National Concrete Bridge Council

2025 NCBC WEBINAR SERIES

Introducing Life-365™- a Web App for Estimating the Service Life of Concrete Mixture Designs and Corrosion Protection Systems

February 18, 2026

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www.nationalconcretebridge.org

National Concrete Bridge Council

Update from the National Concrete Bridge Council

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NCBC Webinar Series 2026

National Concrete Bridge Council

March 18: Introduction to the Design Process for Segmental Bridges with the New ASBI Segmental Design Manual

April 15: Stress–Strain Behavior and Bridge Performance of Concrete Containing Expanded Shale, Clay, and Slate Aggregates

May 20: Anchoring to Concrete Updates for 2026 (Part 1)

June 10: Overview of the new M-50 Tech Note on Unducted PT with Epoxy Coated Strand

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Industry Events 2026

Feb 27- Mar 2: NRMCA Annual Convention, Las Vegas

Mar 29- Apr 1: ACI Concrete Convention, Rosemont, IL

Apr 14 : 2026 TRANS-IPIC UTC Workshop, Rosemont, IL *(see handout)*

Apr 13-16 - CRSI Technical Meeting, Napa, CA

Apr 23-24 – NCBC Seminar, Austin, TX *(see handout)*

May 3-9 – PTI Convention, Long Beach, CA

June 15-16 – International Bridge Convention, MD

Jun 28- Jul 2, 2026: AASHTO COBS Annual Mtng,Charlotte

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National Concrete Bridge Council

Mark Ehlen, PhD

- Economist and Engineer with more than 25 years of experience studying durability and permeability of concrete
- Senior Advisor at National Nuclear Security Administration and previously with NIST and Sandia National Labs
- In 2001 he produced BridgeLCC software to estimate life-cycle costs of bridges
- Works with consortium to continue to improve on Life-365

Photo: HNTB, © Core-Visual as seen in *ASPIRE* Summer 2023.

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Presentation

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About this Webinar

- This webinar offers information on the latest version of Life-365. The presentation takes you through the updates and how to use this web-based application to **estimate service life and life-cycle costs of concrete mix designs**.
- It follows a methodology that gives **research-based estimates** of the effects of concrete design, chloride exposure, environmental temperature, concrete mixes and barriers, and reinforcing steel on service life and life-cycle cost.
- While the app has been in use for decades, in 2025 an **online version** of Life-365 was released. This latest version allows users to run Life-365 in a web browser on a desktop, laptop, tablet, or smart phone.
- All features, functions, and reporting reports remain intact, and **projects from the previous version can be imported**. The calculations, functionality, and existing industry-accepted time-to-corrosion estimation process remain unchanged from previous versions.

Learning Objectives

Following this webinar, the participants will be able to:

1. Utilize the latest version of Life-365 on any browser device
2. Estimate & compare the service life of concrete mix designs
3. Calculate & compare industry-accepted time-to-corrosion
4. Review how and when to use in the design of concrete bridges
5. Understand how a consortium of concrete industry companies continues to develop and improve on Life-365.

But will do in order: 2 (3) → 1 → 4 → 5

2. Estimating Service Life: Time to corrosion is based on the **speed** of chlorides moving through concrete to vulnerable rebar that has resistance

Some Speed Factors

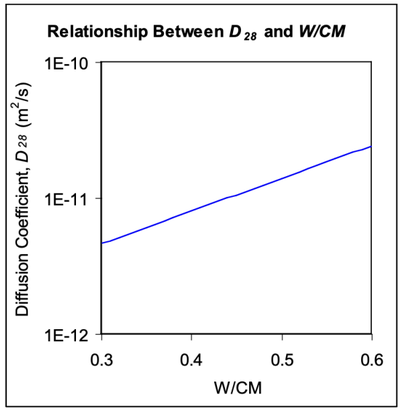


Figure 2.2. Relationship Between D_{28} and w/cm

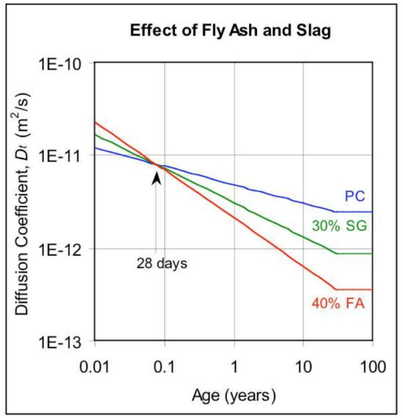


Figure 2.4. Effects of Fly Ash and Slag on D_t

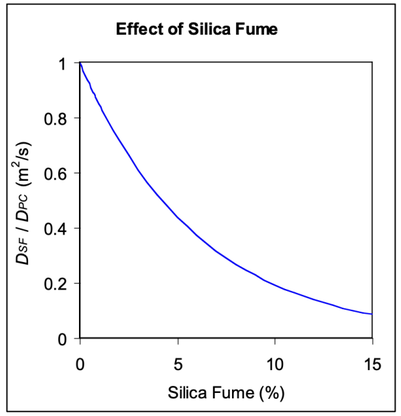
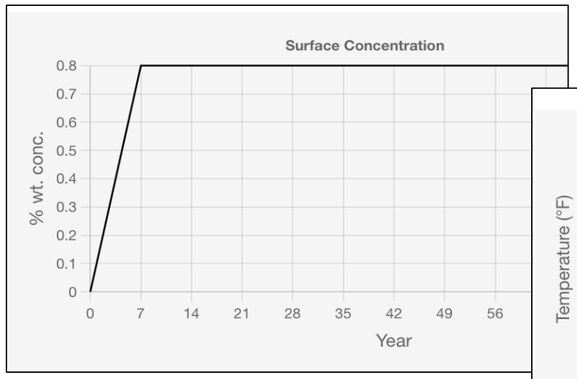
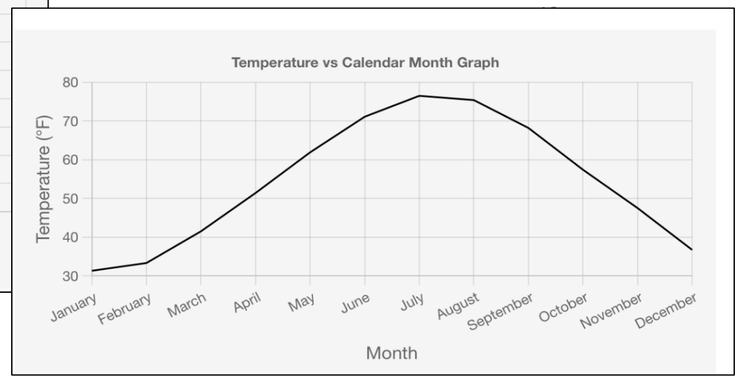


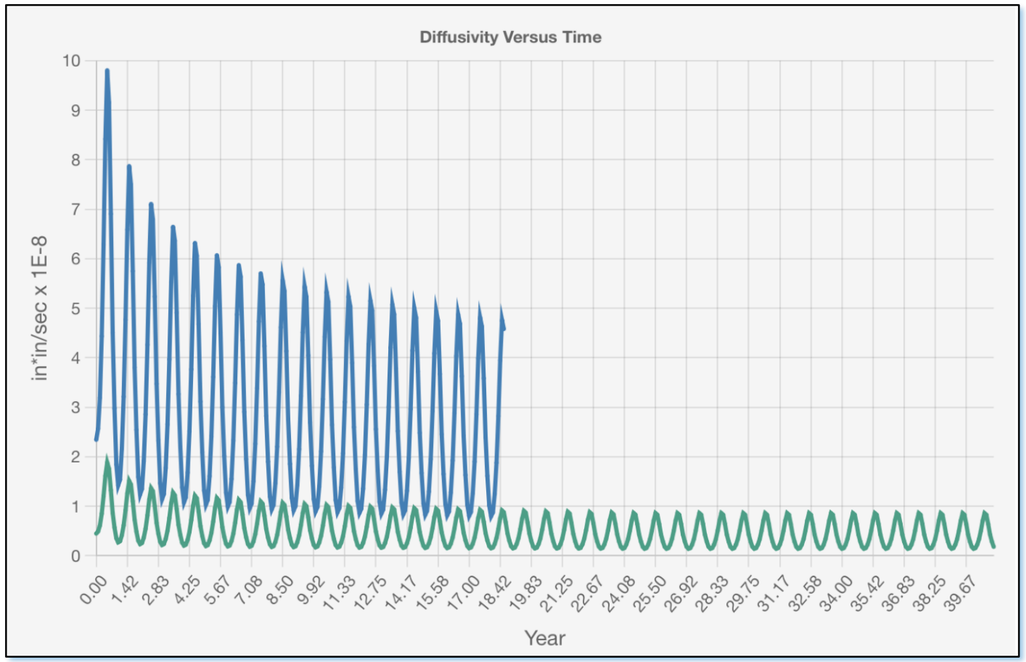
Figure 2.3. Effect of Silica Fume on D_{SF}





Some Speed Results

Different speeds and resistance factors result in different service lifes

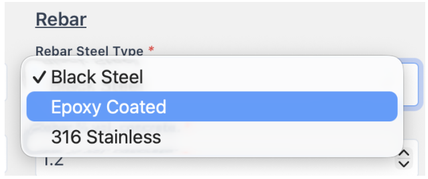


2. Estimating Service Life: Time to corrosion based on speed of chlorides through concrete to vulnerable rebar which has **resistance**

Some Resistance Factors

Table 2. Effects of CNI on Threshold

CNI Dose		Threshold, C_t
liters/m³	gal/cy	(% wt. conc.)
0	0	0.05
10	2	0.15
15	3	0.24
20	4	0.32
25	5	0.37
30	6	0.40



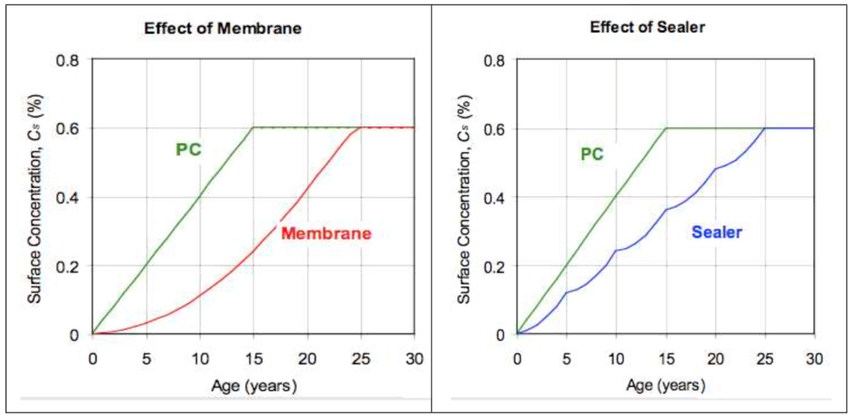
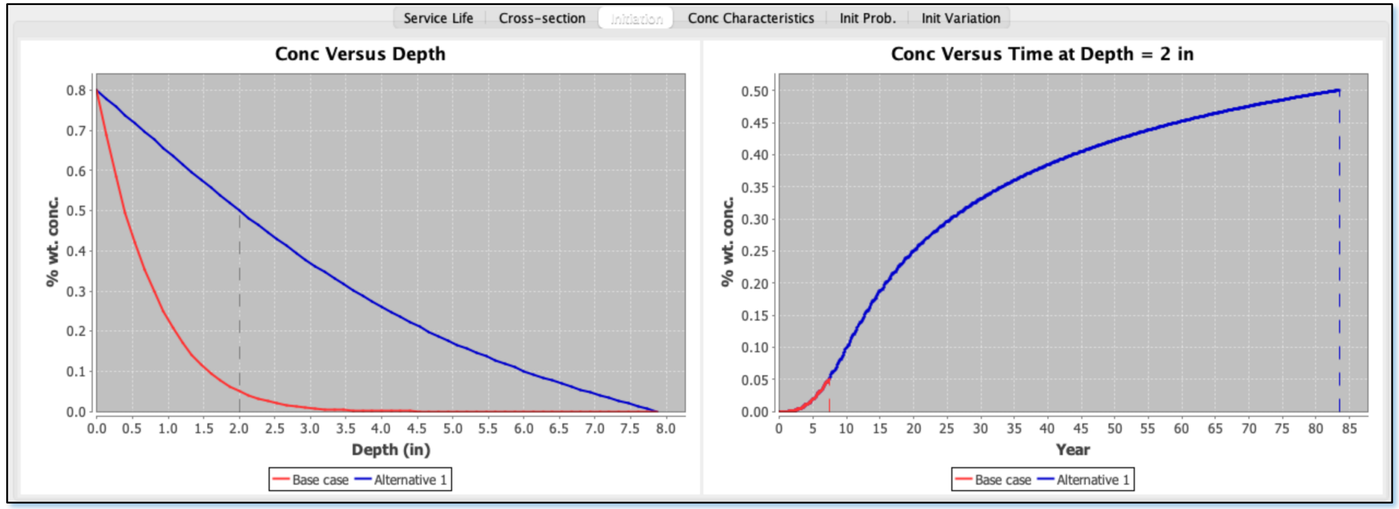


Figure 2.5. Effects of Membranes and Sealers

Some Resistance Results

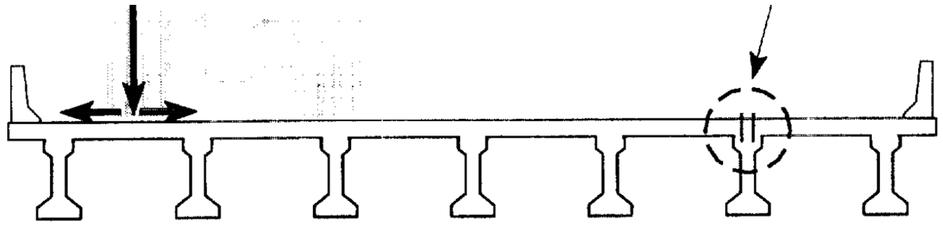
Different speeds and resistance factors result in different service lifes

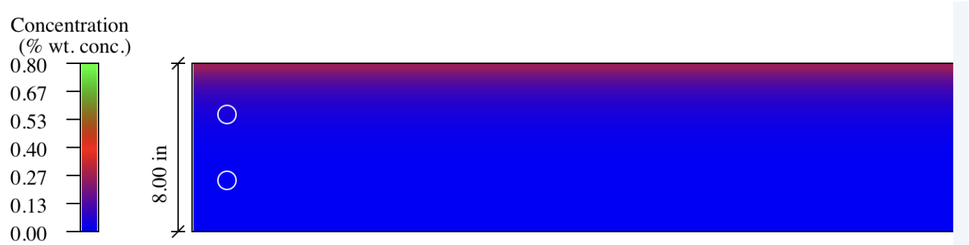


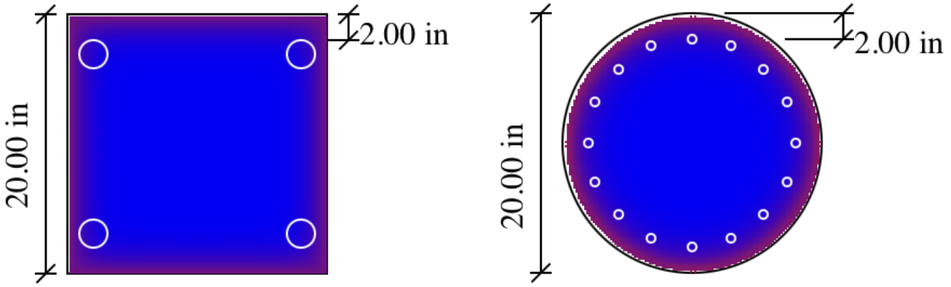
1. How to Use Life-365

Technical Manual: It covers

- Time to corrosion + time for propagation = service life.
- Applied to slabs/walls and round/square columns.
- Time to corrosion based on chloride transport from surface to reinforcing steel; mathematical equations that use physics properties/constants based on concrete properties; 1D and 2D Fickian-related diffusion.
- Includes tool for estimating maximum external chloride concentration
- Download from https://app.life-365.org



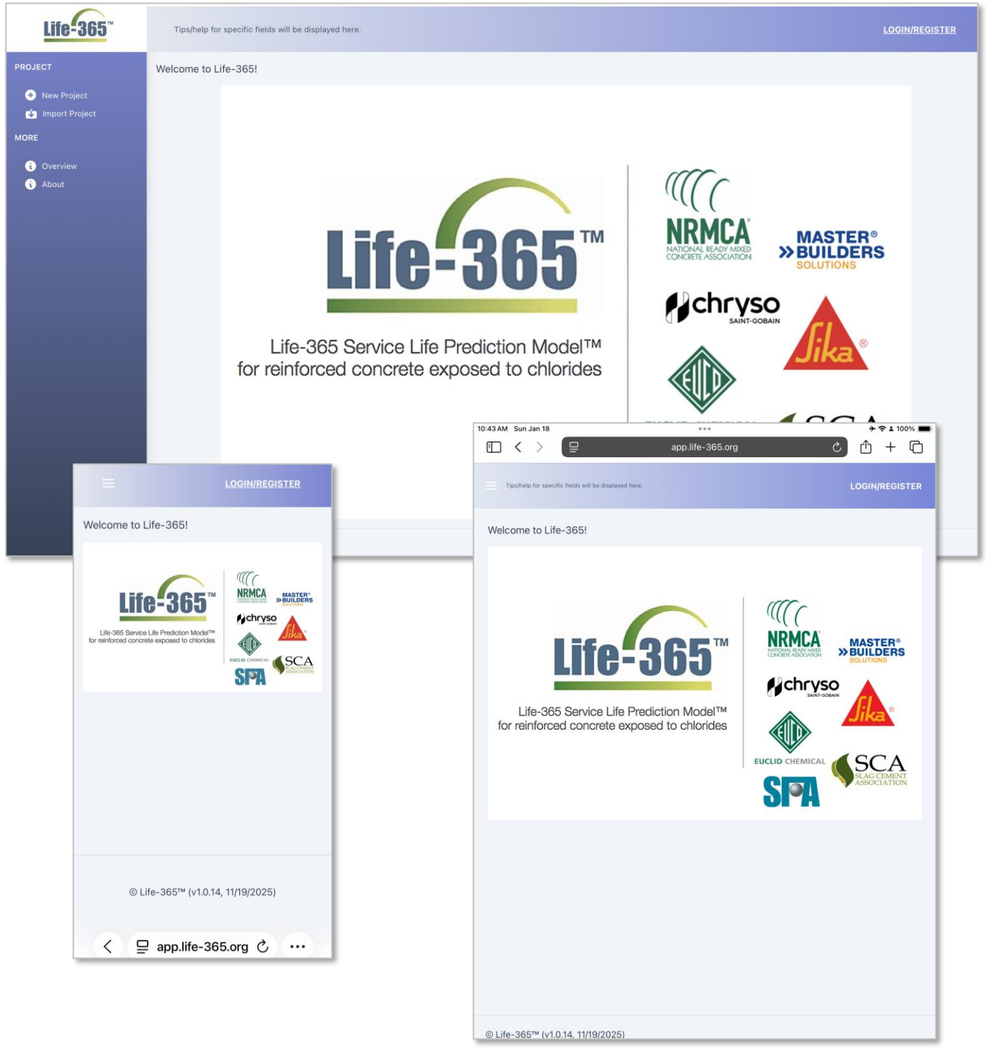




1. How to Use Life-365 on any Device

1. Utilize the latest version of Life-365 on any device.
2. The practice of estimating & comparing the service life & life-cycle costs of concrete mix designs.
3. The practice of calculating & comparing time-to-corrosion.

Access: https://life-365.org/resources/

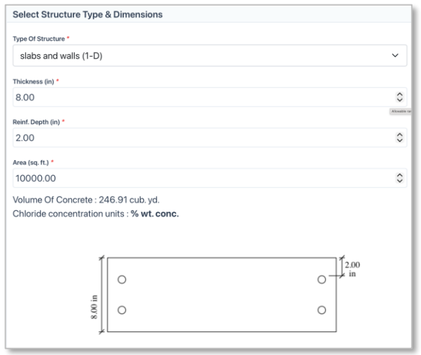


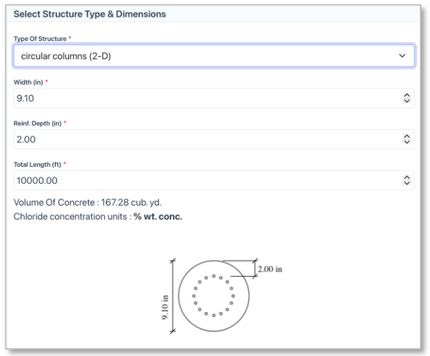
DEMO

https://app.life-365.org

4. How and when to use for concrete bridges

- When durability is a design objective or factor.
- When chloride ingress is the primary (first) means of concrete failure.
- When this chloride ingress is via concrete bridge slabs, round columns, square columns; Does not explicitly include concrete beams.
- When ‘novel’ admixtures can be represented by custom D28 (chloride diffusion coefficient at 28 days), Ct (chloride threshold), propagation, etc.





5. How the Life-365 Industry Consortium Works

1998, National Institute of Standards and Technology (NIST) workshop called for corrosion service life model.

1999: Consortium I formed within **American Concrete Institute's (ACI)** Strategic Development Council (SDC) to fund development of the "Life-365" software program as the first step towards creating a consensus model.

2005: Consortium II formed to fund improvements (**Slag Cement Association** (SCA), the **Concrete Corrosion Inhibitors Association** (CCIA), **National Ready Mixed Concrete Association** (NRMCA) and the **Silica Fume Association** (SFA)).

2008: Life-365 v2.0 is released to industry.

2012: Life-365 v2.1.1 is released after 12-month verification and validation (with E.C. Bentz).

2012: Consortium III formed to continue the improvements of Life-365. (**BASF Admixture Systems**, **Cortec**, **Epoxy Interest Group (Concrete Reinforcing Steel Institute)**, **Euclid Chemical**, **Grace Construction Products**, **National Ready-mixed Concrete Association**, **Sika Corporation**, **Silica Fume Association**, **Slag Cement Association.**)

2013: Added ASTM C1556 Tool to estimate surface chloride levels.

2019-2026: Development and release of Life-365 3.0: Web Version. Same Life-365 2.3 (Java) service-life prediction and life-cycle-costing codebase but on server, totally new web interface.

Michael D.A. Thomas, FACI, is a Professor of civil engineering at the University of New Brunswick, Fredericton, NB, Canada. He is a member of ACI Committees 201, Durability of Concrete; 221, Aggregates; 232, Fly Ash and Natural Pozzolans in Concrete; 233, Ground Slag in Concrete; 234, Silica Fume in Concrete; 236, Material Science of Concrete; 308, Curing Concrete; 365, Service Life Prediction; and E803, Faculty Network Coordinating Committee. He received the ACI Wason Medal for Materials Research and the ACI Construction Award and is a Past President of the ACI Ontario Chapter.

ACI member **Evan C. Bentz** is an Associate Professor of civil engineering at the University of Toronto. He is a member of ACI Committee 365, Service Life Prediction, and Joint ACI-ASCE Committee 445, Shear

concrete research into the

program Response-2010

Life-365™ Service Life Prediction Model™

and Computer Program for Predicting the Service Life and Life-Cycle Cost of Reinforced Concrete Exposed to Chlorides

Version 2.2.3

December 23, 2020

Life-365™

Life-365 Service Life Prediction Model™ for reinforced concrete exposed to chlorides

Produced by the Life-365™ Consortium III

Presenter: Mark A. Ehlen, Ph.D.

- Economist & Engineer; NIST, Sandia National Labs, NNSA
- Joined to improve Life-365 life-cycle costing methods
- Authored several papers below that are available for reference

NISTIR 5864

NIST U.S. DEPARTMENT OF COMMERCE
Technology Administration
National Institute of Standards and Technology

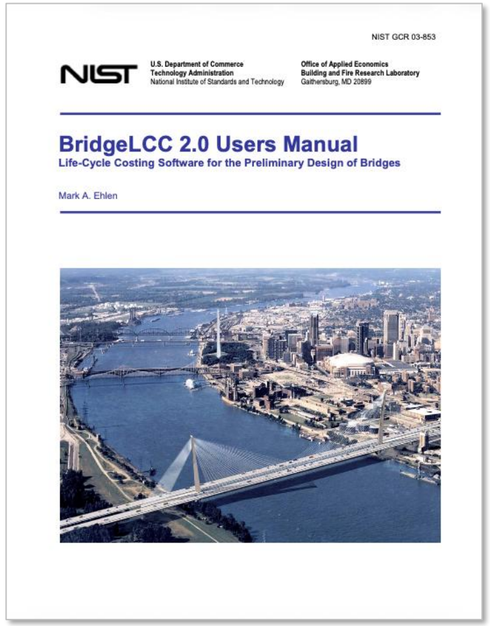
Office of Applied Economics
Building and Fire Research Laboratory
Gaithersburg, Maryland 20899

The Economics of New-Technology Materials: A Case Study of FRP Bridge Decking

Mark A. Ehlen and Harold E. Marshall

July 1996
Building and Fire Research Laboratory
National Institute of Standards and Technology
Gaithersburg, MD 20899

U.S. DEPARTMENT OF COMMERCE
Michael Kantor, Secretary
Technology Administration
Mary L. Good, Under Secretary for Technology
National Institute of Standards and Technology
Arati Prabhakar, Director



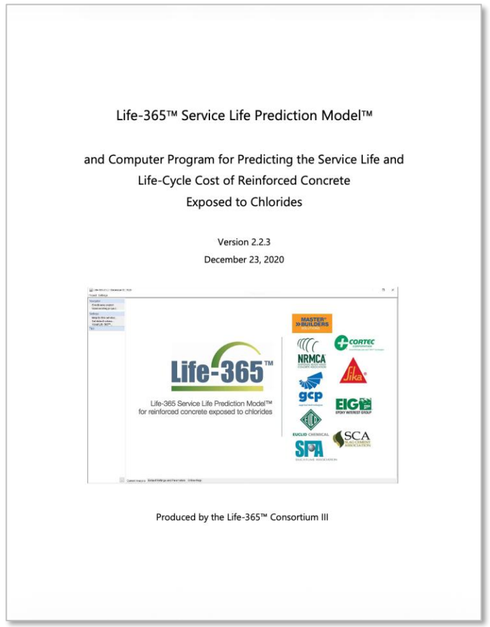
NIST GCR 03-853

NIST U.S. Department of Commerce
Technology Administration
National Institute of Standards and Technology

Office of Applied Economics
Building and Fire Research Laboratory
Gaithersburg, MD 20899

BridgeLCC 2.0 Users Manual
Life-Cycle Costing Software for the Preliminary Design of Bridges

Mark A. Ehlen



Life-365™ Service Life Prediction Model™

and Computer Program for Predicting the Service Life and
Life-Cycle Cost of Reinforced Concrete
Exposed to Chlorides

Version 2.2.3
December 23, 2020

Produced by the Life-365™ Consortium III

Questions
Key Takeaways

National Concrete Bridge Council

Thank you!

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