

## *Creating Durable Concrete Floors*

Bob Swan  
**HDConcrete**  
FLOORS

[Bob@HDConcreteFloors.com](mailto:Bob@HDConcreteFloors.com)

702-239-1027



**We help owners, engineers and facility managers solve tipping floor durability problems.**



## *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

# Improving Concrete Tipping Floors



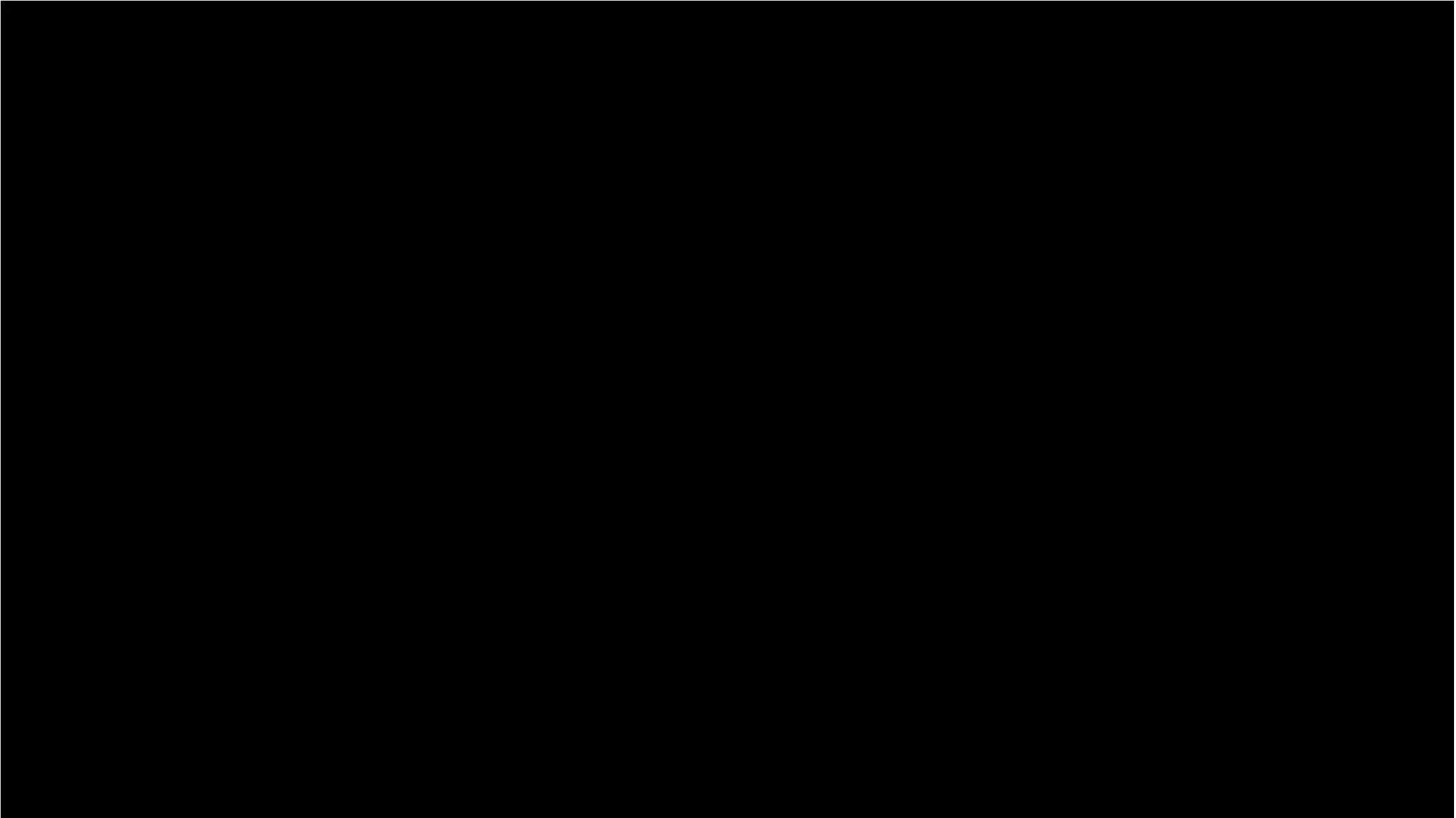
# Improving Concrete Tipping Floors



# **Market Trends For Transfer Stations**

## Increased Construction & Demolition

# Improving Concrete Tipping Floors



# 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**



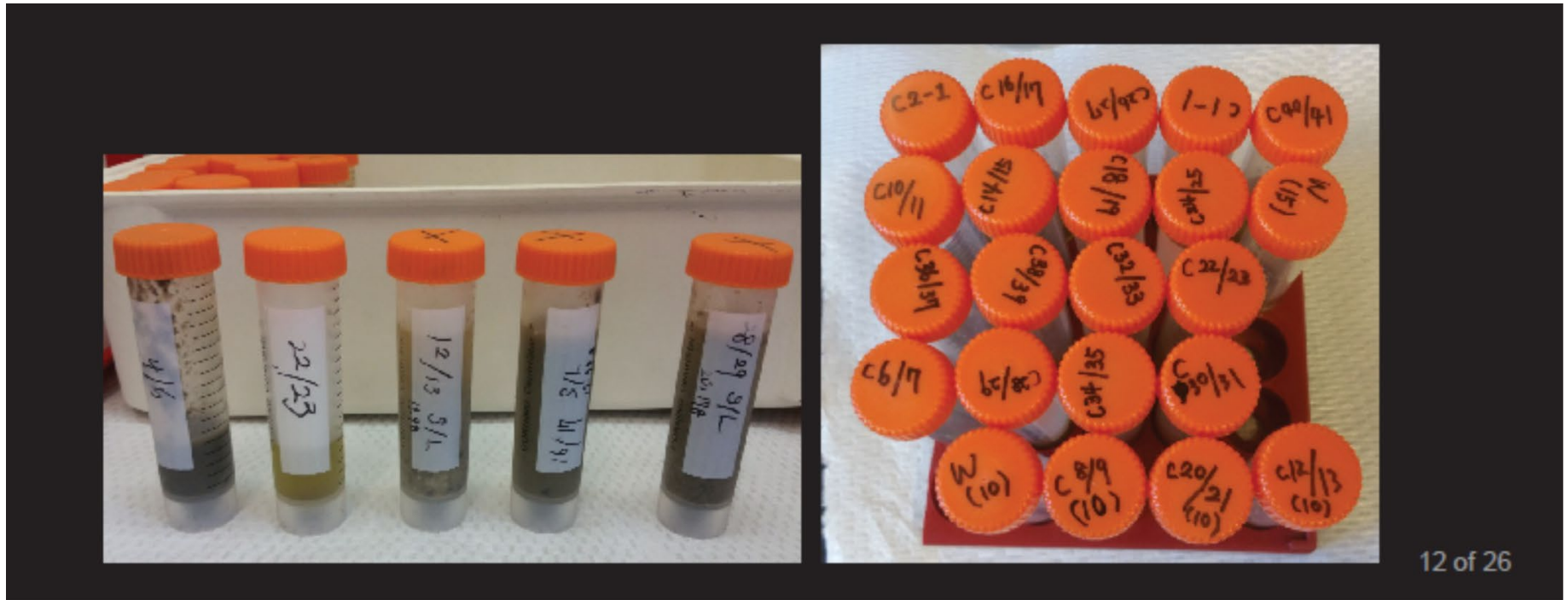
Increased  
Chemical Attack  
**Leachate**

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

**NC STATE  
UNIVERSITY**

## 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

# Improving Concrete Tipping Floors

Increased  
Chemical Attack  
**Leachate**



## Food Waste



## Normal Wear



## Chemical Attack



## Normal Abrasion



# Improving Concrete Tipping Floors

## 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  
Recycling



# Improving Concrete Tipping Floors

Increased  
Chemical Attack  
**Leachate**

Bottle & Can  
Recycling



# Improving Concrete Tipping Floors

Increased  
Chemical Attack  
**Leachate**

Bottle & Can  
Recycling



# Improving Concrete Tipping Floors

Increased  
Chemical Attack  
**Leachate**

Bottle & Can  
Recycling



# Improving Concrete Tipping Floors

Increased  
Chemical Attack  
**Leachate**

Bottle & Can  
Recycling



# 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  
Chemical Attack  
**Leachate**

Steel around  
port edge



# Improving Concrete Tipping Floors

Increased  
Chemical Attack  
**Leachate**

Steel around  
port edge



# Improving Concrete Tipping Floors

Increased  
Chemical Attack  
**Leachate**

Steel around  
port edge



## Port Edge Repairs

Do away with steel entirely.



## Port Edge Repairs

Do away with steel entirely.



# Improving Concrete Tipping Floors

## Port Edge Repairs

Do away with steel entirely.



## *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  
and FLOOR INTEGRITY  
collide



# Improving Concrete Tipping Floors



# Improving Concrete Tipping Floors

When the world of EPA and  
FLOOR INTEGRITY collide



# Improving Concrete Tipping Floors

When the world of EPA and  
FLOOR INTEGRITY collide



# Improving Concrete Tipping Floors

When the world of EPA and  
FLOOR INTEGRITY collide



## *Agenda:*

1. Tipping Floor Deterioration.
2. Issues of safety and environment.
3. How long is your floor going to last?  
**Let's measure it!** For Safety. For Budget.

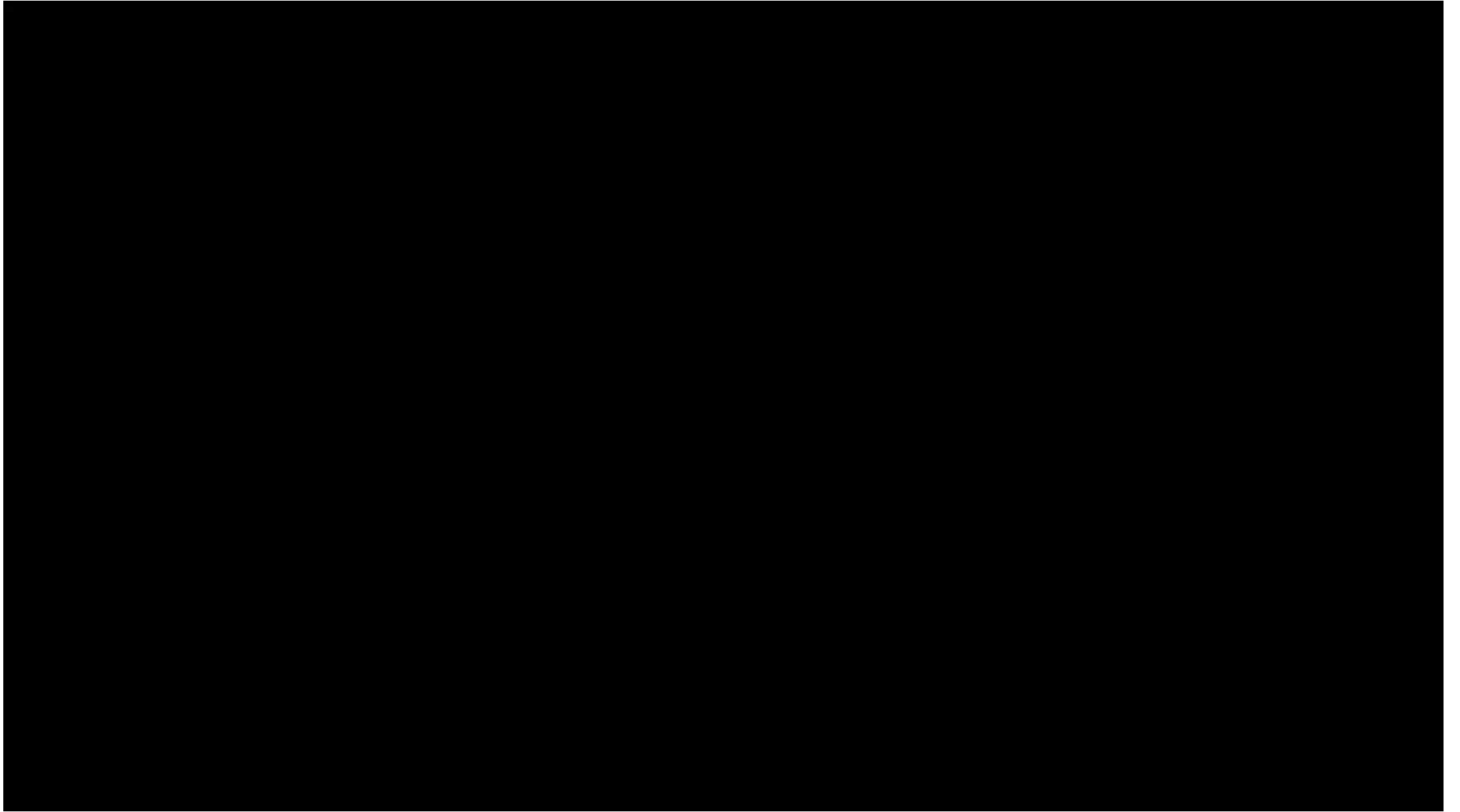
## ***Measuring the rate of concrete wear.***

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

## *Measuring the rate of concrete wear.*

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

# 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

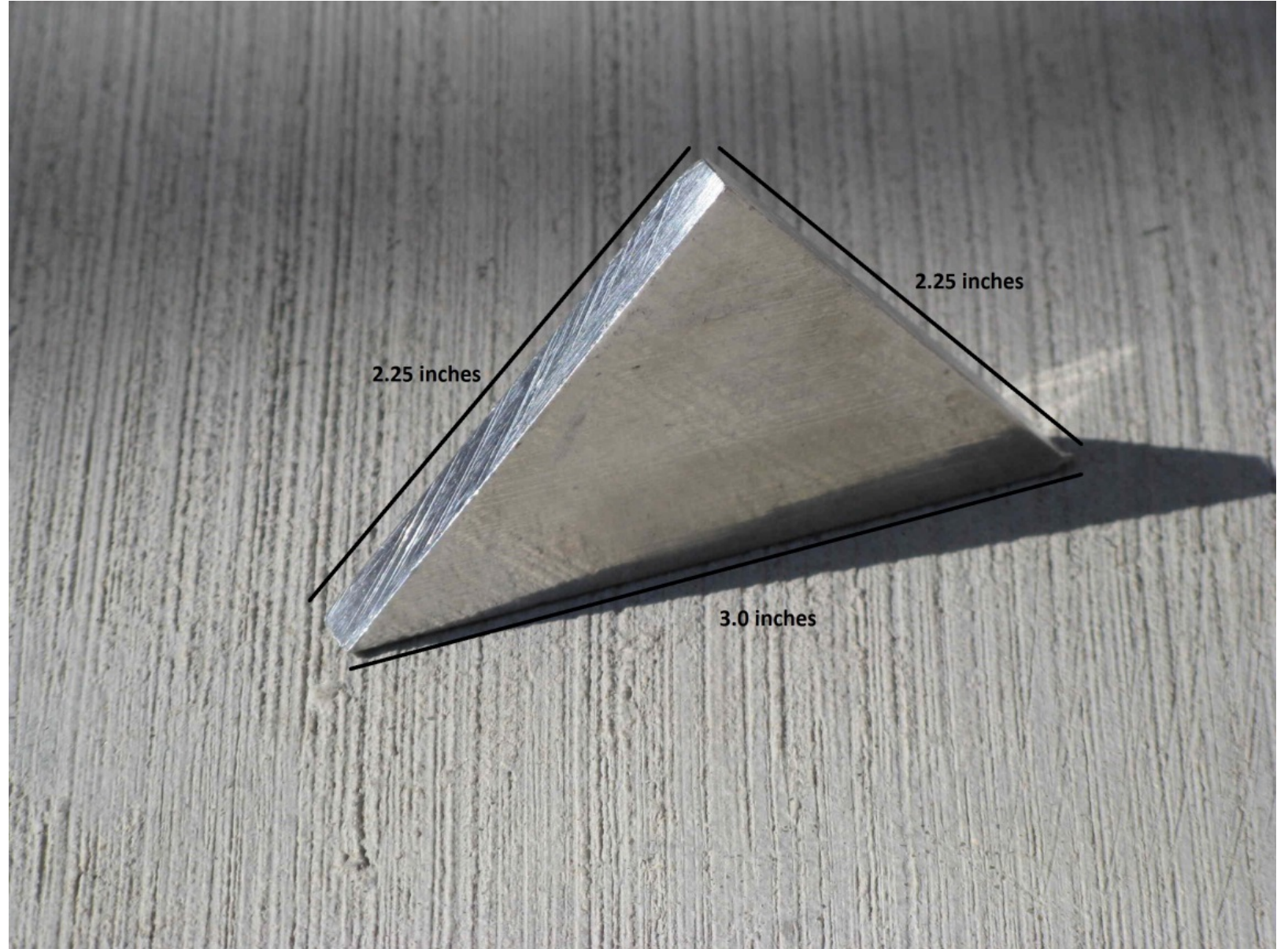
North Shore Marine  
Transfer Station  
NY Sanitation Dept



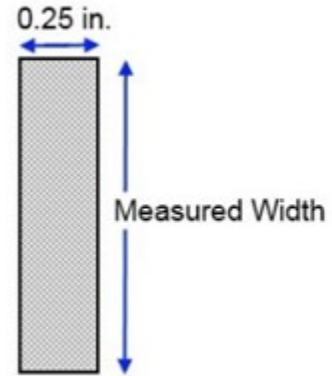
## ***Measuring the rate of concrete wear.***

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

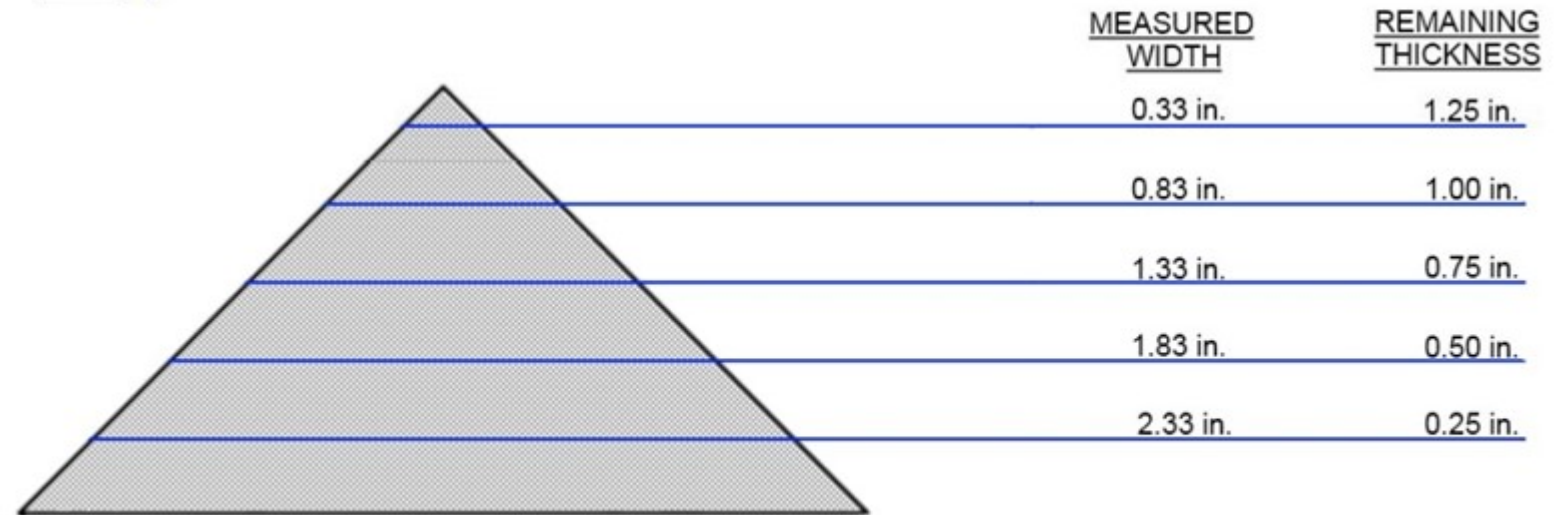
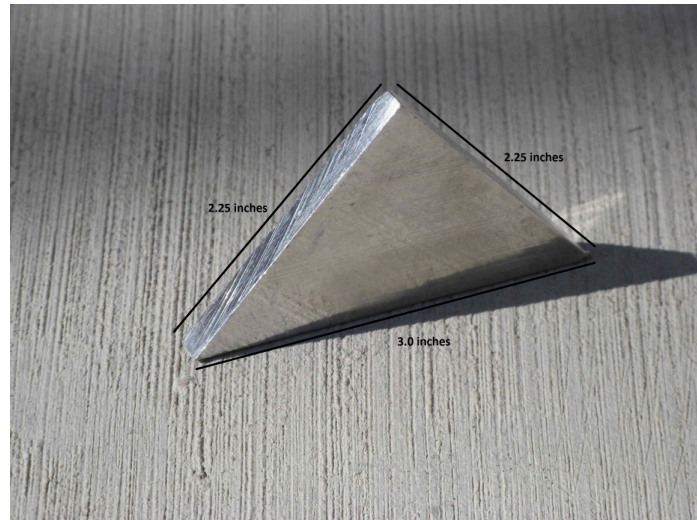
## Wear Indicators



## Wear Indicators



## TIPPING FLOOR WEAR INDICATORS



# Improving Concrete Tipping Floors

## Wear Indicators



## Wear Indicators



## Wear Indicators



# Improving Concrete Tipping Floors

## Wear Indicators



# Improving Concrete Tipping Floors

## Wear Indicators



# Improving Concrete Tipping Floors

## Wear Indicators



## ***Measuring the rate of concrete wear.***

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

# Improving Concrete Tipping Floors

## Laser Scanning



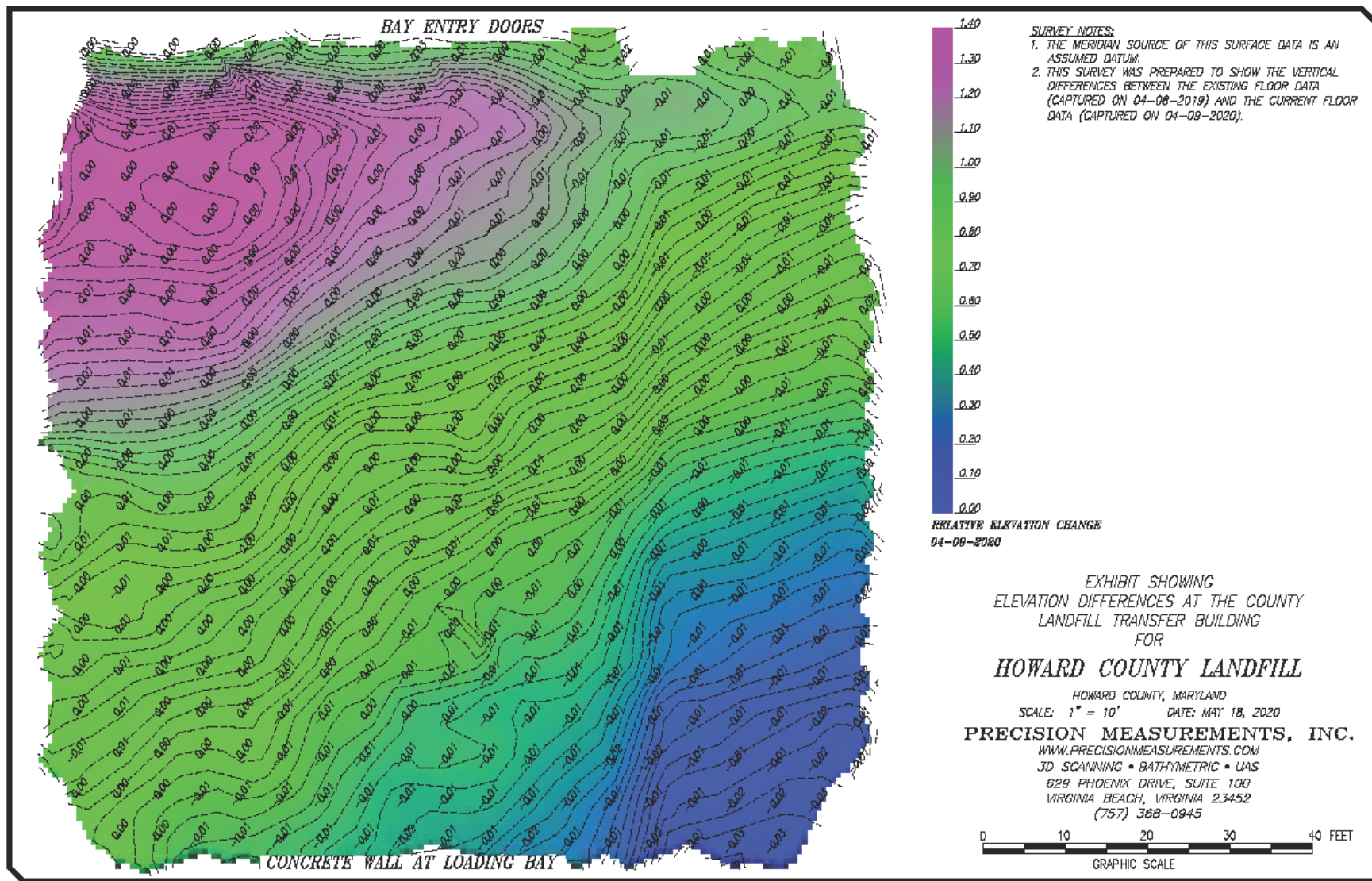
# Improving Concrete Tipping Floors

## Laser Scanning



# Improving Concrete Tipping Floors

## Laser Scanning

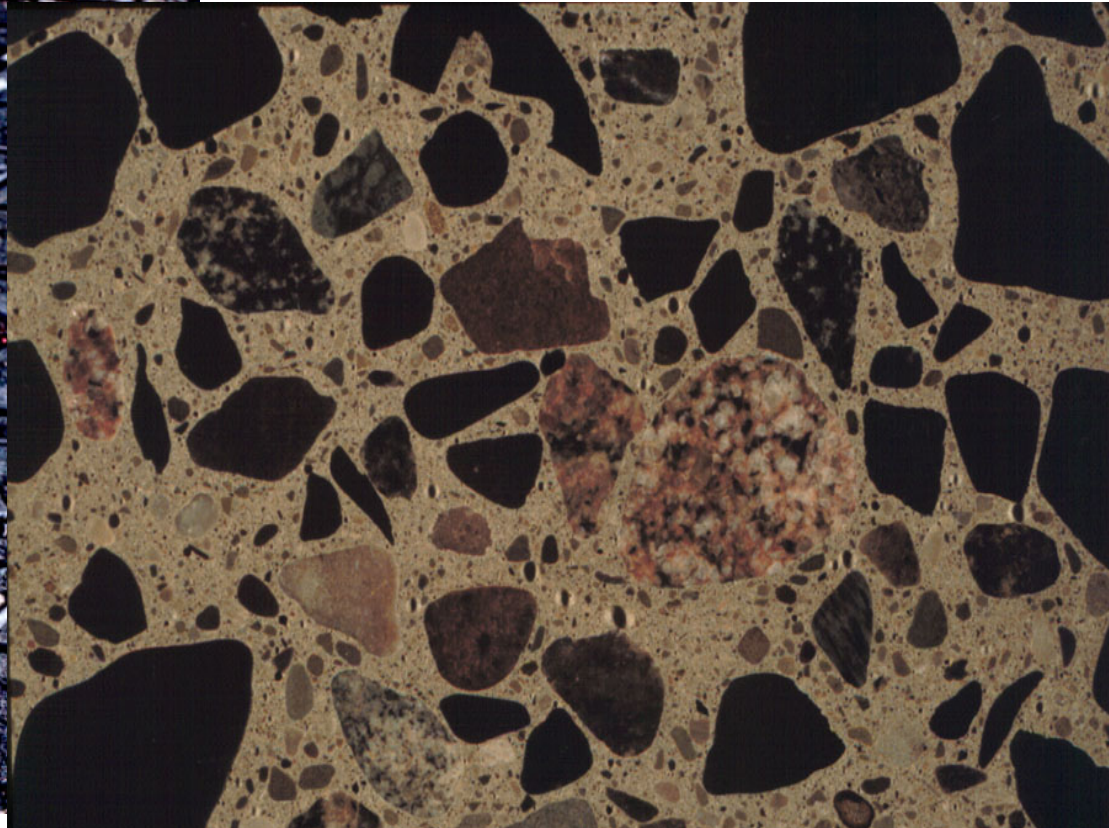


## *Agenda:*

1. Tipping Floor (Concrete) Deterioration.
2. Issues of safety and environment.
3. How long is your floor going to last? Let's measure it!
4. Repair: Full depth with Concrete?  
High Performance topping?



## High Strength Concrete



## High Strength Concrete

6000 psi @ 28 days

Cementitious	680 lbs.
Fly Ash	20%
Fine Aggregate	1150 lbs.
Coarse Aggregate	1900 lbs. (#467 Stone)
Water Content	285 lbs.
Air Content (Entrapped)	1.5%
HRWR	40 oz. +/- Type F
W/cm	0.42
Initial Slump (Water)	2" – 3"
Final Slump	6" – 8"
Shrinkage	≤ 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 lower for roads and pavements than for wearing surfaces, and

roads and pavements.

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

surfaces, such as runways, roads and pavements.

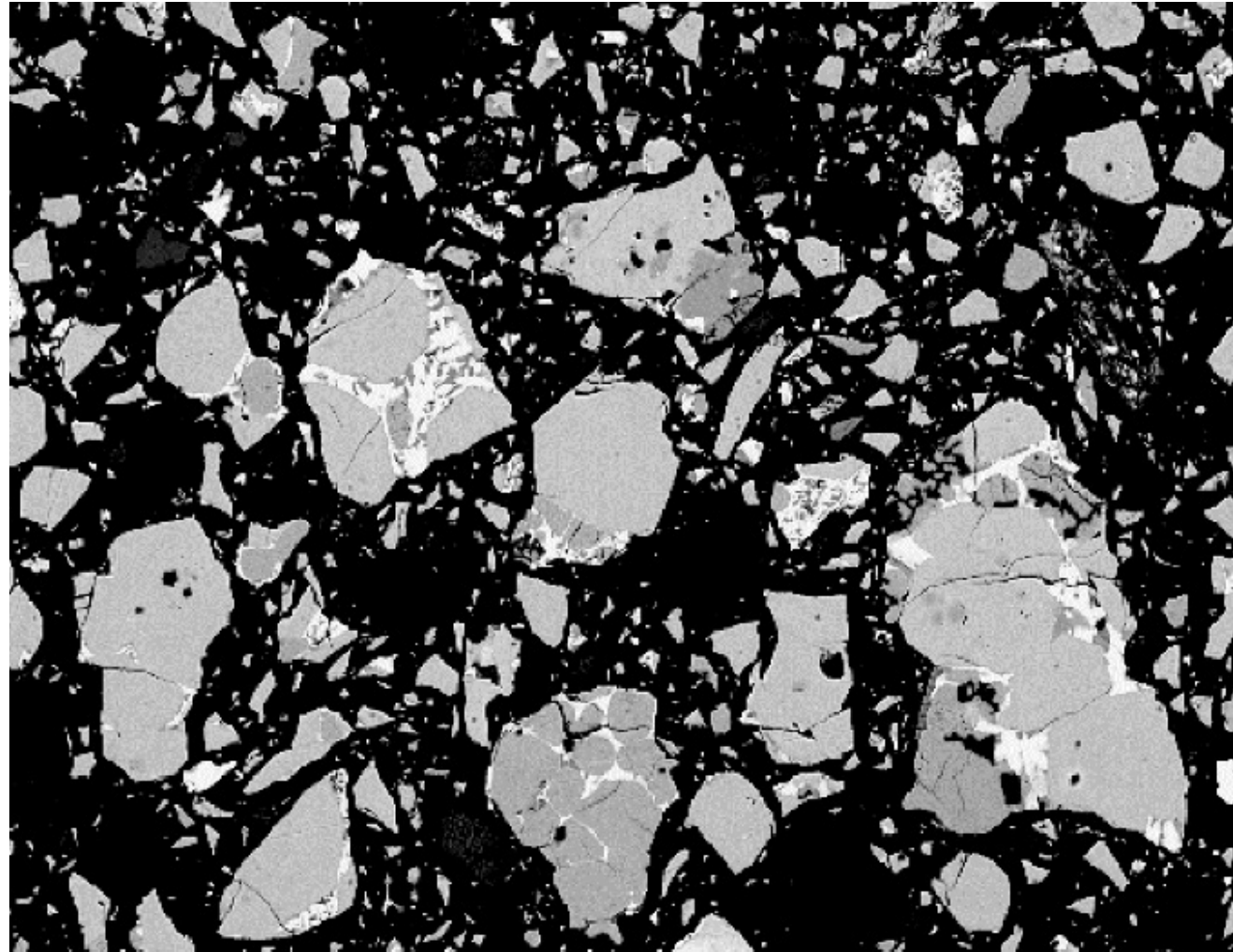
- Abrasion value of aggregate should be lower for wearing surfaces than for concrete other than for wearing surfaces.

# How Does Putting Fly Ash In Concrete Help?

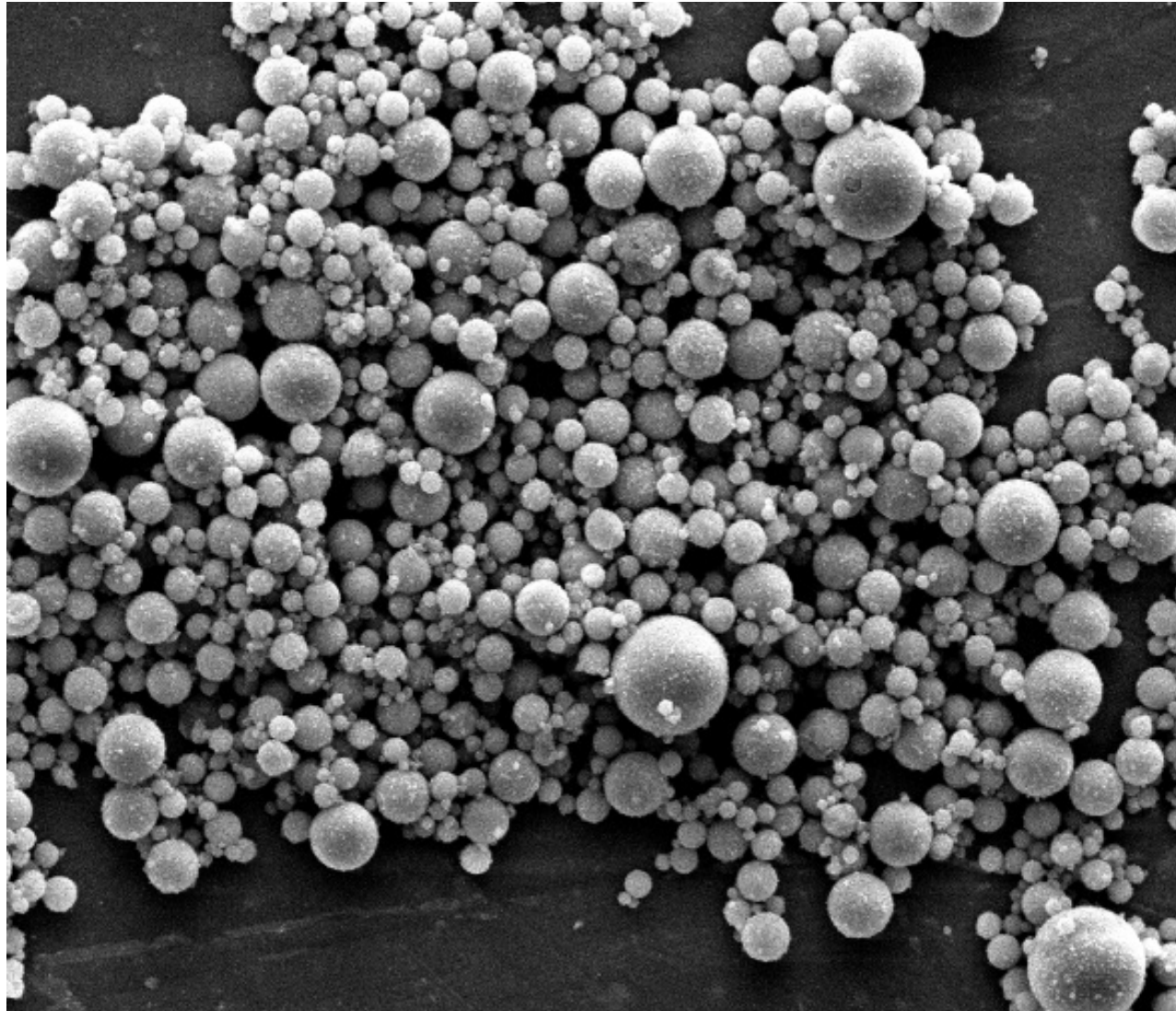
## Fly Ash



# Cement Particles



## Fly Ash



## **Greater Use Of Silica Fume**

**Improves Strength**

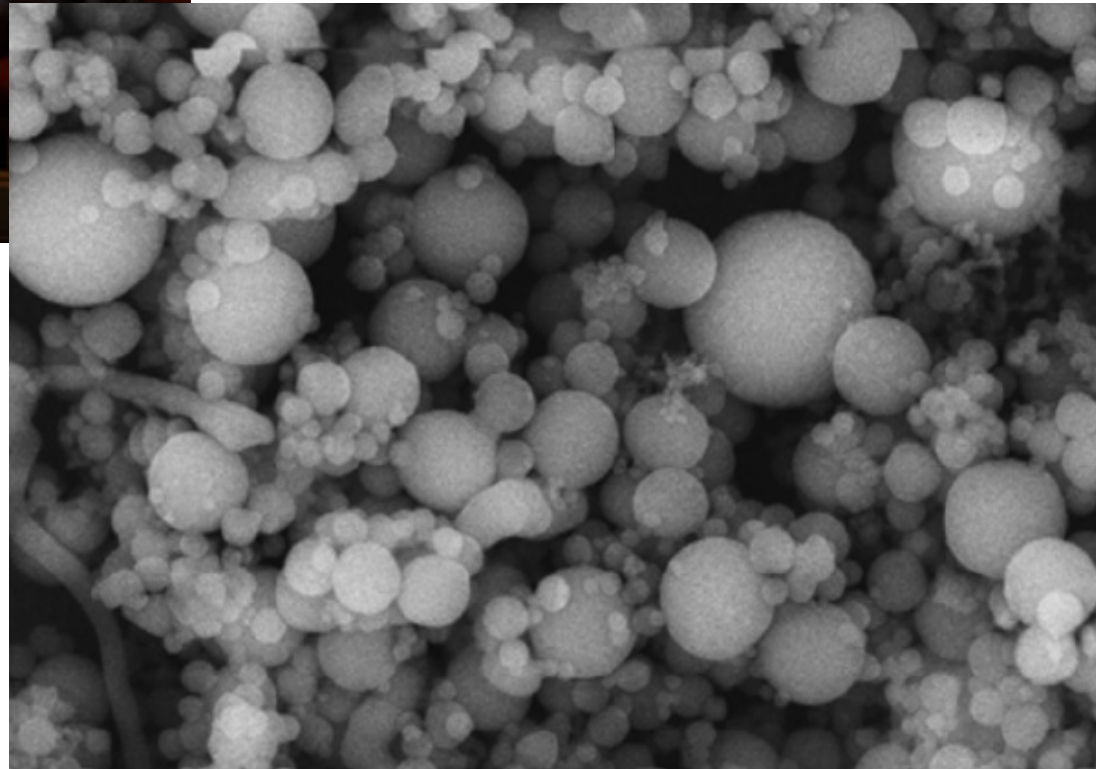
**Reduces Porosity**

# 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.

## *Agenda:*

1. Tipping Floor (Concrete) Deterioration.
2. Issues of safety and environment.
3. How long is your floor going to last? Let's measure it!
4. Repair: Full depth with Concrete?
- 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



Increased  
Chemical Attack  
**Leachate**

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

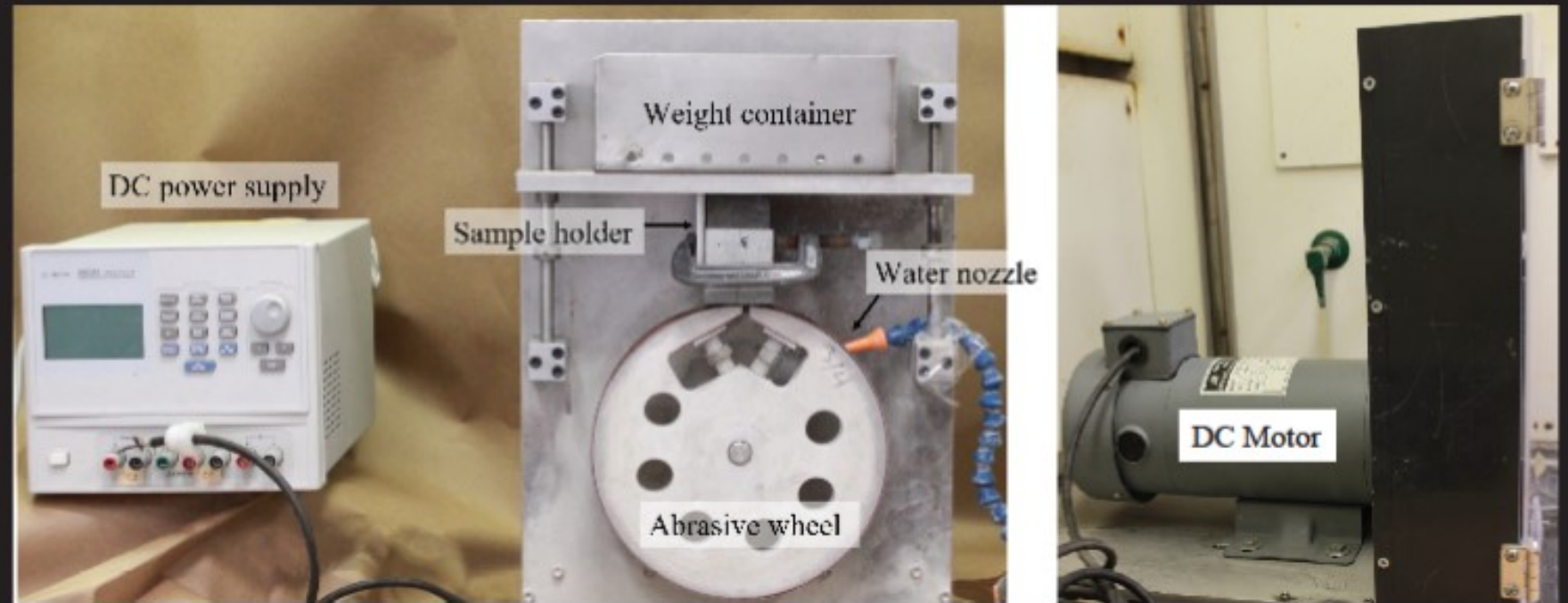
**NC STATE**  
UNIVERSITY

## Chemical Resistance



## Increased Chemical Attack

### THE NEW ABRASION TEST METHOD



## Chemical Resistance



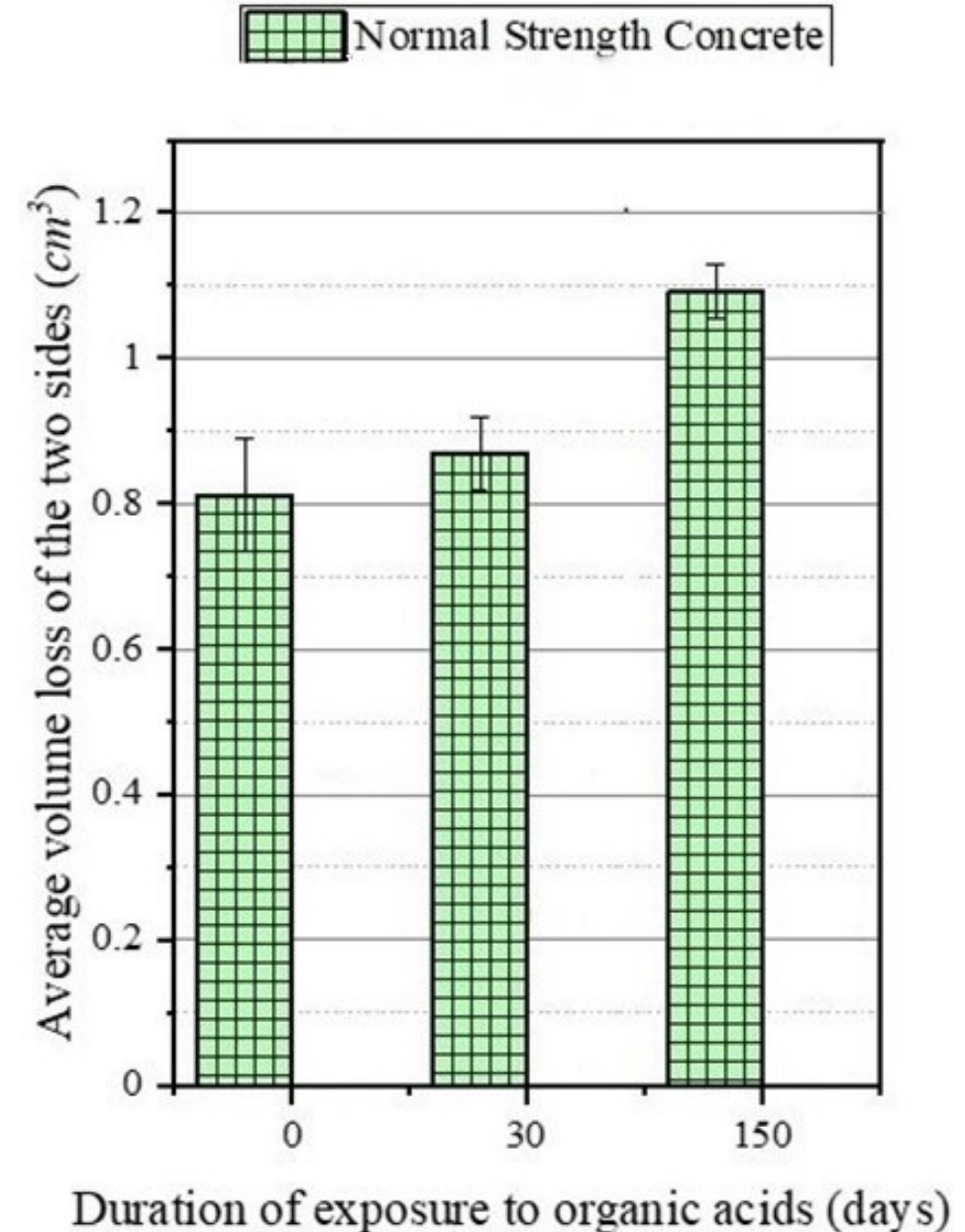
## Chemical Resistance

**Normal Strength:** NC State recommended Concrete Mix for Tipping Floors

7,000 psi

.42 w/c ratio

Granite Aggregate



## Chemical Resistance

**Normal Strength:** NC State recommended  
Concrete Mix for Tipping Floors

7,000 psi

.42 w/c ratio

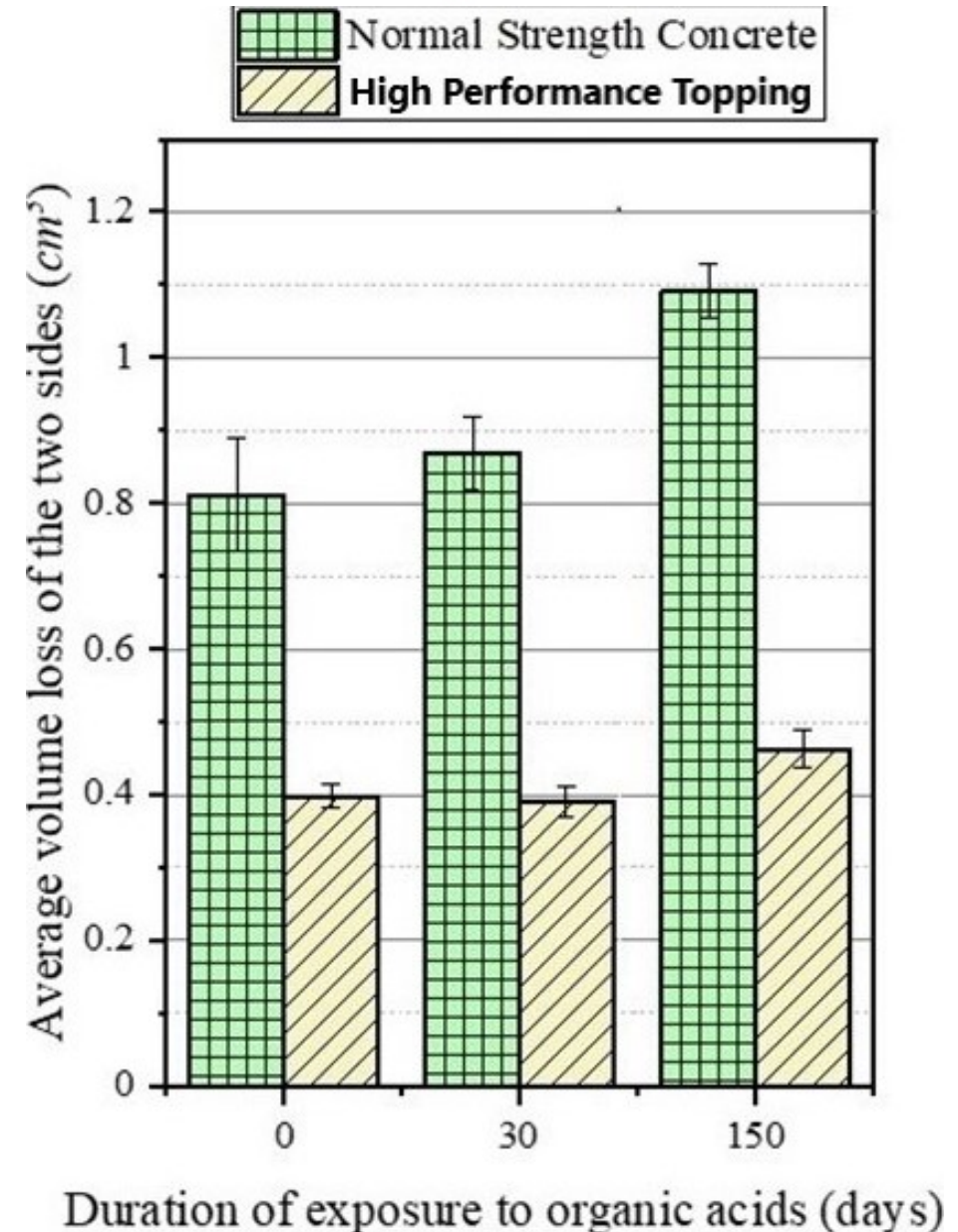
Granite Aggregate

**High Performance Topping:**

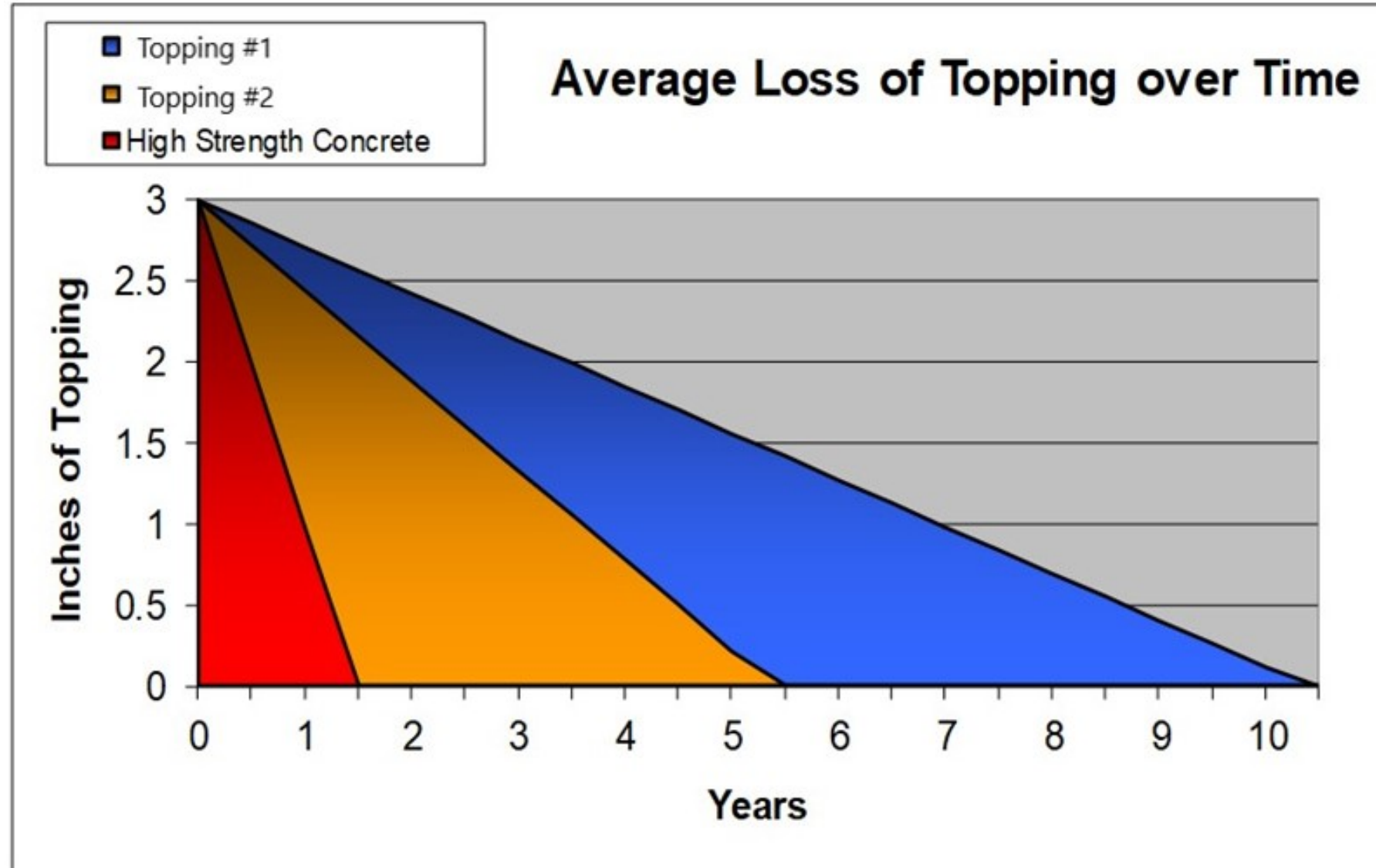
15,000 psi

.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?



# 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](http://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



EUCLID CHEMICAL

**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



*Creating Durable  
Concrete Floors*

**Thank You**

Bob Swan  
**HDConcrete**  
FLOORS

[Bob@HDConcreteFloors.com](mailto:Bob@HDConcreteFloors.com)

702-239-1027

