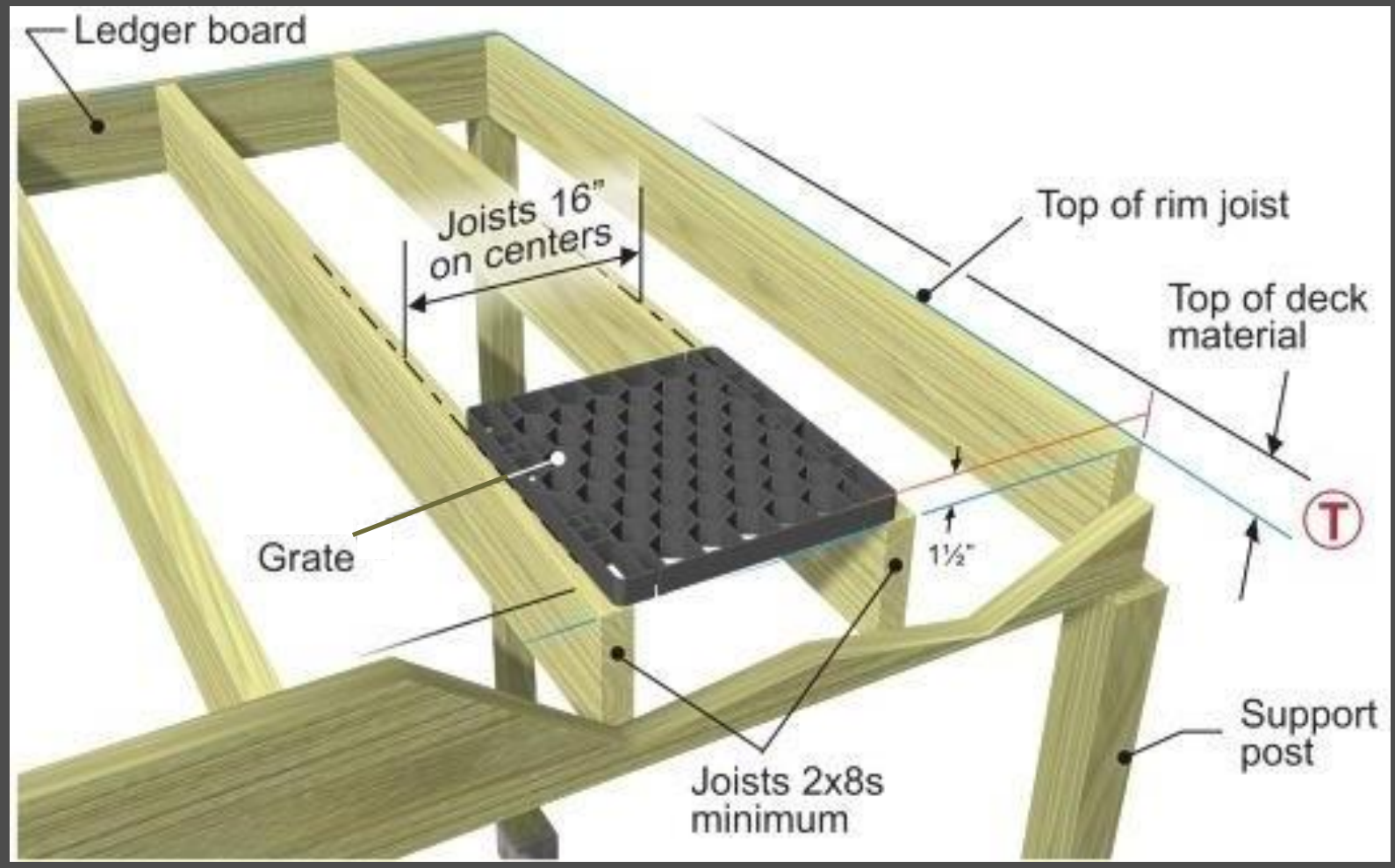
Detailed Technical Drawings are available for the Engineered Polymer Support System





Installing the Engineered Polymer Grates

As previously mentioned, the engineered polymer grates are designed to be installed on either a 16-inch OC joist system or an 8-inch OC joist system.



When installing, the first grate of every other row should be cut in half lengthwise (the 18-inch dimension) so that the joints are staggered when installed, as shown in the photograph. This staggers the spacing of the screws to help prevent weakening the wood.

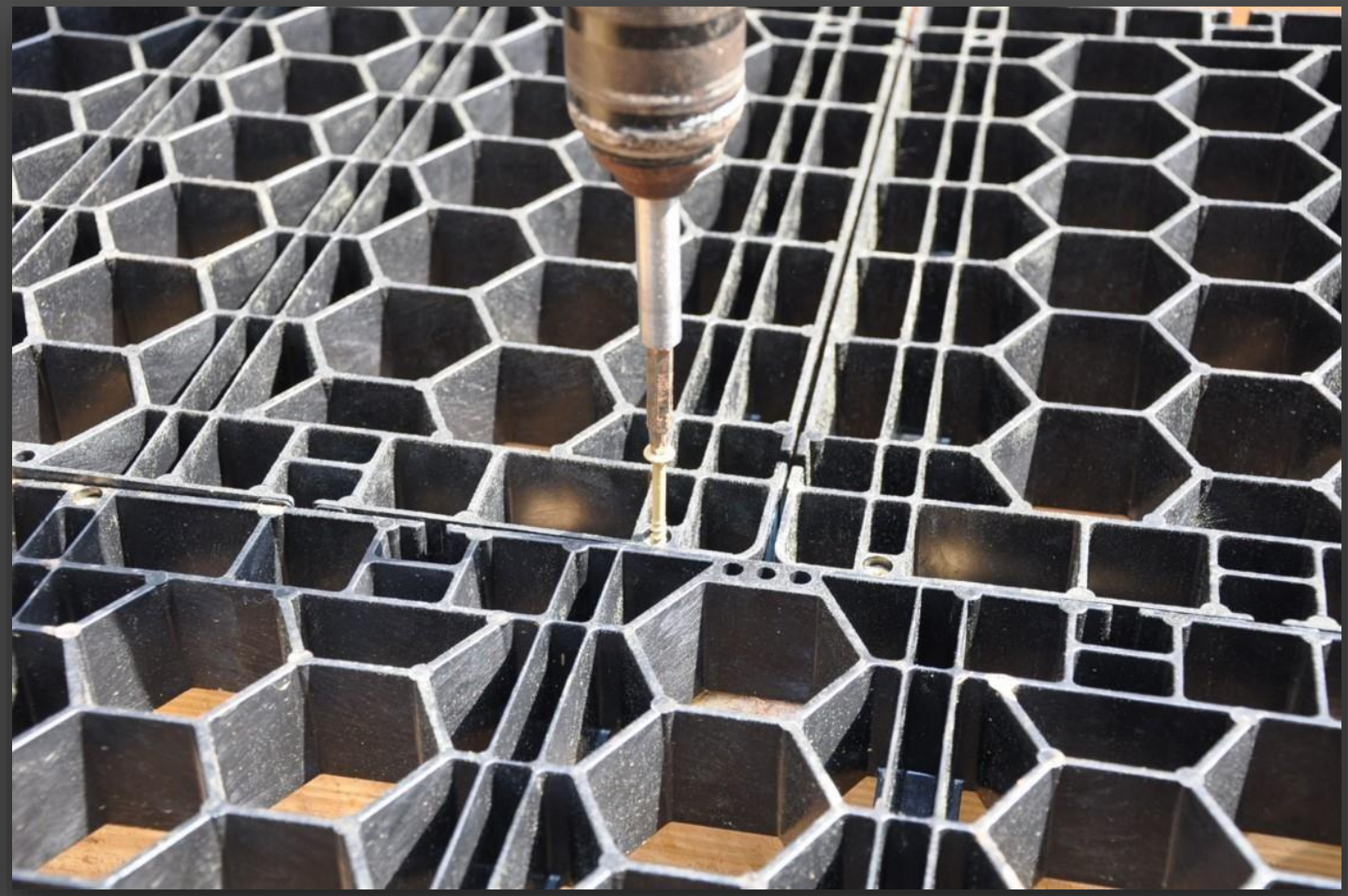
In cases where there is a need for additional gluing surface area, the grate can be turned over and fastened face down, and glue can be applied to the back rib. This can be used for steps as well as the edge of the main deck.

The grates are fastened with four 3-inch-long #9 deck screws. If using metal joists, secure with the appropriate metal screws.

The grate can be cut to size as needed with a reciprocating saw, circular saw, or table saw. **Any time a grate is cut, it should be supported with blocking along the cut edges.**

Properly supporting a cut grate ensures the strength of the final application.

When the screw holes in the grate are cut off, fastening screws can be attached directly through the sidewall of the grate (toenailing) or through the support rib on the bottom of the grate.

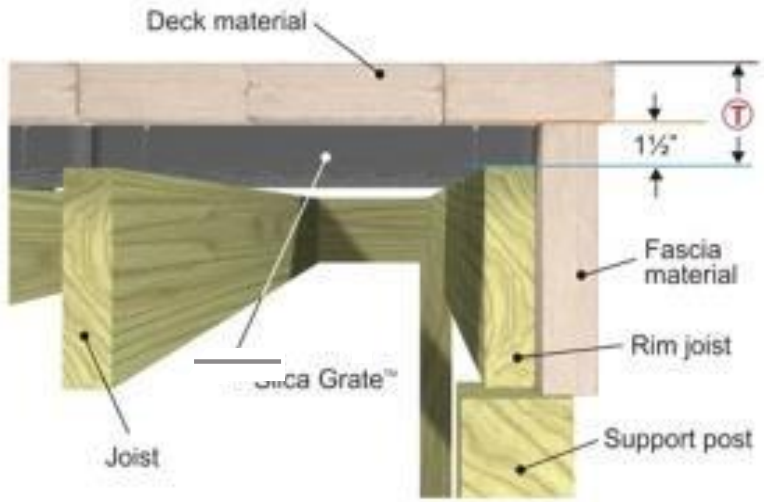


Finishing the Edges

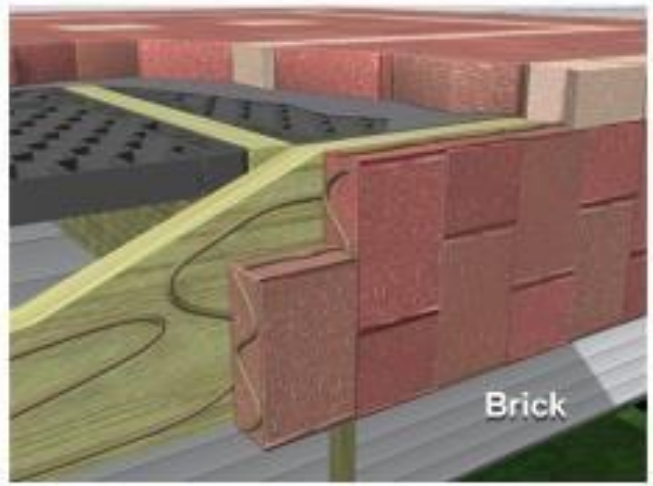
As seen in the images to the right, edges can be finished in a number of options.

The stone or pavers used for the deck flooring can be glued around the edge, or pressure-treated lumber, cedar, redwood, or even composite decking material can serve as edging.

- Finish with natural stone, pavers, tile, wood fascia, or composite decking.
- Wrap rim joist with aluminum or vinyl.



End of Joist (Front) View

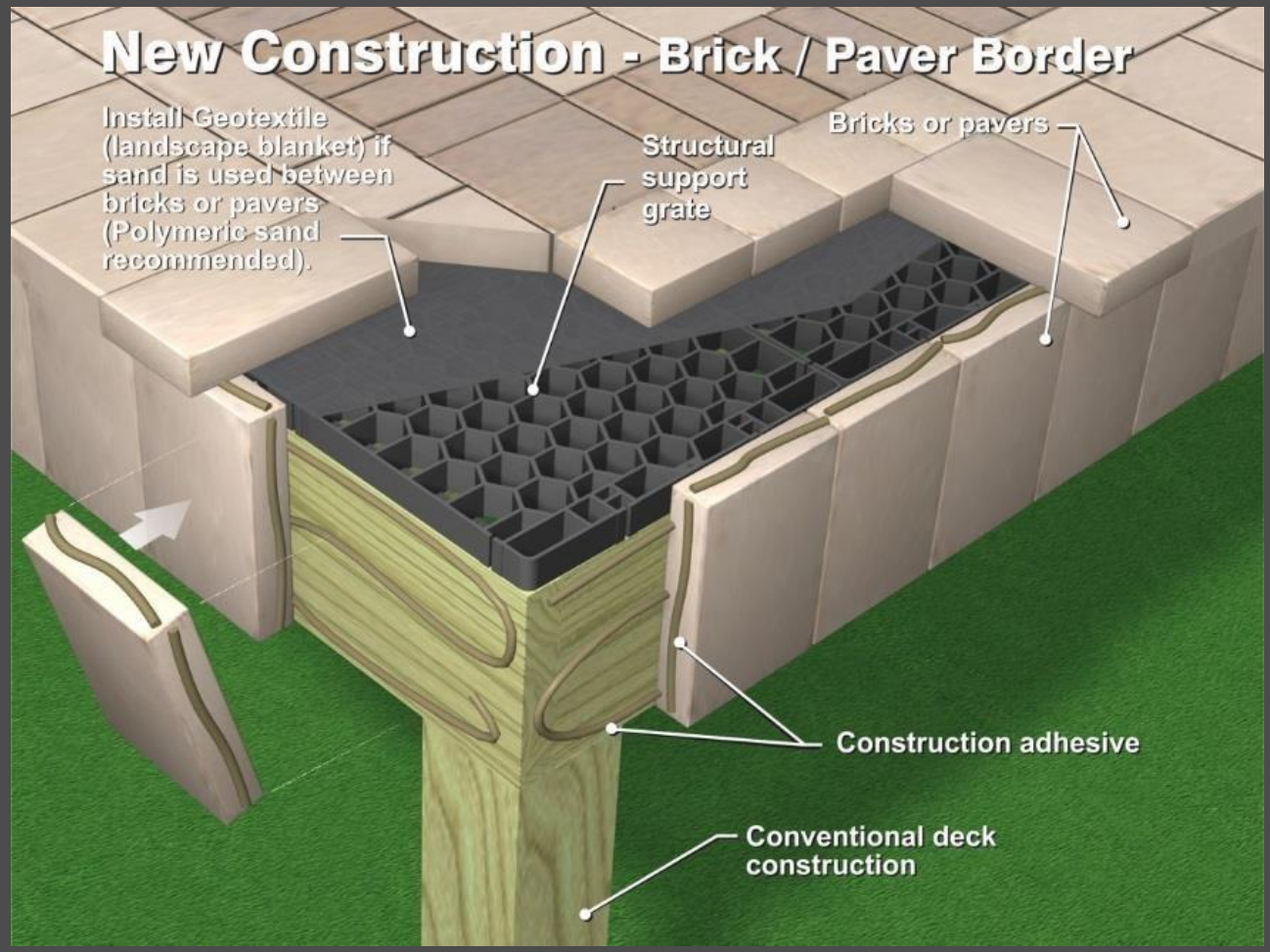


How to Finish the Fascia with Pavers or Stone

Porcelain, tile, pavers, stone, or faux stone can be glued to the fascia with any masonry adhesive.

However, if stone will be glued to the sides of the grate, use an appropriate adhesive that is not caustic to the plastic grate and remains flexible through a freeze-thaw cycle.

A temporary ledger board may be necessary to hold the stones in place until the glue sets.

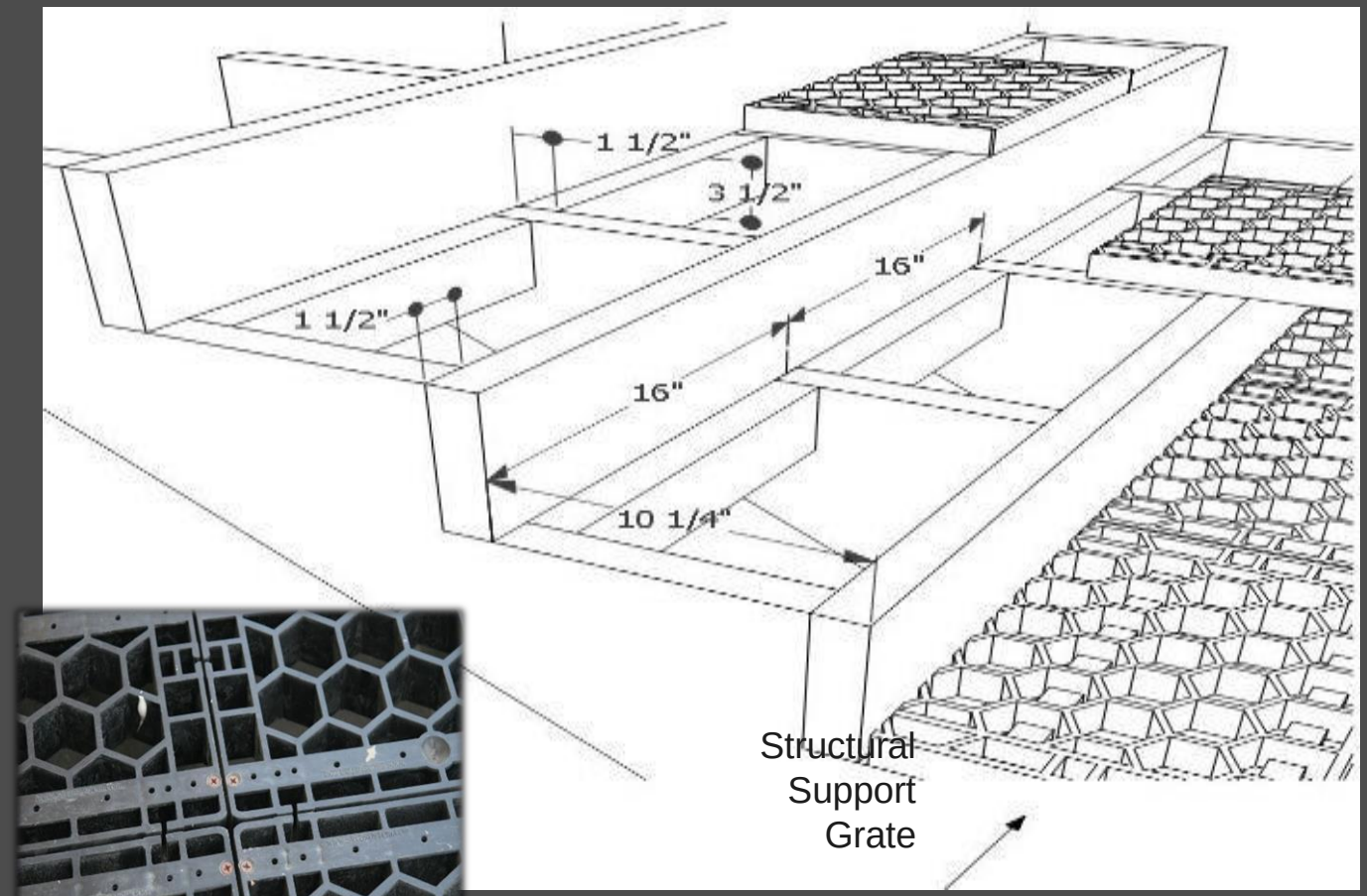


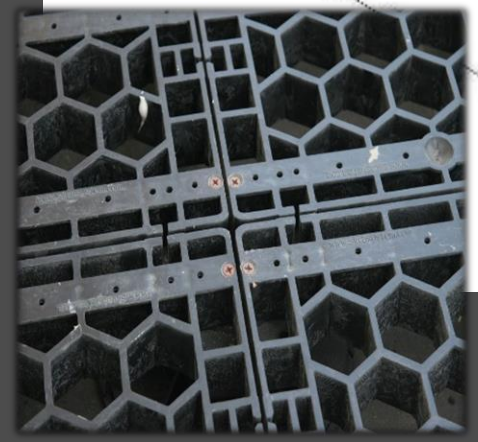
Installation on Stairs

When installing the engineered polymer grates on steps, ensure that the tread and riser spacing is correct. Stringers should be positioned 16 inches OC and the grates cut to the length of the tread. **The grate should be supported on all four sides for stair applications.**

Risers can be finished in stone by attaching the stone to the wood with adhesive. The tread can then be bull-nosed over the top of the riser and secured with adhesive. Stair edges can be finished in a number of options, similar to edge finishes.

In cases where there is a need for additional gluing surface area, the grate can be turned over and fastened face down, and glue can be applied to the back rib (see insert). This can be used for steps as well as the body of the main deck.





Adhesive on Stairs

It’s recommended to use an appropriate adhesive when installing any natural stone, concrete paver, brick paver, or porcelain paver on stairs of any kind, regardless of which installation method is used on the main body of the deck.

The recommended adhesive for use with engineered polymer grates should have the following features and benefits.

Features:

- High strength
- Flexible
- Excellent memory
- Not hard setting
- One part
- Weather resistant
- Fast skinning
- Paintable

Benefits:

- Durable bond to material
- Allows movement of dissimilar materials
- Does not become brittle or crack
- Pick proof
- Easy application
- Long service life
- Minimizes dirt and dust pickup
- Easy to match to substrate

The adhesive must bond wood, stone, and the engineered polymer grate.
(Note: Some adhesives are damaging to plastic.) It must be able to withstand the temperature ranges in the region and must stay flexible and not set hard.

Interface and surfaces must be clean, dry, and free of dust, dirt, oil, and waterproofing and release agents. Cut the cartridge nozzle on a slant to a ¼-inch hole, puncture the inner seal, and apply a uniform bead with steady pressure. Tool immediately after application to ensure full contact with both sides of the joint area. Sealant starts to skin over in 20–25 minutes. A minimum application temperature of 50 degrees Fahrenheit is required.

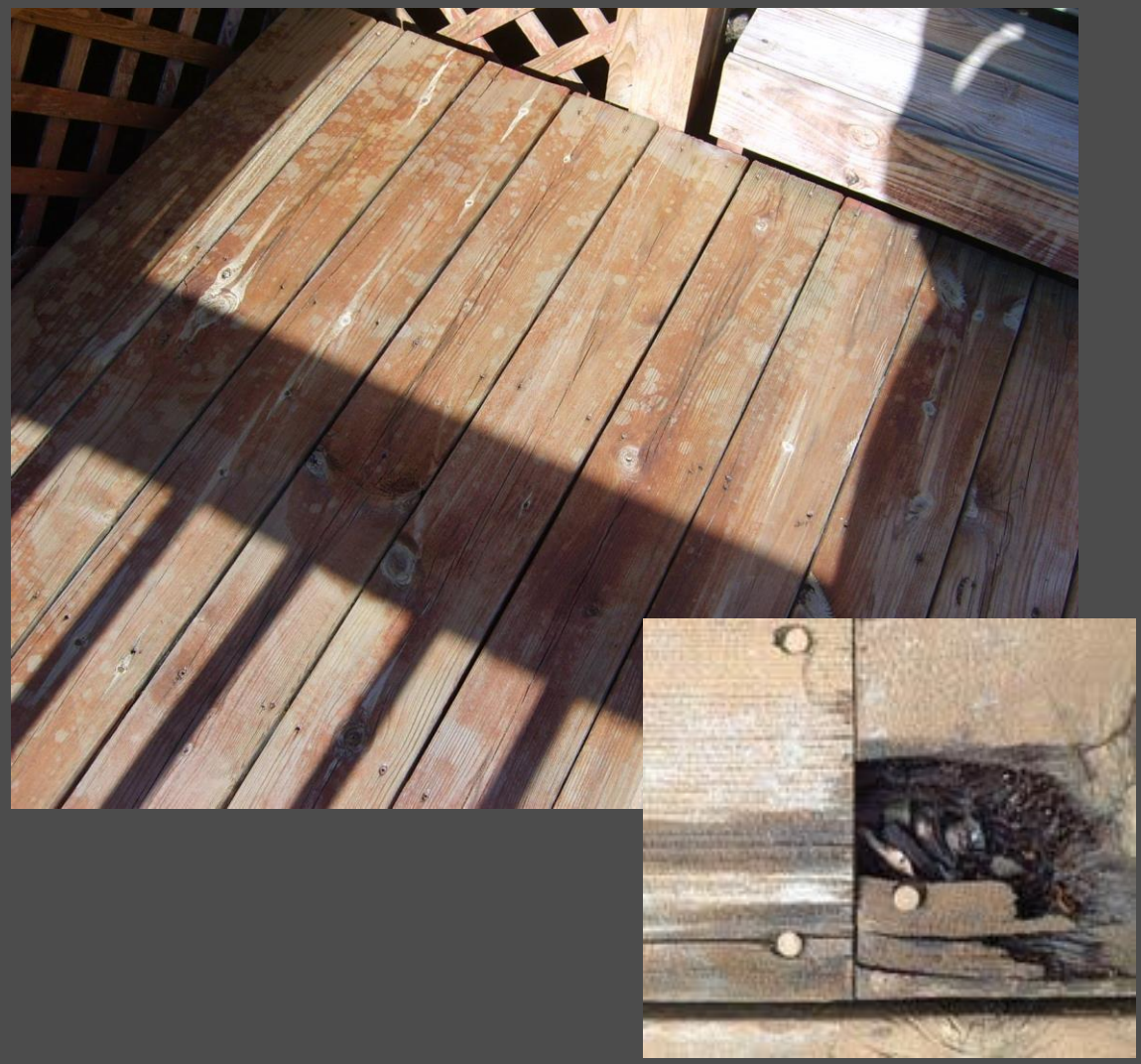
Overview So Far

- Your deck must be flat. If you run a straight edge or long level over the joists, there should be no rocking. (Resource: Refer to “How to Level a Deck” in the how-to videos at stonedeks.com.)
- If you are using polymeric sand with a permeable recycled rubber underlayment or a geotextile, your deck should be pitched. It can be either a 1/16 inch, 1/32 inch, or 1/34 inch over a foot, depending on the depth of your deck. The sand will reduce the water flowing through your deck so excess water needs to run away from the foundation of the home.
- Any cut grates **must** have blocking supporting the cut edges.
- Please remember the engineered polymer grate is designed to flex. There will be flex, which will decrease as you install pavers on top of the grates.
- There are differing methods for installing various types of pavers on the system (i.e., natural stone installation is different from installing porcelain pavers). (Resource: Refer to the “Installation Methods” PDF.)
- Our recommended method for installing porcelain pavers uses a permeable recycled rubber underlayment. Paver spacers are not necessary when the permeable recycled rubber underlayment is used.

Remodeling an Existing Deck

To avoid deck failure, give your deck an annual inspection when the weather is warm and dry, and make any necessary repairs.

- Look especially closely at trouble spots, which include structural members that are close to the ground and any parts of the deck that are near gutter downspouts.
- Check for rot, and probe around posts where they are in contact with the ground or sit on foundation blocks. Any wood that feels soft is rotting wood. Small areas of rot can be removed, and then the hole can be treated with a wood preservative to stop rot and keep it from spreading. Larger areas of rot may require the wood member be replaced.
- Check where stringers come in contact with the ground or landing pad, and check the railing system for loose posts and handrails. Repair by pre-drilling holes and fastening the members with galvanized or stainless steel screws as needed.
- Check for damage to decking boards; they are easy to replace, but a new board is likely to stand out.



When it is evident that many deck boards require replacement, consider switching to a stone deck.

When installing the engineered polymer support system on an existing deck, first ensure the deck joists are in good condition and the correct size for the stone that will be installed. **In many cases, the cost of labor and materials for retrofitting the deck may be about equal in cost to tearing out and rebuilding the deck.**

Inspect the deck to confirm strength and stability. According to the North American Deck and Railing Association (NADRA), there are more than 40 million decks in the United States that are at least 20 years old, and hundreds of reported deck accidents occur annually.

Deck Safety
CHECK YOUR DECK®
www.NADRA®.org

Inspect joists and beams for rot and connecting hardware for rust. Replace hardware where necessary, and put in a temporary support while the old connection is being removed.

If a piece of framing lumber can't be removed and replaced, it can be reinforced. First remove any rot and paint over the area with wood preservative. Then install a "sister" framing member of the same size and dimension alongside the existing one. The new framing member must be secured in the same way as its companion, with joist hangers or similar connecting hardware.

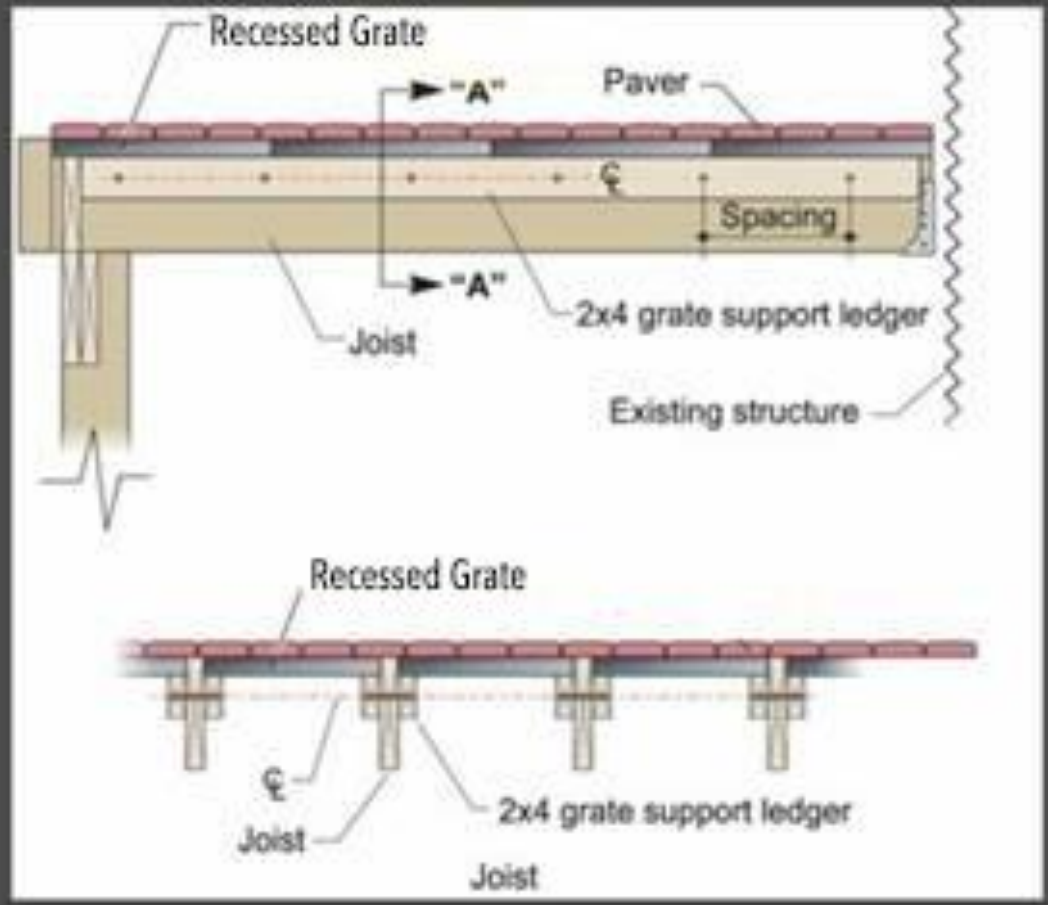
Complete the install by fastening the new member to the old one with stainless steel screws. It is recommended to protect joist hanger connections and the top of all framing members with synthetic butyl deck tape.

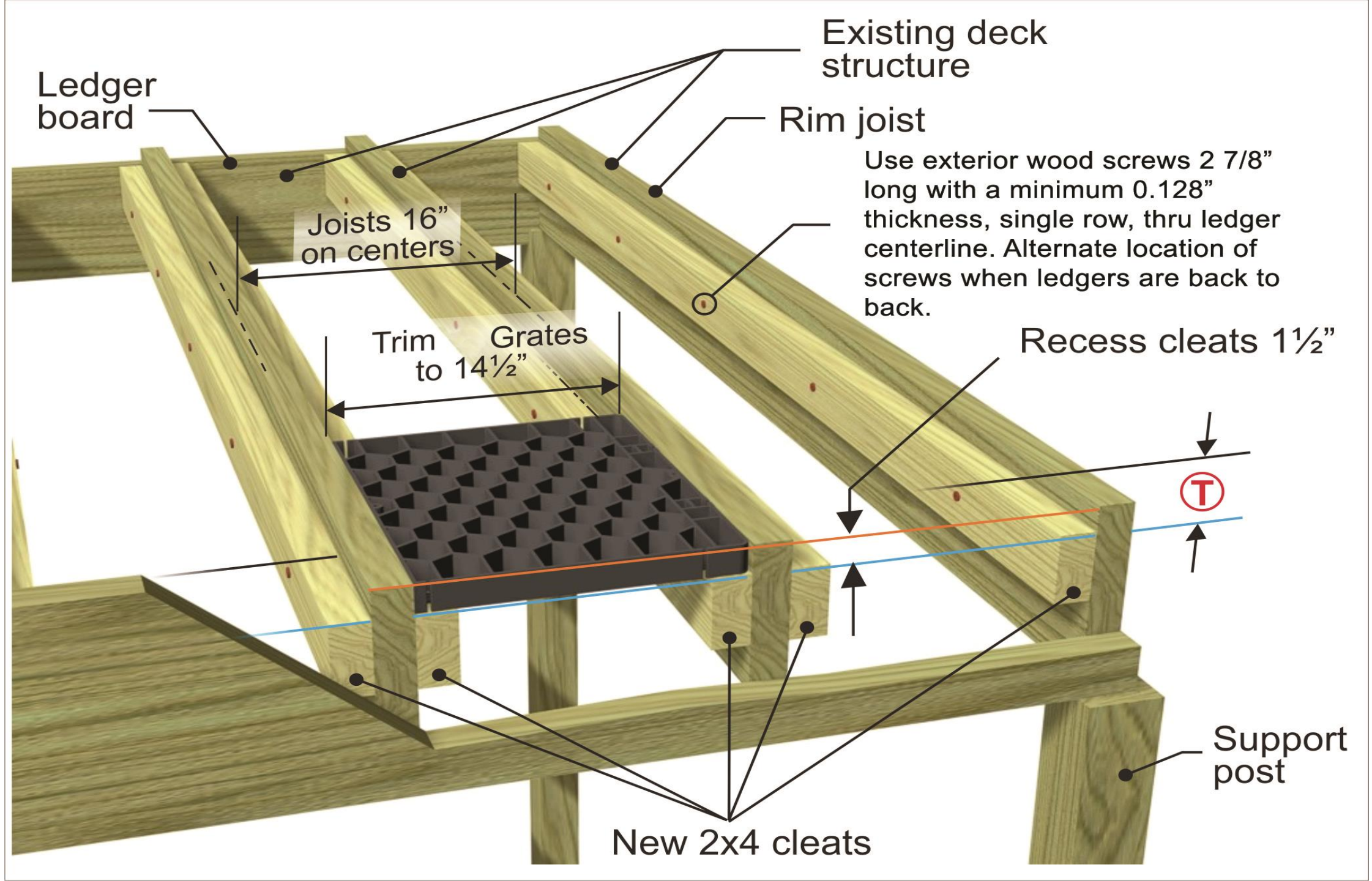
Check the ledger, or framing material, that attaches the deck to the house. The flashing should be in good shape, with no holes or rust, and the ledger should be attached with lag screws, not nails. If the flashing looks worn out or the ledger is attached with nails, repair or replace as needed. Most accidents involving collapsed decks are caused by poor ledger installations.

Support ledger attachment for retrofit applications

Table 2	Natural stone or manufactured concrete paver thickness				
	3/4"	1-1/4"	2"	2-1/2"	3"
screw spacing	18"	16"	14"	13"	12"

1. Use 2¾" long screws, single row, through ledger centerline (℄)
2. Joists are 16" OC spacing
3. Joists and ledger are Southern Pine No. 2 grade, wet service
4. Pavers or stone over grate structural subfloor system, grate figured at 2 psf dead load
5. Live load = 40 psf
6. Paver or stone dead loads based on material weight of 150 pcf
7. Deflection criteria: Live load = L/360, Dead load = L/240




Existing deck structure
Ledger board
Rim joist
Use exterior wood screws 2 7/8" long with a minimum 0.128" thickness, single row, thru ledger centerline. Alternate location of screws when ledgers are back to back.
Joists 16" on centers
Trim Grates to 14½"
Recess cleats 1½"
T
Support post
New 2x4 cleats

REMINDER!

In many cases, the amount of labor and materials required to recess the grate is about the same as just removing and repositioning the joist, or tearing it out and building new framing.

Concrete and mortar cannot be used on the engineered polymer support system. Due to their lack of flexibility, they will break and crumble as the deck flexes through the seasons.

Post Railing Systems

Older decks have railing posts installed on the outside of the deck framing, and they were often notch-cut at the bottom where they fit against the outside joists. Today's codes call for stronger posts that are usually not notched and installed inside of the framing, and therefore must be installed prior to adding the decking.

Wood railing posts are usually 4-by-4s, which can be left bare or covered with PVC or composite sleeves. Most local codes call for a railing that is either 36 or 42 inches tall, but always check the local building code.

Metal or other top-mounted posts can be installed with two bolts, which produces a very strong attachment; however, local codes may require additional hardware for extra strength. When attaching a railing post to an outside joist that is not doubled, install blocking adjacent to or even attached to the post's side; otherwise, the post might wobble.

Installing Railing

There are two methods that can be used to install a railing system on the engineered polymer support system.

The recommended option is to secure the railing system directly to posts that have had the grate and stone cut around them, allowing the post to be exposed the necessary amount for attachment purposes. If the railing system is fastened to the framing and not to the posts, the grates and stones can be cut around the railing and a trim piece used to finish the top.

Another option is to secure the post by drilling directly through the stone or paver, through the grate, and into the substructure to fasten the bolts. However, this can be difficult, and there may be some waste if the paver or stone breaks while being drilled.

All cut edges of grates should be supported with blocking.

Pavers or Bricks Installed with Sand

When installing pavers or bricks with sand in the joint lines, a geotextile blanket or recycled rubber underlayment must first be laid down over the grate. Once the grate is covered with the fabric, the pavers can be arranged in the desired pattern on top. Polymeric sand is then swept into the joint lines and wetted down as directed by the manufacturer.

The perimeter stones can extend over the top edge of the fascia stone or board, or a fascia board can be used to contain the stone on the deck.

Gauged, Clean-Cut Stone or Pavers

When installing gauged, clean-cut stone or pavers, it is not necessary to use a geotextile blanket or recycled rubber underlayment. The stone can be glued directly to the grate using an appropriate adhesive that is not caustic and remains flexible through a freeze-thaw cycle. The perimeter stones should be glued in place and the rest of the stone will remain in place by weight and friction. Or all stones can be glued.

Another option is to glue all of the stone down and allow spacing for water to drain through. With the proper adhesive, only a few points of contact are necessary to create a secure bond. It is recommended to use an adhesive with the features and benefits previously mentioned. This is the least intensive labor application.

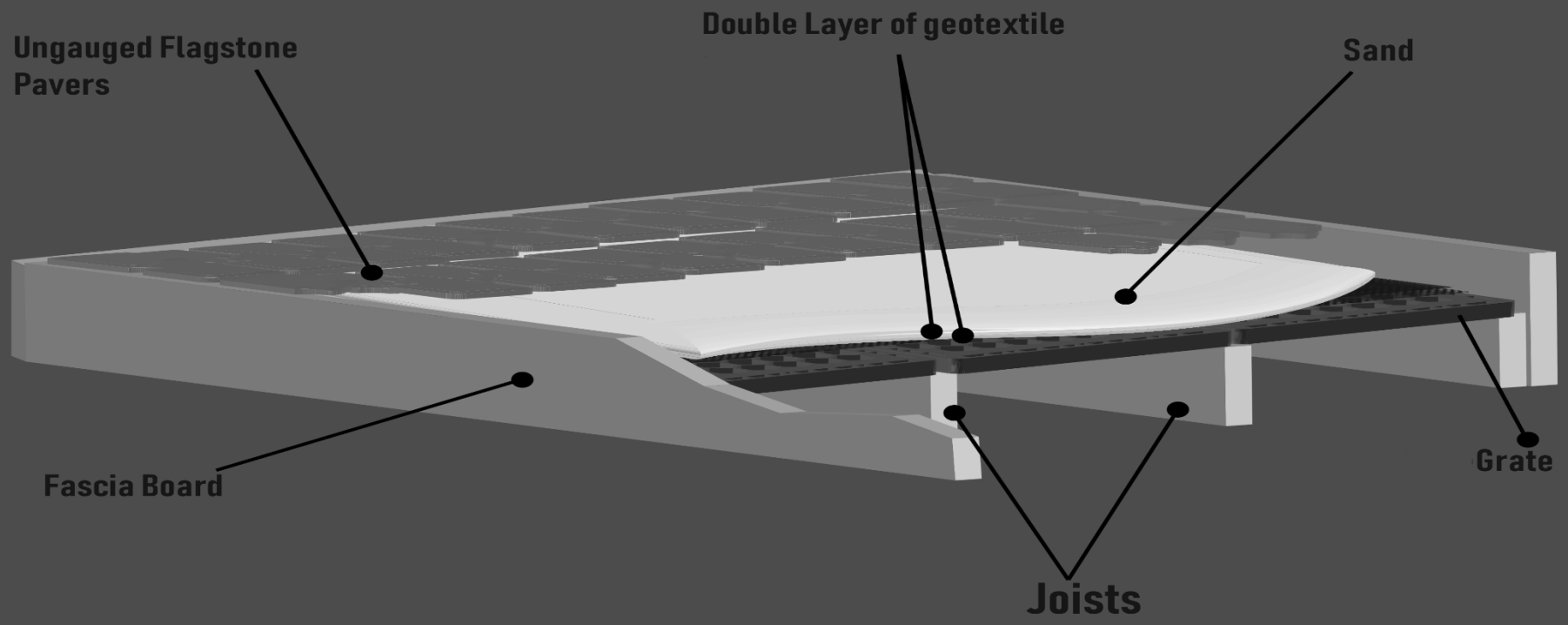
Installing Ungauged Stone

Ungauged stone installation is possible with the engineered polymer support system. It is important to lay two layers of geotextile in an alternating pattern as well as a base of bedding sand. All sides of the deck need to be raised up to contain the sand and stone.

As each stone is placed, it must be seated in the sand and leveled to the stone adjacent to it. Keeping the joint lines between stones to a minimum width is desirable. Due to the nature of natural stone, the stone will not be completely level—there will be high and low spots that need to be adjusted in the sand bed.

Ungauged stone, such as flag stone, requires a sand bed (¼–1 inch) underneath for tamping in order to achieve a more even surface.

Installing Ungauged Stone With Sand



Porcelain Pavers

The recommended method for installing porcelain pavers of any shape is to use a permeable recycled rubber underlayment over the grate and then install the pavers. The permeable recycled rubber underlayment will reduce the hollow sound that can occur when using porcelain pavers.

Once the pavers are in place, polymeric sand should be swept into the joint lines and wetted down as directed by the manufacturer.

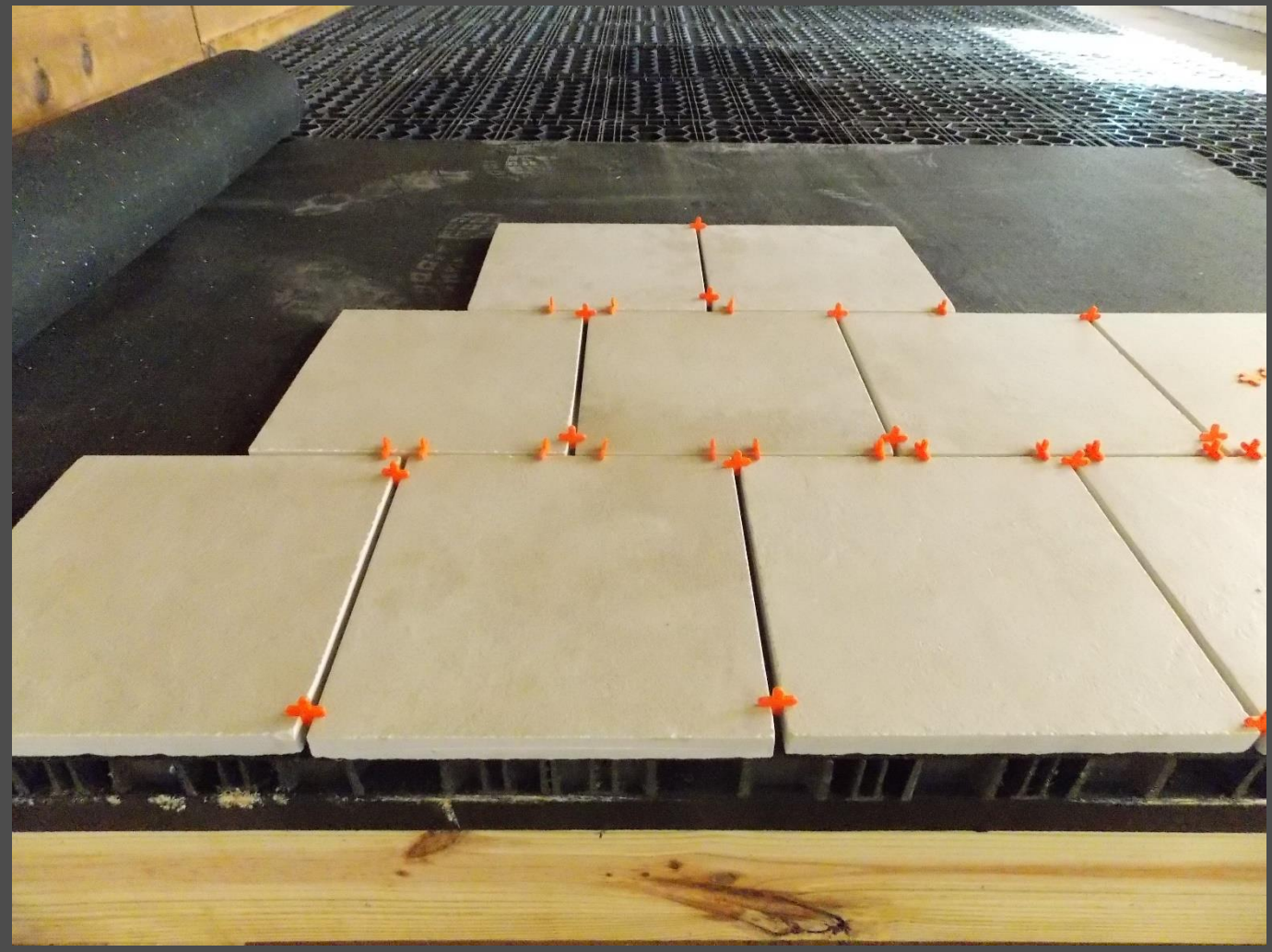
For more permeability, a #9 aggregate or granite chips and a joint stabilizer can be used in the joint lines instead of using polymeric sand.

Most porcelain paver manufacturers do not recommend butting together porcelain pavers, as chipping will occur.

If the suggested permeable recycled rubber underlayment is used, only a two-dimensional interior tile spacer is needed. The nature of the recycled rubber underlayment will create a seal once the paver is placed down; this will keep out much of the moisture, and the polymeric sand will reduce the moisture passing through the joints. Remaining moisture will stay in the joint lines until the air and sun dry it out.

Glue is not necessary when using recycled rubber underlayment with porcelain pavers, but for a more secure installation, apply a small amount on each corner using an adhesive that has the characteristics previously described.

Flexible or rigid spacers are not necessary when recycled rubber underlayment is used.

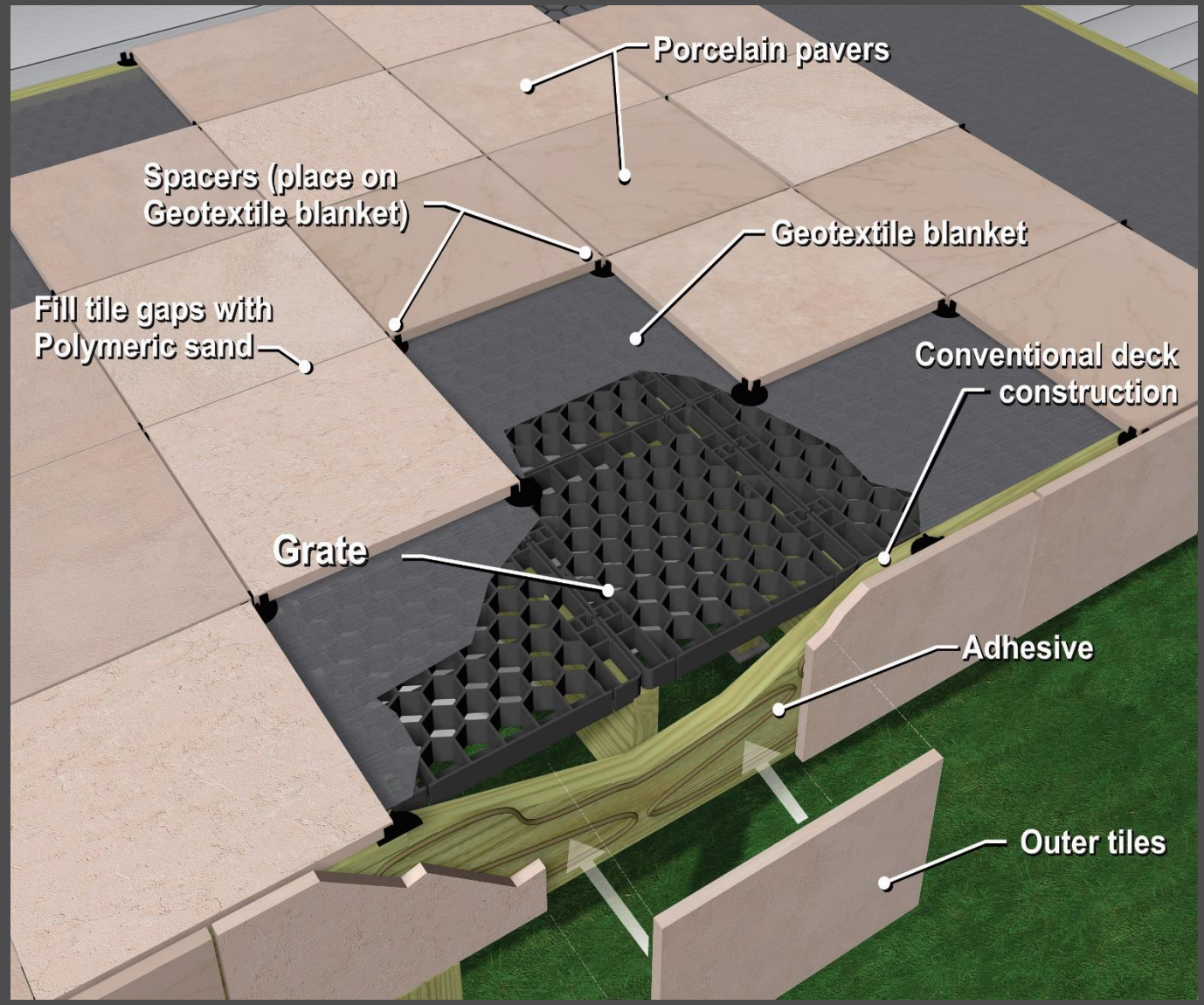


If deadening sound is not an issue, geotextile can be used for installations with polymeric sand. When using geotextile, use spacers under each corner of the pavers. It is also recommended that the pavers be glued to the spacers and the spacers be glued to the geotextile.

Once the pavers are in place, polymeric sand should be swept into the joint lines and wetted down as directed by the manufacturer.

This installation method creates a ridge of support all the way around the paver and locks each one in place but still allows for drainage. The polymeric sand will cover the tabs of the spacers, hiding them from sight. The use of the spacer will help to reduce horizontal movement and deaden sound.

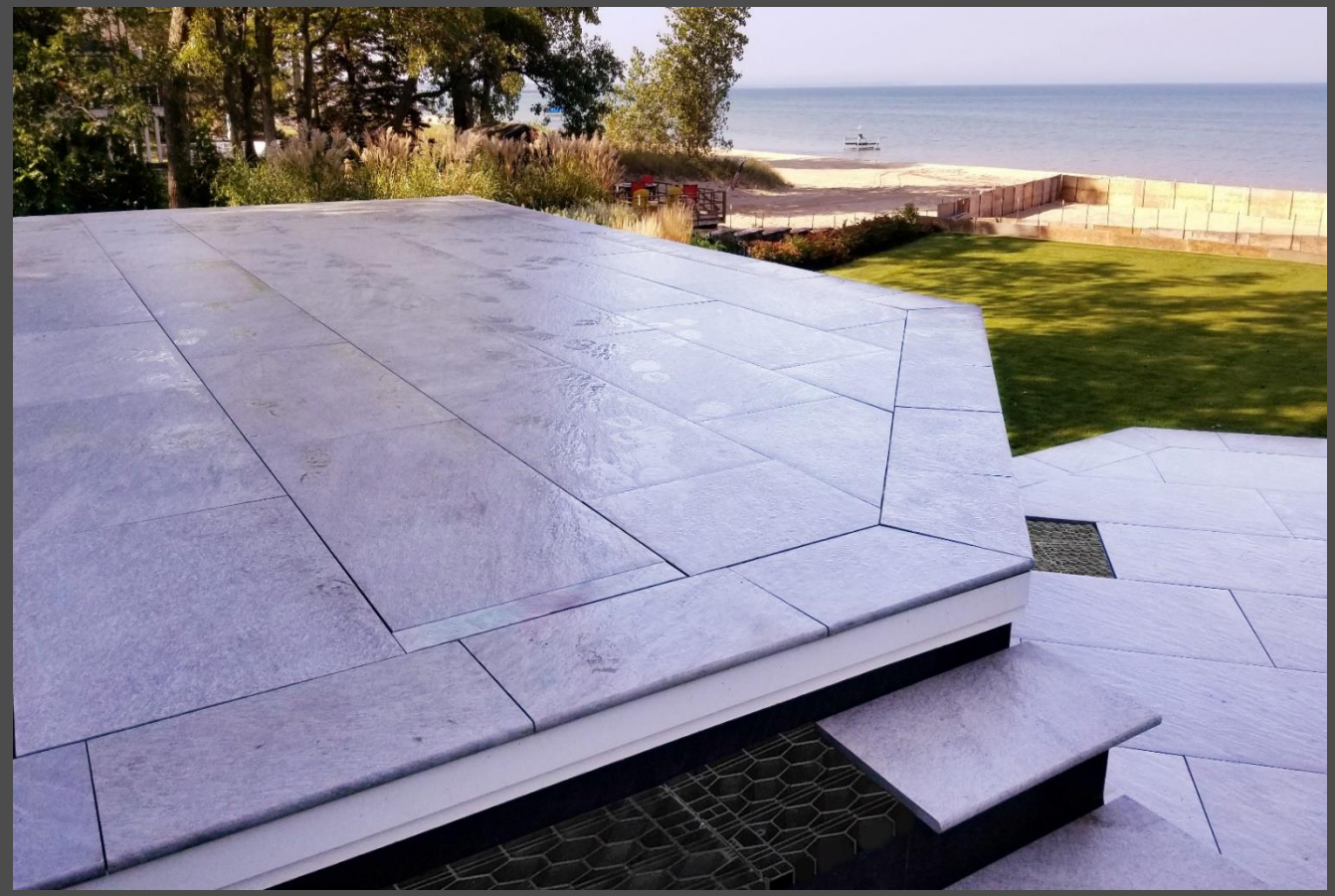
For more permeability, a #9 aggregate or granite chips and a joint stabilizer can be used.



Most porcelain paver manufacturers do not recommend butting together porcelain pavers as chipping will occur.

While it is not our recommended method, some customers prefer to install porcelain pavers with open joint lines.

For installations with open joint lines, flexible or rigid spacers should be applied to the corners of the pavers to prevent clinking and chipping, then glued to the engineered polymer grate using previously specified adhesives.



Porcelain pavers with paving brick accent strip on fascia and steps:

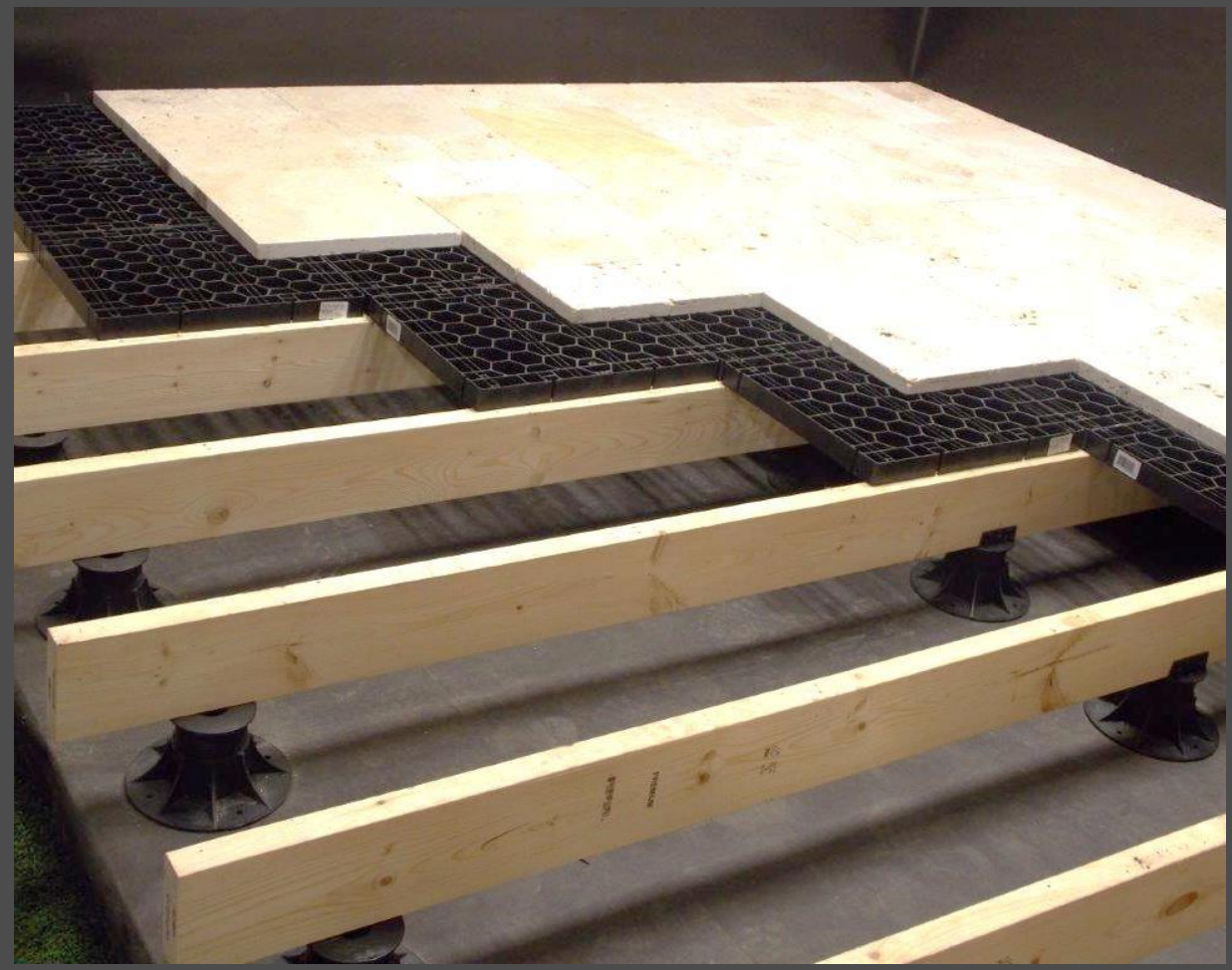
Rooftop Installations

Installing the system on rooftops can be done in one of two ways.

The first method uses pedestals with joist supports and treated lumber or metal joists. The use of joists on the pedestals reduces the number of pedestals required and provides better support for the grates and stone.

It is best to use a dimensional lumber attachment, which should be provided by the pedestal manufacturer. The attachment process of the engineered polymer grate to the joists is the same as with elevated decks.

Follow the installation method suitable for the surface material chosen. For example, lay down recycled rubber underlayment or geotextile fabric, and use polymeric sand for pavers or bricks with joint lines. Or use a recommended adhesive to secure gauged, clean-cut stone or pavers to the engineered polymer grates.



The second method involves supporting each corner of the engineered polymer grate on the pedestal itself and fastening with self-tapping screws.

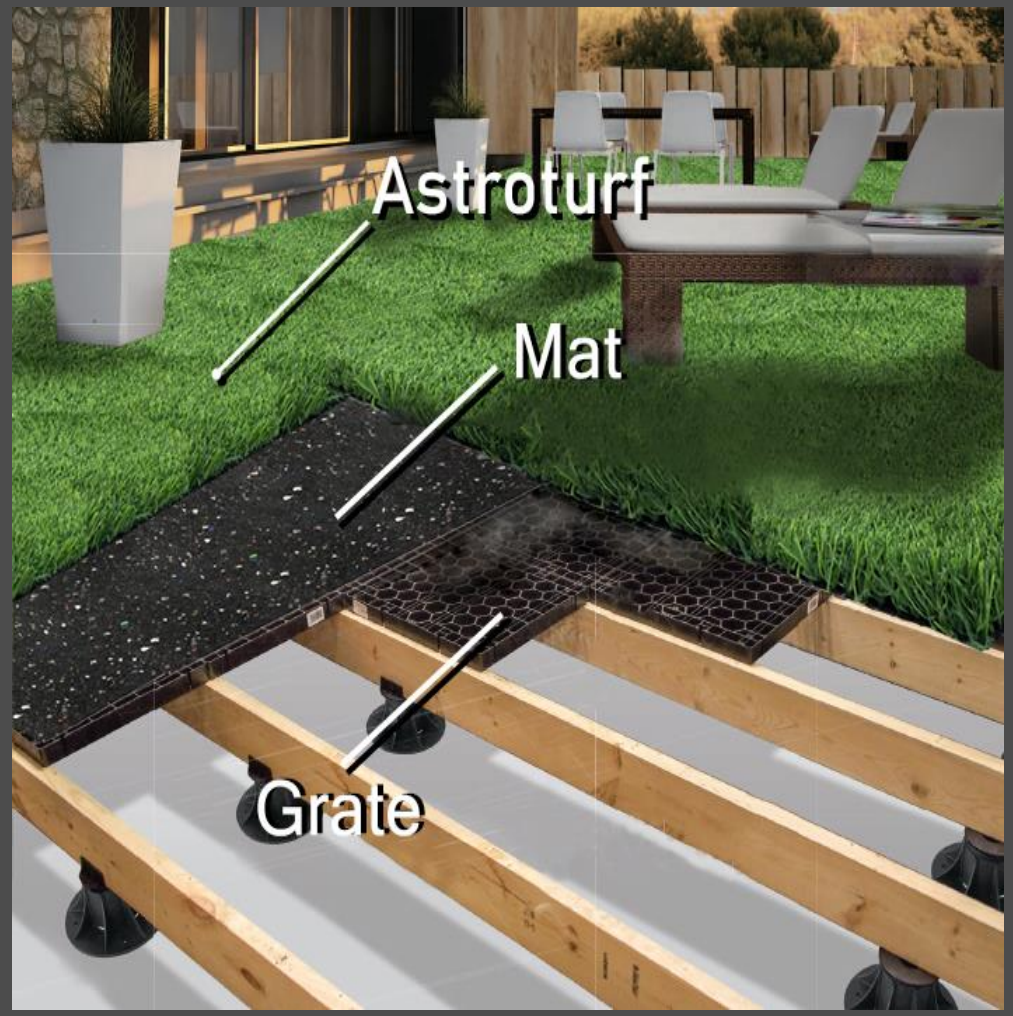
When installing directly on pedestals, the number of pedestals needed to support each corner of the grate will result in an increase in the cost of materials compared to using joists on the pedestals. When using smaller pavers, for instance, an additional pedestal in the center of the grate may be necessary to reduce flexing, and may be required for the warranty.

The engineered polymer grates can be used to install artificial turf, provided 10-millimeter recycled rubber underlayment is applied under the artificial turf. The uniform underlayment can be secured to the engineered polymer grates with adhesive and the artificial turf secured with adhesive or a mechanical fastener.

For the application of artificial turf, it is recommended to install on dimensional lumber or metal framing. If only pedestals are used, warranty restrictions require a pedestal in the center of the engineered polymer grate, as well as pedestals supporting the four corners.

Pictured here is a rooftop application featuring a poolside path of wood pavers and turf surrounding the pool. The system's strength and durability allow for the placement of lounge chairs, cabanas, etc. without worrying about the grates buckling under pressure.

Artificial turf installation on decks or roof tops:



Applications for AstroTurf Rooftops and Decks

- Driving tees
- Children’s play area
- Washable pet area
- Non-paver poolside lounge area

INSTALLATION REMINDERS

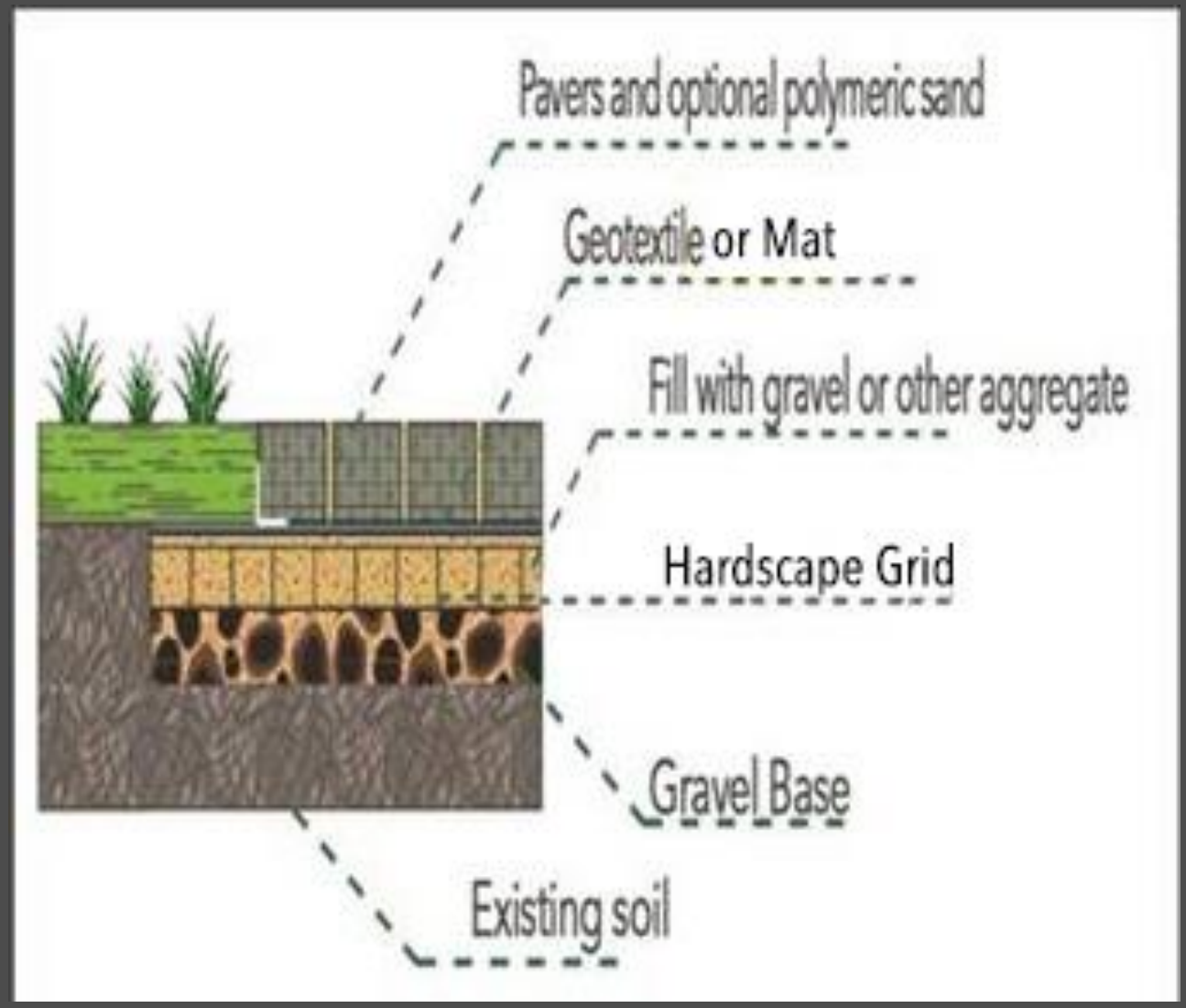
When installing the engineered polymer grate system, remember:

- ***Your deck must be flat.*** If you run a straightedge or long level over the joists, there should be no rocking.
- When using polymeric sand with the permeable rubber mat or a geotextile fabric, ***your deck should be pitched.*** It can be either a 1/16 inch, 1/32 inch, or 1/64 inch over a foot depending on the depth of your deck. The polymeric sand will reduce the water flow through your deck so excess water needs to run away from the foundation of the home.
- ***Any cut grates must be blocked*** along the cut edges.
- Please remember that ***the grate is designed to flex***. There will be flex, but that flex will be reduced as you install pavers to the top of our system.
- ***If you are stepping onto the edge of a grate that has yet to have an adjacent grate, installed, there will be more flex than normal.***
- There are differing methods for installing the various types of pavers on the system. Please refer to installation methods for recommended installation.

Hardscape Ground Installation

For a typical pathway installation, the area must be excavated and the leveling media set in place and compacted. A geotextile blanket (#3 minimum, #5 recommended) should be laid over the leveling media followed by the soil grid. Once the grids are in place, another layer of geotextile blanket should be laid and the pavers, bricks, or natural stone installed.

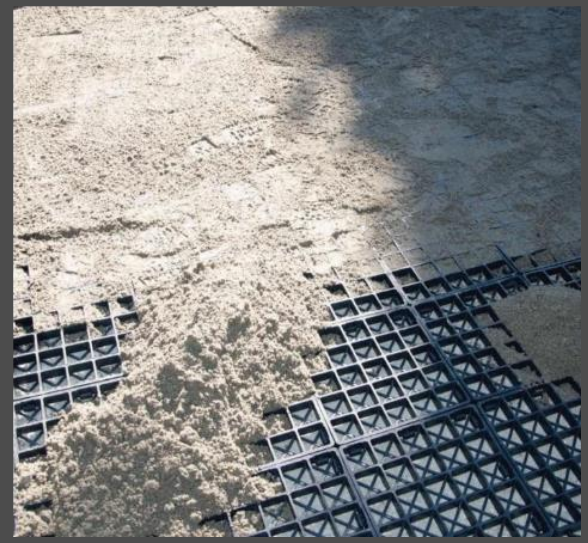
The final step is sweeping polymeric sand into the joint lines and setting per the manufacturer's instructions.



Ground Installation with Soil Grid

The soil grid locks together without the need for extra connectors. It comes in various sizes for various applications and reduces the need for additional base by 50 percent. The soil grid is made from recycled material.

The area should be excavated as usual, the leveling media laid and compacted, then the geotextile blanket layer should be added. When using the soil grids, less base is required than in a normal hardscape ground application. The soil grid is applied as in the paver walkway application depicted on the previous slide; then the soil grid cells are filled with pea gravel and topped with the desired finish gravel.



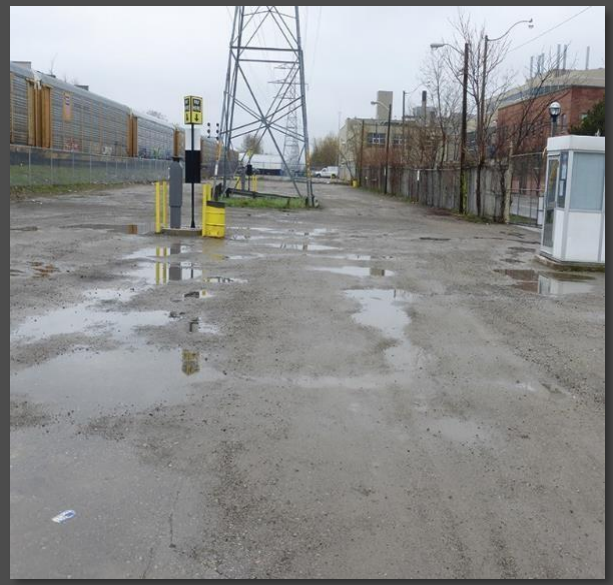
Ground installation with soil grids under second-story balcony using engineered polymer grates:

The soil grid can be used in driveway applications.

Once the sand is applied to the cells, any paver can be used.

The soil grid can be extended to the shoulder in order to stabilize the soil, and grass can be planted with out washing out.

The soil grid can be used in parking lot areas were drainage and stability are issues.



1. Parking lot is often muddy with areas of standing water.

2. Existing gravel is removed.

3. Even before the top layer is applied, the soil grid will support vehicles.

4. A layer of gravel is applied to the top to finish the parking area, creating a stable surface with excellent drainage.

The soil grid can also be used for access roads and utility roads. In road applications the grids can be filled with existing aggregate from the road.

Access roads can be made more stable and longer lasting.

Existing road has soft shoulder issues and pooling water and mud where vehicles become bogged down.

Top layer of the road is removed and grid is applied.

Reapply the aggregate taken from the road. Final product is stable with excellent drainage.

Engineered Polymer Support System Benefits

With the Engineered Polymer Support System:

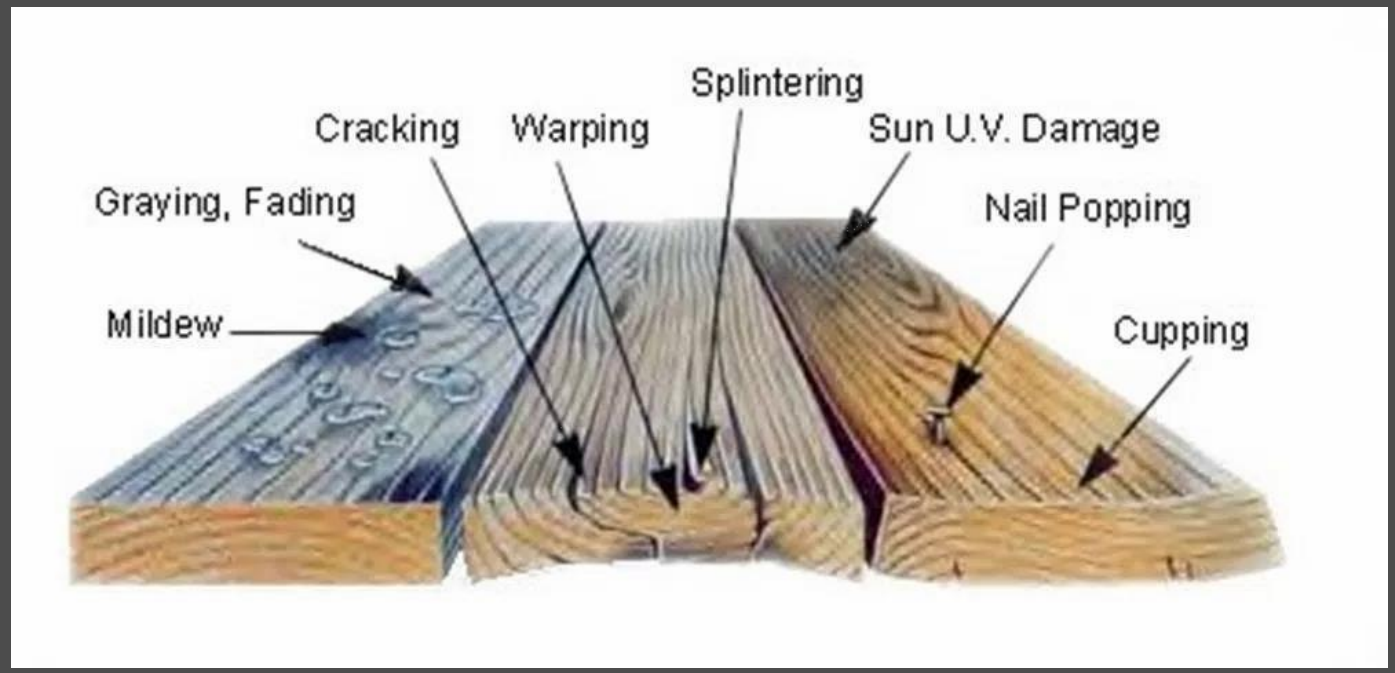
- Your customer can get more for their money.
- Your customer will have a maintenance-free space.
- Your customer has hundreds of design options.
- Your customer will appreciate how quickly the stone can be installed.
- Your customer will have a longer lasting deck.
- Your customer can match their existing hardscape to their deck.

Most people do not know that this is an option. While bidding jobs, you can upsell stone to your customer for a similar price as composite.

Why Not Use Wood or Composite Materials?

The following slides will outline various drawbacks to using wood or composite materials.

However, with the engineered polymer grate system, there are hundreds of design options with low maintenance requirements.



dynamicdecksinc.com/time-for-a-new-deck

Composite Decks

Composite lumber is a combination of wood fibers and plastic, and while composite decking doesn't have the same problems with rot that wood does, it has its own unique issues.

Mold: Moisture can penetrate and soak the fibers and mold can grow. Power washing can often voids the warranty, so hand scrubbing with bleach or other cleansers is required. This doesn't always kill the mold and regrowth is likely.

Delamination: Due to swelling and shrinking from moisture and temperature changes, composite boards can begin to peel, or sometimes even split, causing the boards to lose their strength.

Sun Damage: In full sun, a composite deck can become too hot to walk on in bare feet, and children and pets can suffer burns. Sun exposure can lead to fading and discoloration, mottled and splintered boards, and peeling edges.

Warping: In extreme heat, if not properly supported, composite deck boards can warp, melt, or sag.

Resources and Summary

Stone and pavers are stunning materials for outdoor floors. They are natural, durable, and long lasting, and with good care, they can last far longer than other types of deck surfaces.

The engineered polymer support system, whether used in new construction or retrofit applications, is easy to install and opens up a wide range of design possibilities.

Resources

StoneDeks System. Web. March 2018. <stonedeks.com>.

Deck Industry Association. Web. October 2017. <www.deckindustry.org>.

Decks.com. Web. October 2017. <www.decks.com>.

North American Deck and Railing Association. Web. October 2017. <www.nadra.org>.

Thank you for taking the StoneDeks™ Training!