J-DRain® SWD
Site Water Drainage Composites

NATURAL TURF DRAINAGE- SYNTHETIC TURF DRAINAGE

INSTALLATION GUIDELINES - INTRODUCTION

PURPOSE OF INSTALLING A DRAINAGE SYSTEM: Trench Drainage Systems installed in Natural Turfs shorten the interval of time required to re-open a field to play after a heavy rainfall. Good drainage also promotes a healthier turf and helps the turf resist damage from athletic activities by removing standing water and providing drainage to the root zone. Drainage Systems in Synthetic Turf Installations remove water collected in the underdrain system more effectively and economically than conventional pipe trenches.

There are many design variables to consider when planning a *Drainage Installation* in either Natural or Synthetic Turf. First, you must identify precisely what type of installation you wish to install. The following choices will help guide you through to the next sections:

Now that you have determined the type of drainage you wish to undertake, follow the above references to their designated sections in this manual.

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SYSTEM COMPONENTS:

Prior to undertaking the design of the drainage layout, we need a clear understanding of the components of the drainage system. The following identifies these components

LATERAL TRENCH: A trench that runs laterally across the field at regular intervals for the purpose of collecting excess field water. (See Fig. 1). The trench is 2" wide and only 10" deep. Its very narrow cross section causes little damage and disruption to existing turfs. **J-DRain SWD-6** is placed vertically in the trench and the trench is backfilled with sand. Soil from the excavation of the trench is removed from the field.

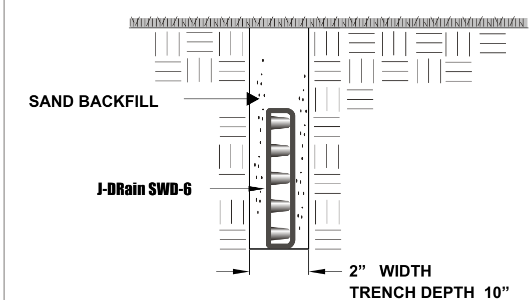

FIG. 1 Lateral Trench

SIDELINE TRENCH: A trench that generally runs just outside the perimeter of the field. The excess field water collected by the Lateral Trenches empty into the *Sideline Trench* for easy removal to a nearby storm sewer or is vented to daylight at a lower elevation. The Sideline Trench is typically 4" wide and 22" deep. (See Fig. 2) **J-DRain SWD-18** is placed vertically in the trench. The *Lateral Trenches* connect to the Sideline Trench with a **J-DRain 6-18 T-CONNECTOR.** (See Fig. 2) It also has a sand backfill and all trench excavations are removed.

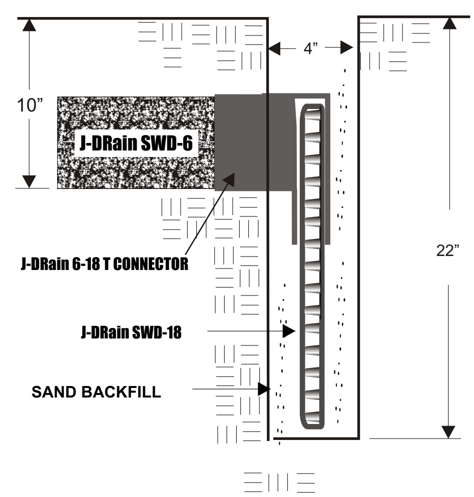

FIG. 2 Sideline Trench

OTHER FITTINGS: **J-DRain LS SIDE OUT** empties water from the *Sideline Trench* into a 4" pipe.. It can be positioned at any location along the *Sideline Trench*. **J-DRain LS END OUT** is used at the end of a *Sideline Trench* to transfer water to a 4" pipe. **J-DRain 6" End Cap** is used to cover a cut end of **J-DRain SWD-6**. (See Fig. 3)

FIG. 3 Other System Fittings

SYSTEM ASSEMBLY: Fig 3 shows an assembly of the components of the drainage system along with their proper fittings for connections.

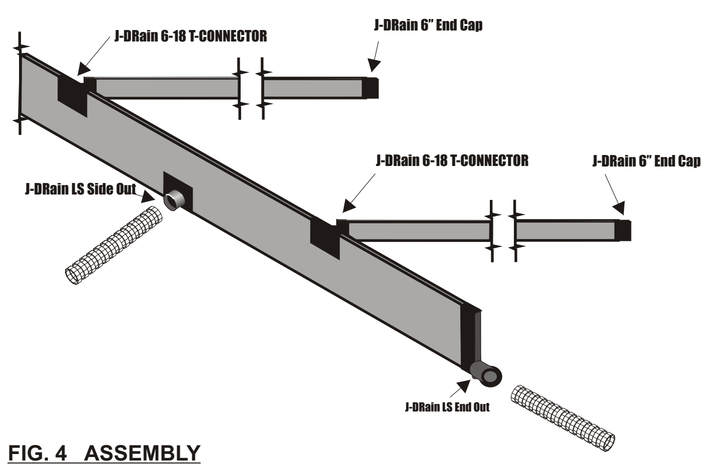

FIG. 4 ASSEMBLY

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NATURAL TURF

DESIGN GUIDELINE - RECTANGULAR FIELDS

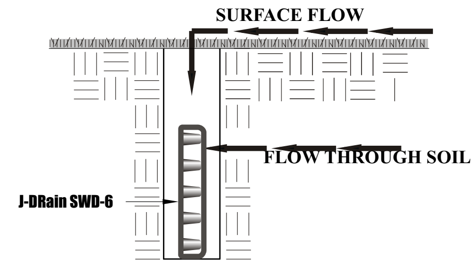

FIG. 5 Lateral Trench

DESIGN METHODOLOGY: There are many design variables when preparing a drainage scheme for a natural turf field. The most important variables are listed below:

1. Slope of Field
2. Surface Flow
3. Permeability of the soil

The *Slope of the Field* plays a very important role in the drainage scheme. The *Flow Through the Soil* is limited by the permeability of the soil and is generally very low. *Surface Flow* is dependent upon the slope of the field and generally is the major contributing factor in drainage and surface drying. (See Fig 5) As surface water travels down the slope of the field it seeks a *Lateral Trench* and quickly enters because the permeability of the sand backfill is much higher than the permeability of the soil. (See Fig. 6)

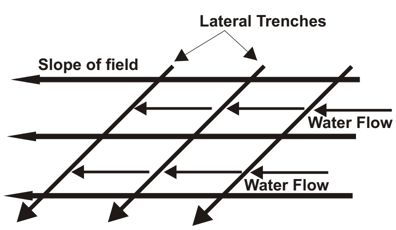

FIG. 6 Lateral Trenches

CALCULATING FLOW CAPACITY OF DRAINAGE SYSTEM:

All of the design variables make it very difficult, if not impossible, to determine water flow through the turf and soil. Trench drainage systems rely on surface flow and the ability of the surface water to penetrate the turf in order to enter the trench. The permeability of the turf can easily be influenced by the type of grass, the amount of compaction of the turf, and thatch buildup in the turf.

Determining the drainage capacity of the drainage system is a very simple matter. Merely multiply the flow rate of the trench drain by the numberof trenches.

Example: 200' X 360' Field

15 gals./min. flow rate X 72 *Lateral Trenches* (36 per side) = 1,080 gals./min.

1,080 gals./min. X 60 min./hour = 64,800 gals./hour

Common sense tells us that the existing turf cannot possibly deliver this volume of water to the drainage system due to the permeability of the turf and the soil. Otherwise, the field would be drained in a matter of minutes. Consider this example:

A field 200' X 360' with a two inch rainfall produces approx. 90,000 gallons of water.

If all of the water passed directly to the drainage system, the field would be dry in approximately one hour. Real conditions tell us that the majority of the rainfall in a two inch rain drains off of the field to the sidelines leaving a saturated surface. This saturated surface is what we deal with in designing a proper drainage system.

Assumption: 50% of rainfall on field runs off to sideline

90,000 gals. X 50% Remaining = 45,000 gals.

You could further assume that a minimum 4 to 6 hours will be required for field drainage,

45,000 ÷ 4 = 11,250 gals./hour

Clearly the drainage system capacity greatly exceeds the field design requirements.

Conclusion: Slope of the field and the distance between the trenches, along with the permeability of the turf and soil are the more important components of the drainage system than the capacity of the drainage system. Additional trenches are added to shorten the distance surface water has to travel to the trench and not to increase the flow capacity of the system.

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FIELD DRAINAGE LAYOUT

1. **IDENTIFY SLOPE OF FIELD (See Fig. 7)**
2. **Place *Lateral Trenches* across field (See Fig. 8) *Lateral Trenches* should intercept slope at 45 degree angles. Include extended area along sidelines for Coaches and Players.**

   Note: Place Lateral Drains at 10' to 12' intervals.
3. **Place *Sideline Trenches* in such a way as to connect all Lateral Trenches on both sides of the field. (See Fig. 9)**

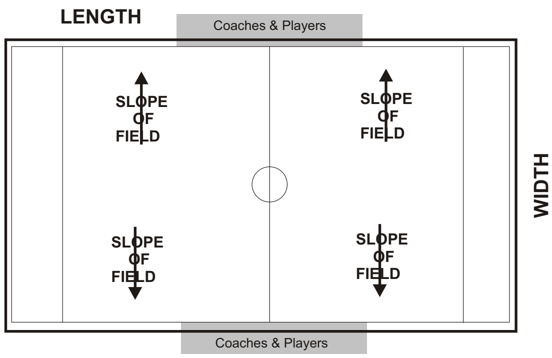


FIG. 7 Determine Slope of Field

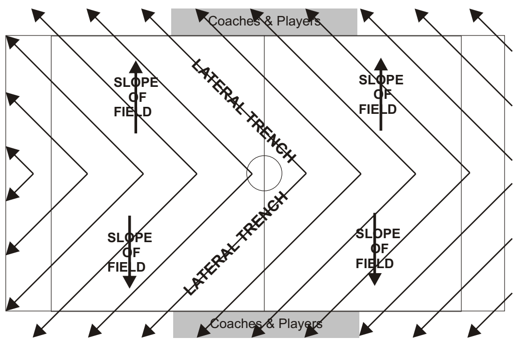


FIG. 8 LATERAL TRENCHES

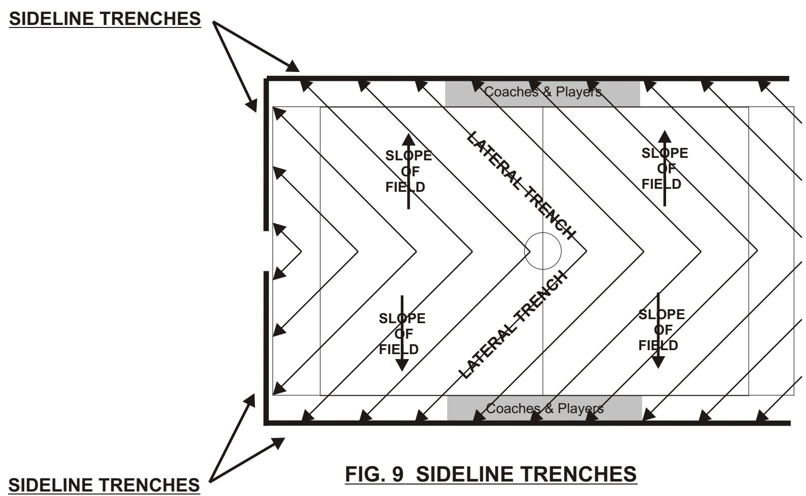


FIG. 9 SIDELINE TRENCHES

COLLECTION POINTS: ***Collection Points*** **are locations where the *Sideline Trenches* make a transition to 4" pipe for removal to daylight or a nearby storm sewer. (See Fig. 10) If the Sideline Trenches have a natural slope, place the collection points at the low corners. Place a minimum of 4 *Collection points* per field. *Sideline Trenches* that have little or no slope should have two additional *Collection Points* added in the other two corners of the field. (See Fig. 11).**

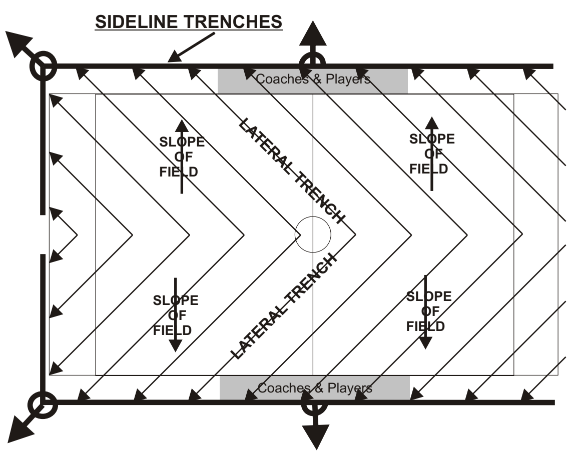
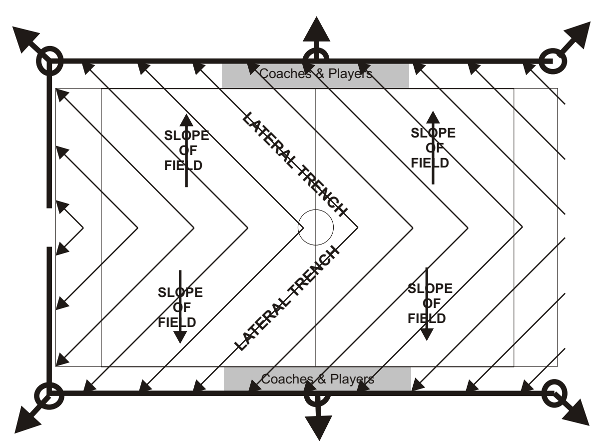


FIG. 10 FOUR COLLECTION POINTS

FIG. 11 SIX COLLECTION POINTS



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FLAT OR MINIMUM SLOPE FIELDS: This type of field should have a *Sideline Trench* around the entire field. (See Fig 12) *Collection Points* should occur at all four corners of the field. For the placement of the *Lateral Trenches* divide the field into four sections. (See Fig. 13) Then place the *Lateral Trenches* in a manner in which the collected water in the *Lateral Trenches* travels the shortest possible distance to the *Sideline Trenches. (See* Fig. 13)

NOTE: It is recommended that the spacing of the Lateral Trenches is shortened to 8' to 10' on center. With little or no slope, the travel time of the surface water to reach the Lateral Trenches is longer.

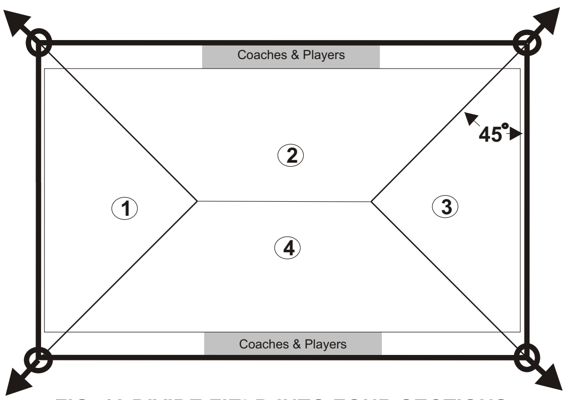


FIG. 12 DIVIDE FIELD INTO FOUR SECTIONS

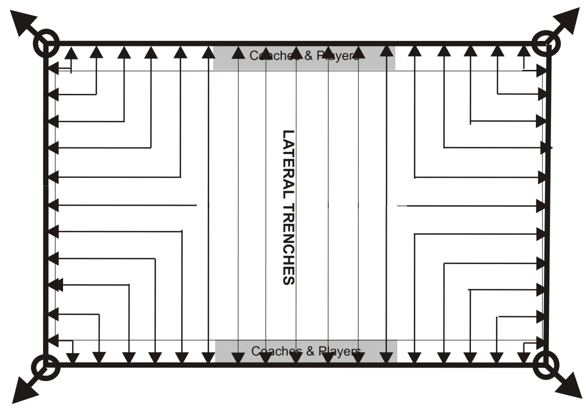


FIG. 13 LATERAL TRENCHES ON FLAT FIELD

BACKFILL PROCEDURE:

TRENCH BACKFILL. All Trenches should be backfilled with sand. (See Fig. 14) The sand should be clean, free-draining, well-graded and free of fine grained soil particles in the silt and clay particle size. After backfilling the trenches with sand, it is recommended that the sand be flooded with a garden hose so that the sand settles and consolidates in the trench. After flooding re-fill the trench with additional sand.

For optimum results and to assist in the prevention of browning of the turf immediately over the trenches, fill the top 2" to 3" of the trenches with a professional turf and horticultural soil amendment. These sport field conditioners are typically made of ceramic, shale or clay granules and support consistent turf growth as they help retain moisture and nutrients for the turf. If you choose this option, re-fill the trenches with the soil amendment instead of sand after flooding the trenches for settlement. (See Fig 14)

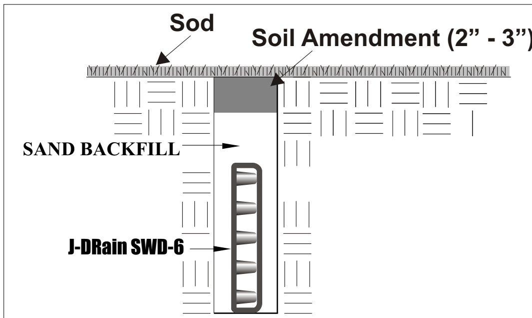
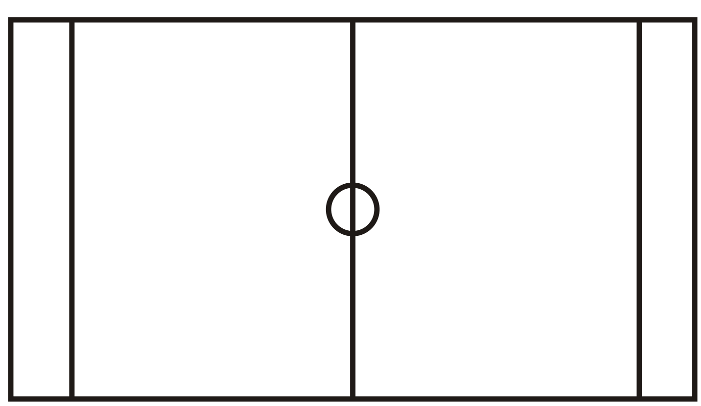


FIG.14 Trench Backfill

RECOMMENDED SOIL AMENDMENT: "Turface MVP" or" Field and Fairway" as manufactured by Profile.
Check website for availability (www.turface.com)

DESIGN ASSISTANCE: JDR Enterprises, Inc. will provide assistance free of charge for laying out your drainage scheme. Simply fill out a drawing as shown below and mail, fax (770)664-7951 or e-mail (info@j-drain.com). Please furnish all of the following information:

1. Locate on a plat similar to the ones shown below the slope of the field. Indicate if there is more than one slope as in a crowned field. Use arrows and list the amount of slope.
2. Locate the length and width of the playing area of the field. Draw on the plat any additional areas along sidelines that you wish to drain, i.e. player and coaching areas.
3. Locate any adjacent storm sewers and indicate location and distance from field. If water collection is to daylight into a ditch or lower area, indicate the areas on the field.
4. Locate any and all underground utility lines, i.e. irrigation and sprinklers, electrical, and any others.
5. Type of turf (Natural or Synthetic).



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NATURAL TURF

BASEBALL FIELDS:

NOTE: Prior to beginning this section, it is recommended that you review the section on System Components on Page 2 and Design Methodology on Page 3.

A typical drainage scheme for a baseball field is shown in Fig. 15. This scheme is based on the same principals as discussed earlier - *Lateral Trenches* intercept slope and *Sideline Trenches* connect *Lateral Trenches* The infield typically requires a longer drying time than the outfield so the spacing should be shortened as shown below.

Lateral Trench Spacing on Infield - 8' - 10'

Lateral Trench Spacing on Outfield - 10' - 12'

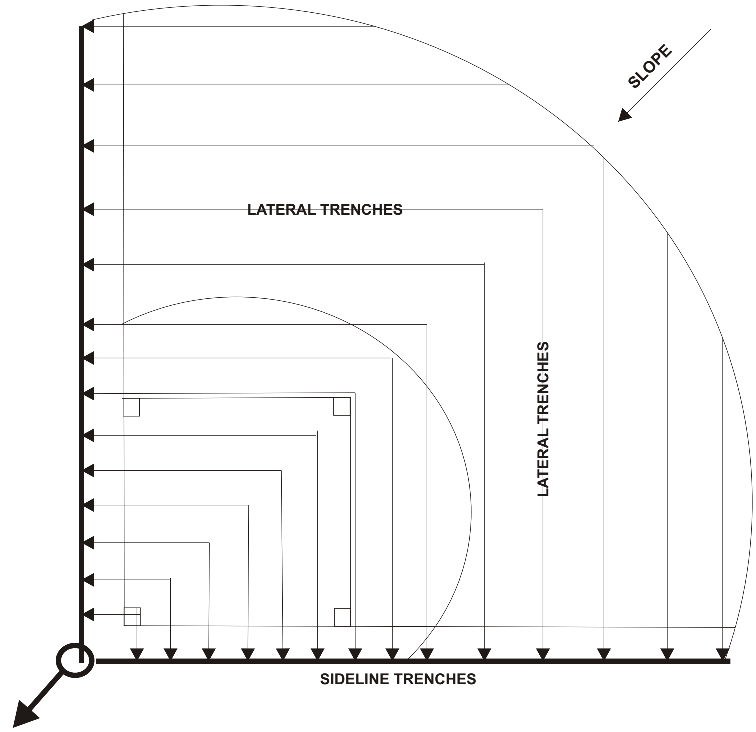
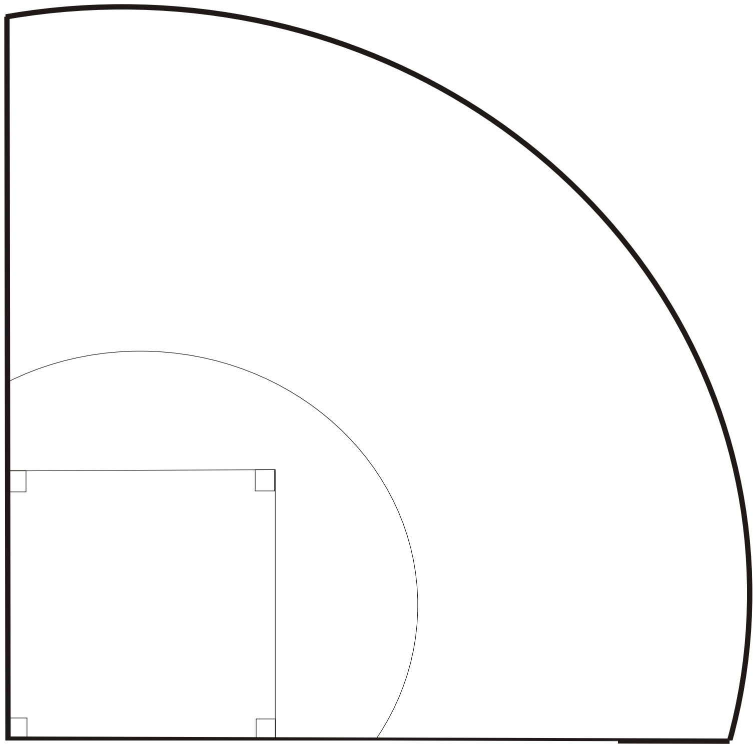


FIG. 15 TYPICAL BASEBALL FIELD



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1. **Locate on a plat similar to the ones shown below the slope of the field. Indicate if there is more than one slope as in a crowned field. Use arrows and list the amount of slope.**
2. **Locate the length and width of the playing area of the field. Draw on the plat any additional areas along sideline that you wish to drain, i.e. player and coaching areas.**
3. **Locate any adjacent storm sewers and indicate location and distance from field. If water collection is to daylight into a ditch or lower area, indicate the areas on the field.**
4. **Locate any and all underground utility lines, i.e. irrigation and sprinklers, electrical, and any others.**
5. **Type of turf (Natural or Synthetic).**

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SYNTHETIC TURF

DESIGN GUIDELINE - RECTANGULAR FIELDS

SYNTHETIC TURF SYSTEM COMPONENTS:

LATERAL DRAINS: J-DRain SWD-12 is laid at regular intervals across the field. It extends from the center of the field and slopes to the sidelines for the purpose of removing rainwater from the gravel fill lying under the Synthetic Turf. J-DRain SWD-12 is a prefabricated composite consisting of a rigid inner core wrapped with a filter fabric. It is capable of conveying large volumes of water to the *Sideline Trenches*.

NOTE: *LATERAL DRAINS* are spaced on 12' to 15' centers.

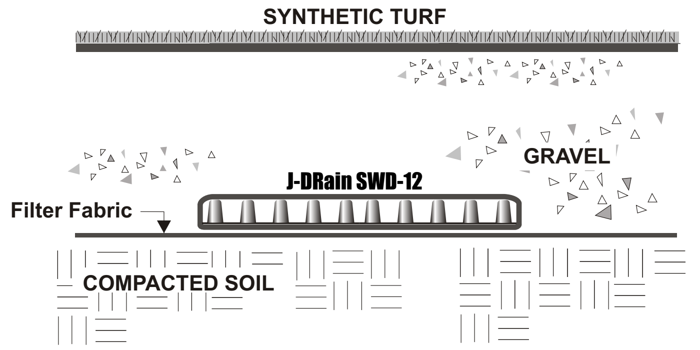

FIG. 1 Lateral Drain

SIDELINE TRENCH: A trench that generally runs just outside the perimeter of the field. The excess field water collected by the *Lateral Drains* empties into the *Sideline Trench*. (See Fig. 2) The *Sideline Trench* is lined with a filter fabric and contains a 6" to 8" pipe for carrying the water to a proper discharge point which generally occurs at the corners of the playing field. **J-DRain SWD-12 *Lateral Drains* are connected to the sideline pipe with a J-DRain LP CONNECTOR as shown in Fig. 2.**

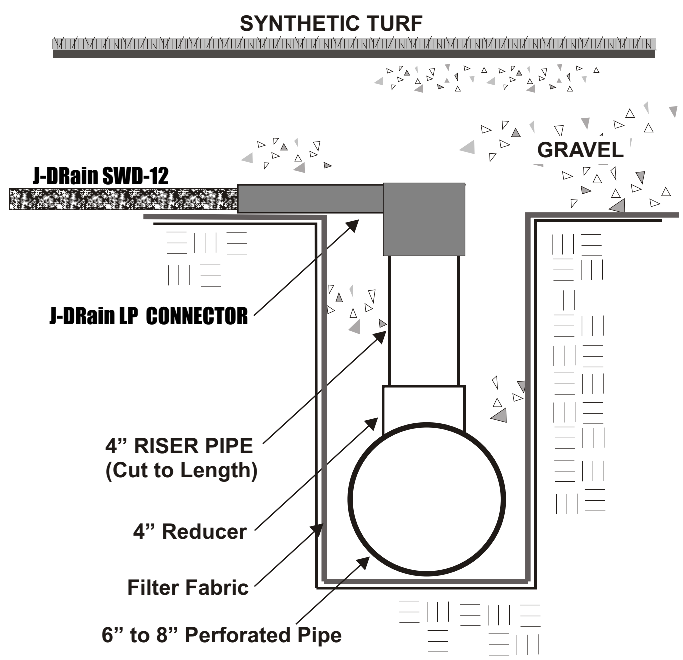

FIG. 2 Sideline Trench

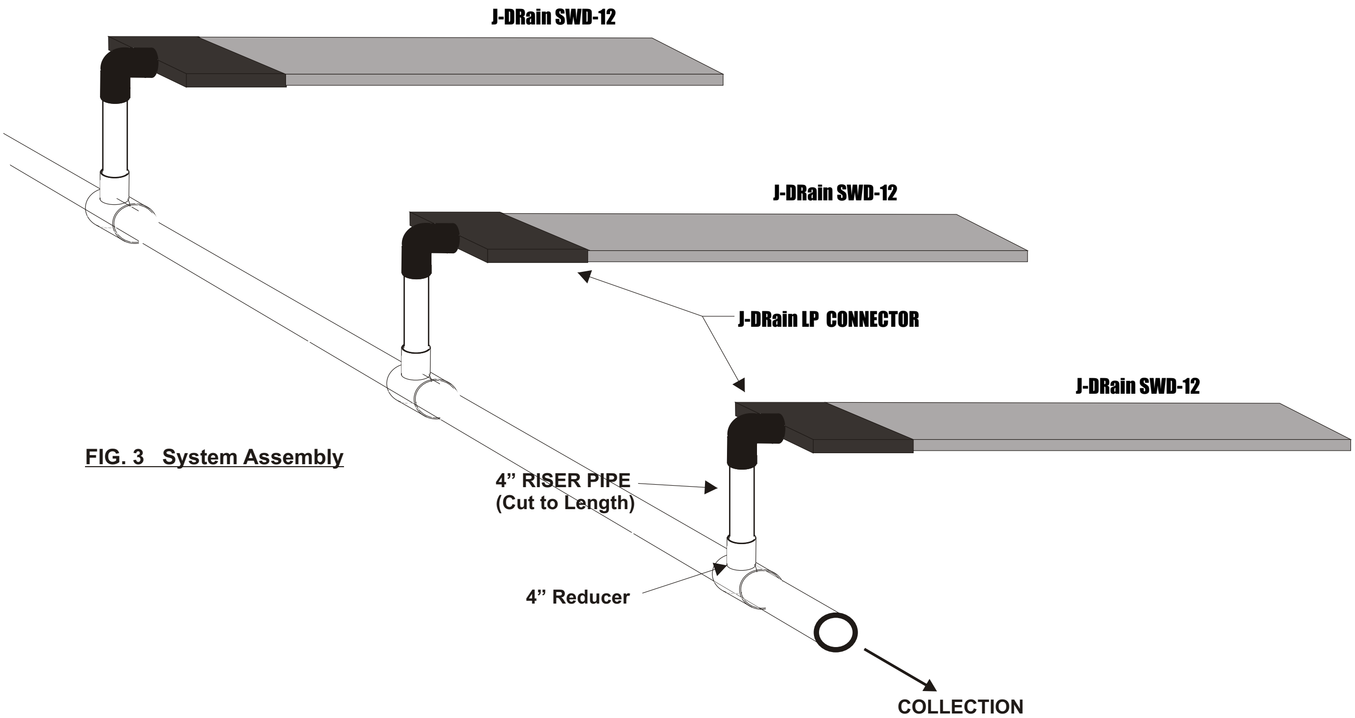

FIG. 3 System Assembly

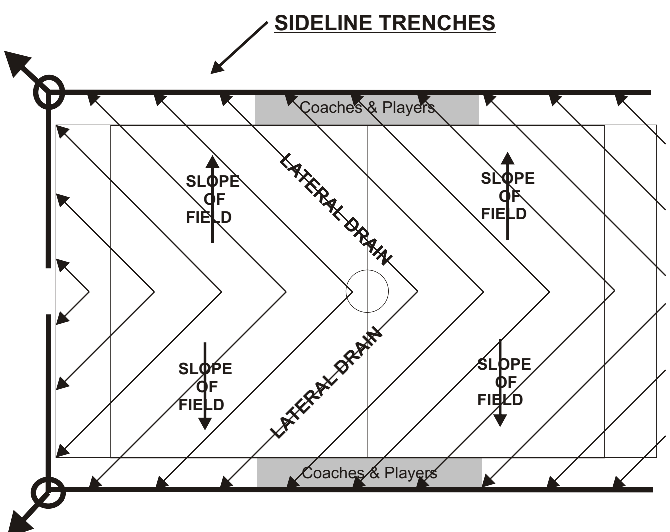

FIG. 4 Typical Field Layout

FIELD LAYOUT: During construction the field is generally graded with a slope from the center to sidelines. *Sideline Trenches* are dug for the collection pipe and the trench is sloped to the collection corners. After grading and compaction, the field and the trenches are lined with a filter fabric. The pipe and the J-DRain SWD-12 *(Lateral Drains)* are placed on the field as shown in Fig. 4 . The *Lateral Drains* are placed at an 45 angle to the slope so that water traveling down the slope seeks out a *Lateral Drain*.

CALCULATING FLOW RATE OF DRAINAGE SYSTEM

WATER FLOW RATES: Unlike natural turfs where permeability of the turf and permeability of the soil play vital roles in design and flow rates, Synthetic Turfs are designed for water to drain through the turf at a rapid rate. The primary restriction of the flow is the Infill that is used in many of the new Synthetic Turf Systems. Aggregate fill underlying the turf is capable of holding a large volume of water in the open space in the aggregate. It is the role of the *Lateral Drains* placed under the aggregate to capture water and deliver it to the *Sideline Trenches* as quickly as possible. The total drainage capacity of the system can be calculated as follows:

Number of *Lateral Drains* X Lateral Drain Flow Rate = Total Drain Capacity

J-DRain SWD-12 has a flow capacity of 30 gal/min at a Hydraulic Gradient of .1.

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Assuming a drainage scheme has 30 Lateral Drains per side of the field (10' Centers), the calculated flow rate is as follows:

30 gal/min X 60 Lateral Drains (12' On Center) = 1800 gal/min

1800 gal/min X 60 min/hour = 108,000 gal/hour

A field 200' X 360' with a two inch rainfall produces approx. 90,000 gallons of water.

<u>CONCLUSION:</u> With a heavy rainfall, as much as 25% of the rainfall will run off the surface to the sidelines. The water flow rate through the turf may be somewhat restricted by the Infill. This, together with the fact that the aggregate fill under the turf acts as a large reservoir for the rainfall, the drainage system easily meets or exceeds the drainage requirement.

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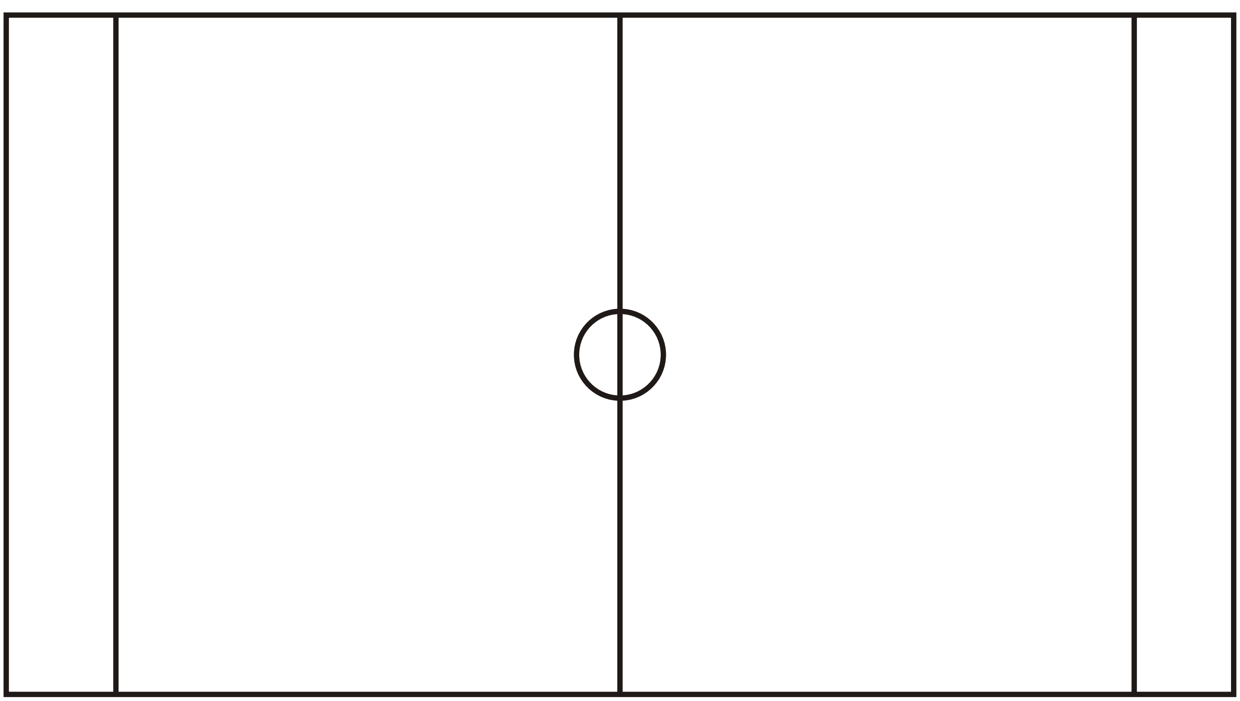
1. Locate on plat below the slope of the field. Indicate if there is more than one slope as in a crowned field. Use arrows and list the amount of slope.
2. Locate the length and width of the playing area of the field. Draw on the plat below any additional areas along sideline that you wish to drain, i.e. player and coaching areas.
3. Locate any adjacent storm sewers and indicate distance from field. Be certain that the storm sewers are lower than the field. If water collection is to daylight into a ditch or lower area, indicate the areas on the field.
4. Locate any and all underground utility lines, i.e. irrigation and sprinklers, electrical, and any others.
5. Type of turf (Natural or Synthetic).



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NATURAL TURF - Golf Courses - General Landscape

DESIGN GUIDELINE

PURPOSE: The purpose of this document is to provide the basic data necessary to design a drainage layout for Golf Courses, Commercial and Residential Landscape.

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SYSTEM COMPONENTS:

LATERAL TRENCH: A trench that runs laterally across the drainage area at regular intervals for the purpose of collecting excess field water. The trench is 2" wide and only 10" deep. (See Fig. 1). Its very narrow cross section causes very little damage and disruption to existing turfs. **J-DRain SWD-6** is placed vertically in the trench and the trench is backfilled with sand. Soil from the excavation of the trench is removed from the field.

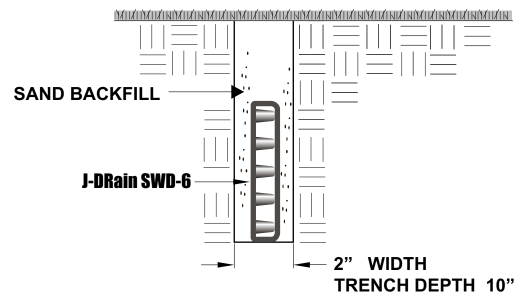

FIG. 1 Lateral Trench

COLLECTOR TRENCH: A trench that generally runs down the center or at the edge of the drainage area. The excess field water collected by the Lateral Trenches empties into the *Collector Trench* for easy removal to a nearby storm sewer or is vented to daylight at a lower elevation. The *Collector Trench* is typically 4" wide and 18" deep. (See Fig. 2) **J-DRain SWD-12** is placed vertically in the trench. The *Lateral Trenches* connect to the Sideline Trench with a **J-DRain NV FITTING** as shown in Fig. 2. It also has a sand backfill and the all trench excavations are removed.

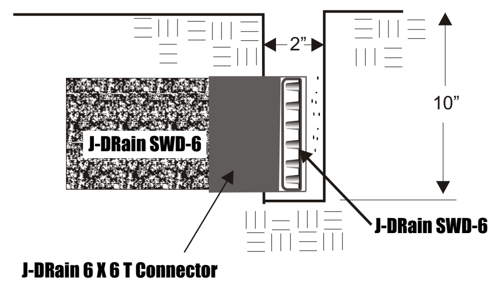

FIG. 2 Collector Trench

OTHER FITTINGS: **J-DRain 6-6 T CONNECTOR** empties water from the *Lateral Trench* to the *Collector Trench. (*See Fig. *3)* It can be positioned at any location along the *Collector Trench*. **J-DRain 6-6 SPLICE** is used to join two sections of at the end of **J-DRain SWD-6. J-DRain 6" End Cap** is used to cover a cut end of **J-DRain SWD-6. J-DRain 6-4 END OUT is used to transition to a 4" corrugated pipe. J-DRain 6-4 SIDE OUT is used to transition to a 4" corrugated pipe.**

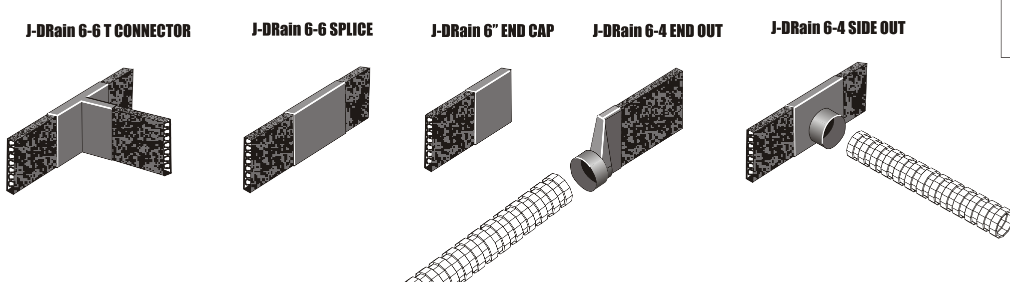

FIG. 3 System Fittings

DESIGN METHODOLOGY: There are many design variables when preparing a drainage scheme for a natural turf area. These variable include:

1. ***Slope of Surface***
2. ***Collector Trench Locations***
3. ***Lateral Trench Locations***
4. ***Collection Points***
5. ***Discharge Points***
6. ***Proper Trench Back Fill***

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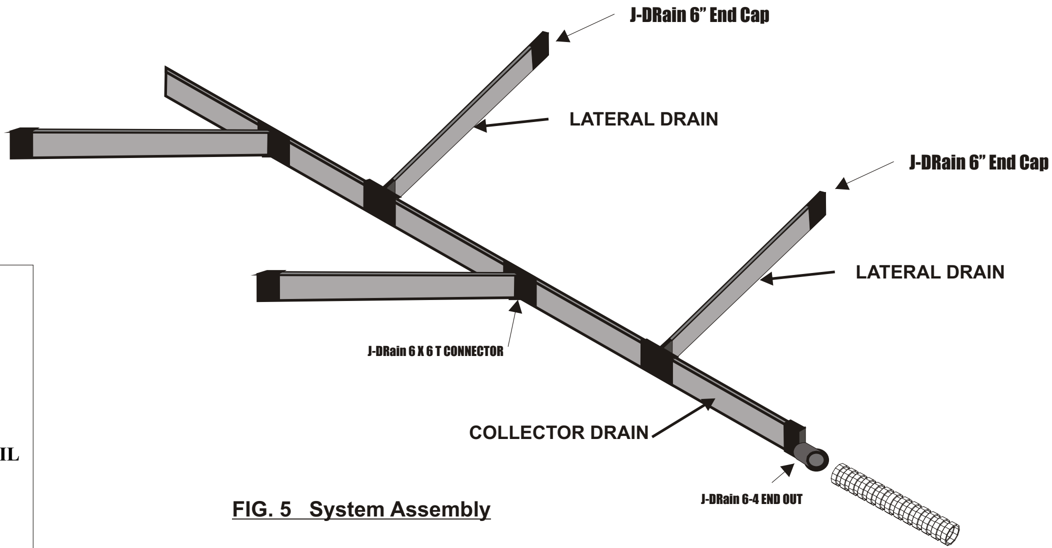

FIG. 5 System Assembly

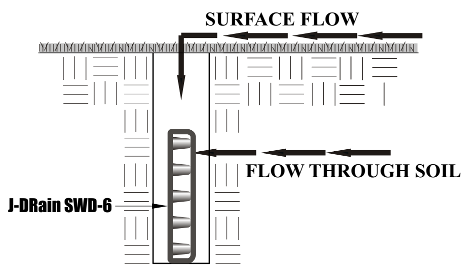

FIG. 4 Lateral Drain

STEP 1.

DETERMINING SLOPE OF DRAINAGE AREA: The slope of the drainage area plays a very large role in the drainage scheme. *Flow Through the Soil* and *Surface Flow* are the major contributing factors in field drainage effectiveness. (See Fig. 5) *Flow Through the Soil* is limited by the permeability of the soil and is generally very low. *Surface Flow* is dependent upon the slope of the surface and generally is the major contributing factor in drainage and surface drying. As surface water travels down the slope it seeks a *Lateral Drain* (See Fig. 6) and quickly enters because the sand backfill in the trench has a much higher permeability than the adjacent soil. It is very important then that the slope of the drainage area is intercepted by *Lateral Drains* at approximately 45 degrees. This ensures that water flowing across the surface will flow into a *Lateral Drain*.

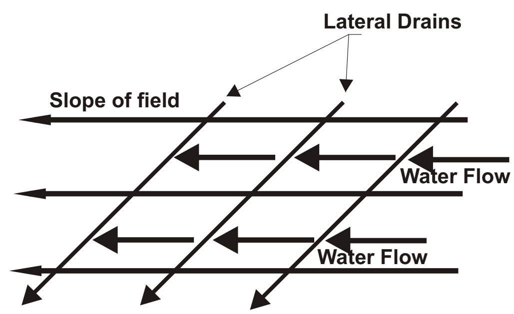

FIG. 6 Lateral Drains

STEP 2.

DRAINAGE LAYOUT: With a paint spray marker or chalk, mark the *Collector Trench* down the middle of the area to be drained.

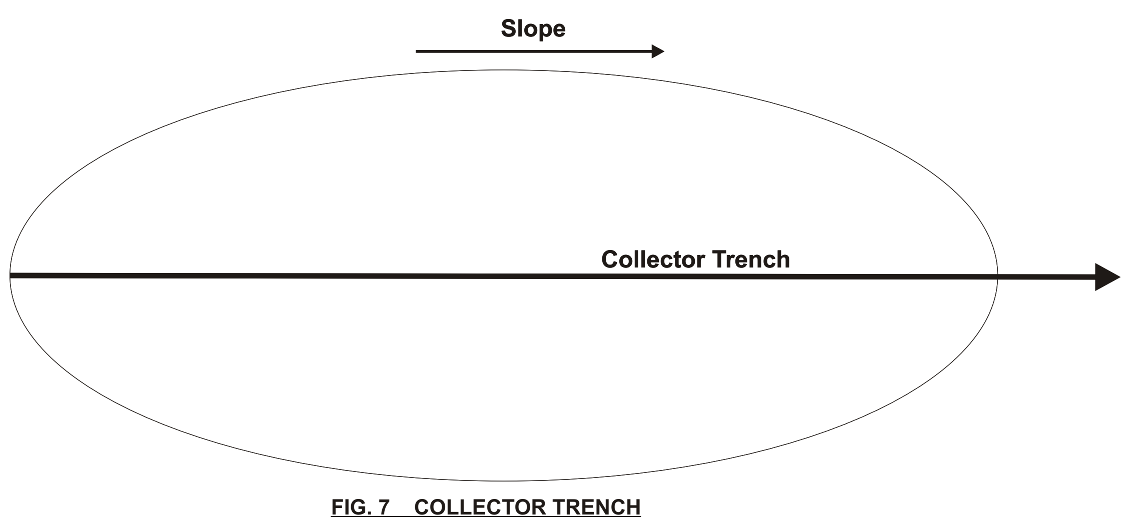

FIG. 7 COLLECTOR TRENCH

JDR ENTERPRISES, INC. 292 SOUTH MAIN ST., SUITE 200 ALPHARETTA, GA 30004
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STEP 2.

LOCATION OF *LATERAL TRENCHES*: From Fig. 6, the LATERAL TRENCHES shold intercept slope at 45 degrees. Mark the Lateral Trenches on the field as shown in Fig. 8.

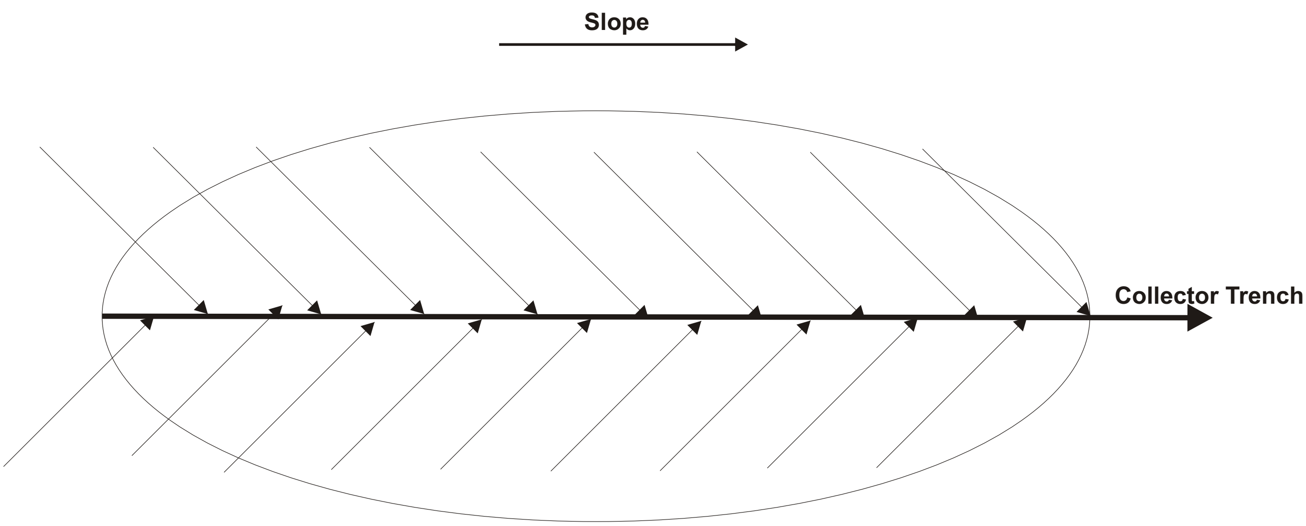

FIG. 8 COLLECTOR TRENCH

DESIGN ASSISTANCE: JDR Enterprises, Inc. will provide assistance free of charge for laying out your drainage scheme. Simply fill out the form below and mail, fax (770)664-7951 or e-mail (info@j-drain.com). Please furnish all of the following information:

1. Locate on a plat the desired areas to be drained showing the slope of the area. Use arrows to locate slope and list the amount of slope.
2. Locate the length and width of the area.
3. Locate any adjacent storm sewers and indicate distance from field. Be certain that the storm sewers are lower than the field. If water collection is to daylight into a ditch or lower area, indicate the areas on the field.
4. Locate any and all underground utility lines, i.e. irrigation and sprinklers, electrical, and any others.
5. Include other pertinent information.