EDITION 5.0

OAKS LANDSCAPE PRODUCTS

Designer Resource Guide

SLABS | PAVERS | WALLS | SPECIALTY & ACCENT PRODUCTS

PLANNING | DESIGN | INSTALLATION | MAINTENANCE GUIDANCE FOR DESIGN PROFESSIONALS

Our Guarantee

Oaks Landscape Products are manufactured to the highest quality standards in a tightly controlled, fully monitored production environment. Oaks Landscape Products warrants the original property owner that the concrete product is free from material defects. Material found to be defective will be replaced without cost. Color matching cannot be guaranteed and replacement labor is not included. This assurance of quality is applicable where concrete products produced by Oaks Landscape Products are installed on the site and is subject to use under normal conditions.

LIMITATIONS & EXCLUSIONS

This Warranty does not apply to damage, deterioration or color change to the concrete products resulting from:

1. Installation of product inconsistent with the Interlocking Concrete Paving Institute (ICPI) or National Concrete Masonry Association (NCMA) guidelines intended for either residential or commercial use applications.
2. Breakage caused from transportation, handling, site design, overloading, impact or base/subgrade settlement.
3. Surface discoloration caused by staining, efflorescence, improper sealing, pollution, poor drainage or abrasion.
4. Fading from normal weathering.
5. Use of de-icing chemicals other than sodium chloride.

Paver: Hydr'eau Pave, Silversand

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We're Here To Help You By Understanding Your Needs...

As a manufacturer of landscape products, we get the opportunity to talk with many design professionals, be they architects, landscape architects, landscape designers, planners or engineers.

One common theme we're hearing in these conversations is that there are simply too many product choices and too much information circulating for any design pro to be an expert on all things. The common request that filters out of these conversations is: Can we, the manufacturer, provide product specific expertise and guidance on how to properly use the products we make?

Our answer is a resounding "Yes it's our pleasure to help"! This Designer Resources Guide, as well as our Continuing Education Offering, were developed to provide the design community with the most up-to-date and unbiased technical support available. While this Guide provides a high level summary of the design tools and resources available from Oaks, as well as identifies which Oaks products are best suited for different applications, our **Continuing Education Offering** focuses on innovative new topics such as:

1) **Finding Balance Between Place and Movement** using the *Woonerf Concept*

2) **Stabilized Backfill Creates All New Opportunities for Segmental Retaining Walls**

We want to be your **One Trusted Source** of not only a quality, versatile product range to the community, but also technical guidance and support.

We Have The Resources To Help You Every Step Of The Way!

PLANNING

- Oaks Design Resource Guide
- Comprehensive library of supporting documentation
- Examples of existing LID BMP projects
- Environmental Product Declarations

DESIGN/ EVALUATION

- ASCE, ICPI and NCMA Manuals & Software
- Capital & Life Cycle Costing Software
- ASTM site inspection protocols
- VESPA design software for retaining walls

SPECIFICATION TENDER

- CSA and ASTM Standards
- Sample Specifications, Patterns, CAD details
- Direct design assistance complete with stamped drawings
- PAT paver pattern files for use in AutoCAD

CONSTRUCTION

- Oaks Inspection Checklists
- ICPI/NCMA Contractor Certification Training
- NCMA Inspector Certification Training

MAINTENANCE

- Oaks Maintenance Guides
- Warranty
- CSA/ASTM Quality Compliance Reports

Product Technology & Quality

These advanced manufacturing technologies are used in select product lines to create a higher standard of material.

EliteFinish™

EliteFinish™ is an advanced manufacturing process that delivers richer, more vibrant color and a harder wearing, more durable and smoother textured surface.

The surface of our EliteFinish™ products is a specially engineered layer of finely-ground, durable aggregates combined with rich color and concentrated cement.
The paver foundation uses coarser stone to ensure long term performance in application. The resulting product delivers an enhanced finish and greater structural integrity.

Products with EliteFinish™:
Molina® 60mm, Market Paver, Molina® 80mm, Eterna

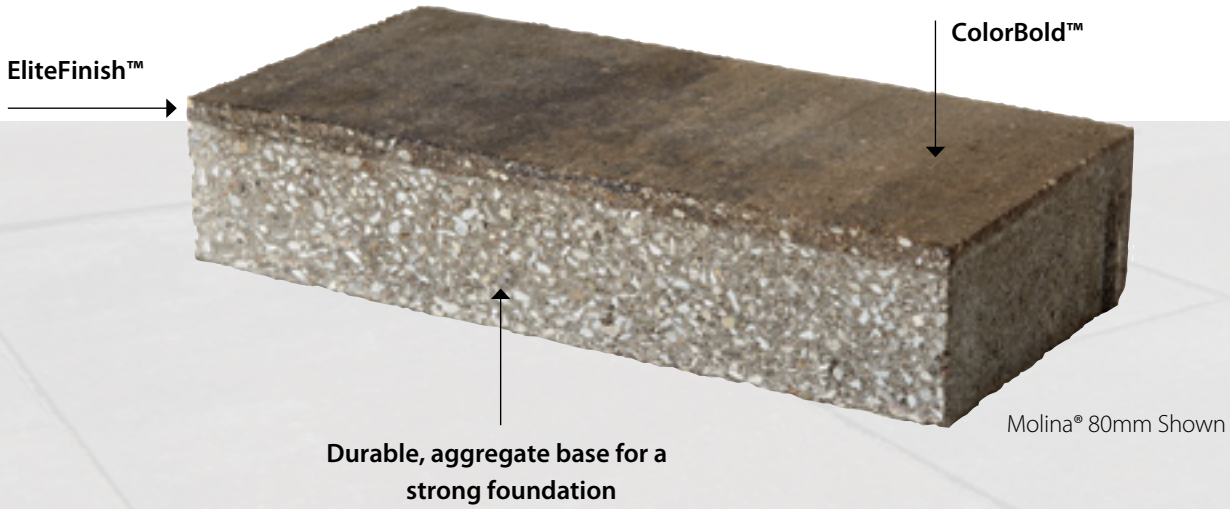
ColorBold™

ColorBold™ is an integral treatment employed during manufacturing that provides a new level of color longevity and stain resistance.

ColorBold™ is a proprietary process where supplemental ingredients penetrate the surface of the product to become an integral part of the unit. Enhanced color depth, extended color durability, improved resistance to stains and acidic materials, as well as improved freeze-thaw capability due to decreased moisture absorption are all benefits delivered with products featuring ColorBold™.

Other color enhancement products are sealers applied post production, after the concrete has been thoroughly cured; the chemical can only penetrate whatever surface voids are present, with the balance being left as a film on the paver surface.

Products with ColorBold™:
Molina® 60mm, Market Paver, Molina® 80mm



Molina® 80mm Shown

Applications & Solutions

Oaks Segmental Pavement Systems are developed for various degrees of traffic, living street appeal, permeable pavement applications and northern climates, with consideration for pedestrian safety and wheelchair accessibility. Whether your intent is to enhance an entrance way, build a staircase or manage grades, Oaks Wall Products offer you design solutions for a variety of wall classifications. This section will guide you through making the right choices for your project, including detailed installation techniques, design tips, capital/life cycle costing and maintenance considerations.

Paver: Presidio, Marble Grey and Onyx

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Segmental Concrete Pavement Systems

ALL OF THESE DETAILS ARE **AVAILABLE ONLINE!**

There are several different locations pavers and slabs can be installed. Some of the most common are: at grade on native soil, over an existing concrete or asphalt road, or above grade on a concrete patio or roof deck. The following two pages provide guidance for the majority of these installation practices, while information on Pedestal Set applications is covered on Page 11. CAD details, material specifications and testing requirements, and installation instructions for each option are available online or upon request.

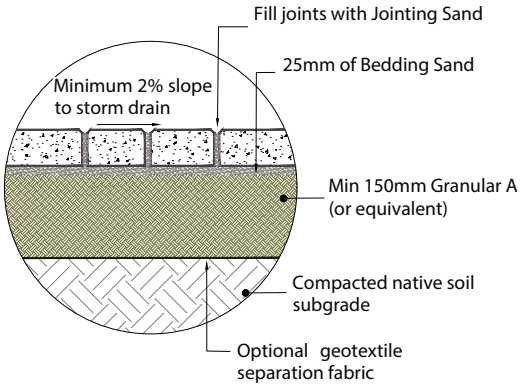
SAND SET ON SUBGRADE

SUITABLE APPLICATIONS: Most pedestrian and vehicular projects.

BENEFIT: Economical installation.

DESIGN NOTES: See ASCE 58-16 for recommended base thickness subject to traffic conditions and subgrade soil type. Need for separation geotextile subject to subgrade soil type. Underdrains may be needed over tight soils (clays).

INSTALLATION NOTES: Ensure subgrade is properly compacted before commencing with Granular A placement. See ICPI (Interlocking Concrete Pavement Institute) for recommended installation practices.



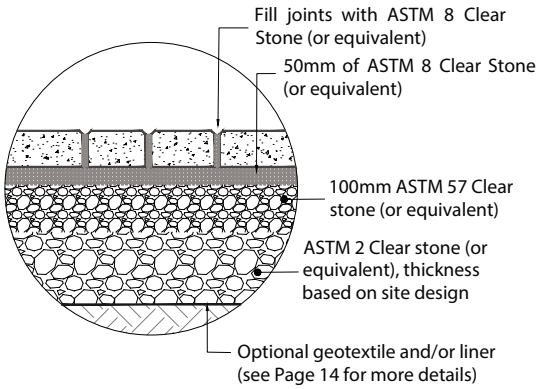
PERMEABLE STONE SET ON SUBGRADE

SUITABLE APPLICATIONS: Most pedestrian and vehicular projects where stormwater management is also an objective.

BENEFIT: Utilizes the same area for traffic / parking and storm water management, frees up other space onsite for revenue generating purposes.

DESIGN NOTES: See ASCE 68-18 for recommended base thickness subject to stormwater management goals, traffic conditions and subgrade soil type. Need for separation geotextile and/or liner, and underdrains, subject to site conditions. See Page 14 for more information.

INSTALLATION NOTES: Consult with Oaks staff on providing contractor training to ensure correct installation practices are being followed.



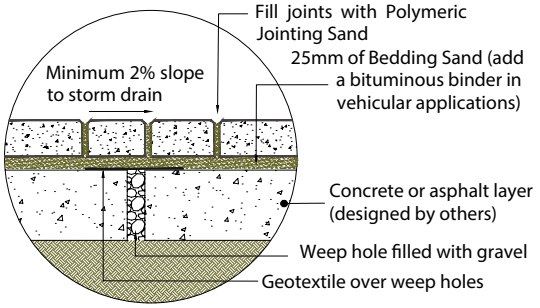
SAND SET OVERLAY ON CONCRETE OR ASPHALT AT GRADE

SUITABLE APPLICATIONS: Recommended over weak native soils. Bituminous set for high traffic areas, crosswalks or intersections

BENEFIT: Combines structural benefits of concrete / asphalt with the aesthetics of pavers and slabs.

DESIGN NOTES: Drain holes are required throughout the pavement area to allow water in the bedding layer to easily drain.

INSTALLATION NOTES: Recommend stabilized jointing sand to minimize water infiltration and tighter height tolerances on the pavers or slabs. For bituminous set, consult with Oaks staff on providing contractor training to ensure correct installation practices are being followed.



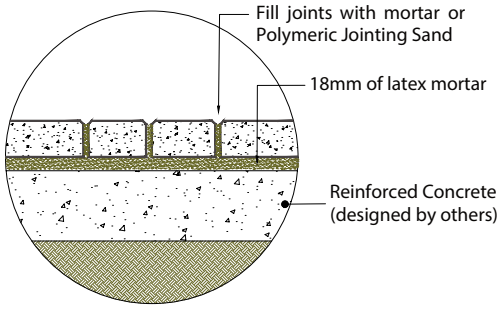
MORTAR SET ON CONCRETE

SUITABLE APPLICATIONS: Interior applications over concrete.

BENEFIT: Creates a very rigid surface.

DESIGN NOTES: For pavers or slabs with small joints, use polymeric sand in lieu of mortar between the units. Control joints in the reinforced concrete need to extend up through the mortar and pavers/slabs.

INSTALLATION NOTES: When using mortar in the joints, be careful to prevent mortar from spilling over the joints, which stains pavers/slabs.



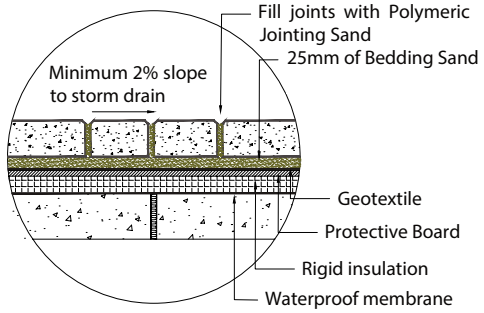
SAND SET ON CONCRETE PATIO OR ROOFDECK

SUITABLE APPLICATIONS: Exterior patios or roofs over concrete decks.

BENEFIT: Provides decorative surfacing over concrete that can be lifted/replaced for maintenance or repairs.

DESIGN NOTES: Concrete deck needs to be sloped away from building to drains as pavement surface follows same slope. Control joints in the reinforced concrete do not need to extend up through the bedding sand and pavers/slabs. Also, see Note 1 below.

INSTALLATION NOTES: Geotextile required above protective board to prevent bedding sand loss.



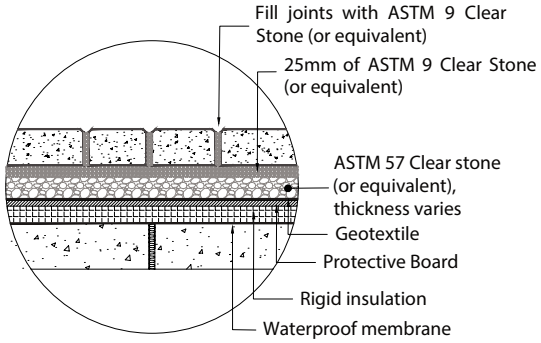
PERMEABLE STONE SET ON CONCRETE PATIO OR ROOFDECK

SUITABLE APPLICATIONS: Exterior patios or roofs over concrete decks where a flat pavement surface is preferred.

BENEFIT: Same as previous, plus pavement surface can be at nominal drainage slope (drainage can occur in the aggregate base).

DESIGN NOTES: Concrete deck needs to be sloped away from building to drains; thickness of ASTM 57 varies as needed to provide flat pavement surface. Also, see Note 1 below.

INSTALLATION NOTES: Size jointing material to accommodate joint width. ASTM 57 stone needs to be manufactured sharp stone (not round river rock) to prevent shifting.



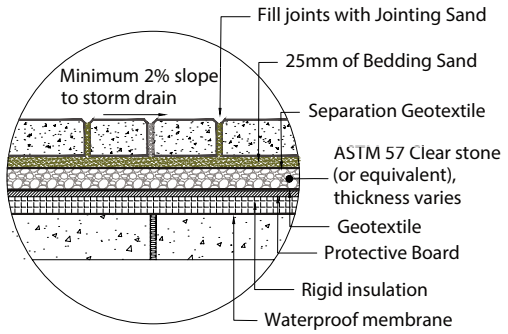
HYBRID SAND/PERMEABLE STONE SET ON CONCRETE PATIO OR ROOFDECK

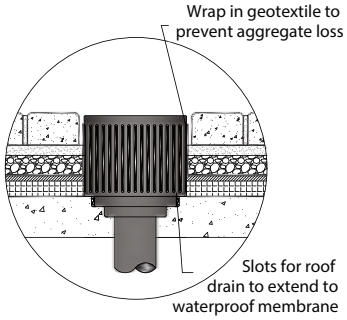
SUITABLE APPLICATIONS: Exterior patios or roofs over concrete decks.

BENEFIT: Provides increased subsurface drainage (over sand set) to better handle moisture that infiltrated through the joints.

DESIGN NOTES: A separation geotextile is required between the bedding sand and ASTM 57 stone. Also, see Note 1 below.

Note 1: On all concrete patio or roof deck applications, the roof drains need to have side slots that extend down to the waterproof membrane so that any moisture below the pavers can escape. Wrap the outside of the drain with geotextile to prevent bedding material loss.

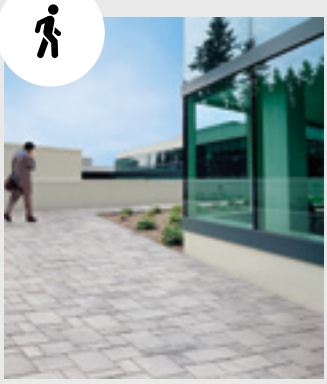




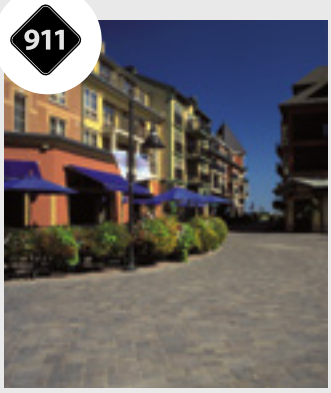
Traffic Defines Product Choices

Designers often ask where we recommend each of our pavers and slabs can be used. Given that the answer is dependant on what will be on the pavement, we have identified eight primary commercial *Pavement Classifications* with each representing a different traffic and/or vehicle weight scenario. The suitability of our pavers and slabs relative to each classification was then evaluated based on aspect ratio and/or finite element analysis results assuming a *Sand Set* on *Subgrade* installation; see *Oaks Tech Note L6 – Structural Design of Vehicular Paver Systems* for more information. In the Product Solutions Section (starting on Page 38) the icons below are used to identify which Pavement Classifications each of our pavers and slabs are recommended for.

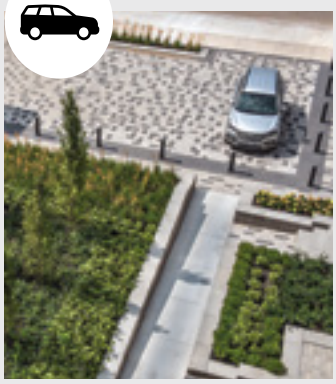
PAVEMENT CLASSIFICATIONS



PEDESTRIAN PLAZAS
There will be no vehicular traffic on these areas (rooftop, courtyards, pool decks).



EMERGENCY & MAINTENANCE ACCESS ROUTES
Although intended primarily for pedestrian access, there can be the occasional maintenance, snow removal or emergency response vehicle (plazas, sidewalks).



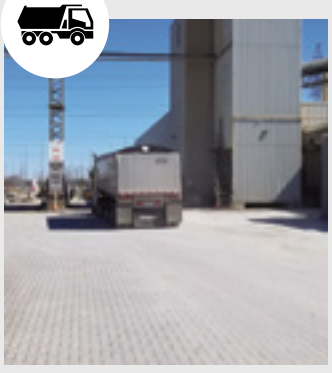
PASSENGER CARS ONLY
These are areas with restricted access to private passenger vehicles (residential driveways, staff parking lots or restaurant drive thru corridors).

CARS AND LIGHT TRUCKS
Open parking areas mostly used by private passenger vehicles and occasional light delivery trucks or small shuttle buses (restaurant parking, hotel or business entrances)

OCCASIONAL HEAVY VEHICLE USE
Open parking areas used by occasional heavy vehicles (garbage collection routes at businesses or townhouses)

REGULAR HEAVY VEHICLE USE
Open parking areas used by regular heavy vehicles (Mall entrances, bus/ delivery routes, or dealership unloading areas)

MUNICIPAL MIXED USE
Any municipal street or private road where there is a general mix of traffic.



INDUSTRIAL AREAS
Regular construction, operational equipment, or heavy vehicular traffic (Manufacturing facilities, ports, terminals)

SPECIAL NOTE ON PEDESTAL SET – At present, there is no CSA or ASTM standard that defines what concrete strength is required in pedestal applications. Therefore Oaks, through the ICPI, is developing and validating a new innovative testing methodology that properly replicates the in-situ loading and support conditions of pedestal set slabs. Once this methodology is completed, Oaks can provide recommendations on which of our product(s) can be used in pedestal set projects.

Pedestal Set Applications

Another question we often get is "what product(s) do you recommend for pedestal set applications"? For those not familiar with pedestal set applications, plastic spacers or pedestals are used to elevate concrete slabs over a built up roof to create an elevated deck. This is generally done to create a horizontal (i.e. easily navigable) surface over a roof deck that is otherwise uneven or sloping, or above ductwork, service pipes or electrical cabling on the rooftop. Unfortunately, prior to 2022 there was no production standard for slabs used in pedestal applications so we refrained from recommending any products. However, in 2021 it was determined that a "2000 lb center load test applied to full size slabs" would be the recommended standard; we then used this to validate the acceptability of our NEW Molina (60mm) 24 x 24 Stone (see page 44) for use in pedestal applications.

Full-Size Slab, Corner Support Testing

Creating Patterns & Mosaics

One of the main reasons that Oaks Segmental Pavements are used by design professionals is the variety of colors, sizes and textures available. You can create anything from simple geometric patterns to random layouts to complex mosaics. When reviewing your options, it is important to note that some of our products come pre-blended with multiple-sized pieces in a bundle, while other products have several separately-packaged size, color and/ or texture options that can be blended on site based on the design. The Product Summary pages indicate which products come in pre-blended or separately packaged bundles. PAT (pattern image) files are now available for Oaks pavers. We have made it easier for you to auto-fill design areas and rotate and scale patterns as needed. Copy our PAT files into the default AutoCAD support folder for hatch patterns, and Oaks patterns will be listed in your hatch menu.

PAT FILES FOR ALL OUR **PAVER** & **SLAB** PRODUCTS ARE AVAILABLE ONLINE!

Visit the **RESOURCES** section of our website: **www.bramptonbrick.com/en/resource-search**.
There you'll find everything from laying pattern summaries to AutoCAD patterns, drawings and files.

Safe Pavements - Trips, Slips & Wheelchair Accessibility

Accessibility standards and building codes deal with individual elements of pavement safety. But there is no one regulation that clearly defines a truly safe pavement for all users. To help us develop products that are safe and comfortable for everyone, Oaks reviews and adopts design standards used by other industries.

HEEL SAFE

ASME: A112.6.3 SECTION 7.12 - HEEL RESISTANT STRAINERS AND GRATES

This guideline limits the maximum grate hole size to 0.31" (8mm) to help prevent heels from entering paver joints, causing injury or falls. We use it to develop our paving products, including permeable pavers. This size is well below Ontario's Accessibility Standard of 20mm and the US ADA Standard of 13mm, which focus on wheelchair tires and cane tips.

SLIP-RESISTANT

2012 INTERNATIONAL BUILDING CODE - ANSI A137.1 SPECIFICATIONS FOR CERAMIC TILE

We tested various paver and slab textures (from smooth to textured) and finishes (including EliteFinish™ and ColorBold™) to find out how changes affect slip resistance. All of our products exceeded the recommended DCOF (dynamic coefficient of friction) of 0.42 set by ANSI A137.1 for ceramic tile. Details on the DCOF testing can be found in *Oaks Tech Note L2 – Coefficient of Friction Testing for Pavers and Slabs.*

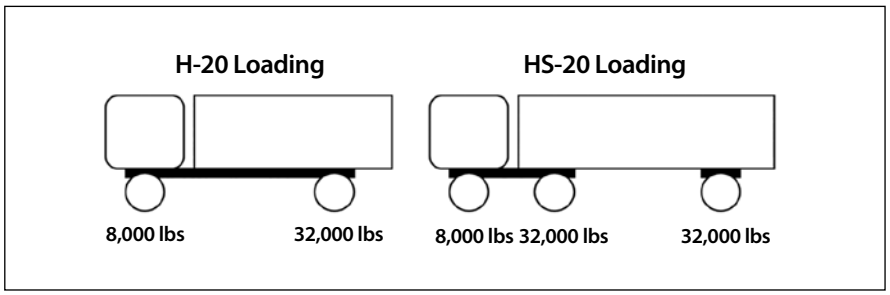
WHEELCHAIR VIBRATION

ASTM E3028 Standard Practice for Computing Wheelchair Pathway Roughness Index as Related to Comfort, Passability and Whole Body Vibrations from Longitudinal Profile Measurements

PathMeT's was used to measure the Wheelchair Pathway Roughness Index (WPRI) for a number of pavement surfaces. The results showed that pavers/slabs with 2mm wide chamfers have less of an impact on wheelchair users than even poured concrete surfaces. For this reason, all recently developed Oaks products – Eterna, Molina, Presidio, Nueva Paver, Nueva Slab, and Market Paver – have micro-chamfers (less than 2mm wide).

H-20 AND HS-20 LOADING

Designers use H-20 or HS-20 from AASHTO to express the extreme load effect created by heavy vehicles (transports, buses and fire trucks) on bridges or other suspended segments such as lids on manholes. Paver systems are installed on a fully supportive base, and are in no way suspended over an opening into which a passing vehicle can collapse; therefore, H-20 or HS-20 loading design principles are not applicable. Refer to Page 10 Pavement Classifications for recommendations on selecting products based on traffic conditions.



Capital & Life Cycle Costing

CAPITAL COST

According to an economic analysis report performed by Pavement Technologies Solutions, there are three primary factors that dictate whether a paver installation can be cost competitive to a traditional asphalt pavement, namely:

- the present cost of asphalt, which fluctuates with the price of oil
- the cost of the paver
- the method of paver installation

For our part, Oaks offers several economical machine install products.

Paver: Hydreau Pave

MACHINE INSTALLATION: Some of our products are manufactured in pre-set patterns for optional machine installation (see the adjacent icon). Mechanical installation can reduce costs significantly for projects over 1,000 square meters (10,000 square feet). Please contact us for product-specific stitching details and more information about mechanical installation.

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what is the expected service life of a sidewalk?

Concrete	Pavers	Asphalt
80 years	**80 years**	**40 years**

Source: Federation of Canadian Municipalities

LIFE CYCLE ANALYSIS

It has long been accepted that maintenance and rehabilitation costs - not just initial capital costs - should be considered when conducting an LCCA for pavements. "Life Cycle Cost Management of Interlocking Concrete Block Pavements – Methodology Report and Software" was developed by Applied Research Associated of Toronto to conduct LCCA for different pavement options including asphalt, cast-in-place concrete and segmental pavements. Please contact us for copies of the report and the software.

UTILITY MAINTENANCE

Segmental pavements offer the advantage of being able to remove and reinstate the wearing course, which can reduce labor, disposal and material replacement costs. There is no need for short-term patching products, and there are no changes to the area's overall appearance when complete. This alone can save significant costs.

Helpful Maintenance Tools:

- Interlocking Concrete Block Pavement Distress Manual
- Asset Management and Pavement Performance Prediction through Pavement Condition Index (Report and Software)
- ICPI Tech Specs 19 & 23
- Oaks Tech Notes L3 and L4

What Is A Permeable Pavement?

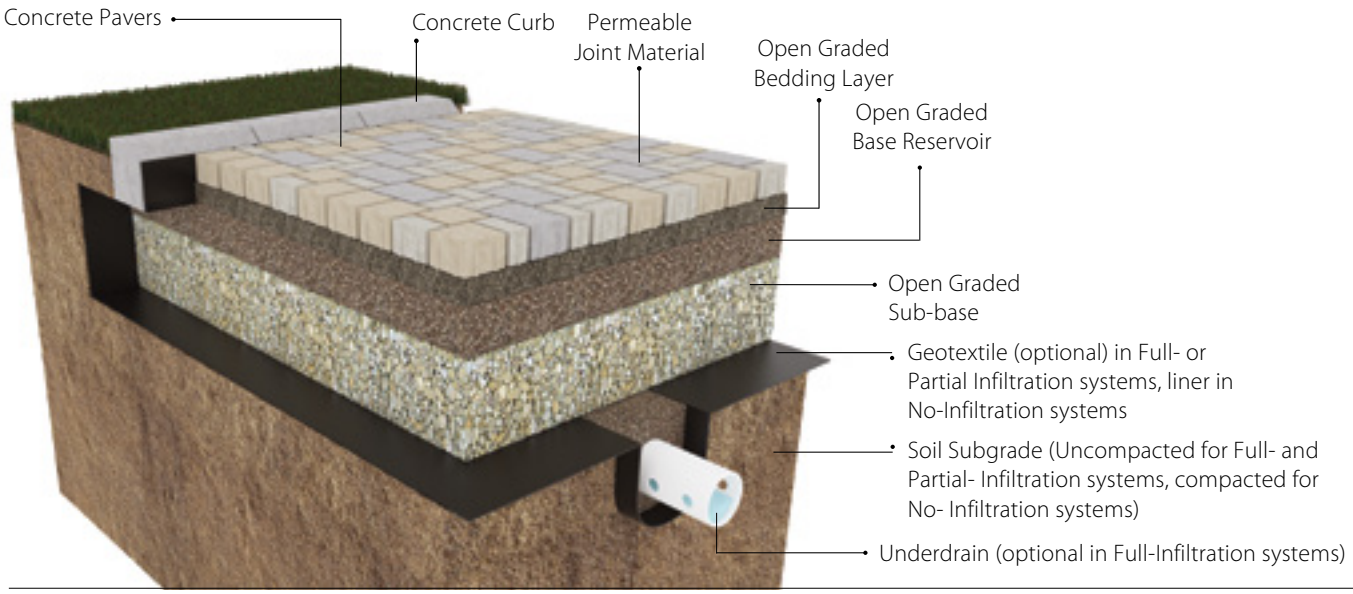
Permeable pavements are pavement systems that allow water to pass through the surface in to an open-graded aggregate base. Widely recognized as a Low Impact Development (LID) strategy, Oaks permeable pavements conform to municipal storm water regulations.

Associated benefits may include:

1. On-site storm water quantity management
2. Improved water quality
3. Groundwater and tree root zone recharge
4. Reduced hydraulic, erosion and thermal impacts to receiving waters
5. Possible reduction or elimination of traditional storm water management infrastructure

PERMEABLE PAVEMENT SYSTEM

Below are the main components of a Permeable Interlocking Concrete Pavement (PICP) system.



ASTM No. 8 Grading Requirements Jointing and Bedding Aggregates	
Sieve Size	Percent Passing
12.5 mm (1/2 in.)	100
9.5 mm (3/8 in.)	85 to 100
4.75 mm (No. 4)	10 to 30
2.36 mm (No. 8)	0 to 10
1.16 mm (No. 16)	0 to 5

(commonly referred to as ¼" clear stone)

ASTM No. 2 Grading Requirements Subbase Aggregate	
Sieve Size	Percent Passing
75 mm (3 in.)	100
63 mm (2 1/2 in.)	90 to 100
50 mm (2 in.)	35 to 70
37.5 mm (1 1/2 in.)	0 to 15
19 mm (3/4 in.)	0 to 5

(commonly referred to as rail ballast)

ASTM No. 57 Grading Requirements Base Aggregates	
Sieve Size	Percent Passing
37.5 mm (1 1/2 in.)	100
25 mm (1 in.)	95 to 100
12.5 mm (1/2 in.)	25 to 60
4.75 mm (No. 4)	0 to 10
2.36 mm (No. 8)	0 to 5

(commonly referred to as ¾" clear stone)

All aggregate types listed should have less than 2% passing the No. 200 sieve, and should be manufactured sharp stone (not river rock)

This symbol is used in the Product Solutions section of this Designer Resource Guide to indicate a permeable paving product. Contact us if you need help sourcing open-graded aggregate materials.

Selecting Which PICP System To Use

Some jurisdictions offer incentives for storm water quantity reduction or have limits on impervious cover; where this is the case, we recommend that you discuss using PCIP with your local municipal and/or regulatory agency before proceeding with your project. If the agency is not familiar with PICP, Oaks staff can provide in-house training and design support.

Some common misconceptions about PICP:

1. **PICP can not be used in vehicular applications.** Permeable pavers are suitable for a wide range of vehicular applications, provided that speed limits are less than 65 km/hr (40mph).
2. **PICP are not safe in pedestrian areas.** Early versions of permeable pavers were a concern for pedestrians because of their large openings. Oaks more modern permeable pavers are designed to be safe for wheelchairs and pedestrians, and are heel-safe. (Details on Page 12)
3. **PICP cannot be used on clay soils.** Provided that the system is designed accordingly, PICP can be used on any type of soil. (Details below)
4. **PICP systems are too expensive to build and maintain.** Factoring the total cost of pavement, drainage infrastructure, storm water quality management and land, PICP can be a cost-effective option. (Details on page 21)

PERMEABLE PAVEMENT TYPES

There are three main types of Permeable Pavement designs:
Full-Infiltration, Partial-Infiltration and No-Infiltration, each referring to the amount of water that infiltrates into the native sub-grade.

	SUB-GRADE INFILTRATION FEASIBLE/ PERMITTED	INPUT EXCEEDS INFILTRATION CAPACITY
FULL INFILTRATION: Use Full-Infiltration systems where the infiltration rate of the native soils exceeds the amount of water added to the PICP system. Underdrains and geotextile are optional.	**YES**	**NO**
PARTIAL INFILTRATION: Use Partial-Infiltration systems where the amount of water added to the PICP system exceeds the infiltration rate of the native soil and some degree of water storage is required. Include an under-drain and an outlet control device (see Page 18) to control the water storage depth in the sub-base.	**YES**	**YES**
NO INFILTRATION: Use No-Infiltration systems over very low permeability, swelling or contaminated soils, or where water harvesting is an objective. Include an under-drain and impermeable liner (on bottom and sides of the system).	**NO**	–

PIPC Pavement Design

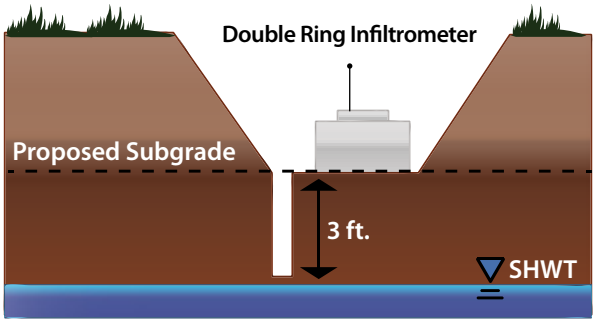
ASCE 68-18 Permeable Interlocking Concrete Pavement was developed to provide design, construction and maintenance guidance for permeable interlocking concrete pavements to achieve storm water management goals while providing a structurally adequate pavement section to accommodate the anticipated vehicular loading in a cost efficient manner.

For copies of the ASCE Manual, or to receive a lunch and learn on the topic **by one of its authors**, contact Oaks staff.

Hydraulic Design Factors

MEASURING SITE INFILTRATION

On-site infiltration testing should be done whenever possible to determine site values. Oaks recommends following the protocols laid out in Appendix C of the *TRCA / CVC Low Impact Development Stormwater Management Planning and Design Guide.* Double-ring infiltrometer or Guelph Permeameter testing should be used as the results are more accurate (they estimate the vertical movement of water only). The test should be done at the bottom elevation of the proposed subbase, which is where sub-grade infiltration will take place in the finished pavement. It should also be verified that the depth to the seasonably high water table (SHWT) is not within 1 meter (3 feet) of the subbase.



ASSESSING INFILTRATION RATES OF SOILS

As part of its Waste Water Flow Management Plan, the City of Toronto summarized the distribution of rainfall events for 16 rainfall stations across the city. The study concluded that 54% of daily storms in Toronto produce less than 5mm of precipitation, and 98% less than 35mm. This table shows sample infiltration rates for different soils. Precipitation of 1.5mm/hour for silty clay may not seem enough to work with a PICP system. But, comparing the daily total (36mm of water infiltration) to the results of the previous study, and it becomes apparent that this infiltration rate exceeds even the 98th percentile of storm events in Toronto.

In other words, even over silty clay storm water will infiltrate into the sub-grade within the same day as the storm event in all but the most severe storms.

SOIL TYPE	INFILTRATION RATE (mm/hour)
SAND	210mm (8.27")
SANDY SILT	26mm (1")
SILT	7mm (0.27")
SILTY CLAY	1.5mm (0.06")
CLAY	0.5mm (0.02")

Source: Porous Pavements

CONTRIBUTING WATER TO PICP

Many agency regulations allow PICP systems to receive run-on from roofs (see adjacent photo), adjacent impervious pavements, and/or stabilized pervious areas (such as lawns). Although these regulations typically specify a maximum run-on ratio (compared to PICP surface area), Oaks recommends that you perform a water balance analysis to determine if the system can accommodate the additional storm water. Adjust the design details as required.

To quantify the run-on, define the total area of each run-on source and estimate the contributing runoff from each source using the adjusted design storm(s) based on standard run-off practices. Be sure to also consider the potential for increased sediment and contaminant loads associated with the additional run-on. A sediment control chamber may be needed. (See Page 18)

Storm Water Quality Modelling

Several jurisdictions place restrictions on the amount of Total Suspended Solids (TSS) that can be discharged from a site to the receiving storm water systems. There are two generally recognized methods of TSS management with permeable pavements.

The first is filtration/straining as surface water infiltrates down through the jointing aggregate between the permeable pavers. Research at Florida Gulf Coast University determined that removal efficiency is a function of the size distribution of the particulate and the grain size of the jointing aggregate. Assuming ASTM #8 stone in the joints, the projected removal efficiency of an NJCAT gradation material is between 61 and 74%, while the removal efficiency of an MTO winter sand approaches 100%.

The second method of preventing TSS from being discharged to the storm water system is, like with other infiltration practices, related to the infiltration capacity of the subgrade soils. To quantify the TSS removal resulting from infiltration, a water balance needs to be conducted to define what percentage of water that enters the base/subbase infiltrates into the subgrade (versus overflows/discharges through the drain). Depending on the native soil type and system design, the percentage of infiltration can range from 0 to 100%, with the resulting reduction in the remaining TSS being proportional.

Storm Water Quantity Modelling

Storm water quantity modelling is performed to calculate and compare the following conditions: pre-development, post-development (uncontrolled), and post-development with BMP practices in place. Since there are no default values for PICP using the Soil Conservation Service (SCS) Curve Numbers (CN) method, it is up to you to determine them.

Start by calculating the expected runoff from the surface of the pavers based on the typical CN for impervious surfaces (CN=98) using the traditional SCS equations below. Remember that a typical 85%-95% solid PICP surface experiences losses similar to traditional pavements due to the cooling/wetting of the paver surface.

$$Q = (P - Ia)2 / (P - Ia + S)$$
$$S = 1000/CN - 10$$

Where:
Q = Total runoff depth (in.)
P = Total precipitation depth (in.)
Ia = Initial abstraction of losses before runoff begins (in.)
S = Potential maximum retention after runoff begins (in.)

With traditional pavements, excess water collects and sheet flows off the pavement surface. With PICP, excess water infiltrates through the joints between the pavers and into the base/sub-base. Surface overflow occurs only after the infiltration capacity of the sub-grade and/or the storage depth of the reservoir is exceeded. The equations used to calculate adjusted flows (Qadj) and adjusted CN (CNadj) are as follows:

$$Qadj = Q - Ts - Ti$$

$$CN_{adj} = \frac{1000}{10 + 5P + 10Q_{adj} - 10(Q_{adj}^2 + 1.25Q_{adj}P)^{1/2}}$$

Where:
CNadj = Adjusted curve number
Qadj = Adjusted runoff depth (in.)
TS = Depth of water storage within aggregate reservoir (in.)
Ti = Depth of water infiltrating into the subgrade over the duration of the design storm (in.)

Examples: 100 yr 24 Hr duration precipitation depth (P) = 8 in; for an asphalt pavement with CN = 98, Q = 7.76 in

Over clay soil using a No Exfilration System

Ts = 4.8 in (using a 12" thick base)
Ti = 0 (system is lined)
Q_{adj} = 7.76 - 4.8 - 0 = 2.96
CN_{adj}= 57
(Underdrain discharge would be controlled using an orifice plate or similar)

Over silty clay soil using a Parial Exfilration System

Ts = 4.8 in (using a 12" thick base)
Ti = 1.44 in/day (see page 16)
Q_{adj} = 7.76 - 4.8 - 1.44 = 1.52
CN_{adj}= 43
(Underdrain raised to minimize discharge, balance of stored water would infiltrate)

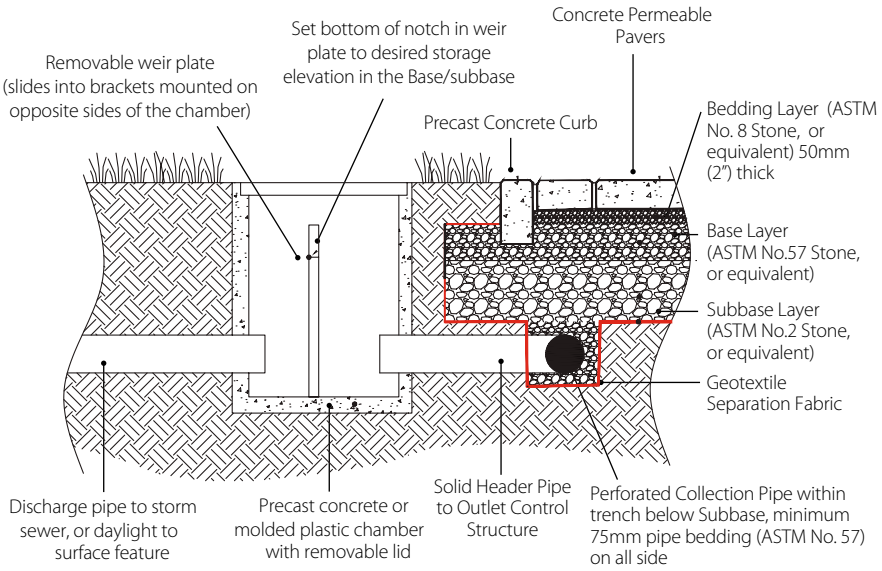
Over silt using a Full Exfilration System

Ts = 4 in (using a 10" thick base)
Ti = 6.48 in/day (see page 16)
Q_{adj} = 7.76 - 4 - 6.48 < 0
CN_{adj}= 0
(No underdrain used, balance of stored water would infiltrate)

Paying Attention To The Details

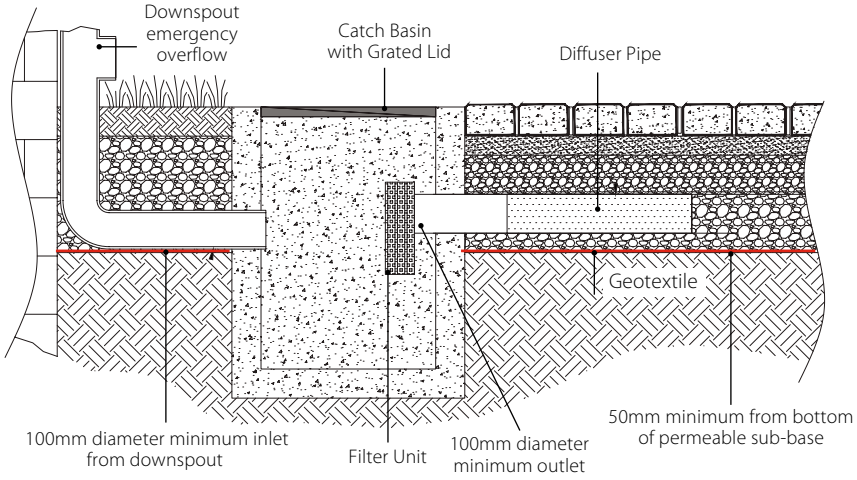
OUTLET CONTROL DEVICE

This device consists of a concrete or plastic vault with a weir plate through the middle. Use it with Partial-Infiltration systems to set the storage elevation of the base/sub-base (where the water does not discharge until it reaches the weir notch) or with No-Infiltration systems to regulate the outlet discharge rate (drill a flow restricting hole through the weir plate).



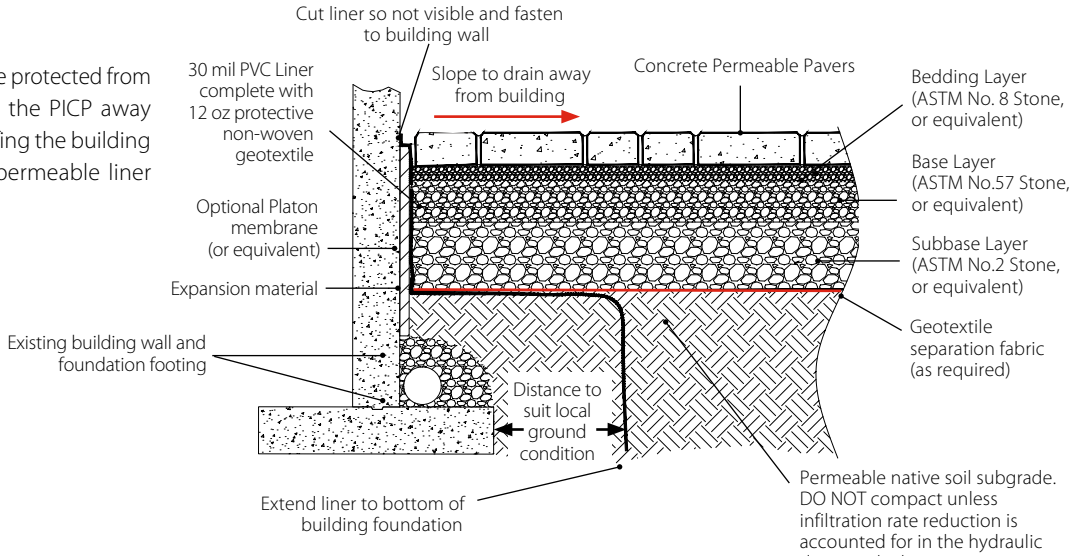
RUN-ON SEDIMENT CONTROL

When adding roof water and storm water from adjacent impervious surfaces, you may need a receiving structure to handle potential sediment and contaminant loads. This diagram shows a sediment control chamber. Please consult with Oaks staff for more information about available alternatives.



PICP ADJACENT TO BUILDINGS

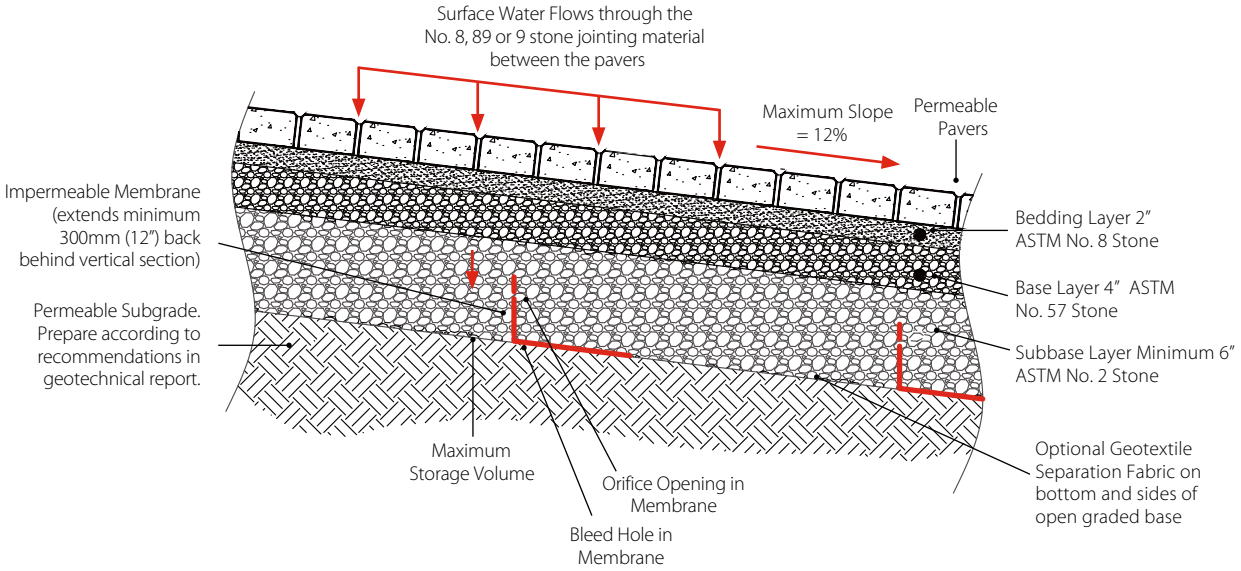
Building foundations should be protected from water infiltration by: sloping the PICP away from the building; waterproofing the building foundation; installing an impermeable liner near the foundation wall.



ALL OF THESE DETAILS ARE
AVAILABLE ONLINE!

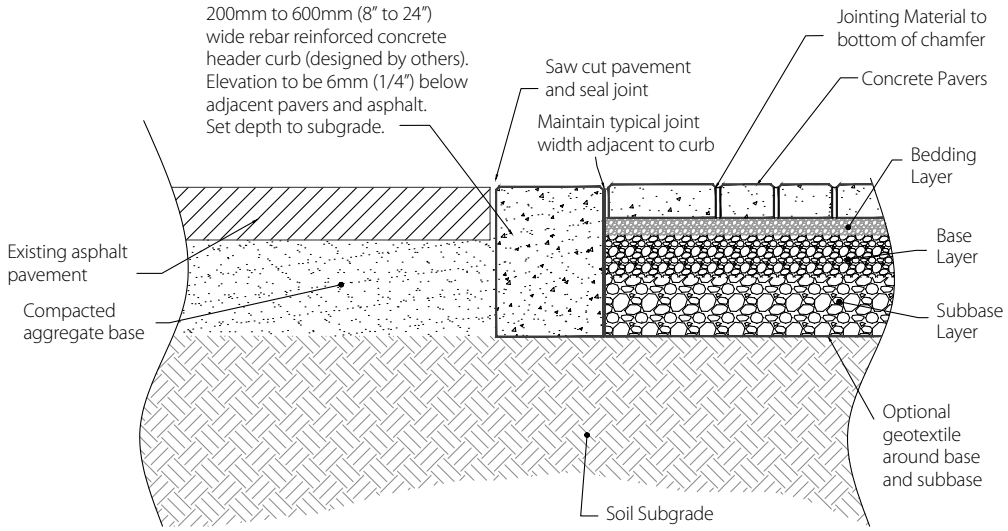
PICP ON SLOPES

For slopes exceeding 5%, use geomembrane check dams to control down slope flows, distribute infiltration over the entire length of the slope and prevent surges from exiting the pavement system at the bottom of the slope.



TRANSITIONS TO IMPERVIOUS SURFACES

Because conventional pavement bases and subbases are not designed for saturation, they require protection from water infiltration. Separate the two pavement systems with an impermeable barrier (geomembrane or concrete). Also consider sloping the PICP sub-grade away from the adjacent conventional pavements or installing under-drains at the interface.



Designing For Northern Climates

Because winter conditions place unique demands on Permeable Pavements, extensive research has been done by the TRCA, the University of New Hampshire and the US EPA among others to evaluate how they perform in cold climates. These are some of the findings.

SNOW AND ICE COVER

Surface accumulations of snow can occur on Permeable Pavement in the winter. Snow has to melt before it can infiltrate. As with any other paving surface, if the Permeable Pavement is not cleared before traffic drives on the surface, snow packing and ice formation may occur. To prevent ice formation, we recommend traditional snow plowing followed by spreading traction control aggregate as required. Instead of sand, spread the same aggregate used in the Permeable Paver joints.

Paver: Avenue Series

Applying anti-icing or pre-wetting chemicals to Permeable Pavement is not recommended. Anti-icing agents, which melt snow before it can become compacted into ice, will likely infiltrate into the system before a storm and impact local groundwater systems. And their magnesium or calcium chloride ingredients chemically attack the cement bond, causing the pavers to disintegrate. If the use of de-icing salts is required, as in the case of a zero ice policy, it is important to note an observation from the University of New Hampshire Stormwater Center: the use of permeable pavements resulted in a 75% average reduction in annual salt. Initial melt water was able to drain, leaving no standing water to re-freeze on the surface.

SURFACE INFILTRATION RATES

Except when packed ice is present on the surface (as noted above), surface infiltration rates of Permeable Pavement are not adversely impacted in cold climates. Although the jointing and reservoir aggregates may become frozen, they still maintain their porosity and permeability.

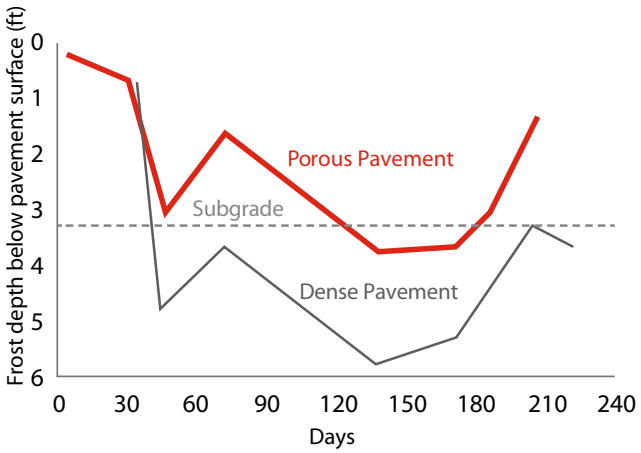
winter data showed permeable pavement systems function well even during freezing temperatures.

Source: TRCA

FROST PENETRATION

Road construction protocol calls for a non-frost susceptible material for a percentage of the frost penetration depth. Because Permeable Pavement profiles use non-frost susceptible materials (i.e. open graded aggregates) and are normally deeper than non permeable profiles, most Permeable Pavements in cold climates have not shown any slumping or frost heaving after years of monitoring.

Where water may be detained for an extended period of time or sub-grade soils are prone to differential frost heave (silts), deepening the road profile can be considered. If water freezes in the reservoir, it can expand into the open voids of the base/sub-base without heaving the pavement. Base/sub-base aggregates are also not likely to develop frost lenses (which cause differential frost heave) due to the lack of fines. Permeable Pavement reservoirs tend to thaw more rapidly due to infiltrating melt water.



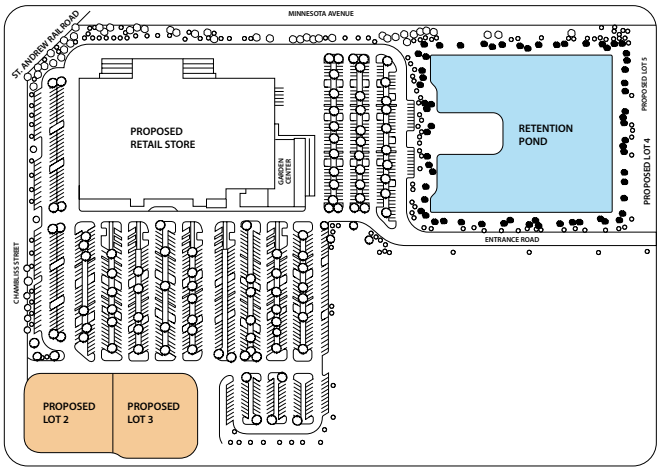
Source: Porous Pavements

Economics Of PICP

CAPITAL COST ANALYSIS

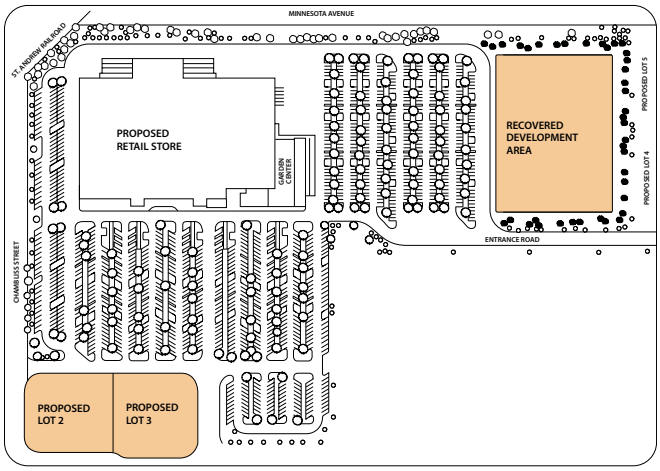
To prepare a true capital cost comparison between Permeable Pavements and traditional practices, three areas of the development need to be considered:

1. **Road Infrastructure** – permeable pavers are installed the same way as standard pavers, with significant cost saving through mechanical installation (see Page 13).
2. **Storm Water Infrastructure** – permeable pavements can reduce and even eliminate the need for traditional storm water infrastructure. The entire pavement surface is one large catch basin/filter, with base/sub-base aggregates providing retention/detention and lateral flow where required.
3. **Income Generating Footprint** – when retention/detention ponds are used, they can take up a lot of property. Consider the profitability of that portion of land if it were available for development, as well as its possible effects on property values. Oaks can provide you with capital cost comparison spreadsheets to help identify the different cost components that should be considered.



< Option 1 – Traditional storm water management uses a retention pond that consumes 20% of the property footprint.

Using PICP created a **20% increase** in usable (i.e. revenue generating) land



Option 2 – Using PICP to manage onsite storm water, gains 20% of the property footprint for additional parking and revenue-generating buildings. **>**

LIFE CYCLE/BENEFIT COST ANALYSIS

We recommend using the TRCA Report *"Assessment of Life Cycle Costs for Low Impact Development Storm Water Management Practices"* and the *"Low Impact Development Costing Tool"* at the site-specific level. These were developed to help assess the design, installation, maintenance and rehabilitation costs over a 50 year period, based on northern conditions. We can help you work through the analysis to determine if Permeable Pavements can save you money.

A number of reports are available for reference at the municipal level. For example, the Philadelphia Water Department determined that Low Impact Development initiatives would provide 20 times the benefits of traditional storm water infrastructure of an equal value.

LID practice life cycle costs were between 35 and 77% less than conventional

Source: TRCA

PICP Maintenance

Refer to Oaks Tech Note L3 - Inspection, Maintenance and Repair of Permeable Pavements – for comprehensive PICP maintenance details. This is a brief summary of selected information.

ROUTINE MAINTENANCE & INSPECTIONS

PICP Maintenance prolongs the performance of the system and prevents problems from developing. Inspections ensure compliance with applicable regulations. This chart outlines recommended PICP routine maintenance and inspections.

ROUTINE MAINTENANCE	FREQUENCY
Display clearly visible signage identifying the surface as a permeable pavement	Improve visibility or replace as required
Vacuum sweep surface debris	Twice annually
Check depth of joint material	Replenish material when >13mm from surface
Check outlets are clear of debris	Ongoing
Verify surface infiltration rate	Annually
Conduct environmental compliance testing as required by the owner / regulatory agency	As specified

Vacuum sweep the PICP surface using a regenerative air sweeper or similar device with a slight vacuum capable of lifting sediment. Do not use a conventional street sweeper, which can remove jointing material and spread additional smaller sediment over the surface. *ASTM C1781 – Standard Test Method for Surface Infiltration Rate of Permeable Unit Pavement Systems* is an easily reproducible and low-cost method of monitoring the performance of PICP. All you need is a 12" diameter plastic or metal ring, plumber's putty, a 20L pail and a stop watch. Test areas that most frequently encounter sediment or debris.

REMEDIAL MAINTENANCE

Remedial maintenance involves rectifying a performance problem or safety concern that needs to be corrected.

REMEDIAL MAINTENANCE	FREQUENCY
Repair ruts and deformations	Ruts > 13mm from grade
Reset shifted pavers	Paver > 6mm above or below grade
Re-stripping of lines	As required
Replace broken pavers	As required
Power vacuum surface and replenish jointing material	Infiltration < 250mm/hr or surface ponding observed
Clean out underdrains and inlet/outlet devices	As required

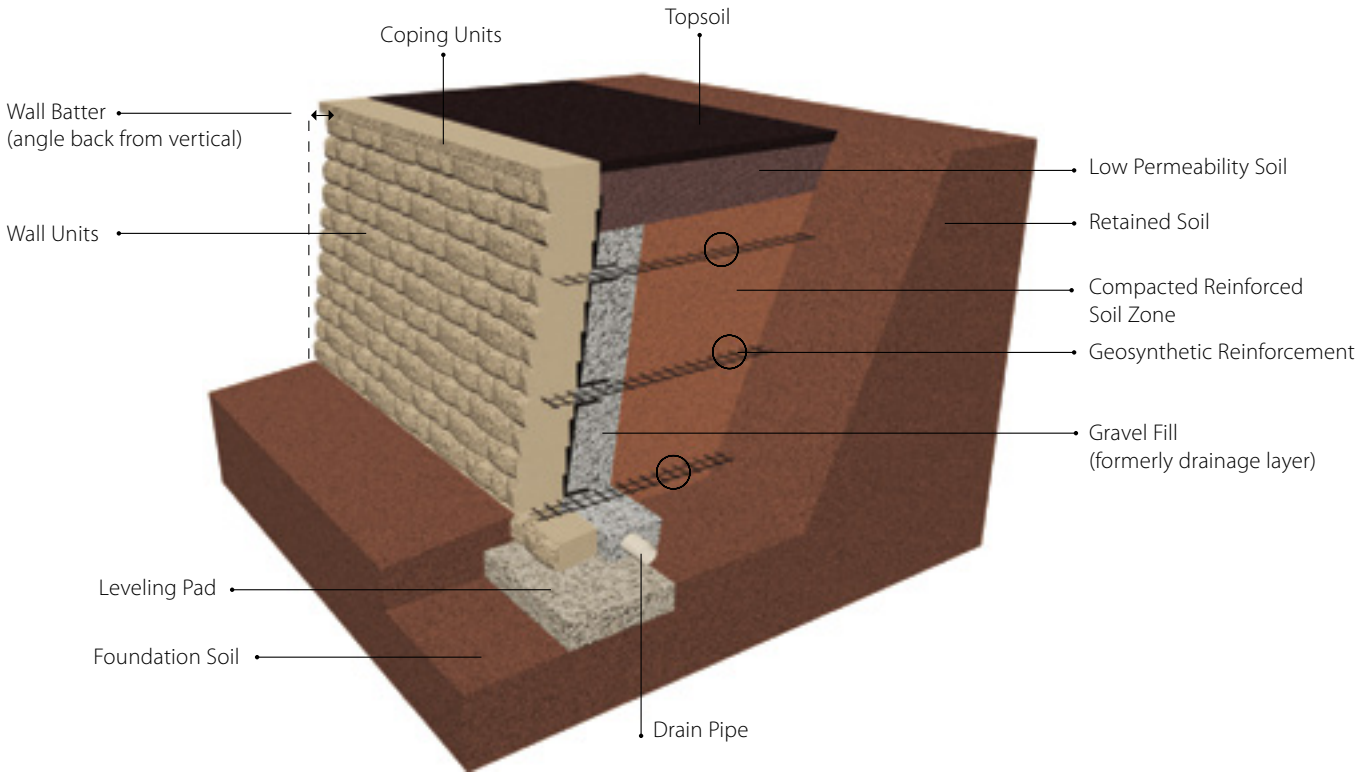
When power vacuuming the surface of the pavers, use a vacuum truck (like an Elgin Whirlwind or equivalent).

There is an ongoing study through the University of Toronto and NSERC that is investigating maintenance best management practices for PICP. New and innovative maintenance equipment, like the Typhoon PICP Joint Cleaning system are being introduced and evaluated. Contact Oaks for updates and information on the test results.

Please note: you do not have to vacuum the entire pavement surface unless needed; focus cleaning on specific areas prone to clogging. Joint material will also be removed, so be prepared to replace it immediately after the area is cleaned.

Segmental Retaining & Architectural Walls

Segmental block walls and reinforced soil have been used for centuries (the most famous application is the Great Wall of China). Today's Segmental Retaining and Architectural Walls are a modern version of this age-old technology. The diagram below lists the parts of a typical Segmental Retaining Wall, while diagrams on page 24 shows the five primary commercial *Wall Classifications*. Icons identify where each wall product is recommended for use in the *Product Selections* pages.

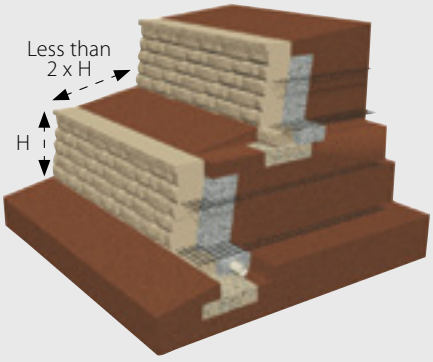


TIERED WALLS

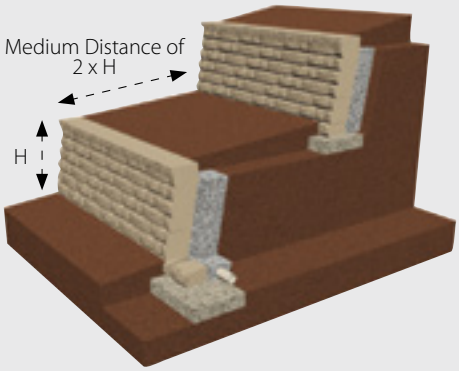
For each wall to be independent of the other, tiered walls need to be built using a 2:1 ratio, with the upper wall built a distance away from the lower wall of at least twice the height of the lower wall. As well, the upper wall must be equal to or less than the height of the lower wall. This is a general rule of thumb and exceptions do exist.

When the distance between the lower and upper walls is less than twice the height of the lower wall, the walls become structurally dependent on each other. In this situation, it is important to take into account global stability - the resistance to overall mass movement of the whole segmental retaining wall system in a circular or sliding mode.

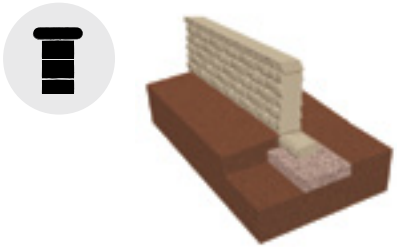
Dependent Terraced Walls



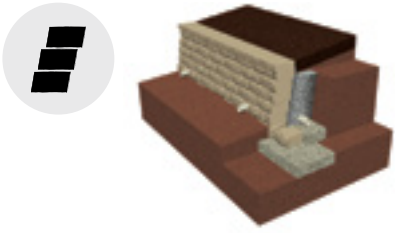
Independent Terraced Walls



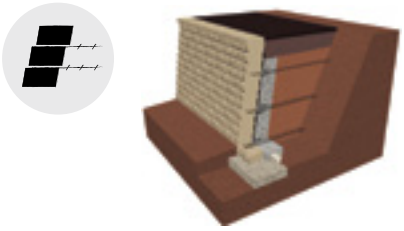
WALL CLASSIFICATIONS



FREESTANDING
Freestanding walls are vertical architectural features finished on both sides. Typically they are small sitting walls (less than 600mm (2') high), but they have also been used as divider walls (see page 29) and even security features.



GRAVITY
Simple (single depth) Gravity walls depend on the mass of the individual wall units dry-stacked on top of one another to hold back the earth behind the wall. Due to the limited mass, these are typically restricted to low retaining walls.



GEOGRID
Geogrid (soil) Reinforced walls include multiple layers of geogrid reinforcement sandwiched between the wall units and extending back into the compacted reinforced soil zone. They are used when the limitations of a conventional Gravity wall are exceeded.

MULTI DEPTH GRAVITY
Multi Depth Gravity walls use products of at least two different depths to increase the overall mass of the wall. (**Note:** there must be a connection between the rows of wall units).
See adjacent page for more information.

STABILIZED BACKFILL
The Stabilized Backfill system is a unique solution commonly used when lot lines, rock outcroppings or other obstructions limit the amount of excavation that can be done, or to provide enhanced stabilization for fences situated close to the back of the wall.
See adjacent page for more information.

For batter, alignment and installation options, go to page 51 of the **Product Selections** section.

CALL BEFORE YOU BUILD – what are the local rules for retaining walls?

Retaining walls are engineered structures that require a site-specific design prepared by a Professional Engineer certified in the jurisdiction where the wall is being constructed. For example:

1. The Ontario Building Code (OBC) requires a site-specific design for retaining walls exposed over 1m (3') that are adjacent to; public property; access to a building; private property allowing public access such as a person's front yard for mail delivery to the front door.
2. Some local municipalities in Ontario have expanded Building Code requirements to include any retaining wall over 1m (3'), including those on private property.
3. The CSLA Canadian Landscape Standards recommends that any wall over 1.2m (4') or one that may be exposed to heavy or dynamic loading should be designed by a structural engineer. An evaluation of soil conditions by a geotechnical engineer may be required.

Check with your local municipality before proceeding with your construction project. Consult with Oaks staff if you require a site-specific design package. (See Page 26 for guidance on how to initiate a site specific design through Oaks)

GUARDS: The OBC also requires a guard at the open side of any wall that meets the above requirements, to prevent pedestrians from falling over the edge. Some municipalities have expanded this requirement to include any steps, ramps, exterior landings, porches, balconies, mezzanines, galleries, or raised walkways where:

1. There is a difference in elevation of more than 600mm (2') between the walking surface and the adjacent surface.
2. The adjacent surface within 1.2m (4') of the walking surface has a slope greater than 1:2.

You will need to incorporate additional design loads into the retaining wall design to compensate for pedestrians pushing against the guards. (See Pages 33 to 35 for more information on pedestrian guards and fences)

Stabilized Backfill Wall

WHAT IS STABILIZED BACKFILL?
Stabilized backfill is a low strength ready mix concrete consisting primarily of aggregate, cement and limited water (low slump); the sand component is not included. Additives are used as required for local conditions. Mix designs are available.

WHAT DOES STABILIZED BACKFILL DO?
Stabilized backfill serves two primary functions: it increases the overall mass of the retaining wall structure, and it serves as the drainage layer behind the wall (reason why no sand is included in the material).

HOW IS STABILIZED BACKFILL PLACED?
Stabilized backfill can be poured directly from a ready mix delivery truck; conveyors and/or pump trucks can also be used where available. The material should be placed in maximum 600mm (2') lifts, and because it has a low slump will need to be worked into place. Do not add water as this could compromise the strength of the end product. Geogrid is placed between the wall blocks and stabilized backfill at every third course to provide a connection between the two materials.

WHEN TO USE STABILIZED BACKFILL?
This approach is commonly used when lot lines, rock outcroppings or other obstructions limit the amount of excavation that can be done, or to provide enhanced stabilization for fences situated close to the back of the wall.

Please consult with Oaks staff for stabilized backfill supplier contacts.

Multi Depth Gravity Wall

WHAT IS A MULTI DEPTH GRAVITY WALL?
Multi depth gravity walls use products of at least two different depths (Proterra) to increase the overall mass of the wall.

WHAT DO THE DEEPER UNITS DO?
The deeper units increase the overall mass of the retaining wall structure, eliminating the need for geogrid behind the wall.

HOW ARE THE DEEPER UNITS PLACED?
Clamps are required to place Proterra units, where double or triples are used, the clamp needs to open to as much as 1125mm wide (see photo below).

WHEN TO USE MULTI DEPTH GRAVITY WALLS?
This approach is commonly used when lot lines, rock outcroppings or other obstructions limit the amount of excavation that can be done, or where future works behind the wall could potentially compromise the structural integrity of a geogrid reinforced wall. Examples would be future planting of trees or installation of an inground pool. In both cases, any geogrid behind the wall could become damaged during excavation.

Please consult with Oaks staff when ordering for multi depth gravity walls as the specific units needed will differ depending on the desired facial appearance of the wall.

Wall Design – How Can Oaks Help?

OAKS LANDSCAPE PRODUCTS

retaining wall design request form

GENERAL INFORMATION

Applicant: _____ Date: _____

Contact Name: _____ Wall Installer: _____

Phone #: _____ Wall Installer Contact #: _____

Email: _____ Wall Installer Email: _____

Applicant Type: Architect ☐ Engineer ☐ Landscape Architect ☐ Contractor ☐

Home Owner ☐ Developer ☐ Other _____

PROJECT INFORMATION

Project Name: _____

Project Address: _____

Contact: _____

Site Plan Available: Yes ☐ No ☐ Geotechnical Report Available: Yes ☐ No ☐

DESIGN SERVICE INFORMATION

Date Needed: _____ Bid/Start Date: _____

Service Requested: Wall Design for Quoting ☐ Drawing for Building Permit Application ☐

Construction Drawings ☐

Product Requested: Proterra ☐ Ortana/Ortana Plus ☐ Nueva® Wall ☐

Wall Type: Single Unit Gravity ☐ Multi Unit Gravity ☐ Stabilized Backfill ☐ Geogrid Reinforced ☐

BASIC SITE INFORMATION

Number of walls on project: _____

Maximum height: _____

Surcharge at top of wall: Landscape/Pedestrian ☐ Vehicular ☐ Slope ☐

Building ☐ Pool ☐ Other _____

Tiered: Yes ☐ No ☐

If yes, provide tier information (setback, heights, # of tiers) _____

Wall batter: (check the appropriate boxes)

	0°	3.5°	7°	8°	14°
Ortana					
Proterra™ (split)					
Proterra™ (smooth)					
Nueva® 150 Wall					
Nueva® 75 Wall					

Rail or fence at top of wall? Yes ☐ No ☐ If yes, type of rail or fence: _____

Site soil description: Clean sands and gravel (ø=36°) ☐ Sands, sandy silts (ø=32°) ☐ Silts, sandy and silty clays (ø=27°) ☐

(If geotechnical report not available)

Slope below wall: Yes ☐ No ☐ How steep: _____ How high: _____

Site soil used for infill? Yes ☐ No ☐ Engineered or native? _____

Water application? Yes ☐ No ☐ Details: _____

Special site requirements/information: _____

Each specific retaining wall product, and each Wall Classification, have their own benefits and limitations. Oaks staff are available to help you decide which product/classification combination(s) will work best for your given application.

Oaks created the adjacent check list to ensure we know all the required particulars of your given project. We ask that you submit this completed form, along with a site plan and geotechnical report (where available) so that we can properly evaluate the project. Factors that Oaks staff will consider include:

- Wall purpose
- Wall height and alignment
- Desired aesthetics
- Surcharge conditions
- Proximity to property line or other existing / proposed barriers behind the wall
- Water impacts above, below or behind the wall
- Construction access
- Site soils
- Type of backfill material being used

A digital/fillable version of this form is available on our website in the Resources section.

General Costing Comparisons

Once we have narrowed down the most suitable product / design option(s), we can use our proprietary estimating tool to generate costing comparisons. Below is an example of a comparison between geogrid reinforced and multi depth gravity designs for a proposed 2m high wall. Costing is broken down into Material & Labor, and Material Only so it is clear where the true costs are.

ECONOMIC COMPARISON	GRID WALL		GRAVITY WALL	
	Mat & Labour	Material Only	Mat & Labour	Material Only
Levelling Pad	$22.05	$3.89	$46.56	$8.21
Proterra	$553.99	$403.99	$851.39	$701.39
Gravel Fill & Drainage	$36.69	$26.34	$36.69	$26.34
Reinforced Zone & Grid	$450.65	$138.14	NA	NA
Low Perm Soil & Geotextile	$14.46	$3.70	$14.46	$3.70
TOTAL PER METRE OF WALL	$1,077.84	$576.06	$949.10	$739.64
TOTAL PER SQUARE METRE	$485.51	$259.49	$427.52	$333.17

Project Specific Quantity Estimates

VESPA MSE (Mechanically Stabilized Earth) design software was created by retaining wall design experts to provide accurate quantity estimates and comprehensive reports while simultaneously performing the necessary analysis in accordance with NCMA (National Concrete Masonry Association) methodologies.

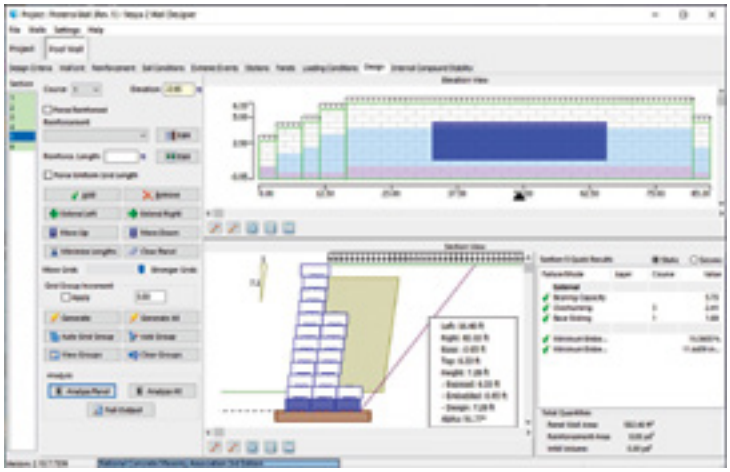
WHAT WE NEED FROM YOU?

A scalable site plan complete with TOW (top of wall) and BOW (bottom of wall) elevations is ideal, but hand sketches will work as long as the distances between elevation points are provided.

WHAT VESPA DOES

Once we input the dimensions of the wall, along with some site specific design details, VESPA generates a wall profile (upper part of screen) and series of cross sections (lower part of screen). The wall profile shows the location of every single unit within the wall. The cross sections show the required lengths of geogrid, depths of stabilized backfill, or number of multi depth units (as applicable), for each panel in the wall.

VESPA now does multi depth gravity wall design!



Quantities

Wall	Facing	Wall/Cap Length [m]	Facing Area [m²]	Total Wall Area [m²]
East Wall	Proterra	64	66	78
West Wall	Proterra	22	8	12
		85	**73**	**89**

Wall	Leveling Pad [m³]	Reinforced Fill [m³]	Drainage Fill [m³]	Core Fill [m³]
East Wall	6.6	45.8	16.2	0.0
West Wall	2.2	0.0	1.5	0.0
Totals:	**8.8**	**45.8**	**17.6**	**0.0**

Reinforcements

Wall	SG200 [m²]	Geogrid Connectors
East Wall	202.3	0
West Wall	0.0	0
Totals:	**202.3**	**0**

WHAT OAKS GIVES TO YOU

Material quantities (see adjacent) can be exported directly from VESPA that list not only the area and length of the wall (from which we can determine the retaining wall product needs) but also the volume of aggregates needed for the levelling pad, reinforced fill (where applicable), and drainage fill as well as the quantity of geogrid and geotextile needed.

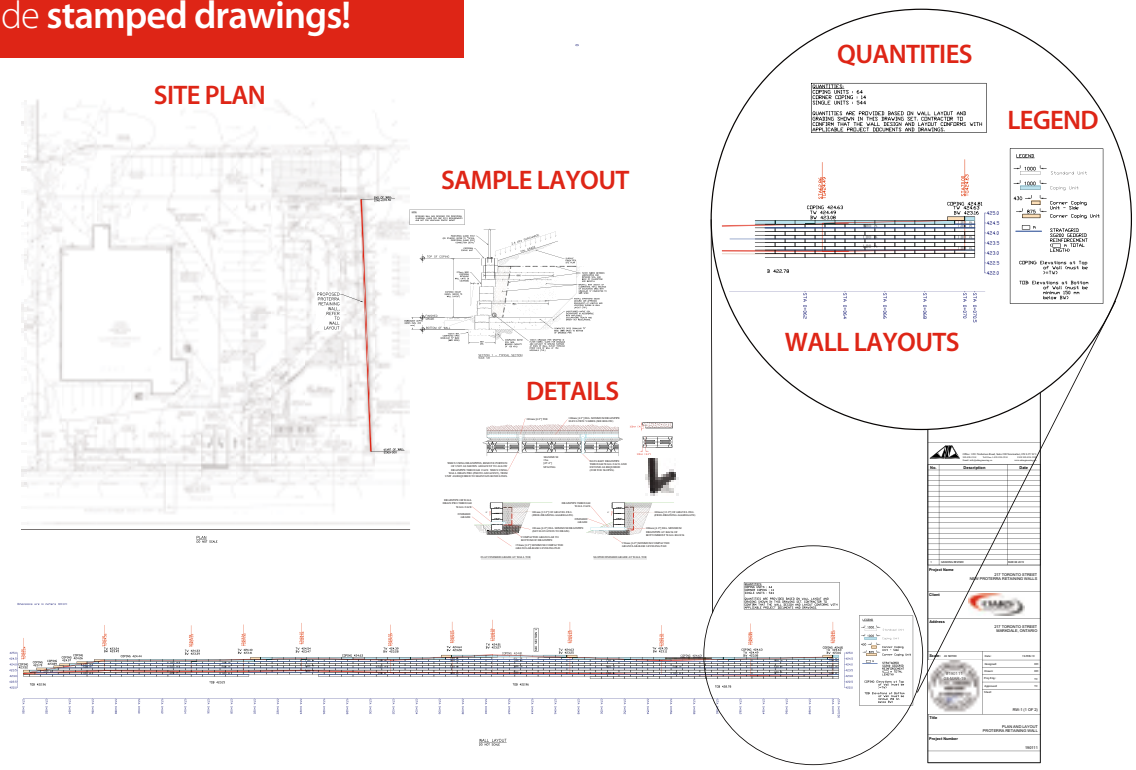
In short, there is more than sufficient information available for local contractors to generate an accurate price estimate.

Stamped Wall Drawings

As mentioned on Page 24, site specific design drawings may need to be submitted to the local regulatory agency for approval and/or construction drawings are desired for tender purposes. Oaks can assist with that.

Wall cross sections and elevation views generated by VESPA can be imported directly into AutoCAD to make a clear and comprehensive drawing package complete with material quantities, color coding of different units for easy identification during construction, wall layouts complete with grid locations / lengths for the entire wall, and applicable details to ensure a quality installation.

We provide **stamped drawings!**



Below is an example of a mosaic in a wall. This particular wall is adjacent to a wave pool, so the contractor decided to incorporate a wave into the wall itself. Where a mosaic is desired, we can show exactly what the mosaic will look like on the wall layout (see above). Because every unit in the wall is shown on the layout, there is no guess work onsite during construction – in essence, we are providing a large scale Lego kit complete with instructions.

Proterra™ (Split & Smooth), Greyfield

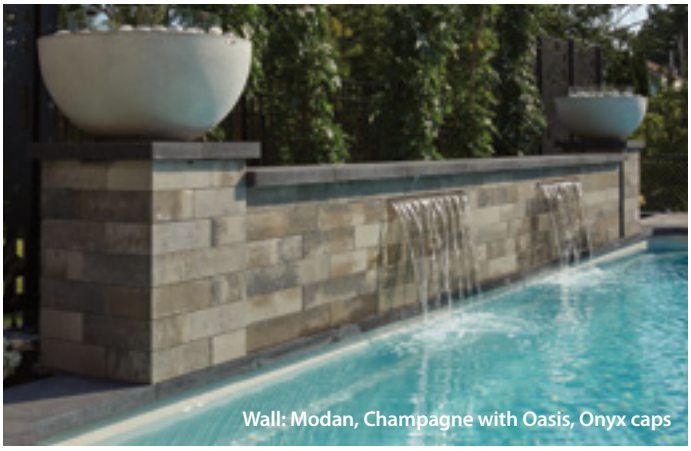
Creating Outdoor Features Or Spaces

Fire pit: Nueva® 75 Wall, Onyx
Seat Wall: Nueva® 150 Wall, Marble Grey with Oasis Bullnose, Onyx Suave coping
Steps: Nueva® Step, Cloudburst
Tree Surround: Modan, Marble Grey
Slabs: Nueva ® Slab, Marble grey with Onyx inset

Garden walls are an aesthetic and effective way of separating patios and gardens. The very nature of architectural wall products make them an economical alternative to complex prefab kits or veneered masonry walls. Architectural walls are an easy way to delineate an outdoor patio, create a cozy courtyard in which customers and staff can sit and relax, or simply provide extra seating.

Modan, Cloudburst with Twilight accents
Rialto 50mm, Marble Grey

BBQ Surround: Modan, Cloudburst & Twilight



Wall: Modan, Champagne with Oasis, Onyx caps

Proterra™ (smooth), Natural

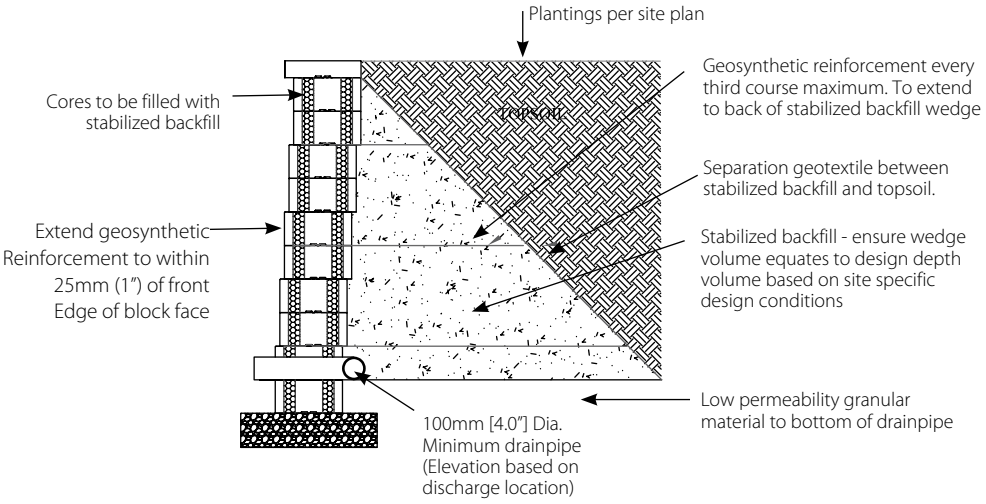
Getting Back To Nature With Planting Beds

Wall: Ortana, Greyfield
Pavers: Avenue Series, Greyfield

Proterra™ (smooth), Natural Mulit Gravity Wall

Planting beds are an easy way to provide pockets of color and life to a yard, which makes the area more inviting and appealing. Defined planting areas also help protect plantings by discouraging pedestrians from walking in the area, and plants tend to be healthier and more productive as one can control the quality of the soil and water drainage.

For Planting Beds enclosed by taller walls (where geogrid reinforcement would typically be needed), Multi Depth Gravity or Stabilized Backfill walls can be used to prevent any conflicts with tree root balls. The diagram below shows how the stabilized backfill can be installed in a wedge configuration to accommodate plantings, while the photo adjacent is of a Proterra Multi Depth Gravity wall installation.



Segmental Retaining Walls Increase Usable Space

Proterra™ (split), Natural

Retaining walls are commonly used to create more usable space onsite, particularly where there are dramatic grade changes over short distances. The rear yard in the above photo would have been un-usable by the home owner without the addition of the retaining walls, and accessibility is maintained between levels through built in staircases.

Proterra™ (split), Natural

In commercial applications, consideration must to be given to providing easy access to customers / clients. A retaining wall was used in the adjacent project to "flatten" the parking lot making it easier to push around the available shopping carts.

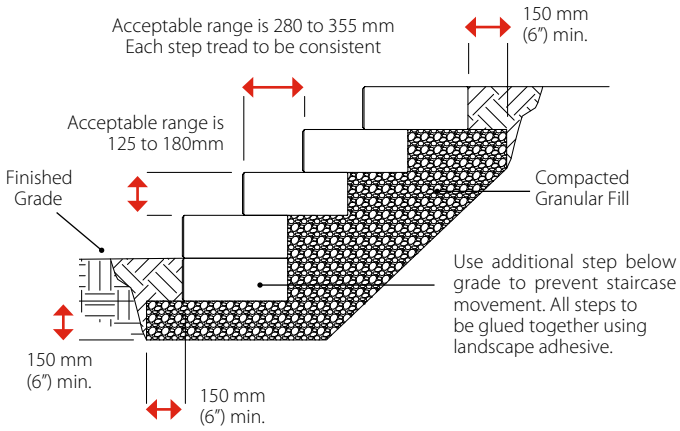
Just a reminder that the associated retaining wall designs can be quite complex – please remember to ask Oaks about design assistance.

Constructing Ramps, Staircases & Seating

Ramps are an economical method of providing accessibility compliance to grade changes. Architectural and retaining walls are often used to contour along the outside of a gentle entrance way ramp, or to provide the actual grade change for elevated ramp structures.

Proterra™ (split), Greyfield

The Integrated Accessibility Standards define an acceptable range of tread rise (vertical change) and run (depth of step tread) that is more stringent than the original OBC criteria – see adjacent. After consultation with contractors and designers, Oaks developed two step systems (to date) to address their aesthetic objectives, provide compliant design options, and improve constructability and in turn long term stability – see Page 56 for product details.



Our Aria and Nueva® Step systems comply with **Design of Public Space criteria**

Nueva® Step, Twilight

Incorporating Guards, Fences And Barriers

Whenever a guard, fence or barrier is placed at or near the top of a retaining wall, there is a potential for overturning at the post location. People lean against guards. A car can strike the barrier. Snow could be pushed up against the fence. Wind can exert pressure on solid (glass panel or board) fences. For these reasons, minimum setback requirements from 0.3m (11.8") to 1.0m (39.4") are usually applied between the back of the wall and the centerline of the guard, fence or barrier. The greater the setback, the lower the impact on the wall facing. Because property owners prefer not to have large spaces between the fence and the back of the wall (wasted space that is difficult to maintain), Oaks has developed creative ways to incorporate guards, fences and barriers into SRWs.

MECHANICS OF WALL OVERTURNING

People or objects pushing against a guard or fence can cause overturning around the bottom of the guard/fence post. If the guard/fence post is buried behind the wall, a surcharge at the back of the wall can occur. To avoid this and prevent the whole system from moving, the weight of the wall and soil in front of guard/fence and the resistance of the geogrid, need to be sufficient.

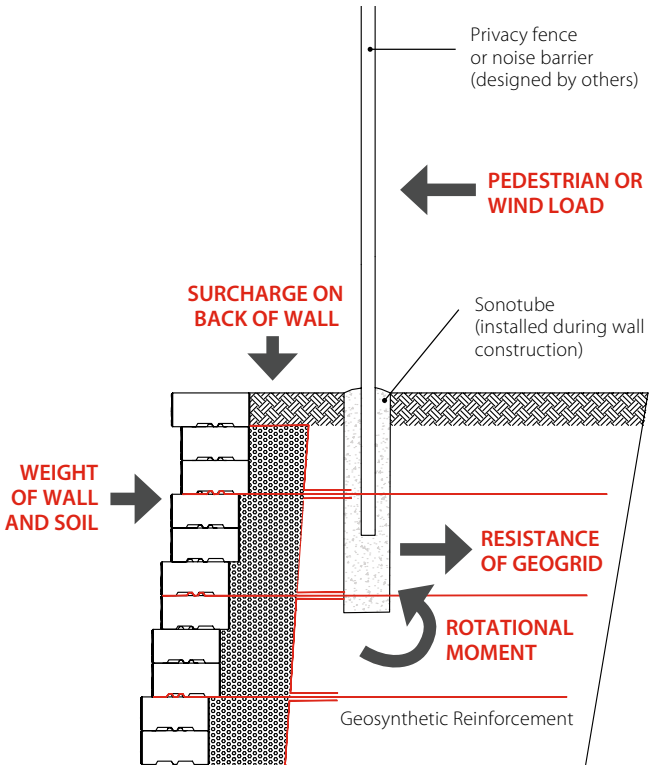
When designing pedestrian guards you need to analyse the following:

1. The horizontal load applied inward or outward on any point at the top of the guard (e.g. 200 lbs at each post).
2. An evenly distributed vertical load applied at the top of the guard (e.g. 50 lbs/linear foot of wall).

The load that creates the most critical condition applies.

For wind loads consider:

1. The percent of area obstructed by the fence – this can range from 3% for chain link to 100% for solid wood.
2. Wind pressure – available in Canada in the National Building Code, Appendix C. Typically 1/30 hourly is used.

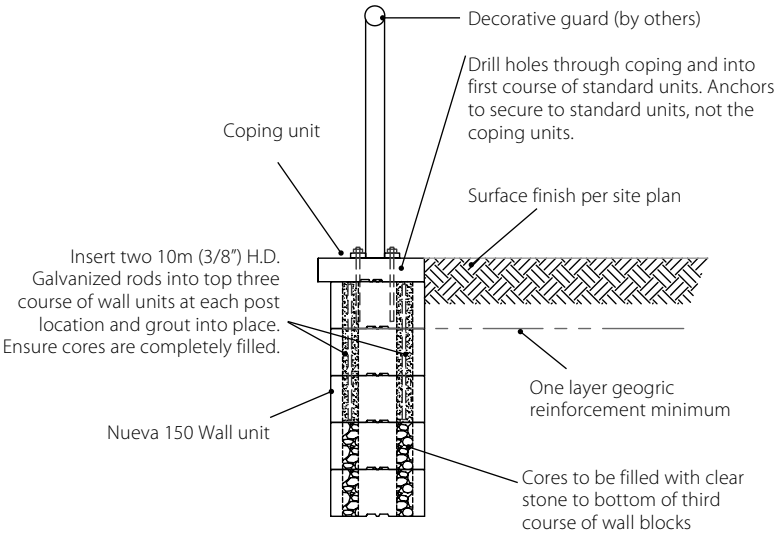


Incorporating Guards, Fences And Barriers

PEDESTRIAN GUARD OPTIONS

SURFACE MOUNTED DECORATIVE RAILING

When mounting a decorative railing to the top of our Proterra, Nueva or Ortana products, gluing a couple of courses together is not enough. To meet Building Code requirements, a minimum of three courses of wall blocks should be mechanically fastened together using threaded rods epoxied into place. With the Nueva 150 wall, the built in cores provide a convenient way to insert the threaded rods without extensive drilling.

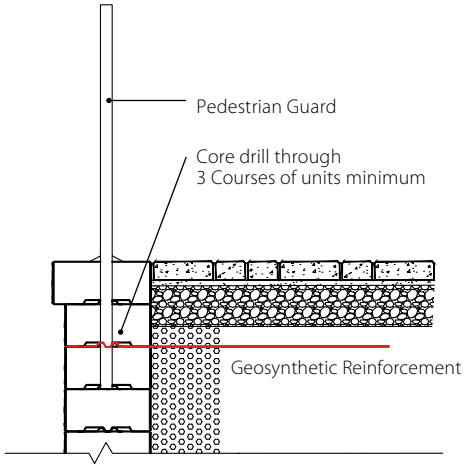


NUEVA 150 WALL

TUBULAR STEEL OR ALUMINUM RAILINGS

With round or square tubular railings, standard practice is to core drill through three courses of wall block into which the tubing is extended and grouted into place; be sure to crown the grout at surface to shed water away from the core holes. It is recommended that Proterra be used in this type of application as there is a reduced risk of unit cracking due to the core drilling as long as the cores are a minimum of 125mm (5") from any edge of the unit and core holes do not exceed 75mm (3") diameter.

Proterra™ (split), Greyfield



PROTERRA™ WALL

SONOTUBE PLACEMENT BEHIND THE WALL

For smaller Oaks products, the weight of the wall will not provide the required resistance to overturning. For best results, secure the guard posts in Sonotubes filled with concrete. These are best located behind the wall (per diagram on Page 33). Where space is tight, you can install the Sonotubes under the wall, with the SRW independent of the fence posts.

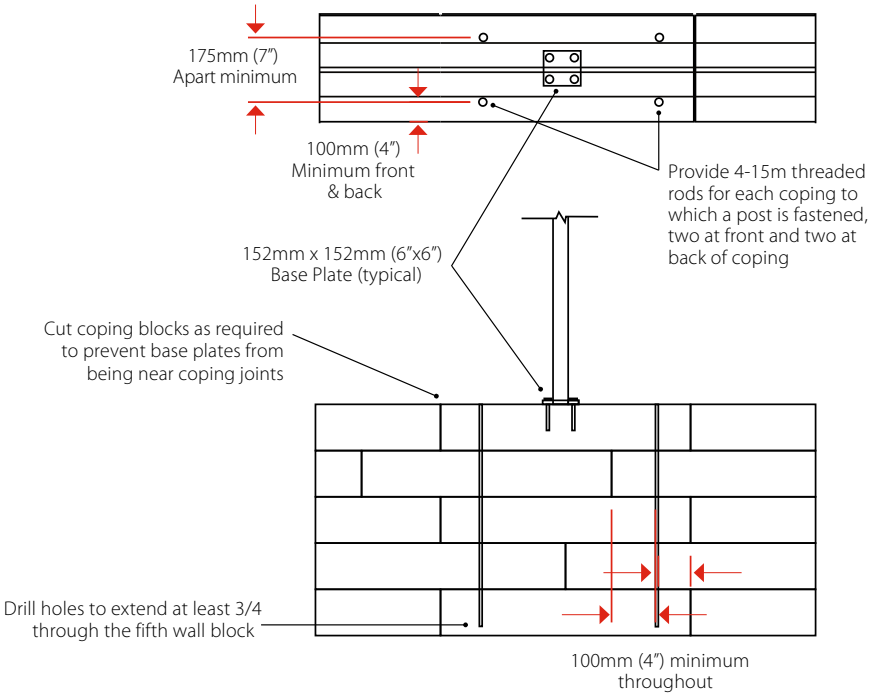
Incorporating Guards, Fences And Barriers

FENCE OPTIONS

Design requirements for walls with fences at or near the top depend on the type of fence. With limited wind load, chain link fences are designed the same way as pedestrian guards. Wooden privacy and glass panel guards/fences on walls act as large sails, so the wall must be designed to account for wind loads.

With Oaks Proterra™, you can surface mount some privacy fences or noise barriers to the coping units, as long as the coping is mechanically fastened to at least four additional courses of wall block. Epoxy a rod into a drill hole at each of the four corners of the coping. (See diagram)

PRIVACY FENCE OR NOISE BARRIER SURFACE MOUNTED ONTO WALL



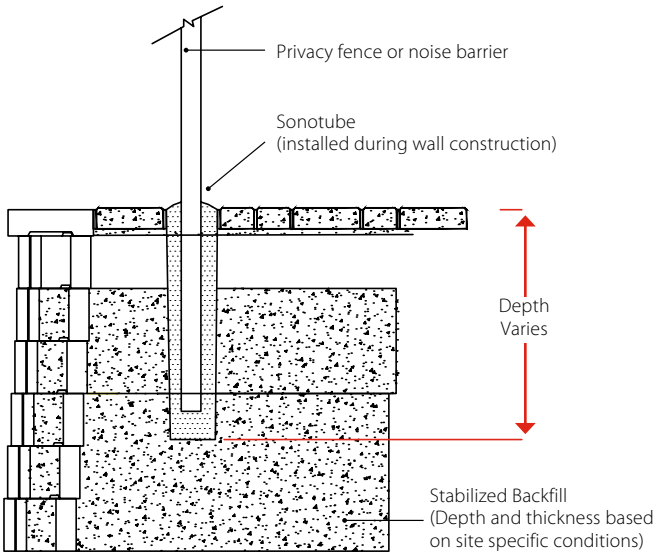
Proterra™ (split), Natural

Incorporating Guards, Fences & Barriers

FENCE OPTIONS

PRIVACY FENCE, NOISE BARRIERS OR TRAFFIC BARRIERS IN SONO TUBES BEHIND THE WALL

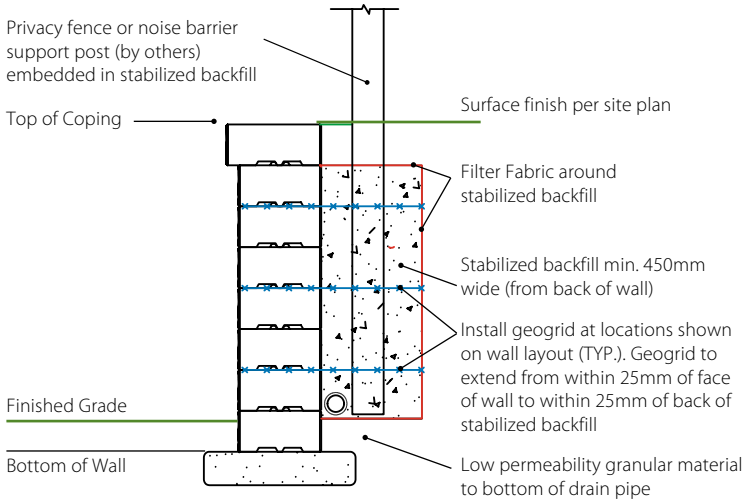
With higher privacy fences or noise barriers, in areas of high wind loads, or where there are traffic barriers, it will be necessary to install the fence/ barrier in sono tubes behind the wall, and to adjust the geogrid lengths accordingly. The photo below shows sono tubes (black) being used for a traffic barriers along the roadway, and large diameter HPDE piping (green) being used for a 3 m noise wall.



IMPORTANT When a fence is within the Reinforce Soil Zone, install Sonotubes during wall construction. This will prevent damage to the grid resulting from sleeves being punched or augured through the reinforced zone. Wrap the geogrid around the Sonotube. Cut only the cross members of the grid, not the strength members. Provide at least 25mm (1") clearance between the inside of the sleeve and the outside of the post to allow for mortar and grout.

PRIVACY FENCE, NOISE BARRIER OR TRAFFIC BARRIER IN STABILIZED BACKFILL

Where there is limited property behind the wall, or the property owner wants to limit the gap between the back of wall and fence or barrier, stabilized backfill can be used. Stabilized backfill is much more rigid than granular fill, so distributes the overturning action over a greater area, and in turn allows the fence or barrier to be moved closer to the wall face.



Drainage Design & Water Considerations

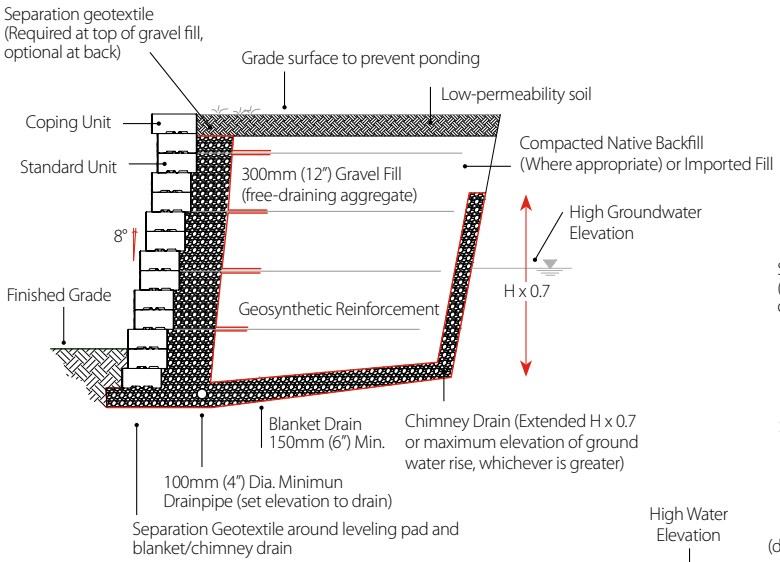
Improper management of surface water can cause erosion. When water infiltrates the Gravel Fill or Reinforced Soil Zone, it can overload a wall. Drainage swales made of low to negligible permeability materials such as clay, plastic liners or concrete can divert water around the back of the wall (see below). Scuppers can provide for controlled flows over the crest of the wall, but they need to include proper erosion control features at the toe of the wall. Drainage inlets can collect water and direct it towards storm water facilities or out the face of the wall.

WATER CAN INCREASE THE PRESSURE BEHIND A WALL BY 2.5 TIMES!

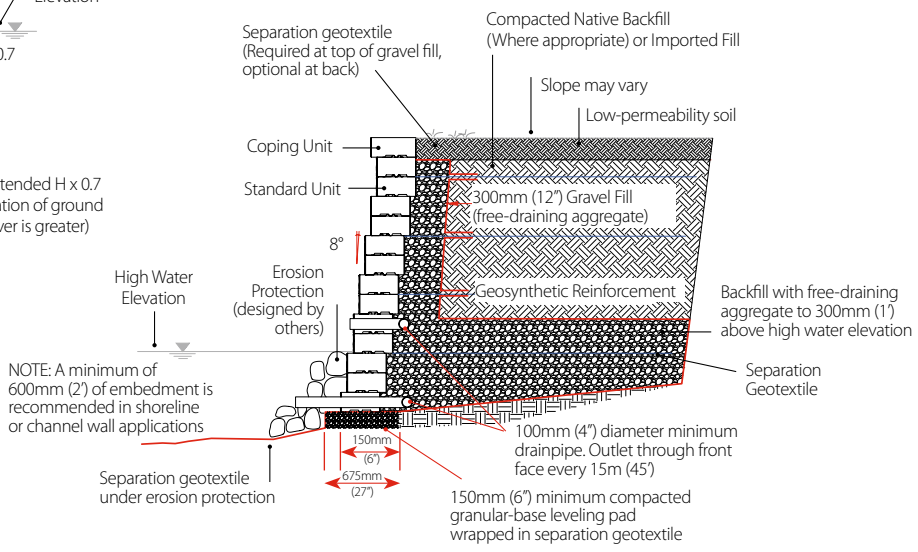
Groundwater can weaken foundation soils supporting the wall, clog drain pipes , and increase external loads on the wall. Blanket or chimney drains may be required to divert groundwater around the wall structure (see below).

When using walls for shoreline stabilization or erosion / sedimentation control along stream banks, some unique considerations need to be addressed in the wall design, such as: erosion at the toe of the wall; potential build up of hydrostatic pressure behind the wall (especially when rapid water level draw down occurs); the forces of waves and ice sheet flows exerted on the face of the wall.

POTENTIAL GROUND WATER DETAIL



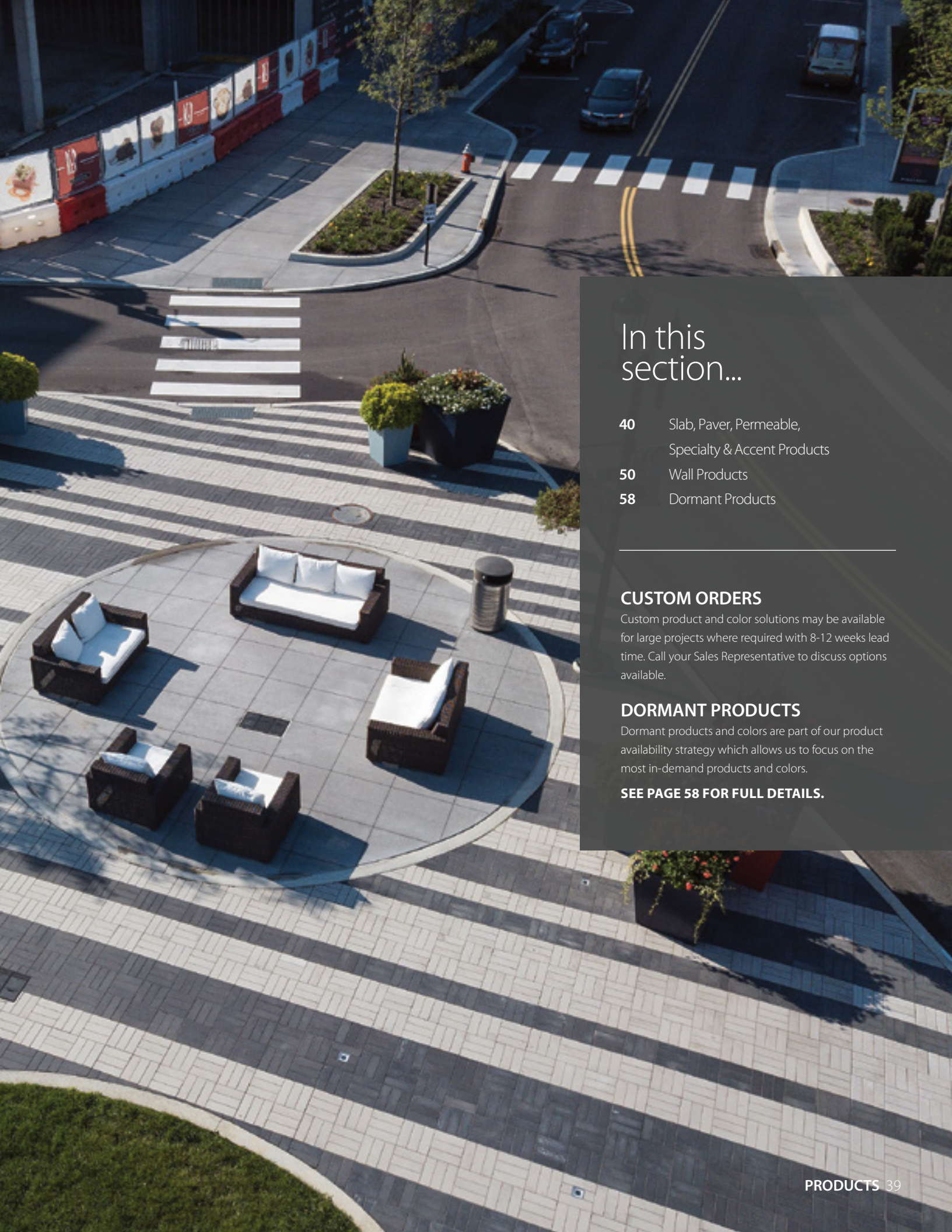
WATERFRONT APPLICATION



Products

Owing to the range of colors, sizes, thicknesses, textures and applications available, Oaks Products are the preferred choice of design professionals. This section will guide you through making the right choices for your segmental pavement or wall design application, including product selection, color palettes and applications. With all Oaks Products, we are always available to assist you with any special requirements of your project, such as soil type, barrier construction or water management.

Paver: Eterna, Cloudburst and Twilight



In this section...

40 Slab, Paver, Permeable, Specialty & Accent Products

50 Wall Products

58 Dormant Products

CUSTOM ORDERS

Custom product and color solutions may be available for large projects where required with 8-12 weeks lead time. Call your Sales Representative to discuss options available.

DORMANT PRODUCTS

Dormant products and colors are part of our product availability strategy which allows us to focus on the most in-demand products and colors.

SEE PAGE 58 FOR FULL DETAILS.

ICON LEGEND

PAVER TRAFFIC LOAD

- PEDESTRIAN PLAZA
- OCCASIONAL HEAVY VEHICLE
- EMERGENCY & MAINTENANCE ACCESS ROUTES
- REGULAR HEAVY VEHICLE
- PASSENGER CARS ONLY
- MUNICIPAL MIXED USE
- CARS & LIGHT TRUCKS
- INDUSTRIAL AREAS

ENVIRONMENTAL COMPLIANCE

- CAN APPLY FOR LEED CREDITS
- PERMEABLE PAVER
- SOLAR REFLECTANCE INDEX (SRI)

INSTALLATION METHODS

- DESIGNED FOR MACHINE INSTALL (SEE PAGE 13)

TECHNOLOGY

- **EliteFinish™** Product produced with enhanced finish technology
- **ColorBold™** Product produced with enhanced color technology

See page 5 for details on each of these Technologies.

See page 10 for details on each of these Pavement Classifications.

SUMMARY CHART

	Width(s) in millimeters	Length(s) in millimeters	Slab or Paver Thickness								
SLABS & COPINGS											
RIALTO 50mm - PAGE 42											
8x16 Stone	200	400	50	•							
Random Bundle	200, 400	400, 600	50	•							
16x24 Stone	400	600	50	•							
MONTEREY - PAGE 42											
8x16 Small Rectangle	200	400	60	•							
Combo Bundle	300, 400, 600	400, 600	60	•							
16x32 Large Rectangle	400	800	60	•							
NUEVA SLAB 50/60mm - PAGE 43											
8x16 Small Rectangle	200	400	50 or 60	•							
Combo Bundle	200, 400	400, 600	50 or 60	•							
NUEVA XL SLAB - PAGE 43											
24 x 36 Slab	600	900	60	•							
MOLINA® 60mm - PAGE 44											
6x12 Stone	150	300	60	•	•	•					
Combo Bundle	300	300, 450, 600	60	•							
24x24 Stone **NEW!**	600	600	60	•							
OASIS COPING - PAGE 44											
Coping Unit	600	360	60	•							
OASIS BULLNOSE COPING - PAGE 44											
Coping Unit	600	360	60	•							

Slab, Paver, Permeable, Specialty & Accent Products

SUMMARY CHART

	Width(s) in millimeters	Length(s) in millimeters	Slab or Paver Thickness								
PAVERS											
TACTILE DOME PAVERS - PAGE 44											
12x12 Stone	305	305	50	•	•						
CLASSIC SERIES (CUSTOM ORDER) - PAGE 45											
4x8 Herringbone Bundle (CUSTOM ORDER)	100	100, 200	60	•	•	•					
4x8 (CUSTOM ORDER)	100	200	60	•	•	•					
8x8 (CUSTOM ORDER)	200	200	60	•	•	•					
12x12 (CUSTOM ORDER)	300	300	60	•	•	•					
MARKET PAVER - PAGE 45											
4x8	100	200	80	•	•	•	•	•	•	•	•
AVENUE SERIES (CUSTOM ORDER) - PAGE 46											
4x8 Herringbone Bundle (CUSTOM ORDER)	100	100, 200	80	•	•	•	•	•	•	•	•
4x8 (CUSTOM ORDER)	100	200	80	•	•	•	•	•	•	•	•
8x8 (CUSTOM ORDER)	200	200	80	•	•	•	•	•	•	•	•
8x12 (CUSTOM ORDER)	200	300	80	•	•	•	•	•			
12x12 (CUSTOM ORDER)	300	300	80	•	•	•	•	•			
12x16 (CUSTOM ORDER)	300	400	80	•	•	•					
TURF-SLAB - PAGE 57											
400x600 Unit	400	600	80		•	•					
HYDR'EAU PAVE (CUSTOM ORDER) - PAGE 47											
Combo Bundle (CUSTOM ORDER)	100, 200	100, 200, 300	80	•	•	•	•	•			
ENVIRO MIDORI (CUSTOM ORDER) - PAGE 47											
Herringbone Bundle (CUSTOM ORDER)	120	120, 240	80	•	•	•	•	•	•	•	•
Random Bundle (CUSTOM ORDER)	120, 240	240, 360	80	•	•	•	•				
NUEVA PAVER - PAGE 48											
8x16 Small Rectangle	200	400	80	•	•	•					
Random Bundle	200, 400	400, 600	80	•	•	•					
RIALTO 80mm - PAGE 48											
8x16 Stone	200	400	80	•	•	•					
Random Bundle	200, 400	400, 600	80	•	•	•					
16x24 Stone	400	600	80	•	•	•					
PRESIDIO (CUSTOM ORDER) - PAGE 49											
Rectangle Stone (CUSTOM ORDER)	168	336	80	•	•	•	•				
Combo Bundle (CUSTOM ORDER)	126, 168	301, 401, 501	80	•	•	•					
MOLINA® 80mm - PAGE 49											
6x12 Stone	150	300	80	•	•	•	•	•			
Combo Bundle	300	300, 450, 600	80	•	•	•					
16x24 Stone	3000	600	80	•	•	•					
ETERNA - PAGE 50											
100x300 (DORMANT)	100	300	100	•	•	•	•	•	•	•	•
100x400 (DORMANT)	100	400	100	•	•	•	•	•			
200x600	200	600	100	•	•	•	•				
400x600	400	600	100	•	•	•	•				
STEPS											
NUEVA STEP - PAGE 50											
1200mm Unit	1200	400	150	•							

Rialto (50mm) **Also available in 80mm units!** See page 48

CHAMPAGNE

CHESTNUT **NEW!**
(Nueva Slab Shown)

Chestnut available in 8x16 Rectangle Stone size only. Ideal for soldier coursing or banding.

GREYFIELD

MACKINAW

MARBLE GREY

MILANO

ONYX **NEW!**

Onyx available in 8x16 Rectangle Stone size only. Ideal for soldier coursing or banding.

RANDOM BUNDLE

8x16 Stone
Width 200mm (7.87")
Length 400mm (15.75")
Pieces/layer: 3
Coverage/layer: 20%

16x16 Stone
Width 400mm (15.75")
Length 400mm (15.75")
Pieces/layer: 3
Coverage/layer: 40%

16x24 Stone
Width 400mm (15.75")
Length 600mm (23.62")
Pieces/layer: 2
Coverage/layer: 40%

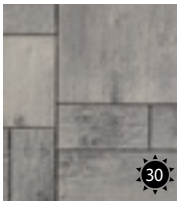
SMALL RECTANGLE

8x16 Stone
Width 200mm (7.87")
Length 400mm (15.75")
Pieces/layer: 15
Coverage/layer: 100%
Individually Packaged
Available in Chestnut & Onyx only.

LARGE RECTANGLE

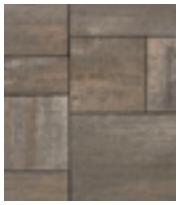
16x24 Stone
Width 400mm (15.75")
Length 600mm (23.62")
Pieces/layer: 5
Coverage/layer: 100%
Individually Packaged

Monterey (60mm) **NEW thickness (previously 50mm)** **LIMITED AVAILABILITY**



MARBLE GREY

ONYX


TWEED

Onyx available in 8x16 Small Rectangle Stone size only. Ideal for soldier coursing or banding.

SMALL RECTANGLE

8x16 Small Rectangle Stone
Width 200mm (7.87")
Length 400mm (15.75")
Pieces/layer: 12
Coverage/layer: 100%
Individually Packaged
Available in Onyx only.

COMBO BUNDLE

12x24 Stone
Width 300mm (11.81")
Length 600mm (23.62")
Pieces/layer: 2
Coverage/layer: 30%

16x16 Stone
Width 400mm (15.75")
Length 400mm (15.75")
Pieces/layer: 3
Coverage/layer: 40%

24x24 Stone
Width 600mm (23.62")
Length 600mm (23.62")
Pieces/layer: 1
Coverage/layer: 30%

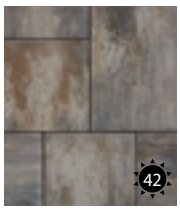
LARGE RECTANGLE

16x32 Large Rectangle Stone
Width 400mm (15.75")
Length 800mm (31.50")
Pieces/layer: 3
Coverage/layer: 100%
Individually Packaged

+Contact your Oaks Dealer or Sales Representative on availability.

Nueva® Slab (50 or 60mm)

Also available in 80mm units! See page 48



CHAMPAGNE

CHESTNUT

Chestnut available in 8x16 Small Rectangle Stone size only. Ideal for soldier coursing or banding.

GREYFIELD

MARBLE GREY

MILANO

ONYX

Onyx available in 8x16 Small Rectangle Stone size only. Ideal for soldier coursing or banding.

RANDOM BUNDLE

8x16 Small Rectangle
Width 200mm (7.87")
Length 400mm (15.75")
Pieces/layer: 3
Coverage/layer: 20%

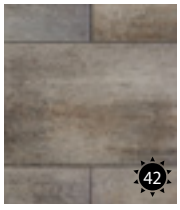
16x16 Stone
Width 400mm (15.75")
Length 400mm (15.75")
Pieces/layer: 3
Coverage/layer: 40%

16x24 Stone
Width 400mm (15.75")
Length 600mm (23.62")
Pieces/layer: 2
Coverage/layer: 40%

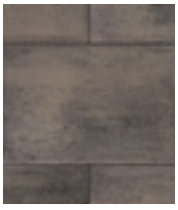
RECTANGLE BUNDLE

8x16 Small Rectangle
Width 200mm (7.87")
Length 400mm (15.75")
Pieces/layer: 15
Coverage/layer: 100%
Individually Packaged
Available in Onyx only.

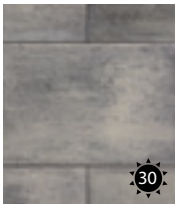
Nueva® XL Slab (60mm)



CHAMPAGNE



GREYFIELD



MARBLE GREY

MILANO

ONYX

24X36 SLAB

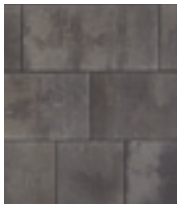
24x36 Slab
Width 600mm (23.62")
Length 900mm (35.43")
Pieces/layer: 2
Coverage/layer: 100%
Individually Packaged

NOTE: When using Nueva Slab with Nueva XL, please understand that colors and tonal consistency between these products may not be exact matches.

Molina® (60mm)

Also available in 80mm units! See page 49 **LIMITED AVAILABILITY**

CLOUDBURST


LUNA **NEW!**

MORAINE

TWILIGHT

COMBO BUNDLE

12x12 Stone
Width 300mm (11.81")
Length 300mm (11.81")
Pieces/layer: 3
Coverage/layer: 25%

12x18 Stone
Width 300mm (11.81")
Length 450mm (17.72")
Pieces/layer: 2
Coverage/layer: 25%

12x24 Stone
Width 300mm (11.81")
Length 600mm (23.62")
Pieces/layer: 3
Coverage/layer: 50%

6X12 STONE

6x12 Stone
Width 150mm (5.91")
Length 300mm (11.81")
Pieces/layer: 24
Coverage/layer: 100%
Individually Packaged

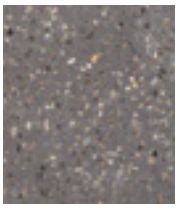
24X24 STONE **NEW!**

24x24 Stone
Width 600mm (23.62")
Length 600mm (23.62")
Pieces/layer: 2
Coverage/layer: 100%
Individually Packaged

+Contact your Oaks Dealer or Sales Representative on availability.

Oasis & Oasis Bullnose Coping (60mm) LIMITED AVAILABILITY

ONYX


ONYX, SUAVE

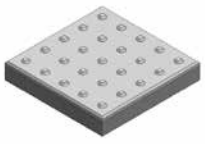
Suave finish only available on Bullnose Coping Stones.

Oasis Coping Unit
Width 610mm (24")
Length 360mm (14.125")
Pieces/layer: 4
Coverage/layer: 100%
Individually Packaged

Bullnose Coping Stone
Width 610mm (24")
Length 360mm (14.125")
Pieces/layer: 3
Coverage/layer: 100%
Individually Packaged

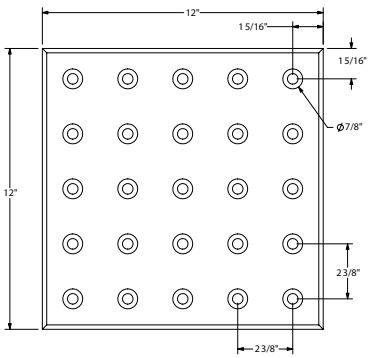
+Contact your Oaks Dealer or Sales Representative on availability.

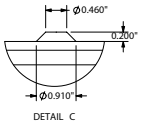
Tactile Dome Pavers (50mm)



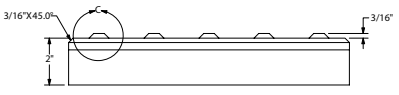
Width 305mm (12")
Length 305mm (12")
Pieces/layer: 12
Coverage/layer: 100%
Individually Packaged

Stock in Charcoal color only. Consult with Oaks staff on other special order sizes, colors and thicknesses - minimum quantities apply.





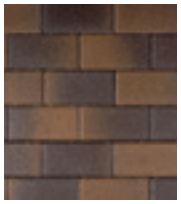
DETAIL C
SCALE 2 : 3



Classic Series (60mm) **CUSTOM ORDER ONLY**

CHARCOAL

GREYFIELD


TIMBERWOOD

NORTHERN

4x8 - CUSTOM ORDER ONLY

4x8 Stone
Width 100mm (3.94")
Length 200mm (7.87")
Pieces/layer: 53
Coverage/layer: 98.1%*
* Two 4x4 stones/layer
Individually Packaged

8x8 - CUSTOM ORDER ONLY

8x8 Stone
Width 200mm (7.87")
Length 200mm (7.87")
Pieces/layer: 30
Coverage/layer: 100%
Individually Packaged

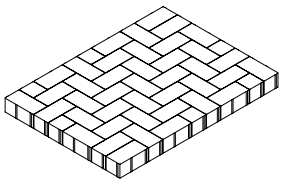
12x12 - CUSTOM ORDER ONLY

12x12 Stone
Width 300mm (11.81")
Length 300mm (11.81")
Pieces/layer: 12
Coverage/layer: 100%
Individually Packaged

HERRINGBONE BUNDLE - CUSTOM ORDER ONLY

4x4 Stone
Width 100mm (3.94")
Width 100mm (3.94")
Pieces/layer: 6
Coverage/layer: 6.8%

4x8 Stone
Width 100mm (3.94")
Length 200mm (7.87")
Pieces/layer: 41
Coverage/layer: 93.2%



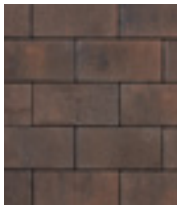
Herringbone Bundle Layout by Layer

†Contact your Oaks Dealer or Sales Representative on availability.

Market Paver (80mm) **LIMITED AVAILABILITY**

ONYX

SANGRIA


SERENGETI

RECTANGLE

4x8
Width 100mm (3.94")
Length 200mm (7.87")
Pieces/layer: 54
Coverage/layer: 100%
Individually Packaged

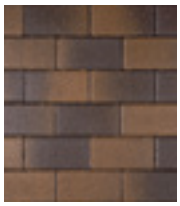
†Contact your Oaks Dealer or Sales Representative on availability.

Avenue Series (80mm) CUSTOM ORDER ONLY

CHARCOAL

EXECUTIVE

GREYFIELD


TIMBERWOOD

MATRIX FINISH - RAVENSTONE BLACK

Call for custom colors.

8x8 - CUSTOM ORDER ONLY

8x8 Stone
Width 200mm (7.87")
Length 200mm (7.87")
Pieces/layer: 30
Coverage/layer: 100%
Individually Packaged

8x12 - CUSTOM ORDER ONLY

8x12 Stone
Width 200mm (7.87")
Length 300mm (11.81")
Pieces/layer: 20
Coverage/layer: 100%
Individually Packaged

12x12 - CUSTOM ORDER ONLY

12x12 Stone
Width 300mm (11.81")
Length 300mm (11.81")
Pieces/layer: 12
Coverage/layer: 100%
Individually Packaged

12x16 - CUSTOM ORDER ONLY

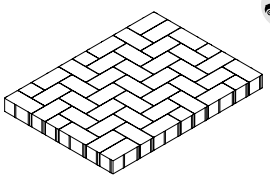
12x16 Stone
Width 300mm (11.81")
Length 400mm (15.75")
Pieces/layer: 9
Coverage/layer: 100%
Individually Packaged

4x8 HERRINGBONE BUNDLE - CUSTOM ORDER ONLY

4x4 Stone
Width 100mm (3.94")
Length 100mm (3.94")
Pieces/layer: 6
Coverage/layer: 6.8%

4x8 Stone
Width 100mm (3.94")
Length 200mm (7.87")
Pieces/layer: 41
Coverage/layer: 93.2%

Herringbone Bundle Layout by Layer



4x8 STANDARD BUNDLE - CUSTOM ORDER ONLY

4x4 Stone
Width 100mm (3.94")
Length 100mm (3.94")
Pieces/layer: 2
Coverage/layer: 1.9%

4x8 Stone
Width 100mm (3.94")
Length 200mm (7.87")
Pieces/layer: 53
Coverage/layer: 98.1%

+Contact your Oaks Dealer or Sales Representative on availability.

Turf-Slab (80mm) CALL FOR AVAILABILITY

Available in Natural color only.

Width 400mm (15.75")
Length 600mm (23.62")
Pieces/layer: 5
Coverage/layer: 100%
Individually Packaged

TYPICAL USES:
Cottage Parking / Emergency & Service Vehicle Access Routes / Slope Erosion Protection / Retention Pond Linings and Vehicular Access Roads / Ditch & Channel Linings / Low Use Turf Areas for Overflow Parking / Environmentally Sensitive Area Erosion Protection / Small Lake Boat Launching Ramps

Hydr'eau Pave (80mm) CUSTOM ORDER ONLY

MACKINAW

SILVERSAND

ONYX

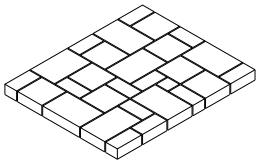
COMBO RANDOM BUNDLE - CUSTOM ORDER ONLY

4x4 Stone
Width 100mm (3.94")
Length 100mm (3.94")
Pieces/layer: 1
Coverage/layer: 1%

4x8 Stone
Width 100mm (3.94")
Length 200mm (7.87")
Pieces/layer: 12
Coverage/layer: 24.2%

8x8 Stone
Width 200mm (7.87")
Length 200mm (7.87")
Pieces/layer: 8
Coverage/layer: 32.3%

8x12 Stone
Width 200mm (7.87")
Length 300mm (11.81")
Pieces/layer: 7
Coverage/layer: 42.4%


Combo Random Bundle Layout by Layer

Enviro Midori (80mm) CUSTOM ORDER ONLY

CHAMPAGNE

MARBLE GREY

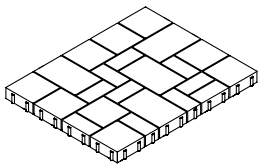
MILANO

RANDOM BUNDLE - CUSTOM ORDER ONLY

5x10 Stone
Width 120mm (4.72")
Length 240mm (9.45")
Pieces/layer: 10
Coverage/layer: 25%

10x10 Stone
Width 240mm (9.45")
Length 240mm (9.45")
Pieces/layer: 9
Coverage/layer: 45%

10x15 Stone
Width 240mm (9.45")
Length 360mm (14.17")
Pieces/layer: 4
Coverage/layer: 30%


Random Bundle Layout by Layer

HERRINGBONE BUNDLE - CUSTOM ORDER ONLY

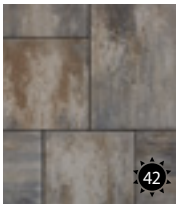
5x5 Stone
Width 120mm (4.72")
Length 120mm (4.72")
Pieces/layer: 6
Coverage/layer: 10.7%

5x10 Stone
Width 120mm (4.72")
Length 240mm (9.45")
Pieces/layer: 25
Coverage/layer: 89.3%

+Contact your Oaks Dealer or Sales Representative on availability.

Nueva® Paver (80mm)

Also available in 50 or 60mm units! See page 43



CHAMPAGNE

CHESTNUT

Chestnut available in 8x16 Small Rectangle Stone size only. Ideal for soldier coursing or banding.

GREYFIELD

MARBLE GREY

MILANO

ONYX

Onyx available in 8x16 Small Rectangle Stone size only. Ideal for soldier coursing or banding.

RANDOM BUNDLE

8x16 Small Rectangle
Width 200mm (7.87")
Length 400mm (15.75")
Pieces/layer: 3
Coverage/layer: 20%

16x16 Stone
Width 400mm (15.75")
Length 400mm (15.75")
Pieces/layer: 3
Coverage/layer: 40%

16x24 Stone
Width 400mm (15.75")
Length 600mm (23.62")
Pieces/layer: 2
Coverage/layer: 40%

RECTANGLE STONE

8x16 Small Rectangle
Width 200mm (7.87")
Length 400mm (15.75")
Pieces/layer: 15
Coverage/layer: 100%
Individually Packaged
Available in Onyx only.

Rialto (80mm)

Also available in 50mm units! See page 42

CHAMPAGNE

CHESTNUT **NEW!**
(Nueva Slab Shown)

Chestnut available in 8x16 Rectangle Stone size only. Ideal for soldier coursing or banding.

GREYFIELD

MACKINAW

MARBLE GREY

MILANO

ONYX **NEW!**

Onyx available in 8x16 Rectangle Stone size only. Ideal for soldier coursing or banding.

RANDOM BUNDLE

8x16 Stone
Width 200mm (7.87")
Length 400mm (15.75")
Pieces/layer: 3
Coverage/layer: 20%

16x16 Stone
Width 400mm (15.75")
Length 400mm (15.75")
Pieces/layer: 3
Coverage/layer: 40%

16x24 Stone
Width 400mm (15.75")
Length 600mm (23.62")
Pieces/layer: 2
Coverage/layer: 40%

SMALL RECTANGLE

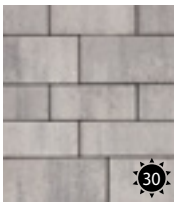
8x16 Stone
Width 200mm (7.87")
Length 400mm (15.75")
Pieces/layer: 15
Coverage/layer: 100%
Individually Packaged
Available in Chestnut & Onyx only.

LARGE RECTANGLE

16x24 Stone
Width 400mm (15.75")
Length 600mm (23.62")
Pieces/layer: 5
Coverage/layer: 100%
Individually Packaged

Presidio (80mm) CUSTOM ORDER ONLY

CHAMPAGNE



MARBLE GREY

MILANO

ONYX

COMBO BUNDLE - CUSTOM ORDER ONLY

Stone 1
Width 126mm (4.96")
Length 301mm (11.85")
Pieces/layer: 4
Coverage/layer: 15%

Stone 2
Width 126mm (4.96")
Length 401mm (15.79")
Pieces/layer: 4
Coverage/layer: 20%

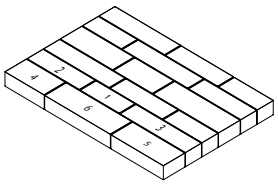
Stone 3
Width 126mm (4.96")
Length 501mm (19.72")
Pieces/layer: 4
Coverage/layer: 25%

Stone 4
Width 168mm (6.61")
Length 301mm (11.85")
Pieces/layer: 2
Coverage/layer: 10%

Stone 5
Width 168mm (6.61")
Length 401mm (15.79")
Pieces/layer: 2
Coverage/layer: 13.3%

Stone 6
Width 168mm (6.61")
Length 501mm (19.72")
Pieces/layer: 2
Coverage/layer: 16.7%

Combo Bundle Layout by Layer



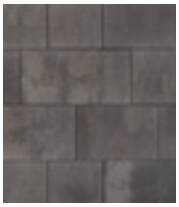
RECTANGLE - CUSTOM ORDER ONLY

Rectangle Stone
Width 168mm (6.61")
Length 336mm (13.23")
Pieces/layer: 15
Coverage/layer: 100%
Individually Packaged

+Contact your Oaks Dealer or Sales Representative on availability.

Molina® (80mm) **Also available in 60mm units!** See page 44 LIMITED AVAILABILITY

CLOUDBURST


LUNA **NEW!**

MORAINE

TWILIGHT

COMBO BUNDLE

12x12 Stone
Width 300mm (11.81")
Length 300mm (11.81")
Pieces/layer: 3
Coverage/layer: 25%

12x16 Stone
Width 300mm (11.81")
Length 450mm (17.72")
Pieces/layer: 2
Coverage/layer: 25%

12x24 Stone
Width 300mm (11.81")
Length 600mm (23.62")
Pieces/layer: 3
Coverage/layer: 50%

6X12 STONE

6x12 Stone
Width 150mm (5.91")
Length 300mm (11.81")
Pieces/layer: 24
Coverage/layer: 100%
Individually Packaged

12X24 STONE

12x24 Stone
Width 300mm (11.81")
Length 600mm (23.62")
Pieces/layer: 6
Coverage/layer: 100%
Individually Packaged

+Contact your Oaks Dealer or Sales Representative on availability.

Eterna (100mm) LIMITED AVAILABILITY

STOCK COLORS

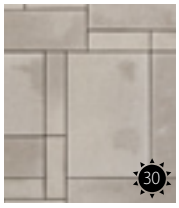
CLOUDBURST **NEW!**

LUNA **NEW!**

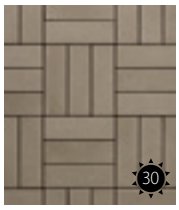
TWILIGHT **NEW!**

CUSTOM ORDER COLORS

DARK OAK

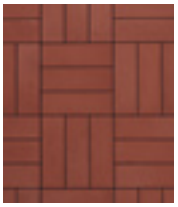

DOVER

NICKLE


OLIVE

ONYX

PLUM


TERRA COTTA

200x600 STONE

200x600 Stone
Width 200mm (7.87")
Length 600mm (23.62")
Pieces/layer: 8
Coverage/layer: 100%
Individually Packaged

400x600 STONE

400x600 Stone
Width 400mm (15.75")
Length 600mm (23.62")
Pieces/layer: 5
Coverage/layer: 100%
Individually Packaged

NOTE:
When ordering Eterna, try to secure product from a single batch lot to reduce the risk of variability. Color and tonal consistency between different sizes and batch lots cannot be guaranteed.

†Contact your Oaks Dealer or Sales Representative on availability.

Nueva® Step LIMITED AVAILABILITY

CHAMPAGNE

CLOUDBURST

MARBLE GREY

ONYX

1200mm Step Unit
Width 1200mm (47.24")
Height 150mm (5.91")
Depth 400mm (15.75")
Smooth on all faces and ends.
Individually Packaged

†Contact your Oaks Dealer or Sales Representative on availability.

ICON LEGEND

WALL TYPE

FREESTANDING

GEOGRID REINFORCED

MULTI DEPTH GRAVITY

SINGLE-DEPTH GRAVITY

STABILIZED BACKFILL

ALIGNMENT

STRAIGHT WALL

CURVED WALL

INSTALLATION OPTIONS

MACHINE INSTALLED

See page 24 for more details on each of these wall types.

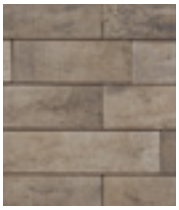
CHOOSING THE RIGHT WALL FOR YOUR PROJECT

In this section, we have included batter, alignment and installation options to further assist in selecting the correct wall for your given application. Please note for 0 degree (vertical) batter walls, we recommend placing a slight back slope to the leveling pad to accommodate forward rotation of the wall during installation; contact Oaks for more details.

SUMMARY CHART

	Connector Type	Batter Options									
NUEVA® 150 WALL - PAGE 52											
Combo Bundle	Split tongue	0°, 3.5°, 7°	•	•		•	•	•		
NUEVA® 75 WALL - PAGE 53											
Combo Bundle	Split tongue	0°, 3.5°, 7°	•	•		•	•	•		
ORTANA - PAGE 54											
Standard/Tapered	Split tongue	0° or 7°	•	•		•	•	•	•	
PROTERRA™ SMOOTH - PAGE 55											
	Split tongue	0°, 8° or 16°	•	•	•	•	•	•		•
PROTERRA™ SPLIT - PAGE 56											
	Split tongue	0°, 8° or 16°	•	•	•	•	•	•		•
MODAN - PAGE 57											
Combo Bundle	Glue	0°		•				•		
Linear Unit	Glue	0°		•				•		
GARDENIA LINEAR - PAGE 57											
	Rear lip	5°		•				•		

Nueva® 150 Wall


CHAMPAGNE

MARBLE GREY

ONYX

Onyx is available in Coping only.

NOTE: For design, please reference the Nueva® Wall Estimating Guide, available in the Resources section of our website.

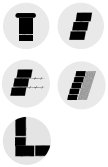
COMBO BUNDLE

16" Unit
Width 400mm (15.75")
Height 150mm (5.91")
Depth 300mm (11.81")
Setback: 0°, 3.5°, 7°
Connection Type:
Split Groove
Smooth on both faces
Pieces/layer: 2
Coverage/layer: 20%

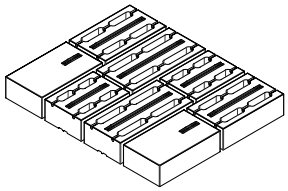
20" Unit
Width 500mm (19.69")
Height 150mm (5.91")
Depth 300mm (11.81")
Setback: 0°, 3.5°, 7°
Connection Type:
Split Groove
Smooth on both faces
Pieces/layer: 2
Coverage/layer: 25%

20" End Unit
Width 500mm (19.69")
Height 150mm (5.91")
Depth 300mm (11.81")
Setback: 0°, 3.5°, 7°
Connection Type:
Split Groove
Smooth on both faces and one end
Pieces/layer: 2
Coverage/layer: 25%

24" Unit
Width 600mm (23.62")
Height 150mm (5.91")
Depth 300mm (11.81")
Setback: 0°, 3.5°, 7°
Connection Type:
Split Groove
Smooth on both faces
Pieces/layer: 2
Coverage/layer: 30%



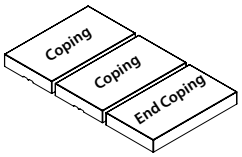
Combo Bundle Layout by Layer



COPING BUNDLE

Coping
Width 600mm (23.62")
Height 75mm (2.95")
Depth 340mm (13.38")
Smooth on both faces
Pieces/layer: 2
Coverage/layer: 67%
Packaged with End Coping Units

End Coping
Width 600mm (23.62")
Height 75mm (2.95")
Depth 340mm (13.38")
Smooth on both faces and one end
Pieces/layer: 1
Coverage/layer: 33%
Packaged with Coping Units



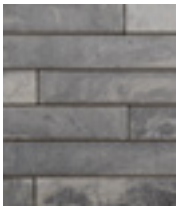
Coping/End Coping Combo Bundle by Layer

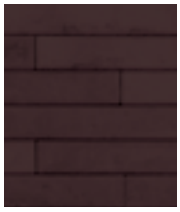
WEDGE UNIT

Wedge Unit
Width 330 mm (12.99")
Height 150 mm (5.91")
Depth 300 mm (11.81")
Individually Packaged

Nueva® 75 Wall

CHAMPAGNE


MARBLE GREY


ONYX

Onyx available in Combo Bundle and Coping!

NOTE: For design, please reference the Nueva® Wall Estimating Guide, available in the Resources section of our website.

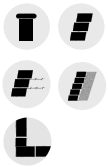
COMBO BUNDLE

16" Unit
Width 400mm (15.75")
Height 75mm (2.95")
Depth 300mm (11.81")
Setback: 0°, 3.5°, 7°
Connection Type:
Split Groove
Smooth on both faces
Pieces/layer: 2
Coverage/layer: 20%

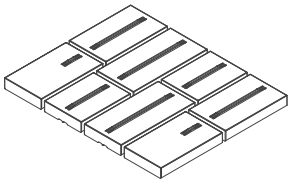
20" Unit
Width 500mm (19.69")
Height 75mm (2.95")
Depth 300mm (11.81")
Setback: 0°, 3.5°, 7°
Connection Type:
Split Groove
Smooth on both faces
Pieces/layer: 2
Coverage/layer: 25%

20" Corner/End Unit
Width 500mm (19.69")
Height 75mm (2.95")
Depth 300mm (11.81")
Setback: 0°, 3.5°, 7°
Connection Type:
Split Groove
Smooth on both faces and one end
Pieces/layer: 2
Coverage/layer: 25%

24" Unit
Width 600mm (23.62")
Height 75mm (2.95")
Depth 300mm (11.81")
Setback: 0°, 3.5°, 7°
Connection Type:
Split Groove
Smooth on both faces
Pieces/layer: 2
Coverage/layer: 30%



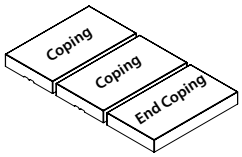
Combo Bundle Layout by Layer



COPING BUNDLE

Coping
Width 600mm (23.62")
Height 75mm (2.95")
Depth 340mm (13.38")
Smooth on both faces
Pieces/layer: 2
Coverage/layer: 67%
Packaged with End Coping Units

End Coping
Width 600mm (23.62")
Height 75mm (2.95")
Depth 340mm (13.38")
Smooth on both faces and one end
Pieces/layer: 1
Coverage/layer: 33%
Packaged with Coping Units



Coping/End Coping Combo Bundle by Layer

WEDGE UNIT

Wedge Unit
Width 330 mm (12.99")
Height 150 mm (5.91")
Depth 300 mm (11.81")
Individually Packaged

Ortana

DESERT

GREYFIELD

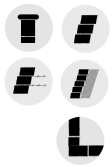
MOUNTAIN

ONYX

SANDALWOOD

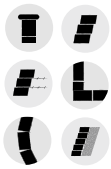
TIMBERWOOD

STANDARD UNIT



Standard Unit
Width 200mm (7.87″)
Height 150mm (5.91″)
Depth 300mm (11.81″)
Setback: 0° or 7°
Connector Type:
Split Tongue
Individually Packaged

TAPERED UNIT



Tapered Unit
Width 200mm (7.87″)
Height 150mm (5.91″)
Depth 300mm (11.81″)
Setback: 0° or 7°
Connector Type:
Split Tongue
Individually Packaged

NOTE: For design, please reference the Ortana Estimating Guide, available in the Resources section of our website.

Ortana Accessory Units

90° Corner Unit
Width 300mm (11.81″)
Height 150mm (5.91″)
Depth 200mm (7.87″)
Split on front face and one end
Individually Packaged

1′ Split-Face Coping Unit
Width 305mm (12″)
Height 75mm (2.95″)
Depth 300mm (11.81″)
Individually Packaged

2′ Split-Face Coping Unit
Width 610mm (24.02″)
Height 75mm (2.95″)
Depth 300mm (11.81″)
Individually Packaged

Proterra™ Smooth **LIMITED AVAILABILITY**

GREYFIELD - Smooth

NATURAL - Smooth

Note: Colored wall units also available as custom order. Minimum quantities apply.

NOTE: For design, please reference the Proterra Estimating Guide, available in the Resources section of our website.

STANDARD UNIT

Standard Unit
Width 1000mm (39.37")
Height 185mm (7.28")
Depth 375mm (14.76 ")
Setback: 0°, 8° or 16°
Connector Type:
Split Tongue
Smooth on both faces.
Individually Packaged

DOUBLE UNIT

Double Unit
Width 1000mm (39.37")
Height 185mm (7.28")
Depth 750mm (29.52") Setback:
0°, 8° or 16°
Connector Type:
Split Tongue
Smooth on one face,
Split on one face.
Comes with one split-face Standard Unit

TRIPLE UNIT

Triple Unit
Width 1000mm (39.37")
Height 185mm (7.28")
Depth 1125mm (44.29")
Setback: 0°, 8° or 16°
Connector Type:
Split Tongue
Smooth on both faces.
Individually Packaged

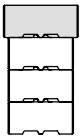
Proterra™ Smooth Accessory Units

Coping Corner/ End Unit - Smooth
Width 1000mm (39.37")
Height 185mm (7.28")
Depth 430mm (16.92")
Smooth on both faces and closed end
Individually Packaged

Standard Corner Unit - Smooth
Width 1000mm (39.37")
Height 185mm (7.28")
Depth 375mm (14.76")
Smooth on both faces and closed end
Individually Packaged

Coping-Step Unit Smooth
Width 1000mm (39.37")
Height 185mm (7.28")
Depth 430mm (16.92")
Smooth on both faces
Individually Packaged

Proterra™ Coping



Smooth Coping and Wall
(Coping centres over wall)

+Contact your Oaks Dealer or Sales Representative on availability.

Proterra™ Split

LIMITED AVAILABILITY

GREYFIELD - Split

NATURAL - Split

TIMBERWOOD - Split

Note: Colored wall units also available as custom order. Minimum quantities apply.

NOTE: For design, please reference the Proterra Estimating Guide, available in the Resources section of our website.

STANDARD UNIT

Standard Unit
Width 1000mm (39.37")
Height 185mm (7.28")
Depth 375mm (14.76")
Setback: 0°, 8° or 16°
Connector Type: Split Tongue
Two units split on one face, smooth on one face.
One unit split on both faces
Individually Packaged

DOUBLE UNIT

Double Unit
Width 1000mm (39.37")
Height 185mm (7.28")
Depth 750mm (29.52")
Setback: 0°, 8° or 16°
Connector Type: Split Tongue
Split-face on one face, smooth on one face
Comes with one Standard Unit

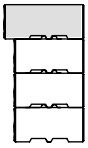
Proterra™ Split Accessory Units

Coping-Step Unit
Width 1000mm (39.37")
Height 185mm (7.28")
Depth 430mm (16.92")
Split on front face, smooth on back face
Individually Packaged

Standard Corner Unit
Width 875mm (34.44")
Height 185mm (7.28")
Depth 375mm (14.76")
Split-face on front and closed end
Individually Packaged

Corner Coping Unit
Width 875mm (34.44")
Height 185mm (7.28")
Depth 430mm (16.92")
Split-face on front and closed end
Individually Packaged

Proterra™ Coping



Split Coping and Wall
(Coping overhangs one side)

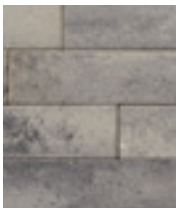
+Contact your Oaks Dealer or Sales Representative on availability.

Modan

LIMITED AVAILABILITY

CHAMPAGNE

CLOUDBURST


MARBLE GREY

TWILIGHT

NOTE: Maximum height not to exceed 660 mm or 6 courses, including buried course for retaining walls, 550 mm or 5 courses, including buried course for garden wall.

COMBO BUNDLE

660 Unit
Width 660mm (25.98")
Height 110mm (4.33")
Depth 220mm (8.66")
Pieces/layer: 4
Coverage/layer: 33.3%
No Connector, glue required
Setback: 0°

550 Unit
Width 550mm (21.65")
Height 110mm (4.33")
Depth 220mm (8.66")
Pieces/layer: 4
Coverage/layer: 27.8%
No Connector, glue required
Setback: 0°

440 Unit
Width 440mm (17.32")
Height 110mm (4.33")
Depth 220mm (8.66")
Pieces/layer: 4
Coverage/layer: 22.2%
No Connector, glue required
Setback: 0°

330 Unit
Width 330mm (12.99")
Height 110mm (4.33")
Depth 220mm (8.66")
Pieces/layer: 4
Coverage/layer: 16.7%
No Connector, glue required
Setback: 0°

LINEAR UNIT

Linear Unit
Width 440mm (17.32")
Height 110mm (4.33")
Depth 220mm (8.66")
No Connector, glue required
Setback: 0°
Individually Packaged

*Concrete adhesive is required between rows for optimum stability.

+Contact your Oaks Dealer or Sales Representative on availability.

Gardenia Linear

CHARTAN

GREYSTONE

SANDSTONE

NOTE: Maximum height under ideal conditions not to exceed 750 mm (including buried course) which is 5 courses. One course to be buried.

LINEAR UNIT

Length 600mm (23.62")
Height 150mm (5.91")
Depth 200mm (7.87")
Setback: 5°
Connector Type: Rear Lip
Individually Packaged

90° CORNER UNIT

Width 300mm (11.81")
Height 150mm (5.91")
Depth 200mm (7.87")
Split on one face and one end.
Individually Packaged

Dormant Products

Long before we print our product guides for each fresh, new landscaping season, we gaze intently into our crystal ball and try to envision what the coming year will bring. Of course, much of that is built on our past successes with you, and as we all know, the last several months have been very challenging times for all of us. Covid-19 has affected our lives both personally and professionally with necessary safety restrictions to follow.

This year, we have implemented a Dormant Products strategy in order to meet the needs of our customers for the most in-demand products and colors. Within the main products section of this product guide, we've displayed our active colors that will be available on a regular basis throughout the season. **Here within our Dormant Products section, you will find a full listing of products and colors that are temporarily gone, but certainly not forgotten.**

In fact, under certain circumstances we can still make these products as a special order, so please contact your local Oaks Sales Representative for full details. We are hopeful that stability returns to our industry, supply chain, and life in general soon. When it does, we will re-evaluate demand for these products and look at bringing them back into regular rotation.

PRODUCT	DORMANT COLORS & SIZES			
Monterey (60mm)	**MARBLE GREY** 8x16 Small Rectangle	**TWEED** 8x16 Small Rectangle	**WICKER** 8x16 Small Rectangle, Random Bundle, 16x32 Large Rectangle	
Nueva Slab/Paver (50/60/80mm)	**CHAMPAGNE** 8x16 Small Rectangle	**CLOUDBURST** 8x16 Small Rectangle	**GREYFIELD** 8x16 Small Rectangle	**MARBLE GREY** 8x16 Small Rectangle
	MILANO 8x16 Small Rectangle			
Eterna (100mm)	**100X300 STONE** Cloudburst, Luna, Twilight	**100X400 STONE** Cloudburst, Luna, Twilight		
Oasis & Oasis Bullnose Coping (60mm)	**DOVER** Coping Unit	**DOVER, SUAVE** Bullnose Coping Unit		
Aria Step	**CHAMPAGNE, GREYFIELD, MILANO**			

Visit our website for more information: www.OAKSpavers.com/dormant-products

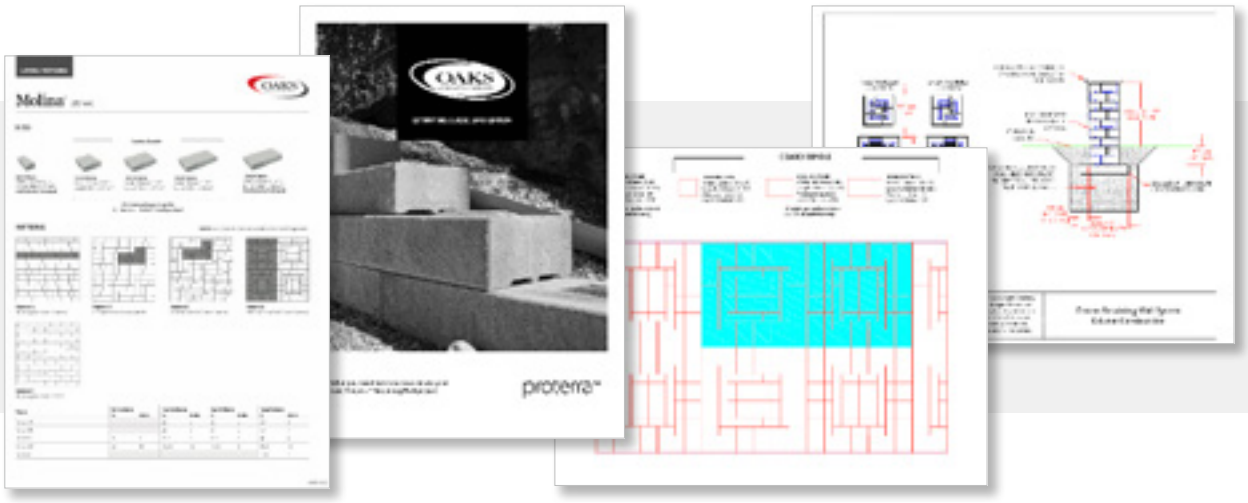
OAKS LANDSCAPE PRODUCTS

online tools + resources

You'll find all of our products categorized online just like they are in this product guide, with product pages designed to include white space for readability. Click on any color swatch to reveal specific details about features, availability, and sizes. Visit our online resource library where you'll find this guide and many other helpful design and estimating resources in our online resource library. Filter by resource type or enter your search term for help that goes far beyond the product pages.

Visit us at OAKSpavers.com today!

RESOURCES TO HELP YOU PLAN AND DESIGN!



On the cover:
Paver: Enviro Midori, Champagne

OAKS LANDSCAPE PRODUCTS

Brampton Brick Limited

Brampton
225 Wanless Drive
Brampton, ON L7A 1E9

Detroit
51744 Pontiac Trail
Wixom, MI 48393

Farmersburg
1256 East County Rd. 950 N.
Farmersburg, IN 47850

Brockville
3007 County Rd. #29
PO Box 141 Brockville,
ON K6V 5V2

Boisbriand
4200, Marcel-Lacasse
Boisbriand, QC J7H 1N3

Cambridge
1038 Rife Road
Cambridge, ON N1R 5S3

Hillsdale
2108 Flos Road Four East,
Hillsdale, ON L0L 1V0

Markham
455 Rodick Road
Markham, ON L6G 1B2

Product representations shown in this publication are intended to convey the general color, texture and appearance of the product. Variations may occur in the manufacturing and printing process. Always select from an actual product sample.

OAKSpavers.com

US - 1.800.876.OAKS (6257)
CA - 1.800.709.OAKS (6257)

icpi Interlocking Concrete Pavement Institute

NATIONAL NCMA CONCRETE MASONRY ASSOCIATION

USAEOLO/03/22