A-19 Test Protocol: Lessons Learned, Industry Reconciliation, Owner Protocol & Enforcement

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Section 1: Overview - Large Movement Modular Expansion Joint Systems

- Encapsulated historical timeline of Modular Bridge Joint Systems, (MBJS).
- Evolution of Specifications and Standards.
- Establishing Industry Standards.
- Current State of the Art
Overview: Modular Bridge Expansion Joint Timeline

1970s
North American introduction of MBEJ proprietary technologies

1980s
Beginning of the “Or Equal” era of MBEJ Designs
Market Introduction of aluminum bolt-thru MBEJs

Early 1990s
Owner dissatisfaction
Performance issues with “Or Equal” MBEJs
No industry standards for design or performance

Late 1990s
Advent and introduction of 3rd party MBEJ testing
Recognized need for design standards/ fatigue requirements with NCHRP Report
AASHTO T-2 adopts recommendations of Dr. Dexter based upon industry-wide test protocol

2000-2012
Owners, engineers and manufacturers accept and comply with standards and validation requirements

2012-2015
Increased influence of Design/Build and P3 leads to decreased enforcement and influence of industry and State DOT standards

2015-2016
Proprietary manufacturer design is tested at Lehigh University
Revised test procedures are utilized. Resulting in recommended Section 19 code revisions to accommodate manufacturer.
Overview: Evolution of Specifications & Standards

- Individual Manufacturer’s engage 3rd Party Testing/Field Evaluation of Proprietary Systems

- 1st Life Cycle Performance Testing Conducted in Germany by F. Tschemmernegg in Conjunction with Maurer and Sohn is introduced to U.S. market.

- C.W. Roeder Reported on Field Measurements of Dynamic Wheel Loads On Modular Expansion Joints for Bridges

- Dexter, Kaczinski and Fisher Established Test Protocol and AASHTO T-2 Accepted Industry Standards.
Overview: Primary Modular Bridge Expansion Joint User States

- General Implementation and Acceptance of Original Section 19 Requirements
- Each State Incorporates Unique Design, QC and Specification Requirements
- Name Brand System Approval Listings Frequently Identified in Specifications
Overview: States with Modular Bridge Expansion Joint Specialists

- Interpretation and Reconciliation of Contract and Specification Requirements vs. Submittal Packages

- Empowered to Enforce Contract Requirements: Basis of Approval or Rejection.

- Fluency of Industry Standards, Test Reports and Specification Requirements
Section 2: Stakeholder Responsibilities – Owner, Contractor, MBJS Manufacturer
Stakeholder Responsibilities: Manufacturer

- Comply with Agreed Industry Standards
- Satisfy and Document Industry Adopted Test Requirements
- Design, Testing and Manufacture Shall be the identical Entity
- Maintain industry Standards for Welded joints
- A need for standardization of Bolted Designs to include the following:
  - Edge Distances
  - Spacing
  - Pre-tensioning
  - Visibly Locking connections
Stakeholder Responsibilities: Manufacturer Pre-qualification

Processing Equipment

Fabrication and in-house quality control

Test validation
Stakeholder Responsibilities: Contractor

- Perform “Due Diligence” on Selecting Manufacturer appropriate to Type of Construction, Scope of Work and Schedule Requirements.
- Review Submittal Package with Manufacturer prior to Owner Review for Approval.
- Pre-Installation Meeting to Reconcile MBJS Installation Criteria.
- Agreed Site Inspection Responsibilities for MBJS Installation
- Proper installation of assemblies
Stakeholder Responsibilities: Contractor
A Sampling of the Most Common Installation Deficiencies

- Care must be taken to prevent cantilevering the support boxes at the joint openings
- Joint System is positioned and set to grade
Stakeholder Responsibilities: Contractor
Stakeholder Responsibilities: Owner

- Departmental Expertise in Developing Standards and Practices.
- Review of Manufacturer Submittal Package for Compliance with State or Industry Standards and Practices.
- Equivalent level of 3rd Party Quality Assurance Expertise and Enforcement of welding and bolting requirement.
- Owner to specify Installation Process, including Concrete, Blockout Reinforcement and all manufacturer hardware for proper installation.
- Establish Criteria and Responsibilities for Installation and Oversite.
Stakeholder Responsibilities: Owner
An “All Inclusive” Approach to MBEJ Specification

- PRESTRESS DEVICE FOR ADJUSTING JOINT OPENING TO TEMPERATURE
- HORIZONTAL TAB PLATE WITH THREADED ROD FOR VERTICAL ADJUSTMENT (SET JOINT TO GRADE)
- SHIPPING DEVICE (ADJUSTABLE FOR TEMPERATURE)
- LIFTING DEVICE (PICK POINTS)
Stakeholder Responsibilities: Owner

QC Factory and Jobsite Inspection

Facility and Jobsite Inspection

- Final field Inspection should include proper alignment with no bends or kinks, spacing and soundness of the studs and proper joint lengths
- On-site Grade and Temperature adjustments
- Water testing for final on-site approval

QC Certification

- Manufacturer certification that all material and fabrication procedures are in accordance with requirements of specifications approved shop drawings
- Certification that welding personnel are qualified and certified under AWS QC1 “Standard Qualification and certification of Welding Inspectors”
- Submit copies of 3rd party testing and QC manual
- Document accepted and formalized QC initiative
- Proper AISC Categorization for MBEJ Manufacturers
- Appropriate QC and Assurance, Procedures and Documentation for All Structural Bolted Connections on Applicable MBEJ Systems
Section 3: Standardizing Industry Requirements: LRFD Section 19
Test Protocol
Standardizing Industry Requirements: LRFD Section 19 Test Protocol

- 2016 Manufacturer Specific Recommended Fatigue Testing Shall be Reconciled with 1997 Industry-Wide Standards.
- 2016 Proposed and Adopted LRFD Section 19 Revisions be subject to Industry Peer Review and possible rewrite.
- Test Specimen Preparation, Manufacture, Test Protocol and Procedure be Standardized in accordance with Original NCHRP Project 12-40
- Establish Bolted connection QC/Inspection standards for modular joints.
- Certification of facilities/sub-fabricators.
- Sub-assemblies being tested must be fabricated by the same entity that Manufactures the Fully Assembled MBEJ.
- Industry-Wide Agreement of Manufacturing QC Standards
Section 4: Recommendations – A Path Forward
Recommendations & Outcome

Recommendations

- Establish a committee consisting of industry representatives, T-2 Consultant, and expansion joint experts from specifying DOT’s.
- States should Re-Establish Bridge Expansion Joint Experts.
- Standardization of Submittal Requirements added to Section 19 to include QC requirements and inspection procedures for welded and bolted connections.
- Installation guidelines for contractors
- Sampling and testing protocol
- Approved Manufacturer must solely conduct Fatigue Testing, Fabrication in accordance with Standards.

Outcome

- Industry-driven uniform test standards
- Each MBEJ user state establishes an “expansion joint expert”
- Quality control standards for all pre-approved manufacturers
- Updated standards to include owner, contractor and manufacturer responsibilities
Please feel free to contact us!

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