
DIG it!
DRAINAGE INSTALLATION GUIDE
FOR IN-GRADE FIXTURES
B-K LIGHTING

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INTRODUCTION

It is true that all B-K Lighting in-grade luminaire products are IP68 rated, which means that they can withstand submersion of up to one meter, it is also understood that for years of trouble free performance, it is best that the soil around the recessed housing provide for ample drainage.

B-K Lighting with the help of Rick Helgeson, PE, of Helgeson Engineering has developed a comprehensive system to help the specifier and the installer determine the need for and the best practice, to specify and install in-grade luminaires.

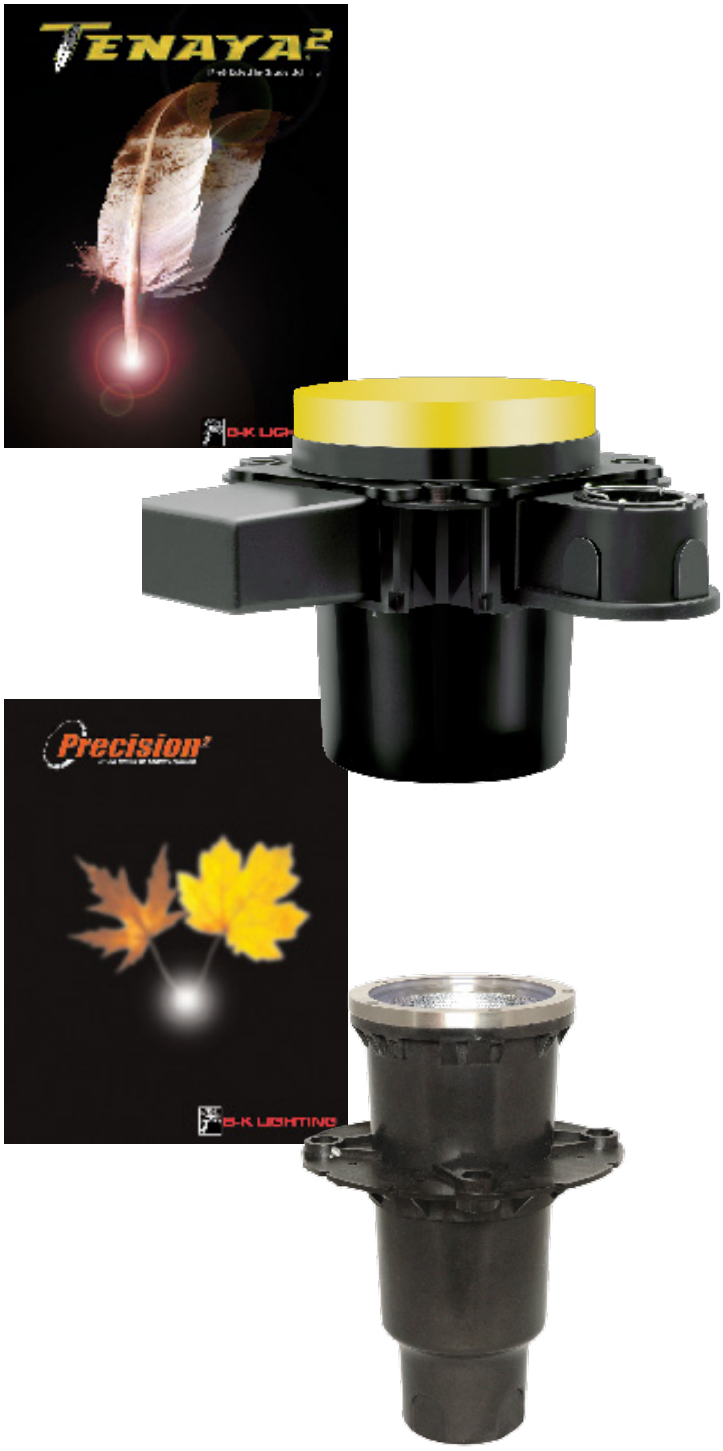
Soil type affects all construction projects and the type of soil present dictates whether or not your construction will be affected by drainage. Specifically, the permeability of the soil (the ability of water to move within a soil) is the controlling factor.

In general, the larger the void spaces a soil type possess (the "gaps" between soil particles), the greater its permeability will be. Conversely, the smaller the void spaces, the less the permeability. Therefore, coarse-grained soils such as sand commonly exhibit higher permeability rates, while fine-grained soils like clay ordinarily have lower permeability rates.

Because of the higher permeability, sandy and granular soils are considered to be "free draining." Silty and clayey soils have poor permeability and therefore have poor drainage characteristics. Clayey soils also tend to swell when saturated with water and shrink as they dry out.

In some locations, such as the San Joaquin Valley of California, topsoil can have underlying layers of highly compacted soil commonly called "hardpan." A hardpan layer will inhibit subsurface drainage as it creates a barrier that water cannot freely pass through.

Soils have been classified into two types for simple "in the field" identification without the need of the sophisticated analysis. Best installation practices have been recommended based on these general soil classifications.



FIRST STEP - DETERMINE YOUR SOIL TYPE

The factors involved in considering whether or not water might maintain a constant presence (constant soil saturation), will require the specifier or installer to examine a few variables. The obvious controlling variables are a project's location, the existing soil type, and the installation practice itself.

Soil type is in reference to the existing soil at the installation site itself. Since the soil's ability to drain is in direct relationship to its type, it is important to be able to distinguish or classify what kind of soil is present at the project site.

Determine Soil Type

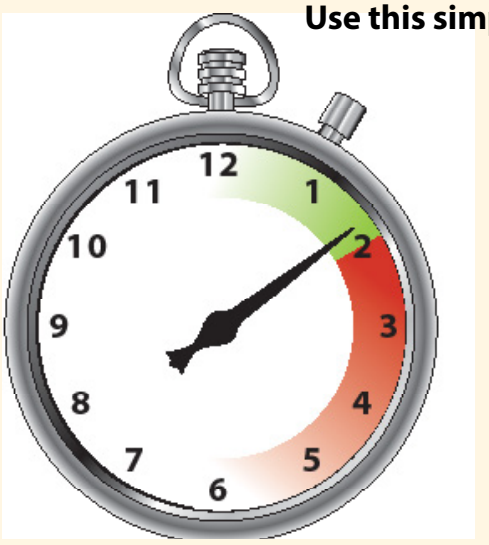
The soil's ability to drain and thus optimize your lighting installation is directly related to its soil type.

Type I

This soil is basically an easily/free draining soil. In general, this type of soil has very little or no clays and may have a "sandy" feel or look to it. Digging is probably easy to moderate in difficulty and water freely percolates into the ground.

Type II

This soil is a medium to difficult draining soil. Typically these types of soils will consist of varied amounts of clays and or "hardpan." These soils are very difficult to dig in and water pools even in small amounts sine the soil does not readily percolate standing water well. This type of soil can take hours or even days to "drain" standing water, especially if the soil is already saturated.



Use this simple test to determine your soil type:

1. Dig a hole at least 18 inches in diameter and 18 to 24 inches in depth.
2. Fill the hole half way with water.
3. Time how long it takes for the water to percolate (drain) into the soil.
4. If the time is less than 2 hours, the soil is TYPE I.
5. If the time is greater than 2 hours, the soil will be TYPE II.

< 2 hours = SOIL TYPE 1

> 2 hours = SOIL TYPE 2

RECOMMENDED INSTALLATION PRACTICES

Type I

This type of soil is the preferred site condition. If your project site is comprised of TYPE I soil, no additional installation preparation should be needed based on the soil's drainage properties. Be sure to review the "Other Considerations" section, as additional installation practices may want to be implemented in conjunction with TYPE I soil based on project site-specific situations.

Type II

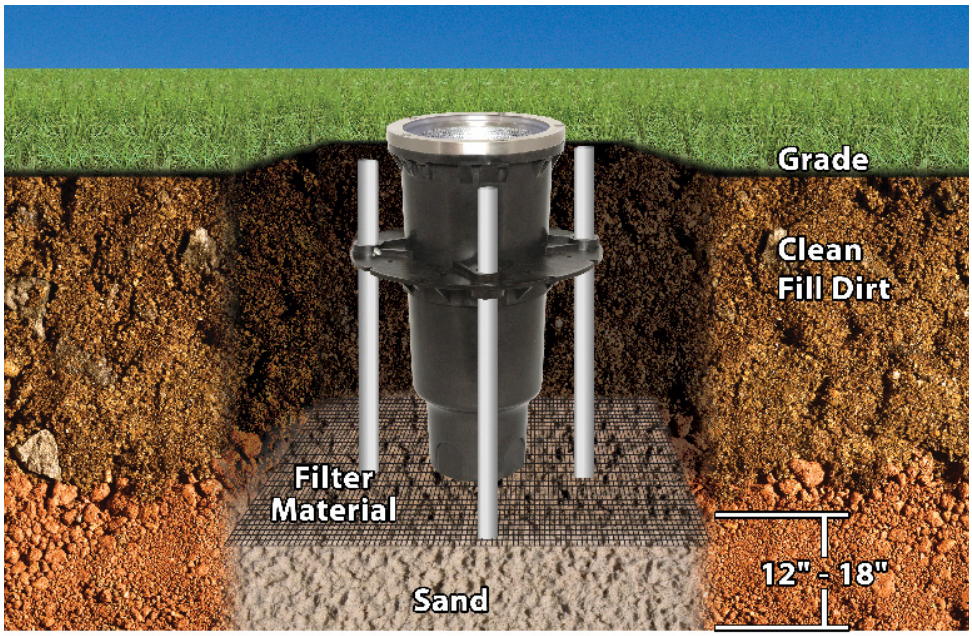
There are three levels of installations recommended for TYPE II soil.

Standard TYPE II Installation (Recommended)

Standard TYPE II installation should consist of over-excavating the hole for the lighting housing 12 to 18 inches in additional depth (see Detail A). The over-excavated portion of the dig should be filled with sand.*

The sand backfill should be moistened and compacted. After compaction, the sand can be easily adjusted to maintain the proper grade for the installation of the housing.

Prior to the final setting of the housing, it is recommended that filter material be placed between the sand and the bottom of the housing. This will help keep the sand out of the perforated housing (bottom) without inhibiting its self-draining properties necessary to rid the housing of internal condensation moisture.



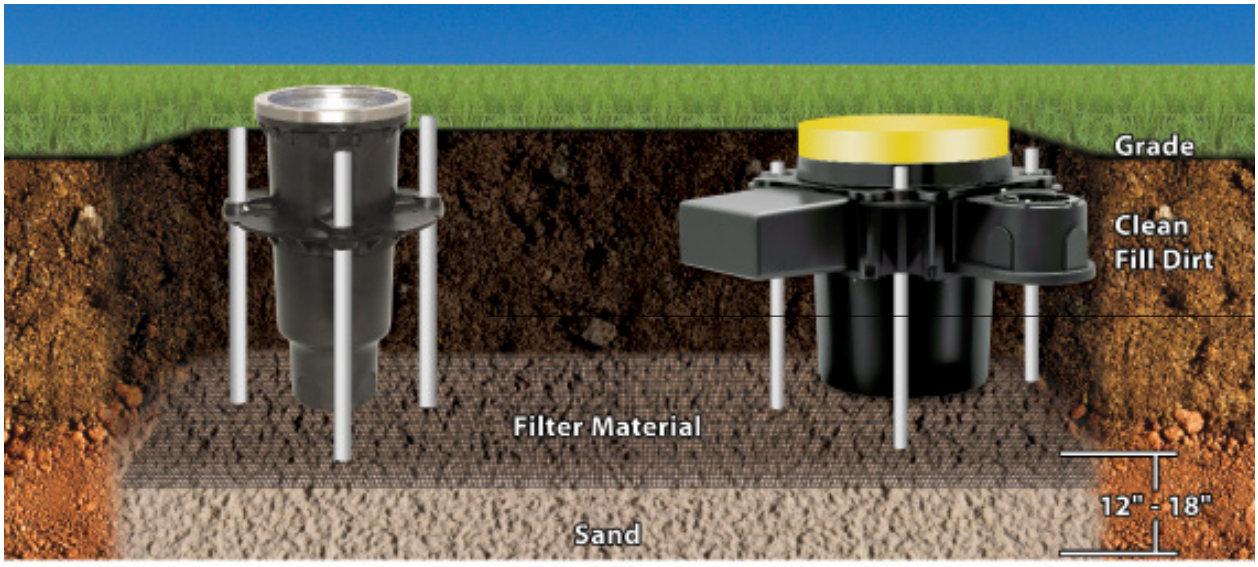
Detail A (Standard Type II Installation)

**NOTE: It is NOT recommended that the backfill material be gravel, rock, or crushed rock. Geotechnical research and analysis has proven that migration of soil particles from a fine soil into a coarse backfill will take place over time. This results as water carries finer soil particles into the pores (void spaces) of the coarser backfill. The resultant of this could cause the ground around the light installation to sink, settle irregularly, or cause the lighting housing to shift.*

RECOMMENDED INSTALLATION PRACTICES

Advanced TYPE II Installation

Advanced TYPE II installation is the same as the standard installation with the inclusion of trenching between housing installations and/or lower elevations. These connecting trenches should be backfilled with compacted sand. Water will migrate through the sand to the lower elevations naturally via gravity (see Detail B).



Detail B (Advanced Type II Installation)

Premium TYPE II Installation

Premium TYPE II installation is the same as the standard installation with the inclusion of subsurface drains (see Detail C). The drains can be PVC or the standard "flex" drain that is commonly available for landscape drainage (some of these drainage pipes can be found pre-perforated).

To make your own perforated pipe, drill ¼-inch to 3/8-inch holes in the 8:30 to 10:30 position and the 1:30 to 3:30 position only where the pipe is directly under the housing, the top and bottom of the pipe must be kept solid

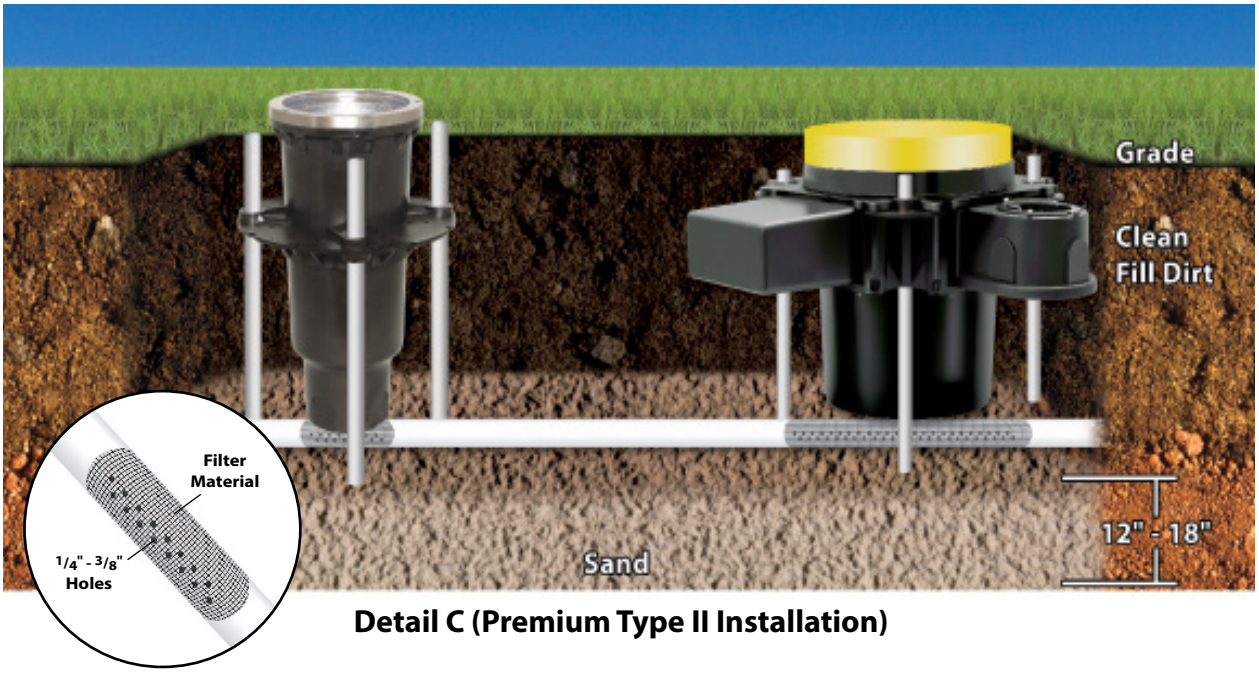
Install the perforated pipe directly under each housing with the holes in the 8:30 to 10:30 and 1:30 to 3:30 position and within the sand filled backfill. The pipe must be wrapped with filter material so the sand backfill does not erode into the drainage system and to prevent clogging.

The perforations will allow the water that is migrating to the sand to leach into the pipe. As an example, with a linear installation of light fixtures, a continuous pipe can be constructed to aid the drainage of all the housings with the use of one or more outlets as

RECOMMENDED INSTALLATION PRACTICES

desired. It should be noted that each installation can vary greatly and the drainage pipe should maintain a grade difference to ensure that collected water will flow to the outlet. Optimum drainage will be achieved if the pipe is installed at ½% (0.5-foot of drop per 100-foot) slope or greater (a minimum slope of 0.15% is sufficient to promote adequate drainage).

The pipe should be at least 3-inches from the bottom of the sand or the bottom of the housing. The water will drain freely from the sand through filter material into the pipe. Sand is the recommended backfill material since it will readily promote drainage of the adjacent soil, sand will not allow the migration of adjacent soil particles, and can be easily compacted - properties that are preventative against settlement without compromising the ease of installation.



Detail C (Premium Type II Installation)

Other Considerations

Concrete
If you are installing the lighting fixtures in concrete and there is a minimum of 5 feet of distance between the lighting fixture and nearby soil, TYPE I installation practices are recommended. (Concrete protects the nearby soil from saturation and the presence of water should not be a factor.)

Planter Areas and walkways
If the lighting fixtures will be installed between a walkway and another landscape feature (such as a building and a sidewalk), TYPE II installation practices are recommended.

Areas subject to heavy rainfall
Advanced or Premium TYPE II installation practices are recommended unless the existing soil demonstrates good TYPE I characteristics.

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