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# Driveways

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## Purpose

The purpose of this paper is to provide information on driveways, including methods to reduce their contribution to stormwater pollution. An engineer or contractor should be consulted if more detailed driveway installation specifications are desired. More specific information related to regulations and planning for commission members or town personnel can be found in Technical Paper #1 of this series.

## Introduction

Driveways are vehicle access ways between a street and abutting property, and are sometimes used as emergency access ways. In low-density residential areas, driveways are often single lane paved areas connecting a carport, garage or off-street parking area to a street. In high-density residential, commercial and industrial areas, driveways lead to off-street parking or loading areas.

While often viewed as a necessary component of the automobile transport network, driveways contribute to the overall imperviousness of a watershed. As a significant component of a community's impervious surface coverage and a recognized generator of polluted runoff, communities should be concerned about the effect of impervious driveways on local waterways. The increase in impervious coverage associated with driveways can result in increased runoff during storm events, and less local groundwater recharge. The driveway essentially connects the impervious areas on individual lots to the local stormwater system.

Research shows that driveways are also a hot spot for the accumulation and conveyance of non-point source pollutants. In Wisconsin, driveways were found to be a significant source of phosphorus loads in stormwater (Bannerman, *et al.*, 1993). Driveways, as pollution generators, are strongly influenced by the emissions, leaks and deteriorating metal parts from the cars using them. In addition, driveways are used as work and play areas. Activities such as washing, repairing and maintaining vehicles and equipment often take place on the driveway. When used as the

work area for changing the family car's oil or washing grass off the lawnmower, inevitable spills and deposits are stored on the driveway's surface and washed by the next rainfall to receiving roads, curbs and catch basins. When gutters and down spouts are directed to driveways, the volume, velocity and pollutant load of driveway runoff increases.

## Driveway Design

Driveway design can range from the minimum needed for practical and safe use to a maximum assuring ease of driving and parking. Many communities, as part of their subdivision and zoning regulations, establish minimum driveway design requirements. If a proposed lot cannot be served by a driveway meeting adopted standards, it will not be approved. Most regulations address driveway location, grading, erosion control, drainage and construction details.

As a general rule, driveways should be designed to be as narrow, short and few as possible to reduce overall impervious coverage. The common driveway types are single slab, made of asphalt or concrete, and ribbon, made of two parallel strips of pavement with grass or stone in between. The single slab is more common as ribbon drives are deemed impractical where the driveway is long or curved.



Ribbon driveway

Improper grading of the area where the driveway crosses over the right-of-way will result in rear bumper scraping. As a general rule, the driveway grade should not exceed 8 percent within the right-of-way area. Most communities establish maximum grades on unpaved driveways ranging from 7 percent to 10 percent.

### **Driveway Width**

Some communities establish minimum widths for driveway rights-of-way as well as minimum travel and cleared ways. For example, Guilford, CT requires that driveways have a minimum travel way of 12', a cleared way of 16' and a 20' right-of-way.

Straight driveways leading to attached garages, located near the street, on level sites, can be as narrow as 7' 8", however many communities require 10' to 12'. A width of 9' is usually more than adequate, for comfortable and safe driving and parking. Communities should consider placing maximum widths of 14' or less on driveways. The recommended width of the most common type of driveway, the single slab, is 9'. However, in some instances 8' will work. The concrete strips in a ribbon driveway should both be at least 2' wide and located so they are separated, 5' on center.

As the minimum safe clearance between two moving cars is two feet, a double lane straight drive could be as narrow as 17'4", however 18' is often the suggested minimum width. Andover, Connecticut suggests shared drives be approximately 12' to 16' wide or just wide enough for two cars to pass. An alternative design for shared drives is a 10' drive that is wider at intervals to allow cars to pass one another.

The design of curved driveways is based on four factors: the distance center-to-center of the front or rear wheels, the distance between the front and rear axles, the turning radius of the outer front wheel and the area needed to provide safe clearance from vegetation or walls bordering the drive. Curved driveways require that lanes be least 9' wide.

If a lip of the driveway is used as a walkway, a minimum of two additional feet should be added to the suggested minimum driveway width. For ribbon driveways also used as walks, the width of the strips should be widened from 2' to 3'.

### **Driveway Length**

Driveway length is often directly related to front yard setback requirements found in the local zoning regulations. For example, if local zoning requires a 50' front yard, a driveway at least 50' long will be needed to connect the garage and the street. If curved drives are installed, they will generally be longer than straight ones.

The Town of Ashford, Connecticut requires that any driveway with a positive slope of 10 percent or greater be paved to a minimum distance of 60' from the edge of the highway.

Avon, Connecticut limits the length of driveways serving rear lots to 1000' and requires that they have an adequate all weather

surface for their entire length. Guilford, Connecticut limits driveway lengths to 750'.

One method to reduce overall driveway length and impervious coverage in a neighborhood is to have a shared driveway. This reduced amount of impervious surface produces less runoff, and therefore less nonpoint pollution.



Shared driveway with concrete grid pavers in Waterford, CT

### **Driveway Surface Materials**

Asphalt is a common driveway surface. The typical base preparation for asphalt involves grading the sub-base, then installing a processed gravel layer, and compacting. A base layer of asphalt may or may not be applied, and then a finer surface asphalt layer is applied.

The ribbon driveway consists of two 2' strips of pavement with grass in between. The ribbon drive is cheaper to install, is less conspicuous and is contains less impervious surface. However, some feel ribbon designs are impractical where driveways are long or curved.

Driveways with grades of less than 7 percent may not need pavement while those greater than 7 percent should have some type of surfacing to prevent erosion. Guilford, Connecticut's minimum construction standard for unpaved driveways is a sub-base of 8" of bank run gravel covered with 3" of processed stone.

### **Alternative Driveway Materials**

The potential adverse impacts of impervious driveways on water resources can be reduced by limiting the size and number of driveways, limiting their imperviousness by using alternative materials, and directing driveway runoff to pervious surfaces.

Although many local driveway regulations require the use of impervious surfaces, there are numerous pervious surfaces that work well on driveways and local regulations should permit their use. Examples of pervious driveway surfaces include concrete paver blocks or grids, plastic grid structures that are filled with

soil/grass or gravel, crushed stone, pervious asphalt and pervious concrete. The key to the use of pervious driveway surfaces is the installation of a sub-base specifically designed to promote infiltration. The companies that offer the alternative surfaces often have a technical specification for bedding materials and sub-base preparation. Crushed stone is a pervious alternative, but when used without a structure, it tends to migrate with car traffic and winter maintenance. There are some newer products on the market that can bind crushed stone, making it a more durable surface while still allowing for infiltration. Pervious asphalt is just a different mix, with a higher proportion of large aggregate than typical asphalt. Pervious concrete also has a different mix than traditional concrete, and the application technique is much different. All of these alternatives have been successfully been used in both warm and cold climates, although some may be more appropriate for certain sites.

If impervious driveway surfaces must be installed, they should be crowned and pitched to direct runoff flow to adjacent pervious areas such as grass, vegetated swales or filter strips. Roof runoff should not flow over driveways but be directed to grass, dry wells or gardens designed as rain gardens. Some infiltration could also be achieved by installing a pervious driveway surface where the driveway intersects the road.

Towns may also provide some regulation related to stormwater from driveways. For example, Andover, Connecticut stipulates that driveways be designed to prevent runoff from entering public rights-of-way by installing privately owned and maintained drainage diversion swales, retention areas, or dry wells. Before a certificate of occupancy is issued, a deed stipulation, approved by the Town Attorney, must be filed in the land records clearly establishing land owner responsibility to maintain the driveway related swale, retention facility or dry well.

### **NEMO Recommendations Regarding Driveways**

- Do not allow roof gutters and downspouts to drain over impervious driveways.
- Use various driveway designs, including ribbon drives that contain less impervious surface than the more common full width, single slab, drive.
- Make single lane straight drives 8' or 9' wide and double lane drives to be 18', if regulations permit.

- Use pervious driveway surfaces to reduce runoff and pollution. Concrete paver blocks and grids, pervious asphalt or concrete, plastic grid structures with grass or crushed stone, and plain crushed stone are all viable options. When installing one of these alternatives, make sure that the contractor is aware of the design and installation differences, and has experience installing alternative materials.
- Where pervious driveway surfaces are used, insure that a proper sub-base is installed that is capable of infiltrating and cleansing stormwater.
- Where impervious driveway surfaces are installed, make sure that they are crowned and pitched to direct runoff to adjacent pervious areas.
- Where impervious driveway surfaces are installed, disrupt their connection to roads, curbs and catch basins with pervious materials in the area where the drive intersects the road.



Roof runoff should be directed to pervious vegetated areas, such as this rain garden.

### **References**

Bannerman, R. T., Owens, D. W., Dodds, R. B., and Hornewer, N. J. 1993. Sources of pollutants in Wisconsin stormwater. *Water Science and Technology*. Vol. 28(3-5), pp. 241-259.

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