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Facts about Corrugated Plastic Drainage Tubing

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The use of corrugated plastic polyethylene tubing for agricultural subsurface drainage has increased rapidly in the Northeast since 1969. Because corrugated plastic tubing is a relatively new material for drainage of agricultural lands, there are many questions about its use. This fact sheet attempts to answer these questions and assist you in deciding whether or not this tubing is suitable for your needs.

Advantages and Disadvantages

Corrugated plastic drainage tubing has several advantages.

- **Ease of handling and hauling**—The material is light, ranging in weight from 72–85 pounds for a 250-foot roll of 4-inch tubing. It is flexible and requires less labor for handling during installation than concrete or clay tile. The light weight of plastic tubing makes it easier to haul and distribute on soft, wet fields.
- **Better alignment in unstable soils**—The long lengths of plastic tubing allow for better alignment in unstable soils such as mucks, peats, and wet sands; joint openings are eliminated.
- **Lower cost installation**—The use of plastic tubing generally lowers the total cost of installing drainage systems, with much of the savings realized from reduced labor costs.

Corrugated plastic drainage tubing is not without disadvantages, however.

- **Reduced strength at high temperatures**—The temperature of black plastic tubing can reach 120°-140° F when strung out in a field on a hot, bright day. The relative strength of 4-inch tubing is reduced 50 percent when the temperature of the tubing is raised from 70° to 120° F. For this reason, precautions must be taken to prevent the impact of sharp, heavy objects on the tubing during installation and to avoid excessive pull. The tubing regains strength when its temperature returns to that of the trench bottom.
- **Reduced flexibility at low temperatures**—Although the relative strength of the tubing increases as the temperature falls, flexibility decreases. The tubing may crack if it is rapidly uncoiled when the temperature is near freezing. One should check the manufacturer's recommendations for handling the material under either hot or cold conditions.
- **Reduced strength by stretching**—Stretch that may occur during installation causes some decrease in strength. This stretch is influenced by the temperature of the tubing at the time it is installed, the amount and duration of drag encountered when the tubing feeds through the installation equipment, and the stretch-resistance characteristics of the tubing. Generally, increased stretch is associated with low-strength tubings. Stretch should not exceed 5 percent during installation of the tubing. The relative strength of 4-inch tubing at 73° F (compared to unstretched tubing) decreases by 11 percent when it is stretched by 5 percent. A 10 percent stretch decreases the relative strength by 24 percent.
- **Flotation**—Plastic tubing floats in shallow water. If tubing begins to float during installation, it is difficult to get backfill material around and over it without getting the backfill underneath the tubing, which causes misalignment. When water is present, tubing should be held in place and covered immediately.

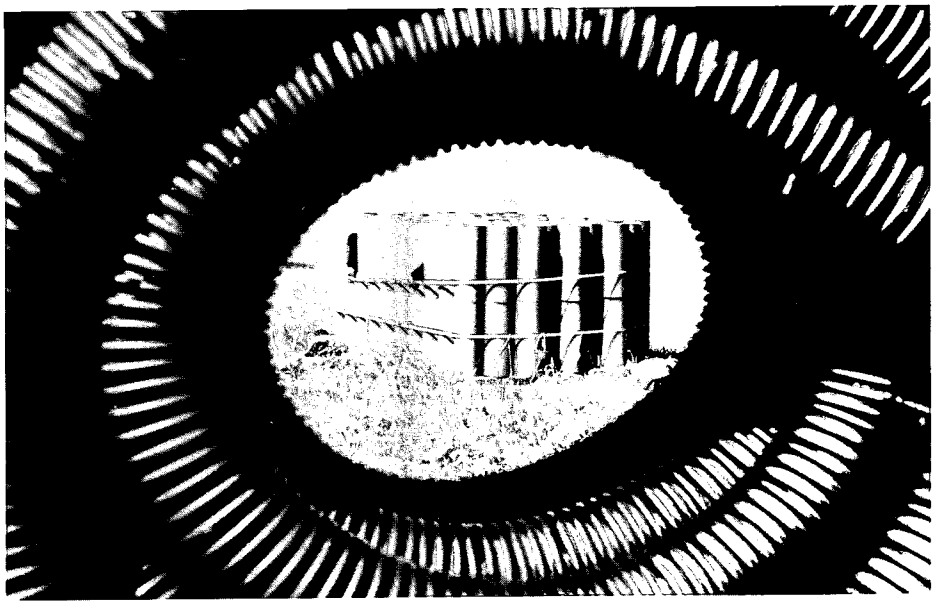

Figure 1. Corrugated plastic tubing is becoming more widely used for agricultural subsurface drainage.

Physical Characteristics

Corrugated plastic drain tubing for agricultural purposes ranges in diameter from 3 to 12 inches. The 4-inch size is most commonly used in agricultural drainage. The smaller sizes (3- to 6-inch diameter) are available in coils of various lengths, depending on the diameter of the tubing. The larger sizes (8- to 12-inch diameter) are produced in short, straight sections.

Corrugated plastic drain tubing is a flexible material, and failure occurs by deflection or collapse. In contrast, clay and concrete tile are rigid materials that fail by cracking. Flexible plastic drain tubing gains most of its soil load-carrying capacity through support from the soil at the sides of the tubing. A load on the top of the tubing causes the sidewalls to bulge outward against the soil, as shown in figure 2.

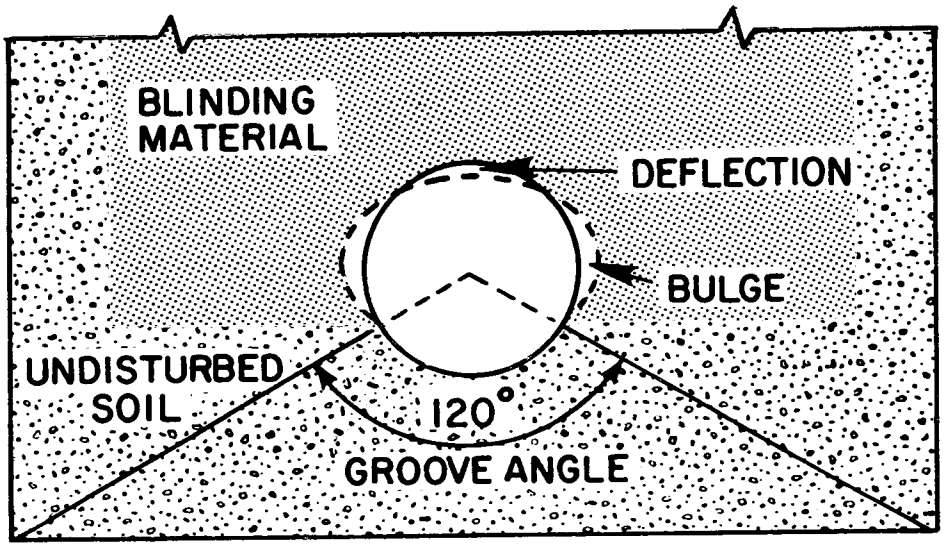

Figure 2. Flexible plastic drain tubing gains most of its soil load-carrying capacity from sidewall support. Proper sidewall support is achieved when tubing is placed into a correctly shaped and sized groove.

This soil resists the bulging and gives flexible tubing more load-carrying ability. The tubing also gains load-carrying capacity through support from the trench bottom. Trenching machines used for agricultural drainage usually make a groove along the centerline of the bottom of the trench to provide this necessary support. The groove in the undisturbed soil in the trench bottom can be semicircular, trapezoidal shaped, or a 90-degree V shape, and the groove angle can vary from 60 to 120 degrees without significantly changing the load-carrying capacity or the deflection. Drain pipes should not be placed on a flat surface or in a flat-bottom trench. Another important advantage of the groove is its contribution toward improved pipe or tubing alignment during installation.

The amount of deflection that occurs in corrugated plastic drain tubing depends on the strength of the flexible tubing, the bearing strength of the surrounding soil, the angle of the trench-bottom groove, the amount of tube stretching that occurs during installation, the methods used for blinding and backfilling, and the age of the tubing installation. The amount of deflection that takes place is an indication of the durability of the tubing. Maximum limits of 20 to 30 percent deflection are used to indicate drain failure. In general, about 80 percent of the deflection occurs during the two years following installation, the remainder during the third and fourth year, and essentially none after 4 years. Numerous field measurements report average deflections of 15 percent in 4-inch plastic drain tubing.

Water enters plastic drains through small openings located in the valleys between corrugations. The flow into a plastic drain with 24 1-inch × 1/16-inch slots per foot is about the same as the flow into a tile line with a 1/8-inch gap between the tiles. Both provide about 1 1/2 square inches of openings per foot of drain.

How do corrugations affect flow? Research indicates that a 4-inch corrugated plastic drain can carry about 75 percent as much water as a well-aligned 4-inch clay or concrete drain tile on the same grade. This reduction in capacity is not significant for most lateral lines since 4-inch laterals spaced 50 feet apart at a 0.1 percent grade seldom flow full unless they are more than 2,000 feet long. Main lines are designed for full flow, however, and the reduction in flow caused by corrugations must be considered.

More Information

For additional assistance, contact your Cooperative Extension agent, district soil conservationist, land improvement contractor, or a drainage sales representative.

Cooperative Extension, the New York State College of Human Ecology, and the New York State College of Agriculture and Life Sciences, at Cornell University, Ithaca, N.Y., and the U.S. Department of Agriculture, cooperating. In furtherance of Acts of Congress May 8, June 30, 1914, and providing equal opportunities in employment and programs. Lucinda A. Noble, Director. 10/79 CP 2M 6360-A