EUCLID CHEMICAL

Integrally Colored Concrete Best Practices

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INCRETE® SYSTEMS

DECORATIVE CONCRETE BY EUCLID CHEMICAL

What is Integral Color ?

Raw Material

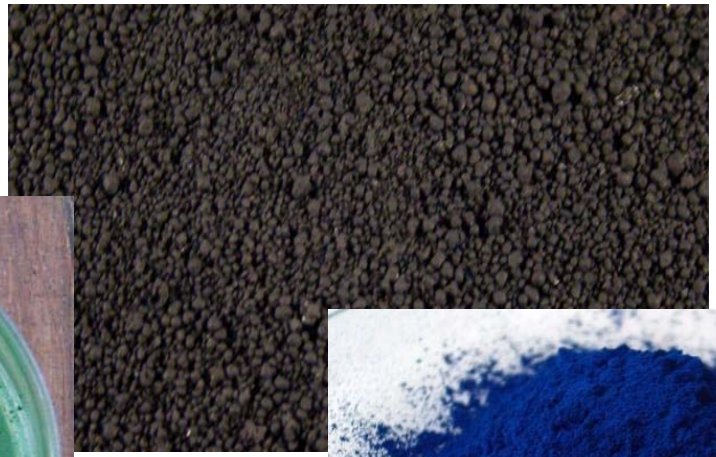
- ❑ Synthetic Iron Oxides
- ❑ Natural Oxides
- ❑ Organic Pigments

Synthetic Iron Oxides

- Most Prevalent in the Industry
- Processing of Metallic Iron with Nitrobenzene
- High Tint Strength
- UV Stable
- Weather Stable
- Insoluble in Water

What is Integral Color ?

Organics



- Carbon Black, Phthalo Blues and Greens
- High Tint Strength
- NOT Weather Safe. Susceptible To Fading
- May Affect Air Entrainment

What is Integral Color ?

Available in Three Basic Forms

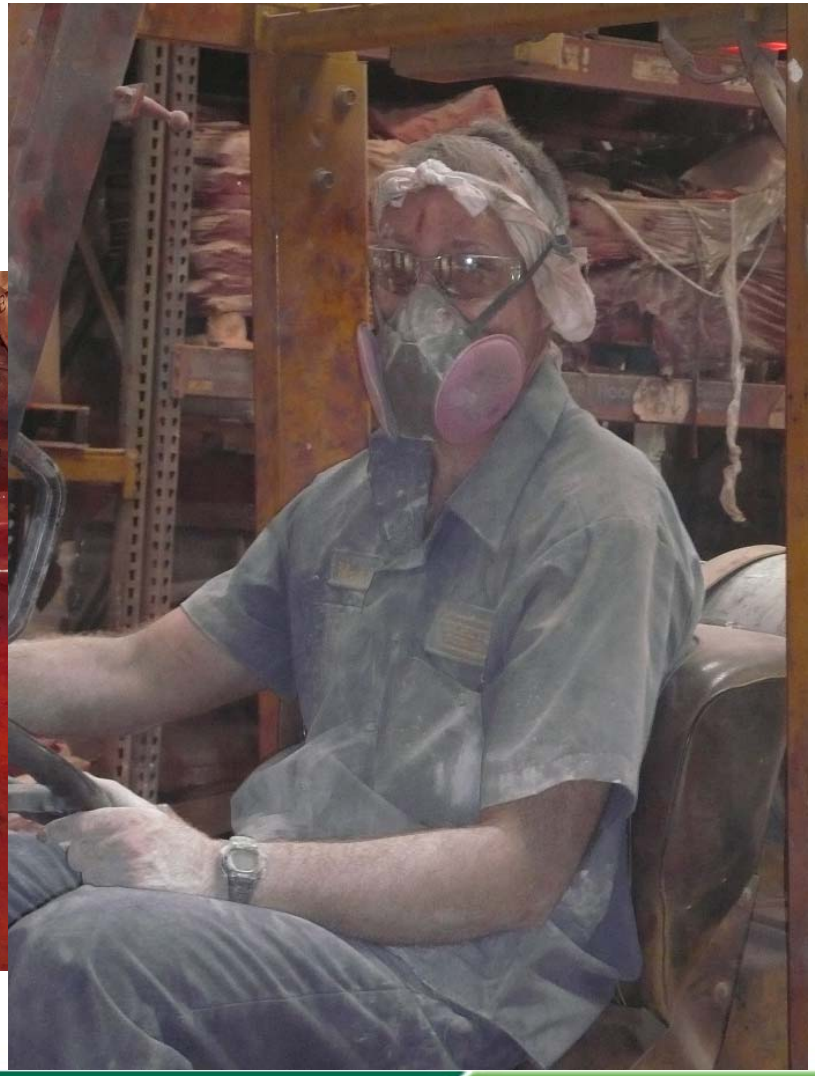
- Powder
- Liquid
- Granular

What is Integral Color

Powder

What is Integral Color

Powder



What is Integral Color

Liquid

What is Integral Color

Liquid

What is Integral Color

What is Integral Color

Granular

What is Integral Color?

Granular Pigment ADVANTAGES

- Lower Dosage than Liquid
- No Shelf Life
- No Product Settling
- No Recycling Required
- Spills Clean Easily- No Mess
- No Freezing
- You Don’t Pay for Water
- Free Flowing Grains
- Low/No Dust
- Pure Synthetic Iron Oxides- No Fillers

What is Integral Color ?

Loading

- Portland is Measured in 94 lb “Sacks”
- Also Designated as “Per 100 Weight” or as a Percentage
- Integral Loading Refers to How Much Integral per Sack
- Whether Powder is Sold by the Pound or by the Yard, Cement Content is the Determining Factor

Additional Information

- Pigment Particles are 10 Times Finer Than Portland
- NOT Meant For Dry Shake Application

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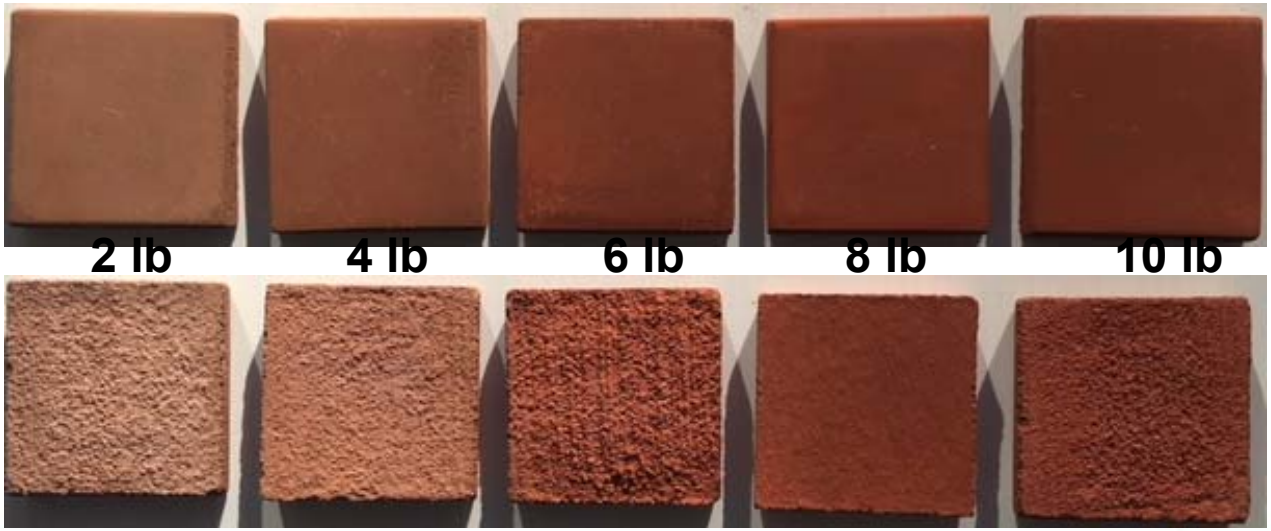
- Can’t Gauge Final Color by Dry Pigment

What is Integral Color ?

Additional Information

- Pigment Particles are 10 Times Finer Than Portland
- NOT Meant For Dry Shake Application
- Colors the Portland Cement Only
- Can't Gauge Final Color by Dry Pigment
- Keep It Under 10% to Avoid Weakening Concrete
- After 6% or 7% Not Much of a Visual Change in Final Color



What is Integral Color ?

ASTM C-979

Sets Standard for Integral Pigments, Including

- **UV Stability**
- **Alkali Resistance**
- **Wettability and Solubility**
- **Curing Stability**
- **Total Sulfates**
- **Affect on Setting of Concrete**
- **Affect on Compressive Strength of Concrete**
- **Color Match of Shipment**

Managing Customer Expectations

- **THE Key to a Good Job**

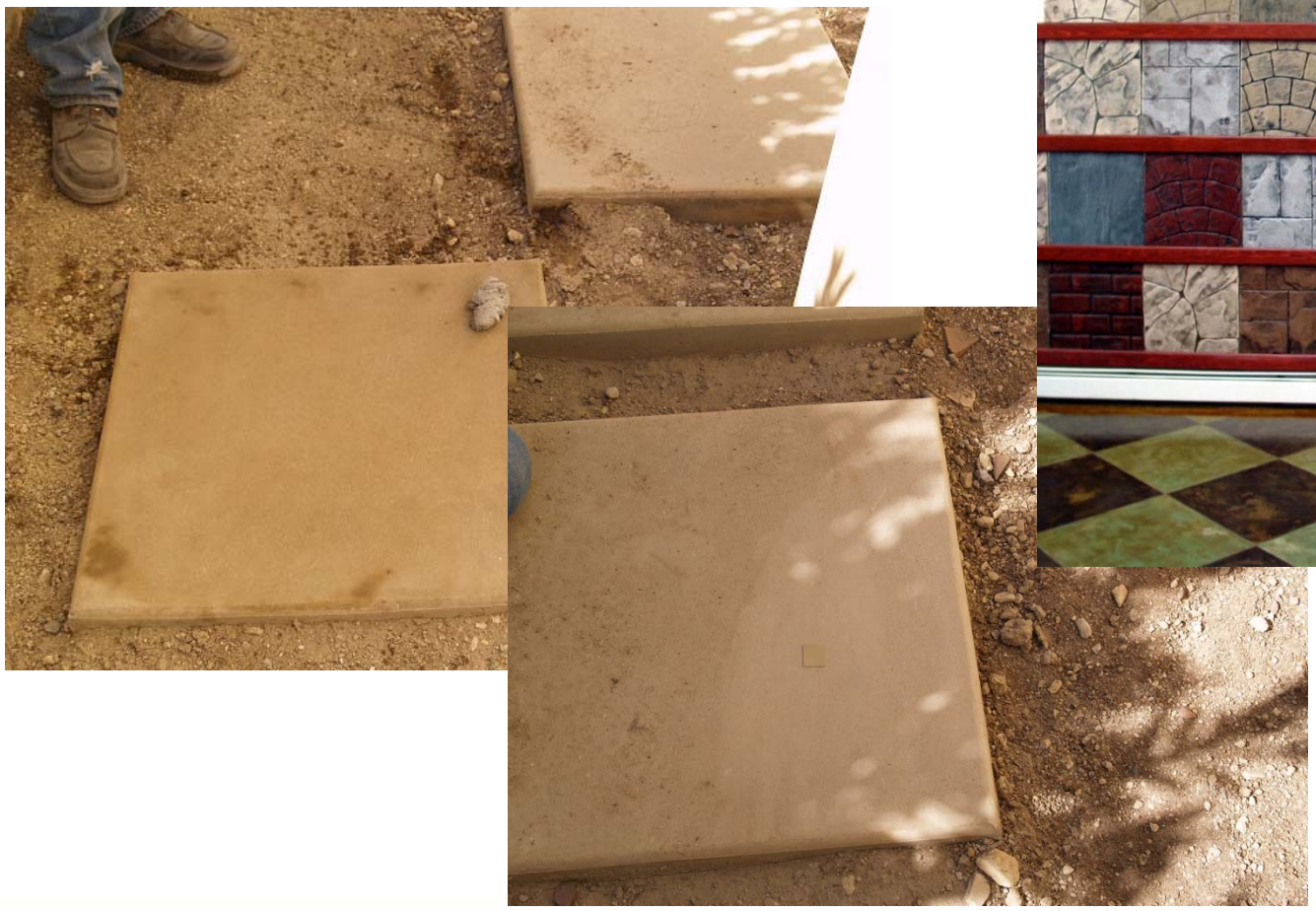
  Meaning the customer is happy enough for you to get paid
  Meaning you can use the customer for a referral

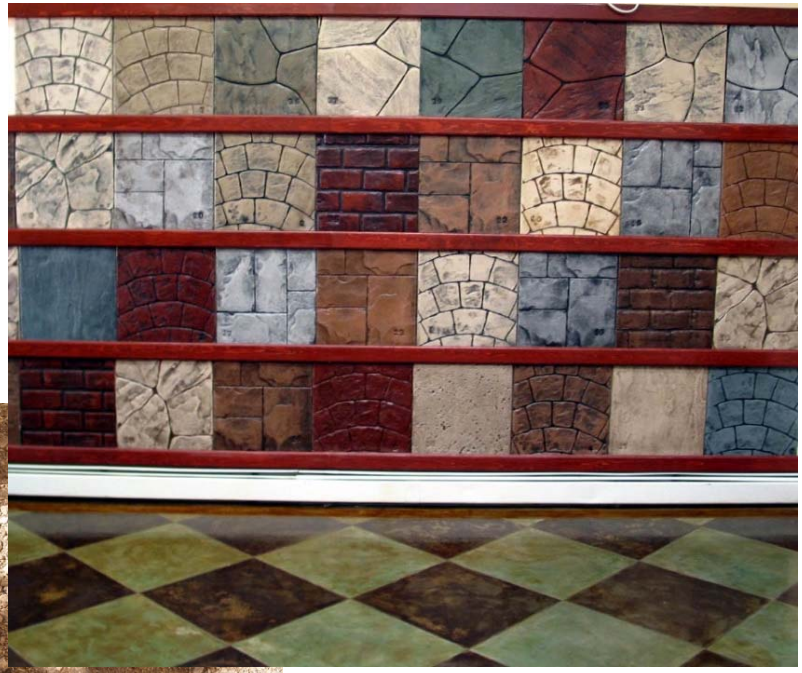
- **Educate The Consumer**

  This is not a paint or a coating
  You are dying a natural material with another natural material
  List the shortcomings as well as the benefits

Managing Customer Expectations

- **Sell From Samples and Mock Ups**





Managing Customer Expectations

- **NOT Color Charts**

Managing Customer Expectations

Use Same Raw Materials and Finish Techniques as the Project

Troweled Finish = More Inconsistent Looking Color and Highlights Imperfections

Managing Customer Expectations

- **Photos, Photos, Photos (For Ideas NOT for Color Selection)**

These 2 photos are of the same pile of concrete

Managing Customer Expectations

- **Photos, Photos, Photos (For Ideas NOT for Color Selection)**

These 2 jobs photos were taken the same day

Managing Customer Expectations

- **References and Referrals**

The Look of Genuine Brick, Slate or Cobblestone in Your Choice of Color!

CONSTRUCTION

Reference Sheet

Construction, Inc. is Ph: Fax:
Trail
Lookout Mountain, Georgia 30750 www. com

CREDENTIALS

- Licensed, Insured, and Bonded
- Decorative Concrete for 23 yrs
- Award Winning Company
- Complete Showroom Available
- American Concrete Certified
- Member of the Tennessee Ready Mix Concrete Association of Chattanooga
- Better Business Bureau Complaint-free
- OSHA Certified
- Office Staff & Job Estimator
- Certificate of Insurance upon request

AWARDS

1999	Systems Top Producer
1999	TRMCA (Tenn. Ready Mix Concrete Assoc.) Best Concrete Driveway Award
2000	TRMCA Broad St. Concrete Excellence Award for Design & Craftsmanship
2001	Systems Distributor of the Year
2004	Systems International Job of the Year Award

REFERENCES

Talley Construction	706-866-0596	Linda Sharp	423-855-4434
City of Chattanooga	423-757-5117	Rhonda Parks	423-344-1696
Hudson Co. (McDonalds)	256-657-6100	Joyce Atchley	423-821-5323
Fulmer Concrete	423-855-1551	Henley Const.	423-624-9768
Yerbey Concrete Const	423-698-6844	Stein Const.	423-696-0271
Cope Brothers Const.	706-226-0989	Ronnie Barnes	423-894-1914
Berry Construction	423-267-2234	Sammy Feehrer	423-478-5533
E. M. J. Corporation	423-855-1650	Tom Stephens	423-488-1188
Raines Brothers	423-265-0467	Sharon Duble	706-398-0466
Tenn Valley Authority	256-437-4551	Sarah Swann	423-886-3232
Dr. Donald Hetzel	423-629-8258	T.U. Parks	423-648-3800
John Gildernew	706-820-1990	Steve Tabb	423-629-2827
Bill & Anita Mitchum	423-886-6089	David Patten	423-756-2371
Mike & Alisa Stipanov	423-396-9461	Bill Worley	423-296-4320
Hyman Kaplan	423-400-4141	Linda Sylvester	423-316-2456
Sharon Patten	423-886-1280	Mill Run Subdivision	
Bob Hardaway	706-278-2433	Contact: Robin Smith	423-400-5016
Marilyn Keller	423-886-5444	Shaub Construction	
Greg and Zane Brown	423-825-1440	(Dairy Queen & Grill)	615-254-7160

We have also done numerous jobs for the Georgia Department of Transportation. We have completed projects at The Grand Ole Opry House in Nashville and Six Flags over Georgia in Atlanta.

Thousands **of satisfied customers**

How the Mix Affects The Final Color

How the Mix Affects The Final Color

PORTLAND CEMENT	**560 lbs**	
SAND	**1120 lbs**	
AGGREGATE	**1680 lbs**	
WATER	**30-35 Gals**	
ADMIXTURE (or 2)	**TOTAL**	**3360 lbs**

Integral Color will typically weigh between 6 to 36 pounds…BY FAR the smallest ingredient.

How the Mix Affects The Final Color

Doesn't it make sense that ALL those other ingredients have a dramatic bearing on the final color?

YES

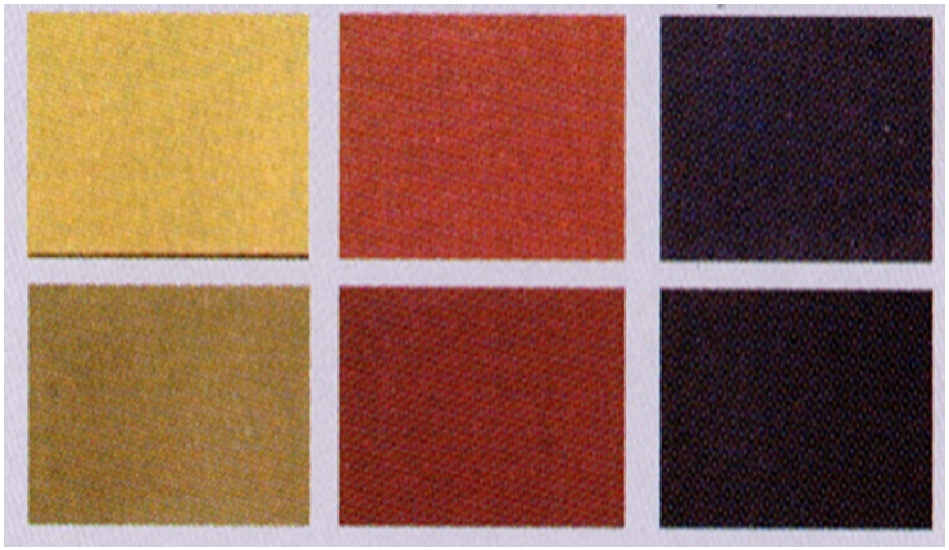
How the Mix Affects The Final Color

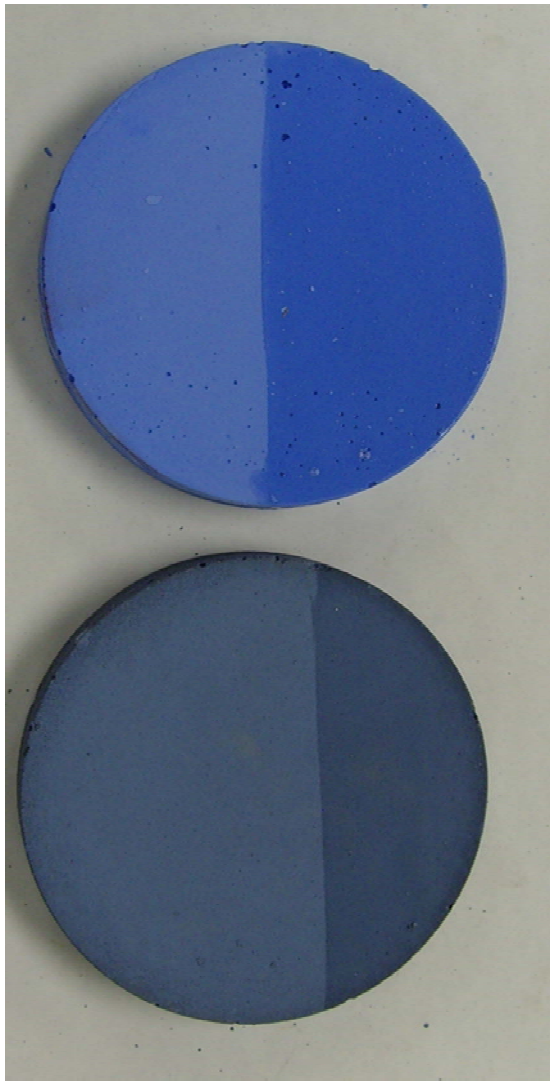
CEMENT COLOR

White vs Gray

White

Gray



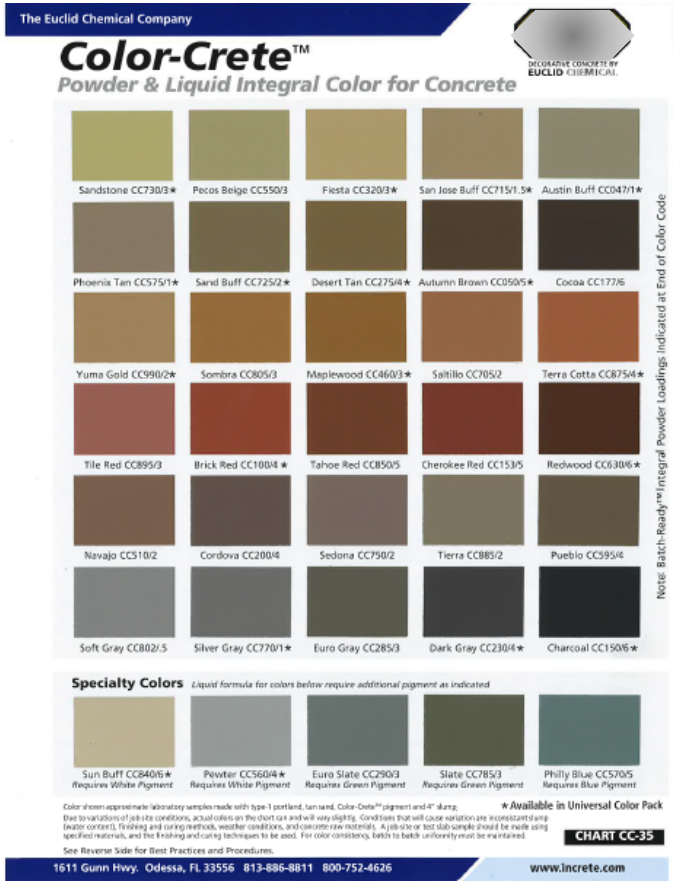


How the Mix Affects The Final Color

CEMENT COLOR

White vs Gray

All With Gray Cement



Some with White Cement

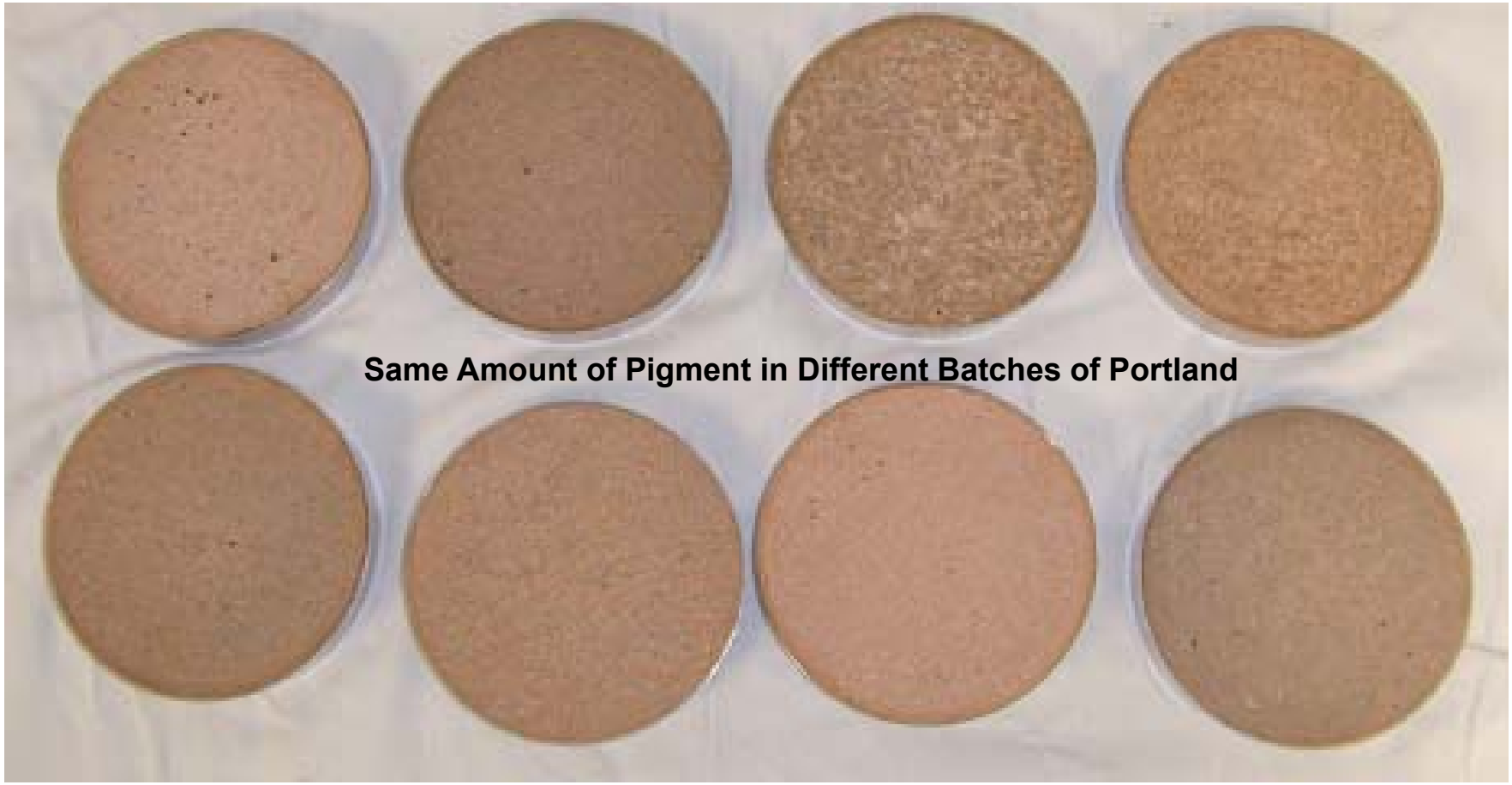
CEMENT COLOR

Gray vs Gray

Lots of Different Shades of Gray Portland

CEMENT COLOR

Gray vs Gray

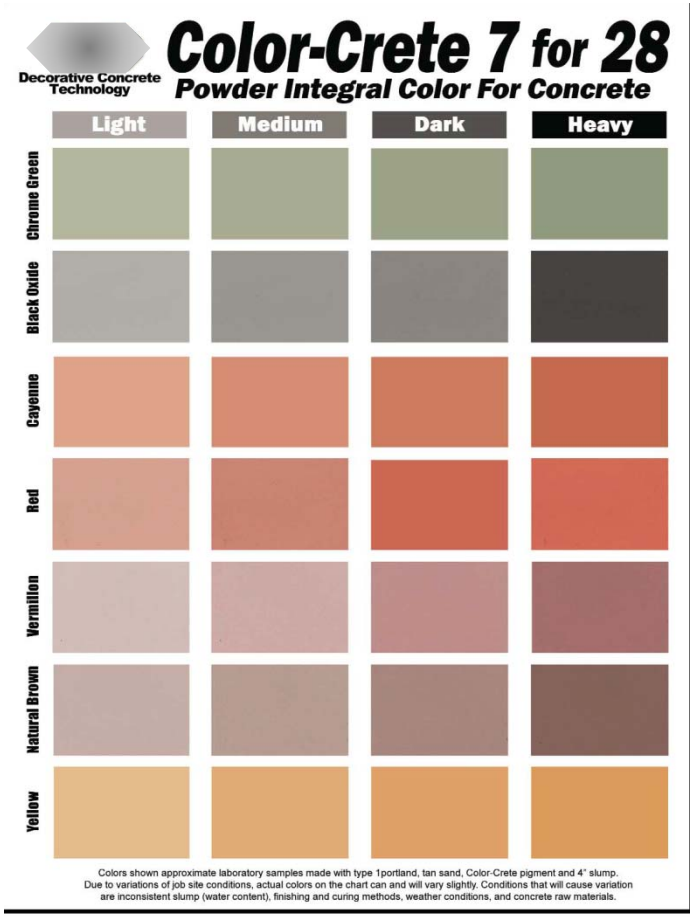


CEMENT COLOR

Same Pigment, Two Different Cements

How the Mix Affects The Final Color

CEMENT CONTENT



4 yrd 2 yrd 1yrd

How the Mix Affects The Final Color

ADMIXTURES

How the Mix Affects The Final Color

ADMIXTURES

❑ Air Entraining	Normally Lighter
❑ Plasticizer	Initially Darker (reduced affects Later)
❑ Accelerator (NO Calcium Chloride)	Darker
❑ Water Repellant	Possibly Darker

ADMIXTURES

No Calcium Chloride Based Accelerators

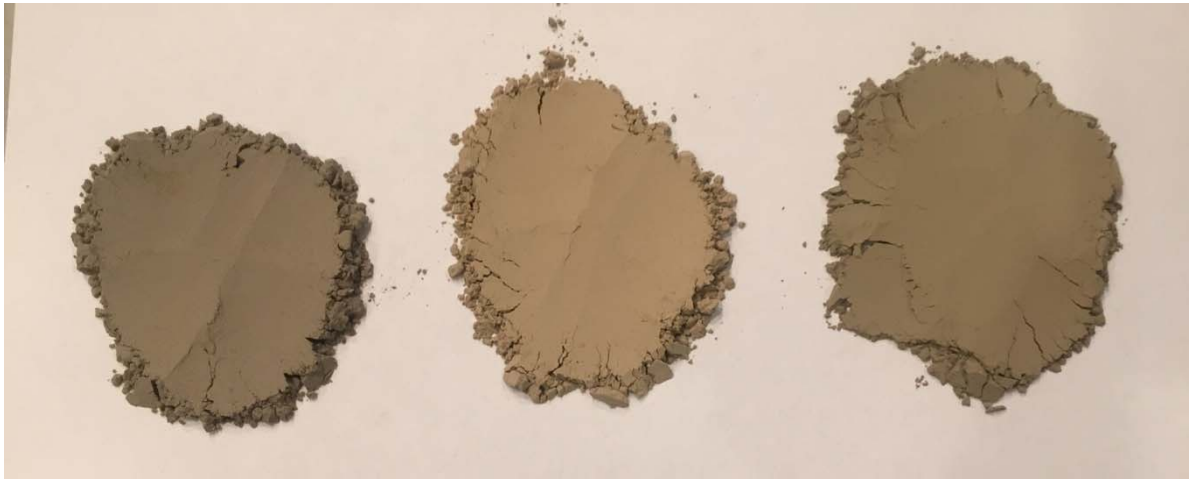
Most Commonly Available
Least Expensive
Decreases Set Time
Increases High Early Strength
BUT, Will Leave a Blotchy, Hazy Surface

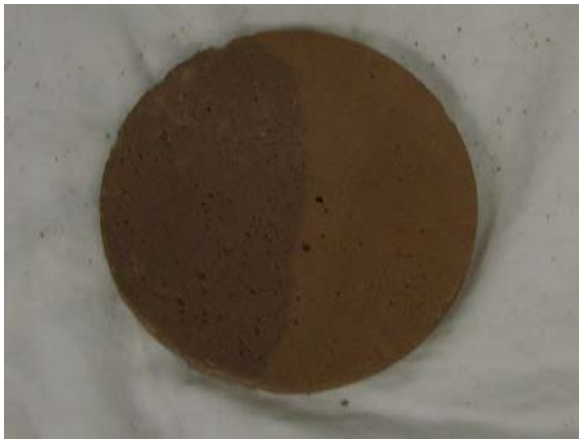
Use Non Calcium Chloride Accelerators

How the Mix Affects The Final Color

ADMIXTURES

Pozzolans- Portland Substitutes
ie. Fly Ash and Slag





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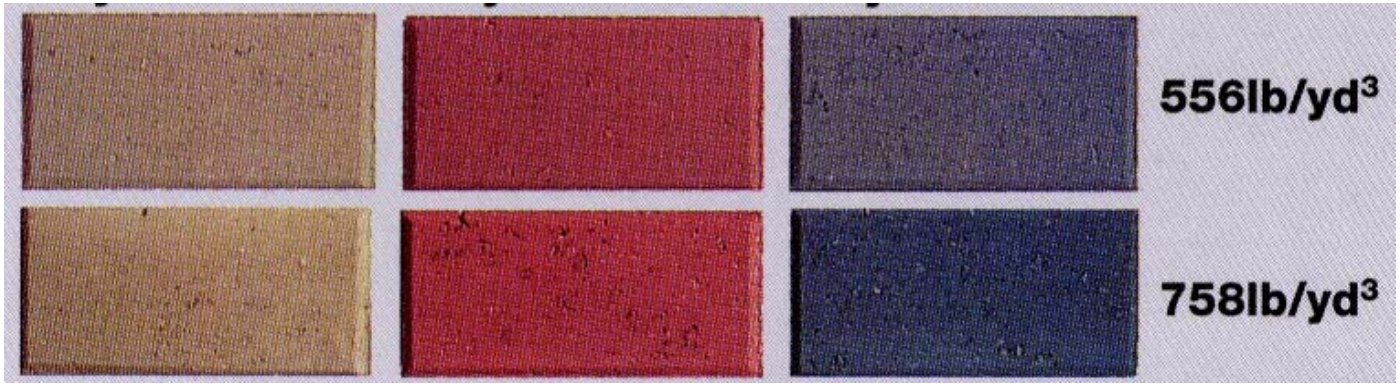
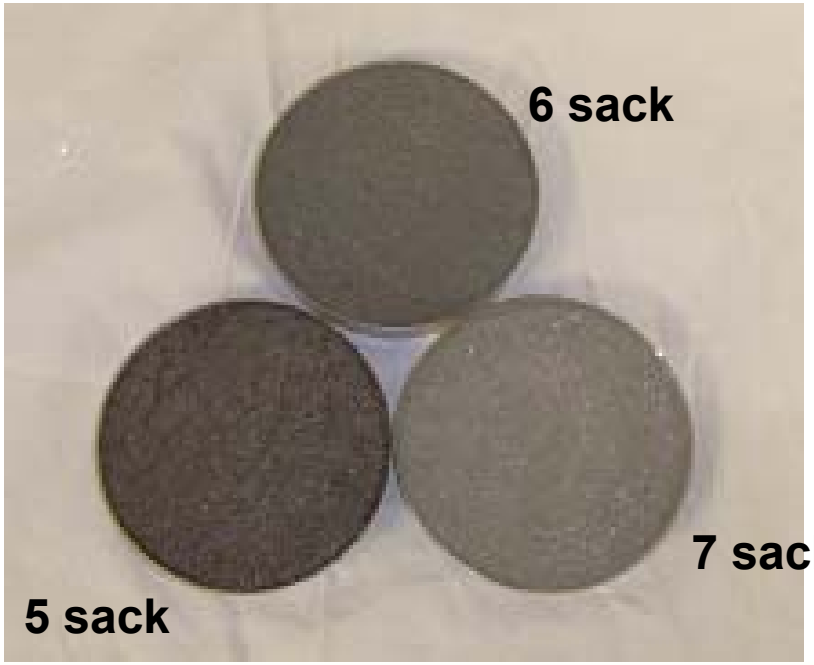




How the Mix Affects The Final Color

AGGREGATES

- Largest Part of The Concrete Mix
- Initial Influence but Greater Influence as the Slab Weathers

WATER TO CEMENT RATIO

- **Most Chart Colors/Samples Produced at 4” Slump**
- **Choose Lowest Possible Slump (4”-5”)**
- **If Higher Slump Needed For Placement, Use Plasticizer**
- **Consider Moisture in Raw Materials**
- **More Water = Lighter Color**

  Color Concentration
  Bleed Water Rises and Leaves Larger Pores/Capillaries
  Resulting in Lighter Looking Surface

- **Don’t Add Water at the Job Site. If You Do- Be Consistent**

WATER TO CEMENT RATIO

WATER TO CEMENT RATIO

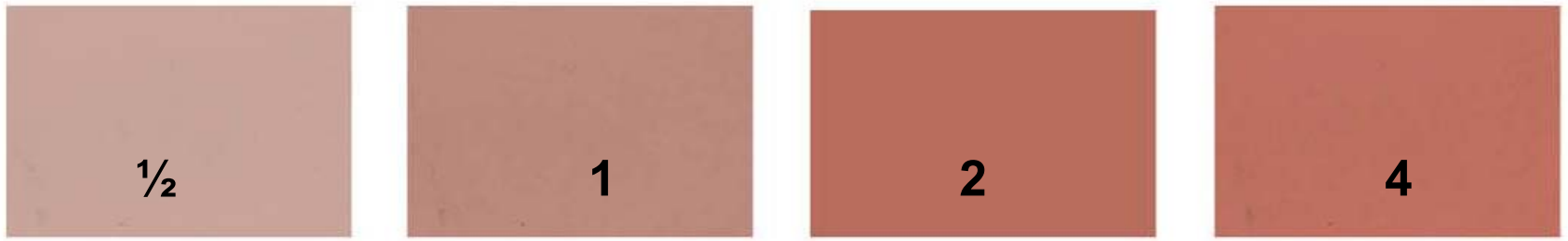
Two Pours, Same Day. Water Added to Second Pour

How the Mix Affects The Final Color

Question??

At What Loading Will the Mix Components Have More Influence?

High or Low?



Best Practices

- Mock Ups Should Be at Least 3 Yards
- Use Same Raws as Will be Used in Final Project
- Use Minimum Cement Content of 470 lbs/Yard
- Use 100% Portland. If Pozzolans Used, Be Consistent
- Do Not Exceed 5” Slump
- At The Plant, Add Pigment to the Head Water
- At the Job Site, Add Color Into Mix (Avoid Fins). Mix 8 to 12 Mins, Check For Ribboning

Best Practices

- If Sand Blasting or Exposing Agg, Cut Pigment Bag Open and Pour Color Into Truck
- Also Short Mix Time or Small Aggregate May Not Completely Disintegrate Bags
- If Using Liquid Color at Job Site, Use Same Amount of Rinse Water in Each Bucket
- Use No Calcium Chloride in Mix
- Keep Mix Time Consistent

Conclusions

With a Little Care and Attention to Detail, You Will End Up with a Close Match

Conclusions

However, If You Just Roll The Dice, You Will Probably End Up With…

Job Site Prep

Grade Land So Water Will Drain Away From Slab

Job Site Prep

Place Concrete Over Uniformly Graded Compacted Subgrade/Sub Base (Sand, Gravel, Crushed Stone)

Job Site Prep

Dampen Sub Base

Job Site Prep

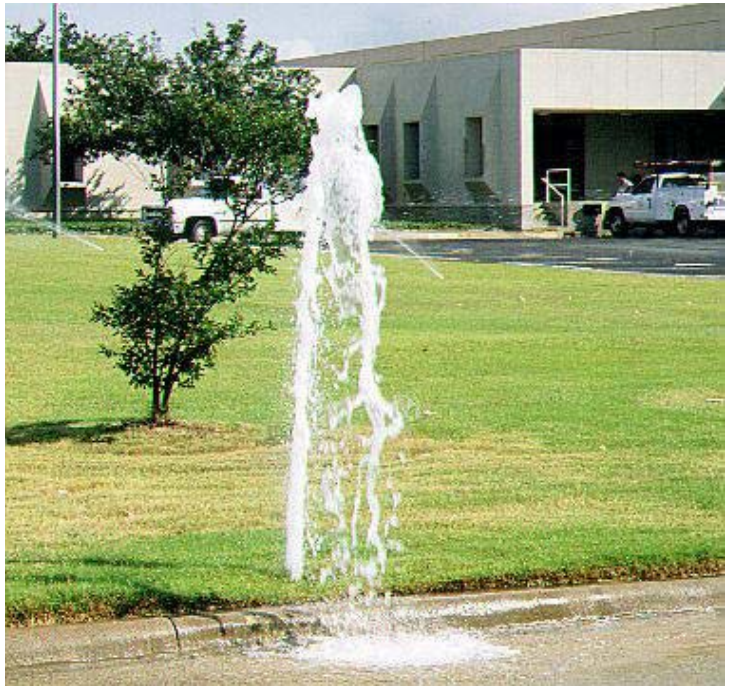
Don’t Pour Over Mud, Standing Water, Frost, or Ice

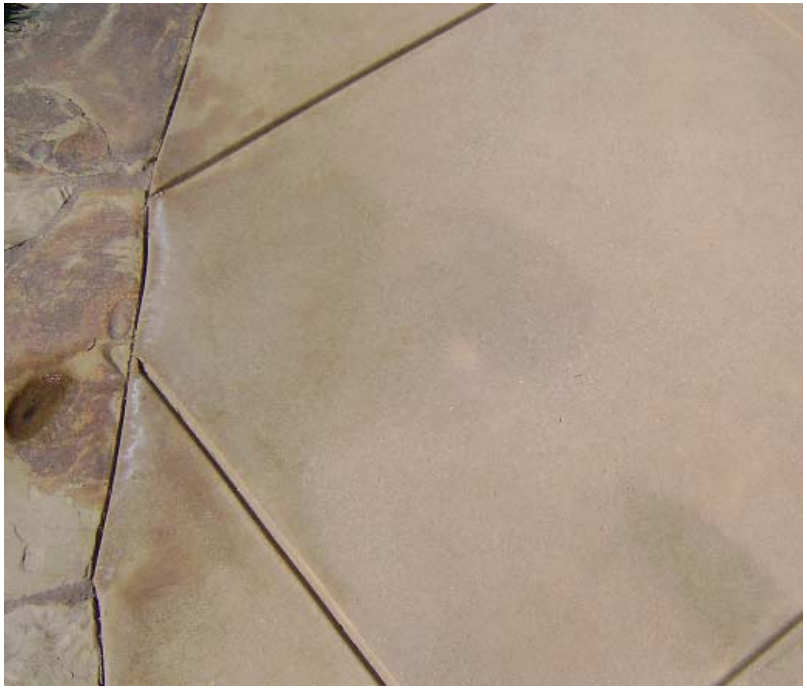
Job Site Prep

Set Forms to Achieve Uniform Slab Thickness

Job Site Prep

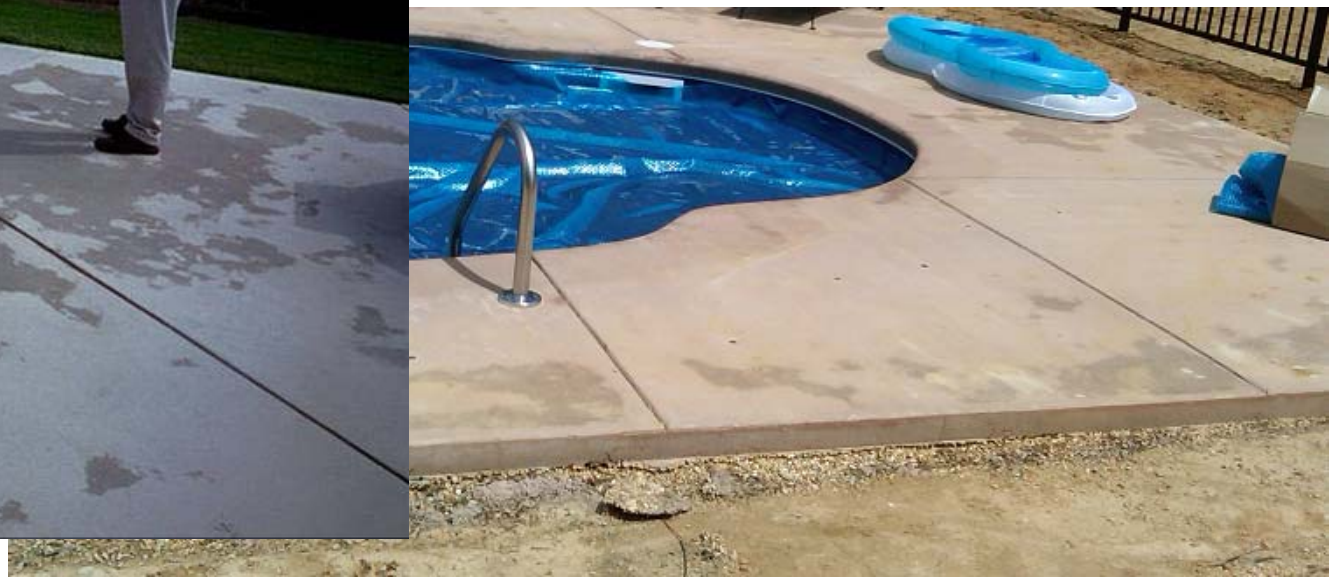
Turn Off Sprinklers





Job Site Prep

Improper Prep Can Lead To Disaster



Weather

- **Temperature Affects Cure Time**
- **Temperature Affects Water Required to Maintain Consistent Slump**
- **Temperature Affects Size and Shape of Calcium Silicate Crystals During Hydration**
  - Higher Temp = More Irregular and Larger Crystals
  - = More Porous Concrete
  - = Greater Light Scattering Across Surface
  - = Lighter Looking Color

Weather

Brookings, SD

16 Month Project

Weather

- Try To Place During Consistent Weather
- 60 to 80 Degrees is Perfect
- Schedule to Avoid Exposure to Hot Sun Until Curing Materials Are Applied
- Avoid Windy Conditions
- No Rain, Snow, or Sub Freezing Temps

INTEGRALLY COLORED CONCRETE
BEST PRACTICES

RECAP

Be Consistent

Be Detailed

INCRETE SYSTEMS
DECORATIVE CONCRETE BY EUCLID CHEMICAL

QUESTIONS AND COMMENTS ??

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