



STRATEGIC HIGHWAY RESEARCH PROGRAM

*Accelerating solutions for highway safety, renewal, reliability, and capacity*

---



## SHRP 2 Renewal Program Overview

**ARCHES – SPENS Seminar**  
**Ljubljana, Slovenia**  
**August 2009**

---

TRANSPORTATION RESEARCH BOARD  
OF THE NATIONAL ACADEMIES

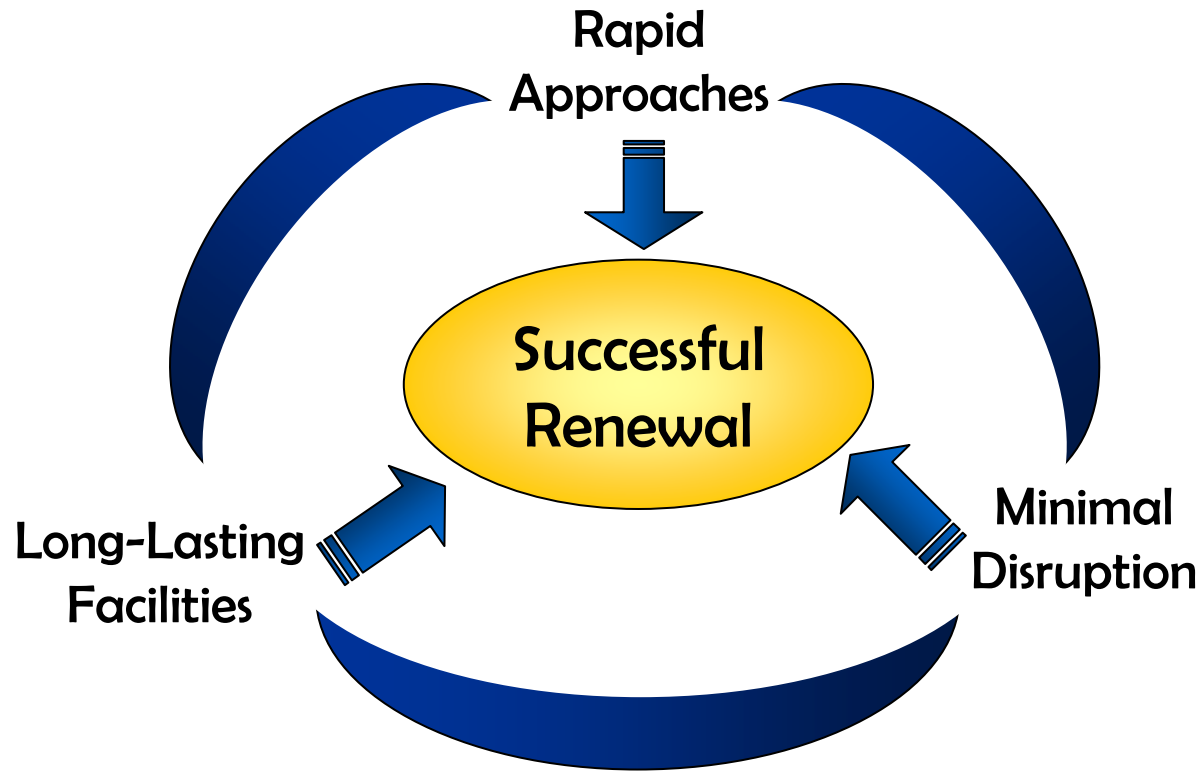


*Accelerating solutions for highway safety, renewal, reliability, and capacity*

---

- Overview of SHRP2 Renewal Program
- Review of Selected Projects
- Planning for Implementation

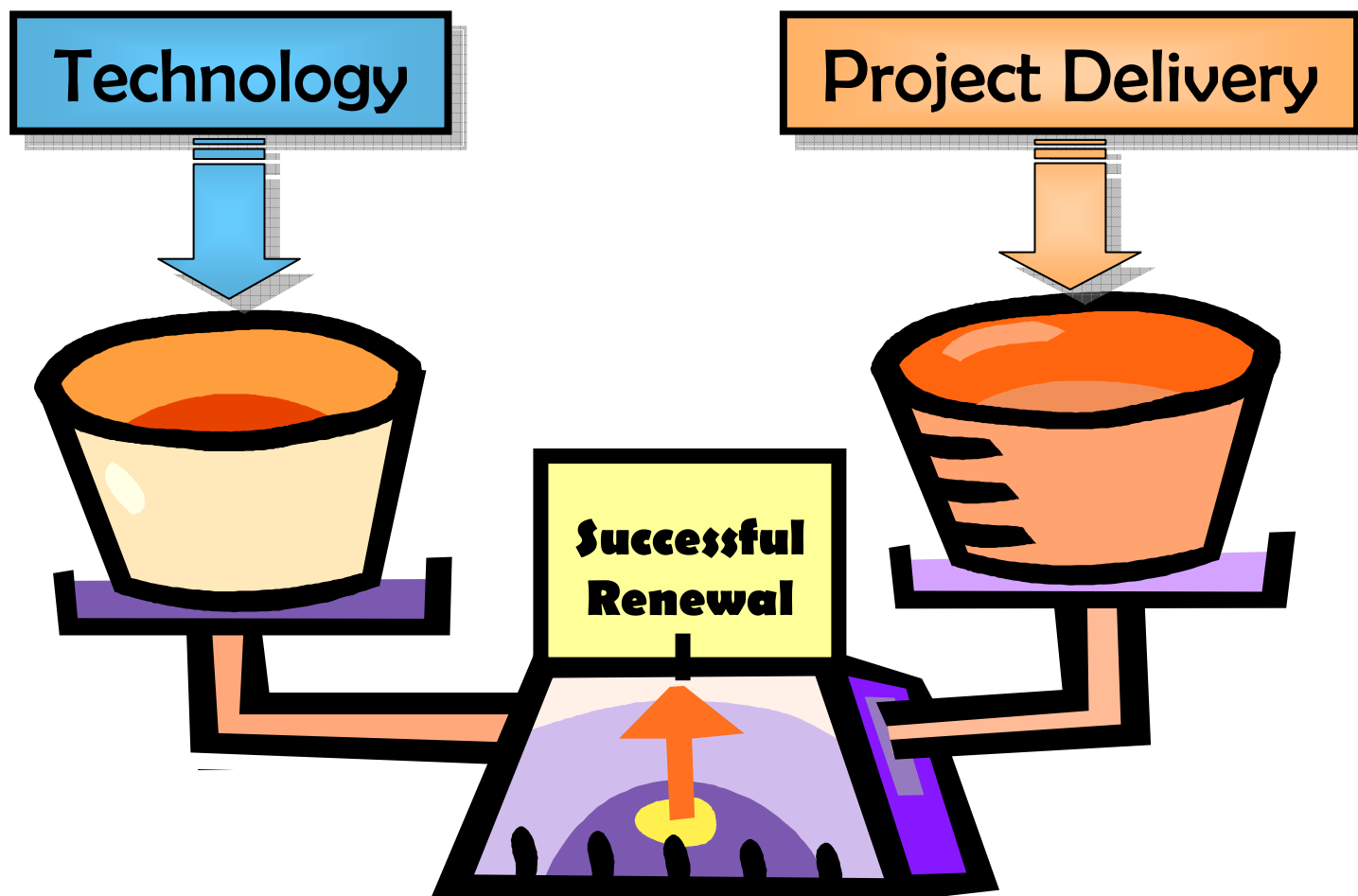
# Renewal Program - Goals



**“GET IN, GET OUT, STAY OUT”**  
The search for renewal tools and techniques that reduce preparation and execution times, reduce disruptions to traffic, utilities, and neighborhoods, and extend the time between renewal activities



# Balanced approach



# 28 Research Projects - \$32 Million

## Rapid Approaches

R01. Locating Utilities\*

R02. Geotech Solutions

R03. Worker Fatigue

R04. Innovative Bridge Designs

R05. Modular Pavement

R06. High-Speed NDT\*

R07. Performance Specs

R09. Risk Manual

R10. Project Management for Large Projects

## Minimize Disruption

R11. Strategic Approaches at Corridor/Network Level

R16. Railroad-DOT Mitigation Strategies

R15. Integrating Utility and Transportation Agency Priorities\*

## Long-Lived Facilities

R19. Bridges for Service Life of 100 Years\*

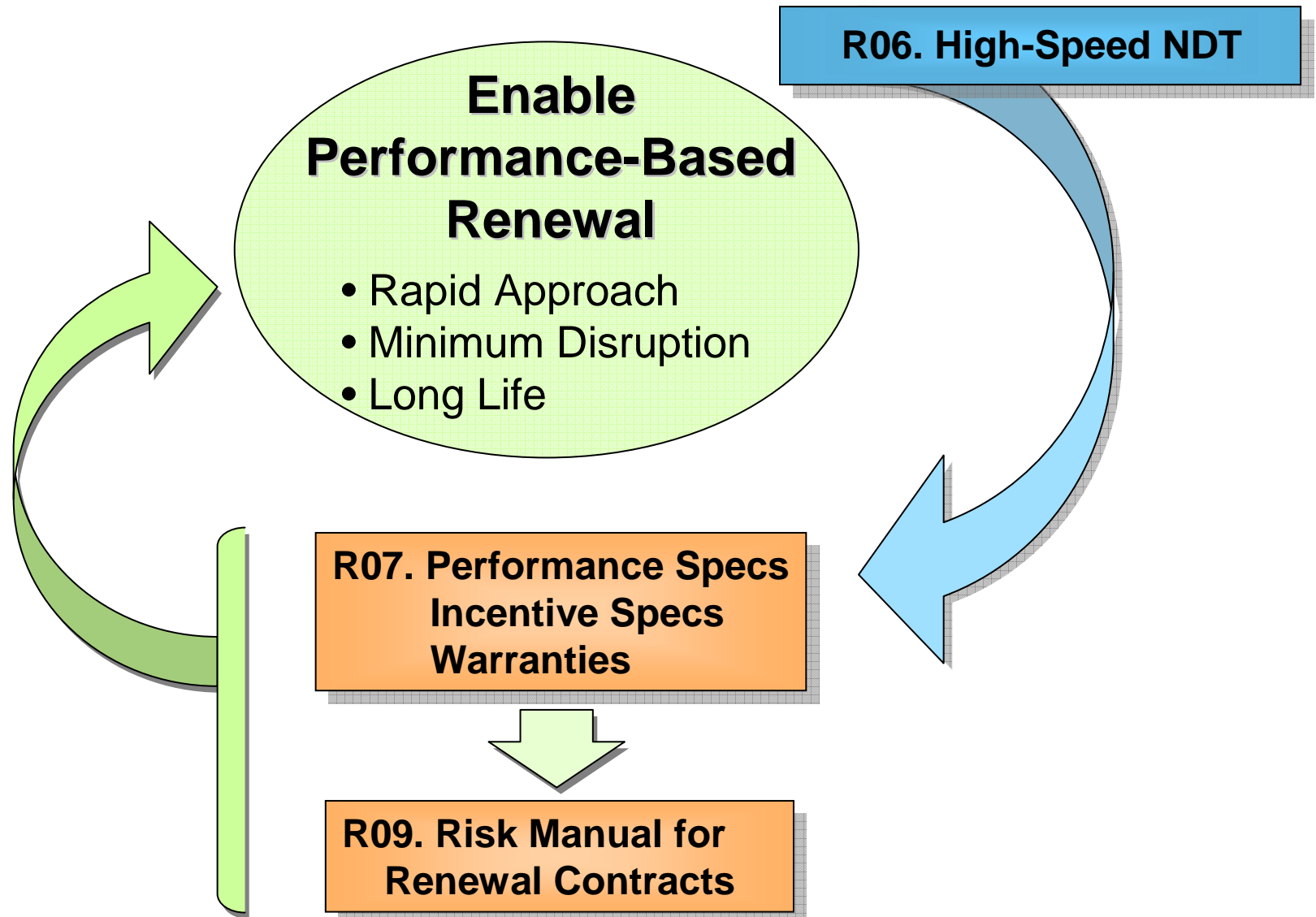
R21. Composite Systems

R23. Using Existing In-place Pavement & Achieving long Life

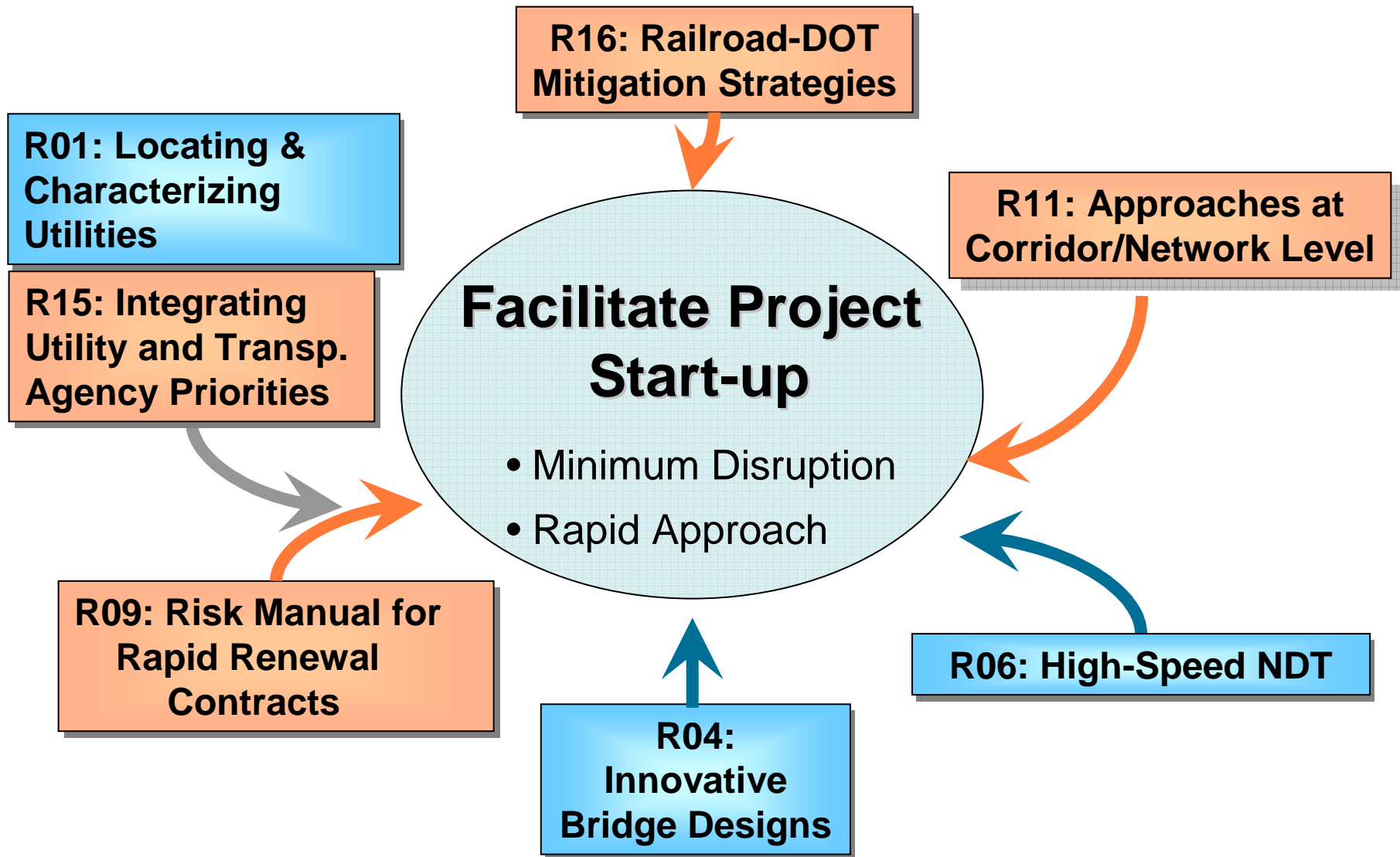
R26. Preservation Approaches

- Technology Related
- Project Delivery Related
- \* Indicates Multiple Projects

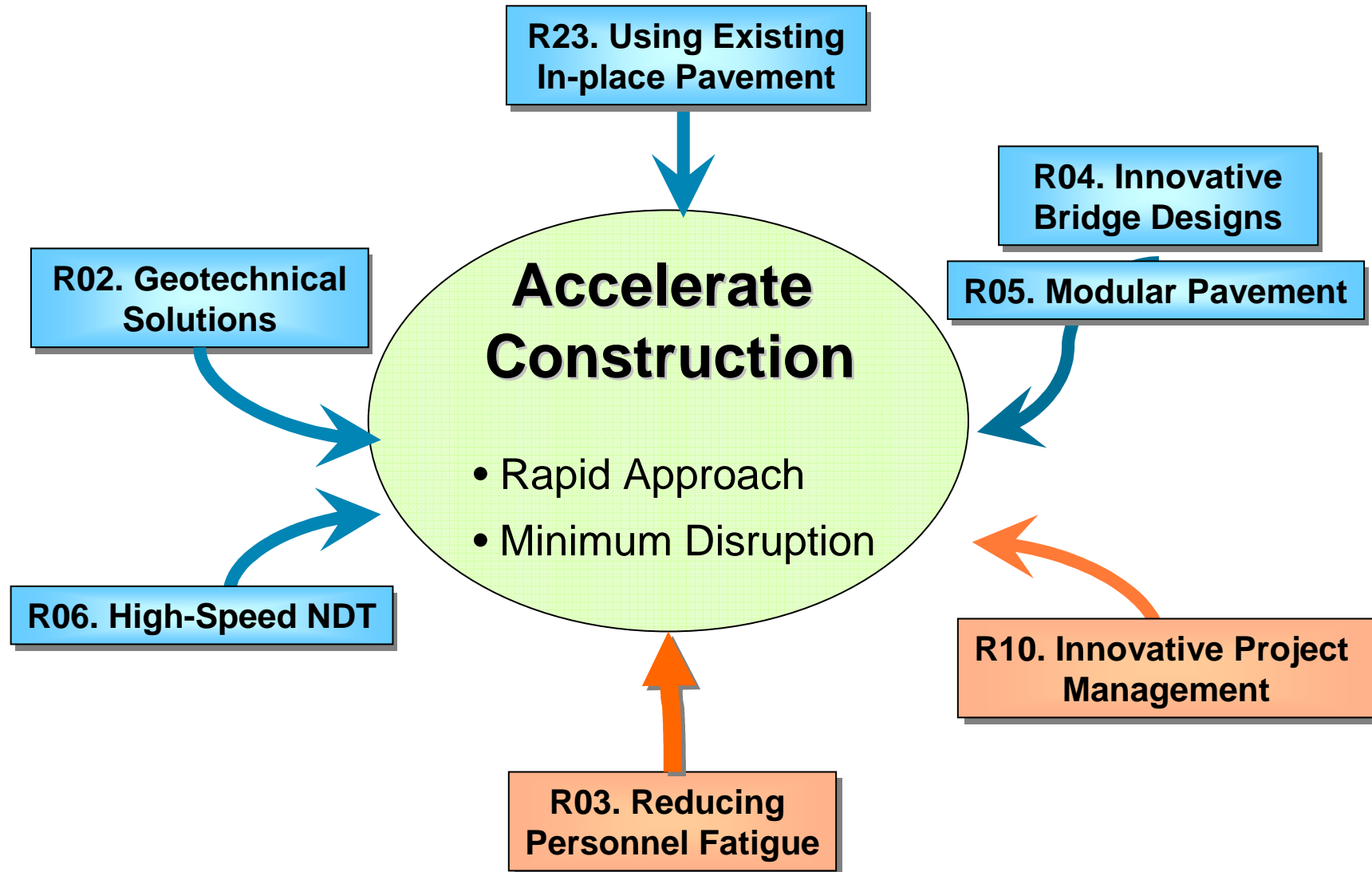
# Integrated Tactic 1



# Integrated Tactic 2

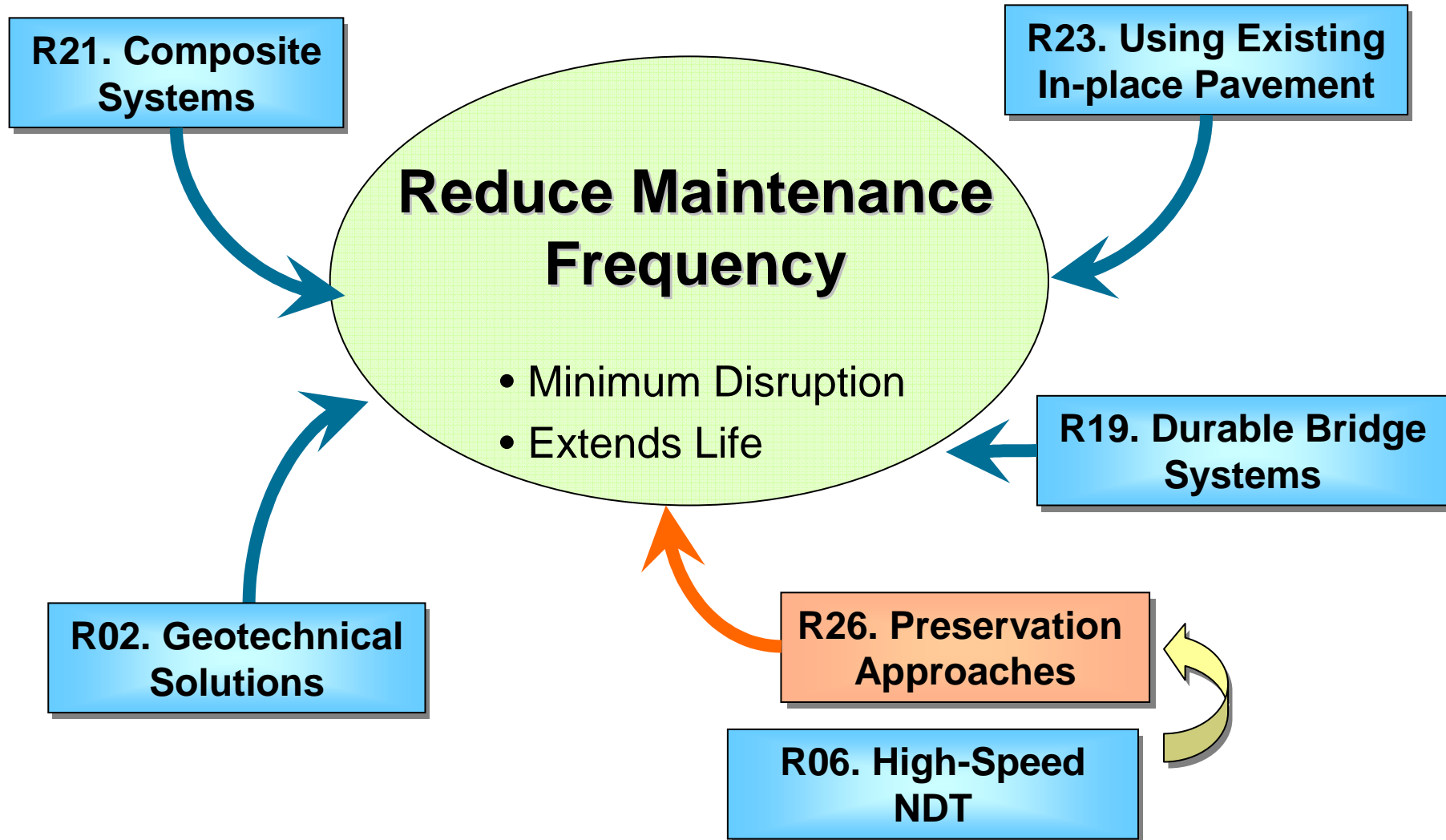


# Integrated Tactic 3

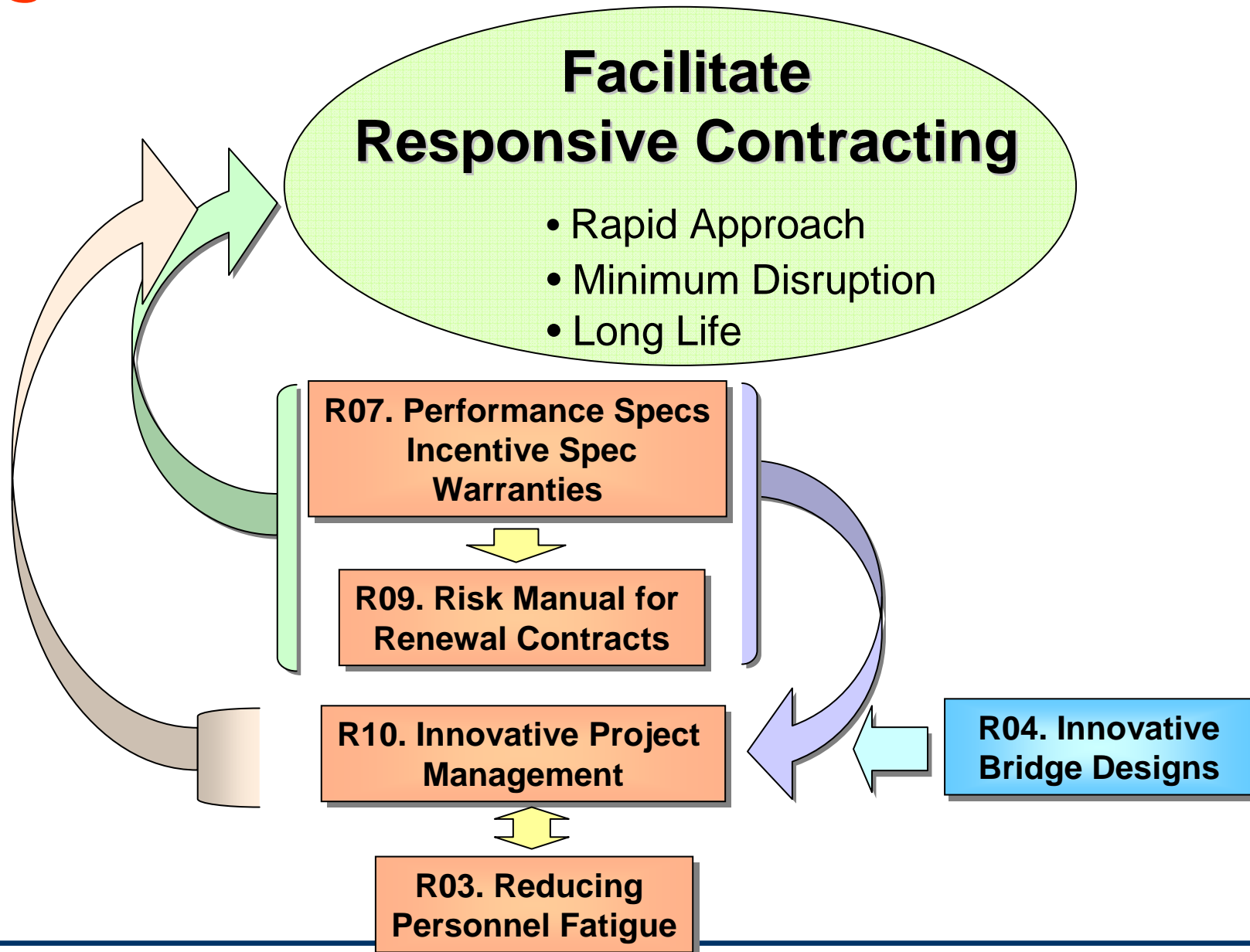




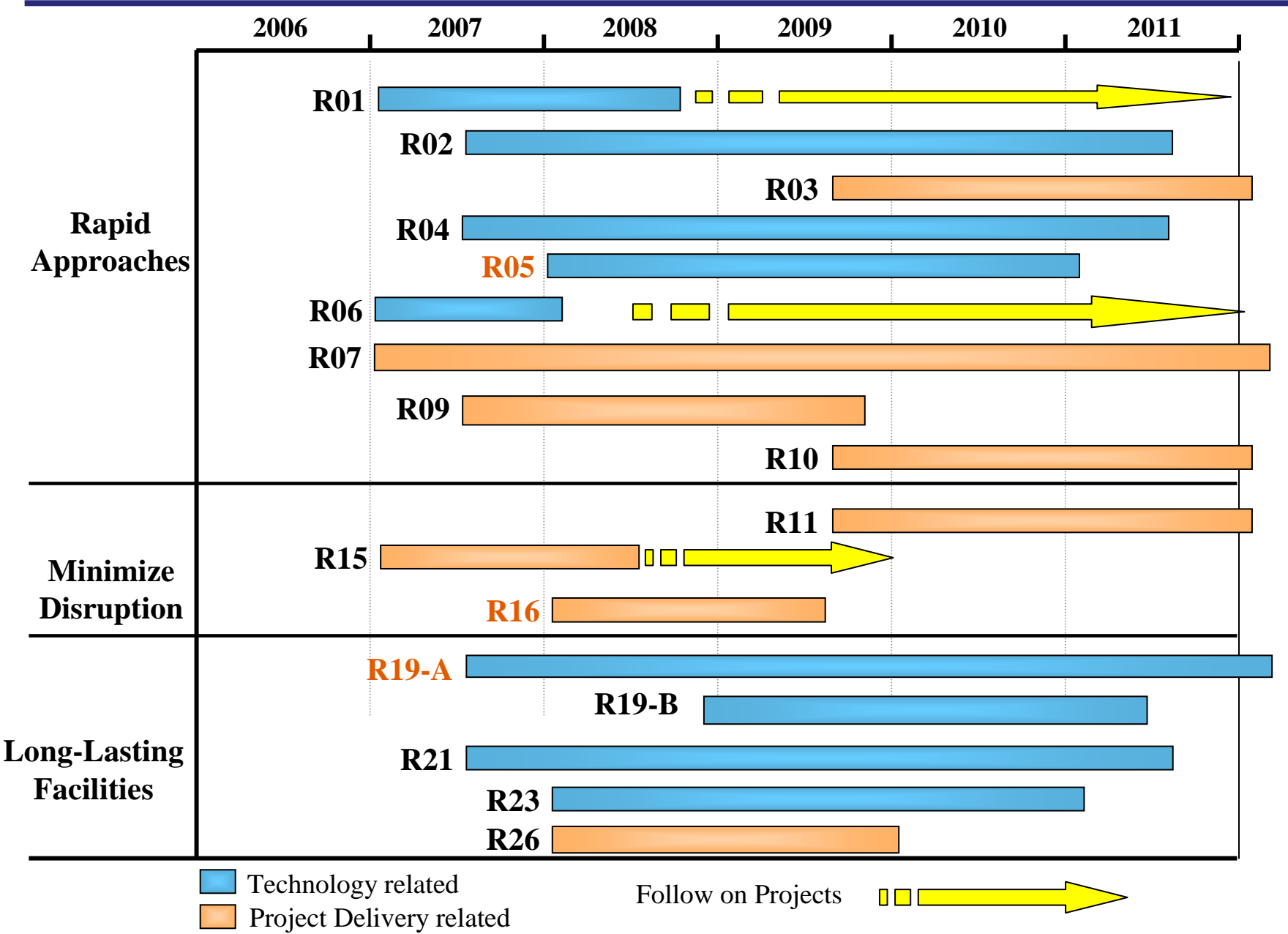
# Integrated Tactic 4



# Integrated Tactic 5



# Status - Renewal Research Program



# Modular Pavement Technology



# What we are facing...

---

- Heavy Traffic Volumes
- Concern to maximize the movement of traffic
- Restrictions on the time and length of traffic lane closures
- Need to maximize pavement service life
- Need to minimize impacts on traffic



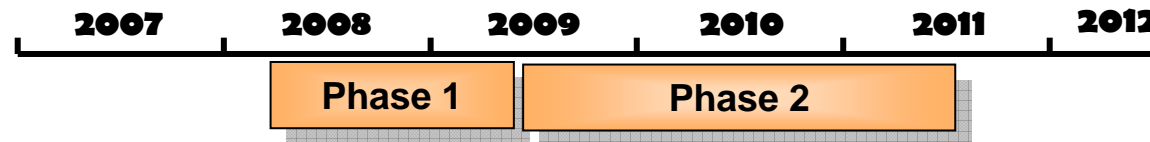
# What is SHRP2 Doing

## Project R05. Modular Pavement Technology



Focus on

Developing tools for the design, construction, installation, maintenance, and evaluation of modular pavement systems



**Contract: Fugro, \$1M**

# Why Modular Pavements?

---

- More control on the quality of the materials
- Better quality control of the fabrication
- Better curing conditions
- Minimal weather restrictions on when it can be placed
- Reduced delay prior to opening to traffic (no on-site concrete curing)

# Modular Pavement Applications

---

- Intermittent repairs – plain concrete panels
  - Full-depth or full panel replacement
- Continuous Applications (longer length/larger area) – Rehab of ACP or PCCP; bridge approach slabs
  - Conventional jointed systems
  - Prestressed panels – fewer active joints





# On-going or Planned Projects

---

- New York DOT
- New Jersey DOT
- Delaware DOT
- Illinois Tollway
- Caltrans
- MTO, Canada

# Gaps in Modular Pavement Technology

---

- Insufficient understanding of modular pavement behavior and long-term performance.
- Lack of Best Practices for design, construction and M&R of modular pavement systems
- Lack of well developed, experienced-based generic specifications for use of precast systems
- Well developed acceptance testing (QA) procedures for different systems
- Opening to traffic requirements

# R05. Modular Pavement Technology

---

## Anticipated Products

- Guidance on the potential uses of modular pavement systems for specific rapid renewal applications.
- Generic Modular Pavement Design Procedures.
- Guidelines and model specifications for construction, installation, and acceptance criteria for modular pavements.
- A long-term evaluation plan to assess the performance of modular systems and refinements in designs and materials.

# Railroad / DOT coordination

## in Highway Renewal Projects



# What we are facing...

---

- Railroad (RR) presence complicates highway renewal projects
- RRs are very protective of their corridors
  - Issues arise of safety, train operations, highway project scope
- Railroads are private & for profit
  - Most highway projects do not provide an inherent benefit to the RR
- Each RR is unique



# R16. Railroad-DOT Institutional Mitigation Strategies

---

## *Focus on*

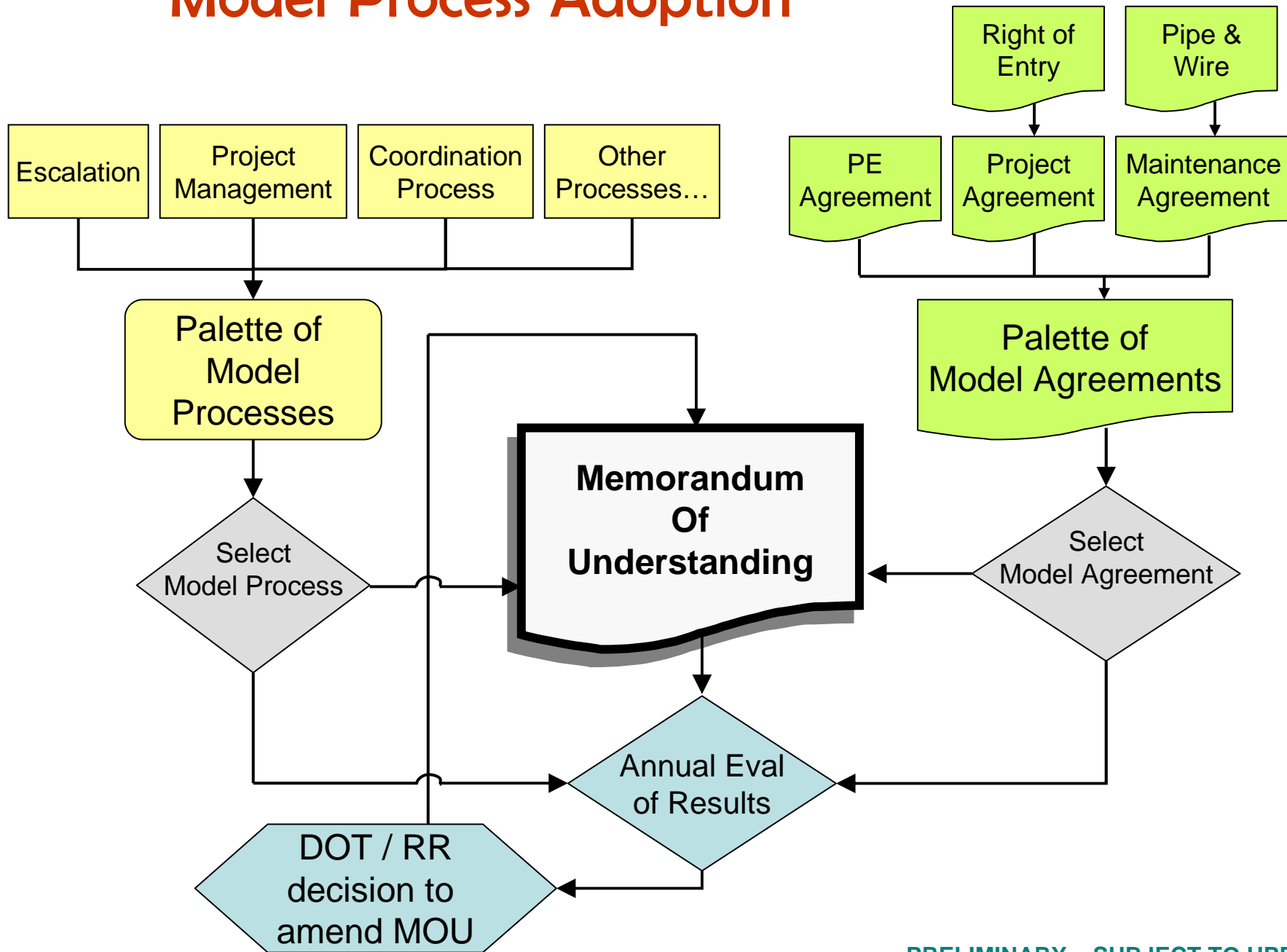
Identifying institutional arrangements and developing tools to facilitate beneficial relations between railroads and DOTs

### Anticipated Products

- **Effective practices** document
- **Model agreements**
- **Streamlined permitting** procedures.
- Recommended specifications, institutional, and policy **changes for implementation**



# Model Process Adoption

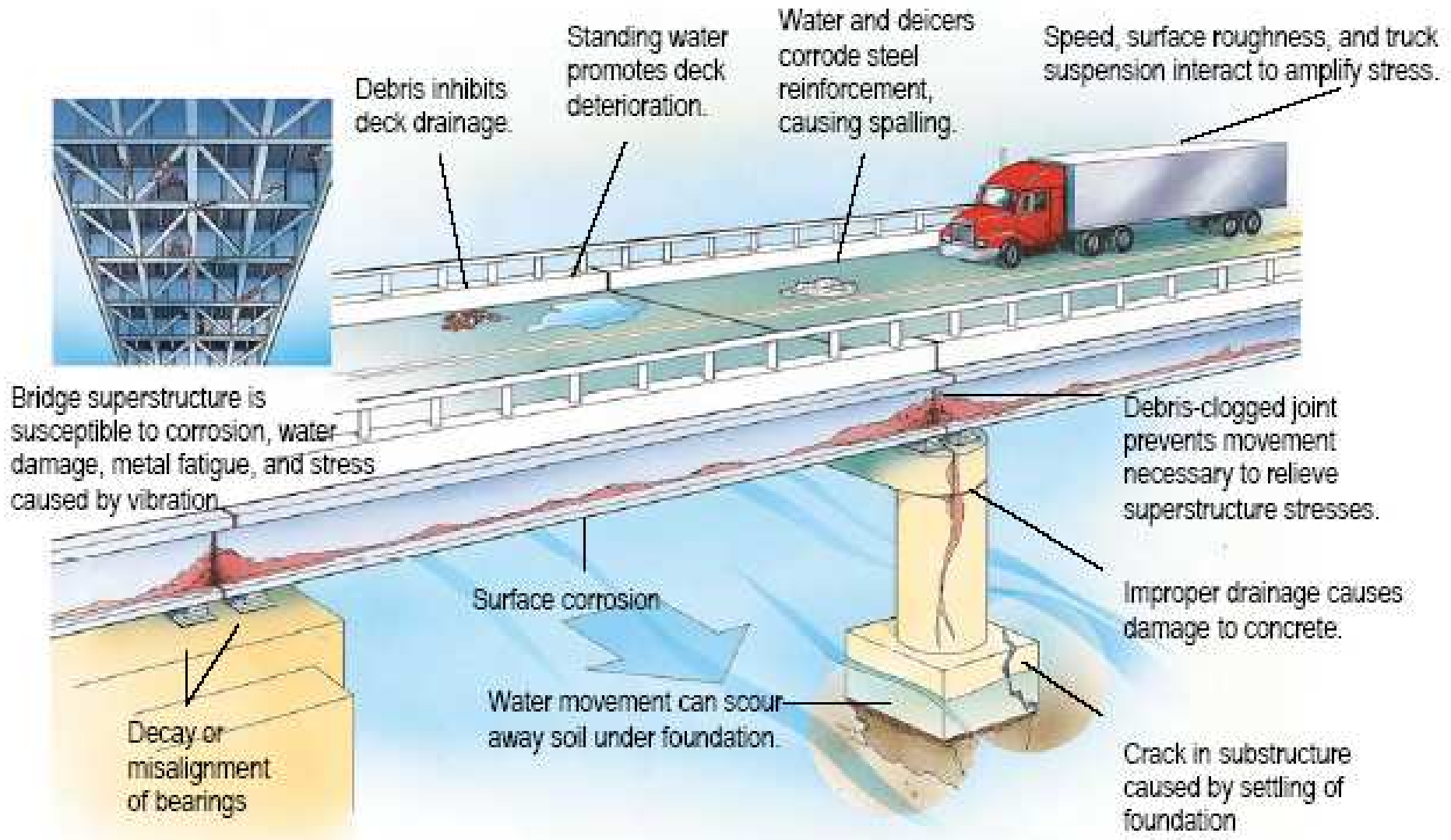


# Life of Bridges





# What we are facing...



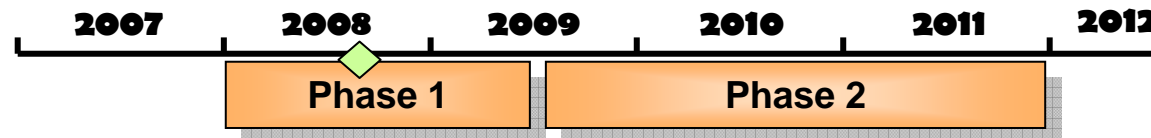
# What SHRP 2 is doing ...



## Project R19-A. 100-Year Bridges: Innovative systems

### Focus on

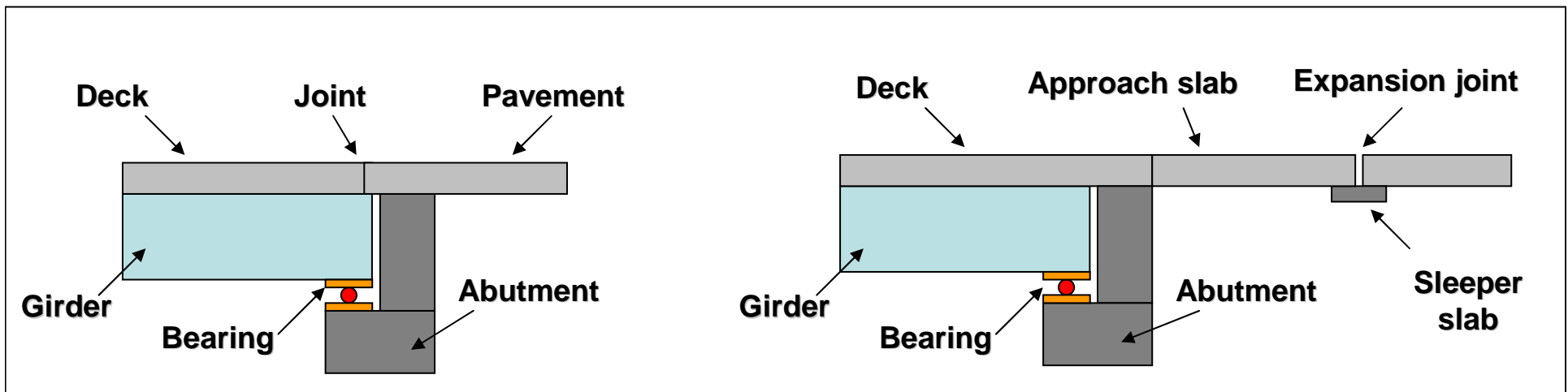
Improving existing and prove promising concepts for systems, subsystems, and components that historically limit the service life of bridges



**Contract: University of Nebraska-Lincoln, \$2 M**

# Desired Characteristics of Bridges Designed for 100+ Years of Service Life

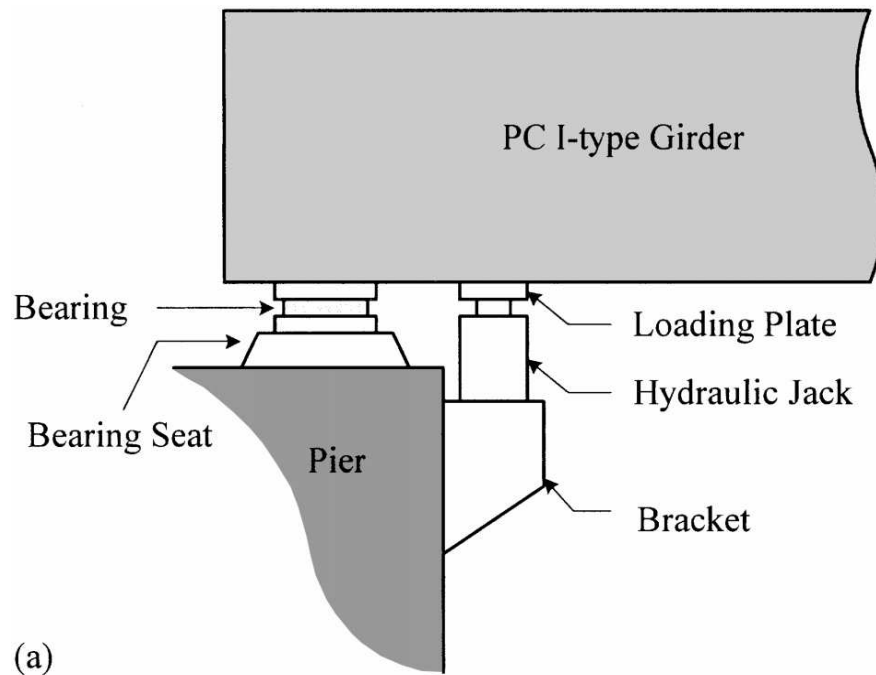
a) Components should be designed considering the system



# Desired Characteristics of Bridges Designed for 100+ Years of Service Life

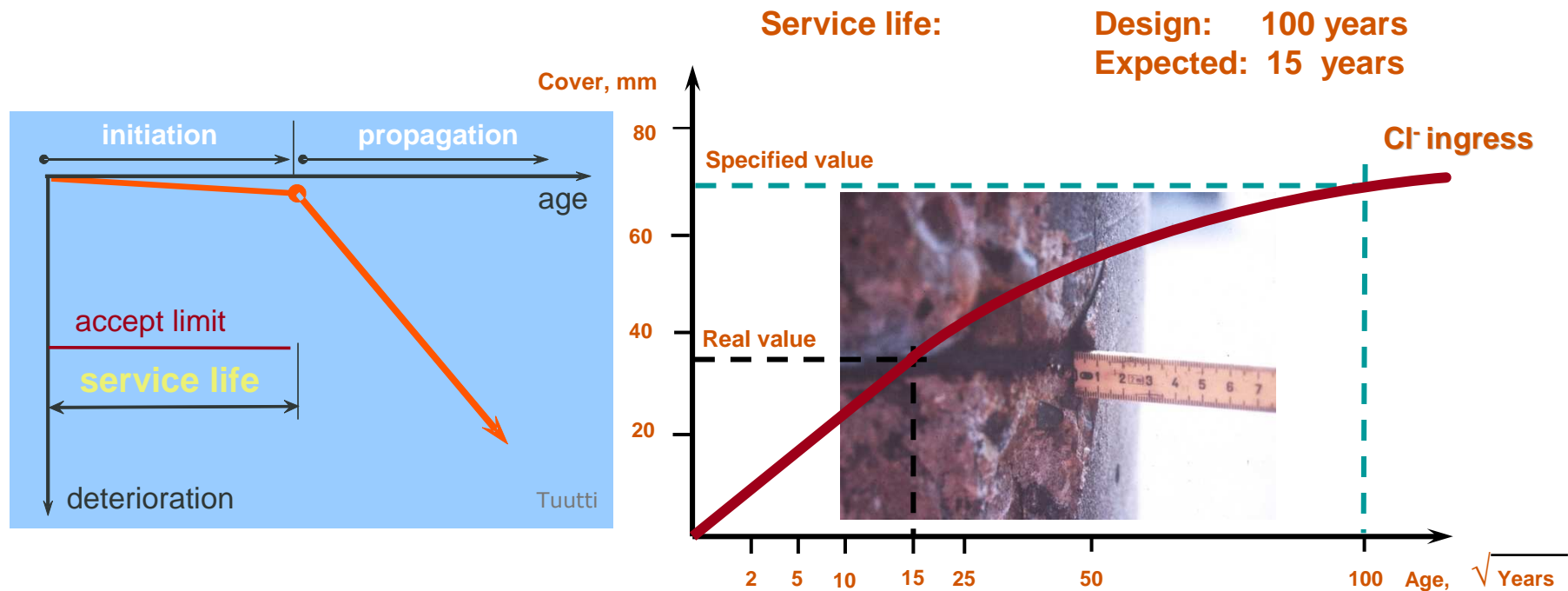
a) Components should be designed considering the system

b) Should be Easy to Replace



# Desired Characteristics of Bridges Designed for 100+ Years of Service Life

- a) Components should be designed considering the system
- b) Should be Easy to Replace
- c) Predictable Service Life



# Desired Characteristics of Bridges Designed for 100+ Years of Service Life

- a) Components should be designed considering the system
- b) Should be Easy to Replace
- c) Predictable Service Life
- d) **Inspectability**



# Desired Characteristics of Bridges Designed for 100+ Years of Service Life

- a) Components should be designed considering the system
- b) Should be Easy to Replace
- c) Predictable Service Life
- d) Inspectability
- e) **Maintenance Plan**



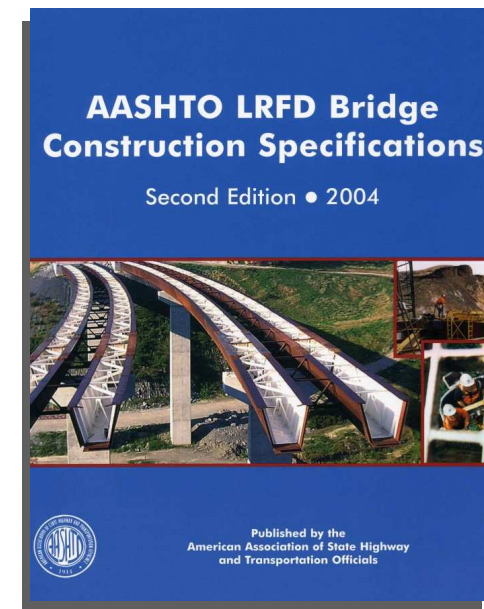
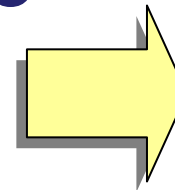
# Desired Characteristics of Bridges Designed for 100+ Years of Service Life

- a) Components should be designed considering the system
- b) Should be Easy to Replace
- c) Predictable Service Life
- d) Inspectability
- e) Maintenance Plan
- f) Economy – Life cycle cost analysis needs to be part of design process



# Products will include...

- New / improved systems, subsystems, components – *Proof of concept*
- Analysis methods, examples, details, etc.
- Recommendations for AASHTO-formatted LRFD design and construction specifications.
- Stand alone document devoted to Design for Life.



## Example of Technology Table

Concrete durability

Service Life Issue	Solutions	Advantage	Disadvantage	Failure Modes	Expected Service Life	System Preservation Requirements	Areas for Further Research
Freeze and thaw	Good air void system	High resistance to freezing and thawing	Reduction in strength due to extra air	Cracking, scaling	High	good drainage and low permeability for reduced level of saturation	Small, well distributed bubbles

**PRELIMINARY – SUBJECT TO UPDATES**

## Example of Strategy Table

Concrete durability – Strategy to combat Freeze and Thaw

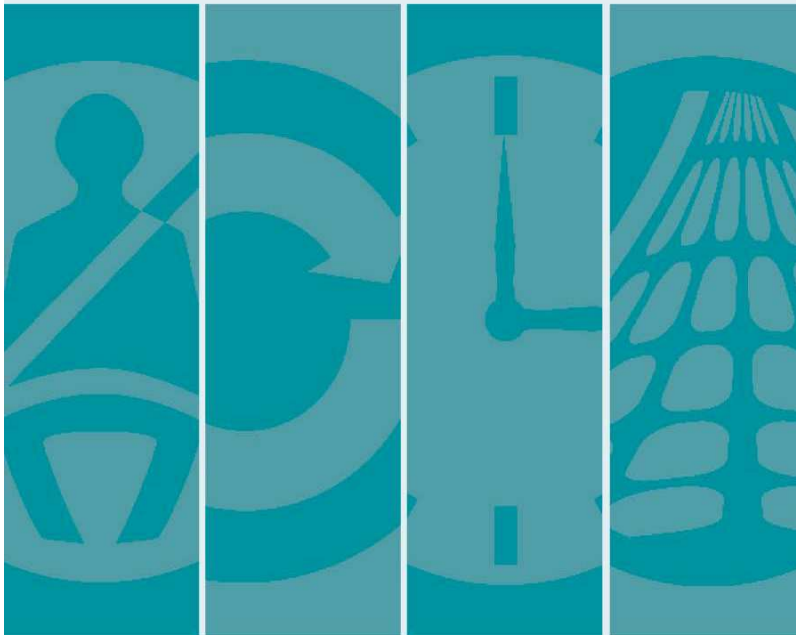
Strategy	Air Entrainment Criteria	Aggregate Criteria	Strength Criteria	Other Protection Methods	Maintenance Requirements	Comments
FT1	Min 6%	Sound	≥3500 psi?	N/A	None	

**PRELIMINARY – SUBJECT TO UPDATES**

SPECIAL REPORT 296

## Implementing the Results of the Second Strategic Highway Research Program

*Saving Lives, Reducing Congestion,  
Improving Quality of Life*



TRANSPORTATION RESEARCH BOARD  
OF THE NATIONAL ACADEMIES

## IMPLEMENTATION

Recommendations of the report  
committee:

- Establish an implementation program
- The principal agent should be FHWA with AASHTO, NHTSA, and TRB
- Provide stable and predictable funding
- Formal stakeholder advisory structure
- Detailed plans as soon as possible

# Principles

- Establish principal implementation agent early
- Involve stakeholders
- Communicate ceaselessly
- Prioritize products for optimal success
- Market and package/brand products
- Choose the right implementation strategies
- Balance divergent and convergent approaches

# Key Strategies

- Strategic packaging and branding
- Technical assistance
- Standards, specifications, guidebooks, manuals
- Follow-on research, testing, evaluation
- Lead users and demonstration projects
- Training and education
- Long-term stewardship

*Knowledge Management and IT*

## Recommendation 3

Funding:

\$400 million over 6 years

- Over and above ongoing FHWA and NHTSA research budgets

# Early Implementation Activities

- TRB implementation coordinator—Jerry DiMaggio
- Meetings with FHWA, NHTSA, other stakeholders, international
- Prepare product lists
- “First Fruits”—early product marketing





# Thank You for your Attention

For more information:

[www.trb.org/shrp2](http://www.trb.org/shrp2)