

Creating Durable Concrete Floors

Bob Swan
HD Concrete Floors



Agenda:

1. Tipping Floor Deterioration.
2. Issues of safety and environmental compliance.
3. How long is your floor going to last? Let's measure it!
4. Repair: Full depth with Concrete? High Performance topping?
5. Contractor and material selection. Criteria?

Agenda:

1. Tipping Floor Deterioration.

Market Trends For Transfer Stations

Market Trends For Transfer Stations

Increase in volume MSW

Improving Concrete Tipping Floors



Market Trends For Transfer Stations

Increased Equipment Size

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Improving Concrete Tipping Floors

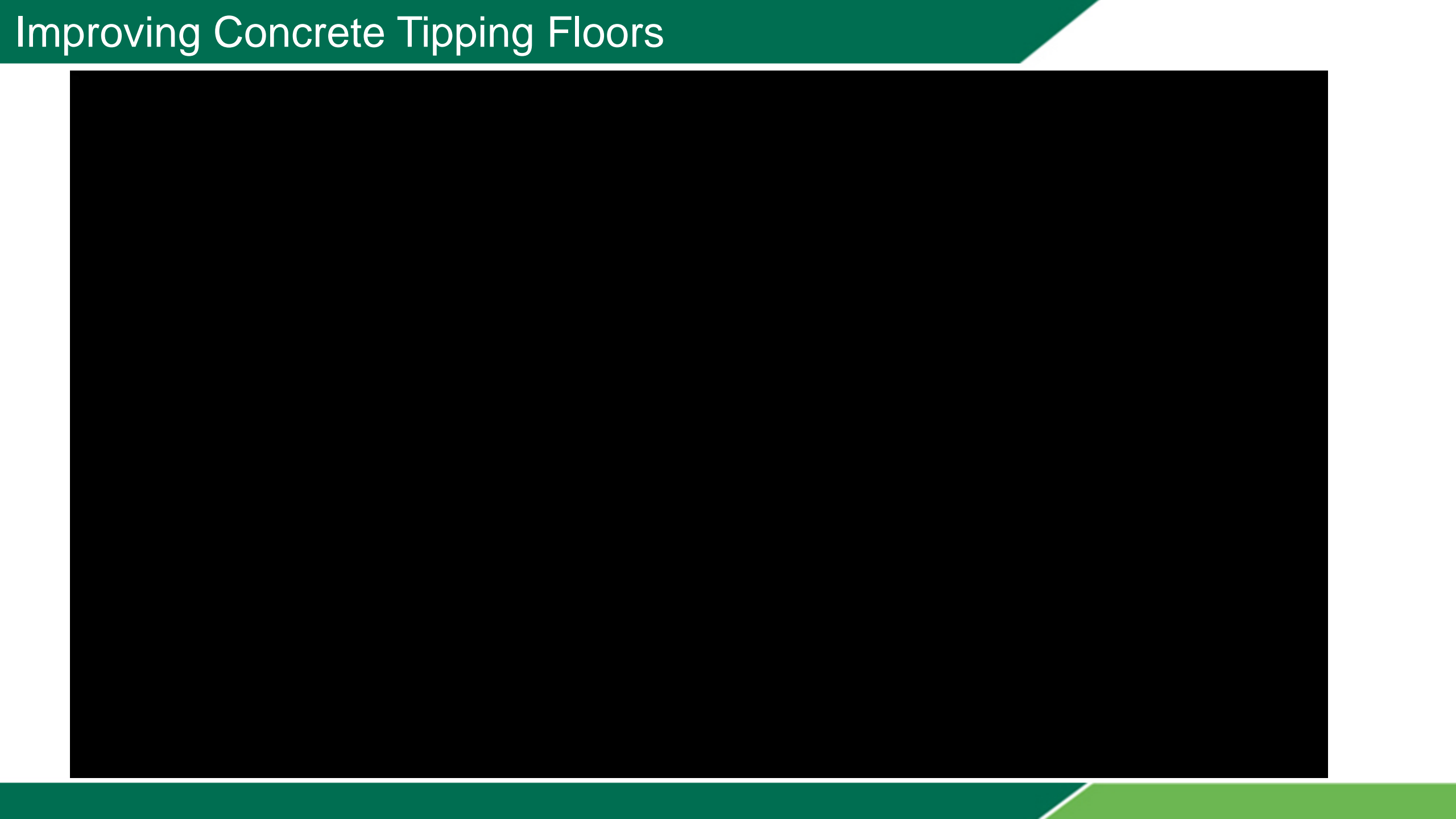


Improving Concrete Tipping Floors



Market Trends For Transfer Stations

Increased Construction & Demolition



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Market Trends For Transfer Stations

Increased Chemical Attack: Leachate

Improving Concrete Tipping Floors

Increased
Chemical Attack
Leachate

Why is
Leachate
such a
problem?



Increased
Chemical Attack
Leachate

NC STATE | College of
UNIVERSITY | **Engineering**



**Environmental Research
& Education Foundation**

Lighting a path to sustainable waste management practices

SMITH+
GARDNER
ENGINEERS

**Increased
Chemical Attack
Leachate**

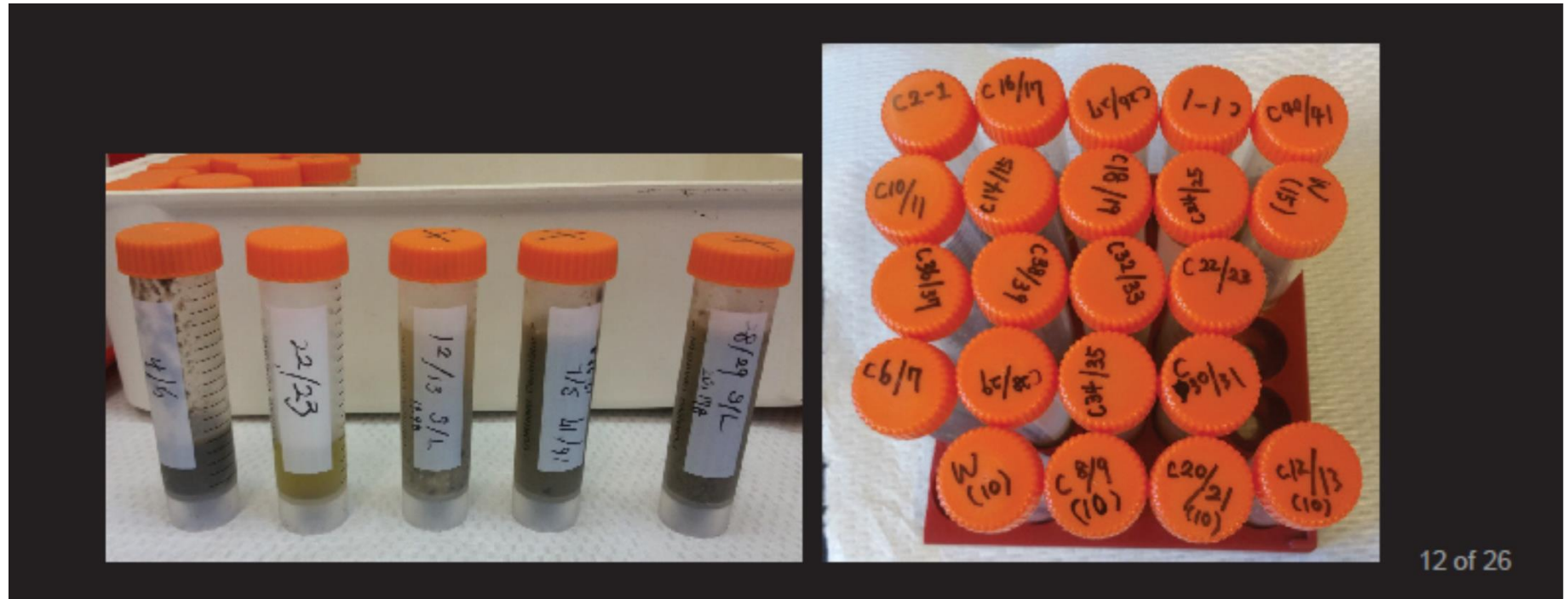
**Design of Waste Transfer Station Concrete
Floor against Premature Deterioration**

**NC STATE
UNIVERSITY**

Improving Concrete Tipping Floors

Increased Chemical Attack Leachate

A number sample were collected from landfills, transfer stations and anaerobic digesters.



Increased Chemical Attack **Leachate**

pH of normal
concrete: 10-12

Lowering pH =
Acid Attack

MEDIAN VALUES OF MAJOR COMPONENTS

	pH	Volatile Fatty Acids (mg/L)			Anions (mg/L)	
		Acetic	Propionic	Butyric	Chloride	Sulfate
Median	4.70	2949	351	325	1139	299

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Increased
Chemical Attack
Leachate



Food Waste



Normal Wear



Chemical Attack



Normal Abrasion



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Increased Chemical Attack **Leachate**

Leachate ends
up on tip
floors a lot of
different way.



Improving Concrete Tipping Floors

Increased
Chemical Attack
Leachate

Bottle & Can
Recycling



Improving Concrete Tipping Floors

Increased
Chemical Attack
Leachate

Bottle & Can
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Improving Concrete Tipping Floors

Increased
Chemical Attack
Leachate

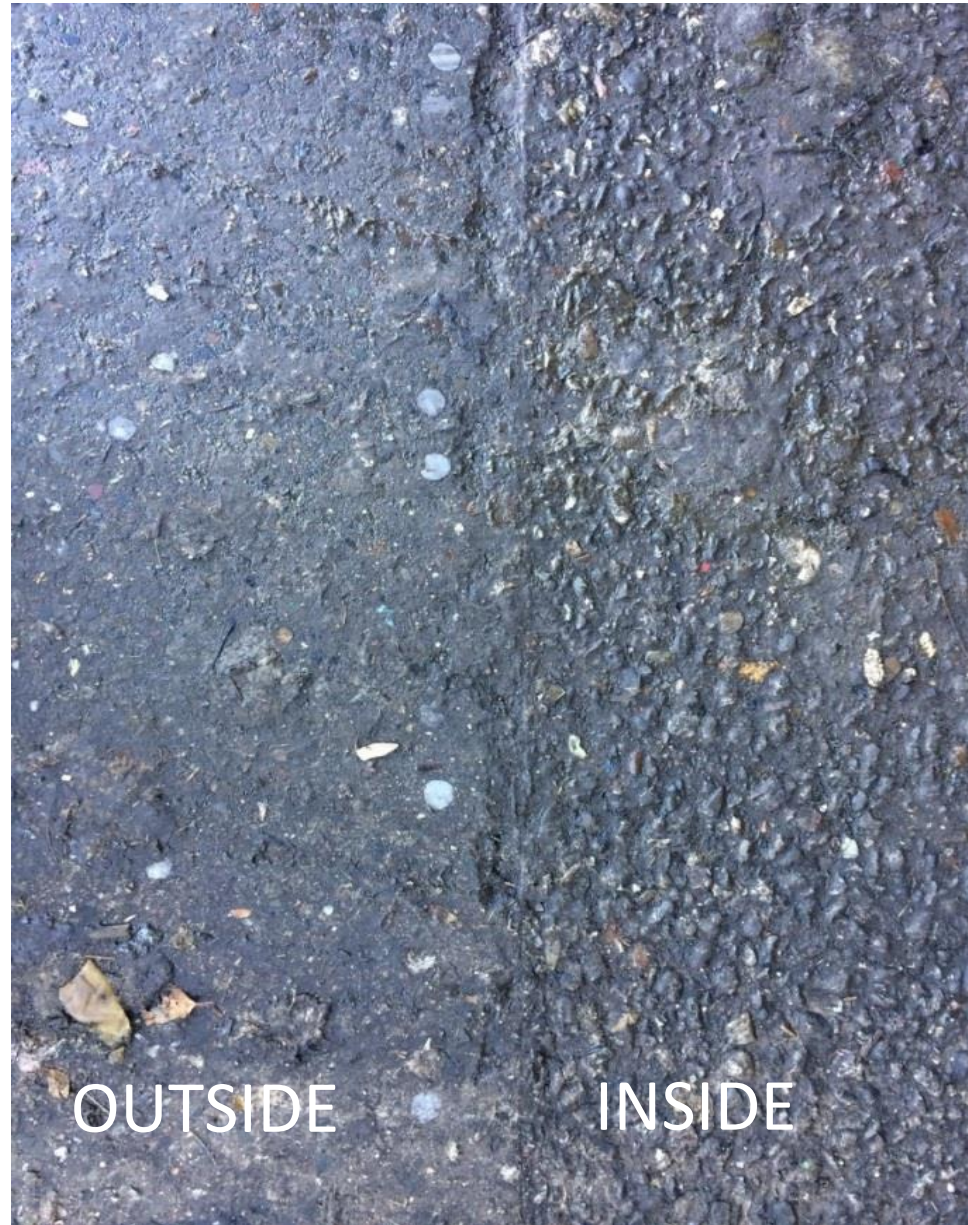
Anaerobic
Digester



Improving Concrete Tipping Floors

Increased
Chemical Attack
Leachate

Anaerobic
Digester



Improving Concrete Tipping Floors

Increased
Chemical Attack
Leachate

Steel around
port edge



Improving Concrete Tipping Floors

Increased
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Leachate

Steel around
port edge



Improving Concrete Tipping Floors

Increased
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Steel around
port edge



Improving Concrete Tipping Floors

Increased
Chemical Attack
Leachate

Steel around
port edge



Agenda:

1. Tipping Floor (Concrete) Deterioration.

2. Issues of safety and environment.

Improving Concrete Tipping Floors

When the worlds of SAFETY
and FLOOR INTEGRITY collide



Improving Concrete Tipping Floors



When the worlds of SAFETY
and FLOOR INTEGRITY collide



Improving Concrete Tipping Floors

When the world of SAFETY
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Improving Concrete Tipping Floors

When the world of EPA and
FLOOR INTEGRITY collide



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3. How long is your floor going to last?

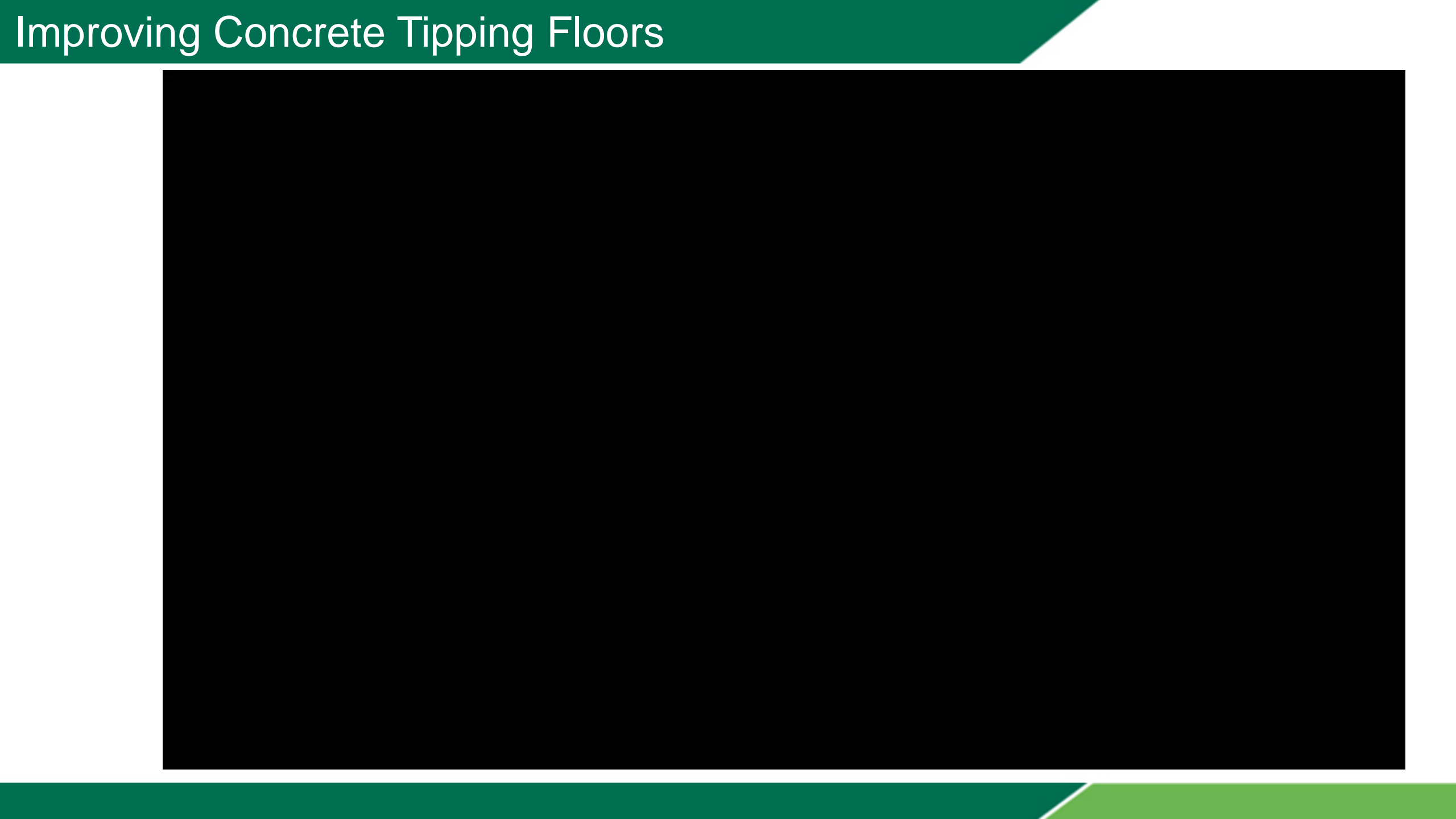
Let's measure it! For Safety. For Budget.

Measuring the rate of concrete wear.

- 1. Monitor Tons/Day and Visual***
- 2. Use of Wear Indicators***
- 3. Laser Scanning***

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- 1. Monitor Tons/Day and Visual*
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Improving Concrete Tipping Floors

Improving Concrete Tipping Floors

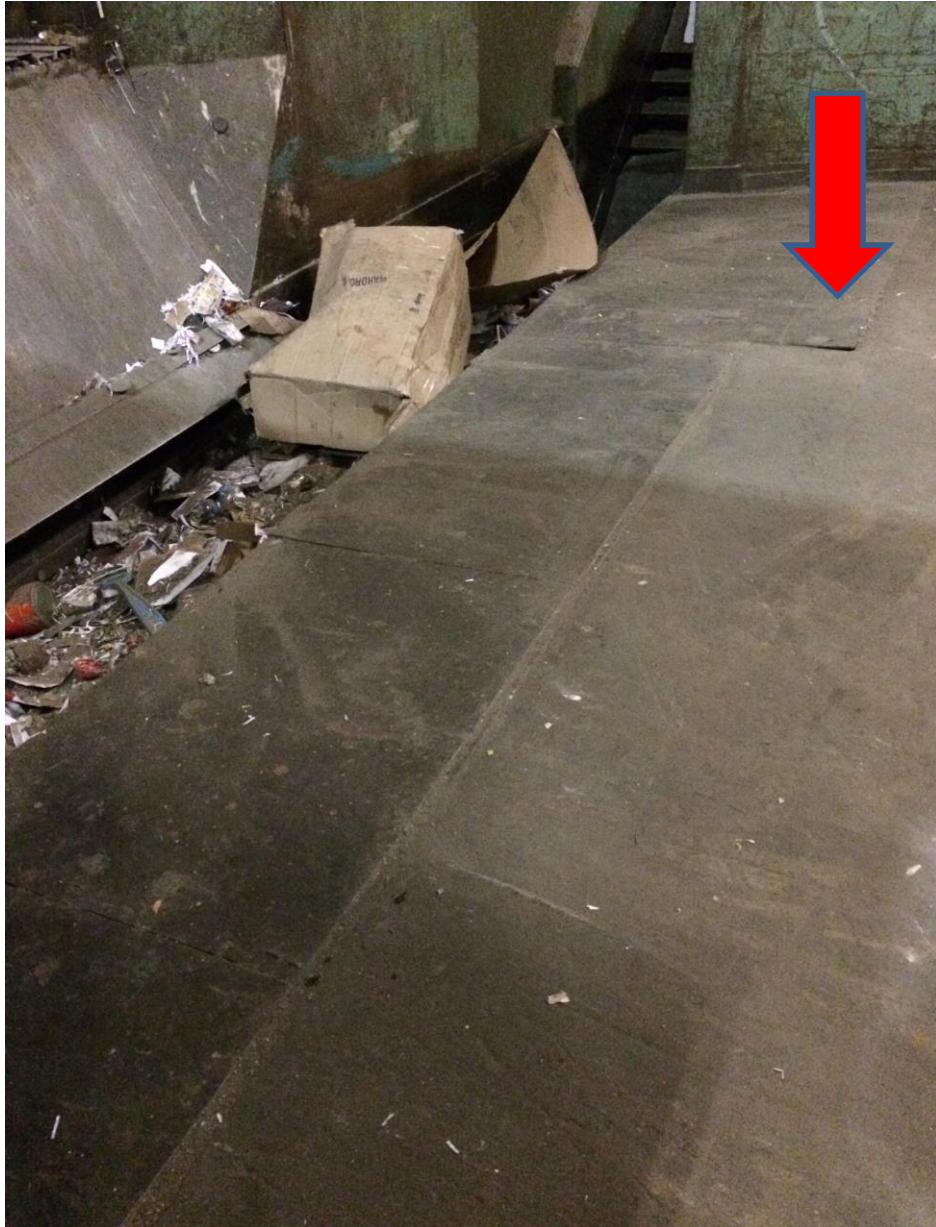
**The Floor
doesn't
wear
evenly**



Improving Concrete Tipping Floors



Improving Concrete Tipping Floors



Improving Concrete Tipping Floors

North Shore Marine
Transfer Station
NYC Sanitation Dept



Improving Concrete Tipping Floors

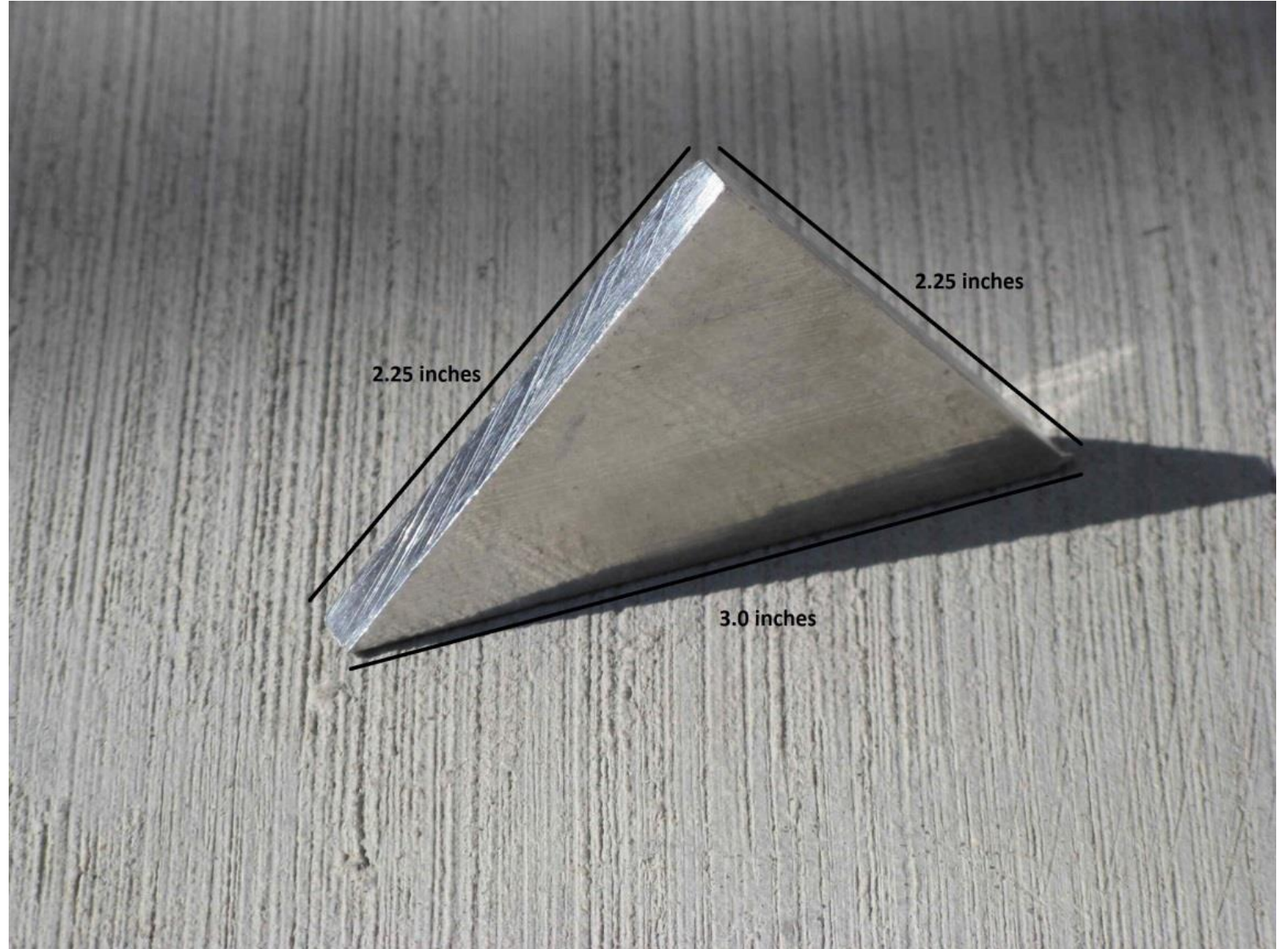
North Shore Marine
Transfer Station
NY Sanitation Dept



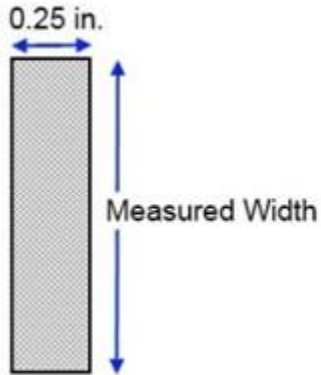
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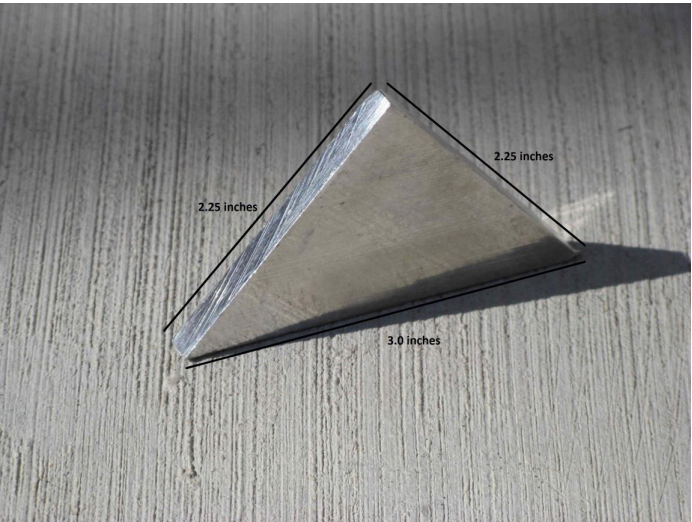
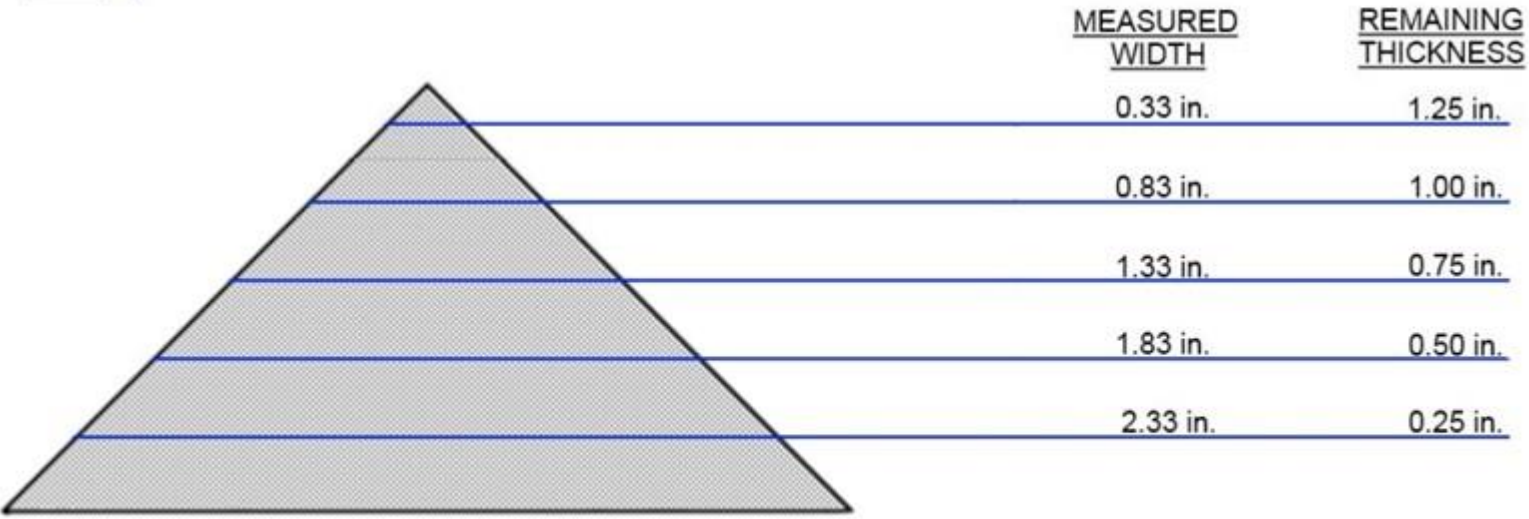
Wear Indicators



Wear Indicators



TIPPING FLOOR WEAR INDICATORS



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Wear Indicators



Improving Concrete Tipping Floors

Wear Indicators



Wear Indicators



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Wear Indicators



Improving Concrete Tipping Floors

Wear Indicators



Improving Concrete Tipping Floors

Wear Indicators



Measuring the rate of concrete wear.

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Improving Concrete Tipping Floors

Laser Scanning



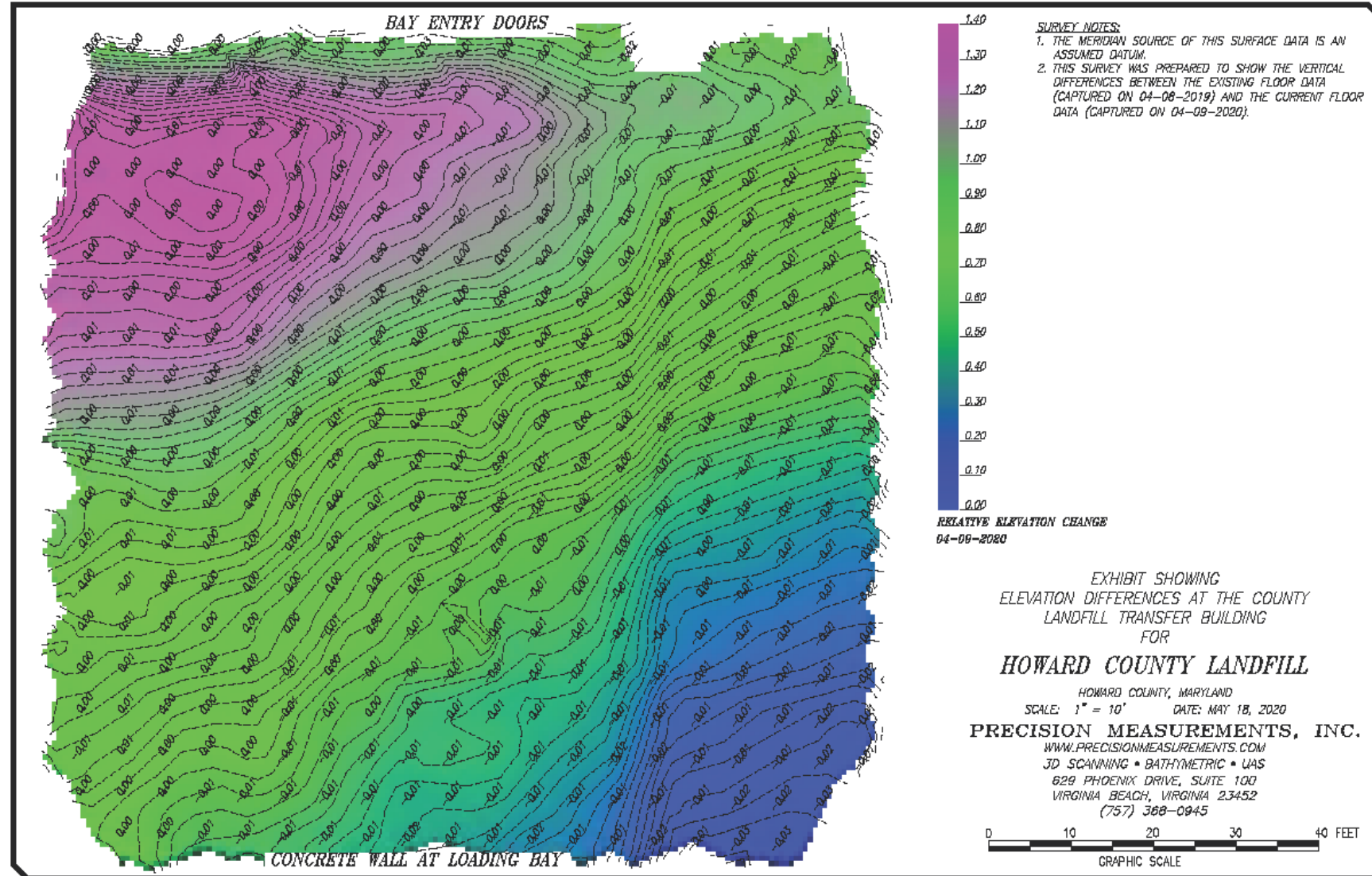
Improving Concrete Tipping Floors

Laser Scanning



Improving Concrete Tipping Floors

Laser Scanning

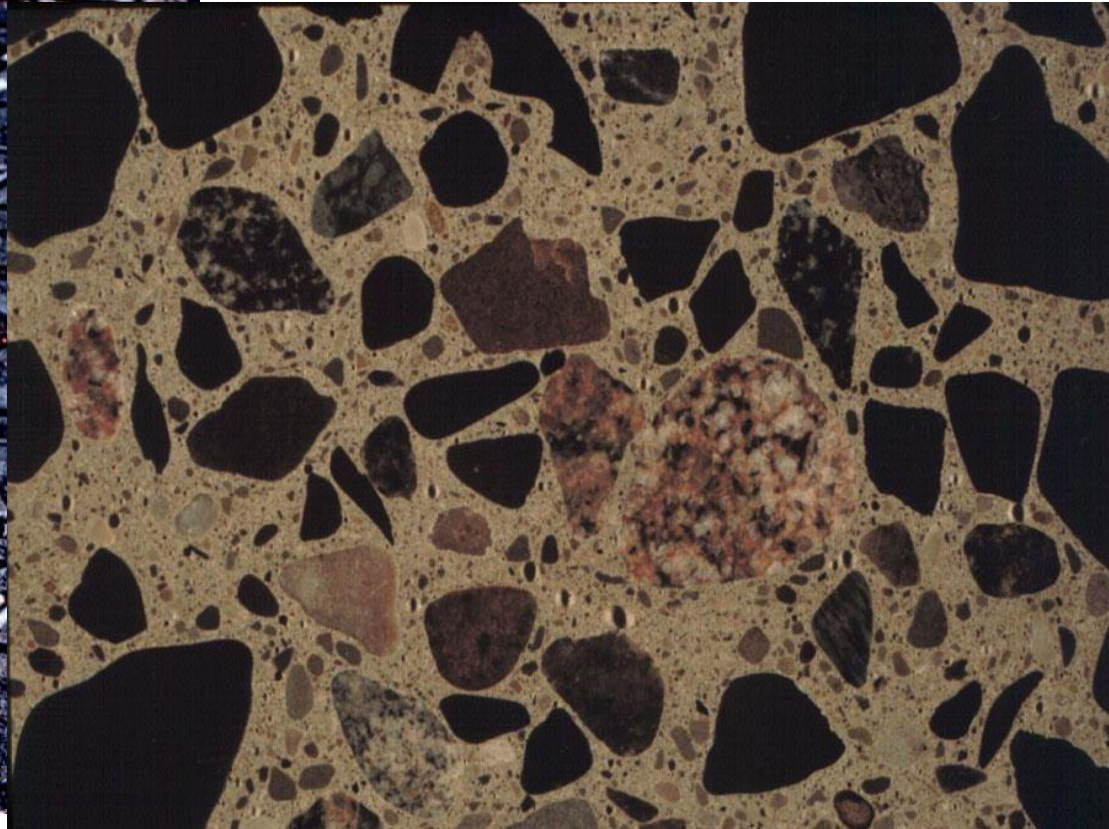


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High Performance topping?



High Strength Concrete



High Strength Concrete

Cementitious
Fly Ash
Fine Aggregate
Coarse Aggregate
Water Content
Air Content (Entrapped)
HRWR
W/cm
Initial Slump (Water)
Final Slump
Shrinkage

6000 psi @ 28 days

680 lbs.

20%

1150 lbs.

1900 lbs.
(#467 Stone)

285 lbs.

1.5%

40 oz. +/- Type F

0.42

2" – 3"

6" – 8"

≤ 0.04% @ 28 days

High Strength Concrete

What can be done to make the concrete better?



Improving Concrete Tipping Floors



**Fig. 3: Coarse aggregate used for the distribution center concrete
(No. 467 stone [37.5 to 4.75 mm])**

QUALITY REQUIREMENTS OF AGGREGATE

- Flaky and Elongated pieces should be limited.
- Aggregate crushing value should be less than for wearing surfaces, and

roads and pavements.

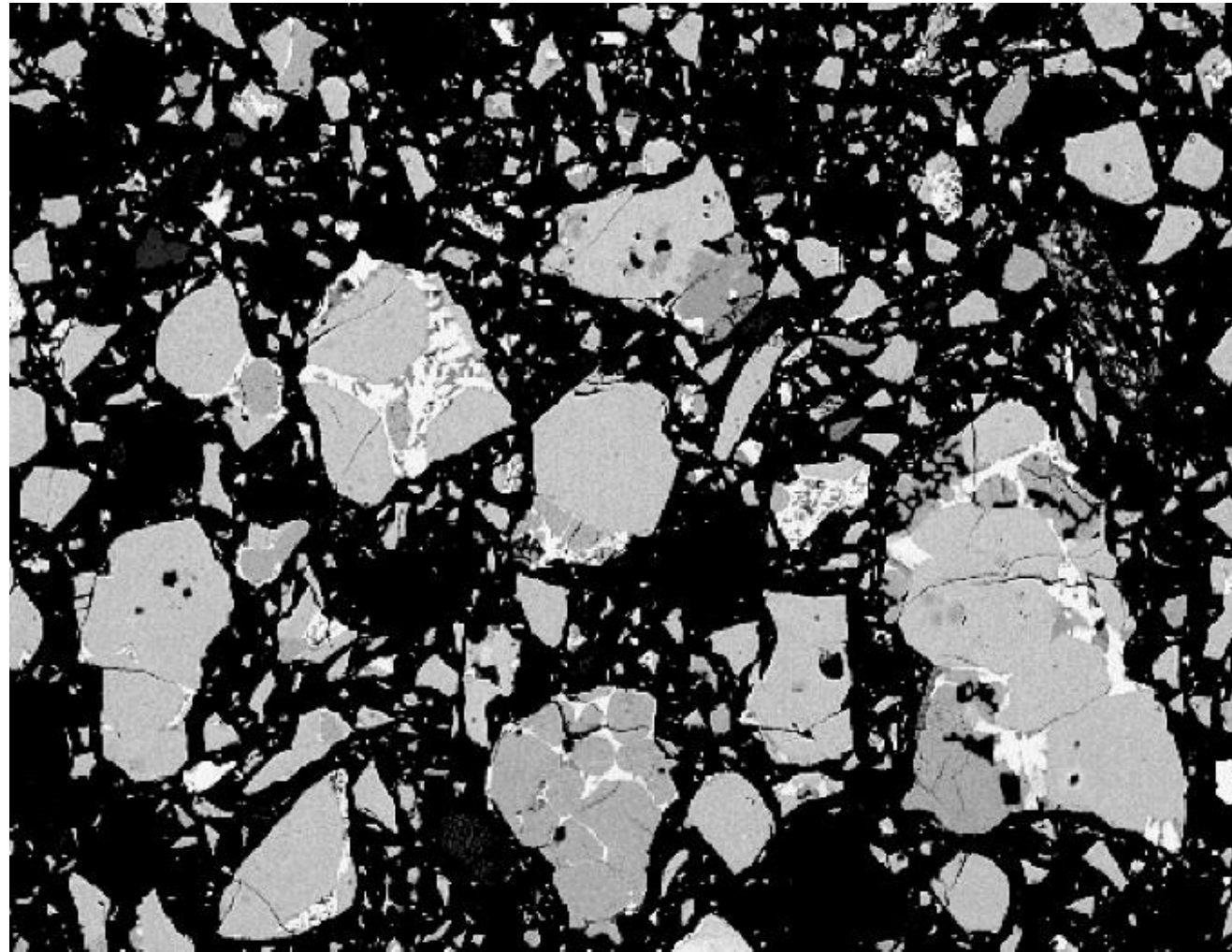
- Aggregate impact value should be less than for concrete other than for wearing

surfaces, such as runways, roads

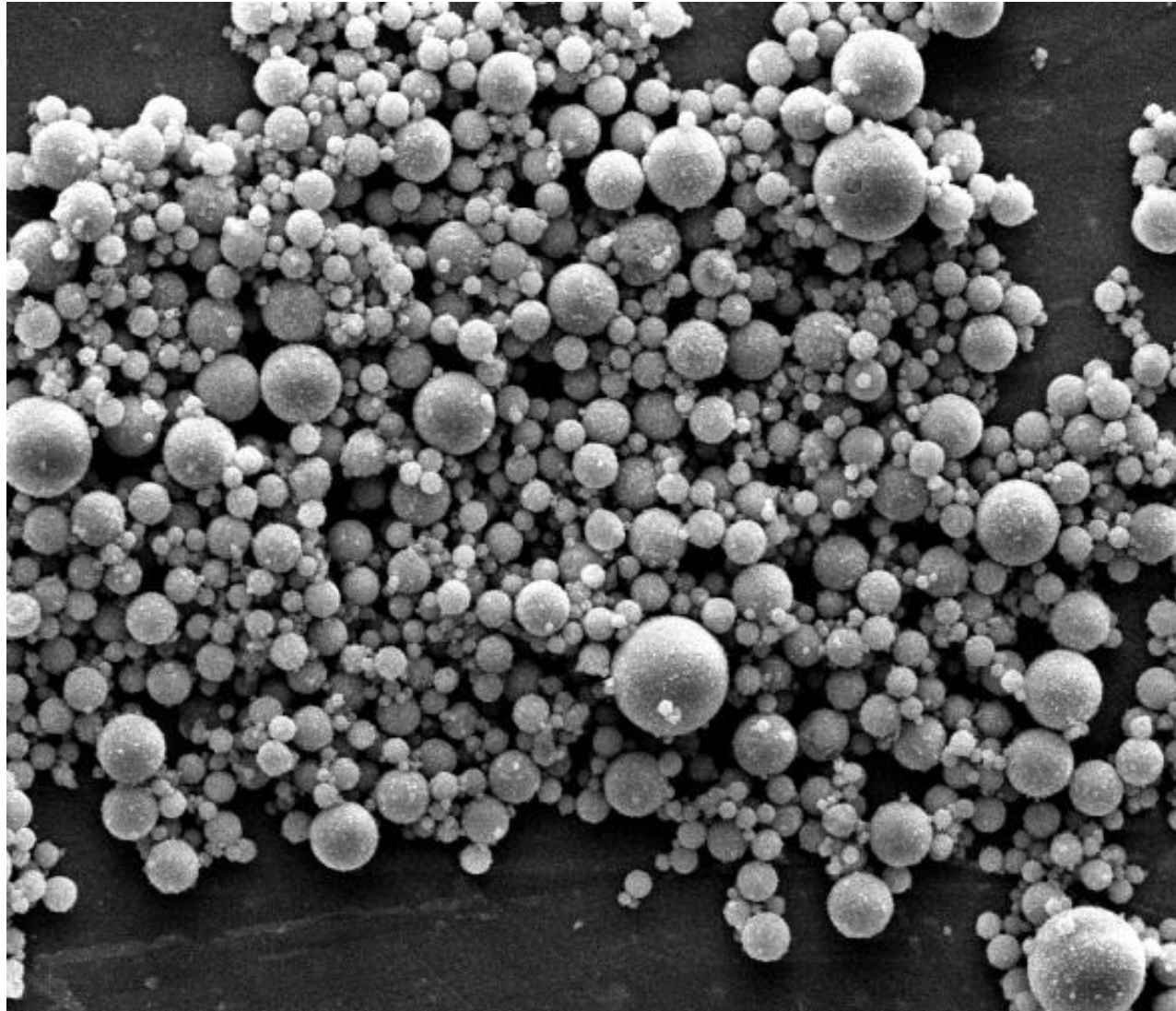
- Abrasion value of aggregate should be less than 10 percent by weight for aggregate

How Does Putting Fly Ash In Concrete Help?

Cement Particles



Fly Ash



Greater Use Of Silica Fume

Improves Strength

Reduces Porosity

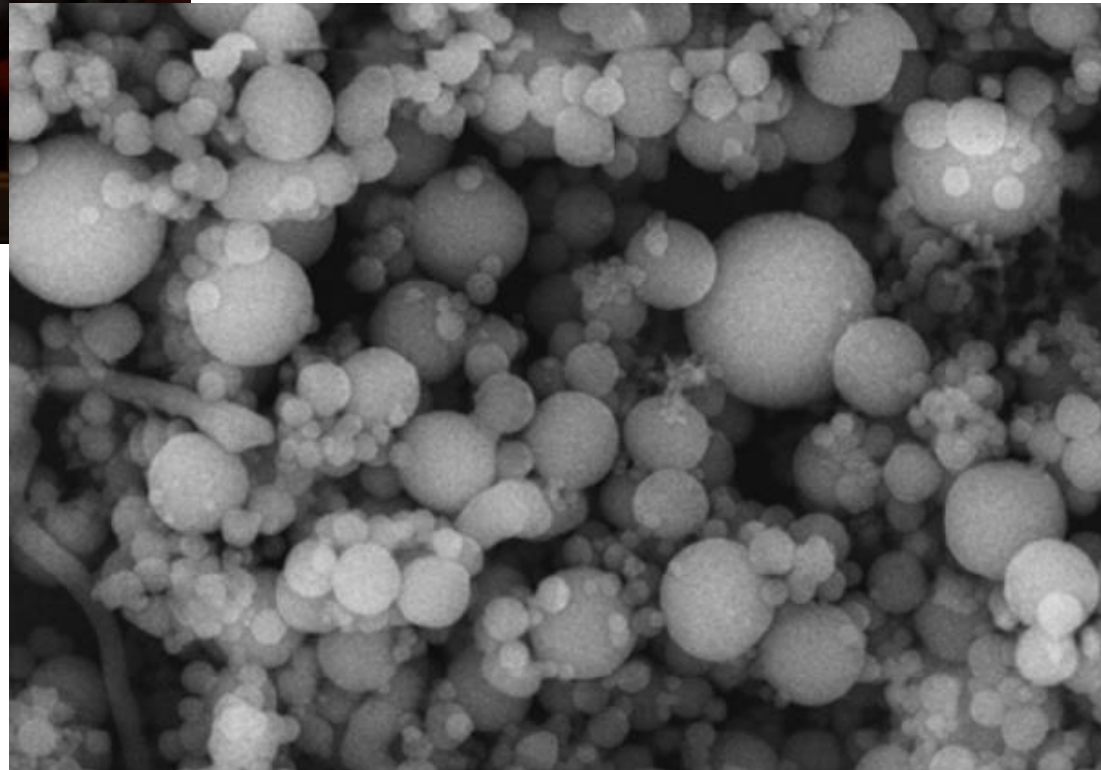
Improving Concrete Tipping Floors



Silica Fume / Micro Silica

By product of Electric Arc
Furnaces used in making steel

**Also rounded and
1,000 times smaller
than cement particles.**



Chemical Resistance

Normal Strength: NC State
recommended Concrete Mix for
Tipping Floors

7,000 psi

.42 w/c ratio

Granite Aggregate

Concrete:

Summary Recommendations:

1. Abrasion resistance is directly related to aggregate hardness.
2. Lower W/C ratio improves abrasion resistance when concrete is exposed to leachate.
3. QC. Make sure you require cylinders taken at job site.

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- 5. High Performance topping?**

Improving Concrete Tipping Floors

High Performance Topping



Advantages of High-Performance Topping

1. Far better performance over concrete
2. Reduced Down Time vs Concrete.

Installation over a weekend



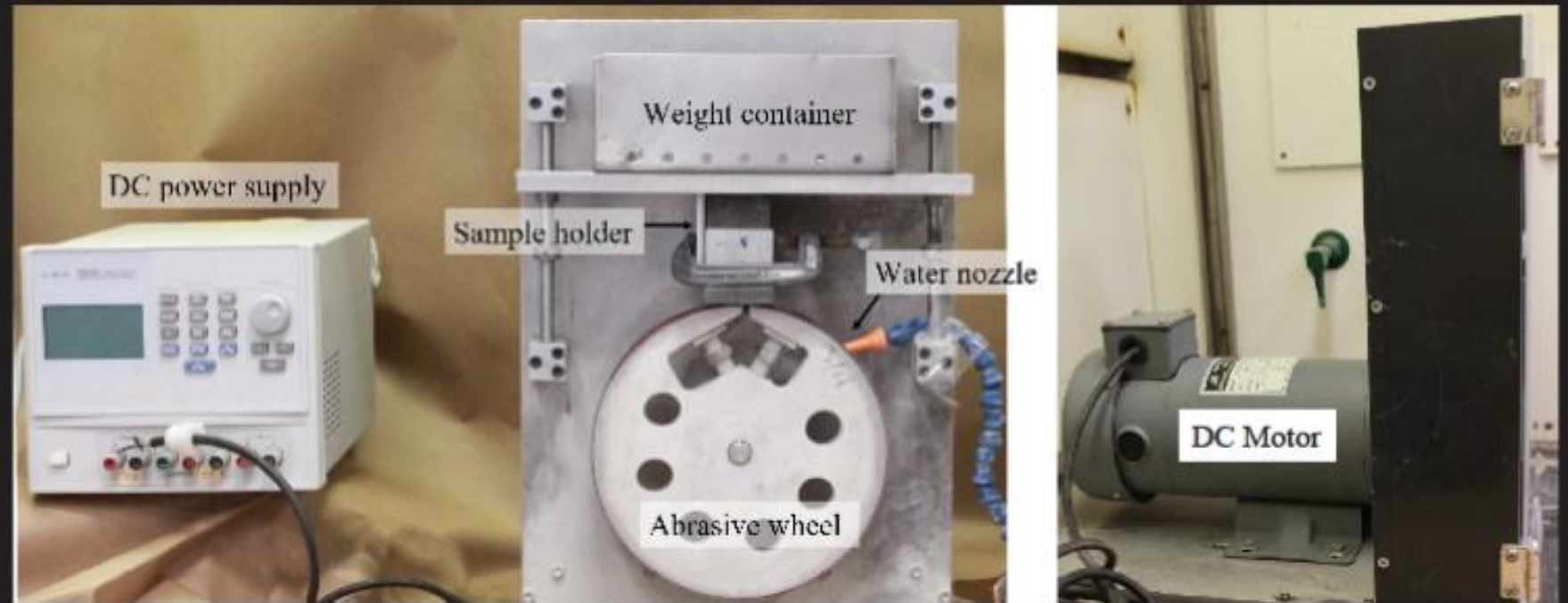
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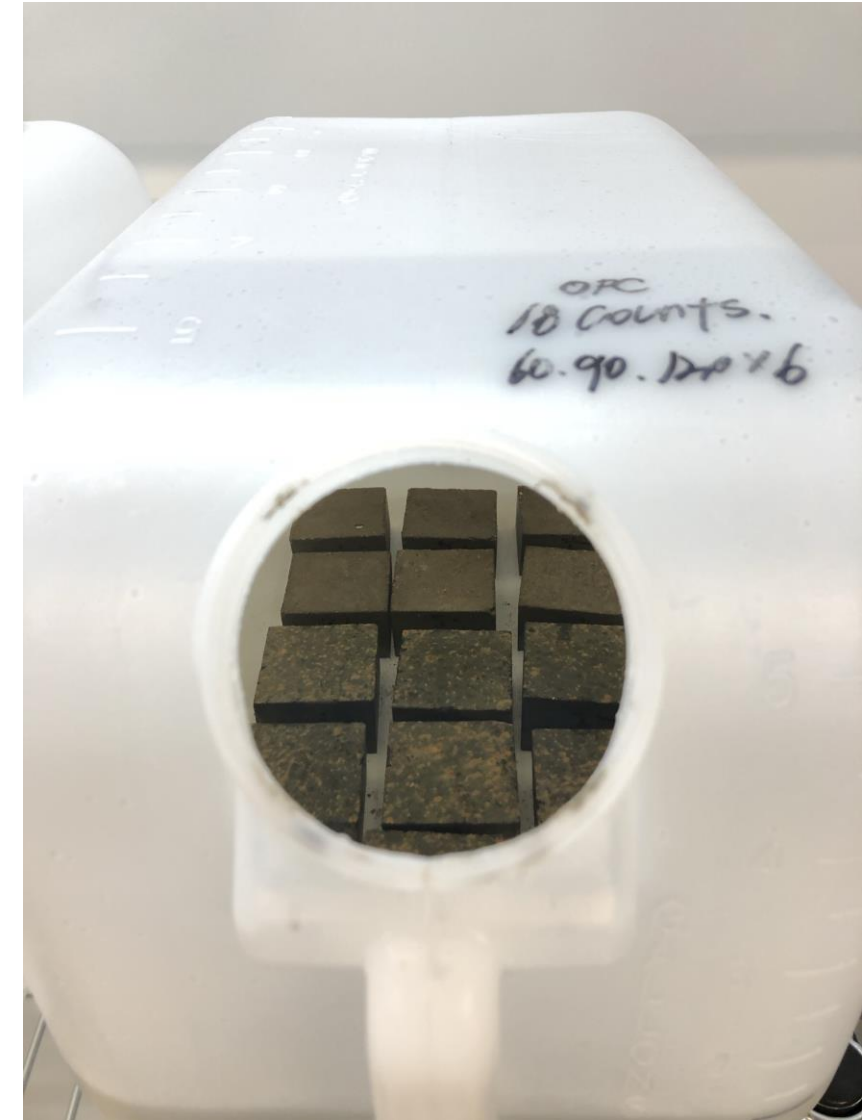
Increased Chemical Attack

THE NEW ABRASION TEST METHOD



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Chemical Resistance



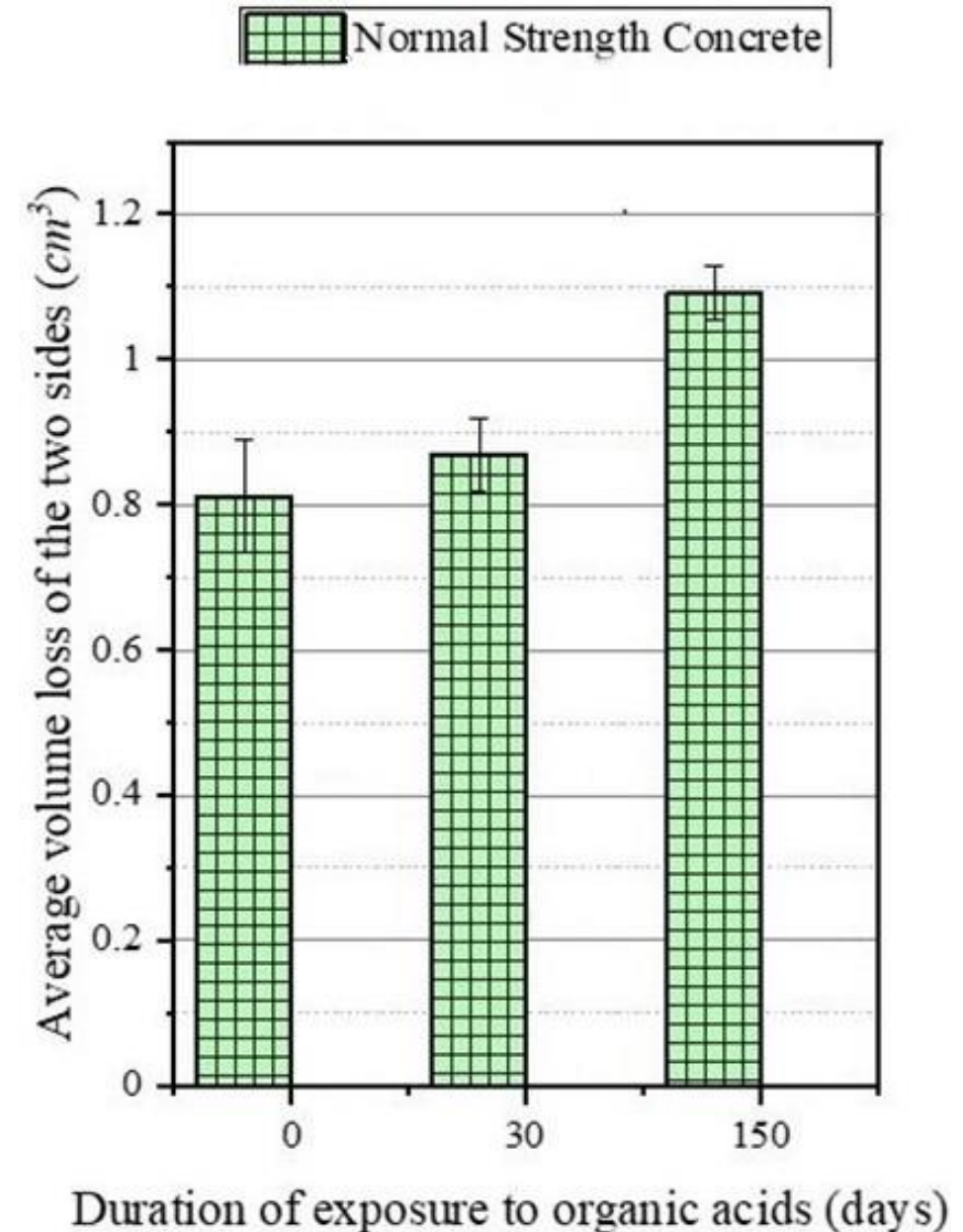
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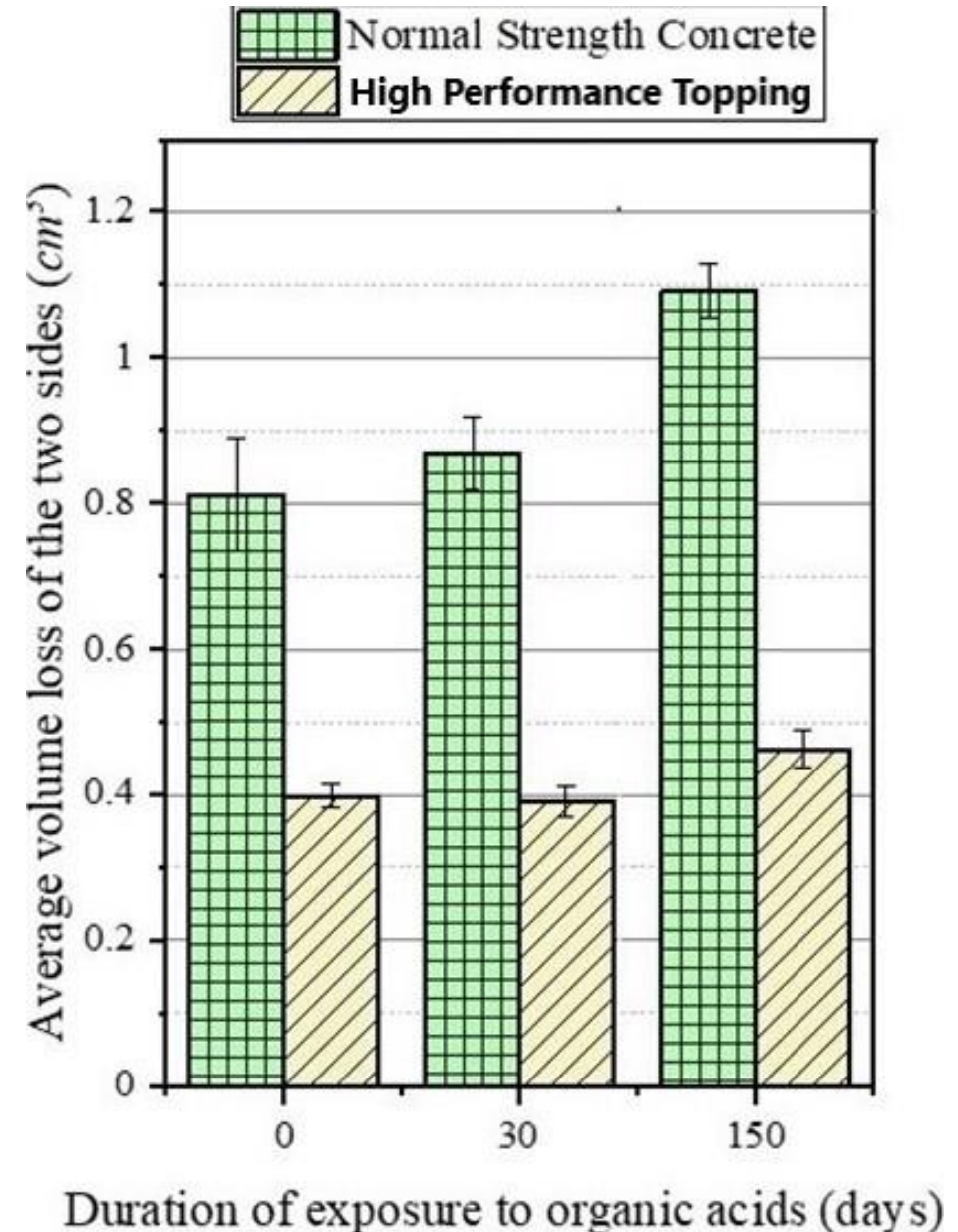
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High Performance Topping:

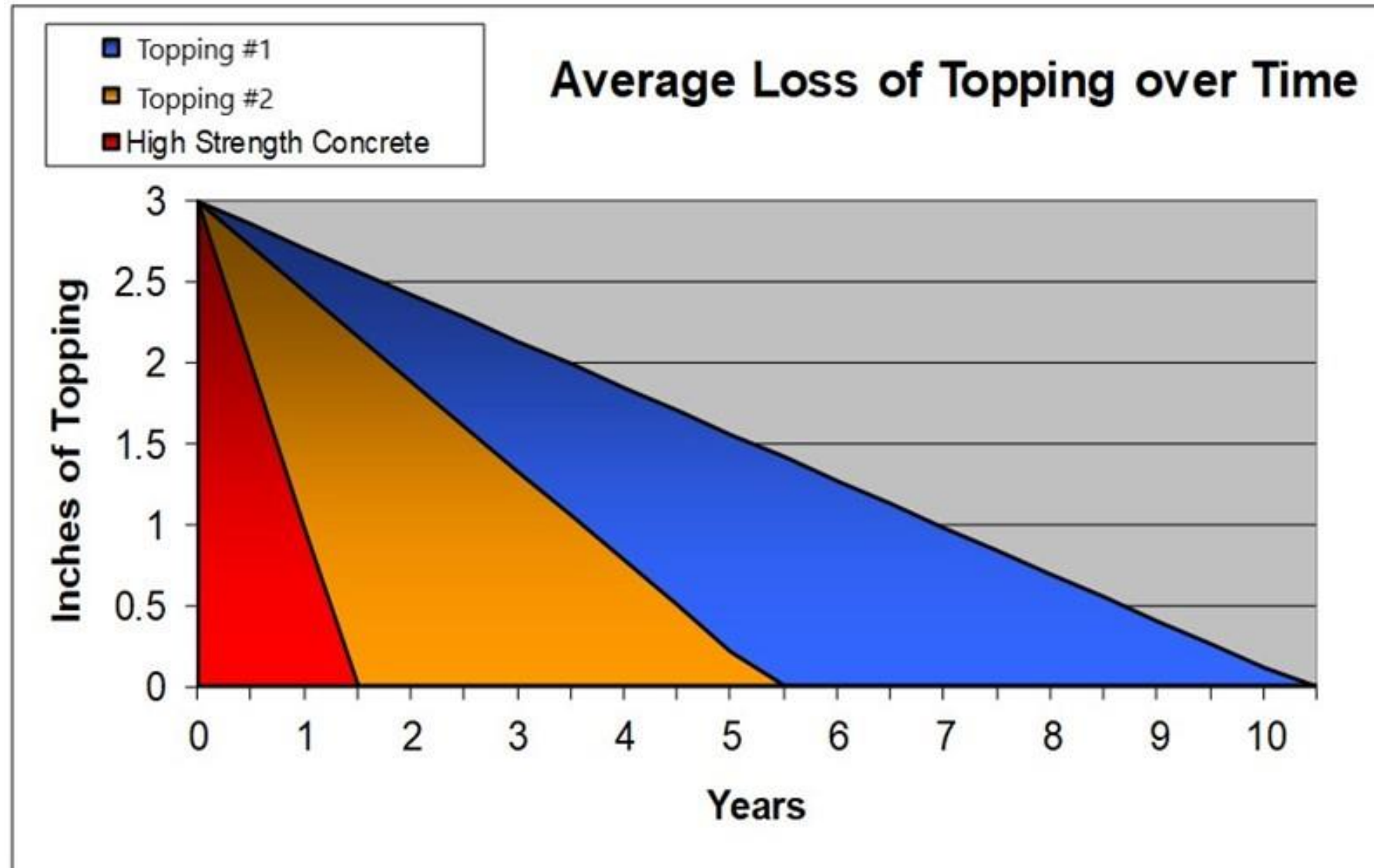
15,000 psi

.27 w/c ratio

Calcined Bauxite Aggregate



◆ Surface life is 3-5x



Improving Concrete Tipping Floors

- ◆ Is Down Time an Issue?
- ◆ Installation over a weekend



Improving Concrete Tipping Floors

◆ Is Down Time an Issue?



Bottom Line:

1. If Concrete lasting 15 – 20 years and you can shut down for 10-14 days....concrete makes a lot of sense.
2. But if concrete is only lasting 5-10 years and/or you need to minimize shutdown, a high performance topping should be considered.

High Performance Topping

◆ Qualified Installer

EucoFloor 404 Reference List 2019.pdf

- #1 **Project Name:** Sunnyvale SMaRT Station
Owner: City of Sunnyvale
Description of Work: Transfer Station Floor Overlay
Square Feet Installed: 9,000 SF **Installed Completion Date:** February 23, 2018
- #2 **Project Name:** CLARTS
Owner: City of Los Angeles
Description of Work: Transfer Station Floor Overlay at Ports
Square Feet Installed: 7,200 SF & 7,000 SF **Installed Completion Date:** November 19, 2016 & January 27, 2018.
- #3 **Project Name:** SBWMA Transfer Station & MRF Floor Repair
Owner: South Bayside Waste Management Authority
Description of Work: Repair Main Tipping Floor & MRF
Square Feet Installed: 7,800 SF & 4,970 SF **Installed Completion Date:** April 15, 2016 & November 5, 2017
- #4 **Project Name:** American Waste Transfer Station
Owner: Republic Services
Description of Work: Cast & Repour Port Edge / Overlay Main Transfer Station
Square Feet Installed: 7,620 SF **Installed Completion Date:** November 11, 2017
- #5 **Project Name:** Grand Central Recycling & Transfer Station
Owner: Pete Perez
Description of Work: Transfer Station Floor Overlay
Square Feet Installed: 6,800 SF **Installed Completion Date:** June 6, 2015
- #6 **Project Name:** Henderson Transfer Station
Owner: Republic Services
Description of Work: Overlay Main Tipping Floor / Cast & Repour Port Edge
Square Feet Installed: 3,600 SF 3,600 SF 3,000 SF **Installed Completion Date:** March 30, 2014 & April 12, 2015 & March 14, 2017

High Performance Topping

Contractor
should be
certified/trained
by manufacturer



The Euclid Chemical Company
19218 Redwood Road
Cleveland, OH 44110
Phone: 800-321-7628
Fax: 216-531-9596
www.euclidchemical.com

August 19, 2014

Infrastructure Repair
Services
163 Beaverbrook Road
Lincoln Park, NJ
973-692-0002

Re: Certification for Infrastructure Repair Services (IRS) as
Approved Contractor High Performance / High Durability
Concrete Toppings

To Whom It May Concern:

The Euclid Chemical Company certifies that Infrastructure Repair Services (IRS) is approved, qualified and experienced regarding the use and installation procedures for products manufactured by The Euclid Chemical Company. The IRS crew has specifically been trained and is experienced in the use of Euclid Chemical products related to the repair and restoration of heavy duty flooring applications such as tipping floors in solid waste transfer stations. This includes surface preparation of the substrate concrete and application of the toppings. Any questions, my contact information is listed below.

Sincerely,

High Performance Topping

Warranty should guaranty bond of the topping to the substrate and no wear through during the warranty period.

Manufacturer Obligations

The Euclid Chemical Company warrants its products to conform to the quality standards as stated in the specific product literature. The Euclid Chemical Company stands fully behind its products when used by qualified, competent persons following accepted construction procedures as outlined in our current published literature. In the event that a problem occurs, The Euclid Chemical Company reserves the right to have the true cause of the problem determined by accepted test methods performed by an independent, qualified concrete consultant or testing laboratory.

One Year Warranty Regarding Wear Resistance - The topping material EucoFloor 404 shall be guaranteed against premature wear and/or loss of bond to the substrate for one (1) years from the date of installation. If any portion of the topping wears through to concrete base before the warranty period expires, that portion shall be repaired or replaced by The Manufacturer and/ or The Contractor. One year of wear will be defined as a calendar year from date of installation.

This warranty covers failure of repairs subject to normal and usual exposure, but excluding failures due to acts of God, unusual weather phenomena, failure of substrates, faulty or inadequate design, structural defects, building alterations, fire, abuse by unusual traffic and loading or other abnormal activities.

If upon laboratory/petrographic testing, it has been determined that the product was the cause of the repair failure, The Euclid Chemical Company will authorize the appropriate repairs to the

High Performance Topping

Warranty should be
written and cover
Material and Labor

The Euclid Chemical Company



**Material and Labor
Sample Warranty**

Warranty Number:
Project:
Owner:
Architect/Engineer:
Applicator:
Products:
Square Footage:
Euclid Sales Representative:
Date of Project Completion:
Duration of Warranty: 1 year

High Performance Topping

Warranty: Signed by all parties.

Manufacturer
By:
Title:
Date:

Contractor |
By:
Title:
Date:

Owner or Owner's Representative
By:
Title:
Date:

Key Items in Specification

Qualified Contractor – Experienced with references of similar jobs

Topping – 6 successful projects within last 5 years

Topping Warranty – Material & Labor that covers Bond and Wear Through

Concrete – run job site QC regarding strengths

The Good News

- ◆ You have choices regarding the quality of your tipping floor
- ◆ Those choices have significantly improved over the years



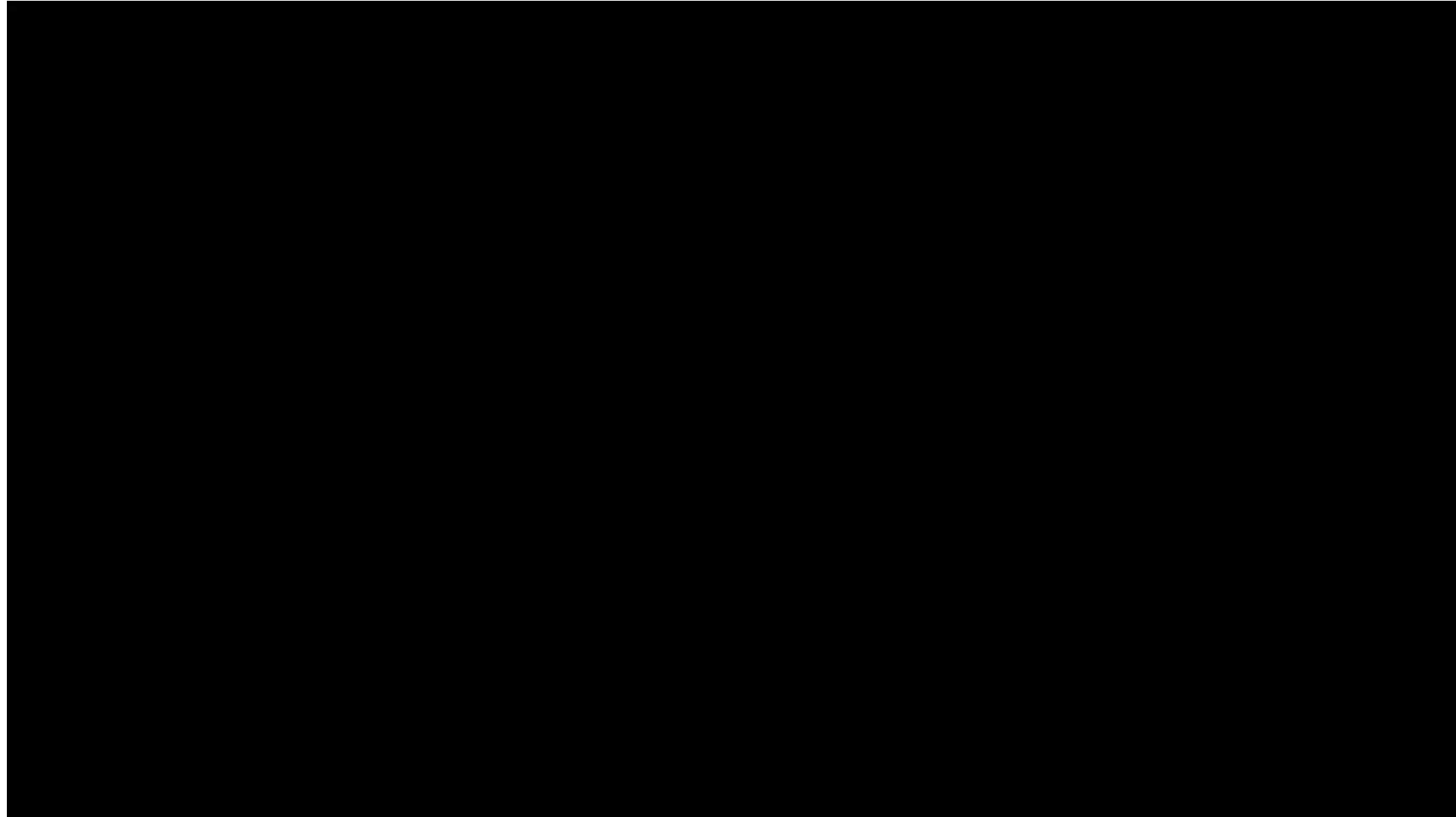
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Thank You



◆ Is Down Time an Issue?

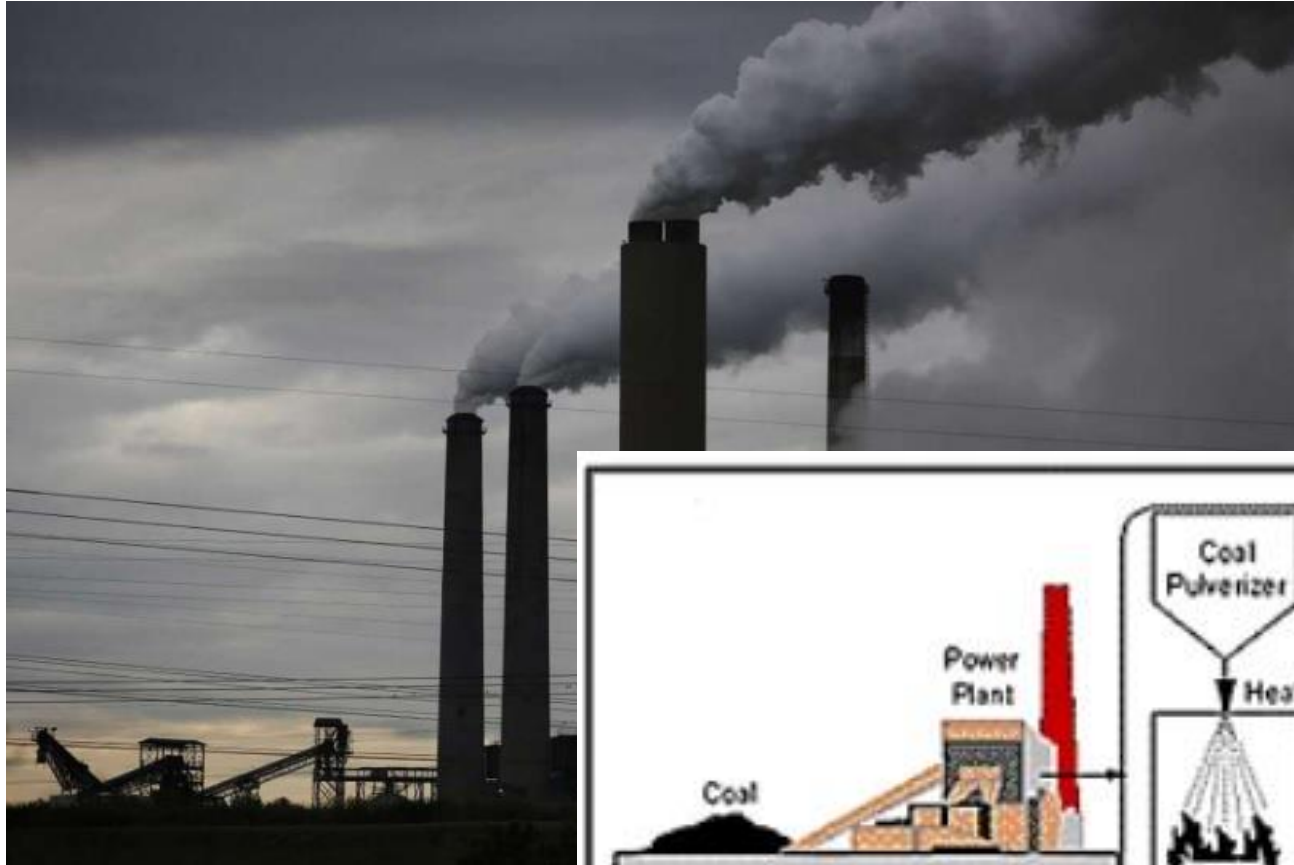


Improving Concrete Tipping Floors

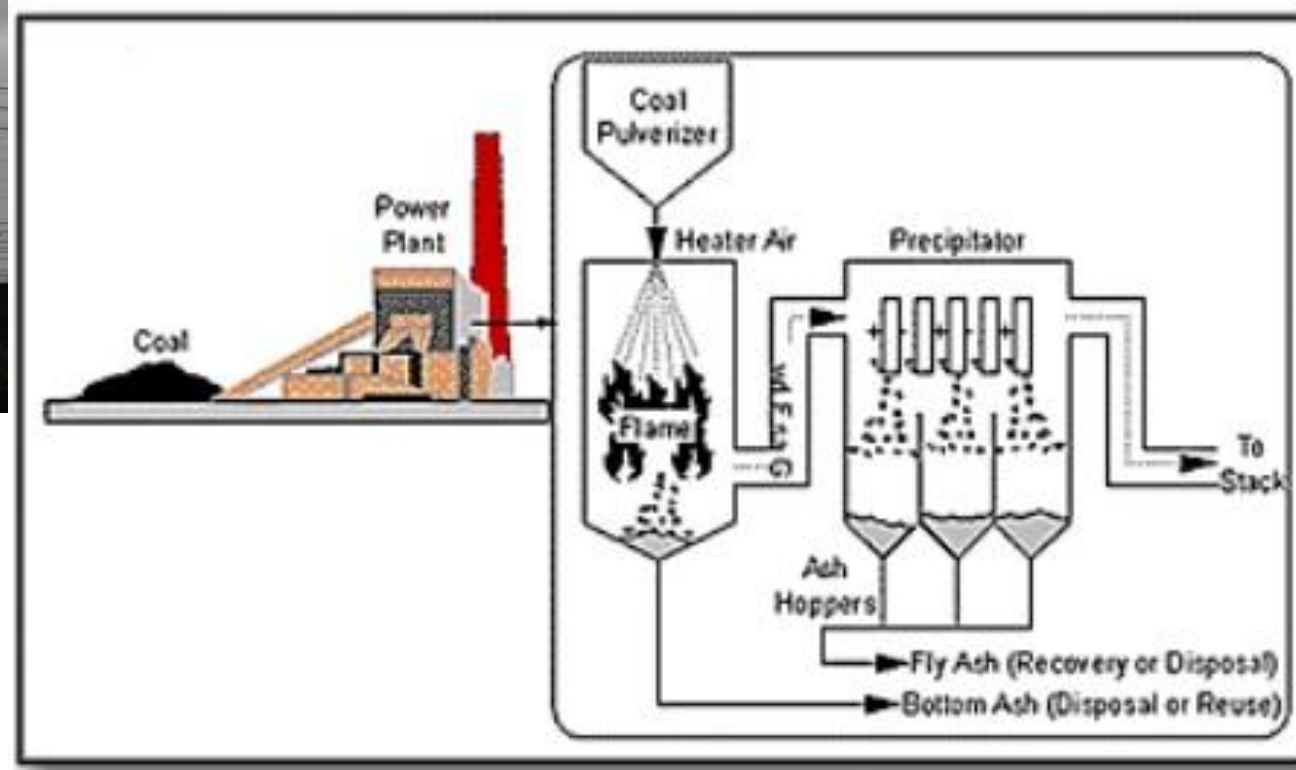
Increased
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Leachate



Improving Concrete Tipping Floors



Fly Ash

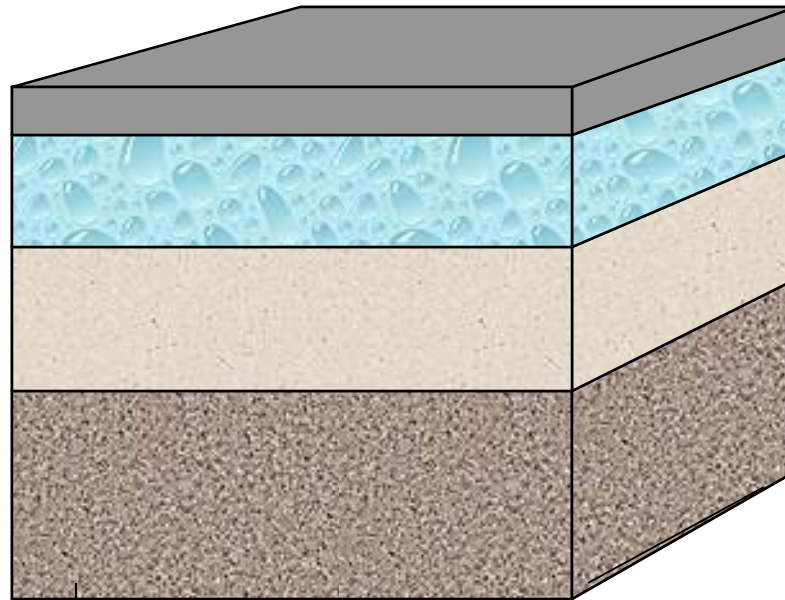


QUALITY REQUIREMENTS OF AGGREGATE

- Aggregates should be strong, hard, dense, durable, clear and free from veins and adherent coating.
- Aggregates should be free from injurious amounts of disintegrated pieces, alkalis, vegetable matter and other deleterious substances.
- **Flaky** and **Elongated** pieces should not be present in aggregate mass.
- **Aggregate crushing value** should not exceed 45 percent for aggregate used for concrete other than for wearing surfaces, and 30 percent for concrete for wearing surfaces, such as runways, roads and pavements.
- **Aggregate impact value** should not exceed 45 percent by weight for aggregates used for concrete other than for wearing surfaces and 30 percent by weight for concrete for wearing surfaces, such as runways, roads and pavements.
- **Abrasion value of aggregate** when tested using Los Angeles machine, should not exceed 30 percent by weight for aggregates to be used in concrete for wearing surfaces and 50 percent by weight for aggregates to be used in other concrete.

Concrete

Occupied Volume of Materials in One Cubic Yard of Concrete



Cement - 9%

Water - 17%

Fine Aggregate - 33%

(Total Combined
60% to 75%)

Coarse Aggregate - 41%

**Air Content will vary (Typically)
1.5% to 8%**

**Water/Cement Ratio
(W/C)**

High Performance Topping

1. Proven track record.
2. Installer should be VERY familiar with the product.
3. Performance should greatly exceed that of concrete.
4. Installation performed over a weekend for minimal downtime.
5. Warranty