

S P E C I F I C A T I O N S

SECTION 02541

SYNTHETIC GRASS GOLF GREEN CONSTRUCTION

PART 1 – GENERAL

1.01 SUMMARY

- A. This section includes and is not limited to...
1. Installation of a surface consisting of a mat-like network of thick, densely tufted ultraviolet resistant fibers interlocked with sand.
 2. (Rock) (Asphalt) (Concrete) Base Course.
 3. Subgrade preparation.
- B. Related Sections
1. Section (01300): Submittals) (01340: Shop Drawings, Product Data and Samples).
 2. Section (02500: Paving and Surfacing) (02510: Asphaltic Concrete Paving).
 3. Section (02520: Portland Cement Concrete Paving) (03300: Cast-In-Place-Concrete)

1.02 QUALITY ASSURANCE

- A. The NGI golf green shall be installed only by an NGI approved installer.
- B. Each roll shall be clearly marked
- C. No material shall be installed when rain is imminent.
1. The installation of the NGI Golf Green System shall be done in dry weather.
 2. Neither surface nor aggregate can be moist or wet during installation.
 3. Fabrication shall be done in dry weather with the temperature above 50E F (10EC)

section 02451 Synthetic Golf Surfacing cont'd

1.03 WARRANTY

- I. Materials shall have a one-year written limited warranty supplied by the manufacturer.

Contractor shall provide (Owner) (Architect) (Landscape Architect) (Engineer) with a written warranty at completion of the project in accordance with Section(01700) (01740) of the Project Manual.

PART 2 – PRODUCTS

2.01 NGI GOLF GREEN SYSTEM

- A. The NGI Golf Green System shall consist of fibers with ultraviolet stabilization and shall meet the following minimum specifications:

1.	Standard Roll Size	12' X custom cuts available
2.	Construction	Tufted
3.	Breaking Elongation	124% (ASTM D1682)
4.	Breaking Load	181 lbs (82.1kg) (ASTM D1682)
5.	Grab Tear Strength	200 lbs (90.7kg) (ASTM D 1682)
6.	Sean Tensile Strength	55 lbs/in (9.96 kg/cm), minimum
7.	Melting Point	168EC (334.4EF)
8.	Fiber Type	Fibrillated
9.	Interliner	Woven Polypropylene
10.	Abrasion Resilience	0.4 Grams
11.	Flammability Test	Pass
12.	Standard Color	Merion Green

- B. Granular Fill Material shall be as specified by turf manufacturer applied at a rate of 8 lbs per square foot for Course Green material and 2.75-3.0 lbs per square foot for ProPutt. All aggregate shall be kept dry and installed on a dry surface.

- C. Seams: Weather resistant tape and high strength nitrile based adhesive highly resistant to aliphale hydrocarbons.

GOLF GREENS CAN BE CUSTOM BUILT FOR EACH INSTALLATION. GREEN ENLARGEMENTS SHOULD BE MADE WITHIN 12' INCREMENTS.

section 02451 Synthetic Golf Surfacing cont'd

2.02 BASE MATERIALS

- I. Minimum (4" asphalt) {4" concrete} 4" aggregate base with ½" to ¾" layer of stone dust screenings or compactable sand for the leveling course. Constructed on a prepared subgrade per plans and specifications.

** NOTE: Asphalt and concrete are acceptable for putting greens. Golf greens to be used for chipping *and* putting should use the aggregate construction.**

ROCK BASE MATERIALS - OPTION 1

- B. Minimum 4" crushed stone rock base shall be used.
 1. Material for crushed stone base may be a combination of crushed stone, crushed or crushed or uncrushed gravel, sand gravel, limestone gravel or other locally qualified binder materials approved by the (Owner) (Architect) (Landscape Architect) (Engineer).
 2. These materials shall be thoroughly mixed to ensure the final product will have a uniform grading and plasticity.
 3. The crushed stone or gravel shall conform to local specifications for rock base construction and the following:

a.	Retained on the 2" sieve	0%
b.	Retained on the 1 ½" sieve	0-5%
c.	Retained on the ¾" sieve	5-30%
d.	Retained on the No. 4 sieve	35-60%
e.	Retained on the No. 8 sieve	45-70%
f.	Retained on the No. 40 sieve	60-84%
g.	Retained on the No. 200 sieve	80-93%
- C. Crushed Aggregate Base Course Construction: If the required compacted depth of the base course exceeds 6", the base shall be constructed in two or more layers of approximately equal thickness.



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section 02451 Synthetic Golf Surfacing cont'd

ASPHALT BASE MATERIALS - OPTION 2

B. Asphalt base course, minimum 2" thick composed of aggregate and bituminous material mixed in a central plant, and constructed on a prepared subgrade in accordance with this section and in conformity with the dimensions and typical cross section shown on plans.

C. Aggregate for Asphalt Base: Unless otherwise specified, aggregates shall be cleaned, washed, graded gravel, sand and mineral filler, in any combination with all materials complying with the quality, sieve analysis, and plasticity requirements specified herein.

D. The combination of aggregate and mineral filler used for bituminous construction shall be uniformly graded from coarse to fine. The sieve analysis of the combined aggregates immediately prior to mixing with bituminous material shall comply with the following:

1.	Retained on the 1 ½" sieve	0%
2.	Retained on the 1" sieve	0-3%
3.	Retained on the 3/8" sieve	1-30%
4.	Retained on the No. 8 sieve	20-50%
5.	Retained on No. 30 sieve not more than	80%
6.	Retained on the No. 200 sieve	88-94%
7.	Plastic index	0-6%

Please note that this specification is to be used as a guideline. This information may not be proper under all conditions

CONCRETE BASE MATERIALS- OPTION 3

B. Concrete shall have a compressive strength of 3500 psi, min. 28 days.

1. Normal Weight Concrete: ASTM C33 aggregate, cement and water, weighing 145-150 pounds per cubic foot, cured and air dried.
2. Portland Cement: ASTM C150, Type I or III, natural color, domestic manufacture. Only one brand of cement shall be used throughout.
3. Normal Weight Aggregate: Fine and Coarse aggregate meeting ASTM C33.

C. Air-Entraining Admixture: ASTM C260, add to produce air entrainment per ACI 318.

D. Water reducing Admixture: ASTM, C491.

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section 02451 Synthetic Golf Surfacing cont'd

- E. Chemical Retarders and Accelerators: ASTM C494. Add as required by weather conditions.
- F. Calcium Chloride or mixtures containing calcium chloride or fly ash shall not be used in concrete without {Owner's} {Architect's} {Landscape Architect's} {Engineer's} approval.
- G. Batch and mix concrete as per ASTM C94.
- H. Additional water shall not be added to the mix except as directed by Architect, or allowed herein for hot weather concreting.
- I. Concrete shall be delivered as such a rate as will assure prompt discharge upon truck arrival. Place no concrete which has been discharged from mixer truck for longer than 30 minutes.
- J. Truck mixers with unacceptable batch concrete will be rejected. Dispose of concrete legally and clean mix prior to refill. Rejected mixers will be singled out on new delivery for slump and mix test.

PART 3- EXECUTION

3.01 SUBGRADE AND SURFACE PREPARATION

- I. The area is to be cleared of all trees, stumps, vegetation and topsoil.
- II. Prepare subgrade by blading, rolling and lightly scarifying until a sound surface within 1/4" in 10' when measured in any direction with 3% minimum slope. Small areas of 5-15% slope may be used to form undulations.
- III. Contours of the subgrade shall conform to those of the proposed finish grade of +/- 1/2".
- IV. Fill and Compaction
 - 1. When fill is required, it shall be placed in 6" lifts maximum, with approved material and each lift shall be thoroughly compacted to a density of 95% proctor.
 - 2. All unstable or otherwise objectionable material shall be removed from the subgrade and replaced with approved material.

section 02451 Synthetic Golf Surfacing cont'd

3. All holes, ruts and depressions shall be filled, reshaped and compacted as required to place the subgrade in acceptable condition to receive material
4. Prior to placing succeeding layers of material the top of the underlayer shall be significantly moist to ensure uniform moisture between layers.
5. The edges and edge slopes of the subgrade shall be bladed and otherwise depressed to conform to the lines and dimensions of the finished surface.

ROCK BASE INSTALLATION- OPTION 1

3.02 PLACING OF THE ROCK BASE

- I. The maximum compacted thickness of any one layer shall not exceed 6".
- II. Immediately after placing, the material shall be compacted at not less than 95% density.
- III. Prior to placing succeeding layers of material, the top of the underlayer shall be significantly moist to ensure uniform moisture between layers.
- IV. The surface of the compacted finish base course shall be uniform and smooth, conforming to specified sloping requirements for golf greens.
- V. After the completion of the rock base ½" to ¾" layer of stone dust screenings or compactable sand shall be applied to make sure surface is level.
 1. Screenings shall be spread thoroughly and compacted.
 2. Finished surface of the leveling course shall not vary from the specified grade more than 1/8" in 10' when measured in any direction

section 02451 Synthetic Golf Surfacing cont'd

ASPHALT INSTALLATION- OPTION 2

3.02 PLACING OF ASPHALT MIXTURE

The mixed asphalt material shall be spread and finished true to crown and grade by machine methods. Bituminous mixtures may be spread and finished by hand methods only where machine methods are impractical, as in the case of special areas which, because of irregularity or other unavoidable obstacles, do not lend themselves to machine placing.

- A. The machine shall spread the bituminous mixtures and shall strike a finish that is smooth, true to cross section, uniform in density and texture, and free from hollows, transverse corrugations and other irregularities.
- B. After spreading and strike-off and as soon as the temperature and mix conditions permit the rolling to be performed without excessive shoving or tearing, the mixture shall be thoroughly and uniformly compacted by rolling. Compaction shall be accomplished by either a self-propelled pneumatic-tired or vibratory roller.
 - 1. Rollers shall be operated by competent and experienced roller men and shall be kept in operation continuously if necessary so that all parts of the pavement will receive substantially equal compaction at the time desired.
 - 2. The {Owner} {Architect} {Landscape Architect} {Engineer} shall order the mixing plant to cease operation at any time proper rolling is not being performed. Any mixture that becomes loose, broken or mixed with foreign material, or which is in any way defective in finish or density, or does not comply in all other respects with the requirements of this Section shall be removed, replaced with suitable material, and finish in accord with this Section.
- I. Surface Course
 - 1. Hot plant mix having a maximum aggregate size of 3/8" in accordance with specifications of the Asphalt Institute shall be constructed over the leveling course to a compacted thickness of not less than 1".

section 02451 Synthetic Golf Surfacing cont'd

2. Placement of the surface course shall not allow paving seams above to be directly in line with the paving seams of the leveling course.
3. Hot plant mix shall be spread by methods proposed by the Contractor to meet the tolerances specified herein.
 1. The hot plant mix shall be thoroughly compacted by rolling with a powered steel wheel tandem roller weighing not less than 4 tons nor more than 6 tons.
 2. The finished surface of the leveling course shall not vary from the specified grade more than 1/8" in 10' when measured in any direction.

CONCRETE INSTALLATION - OPTION 3

3.02 PLACING OF CONCRETE BASE

- A. Before placing concrete, preliminary work such as forms and reinforcing steel, sleeves and embedded items shall be checked carefully, inspected and approved.
- B. Concrete shall be handled from mixer to place of final deposit as rapidly as practical by methods which shall prevent separation or loss of ingredients. Transporting and handling equipment shall be cleaned at frequent intervals and flushed thoroughly with water before and after each days run. Water shall not be discharged into concrete forms.
- C. No concrete shall be placed in forms after initial set has taken. Re-tempering of concrete which has partially set is prohibited. Place concrete in the forms within 1 1/2 hours after initial batching. No placing will be permitted when the sun, temperature, wind or limitations of facilities prevent proper finishing and curing.
- D. Deposit concrete as near final position as possible to avoid re-handling. Deposit concrete continuously and as rapidly as practical until entire unit of pour is completed with thorough consolidation by vibrating to ensure a dense, homogenous mass without voids or pockets.

section 02451 Synthetic Golf Surfacing cont'd

- E. Precaution shall be taken to prevent high temperatures in fresh concrete during hot weather, in accordance with ACI 305. Water reducing set retarding admixtures shall be used in such quantities as recommended by concrete supplier to assure that concrete remains workable and lift lines will not be visible. Cold weather placement shall be in accordance with ACI 306.
- F. Concrete Finishing
 - 1. Float concrete with a wood float in a manner which will compact it and produce a surface free from depressions or inequalities of any kind. Slabs shall be level with a tolerance of 1/8" in 10' and shall slope overall no more than 1/4".
 - 2. After the concrete has hardened sufficiently to prevent fine materials from working to the top and allowed to stand until all water sheen has disappeared, steel trowel surface.
 - 3. Perform final troweling after the concrete is hard so that no mortar accumulates on the trowel and a ringing sound is produced as the trowel is drawn over the surface.
 - 4. The drying of the surface moisture before troweling must proceed naturally and must not be hastened by the dusting on of dry sand or cement.

3.03 SURFACE PREPARATION

- A. Sport surfacing system shall be installed on a sound base surface within surface tolerance not exceeding 1/8" in 10' when measured in any direction with a minimum slope in one direction of 3%.
- B. The entire surface shall be checked for any depressions. Depressions 1/8" or deeper shall be filled and leveled.
 - 1. On rock base, use screenings to level.
 - 2. For an asphalt base, provide a sand-filled asphalt emulsion or concrete latex patch mix.
 - 3. Concrete and asphalt surfaces shall be thoroughly cleaned to remove dust, dirt and foreign debris.

section 02451 Synthetic Golf Surfacing cont'd

3.04 NGI GOLF GREEN SYSTEM

- A. The surface course shall be installed according to manufacturer's specifications.
- B. Specifically engineered resilient shock pad system shall be placed over a stable subbase with Novagrasse golf surfacing course laid over top.
- C. All surface course materials are to be installed after the surface has been inspected and approved by the {Owner} {Architect} {Landscape Architect} {Engineer}.
- D. All rolls of surface mat are to be laid out so that the fibers are laying in the same direction.
- E. All joints shall be attached with a single strength industrial adhesive and a high quality weatherproof tape. Heat seaming method shall not be allowed. All seams shall be cut without damaging the fibers.
- F. Sand Layer: Using a special mechanical devise to filter the sand into the fiber, the sand shall be filtered into the surface mat in several light layers and shall be brushed in to allow the fibers to stand erect.
- G. Cup Placement
 - 1. The cups should be set in the relatively flat areas.
 - 2. The cups should be placed 4-12', minimum, away from the edge of the green depending on the size of the green, number of cups and their location.
 - 3. The cups should be placed so that putting for one of the holes will not interfere another.
- H. Do not allow petroleum products to be spilled on the Novagrasse surface.

section 02451 Synthetic Golf Surfacing cont'd

3.05 CLEAN-UP

- A. Upon completion of the work, the contractor shall remove all containers, surplus materials and debris and have the site in a clean and orderly condition acceptable to the {Owner} {Architect} {Landscape Architect} {Engineer}.
- B. Maintenance: Periodic brushing is the only routine maintenance required.
- C. Provide {Owner} {Architect} {Landscape Architect} {Engineer} with NGI Maintenance Manual at completion of project in accordance with Section {01700} of the Project Manual.

END OF SECTION