



## **INTSTALLATION TECHNIQUES & GUIDELINES**



## **INTRODUCTION**

It is important to state that every golf course is a unique product, with its own set of circumstances. Each bunker project will have its own solutions and considerations.

A golf course should always seek the advice of trusted professionals, architects, and builders before proceeding with a project.



# INSTALLATION TECHNIQUES & GUIDELINES

## Estimating Product Requirements

### GENERAL CONCEPTS

In order to get a more accurate estimate of square footage, it is recommended that a measuring wheel or measuring tape. Some facilities may already have accurate bunker measurements from original course designs or past estimating. It is always a good idea to double check measurements where possible.

It is important to mention the concept of waste at this point. Some facilities will choose to install large, complete pieces or segments and not use small trimmings. Other facilities will choose to maximize material in every way. The trade-offs are minimal when considering labor and fastener costs. Some simply prefer to have the fewest seams possible.

Sandtrapper is available in 56 inch and 90 inch rolls. The wider roll provides for fewer seams and reduced installation labor, but will have a higher waste factor. The narrow roll allows for tighter controls on waste and is easier to handle around the course but will provide for more seams.

If no measurements exist or measurements have not been taken in some time, it is recommended to stay organized, number each bunker for each goal, and record dimensions onto paper or in a spreadsheet. Some may even choose to plot or diagram each of their bunkers.

### BASIC MEASURES

For simple bunker designs, the simplest method for determining area is to take two measurements on the 'X' and 'Y' axes. Slightly more accurate is to divide the bunker into four quarters and measure each quarter separately.

### ADVANCED MEASURES

One advanced method is to identify the single largest rectangular object in the bunker and measure it, then taking each small contour and measuring in smaller increments. Another method is to identify 100 square foot blocks and tally how many blocks would fit in the bunker.

### OVERAGES

For simple bunker designs is recommended to add 10% to the base measurement. For moderate bunker designs, 13 to 15% should be added. For more drastic or complex designs, 18 to 20% should be added. Some of the overage accounts for overlap and some accounts for waste.

### STAPLE REQUIREMENTS

The most common estimate we see used is one staple per square foot. When bunkers have steeper slopes, the density needs to be increased to 1.5 staples per square foot. Some simply order one box (1000 staples) for each 56 inch roll ordered.

### REORDERS

It is common for people to simply miss the estimate, especially if one estimates tightly. Not a problem, as we expedite liner and staple reorders to keep your project on track.





# INSTALLATION TECHNIQUES & GUIDELINES

## Bunker Preparations

### GENERAL CONCEPTS

It is always recommended to consult with your architect, golf course builder, or physical engineer to determine best practices.

When renovating golf course bunkers, it's the perfect time to consider any improvements in design, playability, and functionality. Most importantly, drainage should be assessed to determine water flow out of the bunker and correct poor designs.

### SAND REMOVAL

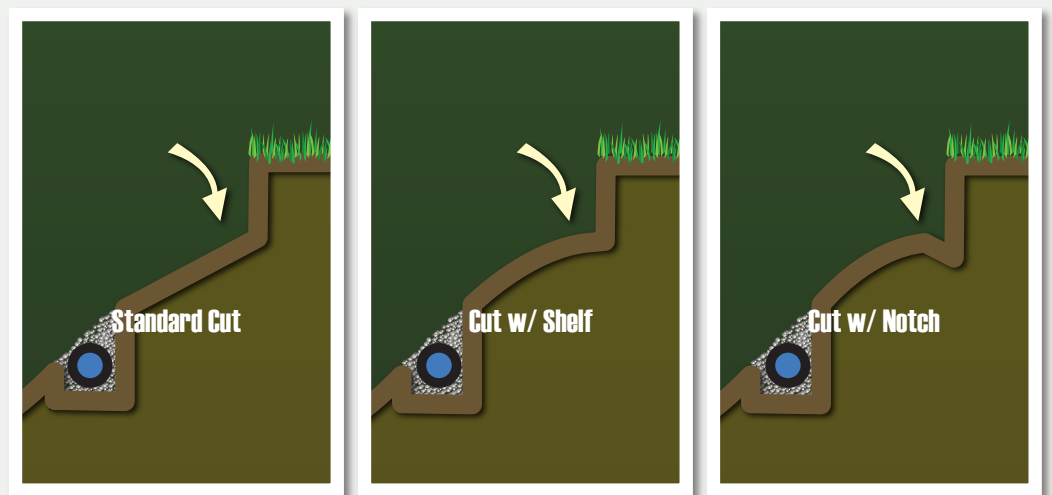
Prior to installing Sandtrapper, existing sand should be cored from the bunker and reserved for other uses around the course.

### BUNKER SUBSTRATE/BASE

Once sand is removed, it is a good time to adjust or reshape the base of the bunker and/or prepare for any drainage work that may be performed. The bunker base should be firm and compacted prior to the installation of the liner.

### ADDRESSING BUNKER EDGES/PERIMETER

With the sand removed, it's also recommended to address the cut or edge of the bunker. Like the base, the cut should be firm and compact. On bunkers with a higher degree of slope, it's recommended to have a small "shelf" at the base of the cut. Some facilities will even go so far as to excavate a small groove into the base of the cut.





# INSTALLATION TECHNIQUES & GUIDELINES

## Drainage Planning

### GENERAL CONCEPTS

It is always recommended to consult with your architect, golf course builder, or physical engineer to determine best practices.



Controlling washouts and maintaining the integrity of a bunker is greatly improved when using Sandtrapper. However, bunker liners should be used in conjunction with proper drainage methods.

If a bunker has existing drainage, the bunker drainage system should be checked, cleaned, and/or repaired prior to installing Sandtrapper.

### DRAINAGE SYSTEM TYPES

Most bunker drainage systems use some form of 4-inch corrugated pipe and gravel. Any drainage design will vary greatly, depending on the local climate, soil conditions, architect/builder design preference, and cost.

Design varies widely, from simple 'Y' designs, to herringbone or "French" drainage systems. It is also common to see smile drains incorporated into drainage systems and used across slopes to pull water more quickly. Any drainage line that is placed should be perpendicular to the slope of the bunker.

### DRAINAGE TRENCHES & BUNKER LINERS

It is important to mention that most liner installations will cover the drainage system. In some cases only a portion of a bunker is lined or a facility prefers access to the drainage system. In these cases, adding the final gravel layer over the corrugated pipe should be delayed until the liner is carried down into the drainage trench and secured.





# INSTALLATION TECHNIQUES & GUIDELINES

## Product Alignment & Arrangement - Part 1

### GENERAL CONCEPTS

There are a few basic theories concerning how best to arrange Sandtrapper in a bunker. For most, the objective is to minimize seams and to use as many continuous segments as possible. For others, the focus is on minimizing product waste. There are a number of trade-offs to consider when organizing for product placement.

### MINIMIZING PRODUCT SEAMS

For those looking to have the fewest seams possible, the 90" roll width helps to achieve this objective. The wider roll widths speed installation (reduced cutting and stapling time/cost) but will lead to an increase in product waste. Waste can be best described as remnant segments that cannot fit (or be used) in the smaller corners/parts of the bunker.

Further minimizing of seams can be addressed by orienting the roll/segment (either 56" or 90" width rolls) down the longest length of the bunker (normally placed in the middle) and work the next segments alongside and outwards to cover the bunker.

### MINIMIZING WASTE

For those looking to reduce material waste, this can be achieved by using the 56" roll width and by incorporating smaller segments where they will fit. Since Sandtrapper is a non-woven material, there is no orientation that you need to match from one segment to another.

Smaller segments will produce more seams, creating the need to use more sod staples along those seams. It's recommended that if small segments are to be used, that the segments are no smaller than 10 square feet or that the segments are not less than 2 feet in width. This allows for better securing with sod staples.

### PARALLEL VS. PERPENDICULAR TO SLOPE ANGLE

Sandtrapper can be installed in either case with no effect on performance. The images below illustrate two different installations where each method was used. Given the wide range of bunker styles and shapes, it's possible to have both parallel and perpendicular alignment in the same bunker.

NOTE: The blue arrows reflect bunker slopes and the green arrows show product orientation.





# INSTALLATION TECHNIQUES & GUIDELINES

## Product Alignment & Arrangement - Part 2

### ADDRESSING SEAMS

We recommend that seams between Sandtrapper segments be overlapped 2"-3" so that the securing sod staple will be driven through both segments. Increasing the overlap is acceptable and does not change performance.

With regards to overlap, some prefer to place Sandtrapper much the way one would shingle a roof, with the bottom segment at the base and working upwards. Each successive segment would then be placed and overlapped on top of the previous/lower segment.

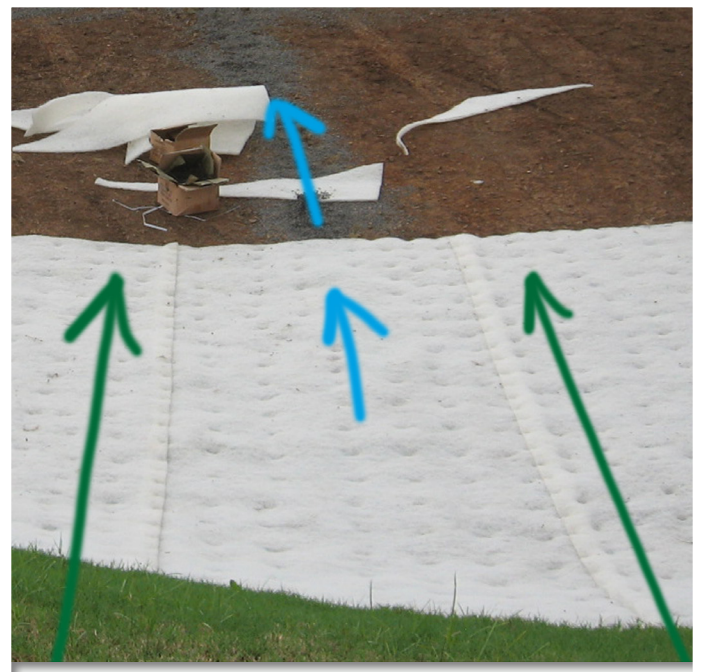
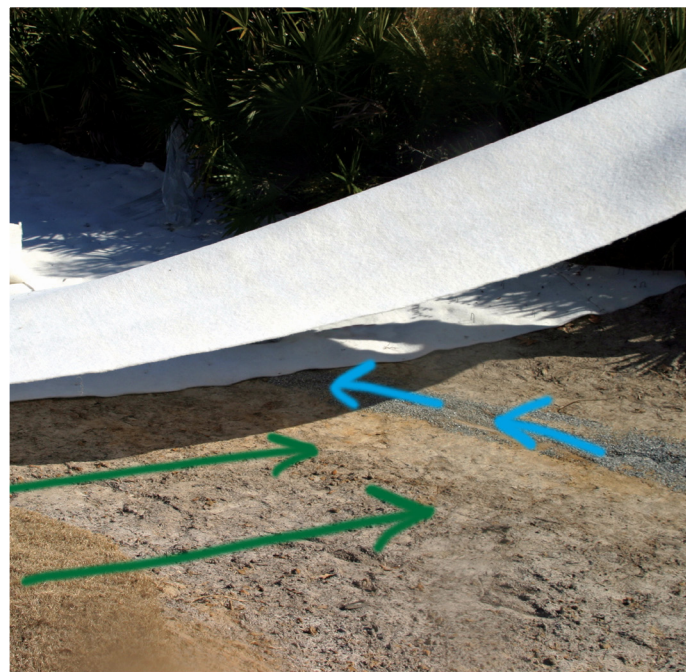
Some prefer to consider the angle to the hole or angle of play. In this case, the concern is to avoid the leading edge of the upper Sandtrapper layer being exposed to the club face. If the seams are perpendicular to the angle of play, the idea is to have the overlap point towards the hole or angle of play.

Although the recommended sand depth of 4" to 6" adequately covers any seams, the question has been raised. Some choose to avoid overlap completely by butting seams together and applying construction adhesive to the seam. NOTE: Construction adhesive works well in these cases but does increase installation costs.

### DRAINAGE LINES & SEAMS

In order to better secure Sandtrapper, it is recommended that placing seams directly over drainage lines be avoided. This applies specifically to cases where Sandtrapper is aligned parallel to the main drain line. It's recommended that you position Sandtrapper over the drain line so that there is adequate area to secure the liner onto either side of the drainage trench. If the seam runs parallel and down the line, directly over the line, you will not be able to effectively secure the seams into drainage system gravel.

NOTE: The blue arrows reflect the drain line direction and the green arrows show product orientation. This prevents seams being placed in areas difficult to secure with staples.





# INSTALLATION TECHNIQUES & GUIDELINES

## Fasteners & Securing Techniques

### GENERAL CONCEPTS

IVI-GOLF offers a range of fastener products that can be used to secure Sandtrapper to the bunker substrate. Although the most common is the 8-inch, 11 gauge sod staple, IVI-GOLF carries a wide range of dimensions, gauges, and styles to suit specific installation requirements.

### STAPLE REQUIREMENTS

The most common estimate we see used is one staple per square foot. When bunkers have steeper slopes, the density needs to be increased to 1.5 staples per square foot. Some simply order one box (1000 staples) for each 56 inch roll ordered. We recommend that one plans for an overage of staples (1.5 staples per square foot) to avoid any wait time for a supplemental shipment of staples to arrive. We also recommend to select a mid point during the project to verify staple use and confirm whether more staples are needed.

### BASIC STAPLE USE

The normal routine for staple use is one staple every 6 to 8 inches along seams and edges and every 12 inches in the interior. This pattern will vary based on your location in the bunker. Sloped faces will require the field pattern to be tighter. Bunker bases afford the use of fewer staples, spread farther apart.

The soil conditions will also impact staple spacing. Sandy soil require the use of longer staples. Rocky soils require staples to be driven where they are not impeded. This may require several attempts and may result in bent staples. IVI-GOLF carries specialized staples that work more effectively in rocky soils.

As a general rule, it's recommended to drive staples into the soil at a slight angle. This allows for a better attachment and helps prevent heaving in northern climates.





# INSTALLATION TECHNIQUES & GUIDELINES

## Installation Around Edges & Drainage - Part 1

### GENERAL CONCEPTS

There are a range of options when addressing edges and drainage areas. Much will depend on the shape/design of the bunker and the soil conditions present. It will also depend on the preferences of the course/superintendent as to how they would implement bunker liner technology.

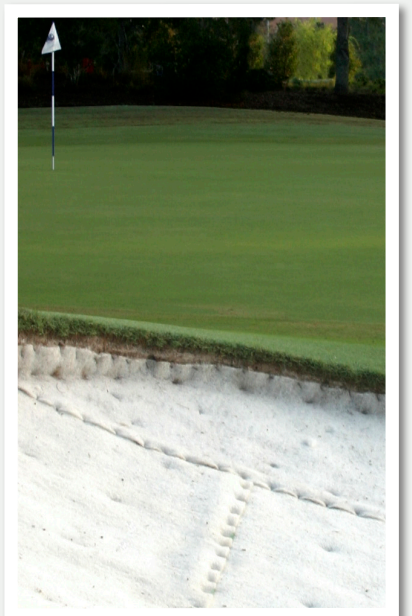
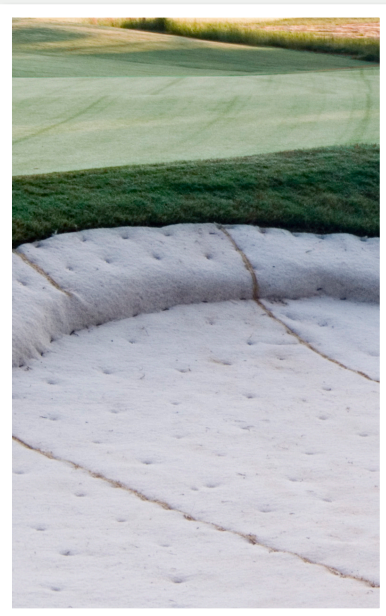
### EDGES

It is important to address edges securely. If staples are spaced more narrowly, you will insure a better, more secure install. Trimming is always recommended to be performed in a tidy manner.

### DRAINAGE

Most installations will cover the completed, graveled drainage trenches for a complete coverage of the bunker with the liner. This eliminates any concern over contamination.

Some courses/superintendents will prefer to have access to drainage lines. NOTE: An uncovered drainage line will allow drainage gravel to migrate upwards over time and contaminate the bunker sand with gravel.





# INSTALLATION TECHNIQUES & GUIDELINES

## Installation Around Edges & Drainage - Part 2

Proper installation insures the maximum performance from your Sandtrapper Bunker Liner. Each of the product styles can be used to line the bunker or be used in combination for a specific bunker area.



Sandtrapper II is used for steep sloped bunker conditions where maximum performance is desired.

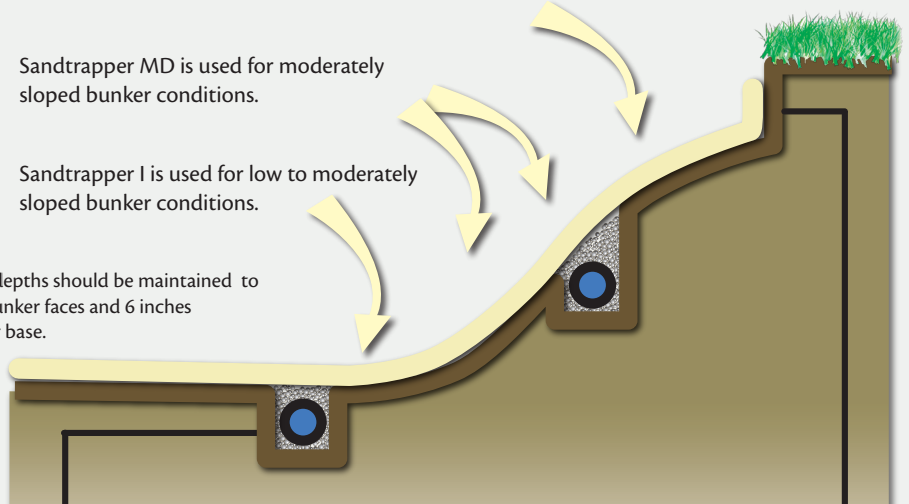


Sandtrapper MD is used for moderately sloped bunker conditions.



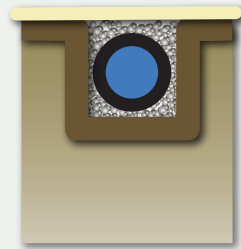
Sandtrapper I is used for low to moderately sloped bunker conditions.

NOTE: Sand depths should be maintained to 4 inches on bunker faces and 6 inches on the bunker base.

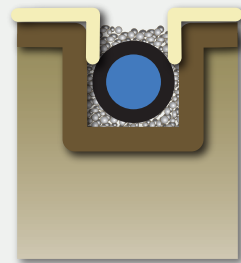


### DRAINAGE

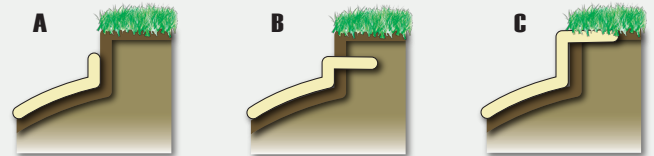
### EDGE DETAIL



Sandtrapper II, MD and I are all able to be placed over drainage lines. By doing so, maximum performance against drainage gravel contamination is achieved.



Should access be required to the drainage system, Sandtrapper can be tucked down and into the drainage trench.



A variety of methods exist to install Sandtrapper at the bunker edges. Each has its own advantage, given soil types and grass varieties.

OPTION A - Sandtrapper is brought to and up the bunker edge, being secured into the edge with sod staples.

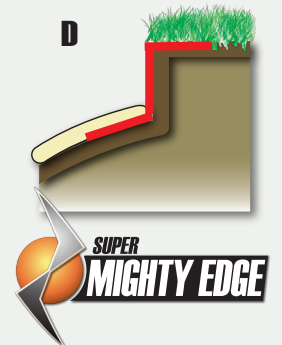
OPTION B - Sandtrapper is brought to and up the bunker edge, then tucked into the soil below the root zone of the grass above.

OPTION C - Sandtrapper is brought up and over the bunker edge. Grass is placed on top with root structure growing into the liner.

OPTION D - Shown in red, Super Mighty Edge is an innovative way to secure the bunker edge. Super Mighty Edge is applied under the liner and secured into the edge with sod staples for long-term bunker protection.



In 2011, IVI-GOLF introduced Sandtrapper SL, a "soft loft" technology used by some as an alternative to the traditional Sandtrapper options.





# INSTALLATION TECHNIQUES & GUIDELINES

## Enhanced Techniques

### GENERAL CONCEPTS

Over the years, we've seen a number of innovative methods to install Sandtrapper. They address particular issues in creative ways to address specific needs of the course.

### STAPLE "TOPPING"

In northern climates where the freeze-thaw cycle is a concern, some superintendents have used construction adhesive to secure the top of the sod staple to the bunker liner. Applying a small dab of adhesive on the staple top and spreading/smoothing to the liner increases the surface area in contact with the liner. The result is a significant reduction of heaved staples when frequent freeze/thaw cycles occur during the winter months.

### SEAM BUTTING

Some facilities prefer not to overlap seams. Instead, we've seen where the edges of Sandtrapper are butted together and set with a bead of construction adhesive.

### ANCHORS & WASHERS

Some rocky soil conditions make it extremely difficult to secure Sandtrapper with sod staples. In these situations, we've seen facilities place a steel/spike and washer through the liner and hammer into the rocky soil.

In situations where the subsurface is entirely bedrock, we've seen facilities tap pilot holes with masonry bits and drive masonry anchors (with washers) to secure the liner.

