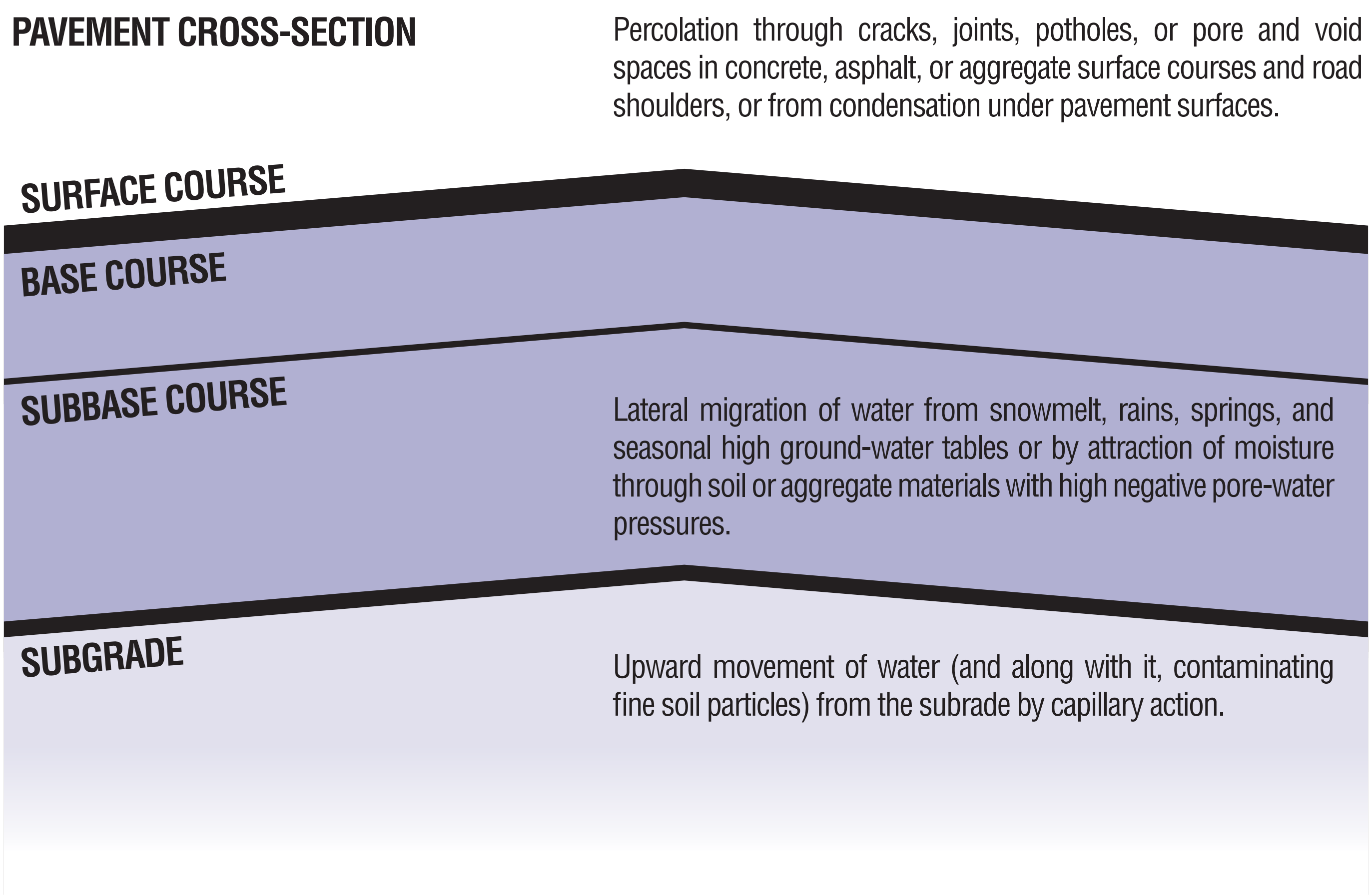
WATER, THE MAJOR ENVIRONMENTAL FACTOR AFFECTING ROADS AND EARTHWORKS

POTENTIAL SOURCES AND MECHANISMS OF WATER FLOW THROUGH CONVENTIONALLY DESIGNED ROAD STRUCTURES



Let's talk about the service environment of your roads (landfill caps, embankments, runways, parking lots, etc.). A road is called upon to be of service in an environment no different from that of your home; you normally elevate the structure above the subgrade soils to insure that it is not sitting in water, and above the structure you construct a sloped surface or roof with adjacent drains or gutters to rapidly flow water away. In the interest of economy, these two types of structures are not built to be water-0proof or impermeable. They instead depend upon fairly dense, low-permeability surfaces with adequate cross slope to insure that water is never ponded and head pressure never developed on or adjacent to the structure. This is often where the similarity between house design and highway design ends.

A house is built on the assumption that you can go one step further and keep the water out of the center of the structure (the living space) by adding further "options" to the framework. Most road designs take an opposite approach and assume that moisture flow will occur through the center of the structure (the base and subbase materials) from vertical and lateral intrusion as well as from upward capillary migration. Testing and design are based upon the assumption that saturated conditions cannot be avoided. For the sake of stimulating questions as to the economic

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sense of operating on this assumption, let's go back to the analogy of the new house and use road design methodology to build a new house. The first step would be to go to a testing lab and immerse a prototype of your normal house underwater for four days, based on the assumption that in looking to the past, your base and subbase course materials historically have become saturated over time. As you can imagine, the economic ramifications of this approach to house design would be very expensive. The methods that have been developed in home construction to keep water out of the internal environment would not work if subjected to this test. You would be forced by this design methodology to either live with the water or go to the expense of building an impermeable house. A used submarine might be perfect.

In spite of the elevation, cross slope, and lateral drainage built into a conventionally designed road, and in spite of all the additional "options" such as paved surfaces, paved road shoulders, subsurface drains, filter fabrics, open-graded aggregates, and the various conventional treatments to increase strength of the base and subbase course materials, moisture flow and fluctuations in moisture content still occur. They continue to be destructive factors in the performance of the base and subbase materials and in the service-life of pavements. Like a dripping faucet. but even more so, most of this moisture flow is very subtle. The culprit is basically invisible, but the damage is not.

With all the effort already invested during road construction in the framework of a structure that can support traffic and she d rainwater, why not take the next step? Look for an economical "option" to finish the job you started. Treat the moisture susceptibility of the base and subbase course materials and give them the figurative "ceiling, floor and walls" to resist damaging moisture fluctuations. Analyze the economies in construction costs and extended service-life that can be gained by designing moisture fluctuations. Analyze the economies in construction costs and extended service-life that can be gained by designing for unsaturated conditions, and then look for technologies to achieve that performance and economy. Keep moisture flowing off your pavements – not through them.

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