Geogrid Technical Guide

Explore our Geogrid Technical Guide to learn more about Titan geogrids for your next project.

Interested in learning more? Give us a call! We provide design assistance to help you spec the right geogrid for the right job.

TITAN

BUILD YOUR LEGEND

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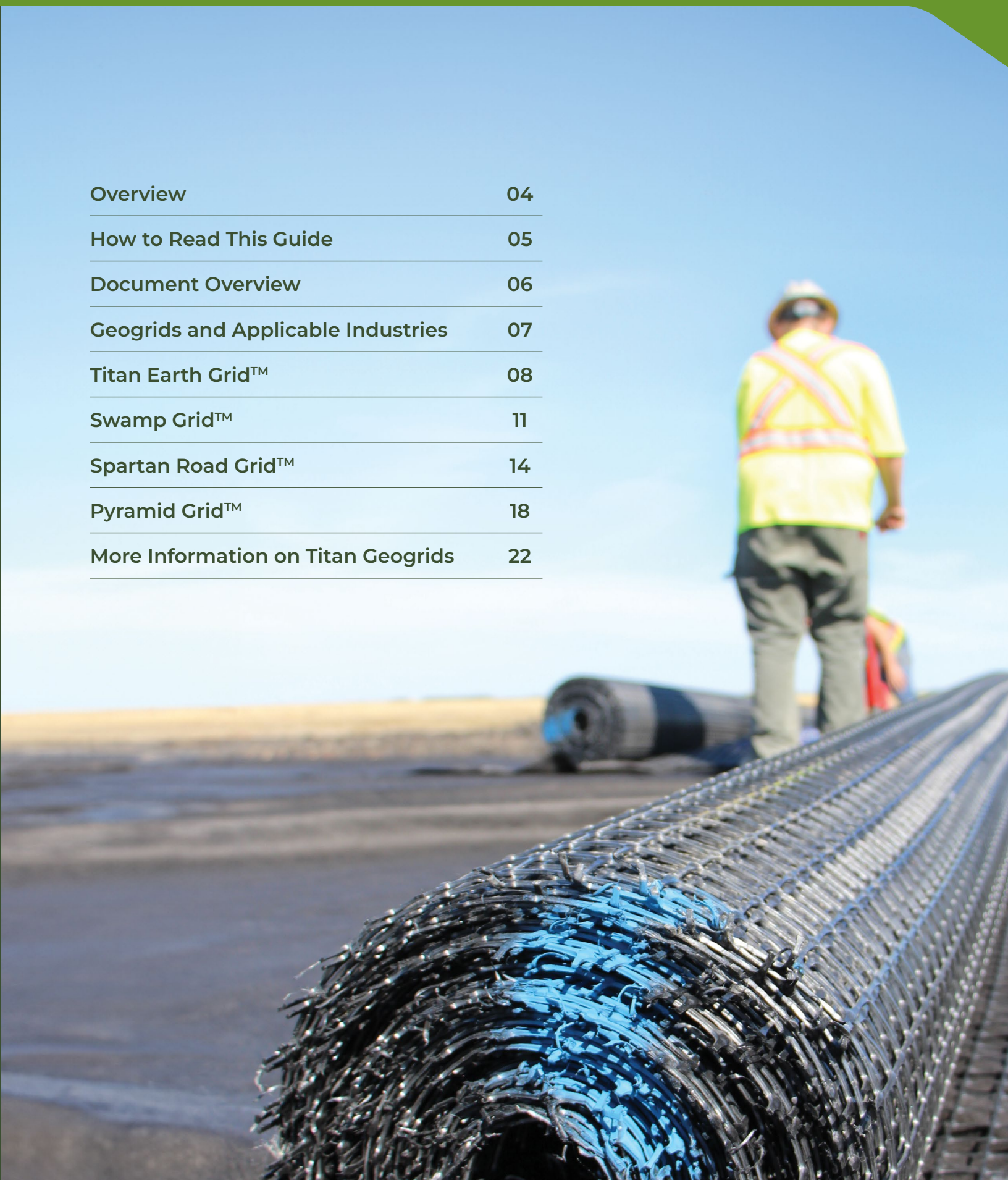


OVERVIEW

You're looking for new ways to bring innovation and quality to your design specifications while staying under budget. We understand the difference between geogrids is crucial for selecting the correct product for your projects. This guide is an all-encompassing resource designed to make your research process easier. Explore this guide to learn everything you need to know about Titan's geogrids for your next project.

HOW TO READ THIS GUIDE

Four of Titan's geogrid solutions are included in this guide:
Titan Earth Grid™, Swamp Grid™, Spartan Road Grid™, and Pyramid Grid™.
For each geogrid, we've compiled all the essential information you need to make an informed decision on your project specifications:

- **Appropriate applications**
- **Top product attributes**
- **Technical definitions**
- **Comprehensive specification data**

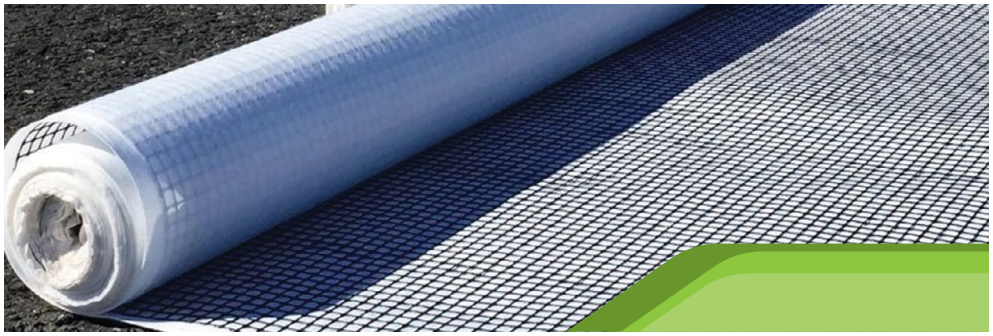
This guide is intended to provide engineers with an all-encompassing resource on Titan's core geogrids to make your job easier on current and future applications.

Want to speak with an expert? Request a consultation with one of our in-house technical experts to discuss your unique project needs and discover how Titan geogrids will address a wide variety of complex engineering challenges.

Geogrids Included in This Guide

TITAN EARTH GRID™

SWAMP GRID™



SPARTAN ROAD GRID™

PYRAMID GRID™

Applications & Industries

Titan geogrids have been engineered for civil infrastructure projects across many applications and industries.

APPLICATION	GEOGRID	PURPOSE
• Soft-subgrades • Base reinforcement • Railway ballasts • Mine haul rods • Parking lots • Foundation support • Oil platform access roads • Forestry and logging roads	**Titan Earth Grid™**	Designed to increase the bearing capacity and stabilization of low load bearing soils.
• Soft-saturated subgrades • Railway sub-ballasts • Oil platform access roads • Temporary military roads • Mine haul roads • Forestry and logging roads • Coastal roads, parking lots • Foundation support	**Swamp Grid™**	Designed as an all-in-one solution for soil reinforcement with added soil filtration, separation, and sub-base drainage performance.
• High traffic pavement • New highway construction, maintenance & repair • Airport runways, taxiways, roads, bridges, parking lots, etc.	**Spartan Road Grid™**	Designed as an interlayer for asphalt reinforcement to minimize reflective cracking, rutting, increase fatigue life and enhance pavement life and performance while helping to reduce project and maintenance costs.
• Retaining wall systems • Bridge abutments • Vegetated retaining walls • Steep reinforced slopes • Embankments on soft subgrades • Veneer reinforcement	**Pyramid Grid™**	Designed for soil reinforcement in applications such as retaining walls and steep slopes where soil strength develops uniaxially.

Titan Earth Grid™

Titan Earth Grid™ works to increase the bearing capacity and stabilization of low load bearing soils. It's designed specifically for soft soil.

Titan Earth Grid™ is a biaxial polypropylene (PP) geogrid and the better choice when compared to polyester or PP welded junction alternatives. We're happy to walk through a detailed product comparison with you. Simply give us a call!

Common applications where Titan Earth Grid™ is valuable:

- **Site subgrades**
- **Railway ballasts**
- **Oil platform access roads**
- **Temporary military roads**
- **Mine haul roads**
- **Forestry and logging roads**
- **Coastal roads**
- **Parking lots**
- **Under hydro-electric transmission line towers**
- **Foundation support**

TITAN EARTH GRID™ TOP ATTRIBUTES

Titan Earth Grid™ is an extruded polypropylene geogrid with high tensile stiffness. It is strong in many categories, including manufacturing and mechanical properties.

MANUFACTURING

MECHANICAL PROPERTIES

STRUCTURAL INTEGRITY

DURABILITY

For base reinforcement applications, when compared to polyester and other polypropylene geogrids, Titan Earth Grid™ excels in structural integrity and durability.

ALL PRODUCT SOLUTIONS ARE BACKED BY COMPREHENSIVE ENGINEERING AND SPECIALIZED TECHNICAL SUPPORT.

Using the latest in advanced design software, we work with engineers and consultants all over the world to provide free first-class customized pre-design support, helping to save time on infrastructure, site development and geotechnical projects.

Titan Earth Grid™ Technical Data

MECHANICAL PROPERTIES	
Tensile Strength	The resistance of the geogrid to deformation when it is elongated at a constant strain rate.
Aperture Size	Length and width of the geogrid opening measured at center of the rib.
Minimum Rib Thickness	Minimum thickness of the intersection ribs of the geogrid, excluding the junctions.
DURABILITY	
Resistance to Long-Term Degradation	Resistance of the geogrid to the loss in its Tensile Strength and structural integrity when subjected to chemically aggressive environments.
Resistance to UV Degradation	The resistance of the geogrid to loss in its Tensile Strength or structural integrity when subjected to ultraviolet light.
STRUCTURAL INTEGRITY	
Flexural Rigidity	The resistance of a geogrid strip against bending under its own gravity force. It is also called bending stiffness in mechanics.
Aperture Stability	The resistance of a geogrid against torque (rotational force around the test specimen center) within the geogrid plane.
Junction Efficiency	Junction efficiency is the ratio of the single junction strength to the single rib tensile strength. If the junction strength is equal to the strength of the single rib, the junction efficiency is 100%.
FABRICATION	
Material	Polypropylene
Manufacturing	Punched and drawing process

Titan Earth Grid™ Technical Data

Technical Data Breakdown

	Titan Earth Grid™ 2	Titan Earth Grid™ 15	Titan Earth Grid™ 16	Titan Earth Grid™ 20	Titan Earth Grid™ 24	Titan Earth Grid™ 30	Titan Earth Grid™ 40	Test Method
Material	Polypropylene	Polypropylene	Polypropylene	Polypropylene	Polypropylene	Polypropylene	Polypropylene	N/A
Manufacturing	Integrally formed, monolithic, biaxial geogrid	Integrally formed, monolithic, isotropic biaxial geogrid	Integrally formed, monolithic, isotropic biaxial geogrid	Integrally formed, monolithic, biaxial geogrid	Integrally formed, monolithic, isotropic biaxial geogrid	Integrally formed, monolithic, isotropic biaxial geogrid	Integrally formed, monolithic, isotropic biaxial geogrid	N/A
Carbon Black Content (Min.)	2%	2%	2%	2%	2%	2%	2%	ASTM D 4218
Ultimate Tensile Strength [1]	19.2 x 28.8 kN/m	15 x 15 kN/m	16 x 16 kN/m	20 x 20 kN/m	24 x 24 kN/m	30 x 30 kN/m	40 x 40 kN/m	ASTM D 6637
Tensile Strength at 2% Strain [1]	6.0 x 9.0 kN/m	5.5 x 5.5 kN/m	6.5 x 6.5 kN/m	8.0 x 8.0 kN/m	10.5 x 10.5 kN/m	12.0 x 12.0 kN/m	16.0 x 16.0 kN/m	ASTM D 6637
Tensile Strength at 5% Strain [1]	11.8 x 19.6 kN/m	11 x 11 kN/m	11.5 x 11.5 kN/m	14.0 x 14.0 kN/m	19.6 x 19.6 kN/m	22.0 x 22.0 kN/m	30.0 x 30.0 kN/m	ASTM D 6637
Junction Strength [1][3]	18.9 x 27.4 kN/m	14.2 x 14.2 kN/m	15.2 x 15.2 kN/m	19.0 x 19.0 kN/m	22.8 x 22.8 kN/m	28.5 x 28.5 kN/m	38 x 38 kN/m	GRI-GG2, ASTM D 7737
Flexural Rigidity [1]	800,000 mg-cm	325,000 mg-cm	350,000 mg-cm	750,000 mg-cm	1,000,000 mg-cm	2,000,000 mg-cm	3,500,000 mg-cm	ASTM D 7748
Aperture Stability [2][4]	0.65 m-N/deg	0.38 m-N/deg	0.39 m-N/deg	0.50 m-N/deg	0.65 m-N/deg	0.75 m-N/deg	0.9 m-N/deg	US. COE
Min. Rib Thickness	1.6 mm (MD), 1.2 mm (XD)	1.0 mm (MD), 0.8 mm (XD)	1.0 mm (MD), 0.9 mm (XD)	1.4 mm (MD), 1.0 mm (XD)	1.7 mm (MD), 1.3 mm (XD)	2.3 mm (MD), 1.5 mm (XD)	3.3 mm (MD), 2.0 mm (XD)	Callipered
Aperture Size [2][5]	25 mm (MD), 33 mm (XD)	35.5 mm	35.5 mm	35 mm	34 mm	38 mm	33 mm	Nominal
Junction Efficiency [1][3]	>95%	>95%	>95%	>95%	>95%	>95%	>95%	GRI-GG2, ASTM D 7737
UV Resistance	100%	100%	100%	100%	100%	100%	100%	ASTM D 4355
Typical Roll Dimension								
Roll Width	3.95 m	3.95 m	3.95 m	3.95 m	3.95 m	3.95 m	3.95 m	Minimum
Roll Length [4]	50 m	50 m	50 m	50 m	50 m	50 m	50 m	Minimum

NOTES:
(1) Minimum Average Roll Values (MARV). Calculated as (mean minus 2x standard deviation) as per ASTM-D4759-02.
(2) Average.
(3) Junction efficiency is defined as junction strength divided by multi-rib strength.
(4) Resistance to in plane rotational movement measured at an applied moment = 2m-N (20 kg-cm) in accordance with US Army Corps of Engineers methodology for the measurement of torsional rigidity.
(5) Aperture tolerance: within +/- 10% coefficient of variance.
(6) Custom length orders can be accommodated.

Swamp Grid™

Designed as an all-in-one solution, Swamp Grid™ offers soil reinforcement with added soil filtration, soil separation, and sub-base drainage performance. It's designed specifically for swampy and saturated soils.

Swamp Grid™ is a composite geogrid and the better choice when compared to strapwelded alternatives. We're happy to walk through a detailed product comparison with you. Simply give us a call!

Common applications where Swamp Grid™ is valuable:

- **Site developments**
- **Mine haul roads**
- **Oil platform access roads**
- **Temporary military roads**
- **Forestry and logging roads**
- **Coastal roads**
- **Rural roads**
- **Streets and highways**
- **Parking lots**
- **Overburden or waste rock**
- **Stock mile areas (mine sites)**

SWAMP GRID™ TOP ATTRIBUTES

Swamp Grid™ is a composite geogrid made of high stiffness biaxial polypropylene (PP) geogrid, heat bonded to a continuous filament nonwoven polyester geotextile that acts as a filter and soil separator. It is strong in many categories, including drainage, reinforcement, mechanical properties, and durability.

DRAINAGE

REINFORCEMENT

MECHANICAL PROPERTIES

DURABILITY

When compared to alternative, strap welded, extruded, and other geogrids, Swamp Grid™ excels in separation, filtration and product structure.

SEPARATION

FILTRATION

PRODUCT STRUCTURE

ALL PRODUCT SOLUTIONS ARE BACKED BY COMPREHENSIVE ENGINEERING AND SPECIALIZED TECHNICAL SUPPORT.

Using the latest in advanced design software, we work with engineers and consultants all over the world to provide free first-class customized pre-design support, helping to save time on infrastructure, site development and geotechnical projects.

Swamp Grid™ Technical Data

MECHANICAL PROPERTIES – GEOGRID COMPONENT	
Tensile Strength	The resistance of the geogrid to deformation when it is elongated at a constant strain rate.
Junction Efficiency	Junction efficiency is the ratio of the single junction strength to the single rib tensile strength. If the junction strength is equal to the strength of the single rib, the junction efficiency is 100%.
Flexural Rigidity	The resistance of a geogrid strip against bending under its own gravity force. It is also called bending stiffness in mechanics.
Aperture Stability	The resistance of a geogrid against torque (rotational force around the test specimen center) within the geogrid plane.
Aperture Size	Length and Width of the geogrid opening measured at center of the rib.
MECHANICAL & HYDRAULIC PROPERTIES – GEOTEXTILE COMPONENT	
Grab Strength	The max force mobilized when a geotextile specimen is partially gripped at the center portion of the two ends and elongated at a constant speed.
Trapezoidal Tear Strength	The resistance of a geotextile specimen against propagation of an initial crack (slit) within the geotextile specimen.
Apparent Opening Size	The apparent opening size is the equivalent diameter of round openings of a geotextile through which the largest soil particles can pass.
Flow Rate	The rate of the water flow within the plane of the geotextile.
FABRICATION	
Material	Polypropylene (PP) for the geogrid component and continuous filament Polyester (PET) for the nonwoven geotextile.
Manufacturing	Punched and drawn geogrid heat bonded to the nonwoven geotextile.

Swamp Grid™ Technical Data

Technical Data Breakdown

	Swamp Grid™ 20	Swamp Grid™ 30	Swamp Grid™ 40	Test Method
Material	Integrally formed polypropylene geogrid bonded to a 150gsm polyester continuous filament non woven geotextile	Integrally formed polypropylene geogrid bonded to a 150gsm polyester continuous filament non woven geotextile	Integrally formed polypropylene geogrid bonded to a 150gsm polyester continuous filament non woven geotextile	N/A
Manufacturing	Produced by punched and drawn process, having monolithic integral nodes, very high junction strength and flexural rigidity	Produced by punched and drawn process, having monolithic integral nodes, very high junction strength and flexural rigidity	Produced by punched and drawn process, having monolithic integral nodes, very high junction strength and flexural rigidity	N/A
Biaxial Geogrid				
Carbon Black Content	2%	2%	2%	ASTM D 4218
Ultimate Tensile Strength [1]	20 x 20 kN/m	30 x 30 kN/m	40 x 40 kN/m	ASTM D 6637
Tensile Strength at 2% Strain [1]	8 x 8 kN/m	12 x 12 kN/m	16 x 16 kN/m	ASTM D 6637
Tensile Strength at 5% Strain [1]	16 x 16 kN/m	22 x 22 kN/m	30 x 30 kN/m	ASTM D 6637
Junction Efficiency [2][3]	>95%	>95%	>95%	GRI-GG2, ASTM D 7737
Flexural Rigidity [1]	750,000 mg-cm	2,000,000 mg-cm	3,500,000 mg-cm	ASTM D 7748
Aperture Stability [2][4]	0.50 m-N/deg	0.75 m-N/deg	0.90 m-N/deg	US. COE
Min. Rib Thickness	1.4 mm (MD), 1.0 mm (XD)	2.3 mm (MD), 1.5 mm (XD)	3.3 mm (MD), 2.0 mm (XD)	Callipered
Aperture Size [2][5]	35 mm	38 mm	37 mm	Nominal
UV Resistance	100%	100%	100%	ASTM D 4355
Nonwoven Geotextile				
Grab Strength [1]	600 N	600 N	600 N	ASTM D 4632
Trapezoidal Tear [1]	250 N	250 N	250 N	ASTM D 4533
Flow Rate	5000 L/min/m²	5000 L/min/m²	5000 L/min/m²	ASTM D 4491
Apparent Opening Size, O_{95}	0.12 mm	0.12 mm	0.12 mm	ASTM D 4751
Mass Per Unit Area [2]	150 g/m²	150 g/m²	150 g/m²	ASTM D 5261
Typical Roll Dimensions				
Roll Width [6]	3.95 m	3.95 m	3.95 m	N/A
Roll Length [7]	50 m	50 m	50 m	N/A

NOTES:
(1) Minimum Average Roll Values (MARV). Calculated as (mean minus 2x standard deviation) as per ASTM-D4759-02.
(2) Average.
(3) Junction efficiency is defined as junction strength divided by multi-rib strength.
(4) Resistance to in plane rotational movement measured at an applied moment = 2m-N (20 kg-cm) in accordance with US Army Corps of Engineers methodology for the measurement of torsional rigidity.
(5) Aperture tolerance: within +/- 10% coefficient of variance.
(6) Custom roll width of 5.95m can be supplied for special orders.
(7) Custom length orders can be accommodated.

Spartan Road Grid™

Spartan Road Grid™ is a market leading asphalt reinforcing interlayer that boosts paved infrastructure performance and saves costly repairs.

Spartan Road Grid™ is a self-adhesive composite fiberglass geogrid and the better choice compared to polyester alternatives. We're happy to walk through a detailed product comparison with you. Simply give us a call!

Common applications where Spartan Road Grid™ is valuable:

- **Airport runways**
- **Taxiways**
- **Roads**
- **Bridges**
- **Parking lots**

SPARTAN ROAD GRID™ TOP ATTRIBUTES

Spartan Road Grid™ is a fiberglass geogrid with high modulus and is strong in many categories, including manufacturing and adhesion strength.

MANUFACTURING

ADHESION

THERMAL PROPERTIES

MECHANICAL PROPERTIES

When compared to alternative, polyester and other fiberglass geogrids, Spartan Road Grid™excels in thermal and mechanical properties.

ALL PRODUCT SOLUTIONS ARE BACKED BY COMPREHENSIVE ENGINEERING AND SPECIALIZED TECHNICAL SUPPORT.

Using the latest in advanced design software, we work with engineers and consultants all over the world to provide free first-class customized pre-design support, helping to save time on infrastructure, site development and geotechnical projects.

Spartan Road Grid™ Technical Data

MECHANICAL PROPERTIES	
Tensile Strength	The resistance of the geogrid to deformation when it is elongated at a constant strain rate.
Aperture Size	Length and width of the geogrid opening measured at center of the rib.
Secant Stiffness	Measurement of geogrid material's elasticity, obtained from the load displacement curve.
Strain at Ultimate	The deformation of the geogrid reached the ultimate tensile strength.
THERMAL PROPERTIES	
Melting Point	Melting Point (Coating): The point where the coating material of the geogrid changes from a solid to liquid. Melting Point (Glass): The point where the glass fiber of the geogrid changes from a solid to liquid.
ADHESION	
Adhesion Strength	The interface strength between adhesive of the geogrid and substrate, characterized by the force required to pull the geogrid up from the surface that it is adhered to.
FABRICATION	
Material	Fiberglass
Manufacturing	Woven fiberglass grid with polymeric coating

Spartan Road Grid™ Technical Data

Fiberglass-Geogrid Composite

MECHANICAL PROPERTIES	
Tensile Strength	The resistance of the geogrid to deformation when it is elongated at a constant strain rate.
Aperture Size	Length and width of the geogrid opening measured at center of the rib.
Secant Stiffness	Measurement of geogrid material's elasticity, obtained from the load displacement curve.
Strain at Ultimate	The deformation of the geogrid reached at the ultimate tensile strength.
THERMAL PROPERTIES	
Melting Point	Melting Point (Coating): The point where the coating material of the geogrid changes from a solid to liquid. Melting Point (Glass): The point where the glass fiber of the geogrid changes from a solid to liquid.
ADHESION	
Asphalt Retention	The quantity of asphalt required to saturate the paving fabric component completely.
FABRICATION	
Material	Fiberglass for the geogrid component and polypropylene for the paving fabric (nonwoven geotextile component)
Manufacturing	Woven fiberglass grid with polymeric coating, bonded to a paving fabric

Spartan Road Grid™ Technical Data

Technical Data Breakdown

	Spartan Road Grid™ 10	Spartan Road Grid™ 10C	Spartan Road Grid™ 11	Spartan Road Grid™ 20	Test Method
Material	Fiberglass	Fiberglass	Fiberglass	Fiberglass	N/A
Manufacturing	Woven fibreglass geogrid	Woven fibreglass geogrid with polymeric coating bonded to a paving fabric	Woven fibreglass geogrid	Woven fibreglass geogrid	N/A
Geogrid Coating	Polymeric coating with pressure sensitive self-adhesive backing on one side	Polymeric coating bonded to a PP paving fabric	Polymeric coating with pressure sensitive self-adhesive backing on one side	Polymeric coating with pressure sensitive self-adhesive backing on one side	N/A
Ultimate Tensile Strength [1]	100 x 100 kN/m	100 x 100 kN/m	100 x 100 kN/m	100 x 200 kN/m	ASTM D 6637
Tensile Strength at 2% Strain [1]	80 x 80 kN/m	80 x 80 kN/m	80 x 80 kN/m	80 x 160 kN/m	ASTM D 6637
Secant Stiffness EA at 2% Strain	4000 x 4000 kN/m	4000 x 4000 kN/m	4000 x 4000 kN/m	4000 x 8000 kN/m	ASTM D 6637
Shrinkage Properties	Less than 0.5% at 200°C after 15 minutes	Less than 0.5% at 200°C after 15 minutes	Less than 0.5% at 200°C after 15 minutes	Less than 0.5% at 200°C after 15 minutes	Internal Test Method
Optimum Elasticity Modulus [2]	73,000 MPa	73,000 MPa	73,000 MPa	73,000 MPa	N/A
Coating Melting Point	>400°C	>400°C	>400°C	>400°C	ASTM D 276
Melting Point Glass	>820°C	>820°C	>820°C	>820°C	ASTM C 338
Strain at Ultimate [2]	<3%	<3%	<3%	<3%	ASTM D 6637
Asphalt Retention	N/A	1.35 L/m^2	N/A	N/A	ASTM D 6140
Aperture Size	12.7 mm	12.7 mm	25.4 mm	12.7 mm	Nominal
Mass/Unit Area [2]	420 g/m^2	570 g/m^2	420 g/m^2	610 g/m^2	ASTM D 5261
Extra Features	Pressure Sensitive Self Adhesive	Continuous Non-Deforming Water-Resistant Barrier	Pressure Sensitive Self Adhesive	Pressure Sensitive Self Adhesive	N/A
Adhesion Strength [3]	20lbs	N/A	20lbs	20lbs	N/A
Typical Roll Dimensions					
Roll Width [3]	1.5 m or 2.25 m	3.95 m	1.5 m or 2.25 m	1.5 m or 2.25 m	Minimum
Roll Length [3]	100 m or 75 m	50 m	100 m or 75 m	75 m	Minimum

NOTES:
(1) Minimum Average Roll Values (MARV). Calculated as (mean minus 2x standard deviation) as per ASTM-D4759-02.
(2) Mean.
(3) Typical - Standard roll lengths are shown; the products may be fabricated to custom lengths to suit the contractor's requirements.

Pyramid Grid™

Pyramid Grid™ is the most effective soil stabilization solution for structurally sound MSE retaining walls and steep slopes.

Pyramid Grid™ is a uniaxial polyester (PET) geogrid and the better choice when compared to polyethylene alternatives. We're happy to walk through a detailed product comparison with you. Simply give us a call!

Common applications where Pyramid Grid™ is valuable:

- **Retaining wall systems**
- **Bridge abutments**
- **Vegetated retaining walls**
- **Steep reinforced slopes**
- **Embankments on soft subgrades**
- **Landfill liner reinforcement**
- **Mining applications**
- **Veneer reinforcement for landfill capping**

PYRAMID GRID™ TOP ATTRIBUTES

Pyramid Grid™ is a high tenacity PVC coated polyester geogrid with low long term reduction factors. It is strong in many categories, including manufacturing, chemical resistance and creep reduced strength.

MANUFACTURING

CREEP REDUCED STRENGTH

CHEMICAL RESISTANCE

When compared to HDPE and other polyester geogrid alternatives, Pyramid Grid™ excels in mechanical properties, long term design strength, and durability.

MECHANICAL PROPERTIES

LONG TERM DESIGN STRENGTH

DURABILITY

ALL PRODUCT SOLUTIONS ARE BACKED BY COMPREHENSIVE ENGINEERING AND SPECIALIZED TECHNICAL SUPPORT.

Using the latest in advanced design software, we work with engineers and consultants all over the world to provide free first-class customized pre-design support, helping to save time on infrastructure, site development and geotechnical projects.

Pyramid Grid™ Technical Data

MECHANICAL PROPERTIES	
Tensile Strength	The resistance of the geogrid to deformation when it is elongated at a constant strain rate.
Aperture Size	Length and width of the geogrid opening measured at center of the rib.
Strain at Ultimate Strength	The deformation of the geogrid reached at the ultimate tensile strength.
LONG TERM PERFORMANCE	
LTDS (Long term design strength) as per National Concrete Masonry Association (NCMA) "Design Manual for Segmental Retaining Walls," Second Edition – 2002 or T_{al} (long term material strength) as per Federal Highways Administration (FHWA-NHI-00-043) – 2011 "Mechanical Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines" is calculated as follows: **LTDS is calculated for 120 years of design life.** **LTDS or $T_{al} = \left(\frac{T_{ult}}{RF_{ID} \times RF_{CR} \times RF_{d}}\right)$** **$RF_{CR}$ = Reduction Factor due to creep (1.46)** **RF_{ID} = Reduction Factor due to Installation damage (This number varies with the type of back fill used.)** • **RF_{ID} (sand, silt, and clay) = 1.05** • **RF_{ID} (Concrete Sand) = 1.06 - 1.08** • **RF_{ID} Granular B, Type I = 1.20** • **RF_{ID} Granular B, Type II = 1.12** **RF_{D} = Reduction Factor due to durability (1.1)** **T_{ult} = MARV value of the ultimate strength (ASTM D 6637) in the machine direction (MD)** Recommended minimum reduction factors are based on product-specific testing. Sometimes the Project Specifications and/ or design code requirements may require higher reduction factors.	The amount of Tensile strength remaining in the geogrid at the end of its service life, assuming it has spent its life in service. LTDS is calculated by taking the ultimate tensile strength of the geogrid and dividing it by the partial reduction factors.
FABRICATION	
Material	High tenacity polyester (PET) for the geogrid component and poly vinyl chloride (PVC) for the coating component
Manufacturing	Knitted PET geogrid with PVC coating

Pyramid Grid™ Technical Data

Technical Data Breakdown

	Pyramid Grid™ 50	Pyramid™ 60	Pyramid Grid™ 70	Pyramid Grid™ 80	Pyramid Grid™ 100
Material	Polyester	Polyester	Polyester	Polyester	Polyester
Manufacturing	Manufactured with high molecular weight, high tenacity polyester yarns using a precision knitting process, coated with PVC	Manufactured with high molecular weight, high tenacity polyester yarns using a precision knitting process, coated with PVC	Manufactured with high molecular weight, high tenacity polyester yarns using a precision knitting process, coated with PVC	Manufactured with high molecular weight, high tenacity polyester yarns using a precision knitting process, coated with PVC	Manufactured with high molecular weight, high tenacity polyester yarns using a precision knitting process, coated with PVC
Ultimate Tensile Strength MD [1]	50 kN/m	60 kN/m	70 kN/m	80 kN/m	100 kN/m
Tensile Strength at 5% Strain [1]	22 kN/m	25.5 kN/m	27 kN/m	33.20 kN/m	42.0 kN/m
Strain at Ultimate [2]	<13%	<13%	<13%	<13%	<13%
Creep Reduced Strength [1]	34.25 kN/m	41.10 kN/m	47.94 kN/m	54.80 kN/m	68.49 kN/m
Creep Reduction Factor	1.46	1.46	1.46	1.46	1.46
Installation Damage Reduction Factor	1.05	1.05	1.05	1.05	1.05
Durability Reduction Factor	1.1	1.1	1.1	1.1	1.1
Long Term Design Strength (Sand, silt and clay) for 120 years of design life [1][3]	29.65 kN/m	35.60 kN/m	41.52 kN/m	47.45 kN/m	59.31 kN/m
Molecular Weight (Min.)	31000 g/mol	31000 g/mol	31000 g/mol	31000 g/mol	31000 g/mol
Carboxyl End Group (CEG) Count Max	25 mMol/kg	25 mMol/kg	25 mMol/kg	25 mMol/kg	25 mMol/kg
Typical Roll Dimension					
Roll Width [4]	2.5 m/5.0 m	2.5 m/5.0 m	2.5 m/5.0 m	2.5 m/5.0 m	2.5 m/5.0 m
Roll Length [4]	50 m	50 m	50 m	50 m	50 m

NOTES:
(1) Minimum Average Roll Values (MARV). Calculated as (mean minus 2x standard deviation) as per ASTM-D4759-02.
(2) Average.
(3) LTDS or $T_{al} = T_{ult}$/(RF creep x RF installation damage x RF durability) for sand, silt and clay, soil $D_{max} \leq 25mm$, $D_{50} < 0.2mm$.
Reduction factor due to installation damage for other soil types available on request.
(4) Typical - Standard roll lengths are shown; the products may be fabricated to custom lengths to suit the contractor's requirements.

Pyramid Grid™ Technical Data

	Pyramid Grid™ 120	Pyramid Grid™ 150	Pyramid Grid™ 200	Pyramid Grid™ 250	Pyramid Grid™ 400	Test Method
Material	Polyester	Polyester	Polyester	Polyester	Polyester	N/A
Manufacturing	Manufactured with high molecular weight, high tenacity polyester yarns using a precision knitting process, coated with PVC	Manufactured with high molecular weight, high tenacity polyester yarns using a precision knitting process, coated with PVC	Manufactured with high molecular weight, high tenacity polyester yarns using a precision knitting process, coated with PVC	Manufactured with high molecular weight, high tenacity polyester yarns using a precision knitting process, coated with PVC	Manufactured with high molecular weight, high tenacity polyester yarns using a precision knitting process, coated with PVC	N/A
Ultimate Tensile Strength MD [1]	120 kN/m	150 kN/m	200 kN/m	250 kN/m	400 kN/m	ASTM D 6637
Tensile Strength at 5% Strain [1]	48 kN/m	51 kN/m	70 kN/m	85 kN/m	128.0 kN/m	ASTM D 6637
Strain at Ultimate [2]	<13%	<13%	<13%	<13%	<13%	ASTM D 6637
Creep Reduced Strength [1]	82.19 kN/m	102.73 kN/m	136.98 kN/m	171.23 kN/m	273.97 kN/m	ASTM D 6992
Creep Reduction Factor	1.46	1.46	1.46	1.46	1.46	ASTM D 6992
Installation Damage Reduction Factor	1.05	1.05	1.05	1.05	1.05	ASTM D 5818
Durability Reduction Factor	1.1	1.1	1.1	1.1	1.1	GRI-GG8, GRI-GG7
Long Term Design Strength (Sand, silt and clay) for 120years of design life [1][3]	71.17 kN/m	88.96 kN/m	118.61 kN/m	148.26 kN/m	237.20 kN/m	GRI-GG4(b)
Molecular Weight (Min.)	31000 g/mol	31000 g/mol	31000 g/mol	31000 g/mol	31000 g/mol	ASTM D4603, GRI-GG8
Carboxyl End Group (CEG) Count Max	25 mMol/kg	25 mMol/kg	25 mMol/kg	25 mMol/kg	25 mMol/kg	ASTM D 7409, GRI-GG7
Typical Roll Dimension						
Roll Width [4]	2.5 m/5.0 m	2.5 m/5.0 m	2.5 m/5.0 m	2.5 m/5.0 m	2.5 m/5.0 m	Minimum
Roll Length [4]	50.0 m	50.0 m	50.0 m	50.0 m	50.0 m	Minimum

NOTES:
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(2) Average.
(3) LTDS or $T_{al} = T_{ult}$/(RF creep x RF installation damage x RF durability) for sand, silt and clay, soil $D_{max} \leq 25$mm, $D_{50} < 0.2$mm.
Reduction factor due to installation damage for other soil types available on request.
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ABOUT TITAN ENVIRONMENTAL

High Performing Products Backed by Comprehensive Service

We offer geogrid solutions with comprehensive service giving you peace of mind that your site and investment are protected.

Product Supply

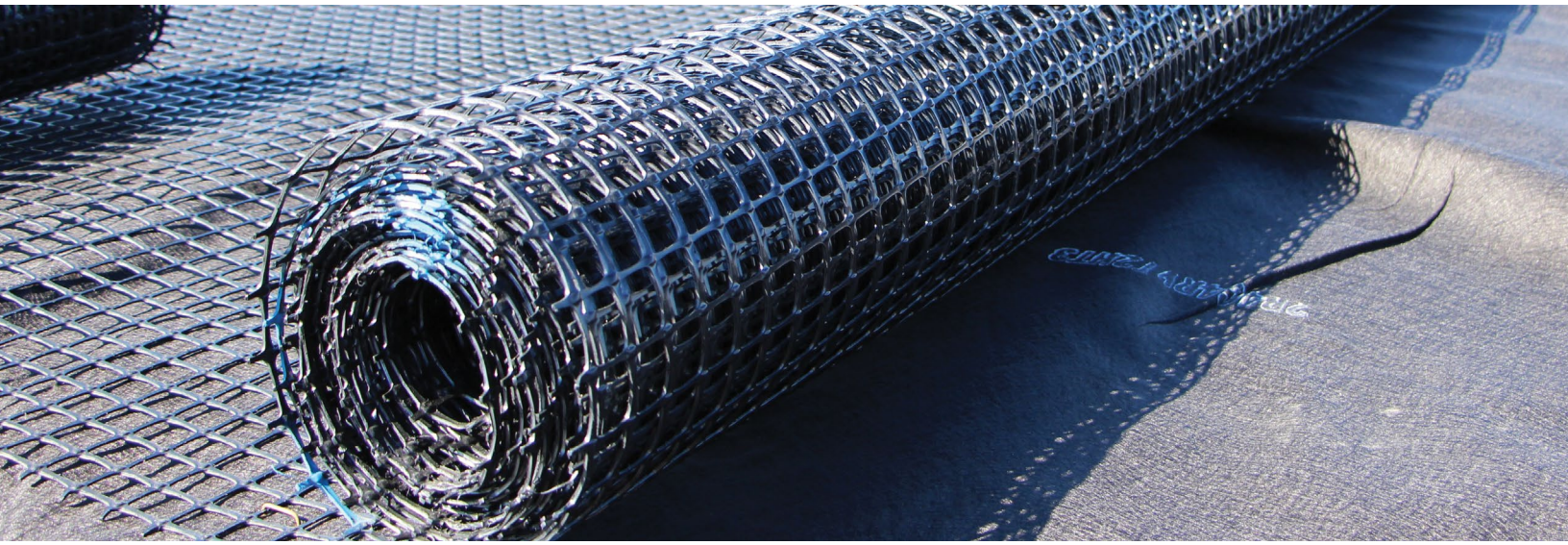
Geogrid products are available from all Titan locations. We provide competitive quotes for every component of your geogrid project.

Design Assistance

Site conditions can present unique design challenges. We know time isn't always on your side and you could use help with a design solution. We work closely with project owners and consultants to evaluate site specific problems and help you choose the best solution for your project.

Installation Support

Titan's supply and installation service is backed by a team of product specialists with extensive technical knowledge and expertise. When planning your project, you can count on our team to listen to your project needs, effectively answer your product questions, and provide you with sound technical support to help you select the right product for your project.



Geogrid Consultations

Want to speak with an expert? Request a consultation with one of our in-house technical experts to discuss your unique project needs and discover how Titan geogrids will address a wide variety of complex engineering challenges.

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