PEX

Center of Excellence for Preservation
and Service Life Extension

ICRI Spring Convention
Nashville, TN

March 18, 2026

Center of Excellence for Concrete Preservation and Service Life Extension

Agenda

- **Introduction**
- Advocate for responsible stewardship of the built concrete environment (Goal #4)
- Develop strategies to conserve resources and reduce environmental impact through concrete asset management (Goal #2)
- Planned activities for 2026 & 2027

Center of Excellence for Concrete
Preservation and Service Life Extension

P+Ex Video

Center of Excellence for Concrete Preservation and Service Life Extension

Mission & Vision Statement

Mission

To drive global awareness, education, tools and actions to preserve and extend the service life of concrete structures to ensure a sustainable built environment.

Vision

To promote and lead “Concrete Preservation and Service Life Extension Initiatives” to contribute to sustainable solutions for society

Exciting News:

P+Ex & ICRI partner to shape the future of sustainable concrete structures!

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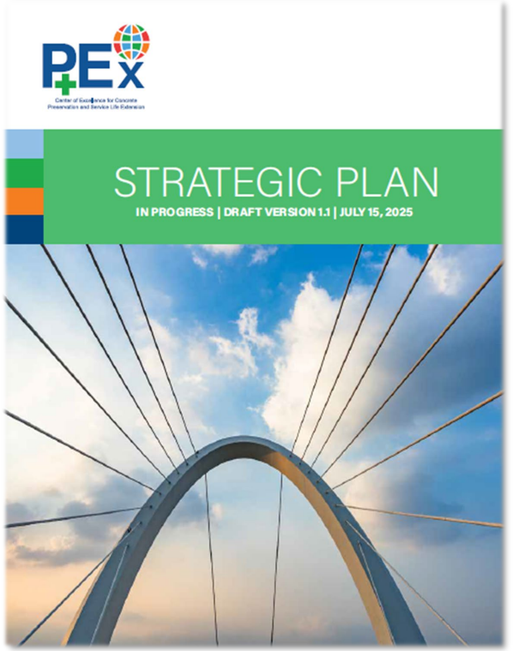
Strategic Goals

1. Highlight the societal benefits of enhanced service life for new and existing structures.
2. Develop strategies to conserve resources and reduce environmental impact through proper concrete asset management.
3. Raise awareness of the financial benefits of durability design and service life extension.
4. Advocate for responsible stewardship of the built concrete environment.
5. Serve as a knowledge hub for tools and techniques to extend service life.
6. Publish periodic sustainability reports on the repair industry's efforts and set future goals as needed



P+Ex – Non-Profit Center of Excellence Organization

Center of Excellence for Concrete Preservation and Service Life Extension

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Goal #4 – Advocate for responsible stewardship of the built concrete environment

Main Objectives:

- Develop and deliver communication materials
  - Video for company employees to appreciate their high purpose
  - PowerPoint presentation for companies to promote sustainability in their proposals
  - Publish a paper on how to communicate environmental and financial savings to clients
  - Publish an article on P+Ex's progress to date
- Host 3 P+Ex events per year
  - Presentation at @ICRI / ACI conventions, conferences, trade association meetings, etc.

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P+Ex Video - Repair Industry & YOU

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Connecting Our People to a Higher Purpose

- What people are saying
- Voices from the Industry
  - Short video interviews featuring industry professionals sharing how their work contributes to a higher purpose:
    - Protecting public safety
    - Preserving historical heritage structures
    - Improving the built environment that we are living in
    - Supporting a more sustainable future for the next generation
- Join the conversation
  - On-site video interviews conducted before and after this session
- Let us hear from you!

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P+Ex Sales Pitch Slide Deck

- Developing sales-ready slide decks to help companies translate technical solutions into compelling sustainability value propositions
  - Sustainability: a business imperative, not a buzzword
  - Service life extension as one of the most impactful sustainability strategy
  - Join P+Ex movement: advancing durability, stainability and measurable value

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SHAPING THE FUTURE

OF CONCRETE PRESERVATION

"In reality, the most sustainable, low-carbon concrete structure is often the one already built."

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Sustainability

WHY IT MATTERS FOR YOUR BUSINESS

Sustainability is defined as: “the integration of environmental health, societal and economic vitality to create thriving, healthy, diverse and resilient communities for this generation and generations to come”.

- Enhanced financial & operational performance longevity
- Enhances brand reputation and customer loyalty
- Attracts and retains talent
- Risk management and compliance

Why Service Life Extension?

THE FOUNDATION OF SUSTAINABILITY

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- Service Life Extension is a net reducer of CO_2 emissions
- For every day we keep our current concrete inventory in service we save *6.6 million tons* of CO_2 emissions (in the USA)
- Service Life Extension saves natural resources for future use and offsets the need to demolish and replace structures we already have

SERVICE LIFE EXTENSION IS THE FOUNDATION OF SUSTAINABILITY

USA produces **400 MILLION** cubic yards of concrete per year (2.3% of global production)

12 BILLION cubic yards of concrete in service in USA (~2.4 Billion ton CO2 footprint)

Extending the service life of the existing concrete inventory by one day prevents **6.6 MILLION** tons of CO2 emissions (net decarbonization).

Join the Movement

SHAPING THE FUTURE OF CONCRETE PRESERVATOIN

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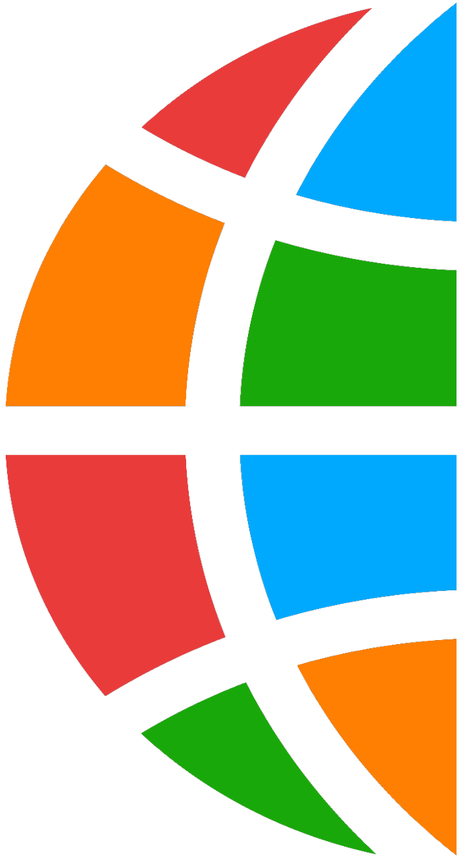
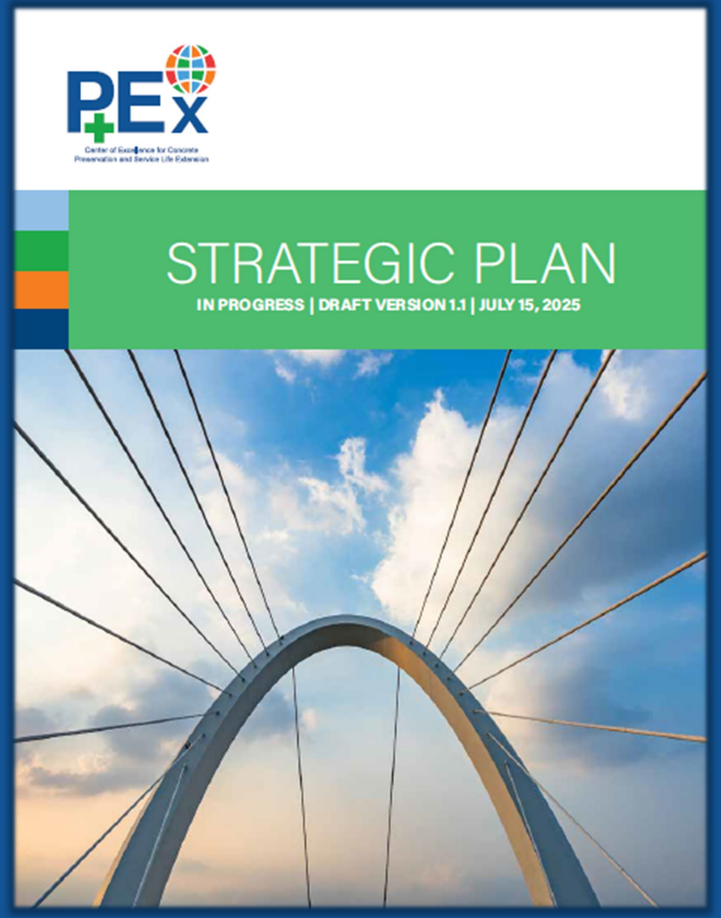


- P+Ex is a non-profit center of excellence; serves as industry advocate for responsible stewardship of the built concrete environment
- P+Ex promotes and leads proactive actions to extend the service life of existing concrete structures while contributing and to development of new sustainable solutions for our society

Why P+Ex?

PRESERVE AND EXTEND SERVICE LIFE OF CONCRETE

- Serves as a collaborative platform with a shared mission across the construction industry to advocate service life extension of concrete
- Provides technical guidance and credible and quantifiable evidence for the societal, environmental and economic benefits of enhanced service life of concrete structures
- Helps owners, engineers, policy makers and all stakeholders manage concrete structures as long-term and valuable assets



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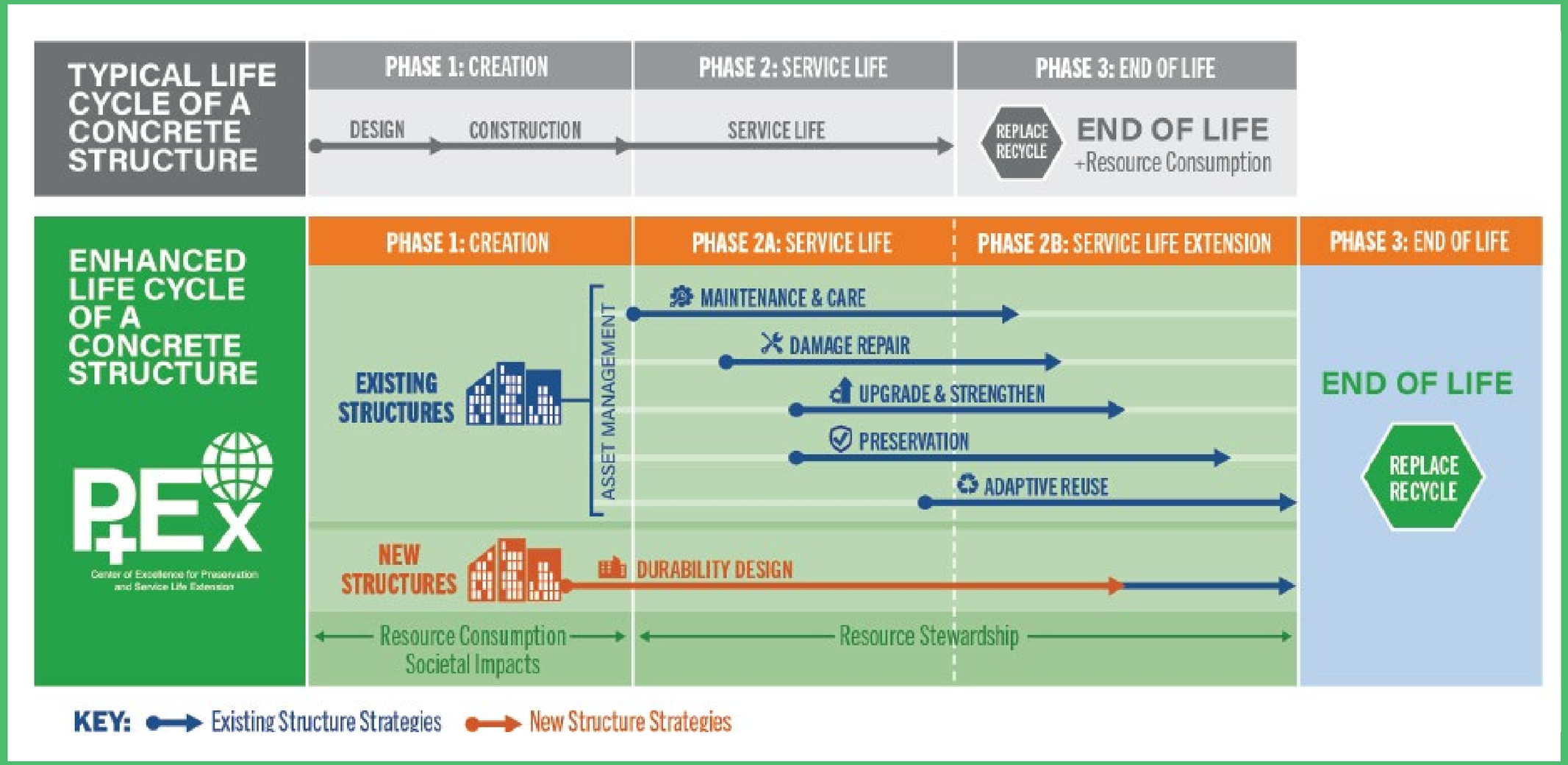
Why P+Ex?

PRESERVE AND EXTEND SERVICE LIFE OF CONCRETE



Join the Movement

SHAPING THE FUTURE OF CONCRETE PRESERVATION

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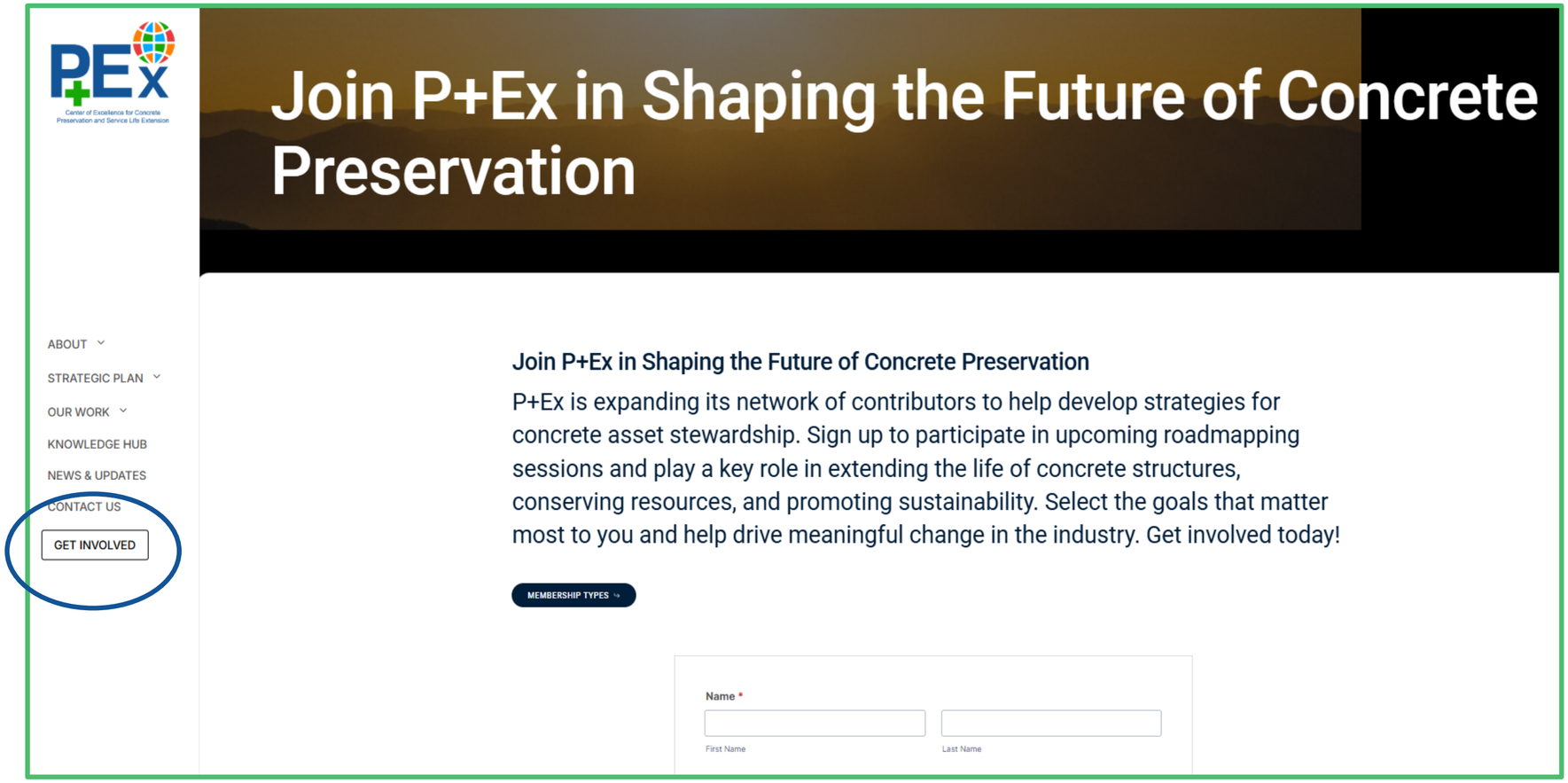
- Visit our site – www.pexcoe.org today
- Click the GET INVOLVED button



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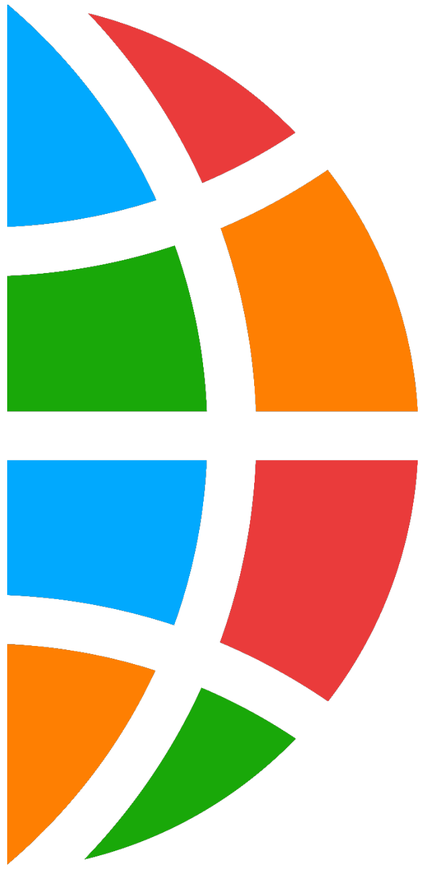

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Goal #2 – Develop Strategies to Conserve Resources and Reduce Environmental Impact through Concrete Asset Management

Main Objectives:

- Assemble case studies to build database for environmental declaration of repair systems (EDRS)
  - Publish the LCA case study in a technical journal
  - Assemble at least 5 more case studies based on established methodology and enter them into the database (need a template for case studies)
- Initiate “Environmental Declaration for Repair Systems ” (EDRS) by engaging professionals, program operators and create a panel to establish c-PCR (complementary Product Category Rules) for repair systems

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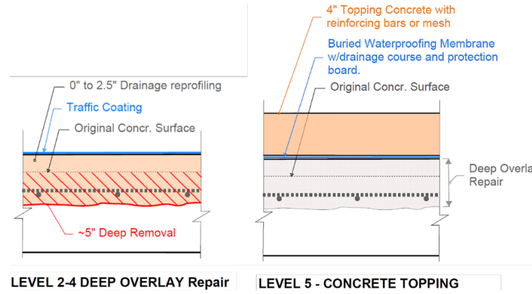
Goal #2 – Conserve Resources and Reduce Environmental Impact

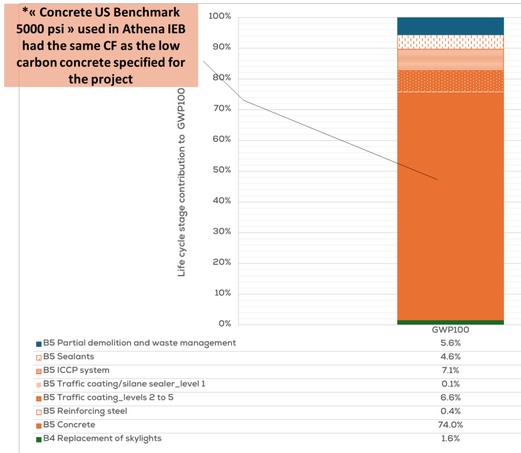
- PVM parking garage case study update
  - Combined service-life analysis (SLA) carbon footprint calculation for PVM Parking Garage
  - Followed applicable standards and guides
  - Saved life cycle GHG emissions of PVM garage project is estimated to be 973 ton of CO_2 eq* (~45% reduction)
  - Reviewed and verified to conform with ISO 14044:2006 & 14071:2024
  - Final report will be published on P+Ex website

* Roughly 1200 tons of OPC emission; or 4800 CY RMX concrete emission based on EPD of OPC & RMX

Goal #2 – PVM Parking Garage Case Study Concluding Remarks

- Achieving the maximum carbon benefit depends on:
  - Type of repair solutions (depth of the concrete reparations, quantity and type of protection systems
  - Service life of repair solutions (before corrosion)
  - Carbon intensity of repair solutions
- When considered early in the design process and aligned with specific service life objectives, these parameters can guide decision-making similarly to a cost-benefit analysis





Methodology Used for the Case Study

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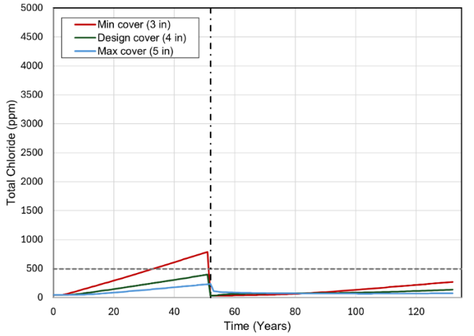
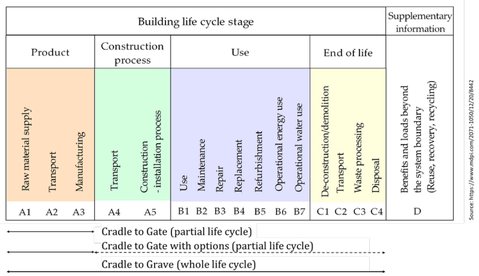
Step 1 Collect project information and inspection reports

Step 2 Carry out Service Life Analysis (SLA) based on available data and computer modeling

Step 3 Follow Life Cycle Analysis (LCA) procedure for GHG emission estimation

Step 4 Verify data and finalize report (per ISO 14044:2006)





More case studies are planned to refine the methodology, and the results will be stored in the database

NORDA STELO

SIMCO DURABILITY ENGINEERING

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Preservation Example – Quay Quarter Tower (QQT)

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Source: Quay quarter tower - world's first upcycled skyscraper | 3xn architects | 3XN

3XN QQT – Conserve Resources and Reduce Environmental Impact

- Originally built in 1976, floor areas and layouts became unstable for a commercial use
- Instead of demolishing/newbuild, it was renovated (keeping 95% of the building core)
- Doubled the usable area from 45,000 to 102,000 m^2, and accommodated double the number of users (from 4500 to 9,000)
- By transforming the existing assets, 9 months of work in the process was shortened, and 23,000 m^3 (~30,000 yd^3) of concrete and 12,000 tons of CO_2 was saved

Source: Sika' 2022 Annual report;
Quay quarter tower - world's first upcycled skyscraper | 3xn architects | 3XN

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Potential Case study – Lhoist Industrial Plant Column Rehabilitation

Project Overview

- Industrial reinforced concrete columns
- Reinforcement corrosion and loss of concrete cover at column base
- Progressive deterioration risk if untreated

Approaches:

- Removal of unsound material, cleaning of exposed reinforcement
- Application of ductile cementitious overlay to reconstitute surface integrity
- 10 columns rehabilitated
- Did not alter flexural or axial design capacity — focused solely on system capacity maintenance

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Life Cycle & Embodied Carbon Comparative Scenarios

Intervention Options	Cost	Service Interval*	Embodied CO_2**
Localized Patching (Does not address progressive durability risk)	$5–10k	3–7 yrs	Low
Ductile Cementitious Section Reconstitution	**$5–12k**	**15–25 yrs**	**Very Low**
Steel Jacketing (3/8” full height) (Higher steel intensity; greater installation complexity)	$80–150k	20–30+ yrs	~26–36 t
Full Column Replacement (High concrete + steel material demand; operational disruption)	$150–250k	40–50+ yrs	~25–45 t

*Service interval estimates depend on exposure conditions and maintenance regime.

**Embodied CO_2 values are order-of-magnitude estimates using comparative scenario methodology.

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Plan for Goal #1 in next 24 months – Highlight the societal benefits of enhanced service life for new and existing structures

- Collaborate with ACI/ASCE for the inclusion of durability requirements in codes and standards
  - MoU with ACI and establish action plan
    - set up P+Ex and ACI/ASCE roadmap meeting
  - 1 White paper re. FL Condo financial/societal impact
  - Influence FL building code body to adopt more protective strategy for chloride exposure structures
- Educational videos for condo owners, parking garage, general audience

Task group needed:

- write up a draft language for insertion into building code
- Canadian example

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Canadian Building Code Example

- National Building Code of Canada 2010
  - Section 4.4. Design requirements for special structures
    - Section 4.4.2.1 Design Basis for Parking Structures
      1) Parking structures shall be designed in conformance with CSA S413, “Parking Structures”

- CSA S413-07 Parking Structures
  - Acceptable protection systems are specified in Table 1.
  - Membrane required on suspended parking slabs

Table 1
Acceptable protection systems for floors and roofs
(See Clauses 0.3, 7.3.1.1, 7.3.1.3, 7.3.2.1, 7.3.4–7.3.7, 7.3.8.2, 7.3.10.1, 9.3.2, H.4, H.7.3, H.7.3.1, and H.7.3.6 and Figure D.1.)

		Protection type				Top cover†, mm			Bottom cover‡, mm
		M	I§	X**	S††	Bars and WWR			
						Exposure condition			
	System designation	Membrane	Corrosion inhibitor	C-XL concrete	Sealer	Normal‡‡	Severe	Sheath, duct§§	Bar, WWR, sheath, duct
Systems applicable to all construction*	MI	✓	✓			40	40	60	30
	MX	✓		✓		40	40	60	30
	M	✓				40	45	60	30
Systems applicable only to bonded post-tensioned and precast*** pretensioned construction†††	IX		✓	✓		40	45	60	30
	IS		✓		✓	45	50	60	30
	I		✓			50	55	60	30
	XS			✓	✓	55	60	60	30
	X			✓		60	65	60	30

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Plan for Goal #2 in next 24 months –
Develop strategies to conserve resources and reduce environmental impact through concrete asset management

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Build a List of Repair Systems for Service Life Extension and EDRS

- Potential repair solutions, e.g.
  - Concrete removal and replacement (localized or whole area)
  - Membrane and sealers
  - Crack repair
  - Cathodic Protection System
- Influencing factors for their applications, e.g.
  - Which structure type
  - Exposure environment
- Service life prediction for each solution with various scenarios
  - Define the service life
  - How to predict it?

Task group needed

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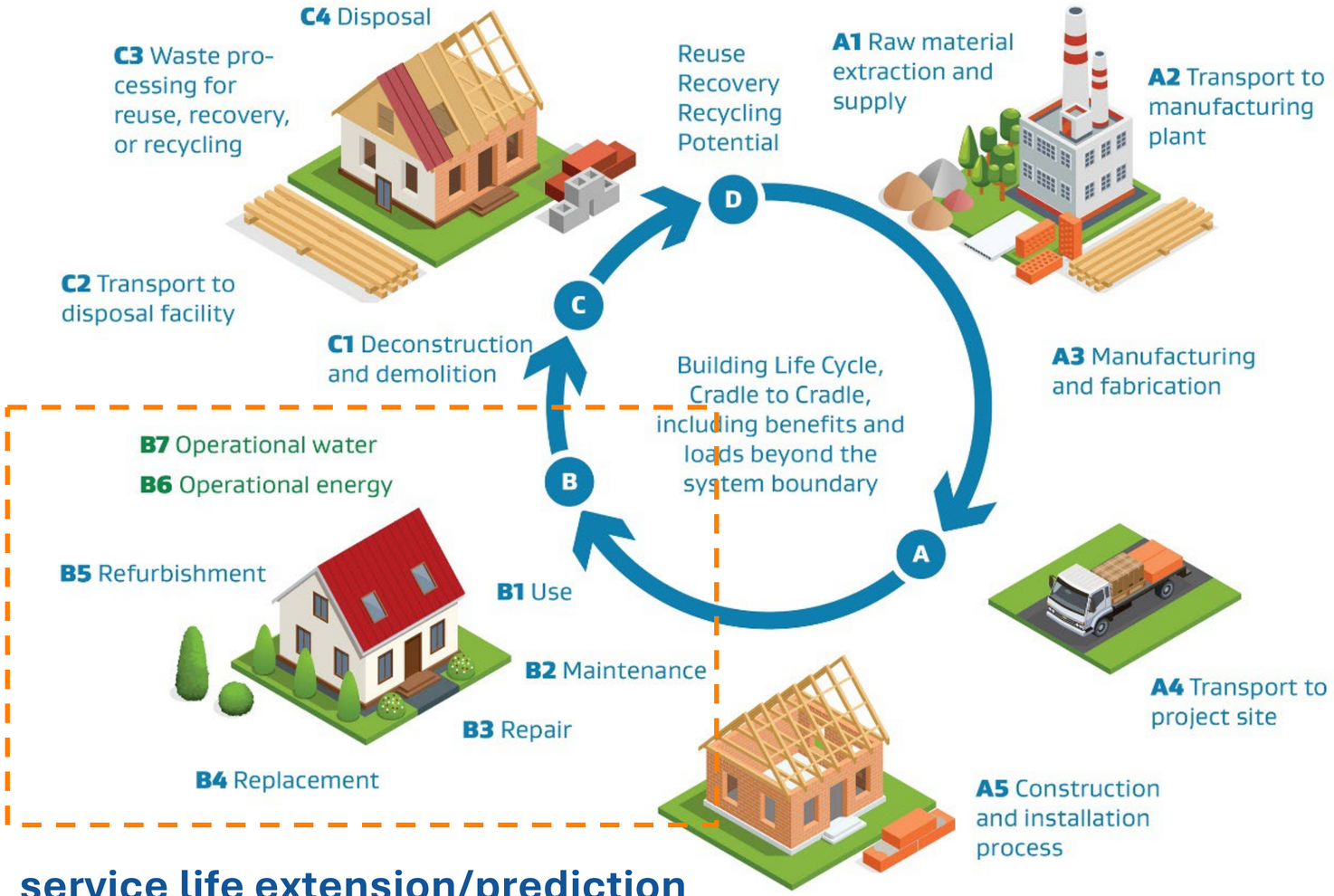
Initiate “Environmental Declaration for Repair Systems ” (EDRS)



service life extension/prediction

MBIE *Whole of Life Embodied Carbon Technical Methodology*

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Plan for Goal #3 in next 24 months –
Raise awareness of the financial benefits of durability design and service life extension

- Publish a position paper describing the repair industry and its market size
- Assemble case studies of financial benefits based on Sitter's "Law of Fives"
  - Publish a paper on how to communicate the savings (incl. environmental and financial) to the clients

Task group needed:
- Create case studies to show the financial benefits of early repair maintenance
- Ideal member for the task group will bring a case study example

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Join Us on This Exciting Journey

Recruiting Staff

- Executive Director
- Technical Director

Need your participation in the task groups:

Goal #1 (Societal impact)

- Write up a draft language for insertion into building code

Goal #2 (Environmental impact)

- Build a list of repair systems for service life extension and EDRS

Goal #3 (Financial impact)

- Create case studies to show the financial benefits of early repair maintenance

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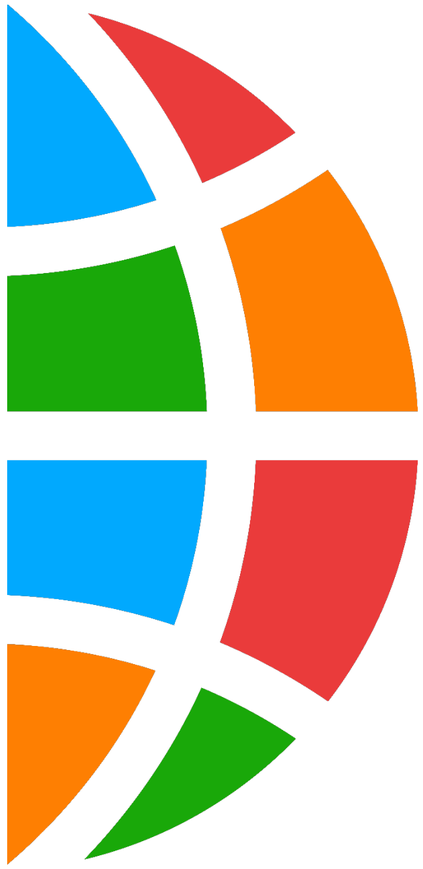
Acknowledgements

- Thank you for ICRI's continuous support and hosting our workshops
- Thanks to P+Ex Sponsoring Members' engagement and financial contributions
- Appreciation to all active participants in our working groups



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