SECTION 32 12 43g

POROUS FLEXIBLE PAVING

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\*\* NOTE TO SPECIFIER \*\* TRUEGRID Permeable Pavers; products.
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This section is based on the products of TRUEGRID Permeable Pavers, which is located at:
2500 Summer St. Unit 3225
Houston, TX 77007
Tel: 855-355-GRID
Email: [request info ()](http://admin.arcat.com/users.pl?action=UserEmail&company=TRUEGRID+Permeable+Pavers&coid=50338&rep=&fax=&message=RE:%20Spec%20Question%20(02795tru):%20%20&mf=)
Web: [www.truegridpaver.com](http://www.truegridpaver.com)
 [ [Click Here](http://www.arcat.com/arcatcos/cos50/arc50338.html) ] for additional information.
Like concrete and asphalt, permeable pavers are an extremely long-lasting and durable paving solution. Before they are filled with gravel, limestone or any of the many other compatible materials, they offer a strength of over 6800 PSI, allowing them to be driven on by heavy equipment during the installation process. Once filled, they offer compression strengths of over 8000 PSI, allowing them to handle even the heaviest commercial traffic, such as tractor trailers, forklifts or construction equipment, and standard automobile traffic at high volumes.
They require less maintenance than either concrete or asphalt, and are not vulnerable to cracking, sun exposure, frost, rain or erosion. Permeable pavers are far less labor-intensive to install, because they are lightweight and can cover a large area quickly. The grids can easily be moved into position by a single person, cut to fit, if necessary, then interlocked with adjoining grids. Afterward, heavy equipment can be used to dump and spread the fill material, then compress it into the permeable pavers. No special finishing equipment is required, and no sealants need to be applied.

1. GENERAL
	1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Base course, over sub-base prepared by others.
		2. Porous Pavers.
		3. Parking Delineators.
		4. Gravel fill.
		5. Grass fill.
	1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 31 20 00 - Earth Moving.
		2. Section 33 46 13.13 - Foundation Drainage Piping.
		3. Section 32 10 00 - Bases, Ballasts, and Paving.
		4. Section 32 30 00 - Site Improvements.
		5. Section 32 86 00 - Agricultural Irrigation.
		6. Section 32 92 13 - Hydro-Mulching.
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. AASHTO - Guide Manual for Condition Evaluation and Load and Resistance Factor Rating (LRFR) of Highway Bridges..
	1. SUBMITTALS
		1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
		2. Product Data: Manufacturer's data sheets on each product to be used, including:
			1. Preparation instructions and recommendations.
			2. Storage and handling requirements and recommendations.
			3. Installation methods.
		3. Shop Drawings: Submit manufacturer's shop drawings including laying pattern and parking delineators locations.

\*\* NOTE TO SPECIFIER \*\* Delete the following paragraphs if LEED is not applicable.

* + 1. LEED Submittals: Provide documentation of how the requirements of Credit will be met:
			1. List of proposed materials with recycled content. Indicate post-consumer recycled content and pre-consumer recycled content for each product having recycled content.
			2. Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content.
		2. Samples: Submit two square samples of Permeable Pavers Units product specified.
		3. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
		4. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic fertilizing and maintenance.
	1. QUALITY ASSURANCE
		1. Manufacturer Qualifications: Manufacturer with a minimum for five years documented experience with the products specified.
		2. Installer Qualifications: Installer experienced in performing work of this section that has specialized in installation of work similar to that required for this project. Installer must also be able to provide skilled workman with satisfactory record of performance on landscaping or paving projects of comparable size and quality.
		3. Pre-Installation Meetings:
			1. Convene a pre-installation meeting a minimum of two weeks prior to start of porous paving systems.
			2. Verify project requirements, subbase and base conditions, manufacturer's installation instructions and coordination with other related work.
			3. Require attendance of parties directly affecting work of this section, including the Contractor, Architect, engineer, and installer. Manufacturer's representative may attend by phone conference as needed.

\*\* NOTE TO SPECIFIER \*\* Include a mock-up if the project size and/or quality warrant taking such a precaution. The following is one example of how a mock-up on a large project might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the project.

* + 1. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
			1. Finish areas designated by Architect.
			2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
			3. Refinish mock-up area as required to produce acceptable work.
	1. DELIVERY, STORAGE, AND HANDLING
		1. Store products in manufacturer's unopened packaging until ready for installation.
		2. Protect porous paver units from damage during delivery and store under tarp when time from delivery to installation exceeds 30 days.
		3. Protect materials during handling and installation to prevent damage.
	2. SEQUENCING
		1. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.
	3. PROJECT CONDITIONS
		1. Maintain environmental conditions recommended by manufacturer for desired results. Do not install products under conditions outside manufacturer's absolute limits.
		2. Do not begin installation of porous pavements until all hard surface paving adjacent to porous pavement areas, including concrete walks and asphalt paving, is completed.
		3. Install turf when ambient air temperature is at least 55 degrees F.
		4. In wet weather, do not build on wet, saturated or muddy subgrade
		5. In cold weather, do not use frozen materials or materials coated with ice or frost, and do not build on frozen base or wet, saturated or muddy subgrade.
		6. Protect partially completed porous paving against damage from other construction traffic when work is in progress.
		7. Protect Grass Fill / Sodded paving areas from traffic until grass root system has matured for at least 3 to 4 weeks. Use barricades to only permit accessible by emergency and fire equipment
	4. WARRANTY
		1. Provide with the manufacture's 5 year limited warranty.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: TRUEGRID Permeable Pavers, which is located at: 2500 Summer St. Unit 3225; Houston, TX 77007; Tel: 855-355-GRID; Email: [request info ()](http://admin.arcat.com/users.pl?action=UserEmail&company=TRUEGRID+Permeable+Pavers&coid=50338&rep=&fax=&message=RE:%20Spec%20Question%20(02795tru):%20%20&mf=); Web: [www.truegridpaver.com](http://www.truegridpaver.com)

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
		2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

\*\* NOTE TO SPECIFIER \*\* Edit the following paragraphs as required and applicable to project requirements. Delete the paragraphs that are not applicable.

* 1. PRODUCTS
		1. Permeable Pavers, TRUEGRID ECO for grass or gravel applications.
			1. AASHTO H20, HS20 Rated.
			2. Manufactured in the USA.
			3. High density polyethylene (HDPE): 100 percent post-consumer recycled materials
			4. Recycled and recyclable content: 100 percent post-consumer recycled materials
			5. Color: black- carbon black additive for long term UV stabilization
			6. Paver size: 24 inches by 24 inches by 1 inch.
			7. Pre-assembled 4 foot by 4 foot sections
			8. Cylindrical cell design for column strength
			9. Cell size: 3.25 inch inside diameter
			10. Co-joined cells at 48 places for strength
			11. Wall thickness: 0.240 inch at 48 load bearing points per paver; 0.120 inch nominal
			12. Connections:
				1. No clips or stakes necessary
				2. No additional parts or tools needed
				3. Integral male-female three point locking system
				4. Wall thickness at tabs: 0.290 inch
			13. Molded in X-anchors to stabilize pavers: no stakes necessary
			14. S-Flexural joints molded in for soil seasonal expansion and contraction
			15. Nominal Coverage per Paver: 4 square feet
			16. Weight per paver: 2.55 lbs
			17. Permeability of System: 100 percent
			18. Compressive Strength (filled): 892,800 psf; 6200 psi
			19. Material Safety: ground water neutral, 100 percent inert
			20. Chemical Resistant: Excellent: highly resistant to hydrocarbons, oils
		2. Permeable Pavers, TRUEGRID PRO for grass or gravel applications.
			1. AASHTO H20, HS20 Rated.
			2. Manufactured in the USA.
			3. High density polyethylene (HDPE): 100 percent post-consumer recycled materials
			4. Recycled and recyclable content: 100 percent
			5. Color: black- carbon black additive for long term UV stabilization
			6. Paver size: 16 inches by 16 inches by 1.8 inches.
			7. Pre-assembled: 4 foot by 4 foot sections
			8. Cylindrical cell design for column strength
			9. Cell size: 3.25 inch inside diameter
			10. Co-joined cells at 16 places for strength
			11. Wall thickness: 0.150 inch nominal
			12. A minimum of 2 co-joined common walls per cell for structural integrity
			13. Connections:
				1. No clips or stakes necessary
				2. No additional parts or tools needed
				3. Integral male-female three point locking system
				4. Wall thickness at tabs: 0.290 inch
			14. Molded in X-anchors to stabilize pavers: no stakes necessary
			15. S-Flexural joints molded in for soil seasonal expansion and contraction
			16. Nominal Coverage per Paver: 4 square feet
			17. Weight per paver: 2.22 lbs
			18. Permeability of System: 100 percent
			19. Compressive Strength (filled): 1,152,000 psf; 8000 psi
			20. Material Safety: ground water neutral, 100 percent inert
			21. Chemical Resistant: Excellent: highly resistant to hydrocarbons, oils
		3. Permeable Pavers, TRUEGRID PRO PLUS for grass or gravel applications.
			1. AASHTO H20, HS20 Rated.
			2. Manufactured in the USA.
			3. High density polyethylene (HDPE): 100 percent post-consumer recycled materials
			4. Recycled and recyclable content: 100 percent
			5. Color: black- carbon black additive for long term UV stabilization
			6. Paver size: 24 inches by 24 inches by 1.8 inches.
			7. Pre-assembled: 4 foot by 4 foot sections
			8. Cylindrical cell design for column strength
			9. Cell size: 3.30 inch inside diameter
			10. Co-joined cells at 48 places for strength
			11. Wall thickness: 0.150 inch /.250 inch nominal
			12. A minimum of 2 co-joined common walls per cell for structural integrity
			13. Connections:
				1. No clips or stakes necessary
				2. No additional parts or tools needed
				3. Integral male-female three point locking system
				4. Wall thickness at tabs: 0.290 inch
			14. Molded in X-anchors to stabilize pavers: no stakes necessary
			15. S-Flexural joints molded in for soil seasonal expansion and contraction
			16. Nominal Coverage per Paver: 4 square feet
			17. Weight per paver: 5.25 lbs
			18. Permeability of System: 100 percent
			19. Compressive Strength (filled): 1,152,000 psf; 8000 psi
			20. Material Safety: ground water neutral, 100 percent inert
			21. Chemical Resistant: Excellent: highly resistant to hydrocarbons, oils
		4. Parking Delineators: TRUEGRID SuperSpot for grass or gravel applications.
			1. AASHTO H20, HS20 Rated.
			2. Domed and ribbed for super strength.
			3. Long term UV stabilized
			4. 0.90 inch profile above grid
			5. 3.25 inch diameter
		5. Base Course: TRUEGRID was developed to accept multiple acceptable base materials. Locally sourced angular stone/clean for base material. Crushed granite, sandy gravel material, crushed concrete, limestone rock, and crushed lava are some of the acceptable materials. Variations in permeability of aggregate should be:
			1. Conforming to the following sieve analysis and requirements:
				1. Percent Passing: 100 - Sieve Size: 3/4 - 1 inch
				2. Percent Passing: 85 - Sieve Size: 3/8 inch
				3. Percent Passing: 60 - Sieve Size: #4
				4. Percent Passing: 30 - Sieve Size: #40
				5. Percent Passing: < 3 - Sieve Size: #200
			2. Sources of the material may include "pit run" or "crusher run". Crusher run material will typically require sand to be added (20 to 30 percent by volume) for long term high porosity. Should local sources not be available an alternative mixture can be created by mixing 2/3 crushed stone (0.75 inch diameter) with 1/3 sand as available.
			3. Geo grid or Geo fabric may be required for soil stabilization between sub grade and base material. Consult with site engineer or TRUEGRID for specifics or recommendation.
		6. Gravel Fill: Obtain clean, washed angular rock to fill the 1.0 inch tall TRUEGRID ECO cells and spaces between. TRUEGRID can be filled to top of cells and exposed or overfilled to hide cells. Fill rock should be 1/2 inch to 3/4 inch diameter:
			1. TRUEGRID's design does not require anchors on level ground or slopes up to 10 degrees. TRUEGRID is designed for slopes above 10 degrees. However, as a precaution, anchors/staking may be considered per each sloped install above 10 degrees.
			2. Fill rock to top of cells for ADA compliance.
		7. Gravel Fill: Obtain clean, washed angular rock to fill the 1.8 inch tall TRUEGRID PRO cells and spaces between. TRUEGRID can be filled to top of cells and exposed or overfilled to hide cells. Fill rock should be 5/8 inch to 3/4 inch diameter:
			1. TRUEGRID's design does not require anchors on level ground or slopes up to 10 degrees. TRUEGRID is designed for slopes above 10 degrees. However, as a precaution, anchors/staking may be considered per each sloped install above 10 degrees.
			2. Fill rock to top of cells for ADA compliance.
		8. Gravel Fill: Obtain clean, washed angular rock to fill the 1.8 inch tall TRUEGRID PRO PLUS cells and spaces between. TRUEGRID can be filled to top of cells and exposed or overfilled to hide cells. Fill rock should be 5/8 inch to 3/4 inch diameter:
			1. TRUEGRID's design does not require anchors on level ground or slopes up to 10 degrees. TRUEGRID is designed for slopes above 10 degrees. However, as a precaution, anchors/staking may be considered per each sloped install above 10 degrees.
			2. Fill rock to top of cells for ADA compliance.

\*\* NOTE TO SPECIFIER \*\* The soil requirements of the grass variety selected for the project will dictate the selection of sandy loam or loam soil. Grass species resistant to wear by traffic generally include Zoysia, Fescue or Bermuda for southern climates and Blue Rye/ Fescue mix for northern climates. Check with local seed or sod sources for best results. Firelanes can use the same grass species as the surrounding turf. Parking or traffic applications require more wear resistance, best by seed or hydroseeding/ hydromulching.

* + 1. Grass Fill: A sandy loam or loam soil should be used to fill the empty grass paver cells. The selection of sandy loam or loam soil should be made based upon the soil requirements of the turf variety selected for the project. Other soils if compatible with type of seed or sod are acceptable.
1. EXECUTION
	1. EXAMINATION
		1. Before beginning installation, verify site conditions are as indicated on the drawings. Notify the Architect if site conditions are not acceptable. Do not begin preparation or installation until unacceptable conditions have been corrected.
		2. Ensure that adjacent hard-surfaced paving work is completed before installing porous pavement system.
	2. PREPARATION
		1. Subgrade:

\*\* NOTE TO SPECIFIER \*\* Coordinate paragraphs below with Section 31 20 00 - Earth Moving Earthwork. Proper subgrade preparation is required to enable the units to interlock properly and remain stationary after installation. Note that subgrade specified in Section 32 10 00 - Bases, Ballasts, and Paving should be compacted to 95 percent proctor density.

* + - 1. Prepare subgrade as specified in Section 32 10 00 - Bases, Ballasts, and Paving. Verify subgrade in accordance with porous paving system manufacturer's instructions.
			2. Excavate area allowing for unit thickness and the engineered base depth (where required).
			3. Provide adequate drainage from excavated area if area has potential to collect water, when working with in-place soils that have poor permeability.
			4. Ensure in-place soil is relatively dry and free from standing water.
			5. Uniformly grade base.
			6. Level and clear base of large objects, such as rocks and pieces of wood.
		1. Base Preparation:

\*\* NOTE TO SPECIFIER \*\* Coordinate paragraphs below with base installation provided by others. Delete subdrain paragraph if not applicable. The strength of the porous paver system is determined, in part, by the support provided by the engineered base. Consult TrueGrid for engineered base details and thickness recommendations.

* + - 1. Install Base as specified in Section 32 10 00 - Bases, Ballasts, and Paving. Verify engineered base is installed in accordance with porous paving system manufacturer's instructions.
			2. Coordinate base installation and preparation with subdrains specified in Section 33 46 13.13 - Foundation Drainage Piping.
			3. If required, place a geotextile separation layer between the natural ground and the ' engineered base.
			4. Place base course material over prepared sub base to grades indicated on the Drawings or from manufacturer's recommended depths per application type.
			5. Place in lifts not to exceed 4 inches, compacting each lift separately to 95 percent Modified Proctor for non-open grade material. Open grade base material to be leveled and heavily compacted in 4 inch lifts to settle and lock in angular stone.
			6. Leave minimum 1.8 inch for Permeable Paver unit for final elevation.
	1. INSTALLATION
		1. Install in accordance with manufacturer's instructions.

\*\* NOTE TO SPECIFIER \*\* Select one of the following three paragraphs to match the TRUEGRID product specified and delete those that are not applicable.

* + 1. Install TRUEGRID ECO Permeable Paver units by placing cells face up. Sheets are preassembled in 4 foot by 4 foot sheets are connected with friction fit interlocking connectors. No tooling are required to connect or disconnect units. Sheets may be separated into 4 Individual 24 inch by 24 inch pieces and reconfigured as needed. Cut units around curves and organic shapes with an electrical handsaw. Place units to maintain a 1 inch clearance to any pre-installed object or surface structure. Top of cells shall be between 0.25 inch to 0.5 inch below the surface of adjacent hard-surface pavements.
		2. Install TRUEGRID PRO Permeable Paver units by placing cells face up. Sheets are preassembled in 4 foot by 4 foot sheets are connected with friction fit interlocking connectors. No tooling are required to connect or disconnect units. Sheets may be separated into 9 Individual 16 inch by 16 inch pieces and reconfigured as needed. Cut units around curves and organic shapes with an electrical handsaw. Place units to maintain a 1 inch clearance to any pre-installed object or surface structure. Top of cells shall be between 0.25 inch to 0.5 inch below the surface of adjacent hard-surface pavements.
		3. Install TRUEGRID PRO PLUS Permeable Paver units by placing cells face up. Sheets are preassembled in 4 foot by 4 foot sheets are connected with friction fit interlocking connectors. No tooling are required to connect or disconnect units. Sheets may be separated into 4 Individual 24 inch by 24 inch pieces and reconfigured as needed. Cut units around curves and organic shapes with an electrical handsaw. Place units to maintain a 1 inch clearance to any pre-installed object or surface structure. Top of cells shall be between 0.25 inch to 0.5 inch below the surface of adjacent hard-surface pavements.

\*\* NOTE TO SPECIFIER \*\* Edit the following three paragraphs to match the surfacing required and delete if not applicable.

* + 1. Gravel Surfacing: Install Gravel into TRUEGRID cavities by back dumping directly from dump truck or from buckets mounted to tractors. Hand shoveling fill gravel into the cells is also acceptable for smaller jobs.
			1. Direct vehicles to exit the site by driving forward. Avoid sharp turns over unfilled rings.
			2. Spread gravel fill using steer loaders, power brooms, blades, flat bottomed shovels, and/or wide "asphalt rakes" to fill the cells.
			3. Compact gravel when the cells are at capacity with a roller for larger areas or vibrating plate for smaller areas.
			4. If fully covering TRUEGRID cells, typical coverage is 0.25 inch to 0.5 inch above cells.
		2. Hydro Seeding/Hydro-Mulch Surfacing: Provide and place as specified in Section 32 92 13 - Hydro-Mulching. Homogeneously mix a combination of water, seed and fertilizer in a truck mounted tank. Spray the seed mixture onto the site at specification rates. Coverage should be uniform and complete. Following germination of the seed, areas lacking germination larger than 8 inches by 8 inches must be reseeded immediately. Seeded areas must be fertilized and kept moist during development of the turf.
		3. Sod: Provide and place as specified in Section 32 92 13 - Hydro-Mulching. Use 0.5 inch thick (soil thickness) rolled sod from a reputable grower. Species should be wear resistant, free from disease, and in excellent condition.
	1. PROTECTION
		1. Protect installed products until completion of project.
		2. Gravel fill: Avoid sharp turns or "jack knifes" in trailered vehicles when cells are empty. Damage due to buckling can occur. TRUEGRID can be driven on pre-fill by gravel trucks and construction equipment to speed the installation process.
		3. Grass Fill / Seeded: Protect seeded areas from any traffic, other than emergency vehicles, for a period of 4 to 6 weeks, or until the grass is mature to handle traffic. Avoid sharp turns or "jack knifes" in trailered vehicles when cells are empty. Damage due to buckling can occur.
		4. Grass Fill / Sodded: Sodded areas must be protected from any traffic, other than emergency vehicles, for a period of 3 to 4 weeks, or until root system has been established.
		5. Dumpster areas: Permeable pavers are not recommended in areas under and directly around dumpsters. A concrete pad is recommended for these areas due to the drop and drag action.
		6. Repair or replace damaged products before Substantial Completion.
	2. MAINTENANCE

\*\* NOTE TO SPECIFIER \*\* Edit the following paragraphs for installed system(s). Coordinate with Section 32 92 13 - Hydro-Mulching

* + 1. For gravel fill surfaces, maintain a 0.5 in (13 mm) surcharge of aggregate as a surface wear course. Surface should be inspected from time to time to identify signs of slight cell infill loss.
		2. Maintain grass in accordance with manufacturer's instructions and as specified in Section 32 92 13 - Hydro-Mulching.
		3. Monitor pavement to ensure traffic frequency and loading does not exceed the pavement design.
		4. When snow removal is required, keep a metal edged plow blade from coming in contact with the surface during plowing operations to avoid causing damage to the units. Use a plow blade a minimum of 1 inch above the surface and with a flexible rubber edge or with skids on the lower outside corners so the plow blade does not come in contact with the units.

END OF SECTION