

Modified: February 28, 2011

Note: **Highlighted text needs to be completed by Architect/Specifier**
RS (rubber & sand filled system) or R (rubber-only filled system)

SECTION 02790 - ARTIFICIAL TURF

A-Turf® Titan

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. The extent of artificial turf work is shown on the drawings.
- B. Artificial turf work includes, but is not limited to, the following:
 - 1. A complete synthetic turf system, consisting of a vertical draining gravel blanket and nominal **two and one quarter inch (2.25")** long polyethylene parallel-ling slit and dual monofilament blended fibers, tufted into a primary backing with a secondary backing consisting of a minimum of **22** ounces of urethane per square yard.
 - 2. A resilient infill system, consisting of **(for RS) a mixture of rubber granules and silica sand (or) (for R) rubber granules only.**
 - 3. Tufted-in game lines and perimeter lines per drawings. Remaining required game marking shall be permanently inlaid or painted as per drawings; direction of Owner or Owner's Representative.
 - 4. Pre-manufactured porous ShockPad. (Alternate Bid Item)
 - 5. Edge details.
 - 6. Maintenance manual.
 - 7. Written company warranty: **8-year warranty or 12-year (8-year plus 4-year supplemental warranty)**, supported by a 3rd party insured 8-year warranty policy from an A-Rated domestic insurance carrier. Letters of credit are not permissible. Actual and current policy must be submitted for verification.
 - 8. Striping and seaming plan: Striping plan; layouts for the sports as shown on the drawings showing any field lines, logos, markings and boundaries.
 - 9. Train field maintenance personnel in proper care maintenance procedures.
 - 10. When applicable, Field Builder and Base Construction Contractor to coordinate to make sure football goal posts are adjusted to achieve ten feet (10') height above finished playing surface.
- C. Provide all materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.
- D. The artificial turf shall be specifically designed, manufactured and installed for the intended sports and events. Typically sports include, but are not limited to, football, soccer, lacrosse, field hockey, baseball and softball. At the time of substantial

completion, the system's shock attenuation shall have an average G-max value less than 110 for a padded system and less than 135 for a non-padded system, based on ASTM-F355A. At no time shall the G-max value exceed 145 for a padded system and 170 for a non-padded system throughout the life of the warranty.

- E. Copies of independent laboratory test reports on system or components:
1. ASTM D 792 Specific Gravity
 2. ASTM D 1335 Tuft Bind
 3. ASTM D 5034 Grab Breaking Strength
 4. ASTM D 418 Pile Height, Tuft Spacing, Face Weight and Total Weight
 5. ASTM D 2859 Flammability (Pill test)
 6. ASTM F 1551 Water Permeability
- F. Prior to Final Acceptance, the Field Builder shall submit to the owner three (3) copies of their maintenance manuals. These manuals will include all necessary instructions for the proper care and maintenance of the newly installed synthetic turf system.

1.02 SUBMITTALS

Submit the following within 48 hours of bid opening, as requested:

- A. Three (3) copies of most recent installation/reference list for all projects of similar scope to this project completed in the last three years.
- B. Three (3) copies of most recent independently audited financial statements.
- C. Three (3) copies of required 3rd party insurance policy, demonstrating that all of the requirements outlined in Section 1.04 F Quality Assurance are met. Actual policy must be submitted.
- D. One (1) 12" x 12" sample of proposed synthetic turf carpet and one (1) 12" x 12" boxed turf sample including infill representative of finished synthetic turf system. Also submit three (3) copies of product data and testing documents demonstrating that proposed system meets or exceeds all specified requirements. One (1) 12" x 12" sample of rubber ShockPad must also be submitted, if applicable.

Note: If these submittal items are requested and deemed to be insufficient, the Field Builder will not be approved.

Submit the following prior to the ordering of materials:

- A. Material Certificates and Samples: Provide seven (7) copies for each material from material producer that will be used for this project. Each material certificate must be stamped and checked as approved by the Field Builder before submittal to the Architect.
- B. Provide to the Architect materials samples of the following: Two (2) 12" x 12" samples of synthetic turf carpet and color yarn samples, (for RS) two (2) bagged samples each of rubber and sand infill material (or) (for R) two (2) bagged samples of rubber infill material.
- C. Submit two (2) 12" x 12" samples of 10mm (or specify thickness) rubber ShockPad with product data sheet, if Owner chooses this alternate.

- D. Submittals: Prior to order of materials, the Field Builder shall submit a sample warranty, seam layout plan, striping plan and any details of construction that deviate from the plans and specifications.
- E. Submit three (3) copies of the resume of proposed installation foreman. Installation crew must meet or exceed all requirements outlined in Section 1.04.
- F. Three (3) copies of Field Builder's recommended maintenance equipment cut sheets.

1.03 JOB CONDITIONS

- A. All job conditions in Section 02200 apply.

1.04 QUALITY ASSURANCE

- A. Provide a qualified installation foreman to coordinate and review the component parts of the artificial turf system. Submit a resume of experience for Architect's approval prior to starting work.
- B. **Rubber & Sand (or) Rubber-Only Filled Artificial Turf:**
 - 1. Factory-trained technicians skilled in the installation of athletic-caliber infilled synthetic turf systems will undertake the placement of the turf. Special brushing equipment and techniques will be used in the installation.
 - 2. The designated installation crew shall have installed a minimum of ten high quality, stadium grade (for RS) rubber/sand (or) (for R) rubber-only filled synthetic turf systems of 65,000 square feet or greater in the past three years.
 - 3. A notarized letter from the Field Builder that the installation crew and foreman are factory certified must be submitted prior to the start of turf installation.
- C. Provide a colored striping plan detailing lines, numbers and letters. Coordinate with Owner or Owner's Representative and Architect to get final approval of all designated colors, dimensions and logo/lettering designs.
- D. The Field Builder shall meet the following criteria:
 - 1. **Manufacturer/Field Builder's Experience:**
 - a. The Turf Manufacturer and the Field Builder must be experienced in the manufacturing and installation of this type of artificial turf system and provide project references of the synthetic grass system being installed at 100 similar exterior sites in the United States over the last 5 years, a minimum of 65,000 square feet each.
 - b. The Field Builder must have actively been in business – under its current name – for at least the past five years; and must have a minimum of 25 athletic fields still in use in the United States for a minimum of the past 5 years.
 - c. The Field Builder must provide competent workmen skilled in this type of artificial turf installation. The designated Supervisory personnel on the project must be certified, in writing, by the Field Builder as competent in the installation of this material, including gluing or sewing seams and proper installation of the infill mixture. The Field Builder shall have a qualified job foreman on site to certify the installation and warranty compliance.

E. Warranty:

1. The warranty coverage shall not be prorated nor place limits on the amount of the field's usage.
2. The Field Builder shall submit its written company warranty: **8-year warranty or 12-year (8-year plus 4-year supplemental warranty)**, which warrants the usability and playability of the artificial turf system for its intended uses. A 3rd party insured 8-year warranty from an A-Rated domestic insurance carrier is required in addition to the Field Builder's warranty.
3. The Field Builder's warranty must have the following characteristics:
 - a. Provide full coverage for a minimum of **eight (8) or twelve (12)** years from the date of Substantial Completion.
 - b. Warrant materials and workmanship.
 - c. Warrant that the materials installed meet or exceed the system specifications.
 - d. Repair or replace such portions of the installed materials that are no longer serviceable to maintain a serviceable and playable surface.
 - e. Be from a single source covering workmanship and all materials.
 - f. Assure the availability of exact or substantially the same replacement materials for the artificial turf system installed for the full warranty period.
 - g. Include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism and acts of God beyond the control of the Turf Manufacturer or Field Builder.
 - h. Cover defects in the installation and workmanship. Assure the installation was done in accordance with both the Field Builder's recommendations and any written directives of the Field Builder's on-site representative.
 - i. Shall be limited to repair or replacement of the affected areas at the option of the Field Builder, and shall include all necessary materials, labor, transportation costs, etc. to complete said repairs.
 - j. The Field Builder may be required, upon the request of the Owner, to provide a list of ten (10) clients for which they have completed after-the-sale warranty work.
 - k. All designs, game markings and layouts shall conform to all currently applicable National Federation State High School Association or NCAA rules and regulations, or league specific requirements, depending on what applies.
 - l. All components and Field Builder's installation method shall be designed and manufactured for use on outdoor athletic fields. The materials as hereinafter specified, shall withstand full climatic exposure in the location of the field, be resistant to insect infestation, rot, fungus and mildew; it shall also withstand ultra-violet rays and extreme heat, it shall allow the

free flow of water horizontally to perimeter areas and vertically to the gravel blanket and into the field drainage system below the surface.

- m. The adhesive bonded or sewn seams of all system components shall provide a permanent, tight, secure and hazard-free athletic playing surface. All inlaid markings (game lines, logos, etc.) shall remain in place throughout the duration of the warranty period.
- n. The installed artificial turf system's drainage capability shall allow water flow through the system (turf & infill) at a rate of not less than 10 inches +/- per hour.

PART 2 – PRODUCTS

2.01 SYNTHETIC GRASS SYSTEM

A. Synthetic Grass – Titan

Pile Weight: 50 oz/sy

Face Yarn Type: 100% polyethylene parallel-long slit fiber (Thiolon XP Tapeslide) and MonoQuad (TenCate Classic MF and Monoslide Pro) in dual cross section by dual yarn thicknesses – with low glare finish, six-ply

Yarn Size: 8,000 denier for parallel-long; 9,000 denier for MonoQuad (6 ends/1,500 denier per end)

Yarn Thickness: 100 microns for parallel-long; 220-260 microns for Quad

Pile Height (Finished): 2.25"

Color: Field Green, Field Green / Lime Green, Field Green / Olive Green (dual colors as alternating panels or blended fibers)

Construction: Broadloom tufted

Stitch Rate: 10/3"

Tufting Gauge: 3/8"

Primary Backing: TenCate XK TuffBack

Secondary Backing: 22 oz/sy urethane

Total Product Weight: 80 oz/sy (+/- 2 oz)

Finished Roll Width: 15'

Finished Roll Length: Up to 220'

Perforation (Outdoors): 3/16" holes on staggered 4" (approximate) centers

Turf Permeability: > 20" +/- per hour

Infill Composition: (for RS) Ambiently ground SBR crumb rubber mixture and rounded or sub-angular, uniformly sized silica sand (or) (for R) Ambiently ground SBR crumb rubber granules only (specify if preference is cryogenically processed)

The carpet shall be delivered in 15-foot wide rolls with the four (4") inch white, football 5-yard lines tufted into each roll, when applicable. The perimeter white line shall also be tufted into the individual sideline rolls, when applicable. The rolls shall be of sufficient length to go from sideline to sideline. Head seams, between the sidelines, will not be acceptable.

As applicable, provide game markings as follows: Hash marks, numbers, individual yard marks, and soccer, boys lacrosse, school logo and related markings shall be cut in and glued

or painted in accordance with Field Builder's recommendations. (List or add only markings that apply)

Provide a school logo as follows: (Put in description)

- B. Resilient Infill: A resilient infill system, consisting of (for RS) a specially formulated mixture of 3 lbs. per square foot of rubber and 3 lbs. per square foot of sand (or) (for R) 3.3 lbs. per square foot of SBR crumb rubber engineered to provide the look, feel, footing and shock absorption of a natural grass field in ideal conditions.
1. Ambiently ground SBR Crumb Rubber. Granules shall contain minimal dust or contaminants and shall be derived from the ambient processing form of recycled tires. Color shall be substantially black and shall meet the 10 – 20 or 8 – 16 mesh size designation.
 - A. The clean, uniformly sized particles shall be consistent in shape and particle size distribution.
 - B. The particles shall resist abrasion in high traffic and excessive wear applications and provide stability to artificial sports turf applications.
 - C. The particles shall be processed and sized under rigid specifications and Manufacturers' statistical and quality control assurance program.
 - D. Particles shall be structurally pure and consistently uniform in size distribution for predictable performance.
 2. Sand Particulate. The sand provided as a component of the infill mixture shall be rounded or sub-angular so as to minimize abrasion to the athlete and synthetic grass fibers. (delete this paragraph if R system)
- C. **BASE BID:** Standard of Quality shall be A-Turf Titan synthetic turf system as built by A-Turf, Inc. or Architect approved equal. Contact A-Turf: 888-777-6910.
1. Alternate: (List alternates, if any, or delete)
 2. Alternate: (List alternates, if any, or delete)

Manufacturers for synthetic turf alternates shall meet or exceed the requirements listed in Part 2.01. If these submittal items are requested and deemed to be insufficient, the Field Builder will not be approved.

2.02 RESILIENT UNDERLAYMENT (PRE-MANUFACTURED RESILIENT SHOCKPAD) – (Alternate Bid Item)

- A. The ShockPad shall be a porous composite (100% SBR particles bound with polyurethane) rubber pad (6010SP) in typical thickness of 10mm (or specify thickness) and shall have an infiltration rate of not less than 12 inches (12") per hour, a minimum recovery rate of 94% at 100 psi per ASTM F36 and a tensile strength of 44 psi per ASTM D412, Die C. Material shall be delivered in four foot (4') wide rolls with protective wrapping, and be of such continuous length to cover the width of the field allowing only one head seam per roll. Standard of quality shall be 6010SP resilient ShockPad as

manufactured by ECORE International or Architect approved equal. Contact ECORE:
800-322-1923.

2.03 VERTICAL DRAINAGE BASE MATERIALS

- A. Excavation: Existing natural grass field shall be excavated to the depth established by the Architect and as shown on the excavation plan. The sub grade shall be shaped to achieve a .5% (one half of one percent) slope from the center of the field to each sideline in order to mirror the grade of the finished synthetic turf surface. The sub grade shall also be compacted and proof rolled to a minimum of a 95% compaction rate.
- B. Geotextile Filter Fabric: Non-woven polypropylene geotextile fabric shall be chemically and biologically inert and shall be Mirafi 140N, Mirafi Inc., Pendergrass, GA (888) 795-0808, or approved equal.
- C. Drainage Pipe: A network of perforated HDPE highway grade drainage pipe (1" x 12" flat panel pipe) shall be installed under a 6" layer of free draining base aggregate. The drainage pipe will be installed in a herringbone pattern every 15 feet on center and will be connected to 8" to 12" (list required size based on design) perimeter collector lines as shown on drawings.

1. ADS AdvanEdge, 800-821-6710 or approved equal.

- A. 1 inch by 12-inch flat drain.
- B. 8-inch diameter perforated collector drainpipe.
- C. Architect approved equal.

D. Stone Base Courses:

The following gradation of stone is a typical and recommended specification. The synthetic turf Base Contractor is required to focus on achieving the planarity, porosity and compaction requirements to provide a sound crushed stone base for synthetic turf installation.

- 1. The free-draining base aggregate base layer shall consist of a consistent depth of open graded material. Base drainage aggregate used must achieve a 95% minimum overall compaction rate. Material shall conform to the AASHTO #57 limestone classification. The open graded aggregate material shall conform to the following criteria:

Base Aggregate: Open Graded Stone (OGS)

	<u>Weight Passing</u>	<u>Approximate Percentage Passing</u>
2" Sieve	36.99	100.0%
3/4" Sieve	34.04	92.0%
3/8" Sieve	21.5	58.0%
#4 Sieve	9.34	25.0%
#16 Sieve	203.3 grams	9.2%

- 2. The choker material shall be AASHTO #8. Material must be clean.

Subject to architectural approval, local or regional stone specifications that meet compaction and porosity requirements are permitted.

Choker Material:

	<u>Weight Passing</u>	<u>Approximate Percentage Passing</u>
1/2" Sieve	10.99 lbs.	100.0%
3/8" Sieve	10.23 lbs.	93.1%
#4 Sieve	2.13 lbs.	19.4%
#8 Sieve	0.18 lbs.	1.6%
#16 Sieve	0.12 lbs.	1.1%

- E. Adhesives for bonding tufted synthetic turf shall be one-part moisture-cured polyurethane obtained from a single manufacturer and be equivalent to 34-G as manufactured by Synthetic Surfaces, Inc., Scotch Plains, NJ (908) 233-6803, or approved equal as designated by the Field Builder.
 - 1. Seaming Tape: Tape for securing seams in the tufted synthetic turf and inlaid lines shall be high quality tape made with a minimum roll width of 12 inches.
- F. Sewn seams: If seams are to be sewn, they must be sewn with high quality cord/thread as recommended by Field Builder.
- G. Line Painting: Line paint for game lines and field markings, where applicable, shall be as directed and approved by Field Builder. Acceptable synthetic turf paint manufacturers:
 - 1. Pioneer Paints: 800-877-1500
 - 2. World Class Paints: 800-748-9649
 - 3. Approved Equivalent

2.04 NEW GROOMING EQUIPMENT

- A. Provide one (1) pull behind GreensGroomer drag brush as manufactured by WorldWide, Inc., 888-298-8852. Must be electrical unit, model number 720SDE.
- B. (list desired sweeper model – if required)

PART 3 – EXECUTION

3.01 SUBMITTALS

- A. Prior to ordering materials, submit a 3rd party insured warranty policy, a sample warranty, seam layout of field, striping plan and all details of construction that deviate from the plans and specifications.

3.02 VERTICALLY DRAINING BASE

- A. The synthetic turf Base Contractor shall strictly adhere to the installation procedures outlined under this section. Any variance from these requirements must be accepted in writing, by the Field Builder's on-site representative, and submitted to the Architect/Owner, verifying that the changes do not in any way affect the warranty.

- B. Install geotextile fabric over excavated and prepared sub-grade in accordance Field Builder's recommendations. Provide a 36" minimum overlap at all seams. Fabric shall first be installed in the drainage trenches prior to installation of perimeter collector lines. After backfilling of all trenches is complete, the entire field shall be covered with fabric prior to the base aggregate application.
- C. Trenching, Drainage Pipe Installation and Backfilling: All piping shall be as specified and connected by Field Builder's couplers, plugs etc.
1. The base grade shall be shaped to mirror the finished grade and approved by the Architect and/or Owner's Representative. The Base Contractor shall begin layout and trenching for the drainage network as indicated on the drainage plan and all details that apply. Collector lines shall be installed before lateral lines and shall begin with the deepest elevations. Collector lines shall be connected to discharge outlet at the onset of operations. Trenching progress shall work upward in elevation to allow for immediate discharge of water from the entire field in the event of a rainfall.
 2. No trenches, with or without pipe, shall be permitted, to remain unfilled overnight and/or while crews are not progressively working on site.
 3. All perimeter trenches must be dug in accordance with the field drainage plan details.
 4. After all collector and lateral lines have been installed, the Base Contractor shall repair any sub grade undulations prior to installing geotextile fabric.
- D. Concrete Header Curb and Pressure Treated Wood Turf Nailer: The synthetic turf perimeter fastening structure shall be installed before the drainage aggregate.
1. The 6" x 12" concrete header curb (or specify) shall be installed in accordance with the Drawings and/or Shop Drawings and these Specifications. The foundation of the concrete header curb shall be a compacted free draining aggregate. Future water entering the foundation shall have a free draining path directly to the perimeter collector pipe.
 2. Install a pressure treated wood 2" x 4" nailer. Pressure treated wood nailer shall be set 1.5 inches below top of the curb by means of a Tapcon or ramset every 12 inches. This shall be the responsibility of the Base Contractor. See synthetic turf edge attachment detail.
- E. Base Drainage Aggregate: The installation of the base drainage aggregate shall only begin after the drainage pipe installation has been inspected and approved by Owner's Representative. Installation of the Free Draining Base Aggregate shall follow procedures that protect the base grade soils and drainage pipe. The drainage pipe network and its existing elevations shall not be disrupted through ground pressures from trucks, dozers or by any other means.
1. The base grade subsoil shall be dry before undertaking the placement of base aggregate.
 2. Delivery trucks shall enter the field only from the designated entrance point. Base course stone shall be dumped closest to the entrance first and continuously

worked towards the furthest point of the field. Extreme care must be taken not to disturb sub grade or drainage network.

3. Track-type dozers shall push out the stone from behind the pile onto and toward the field center. Dozers shall only traffic the aggregate they are spreading.
 4. Bulldozer blades shall be equipped with a laser-guided hydraulic system. Care shall be taken not to disturb or contact the base grade soils with the dozer blades or tracks. All equipment trafficking over the drainage aggregate shall insure there is a minimum depth of 4" of aggregate between the geotextile fabric and the dozer track ground contact position.
 5. When the aggregate spreading is completed, the surface shall be further-firmed by a 5-ton roller. Static vibration shall not be part of this process.
 6. The stone shall be left firm, but not over-compacted as to protect the porosity and drainage capabilities of the aggregate profile.
 7. After the drainage stone has been uniformly spread throughout the surface, the surface shall receive a final laser finished grade. This process shall be accomplished using a turf-type tractor, or lightweight grader, equipped with high flotation tires and a hydraulically controlled laser blade.
 8. The free-draining base course must be installed to a depth of 4.5 inches and shall be independently tested for an overall compaction rate of 95% proctor.
- F. Choker Levels: The base drainage stone final elevations shall mirror the proposed choker layer final grade material. Care shall be taken not to allow the coarser aggregate to surface into the profile or finished grade of the choker layer.
1. The choker layer shall be applied using high flotation grading equipment. The choker material shall be evenly spread throughout the proposed field surface to the final pre-pad or pre-turf elevations.
 2. After the choker material has been uniformly spread throughout the surface by the described method, the surface shall receive a final laser finish grade. This process shall be accomplished using a turf-type tractor, or lightweight grader, equipped with high flotation tires and a hydraulically controlled laser blade.
 3. Care shall be taken throughout the installation not to force the choker material into the porosity of the base aggregate below.
 4. Final choke layer must be graded by means of a laser within 0 to 1/2 inch from design grade. The finished surface tolerance must not exceed 1/4 inch over 10 feet in all directions. Base Contractor must provide a topographical survey with a minimum of 200 shots demonstrating finished grade meets all written requirements.
 5. Final layer of stone must be installed at a depth of 1.5 inches. Finished aggregate base must be proof-rolled by means of 2- to 5-ton roller. The finished aggregate base must achieve an overall compaction rate of 95% proctor in accordance with ASTM D1557. It shall also be flush with top of pressure treated wood nailer.

6. The synthetic turf Base Contractor is required to stringline the entire field every five feet to identify high and low spots. And identified high and low spots must be eliminated prior to installation of the synthetic turf.
- G. Base Acceptance: The Architect and/or Owner's Representative must jointly approve the base before ShockPad or turf installation can begin.
- H. Optional Resilient ShockPad, when applicable:
1. After the choker layer grades have been approved and inspected, the resilient ShockPad shall be installed from sideline to sideline.
 - a. Equipment and personnel shall take extreme care to minimize disturbance of the stone base during ShockPad installation.
 - b. All operations shall work from behind the rolled out ShockPad or from adjacent, pre-installed pad surface.
 - c. One head seam shall be allowed per length. Head seams shall be staggered so as not to be within 10' of the previously installed roll.
 - d. The head seam shall overlap approximately 4 inches on original roll out. Second and subsequent rolls shall be rolled out within 1 inch, or less, of the previous roll and allowed to expand or contract before manually sliding in place.
 - e. After allowance for expansion or contraction, the padding shall slide into place so as to touch the edge or seam of the previous. Care shall be taken so as not to disturb the choker layer material when butting the seams together.
 2. The Resilient ShockPad shall not receive a final cut or edging detail until the material has relaxed/expanded in direct sunlight for a minimum of six hours.
 - a. No open seams shall exceed 1/4" (in expanded state) after final seam or end cutting is complete.
 - b. Padding material shall stop just short of the exposed nailer board.
 3. The Resilient ShockPad shall be inspected by the Field Builder after completion to insure the surface is smooth with only minor bumps from stone particles or other material protruding from underneath that will not show up once the turf is laid over top.
 - a. Expansion bubbles and open seams shall be repaired prior to final inspection.
 - b. Repeat inspections shall be carried out prior to each roll of synthetic turf being installed.
- I. Synthetic Turf and Infill Materials
1. After a final inspection of the Resilient ShockPad by the Field Builder and the Owner's Representative, the synthetic turf installation shall begin. The first roll shall begin with the longest perpendicular cross-field distance. No head seams shall be permitted in the inbound playing surface.

2. The rolls of turf shall be rolled out a minimum of four hours prior to starting seaming procedures and allowed to relax/expand.
 - a. All visible wrinkles shall be stretched out before seaming.
 - b. Seams shall be flat, tight and permanent with no separation or fraying.
 - c. Synthetic turf yarn fabric that is trapped or glued between seams shall be freed from the seams by hand or other approved method to an upright position prior to the commencement of brushing and top dressing procedures.
 - d. All synthetic turf seams shall be assembled as follows: The full width rolls shall be laid out across the field. Utilizing standard state of the art adhering or sewing procedures, each roll shall be attached to the next.
 - e. When all of the rolls of the playing surface have been installed, the sideline areas shall be installed perpendicular to the playing field. The yard lines, game markings, sidelines, etc. of all applicable sports shall be tufted into carpet by the manufacturer wherever possible.
3. After all seaming is completed and inlaid lines, logos and lettering have been installed; the infill materials shall be spread evenly, using a drop spreader or top dresser.
 - a. (for RS) Crumb rubber and sand (or) (for R) Crumb rubber shall be applied in a uniform rate of multiple applications until the specified infill depth is achieved.
 - b. Infill material shall be brushed between infill applications with a motorized rotary broom and pull-type groomer brush simultaneously.
 - c. A minimum infill rate of (for RS) 3 lbs. of rubber and 3 lbs. of sand (or) (for R) 3.3 lbs. of rubber per square foot is required.

J. Tufted and Inlaid Lines

1. Layout and descriptions of tufted, inlaid and/or painted lines shall be as indicated on final shop drawings.
2. Inlaid lines and field markings shall be cut in using seaming methods recommended by the Field Builder.

K. Synthetic Turf Perimeter Attachment:

1. After final trimming of the turf, the turf shall be screwed, nailed or stapled to the pressure treated wood nailer system as per the Field Builder's recommendations.

3.03 FIELD LAYOUT

- A. Field layout shall be as shown on the record drawings. Typically the final approved striping and seaming plan that was used to manufacture and install the field is acceptable. Any Owner-approved changes that took place during the installation must be marked in red and resubmitted.

3.04 CLOSEOUT

- A. The Field Builder must verify that a qualified representative has inspected the installation and that the finished field surface conforms to the Field Builder's requirements.
- B. The Field Builder must provide the Owner with the pull behind maintenance brush as outlined in section 2.04 New Synthetic Turf Grooming Equipment.
- C. The Field Builder shall provide a warranty to the Owner that covers defects in materials and workmanship of the turf for a period of 8 years from the date of Substantial Completion as described in 1.04 F. Submit three (3) copies of the warranty.
- D. The company's 8-year or 12-year (8-year plus 4-year supplemental warranty) warranty must also be supported by a 3rd party insured 8-year warranty from an A-rated domestic insurance carrier. The value of the policy shall be \$5,000,000 for each insured warranty and \$15,000,000 annual aggregate. Only true 3rd party policies will be accepted. Companies submitting policies that are actually letters of credit or not truly a 3rd party insurance policy will not be accepted. Submit three (3) copies of the actual insurance policy.
- E. The Field Builder must submit three (3) copies of its standard maintenance manual to the owner.
- F. Field Builder must train Owner's designated field personnel in proper grooming and care procedures. This includes training field personnel how to properly use grooming equipment as well as make minor repairs.
- G. Extra materials: Field Builder must leave 500 lbs. of rubber granules and the equivalent of 15' x 10' (all pieces combined) of turf with Owner before leaving job site. All salvageable pieces of colored turf used during the installation should be left with the Owner as well.

3.05 CLEAN UP

- A. Field Builder shall provide the labor, supplies and equipment as necessary for final cleaning of surface and installed items.
- B. All usable remnants of new material shall be neatly rolled up and turned over to the Owner at a place and area designated by the Owner.
- C. During the contract and at intervals as directed by the Architect and as synthetic turf installation is completed, clear the site of all extraneous materials, rubbish, or debris and leave the site in a clean, safe, well draining, neat condition.
- D. Surface, recesses, enclosures, etc. shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the Owner.

3.06 G-MAX TESTING

- A. Optional at substantial completion, the Field Builder can, as specified, hire an independent testing laboratory to perform a G-max test (ASTM 355, 1936 method) to verify that the shock attenuation properties of the field meet the requirements set forth in this specification. Submit three (3) copies of the G-max test to the Owner.
- B. At the time of substantial completion, the average G-max rating must not exceed 110 for a padded system and 135 for a non-padded system. The average G-max of a padded

system must not exceed 145 and for a non-padded system 170 at any time during the life of the warranty. The Owner reserves the right to have the field tested for shock attenuation at its own cost at anytime it deems necessary. If at anytime the G-max ranges reach unacceptable levels, it is the responsibility of the Field Builder to bring the field back into the required ranges at no cost to the Owner.