

Fluctuating Temps Cause Potholes

Freeze-Thaw Cycles Damaging to Road Pavements

Midwinter warm spells might be a welcome reprieve for residents in Pennsylvania's snowy northwest region, but it's not always fun in the sun for those who care for the roadways.

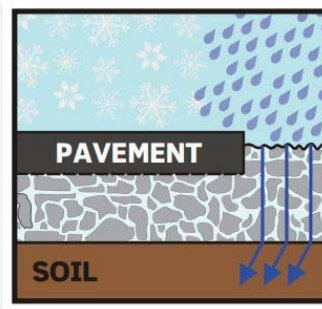
Repeated rounds of alternating warm and freezing temperatures can produce potholes. Generally speaking, the more times throughout the winter season that the temperatures fluctuate from warm to cold, the more frequent the development of potholes.

Typically, potholes form when water from melting snow or rain seeps through cracks in a road surface during warm weather, then the liquid freezes and expands when temperatures plummet. This pushes a portion of the roadway and the ground up. When the ground thaws again in warmer temperatures, it returns to its normal level. However, the roadway sometimes remains in the raised position.

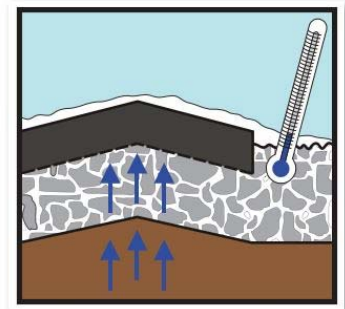
As the water in the ground repeatedly freezes and thaws due to temperature fluctuations, a cavity forms between the roadway and the ground, which destroys the strength of the pavement.

As cars, trucks, and other heavy equipment drive over the raised sections of roadway, the pavement can break and potholes are formed.

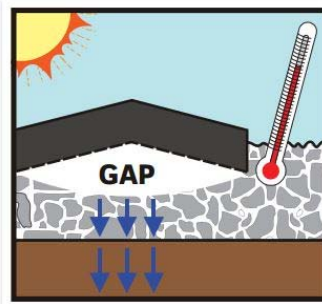
How Potholes Form



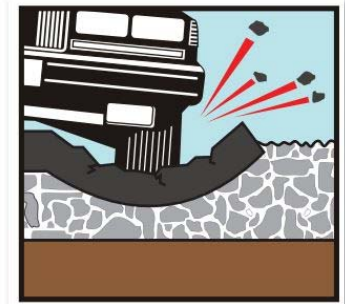
Potholes begin after snow or rain seeps into the soil below the road surface.



The moisture freezes when temperatures drop, causing the ground to expand and push the pavement up.



As temperatures rise, the ground returns to normal level but the pavement often remains raised. This creates a gap between the pavement and the ground below it.



When vehicles drive over this cavity, the pavement surface cracks and falls into the hollow space, leading to the birth of another pothole.

Courtesy of the Michigan Department of Transportation



As the spring season approaches in northwestern Pennsylvania, the daylight hours traditionally feature warmer temperatures but the nights remain cooler — leading to a larger occurrence of potholes than other times of the year.

(Continued on page 2)

Covered in this issue:

Embedded Tech and Engineering Topics — Freeze-thaw cycle, Ratio, Air Space

Vocabulary Terms — Fluctuation, Precipitation

Want to have "Road Trip" sent directly to your email every other month? Submit your email address to jharry@pa.gov and you'll be added to the list.

The newsletter is also available online at www.penndot.gov/RegionalOffices/district-1.

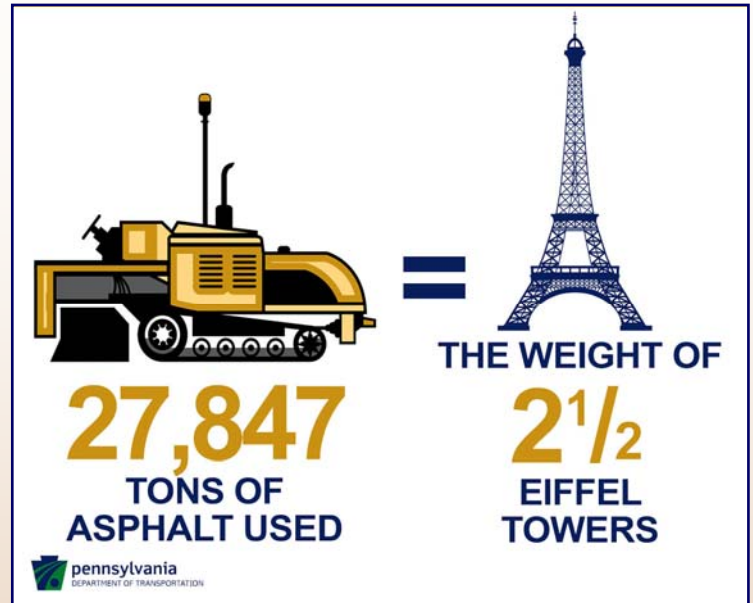
Pothole Repairs Are Often Temporary

(Continued from page 1)

In 2016, PennDOT spent \$35.2 million for pothole repairs statewide, using nearly 53,000 tons of asphalt.

In the northwest district of PennDOT, repair crews have been using cold patch – a mixture of oil and stone that remains pliable in cold temperatures – until hot asphalt for more permanent repairs becomes available in the spring when the region’s asphalt plants open.

Motorists can report potholes to PennDOT by calling 1-800-FIX-ROAD, or accessing the Customer Care Center on the PennDOT web page, www.penndot.gov.



DID YOU KNOW... Converting Rainfall to Snowfall

March in Pennsylvania often means one day it is snowing, the next day raining, then back to snow the following day.

The swing in precipitation can make one wonder — what if all this rain was snow?

According to AccuWeather, air temperature can have a huge impact on the rain to snow ratio. In colder weather, snow has more air space, so there are more inches of soft, fluffy snow. Wet snow that falls at the freezing mark is usually sloppy and heavy. Meaning, the colder the temperatures

the higher the rain to snow ratio.

Generally speaking, in temperatures between 28 to 34 degrees Fahrenheit — 1 inch of rain is the equivalent of 10 inches of snow.

The table to the right gives a brief look at how temperature can effect the rain to snow ratio and provides the conversion of 1 inch of rain to estimated snowfall at various temperature ranges. The information was provided by the National Oceanic and Atmospheric Administration (NOAA).

Temperature (degrees F)	Snow (inches)
28° to 34°	10
20° to 27°	15
15° to 19°	20
10° to 14°	30
0° to 9°	40
-1° to -20°	50
-21° to -40°	100

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