



Playground Safety Surfacing Aggregate Subsurface Detailed Specification

PART 1 - PRODUCT STORAGE

1.1 Aggregate

If subsurface is to be installed when temperature is near freezing during the day and below freezing during the evening, than the aggregate materials should be stored in a large pile. Access for loading should be though one location only. This will allow the outer "frozen cap" to protect the inner material from freezing. Proper compaction cannot be completed using frozen clumps of aggregate.

PART 2 - TOOLS NEEDED

2.1 Necessary Tools

- A. Moving Aggregate - shovels, rakes, wheelbarrows, etc.
- B. Site Layout - tape measure, string line, sledge hammer, stakes, etc.
- C. Site Cleaning - brooms, rakes, shovels, backpack blower, etc.
- D. Mechanical Compaction - rolling, vibrating compactor or vibratory tamper.
- E. Manual Compaction - hand tamper for edges, water hose to water compacted surface.
- F. Chalk Line - to mark off the site for accurate determination of the size of the area.

2.2 Optional Tools

- A. Skid Steer - for larger surface areas, which require delivery of large volumes of aggregate.

2.3 Consumables

- A. Site Protection Lumber - If skid steer or other heavy equipment is to be used over landscaped areas, plywood, lumber, etc. should be used to protect the area from damage.

PART 3 - SITE SURVEY

3.1 Orientation

Although the final orientation of the installed playground safety surface may not be a matter of choice, some consideration should be given to the following items.

- A. Direct Sunlight
Playground safety surfacing is made from rubber. Rubber absorbs heat from infrared light. (Surface heat is from exposure to direct sunlight, not from exposure to atmospheric temperature). If the playground safety surface is exposed to direct sunlight, design considerations should include lighter colors that reflect infrared (although variance in color only has a modest impact on surface temperature).

Rubber playground safety surfacing, in direct sunlight exposure, typically will have a surface temperature that is 10 to 15 degrees F higher than adjacent asphalt. On a bright sunny day, with exposure to the south or west, the playground safety surface will be hot to touch. However, on north or east exposure and in areas that receive partial shading, the playground safety surface will be close to the same temperature as the atmosphere. In northern climates, warmer surface temperatures during the cooler days of the early spring and late fall are often preferred.

- B. Shaded/Damp Areas
A site with complete and continual shade may remain damp, resulting in mildew and/or mold growth. In shaded areas, more frequent cleaning may be necessary.



3.2 Accessibility

Determine the method of aggregate delivery. How will the aggregate be brought to the final subsurface area? Can a truck drive over adjacent areas without damage? Is a skid steer needed? If so, can it drive across adjacent areas without damage? Is there a fence that needs to be removed? Consideration must be given to each of the above questions prior to commencement of the subsurface installation in order to plan for the tools needed and the work flow process.

3.3 Work Time Restrictions

Is the installation in a residential area thus preventing early or late installation hours? Will 24 hour access be allowed?

3.4 Security

In order to protect work in progress (subsurface grading and compaction, wet pour, curing time, etc.), will additional, site security be necessary? From when? Until when? Will construction barrier tape or fencing need to be set up for pedestrian safety?

3.5 Utilities Accessibility

Water will be needed for compaction. Is this locally available? Are electrical outlets available?

PART 4 - SUBSURFACE DRAINAGE

A properly designed and installed water collection system is often overlooked during site planning stages because in many cases a planner's mind is focused on impervious surfaces (i.e. concrete or asphalt, etc.) where subsurface drainage may not need to be installed. It is critical that a proper subsurface drainage system be planned and implemented or the playground safety surfacing may not stay level and ultimately may become damaged due to hydraulic pressure.

4.1 Evaluate Existing Drainage

A. Above Grade Installation

If the installation site is higher than adjacent grades with natural drainage (adjacent grades slope away from the installation site at more than 1" in 12"), and does not currently collect water, then additional storm water management may not be necessary. The surface water will percolate through the playground safety surfacing. It will then drain across the top of the compacted or solid subsurface and out the edges. It is recommended that an individual with drainage experience inspect the site prior to commencement of the installation.

B. Below Grade Installation

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

4.2 Install Water Collection/Drainage System

If the subsurface needs to have a water collection system, then perforated PVC pipe should be used. The perforated PVC pipe must be installed under and surrounding the subsurface area and tied into the external storm water collection system (ditch, storm sewer, etc). The perforated PVC should be placed below the top plane of subsurface aggregate and encapsulated in 3/4" crushed stone. Keep in mind that compacted aggregate, when using various sized granules is not very porous and therefore the subsurface should be sloped towards the water collection PVC pipe.

1. Excavate trenches to contain perforated PVC pipe.
2. Install perforated PVC pipe with correct slope. Connect ends.
3. Back fill trenches with 3/4" crushed stone wrap to a diameter of approximately 12".
4. Tie drainage system into existing storm sewer or ditch.



PART 5 - SITE PREPARATION

5.1 Site Preparation as Separate Contract

Subsurface preparation is normally covered under a separate contract from the playground safety surfacing installation, however the following information is provided as a guideline.

5.2 Remove Sod and Topsoil

Continue to remove topsoil until solid, packed and stable subsoil is visible and level. Retain materials on site for potential future use as back fill. Remove excess material.

5.3 Test Subsoil for Compaction

If subsoil is of poor quality then there is a possibility that geotextile fabric may be necessary between the subsoil and the aggregate subsurface. The subsoil can be compaction tested by driving a vehicle over the area. If the subsoil compresses and rebounds greater than 1" (25mm) additional compaction or thicker aggregate subsurface will be needed.

5.4 Install Drainage Collection System (if needed) Prior to Subsurface Installation

Drainage system installed as described above prior to installation of subsurface.

5.5 Install Retainer Edge (as necessary)

A. Increase Depth Edge

If the playground safety surface is adjacent to a loose (soil, sod, gravel, sand) material, the edge of the aggregate subsurface can be sloped under this loose material. The extent of the sloped run and rise depends on the potential for the adjacent surface to become disturbed. If the adjacent surface is to have sod/grass and is not expected to be used frequently, a 12" run at a 1:1 slope will provide a sufficient edge. If, however, the adjacent surface is sand and/or is expected to receive heavy use, this edge should extend for at least 24" at a 1:2 slope.

B. Solid Retainer Edge - Buried

A suitable, solid retainer edge for the compacted aggregate subsurface can be made from concrete (curb) or pressure treated wood. Ensure that the design of this wall will allow for soil movement due to frost or other forces. Typically this would require a minimum of a 12" tall wall at 6" wide. If the wall is to be pressure treated 6 by 6's, it should be supported with vertical support posts, set in concrete every 72" on center.

The top surface of the retainer wall should be low enough to allow for the playground safety surface to be installed on it while providing the finish surface at the elevation required.

C. Solid Retainer Edge - Exposed

Follow similar installation instructions as described above except that the placement of the wall will allow for it to be exposed.

If the exposed retainer edge surrounds a play area, it must be outside of the fall zone.

D. Solid Retainer Edge - Existing

Concrete walkways, asphalt pathways, building walls and retainer walls are just a few examples of retainer edges that typically are existing and surround the site prior to most installations.

PART 6 - SUBSURFACE INSTALLATION

6.1 Subsoil Geotextile Fabric (if necessary)

Install geotextile fabric over subsoil (if necessary, see above.) Overlap joints by 12". Seal joints using polyurethane adhesive.



6.2 Install 4" to 8" Compacted Aggregate

If base is sandy (drains quickly) and is stable (well packed) and/or in low frost, low moisture areas, 4" of compacted aggregate should provide sufficient subsurface for pedestrian use. (Contact local soil engineers or paving stone installers for detailed, local aggregate specifications and performance expectations). In higher moisture and/or high frost areas, up to 8" of compacted aggregate may be necessary.

Install the compacted aggregate in 4" layers. Level and compact each layer separately.

6.3 Compactor

It is critical that the subsurface be properly compacted. Without adequate subsurface compaction, the planarity of the playground safety surface will change as the subsurface planarity changes.

Use a vibrating compactor to reach 95% SPD (Standard Proctor Density). Rolling and vibrating compactors provide best compacting. Complete multiple passes in each direction.

6.4 Aggregate Grading

Aggregate should match the grading chart shown below. Any local aggregate supplier will provide, on request, a grading chart for the aggregate that they are proposing as a substitute. It is important that the materials they are proposing to supply, matches (as closely as possible) the chart shown below.

U.S. Sieve	Percent Passing
1"	100
3/4"	90-100
No. 4	35-60
No. 30	10-30
No. 200	2-9

The above sieve analysis is the "ideal" for a simple and long lasting compacted aggregate subsurface. Since a compacted aggregate subsurface is subject to potential movement, we recommend staying within the above gradient to reduce subsurface movement possibility.

6.5 Assist Compaction by Soaking Aggregate

Soak the area with water. Allow the water to percolate through the aggregate and partially dry. Then re-compact. Once materials have been adequately compacted, a compaction test is recommended. However, a simple "heel test" is adequate for an approximation of compaction. Kick the compacted aggregate at an angle with boot heel. If heel can be pushed into aggregate, it is not properly compacted.

6.6 Assist Compaction by Adding Cement

If after completing the above steps, the aggregate supplied still does not reach the specified density of 95% SPD, than compaction can be enhanced by spreading 1 80lb bag of cement over 200 sq ft of aggregate subsurface. Water this cement to allow it to percolate into the aggregate. Repeat the above procedure. Compact with rolling compactor after completion of cement addition.

6.7 Re-Compact Aggregate around Adjacent Structure

Special attention must be paid to the areas around posts that support adjacent structures such as playground equipment, shade structures, retainer walls, etc. It is critical to emphasize to the installer of these adjacent structures the importance of compacting the aggregate backfill in these areas. Most third party installers, not being responsible for the subsurface, will normally just fill the holes full and "tap" them slightly on the surface and then leave. If a playground safety surface installation is completed directly over these poorly packed holes, the subsurface will settle after the first rainstorm and the playground safety surface around the poles will become uneven.



The backfill material placed into the excavated hole must be thoroughly compacted every 4" of depth. Since it is not possible to know for certain if the subsurface installation contractor completed the aggregate compaction to specifications it is important to have third party contractors sign a subsurface preparation agreement (see attached). If the owner or subsurface installer has not opted to fill the holes to the top with concrete, upon arrival at the site, we recommend removing some of the pre-filled material around the post holes. Then soak the material that is left around the base of the pole. Then re-install the aggregate materials and compact every 4" of vertical depth. In addition, a small cap of concrete could be poured over the last 4" of depth before installing the playground safety surface.

6.8 Level Sub-Surface Aggregate to +/- 1/4" over 10' Measured in Any Direction

Most compacted aggregate will have a size ranging from "dust" to 3/4". This is a difficult product to get smooth enough for a proper playground safety surface installation due to the larger material in the mix. These larger stones can prevent an even, smooth application.

Since the planarity of the aggregate subsurface will determine the planarity of the playground safety surface we recommend installing a thin layer of 1/4" minus "chips & dust" or granite screenings over the final compacted and leveled subsurface. The "chips and dust" are used to "fill in" the minor undulations in the planarity of the compacted aggregate.

6.9 Extend Granular Base 3" to 6" Past Actual Edge of Installation

The edge of the playground safety surface is the area of greatest use and abuse. Lawn mowers, string trimmers, etc., often come in contact with the edge. Extending the subsurface aggregate base 3" to 6" past the anticipated final edge of the playground safety surface will assist in stabilizing the edge in the future.

6.10 Taper Edge When Adjacent to Non-Solid Edge

When no solid retainer is going to be used at the edge, then the aggregate subsurface must be sloped off at a 4" (rise) in 12" (run) for 12" linear inches or until the compacted subsurface is 4" below finished grade of any adjacent areas. This prevents a tripping hazard in the event the adjacent loose material erodes and exposes the edge.

6.11 Subsurface Slope to Be 2% or Greater

Subsurface slope should be a minimum of 2%. (About 1/4" in 12")

6.12 Inspect Final Compacted Aggregate Subsurface

It is important to carefully inspect any subsurface supplied by an outside contractor. Often, the owner assumes that installing the playground safety surface over the subsurface indicates acceptance and responsibility for the subsurface. Because the cost to remove and replace a good playground safety surface over a poor subsurface is significant, it is important to emphasize to the owner that installing over any type of subsurface prepared by another contractor in no way indicates approval of the subsurface compaction and stability. It is only an indication that the installer of the playground safety surface is satisfied with the planarity of the subsurface.

Owner, hereby acknowledges that aggregate subsurface was not installed by the playground safety surfacing installer, therefore the playground safety surfacing installer is not responsible for the planarity, compaction, drainage and composition of the aggregate subsurface and cannot be held responsible for the immediate or long term performance of the aggregate subsurface or changes that may occur to the playground safety surfacing due to aggregate subsurface failure. Owner hereby accepts full responsibility for any labor and/or material costs to remove and replace the playground safety surfacing in the event of aggregate subsurface failure.

If the playground safety surfacing installer, upon arrival at the site, determines that the aggregate subsurface does not meet specifications, Owner will be informed and be given the option of having the playground safety surfacing installer rectify the aggregate subsurface at \$_____/hr/man or having the playground safety surfacing installer standby at \$_____/hr/man while Owner rectifies the aggregate subsurface.