

# A Study on Effect of Surface Retarders and Exposure Time on Exposed Aggregate Concrete

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Exposed aggregate concrete (EAC) is known for its ability to lower pavement noise with its surface texture. When it comes to EAC, surface retarder is necessary to delay the setting time of the concrete surface. The typical recommended exposure time of EAC is between 24 and 48 hours. This construction technology, particular in pavement application, has not been widely used in Korea yet. Due to the lack of experience and standard on EAC, researches are necessary. In this study, the effect of various surface retarders on exposure depth (MTD: mean texture depth, MPD: mean profile depth) and exposed aggregate number (EAN) are investigated. The variation of those parameters between 24 and 48 hours is also studied. Through the laboratory experimental tests, the surface retarders were proven to be effective in create low to high exposure depth and EAN within the testing period. For the concrete mixture in this study, stone matrix asphalt (SMA) aggregate of 6mm is used. The specimens are casted into 30cmx30cmx5cm. Three types of surface retarders (Table 1) are applied on the surface of specimens, respectively. The surface of each specimen is then exposed at 24, 41, 44 and 48 hours.

Table 1. Main Component and Properties of Surface Retarders

Retarder	Main Component	Properties
Retarder A	Sodium Gluconate	Water based retarder, exposure depth up to 4mm
Retarder B	Tartaric Acid	Multiple grades, water based retarder, exposure depth up to 32mm
Retarder C (2.0, 2.5, 4.0)	Citric Acid	Multiple grades, water based retarder, exposure depth up to 7mm

Some retarders worked better than the other in term of exposure depth of aggregate. However, only optimal depth is needed to yield a good EACP surface in term of noise level minimization and pavement surface durability. The value of MTD and MPD are similar in general ( $MPD = 0.91MTD + 0.27$ ,  $R^2=0.85$ ). Within the exposure time aggregate

of 24 and 48hours ,no significant change was observed on MTD/MPD.This indicated that surface exposure can be conducted anytime between 24 and 48hours. Interestingly, it was observed that when the aggregate exposure depth increases, the number of aggregate decreases (Figure1). This outcome is reasonable because when the exposure depth reaches certain level, some of the aggregates tend to popout. Overall, the results have confirmed that it is possible to control the aggregate exposure depth with EAN varied accordingly within an appropriate exposure time.

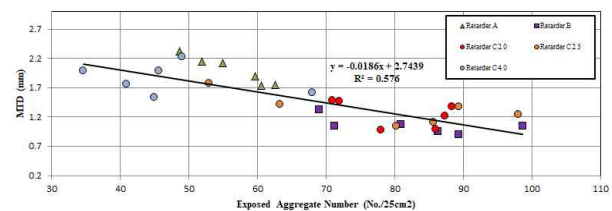


Figure 1. Relationship between EAN and MTD

**Keywords :** Pavement noise, exposed aggregate concrete (EAC), surface retarder, mean texture depth (MTD), mean profile depth( MPD), exposed aggregate number (EAN)

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