

National Concrete Pavement Technology Center



Mix Design and Analysis Track

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Portable Analysis Device

- Potential performance of a mixture can be tested in the lab before construction
- QC and QC tests simply need to prove that the mix in the truck is the same
- Critical parameters
 - Binder type and dosage
 - Water content

Portable Analysis Device

- Need a tool to report mixture ingredients
 - Precise enough
 - Able to analyze wet mixture
 - Obtaining a representative sample
 - Cementitious materials all made from the same building blocks

Portable Analysis Device

- XRF - X-Ray Fluorescence
 - Does not detect light elements
 - Calibration is a black art
 - Intended for powders
 - May not be good enough w.r.t quantitative analysis



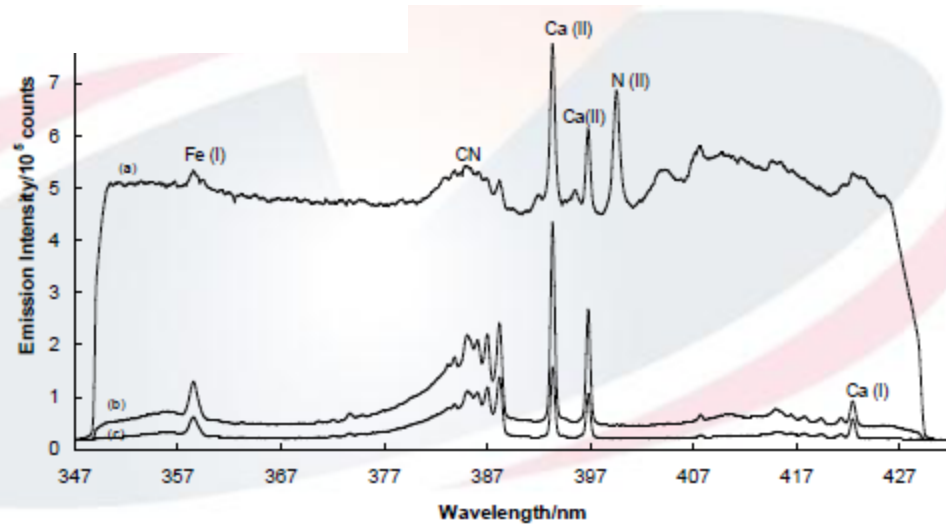
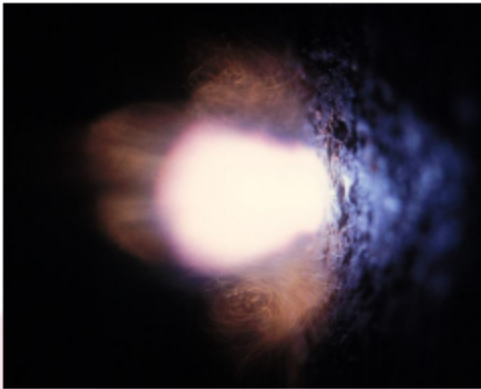
Portable Analysis Device

- LIBS - Laser Induced Breakdown Spectroscopy
 - Sans surface of 20mm x 5mm grid
 - Can detect all elements
 - Scan time = 1 minute
 - Can reportedly test fluids



Portable Analysis Device

- LIBS - Laser Induced Breakdown Spectroscopy



LASER

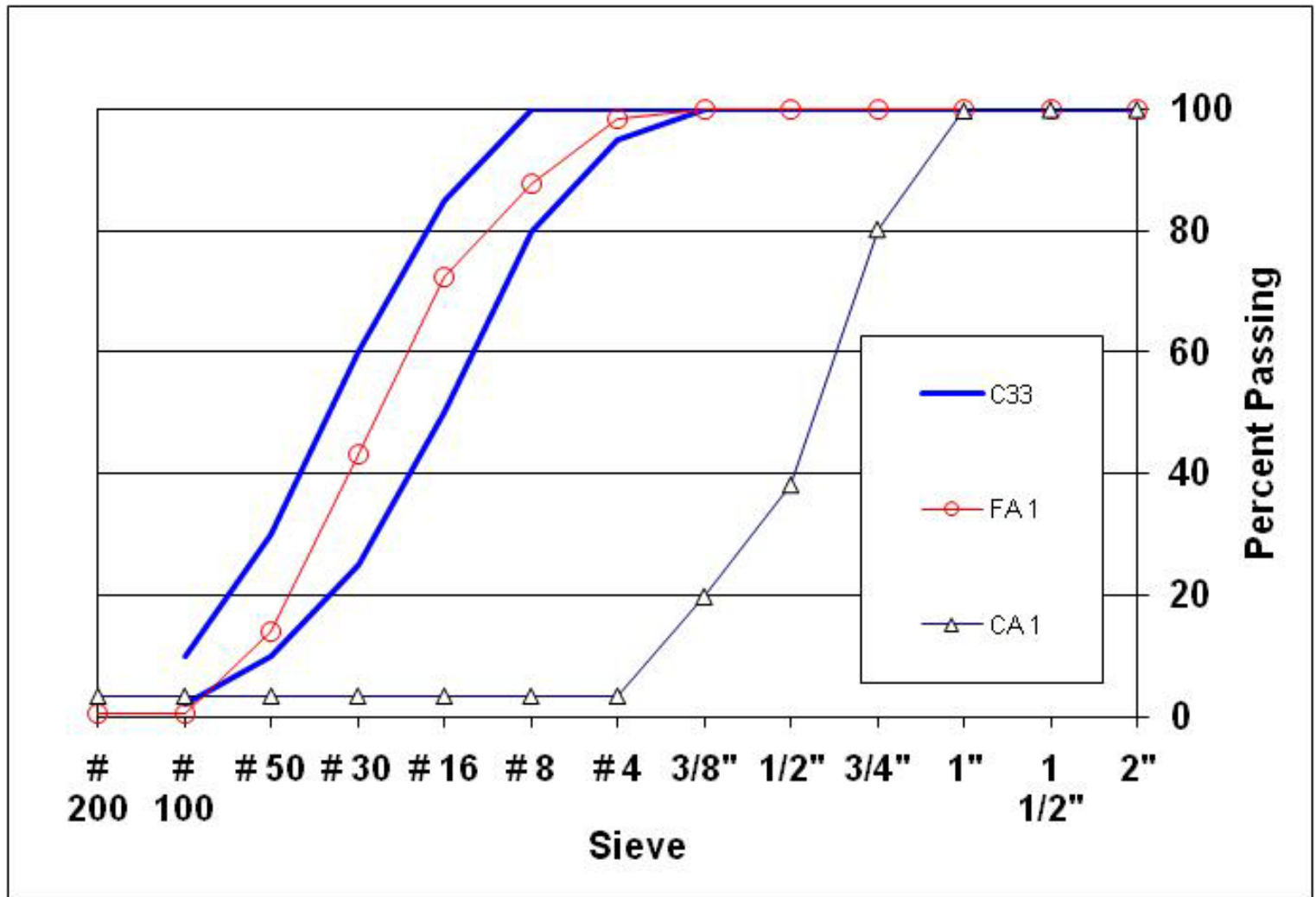
Lens

Sample

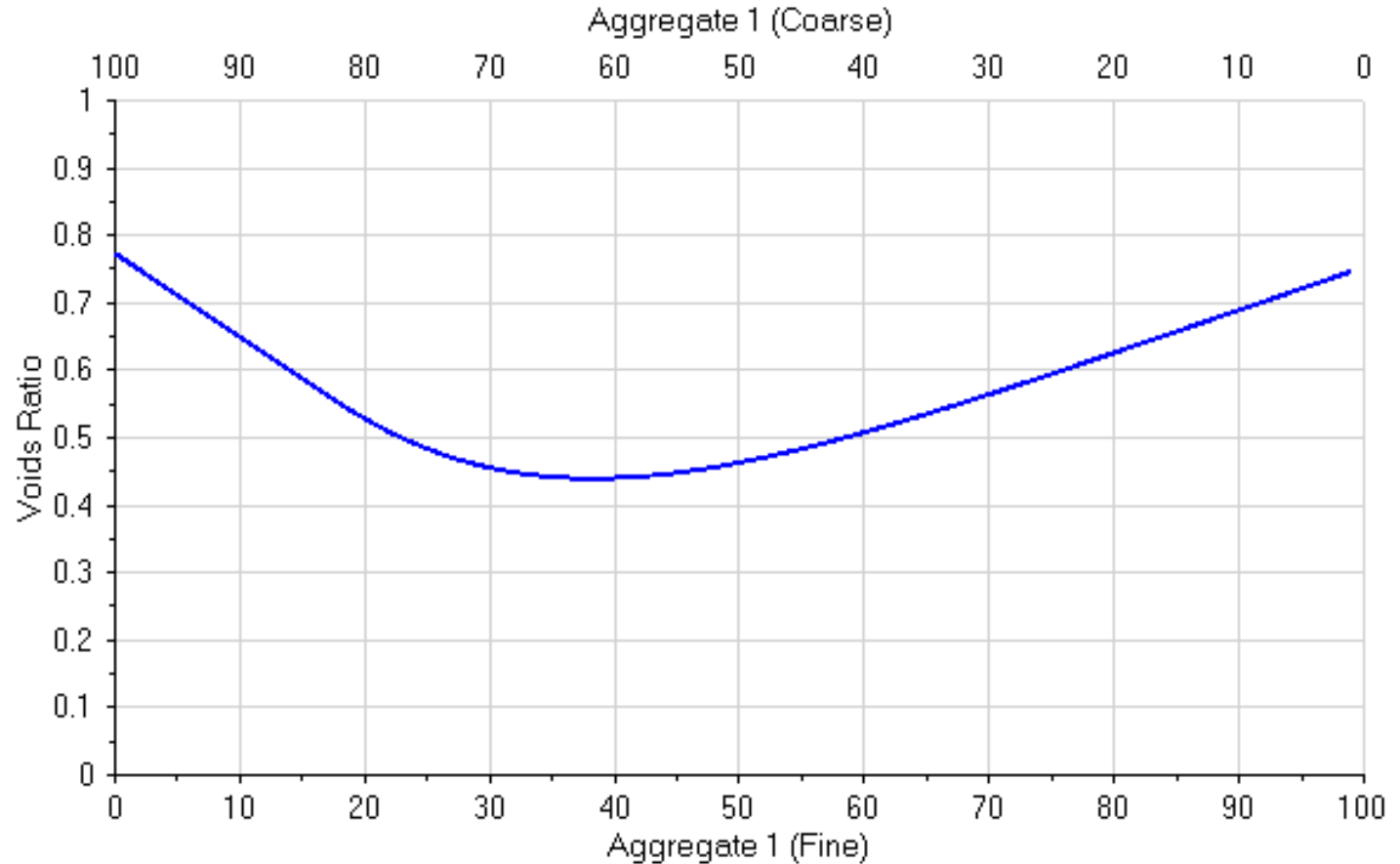
Mix Proportioning

- Based on ICAR approach for SCC (Fowler):
 - Choose aggregate system
 - Choose paste quantity
 - Choose paste quality

Aggregate System

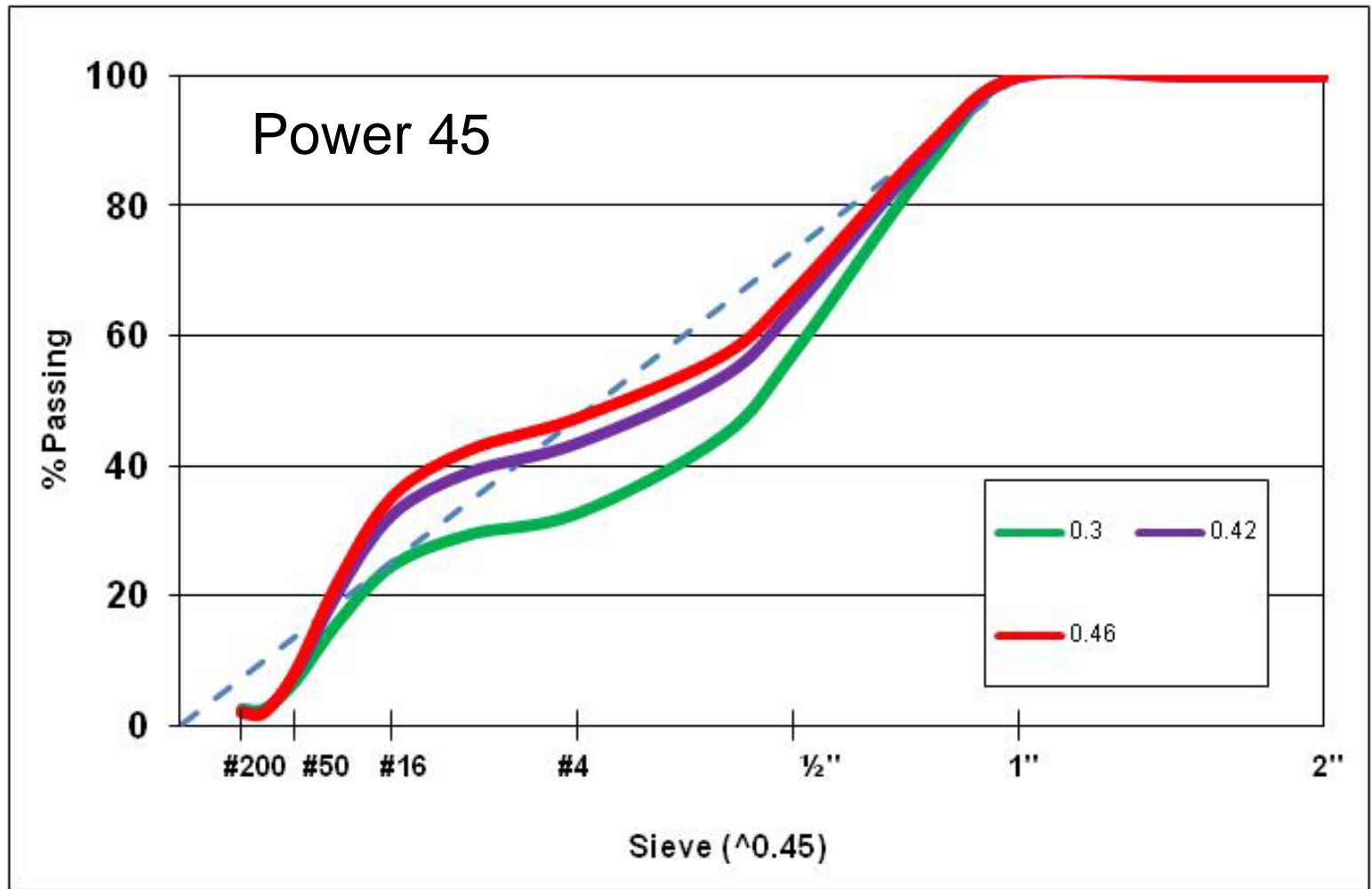


Aggregate System



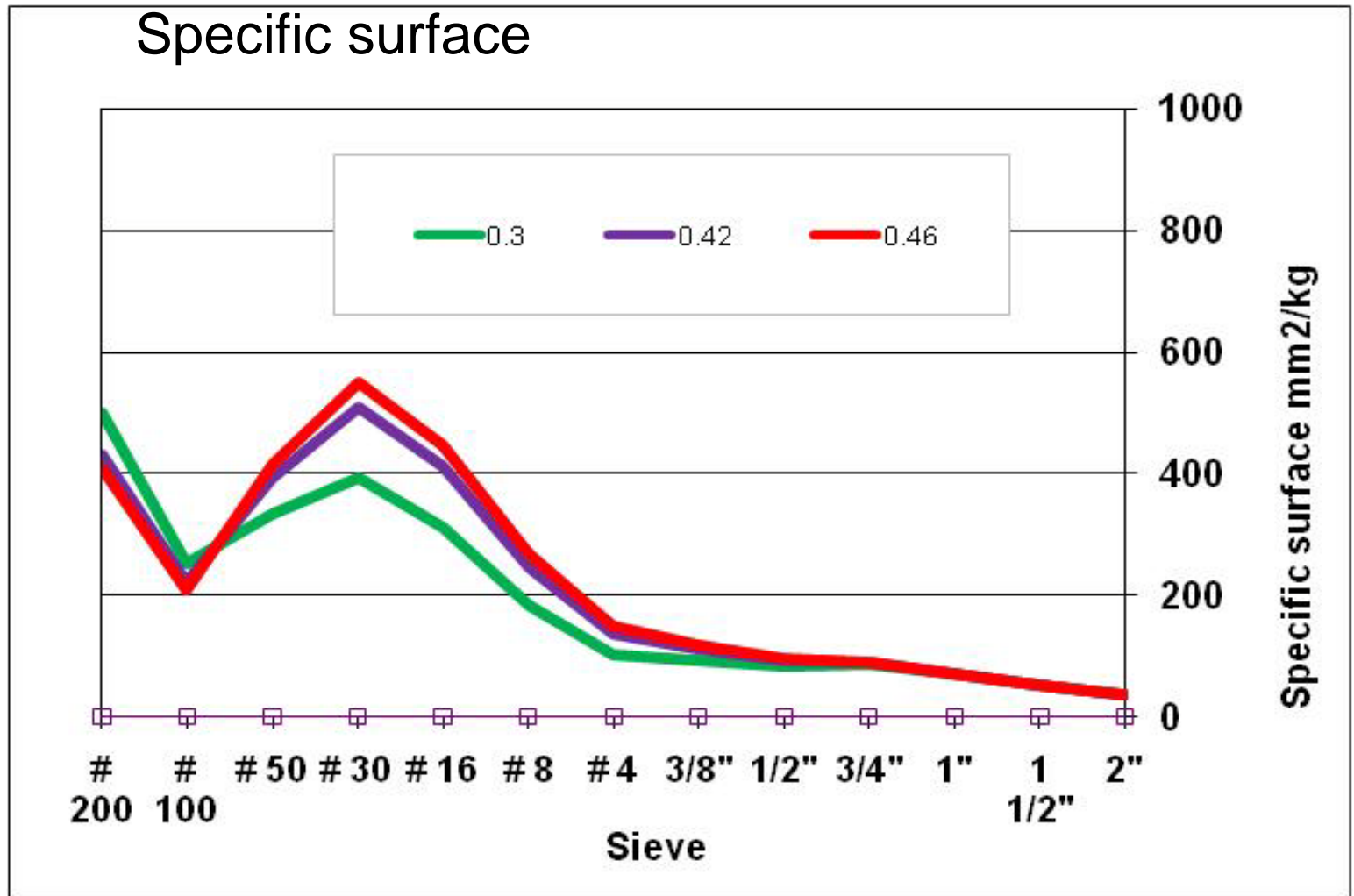
62% coarse, 38% fine
Measured voids = 18.5%

Aggregate System



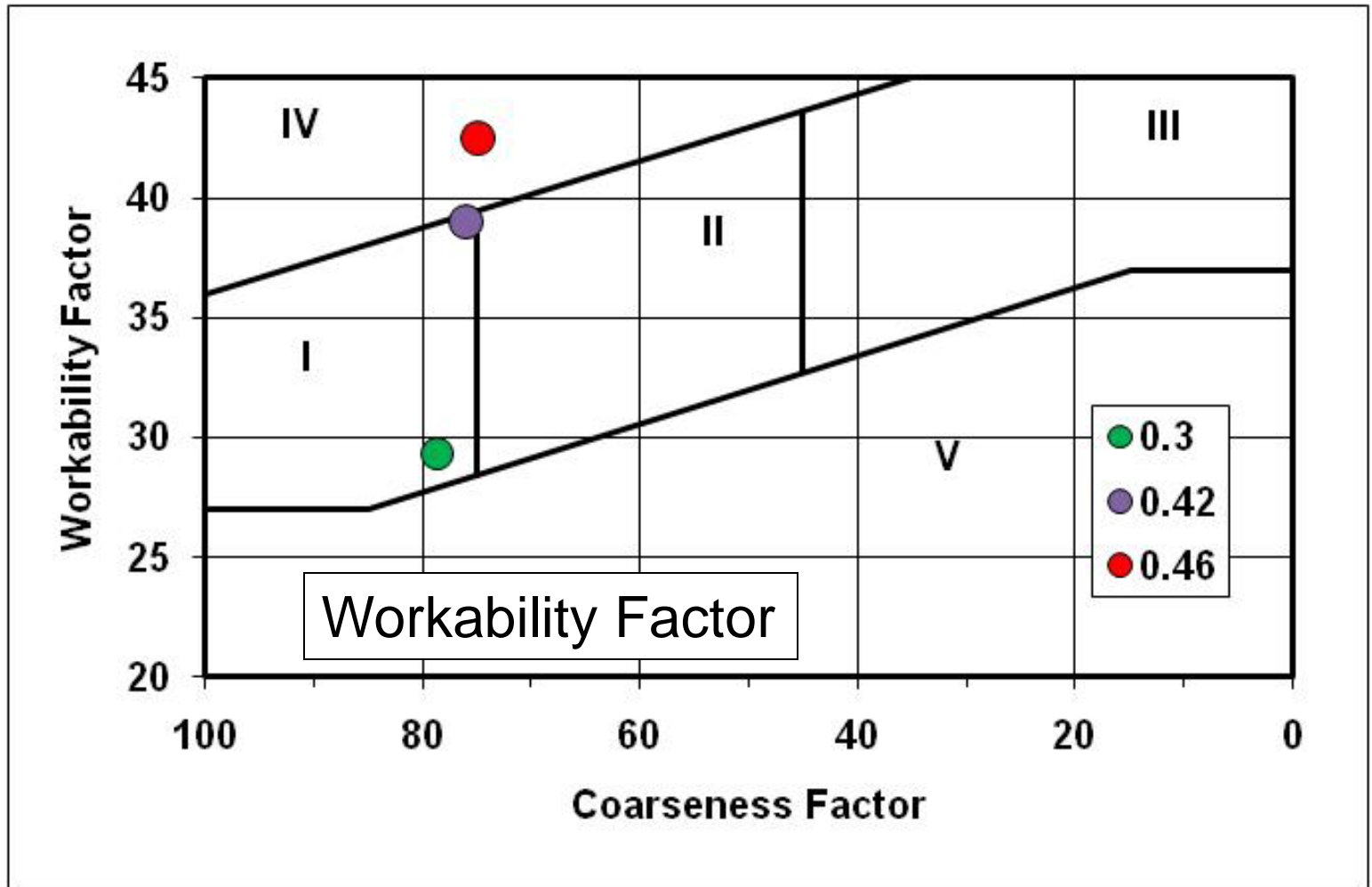
54% coarse, 46% fine

Aggregate System



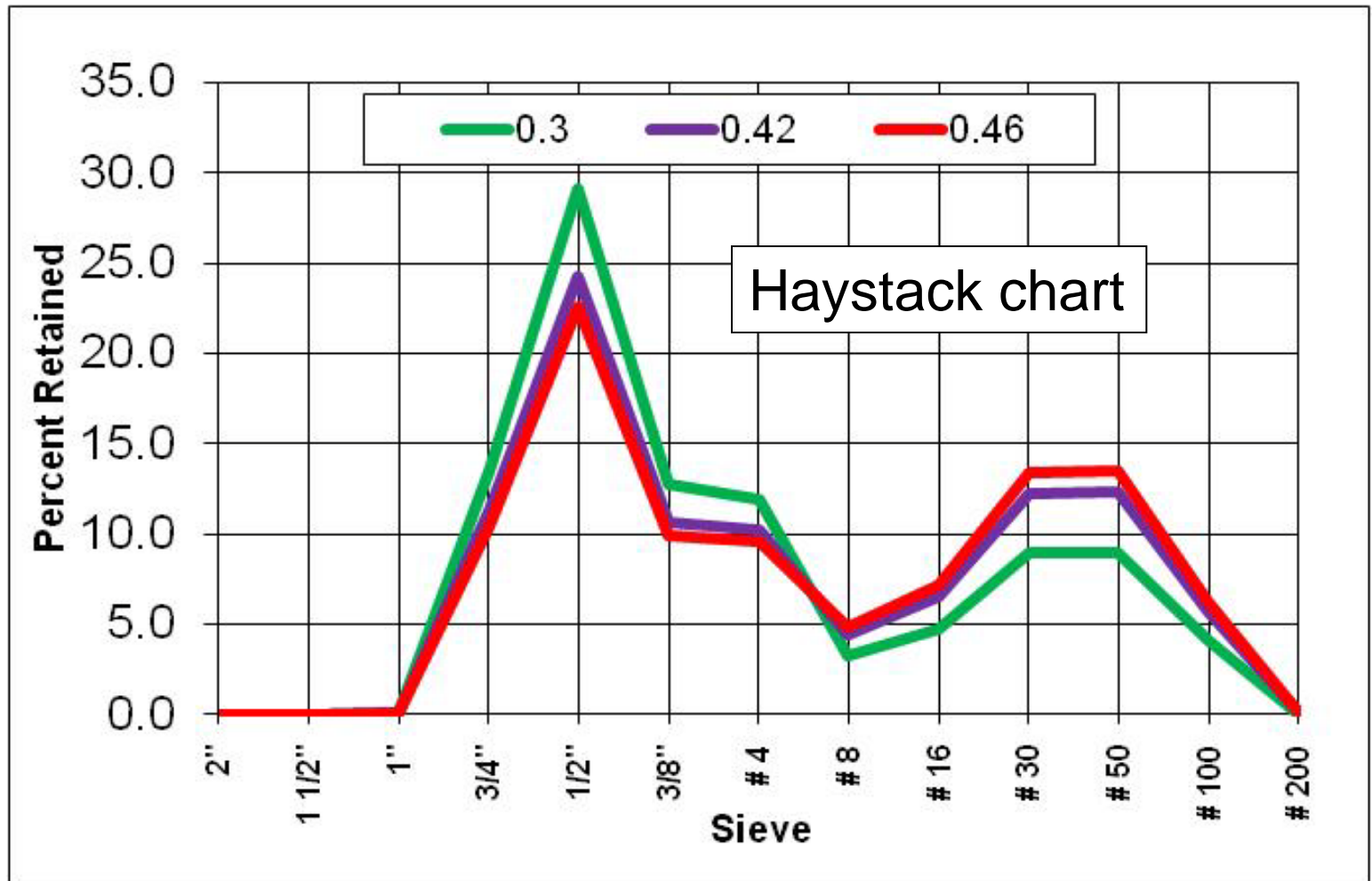
69% coarse, 31% fine

Aggregate System



58% coarse, 42% fine

Aggregate System



58% coarse, 42% fine

Mix Proportioning

- Paste quantity

300 pcy 82% of voids 400 pcy 106% of voids

