Installation | **Dash**

These specifications are intended for **GUIDELINE** purposes only, for the design and construction of a "Dynamic Base" used in conjunction with Dash. All architect's specifications and drawings should be followed. PLAE is responsible for planarity inspection only.

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BASE FAQS
FREQUENTLY ASKED QUESTIONS

1. What is the base?
a. The base is the foundation of your synthetic turf field. It must provide a stable platform so the synthetic turf can be uniform, predictable place to play. A properly constructed base can provide up to 30 years of use under several synthetic turf installations. It is a large portion of your installation and it must be installed properly.

2. What makes up the base preparation?
a. Excavation of the existing soils
b. Compaction of the existing material
c. Installation of liners or geotextiles (if required), specially designed crushed stone, curb perimeter anchoring system to hone the base in place.

3. How does it drain?
a. These are vertical and surface draining fields. The water sheets across the surface of the synthetic turf system or goes through the synthetic turf and infill into a porous crushed stone base where it is captured by a network of field drains. Then the water moves to a collector drain that empties into your existing storm sewer or drainage swales.

4. How much water can these systems handle?
a. Most are designed to handle 15" of rain per hour minimum.

5. How much of this stone is needed and where do you get it?
a. It depends on existing soil conditions, but 80% of our fields have 6" of the crushed stone. The stone is a special design that contains fractured pieces with very little fines (small pieces). These angular pieces fit together to create the stable platform we need. There is stone size analysis (sieve size) in the base guidelines. Most states have a Department of Transportation (D.O.T.) specification that closely matches our guidelines.

6. How do we know if it's the right stone?
a. The best way is to hire a professional Architect, Landscape Architect, Geotechnical Firm, or Engineer that has experience in building these fields. They can "marry" our guidelines with D.O.T. stone to control costs and provide a great base.

7. What is the effect of the "wrong stone"?
a. Ninety percent of the problems you see with synthetic turf drainage is poor base – specifically, the wrong stone selection. The use of recycled concrete or standard "road base" material will not work long-term. In addition, many manufacturers recommend a "Fine Grading Layer" to provide final planarity. In some cases, this layer performs its job too well– literally choking off the drainage. PLAE likes a single lift of clean, properly selected fractured stone.

8. How long have these stone bases been used?
a. The first stone bases were constructed in the USA in 1983. Since that time, there have been almost 3,000 constructed in the USA. It is a proven system.

9. What is the perimeter anchoring system?
a. The best system is a concrete curb with a wood nailer board attached or a continuous trench drain system. This provides a neat, clean edge to attach the synthetic turf. There are different ways to handle the edge of the synthetic turf. It depends on if it abuts a running track, grass, or a wall. Again, your best bet is to hire an experienced professional Designer to customize your base and edge details.

10. Walk me through a typical conversion of natural grass to get it ready for synthetic turf.
a.
i. Excavate the existing natural grass and approximately 8" of soil.
ii. Compact the subgrade soil to 95% or more.
iii. The completed base and adjacent curbs/perimeter nailer shall be inspected by the Engineer or Sitework Contractor by means of a laser and plotted on a 10-foot grid. Based upon the Contractor's inspection of the topographical survey, the Sitework Contractor shall fine grade the base suitably, including properly rolling and compacting the base to achieve a surface planarity within of ¼" in 10-feet (+0, -¼"). OWNER, ENGINEER, OR PRIME CONTRACTOR SHALL NOT APPROVE THE BASE FOR TOLERANCE TO GRADE WITHOUT OBTAINING THE TOPOGRAPHICAL SURVEY.
iv. Subgrade and base shall be uniformly compacted to a minimum of 95% of maximum dry density. Care must be exercised to minimize segregation. Engineer/Sitework Contractor shall make written records available to Synthetic Turf Contractor's inspector for both drainage/permeability and compaction/planarity as obtained from a minimum 10' x 10' grid.

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b.
i. Build a concrete curb with wooden nailer board to attach the synthetic turf to and keep everything in place.
ii. Install a non-porous liner, or geotextile, on the compacted soil as recommended by your design professional.
iii. Install a series of field drains using “flat pipe” (or composite drain) laid out in a herringbone pattern.
iv. Fill the field with 4” of free draining stone and 2” of finish stone.
v. Laser level for planarity.
vi. Tie the field drains into the collector drains.
vii. Tie collector drains into existing storm sewer system.

Remember, this foundation must be designated to perform for 30 years or more. It has to be strong enough to support an ambulance and maintenance equipment yet porous enough to take a high intensity rain. The base must remain level and uniform throughout its life – even after decades of exposure to freeze/thaw and unlimited use. Consult and use our guidelines but realize they are just that. They are not a site-specific design for your project. Invest in a good, experienced design professional and don’t skimp on this portion of your project.

SCOPE

These guidelines are intended as a general guide for the design and construction of the base work for a synthetic turf system installation. These may be modified as required based on specific project requirements.

The design criteria described herein include:
1) Site evaluation,
2) Bulk excavation and grading,
3) Installation of impermeable field liner or permeable geotextile fabric,
4) Perimeter drainage collector network and field composite drainage grid system, and
5) Construction of permeable aggregate base layer.

Modifications to the design criteria described herein may become necessary depending on the geographical location, soil conditions, and county and state specifications and design practices. The final decision for the design should be left to the local Architect, Engineer, or Soils Engineer.

1) Site Evaluation – (By Owner)

Upon selection of the site for the playing field, a competent testing laboratory should evaluate the overall soil conditions and drainage properties of the location. Test borings should be made at representative locations throughout the site at a minimum of nine (9) locations. The borings should be tested for the following (to a minimum of 10 feet or refusal):
(a) Soil classification at different depths,1
(b) Moisture content, by layer, 2
(c) Percolation rate, by layer, 3
(d) Sieve analysis, by layer, 4
(e) Soil unconfined compressive strength at different depths, 5
(f) Standard proctor on base layer, 6
During this initial testing, the presence of any pavement, wood, rock, ledge, water or other debris should be reported. The Testing Laboratory and Architect, Engineer, or Soils Engineer should make the final recommendation concerning the suitability of the site.

1 ASTM Test Method D2487
2 ASTM Test Method C566
3 ASTM Test Method D2434 or D3385
4 ASTM Test Method D422
5 ASTM Test Method D2166
6 ASTM Test Method D698

2) Excavation & Grading

A single benchmark must be established prior to any excavation and maintained by a licensed Surveyor of record during the entire construction process. The site should then be excavated to a depth per plan design. During excavation all grass, topsoil, debris, etc., should be stripped, in their entirety, and stockpiled in preselected areas where it will not interfere with the work (or disposed of offsite). All other excavated soil should, depending on its overall properties, be hauled away, or put aside for possible use as select fill.

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For all fill areas, or to fill any areas that may be over-excavated, select fill material shall be used to achieve design subgrade elevations. Select fill material shall be inert soil, clean and free from organic matter, roots, brush or other vegetation, trash, debris or other detrimental substances, and rocks or unbroken lumps larger than 3 inches, and shall be tested and approved by the soil testing and observation agency prior to placement. Unless otherwise authorized by Soils Engineer fill shall meet the following requirements:
a) Plastic Index of not more than 30 per ASTM D424
b) Minimum laboratory dry weight at optimum moisture content of 110 lbs/CF
c) Satisfactory soil materials are defined as those complying with ASTM 2487 soil classification groups GW, GP, GM, SM, and SP
d) Unsatisfactory soil materials are defined as those complying with ASTM 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT
e) Shale shall not be considered suitable for fill unless specifically approved by Soils Engineer.

The Soils Engineer will determine whether the materials in the excavated areas are suitable for use as select fill. All unsuitable material shall be removed and, prior to installation, the Soils Engineer shall approve all new materials to be used as select fill.

The subgrade shall be brought up to elevation using approved select fill material. This material shall be placed in lifts not greater than 8" in depth. Each lift (layer or course) shall be compacted to at least 95% of maximum dry density at optimum moisture content per ASTM D698 Standard Proctor method. The moisture in the soil, at the time of compaction, shall be uniformly distributed and should be within 90 and 120% range of the optimum.

Proof roll:
Proof roll and mark "soft spots" for additional compaction or correction. Use loaded tandem or triaxle dump truck fully loaded with minimum total load of 20 tons. Proof rolling operations must be performed in the presence of a Soils Engineer. Any soft or yielding areas shall be re-compacted or removed and replaced with suitable material to meet required compaction requirements. Unless specified otherwise, any required subgrade remediation work would be done at additional cost to the Owner.

Finished Grading:
The finished surface of the subgrade shall have a finished subgrade in accordance with the plans and specifications. Final subgrade shall be established to within a tolerance of + / - 1/10th of the designed subgrade elevation

Grade Verification:
A certified survey shall be performed on a 25-foot grid to verify grade and elevation of the subgrade.

Trench Excavation:
Excavate perimeter drainage collector trenches 18" wide and 20" deep (minimum). The trenches should be excavated with a minimum of 0.5% slope starting from the low point of the drainage system at the outlet extending toward the high point(s). Design of the collector trenches should incorporate the following:
a) All loose debris shall be removed from the trenches;
b) The trenches shall be backfilled using permeable drainage base aggregate or other porous premium materials and compacted by hand tamping (or equivalent machinery) to a minimum 95% of the maximum density.7
7 ASTM Test Method D698

3) Impermeable Liner/Geotextile Fabric (if required, based on Soils Engineers' recommendation)

Impermeable Liner Material: Liner shall be UV resistant and shall have the following average properties (values from individual rolls should not vary from these values by more than +/- 10%):

Property	**Test Method**	**Requirements**
Appearance		Black or Black/Silver
Normal Thickness		12mm
Weight		6 oz/yd2
Tensile Strength	ASTM D751 (Method A)	215 lbs Warps 175 lbs Weft
Tear Strength	ASTM D751 (Method B)	60 lbs Warp 64 lbs Weft
Accelerated Weathering/UV	ASTM G53-84	More than 80% strength retention after 2,000 hrs
Mullen Burst	ASTM D751	350psi

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Permeable Geotextile Fabric Liner Material:
In certain cases, local conditions will not allow, or are not appropriate, for the installation of an impermeable moisture barrier. In such cases, a permeable geotextile may be substituted. A non-woven fabric weighing at least 4 oz./ SY meeting the following average values is acceptable.

Property	**Test Procedure**	**Min. Avg Roll Values US Units/Metric Units**
Mechanical		
Tensile Strength	ASTM D4632	112 lbs / 510 N
Elongation at Break	ASTM D4632	50%
Trapezodial Tear	ASTM D4533	49 lbs / 210 N
Mullen Burst	ASTM D3786	210 psi / 1551 Kpa
Puncture Strength	ASTM D4833	65 lbs / 289 N
Hydraulic		
EOS (AOS)	ASTM D4751	70 US Sieve / 212 mm
Water Permittivity	ASTM D4491	2.0 sec-1
Water Permeability	ASTM D4491	.22 cm / sec
Flow Rate	ASTM D4491	140 gpm / ft2 5698 lmp / m2
Endurance		
UV Resistance	ASTM D4355	70%

Installation Impermeable/Permeable Liner:
The subgrade surface is to be uniform and free of rocks, depressions, voids, and irregularities that might damage liner. Install liner in accordance with Liner Manufacturer's written recommendations.

1) The liner should be placed in the perimeter trench first. The trench liner should be separate from the liner on the field. Overlap field and trench sections a minimum of 18" in the direction of water flow.
2) Overlap joints a minimum of 8". All laps shall be overlapped in direction the water flows.
3) Place a suitable amount of ballast on the liner to prevent movement by wind. The ballast shall be in a form that will not damage liner.
4) Direct loading on the fabric by traffic shall not be allowed. A minimum of 6" of material cover must be placed prior to traffic.
5) Repair punctured or torn liner by overlapping additional fabric and jointing in accordance with manufacturer's recommendations.
6) The liner must completely line perimeter trench in a continuous manner.

4) Perimeter Drainage Collector & Field Composite Drains

Perimeter Collectors Drains: Install 8" to 12" diameter* perforated HDPE, smooth-walled interior, corrugated pipes in the perimeter collector trenches. The centerline of the pipe shall coincide with the centerline of trench. The pipes shall be strong and capable of withstanding the anticipated loading without deformation. Each header should be designed to handle the maximum rainfall in that particular location.

Collector headers must be drained to an acceptable properly sized storm sewer or approved discharge outlet.

Note:
Pipe sizes may need to be verified by a licensed engineer to assure conformance with local drainage requirements.
a) Place a minimum of 4" clean, crushed, free draining aggregate (maximum size of .75") on the sides of the drainpipes and headers, and 6" minimum of the aggregate on top of the pipe network.
Compact suitably.

Field Composite Drains:
omposite drains to be 12" wide by 1" thick strip drain consisting of a nylon core of fused and entangled filaments completely encased in a non-woven heat bonded geotextile fabric. Material to be Enkaturf_Drain 9323 as manufactured by Colbond Geosynthetics, or approved equal.

Install composite under drain conduits at approximately 15' on center at a 45-degree angle to sidelines or as otherwise indicated on the drawings. Composite drains shall be laid directly on top of the liner, securing to every 15 linear feet with duct tape for impermeable liner and 6" spikes with geotextile liner. Drape ends of these composite drains into the perimeter drain collector trench system.

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5) Permeable Aggregate Base Layer

A uniformly mixed processed stone shall be placed over the entire base, which has been covered with the moisture barrier or geotextile and the composite drain system. The aggregate shall comprise of a minimum 6" compacted, stable, permeable, and processed stone. Care shall be taken to maintain the grade designed for the base. The capability of the processed stone drainage layer to meet the stability and permeability requirements must be determined by a certified laboratory prior to construction of the course. Aggregate 404.645.7900 | plae.us 9 shall be durable and not exceed 12% loss of materials as determined by a sulfate soundness test (ASTM C88). The processed stone layer shall be compacted to a minimum of 95% of maximum density (per ASTM D698). Typical aggregate or aggregate blends found acceptable, as a processed stone drainage course should conform to the following gradation:

Sieve	Metric (mm)	Percent Passing by Weight
1.5”	38.1	100
1”	25.4	95-100
.75”	19.0	80-100
.50”	12.7	60-80
.375”	9.52	30-50
No. 4	4.75	20-40
No. 8	2.38	10-30
No. 40	0.42	5-17
No. 200	75	1-4

Note:

If local resources cannot provide a single blended mix approximating the above listed gradation breakdown, it will be acceptable to install a 2-layer base system consisting of an open-graded bottom layer (+/- .75” clean stone), topped by a layer of screenings. Completed 2- layer system must meet same compaction and percolation specifications.

Delivery Moisture Content of Stone Base:

Processed stone must contain 90% to 110% of the optimum moisture content to ensure that fines do not migrate in transit or during placement and to facilitate proper compaction. It is critical that the installation contractor ensure that aggregate leaving the source plant meet this requirement. The Contractor shall apply water to the processed stone on site to attain and maintain this minimum moisture content.

Handling & Placement:

a) Prior to aggregate placement, remove any excess or contaminated backfill from the drainage trenches.
b) Should any separation of the materials occur, during any stage of the spreading or stockpiling, the Contractor must immediately remove and dispose of segregated material and correct or change handling procedures to prevent any further separation. Double handling of materials should be avoided.
c) The Contractor shall utilize laser-controlled equipment for the grading of the processed stone to ensure accuracy in grading tolerances.
d) Install processed stone base, whenever possible, from sideline toward centerline, parallel to the composite drain network, to the lines and grades shown on the drawings. Distance material is pushed from point of discharge should be limited to that where segregation of materials does not occur.
e) Each layer must be spread uniformly with equipment that will not cause perceptible separation in gradation (segregation of the aggregates), preferably a self-propelled paving machine, or a small grader or low ground pressure (LPG) dozer.
f) The Contractor shall grade the surface of the processed stone acceptable to receive the final synthetic turf surface system.

Compaction and Planarity:

a) The processed stone shall be compacted to a minimum density of not less than 95% of maximum density as determined by ASTM D698.
b) The finished aggregate surface shall not deviate (tolerance-to-grade) by more than plus or minus .25” (.02’) from designated compacted grade elevations when checked by 25’ grid survey. Surface shall also not indicate any deviation more than .25" (.02’) in 10' (any direction) when placed under a 10’ straight edge. This tolerance is required over the entire field. Areas that deviate should be marked with spray paint and corrected by re-grading or filling low areas with crushed stone, granite chips or screenings, and rolling tight to achieve proper density.

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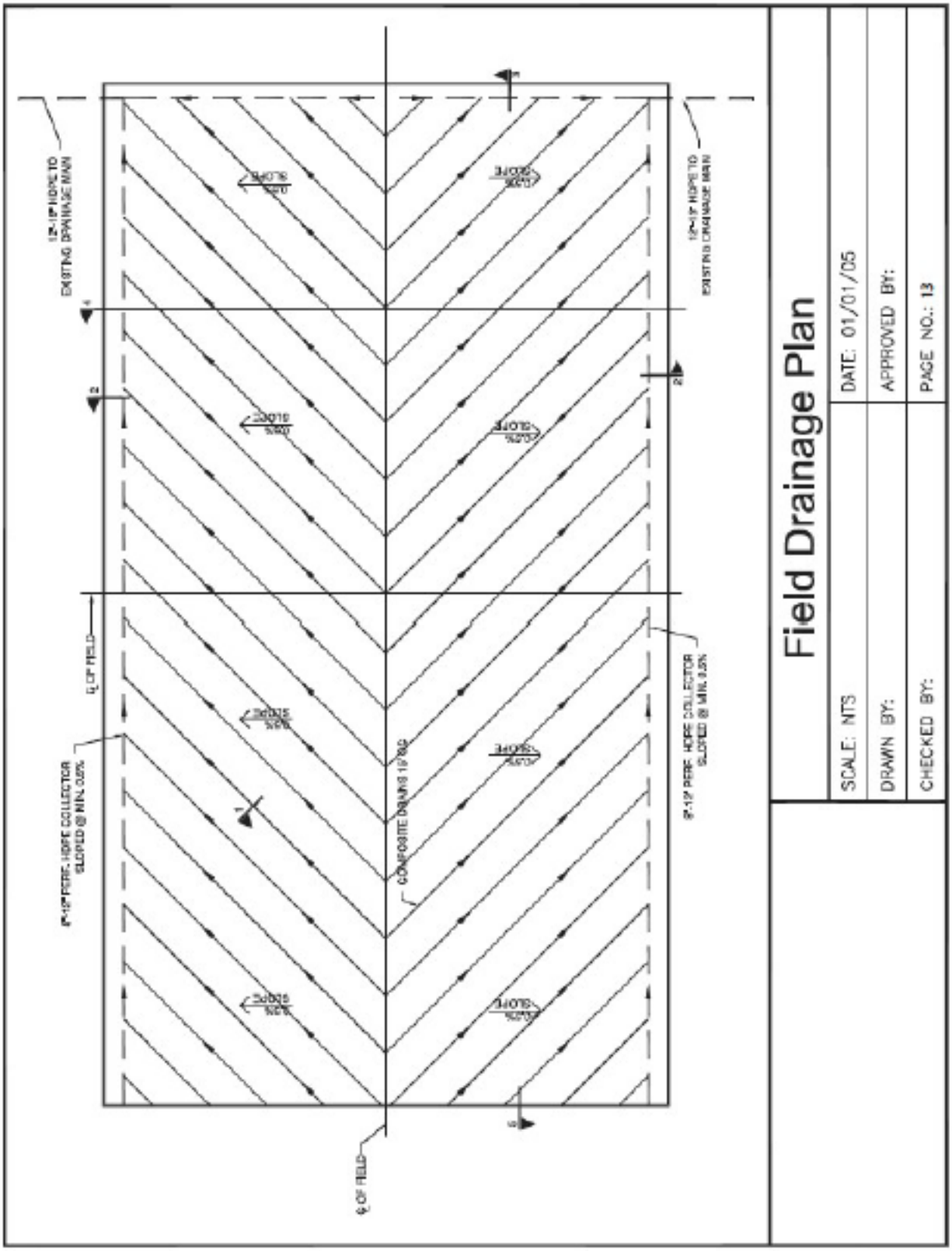
Testing of Completed Aggregate Drainage Layer:

a) The surface of the processed stone course shall be well drained at all times. No standing water shall be permitted at any time. The permeability of the aggregate shall be field checked. Test samples shall be taken (at a minimum of) one sample per every 10,000 square feet or as otherwise directed by the Owner's Representative. Final in-place aggregate shall have a percolation rate of not less than 20" per hour. Surface elevations and planarity shall be verified by means of an independent survey utilizing a maximum grid size spacing of 25' x 25'. (Grid size may be reduced to 20' x 20' or even 10' x 10' depending on individual field dimensions and configuration.)

b) All test results will be logged and documented by the Owner's Representative or Project Engineer. If at any time the processed stone base does not meet specifications, it shall be the Contractor's responsibility to restore, at his expense, the processed stone base to the required grade, cross-section, and density.

c) When the Contractor has independently confirmed that they are in compliance with all the above listed requirements (planarity and elevation verified by a licensed Surveyor and compaction, gradation, and permeability verified by the specified tests), he shall notify the Owner's Representative to schedule a final inspection by the Synthetic Turf System Installer. During this final inspection, the Contractor shall make available an orbital laser system for checking grades. Any deficiencies uncovered during this inspection must be remedied to the satisfaction of the Synthetic Turf System Installer before the base system will be considered acceptable.


Field Drainage Plan
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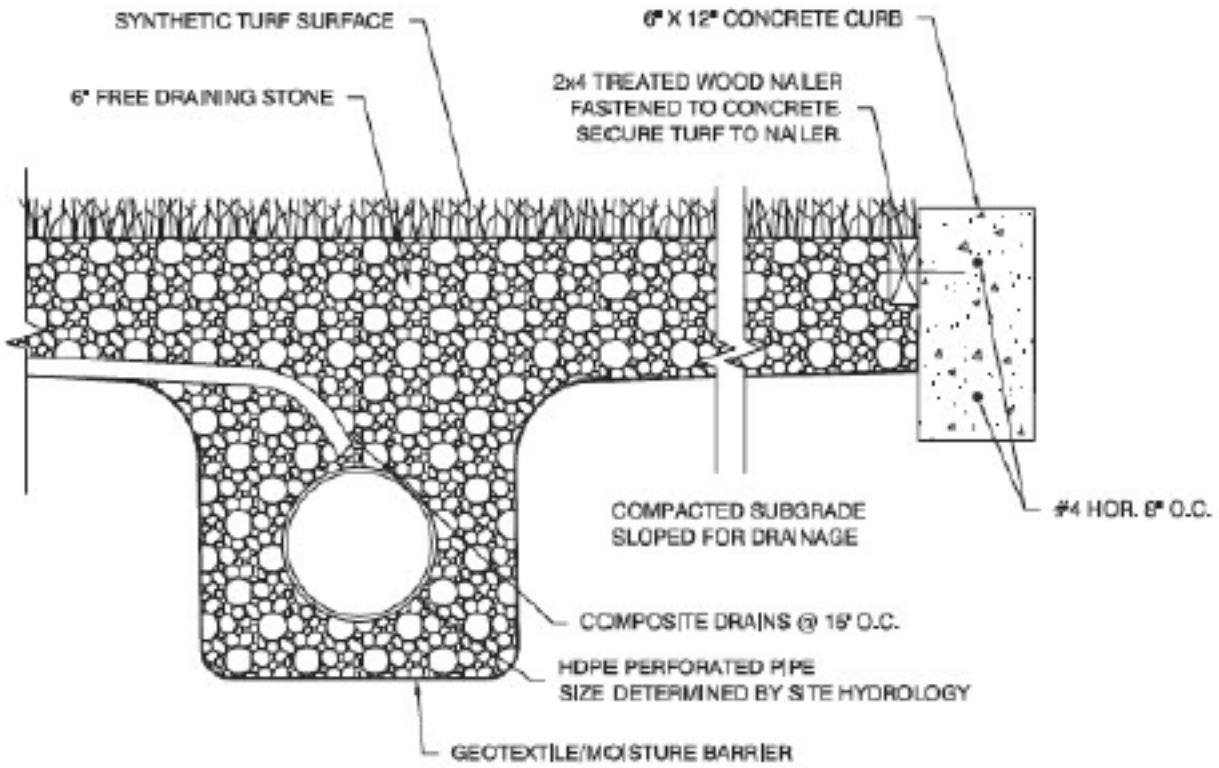
12"-18" HDPE TO EXISTING DRAINAGE MAIN
12"-18" HDPE TO EXISTING DRAINAGE MAIN
4" PERF. HDPE COLLECTOR SLOPED @ MIN. 0.5%
4" PERF. HDPE COLLECTOR SLOPED @ MIN. 0.5%
COMPOSITE DRAIN 15" OC
℄ OF FIELD
℄ OF FIELD
SLOPE



TURF EDGE DETAIL

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Turf at Concrete Curb	
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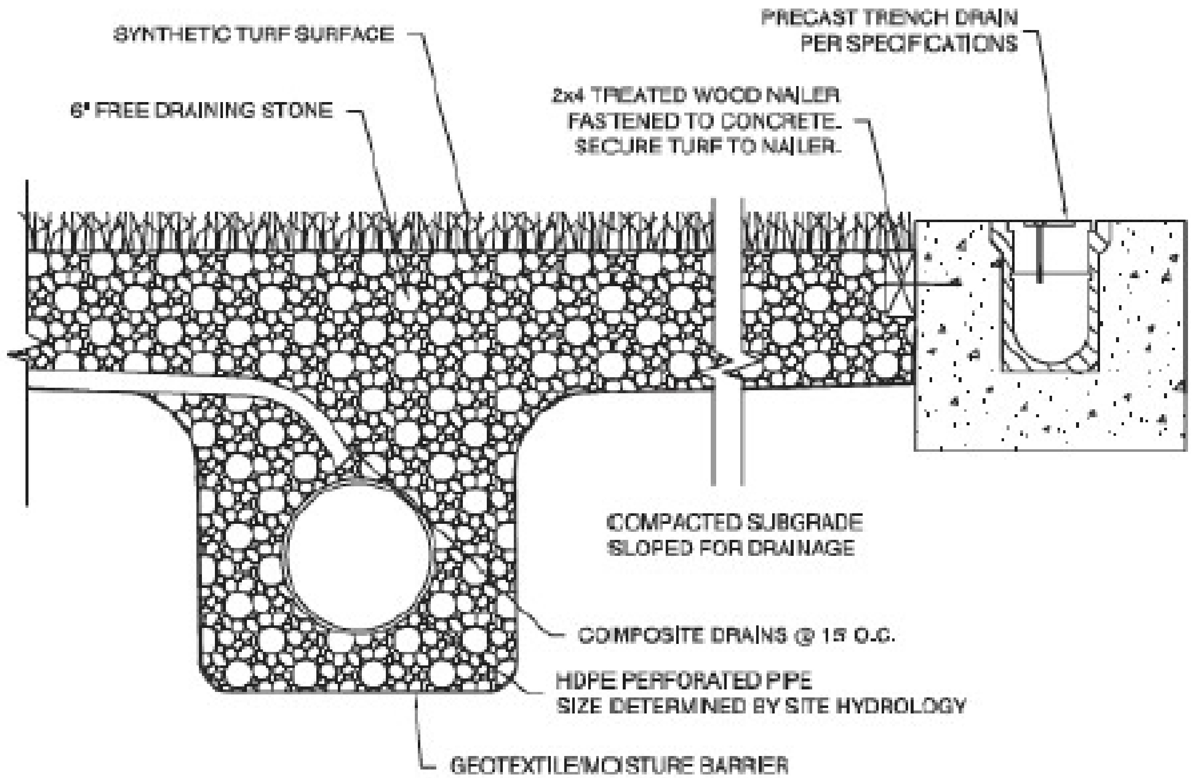

TURF EDGE DETAIL

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Turf at Trench Drain

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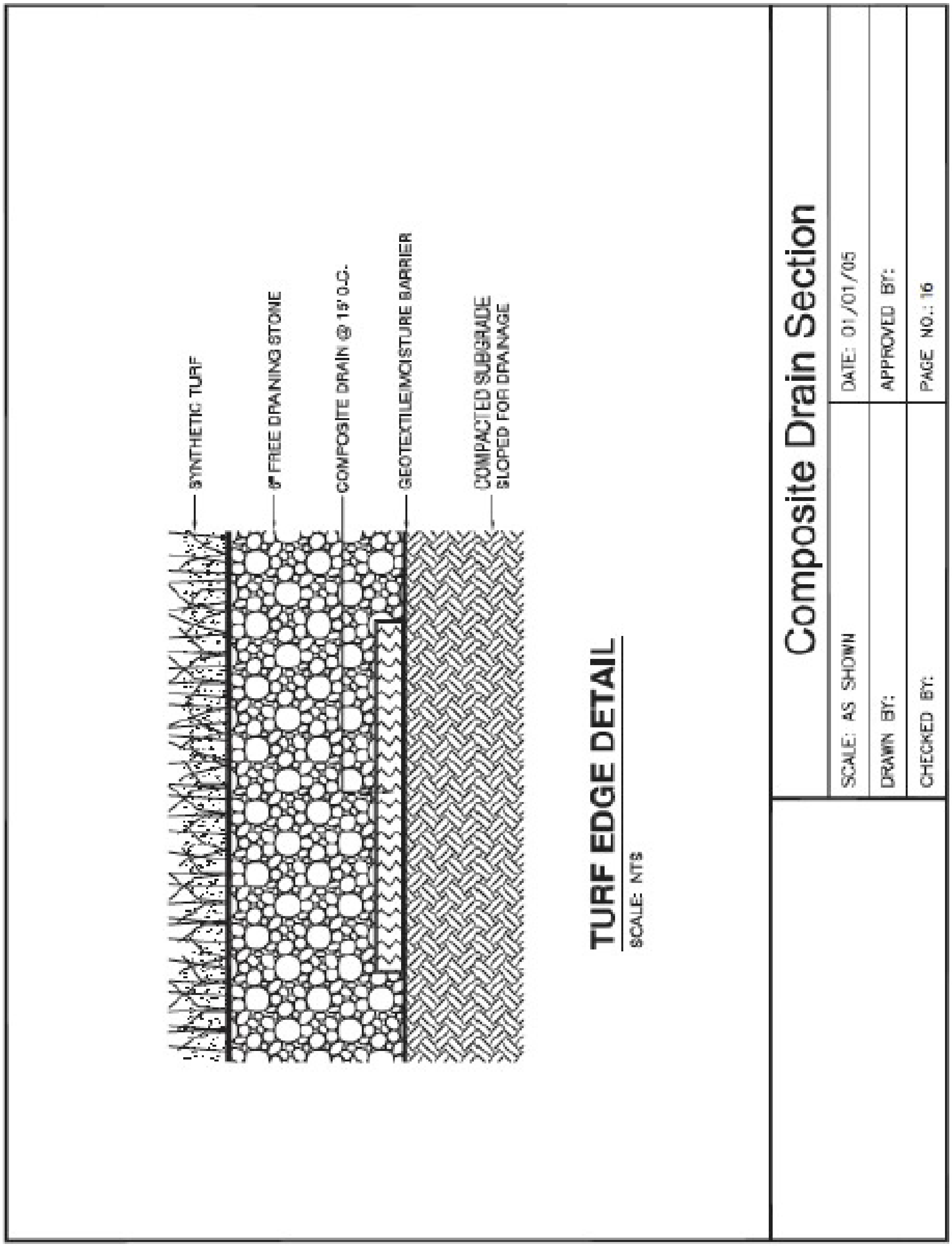
SYNTHETIC TURF
6" FREE DRAINING STONE
COMPOSITE DRAIN @ 15' O.C.
GEOTEXTILE/MOISTURE BARRIER
COMPACTED SUBGRADE
SLOPED FOR DRAINAGE
TURF EDGE DETAIL
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Composite Drain Section
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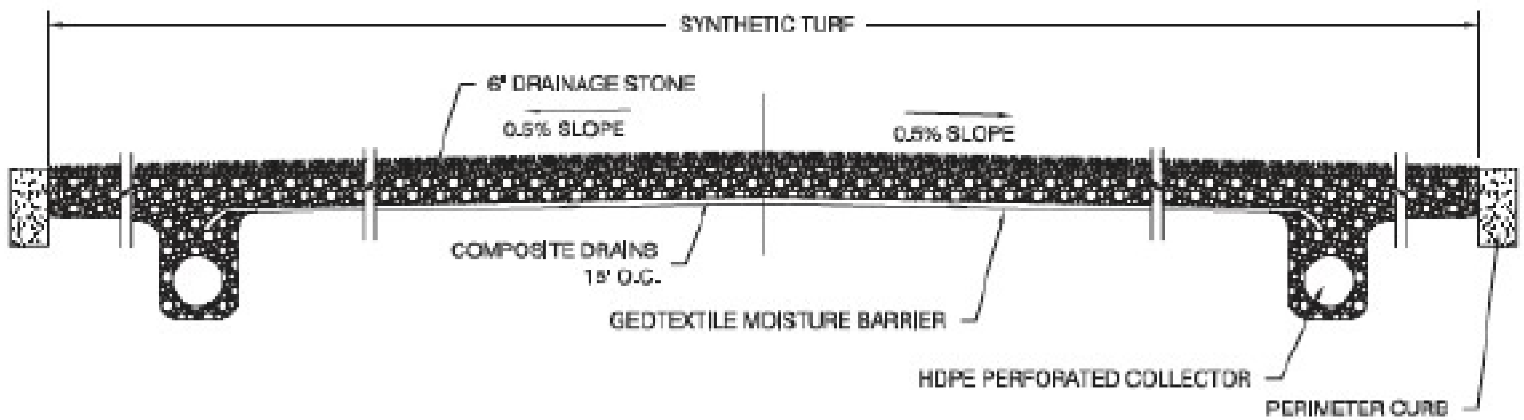

SECTION THRU FIELD

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Section Thru Field with Concrete Curbs	
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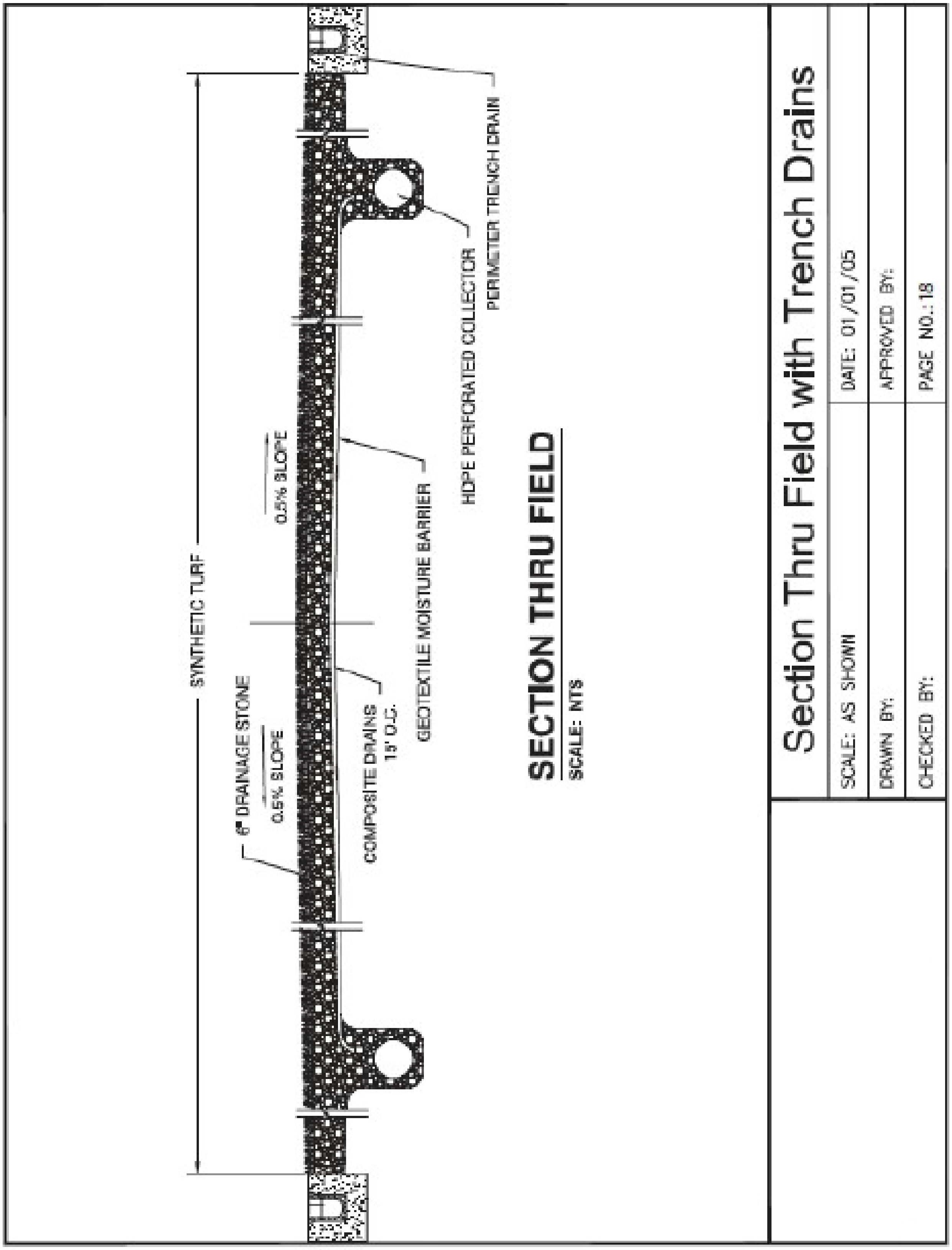
SYNTHETIC TURF
6" DRAINAGE STONE
0.5% SLOPE
0.5% SLOPE
COMPOSITE DRAINS
15' O.C.
GEOTEXTILE MOISTURE BARRIER
HDPE PERFORATED COLLECTOR
PERIMETER TRENCH DRAIN
SECTION THRU FIELD
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Section Thru Field with Trench Drains
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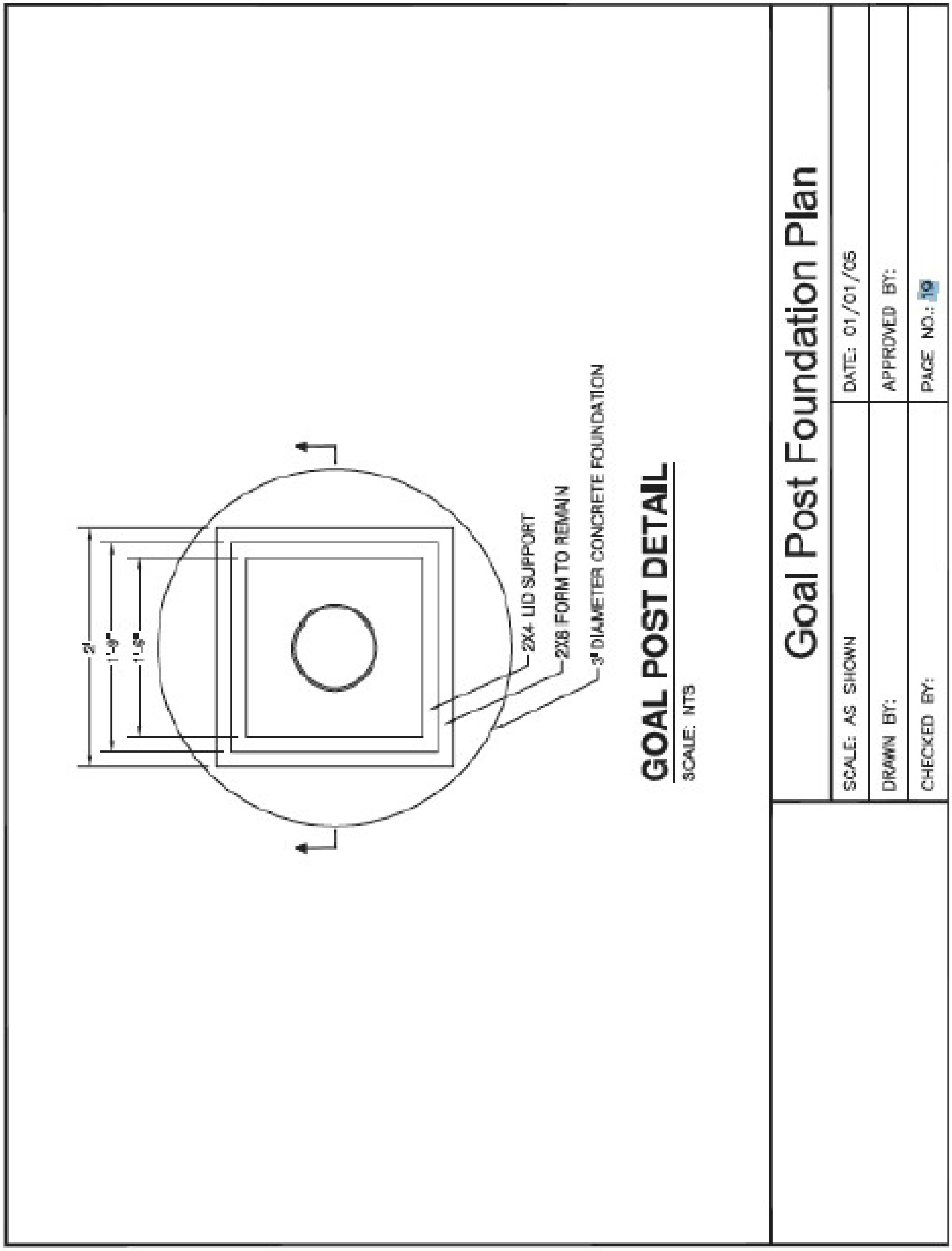

Goal Post Foundation Plan
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GOAL POST DETAIL
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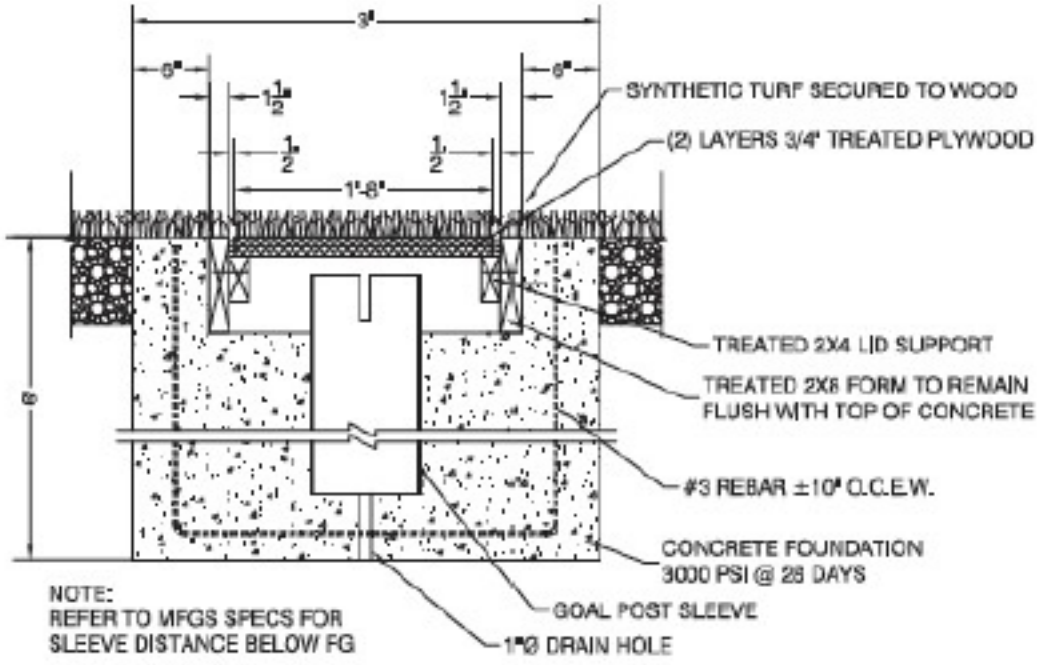
2X4 LID SUPPORT
2X8 FORM TO REMAIN
3' DIAMETER CONCRETE FOUNDATION



GOAL POST DETAIL

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Goal Post Foundation Section	
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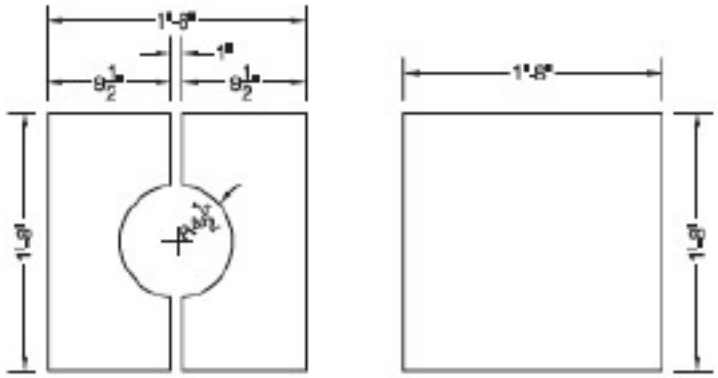

NOTE: FIELD VERIFY ALL DIMENSIONS

GOAL POST COVER TYPE 'A'
2 SETS REQ'D AS SHOWN

GOAL POST COVER TYPE 'B'
2 SETS REQ'D AS SHOWN

GOAL POST DETAIL

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	Goal Post Covers	
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