The A.B.C.s of Accelerated Bridge Construction Risk Mitigation

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100,000+ Deficient Bridges in the USA

Work Zone Mobility and Safety

ABC Techniques
ABC: Potential Risk Elements

- Contractual
- Management
- Public Relations
- Regulatory
- Site Conditions
- Technical / Executional Risk
- Third-Party
Safety First

- Strategies for Enhancing
  - Worker Safety
  - Public Safety
Contract Language

- Parties understanding obligations and roles in the contract process.
- Ensure all opportunities are explored
Contract Language

- Assign risk to party best able to deal with it
- Contract should address differing site conditions
- Missing Scope / Scope Growth
Management: Equipment

• Equipment failure
• Overruns on equipment. SPMTs expensive
• SPMT availability
• Having tools needed
Management: Procurement

- Availability and quality of Subs / Suppliers
- Delays due to long lead time or delayed deliveries
- Materials performing as intended
- Hitting target cost for precise fabrication – tighter tolerances
Management: Execution

• Timely action
• Good communication and cooperation within team
• Third-party communication and cooperation
• Working through learning curve realities
• Timely completion of incidental work
Management: Personnel

- Availability of quality labor
- Contractor, designer, owner staff
  - Technical ability
  - Partnering ability
  - ABC Experience
  - Knowledge of project history
- Avoiding burnout and errors in judgement.
- Schedule must have flexibility to level resources
Management: Quality

- Strategies for Ensuring Quality
  - Planning and ITP
  - Pre-Activity Meetings
  - Verification Plan
  - Follow-up and CAR program
  - Continuous Improvement
Management: Contingencies

• Establish robust recovery plan
Public Relations: Inconvenience

• Be a good neighbor
• Environmental awareness
• Cultural awareness
Regulatory

- Compliance with MOT guidelines and standards
- Compliance with environmental guidelines and standards
Site Conditions: Access

- Right-of-Way clearances for staging and transit
- Gradation of access
- Pre-condition survey
- Restoration requirements
Site Conditions: Existing Structures

- Existing Structure and Utility conflicts; below ground, aerial, etc
- Structural health of existing structure to support demo loading, transit loading, and new structure.
Site Conditions: Subsurface

- Unknown utilities and/or subsurface conditions
- Soft Ground - not able to support equipment
Site Conditions

- Water Hazards: Tidal, Current, Ground Water
- Unfavorable Weather: Cold, Wind, Heat, Rain
- Technical Execution Parameters: Temperature, etc
- Moisture Sensitive Backfills
- Contingency Paving
ABC Technical Challenges

Design it

Build it

Move it

Place it

Connect it

Keep it Safe / Make it Right

WE 19
ABC Technique: Sliding (Launching, Spinning)

Transverse Slide from:
Temporary Bent to:
Existing or New Abutment

Launch New Bridge through Existing Structure

WE 20
ABC Technique: Segmental
ABC Technique: Heavy Lift

Float in

Self-Propelled Modular Transporter (SPMT)

Prefabricated Substructure
Is There a Code for That?

- Reuse of Existing Elements
- Limit States
- Cracking
- Connections
- Deck Panels

Agree on What Constitutes an Acceptable Outcome Beforehand
Many People in the Process won’t be Familiar with Erection Techniques and Equipment

- Jacks
- Rollers
- SPMTs
- Barges
- Gantries
- Grout Bags
Choose Design Consistent with Erection Method

Seat Abutment Allows Embankment and Abutment to be Completed Before Bridge Slide (or Reuse of Existing Abutment)

Semi-Integral Abutment Requires Backfill and Wing Wall Construction after Slide
Interim Support Conditions

Precast Girders cannot Cantilever Very Far
Deck and Barriers Stopped Short

Post-Tensioned Box Girder can Easily Handle the Cantilever

WE 26
Interaction with Erection Equipment

Open Section is not Stiff Enough to Overcome Friction in SPMTs

Four-Point Control

Box Section is 1,000-times Stiffer in Torsion

Can’t Control Reactions → Must Couple Jacks
Sound and Secure Travel Path

Travel Path Risks:
- Utilities
- Clearance
- Bearing Capacity
- Will there be Enough TIME?!
Delivering Over Existing Bridges

Modules May Need to be Delivered Over Existing Bridges
What are the Allowable Loads? Who is Responsible for Checking?
Temporal and Physical Separation of Workers, Modules and Equipment from Traffic and the Public Generally
Reduced Workers’ Risk
• Exposure to elevated working conditions
• Exposure to traffic
• Better emergency access

Reduced Owner’s Risk
• Shortened MOT period
• Little of no work over traffic

Reduced Contractor’s Risk
• Highly engineered systems
• Total control of bridge farm
• Total control of travel path
Risk Reduction: Maximize Work at Bridge Farm

Delivering Girders Still Presents a Risk

Maximizing Precasting in the Bridge Farm Reduces Interaction with Traffic
Accurate Surveys to Make it Fit

With ABC the Bridge is Built “In the Yard”
The Ability to “Cut to Fit” is Lost

Ye Olde Notice:
No matter how many times I cut it, it was still too short.
Connections Must do More:

- Achieve Final Alignment
- Allow Control of Big Pieces
- Provide for Rapid Load Transfer
Connections

Longitudinal Slab Joint must be made Overnight
ABC Risk Mitigation Strategies

- **Think Safety in all aspects of the process**
- **Assign risk to the party best able to deal with it**
- **Involve the contractor early to identify and mitigate risk**
ABC Risk Mitigations

- Build it “right the first time” mentality
- Be aware of contract provisions
- Support your partner
- Communicate vital information to the public
- Assign experienced team and allow time for planning
- Attack procurement early – watch long lead times.
- Match design with erection method
- Allow for adequate construction tolerances
- Perform adequate site survey – understand conditions
- Develop recovery plans
- Sweat the details
Accelerated Bridge Construction

WE CAN BUILD IT!