



A PRECASTER'S PERSPECTIVE ON TYPE II CEMENT

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**3.5
YEARS**





**WHY AM I
UP HERE?**

**LET'S *BURN* INTO
THIS *HOT* TOPIC**



What is Portland Limestone Cement?



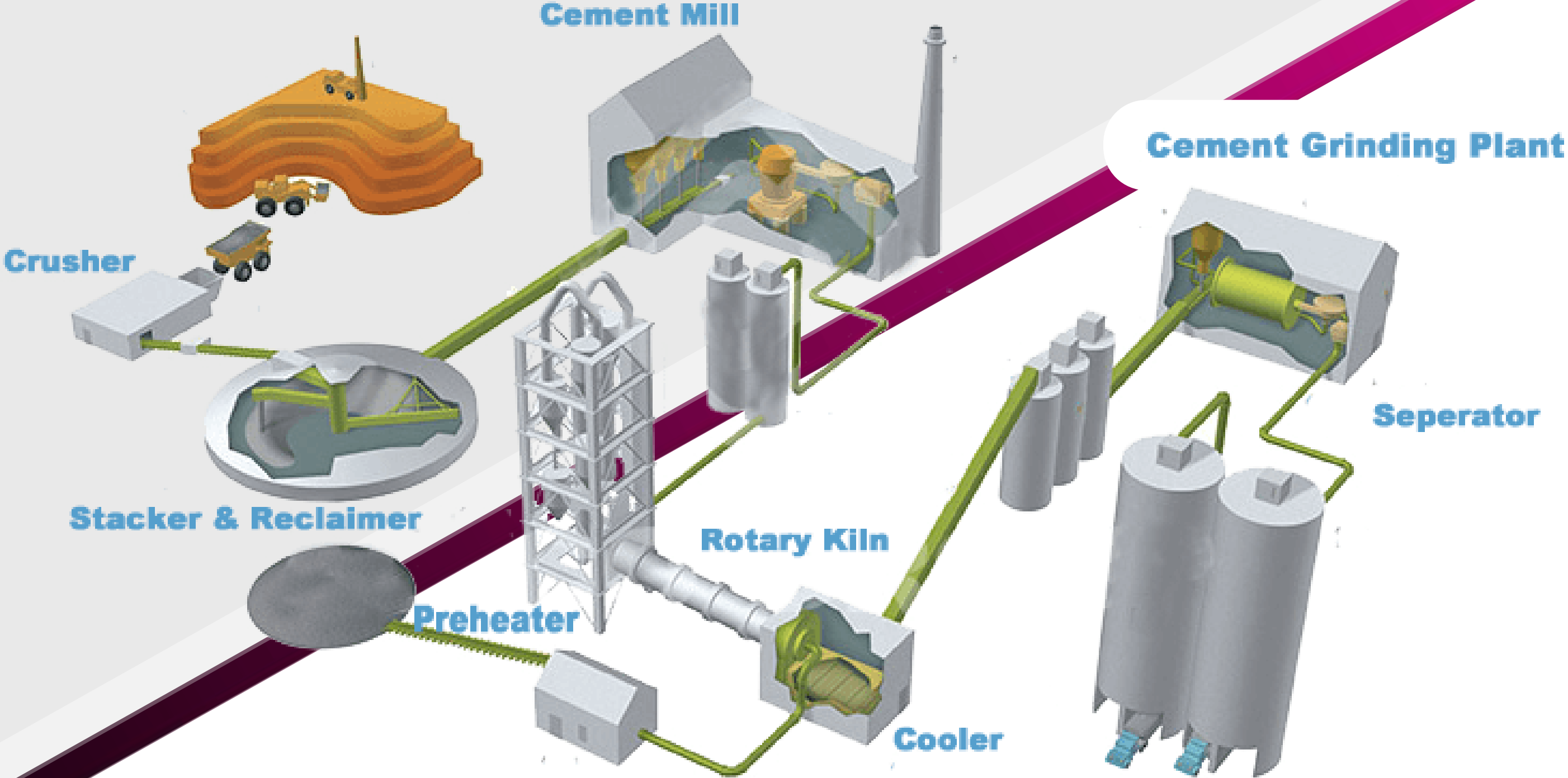
- 5 to 15% limestone by mass is introduced in the final grinding process

Portland Cement
=
**91% Reactive
Clinker**

**Portland
Limestone Cement**
=
**83% Reactive
Clinker**

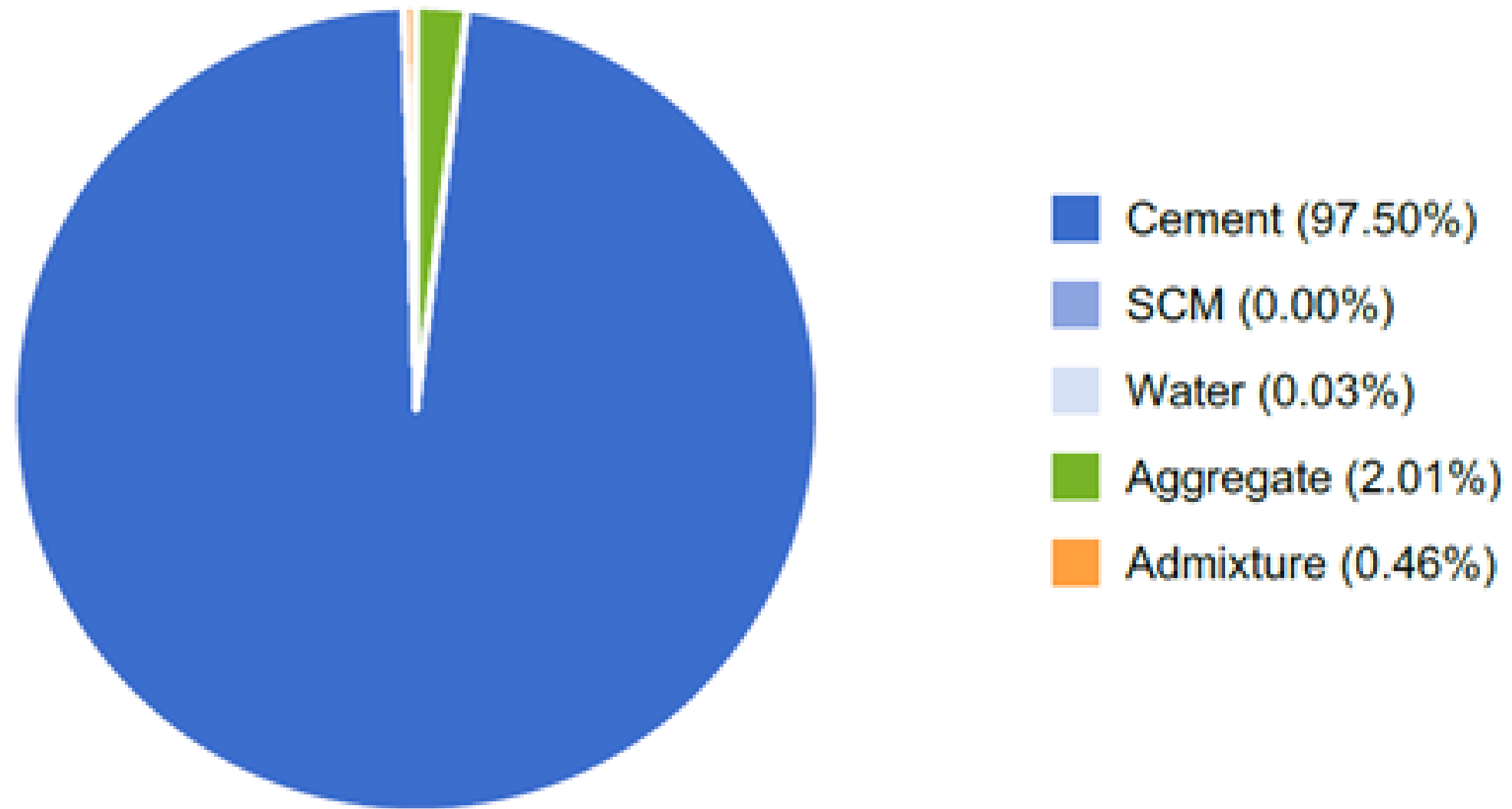


What is Portland Limestone Cement?



Why the Market + Government is going After Cement?

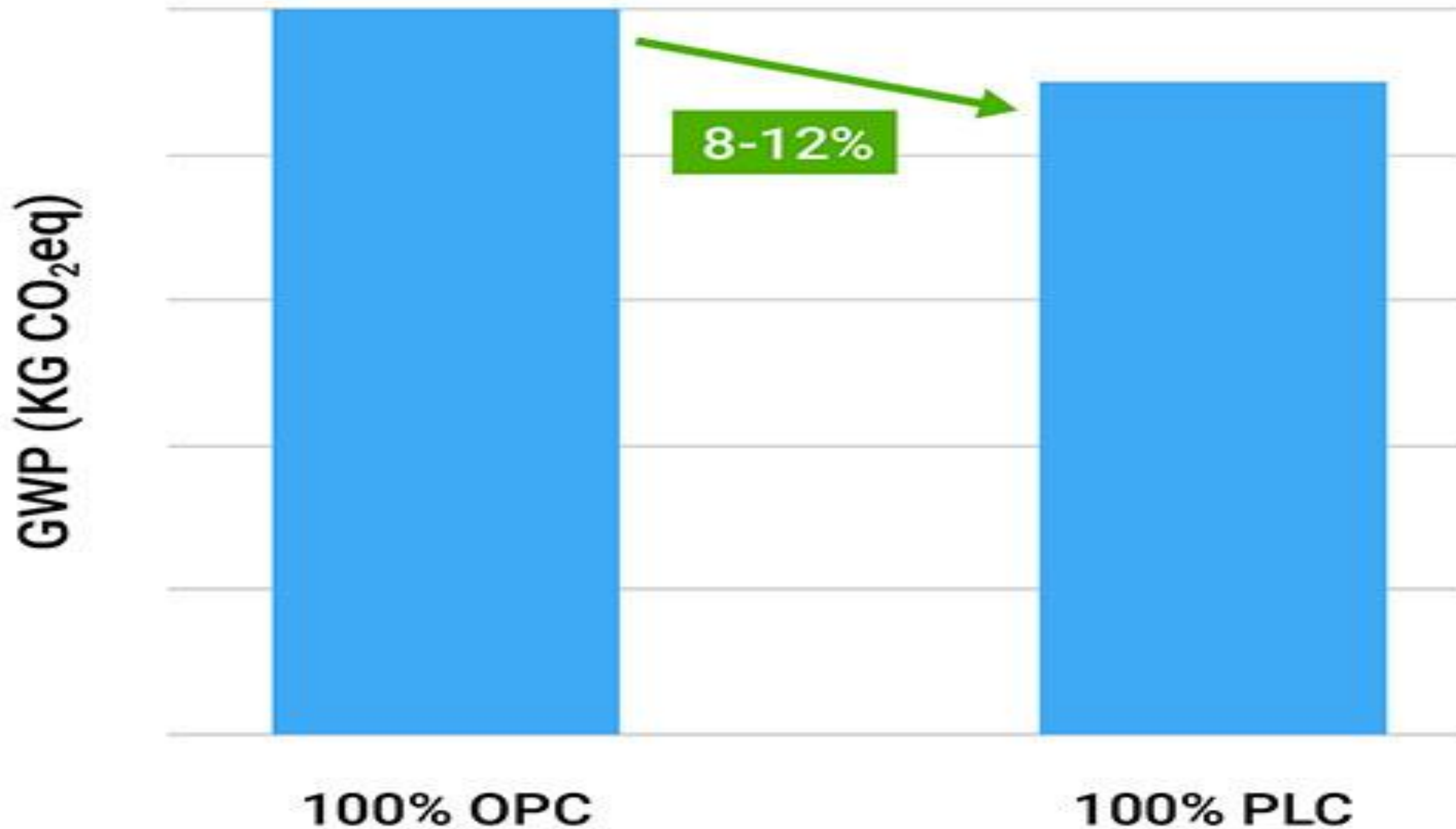
No XS55, 750 lb/yd³ cement, CO₂e: 279 kg CO₂e/yd³



How Does Portland Limestone Cement Reduce CO₂?

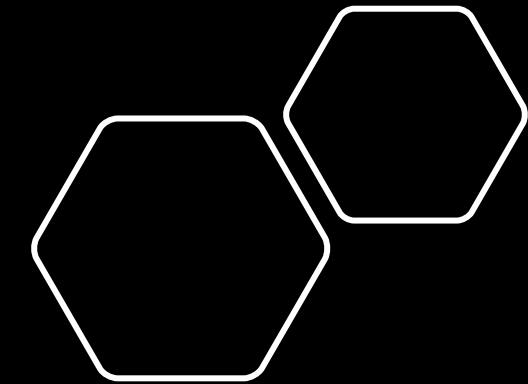
- By not heating 10% to 15% of the Cement by weight of material.
- 10% to 15% is not heated to 2,700 Degrees Fahrenheit therefore reducing CO₂ emissions.

PLC Lowers the CO₂ by 8-12% per Ton of Cement



4.1 Billion Tons of Concrete was produced Globally in 2023.

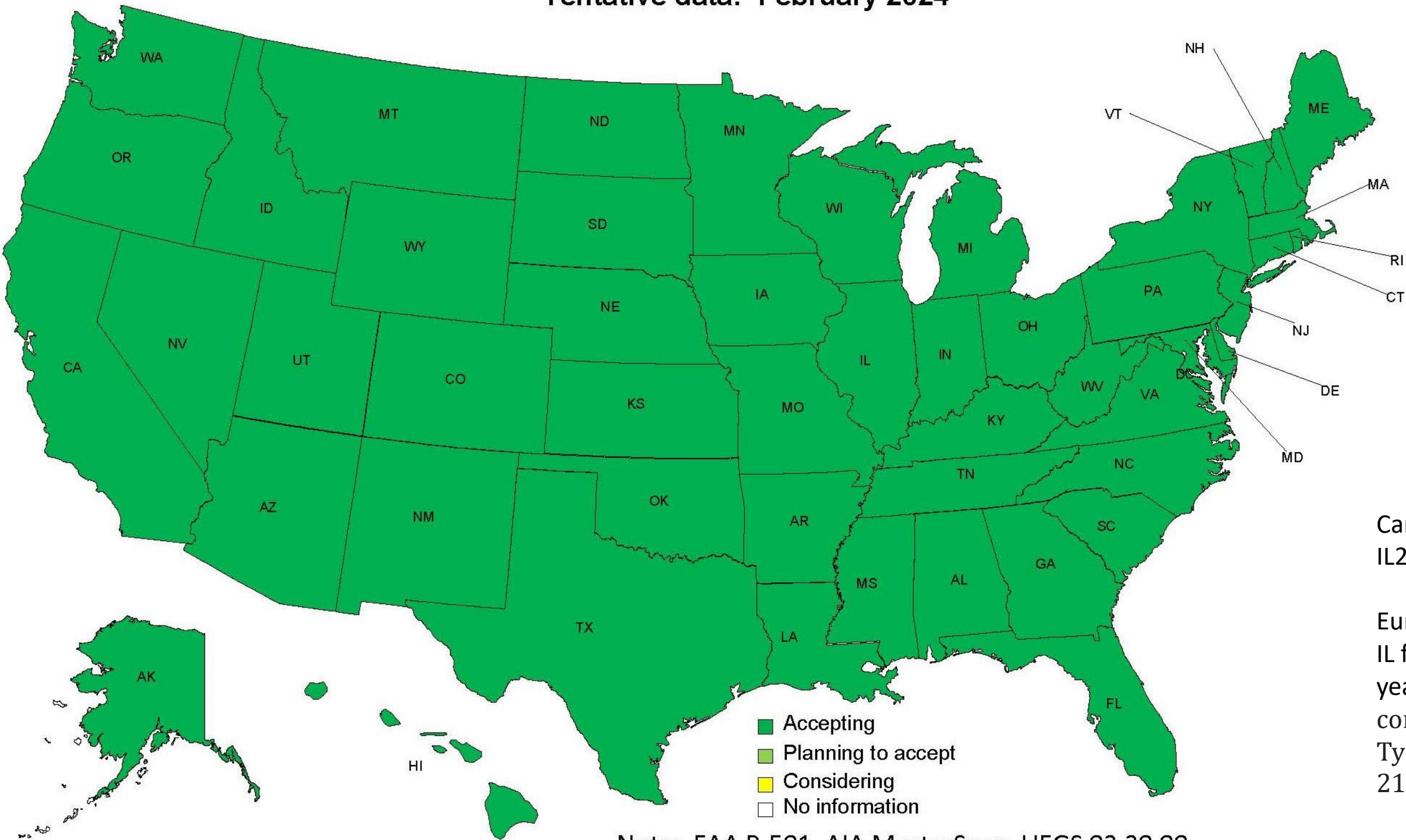
GWP – Global Warming Potential



- An Environmental Product Declaration is a communication document that quantifies environmental impact data from manufacturing a product.
- Will be needed to produce for government funded projects. You will have to prove that your product stays below the carbon footprint allowed for a job.
- Think of this as a nutrition label on food products.

State DOT Acceptance of Portland-Limestone Cement

Tentative data: February 2024



Canada currently using IL20

Europe has been using IL for more than 40 years. Type II/A-L containing 6-20% and Type II/B-L containing 21-35%

Note: FAA P-501, AIA MasterSpec, UFGS 03 30 00, and ACI and ICC building codes permit use of PLC

STAY IN MY LANE

Strength Development

What strength is crucial to precasters?

10-12 hr Strength

=

**To Strip
Forms and
Lift Product**

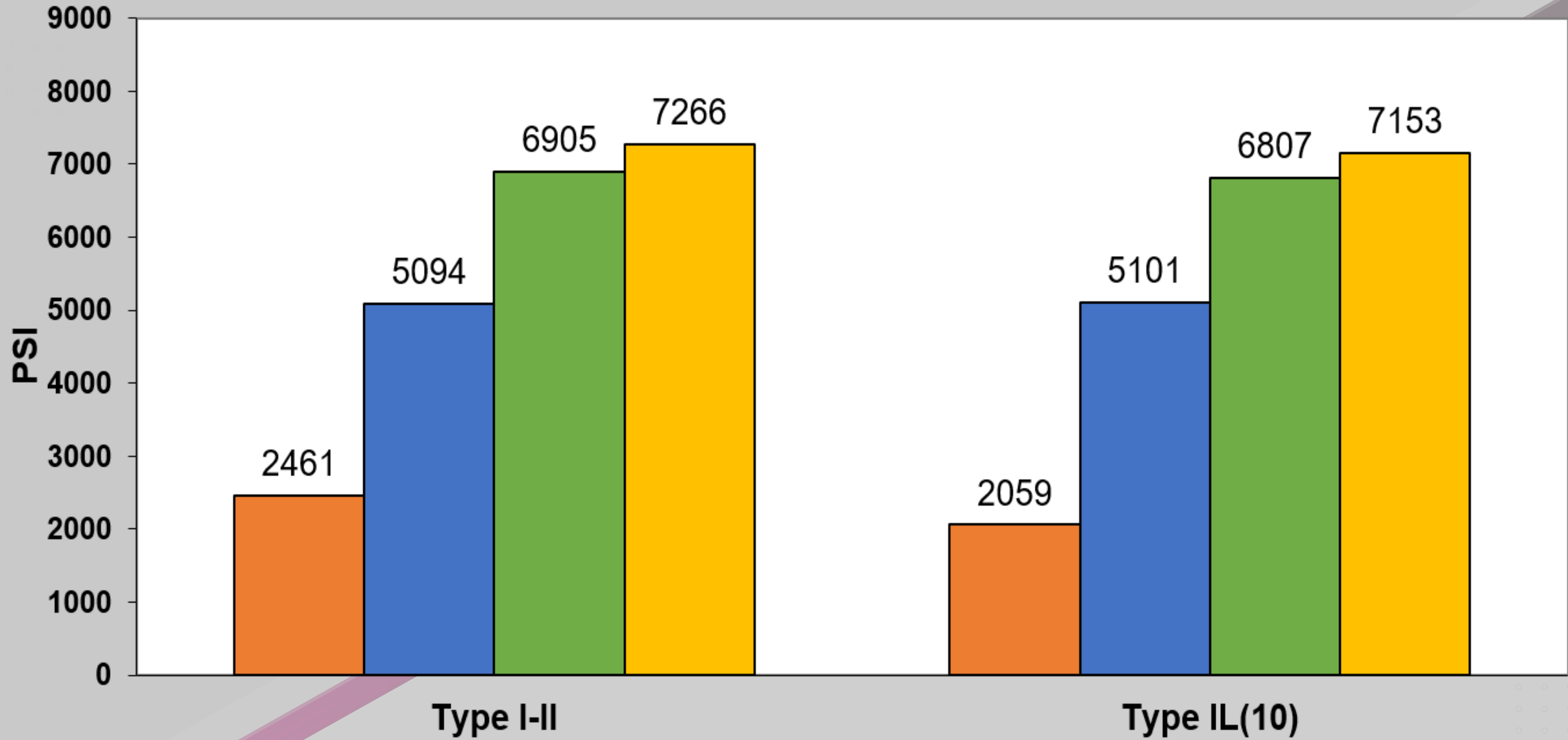


This is why IL can be an issue for Precasters!

- Early age strength
- Early age shrinkage



Mix Design Comparative Testing Compressive Strengths



! The dilution of the mix design is based on replacing reactive clinker with 5-15% limestone

1 Day 7 Day 28 Day 56 Day

Strength Development

SCC 80+ Mix 1										
	Yield	oz/cwt	oz/yd	1 Yard	UOM	specific gravity	Yield 1 Yard	Gal	DOTD Code	DOTD SMM
Cement Portland Type I/II				705	lb	3.15	3.59		772	APS0000200
Sand				1296	lb	2.58	8.05		AY16	APS00007020
Aggregate - 3/8"				1448	lb	2.59	8.96		AY16	APS00007020
Glenium 7920 (Dosage 2-12 oz/cwt)		5.0	35	2	oz	1.00	0.04	0.27	58FD	APS00001280
Master Set R 961		0.8	11	1	oz	1.00	0.01	0.09		APS00001280
MB Air Entraining (2-7%) (Dosage 0.13-4 oz/cwt)	7%	0.71	5	0	oz	1.00	1.89	0.04	58EH	APS00001280
Total Water				279	lb	1.00	4.47	33.43		
				3,731	Lbs		27.00	Cu Ft		
Density lbs/cu.ft.	138.2									
Water / cement ratio	0.40				Note	R-961 11oz summer; 5 oz winter				
Paste (10 cu ft/ cu yd ideal) (C +A + W)	9.95									
C/W	2.53					IL Specific Gravity = 3.10-3.12				
28 Day Strength - psi (4,500 min) = 2700*C/W - 760	6,065									
Spread (24"-32")	26									

Strength Development

Type I/II

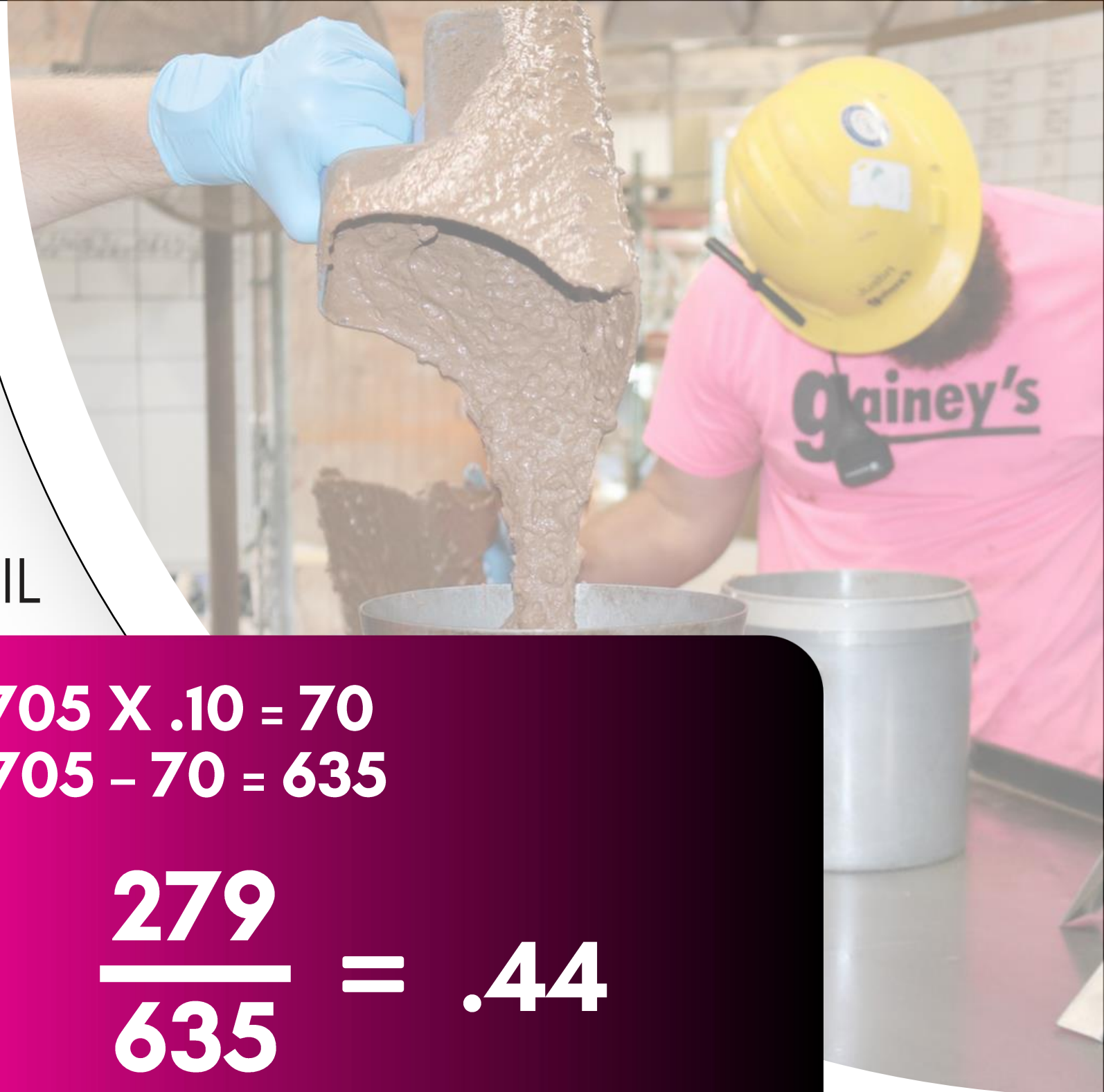
W/C Ratio

$$\frac{279}{705} = .40$$

Type II

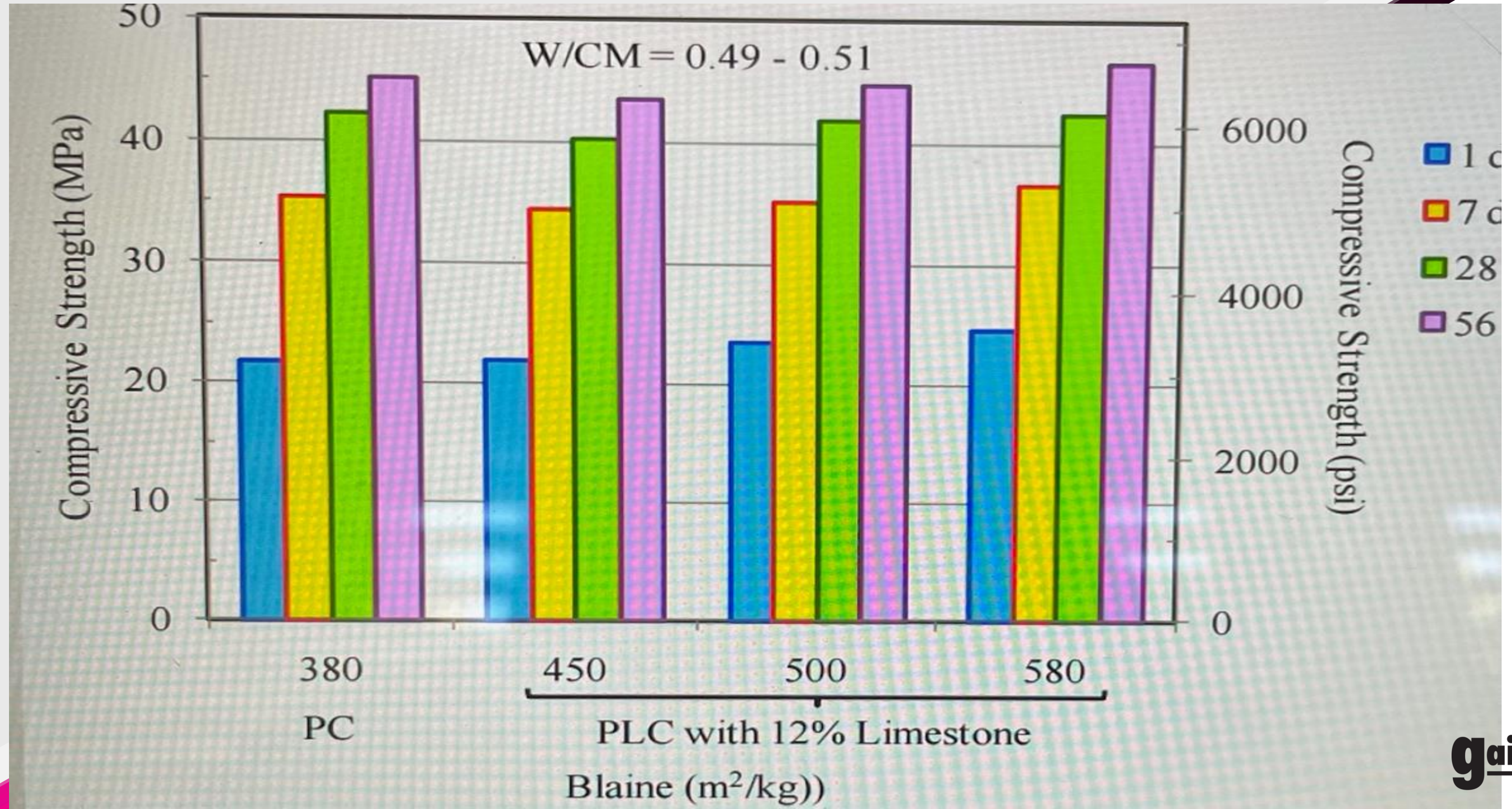
$$705 \times .10 = 70$$
$$705 - 70 = 635$$

$$\frac{279}{635} = .44$$



Strength Development

Impact of Blaine or "Fineness"



**Lower Early
Strengths**

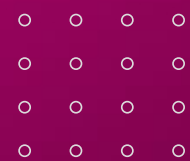
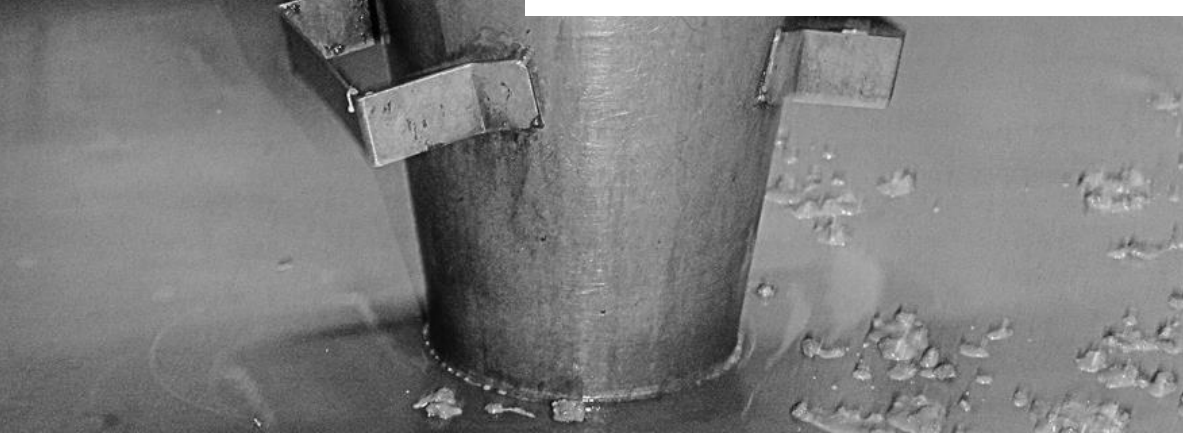
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**Increased Cost
for Precasters**





1L Eventually Catches Up in Strength



①

Particle
Packing

②

Additional
Nucleation

③

Lower
C3A
tricalcium
aluminate

BUT...

DRYING SHRINKAGE

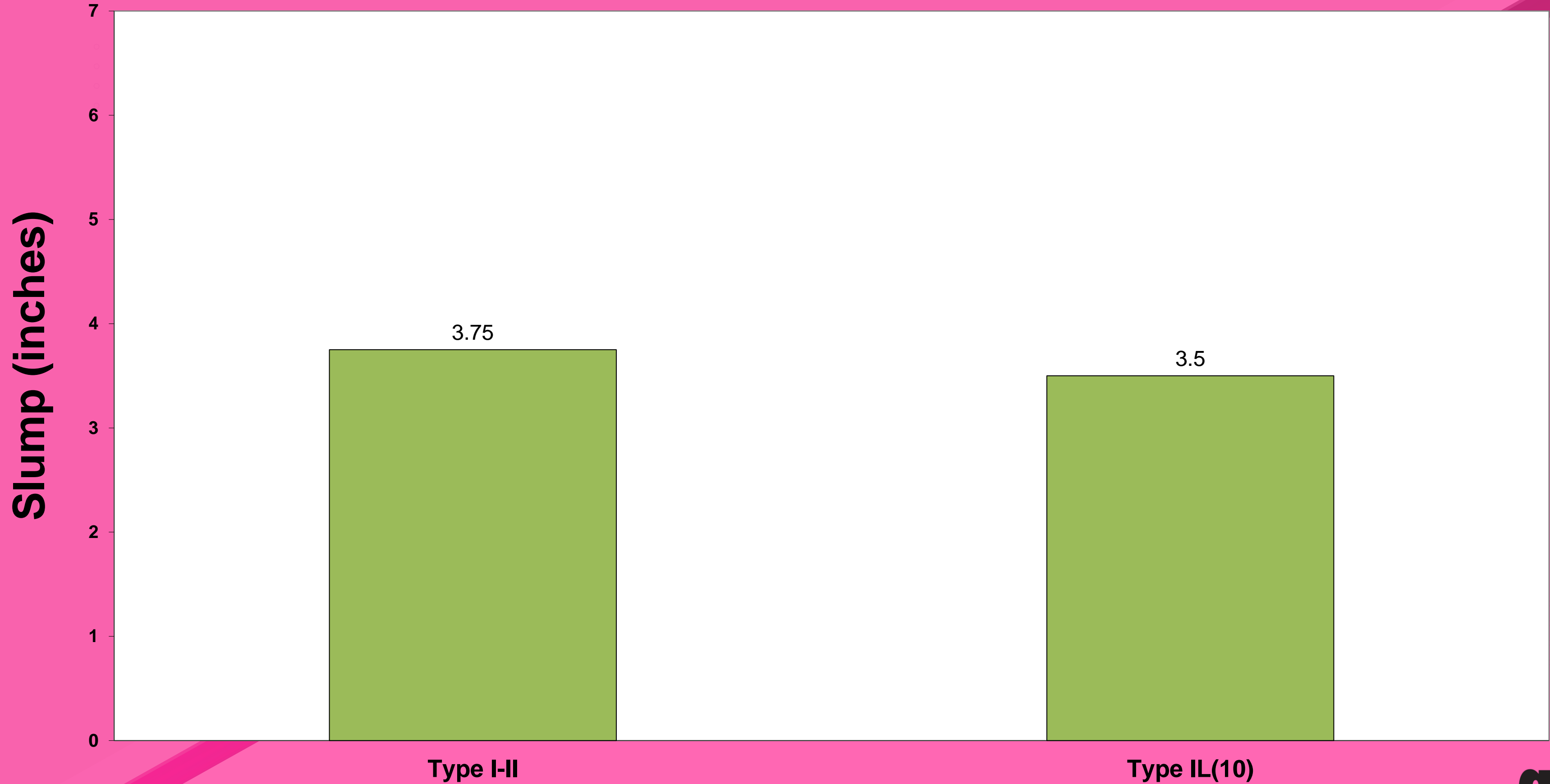


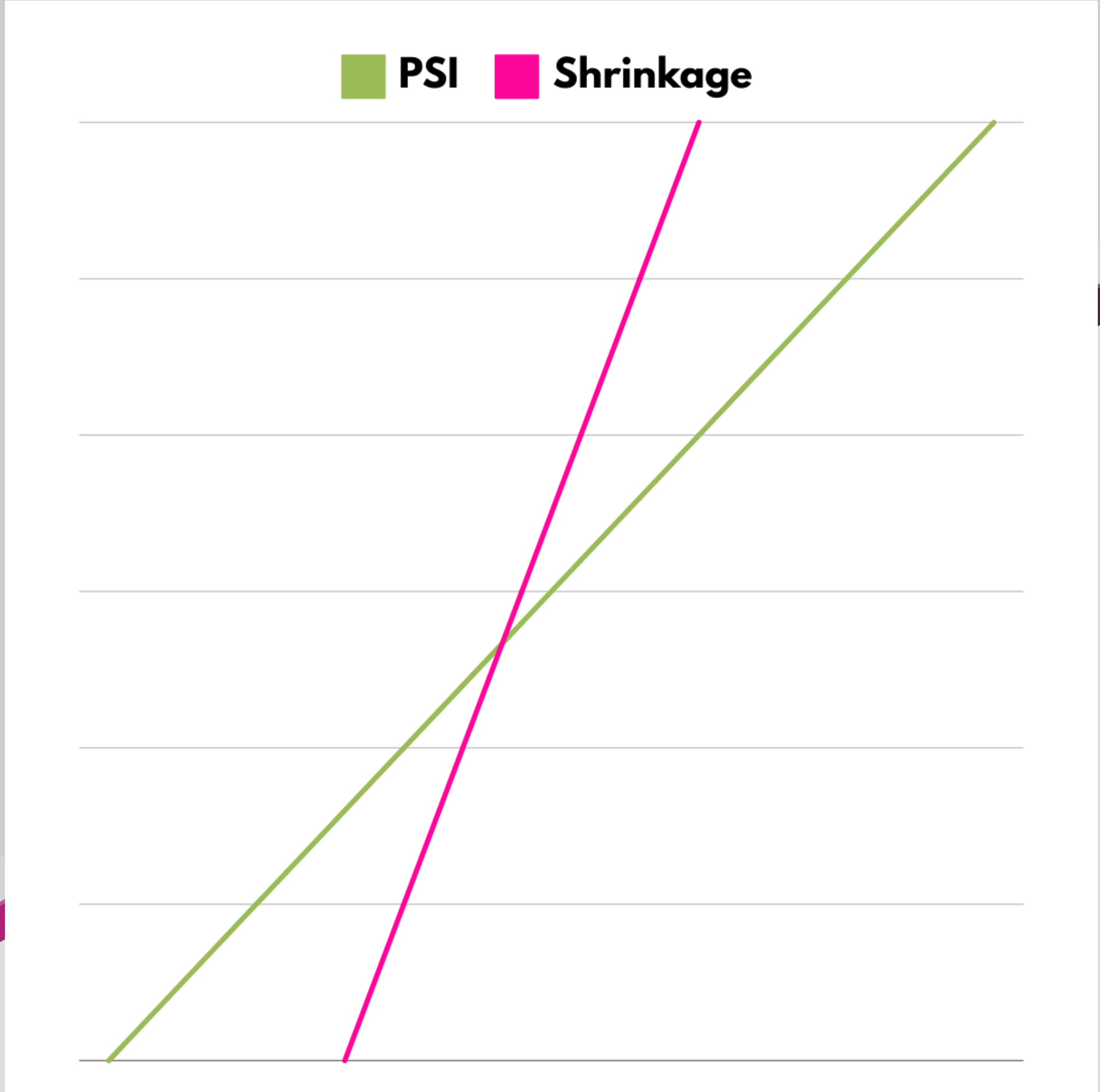
**Type I/II
VS
Type II**



Mix Design Comparative Testing

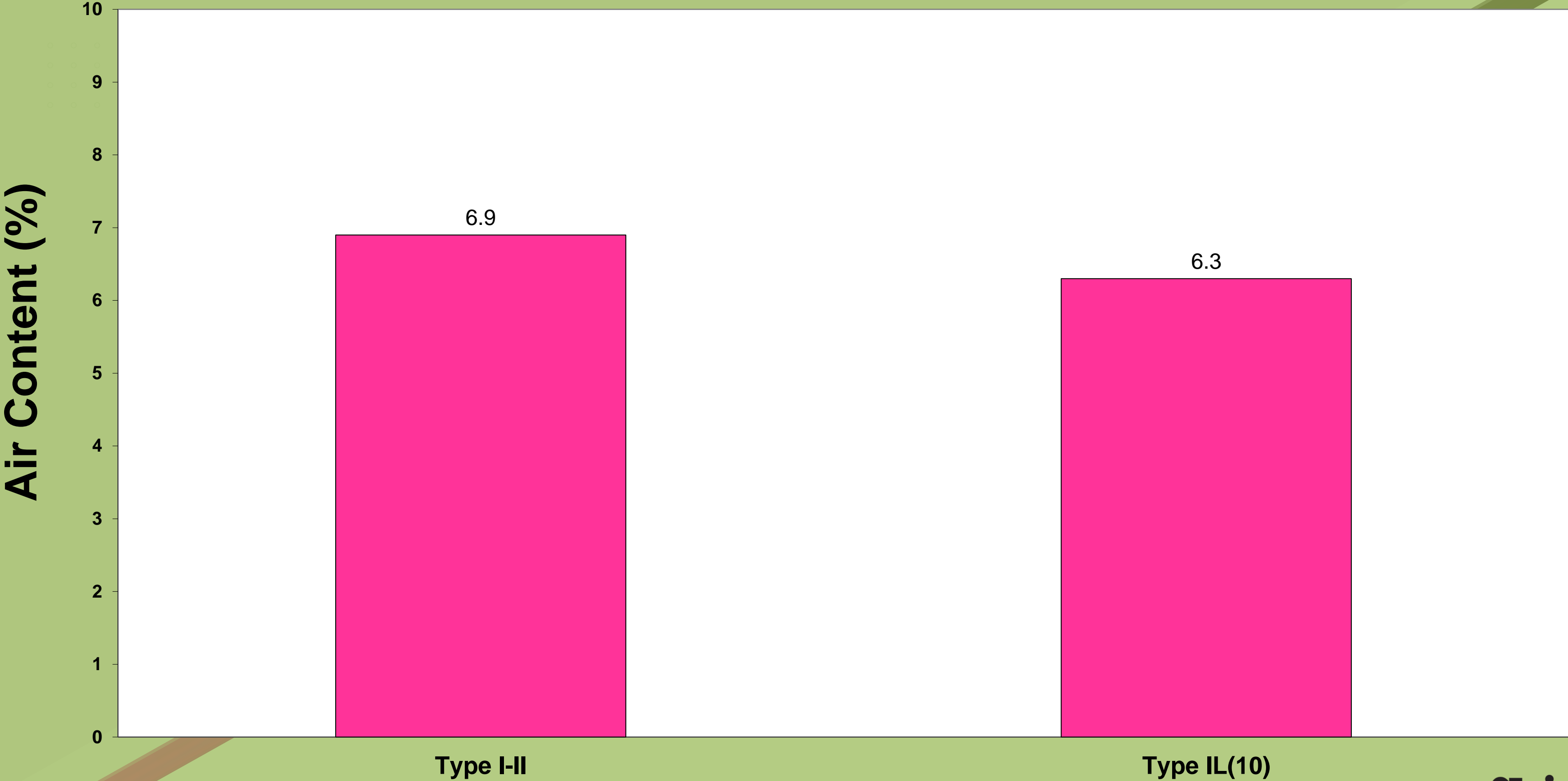
Water Demand - w/c ratio of 0.431





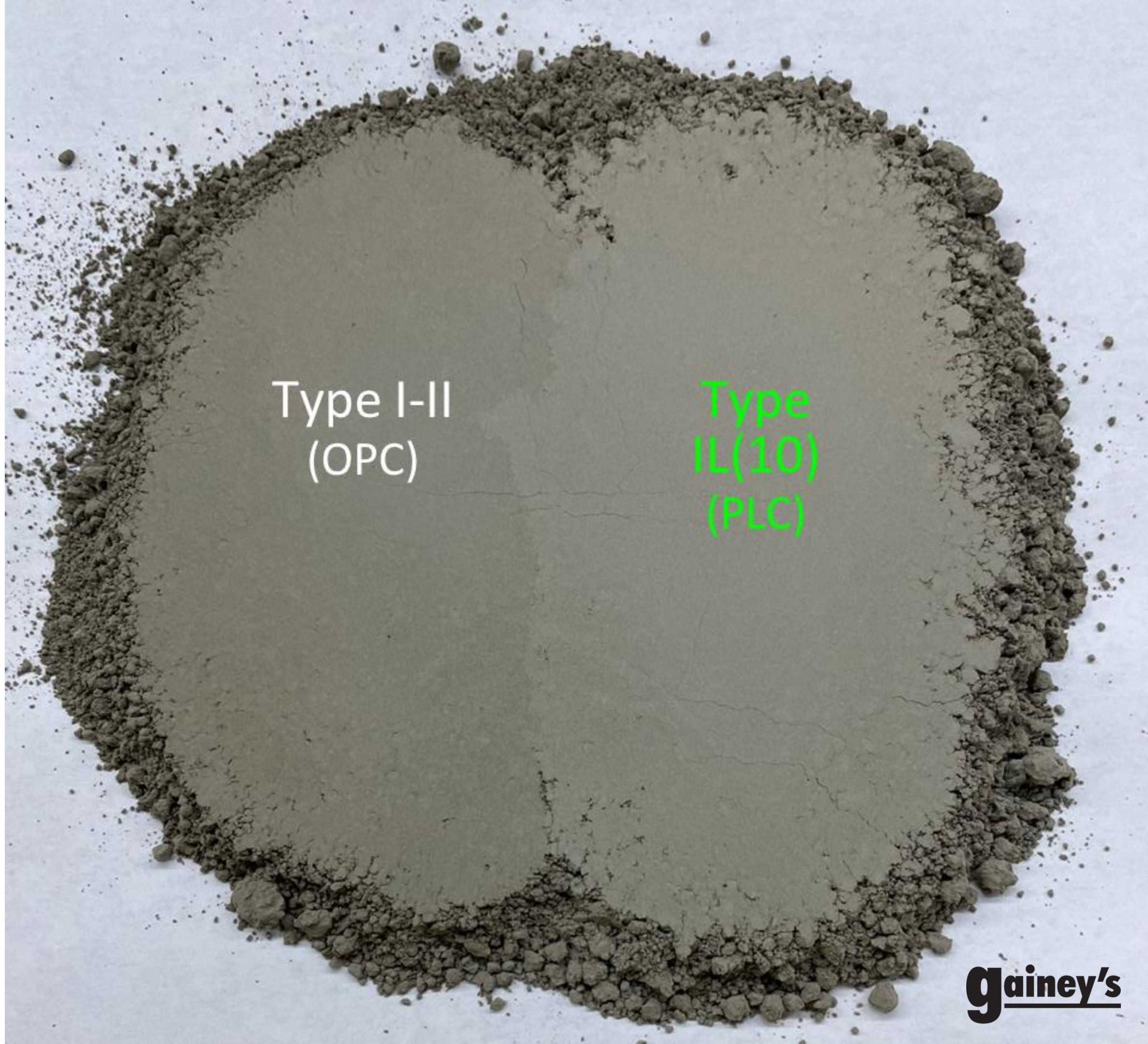
Mix Design Comparative Testing

Air Content





Color Comparison



Type I-II
(OPC)

Type
IL(10)
(PLC)



