ACPA National Update

60th Annual ICPA
Concrete Pavement Workshop
February 7 – 9, 2024

Eric Ferrebee, P.E.
Senior Director of Technical Services

ACPA
AMERICAN CONCRETE PAVEMENT ASSOCIATION

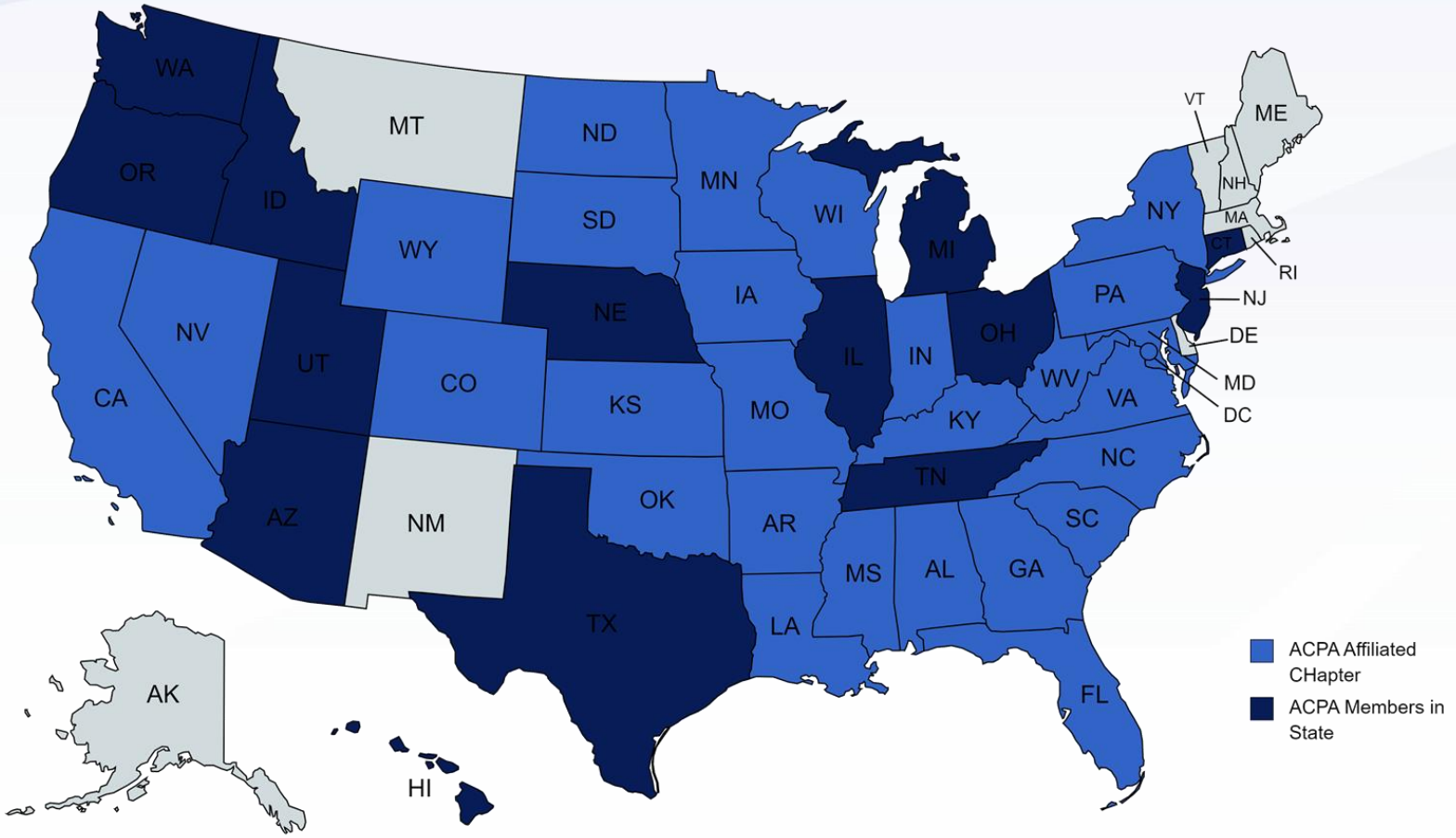
Who is ACPA?

ACPA is the only national trade association dedicated solely to concrete pavement

ACPA's mission is to develop and protect concrete pavement markets through education, advocacy, marketing, and industry technical leadership.

ACPA's vision is for concrete to be the pavement material of choice, benefitting communities and society within US, state, and local economies.

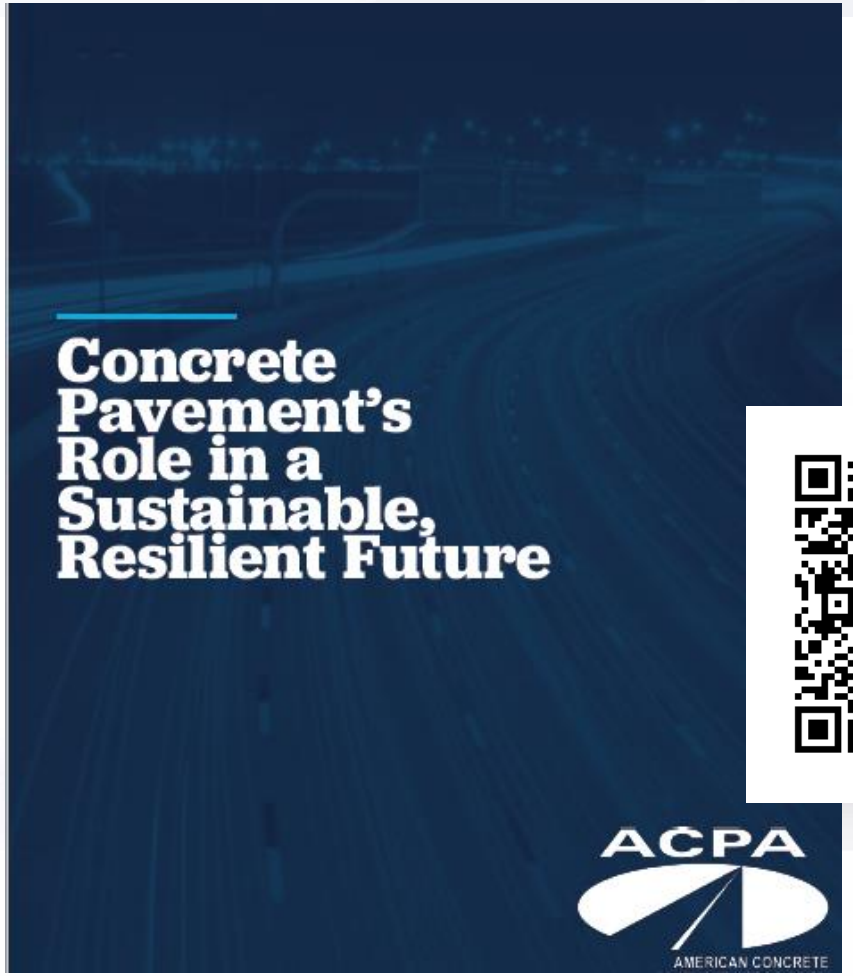
Who is ACPA?



- 200+ Contractor Members
- 15 Cement Companies
- 60+ Equipment, etc.
- Federation of 17 “Chapters”
- Staff of Civil Engineers


Sustainability Can't Be
Achieved Without Competition
ACPA

Sustainability



Federal Sustainable Pavements Key Initiatives

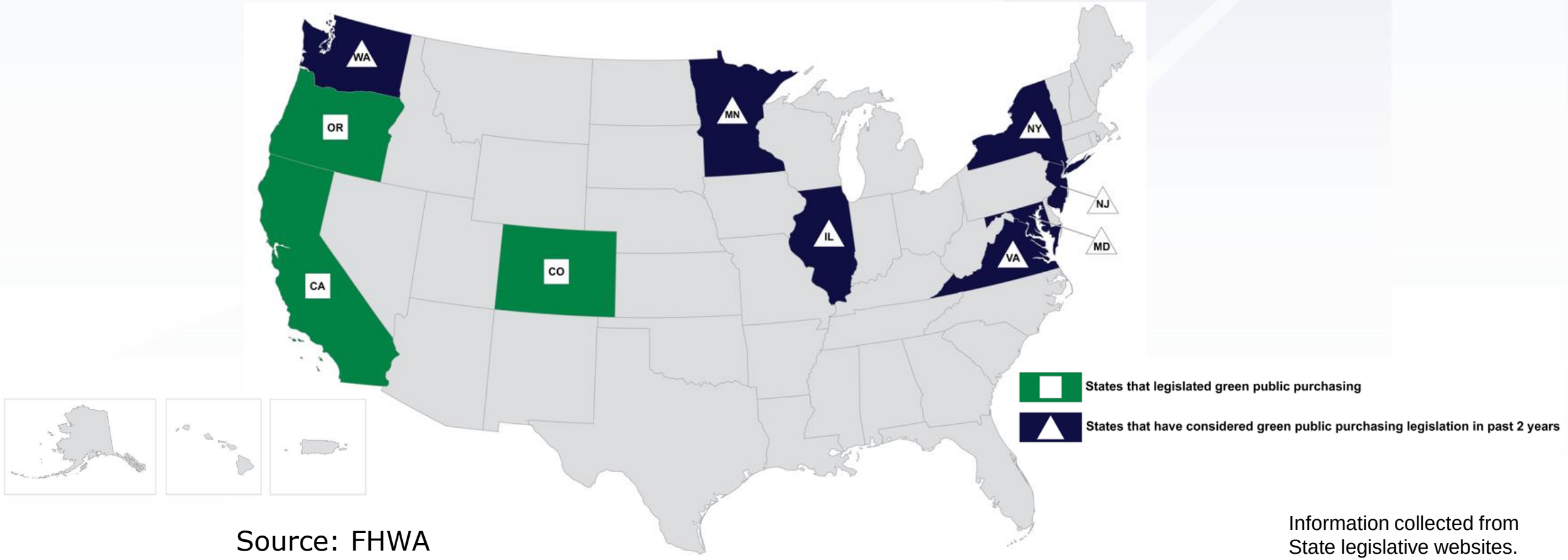
WH Buy Clean Initiative
14057 specified goal towards Federal Buy Clean Policy for federally funded projects

Inflation Reduction Act
$2 Billion for FHWA
Low-carbon transportation materials grants (P.L. 117-169)

25 States (+2 Locals) Participating
FHWA supporting 35+ projects from 27 agencies with $7.1M

EDC-7
State DOTs
EPDs for Sustainable Project Delivery

Buy Clean Policies at the State Level

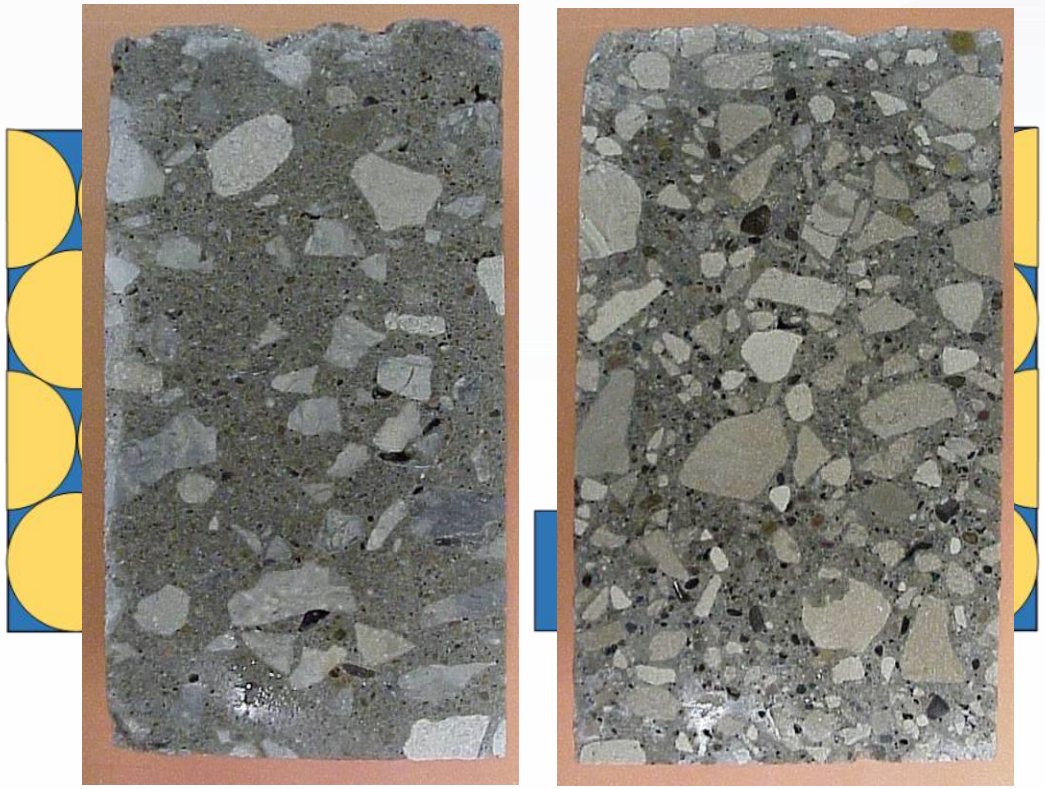


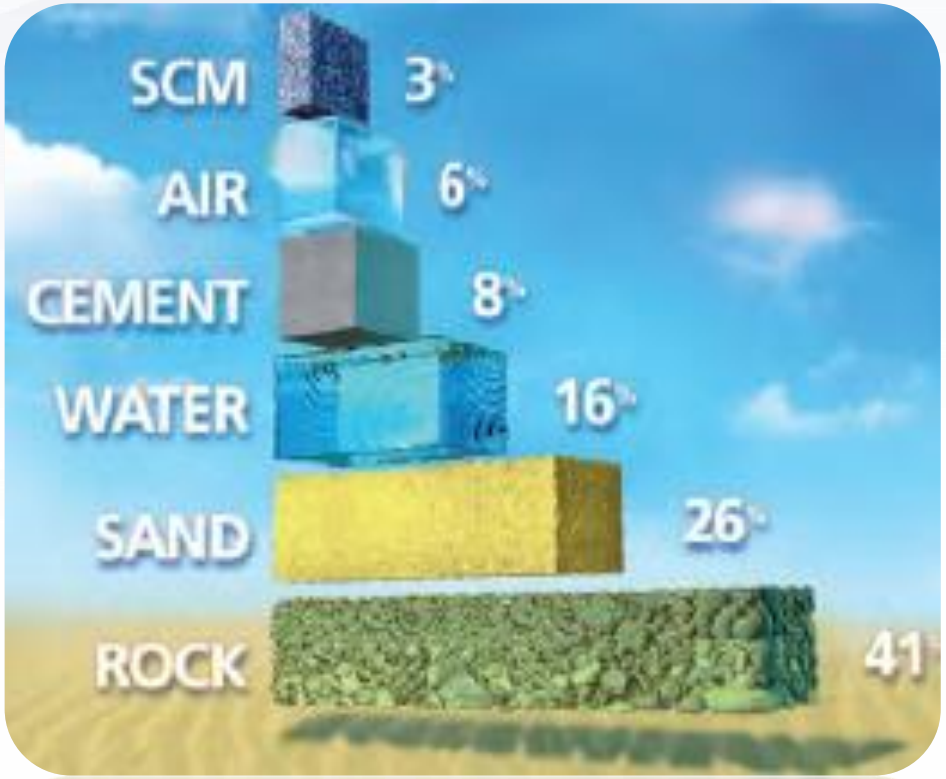
Source: FHWA

Information collected from State legislative websites.

Optimizing Mix Designs

- Performance Engineered Mixtures (PEM)
  - Optimized cement gradations lead to optimized cementitious contents

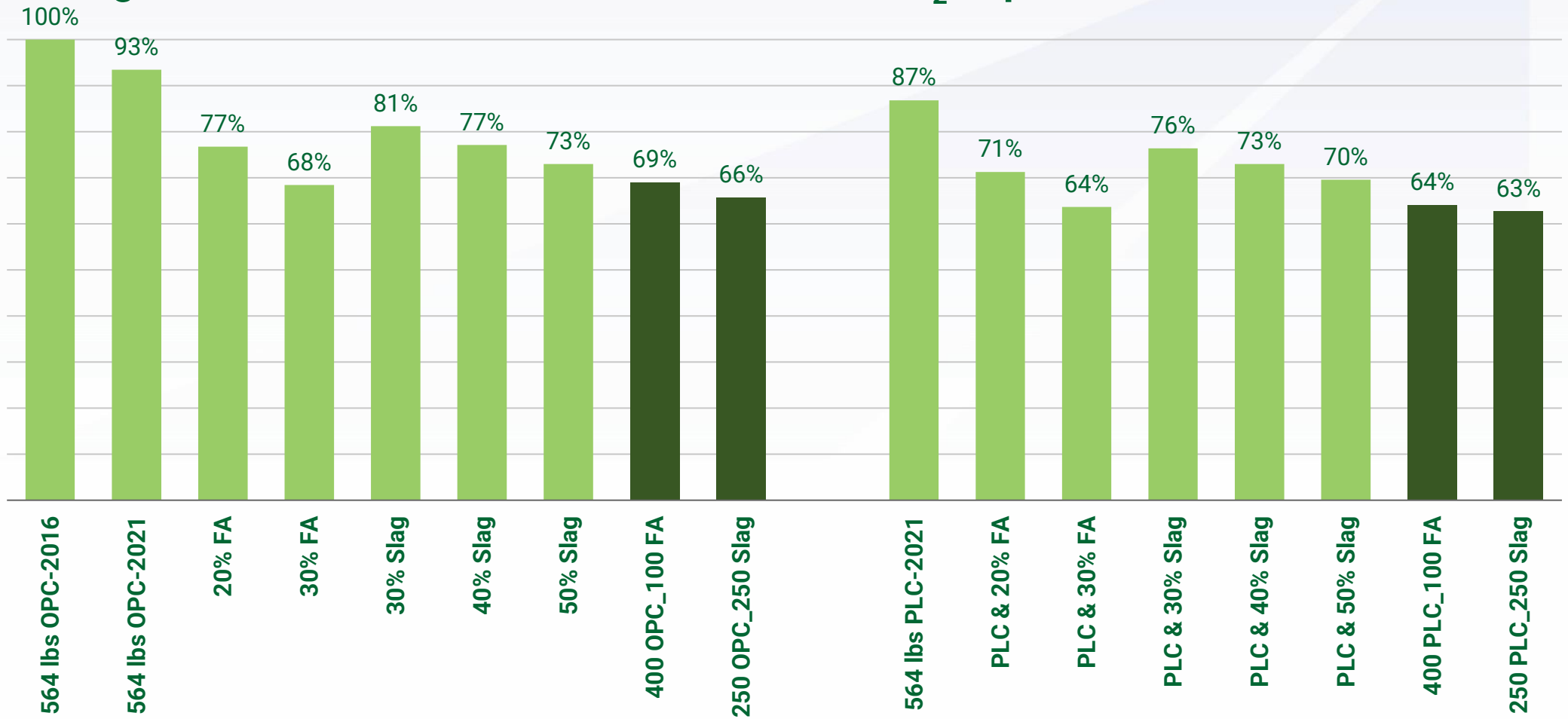




Optimizing Mix Designs

Using SCMs and optimizing concrete mix designs lowers CO_2 of the mix

Using Portland Limestone Cements lowers the CO_2 impacts some more



GWP - global warming potential
For standard six sack (564lb/cy) Mix; Assumed Slag shipping Distance = 10,500 miles (*Rizhao to FL)*

Quantification of Impacts – Push for EPDs

- Environmental Product Declarations (EPDs)
  - Focus of FHWA programs:
    - IRA – $2 B LCTM Program
    - EDC – 7
    - Climate challenge (to an extent)
  - ACPA partnered with WAP Sustainability
    - Reduced cost access to Theta EPD tool
  - EPA Grant program focused on EPDs

EPD
ENVIRONMENTAL PRODUCT DECLARATION

WAP
SUSTAINABILITY CONSULTING

theta
by WAP Sustainability

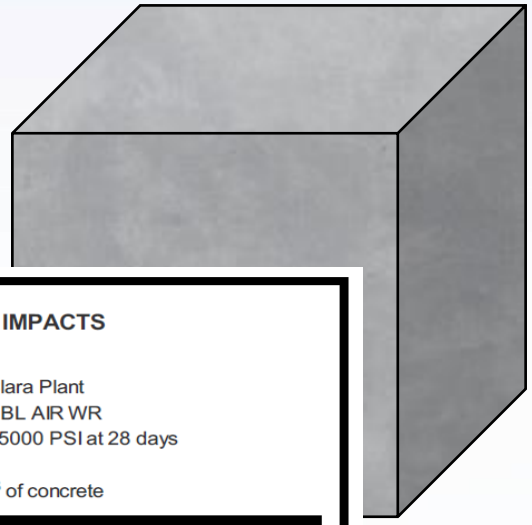
Preparing for EPDs

- To be ready for FHWA's LCTM program and help industry and agencies be prepared for these grants, ACPA is helping lead the Reduced Carbon Concrete Consortium (RC3).

- https://rc3.acpa.org/

- If an agency wants to implement EPDs for concrete pavement, please work with local (and national) industry

EPDs Don't Capture All of Concrete's Benefits



ENVIRONMENTAL IMPACTS

Declared Product:
Mix 1618915 • Santa Clara Plant
A4GRC 658 C+S 30% BL AIR WR
Compressive strength: 5000 PSI at 28 days

Declared Unit: 1 m^3 of concrete

Global Warming Potential (kg CO_2-eq)	392
Ozone Depletion Potential (kg CFC-11-eq)	1.1E-5
Acidification Potential (kg SO_2-eq)	2.06
Eutrophication Potential (kg N-eq)	0.46
Photochemical Ozone Creation Potential (kg O_3-eq)	45.5
Abiotic Depletion, non-fossil (kg Sb-eq)	1.4E-6
Abiotic Depletion, fossil (MJ)	695
Total Waste Disposed (kg)	2.71
Consumption of Freshwater (m^3)	1.01

Product Components: crushed aggregate (ASTM C33), natural aggregate (ASTM C33), Portland cement (ASTM C150), slag cement (ASTM C989), batch water (ASTM C1602), admixture (ASTM C494), admixture (ASTM C260)

Additional detail and impacts are reported on page three of this EPD

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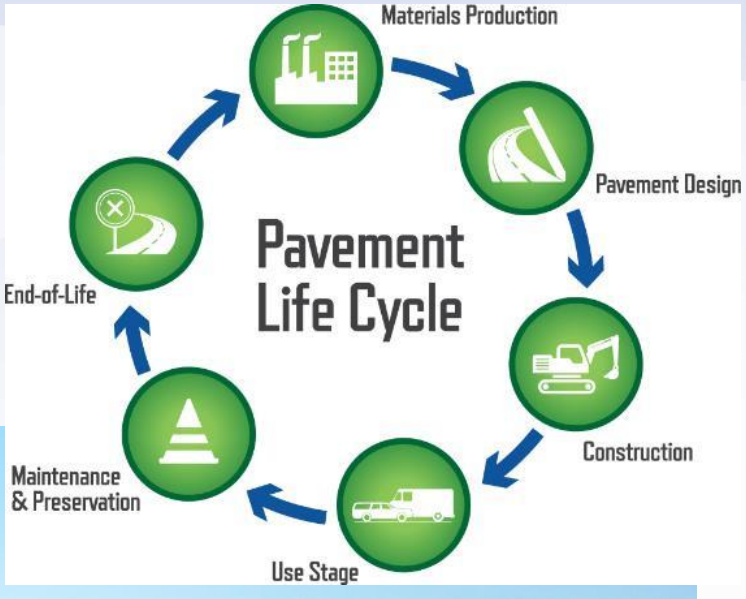
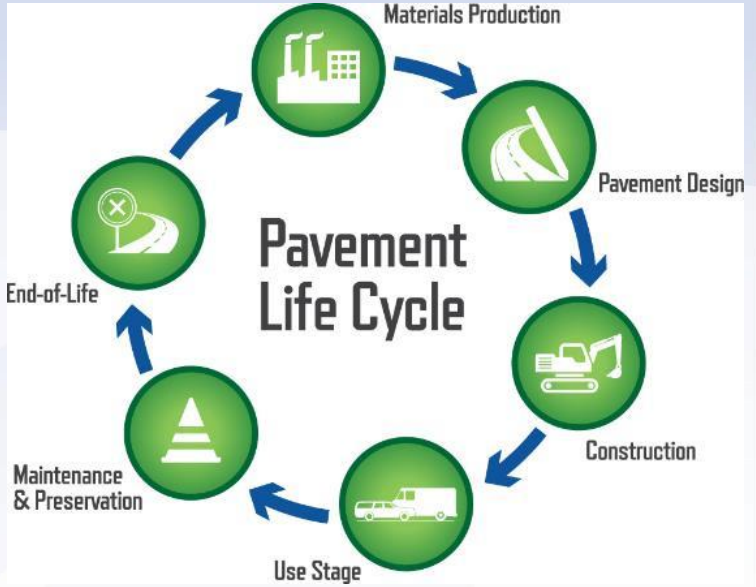


Embracing Concrete's Life Cycle Benefits



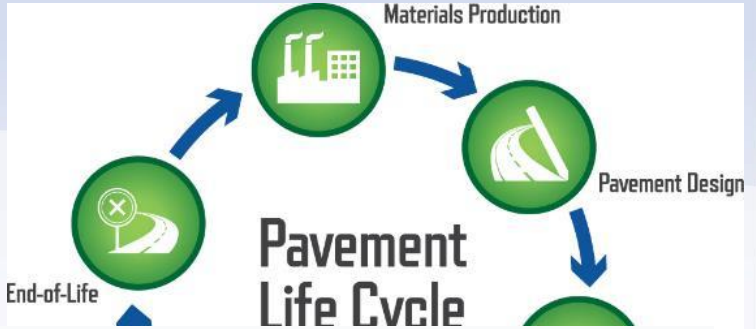
Design and Construction

- Long-life pavements
- Concrete overlays
- Design optimization
- Process optimization

PvD AASHTOWare Pavement ME Design

PavementDesigner.org

Embracing Concrete's Life Cycle Benefits



Use and Preservation

IGGA
International Grooving & Grinding Association
Your Pavement Preservation Resource® since 1972

MIT CSHub
MIT Concrete Sustainability Hub

MIT Fuel/Carbon Savings Calculator

This app was developed using the concepts and models discussed in Journal of Cleaner Production in 2016. The Fuel/Carbon Saving App looks at an instantaneous improvement in IRI for a set amount of traffic on a daily basis. This daily savings can then be used to estimate annual savings for a set period of time. Estimating actual IRI for future years was considered but not used due to the fact that the estimates could never be confirmed. Allowing the user to extrapolate the findings on a daily level to an annual level was seen as the best estimate. Users should understand these are only estimates based on current traffic and smoothness calculations.

Estimated IRI Pre-Grind	112 in/mi	Estimated IRI Post-Grind	75 in/mi
Traffic Speed	60 mph	Average Daily Traffic	30000
Percent Trucks	10 %		

Calculations

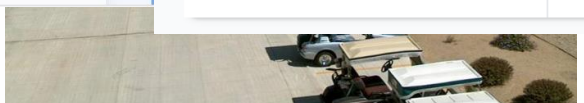
Cars Per Day	27,000
Trucks Per Day	3,000
Daily Fuel Savings Per Mile	$74.08
Annual Fuel Savings Per Mile	$27,040.13

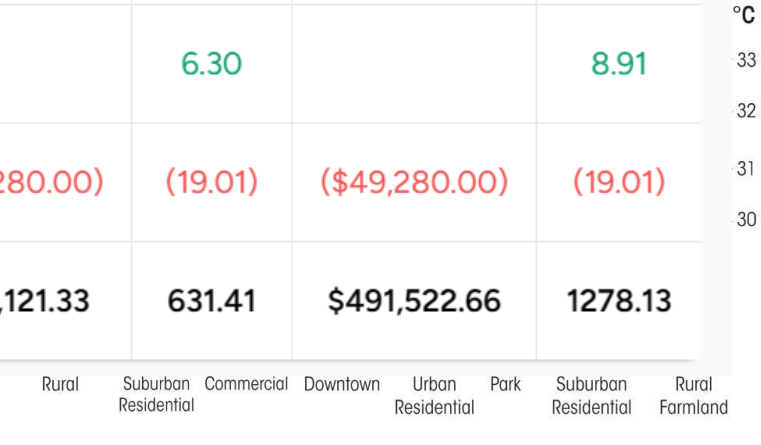
https://calculators.igga.net

Cost Carbon Benefit Table

Print

Category	10 Year Benefit		20 Year Benefit	
	Cost ($)	Carbon (Metric Tons)	Cost ($)	Carbon (Metric Tons)
Fuel Savings for IRI	$270,401.33	644.12	$540,802.66	1288.23
Carbon Sequestration		6.30		8.91
Cost of Grinding	($49,280.00)	(19.01)	($49,280.00)	(19.01)
Total (savings)	**$221,121.33**	**631.41**	**$491,522.66**	**1278.13**





Step 3: Run LCA

Pavement LCA Output

Analysis Setup

Analysis Period (years): 50

Number of Iteration: 100

Rehabilitation Schedule

Run LCA

Postprocessing

Save Results

Load Results

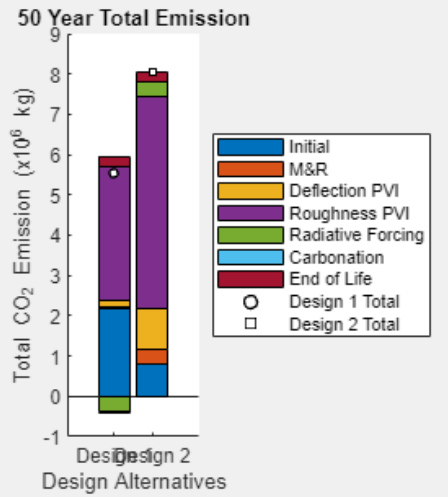
Design 1

Design	Pavement Type	Thickness (in.)	M&R Treatment	Time (year)
Surface	JPCP	13.5	Diamond Grinding	42
Base	Granular Base	6	Unspecified	0
ESALs (20 years Design Life)		4.386e+07	Unspecified	0

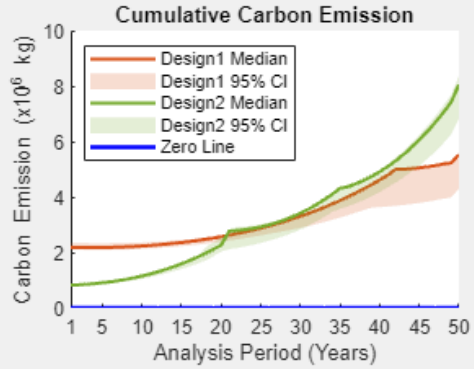
Design 2

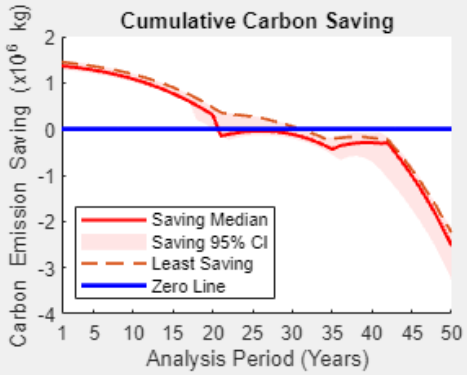
Design	Pavement Type	Thickness (in.)	M&R Treatment	Time (year)
Surface	HMA	9	AC Mill and Fill (in)	21
Base	Granular Base	6	Crack and Seal	35
ESALs (20 years Design Life)		2.879e+07	Unspecified	0

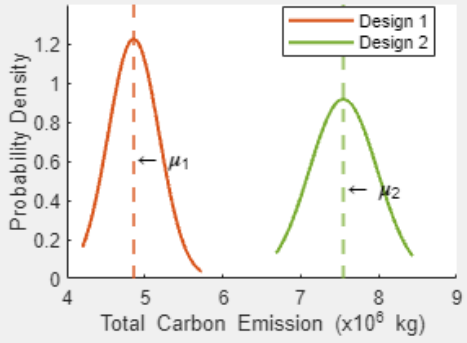
Global Warming Potentials

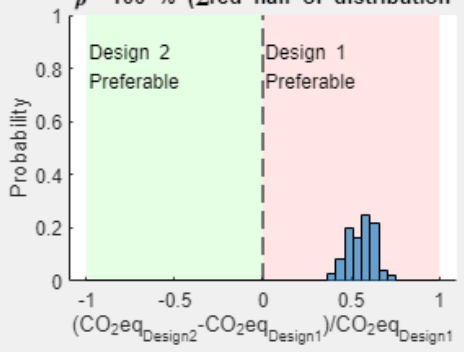


Full Results Visualization



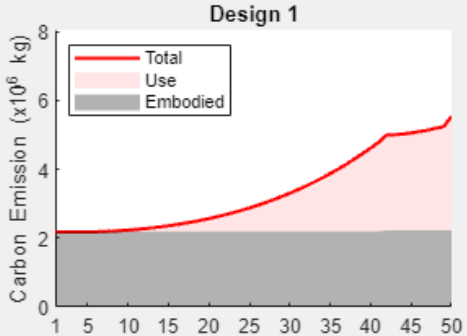


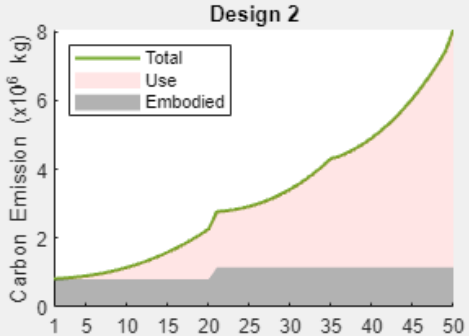


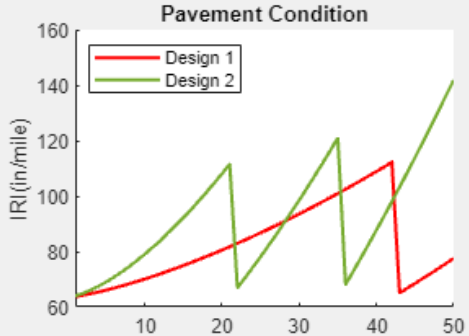


Median Instance

State	Alabama
Rural	Interstate
AADT	43120
AADTT	11864
Reliability	90
Design Life	20







Global W
Pote
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Paven
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Payback: Yr 6
22,966
17,943
395
1,322
3,307
11,043
6,025
20
424
4,575
AC
PCC
Florida
(Urban)

plementary Information for
action (Fuel efficiency) and Albedo

Re-Focusing Sustainability

- Meeting the needs of today without compromising future generations' ability to meet their own

Sustainable practices are simply good engineering

Messaging – Healthy Competition

How Agencies can Reduce Costs by Improving the Competitiveness of their Bid Environments

ACPA
AMERICAN CONCRETE PAVEMENT ASSOCIATION

Myth: *Given current supply chain challenges and materials cost increases, there's no way to lower the unit cost of a pavement.*

Fact: *Encouraging competition between paving materials would cause costs for all materials to go down.*

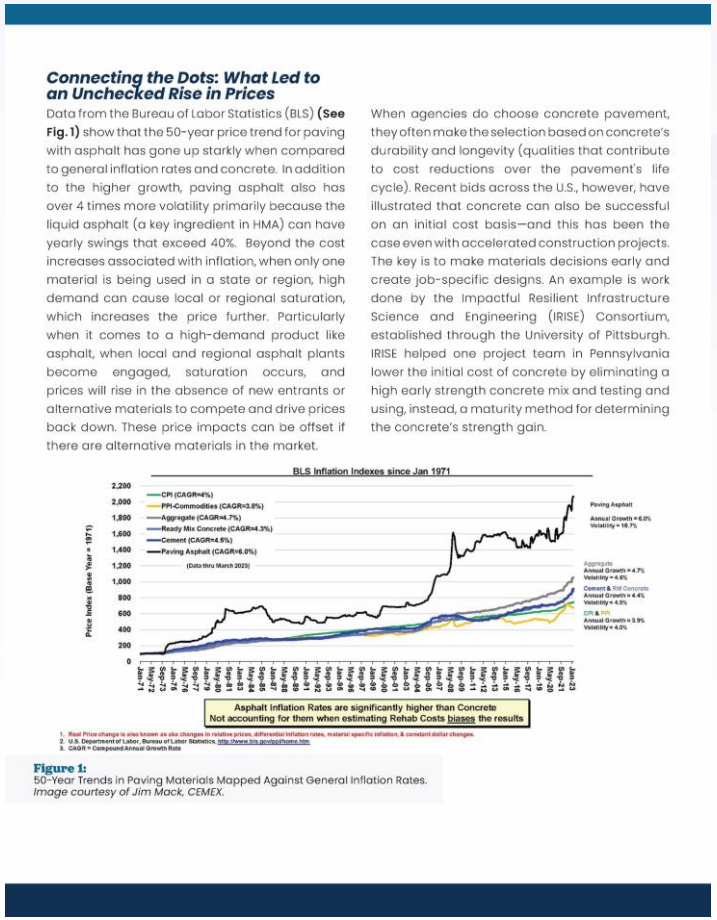
Research has shown that, as inter-industry competition increases, unit costs of both concrete and asphalt paving materials fall significantly—particularly those of concrete. For example, if a state with a low concrete market share (e.g., 1 %) were to increase its concrete market share to 25%, it would lower concrete and asphalt paving material unit costs by around 29% and 8%, respectively.

Is Concrete a Viable Alternative to Asphalt?

Concrete has a proven record of being a viable paving material. In fact, in the mid-twentieth century when the interstate system was new, concrete was the most common paving material. Its decline in use is largely attributable to a decline in information dissemination on concrete repair, maintenance and replacement—a situation that occurred gradually with the rising use of asphalt. With renewed education efforts, however, inter-industry levels of competition (that is, competition between firms that pave with different materials) can increase, and costs across the board will lower.

Why Improving Competition Works

Improving inter-industry competition would bring both additional contractors to the bidding process and a second level of competition into the supply chain between the suppliers (e.g. the asphalt, concrete and cement suppliers). While these suppliers may not directly compete against one another, the sustained competitive pressures between the industries will drive costs lower as skilled personnel develop, supply chains get established, construction quality improves, innovation is spurred and risks decline. See the sidebar on research that supports this.



Connecting the Dots: What Led to an Unchecked Rise in Prices

Data from the Bureau of Labor Statistics (BLS) **(See Fig. 1)** show that the 50-year price trend for paving with asphalt has gone up starkly when compared to general inflation rates and concrete. In addition to the higher growth, paving asphalt also has over 4 times more volatility primarily because the liquid asphalt (a key ingredient in HMA) can have yearly swings that exceed 40%. Beyond the cost increases associated with inflation, when only one material is being used in a state or region, high demand can cause local or regional saturation, which increases the price further. Particularly when it comes to a high-demand product like asphalt, when local and regional asphalt plants become engaged, saturation occurs, and prices will rise in the absence of new entrants or alternative materials to compete and drive prices back down. These price impacts can be offset if there are alternative materials in the market.

When agencies do choose concrete pavement, they often make the selection based on concrete's durability and longevity (qualities that contribute to cost reductions over the pavement's life cycle). Recent bids across the U.S., however, have illustrated that concrete can also be successful on an initial cost basis—and this has been the case even with accelerated construction projects. The key is to make materials decisions early and create job-specific designs. An example is work done by the Impactful Resilient Infrastructure Science and Engineering (IRISE) Consortium, established through the University of Pittsburgh. IRISE helped one project team in Pennsylvania lower the initial cost of concrete by eliminating a high early strength concrete mix and testing and using, instead, a maturity method for determining the concrete's strength gain.

Figure 1:
50-Year Trends in Paving Materials Mapped Against General Inflation Rates.
Image courtesy of Jim Mack, CEMEX.

- "How Agencies can Reduce Costs by Improving the Competitiveness of their Bid Environments"
- Created with input from Chapter State Execs and industry partners
- Featured in January Roads and Bridges magazine

Messaging – Long Life Pavements

American Concrete Pavement Association Presents Lifetime Pavement Recognition Awards

Two long-life pavements were recognized with the American Concrete Pavement Association's (ACPA's) Lifetime Pavement Recognition Award

Pavement Surpasses 90 Years of Service in Colorado

The City of Boulder was recognized with an award for a four-block section of Mapleton Avenue, a location of great importance to a vibrant city. Built in 1927, and with minimal maintenance since, the concrete pavement stands as an exceptional and durable example of concrete put to the test. This historic section of Mapleton Avenue has contributed to economic development, including mining camps, the discovery of gold, and the growth of the University of Colorado.

CASE STUDY: PERMANENT PAVEMENTS

MINIMAL REPAIRS NEEDED TO BRING I-70 IN COLORADO INTO ITS 50TH YEAR AND BEYOND

A concrete section of I-70 located on Colorado's western slope has served its region for 46 years. Despite supporting population growth that took Rifle from about 2,000 residents to more than 10,000 and doubled the expected traffic volume, the pavement has required rehabilitation only twice and is expected to last for many years to come.

Constructed in 1976, the concrete section of I-70 outside of Rifle, Colorado, is 10.5 miles of 8-inch concrete pavement on top of cement-treated base. The road was originally constructed to continue the development of the interstate highway system through Garfield County. It has served western Colorado with minimal maintenance for 46 years and is intended to stay in service for years to come. At the time of its construction, Rifle had just over 2,000 residents; during the decades following the construction of the concrete section of the highway, the municipality's population grew rapidly and now boasts over 10,000 residents. Throughout the five-fold increase in population and doubling of expected traffic volume, the concrete section of highway has required only minor rehabilitation on two occasions. The pavement met its 20-year design life in 1996 with no rehabilitation work needed. In 2004/2005 – nearly 30 years after construction – the Colorado Department of Transportation (CDOT) completed a panel replacement and diamond grind project to improve smoothness. In 2014 – 38 years after construction – CDOT did another panel replacement project. As of 2022 – 46 years after construction – CDOT has spent a mere $7.9 million on rehabilitating this long-life pavement. The state's pavement condition survey identified that this section of I-70 would benefit from additional panel replacements and diamond grinding, so CDOT has a minor rehabilitation project scheduled for 2023. CDOT plans to continue to maintain this pavement, ensuring it will effectively perform for well over five decades.

COMMUNITY IMPACTS

In a ranching community originally populated after the arrival of the railroad, Rifle depends on its connection to the rest of the state. The concrete section of I-70 outside of Rifle served the area throughout its period of greatest population growth and is older than the majority of the current residents. Connecting the rural region between Grand Junction and Denver, the long life of the concrete pavement has supported Rifle and the surrounding area for 46 years and will continue to do so for years to come.

KEY BENEFITS

The long life of this pavement:

- Saved taxpayer dollars by serving its purpose with minimal repairs
- Conserved resources by not needing reconstruction or replacement
- Reduced greenhouse gas emissions by increasing the fuel efficiency of the large number of trucks traveling over it
- Freed up state resources to pursue infrastructure projects in other parts of the region

CONCRETE PAVEMENTS - THE ***PERMANENT*** SOLUTION

ACPA

Messaging & Marketing

- Social Media
- PR
- Newsletter
- Magazine
- Resources for State Chapters
  - Case Studies
  - White Paper Resources
  - Social Media Posts

34th Excellence in Concrete Pavement Awards

ACPA 65th ANNUAL MEETING
LONGEVITY • PERMANENT PAVEMENTS • INNOVATION • SUSTAINABILITY

ACPA

AMERICAN CONCRETE PAVEMENT ASSOCIATION

ACPA Technical Services Briefing Report for 2023 Q2

ACPA's engineering staff delivers consultation, specification interpretation, education, and other technical services to ACPA members, State and Federal Agencies and Chapter/State Partners. These services translate to millions of dollars annually in industry savings or profit/revenue potential. The summary provided below is a snapshot of some of the work performed during CY2023 Q2, compiled to convey a clearer understanding of the value provided by ACPA's technical services staff. Additional work of the staff in areas of market development or advocacy has been omitted for relative brevity.

Airport Market

ACPA assistance to contractors and airports resulted in **potential member cost savings/ opportunities of more than $2.0M** in Q2!

Direct Agency Assistance

- Effected changes to FAA standard specs.
- Planned education on various concrete airfield challenges.
- Assisted agencies in:
  - Developing competitive PCC design options for an ADAB project—**with a potential concrete paving value of ~$8M.**
  - Developing concrete overlay options.
  - Developing PCCP smoothness specification.
  - Assisting in technical review of research proposals for curl and warp.

Highway/SLR Market

ACPA support provided the potential for significant contractor savings beyond the value of ACPA advocacy efforts.

Direct Chapter/Affiliate Support

ACPA staff provides extensive technical assistance and training/education sessions to Chapter/State partners.

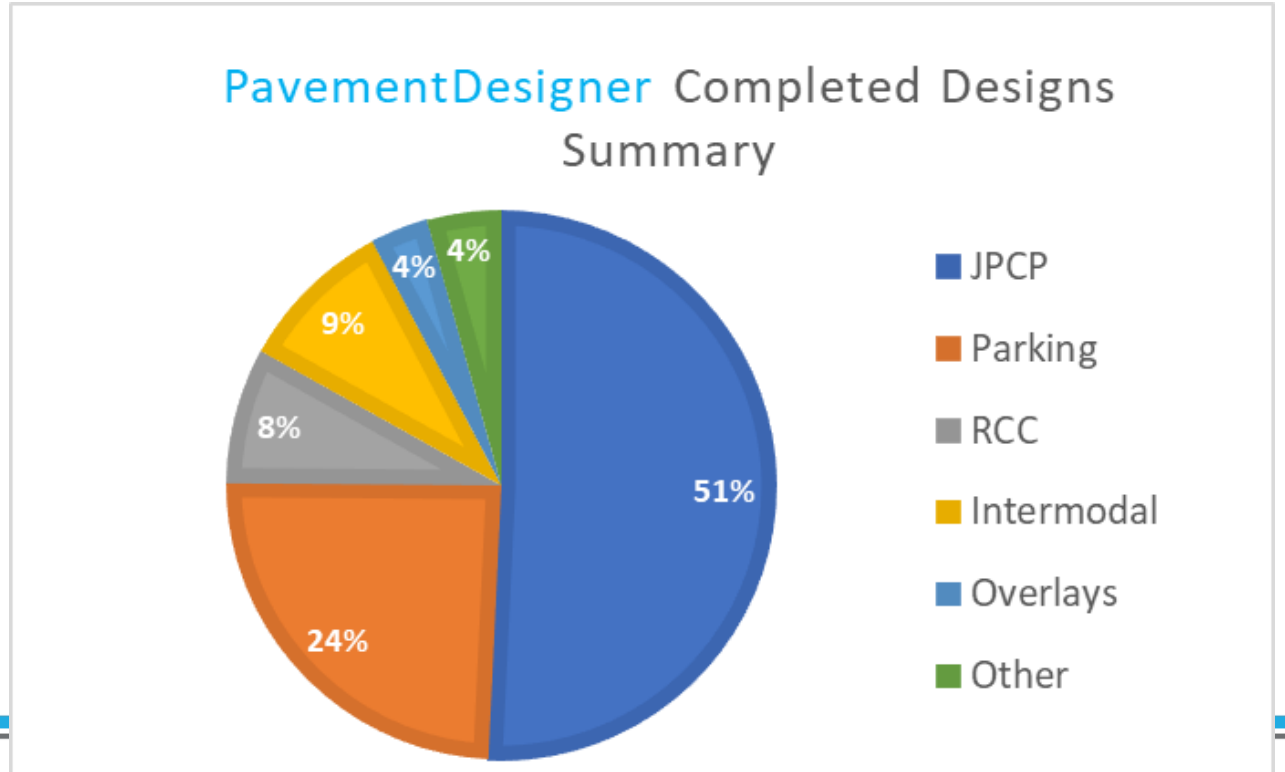
Technical Services

- ACPA Committees
  - Design & Engineering
  - Research, Technology, & Innovation
  - Quality Construction
  - Marcomm, GA
- C/S Committee
- IGGA Preservation partnership
- CP Tech Center
- Workshops

- Informs Engagement with Other Organizations
  - FAA – REDAC, ACPTP
  - FHWA – SPTWG, CPM TFG
  - AASHTO, NCC, TRB
  - ACI, ASCE, ISCP
  - MIT CSHub

Celebrated 5 Years of PavementDesigner in 2023

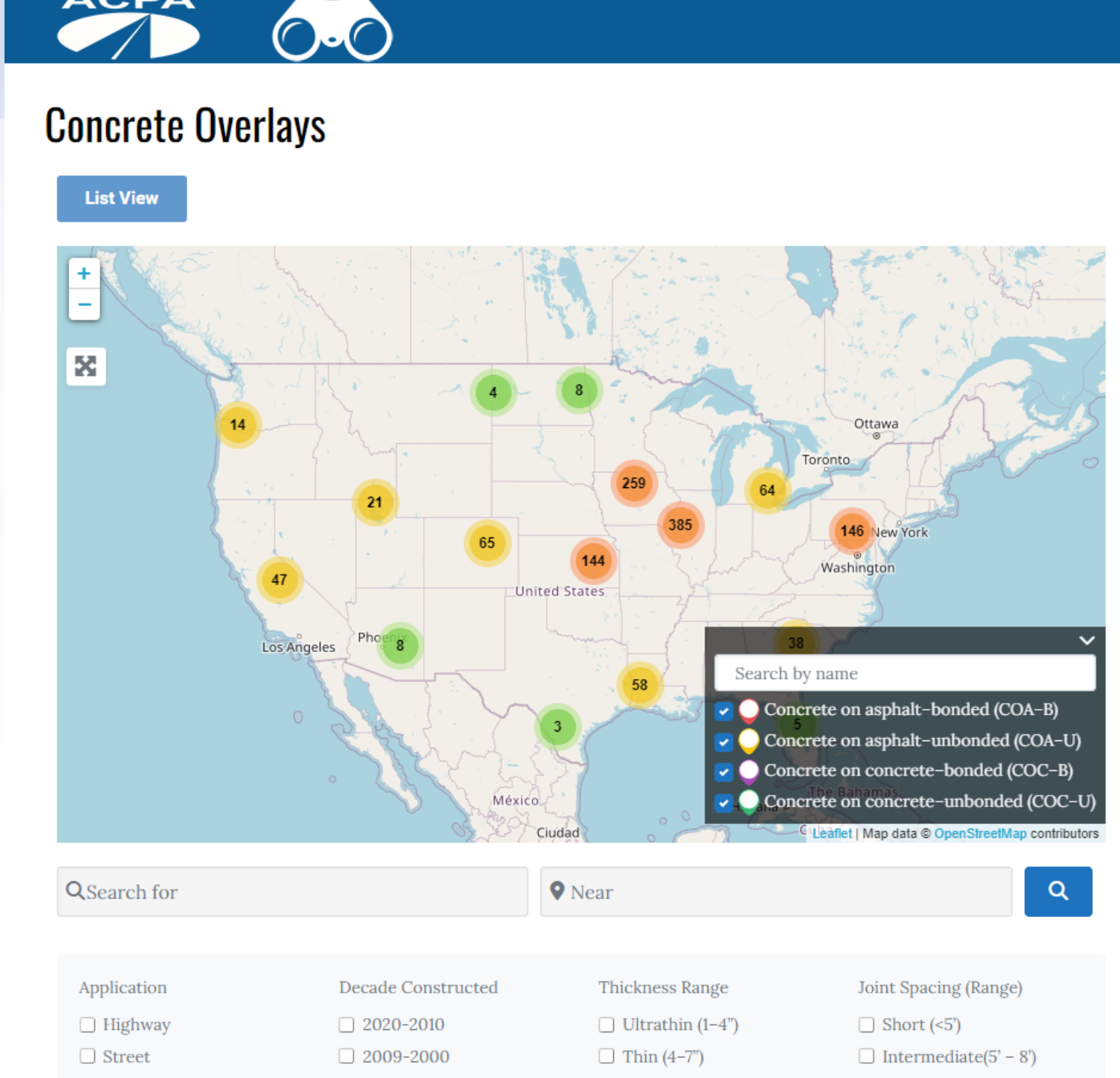
- Over 38,500 Users!
- Over 122,000 completed design runs



PavementDesigner.org

Updated Explorer Tools

- Updated Overlay explorer is available online.
- Other explorers in the works



Intersection and Roundabout Guidance

Technical Bulletin

Concrete Intersections & Roundabouts

Overview

Traffic damages at-grade intersection pavements perhaps more
than any other location. Heavy vehicle stopping and turning can

Introduction

At-grade intersections along business, indus-
trial and arterial corridor routes are some of
the
urba
and
ates
loca
vide
dors
also

- Also been collecting examples with MOT challenges and successes

Government Affairs

- ACPA lobbying to protect APTP and AID-PT programs
- Congressional briefing on pavement sustainability
- Comments on federal rulemakings
  - EPA, GSA, etc.
- Continued work with FHWA to ensure funding through Bipartisan Infrastructure Law (BIL) continues to flow to concrete paving.


Save the Date:
ACPA Mid-Year Meeting
June 4-6, 2024
Kansas City, MO


Save the Date:
61st Annual Meeting
December 3-5, 2024
Phoenix, AZ

13TH INTERNATIONAL CONFERENCE ON CONCRETE PAVEMENTS

AUGUST 25–29, 2024

https://13thiccp.concretepavements.org/

THE DEPOT
MINNEAPOLIS, MINNESOTA, USA

- ~100 Technical Paper Presentations
- 10 four-hour workshops and Student Competitions
- MnROAD and City Street Tours
- Social Events, Food, and Fun!