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FHWA OFFICE OF OPERATIONS PEER EXCHANGE WORKSHOP

ACCELERATED ROAD WORKS FOR WORK ZONE SAFETY AND MOBILITY

Accelerated Construction Techniques

Jagannath Mallela

June 5-6, 2012

Denver, CO

APPLIED RESEARCH ASSOCIATES, INC.
An Employee Owned Company

Accelerated Bridge Construction

Objectives

- The reasons for using ABC/PBES
- Definitions of ABC/PBES
- Benefits of ABC/PBES
- Focus Areas
- The status of EDC deployment goals for ABC/PBES

Reasons for Using ABC

Present & Future Challenges

- Aging Infrastructure
- Increased traffic volumes
  - Freight tonnage
  - Urban capacity
- Rising construction costs
  - $176B to maintain bridges (2005-2024)
  - $8.8B annually

Work Zone & Congestion Impacts

Work zone:

- 6,400 work zones (2003)
- 6,157 lane miles closed
- 20% capacity reduction

Congestion:

- Congestion robs our nation of productivity and quality of life
- 4 billion hours/year time delay
- 2.9 billion gallons of wasted gas/year
- $78.2 billion in 437 urban areas

More Challenges Ahead

- Globalization of manufacturing increases demands on our transportation Intermodal networks
- 1 M more truck traffic by 2016 (ATA)
- More drivers on highways
- Urban Sprawl Continues

Definitions of ABC/PBES

Accelerate Bridge Construction (ABC)

ABC (v): The use of ***innovative*** planning, design, materials, and construction methods to reduce onsite construction and mobility impact times

PBES are structural components of a bridge that are built offsite, or adjacent to the alignment, and includes features that reduce the ***onsite construction*** **time** and ***mobility impact time*** that occurs from ***conventional construction*** methods.

Benefits of ABC/PBES

Benefits of ABC with PBES

ABC / PBES improves:

- Work-zone safety for the traveling public and contractor personnel
- Material quality and product durability
- Total project delivery time
- Site constructability issues

ABC / PBES reduces:

- Mobility Impacts
- Onsite construction times
- Weather-related time delays

ABC / PBES can minimize:

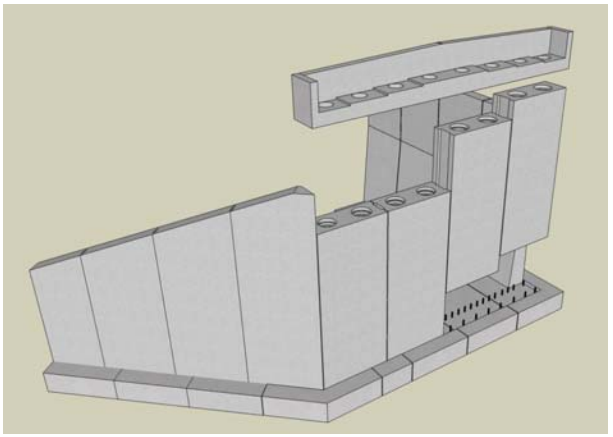
- Environmental impacts
- Impacts to existing roadway alignment
- Utility relocations and right-of-way take

FHWA Ever Day Counts ABC Focus Areas

Focus Areas

Foundation & Wall Elements	Rapid Embankment Construction	Prefabricated Bridge Elements & Systems	Structural Placement Methods	Fast Track Contracting
Continuous Flight Auger Piles Geosynthetic Reinforced Soil (GRS) Integrated Bridge System Prefabricated pier cofferdams	EPS Geofoam	Prefabricated Elements - Superstructure - Substructure Prefabricated Systems - Superstructure - Substructure - Total Bridge	Self-Propelled Modular Transporters Longitudinal Launching Horizontal Sliding or Skidding Other conventional or heavy lifting equipment or methods	Innovative Contracting - Best Value - CMGC method - Design-Build - A+B Bidding - A+B+C Bidding - Warranties

Source: FHWA EDC PBES Initiative

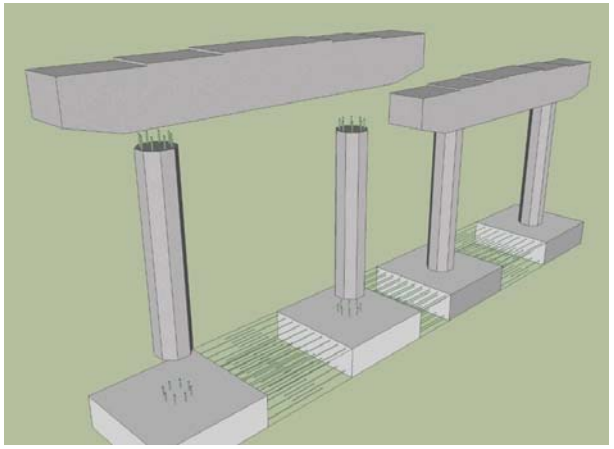


Prefabricated Cantilever Abutment (Source: FHWA ABC Manual)

Partial Depth Precast Deck (Source: FHWA Highways for Life)

Sliding (FHWA HfL)

Bridge Move with SPMT (Mammoet)



Precast Open Frame Pier Bent (Source: FHWA ABC Manual)

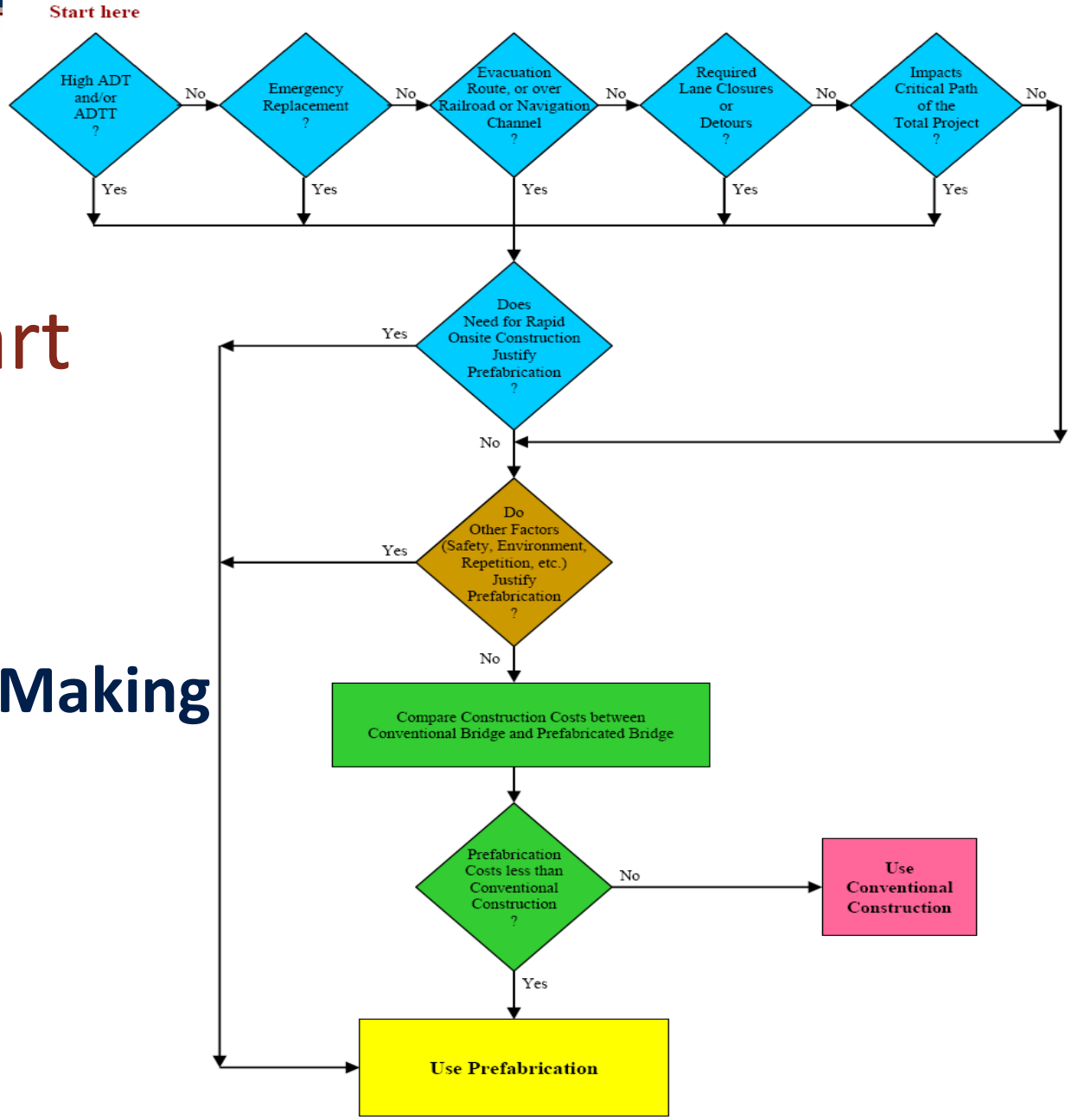
Bridge Move with SPMT (Source: FHWA Highways for Life)

Strand Jack Lifting (Mammoet)

ABC Decision Framework

Flowchart

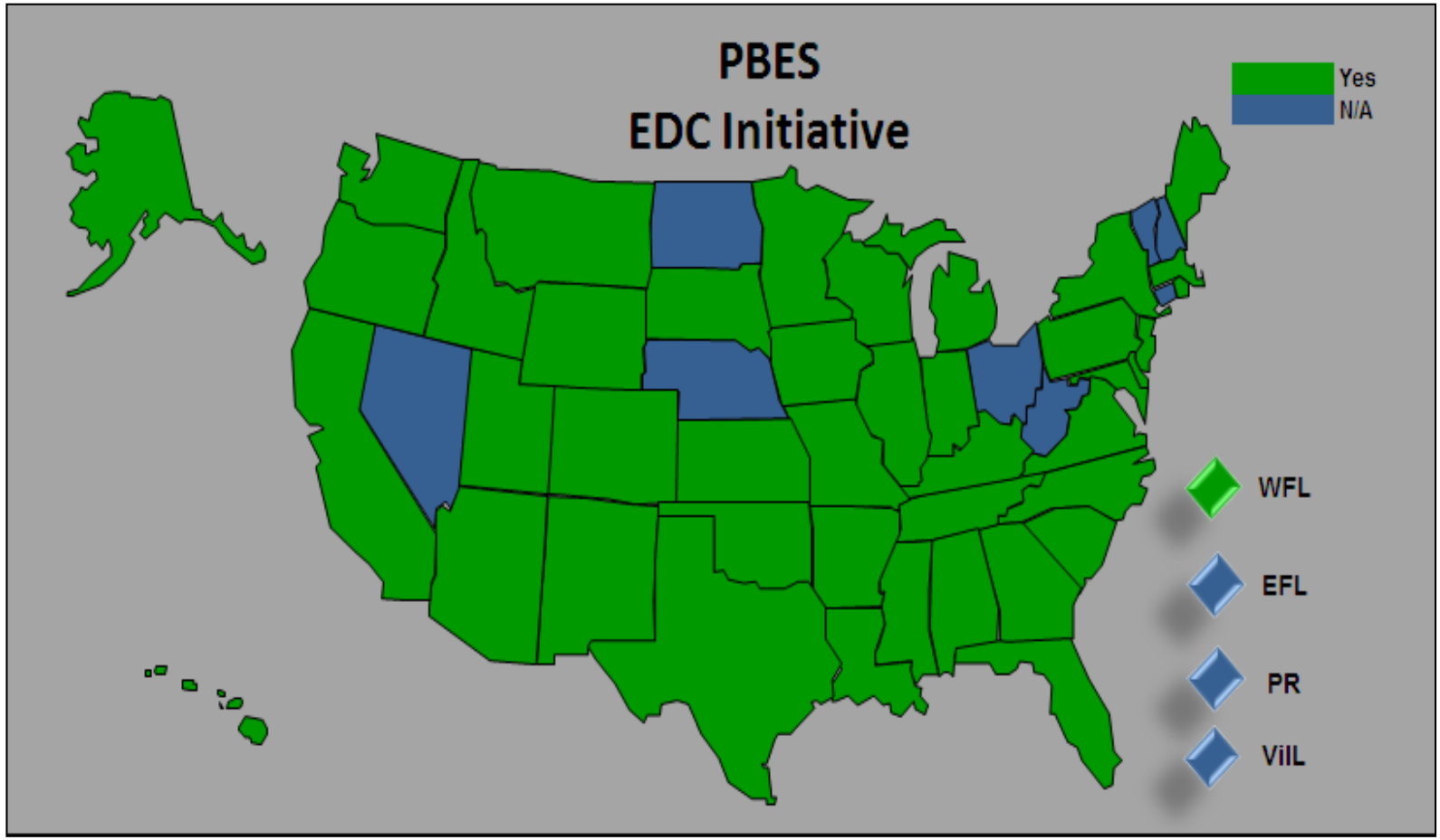
Decision Making



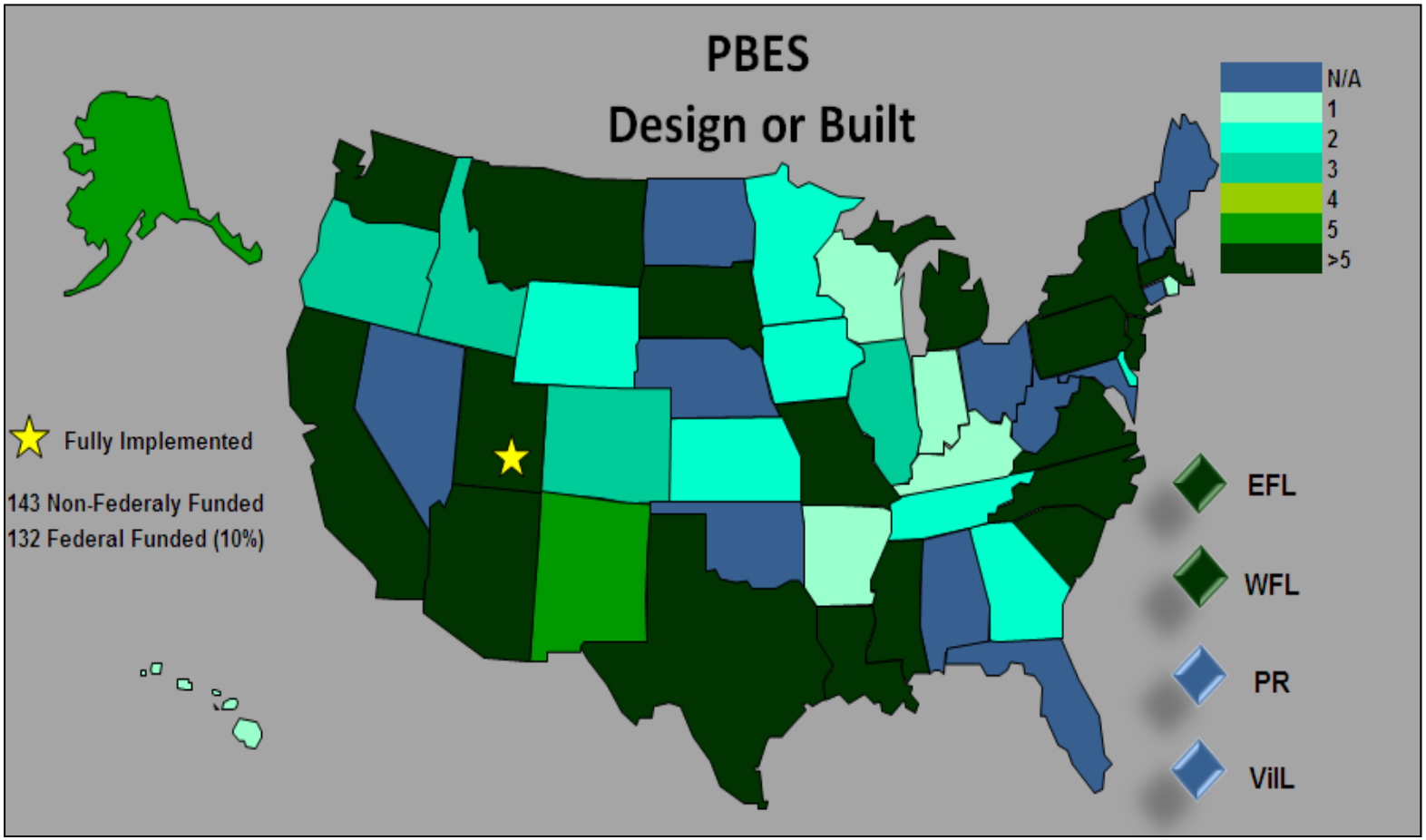
AT A GLANCE

The Status of EDC Deployment Goals for ABC/PBES

Pursuing PBES for EDC



Current Status



Conclusions

Advantages:

- Faster (offsite & off critical path)
- Safer (public and construction)
- Better Quality (controlled environment)
- Lower Cost (total project/life cycle costs)
- Easily adaptable to many site constraints

Questions?

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FHWA OFFICE OF OPERATIONS PEER EXCHANGE WORKSHOP

INNOVATIVE CONTRACTING AND ACCELERATED CONSTRUCTION TECHNIQUES FOR WORK ZONE SAFETY AND MOBILITY

Precast Concrete Pavement Systems for Rapid Repair, Rehabilitation, and Construction

Jagannath Mallela

September 19, 2011

Baltimore, MD

APPLIED RESEARCH ASSOCIATES, INC.
An Employee Owned Company

Accelerated Construction of Concrete Pavements

- Precast Concrete Pavement Systems (PCPS) for concrete pavement construction
  - Momentum is growing
  - Demonstration projects and pilot projects
  - Innovations and modifications
  - Specifications

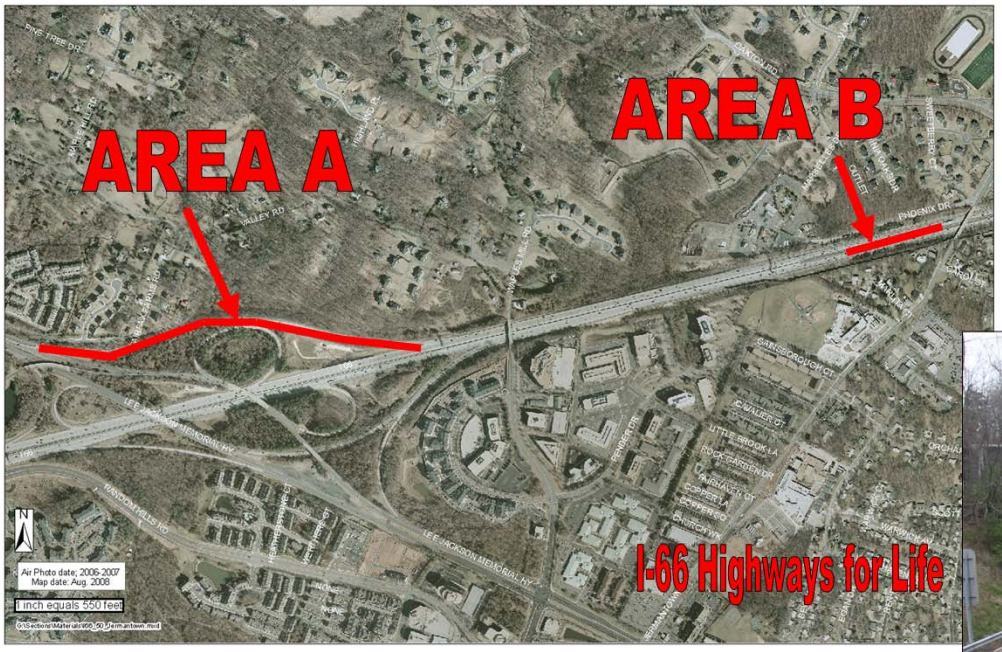
PCPS Attributes

- Improved quality and performance
- Accelerate construction
- Reduce work zone size and times
- Reduce safety risks
- Reduce risk to contractor and owner agency (use specific terms)
- Extended construction season
- Reduced costs

PCPS Basics

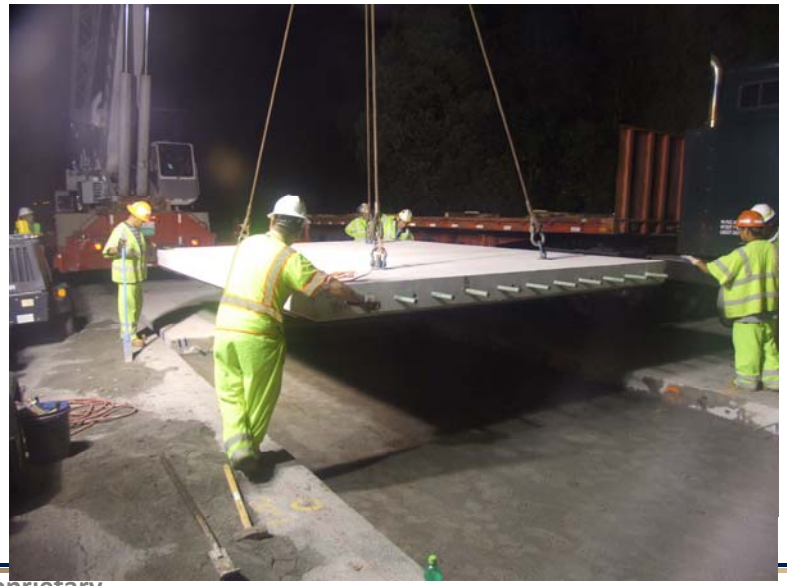
- Fabricated off-site
- Transported to the project site
- Installed on a prepared foundation
- No field curing or time to achieve strength
- Two main categories
  - Jointed Systems – Include system specific joint design
    - Example – Super-Slab and several other generic systems
  - Prestressed Systems – Use a combination of pretensioning (plant during fabrication) and post-tensioning (installation)
    - Example – Precast Prestressed Pavement System (PPCP)

Recent Project Example – I-66 WB, Fairfax, VA



Jointed PCPS - Super-Slab® Pictures

(From I-66 VA and Tappan Zee Toll plaza)



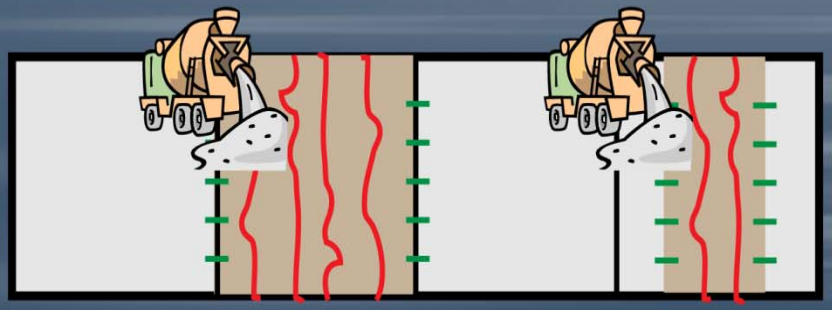
PPCP Pictures *(From I-66 VA)*

Applications

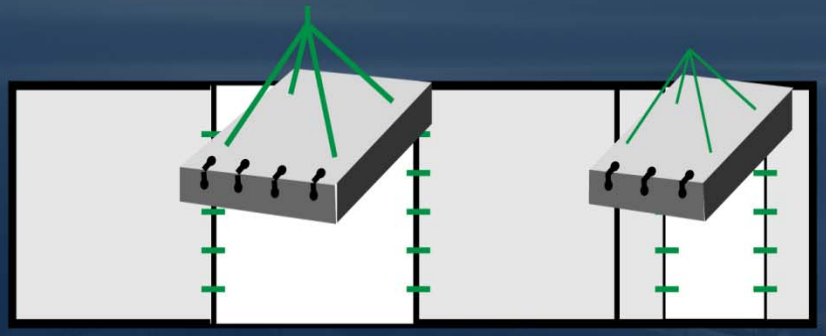
Slab replacement

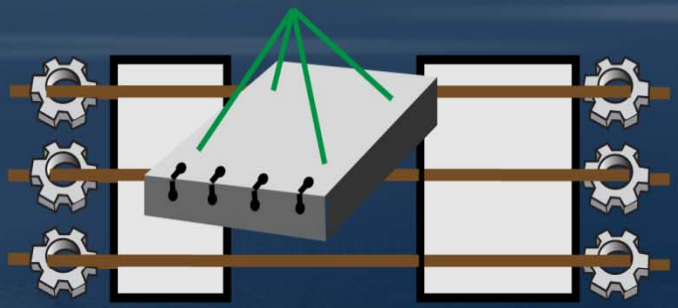
Full-depth repair

Conventional paving



Conventional



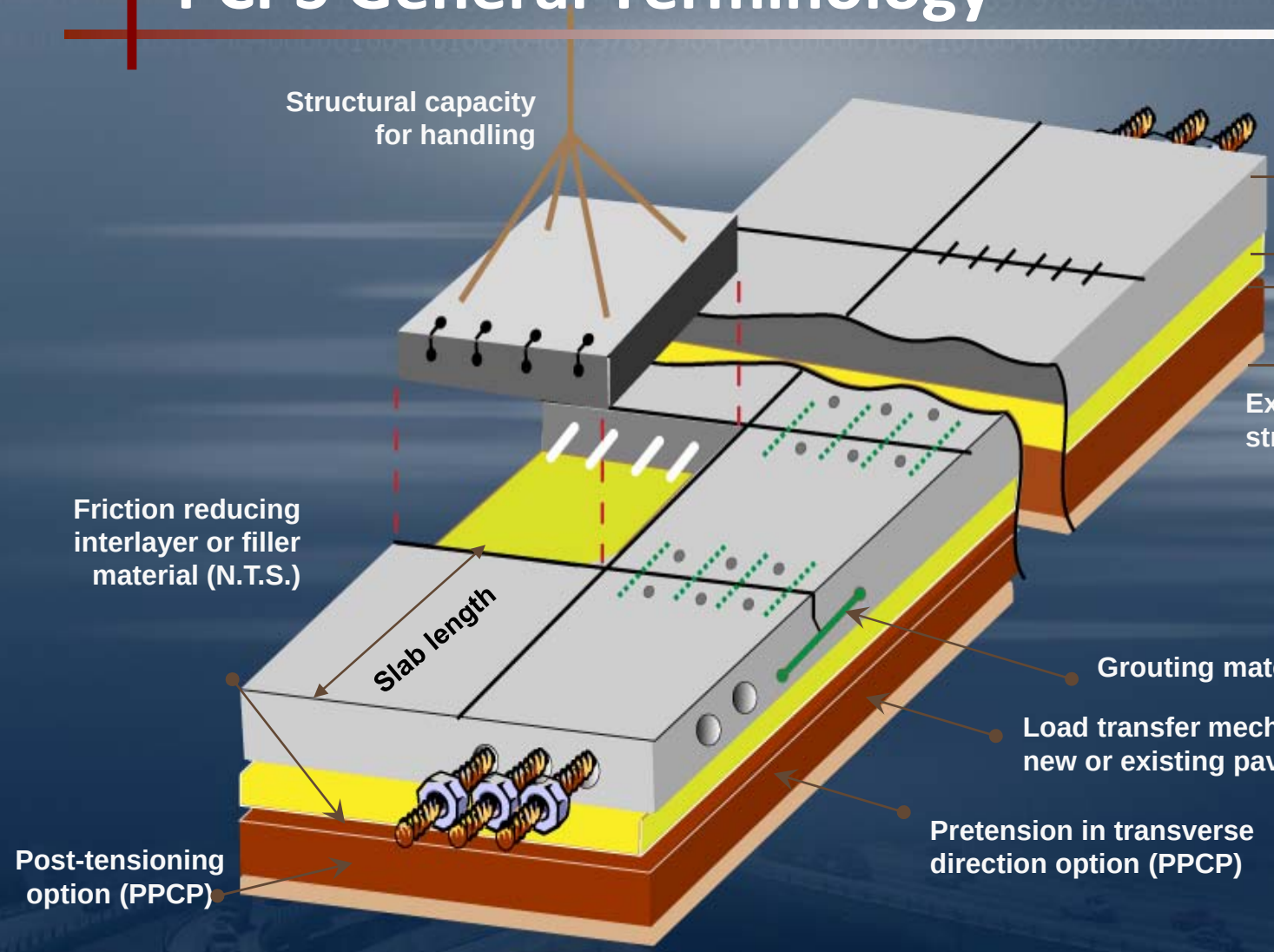


PCPS

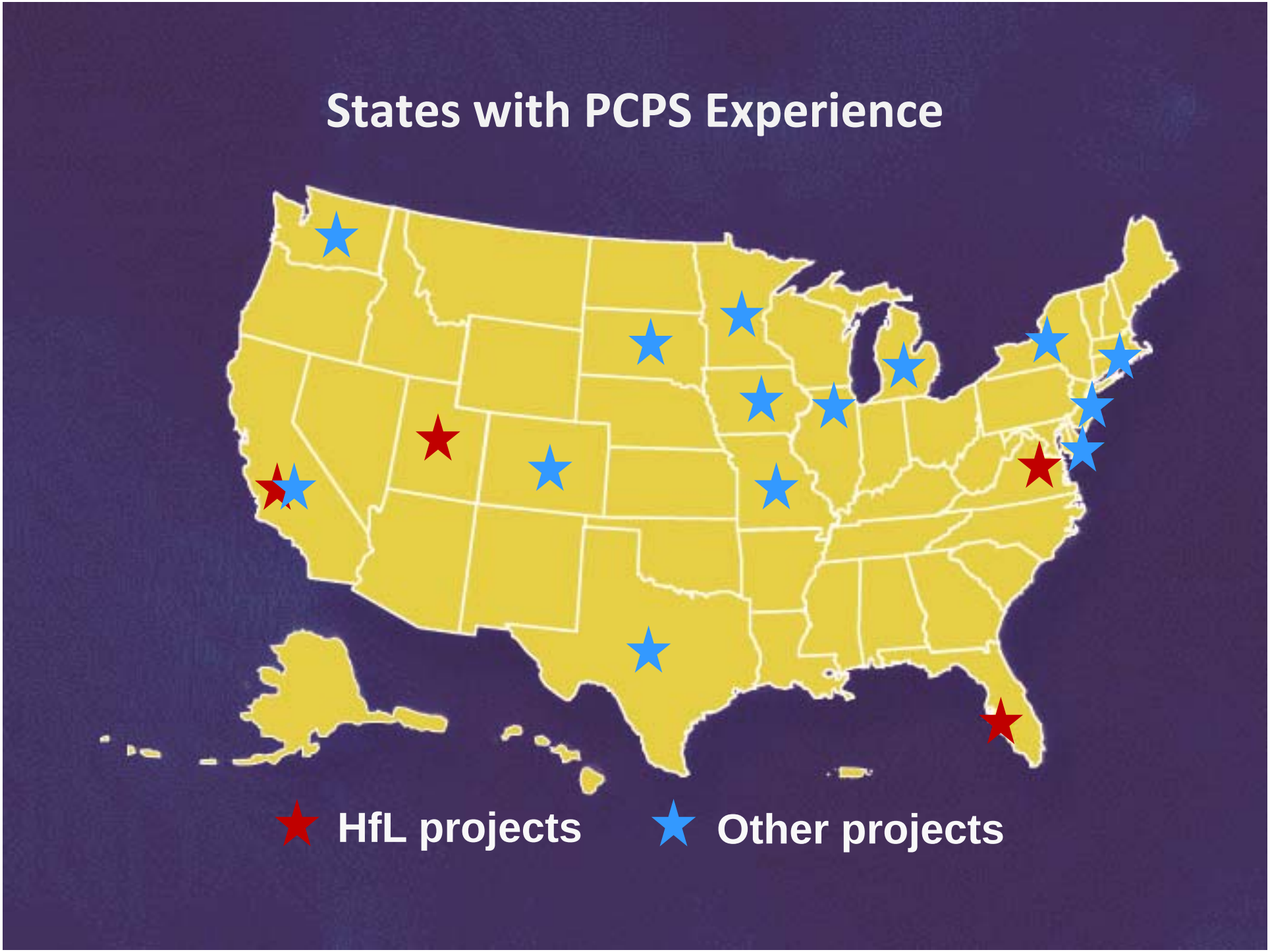
Rehabilitation

Post-tensioning (optional)
New Construction

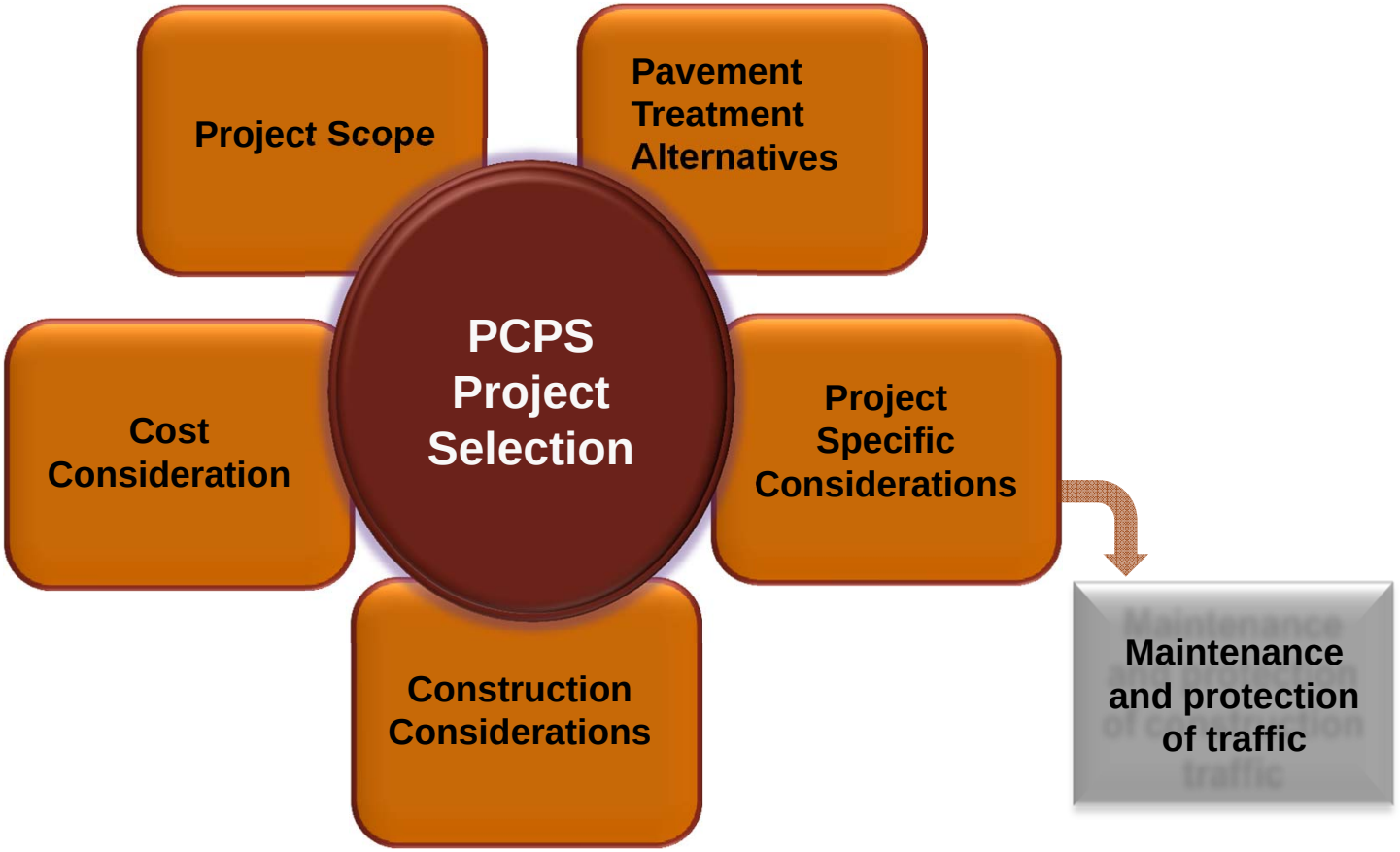
PCPS General Terminology



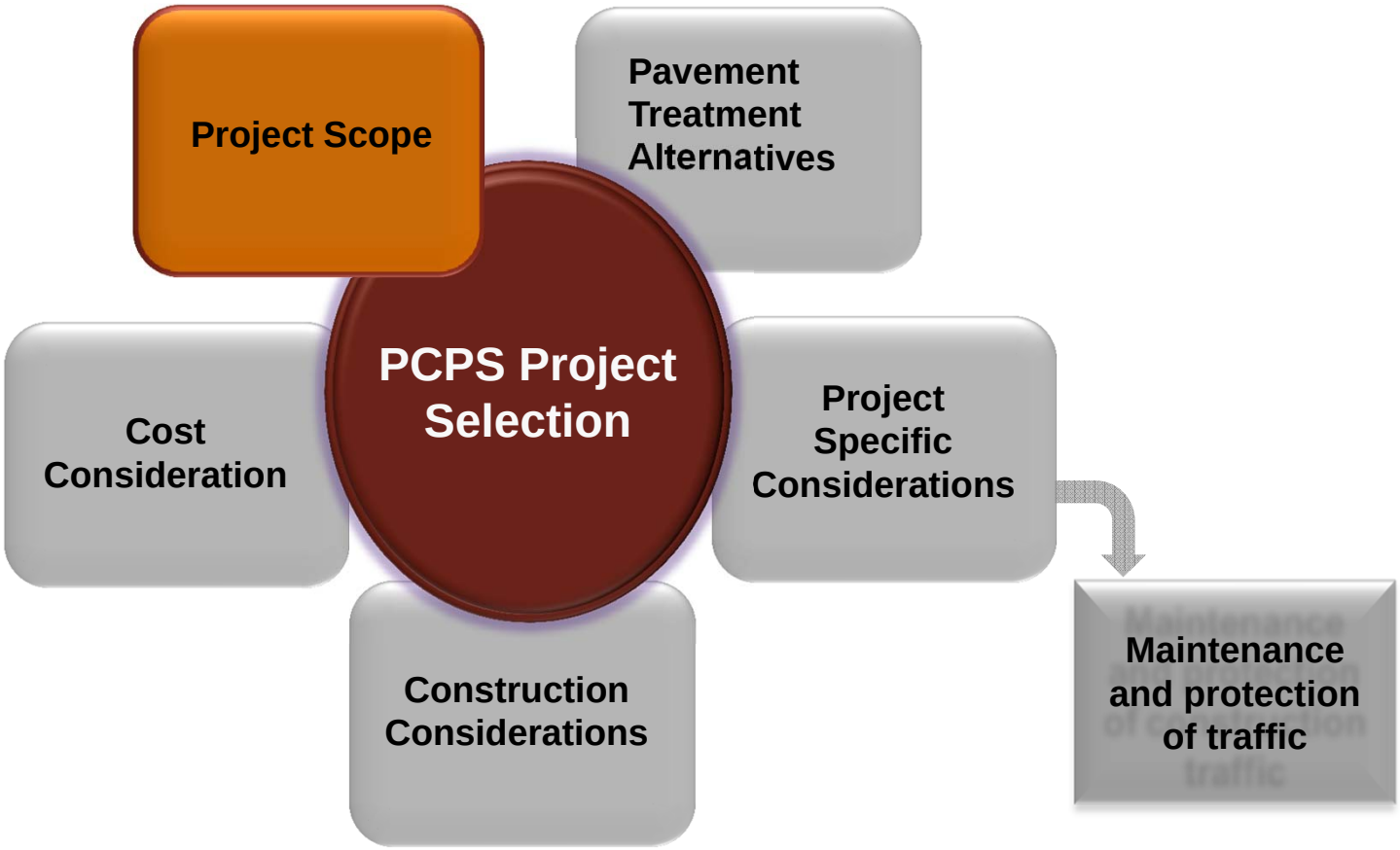
States with PCPS Experience



Project Level Decision Logic



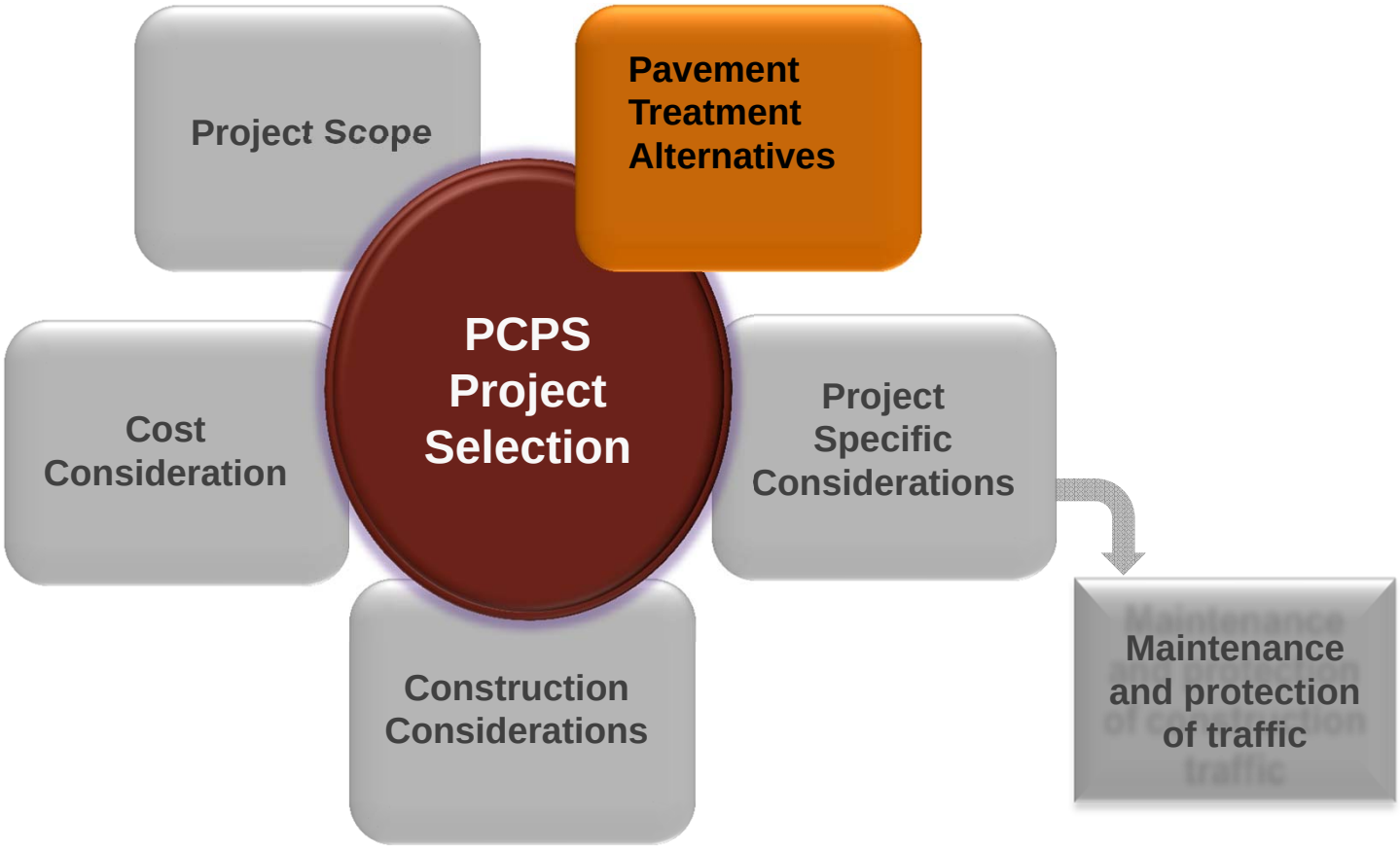
Project Level Decision Logic



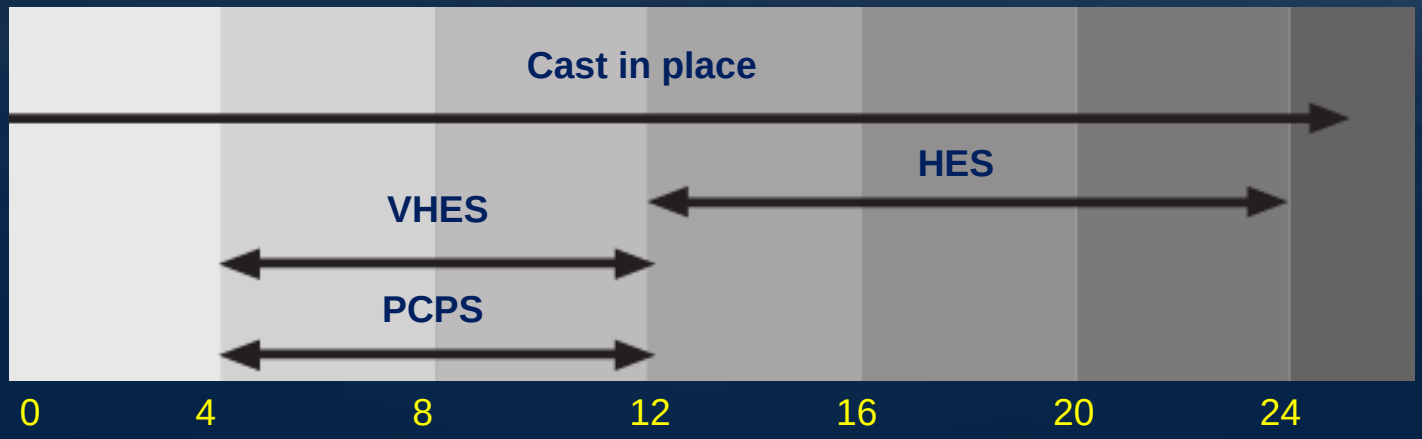
Project Scope

- Pavement service life and objectives
- Current & projected traffic density
- Slab replacement criteria
- Estimated project duration
- Work window options

Project Level Decision Logic

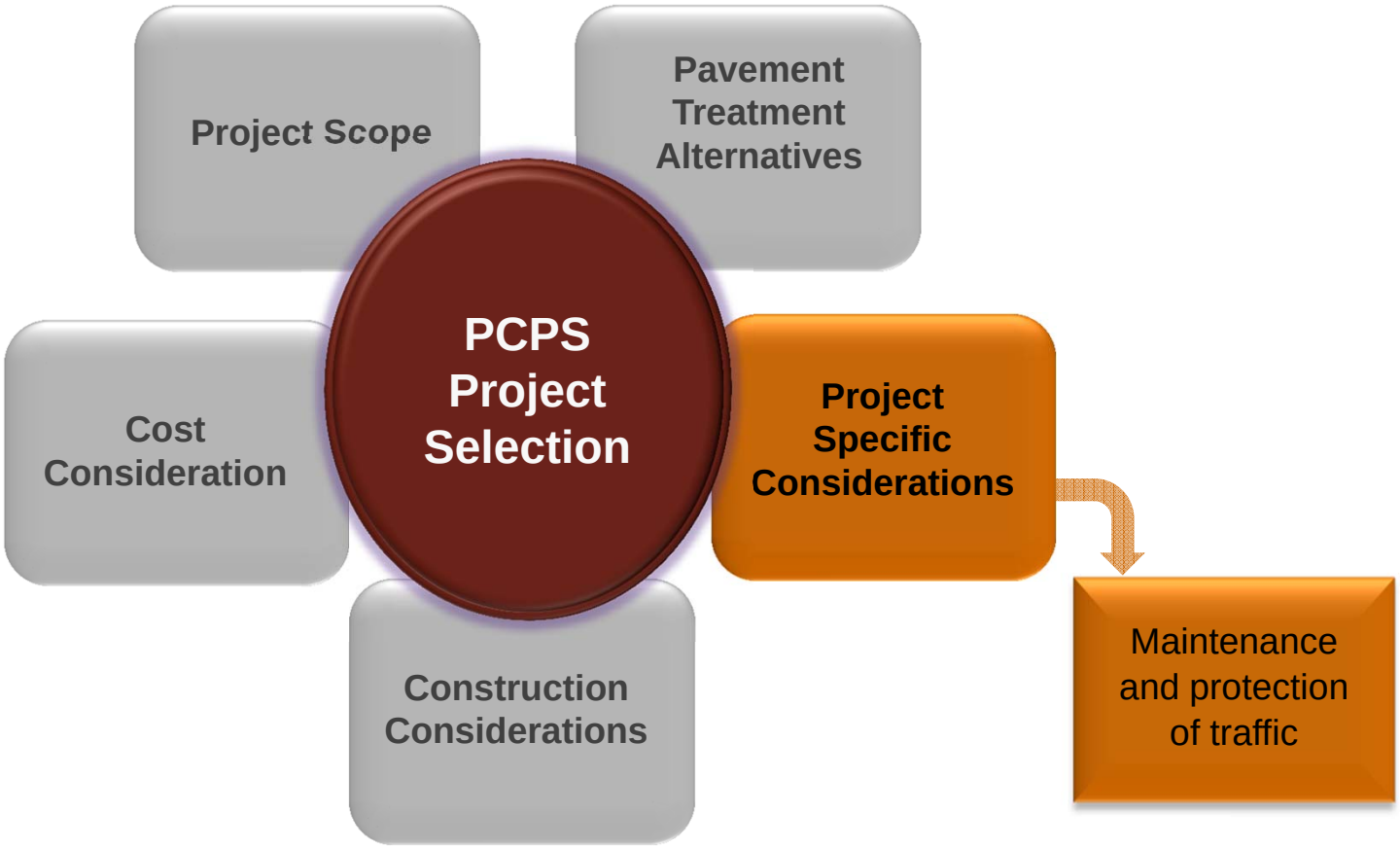


Pavement Treatment Alternatives



General rules of thumb, based on lane occupancy times

Project Level Decision Logic



Project Specific Considerations

Maintenance and protection of traffic

- Need for accelerated construction
  - M&PT considerations, seasonal restrictions, stakeholder impact
- Funding guidelines
- Design and engineering data requirements
- Construction risk
- Specifications

Specification Options

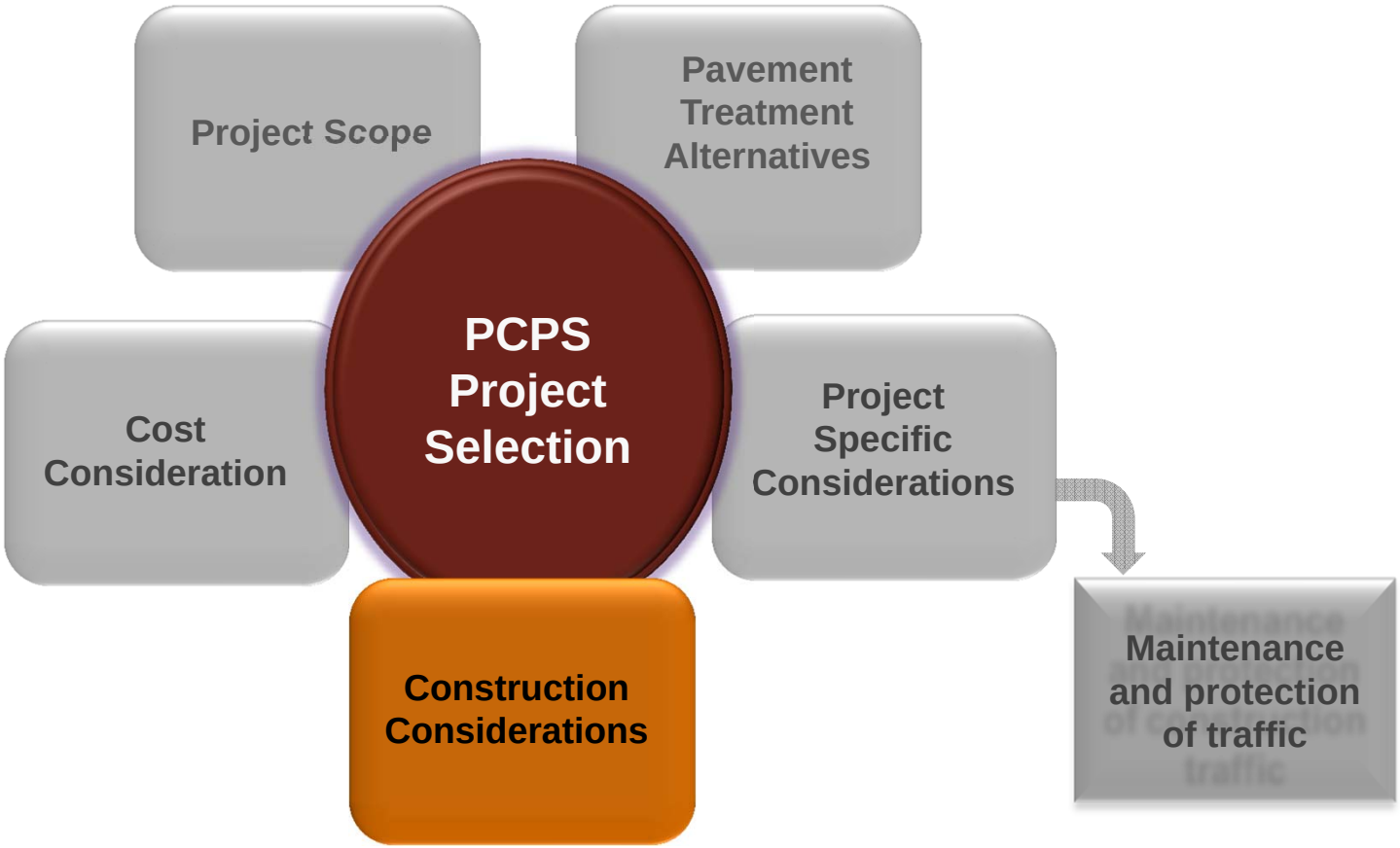
- Sole Source Specification
  - Preselect PCPS system and work directly with provider
- Multiple Source Specification
  - Use PCPS with general performance guidelines
- Generic Specification-Prequalification:
  - Use generic performance specifications = Prequalification of Precast Concrete Paving Systems (www.aashtotig.org)

Prequalification of PCPS
Gaining State DOT Approval

- Type of system employed
- Slab thickness
- Slab geometry
- Joint matching needs
- Load transfer
- Reinforcing steel
- Material handling
- Embedment material
- Subgrade requirements
- Bedding requirements
- Pre & post-tension requirements
- Surface texture
- Ride quality
- Load transfer efficiency
- Slab installation procedures

Trial installations - prove the PCPS off-site - before the project begins

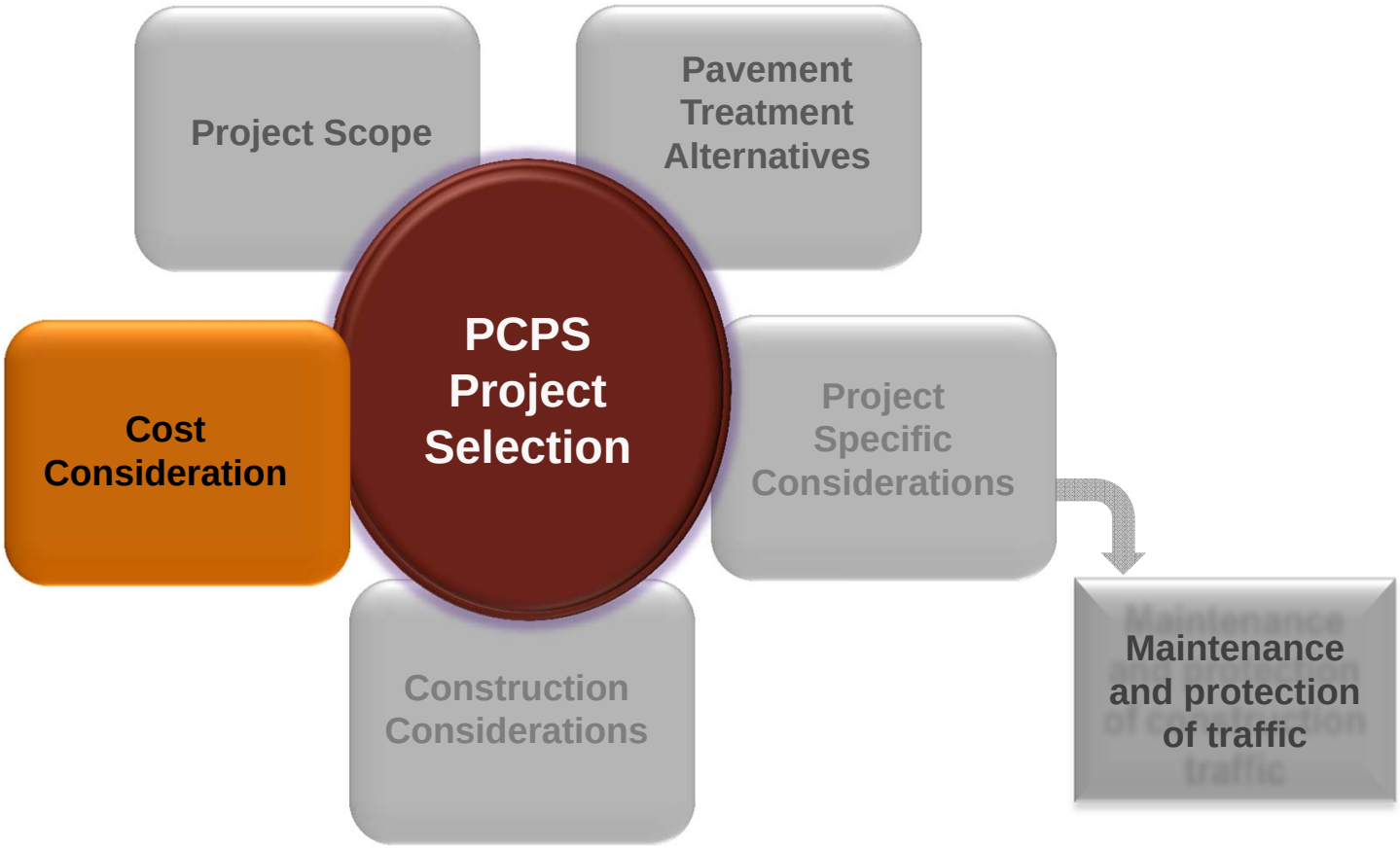
Project Level Decision Logic



Construction Considerations

- Qualified precaster presence in area
- Contractor's familiarity with PCPS construction process
- Planning and scheduling
- Quality assurance
- Contract plans

Project Level Decision Logic



Cost Considerations

- Should expand beyond initial costs
- LCCA - reduced maintenance costs and user-delay cost
- MTO reports only 10% higher cost than high early strength
- Economies of scale and industry familiarity
- Considerations of Road User Costs appropriate

PCPS Summary

- Successful installations nationwide
- Proven long term performance
- Ideal for accelerated construction for projects with lane closure restrictions
- Specification and guidelines available for your use
- PCPS can be added to your PCC treatment toolbox

Thank you!!

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