Service Life Guidance, PBPD, Alternative Studies

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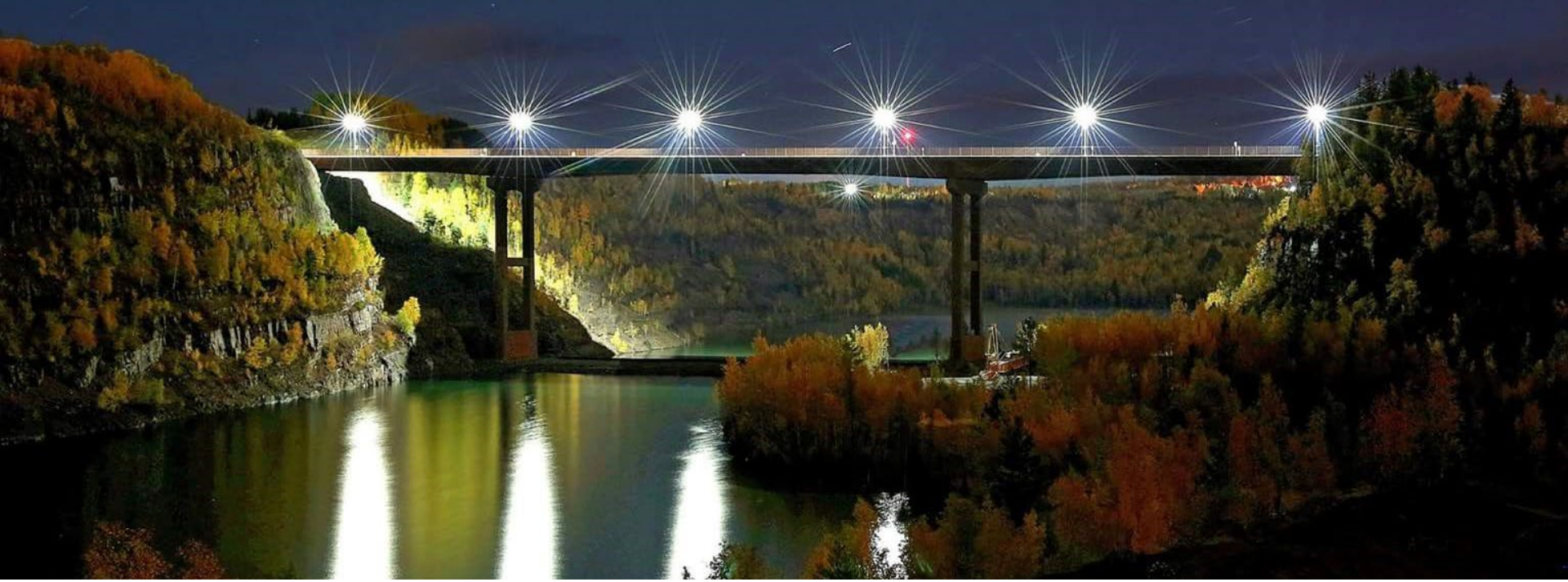
Introduction

- MnDOT Bridge Office - Prelim Plans Unit, since July 2018
- Prior to that, worked for SEH for almost 20 years.
  - Worked primarily in preliminary road design, and worked on many bridge projects, including the Red Wing Bridge project and the TH 53 relocation in Virginia.



Service Life Guidance

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Service Life Guidance

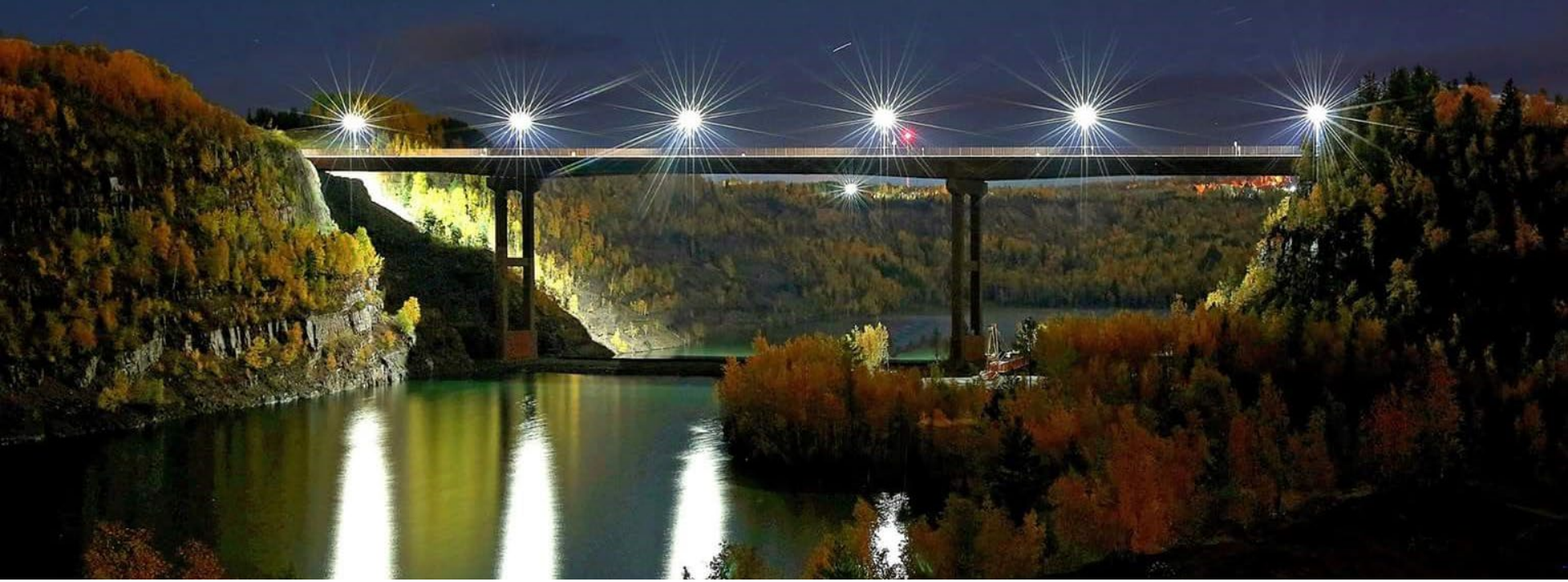
- What is Service Life Design?
  - Basically, how long is this bridge going to be designed for?
  - Determine based on several factors
    - Is there potential to replace the deck in the future?
    - Initial and life cycle costs
    - Ramifications to the traveling public (long detours, traffic disruptions)
    - Environmental conditions that keep us from being able to work there.
  - Location of bridge, and how easy/difficult is it for future work?

Service Life Guidance

- What is Service Life Design (cont'd)?
  - Three Levels
    - Normal – 75 years based on AASHTO (most) – *There is a potential that the deck will be replaced during the life of the bridge.*
    - Enhanced – *The goal of this category is to provide a deck that will not need replacement in 75 years and lowered maintenance needs than normal service life.*
    - Maximum – Longest service life at 100 years, using all the best options in our toolbox. – *It is expected that all structural elements will exceed 100 years of service.*
  - Service Life doesn't guarantee that the bridge is going to last. Maintenance activities are necessary. Service life provides the backbone to enable the bridge to last as long as needed.

Service Life Guidance

- How to get to achieved levels?
  - Materials
    - Normal service life can be achieved using MnDOT typical practice
    - Enhanced and maximum service life use better materials (ie, stainless steel rebar, or better coatings)
  - Details
    - Increased cover in key areas to protect rebar
  - Better Construction Practices



Performance Based Practical Design

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Performance Based Practical Design

- Intro - What is PBPD?
  - From FHWA - PBPD is a decision-making approach that helps agencies better manage transportation investments and serve system-level needs and performance priorities with limited resources.
  - Early to mid-00's, Missouri first started using "practical design". To "build good projects everywhere - rather than perfect projects somewhere."
  - PBPD was first coined by FHWA, combining pre-existing ideas of practical design and performance-based design.
  - FHWA felt that we needed to take a rigorous performance-based/evidence-based approach in order to do practical design responsibly.
  - Both MnDOT and FHWA feel like you can't have one with the other, they go together.

Performance Based Practical Design

- Intro – What is PBPD (cont'd)
  - MnDOT adopted its PBPD policy in 2017.
  - Published the first edition of the guidance document in 2018 http://www.dot.state.mn.us/pbpd/design-guidance.html
    - Temporary foothold until adopted into Facilities Design Guide (FDG)
    - Traditional charts/typical sections have been archived.
  - Future is likely some combination of dimensional framework (standards) and performance-based tools and methods.
  - PBPD is one of several interrelated concepts, all existing under the philosophical umbrella of Context Sensitive Solutions (CSS).
  - Many resources available on FHWA and MnDOT websites.

Performance Based Practical Design

- Summary
  - There is no one correct way to do PBPD, but there is certainly incorrect ways to use PBPD.
    - Looking at projects from a bigger picture, and not losing site of that.
    - Can't "PBPD" your way out of an underfunded project.
  - Puts the engineering back into engineering.
    - Less tables/charts. Evaluate the data/context/surroundings and use judgement based off this information
    - Conversations with all groups, understanding all needs. Can lead to "hard conversations" but taking this time, to understand, will lead to stronger understanding of one another.
    - Can't design in a vacuum.

Performance Based Practical Design

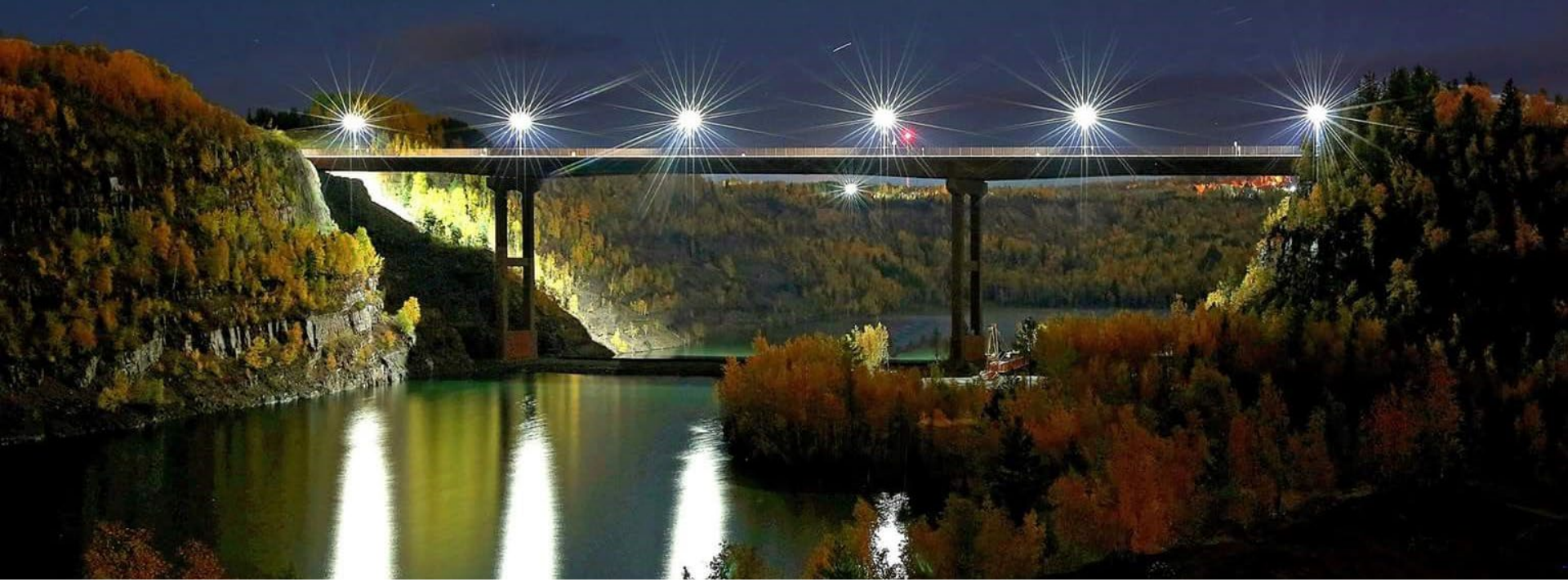
- Why?
  - To be more responsible with our money, plain and simple. Looking at your purpose and need, and staying as closely within that context, and "right sizing" your project, to hit your project goals. Small savings on each project, allows you to do more projects. By not doing this, we potentially steal from needs elsewhere, both currently and in the future.

Performance Based Practical Design

- What are some elements we are looking at, specifically with Bridges?
  - Widths: Shoulder and Travel Lanes.
    - PBPD guidance book, bridge chapter.
    - For complex bridges, major river crossings, long spans: conduct risk assessment.
  - Under Bridge Typical Section
    - Tech Memo (20-03-TS-01)
    - Traditionally looked at a 30’ “clear zone”, now looks at data and specific criteria (shoulder, snow storage, drainage, maintenance, multi-modal, construction/staging) to determine appropriate lateral clearance.
    - Helps reduce span lengths, which is a cost savings.
    - To Note:
      - Snow storage is separate from shoulder.
      - 1:2 slope is not a hazard if it is smooth.
      - 1:10 is the slope for snow storage.

Performance Based Practical Design

- Example : TH 23 – Corridors of Commerce in D8
    - Main objective is to improve the movement of freight and provide additional highway capacity where there are currently bottlenecks in the system.
    - This section had a lower ADT, and the 4 lanes were more for continuity and above-mentioned objective.
    - Determined to change "passing lane" to 11' lane (instead of 12' standard) and reduced outside shoulder widths from 10' to 8'.
    - 12 miles, this took 3' of pavement/grading off the length of the project (for one direction, so 6' total), adds up to significant cost savings in pavement and earthwork, culvert lengths, bridge widths/lengths.
    - Example of a relatively small change, that did not affect performance, but added up to a significant cost savings.



Alternative Studies

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Alternative Studies

- Alternative Studies – Determining Type, Size and Location
  - Start as early as possible – Scoping/Early Preliminary Design
    - Gather your information.
      - What is the project?
      - Constraints? Needs? Desires?
    - Use your resources.
      - Manuals, websites, subject matter experts, projects, experiences.
    - Communication.
      - Can’t stress enough, how important communication with team members are.
      - Understand the project, and the needs.

Alternative Studies

- Start the Design Process
  - Then using this information, start exploring the options that best fit these project needs and sight constraints.
    - Example : Structure depth, vs profile raise
    - Working with the PM, with all groups: APPLES TO APPLES
  - Is there additional back and forth with functional groups?
  - Depending on what you are spanning, will also set you down certain paths.
    - Over Roadway – Under bridge typical section
    - Over Waterway – Hydraulics, waterway requirements
    - Over Railroad – Early coordination to understand requirements/variances.

Alternative Studies

- Bridge Details
  - Prestressed Beams are preferred over steel.
  - When possible, integral abutments are the preferred choice.
    - (see BDM Ch. 11 for criteria).
  - Are there retaining walls, and how do those tie in and interact with the bridge?
  - Geotechnical details that play into design? (ie, foundation needs)
  - Remember, a shorter bridge deck, does not always mean cheaper structure!

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Questions?