



Overview of New Illinois Tollway Accelerated Bridge Construction Process

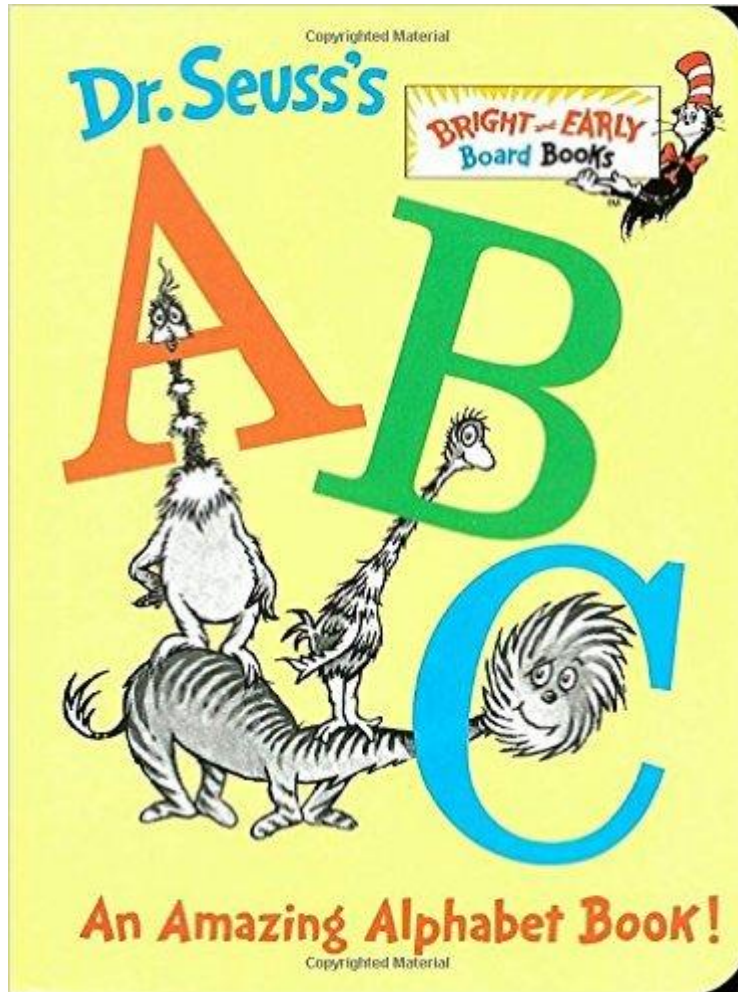
Eric Ozimok

AECOM

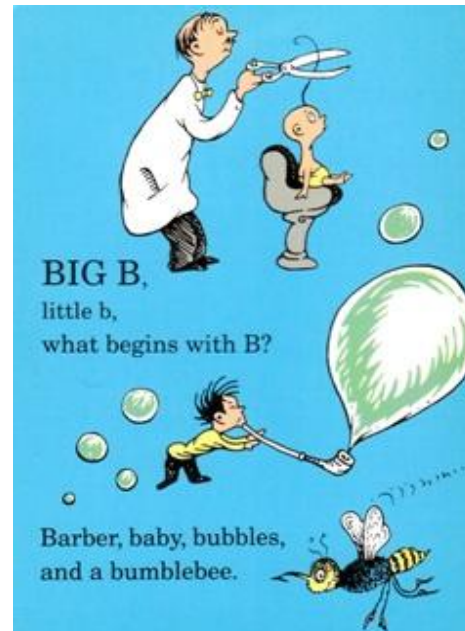
Goals for Presentation

- *Define the new Illinois Tollway ABC Process*
- *Discuss how to incorporate ABC Process into current contracts*
- *Provide a brief overview of the decision making tools, technologies and resources*
- *Discuss Future Illinois Tollway ABC Goals*

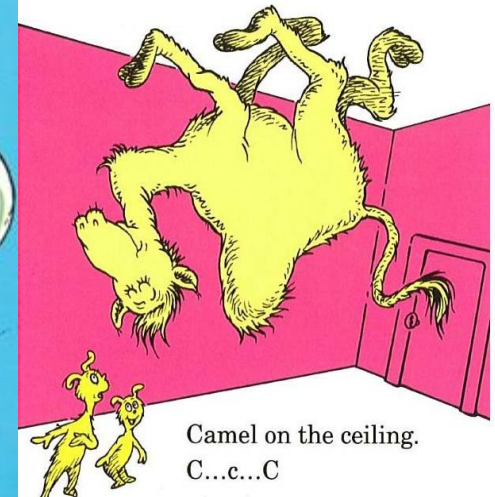
Lets talk ABC's



Aunt Annie's alligator



BIG C,
little c,
what begins with C?



What is the ABC Process?

- *Initial release focused on planning and design*
(Designer)
- *Future updates will focus on construction and contract packaging* **(Contractor)**
 - Special Provisions
 - Standard Details
 - Contract Delivery and Bidding



The Illinois Tollway will provide appropriate direction during project development

What is the ABC Process?

■ *December 2016 - Released ABC Process*

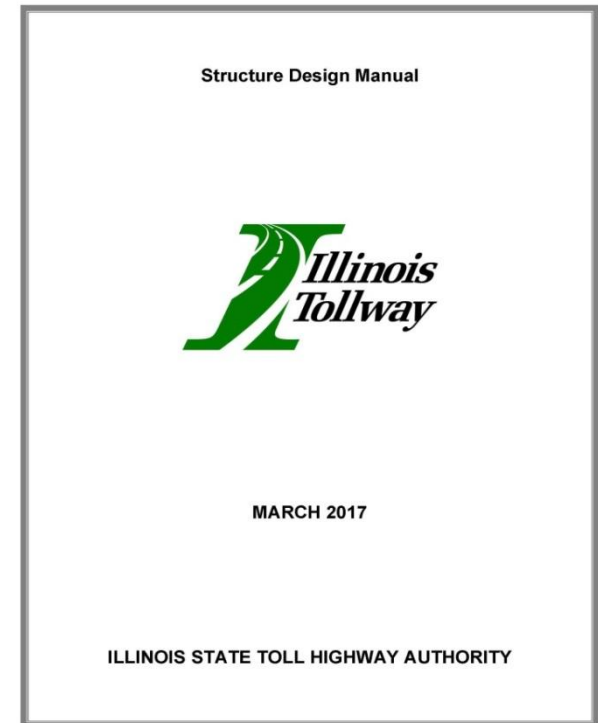
- ❑ Design Bulletin 16-03
- ❑ Provides consistent approach for evaluating, designing and constructing projects with ABC



What is the ABC Process?

■ *December 2016 - Released ABC Process*

- ☐ Help Guide Project Specific Evaluation
- ☐ Standard Tools developed to Evaluate ABC
- ☐ Defines most common ABC Technologies Available
- ☐ Encourages Use of Alternate Design and Construction



What is the ABC Process?

■ *December 2016 - Released ABC Process*

- ☐ Defines the Design Phase Project Deliverables required for ABC
- ☐ Provides a List of Key Resources
- ☐ Comprehensive example developed to aid DSE's in evaluating ABC



What is the ABC Process?

■ *December 2016 - Released ABC Process*

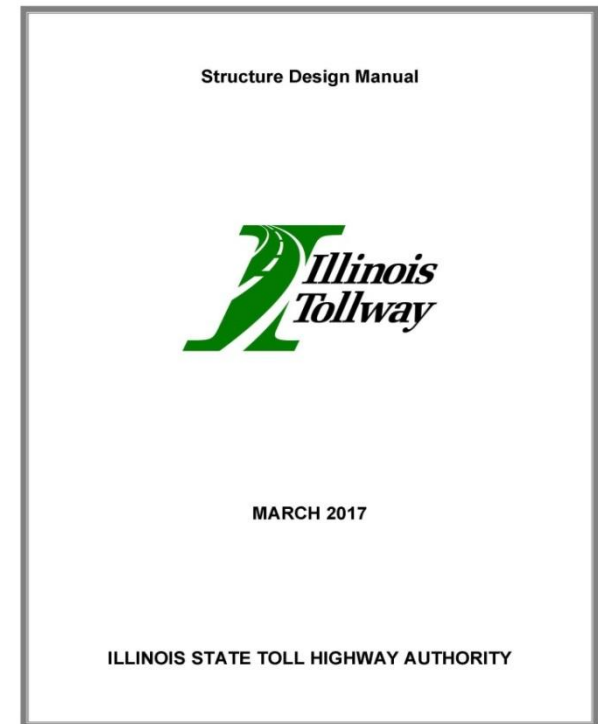
- ☐ DSE to incorporate into all Pre-Concept and Concept contracts under design
- ☐ If beyond Concept Stage does not apply
- ☐ All Future Tollway projects to incorporate into planning process



What is the ABC Process?

■ *December 2016 - Released ABC Process*

- ❑ Exceptions shall be coordinated with the Project Manager and documented as a design deviation
- ❑ DSE will need to work with Tollway for Contract Documents and Packaging



Structure Design Manual



MARCH 2017

ILLINOIS STATE TOLL HIGHWAY AUTHORITY

**Design Bulletin 16-03
will be included in
March 2017 update of
Structure Design
Manual**

**No Major Revisions
are anticipated**

Structure Design Manual

■ *Section 27.0 Accelerated Bridge Construction*

- 27.1 Introduction
- 27.2 Illinois Tollway ABC Committee
- 27.3 Decision Framework for ABC
- 27.4 ABC Technologies
- 27.5 ABC Project Delivery Methods
- 27.6 ABC References

27.3 Decision Framework for ABC

■ *Meat and Potatoes of ABC Process*

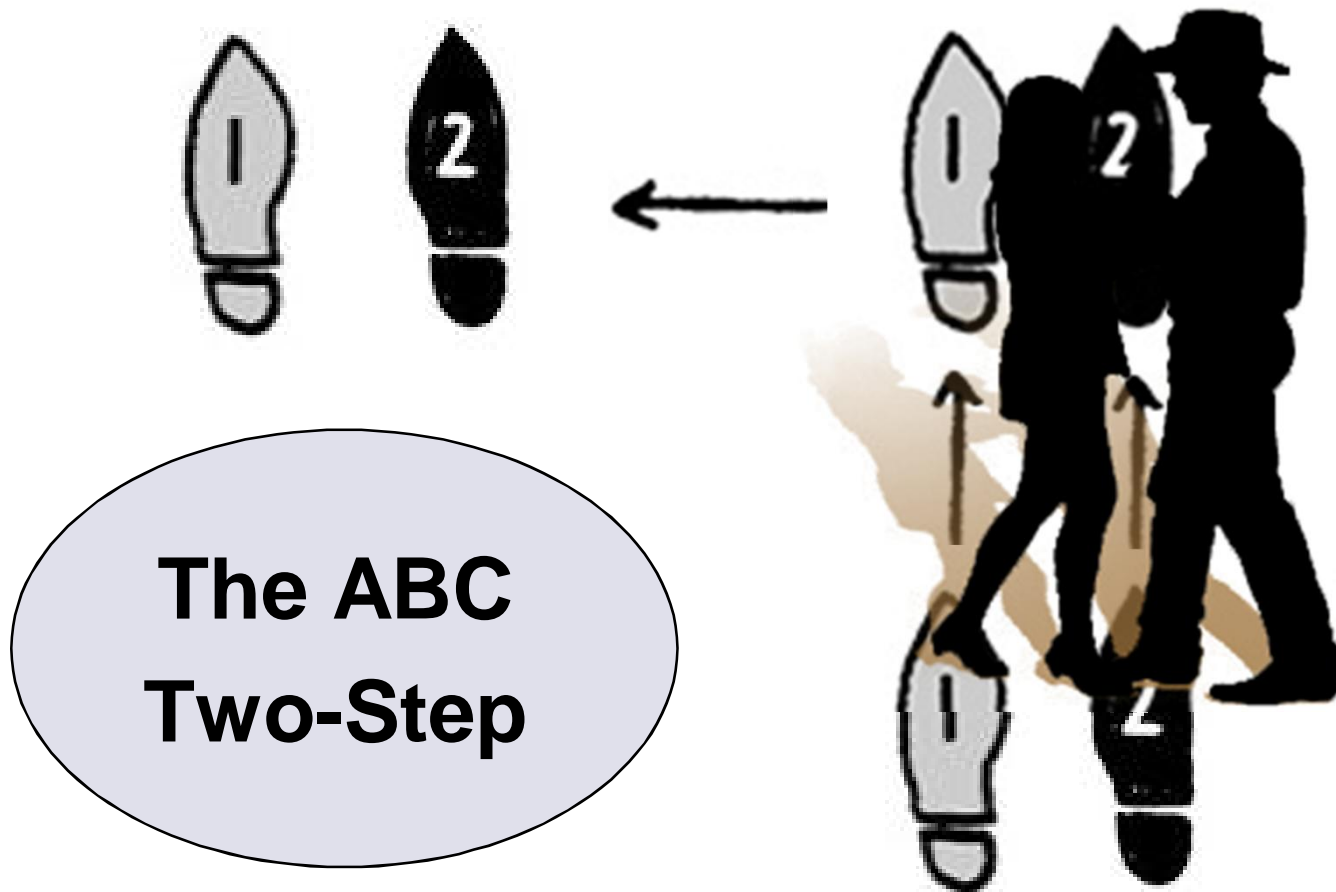
- ✓ Defines the Decision Making
- ✓ Helps DSE's "think-through" and Execute Design
- ✓ Standard Tools Developed



GOAL = Start with Conventional Construction and try to Prove ABC provides a Benefit

27.3 Decision Framework for ABC

■ *Consists of a Two-Step Process*



How to Evaluate for ABC?



Step 1

27.3 Decision Framework for ABC

■ **Step One: ABC Decision Matrix Tool (DMT)**

- ✓ *Spreadsheet available for download*
- ✓ *Master Plan or Pre-Conceptual Stage*
- ✓ *Assessment of impact ABC Technologies may have at a Bridge Location*
- ✓ *Does not specify which ABC Technologies*

Determines if the site and bridge are a good candidate for ABC

27.3 Decision Framework for ABC

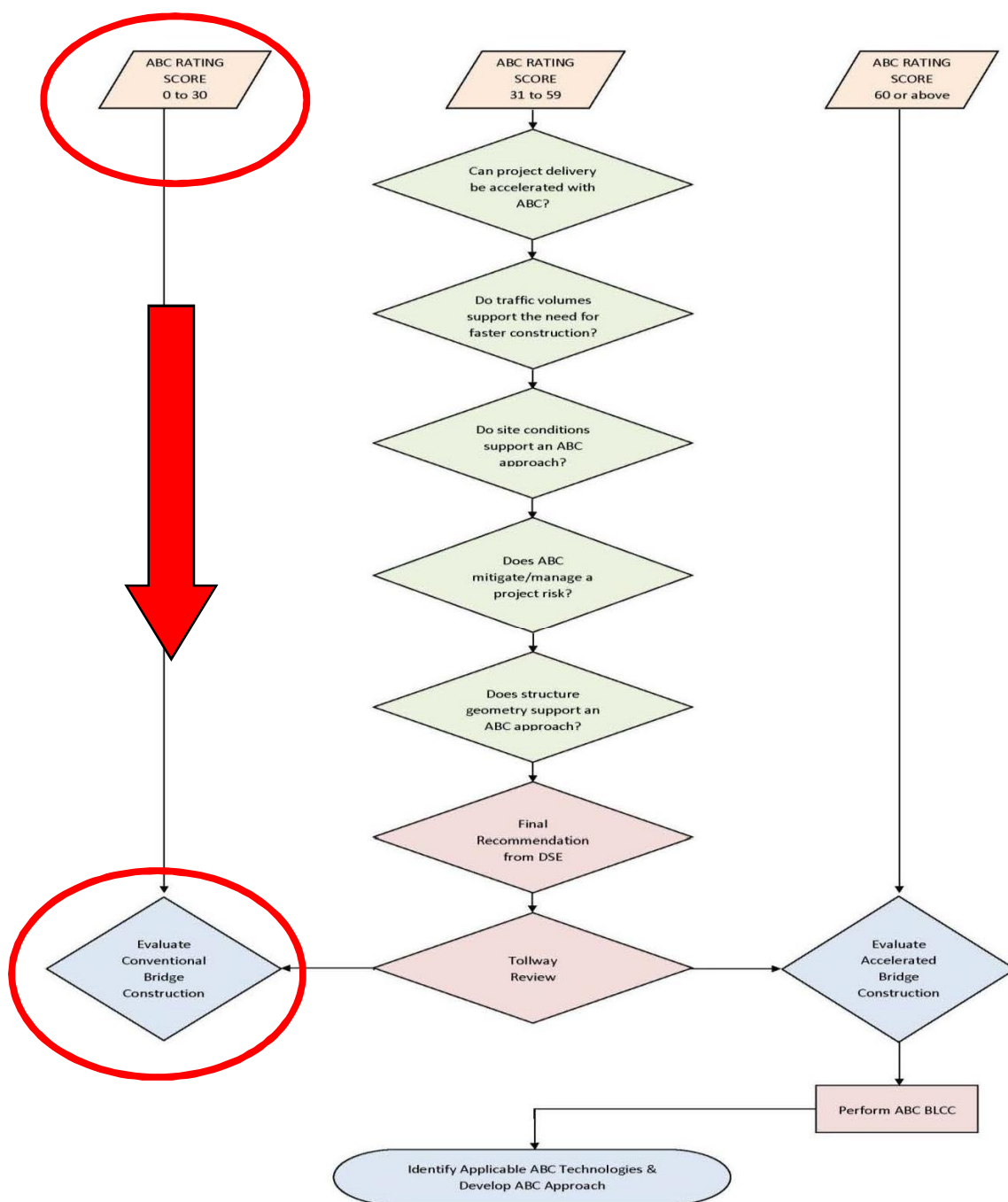
■ **Step One: ABC Decision Matrix Tool (DMT)**

- ✓ *Only required for new bridges or existing bridges to be replaced or reconstructed*
- ✓ *Not required for bridge rehabilitation, retaining walls or culverts*
- ✓ *Shall be completed for each individual bridge*
- ✓ *Dual structures require only one ABC DMT*

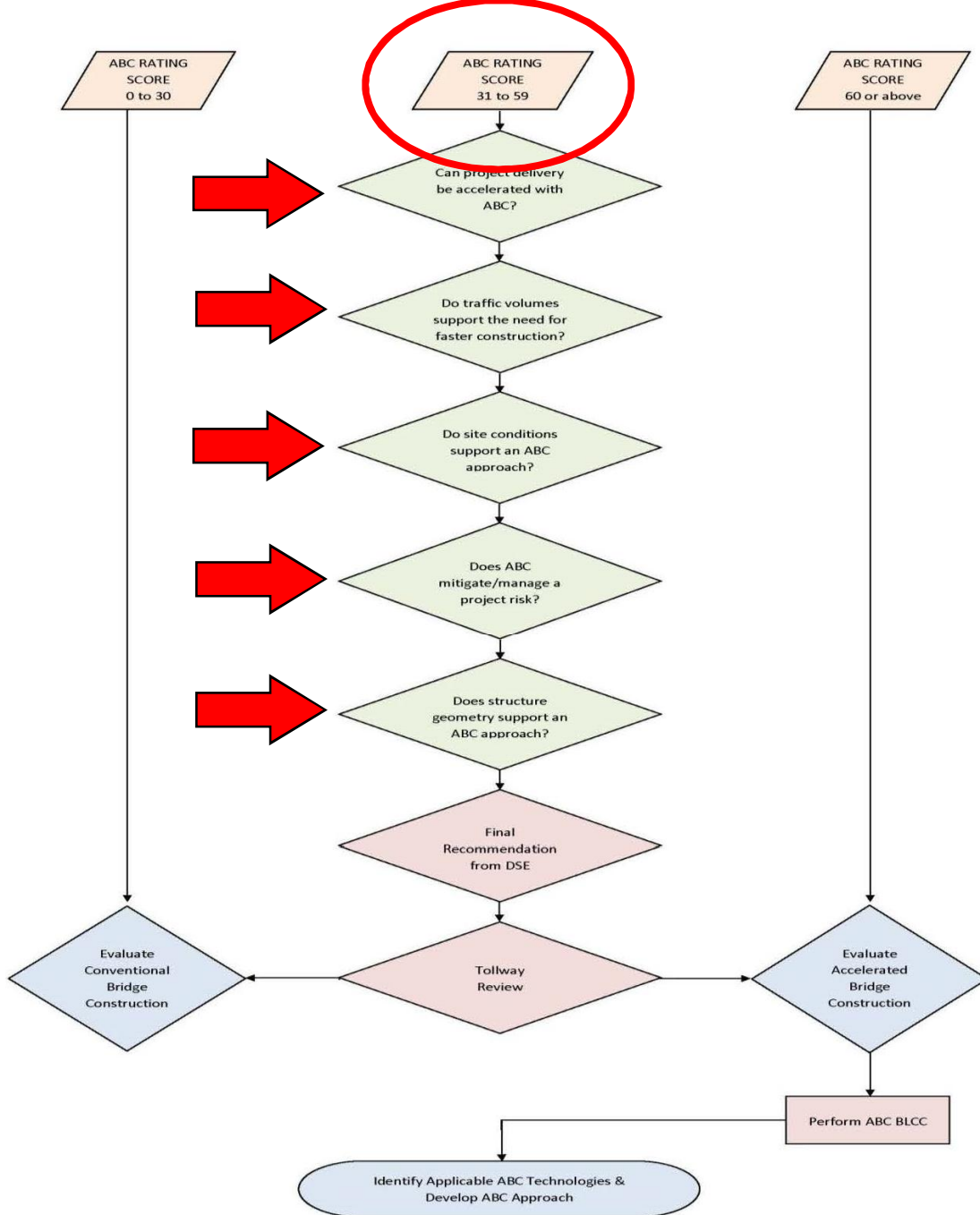
Assess the entire site and include all information

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY ACCELERATED BRIDGE CONSTRUCTION (ABC) - DECISION MATRIX TOOL (DMT)			
Prepared By	XX	Prepared On	xx/xx/xxxx
Checked By	XX	Checked On	xx/xx/xxxx
Bridge No.	XXXXX	Mile Post	xx.xx
Location	xxxxxx		
ABC Rating Procedure		December 2016	
Note to User: Refer to Structure Design Manual Article 27.3.1 for general guidance on using this tool.			
Average Daily Traffic (Combined over and under)	<input style="width: 50px; height: 20px;" type="text"/>	0 No traffic during construction 1 Less than 20,000 2 20,000 to 50,000 3 50,001 to 100,000 4 100,001 to 150,000 5 More than 150,000	
Traffic Impact (Based on Severity Index)	<input style="width: 50px; height: 20px;" type="text"/>	0 Least severe traffic impact 1 More severe traffic impact than 0 2 More severe traffic impact than 1 3 More severe traffic impact than 2 4 More severe traffic impact than 3 5 Most severe traffic impact	
Maintenance of Traffic	<input style="width: 50px; height: 20px;" type="text"/>	0 No impact 1 Short duration with simple MOT 2 Short duration with multiple staging 3 Normal duration 4 Long duration with simple MOT 5 Long duration with multiple staging	
Economic Impact	<input style="width: 50px; height: 20px;" type="text"/>	0 Low business impact 3 Medium business impact 5 High business impact	
Bridge Classification	<input style="width: 50px; height: 20px;" type="text"/>	0 Typical bridge 3 Essential bridge 5 Critical bridge	
Railroad/Waterway Impact	<input style="width: 50px; height: 20px;" type="text"/>	0 No railroad or minor railroad spur or no waterway 3 One mainline railroad track or waterway 5 Multiple mainline railroad tracks or waterway with commercial traffic	
Environmental Impact	<input style="width: 50px; height: 20px;" type="text"/>	0 No impact 1 Minimum impact 3 Medium impact 5 Maximum impact	
Economy of Scale (Total number of spans)	<input style="width: 50px; height: 20px;" type="text"/>	0 1 span 1 2 or 3 spans 3 4 or 5 spans 5 More than 5 spans	
Use of Typical Details	<input style="width: 50px; height: 20px;" type="text"/>	0 Complex or unsymmetrical geometry 3 Some complexity 5 Simple, symmetrical geometry	
Accessibility	<input style="width: 50px; height: 20px;" type="text"/>	0 Unfavorable site with no ROW available 3 Favorable site with some ROW available 5 Favorable site with plenty of ROW available	

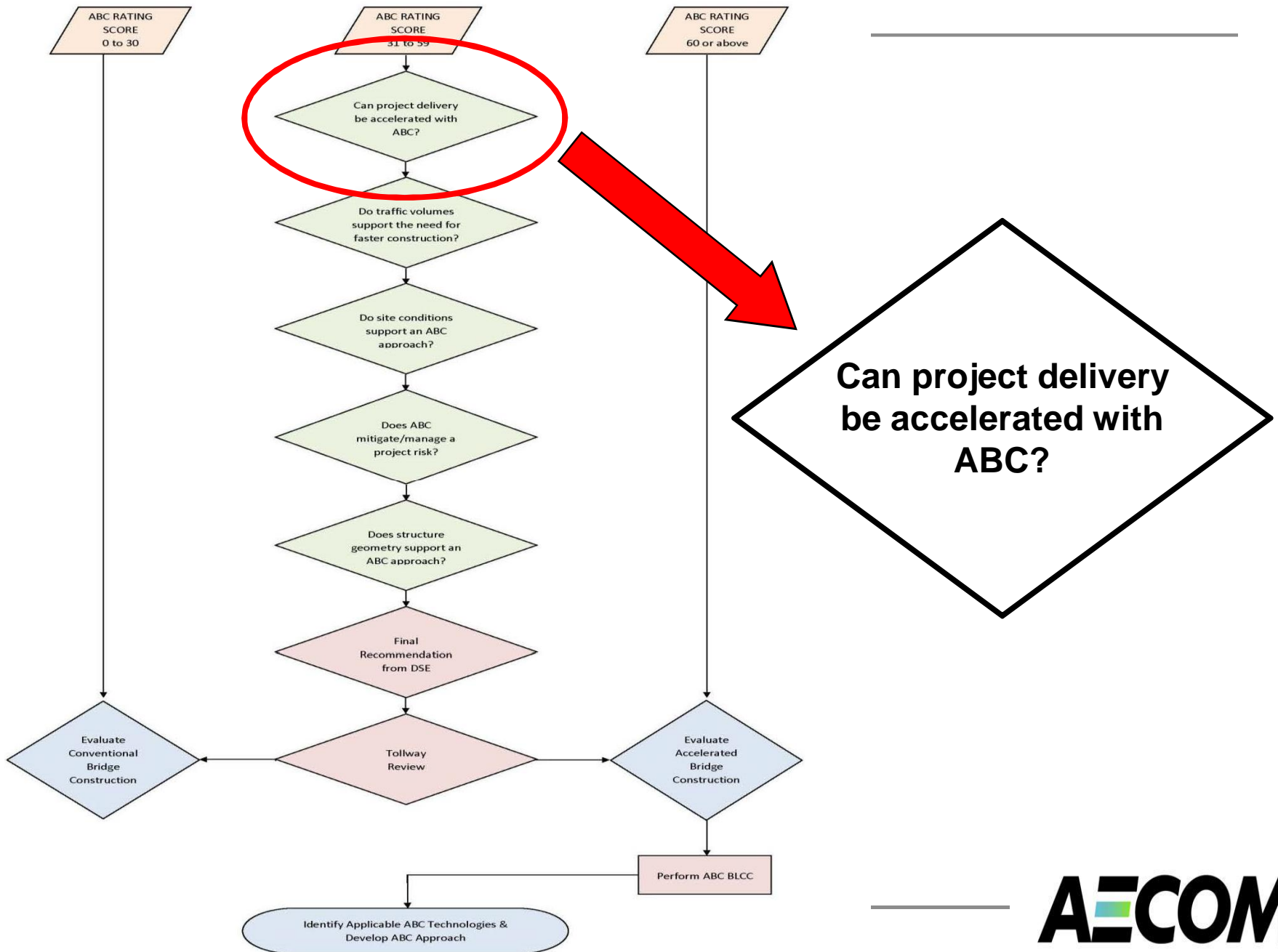
- DSE inputs scores for 10 variables
- Scores are based on site specific constraints
- Level of subjectivity
- Tool Calculates ABC Rating Score based on input
- Provides a Yes/No answer

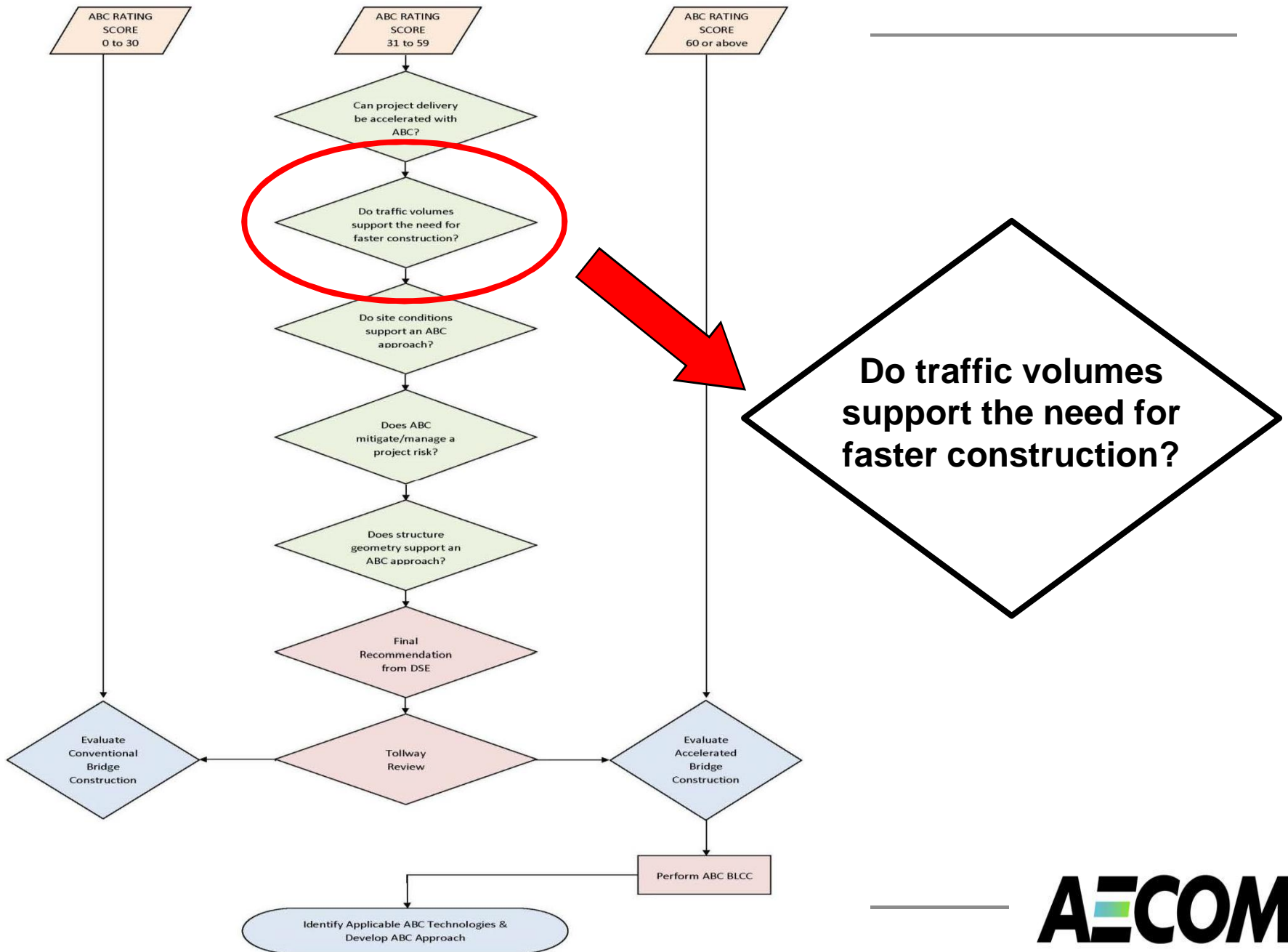


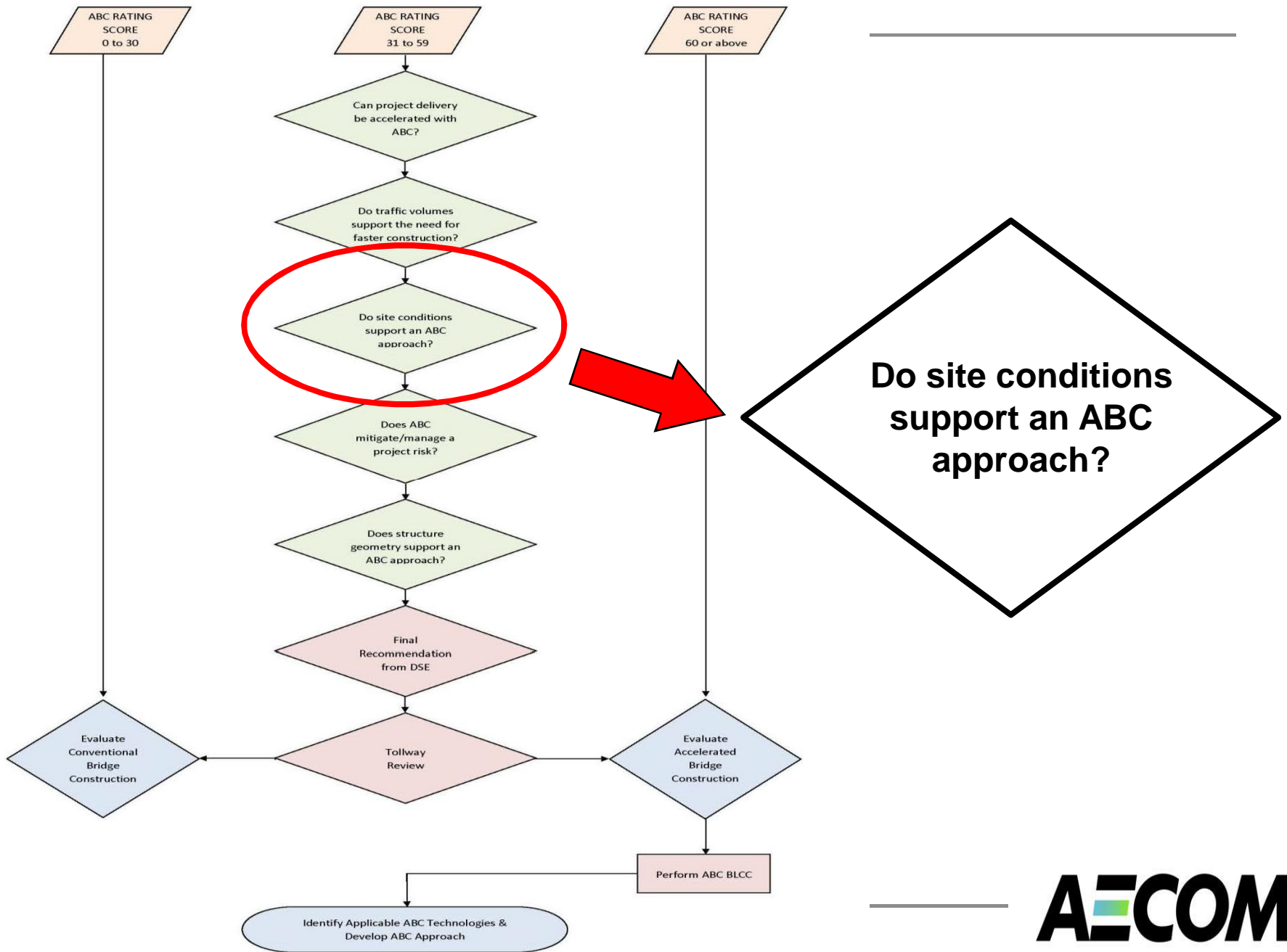
- 0 to 30 - Conventional Construction shall be evaluated further
- 31 to 59 – DSE shall consider additional factors
- 60 or above – ABC shall be evaluated further

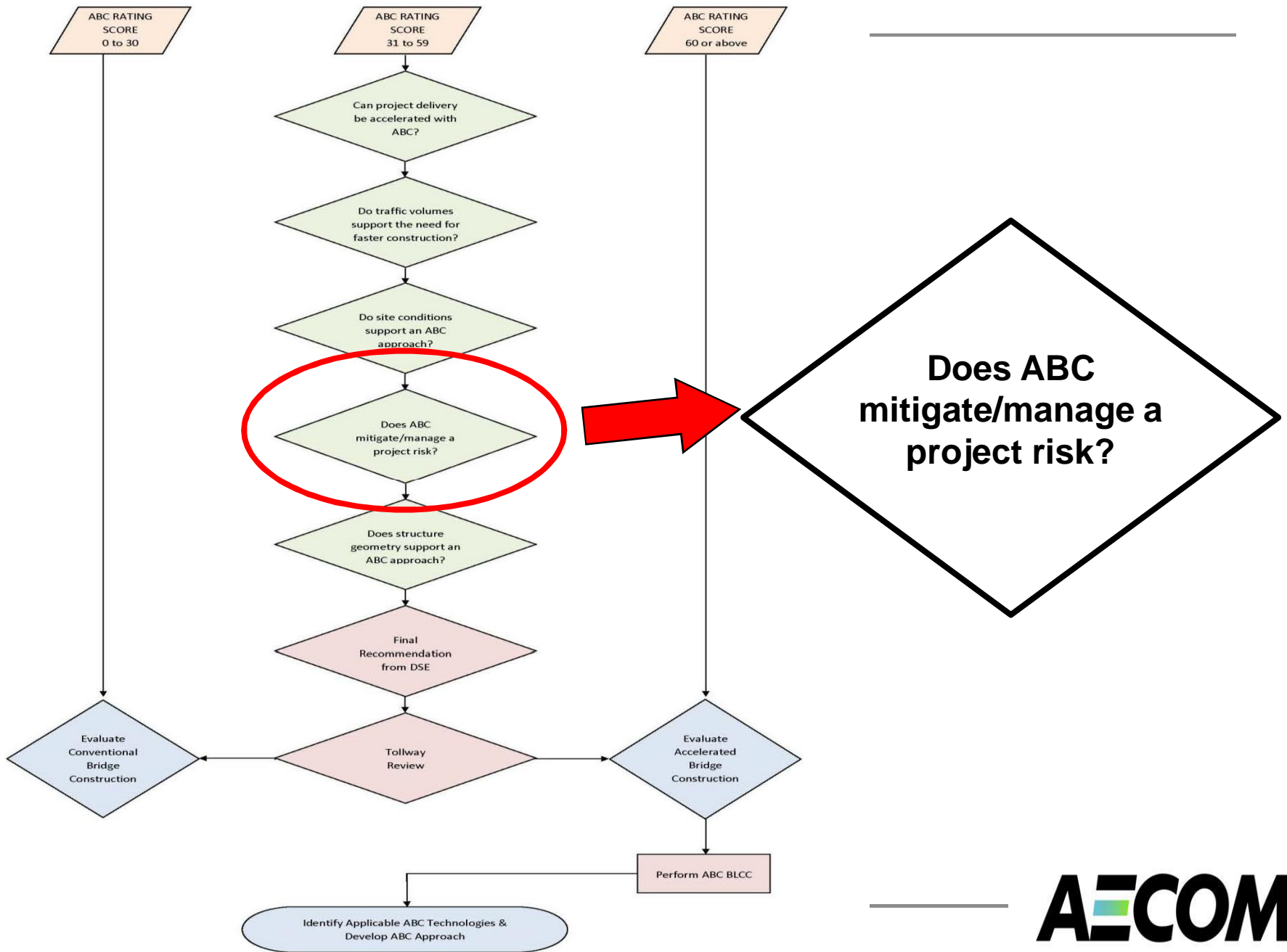


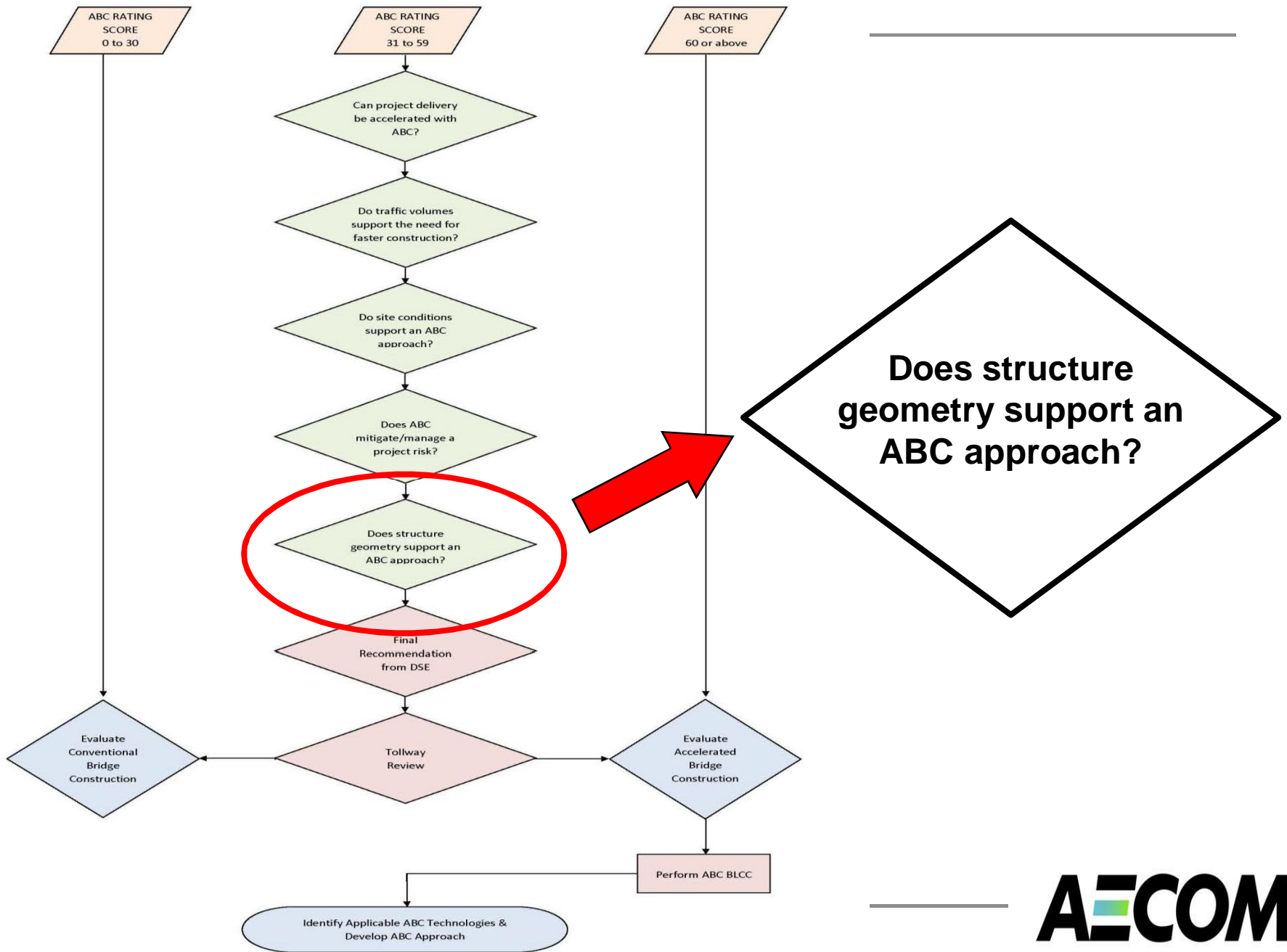
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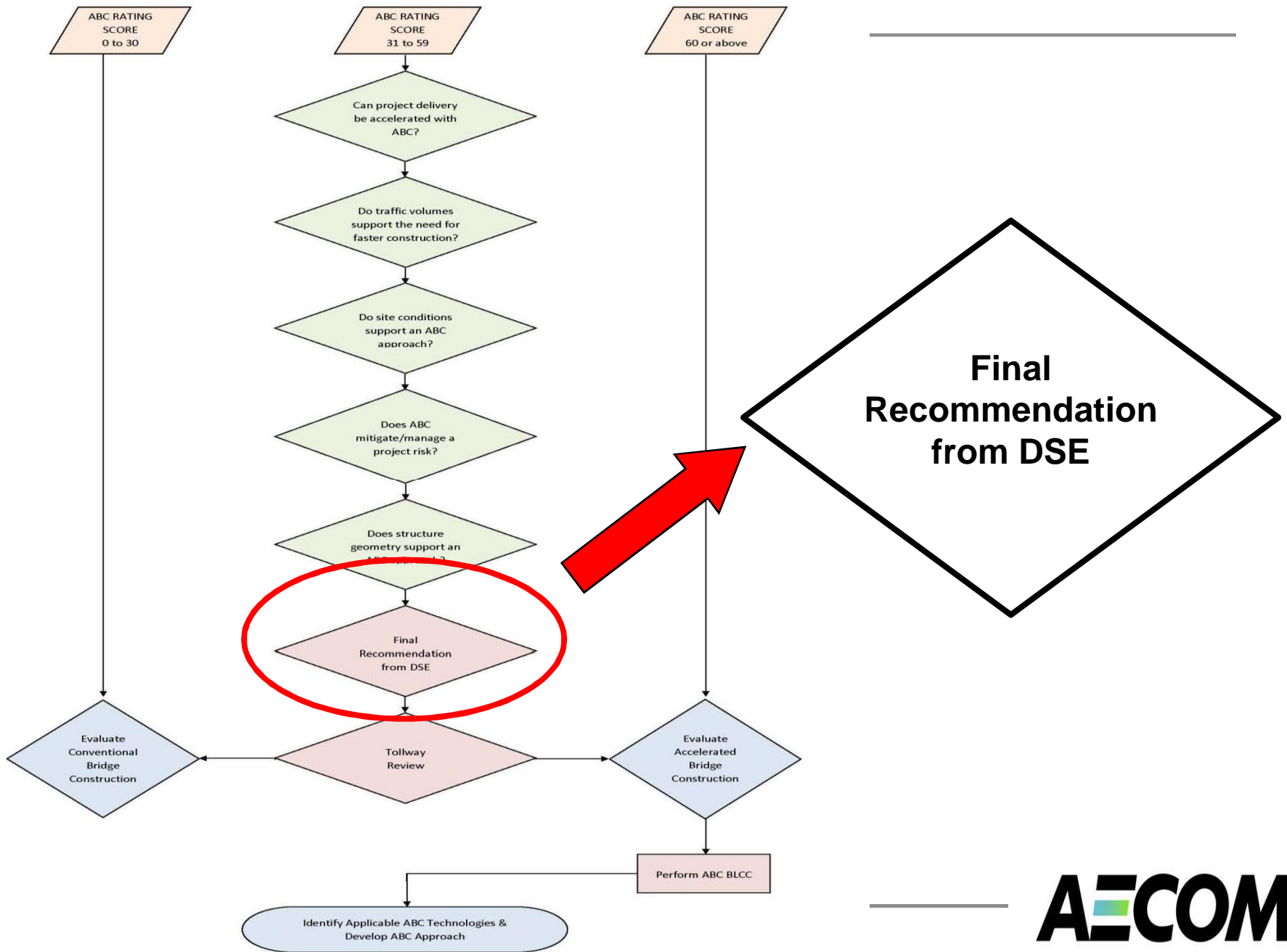


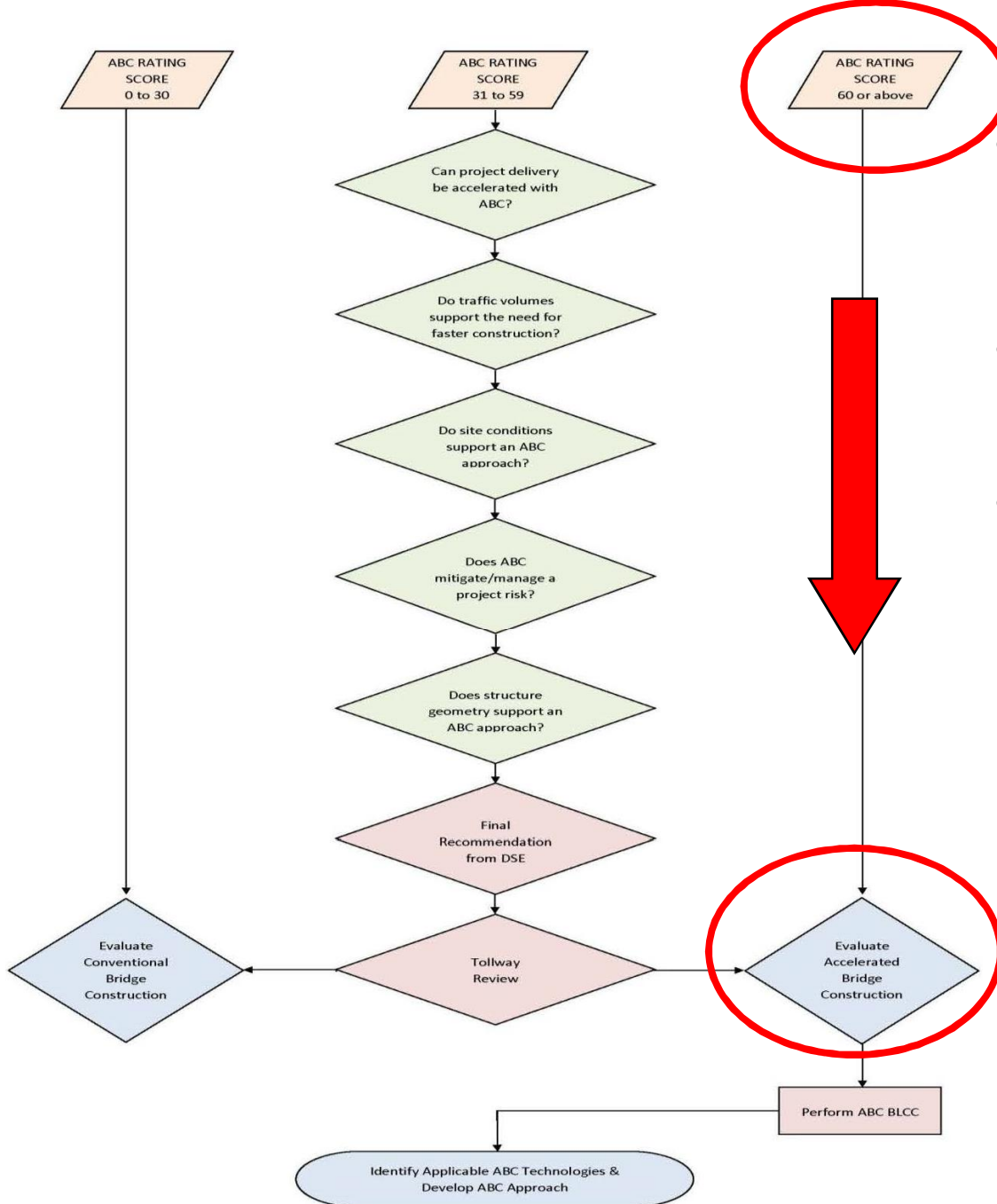




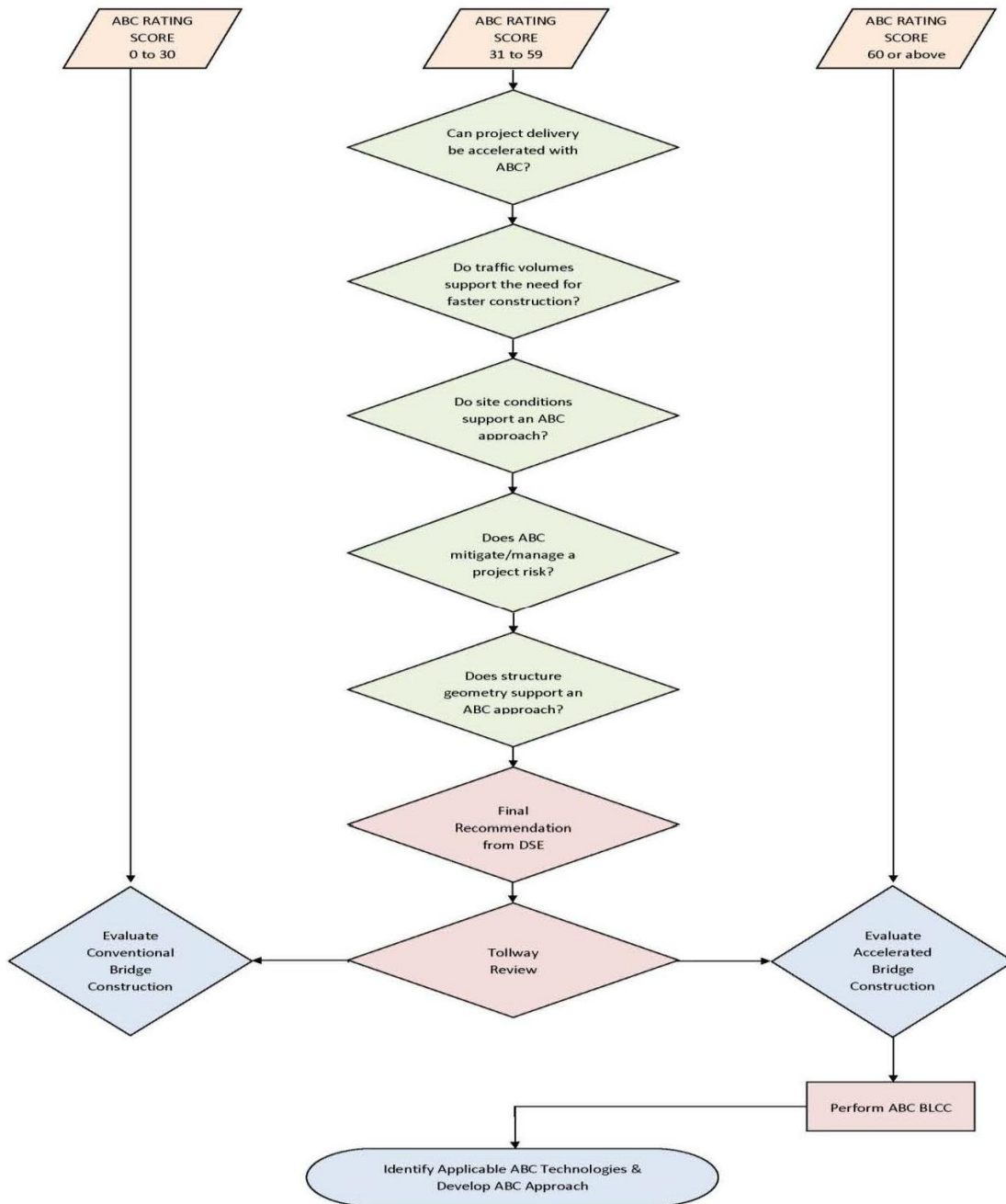








- 0 to 30 - Conventional Construction shall be evaluated further
- 31 to 59 – DSE shall consider additional factors
- 60 or above – ABC shall be evaluated further



- DSE shall look at global perspective of project
- **Final recommendation to be Included in Master Plan Study or Technical Memo**



How to Evaluate for ABC?



Step 2

27.3 Decision Framework for ABC

■ ***Step Two: ABC Bridge Life Cycle Comparison Tool (BLCC)***

- ✓ *Spreadsheet available for download*
- ✓ *Concept Stage*
- ✓ *Helps compare and eliminate potential ABC technologies based on economic efficiency*
- ✓ *Does not calculate actual Life Cycle Costs*
- ✓ *Does not capture Service Disruptions*

27.3 Decision Framework for ABC

■ ***Step Two: ABC Bridge Life Cycle Comparison Tool (BLCC)***

- ✓ *Only required for structures that recommend ABC to be evaluated further from ABC DMT*
- ✓ *Level of subjectivity to tool*
- ✓ *Tool makes assumptions about cost and service life*

DSE has ability to change assumptions

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY ACCELERATED BRIDGE CONSTRUCTION (ABC) - BRIDGE LIFE CYCLE COMPARISON (BLCC) TOOL			
Prepared By	XX	Prepared On	xx/xx/xxxx
Checked By	XX	Checked On	xx/xx/xxxx
Bridge No.	XXXXX	Mile Post	xx.xx
Location	xxxxxx		
ABC BLCC Tool		December 2016	



Note to User: Refer to Structure Design Manual Article 27.3.2 for general guidance on using this tool.

INDIVIDUAL ABC BLCC RATING SCORE INPUT

INITIAL COSTS (IC)

Total Labor (On-Site and Off-Site)	<input style="width: 100%;" type="text"/>	1	Estimated construction time >= 18 months
		2	13 months <= Estimated construction time < 18 months
		3	8 months <= Estimated construction time < 13 months
		4	3 months <= Estimated construction time < 8 months
		5	Estimated construction time < 3 months
Deck Material	<input style="width: 100%;" type="text"/>	1	Deck type is cast-in-place concrete
		2	Deck type is precast concrete panels
Superstructure Material	<input style="width: 100%;" type="text"/>	1	Superstructure type is cast-in-place concrete
		2	Superstructure type is precast concrete or steel
Substructure Material	<input style="width: 100%;" type="text"/>	1	Substructure type is cast-in-place concrete
		2	Substructure type is precast concrete
Equipment	<input style="width: 100%;" type="text"/>	1	Self-Propelled Modular Transport equipment required
		2	Bridge Slide-In equipment required
		3	Specialty Crane Based equipment required
		4	Prefabricated Bridge Element System or Longitudinal Launch required
		5	Typical cast-in-place concrete/steel construction equipment required
Agency Costs	<input style="width: 100%;" type="text"/>	1	Extensive agency coordination
		2	Moderate agency coordination
		3	Normal agency coordination
Right-of-Way	<input style="width: 100%;" type="text"/>	1	Required R.O.W. acquisition > 1 acre
		2	0.5 acres < Required R.O.W. acquisition <= 1 acre
		3	0.25 acres < Required R.O.W. acquisition <= 0.5 acres
		4	0 acres < Required R.O.W. acquisition <= 0.25 acres
		5	Required R.O.W. acquisition = 0 acres
Environmental Impact Costs	<input style="width: 100%;" type="text"/>	1	Maximum impact
		2	Medium impact
		3	Minimum impact
		4	No Impact

- DSE identifies ABC Technologies – “Bridge Alternatives”
- DSE inputs scores for variables in 3 categories
- Tool Calculates a Total ABC Rating Score

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY

ACCELERATED BRIDGE CONSTRUCTION (ABC) - BRIDGE LIFE CYCLE COMPARISON (BLCC) TOOL

Prepared By XX
Checked By XX
Bridge No. XXXXX
Location xxxxxx

Prepared On xx/xx/xxxx
Checked On xx/xx/xxxx
Mile Post xx.xx



ABC BLCC Tool

December 2016

Note to User: Refer to Structure Design Manual Article 27.3.2 for general guidance on using this tool.

TOTAL ABC BLCC RATING SCORE SUMMARY

Total ABC BLCC Rating Score = $0.33(IC) + 0.34(TIC) + 0.33(MC)$

DIRECTIONS FOR USER:

User to Input values

User may elect to add additional bridge alternatives to the ABC BLCC Tool to accurately compare all

Construction Type = Enter the type of construction (Conventional or ABC)

Deck = Enter the type of deck material (CIP or Precast Panels)

Super = Enter the type of Superstructure (CIP, Precast or Steel)

Sub = Enter the type of substructure (CIP or PBES)

Method = Enter the type of construction method (Conventional, Lateral Slide, SPMT, Longitudinal Launch, Crane Based)

Bridge Alternates Investigated					
Name	Construction Type	Deck	Super	Sub	Method
Bridge Alternative #1					
Bridge Alternative #2					
Bridge Alternative #3					
Bridge Alternative #4					
Bridge Alternative #5					

Manually Input results for different Bridge Alternatives Investigated:

Total ABC BLCC Rating Score					
	Alt #1	Alt #2	Alt #3	Alt #4	Alt #5
Initial Costs (IC)					
Traffic Impact Costs (TIC)					
Maintenance Costs (MC)					
Total ABC BLCC Rating Score	0	0	0	0	0

User may elect to add additional Recommended Bridge Alternatives to the ABC BLCC Tool to evaluate further in the Bridge Type Study and perform a cost comparison.

Recommended Bridge Alternatives					
Bridge Alternatives to Consider Based on Total ABC BLCC Rating Score:					



- Based on comparison summary, DSE eliminates alternatives
- Global perspective and final recommendation
- Incorporate into Bridge Type Study**
- Perform cost comparison
- Make Final Recommendation
- TS&L Plans**

Structure Design Manual

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27.4 ABC Technologies

- *Defines most commonly used technologies*

- ☐ Encourages their use
- ☐ Provides General Guidance
- ☐ Includes Factors to Consider
- ☐ Provides Key Resources

Not intended to be all inclusive

Provided for information only

DSE to determine applicable Technologies

27.4 ABC Technologies

■ *Most Common Prefabricated Bridge Elements*

- ☐ Precast Deck Panels
- ☐ Precast Pier Cap/Columns
- ☐ Precast Abutment/Walls
- ☐ Precast Approaches
- ☐ Precast Foundations
- ☐ Precast Parapets



Tollway to Develop Base Sheets

27.4 ABC Technologies

■ *Most Common Prefabricated Bridge Systems*

- ☐ Prefabricated Super or Substructure System
- ☐ Prefabricated Total Bridge Systems

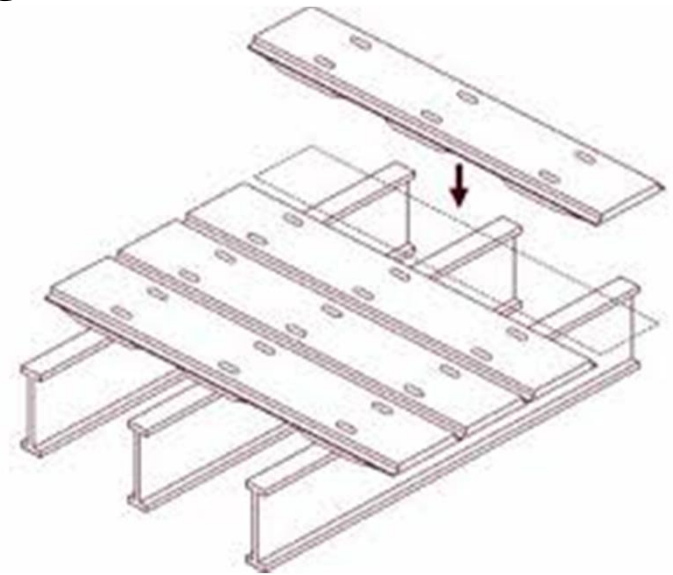


Commonly used on Rail and Water Crossings

27.4 ABC Technologies

■ *Most Common ABC Materials*

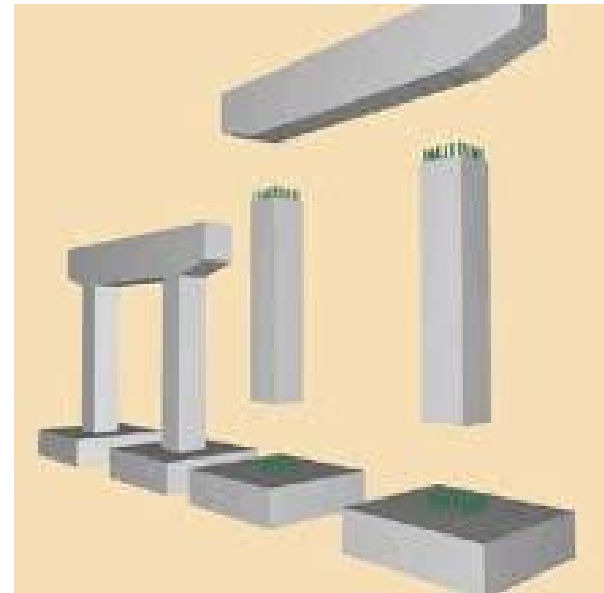
- ☐ *Consider material carefully*
- ☐ *Service life and durability*
- ☐ *Use caution selecting material types not used on Tollway*
- ☐ *Coordinate with Tollway Materials*
- ☐ **Ultra-High Performance Concrete (UHPC)**
 - **Precast Deck Panels**



27.4 ABC Technologies

■ *Most Common ABC Connections*

- ❑ *Limit durability issues*
- ❑ *Simplify details*
- ❑ *Most Common*
 - ***Grouted Splice Couplers***
 - *Concrete Closure Pours*
 - *Traditional Post-Tensioning*
 - *Grouted Post-Tensioning*
 - *Welded Connections*
 - *Bolted Connections*



27.4 ABC Technologies

■ *Most Common Bridge Installation Methods*

□ Self-Propelled Modular
Transporter (SPMT)

□ Lateral Slide-in



27.4 ABC Technologies

■ *Most Common Bridge Installation Methods*

□ Longitudinal Launching

□ Crane Based



Contractor's Means and Methods

Structure Design Manual

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27.5 ABC Project Delivery Methods

■ *Most Commonly used Contract Provisions:*

- ☐ Incentive/Disincentive
- ☐ Lane Rental
- ☐ A+B Bidding

Tollway is planning to develop Special Provisions for several of these methods



Illinois Tollway Supplemental Specifications
to the
Illinois Department of Transportation
Standard Specifications for Road and Bridge
Construction
Adopted April 1, 2016

Issued April 1, 2016

The Illinois State Toll Highway Authority

Structure Design Manual

■ *Section 27.0 Accelerated Bridge Construction*

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27.6 ABC References

■ *Key References*



- Has been promoting, supporting and advancing ABC efforts nationwide

□ **ABC University Transportation Center**

- Experienced and knowledgeable bridge academics and engineers
- Supports research and initiatives to develop ABC



27.6 ABC References

■ *Valuable Websites*

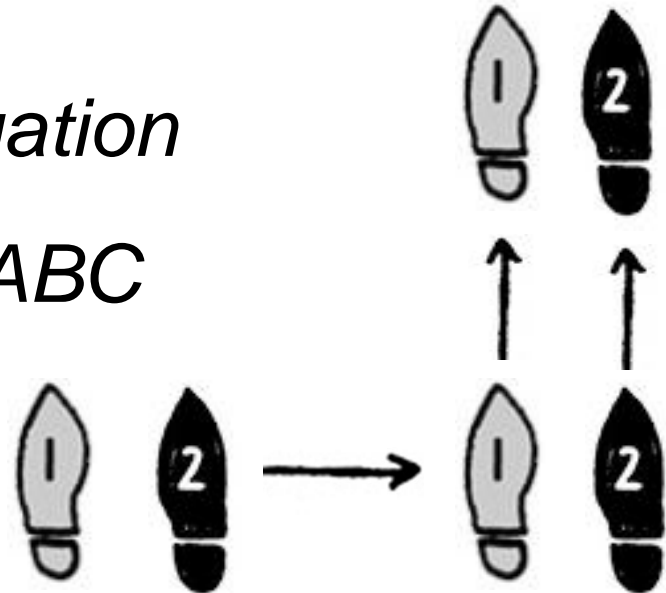
- ☐ Can be used as resources for ABC

■ *Key Publications*

- ☐ Federal Highway Administration (FHWA)
- ☐ Transportation Research Board – Strategic Highway Research Program (TRB-SHRP)
- ☐ National Cooperative Highway Research Program (NCHRP)

Summary

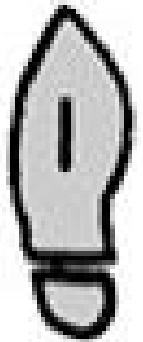
- *Design Bulletin 16-03*
- *Initial release focused on planning and design (**Designer**)*
- *Help Guide Project Evaluation*
- *Decision Framework for ABC*
 - Two Step Process
 - ABC DMT
 - ABC BLCC Tool



Summary

■ *ABC DMT*

- Master Plan or Pre-Conceptual Stage
- Determines if the site and bridge are a good candidate for ABC



■ *ABC BLCC Tool*

- Concept Stage
- Helps compare and eliminate potential ABC technologies based on economic efficiency



Summary

- *DSE to incorporate into all Pre-Concept and Concept contracts under design*
- *Future updates will focus on construction and contract documents (**Contractor**)*
- *Work with Tollway for Contract Packaging*

GOAL = Start with Conventional Construction and try to Prove ABC provides a Benefit

The Future?



Future Goals

- *Incorporate Design Bulletin 16-03 into SDM*
 - No Major Revisions Anticipated
- *Develop Base Sheets and Special Provisions*
- *Incorporate bidding requirements for Bridge Installation Methods*



Future Goals

- *Develop Pilot Projects*
 - Determine cost of ABC projects
 - Lessons Learned
- *Continue to Grow and Develop Policy*
 - Adapt to the industry
 - Update as necessary
 - Evolve





Thank you