



2023 Spring Conference at Rocky Gap Resort
Flintstone, Maryland
Green Building with Concrete in Maryland

Thomas (Tom) Evans
Executive Director
Maryland Ready Mix Concrete Association

May 11, 2023

1

BIOGRAPHY



Thomas (Tom) Evans
Executive Director
Maryland Ready Mix
Concrete Association
Frederick, Maryland
301-694-4899
tom@marylandconcrete.com

- Immersed in the ready mixed concrete industry since 1989 accepting a variety of responsibilities including plant operations, batching, dispatching, placing, finishing, sales, marketing, promotion, education, and advocacy.
- 26 years serving the membership of the Maryland Ready Mix Concrete Association (MRMCA).
- Prior to Maryland, Tom led concrete promotion for the New Jersey Concrete & Aggregate Association.
- Tom is a Past President of the Board of Directors of the American Concrete Institute (ACI) MD Chapter.
- He received his Bachelor of Arts Degree from West Virginia University in 1987.
- Tom and his wife and family enjoy their 1860's home in Frederick.

2

ABSTRACT

Green Building With Concrete in Maryland (1.0PDH)

This presentation will cover a variety of applications where concrete, used as a building material, leads the way when it comes to constructing truly sustainable structures and pavements.

- Starting with pavements, this presentation will highlight the benefits of planning and designing sites with concrete pavements.
- Next, this discussion will move to vertical construction and highlight the types of structures where concrete frame systems provide design flexibility as well as energy efficiency and resilience.
- The presentation will also touch on the global perspective of concrete and provide resources for concrete information relating to sustainability.

3

Applications for concrete Pavements

- Driveways
- Parking Lots
- Streets
- Intersections
- Airports

4

Driveways



5

Parking lots



6



Streets

7

Intersections

CASE STUDY

Rosemont Avenue

Fast Track Concrete Re-surfacing

Case Study: Concrete Overlay, Frederick, MD

Location: Rosemont Avenue at Baughman's Lane in Frederick, MD

Summary: Two thru lanes (from the intersection stop bar back approximately 200 feet) were repaired and ready for traffic in less than 24 hours.

Scope: The City of Frederick and the Concrete Industry partnered to implement a fast-track concrete resurfacing / overlay of two thru lanes where asphalt had failed twice over the past 10 years. The two lanes experience a high volume of traffic as one of Fort Detrick's exits is just west of the intersection. The City had participated in the annual Concrete Conference over the past few years and realized the long-term solution for this intersection was concrete. Cores were taken to determine the existing asphalt thickness. Six inches of the existing asphalt was removed on a Friday evening and six inches of concrete was placed early Saturday morning. The concrete was placed over the remaining 6-10 inches of asphalt. Match cure cylinders were used for this project to help determine in-place compressive strengths. The City of Frederick is pleased with the concrete overlay and looks forward to the next few decades without maintenance on this pavement.

Date: October 21, 2010 starting at 10:00 PM and opened to traffic on October 23, 2010 at 5:00 AM

CASE STUDY

MD 210 Left Turn Lane

Full Depth Replacement of Asphalt Lane

Case Study: MD Route 210 Left Turn Lane

Location: Intersection of MD Route 210 and Old Fort Road, Fort Washington, MD - SHA District 3

Summary: An asphalt lane that required frequent resurfacing was successfully repaired with concrete causing very minimal interruption to the traveling public.

Scope: The asphalt pavement in the south bound left-hand turning lane was severely rutted and deteriorated. This busy, high-traffic intersection receives about 300 loaded dump trucks per day making the same left turn. This was a frequent maintenance issue for SHA District 3 as the asphalt needed regular resurfacing with the most recent rehabilitation being less than two years before the more durable concrete solution.

The concrete solution, consisted of removing the existing asphalt from the 225 feet long, 13 foot wide lane along with six inches of aggregate base, then nine inches of concrete was placed with transverse joints every 15 feet and transverse tined for surface texture. The lane was closed on a Saturday to minimize traffic interruption and returned to service by the end of the day based on reaching 2,000 psi.

Date: October 2010

8



9

Benefits of Planning and Designing With Concrete For Pavements

- Lighting / Safety
- Durability
- Recycled Materials
- Urban Heat Island Effect
- Hydrology
- Innovation

10

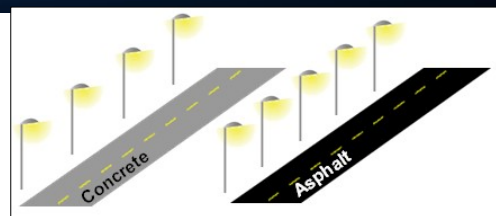


11

Energy Savings and Illumination

Higher reflectivity
reduces lighting
requirements

Nearly 25% reduction
in energy costs for
lighting



12

Bright Surface for
Excellent Visibility
and Enhanced
SAFETY



Optimum
Reflectivity
Results in
LOWER ENERGY USE

13

“The higher reflectance values from concrete play as much of a role in the visibility and apparent brightness of the site as the lighting.”



www1.eere.energy.gov/femp/technologies/solid_state_lighting.html

14

Durability



MD 355 at MD 27

Concrete Overlay of Asphalt Approach



MRMCA
MARYLAND READY MIX
CONCRETE ASSOCIATION

Case Study: MD 355 at MD 27 Intersection Improvement

Location: Gathersburg, Maryland, SHA District 3

Existing Pavement:

- Was severely rutted (see first photo)
- Six-lane divided, Urban highway with Turn Lanes
- Total project length is approximately 0.60 miles
- HMA Pavement constructed in 1995
- AADT: 38,100 with 5% trucks (2009)
- 2011 IRI: 151

Project Highlights:

- First project in SHA District 3 for Concrete Overlay
- First project in MD with more than one leg of the intersection (Total 3 legs included)
- Bonded Concrete Overlay on existing HMA Pavement after 6" Grinding
 - 6" thick
 - 6' X 6' Joint Spacing
- Work Completed over a series of weekends in







15

Durability

Concrete overlay provides a rigid pavement surface able to withstand heavy traffic loads



Before



After

16



17

902 — PORTLAND CEMENT CONCRETE AND RELATED PRODUCTS
851

Recycled Materials

902.10.03 Portland Cement Concrete Mixtures.

The concrete mixes shall conform to the following:

TABLE 902 A

MIX NO.	SPECIFIED COMPRESSIVE STRENGTH, psi	COMPREHENSIVE STRENGTH ACCEPTANCE TEST AGE, days	STD. DEV., psi	CRITICAL VALUE, psi	MIN. CEMENT, lb/yd ³	COARSE AGGREGATE SIZE, M43 / M195	MAX. WATER/CEMENT RATIO, by wt	SLUMP, in.	TOTAL AIR CONTENT, %	CONCRETE TEMPERATURE, °F.
1	2500	28	375	2430	455	57.67	0.55	2 - 5	5 - 8	50 - 95
2	3000	28	450	3010	530	57.67	0.50	2 - 5	5 - 8	50 - 95

Note 1: When concrete is exposed to water exceeding 15 000 ppm sodium chloride content, Type II cement shall be used. In lieu of Type II cement, a Type I or a **Type 1L blended hydraulic cement may be used** in combined form with an amount of up to 50 percent replacement with slag cement, or an amount of up to 25 percent replacement with Class F fly ash. The Contractor shall submit to the Engineer the proposed mix proportions and satisfactory test results according to C1012 showing a

11	4200	28	630	4420	—	57.67	0.45	2 - 5	5 - 8	50 - 80
12	4200	28	630	4420	—	¾" - No. 4	0.45	2 - 5	6 - 9	50 - 80
13	4000	28	600	4180	615	57.67	0.45	2 - 5	5 - 8	50 - 95
HE	3000	(b)	N/A	N/A	N/A	N/A	N/A	3 - 9	5 - 8	60 - 100
PC (c)	N/A	N/A	N/A	N/A	450	7.8	0.45	N/A	15 - 25	N/A
WT	2500	(d)	N/A	N/A	650	57	0.45	5 max	5 - 8	50 - 95

18

Recycled Concrete



Crushed Returned Concrete as Aggregates for New Concrete Final Report

19

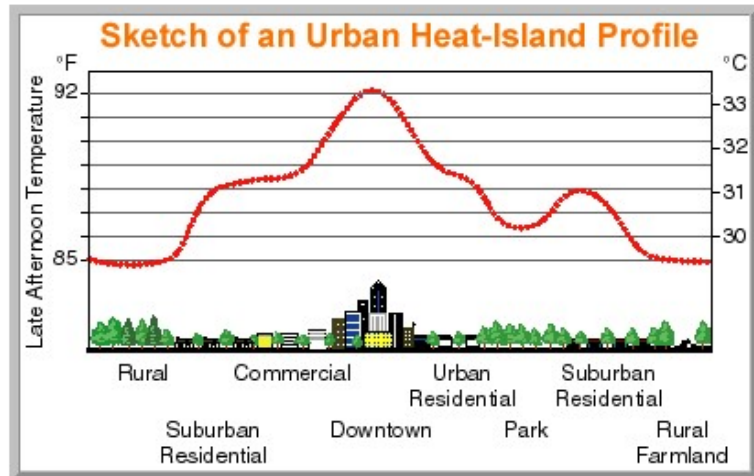
Urban Heat Island Effect



20

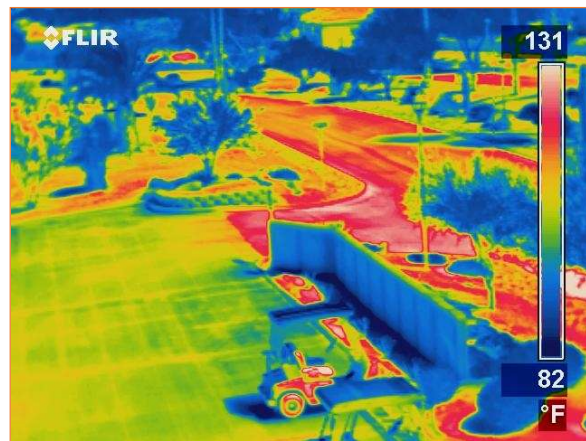
Heat Island Mitigation

- Concrete's lighter color means less heat absorption
- Lowers ambient air temperature by 7 to 10 degrees
- 1 degree equals 1.5% change in energy consumption



21

Concrete Pavements can Reduce Global Warming Potential by 50%



Photos courtesy of the American Concrete Pavement Association

22

Hydrology



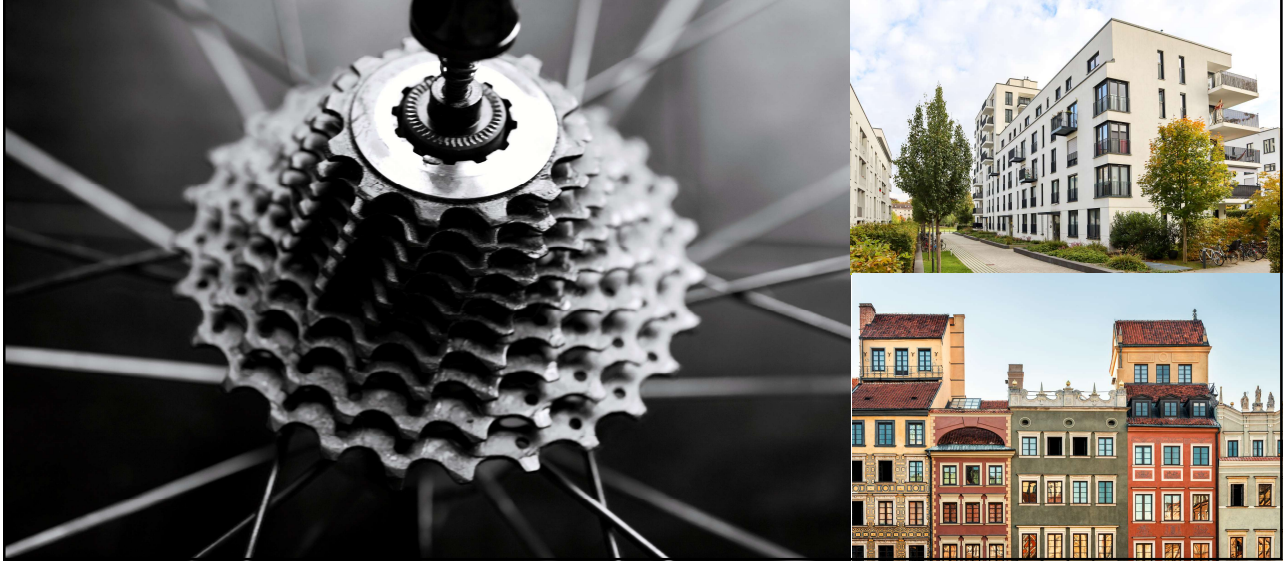
23

Innovation



24

Now shifting gears to Buildings



25

Applications for Concrete **BUILDINGS**

- Schools
- Homes
- Offices
- Hospitality
- Medical / Safety EMS facilities

26



27



28



29



30



CASE STUDY: VALUE

**CITY OF LAS VEGAS
FIRE STATION 107**
9398 Sundial Drive, Las Vegas, Nevada

Completed: 2012
Project Size: 7,800 sq. ft.
Project Cost: \$3.3 million

Architects: City of Las Vegas
Project Owner: City of Las Vegas
ICF Manufacturer: Fox Blocks






TAKING THE LEED AND BENEFITING THE COMMUNITY

When the City of Las Vegas mandated that all new city construction projects be LEED Silver Certified, builders knew just the material to use for the construction of two new fire stations. Insulated Concrete Forms (ICFs) were chosen as a way to meet LEED requirements without sacrificing the safety, resiliency and cost effectiveness the city needed in its municipal projects. The city was so pleased with the ICF construction of fire station 106 and 107, they ordered the material to be used in the construction of Fire Station 108. The city is also considering making ICFs the go-to product for all future municipal construction projects.

01. Reducing energy costs.
Energy costs are 38% lower than the standard baseline building referenced in LEED, thanks to the thermal envelope properties of ICFs paired with the building's use of a state-of-the-art HVAC compressor, a highly insulated roof and low-e performance windows.


02. Staying on schedule and under budget.
Thanks to the ease of ICF construction, the project was able to stay on schedule. Additionally, the project finished \$1 million under budget.

03. Taking a cue from its natural surroundings.
The architecture of the fire station incorporated natural stone veneer, Spanish roofing tiles and smooth plaster finishes in a warm color palette to complement the building's natural surroundings and construction style of homes in the area.

04. Meeting special design challenges.
The structural detailing on the project required the curved top of the ICF walls to match the radius of the steel roof beams. The ICF perimeter walls also continuously change in height. The ICFs used in construction had to be cut in various ways to meet these architectural demands.

A Coalition of the National Ready Mixed Concrete Association | BuildWithStrength.com

31




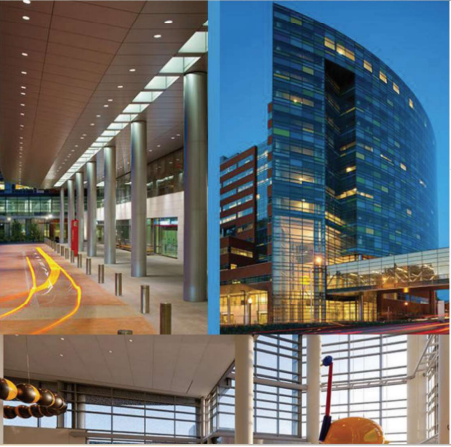
CASE STUDY: SAFETY

**JOHNS HOPKINS HOSPITAL
NEW CLINICAL BUILDING**
1800 Orleans St. Baltimore, Maryland 21287

Completed: 2012
Project Size: 1.6 million sq. ft.

Project Cost: \$1.1 billion
Architects: Perkins + Will





A NEW ERA OF HEALTH CARE.

By including concrete in its construction, the Johns Hopkins Hospital New Clinical Building puts the safety and security of patients, families and hospital staff first. Encompassing five acres, the New Clinical Building includes two 12-story patient towers, the Charlotte R. Bloomberg Children's Center and the Sheikh Zayed Tower, in addition to 560 private patient rooms, 33 operating rooms, and new adult and pediatric emergency departments.

01. Starting with a foundation that puts safety first.
275 caissons support the building, with cast-in-place concrete foundation walls. The caissons utilize 3,000 psi reinforced concrete that measure 3 feet to 10 feet in diameter and 30 feet to 50 feet in depth.

02. Durability achieved through a concrete exterior.
Nearly 43% of the building's exterior is precast concrete finished with a brick veneer. 1,350 precast concrete panels measuring 6 inches thick make up the building's exterior, keeping the building free of decay and keep patients safe in the event of a natural disaster.

03. Cast-in-place concrete floors.
Normal weight, reinforced concrete slabs measuring 5 1/2 inches to 11 inches were used in floors B3 to B. Light weight, reinforced concrete was used for floors 9 to roof. Concrete floors help insulate the structure and keep noise transfer between floors to a minimum.

AWARDS:

AGC of DC
Washington Contractor Award, Merit Award - Healthcare Project

ENR Mid Atlantic
Best Projects of 2012, Healthcare Project Award of Merit

ENR Mid Atlantic
Best Projects of 2012, Specialty Contracting Award of Merit

Greater Baltimore Committee
Bridging the Gap

32

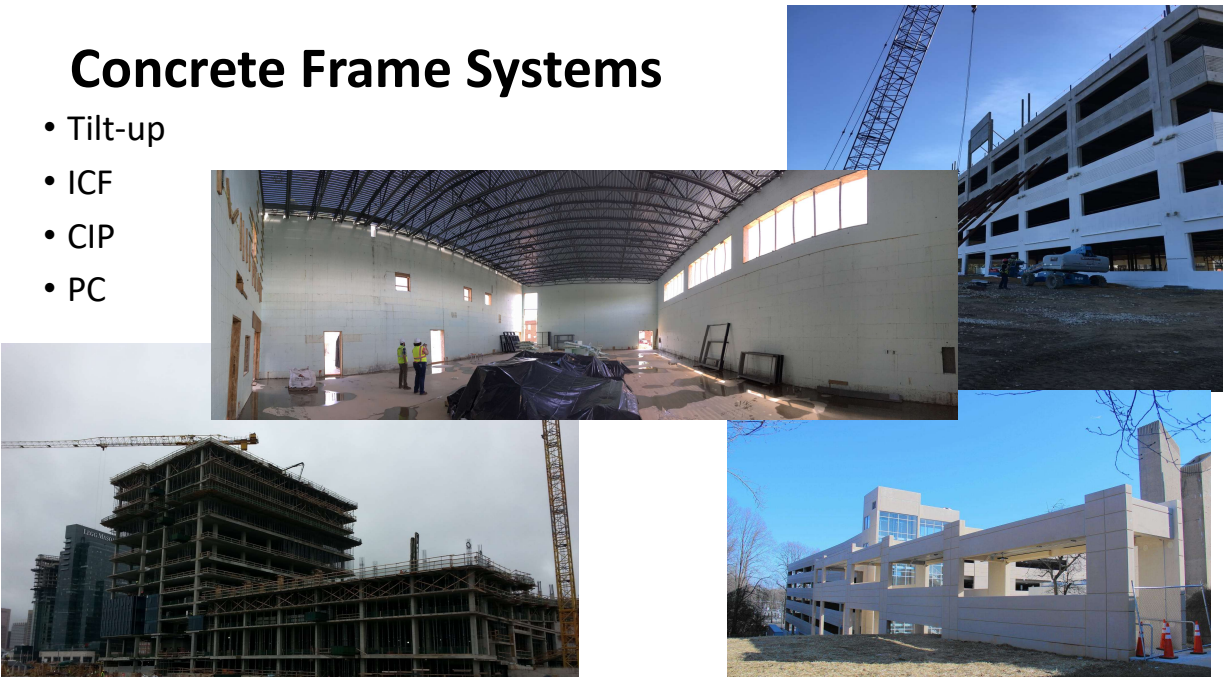
Benefits of Planning and Designing With Concrete For Vertical Construction

- Concrete Frame Systems
- Design Flexibility
- Energy Efficiency
- Resilience

33

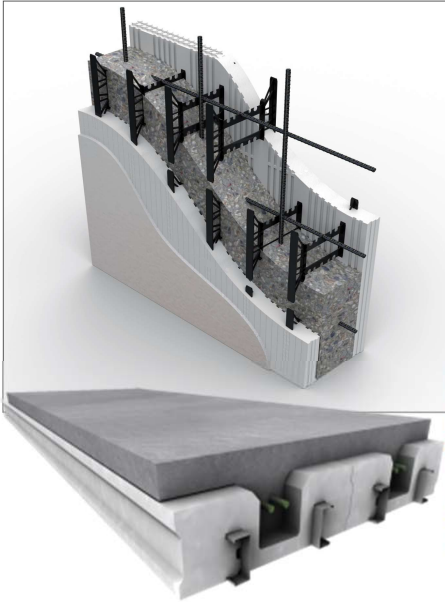
Concrete Frame Systems

- Tilt-up
- ICF
- CIP
- PC



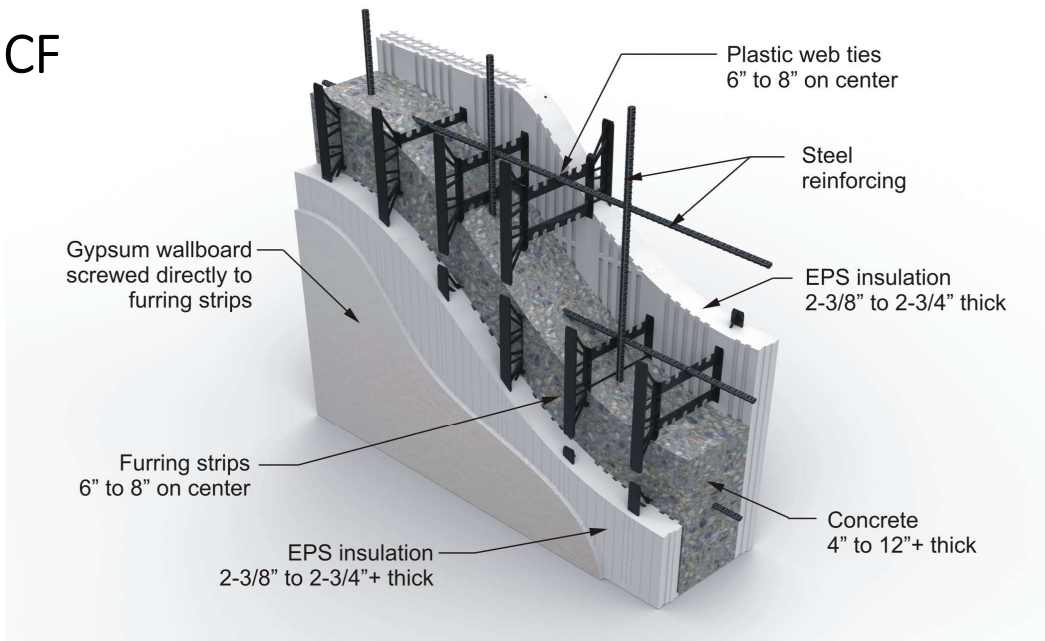
34

Design Flexibility

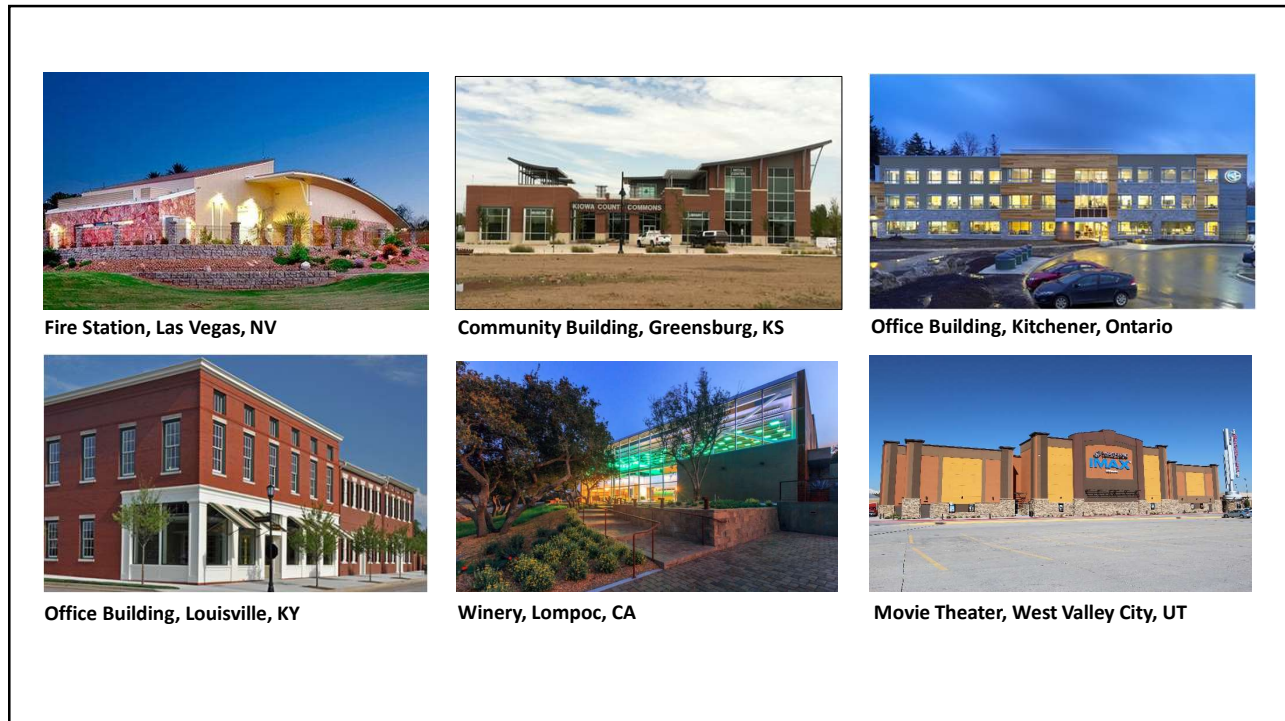


35

ICF



36



37


The webpage layout includes the following elements:

- Navigation Menu:** Home, Now Renting, Green Living, Commercial Spaces, About, Contact.
- Section Header:** Green Living.
- Main Text:** AWARD WINNING GREEN BUILDING. Maryland's most energy-efficient apartment homes ever built.
- Image:** A large photograph of a multi-story apartment building under construction, showing the concrete frame and a red crane.
- Certification Certificate:**
 - Home Innovation** NGBS GREEN CERTIFIED.
 - NATIONAL GREEN BUILDING STANDARD EMERALD**
 - THIS BUILDING HAS MET THE STRAIGHT REQUIREMENTS OF THE IICC 700-2022 NATIONAL GREEN BUILDING STANDARDS.
 - CHESAPEAKE VILLAGE CENTER, 400 MAIN STREET, STEVENSVILLE, MD 21666.
 - DESIGNED BY: EASTERN BAY MANAGEMENT.
 - PROJECT: CHESAPEAKE VILLAGE CENTER, LLC, STEVENSVILLE, MD.
 - CERTIFICATE #19340.
- Text:** NATIONAL GREEN BUILDING STANDARD. Emerald Certification. Chesapeake Village Center is certified with the National Green Building Standard with the Emerald certification. Insulated concrete apartment homes located in Stevensville, Maryland are Maryland's most energy-efficient apartment homes ever built.
- Contact Us:** A button labeled "Contact Us".

38

Month	Townhouse	New ICF
Jul-18	\$117	\$41
Aug-18	\$188	\$84
Sep-18	\$189	\$89
Oct-18	\$205	\$107

Energy Efficiency



1,700 sq. ft townhouse with AC average daily temperature of 75 degrees

VS



3,300 sq. ft ICF house average AC daily temperature of 71 degrees

39

Quick Facts



Graceland Park/O'Donnell Heights ES/MS
Baltimore City Public Schools

Size: 94,000 sf
Completion: 2020, Kids Returned 2021

Net Zero Energy – Emerging
LEED Platinum Certified



Holabird Academy ES/MS
Baltimore City Public Schools

Size: 94,000 sf
Completion: 2020, Kids Returned 2021

Net Zero Energy – Emerging
LEED Platinum Certified



40



BUILDING RESILIENCE - HAZARD MITIGATION





TO LEARN MORE: [CSHUB.MIT.EDU/BUILDINGS/RESILIENCE](https://cshub.mit.edu/buildings/resilience)

Natural disasters cause billions of dollars of damage to our nation's infrastructure every year. While builders generally make decisions about materials and techniques with upfront costs foremost in mind, the long-term cost of repairs in hazard-prone communities can generate increased financial burdens for both building owners and communities. Factoring resilience into building design can help reduce lifetime repair and maintenance costs in hazard-prone areas and allow communities to recover more quickly from a disaster.

Life cycle cost analysis (LCCA) provides a framework that building designers can use to consider and mitigate future economic impacts. The CSHub LCCA approach incorporates a risk-based analysis of hazards specific to a building's geographic area:

- Between 1996 and 2014, damages in the US due to hazards (hurricanes, tornadoes, floods, earthquakes, etc.) totaled over \$377 billion, according to the National Weather Service.
- In areas that are most vulnerable to natural hazards, hazard-related repair costs can exceed the initial costs of building a structure.

41



- Fire-rated Walls
 - 2 hrs for 4" wall
 - 3 hrs for 6" wall
 - 4 hrs for 8" wall
- Fire-rated Floors
 - 2 to 3 hrs (depends on system)
- High Impact Resistance
- Sound Transmission in Walls STC: 55-70
- Sound Transmission in Floors STC: 50+

42



43

Perspectives and Resources for Sustainable Concrete

- UMD study on emissions during manufacturing
- MRMCA, BWS, PaveAhead and NRMCA
- CSH at MIT
- Shaped by Concrete and PCA
- Federal and State Government



44



Emissions Reductions and the Economic Impacts on Maryland's Manufacturing Sector

Aug 23th, 2022

45

Maryland's manufacturing sector is a critical element in delivering the State's ambitious climate targets

- The Maryland Climate Solutions Now Act of 2022 sets the most ambitious state climate targets in the U.S. with the goals of a 60% reduction in statewide emissions from 2006 levels by 2031 and achieving net-zero by 2045.
- The manufacturing sector in Maryland presents unique challenges for these goals due to difficult-to-decarbonize process emissions and the potential cost increases and employment impacts to the sector.
- To support enhanced climate actions in Maryland's manufacturing sector, this study assesses different emissions reduction strategies, quantifies the associated social and economic impacts, and discusses policy options to help achieve emissions reductions with lower costs to the sector.

46

The concrete industry understands the challenge...

- Owners want the benefits of concrete for pavements and buildings
- Owners want to lower GHG emissions
- We can help owners achieve both
- Let's talk



47

This is a screenshot of a website landing page. The background is an aerial view of a modern building with a green roof. In the top left corner, there is a yellow circular logo with 'BUILD WITH STRENGTH'. In the top right corner, there is a search icon, a menu icon, and a yellow button labeled 'Explore Resources'. The main content area features a dark grey box with the text 'Sustainability Starts Here' in large white font. Below this, smaller white text reads: 'Our goal is to cut our carbon emissions to zero by 2050, and we've already made great strides. Since 2014, National Ready Mixed Concrete Association members have reduced their emissions by 21%.' At the bottom of this box are two yellow buttons labeled 'Learn More' and 'Subscribe'. At the very bottom of the page, the URL 'Build With Strength.com/Resources' is displayed in white text.

48

49

50

MIT Concrete Sustainability Hub Home About Us Key Impacts Resources News Social Media MIT

Carbon-neutral pavements are possible by 2050...

If government and industry actors come together to accelerate currently available solutions and pursue carbon capture technologies. Considering the performance limits, more than half of the material's decarbonization way can be achieved without any innovative technologies. In addition to construction materials, achieving carbon neutrality in the pavement life cycle requires more than just materials. A range of use-phase components, including albedo, pavement-vehicle interaction, carbon uptake, and end-of-life opportunities, can provide significant opportunities to reduce carbon dioxide emissions from the life cycle of pavements.

[Click to read more.](#)

cshub.mit.edu

The MIT Concrete Sustainability Hub makes key impacts in three areas:

- Carbon Neutrality**
Carbon neutral concrete is possible. Solutions are available today, and new ones are being developed for the future. One of the major goals of MIT CSHub is to help realize a carbon neutral concrete industry.
- Infrastructure**
Effective, sustainable infrastructure spending can improve system performance and impact climate change. MIT CSHub investigates how low carbon infrastructure may be built with very finite resources.
- Resilience**
The risk of hazards like natural disasters and extreme heat is underestimated. Stronger construction to mitigate it is undervalued. MIT CSHub studies how cities can be made

51

shaped ABOUT CONCRETE SHAPING OUR WORLD ROADMAP TO CARBON NEUTRALITY NEWS

Modern society has been built using cement and concrete.

These materials are used throughout our daily lives to shape the world around us. Our roadways, homes, schools, communities and cities have all been shaped by cement and concrete. In fact, the only other material consumed more than concrete is water.

Scroll for more about Shaped by Concrete

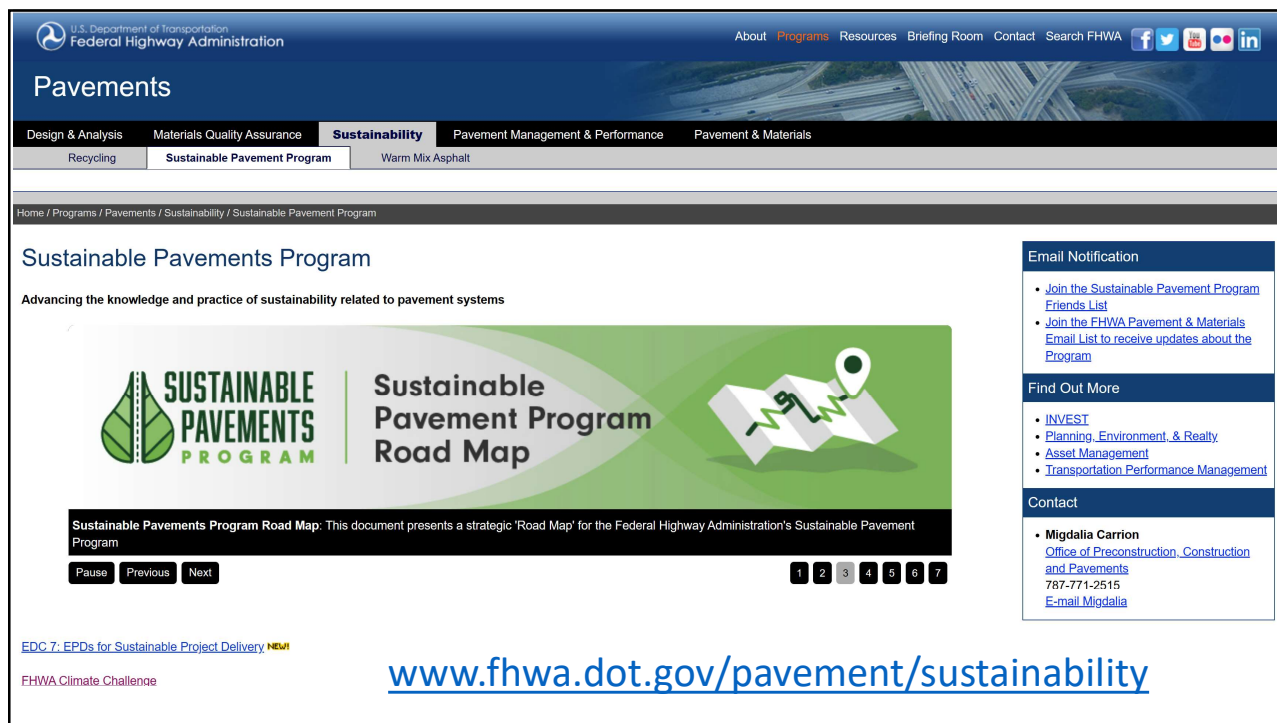
BY CONCRETE

Shapedbyconcrete.com

52



53



54

MARYLAND DEPARTMENT OF TRANSPORTATION NETS FEDERAL GRANTS FOR INNOVATIVE CLIMATE CHANGE STUDIES

FOR IMMEDIATE RELEASE

Contact:
MDOT Public Affairs
David Broughton, 410-865-1029
Jim Joyner, 410-865-1030

MDOT Exploring Ways to Cut Greenhouse Gas Emissions as Part of 'Climate Challenge'

HANOVER, MD (October 20, 2022) – The Maryland Department of Transportation has been awarded a pair of grants from the U.S. Department of Transportation Federal Highway Administration (FHWA) to explore ways to cut greenhouse gas emissions in transportation-related projects. The awards were announced today in Washington, D.C., and are part of FHWA's Climate Challenge, an initiative to research how sustainable materials and practices could help reduce greenhouse gas emissions in highway projects.

"Environmental stewardship is an essential element of MDOT's commitment to maintain our transportation network and improve services for Marylanders," said MDOT Secretary James F. Ports, Jr. "We appreciate the federal government recognizing our efforts and supporting additional research that could benefit the environment here, across the country and around the world."

Two MDOT units – MDOT State Highway Administration (MDOT SHA) and MDOT Maryland Port Administration (MDOT MPA) – each received an FHWA grant, totaling a combined \$312,000. The two projects carry an overall cost of \$390,000, with MDOT contributing the balance. The projects are:

- **MDOT SHA** — will investigate the service life and environmental performance of products and materials used in highway projects, such as asphalt and concrete. The research will help MDOT SHA set environmental performance measures for Maryland projects and could help establish benchmarks here and in other states. The \$85,000 project will receive \$68,000 through the grant, and FHWA also will provide technical assistance.

WES MOORE, Governor

Ch. 202

Chapter 202

(House Bill 261)

AN ACT concerning

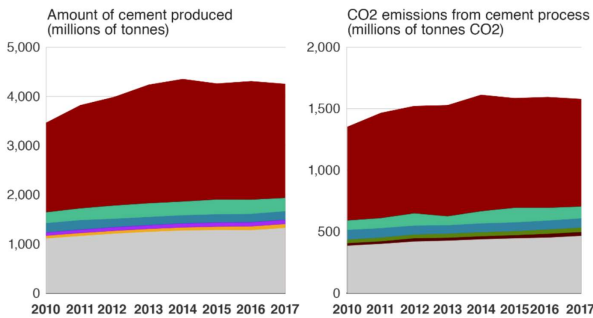
Public Eligible Projects – Global Warming Potential of Materials Procurement of Construction Materials (Buy Clean Maryland Act)

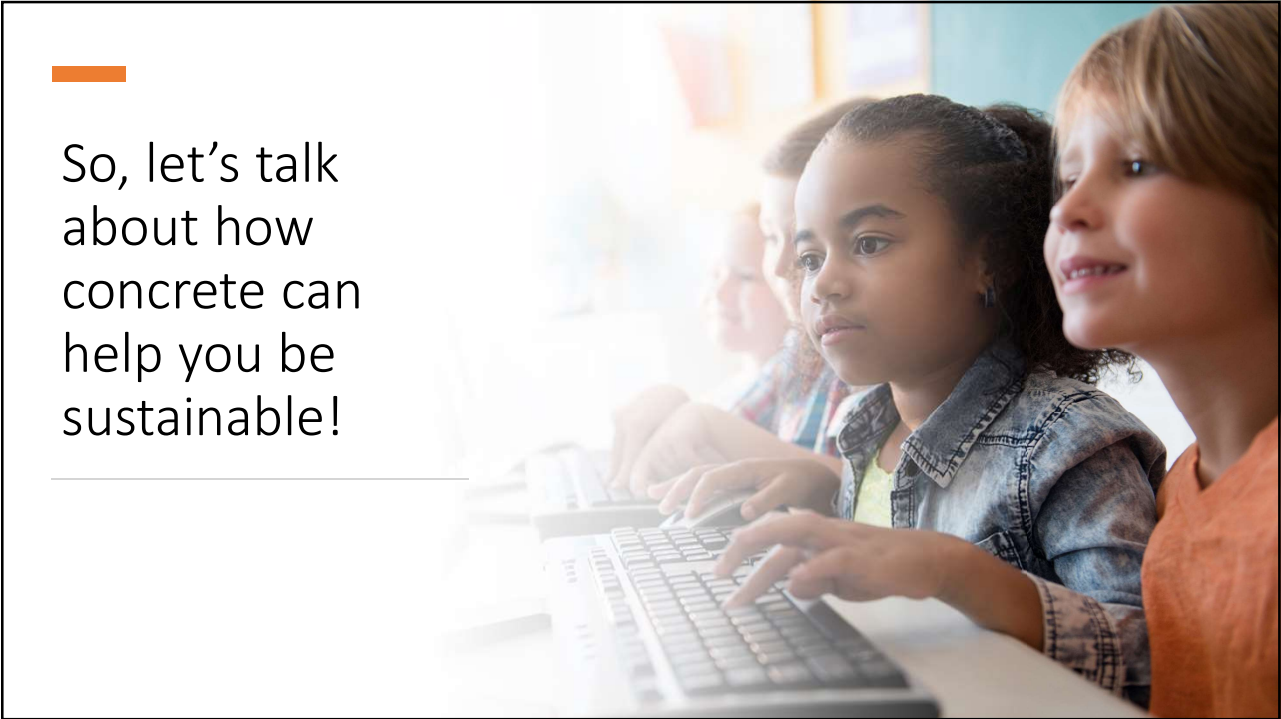
FOR the purpose of requiring producers of eligible materials to submit certain declarations to the Department of General Services by a certain date; requiring the Department to assess and to establish a maximum acceptable global warming potential for certain categories of eligible materials used in certain eligible projects; requiring the Department to review the maximum acceptable global warming potential for each category of eligible materials and authorizing the Department to make certain adjustments according to a certain schedule; prohibiting the Department from increasing the maximum acceptable global warming potential for a category of eligible materials; requiring a unit of State government to specify the eligible materials that will be used in an eligible project in the solicitation for an eligible project; requiring a successful bidder or offeror of an eligible project to submit certain information about each eligible material proposed to be used in an eligible project; prohibiting a contractor from installing any eligible materials on an eligible project until the contractor submits the required information for the eligible material; authorizing the Department to waive certain requirements concerning the use of eligible materials on eligible projects under certain circumstances; providing that the Department shall strive to achieve a continuous reduction of greenhouse gas emissions over time; establishing an Environmental Product Declaration Assistance Fund for a certain purpose; and generally relating to the global warming potential of materials in public eligible projects.

CO2 Emissions and Uptake

China produces most cement and therefore most cement-related CO2 emissions

China India EU US Vietnam Turkey
Egypt Other countries





So, let's talk
about how
concrete can
help you be
sustainable!

57



Tom Evans
Maryland Ready Mix Concrete Association
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tom@marylandconcrete.com

Thank you

58