

# 2016 Annual MDSHA Hot Mix Asphalt Roundtable

## Soils & Aggregate Technology Division, OMT

Dan Sajedi, 443-572-5162

Eric Frempong, 443-572-5055



# Aggregate Sources in Mid-Atlantic Region (MD, PA, VA, WV, DE & NJ)

Total Quarries=114

Coarse & Fine Aggregate =80

Fine Aggregate Only =34



# MDSHA Aggregate Bulletin

## *Aggregate Bulletin Updates*

- Effective January 2013, the bulletin is updated quarterly.
- It is published on the last date of each quarter .

## *Tests & Frequency*

- Specific Gravity and Absorption (1-yr)
- LA (2-yr)
- Soundness (3-yr)
- Alkali-Silica Reaction –ASR (3-yr)
- Dynamic Friction Test (2-yr)
- British Pendulum Test (2-yr)

# MDSHA Aggregate Bulletin

*Availability?*

<http://www.roads.maryland.gov/OMT/AggBlt.pdf>

# Aggregate Bulletin

Maryland



With Pride

**Maryland State Highway Administration  
Office of Materials Technology  
Aggregate Bulletin  
Test Data**

**Notes:**

- (a) Any asphalt mix approved prior to March 01, 2016 should use the Dynamic Friction Values (DFVs) included in the [Aggregate Bulletin of Fourth Quarter 2014, MSMT 416 \(April 2012\)](#) and [Table 901 D \(September 2014\)](#).**
- (b) All asphalt mix designs approved after March 01, 2016 shall use the DFVs provided in this [Aggregate Bulletin](#) and the [revised MSMT 416](#) and [Table 901 \(February 2016\)](#).**

**Office of Materials Technology  
Soils and Aggregate Technology Division  
7450 Traffic Drive  
Hanover, Maryland 21076**

# Aggregate Bulletin Data

## Maryland State Highway Administration: Coarse and Fine Aggregate Test Data

Producer	Aggregate Category	Aggregate Type	Specific Gravity	ABS	LA	* Friction Rating[1]	ASR	Soundness	Material Tested For			
			(SSD)	(%)	(%)		(%)	(%)	(%)	General (HMA Base, GAB, Backfill, etc.)	HMA Surface	High Friction Materials
			T-84 & 85		T-96	ASTM D3319 & E303	ASTM C1260	T-104				
<b>Aggregate Industries, Inc.</b> Accokeek Sand & Gravel Brandywine, MD												
	Coarse	#57	2.594	0.9	38		0.26	4.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Fine	Concrete Sand	2.598	0.8			0.26	1.1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Aggregate Industries, Inc.</b> Charles City Sand & Gravel Charles City, VA												
	Coarse	#57	2.591	0.7	35		0.44	1.3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fine	Concrete Sand	2.622	0.7			0.25	1.8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Aggregate Industries, Inc.</b> Fulks Sand & Gravel Fredericksburg, VA												
	Coarse	#57	2.636	0.5	33		0.12	0.7	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Fine	Concrete Sand	2.599	1.3			0.12	4.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Aggregate Industries, Inc.</b> Kirby Road Sand & Gravel Clinton, MD												
	Coarse	#57	2.587	0.7	33		0.26	0.9	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Fine	Concrete Sand	2.556	0.8			0.26	0.6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Aggregate Industries, Inc.</b> La Plata Sand & Gravel La Plata, MD												
	Coarse	#57	2.576	1.3	34		0.27	2.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Fine	Concrete Sand	2.610	1.0			0.27	1.7	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Aggregate Industries, Inc.</b> Mataponi Sand & Gravel Aylett, VA												
	Fine	Concrete Sand	2.636	0.4			0.02	0.6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Note [1]: Category I (HDFV I): DFV-50  
Category IV (SDFV IV): DFV-30

Category II (HDFV II): DFV-45  
Category V (SDFV V): DFV-25

Category III (HDFV III): DFV-40  
Category VI (LDFV VI): DFV is less than 25.

Updated:  
**February 19, 2016**

\* See notes on front page of Aggregate Bulletin.

# Aggregate Bulletin

## Notes:

- (a) Any asphalt mix approved prior to March 01, 2016 should use the Dynamic Friction Values (DFVs) included in the Aggregate Bulletin of Fourth Quarter 2014, MSMT 416 (April 2012) and Table 901 D (September 2014).
- (b) All asphalt mix designs approved after March 01, 2016 shall use the DFVs provided in this Aggregate Bulletin and the revised MSMT 416 and Table 901 (February 2016).

In general, aggregates with better resistance to polishing have:

- Lower Los Angeles (LA) Abrasion loss
- Lower Sulfate Soundness Loss
- Lower freeze-thaw (F-T) Loss
- Lower Absorption
- Higher Specific Gravity

# Pavement Friction vs. Crash Rates

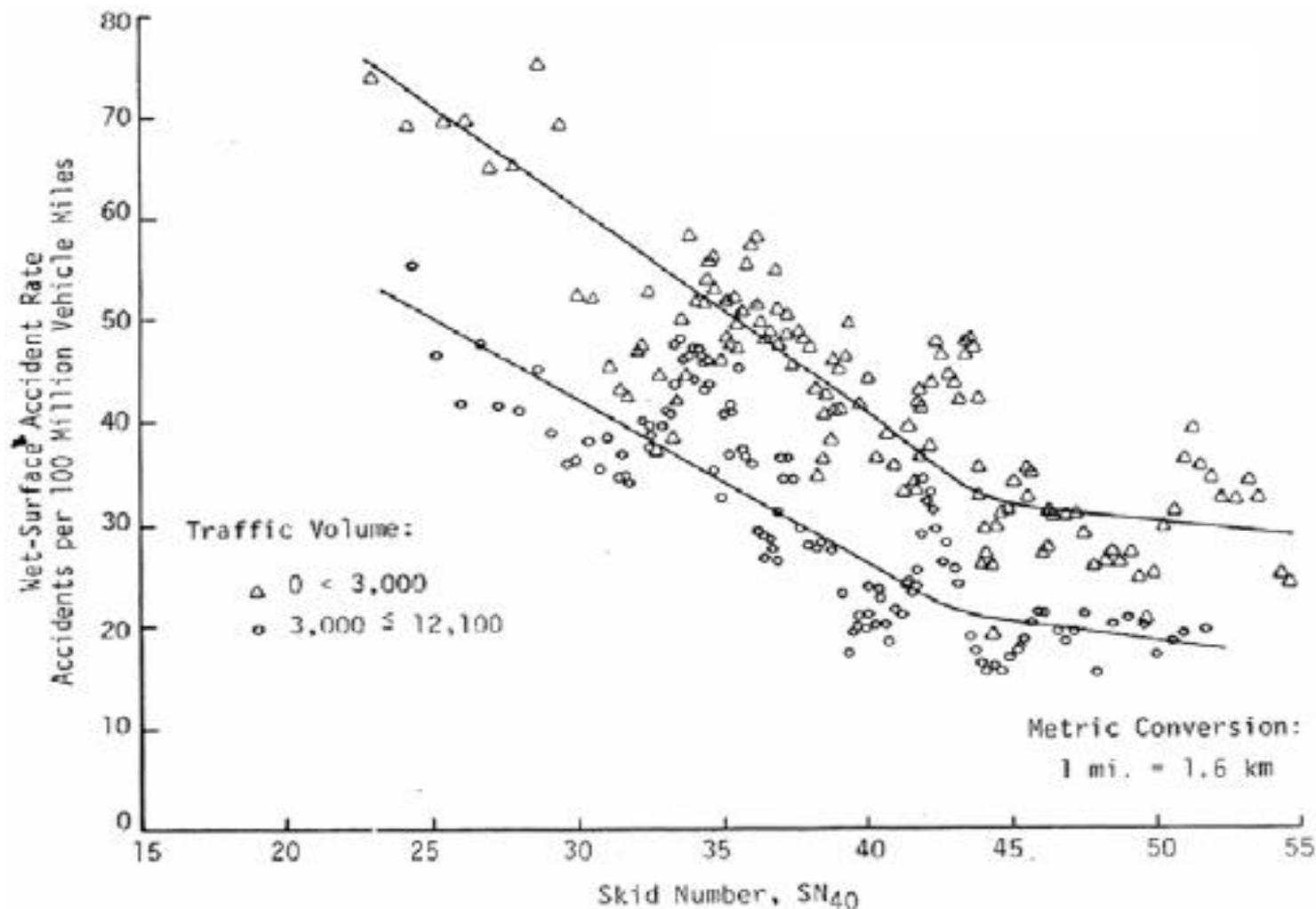


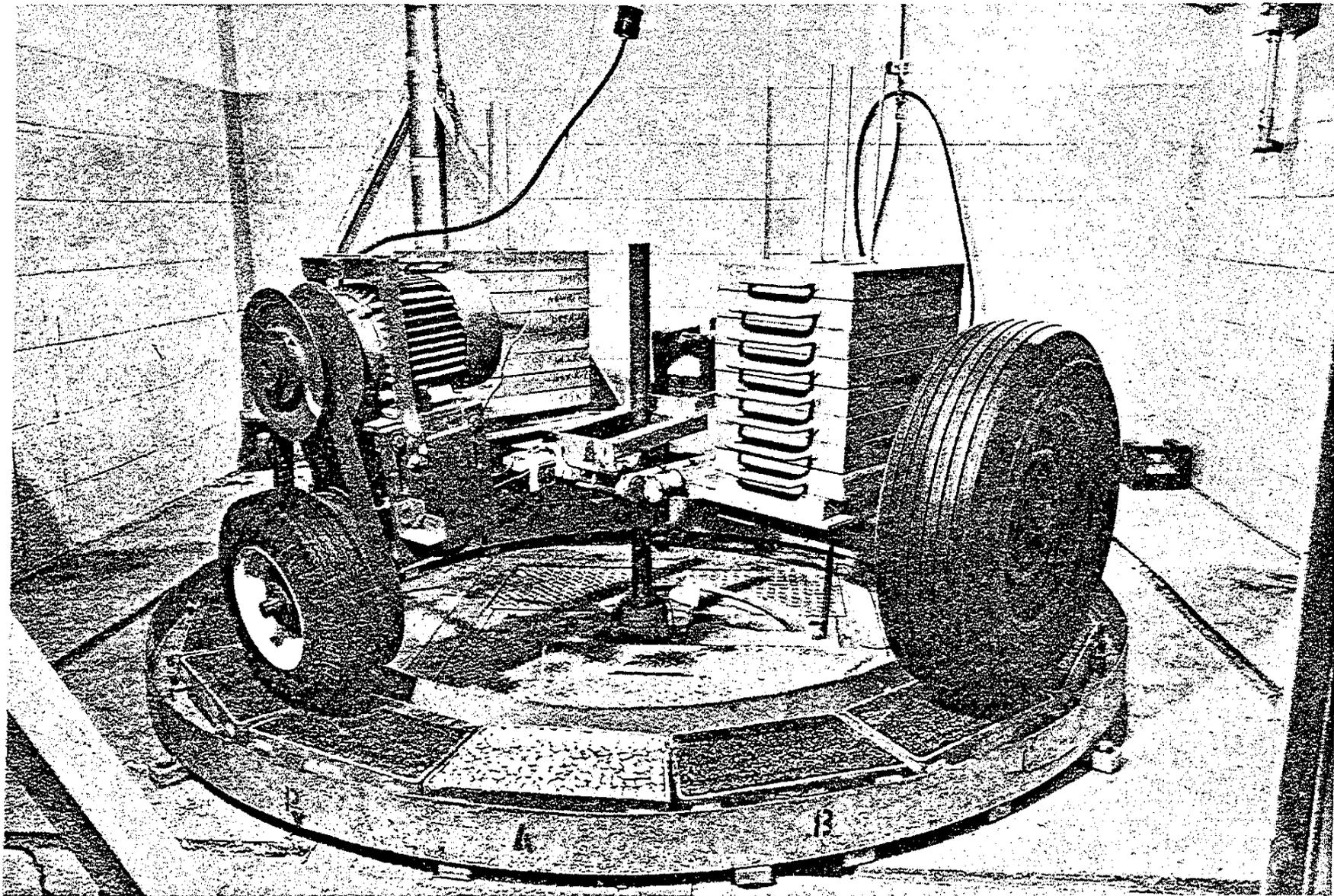
Figure 3. Relationship between wet-weather crash rates and pavement friction (Rizenbergs et al., 1973).

# Pavement Friction vs. Crash Rates (continued)

- The high correlation between pavement skid resistance and rate of crashes, demands a comprehensive material selection and mixture design system.
- Friction properties of aggregate and their ability to keep their rough texture against polishing action of passing traffic need to be addressed carefully.

# Friction Testing

# Old Aggregate polishing



# New Dynamic Friction Testing

- Coefficient of friction
- FN vs. speed
- Measuring micro texture
- CTM-Macro texture measurement

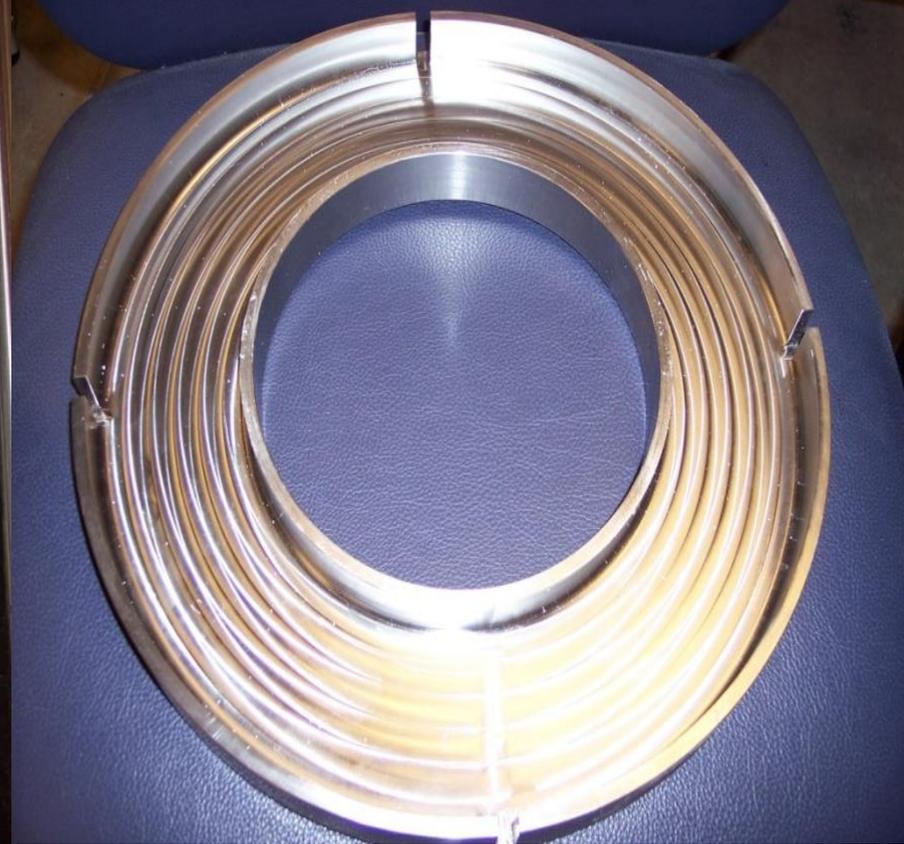
# Dynamic Friction Tester (DFT)



# Specimen and mold



**Sample Casting**

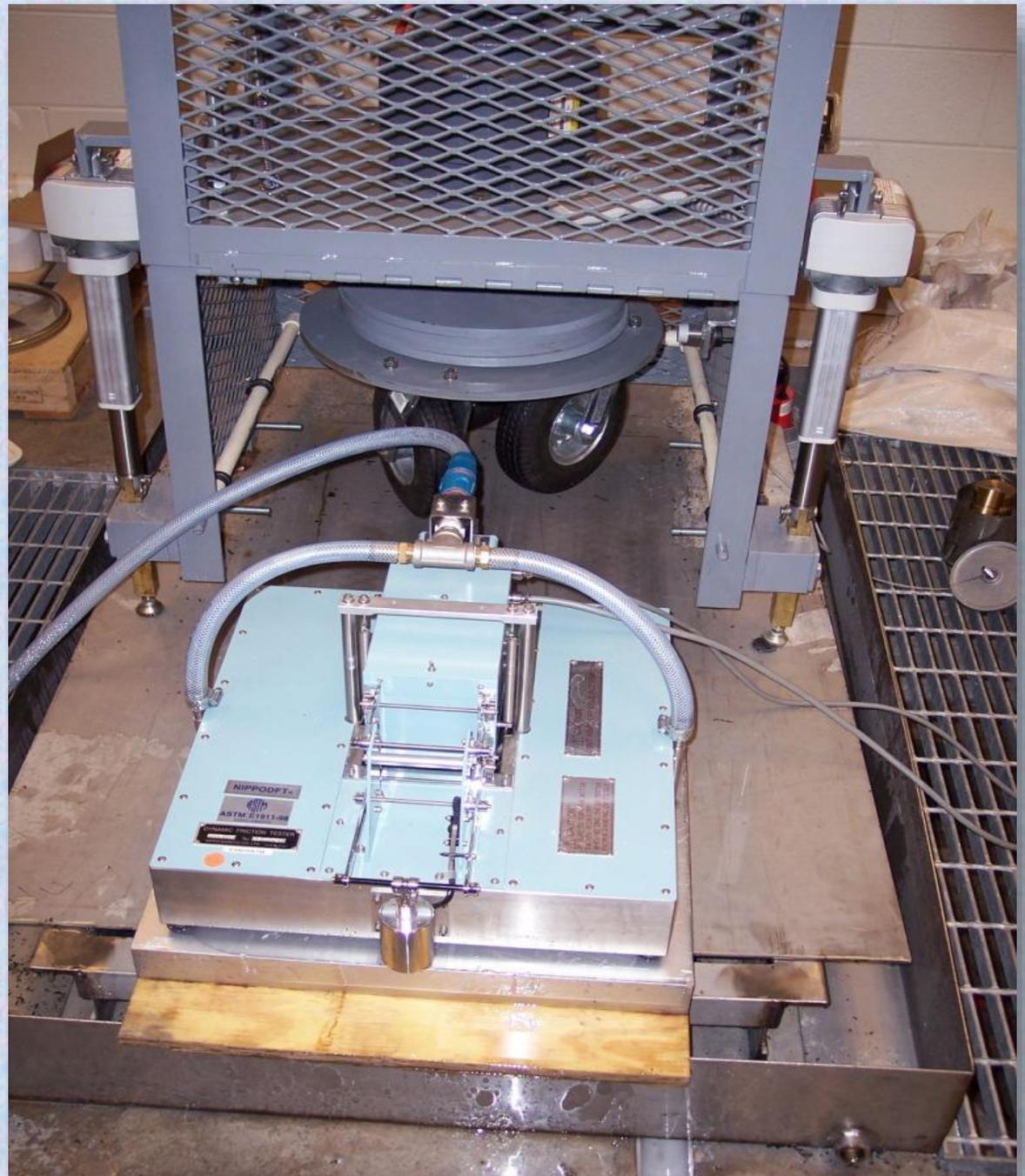


**Sample Mold**

# Aggregate Polishing Equipment

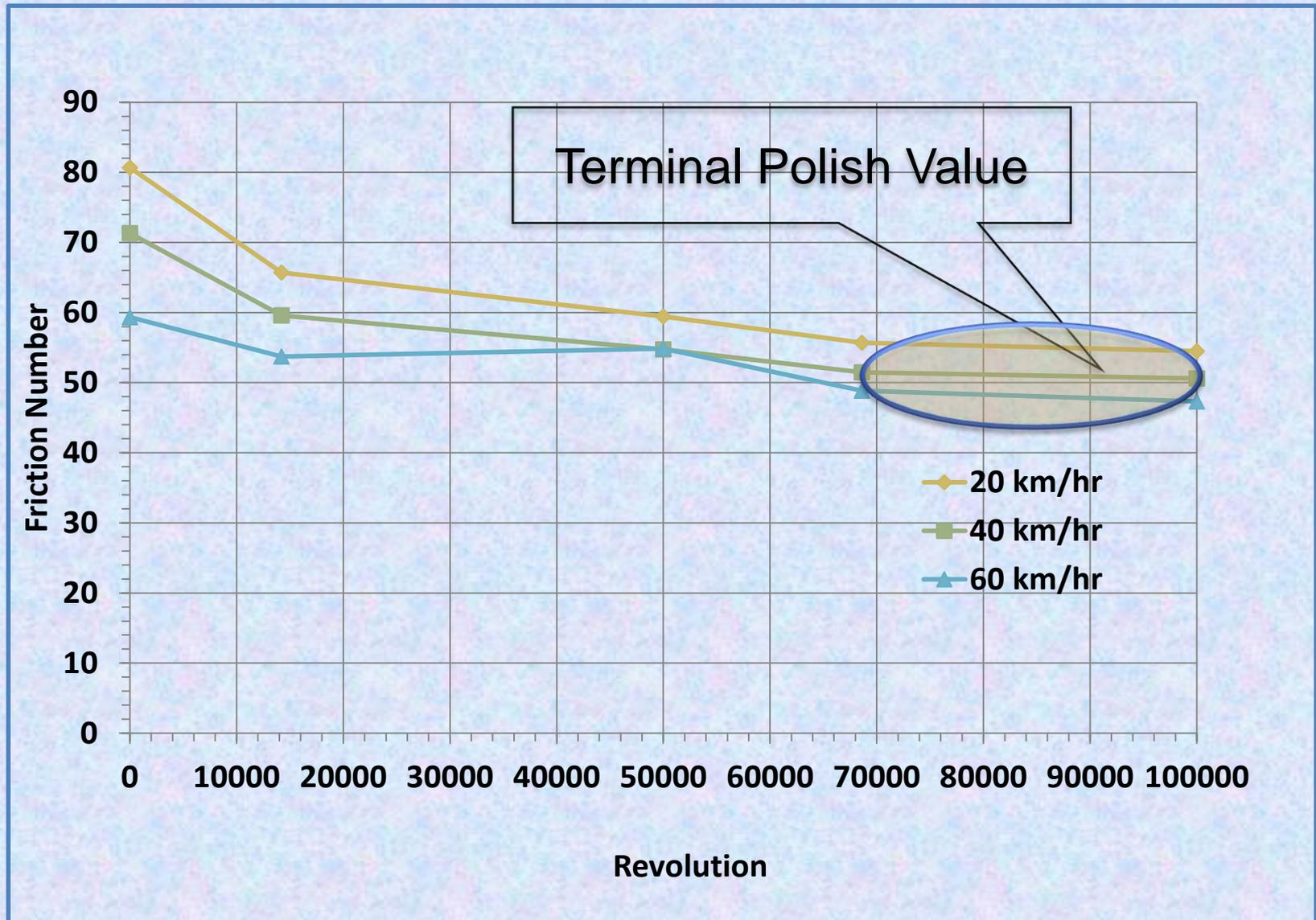


**Dynamic  
Friction Tester  
(DFT)  
ASTM E1911-  
09a**

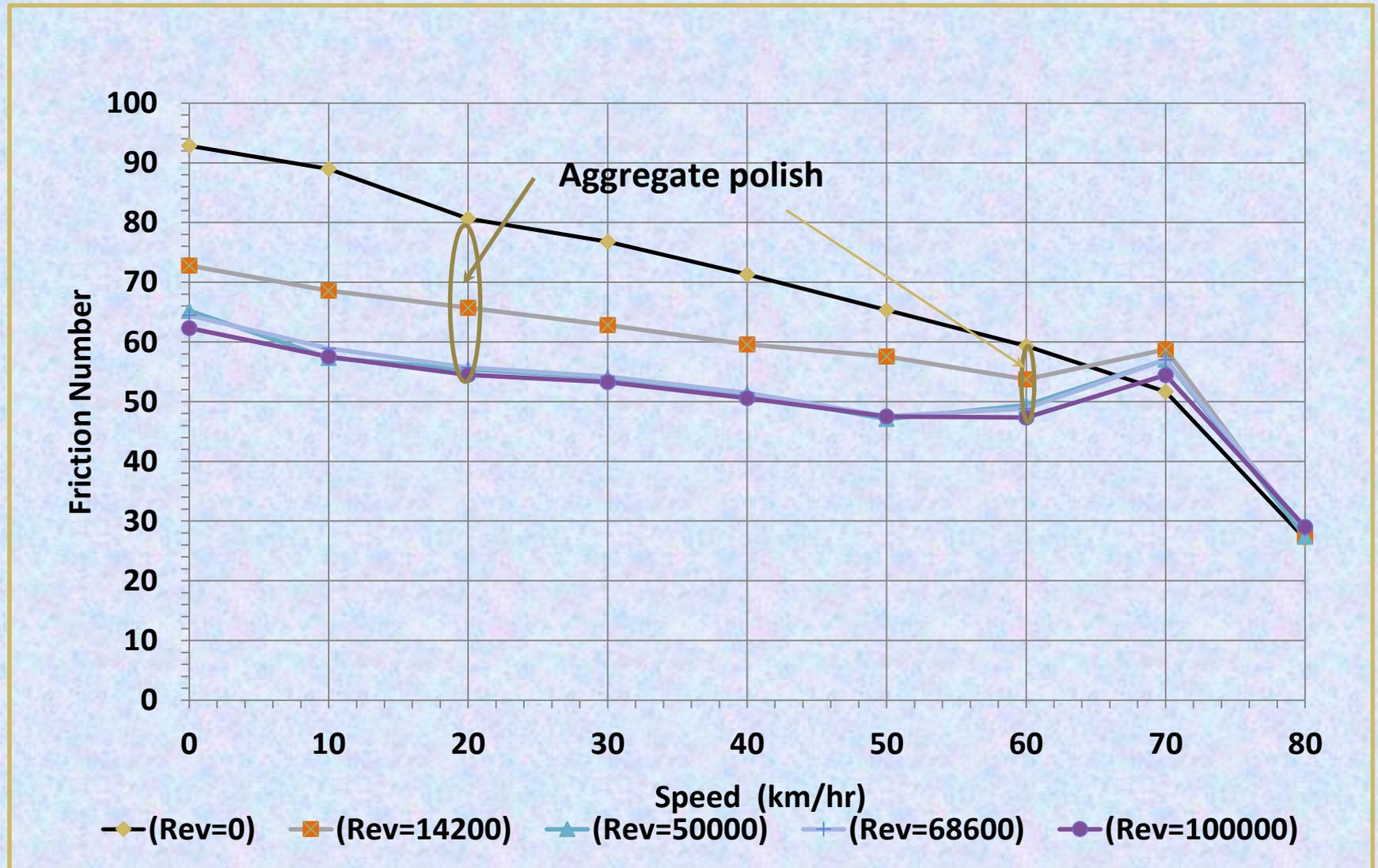




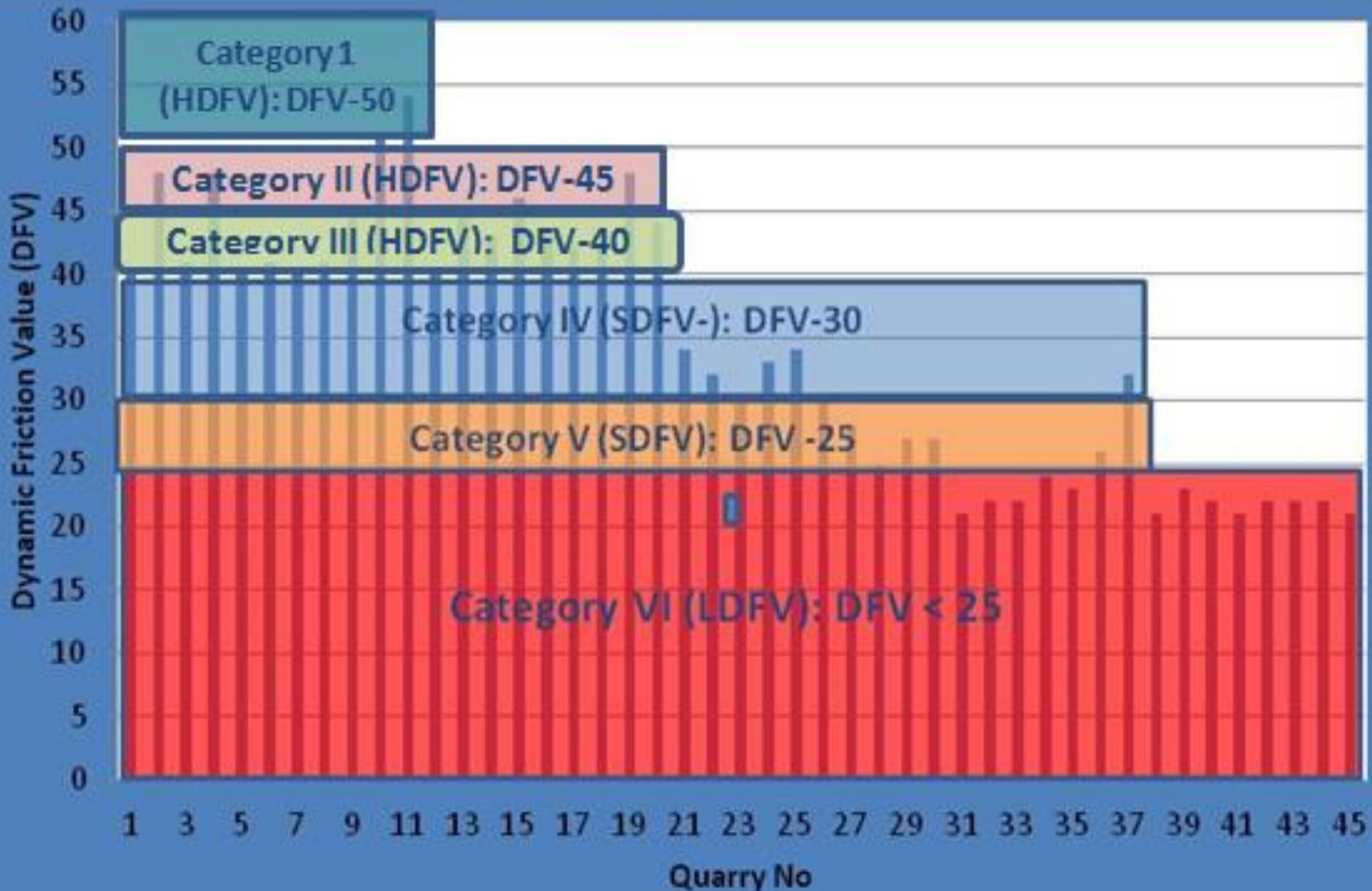
# Typical DFT Test Data vs. Revolution



# Aggregate Polish Property



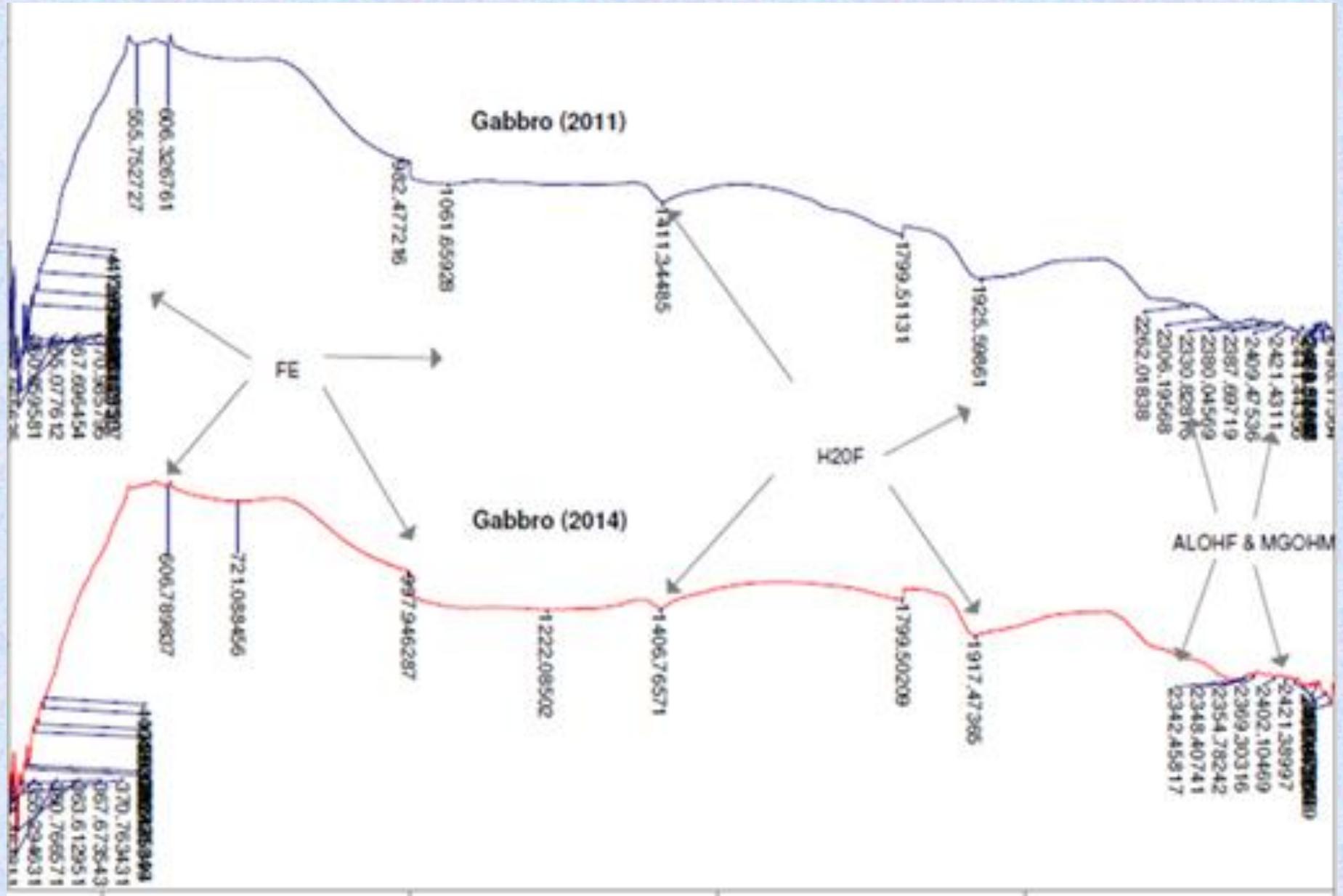
# Coarse Aggregate Category



# **Validation of Aggregate Source Approval with Spectroradiometer**

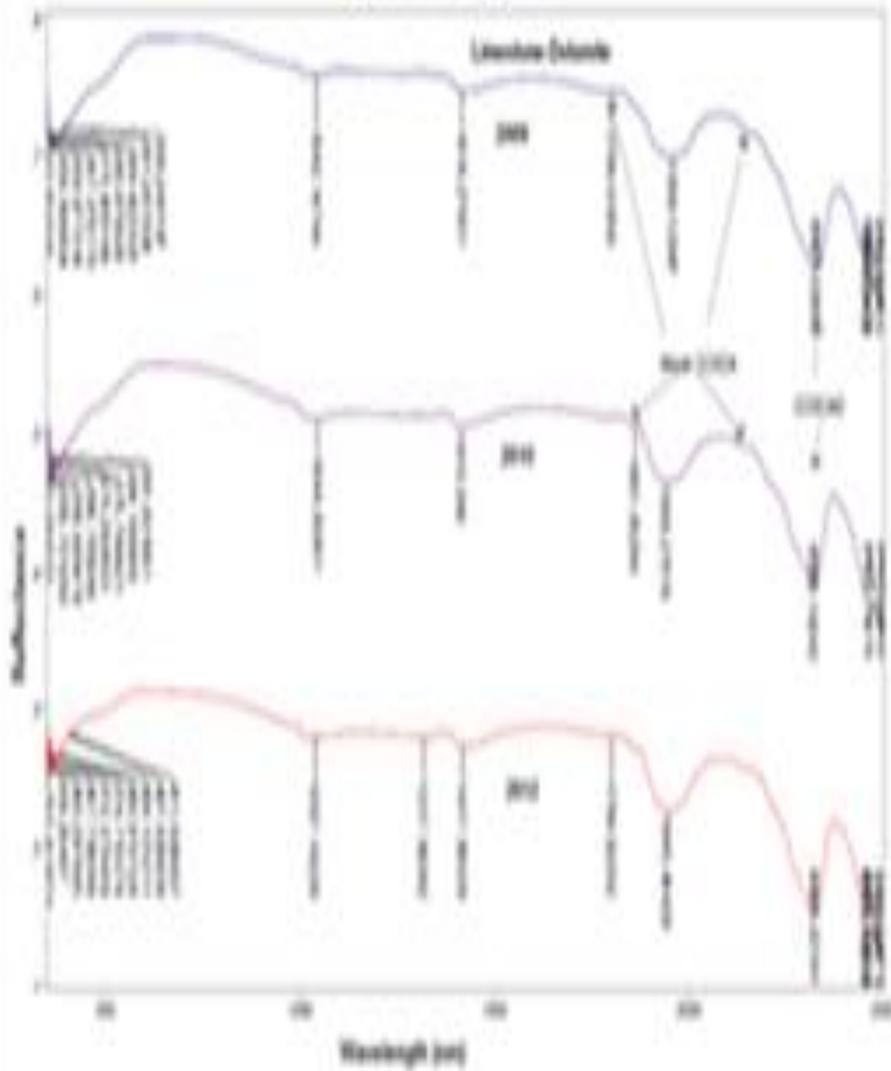
- Ongoing Research Project
- Initiated to validate source approval of HMA surface mix aggregate

# Research Output – Aggregate Spectra

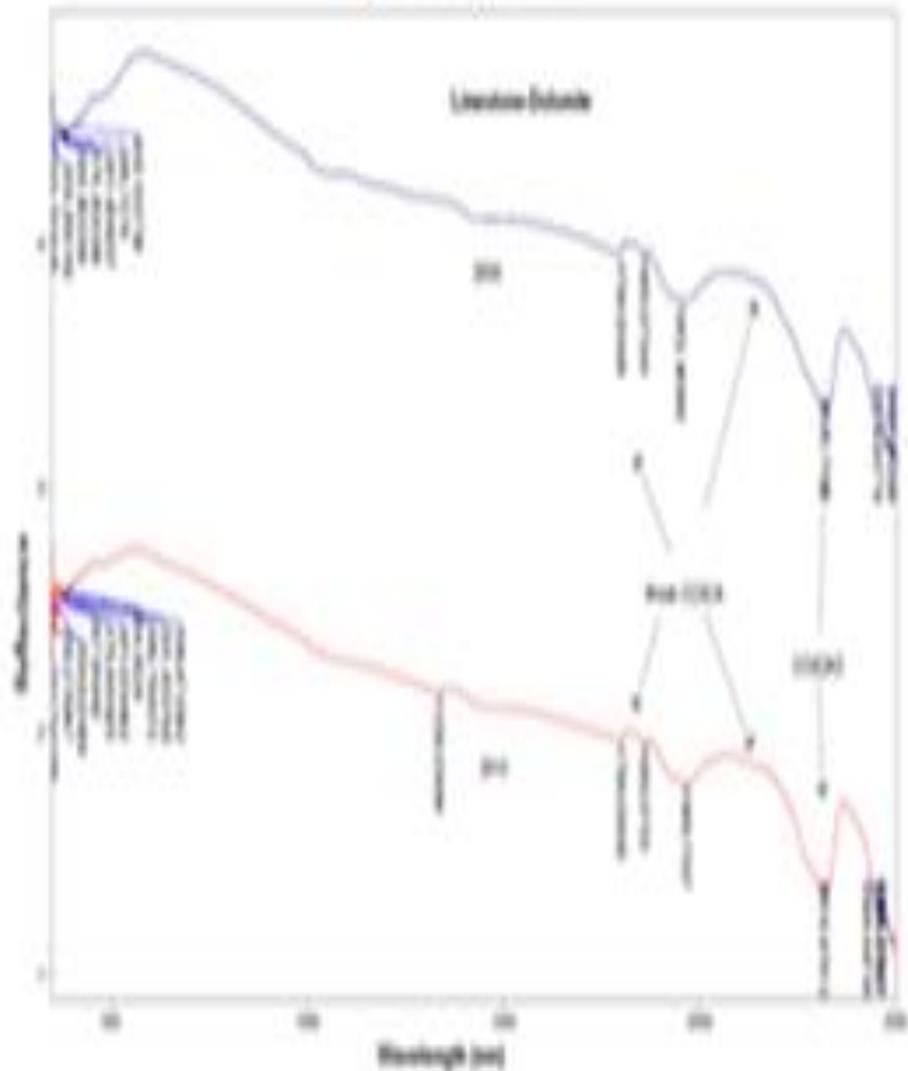


# Spectra of Aggregates

## Quarry 19

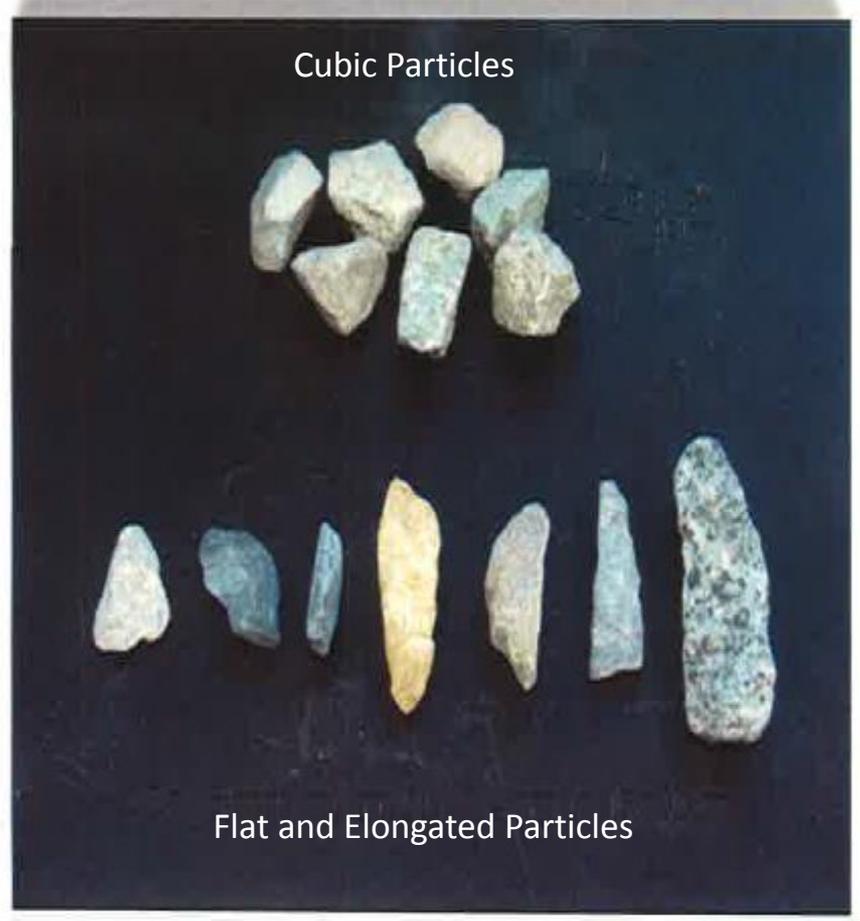
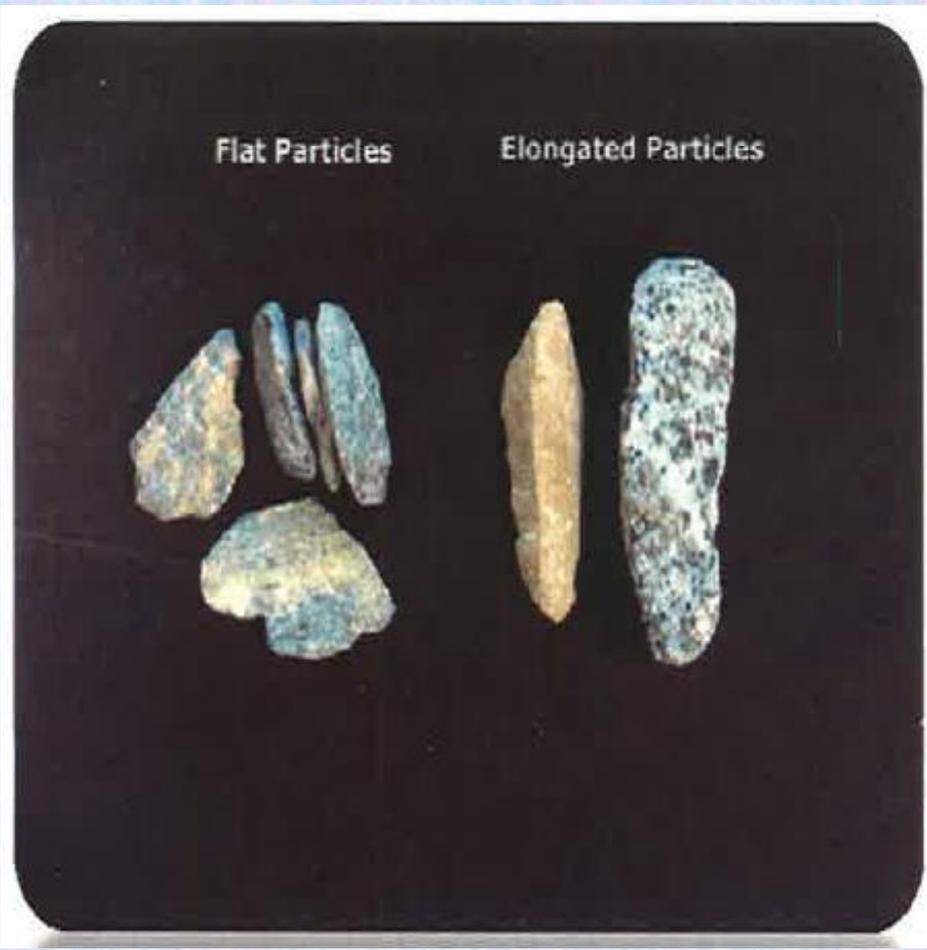


## Quarry 20

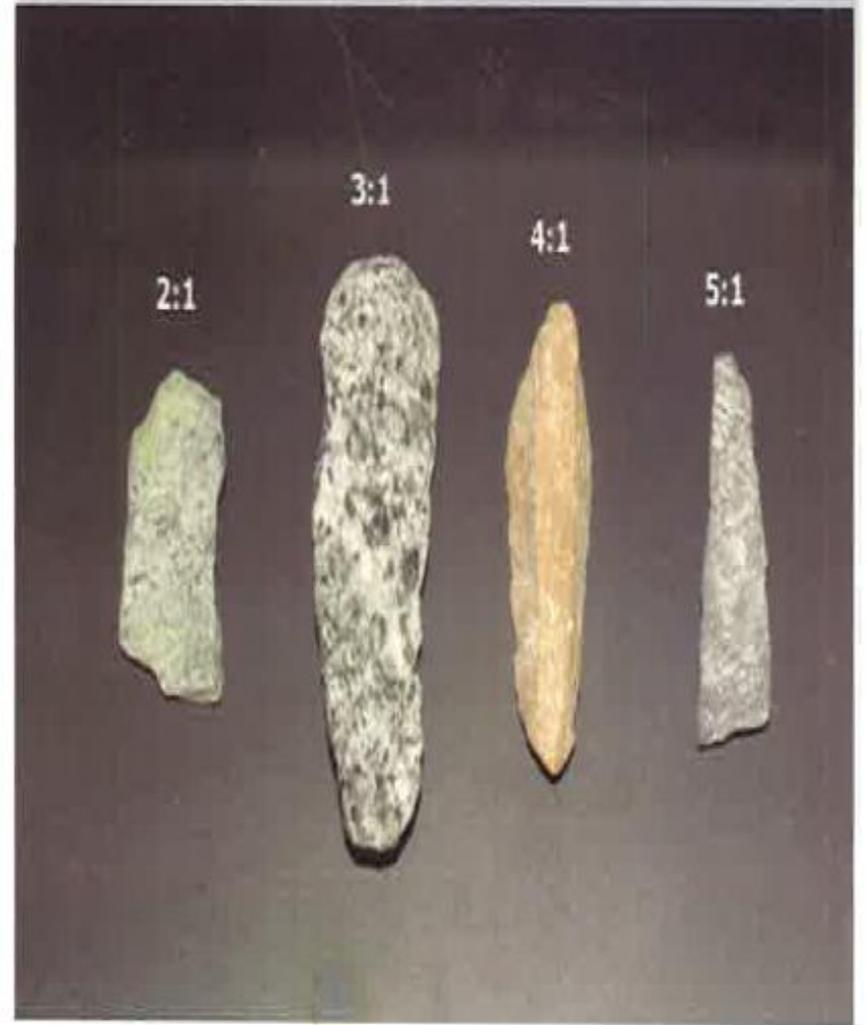


# Flat & Elongated Particle Assessment

# Shapes of Particles



# F & E. Equipment (ASTM-D4791) and Sizes



***Questions ?***