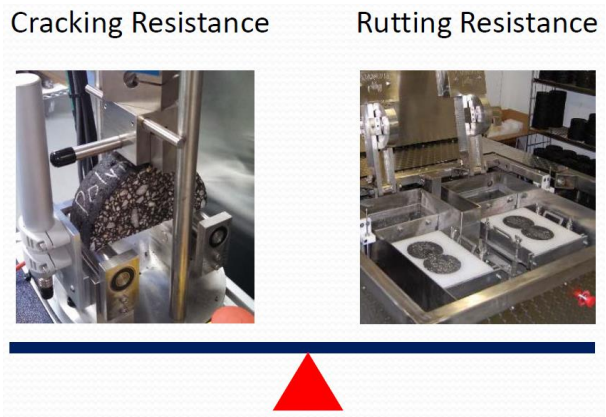
Balanced Mix Designs

Regressing Air Voids for Balanced Mix Design (NCAT 2017)

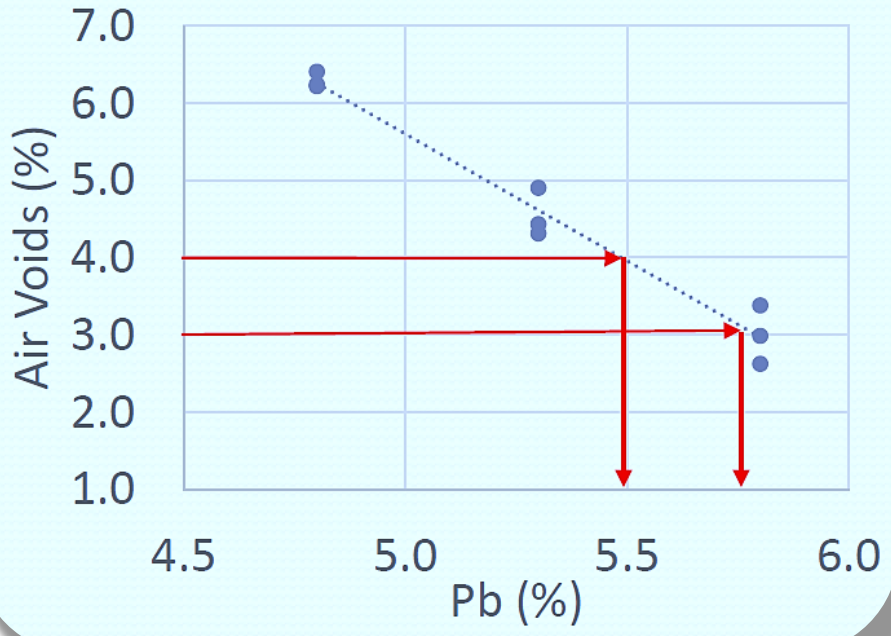


Evaluate the effect of air voids and the influence on mixture resistance to rutting and cracking.

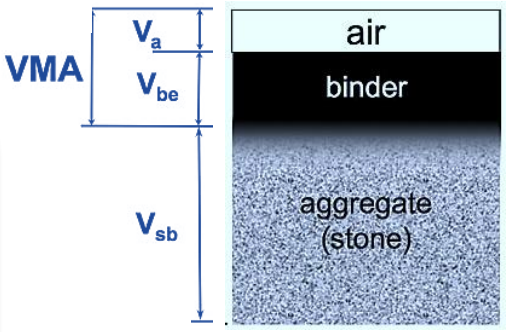
Ways to Increase Mixture AC Content

- *Lowering Gyration Levels (N_{design})*
- *Lowering Design Air Voids*
- *Increasing Minimum VMA*
- *Air Voids Regression Approach*
- *Combination of 2 or more*
- *Some include laboratory performance testing*
  - ***Balanced Mix Design***

Regressed Air Voids



.3 - .4 bump in Pb(%) virgin AC, verify that the mix is not susceptible to rutting.



VMA must be held constant. Typically ranges 13% - 16%.

NCAT study shows the impact of voids regression is promising to improve flexibility without creating a rutting issue.

Balanced Mix Designs

In September 2015, the Federal Highway Administration (FHWA) Expert Task Group on Mixtures and Construction formed a Balanced Mix Design Task Force.

U.S. Department of Transportation
Federal Highway Administration

This group defined balanced mix design (BMD) as "asphalt mix design using performance tests on appropriately conditioned specimens that address multiple modes of distress taking into consideration mix aging, traffic, climate and location within the pavement structure." In short, BMD incorporates two or more mechanical tests, such as a rutting test and a cracking test, to assess how well the mix resists common forms of distress.

The Need for Balance

Today, asphalt mixes are primarily designed under the Superpave system, where proportioning of the aggregates and the asphalt binder relies primarily on empirical aggregate quality characteristics and mix volumetric properties such as air voids, voids in the mineral aggregate (VMA) and voids filled with asphalt (VFA).

Mixes designed with too much asphalt may be susceptible to rutting, while those with too little asphalt may be prone to cracking, raveling or other durability related pavement distresses. Concerns about the accuracy of aggregate specific gravity determinations increase with the incorporation of reclaimed asphalt pavement (RAP) and recycled asphalt shingles (RAS).

Moreover, the effects of the binders in these recycled materials are not captured in volumetric properties. It is still not well understood how recycled binders interact with virgin binders, which ultimately creates more doubt about how these materials affect field performance.

Furthermore, the effects of warm-mix asphalt (WMA) additives, polymers, rejuvenators and fibers cannot be assessed in the current volumetric mix design method. Therefore, performance tests need to be included as part of the mix design procedure to help ensure desirable pavement performance in the field.

The most recent effort to move toward BMD is **NCHRP Project 20-07/Task 406**. The objective of this research is to develop a framework that addresses alternate approaches to devise and implement balanced mix design procedures incorporating performance testing and criteria. The project began in spring 2017.