Trial Batching

FONTE & CO

CONSULTING

TRAINING

CONSTRUCTION EQUIPMENT

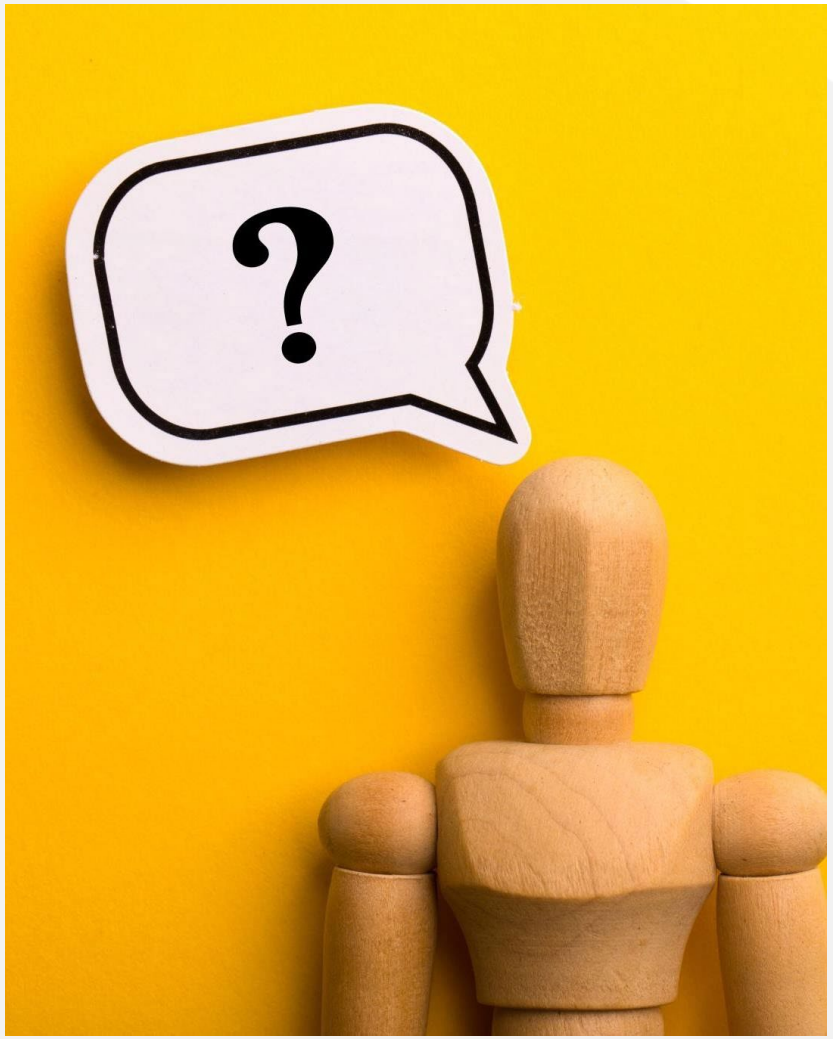
"HELPING YOU BUILD BETTER CONCRETE"

About the Presenters

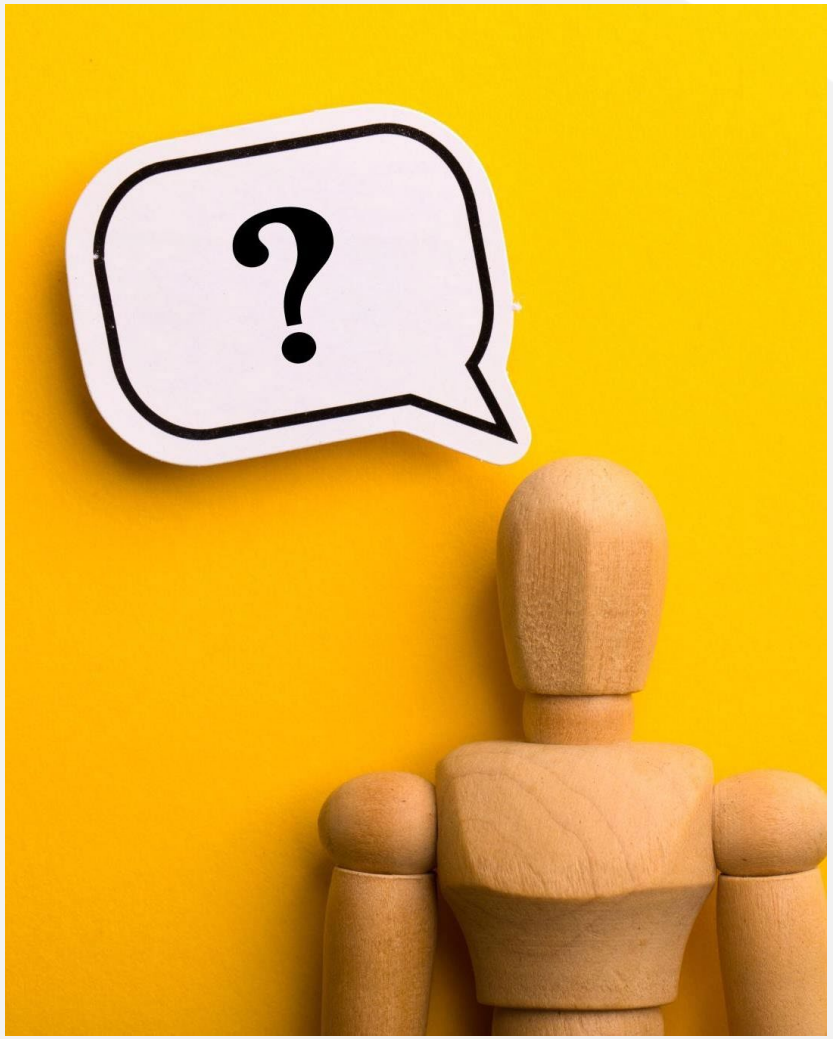
- **Matt Fonte** is the president of **Fonte and Company**. A consulting company that specializes in all aspects of concrete pavements.
- **Matt** is also the President of **Fonte Equipment Company**. An equipment company that specializes in Concrete Batching Equipment.

- Matt has 26 years of experience on the heavy civil construction platform, and 19 of those years have been in the concrete paving industry.
- Throughout these years Matt has developed an extensive knowledge of all aspects of concrete pavements. Most notably in mix design, pavement smoothness, and equipment setup.
- Matt believes we should be good stewards of the taxpayer dollars, and one of the best ways to be a good stewards is investing in smooth long-lasting sustainable concrete pavements.

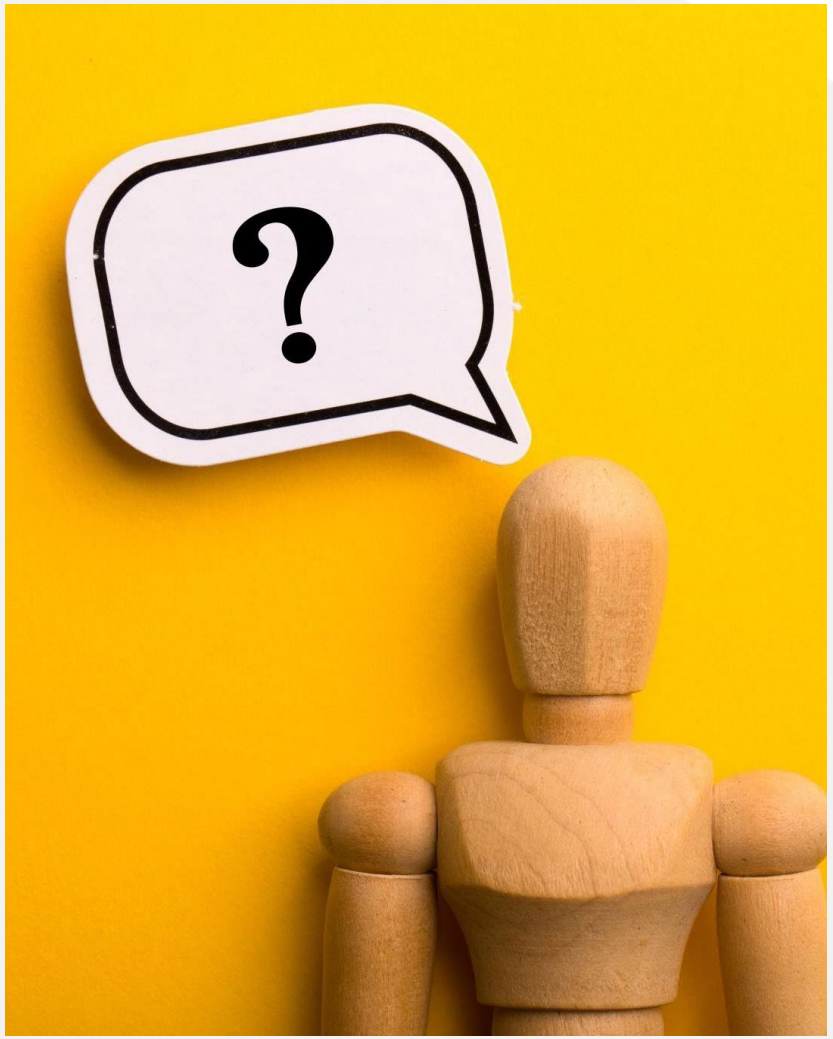
WHAT?



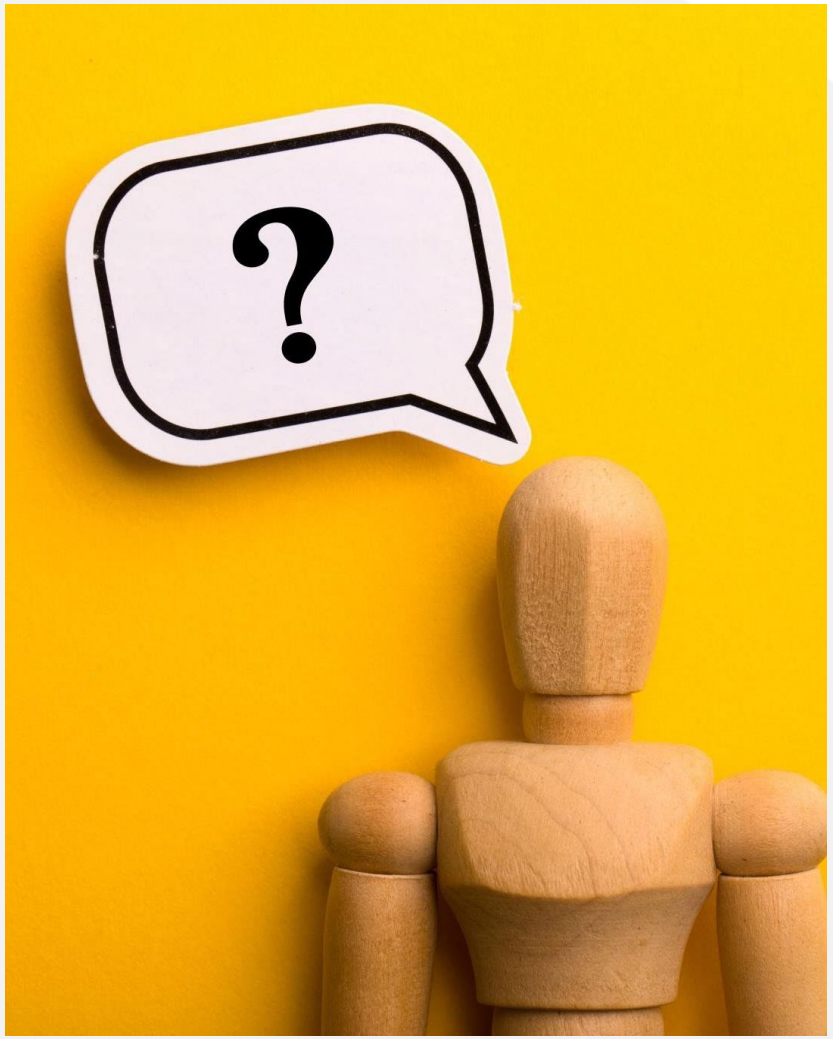
WHY?



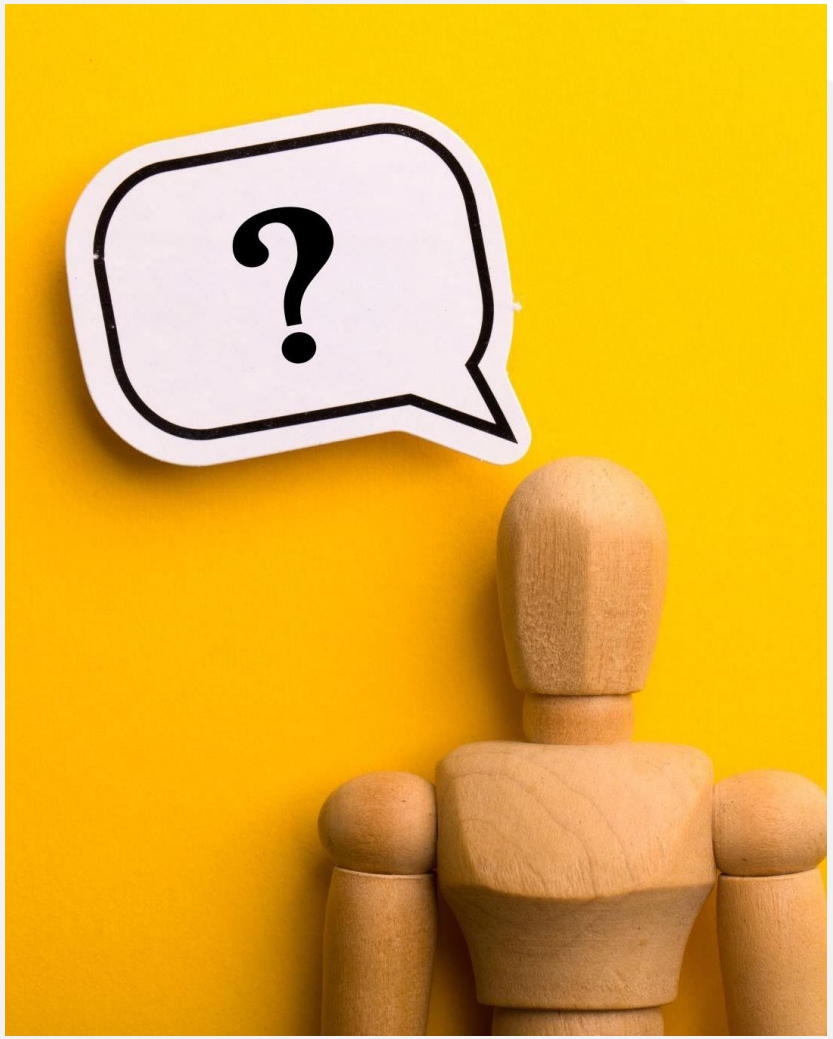
WHY?



WHY?

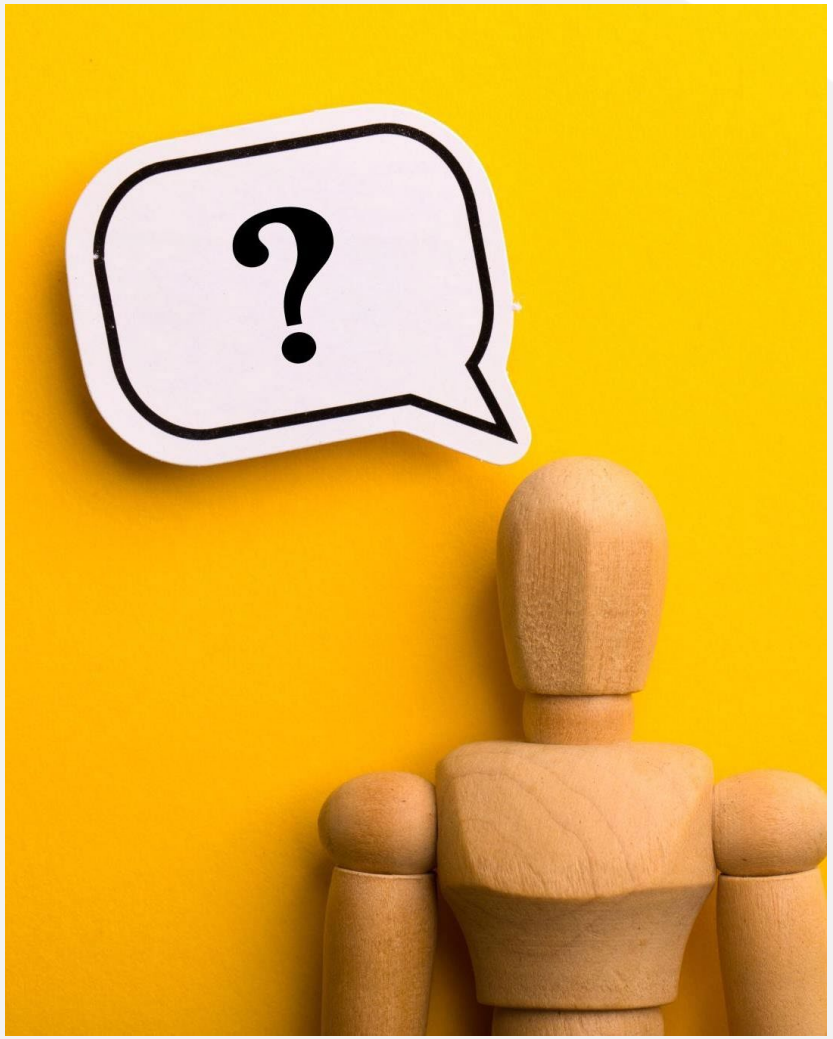


WHY?



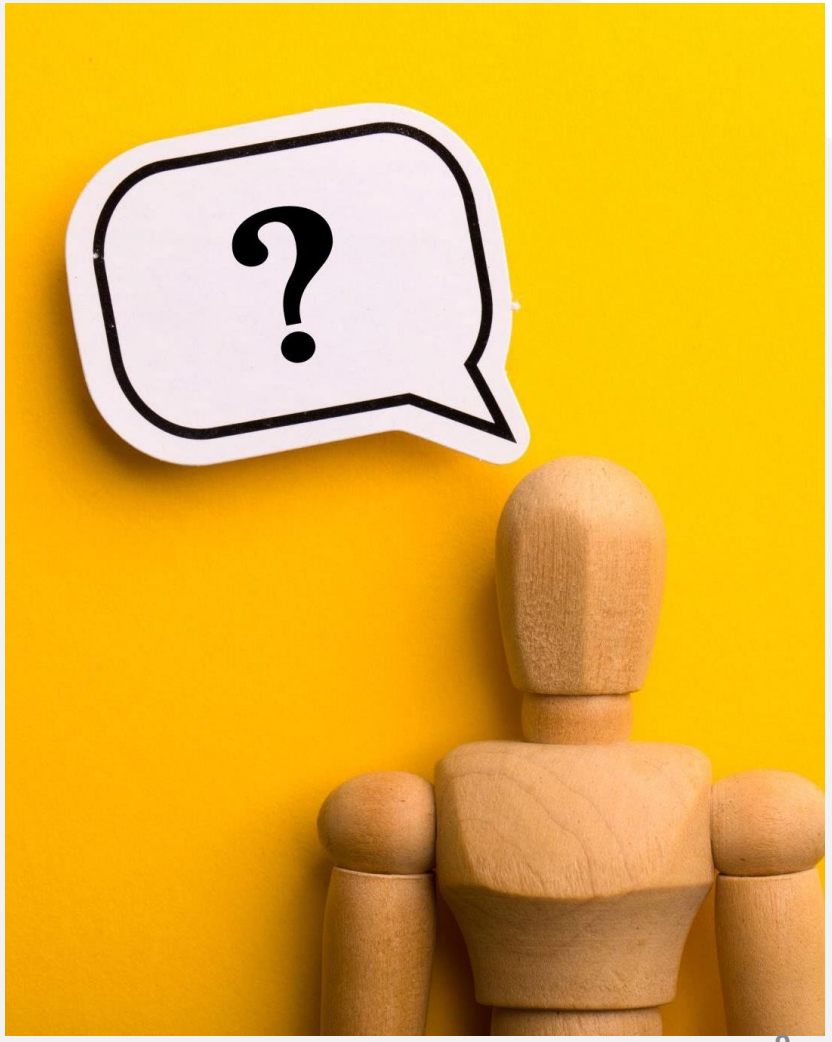
WHY?

- Not all materials are created equal.
- How do you know the limitations of your mix?
- How else do you test for workability?
  - Is your first workability test at the first placement?



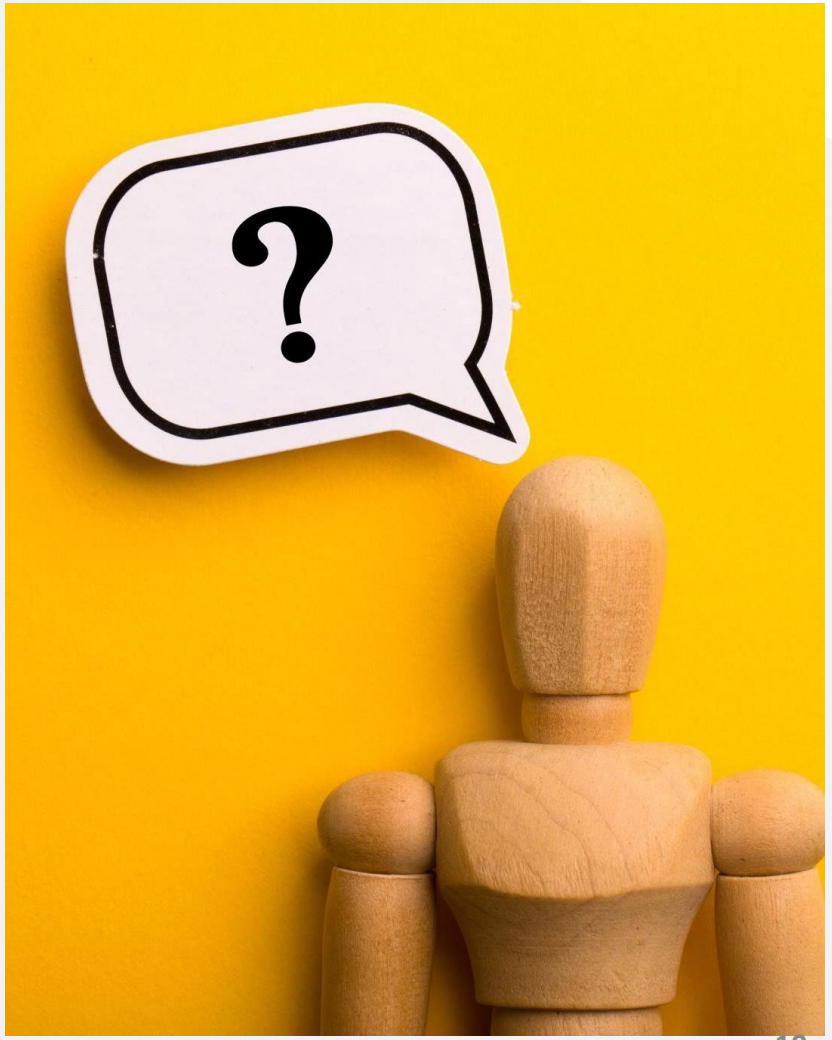
HOW?

- I need a mix proportioning sheet
- I need a mixer
- I need calibrated scales for weighing materials
- I need ml syringes
- I need moisture conditioned aggregates



HOW?

- I need the box testing equipment
- I need a slump cone
- I need cylinder or beam molds
- I need air testing equipment



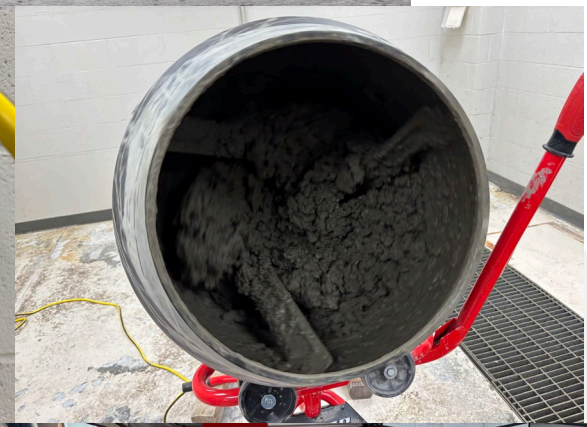
Cost

- ~$40-50
- Syringes
- Wood
- Water

Will a contractor do this?









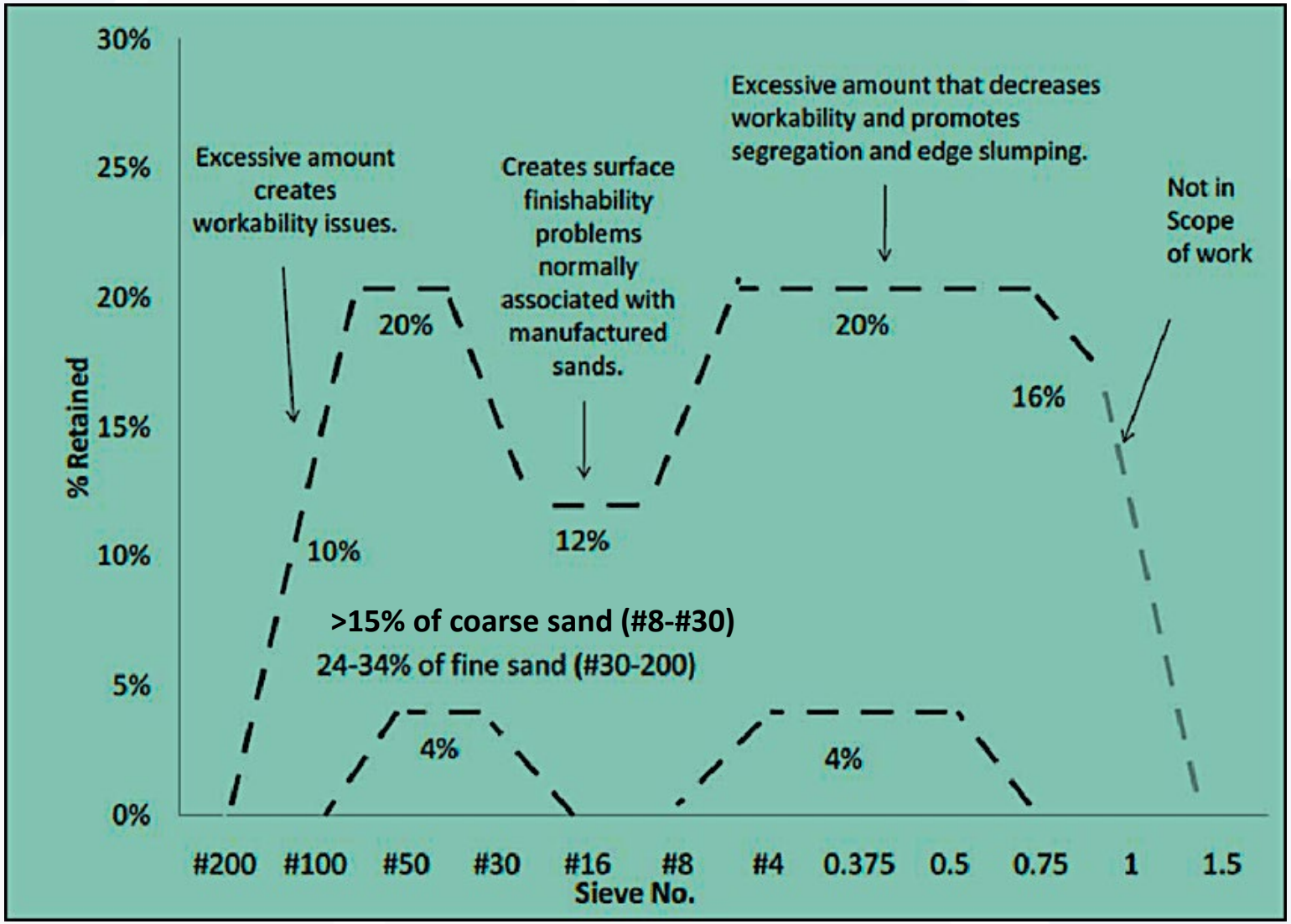



Starts with Combined Aggregates

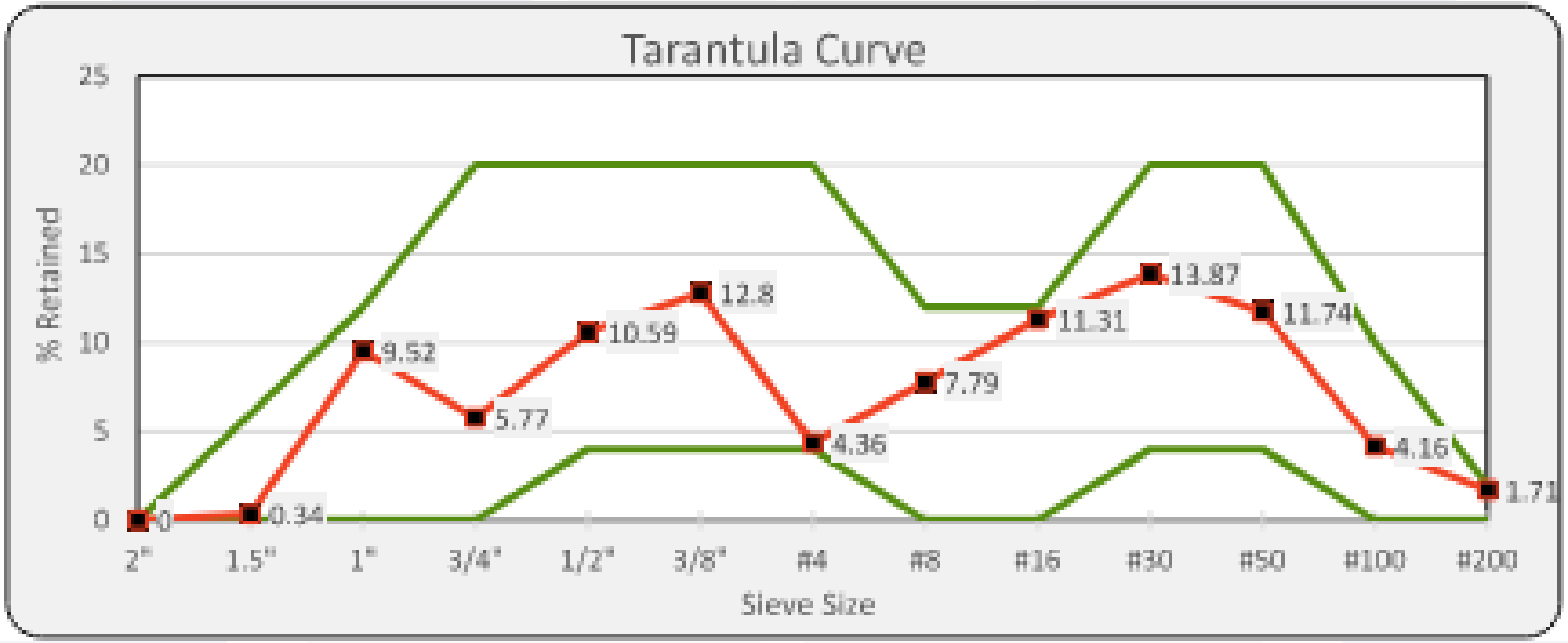
Aggregate Gradations (% passing)						Percent Retained					Percent Contributed			
Sieve Size	Spencer Quarry Stone 1	Spencer Quarry Stone 2		LG Everist Concrete Sand	Total	Spencer Quarry Stone 1	Spencer Quarry Stone 2	0	LG Everist Concrete Sand	Total	Spencer Quarry Stone 1	Spencer Quarry Stone 2	0	LG Everist Concrete Sand
Percent	42	18		40	100	42	18		40	100	42	18		40
2"	100	100		100	100					#VALUE!				
1.5"	100	100		100	100					#VALUE!				
1"	94.8	100		100	97.82	2.184				2.18	100%			
3/4"	68.5	100		100	86.77	11.046				11.05	100%			
1/2"	27.7	94.4		100	68.63	17.136	1.008			18.14	94%	6%		
3/8"	15.3	76.9		100	60.27	5.208	3.15			8.36	62%	38%		
#4	4.5	33.2		96.5	46.47	4.536	7.866		1.4	13.8	33%	57%		10%
#8	2.8	12.9		89.1	39.14	0.714	3.654		2.96	7.33	10%	50%		40%
#16	0.7	1.4		78.1	31.79	0.882	2.07		4.4	7.35	12%	28%		60%
#30	0.6	1.2		55.9	22.83	0.042	0.036		8.88	8.96	0%	0%		99%
#50	0.5	1		20.1	8.43	0.042	0.036		14.32	14.4	0%	0%		99%
#100	0.3	0.7		3.4	1.61	0.084	0.054		6.68	6.82	1%	1%		98%
#200	0.1	0.3		1	0.5	0.084	0.072		0.96	1.12	8%	6%		86%

Gradations

- Mix Designs should always start with combined gradations
- Aggregates have the largest impact on the mix



Gradations


Tarantula Curve
% Retained
25
20
15
10
5
0
0
0.34
9.52
5.77
10.59
12.8
4.36
7.79
11.31
13.87
11.74
4.16
1.71
2"
1.5"
1"
3/4"
1/2"
3/8"
#4
#8
#16
#30
#50
#100
#200
Sieve Size

Balance Out A Cubic Yard

Mix Design Cost Analysis								
	Material	Weight, lbs. (or oz)	Specific Gravity (SSD)	$/unit	Plant Loss	Unit Cost	Density	Volume
Cement	Dacotah Type IL	432	3.17	$226.00	1.03	$ 50.28	197.808	2.184
	Eco Material F Ash	144	2.52	$128.50	1.03	$ 9.53	157.248	0.916
Course Aggregate	Spencer Quarry Stone 1	1290	2.641	$ 30.75	1.05	$ 20.83	164.7984	7.829
	Spencer Quarry Stone 2	553	2.622	$ 17.75	1.05	$ 5.15	163.6128	3.380
	0	0	0	$ 20.75	1.05	$ -	0	0.000
Fine Agg	LG Everist Concrete Sand	1229	2.65	$ 15.75	1.1	$ 10.64	165.36	7.431
Water	Municipal Water	219	1	$ 20.00	1.1	$ 0.58	62.4	3.510
Add Mix	GRT - Polychem VR	2.9	n/a	$ 3.35	1.02	$ 0.08		
	GRT - Polychem Paver Plus	5.8	n/a	$ 4.48	1.02	$ 0.21		
	GRT - Dynamon SX	7	n/a	$ 13.71	1.02	$ 0.76	Air:	1.755
	0	0	n/a	$ 9.00	1.02	$ -	CY:	27.004
	0	0	n/a	$ 13.28	1.02	$ -	Aggregate Weight:	3072
	Mix Wt., lbs.:	3867		Plant Total/CY Cost:		$ 98.06		

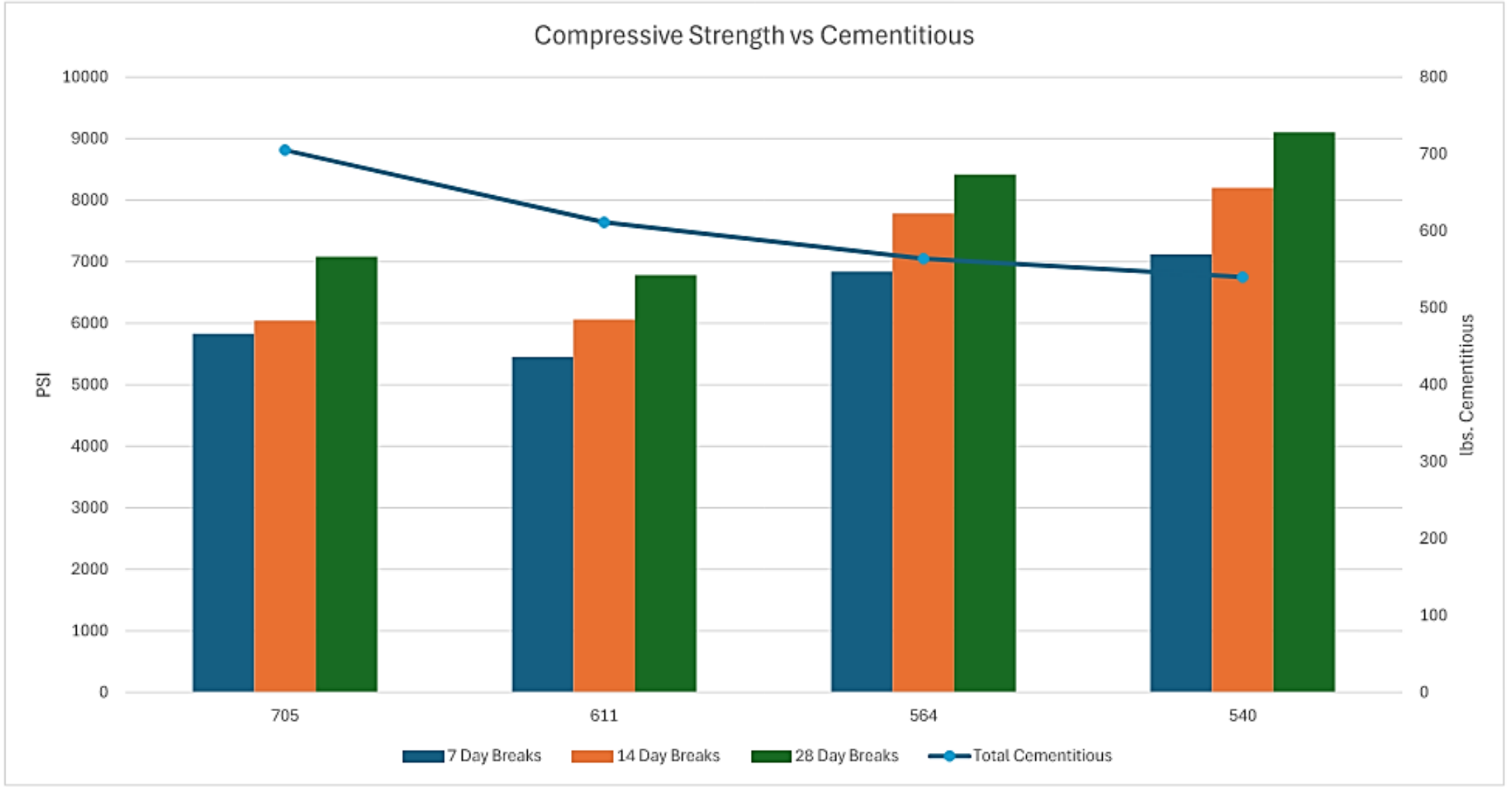
Trail Batch

Scott Blanton - Delta Industries - Limestone (564) 4-4-2025 Test														
Material	0.04 CU YD	1 CU FT	Moisture Adjustment	Actual lbs.	Moisture %	Agg Abs %	Agg Water	Milliliter Target	OZ/CWT Target	Milliliter Actual	Ounces Actual	OZ/CWT Actual	OZ/CY Actual	W/CM Target
Hannibal IL Continental	451	16.70		16.7										0.381
ECO Miller Class C Flyash	113	4.19		4.19										W/CM Actual
1" Limestone #57	1236	45.76	46.17	45.76	2.0%	1.1%	0.41							
Limestone #8	665	24.64	24.93	26.64	2.0%	0.8%	0.32							0.382
Pea Gravel #8	0	0.00	0.00	0	2.0%	4.5%	0.00							Air
Concrete Sand	1267	46.93	49.80	46.93	7.0%	0.9%	2.86							6.0%
Municipal Water	215	7.96	4.38	4.4			7.99							Slump
Chryso Air 1000	12	0.44		0.53			0.96	13.1	2.13	13.1	0.443	2.12	11.96	1.0"
Chryso Zyla 610	0	0.00		Gallons			Gallons	0.0	0.00	0	0.000	0.00	0.00	Box Test
Chryso ADVA 140	16	0.59						17.5	2.84	17.5	0.592	2.83	15.98	5-15%
Chryso V-MAR F100	35	1.30						38.3	6.21	38.3	1.295	6.20	34.97	Mix Time
Chryso Recover	22	0.81						24.1	3.90	24.1	0.815	3.90	22.00	35 min

Cement Content

Nevada Mix

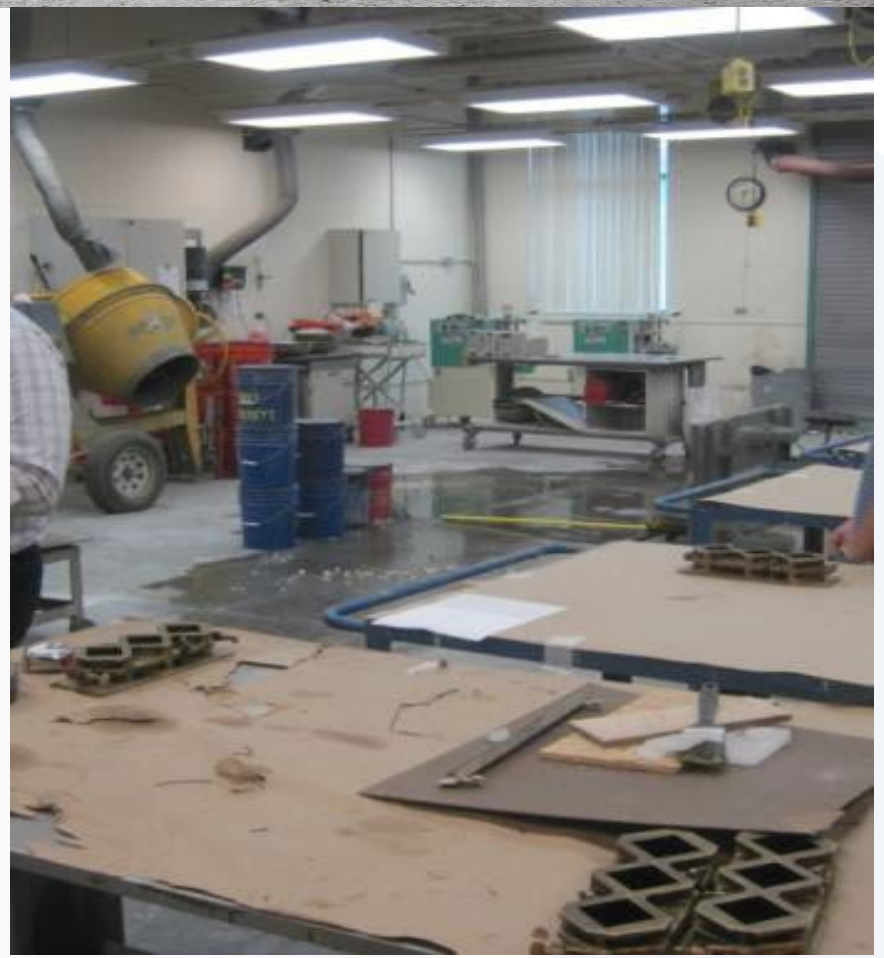
Sack	Total Cementitious	Cement	Class N	#4 Rock	#57 Rock	#89 Rock	Sand	W/CM	Gallons	7 Day Breaks	14 Day Breaks	28 Day Breaks
7.5	705	564	141	550	825	275	1100	0.40	34.17	5830	6040	7080
6.5	611	489	122	587	881	294	1174	0.40	29.38	5450	6060	6780
6	564	452	112	604	906	302	1208	0.40	27.34	6840	7780	8420
5.74	540	432	108	615	923	308	1230	0.40	25.78	7120	8200	9100



FONTE & CO

Trial Batching

- Introduce Aggregates, Cementitious, and Water. (Air Entrainment on the Sand)
- Stop to ensure all materials are mixed. (Scrape the corners if needed)
- Introduce Add Mixtures and visibly look for a change in the concrete. Thoroughly Mix the concrete and test physical properties (Slump, Air, Unit Weight, and The Box Test)
- Simulate the haul. (Agitated or Non-Agitated)
- Test the physical properties again. (Slump, Air, Unit Weight, and The Box Test)
- Is your mix workable at the point of placement?



Trial Batch

- Is the trial batch and the field batch the same concrete?
- Material Variability
- #57 Stone?

Not all Drums are Created Equal

The Box Test

- This test is mandatory for all mix designs.
- This test will tell you how the mix will respond to your paver.
- How well will the mix close up holes
- How well will the mix hold an edge

VKelly

VKelly

Does tell about response to vibration

Adjust aggregate gradation and paste content to achieve desired numbers

Prequalification

FONTE & CO

VKelly

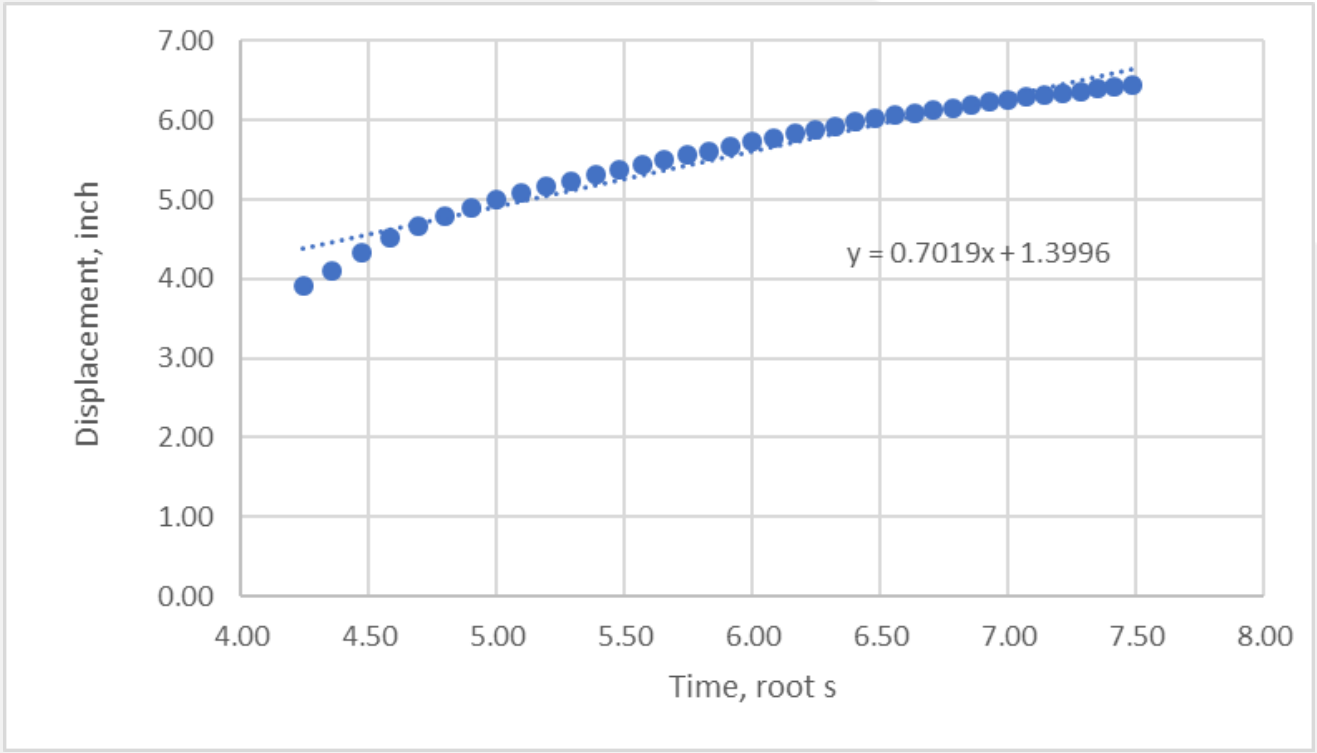
Measure initial slump (initial penetration)

Start vibrator for 36 seconds at 4000 vpm

Record depth periodically

Plot on root time

Calculate slope = VKelly Index



FONTE & CO

Should we start over?

Aggregates & Water Reducers

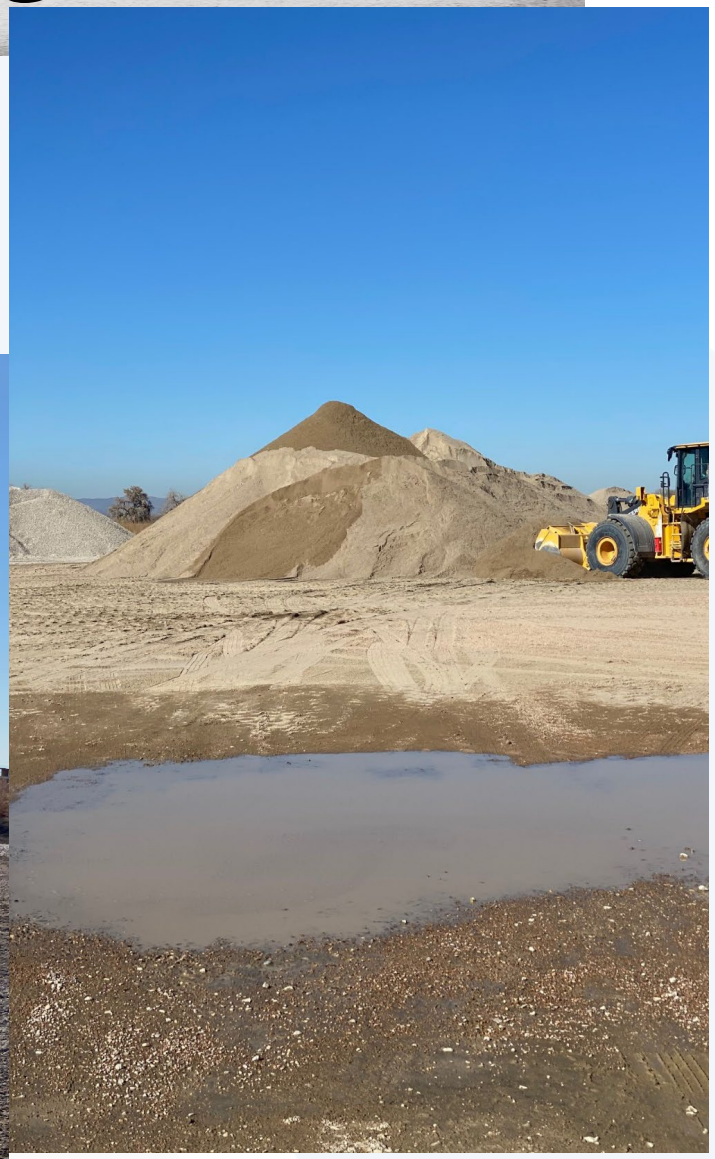
- Mix Designs should always include water reducer effectiveness testing.
- The water reducer can have the second largest impact in the mix.
- Not all water reducers are compatible with all the SCM's or Cements

What About Handwork?

- How do I increase slump?
- What does my admixture package look like?

What About Handwork?

Aggregate Moisture



Aggregate Moisture

Aggregate Moisture

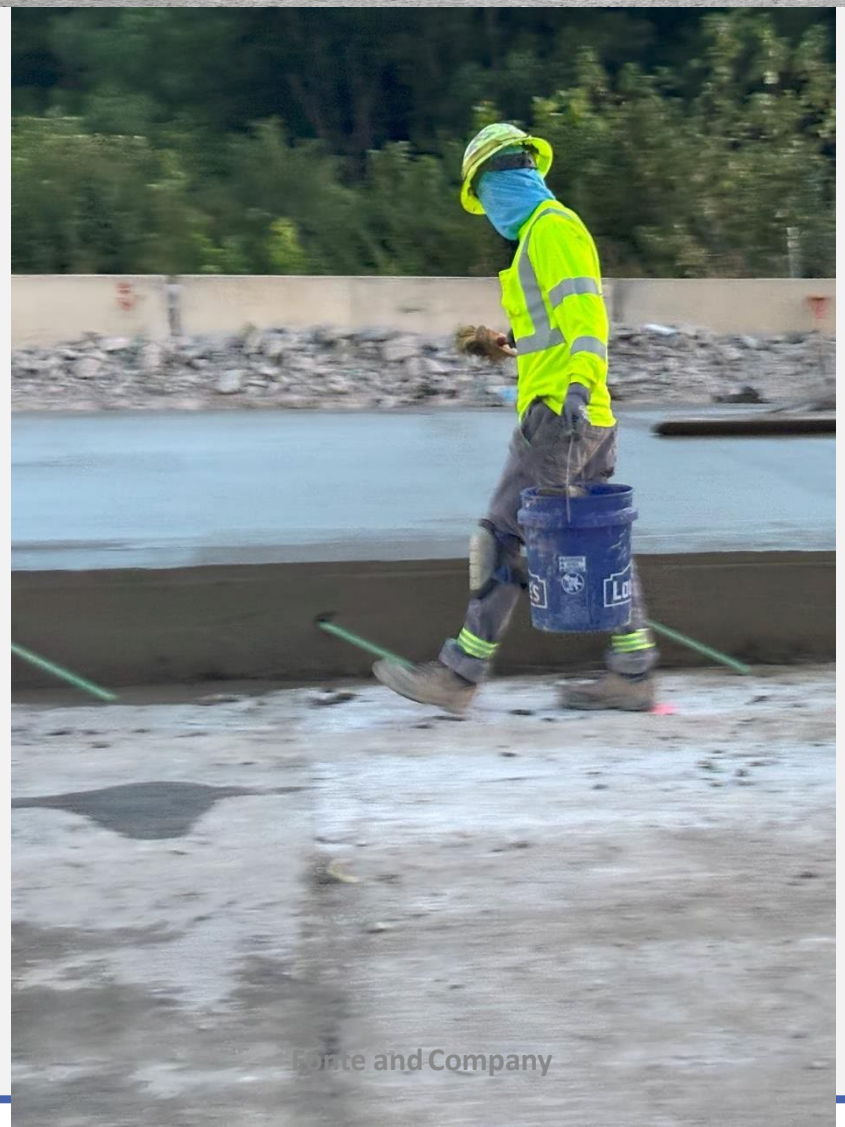
- 520 total cementitious
- 218 lbs. water
- W/CM 0.42
- 3215 lbs. aggregate
- 1% change in aggregate moistures
- 218+32 lbs. water
- 250/520=0.48

Slump

Slump

- Should slump water be counted in the water cement ratio?
- Temper water
- Trim water

No paint brushes EVER!!!



Scaling

FONTE & CO

Summary

- Trail Batching is essential
- Allow for calculated adjustments to the mix during production
  - Aggregate proportions
  - Admixture dosages
- Adjust the mix to improve workability
- Adjust the admixture package for handwork
- Lab verification??

FONTE & CO

Thank You

Matt Fonte

303-478-1529

matt@fonteandco.com

www.fonteandco.com

FONTE & CO

CONSULTING

TRAINING

CONSTRUCTION EQUIPMENT

"HELPING YOU BUILD BETTER CONCRETE"

FONTE & CO