Stone Deck Solutions: Creating Stone Decks, Hardscapes, and Rooftop Decks with an engineered polymer structural support system

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, in ground applications, and in commercial rooftop applications is discussed.

Learning Objectives:

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

- Understand the features and benefits of using an Engineered Polymer Support System for the architect, designer, contractor, and homeowner.
- 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
- Understand the advantages for rooftop and ground installations.
- summarize the issues that can occur with wood or composite systems and how they affect safety and performance

Presentation Topics

- Features & Benefits of using an Engineered Polymer Support System
- Cost comparisons
- Strength and documentation
- Applications: Decks
  - Raised Patios
  - 2nd Story Decks and Balconies
  - Docks
  - Rooftops
  - Ground Application
- Installation

Features and 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**, can be extended up the steps and right onto the deck, and can be matched to interior finishes to tie indoor and outdoor living spaces together.
- The Engineered Polymer Support System is **non-proprietary**—any natural stone or concrete, clay, or porcelain paver 1/2" to 3" thick can be used. There are thousands of styles and colors of natural stone and pavers to choose from.
- **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 maintenance issues of wood decks**.

Features & Benefits of using an Engineered Polymer Support System

- Eliminates Backfill
- Eliminates callbacks due to settling
- Match your Hardscape to elevated surfaces
- Easy to Install
- Reduced maintenance
- Reduced Labor Cost
- More design and finish options for you and your customer
- Easier access for plumbing and wiring
- Cost competitive with composite and vinyl decking
- Take your hardscape right up the steps and onto the porch

Use for: Decks, Docks, Balconies, Second Story Decks, Porches, Gazebos, Rooftops, Pedestrian Bridges, Rooftop Decks, Tiered Patios, Stairs.

Engineered Polymer Grate System

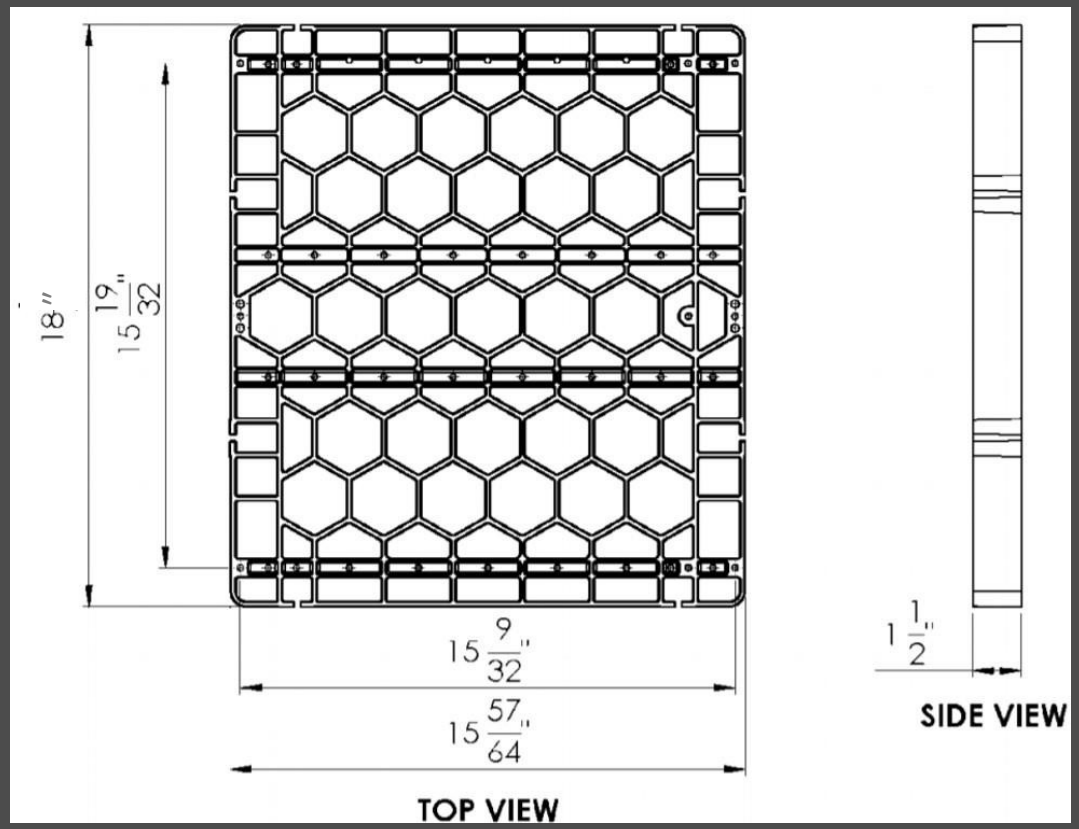
The Engineered Polymer Support System enables the installation of natural stone and concrete pavers, brick, and porcelain pavers on wood or metal floor joists as an alternative to wood, composite, or PVC flooring. The engineered polymer grates in the photo is screwed directly to the top of the floor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

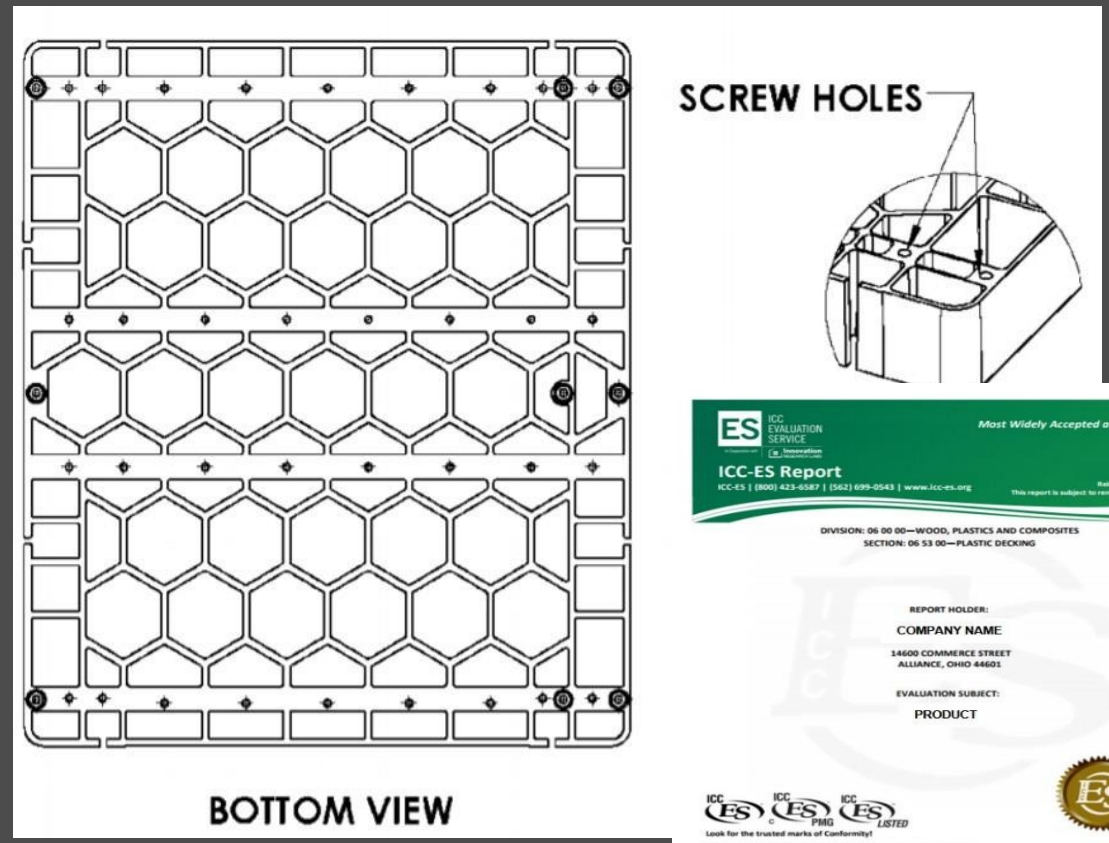
This engineered polymer grate subfloor can be used on top of any wood or metal framing and on pedestals for rooftop applications. Engineered Polymer Soil Grids can be used to provide stabilization to prevent sinking or heaving of stone or pavers when used in ground applications.

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-I.C.C. Certified

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 Grate System, the engineered polymer grate is designed to be installed on either a 16″ OC joist system or an 8″ OC joist system. Each grate measures 16″ x 18″ x 1½″.





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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES

SECTION: 06 53 00—PLASTIC DECKING

REPORT HOLDER:

COMPANY NAME

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EVALUATION SUBJECT:

PRODUCT

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ICC creep testing of the Engineered Polymer Grate

Over 500 lbs. per grate for 30 days for creep testing.

Cost Comparisons:

National Average Deck Comparison

400 Square Foot Deck
6' elevation, 6"x 6" posts, 2"x 12"x 12' joists, installed 16" on-center
All materials for deck frame, including labor*

*Materials included: 6' x 6' posts, 2" x 12" x 12' joists (2 x 10 x 12 joists can also be used), hangers, Simpson Strong-Ties, deck screws, synthetic butyl deck tape (for joist, hanger and post protection), concrete mix, Labor cost calculated for 2 laborers, 4 days of work at $20/hr.

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

National average based on 2018 National Construction Estimator.

Type of Deck	Cost psf
Wood Deck with pressure-treated boards	$15.00
Composite Deck	$29.55 - $35.00
Stone Deck with Porcelain Paver Plank - *Includes Recycled Rubber Underlayment*	$28.66
Stone Deck with Bluestone, Unguaged – *includes 3 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

APPLICATIONS:

Where Do I Use Engineered Polymer Grates?

The following are examples of areas where you can save on labor and materials as well as offering the homeowner and contractor 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
- Multi-level 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. 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.

Multi-Level or Terraced Patios

Multi-level 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.

This project presented issues that would prevent building a hardscape patio:

- wood framing
- foundation wall
- limited access
- 5’ to 6’ of fill: extensive labor and settling potential.

The retaining wall is still built, however, backfill is not needed – no pressure against the foundation or retaining wall or and no call back 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

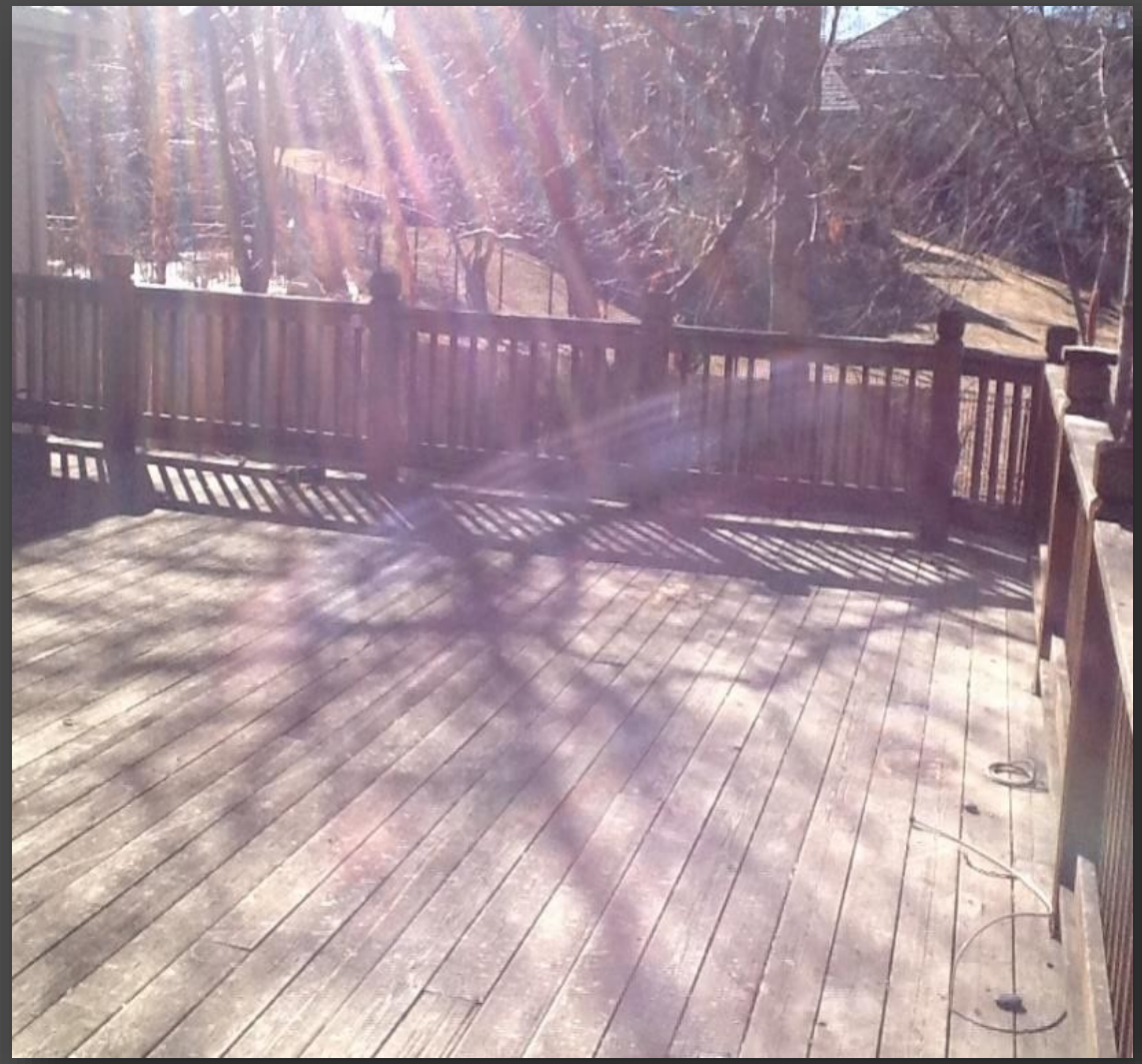
The framing is clad in stone and railings are installed.

Raised or second-story decks with underdeck living space

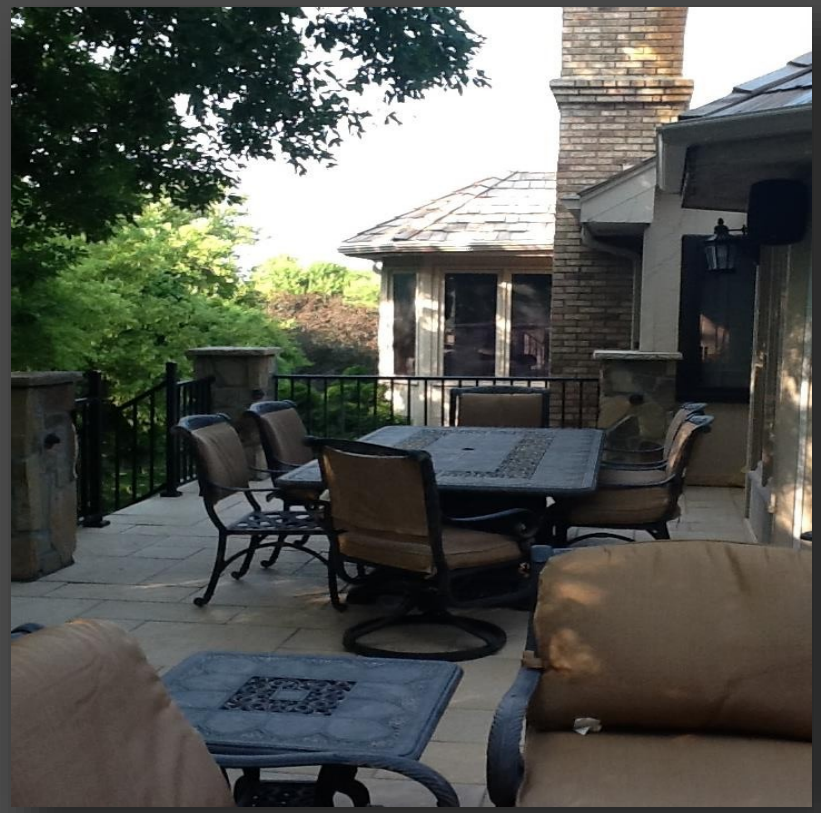
Second-story decks or raised decks that have living or storage space below require a waterproof surface.

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 sub-structure 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.

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

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

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 back fill 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.

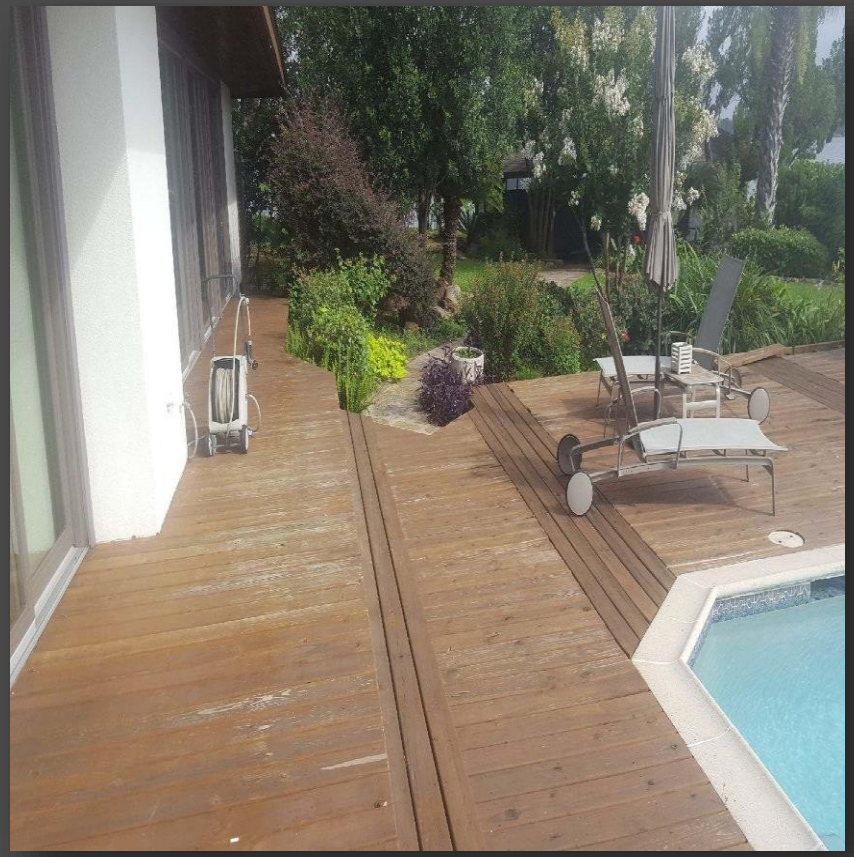
Docks can be finished with a durable, attractive, and slip-resistant stone surface.

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 it’s advantageous or the home owner 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



Composite deck before

deck boards removed

engineered polymer grates being installed

Finished Pool Deck where poor soil conditions existed

The pool deck is matched to the porch and stairs.

The pool deck, landing, stairs, and porch are all finished with the same stone.

Installation

- Framing, Flatness, and pitch of deck
- Thickness of Stone and allowing for height
- Deck and joist tape application
- Footer Depth
- Installing the grates
- Finishing the edges
- Intallation on Stairs
- Remodeling a deck
- Installing railing
- Sizing and spacing
- Paver and Stone Installation
    - Gauged Stone
    - Ungauged Stone
    - Porcelain Pavers
- Rooftop Installation
- Hardscape Ground Installation

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.

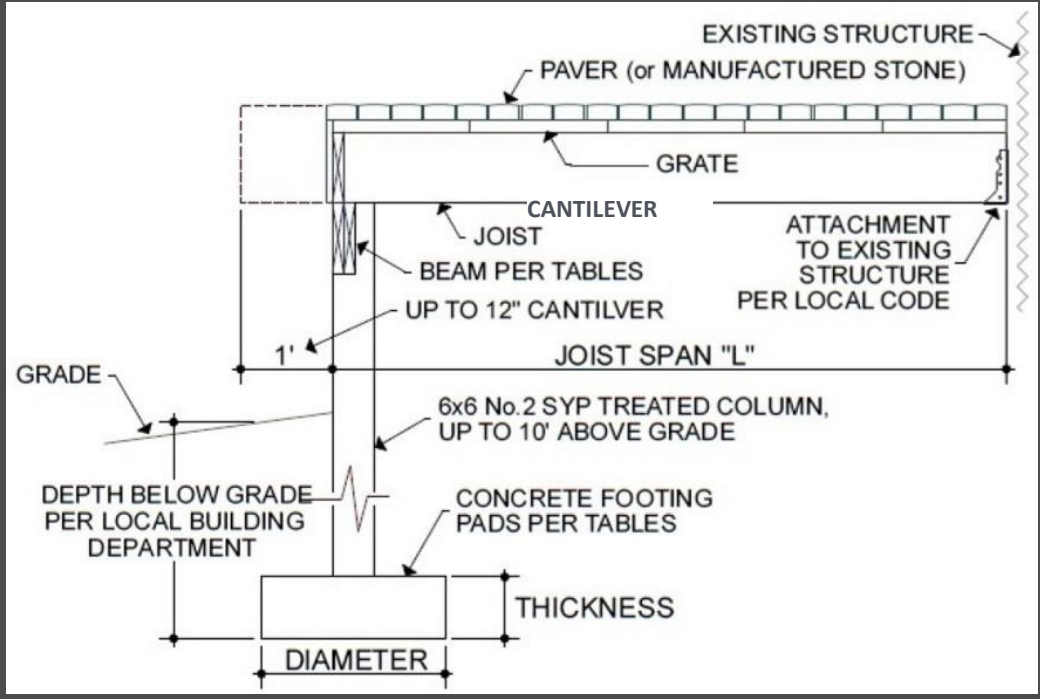
Maximum JOIST spans "L"

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"

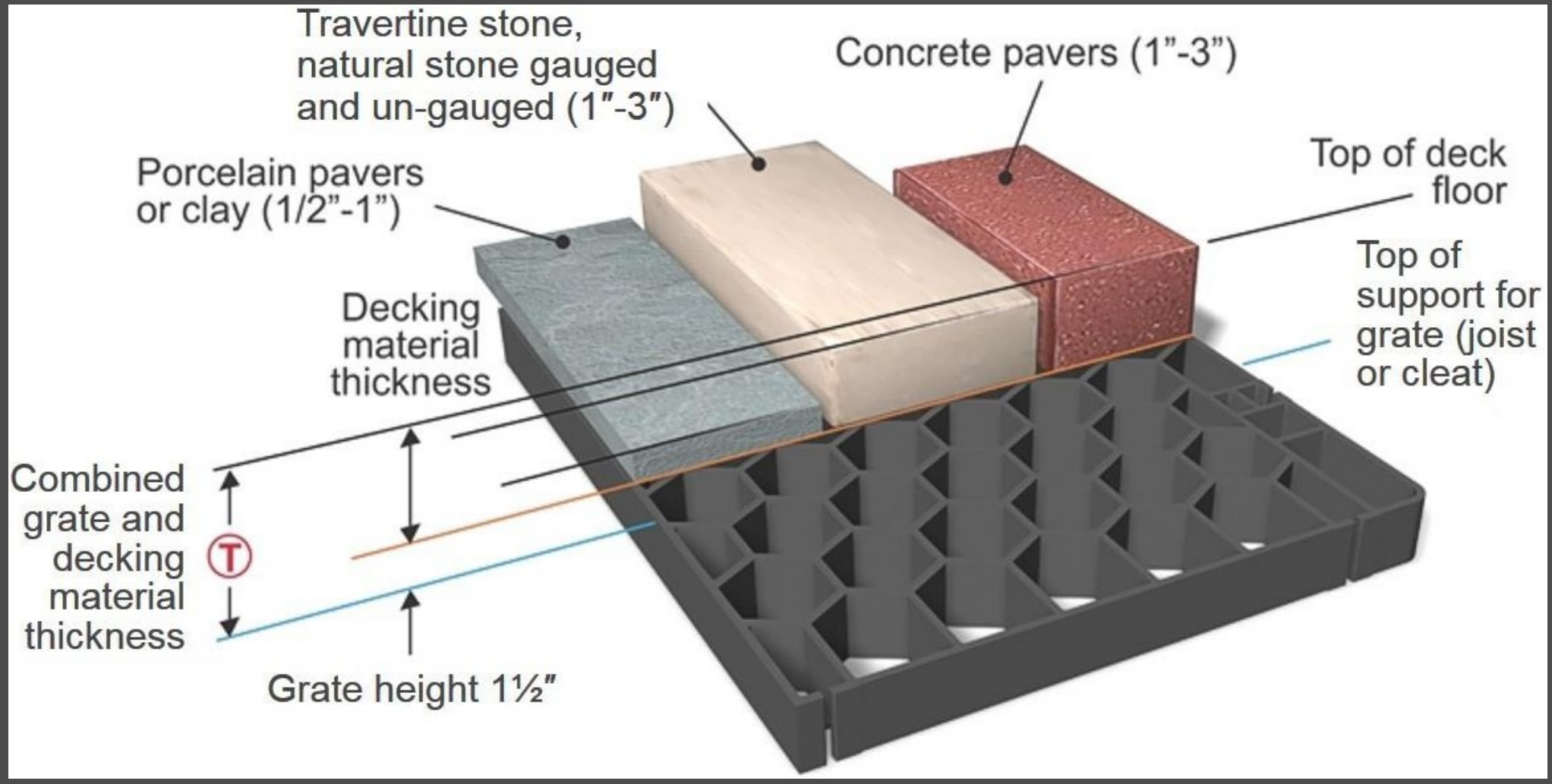
1. Joists are 16" o/c spacing.
2. Joists are Southern Pine, No. 2 grade, wet service.
3. Pavers or stone over grate structural subfloor system, grate figured at 2 psf dead load.
4. Live load = 40 psf.
5. Paver or stone dead loads based on material weight of 150 pcf.
6. Deflection criteria: Live load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



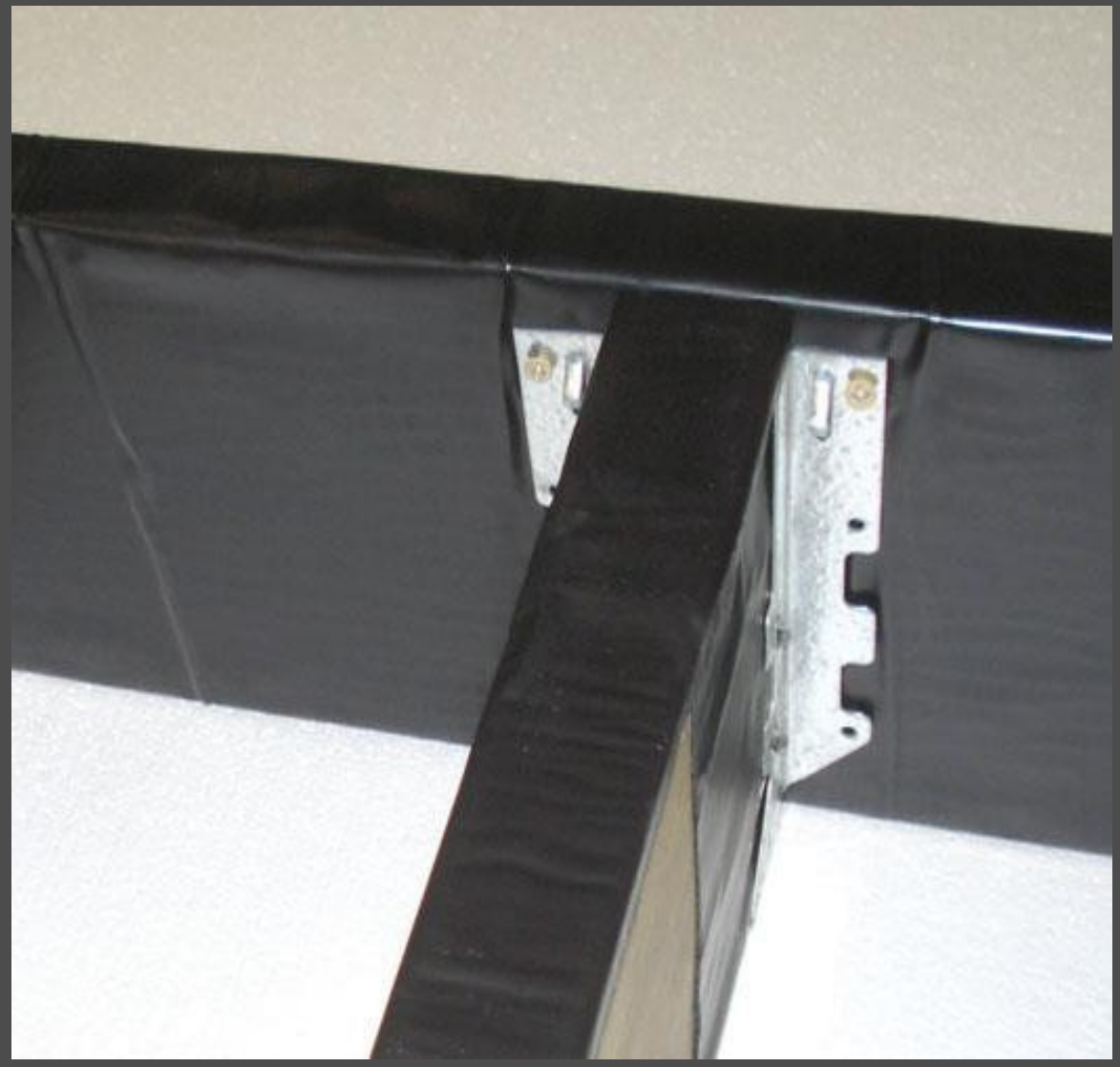
<u>One of the most important things to remember when using the Engineered Polymer Support System is to make sure that the surface of deck joists are flat.</u> When building a deck using wood or composite deck boards, there can be some discrepancy since boards will bend enough to make up the difference; 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.

Thickness of Stone



Deck and joist tape is recommended for all horizontal surfaces, between treated lumber and metal surfaces, and will 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. A standard amount of slope is a 1/4” vertical over 12 “foot horizontal.

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.

Sizing and Spacing

Sizing and spacing for support beams, posts, and footers is 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’ 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.

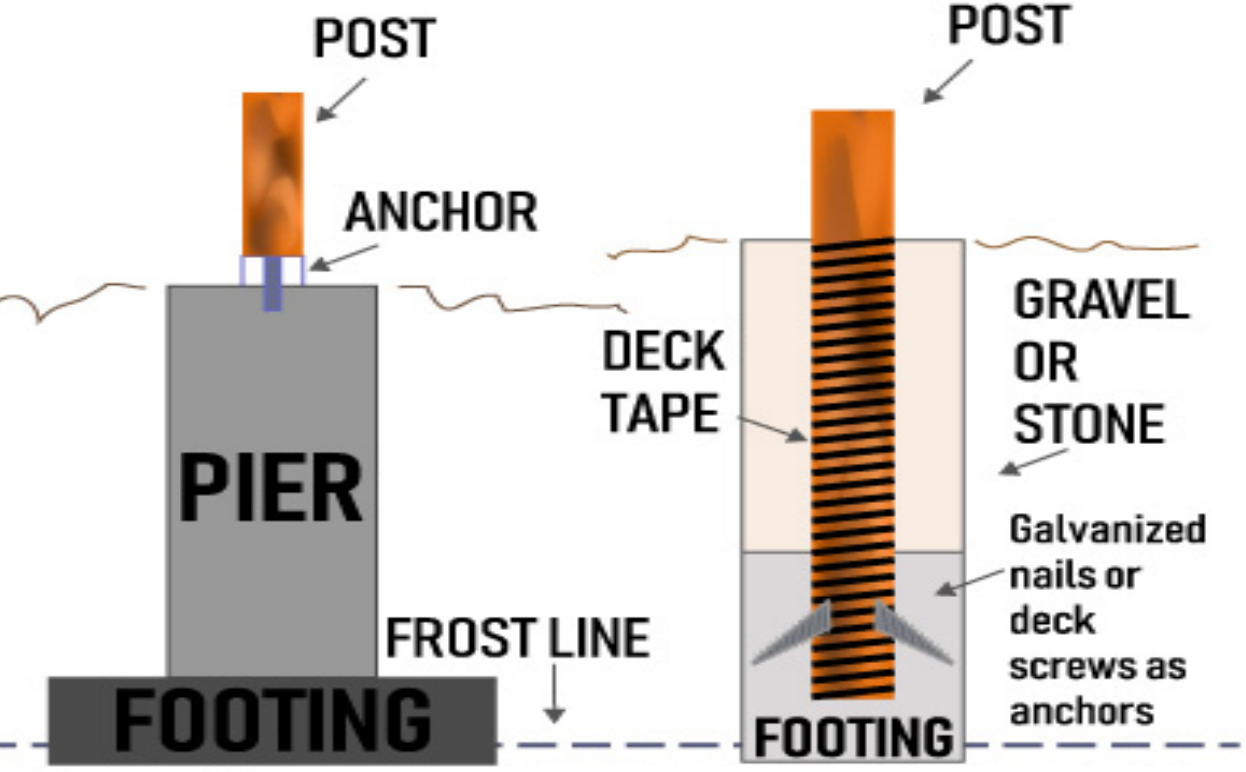
Depending on how the footings will be finished, it may be necessary to haul away the excess dirt. This will prevent any unnecessary damage to the surrounding grass and landscape.

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

Use a 4x4 to compact the soil at the bottom of the hole and then add 6” 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

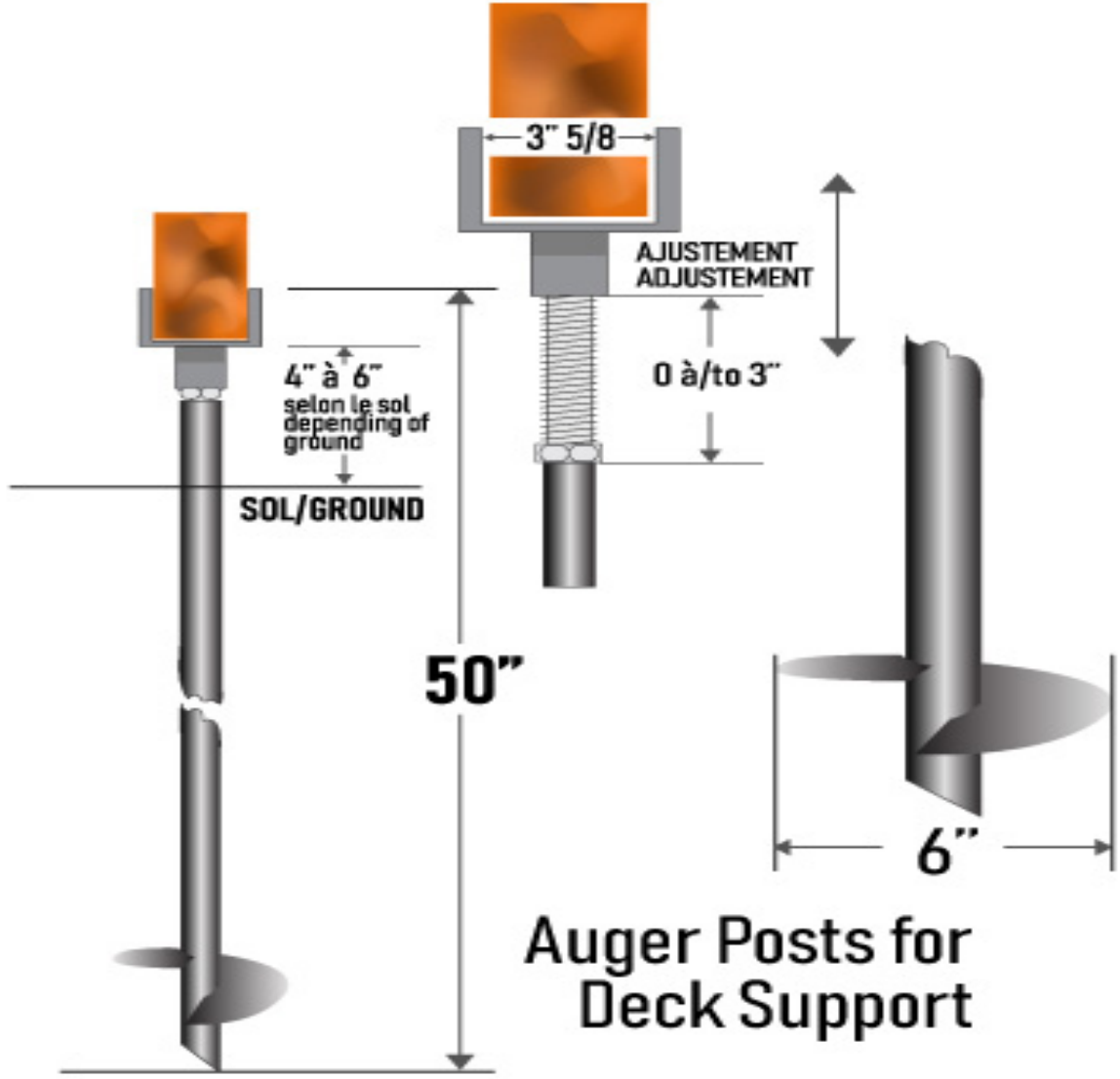
Concrete Footings and Foundations



Poured Concrete Pier and Footing

Post in Poured Concrete Footing

Screw Piles



Auger Posts for Deck Support

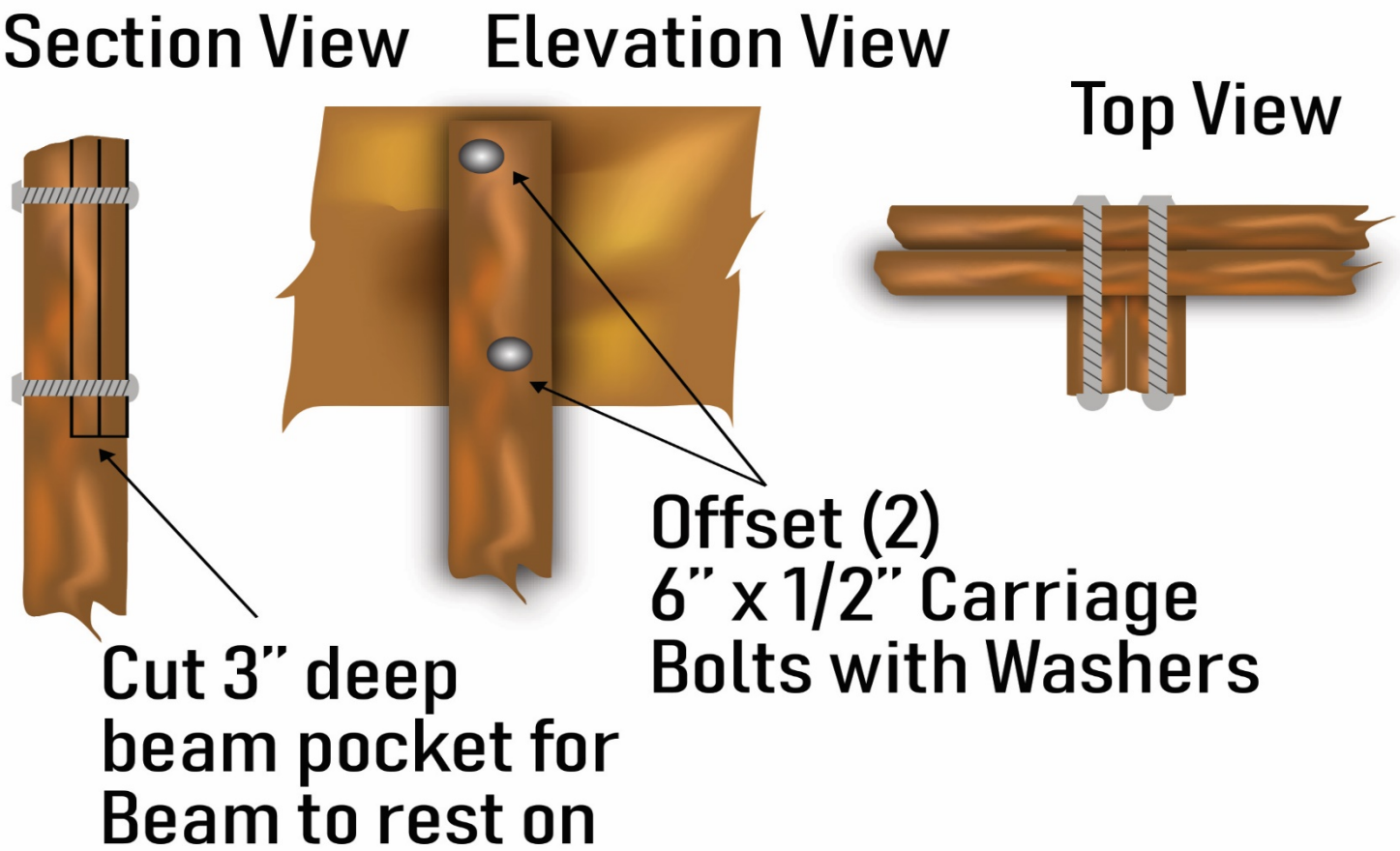
If you feel extra support is needed, it is recommended to switch to 8”on-center rather than doubling your joists.

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

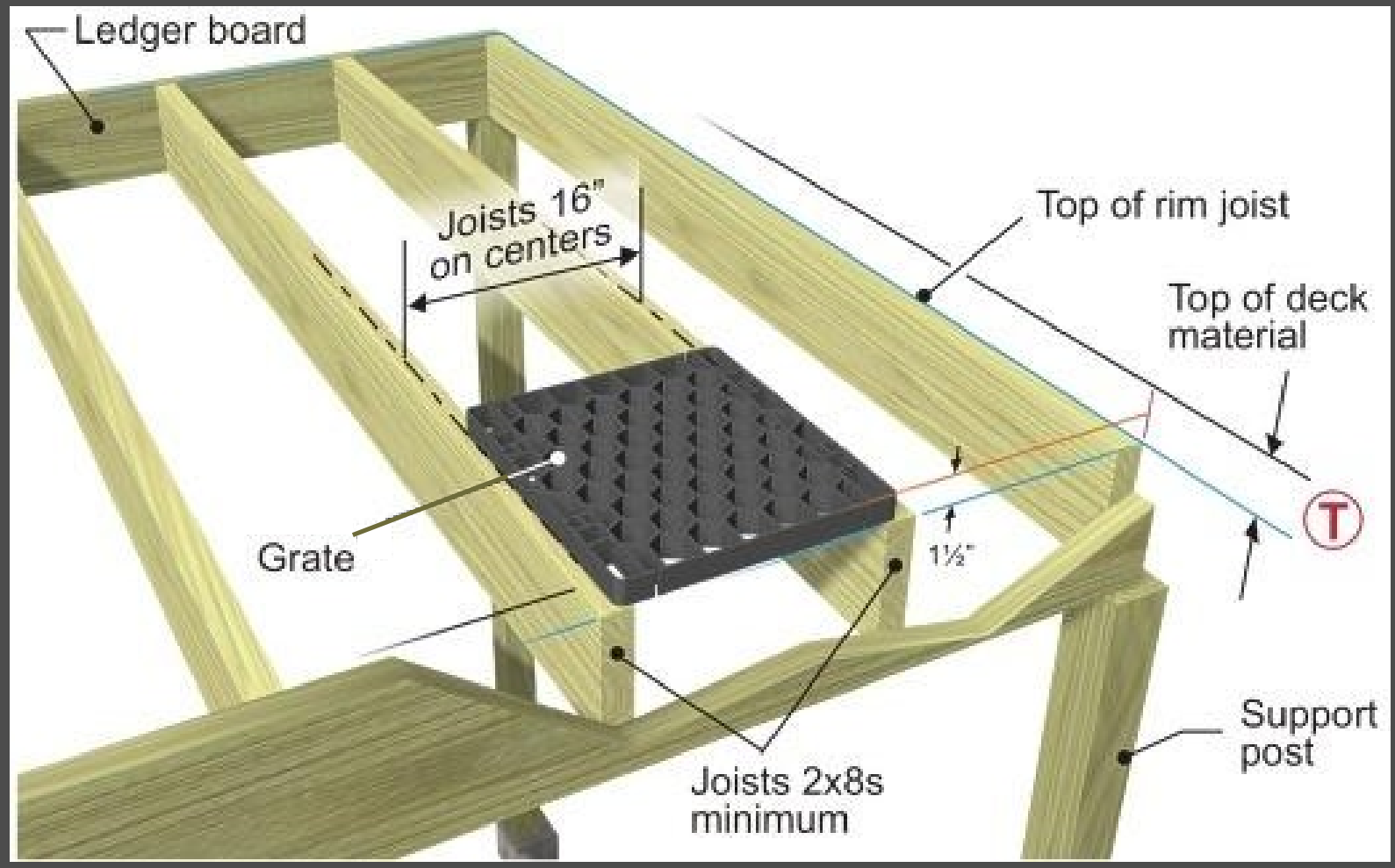
Beam Pocket Cut Into a 6x6 Support Post



Beam Installation Using Simpson Strong Post Cap

Installing the Engineered Polymer Grates

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



STAGGERING THE GRATES:

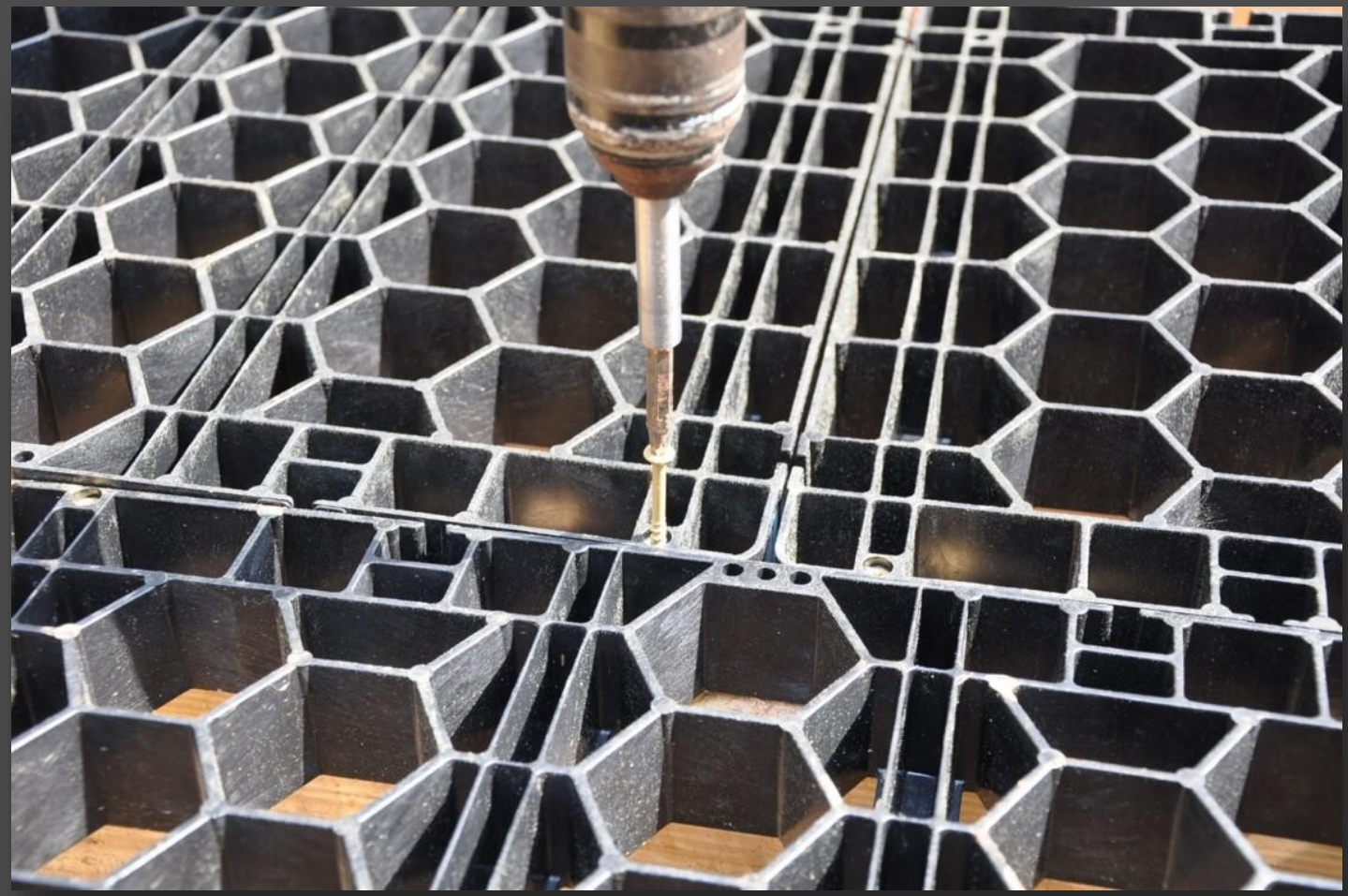
When installing, the first grate of every other row should be cut in half lengthwise (the 18” dimension) so that the joints are staggered when installed, as shown in the photograph. This staggers the spacing of the screws to help prevent weakening the wood.

The engineered polymer grates should be installed with he support straps up for extra surface area for using adhesive to secure the pavers for borders and stairs.

The grates are fastened with four, #9 deck screws, 3” long; if metal joists are used, secure with the appropriate metal screws.

The grate can be cut to size as needed with a reciprocating saw, circular saw, or table saw. If 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.

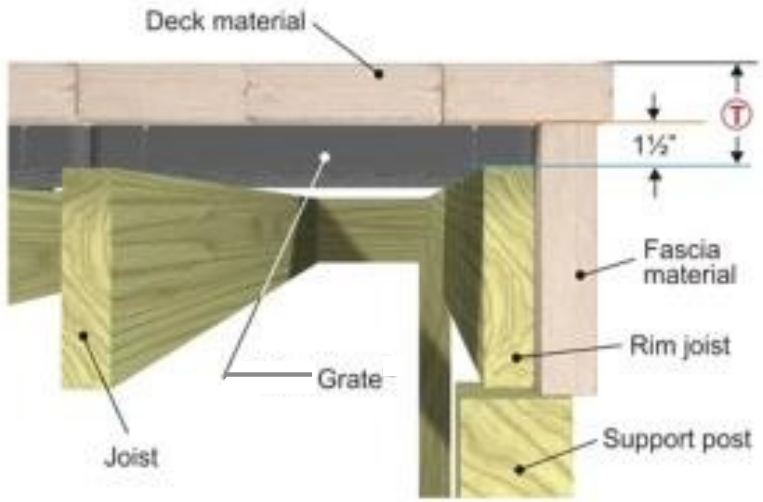
When the screw holes in the grate are cut off, fastening screws can be attached directly through the sidewall of the grate (toenailing) or through the support rib on the bottom of the grate.



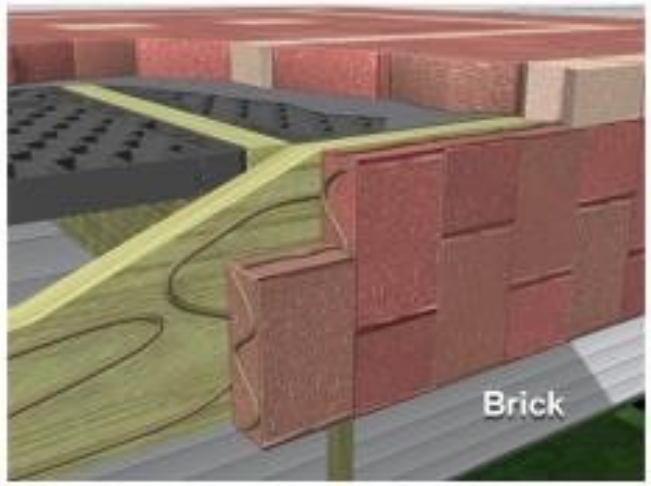
Finishing the Edges

As seen in the images, 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, or 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

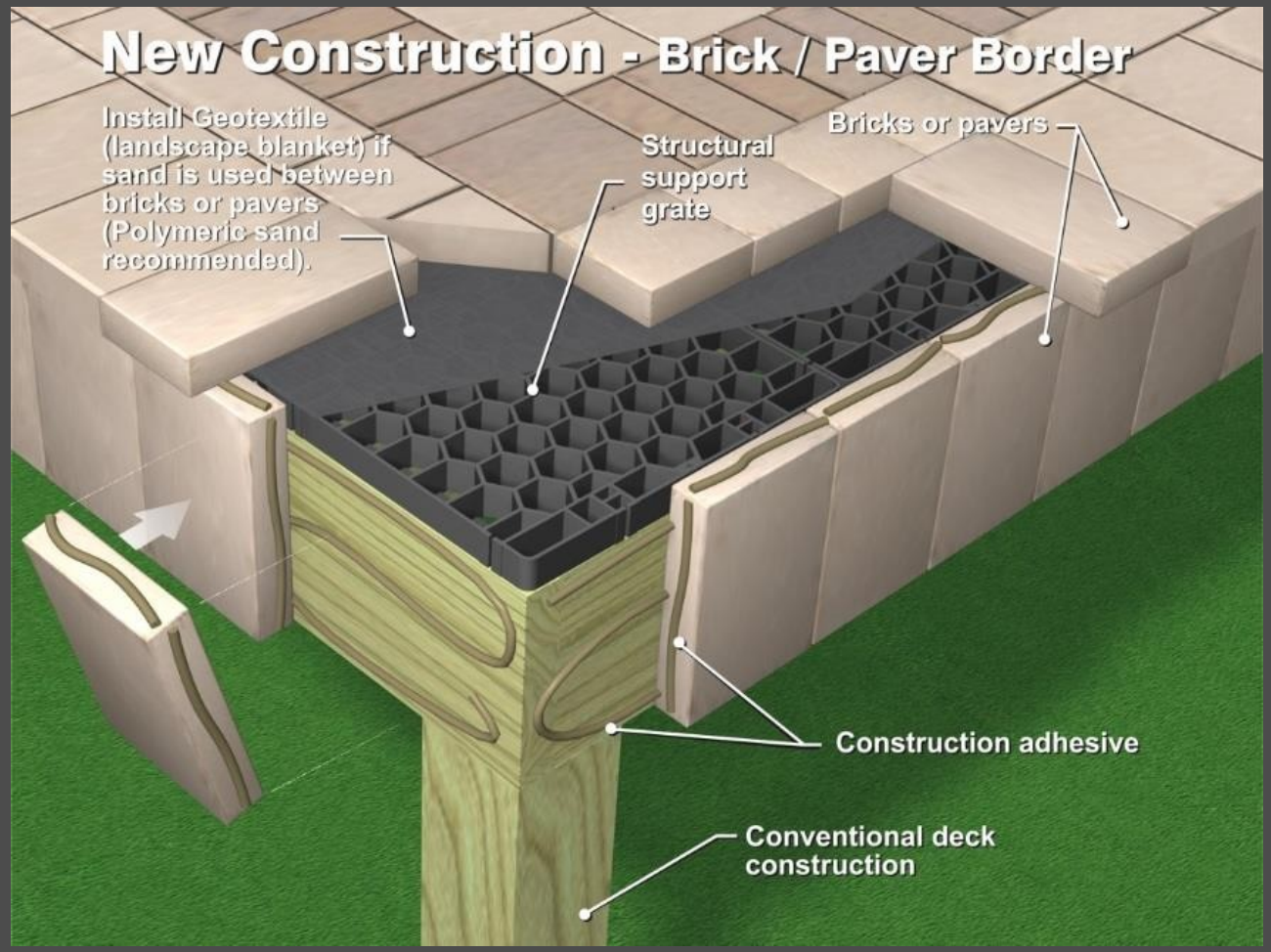


End of Joist (Front) View



How to Finish the Fascia with Pavers or Stone

Porcelain, tile, pavers, stone or faux stone can be glued in place 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.

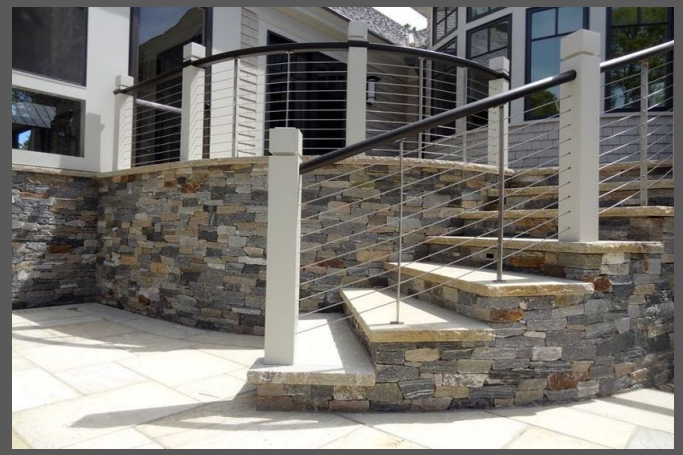
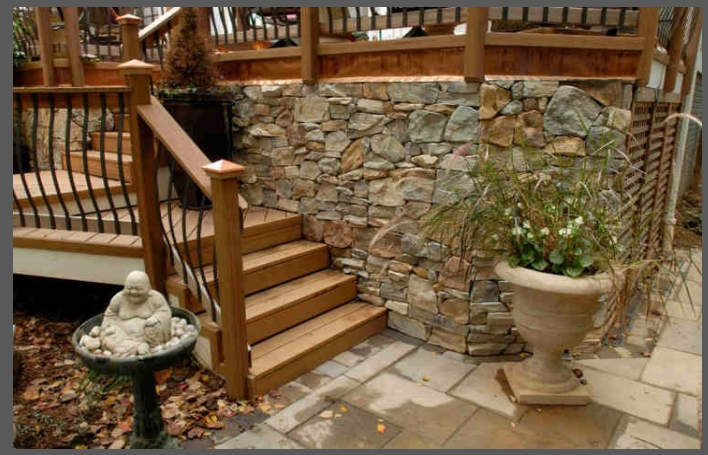


Wall Finish:

The sidewall can be covered with cement board or marine plywood and a faux stone, sidewall tile, or other finish applied.



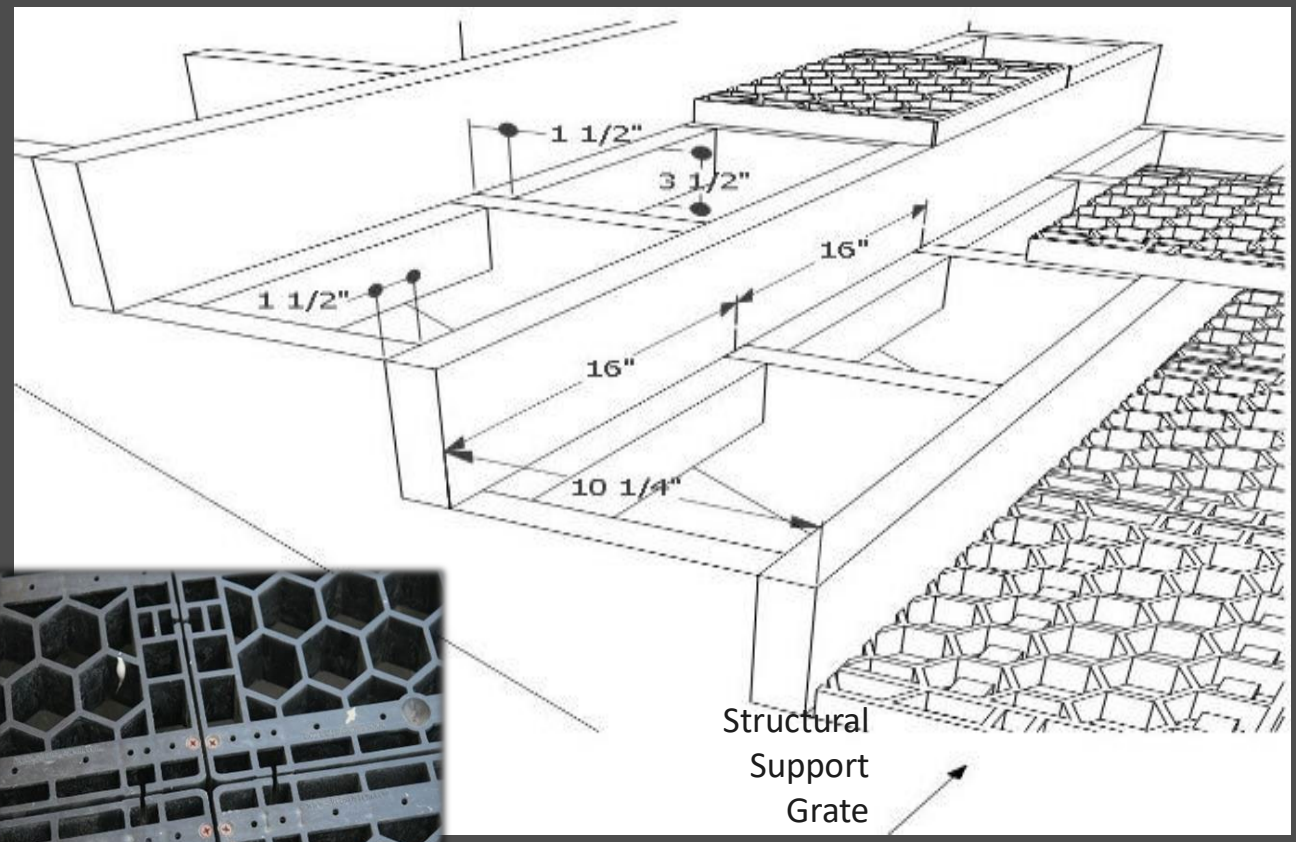


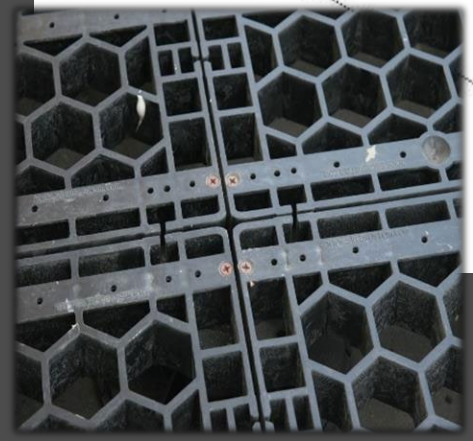



Installation on Stairs

When installing the engineered polymer grates on steps, ensure that the tread and riser spacing is correct. Stringers should be positioned 16” 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 grates should be installed with the support straps up to provide more surface for adhesive. This can be used for steps as well as the body of the main deck.





Adhesive on Stairs, Borders, and Surface

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
- Non 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), 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″ 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 50ºF is required.

Stair Finish with pavers

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 a 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.

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”, 1/32”, or 1/64” 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 our system. Please refer to installation methods for recommended installation.

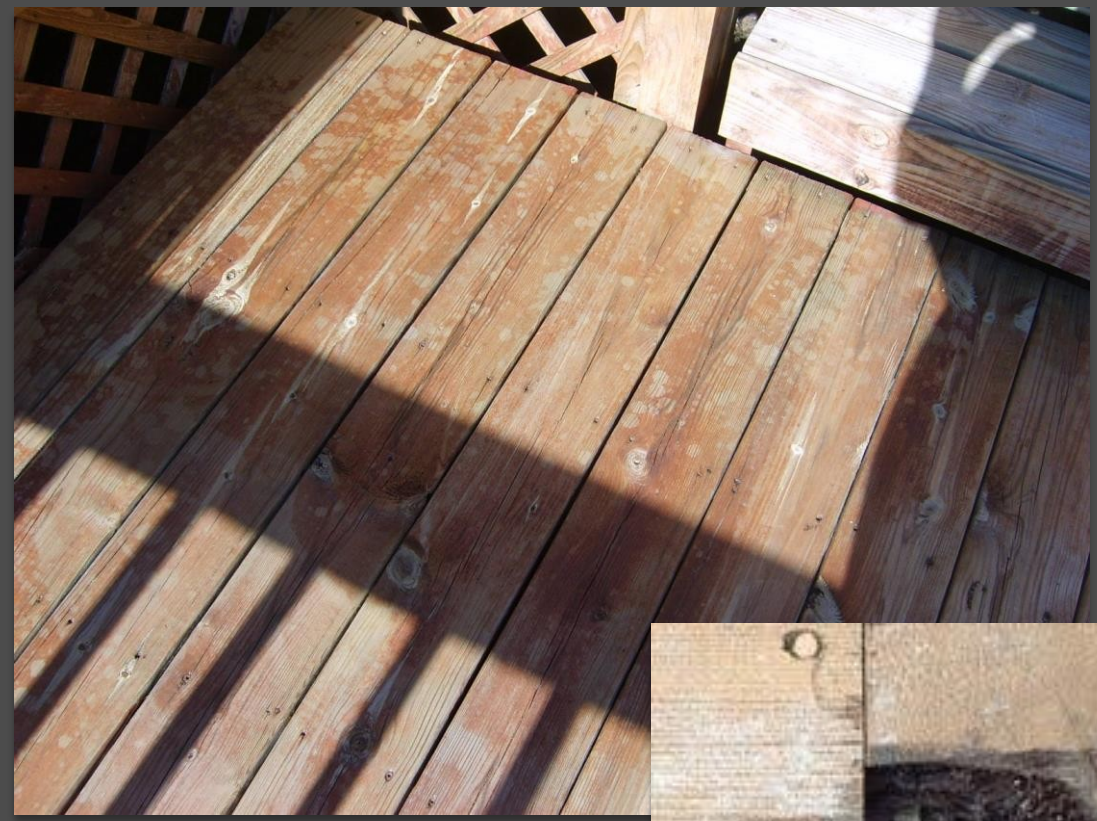
Overview So Far

- Your deck must be flat. If you run a straight-edge or long level over the joists there should be no rocking.
- If you are using polymeric sand with recycled rubber underlayment or a geotextile, your deck should be pitched, a standard slope is ¼” per 12’. The use of polymeric 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 grate is designed to flex. There will be flex, which will be reduced as you install pavers to the top of our system.
- There are differing methods for installing various types of pavers on the system (i.e. natural stone installation is different from installing porcelain pavers).
- Our recommended method for installing porcelain pavers uses recycled rubber underlayment.

Remodeling an Existing Deck

To avoid 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: structural members that are close to the ground, and any parts of the deck that are near gutter spouts.

Check for rot and probe around posts where they are in contact with the ground or sit on foundation blocks. 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. Any wood that's soft is rotting. 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 for damage to decking boards; they are easy to replace, but a new board is likely to stand out.



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. Decks take a lot of abuse: exposed to the harsh rays of the sun, driving rains, ice and snow; a deck can only take so much before it needs some repair. According to the North American Deck and Railing Association (NADRA), there are more than 40 million decks in the US 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.

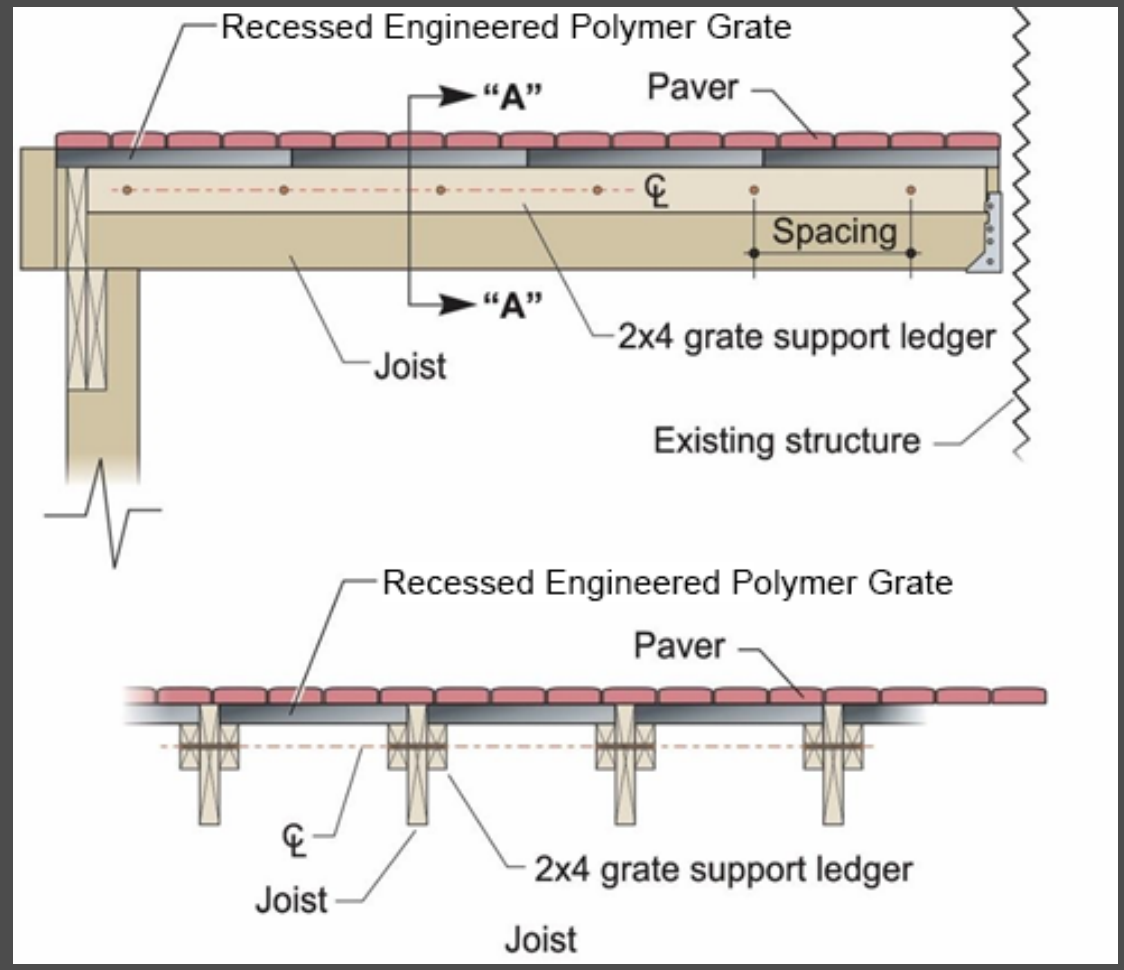
Complete the install by fastening the new member to the old one with stainless steel screws. It is recommended to protect joist hanger connections and the top of all framing members with synthetic butyl deck tape.

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.

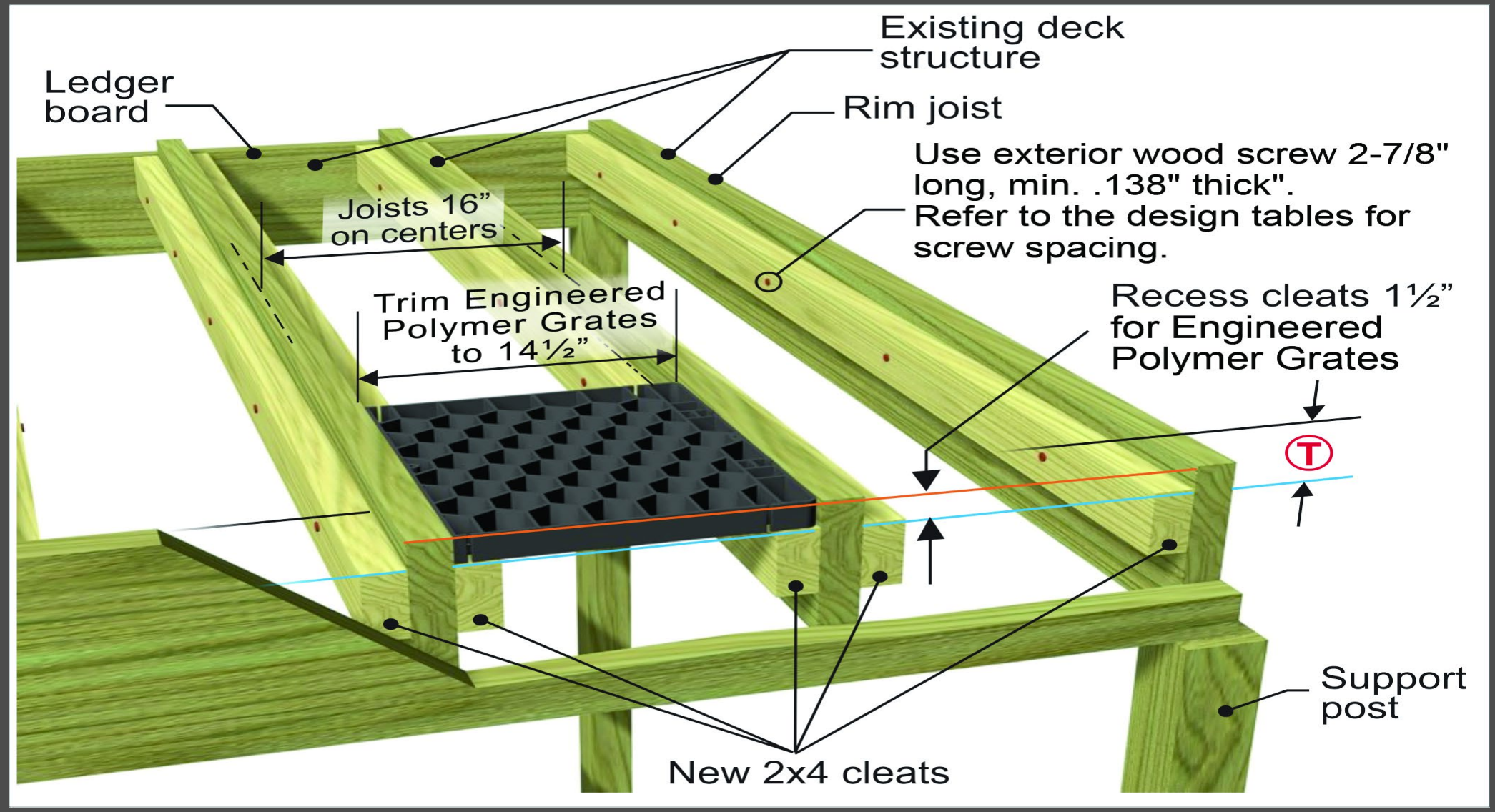
Support ledger attachment for retrofit applications

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 2⅞" 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.



Remodel installation of engineered polymer grates to accommodate door sills.



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 as it is not flexible and 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 are installed inside of the framing and therefore must be installed prior to adding the decking.

Wood railing posts are usually 4x4s, 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" 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.

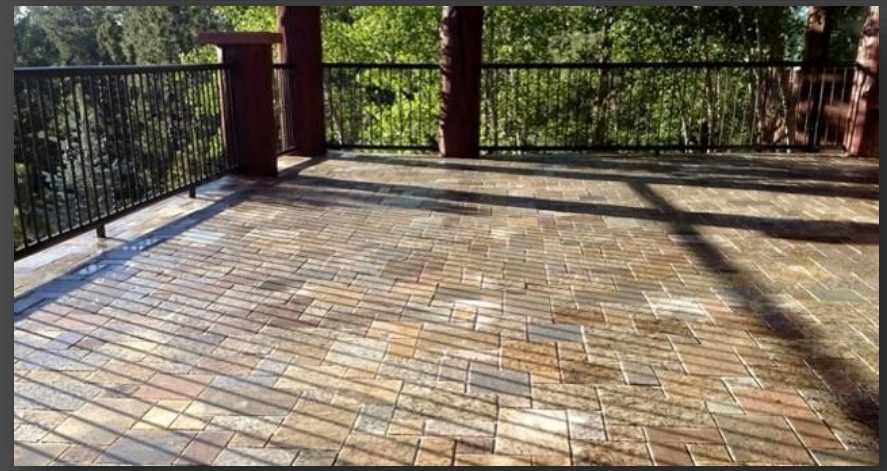
Installing Railing

There are two methods that can be used to install a railing system on the Engineered Polymer Support System.

The first 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. This can be difficult, and there may be some waste if the paver or stone breaks while being drilled.

The second 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.

All cut edges of grates should be supported with blocking.



Paver Installation: 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 overlap the fascia stone or board, or a fascia board can be used to contain the stone on the deck.

Paver Installation: Gauged, Clean-Cut Stone

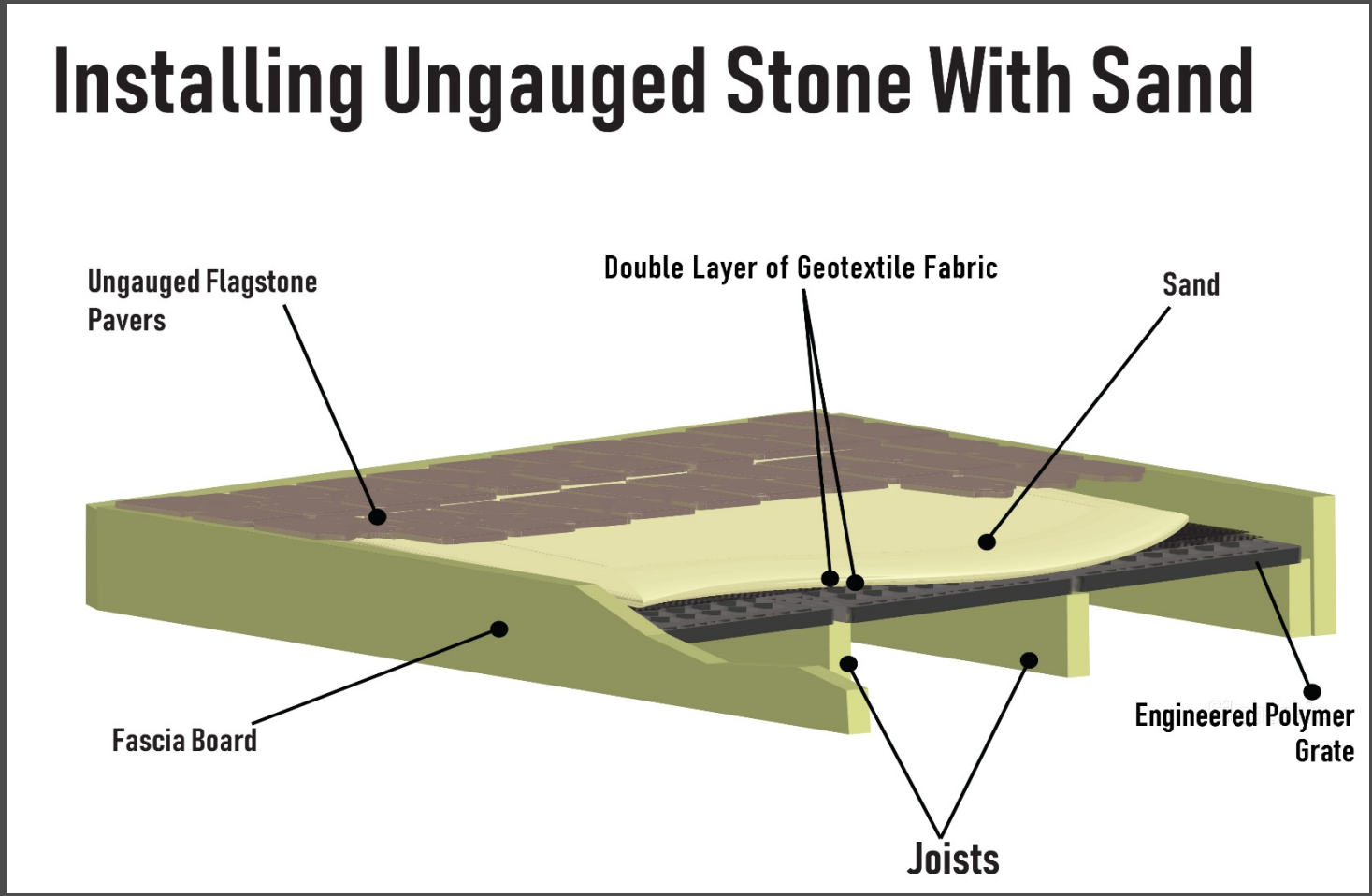
When installing gauged, clean-cut stone or pavers, it is not necessary to use a geotextile blanket or recycled rubber underlayment. The stone can be glued directly to the grate using an appropriate adhesive that is not caustic and remains flexible through a freeze-thaw cycle. The perimeter stones should be glued in place and the rest of the stone will remain in place by weight and friction, or all 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 places need to make contact to create a secure bond. The use of an adhesive with the features and benefits mentioned previously is recommended. This is the least intensive labor application.

Paver Installation: Installing Ungauged Stone

Ungauged stone installation is possible with the Engineered Polymer Support System! However, it is important to lay two layers of geotextile blanket 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. Because of 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”) underneath for tamping in order to achieve a more even surface.



Paver Installation: Porcelain Pavers

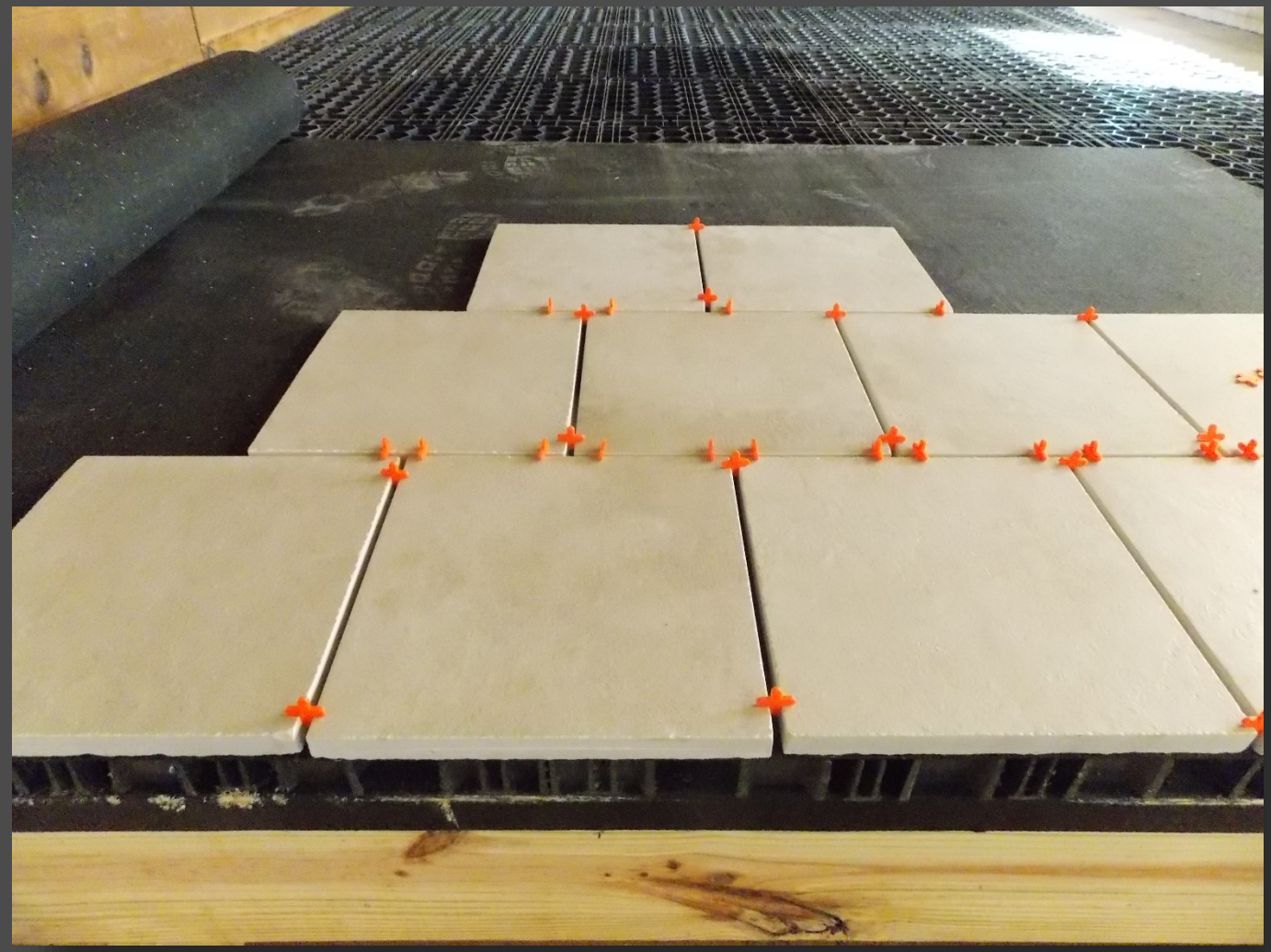
When installing porcelain pavers of any shape, the recommended method is to use a recycled rubber underlayment over the grate and then install the pavers. Geotextile/landscape blanket may also be used. When using geotextile, use spacers under each corner of the pavers. It is also recommended that the pavers be glued to the spacers and the spacers be glued to the blanket.

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 into place, but still allows for drainage. The polymeric sand will cover the tabs of the spacers, hiding them from sight. The use of a spacer will help to reduce horizontal movement and deaden sound.

If the suggested 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.

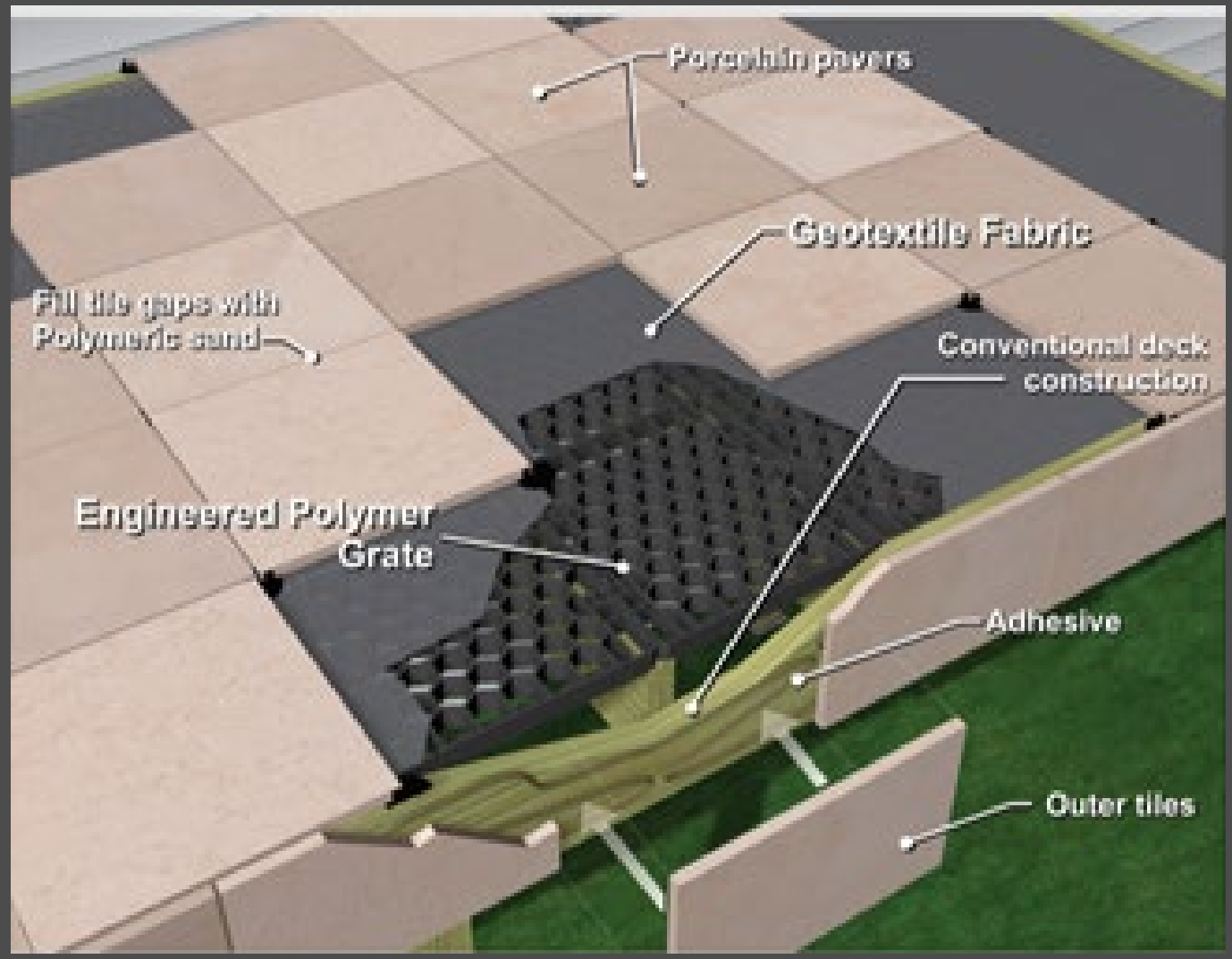


If sound ideadening s not an issue, geotextile can be used for installations with polymeric sand. When using geotextile, use spacers under each corner of the pavers. It is also recommended that the pavers be glued to the spacers and the spacers be glued to the geotextile.

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

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.

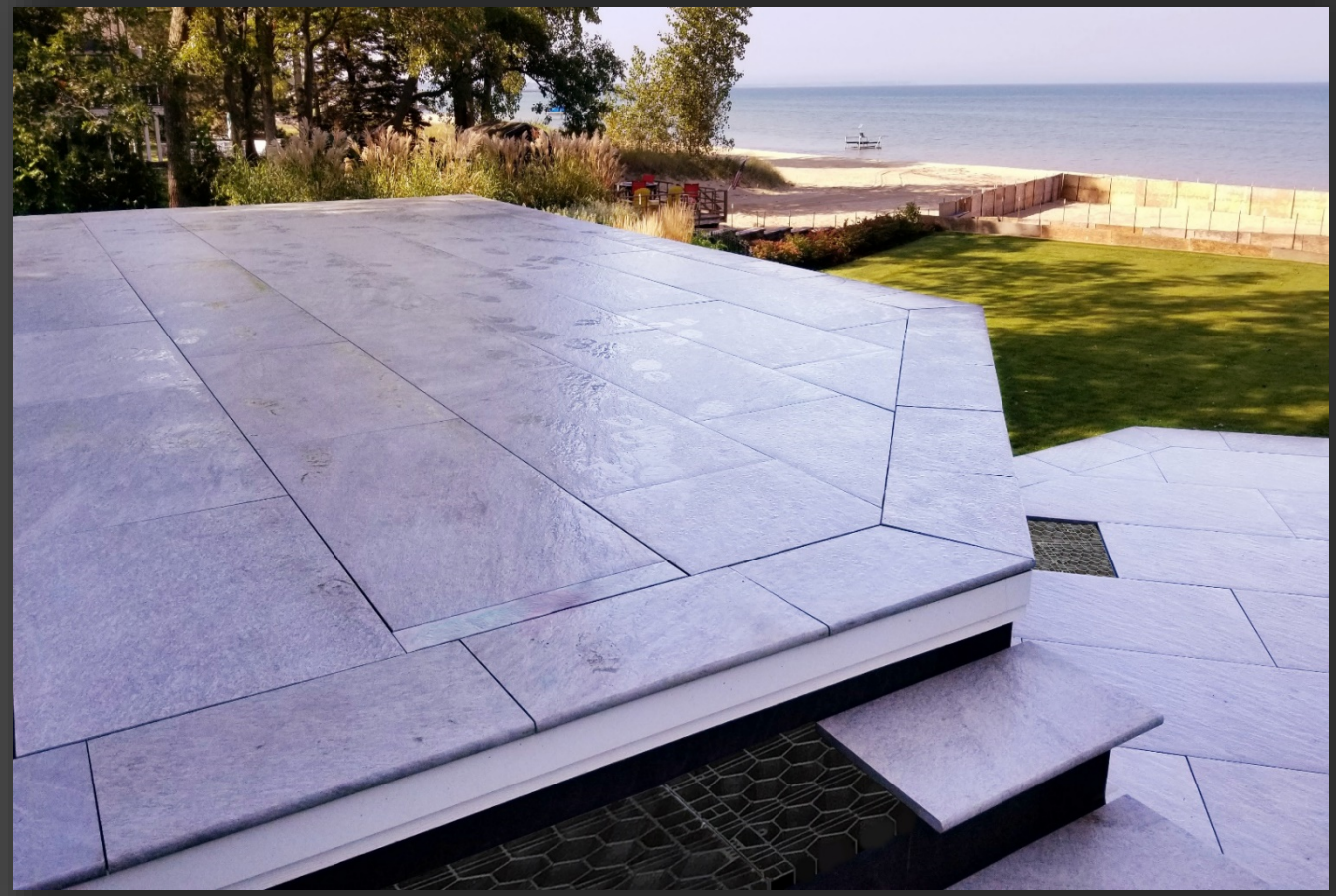
Polymeric sand has limited permeability. For more permeability, a #9 aggregate or granite chips and a joint stabilizer can be used, or a permeable joint filler can be used.



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 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.



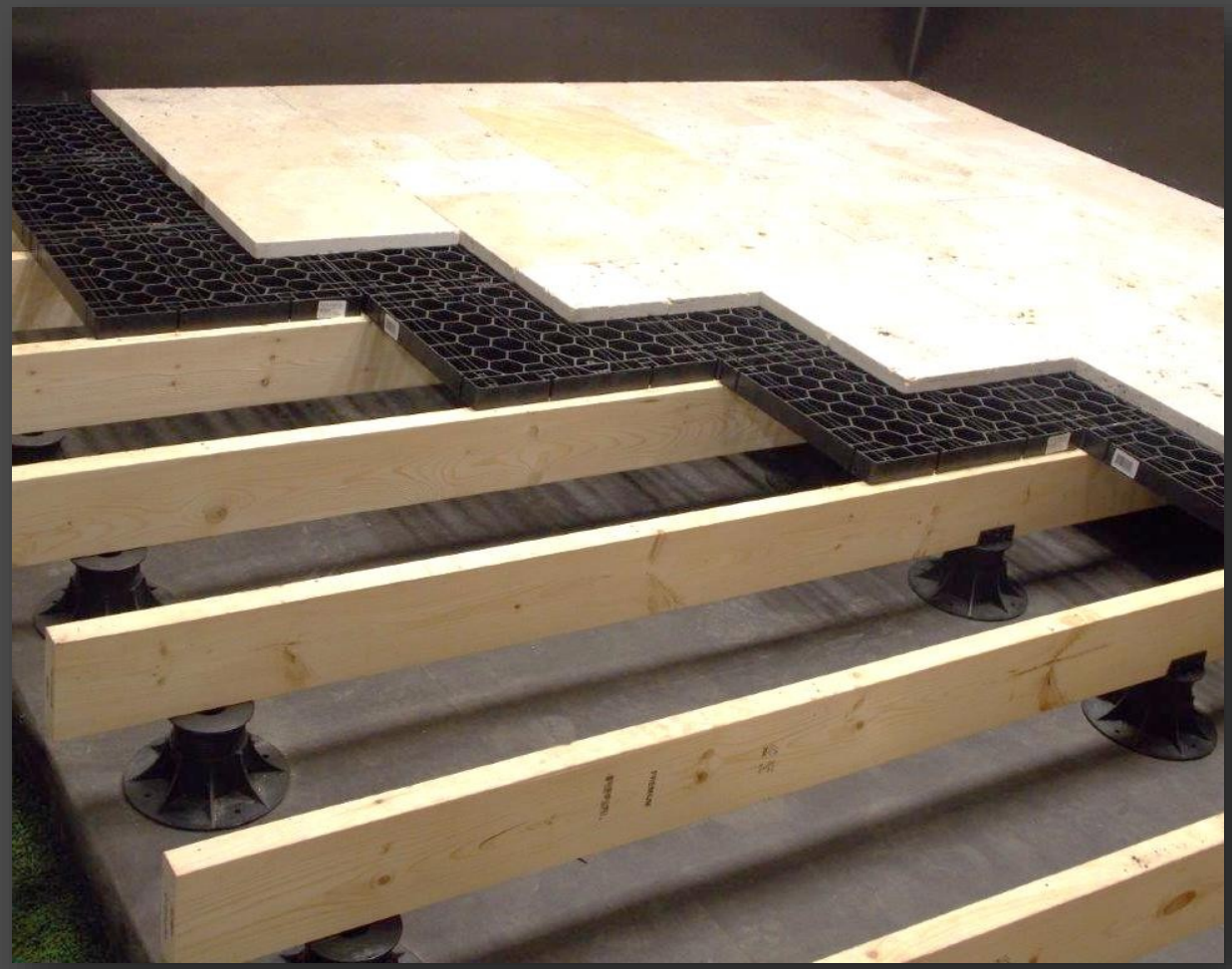
Porcelain pavers with paving brick accent strip on fascia and steps

Rooftop Installations

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

The first method involves the use of 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 grates to the joists is the same as with elevated decks. The use of a joist can reduce the number of pedestals required. The manufacturer has span information available for various types of joists.

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 the appropriate 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. In some cases, for instance, when using smaller pavers, 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 8mm recycled rubber underlayment is applied under the artificial turf. For the application of artificial turf, a pedestal in the center of the engineered polymer grate, as well as pedestals supporting the four corners, is required for the warranty to be honored when dimensional lumber or metal framing is not used. The uniform underlayment can be secured to the engineered polymer grates with adhesive, and the artificial turf secured with adhesive or a mechanical fastener.

Pictured here is a rooftop application featuring a beautiful 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.

Synthetic Turf Installation on Decks or Roof tops

Applications for artificial turf roof tops and decks:

Driving tees

Children’s play area

Washable pet area

Non-paver poolside lounge area

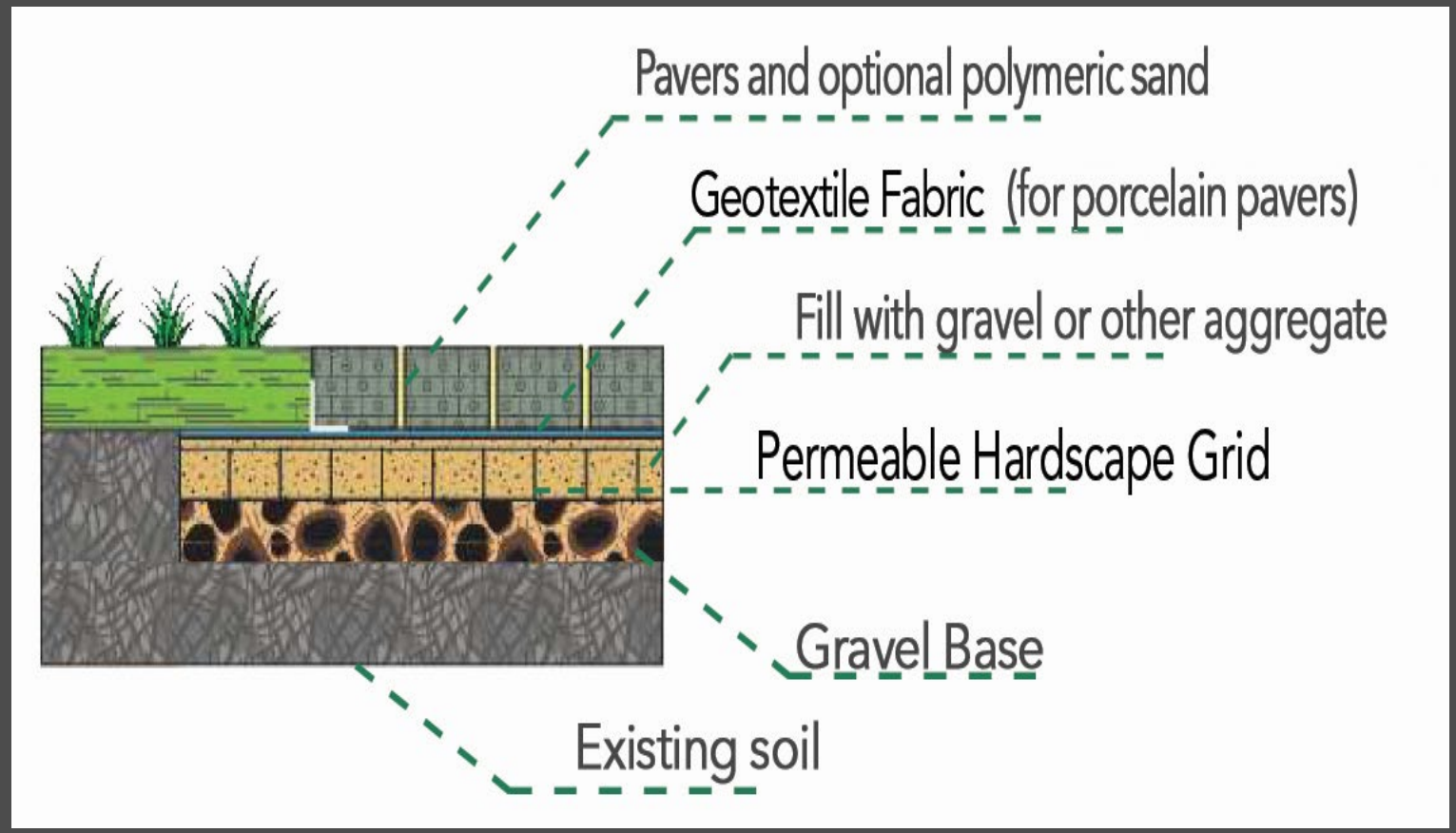
Hardscape Ground Installation

The Hardscape Soil Grid is suitable for paver installations with pedestrian or light vehicle traffic and is not recommended for installation with porcelain pavers.

Benefits:
- reduces base required by 50%
- creates a monolithic pad that reduces heaving and settling of pavers in hardscape applications.
- quick and easy installation

Hardscape Ground Installation

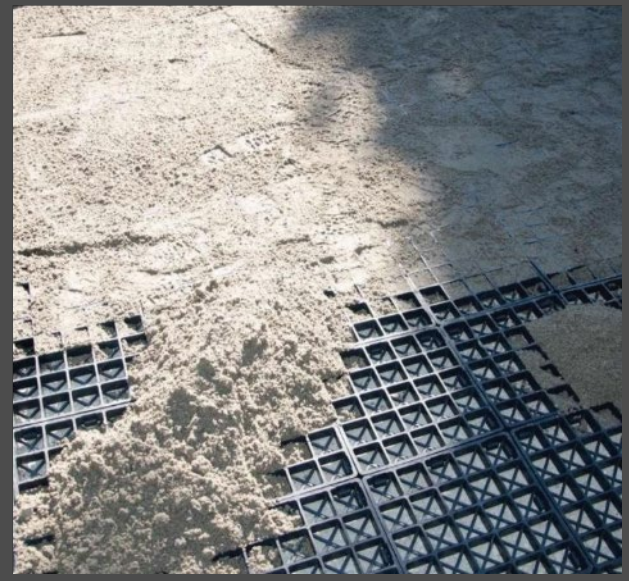
For a typical hardscape pathway installation, the area must be excavated and the leveling media set in place and compacted. A geotextile blanket (#3 minimum, #5 recommended) should be laid over the leveling media followed by the soil grid. Once the grids are in place the grid should be filled with #9 aggregate. Then 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 Grid

The hardscape grid locks together without the need for extra connectors. The hardscape grid is made from recycled polymer material.

The area should be excavated as usual, the leveling media laid and compacted, and 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

Engineered Polymer Support System Benefits for your customers

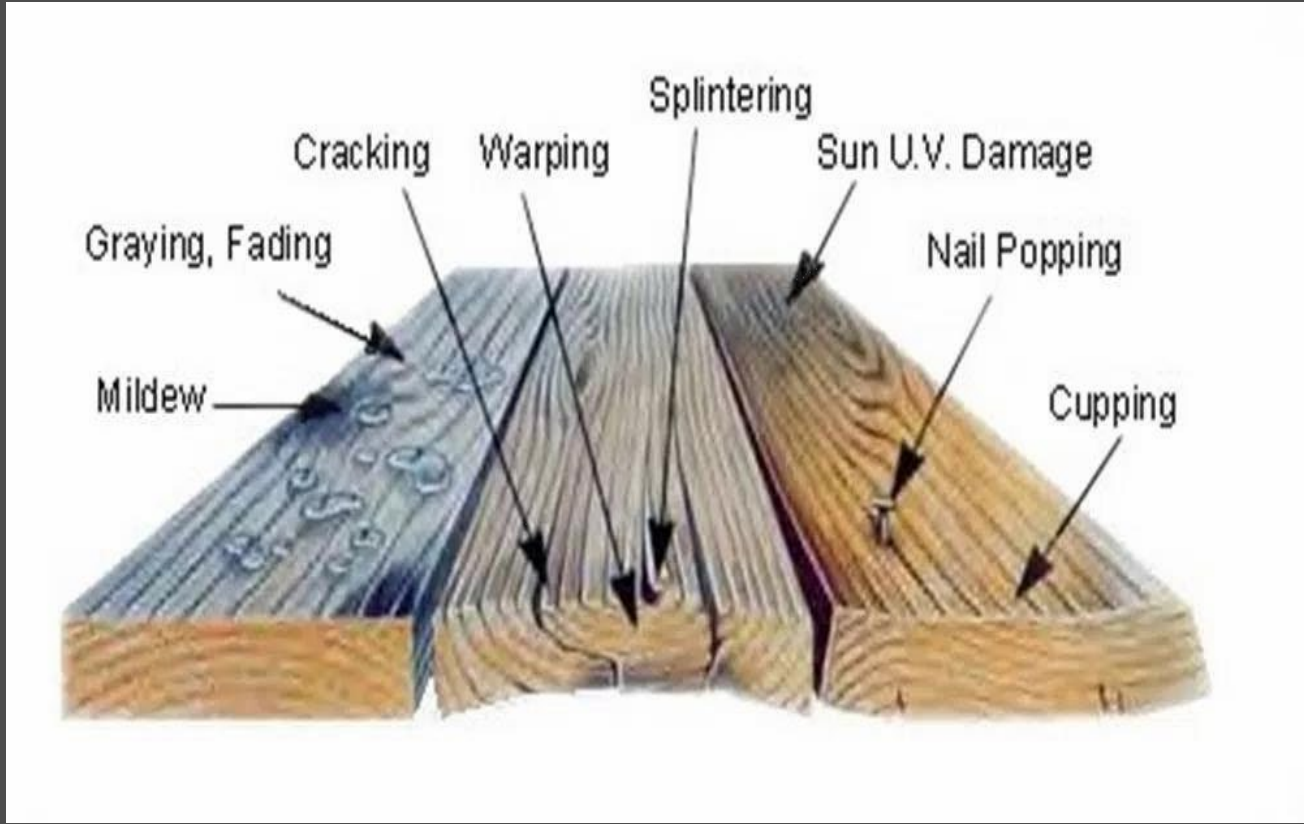
With the Engineered Polymer Support System:

- Your customer can get more for their money
- Your customer will have a low maintenance outdoor living space
- Your customer has hundreds of design options
- Your customer will like how quick 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 are not aware that putting stone or pavers on a deck is an option. While bidding jobs, you can upsell stone to your customer at a price similar to the cost of installing a composite or vinyl lumber deck.

Why Not Use Wood or Composite Materials?

There are drawbacks to using wood or composite materials that will be outlined. However, with the Engineered Polymer Support System there are hundreds of design options with low maintenance requirements.



https://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 void 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

Resources

- *StoneDeks / Engineered Polymer System*, n.d., http://stonedeks.com. Accessed March 2018
- *DeckIndustry.org*. Deck Industry Association, n.d., http://www.deckindustry.org. Accessed October 2017.
- *Decks.com*, n.d., https://www.decks.com. Accessed October 2017.
- *NADRA.org*. North American Deck and Railing Association, n.d., http://www.nadra.org. Accessed October 2017.
- Technical Drawings and Framing Tables available online at www.stonedeks.com

Stone and pavers are stunning materials for outdoor floors. They are natural, durable, and long lasting, and with good care, 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.

Thank you for taking the StoneDeks™ Training!
Welcome to the StoneDeck Revolution