

*North Dakota
Association of
County Engineers*

CONCRETE PAVING FOR COUNTIES THE BUDGET-FRIENDLY PAVEMENT SOLUTION

BRIAN J. ZUROFF, PE

EXECUTIVE DIRECTOR – NORTH DAKOTA CONCRETE COUNCIL



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Good Afternoon, Everyone! I hope everyone is having a great conference. As <EMCEE> mentioned, my name is Brian Zuroff and I am the Executive Director for the North Dakota Concrete Council. The North Dakota Concrete Council is a joint association for the North Dakota Ready Mix & Concrete Products Association, American Concrete Pavement Association – North Dakota Chapter, and the Cement Shippers that reside within our state.

TOPICS

- Why Concrete?
- The Cost “Issue”
- Existing Pavement Infrastructure
- Q&A

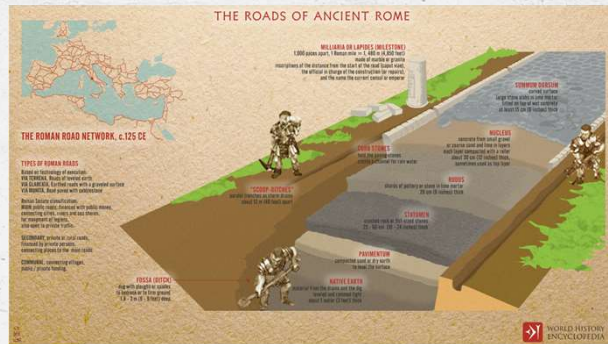


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From the intro slide, I’m sure most of you are thinking “Budget Friendly? This guy is off his rocker!” Well, yes, but also, no. My wife will give you the full details if you’d like. But today I’m here to provide a little education on Why to chose concrete, talk about the Cost “Issue”, what we do with our existing pavement infrastructure, and hopefully have some time for a brief Q&A session.

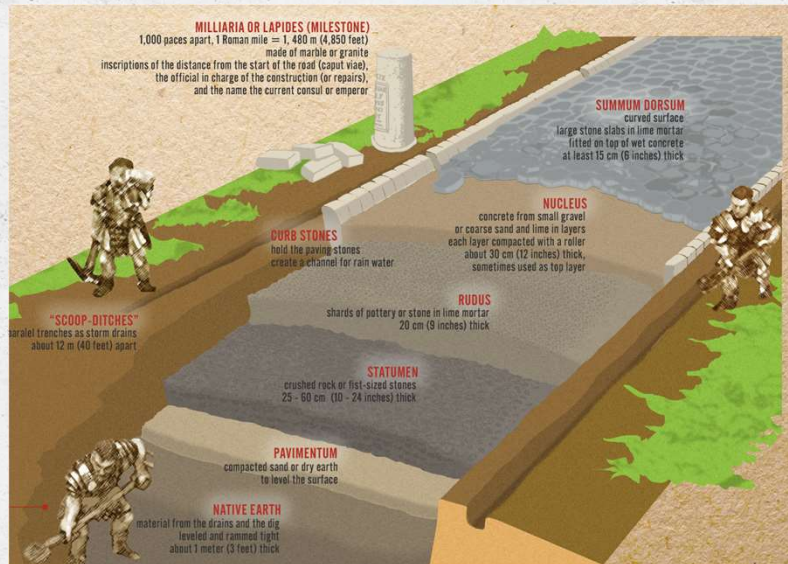
WHY CONCRETE?

- Why Not?



So for the 5 second elevator pitch – why concrete? The bigger question is “Why Not?” Concrete has been utilized in our roadway infrastructure for thousands of years. Evidence can be found dating back to Roman roads pre-dating Jesus Christ. Throughout the Roman Expansion, these ancient civilizations relied on ready-mixed concrete as a part of a readily built roadway utilizing local materials. They didn’t have the haul trucks, pavers, and other heavy equipment that we have today.

Roman Roadways



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Even without the heavy equipment, they were able to utilize local (forced) labor to construct won of the best roadway infrastructures ever made – with most of it still in use today. The Roman roadways didn't look much different than the roadways we construct in modern times either. As you can see, they utilized a prepared subgrade, crushed rock base course, low-grade and high-grade concrete, and topped it with stone. They even had a curved surface that allowed water to drain to a gutter system.

Modern Concrete Roadways



← So how to
we go from
this

To this? →



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So how do we get from roadways of ancient times to our current modern built roadways? We change – very little, actually. While our construction methods have modernized, our typical sections have changed very little and concrete remains the most available, locally sourced construction material – regardless of your location. In North Dakota, there is a concrete batch plant within 50 miles of most any project you’re working on.

Modern Concrete Roadways

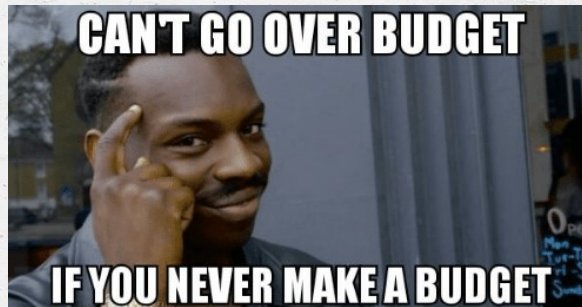


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Our modern concrete roadways, while having a design life of 20-30 years, often exceed that with minimal maintenance requirements. They provide an excellent surface for high volume, high impact roads. As this is the North Dakota Association of County Engineers annual County Roads Conference, I'm just going to assume we're a majority of civil engineers in the room today. From our basic transportation classes in college, we know that age is not necessarily what stresses a roadway and that ADT, Freeze Thaw, and other environmental considerations play a major part in the longevity of our North Dakota Infrastructure. Utilizing a rigid pavement system is one of the best ways to not only combat the harsh elements we have, but ensure we are appropriately utilizing our tax payer's dollars in the most efficient, sustainable manner possible. Which leads me to the next topic – cost.

THE COST “ISSUE”

- “Oh Boy, Concrete is sure a lot more expensive than asphalt!”
- Budgeting
 - Short Term = Maintenance
 - Long Term = Initial or Re-Construction



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One of the most common issues that is often discussed around the utilization of concrete in roadways is the cost. I can't tell you how often I've heard <CLICK> "Oh Boy, Concrete is sure a lot more expensive than asphalt". To which, I ask, define "Expensive". Most of our municipal projects of substantial size require the use of loans and bonding, often secured only by the tax-roles in our counties. Some of our counties are flush with money for annual maintenance and expenditures, most are not. So how do we ensure that we're utilizing tax payer dollars and our road maintenance funds appropriately? We look at the "big picture" of the project in its life span, and <CLICK> BUDGET accordingly. We need to understand that our roadways are not just a means to providing public accessibility throughout our regions, but a major INVESTMENT of our public funds. Our short-term budgeting should simply include our annual and bi-annual maintenance items, while our long term budgeting should be initial construction of roadways or major re-construction of existing infrastructure. Nothing is worse than trying to fit in a \$4M reconstruction into a \$500K annual budget.

Uh-Oh, He's going to hit us with LCCA

- Yup.
- Life Cycle Cost Analysis (LCCA)
 - “A process for evaluating the total economic worth of a usable project segment by analyzing initial costs and discounted future costs, such as maintenance, user costs, reconstruction, rehabilitation, restoring, and resurfacing costs, over the life of the project segment.”
- FHWA Policy on LCCA is that it is a decision support tool, and the results of LCCA are not decisions in and of themselves. The logical analytical evaluation framework that life-cycle cost analyses fosters is as important as the LCCA results themselves.



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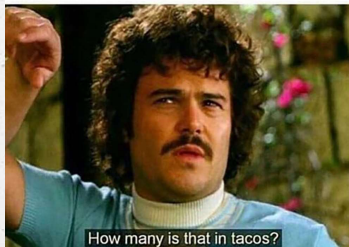
For those of you who have a history in working with Federal Highway and some State Funded projects, I bet your thinking “Uh-Oh, he’s going to hit us with Life Cycle Cost Analysis”. <Click> Yup.

Most of the loans and bonds for a roadway are issued on a 10-year to 20-year basis – so why would we design a roadway that requires a *major* reconstruction at the 12–15-year mark? Proper use of funding would ensure that the project has a sustainable life *at least* as long as we have a loan against it, but ideally twice as long <READ LIFE CYCLE COST ANALYSIS> <READ FHWA Policy>

LCCA – When do we use it?

- The LCCA should be conducted as early in the project development cycle as possible. For pavement design, the appropriate time for conducting the LCCA is during the project design stage.
 - Office of Engineering, Walls, J., & Smith, M. R., Life-Cycle Cost Analysis in Pavement Design: In Search of Better Investment Decisions (1998). Federal Highway Administration. Report Number: FHWA-SA-98-079
- Again, we need to remember this is an **INVESTMENT**

When my smart friends start talking about investment opportunities & stuff..

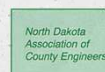


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For most pavement projects, the Life Cycle Cost Analysis should be complete as early as possible in the design stage. And that's not just "the Concrete Guy" saying it – it's the Federal Highway Administration. We need to remember that this is an investment. Would you invest in something that required additional investments to continue to perform prior to its maturity date? Well, unless you're my business partners, I'd assume not. (Bad joke, I know)

LCCA – When do we use it?

- Scope
 - You don't have to include every factor, just the significant factors.
- Analysis Period
 - Your analysis period should be sufficient to capture the full life cycle of your longest pavement alternative.
- Pavement Performance
 - Use real performance periods for all competing alternatives and associated maintenance activities.
- Agency Costs
 - Include all agency costs.



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The best results are to not overly complicate things. I like to refer to the KISS method – Keep It Simple, Stupid. When analyzing our design options, we need to refer a couple of items:

SCOPE: Inclusion of all potential LCCA factors in every analysis is counterproductive; however, all LCCA factors and assumptions should be addressed, even if only limited to an explanation of the rationale for not including eliminated factors in detail.

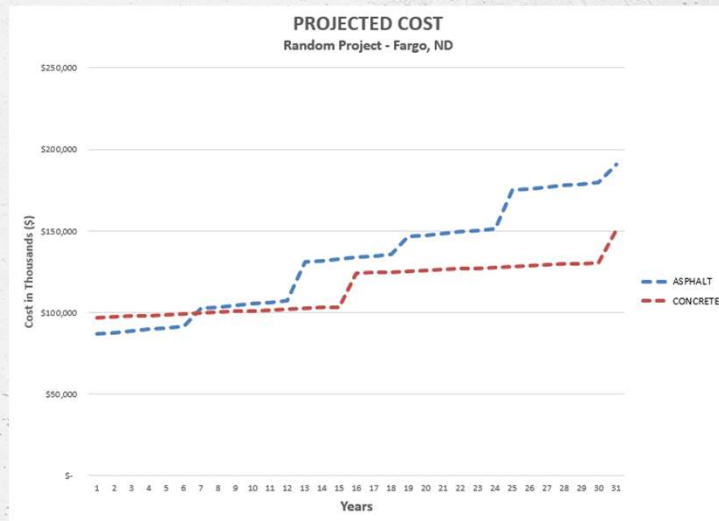
ANALYSIS PERIOD: The LCCA analysis period, or the time horizon over which alternatives are evaluated, should be sufficient to reflect long-term cost differences associated with reasonable design strategies. FHWA's LCCA Policy Statement recommends an analysis period of at least 35 years for all pavement projects.

PAVEMENT PERFORMANCE: Performance periods for individual pavement designs and rehabilitation strategies have a significant impact on analysis results. Longer performance periods for individual pavement designs require fewer rehabilitation projects and associated agency and work zones user costs.

AGENCY COSTS: Agency costs include all costs incurred directly by the agency over the life of the project. They typically include initial preliminary engineering, contract administration, construction supervision and construction costs, as well as future routine and preventive maintenance, resurfacing and rehabilitation cost, and the associated administrative cost... Agency costs also include maintenance of traffic cost.

He's sure getting into the weeds...

- LCCA doesn't need to be strenuous or complicated
- NDCC has plenty of tools to assist
- Basic LCCA can be performed in an hour or less for most projects where we have a grasp on paving related quantities.



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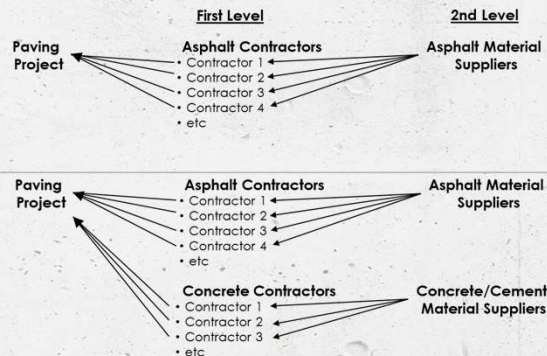
The LCCA process doesn't need to be strenuous or complicated. North Dakota Concrete Council and our affiliates have plenty of tools & professionals to assist you at *no cost to you*. Best of all – the time requirement is minimal. If we have a grasp on our paving-related quantities, a basic LCCA can be performed in less than an hour with the use of appropriate tools. Obviously, there is a lot more to this than we have time to cover in a 30-minute presentation, but I do welcome you to stop over at the NDCC booth when you have a chance if you'd like to discuss.

Lower Your Costs with Project Alternates

- The Engineer doesn't need to choose one or another
 - *Let the contractors do it for you!*
- Introducing Bid Alternates not only ensures you are getting the best product to suit your needs, but introduces additional competition into the market to *lower your costs even more!*

**Intra-Industry
(Contractor) Competition**
Competition Between firms that
pave with the same material

**Inter-Industry
(Industry) Competition**
Competition between firms that
pave with different material
substitutes

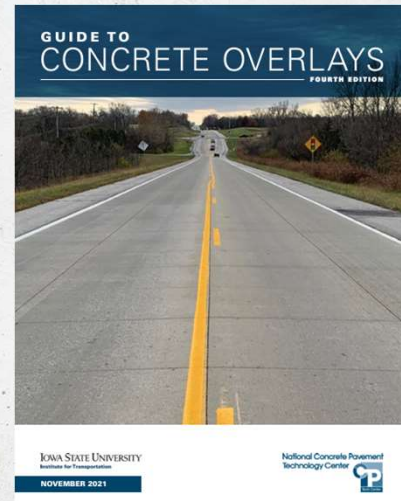


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Another way to lower your cost is with Project Alternates. As Engineers, we don't need to make the hard decision of 'one material over another', we can let the bidding results do that for us! When we introduce bid alternates, this not only ensures that you are getting the best product to suit your needs, but it introduces additional competition into the market to lower your costs even more! With typical intra-Industry competition that we get from specifying one pavement material type, we typically have one or two suppliers providing material quotes to 3, 4, or 5 contractors, who sharpen their pencils to provide the best bid for the work to be performed. Introducing Project Alternates introduces not just more contractors, but more suppliers into the mix. As a result, Inter-Industry competition most often times provides an additional discount rate to the project over what it would be had it been with a single pavement option. This is as simple as providing a different typical section, a few more specification sections, and a bid alternates table. While the engineering costs may be higher, would you spend an additional \$5,000 to potentially save \$80,000? I sure would.

EXISTING PAVEMENT INFRASTRUCTURE

- “We’ve already got plenty of asphalt roads – it’s just easier to Mill & Overlay”
- Existing asphalt roads make a great base course for a CONCRETE overlay!
- CPTechCenter.org/publications/
- If you prefer print versions, let me know!



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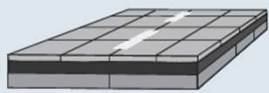
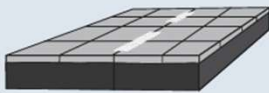
<CLICK> One thing I also hear is “We’ve already got plenty of asphalt roads, it’s just easier to Mill & Overlay”. I will never disagree with that. Stepping back to talk about ‘investments’ – overlays are an amazing way to utilize our INVESTMENT (there’s that word again!) in our existing roads. In fact, <CLICK> existing asphalt roadways make a great base course for a concrete overlay! Most roadways are not ineffective because their subgrade or even base course has exceeded its usefulness – most often times it’s simply a surface pavement structure or ride quality issue. The concrete industry realizes this and as such has spent millions of dollars in research. And what, you may ask, are the results? <CLICK> Well, first, they just give the information away for free! You can visit the CP Tech Center’s website for a plethora of information regarding all things concrete paving. Secondly, conclusive evidence has shown that concrete overlays over asphalt not only have a longer life span, but can help ‘bridge’ subgrade issues. These documents, books, and information are all available electronically for free on the CP Tech Center’s website. I know some of you are probably like me – you love the smell of freshly printed paper and the feeling of breaking in the spine of a new book – <CLICK> if you’d rather have a hard copy, please let me know!

Concrete Overlays aren't just easy – they're practical

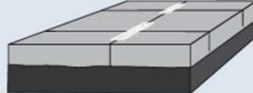
Concrete on Asphalt

Concrete on asphalt (COA) overlays can be designed to address a broad range of existing pavement conditions on both composite and full-depth asphalt pavements. Both bonded (COA-B) and unbonded (COA-U) options enable designs to cost-effectively match the condition of the existing asphalt—from deteriorated to good—as well as geometric parameters.

COA-B (Full Depth and Composite)



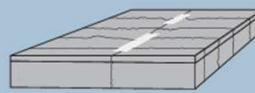
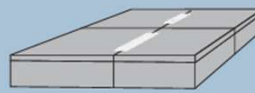
COA-U (Full Depth and Composite)



Concrete on Concrete

Concrete on concrete (COC) overlays can be designed for applications on both existing jointed plain concrete pavement (JPCP) and continuously reinforced concrete pavement (CRCP). The predominance of COC overlay designs are unbonded (COC-U) systems; however, bonded (COC-B) applications can be successful, provided the existing pavement is in good condition.

COC-B (JPCP and CRCP)



COC-U (JPCP and CRCP)



CP Tech Center



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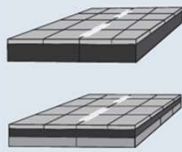
Much like concrete itself, concrete overlays aren't a new thing. Referring back to the Romans, they often would overlay and replace their surfaces as needed to ensure a quality traveling experience. Concrete overlays are broke into 2 primary categories – Concrete on Asphalt (COA) and Concrete on Concrete (COC). Within both, there are bonded and unbonded overlay options to suit your project's needs. However, since this is the County Roads Conference and asphalt roadways are primarily what our North Dakota counties utilize for existing pavement, we'll focus on the Concrete on Asphalt discussion.

Bonded or Unbonded?

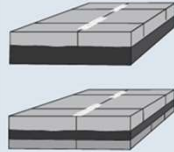
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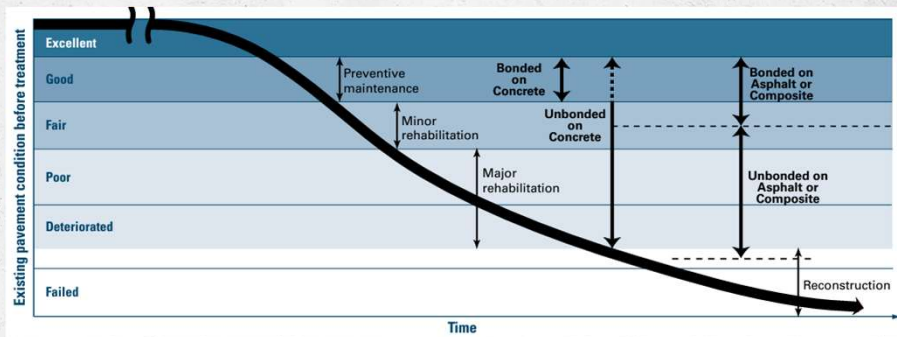
COA-B (Full Depth and Composite)



COA-U (Full Depth and Composite)



CP Tech Center

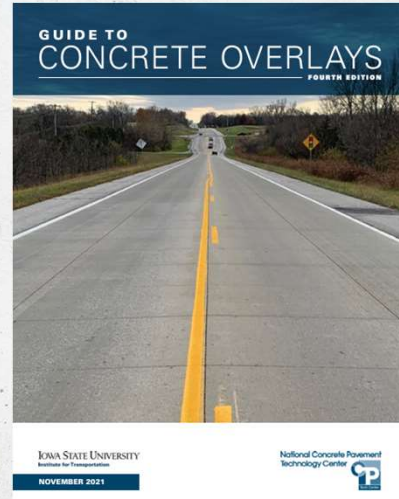


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The decision on whether to proceed with a bonded or un-bonded is as simple as analyzing the existing pavement condition. For roadways that are structurally sound, but may be suffering from ride quality issues and minor structural failures, a Bonded overlay is typically recommended. For roadways that are suffering from moderate to severe surfacing structural failures and have exceeded their design life, an unbonded overlay may be best.

Sorry, this is just a “Preview!”

- Evaluation of Existing Pavements
- Selection of Overlay Options
- Concrete Overlay Design
- Materials & Mixtures
- Construction of Overlays
- Typical Sections & Details Available



While I could spend the next couple of hours discussing Concrete Overlays, I don't think Mike or Genny would be very happy with me! I highly encourage each and every one of you to dig into the Concrete Overlays manual. It reviews the Evaluation of Existing Pavements, Selection of Overlay Options, Concrete Overlay Design, Materials and Mixtures, and construction considerations. <CLICK> Also, we have a full library of typical sections and details for you *at no cost*.

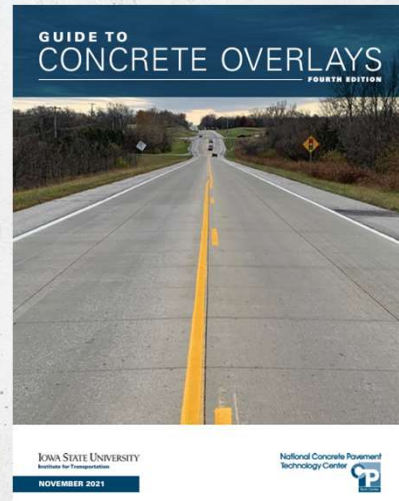
Full Review

- TINSTAFL

– Let me buy you & your staff lunch!



Brian J. Zuroff, PE
Executive Director
North Dakota Concrete Council
Mobile: (701) 319-9168
bzuroff@ndconcrete.com



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If you'd like an even deeper dive, I would love to come to your office and provide a course over the book in its entirety! In our high school economics class, we often learned "TINSTAFL" <Ask Crowd to Repeat the definition> And while there may be no such thing as a free lunch, we would love to buy you one! In about an hour, we can do a deep dive into Concrete Overlays. My contact information is on the screen, or please come see me at the NDCC booth after the presentation.

Thank You!

*North Dakota
Association of
County Engineers*

Questions? Comments?

(Genny has rotten vegetables in the back if you need something to throw!)



←←← Scan for Brian's Contact Info!

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Thank you everyone for letting me come talk to you today! I'd like to open for a brief Q&A session. If you didn't care for my presentation, Genny has some rotten vegetables in the back if you need something to throw!