GeoCeramica® Installation Guide for Unbound Pavements

This guidance is for the creation of an unbound pavement where the paving units are being installed on a sand bedding course and jointed with sand.

Brett GeoCeramica is suitable for site categories IV as defined within BS 7533-4. This is defined as:

Brett GeoCeramica 60mm
Lightly trafficked applications, such as car parks receiving no commercial vehicle traffic, footways subject to domestic vehicular crossover and private driveways. The Bluestone range is suitable for these applications.

Brett GeoCeramica 40mm
Pathways, patios and pedestrian hard landscaping. The Fiordi, Marmostone & Impasto ranges are only suitable for these applications.

For areas exposed to trafficked, guidance for the pavement construction can be sought from the BS7533 suite of standards.
Consideration between the extent of loading and ground strength should be given. Typically, a minimum sub-base thickness of 100mm should be provided.

(Note: GeoCeramica can also be installed using bound methods for both installation and application requirements. Please see separate installation guidance.)

Subgrade

The preparation and construction of the subgrade should generally be in accordance with current practise and described in the Highways Agency's Specification for Highway works.
The existing subgrade material which has been exposed at formation level should be suitably prepared. This will include ensuring a firm surface is offered and the strengthening of any weak areas.
At this stage, it should be decided when to form the final profile of the paved surface to allow for drainage once completed. This should be done by either profiling the subgrade to allow constant thickness of the above layers or by profling the sub-base material (see 'Sub-base' and required falls).

Sub-base

The preparation and construction of the sub-base should generally be in accordance with current practise as described in the Highways Agency specification for Highway works.
The surface levels of the sub-base should be within the following maximum permissible deviations on the surface levels - +5mm to -10mm.
If the sub-base is to be profiled (as opposed to the subgrade), a minimum longitudinal fall of 1% and minimum cross fall of 1.25% are recommended to be introduced into the pavement. These falls stated at absolute minimums. It may be prudent to increase these falls to allow sufficient speed of drainage.
These falls must be maintained through to the finished pavement levels to ensure water run-off.
Care should be taken to ensure a smooth blending of levels and profile. This will help minimise, if not eliminate, excessive cutting of the Brett GeoCeramica product on the surface layer.
The surface of the sub-base should be tight and dense enough to prevent laying course material being lost into it during construction.
The extent of the site preparation should include enough room to provide adequate foundations and backing for any edge restraint preparation and such restraints should be installed before the laying course and GeoCeramica paving units are laid.

Edge Restraints

Edge restraints need to be sufficiently robust to withstand override by any anticipated traffic during construction, in final use and to prevent loss of laying course material. The edge restraint should present a vertical face at least down to the level of the underside of the laying course.
Conventional edge restraint product examples include the Flat Top Edgings, Brett High and Drivestyle Kerb ranges. However the Brett Piatto Concrete Block Paving range with both textured and ground contemorary surfaces with complementary and contrasting colour options and varying plan sizes makes an excellent design alternative.

Laying Course

The laying course should be a sharp sand or a suitable recycled material (e.g. crushed glass) which is laid directly onto the sub-base.
The laying course should contain no material which could detract from the unbound nature of the course, e.g cement or lime. The laying course material should be a naturally occurring sand from the quaternary geological series or sea dredged sands and should conform to the table below:

Laying course material grading (BS EN 12620:2002 GF 85 0/4 (MP) fine aggregate)	
Sieve size (mm)	Percentage by mass passing %
8	100
6.3	95 - 100
4	85 - 99
0.5	30 - 70
0.063	0 - 3

When preparing the laying course, the material should be moist without being saturated. It should show no free water and should bind together when the material is squeezed in the hand and the pressure released.
If the laying course becomes saturated prior to laying the paving units, it may be removed and replaced, or allowed to dry to an acceptable moisture content. To control the moisture content covers may be used.
The laying course material should not be used as a regulating course or used to achieve adequate falls and therefore offer a consistent thickness.
The thickness of the laying course after final compaction of the GeoCeramica surface should be 35mm, with a surface level tolerance of +5mm to -10mm.

It is recommended to use a pre-compaction method followed by a light distressing of the laying course surface. This is achieved by screeding 50mm of material in one layer and compacting using a plate compactor. This surface should be levelled by screeding and then the top 10mm should be lightly loosened with a rake. This approach will ensure a consistent surface flatness.
The laying course materials can offer regional variations and the type of material can influence the compaction characteristics of the laying course. If unsure, a small trial area prior to the full installation is always recommended.

Vibrating plate compactors for the laying course should comply with the following specification: 1800 kg/m^2 to 2100 kg/m^2

Any disturbance of the laying course material that will adversely affect the laying of GeoCeramica units should be corrected.

The area of laying course prepared should generally be such that at the end of a working day, its boundary is not less than 1m ahead of the laying face. All areas of prepared laying course material should be protected and not left exposed overnight.

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GeoCeramica Placement

Take care to open the Brett GeoCeramica packaging in a safe manner ensuring that flags cannot fall over prior to cutting the bands by supporting one end of the pack.

Prior to any placement of the product, risk assessment and method statements should be considered and produced in relation to the site's characteristics.

As a part of the risk assessment, it should be noted the units are circa 30kg's for 40mm & 48kg's for 60mm therefore either a two person manual lift or the use of mechanical handling equipment is recommended.

For more details on suitable mechanical handling options, including vacuum lifting and flag pickers, please visit www.probst-handling .co.uk

Care should be taken when handling the product that the edges are not damaged at any stage of the installation process. We would recommend the protection of the edges when temporarily stored or stacked and ensuring any handling equipment is not able to cause damage whilst lifting and placing.

Brett GeoCeramica units should be placed on the prepared laying course in a nominated pattern. For vehicular loading applications a staggered bond, orientated to resist the effects of vehicular traffic direction, is recommended wherever possible.

An order of laying which maintains an open laying face should be followed. The alignment of paving should be checked periodically for all patterns by using string lines, and adjustments made where necessary.

Any minor adjustments necessary to maintain the laying pattern should then be made.

- Note that product nibs are for product edge protection during manufacturing and transit. They should not be used for joint width regulation.
- A 2mm to 5mm joint range is feasible, however we would recommended a consistent target joint width of 4mm to 5mm.
- Either a string line and/or tile spacers running off the ceramic top surface of the GeoCeramica may be used to check the alignment of the paving units.

On slopes, paving units should be laid commencing from the bottom and working upwards whenever possible.

Jointing sand should be applied before the on-set of any adverse weather and before the end of the working day. When working on slopes, it may be prudent to apply the jointing sand on a more frequent basis to ensure joints widths are maintained.

Cutting and Trimming

Where Brett GeoCeramica units need to be cut or trimmed, sizes smaller than a quarter of the original plan size should be avoided where possible.

The accuracy of cutting the units should be such that the joint between the cut unit and full unit should be consistent with the overall joint width design.

Brett GeoCeramica units should be cut using a water-cooled power saw to ensure heat does not delaminate the ceramic and concrete layers within the product and to comply with all H&S good practise.

For best practise, to avoid chipping of the Ceramic element of GeoCeramica and prolong blade life, it is recommended that a two blade approach is used for cutting GeoCeramica.

Please ensure that the Concrete Blade width does not exceed that of the Ceramic Blade.

The use of a Ceramic Blade such as the Pulvex P1 Series of the Black Diamond PC300 Range have been recommended by the respective company. For more details please visit either manufacturer's website:- www.pulvex.co.uk or www.blackdiamondinternational.co.uk

Further tips from blade manufacturers include:

1. Put the flag on a bed of sand or stone when cutting as this will absorb vibration.
2. Cut a 50mm notch straight through the ceramic at either end of the cut (this relieves some of the tension in the flag).
3. Do not force the blade through the ceramic, allow the blade to cut at its own pace.

Please ensure that any cutting activity has been full risk assessed. For more details on carrying out risk assessments please refer to: www.hse.gov.uk/risk/controlling-risks.htm

Joint Construction & Compaction

Paving units should be laid to the target joint width. Note that if joint widths greater than 5mm are required then a bound construction method should be adopted.

The joint filling material should be dried free-flowing silica sand conforming to the table below should be used.

Jointing material grading (BS EN 12620:2002 GF 85 0/4 (MP) fine aggregate)	
Sieve size (mm)	Percentage by mass passing %
2	100
1	85 - 99
0.5	55 - 100
0.063 (fines content)	0 – 2 (BS EN 12620 fines category f2)

Due to the presence of the open textured backing, we would recommend the jointing sand is topped up during the early life of the pavement.

Consideration of using a self-binding jointing sand can also be given.

Vibrating plate compactors for the pavement surface course should comply with the following specification:

- Plate area of not less than 0.36 m^2
- Effective force transmission rate of not less than 75 kN/m^2 of plate
- Vibration frequency in the range of 65Hz to 100Hz
- Minimum mass of 200kg
- A neoprene sole plate to protect the ceramic surface should be used at all times

Prior to sand joint filling, the paving surface should be checked for surface level tolerance, joint width consistency, joint alignment and to ensure there are no damaged or broken units. Any necessary corrective action should be taken to ensure that the pavement conforms.

Prior to compaction, the surface should be free of debris, joints between paving units should be filled.

The compaction should be carried out as soon as possible after the laying of the GeoCeramica paving units. Compaction should not occur within 1m of any laying face.

It is advisable that all areas of paving, other than an area within 1m of the laying face, should not be left un-compacted at the completion of the day's work.

Replenishment of jointing material after compaction to ensure that it is maintained to the top surface of the GeoCeramica units and re-compaction is required until all joints maintain the jointing material at the required level.

Surface regularity of Brett GeoCeramica pavement after compaction should comply with the following tolerances - 3mm under a 3m straight edge while differences in levels at the joint of adjacent paving units being 2mm or less.