Lowest Life Cycle Cost (LLCC)

pennsylvania
DEPARTMENT OF TRANSPORTATION

What is LLCC?

With the passing of MAP-21 and FAST ACT, states are now required to manage the NHS to the Lowest Life Cycle Cost (LLCC) and document this in their risk-based Transportation Asset Management Plans (TAMPs).

LLCC is a process designed to maximize the life of an asset at the lowest cost through a **risk-based prioritization of preservation, rehabilitation, and reconstruction.** It promotes the right treatment at the right time (with an emphasis on preservation) rather than focusing too heavily on assets in poor condition (e.g., worst-first).

Each cycle shorter than previous cycle

No Preservation

Preservation

Extends life

VS
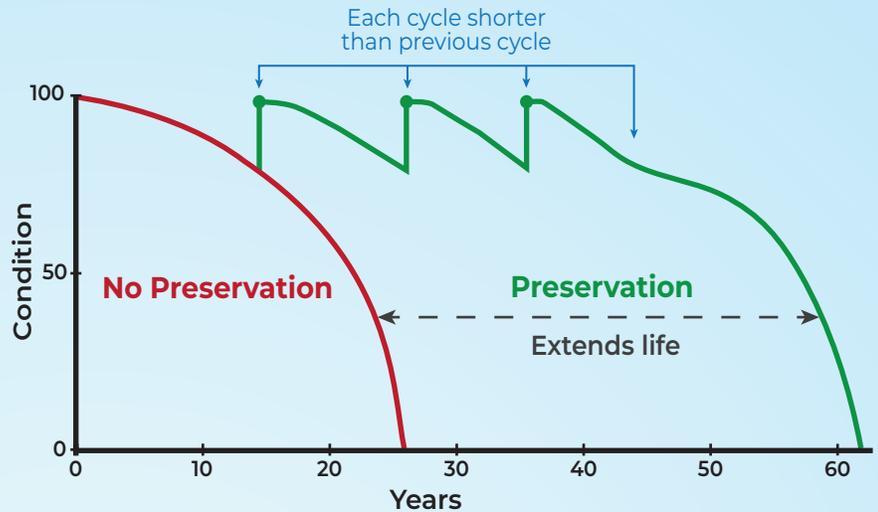
No Preservation   **Preservation**

A series of well-timed preservation activities extends life, maintains the asset at a higher performance level for longer, and lowers the total cost per year.

Why is it Beneficial?

- **Extended life of bridges/pavement (assets)**
- **Lower annual cost over the life of the asset**
- **More effective use of resources**
- **Assets are in better overall condition**

What to Expect

A guidance document regarding transition is in development. Key points include:

- Guidance on transitioning from worst-first to LLCC
- New goals/metrics and how to apply them
- Pavement Asset Management System (PAMS) and Bridge Asset Management System (BAMS) tools to assist in TIP/TYP project selection
- Training on software systems and interim tools

GOAL

Next TIP update to be based on new methodology ➔ Emphasize "on-cycle"

Frequently Asked Questions

Q: What does "worst-first" mean?
A: Focusing on and prioritizing projects for assets in "poor" condition without consideration of remaining life.

Q: If "worst-first" is not the emphasis, do I always prioritize preservation over rehabilitation or reconstruction?
A: No. Prioritization should be based on "duration in condition state". That is, how long will the necessary treatment be appropriate? If the same treatment would still be appropriate later, focus on the projects that may soon deteriorate further and then require a higher-level treatment, or result in an unacceptable condition.

For example:

Bridge "A" recently deteriorated to condition state 4 (poor) and requires replacement but will likely remain in the same condition for a number of years. Bridge "B" has been in condition state 5 (fair) for ten years and is in need of preservation or else it would soon deteriorate to poor if nothing is done.

Bridge "B" should be prioritized ahead of Bridge "A".

Bridge "C" has been in condition state 4 for so long that posting and/or closing may soon be warranted.

Even though Bridge "C" is the "worst" of the three bridges described, it should be the priority – not because it's poor but because it has little remaining life before it reaches an unacceptable condition.

Q: Can an asset be preserved "forever"?
A: No. Each preservation cycle will likely provide less performance life than the one before it. When the added life is no longer worth the cost of the treatment, the timing and type of a higher-level treatment should be considered. It may be prudent to defer any work until the higher-level treatment is necessary to prevent deterioration to an unacceptable condition or even more extensive treatment.

Q: Moving forward, will LLCC be the only consideration?
A: No. Prioritization is a function of condition and risk. For our purposes, risk is measured by impact on the sustainability of the transportation system and primarily defined in terms of traffic, size (deck or pavement area), system type (business plan network, functional class, etc.), and detour length. Simply put, the more people that use a structure, the more important the structure is to the network. Risk is not a function of condition; they are two separate factors that must be measured and managed separately. If two assets are of similar condition and need, risk is considered to prioritize one over the other.

Q: What information is available to make LLCC-based decisions?
A: PAMS and BAMS are designed to generate priorities and schedules based on budgetary constraints, current conditions, deterioration models, treatment "trigger" points, and costs. These systems will be in the hands of Districts and Planning Partners. As they are rolled out, training, data validation, logic "tweaking," and program comparison will be provided.

Q: How do we achieve LLCC if our needs exceed our budget?
A: The intent is to maximize asset life and spend available funds most efficiently. PAMS and BAMS can be used to define unconstrained needs as well as financially constrained outputs used for planning and programming.

Q: What about other factors that are currently considered?
A: There may be other reasons a project needs to be prioritized. Political commitments, environmental justice, deliverability, corridor-based approaches, and excessive maintenance costs are examples. An LLCC-based prioritization is a starting point but non-data driven factors must be considered and weighed by District and Planning Partners to develop a program.

Q: What about immediate repair needs for quick developing and/or unsafe conditions?
A: These situations take funding away from an LLCC-based program but may be necessary. It is important to not consider these repairs as preservation and expect the same life. It is important to plan for the appropriate longer-term project.

Q: What about performance measures and targets?
A: Performance (i.e. percentages of good, fair, and poor) is forecasted based on LLCC prioritized projects and existing programs. While adjustments could potentially be made to try to influence the good/fair/poor reported performance, planning and programming is fundamentally to be LLCC-based and not intended to influence performance measure results. We are required to program to LLCC; performance is merely an indicator of funding level.