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ASPHALT DURABILITY

Canada's standard for roofing asphalt, CSA 123.4, categorizes asphalt into three distinct types based on their softening points and penetration (hardness). The scope of the standard gives guidance with respect to where each asphalt type is to be used. Type I is to be used on built-up roofs with slopes less than or equal to 1:16, Type II on roofs with slopes less than or equal to 1:8, and Type III on roofs with slopes greater than 1:8. It is obvious that the higher the asphalt type, the steeper the slope of the roof on which it can be applied. However, resistance to slippage based on roof slope is not the only consideration when choosing the asphalt type for a particular project.

Almost fifty years ago, the US National Bureau of Standards' renowned roofing expert, Bill Cullen, advised roofing contractors to use the softest asphalt commensurate with slope. This recommendation was based on the physical properties and durability of asphalts. Asphalt is derived from petroleum as a residue after distillation of the more volatile compounds, such as gasoline, naptha and fuel oil. The heavy, unevaporated material is called soft residual asphalt, or flux. To produce roofing asphalt, this material is heated in a still and air is bubbled through it. This "air blowing" oxidizes the flux and causes a chemical reaction resulting in a loss of hydrogen atoms and an increase in molecular weight and subsequent hardening of the asphalt.

The process is carefully controlled and the length of time of the air blowing and heating temperature determines which type of asphalt is produced. The longer the time of air blowing, the harder the asphalt becomes and the less susceptible to flow. Unfortunately, this process also results in the production of some water sensitive molecules. In addition, as the asphalt hardens, its flexibility, flow potential and self-healing properties decrease. Steep asphalt is subject to "alligatoring" or cracking when applied in thick films and its overall weatherability in service is less than that of the softer asphalts. The lower the softening point, the better the asphalt stands up to the elements such as water run-off, thermal shock, oxidation and ultra violet light.[1] For these reasons, Bill Cullen's axiom that the softest asphalt for a given slope should be used still holds true.

Reference:

1. Janicki, R.T. "Catch 22: Effects of Operating Conditions on Asphalt Softening Points." Western Roofing, May/June 1994.