

## Sterling Tile Granular Sub-Surface Preparation Guide



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Revised 5/2022

# Sub-Surface Preparation Guide

## Introduction

**Proper preparation of the sub-surface is critical to the long term success of your project.**

The ideal sub-surface for the Sterling Tile system is properly cured concrete or asphalt. The Sterling Tile system was also designed to be installed over a properly leveled and compacted sub base of 4 to 8 inches of aggregate of the correct size, type and consistency, followed by a minimum 1 inch layer of properly leveled and compacted (1/4 inch minus) “chip & dust” or “granite or limestone screenings”.

Due to the importance of proper sub-base preparation, Sterling Tile has created this separate instructional guide specifically addressing the correct sub-surface preparation techniques required to obtain a surface suitable for a tile installation. Your architect or civil engineer can provide you with proper drainage and base preparation details based on your local conditions.

By investing a few minutes in this manual you will save valuable time on the project while avoiding some of the most common errors associated with the base installation.

## Product Storage

### 1. Geotextiles & Adhesive

Store all Geotextile and joint adhesive in a dry storage area.

### 2. Packing Aggregate

If base is to be installed when temperature is near freezing during the day and below 0°C during the evening, then the aggregate materials should be stored in a large pile and covered to minimize frozen material. Access for loading should be through one location only. This will allow the outer “frozen cap” to protect the inner stored material from freezing. Proper compaction cannot be completed using frozen clumps of aggregate.

## Tools & Consumables

### 1. Must Have Tools

- a. Standard tools for moving aggregate: shovels, earth rakes, wheelbarrows, screed board, etc.
- b. Standard tools for site layout: tape measure, masonry string, sledge hammer, grade stakes, builder’s level, etc.
- c. Standard tools for site cleaning: brooms, leaf rakes, grain shovels, etc.
- d. Standard tools for mechanical compaction: rolling, vibrating Bomag-style packer. For best compaction, use rolling, vibrating compactor instead of vibratory tamper.
- e. Standard tools for manual compaction: hand tamper, sledge hammer for edges, garden hose for moisture, as well as water packed surface.
- f. Heavy duty knife: Heavy duty cutting knife for cutting Geo-Textile.
- g. Chalk line or string line.

### 2. Optional Tools

- a. Stone slinger: used to place loose aggregate rapidly into areas that have multiple obstructions which prevent access by leveling and delivery machinery.
- b. Skid Steer-Bobcat or equivalent: for larger surface areas, which require delivery of large volumes of aggregate.

### 3. Consumables

- a. Site protection lumber: If skid steer or other excavation equipment is to be used over landscaped areas, plywood, should be used to protect the area from damage.

## Site Survey

### 1. Orientation

Although the final orientation of the installed surface may not be a matter of choice, some consideration should be given to direct sunlight.

Sterling Tiles are made from recycled rubber. Rubber absorbs heat from infrared light (i.e. surface heat is from exposure to direct sunlight, not from exposure to atmospheric temperature). If the surface area is exposed to direct sunlight, design considerations should include lighter colors that help reflect infrared light.

Rubber surfacing products, in direct sunlight exposure, typically will have a surface temperature that is 10°C (average), higher than adjacent asphalt. On a bright sunny day, with exposure to the south or west, the surfaces will be hot to touch. However, on north or east exposure, and in areas that receive partial shading, the surface will be close to the same temperature as the atmosphere.

### 2. Accessibility

Determine the method of aggregate delivery. Consideration should be given to access restrictions, time restrictions, existing fencing, the protection surrounding landscaping, specialty tools (stone slinger), etc.

### 3. Necessity for Security

In order to protect work in progress site security may be necessary.

### 4. Utilities Accessibility

Water and electricity will be needed to properly prepare the surface.

## Sub-Surface Drainage

A properly designed water collection system must be installed to ensure that the Sterling Tile surface remains level and to prevent the tile from sitting in standing water for long periods of time. Evaluate existing drainage:

### a. Naturally Draining Sub-Surface

If the installation site is elevated with natural drainage (adjacent grades slope away from the installation site at more than 1 inch in 12 inches), and does not currently collect water, then additional storm water management may not be necessary. All retaining edges must be designed to allow water to drain out the edges of the installation.

It is recommended that an individual with drainage experience (such as a soil or civil engineer), inspect the site prior to commencement of the installation.

#### **b. Non Draining, Sub-Surface**

If the installation area is lower than the adjacent grades and tends to collect water, or if water has standing puddles on the sub-surface, then a sub-surface water management system must be installed.

#### **4. Install Water Collection/Drainage System**

When the sub-surface requires a water collection system, perforated PVC pipe should be used. Perforated PVC pipe must be installed under and surrounding the sub-base area (see 'Details' on following pages), and tied into the external storm water collection system. The perforated PVC should be placed below the top plane of sub-surface aggregate and encapsulated in ¾ inch clear crushed stone. Keep in mind that packed aggregate, when using variant sized granules is not very porous and therefore the sub-surface should be sloped towards the water collection PVC pipe.

- a. Excavate trenches to contain perforated PVC pipe.
- b. Install perforated PVC pipe with correct slope. Connect ends.
- c. Back fill trenches with ¾ inch clear stone wrap to a diameter of approximately 12 inches.
- d. Tie drainage system into existing storm sewer or ditch.

### **Site Preparation - Pre Sub-Surface**

Having a properly compacted, sloped and prepared sub-surface is critical to the final installation of your Sterling Tile project.

An aggregate site should be prepared as though it was a concrete surface. Not all contractors understand that the sub-base must be compacted and graded properly with a 1% slope from the center of site to outside edge.

Having the proper tools including a laser, wood or metal screed board, grade stakes and string line will be important.

The first thing one must do is to establish the final finished surface height. In your case, this will be typically in relation to the already installed playground equipment. In some cases, you might determine the finished height of the surface by the surrounding ground or the relationship between the surface and nearby sidewalks, or curbs.

The next thing you have to consider is any slope you want in the finished surface. Slope is required, to allow rainwater and snow melt to run off the surface. We recommend a 1% slope however the slope must not exceed 2% in order to meet ADA requirements. A gradual slope of one-eighth inch of drop per every foot of run should be enough slope in most instances.

The best way to achieve the correct slope is to establish grade stakes driven into the ground for reference points. The tops of the stakes will represent the different finished heights throughout the surface. Grade stakes are stakes which are used on a construc-

tion site as an elevation reference and can be purchased at most hardware and construction stores.

Stakes should be placed eight feet on center, so that you can set a very straight piece of wood, string line, or perfectly straight metal straight edge on top of the stakes. Gaps under the wood or straight edge, indicate that more material needs to be added. If too much material is placed, then the straightedge will not rest upon the tops of the stakes.

When you have the perfect amount of material in place, with respect to the given stakes, the surface will be perfectly smooth. Correct slope should be verified by rotating the straightedge, on top of the stakes through the site. The network of stakes allows you to move the straightedge to different stakes to check that all points are in the same plane.

Establishing the proper height of the stakes can be a challenge. You can use a builder's level to accomplish this goal and this equipment is normally available at equipment and tool rental stores. An automatic level, self-levelling level or builder's auto level, includes an internal compensator mechanism that, when set close to level, automatically removes any remaining variation from level. This reduces the need to set the instrument truly level. Self-levelling instruments are the preferred instrument on building sites, construction and surveying due to ease of use and rapid setup time.

Establishing proper height is accomplished with two people. The operator looks through the eyepiece of the level while an assistant holds a tape measure or graduated staff vertical at the point under measurement. The instrument and staff are used to gather and/or transfer elevations (levels) during site surveys or building construction.

By using a graduated grade pole on top of each stake, you can tell if the stake is level or in the same plane as all of the rest. A grade pole is simply a vertical ruler that is marked in increments of one-quarter inch.

You can also string lines if the stakes are in line with one another. The string will demonstrate if one stake is higher than an adjacent one. Of course the builders level will do the same as long as you keep track of the different stake heights.

Keep in mind that not all grade stakes will always be at the same elevation. The grade stakes farther from the center of the site will be lower and lower as you continue to create fall as you move away. Being off even slightly can translate into a large problem along the line, making it important to take time to set the stakes right.

The final elevation of the top of the tile should be above the surrounding surfaces to ensure the site stays dry.

#### **Site Preparation as Separate Contract**

Base preparation is normally covered under a separate contract from the resilient surface installation, however the following information is provided as a guideline:

### 1. Remove all Sod and Topsoil

Continue to remove topsoil until solid, packed and stable sub-soil is visible and level.

### 2. Test Sub-Soil for Rebound

If sub-soil is of poor quality, geotextile cloth may be necessary between the sub-soil and the granular sub-surface.

### 3. Install Drainage Collection System

Install Drainage Collection System prior to installation of sub-surface.

### 4. Install Retainer Edge

- a. **Solid Retainer Edge-Buried:** A suitable, solid retainer edge for the packed aggregate sub-surface is required. A concrete (curb), is the preferred retainer. Refer to Detail 'G' for specification.
- b. **Solid Retainer Edge-Exposed:** If the exposed retainer edge surrounds a play area, it must meet minimum distance requirements from the play structure as specified in ASTM F1487 Standard for Public Play. Refer to Detail 'D' for specification.
- c. **Solid Retainer Edge-Existing:** Concrete walkways, asphalt pathways, building walls and retainer walls are just a few examples of retainer edges that typically surround the site prior to most installations.

## Sub-Surface Installation

A solid sub-surface (i.e. concrete, asphalt), is the recommended base for all resilient surfacing products due to the predictable nature of these surfaces. However, a properly prepared aggregate sub-base may be a suitable alternative for some areas and/or budget constraints.

### 1. Sub-Soil Geotextile (If Necessary)

If the sub-soil is not stable the installation of Geotextile fabric between the subsoil and sub-base may be required. Overlap joints by 12 inches. Seal joints using polyurethane adhesive. (Sika221 or equivalent)

### 2. Install 4 to 8 inches of Granular Packing Aggregate

If base is sandy, stable, drains quickly, and is in low frost, low moisture areas, 4 inches of packing granular (Granular 'A' – ¾ inch minus or equal), should provide a sufficient base for a pedestrian use surface.

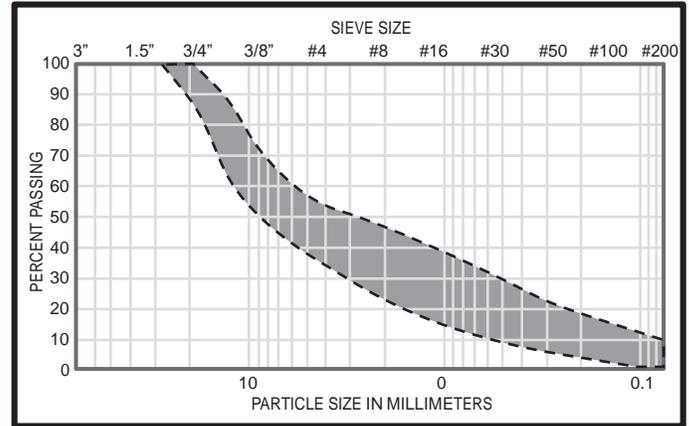
In higher moisture and/or high frost areas, 8 inches of granular material will likely be necessary. Install the granular materials in 3 to 4 inch layers. Level and pack each layer separately.

### Aggregate Description

“Granular ‘A’ shall be produced by crushing. Granular ‘A’ or equivalent shall consist of crushed rock composed of hard fractured fragments free of clay coatings. Granular ‘A’ shall be produced from bedrock or gravel, cobbles or boulder of uniform quality.” (Contact local soil engineers or aggregate suppliers for detailed local aggregate specifications and performance expectations).

### 3. Aggregate Grading Curve

Granular base aggregate (¾ inch minus), should match the grading curve shown below. Aggregate larger than ¾ inch can make final surface leveling difficult. Any local aggregate supplier will provide, on request, a grading curve chart (similar to the one below). It is important that the curve of the materials they are proposing to supply, matches (as closely as possible), to the chart shown below.



The above sieve analysis is the ideal curve for a simple and long lasting packed aggregate sub-surface. Since a packed aggregate base is subject to potential movement, we recommend staying within the above gradient to reduce sub-surface movement possibility.

### 4. Rolling Packer

It is critical that the base be properly compacted. Without adequate sub-surface compaction, the planarity of the finished surface will be changed as the sub-surface planarity changes.

### 5. Assist Packing by Soaking Aggregates

Soak the area with water. Allow the water to percolate through the aggregate and partially dry before compaction. Once materials have been adequately packed, a compaction test (nuclear densometer or equivalent), is recommended for both client and installer assurance of quality.

### 6. Assist Packing by Adding Cement

If after completing the above steps, the aggregate supplied still does not reach the specified density of 95% SPD, then packing can be enhanced by spreading one 88 lb. (40 kg) bag of cement over 200 sqft of aggregate base. Water cement to allow percolation into the aggregate. Repeat the above procedure. Pack with rolling packer after completion of cement addition.

### 7. Use Templates During Auguring

Install play center posts, or any other footings using plywood templates to prevent excavated subsoil from contaminating the base aggregate materials.

### 8. Fill All Footings From Bottom to Top With Concrete

Fill all play center post holes from bottom to top with concrete. Greatmats does not recommend packing the holes full of granular material because of the risk of future sinking after exposure to multiple rainstorms.

### **9. Equipment Play Decks**

Backfill material placed under low decking is often not often leveled or properly compacted due to the confined space and difficulty accepting power equipment. When possible, low lying decks should be removed prior to compaction. If this is not possible, a "2 x 4" extended under the deck can be hit with a sledge to aid in the compaction. Dry cement should also be used to enhance compaction.

### **10. Level Sub-Surface Aggregate to 1/4 Inch Over 10 Feet Measured in Any Direction**

Packing aggregate that falls into the same gradient curve as granular 'A' will have a size ranging from "dust" (microns), to 3/4 inch. This material can be difficult to level enough for a proper surface installation due to the percentage of larger stone in the mix.

### **11. TOP Level "Chips & Dust" – IMPORTANT!**

Since the planarity of the granular base will determine the planarity of the final surface, we recommend installing a properly leveled and compacted minimum 1 inch layer of (1/4 inch minus), "chip & dust" or "granite or limestone screenings" over the final compacted and leveled sub-surface. The finer material is easier to level and will fill the minor undulations in the planarity of the packed aggregate.

### **12. Extend Granular Base 3 to 6 Inches Past Actual Edge of Installation**

The edge of any surface is the area of greatest use and misuse. Lawn mowers, tractors, vehicles, etc., often come in contact with the edge. Extending the sub-surface aggregate base 3 to 6 inches past the anticipated final edge of the resilient surface installation will assist in stabilizing the edge.

### **13. Base Surface Slope to Be 1%**

To facilitate adequate water drainage, base surface slope should be 1%.

### **14. Inspect Final Packed Aggregate Base**

It is important to carefully inspect any base supplied by an outside contractor. Often, clients assume that commencement to install Sterling Tile over the prepared base indicates acceptance and responsibility for the base. Because the cost to remove and replace the resilient surface over a poorly prepared base is significant, it is important to emphasize to the client that commencement of an installation over any type of base prepared by another contractor in no way indicates approval of the base compaction and stability. It is only an indication that the installer of the resilient surface is satisfied with the planarity of the base.

## **Installation of EPDM Rubber Membrane on Granular Base**

### **1. Cut and Place Lengths of EPDM Rubber Membrane**

*- EPDM Rubber Membrane or Equivalent*

Position the first 3m width beside and parallel to the area that has the most cuts for posts and other adjacent supports. Cut the edge of this piece to fit adjacent supports. Allow it to extend at least 12 inches past the posts.

### **2. Overlap by 6 Inches and Continuously Seal Joints**

Overlap the joints by at least 6 inches. Continuously seal joints with polyurethane adhesive (same material used for tile to tile adhesive). In addition, seal joints where the product has been cut multiple times.

### **3. Stretch EPDM Rubber Membrane**

After adhesive has cured, or joint is additionally supported with duct tape, stretch the EPDM Rubber Membrane material as tight as possible.

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