

## **Turf-Tec Shear Strength Tester (Shear Vane) TSHEAR2-M**















The Turf-Tec Shear Strength Tester, known in scientific literature as a Shear Vane Apparatus, is a specially designed tool to test the stability of athletic field turfgrass root systems. In addition, the Turf-Tec Shear Strength Tester also tests the types and depth of cleats that will perform best on your turfgrass root system and environment as well as synthetic turf. Knowing the correct cleat to wear will not only ensure proper footing during play but will also reduce slipping and ensures a safer playing environment for athletes.

The unique design of the Turf-Tec Shear Strength Tester with the Shear Vane Foot allows for testing the stability of your turf and the health of the root system directly on all turfgrass areas. Simply unscrew the Shear Vane Testing Foot and screw in the cleats to be used during play. Insert the tool into the soil and simply turn the tool until the foot starts to slip. You will get a reading, in Newton Meters, as to the shear strength of the turf. Different cleat types and depths can be tested and compared to each other right on the playing field. This will ensure the cleat choice is optimum for that field on that given day, regardless of field moisture, soil types, turf varieties or weather conditions.

**Turf-Tec Shear Strength Tester - TSHEAR2-M**

## Turf-Tec Shear Strength Tester Instructions










	<p><b>Step 1</b> Determine if you are going to test with cleats or the shear vane foot.</p> <p>Note, there are additional options for Synthetic turf and Equine testing.</p>
	<p><b>Step 2</b> Using the horizontal foot pad, press Turf-Tec Shear Strength Tester firmly into the ground until tool shear vane foot or cleats are all the way into the soil surface.</p> <p><b><u>Do not push the unit into the soil with the torque wrench on the unit as damage to the calibration may occur.</u></b></p>
	<p><b>Step 3</b> Place torque wrench into receptacle on top of Turf-Tec Shear Strength Tester as shown.</p> <p>**Make sure the follower needle is on zero and aligned with the direction of turn.</p>
	<p><b>Step 4</b> <b><u>Do not apply any downward pressure on the device when taking a reading!</u></b> Using slow but steady pressure, turn the torque tool using both handles toward the follower needle.</p> <p>When the turf starts to tear, this is the highest number you will see on the follower needle. It is not necessary to completely tear the turf or shear the roots off.</p>
	<p><b>Step 5</b> Read maximum reading on the follower needle and record this number.</p>

	<p><b>Step 6</b> Remove torque wrench from tool.</p> <p><b><u>Do not lay the unit down with the torque wrench attached to the unit as damage to the precision calibration may occur.</u></b></p>
	<p><b>Step 7</b> Remove the tool from the soil and if any turf is on the shear vane, eject it by hand with the ejector foot and lever.</p>
	<p><b>Step 8</b> Pressing down on ejector level to remove soil.</p>
	<p><b>Step 9</b> After testing, remove the torque wrench and reset the follower needle to zero.</p>
	<p><b>Step 10</b> Repeat above procedure for each different type of cleat to be tested.</p>
	<p>The wrench at rest will have the needle pointing towards Zero.</p>
	<p>If the needle ever points away from zero, simply, simply hold the outer dial ring with your forefinger and thumb and rotate the outer ring back toward zero. Note this will not affect the calibration of the wrench.</p>
	

## Testing Areas with Shear Vane Foot

Using the shear vane foot on the Turf-Tec Shear Strength Tester (see above photos) will produce a shear value number that has been researched by the scientific community on sports fields for over 30 years, however data is still being collected on different grass species and soil types. Take at least three readings from each area of the field being tested to get an average of the shear strength of the turf for each cleat to be tested. It is recommended that the field be tested as close to game time as possible to ensure variables like soil moisture content does not change. Different soil moisture contents will be the greatest variable in testing shear strength. It is recommended that when testing shear strength, soil moisture readings should also be recorded by using a Turf-Tec Moisture Sensor. This will ensure that soil moisture is in the same range each time you test that particular field. Worn areas should be tested and compared to non-worn areas to see the difference in shear strength between these areas.

## Switching from Shear Vane to Cleats on Turf-Tec Shear Strength Tester and for Synthetic Turf Fields

		
To switch from the shear vane foot to testing cleats follow these steps...	Place Phillips screwdriver in ejector foot center hole and remove screw	Remove ejector foot plate from unit
		
Remove four Phillips screws from shear vane foot	Remove shear vane foot	Place cleats in holes provided.
		
Do not over tighten cleats	Test as instructed above	



## **Testing Areas with Cleats**

Using cleats on the Turf-Tec Shear Strength Tester (see photos above) will allow different cleats to be tested before a game is played. It is recommended that cleat readings be taken on the practice field with the same length cleat the particular athlete or team regularly uses. At least three readings from different areas of the field should be tested to get an average of the shear strength of the turf. The "baseline" numbers from your own practice fields can be then compared to the field about to be played on and different length cleats can then be tried until similar numbers (as compared to the baseline numbers) are achieved. It is recommended that the field be tested as close to game time as possible to ensure variables, like soil moisture content, do not change. Different soil moisture contents will be the greatest variable in testing shear strength. If you are testing the same field over time and comparing the shear strength, it is recommended that a Turf-Tec Moisture Sensor also be used to ensure that soil moisture is in the same range each time you test that particular field. Worn areas should be tested and compared to non-worn areas to see the difference in shear strength between these areas. Use the new Turf-Tec Shear Strength Tester with cleats to be sure your players are wearing the right cleat for that field. Take the guess work out of choosing the correct cleat and let science determine the best choice.

## **Uses**

The Turf-Tec Shear Strength Tester is not only useful in determining what types of cleats to wear before play. In addition, it is useful in testing the strength of the turfgrass root system and the ability to resist wear.

## **New Sod**

The Turf-Tec Shear Strength Tester is also useful in testing areas that have been re-sodded to be sure the sod is rooted down enough for play. Specifically, test the sod seam and sod corner areas to ensure safe footing.

## **Horse Racetracks – Grass**

For Grass Horserace tracks, testing shear strength will give an indication of the amount of grass roots as well as the turfs shear strength potential. Measuring areas at the 1/8-mile poles in test locations that are 5 and 15 feet from the rail will give a good indication of uniformity and consistency of the track. The goal is to have all shear strength readings on these test areas be within +/- 5% of each area. Taking Moisture readings will ensure all areas also have the same soil moisture percentage so results over time can be compared. It is also suggested that Clegg Impact Tests also be performed on these areas in order to get comparable gMax readings.

## **Horse Racetracks and Arenas – Dirt and Synthetic**

For Dirt and Synthetic Horserace tracks, switch the shear vane foot to the optional Equine Foot. Testing shear strength with the equine foot will give an indication of the amount of shear and shear strength potential on the base material. First the cushion layer should be removed to the base layer and the Turf-Tec Shear Strength Tester with the equine foot should be inserted into the base material and tested. Measuring areas at the 1/4-mile poles in test locations that are 5 and 15 feet from the rail will give a good indication of uniformity and consistency of the base material in the track. The goal is to have all shear strength readings on these test areas be within +/- 5% of each area. Also taking Moisture readings at the same time and areas as shear strength test locations and ensuring that all the areas also have the same soil moisture percentage will allow consistency. Also, keeping a record of soil moisture will allow these shear strength numbers to be compared over time. It is also suggested that Clegg Impact Tests also be performed on these areas in order to get comparable gMax readings.

## **Golf Greens**

The Turf-Tec Shear Strength Tester can show the amount of root mass on golf greens. By comparing healthy turf on greens versus unhealthy turf, the root mass can be easily checked without disturbing the golf greens surface. Unhealthy turf caused by shade, insect and disease pressure, low infiltration rates and any other external pressures can be easily identified. Also, during curative

treatments, root mass recovery can also be assessed. There is also an optional ½ inch spacer foot for the Turf-Tec Shear Strength Tester for monitoring turf root establishment for newly seeded or sprigged turfgrass areas.

### **Testing Qualifications**

The Turf-Tec Shear Strength Tester is designed to give an indication of what the playability of an athletic field will be like. Turf-Tec does not guarantee cleat selection will be the best for athletes, as the ultimate cleat selection depends on skill and ability of each player.

### **Results and Readings Natural Grass Sports Fields**

Research has shown, in general, that readings as listed below are good general guidelines for footing\*, however, additional testing and research is being conducted. The Turf-Tec Shear Strength Tester is also useful in testing areas that have been re-sodded to be sure the sod is rooted down enough for play. Test the seam and corner areas the most to ensure safe footing.

<b>10 Newton Meters or less*</b>	<b>The minimum acceptable value since the turf is easily torn under 10 Nm</b>
<b>Between 10 to 15 Newton Meters*</b>	<b>Fair Shear Strength</b>
<b>Between 15 and 20 Newton Meters*</b>	<b>Good Shear Strength</b>
<b>+ 20 Newton Meters*</b>	<b>Exceptional Shear Strength</b>

\* Reference - J.C. Stier, Dep. of Horticulture, Univ. of Wisconsin, Madison, WI "Kentucky bluegrass grown under reduced irradiance" 53706-1590; J.N. Rogers III, Dep. of Crop and Soil Sciences, Michigan State Univ., East Lansing, MI 48824-1325. Published in Crop Sci. 41:457-465 (2001).

**Other References:**

J.N. Rogers III, DV Waddington and J.C. Harper II, Penn State College of Agriculture Progress Report 393, Dec. 1988 "Relationship between Athletic Field Hardness and Traction, Vegetation, Soil Properties and Maintenance Practices"








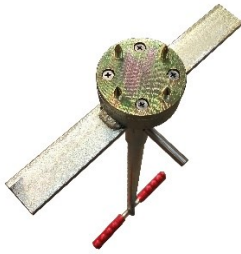

J.C. Stier, Dep. of Horticulture, University of Wisconsin, Madison, McBee (1969) WI 53706-1590; J.N. Rogers, III, J.R. Crum, and P.E. Rieke, Dep. of Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824-1325. "Flurprimidol Effects on Kentucky Bluegrass under Reduced Irradiance" Received 8 Oct. 1998. Published in Crop Sci. 39:1423-1430 (1999).

### **Synthetic Turf Fields**

For testing synthetic turf fields, the unit can also give an indication of the proper length cleats to be worn as well as ensuring the playability and footing is the same across the entire playing surface. Use the Turf-Tec Shear Strength Tester to determine proper cleat length footing values and match those values with an infill depth gauge to also ensure the infill material is the same depth across the entire playing surface. Also testing hardness of the surface with a Clegg Impact Tester to find out gMax readings will also show hardness of the playing surface. By having the cleat shear strength reading, the gMax reading and the infill depth reading all in the same range across the entire playing surface will ensure playability and footing is consistent for synthetic turf safety.







### **Optional - TSHEAR2-SYNTH-FOOT Replacement foot for Synthetic Turf**

For testing synthetic turf fields, the Turf-Tec Shear Strength Tester can be fitted with the optional replacement foot for Synthetic Turf as shown below. This newly designed foot has four hardened steel spikes that protrude 1/2 inch (12.7 mm) below the foot, and into the synthetic turf fibers and infill. The depth is optimal for testing synthetic shear strength values without damaging the turf or backing material. The overall goal is to achieve consistent shear strength values across the entire playing surface. When testing, in addition to the standard 10 recommended test areas shown below, careful attention should be given to painted areas and inlaid areas to ensure footing is consistent in these areas as compared to non-painted and non-inlaid areas.

		
To switch from the shear vane foot to testing synthetic turf, follow these steps...	Place Phillips screwdriver in ejector foot center hole and remove screw	Remove ejector foot plate from unit
		
Remove four Phillips screws from shear vane foot	Remove shear vane foot	Optional Replacement foot for Synthetic Turf
		
Place foot on unit with same four screws as used with other foot	Tighten screws securely (do not overtighten)	Test Synthetic Turf and observe readings. Pay special attention to worn and painted areas

**Optional - TSHEAR2- EQUINE-FOOT**  
**Replacement foot for dirt and synthetic racetracks and arenas**

For testing synthetic turf fields, the Turf-Tec Shear Strength Tester can be fitted with the optional equine replacement foot

		
To switch from the shear vane foot to the equine foot, follow these steps...	Place Phillips screwdriver in ejector foot center hole and remove screw	Remove ejector foot plate from unit
		
Remove four Phillips screws from shear vane foot	Remove shear vane foot	Optional Replacement foot for Horse Dirt Racetracks and Arenas







**Optional - TSHEAR2-SPACER**

**Replacement spacer foot for Turf-Tec Shear Strength Tester for testing turf root establishment on golf greens**

This foot is designed to allow a ¼ inch depth penetration of the Shear Vane Foot for testing turf root establishment for newly planted turf. It can be easily added to the Turf-Tec Shear Strength Tester.

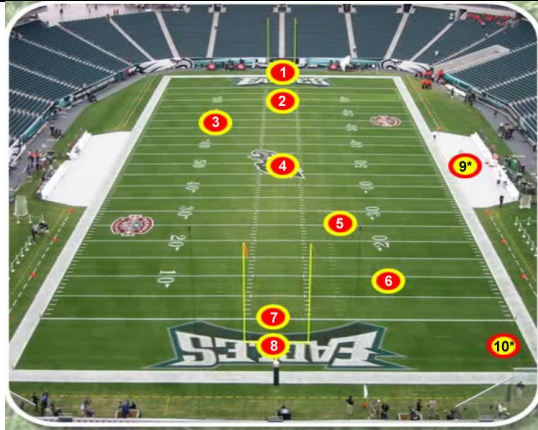
The idea behind this spacer foot is to allow very shallow shear vane measurements to be taken. This is ideal for newly seeded or sprigged greens to determine if the turfgrass roots are established enough for the first mowing. By ensuring adequate root mass, lifting of newly planted turfgrass can be minimized, speeding up the grow in process.

For established cool season golf greens, heat stress can also be assessed by looking to the root mass's integrity, pointing to the need to syringe the greens surface.

		
<p>To switch from the shear vane foot to the spacer foot for testing turf root establishment follow these steps...</p>	<p>Place Phillips screwdriver in ejector foot center hole and remove screw</p>	<p>Remove ejector foot plate from unit</p>
		
<p>Insert longer screw into countersunk portion of spacer foot</p>	<p>Tighten screw</p>	<p>Turf-Tec Shear Strength Tester with spacer foot for turf root establishment is ready to use</p>



### 10 Suggested Test Areas for Shear Strength and Clegg Impact Testing



- **The Turf-Tec Shear Strength readings should be the in the same areas as the Clegg and Moisture Sensor readings.**
- These same test locations are used for natural grass and synthetic turf.
- Total of 10 test areas at locations listed above.
- Test locations are 9 and 10 are for the Sports Field Managers choice whereas lest location # 9 is considered the area on the field with the most wear (These would be areas where equipment enters the field or other high use area). Location # 10 is an area of the field that sees little or almost no wear.
- Soccer / FIFA fields are also tested in the same areas.

### 16 Suggested TSHEAR2 Test Areas readings on Turf Tracks with Shear Vane Foot



- **The Turf-Tec Shear Strength readings should be the in the same areas as the Clegg and Moisture Sensor readings.**
- Total of 16 test areas at 1/8-mile posts.
- Odd Numbered Drop points 1, 3, etc... are taken 5 feet inside the rail.
- Even Numbered Drop points 2, 4, etc... are taken 15 feet inside the rail.
- 2 additional test points also can be added, 1 for the “Best” or unused area of the track and 1 for the “Worst” or most used area of the track like an equipment access gate.

## Suggested TSHEAR2 Test Areas readings on Dirt & Synthetic Tracks with Equine Foot



- **The Turf-Tec Shear Strength readings should be the in the same areas as the Clegg and Moisture Sensor readings.**
- First, the cushion layer should be removed, and the Shear Strength Tester with the Equine Foot should be performed on the base material.
- Total of 12 test areas the first 8 are at 1/4-mile posts.
- First the cushion layer should be removed, and the Clegg Impact test should be performed on the base material.
- Odd Numbered Drop points 1, 3, 5, 7 are taken 5 feet inside the rail.
- Even Numbered Drop points 2, 4, 6, 8 are taken 15 feet inside the rail.
- Drop Points 9 & 10 at the ¼ mile pole in the front chute (¼ chute).
- Drop Points 11 & 12 at the ¾ pole area that is in the back chute (¾ chute).
- 2 additional test points can be added, 1 for the “Best” or unused area of the track and 1 for the “Worst” or most used area of the track like an equipment access gate.

## **Turf-Tec Shear Strength Tester - TSHEAR2-M** **(Optional) - TSHEAR2-SYNTH-FOOT Replacement Foot for Synthetic Turf** **(Optional) - TSHEAR2-EQUINE-FOOT Replacement Foot for Dirt and Synthetic Horse Racetracks and Arenas**

### **LIMITED WARRANTY OF TURF-TEC INTERNATIONAL PRODUCTS**

Turfgrass Products Corporation - dba - Turf-Tec International ("Seller") warrants to the final purchaser, that all Turf-Tec International tools will be free from defects in material or workmanship for a period of one year from date of purchase. SELLER'S SOLE OBLIGATION AND YOUR EXCLUSIVE REMEDY under this Limited Warranty and, to the extent permitted by law, any warranty or condition implied by law, shall be the repair or replacement of parts, without charge, which are defective in material or workmanship, and which have not been misused, carelessly handled, or improperly repaired by persons other than Turf-Tec International. To make a claim under this Limited Warranty, you must return the complete tool, transportation prepaid, to Turf-Tec International after contacting Turf-Tec International and receiving a return authorization number. Please include a dated proof of purchase with your tool.

ANY IMPLIED WARRANTIES SHALL BE LIMITED IN DURATION TO ONE YEAR FROM DATE OF PURCHASE. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING BUT NOT LIMITED TO LIABILITY FOR LOSS OF PROFITS) ARISING FROM THE SALE OR USE OF THIS PRODUCT.

### **Hold Harmless Agreement**

The seller shall protect, defend, indemnify and hold the purchaser and their respective assigns and their attorneys, accountants, employees, officers and directors harmless from and against all losses, costs, liabilities, claims, damages and expenses of every kind and character, as incurred, resulting from or relating to or arising out of the inaccuracy of results, injury of user, injury of sports participant, turfgrass loss, animal injury, warranty, covenant or any agreement made by the seller in this agreement.