

## 2020 ATS WEBINAR QUESTIONNAIRE – MTO RESPONSE

What can you say about EBBR and the DCT, since both are used in low temperature cracking comparison and differences?

Ans: In a study reviewing aged pavements, EBBR testing was conducted on the AC recovered from pavement cores. DCT testing was also conducted on the pavement cores. A good correlation was found between DCT fracture energy and EBBR LTLG. The correlation between fracture energy and EBBR Grade Loss was fair-to-good. A CTAA paper will be published later this year about this study.

What level of compaction is used for FI samples? I understand that they are plant mix, lab compacted and listened for the level of compaction. Are they 7% air void specimens?

Ans: We tested both post-production asphalt mixes and pavement field cores. For post-production mix, the test specimens were targeted to an air void content of  $7.0 \pm 1.0$  percent after saw cutting.

The threshold values proposed for DCT are considerably higher than values proposed in Illinois. Is this because of a difference in PG grades used in Ontario as compared to Illinois? Is it because Ontario mixtures are more crack resistant than the typical Illinois mixtures? Thoughts?

Ans: The PG grades and materials used in paving construction in Illinois are different than those used in Ontario. Illinois Tollway performance criteria for SMA Surface friction mix has a minimum fracture energy requirement of  $750 \text{ J/m}^2$ . Similarly, a minimum fracture energy of  $690 \text{ J/m}^2$  for a high traffic volume road is recommended by the National Pooled Fund Study on Low Temperature Cracking Phase II (Marasteanu et al., 2012). The preliminary threshold values proposed by the ministry for DCT test are based on DCT testing conducted on a range of mixes with various PG grades and traffic levels using post-production asphalt mixes from Ontario paving contracts. Therefore, the preliminary minimum recommended DCT fracture energy values are considered reasonable. Note these preliminary values do not take into account the effect of long-term aging that may result in further reduction in DCT fracture energy. MTO is collecting more samples and conducting more testing in future that may result in fine-tuning the threshold values based on further testing along with field validation.

Syed mentioned shadow testing with North Carolina State University for cyclical fatigue testing. Can you make some comments about your thoughts and experience?

Ans: The shadow study gave us a very good opportunity and hands on experience in conducting cyclic fatigue, dynamic modulus, and SSR tests. Our perception of these tests at the moment is that they are still at research stage. MTO is interested in looking further into cyclic fatigue testing and is conducting some testing on various mixes.

Imran - Were mix samples aged prior to IFIT testing?

Ans: No, we used post-production mix and did not do any further short term or long-term aging on the mix; except, the loose mix was heated to recommended compaction temperature for preparing gyratory compacted specimens.

Imran - How about precision of mix versus binder testing and how would this affect acceptance criteria?

Ans: This is part of an on-going investigation to determine precision of the mix performance tests after further testing and running correlation program.

Imran - How do you think physical hardening is captured by and affecting DCT results?

Ans: As part of the DCT testing, the test specimens were conditioned for a minimum of 8 hrs at the low-test temperatures (i.e., 10°C higher than the low PG grade) that could be seen as exposing the sample to a partial physical hardening, but no extended low temperature conditioning was carried out. MTO will investigate field pavement performance and determine whether the proposed acceptance criteria will need to be modified or further aging/conditioning of samples are required.

Imran - Have you compared CMOD and fracture energy in DCT test?

Ans: We did not compare CMOD and DCT fracture energy and this is something we can review in the near future. We looked at the DCT fracture energy, air voids content, AC content and thickness of the specimens in our analysis. We are aware that there is on-going research that is looking at various additional parameters like CMOD displacement and post peak slope and we are monitoring this on-going research work.

Why different climatic zones (i.e. XX-28 & XX-34) combined with different traffic levels were not considered as part of establishing FI and DCT thresholds?

Ans: There were not sufficient data to develop detailed criteria as proposed in the question. More testing is planned that will allow us to refine the acceptance criteria. Note that a preliminary threshold FI value of 10 is recommended for all mix types with various PG grades and traffic levels; however, for Stone Mastic Asphalt (SMA) (used on high volume freeways and usually includes PG 70-28) a preliminary threshold FI value of 15 is recommended. Therefore, in a way, PG grade and traffic levels are taken into account. Similar approach was taken for DCT.

Does the Ministry envision specifications on recovered asphalt cement to accompany specifications for mix performance criteria? Or is the intent for recovered asphalt cement criteria to serve only as an interim approach as previously stated until mix performance criteria are established?

Ans: The intent for recovered AC acceptance criteria is to serve in the interim until mix performance criteria are established. However, the two criteria may be in place in parallel for a period of time until full transition takes place.

Has the Ministry evaluated how laboratory prepared mix design samples compare to plant produced laboratory compacted specimens with respect to performance test results for SCB I-FIT and DCT? When a practitioner is designing a mix in the laboratory, how might the results from the lab prepared mixes compare to the plant produced laboratory compacted specimens?

Ans: MTO does not have access to the mix produced during the mix design. Therefore, no such evaluation was conducted. However, there is research work done in North America on this topic that could help contractors designing a mix that will meet acceptance criteria. Contractors are encouraged to carry out balanced mix design and conduct mix performance testing.

Are you considering long term conditioning for SCB testing?

Ans: Currently, we are focusing on testing post-production mixes that already have gone through short term aging. We will be looking into the long-term aging and its effects on the SCB-FIT and DCT fracture energy as part of our long-term plan.