

## Research on the Feasibility of Evaluating Low-Temperature Cracking Performance of Asphalt Mixture Using Fracture Energy

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**Abstract :** Low-temperature cracking is one of the major challenges for asphalt pavement in the cold region. Fracture energy could determine from various test methods, which is a commonly used parameter to evaluate the low-temperature cracking resistance of asphalt mixture. However, the feasibility of evaluating the low-temperature cracking performance of asphalt mixture using fracture energy is not investigated comprehensively. This paper aims to verify whether fracture energy is an appropriate parameter to evaluate the low-temperature cracking performance. To achieve this goal, this paper compared the test results of thermal stress restrained specimen test (TSRST) and semi-circular bending test (SCB) of asphalt mixture with different types of aggregate, TSRST and indirect tensile test (IDT) of asphalt mixture with different additives, and single-edge notched beam test (SENB) and TSRST of asphalt mixture with different asphalt. Finally, the correlation between in-suit cracking performance and fracture energy was surveyed. The experimental results showed the evaluation result of critical cracking temperature and fracture energy are not always consistent; the in-suit cracking performance is also not correlated well with fracture energy. These results indicated that it is not feasible to evaluate low-temperature performance by fracture energy. Then, the composition of fracture energy of TSRST, SCB, disk-shaped compact tension test (DCT), three-point bending test (3PB) and IDT was analyzed. The result showed: the area of thermal stress versus temperature curve is the multiple of fracture energy and could be used to represent fracture energy of TSRST, as the multiple is nearly equal among different asphalt mixtures for a specific specimen; the fracture energy, determined from TSRST, SCB, DCT, 3PB, SENB and IDT, is mainly the surface energy that forms the fracture face; fracture energy is inappropriate to evaluate the low-temperature cracking performance of asphalt mixture, as the relaxation/viscous performance is not considered; if the fracture energy was used, it is recommended to combine this parameter with an index characterizing the relaxation or creep performance of asphalt mixture.

**Keywords :** asphalt pavement, cold region, critical cracking temperature, fracture energy, low-temperature cracking

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