

**Expansion Joint Guide Specifications**

Specifier Note: The purpose of this guide specification is to assist the specifier in correctly specifying expansion joint products and incorporating quality assurance measures to ensure a successful installation. The specifier needs to edit the guide specifications to fit the needs of specific projects.

Contact an MM Systems Expansion Joint Specialist to assist in appropriate product selections and specification development.

Email Contact: designassist@mm.systems or Phone: 706-824-7500

MM SYSTEMS

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Attn: National Product Specialist

Throughout the guide specification, there are Specifier notes to assist in editing of the file.



To view non-printing **Editor's Notes** that provide guidance for editing, toggle the “Paragraph” button to open and close.

The specifier needs to select project specific requirement where Brackets [ ]; “AND/OR”; and “OR” have been used to indicate when a selection is required.

SPECIFICATION

**Sections 07 95 13.19**

 **Bolt-In Seismic System - BIS Series**

 **(**Low Profile Parking Structure Seismic Expansion Joint System)

# PART 1 – GENERAL

* 1. WORK INCLUDED
1. The work shall consist of furnishing and installing seismic expansion joints in accordance with the details shown on the plans and the requirements of the specifications. The recessed expansion joint base frames that allow a seismic slide plate to remain flush with finished deck surface. A seismic centering device with impact dampers and displacement springs allow the slide plate to displace and return to its natural position after a seismic occurrence. Watertightness is achieved through a flexible fabric reinforced rubber gutter while high density rubber sound dampers provide impact resistance and sound damping.
2. Related Work
* Section 07 91 00 Preformed Joint Seals
* Section 07 95 13.13 Interior Expansion Joint Cover Assemblies
* Section 07 95 13.16 Exterior Expansion Joint Cover Assemblies
* Section 07 95 63 Bridge Expansion Joint Cover Assemblies
	1. DEFINITIONS (specifier can add actual joint gap values in A through E below)
1. Nominal Joint Width – the width of the linear opening based on an average mean temperature of 60 degrees Fahrenheit (15 degrees Celsius).
2. Maximum Thermal Joint Width – widest linear structural joint opening expected for normal thermal contraction of the structure.
3. Maximum Seismic Joint Width – widest linear structural joint opening expected during a seismic event.
4. Minimum Thermal Joint Width – narrowest linear opening expected for normal thermal expansion of the structure.
5. Minimum Seismic Joint Width – narrowest linear opening expected during a seismic event without damaging the structure.
6. Total Movement Capability – value obtained from the difference between the widest and narrowest joint opening expressed in inches (or millimeters).
7. Lateral Shear – Movement horizontally and parallel to the expansion joint.
8. Vertical Displacement – Movement vertically and parallel to the expansion joint.
9. Fatigue Load – Defined level of load under which joint assembly remains elastic and fully functional, including all noise mitigation components during thermal cycling.
10. Service Load – Defined level of load under which joint assembly remains elastic and fully functional during seismic cycling.
11. Collapse Load – Defined level of load under which joint assembly remains capable of bridging the gap, although plates may yield, and components may break.
	1. ACTION SUBMITTALS
12. Placement drawings – include line diagrams showing plans, elevations, sections details, splices, blockout requirements, entire run of each joint system and attachment to respective substrates.
13. product data – include product details, maintenance and cleaning instructions, Safety Data Sheets, and LEED documentation.
14. Listings and Certifications – submit for all Fire Rated conditions validated through Independent Third-Party Testing Agency.
15. Samples – submit virtual three-dimensional samples demonstrating expansion joint movement and its functioning components thereby fostering an eco-friendly alternative that supports with US Green Building Council initiatives. (three-dimensional Virtual Expansion Joint Samples reduce the carbon footprint compared to physical product samples that often end up in a landfill)
16. Recycled Content – provide product data for recycled content indicating post-consume and pre-consumer recycled content.
17. Independent Third-party Analysis – submit independent analysis from a licensed professional engineer in State of [list state] confirming compliance with the following: (professional engineer should be licensed in the state where the project is located)

VEHICULAR TRAFFIC LOAD

1. Passenger vehicle vertical wheel fatigue load of 2250 lbs., a service load of 3000 lbs., and a collapse load of 4500 lbs. based on a concentrated tire area of 6.0” by 6.0”. (4.5” x 4.5” standard is based on car jack stand on a concrete deck which was never assumed to be located directly over the cover plate)
2. Minimum horizontal force equal to 20% of the maximum vertical wheel load applied in combination with the vertical service and fatigue loads to account for vehicle deceleration and acceleration effects.
3. Minimum additional vertical load factor of 1.3 allows for dynamic, vibratory and impact effects.
4. Designed for passenger vehicles traveling at 5-7 mph sustained speeds in a parking garage.
5. Seismic slide plate cover system shall remain within the elastic range under service and fatigue level loading conditions.
6. Maximum cover plate vertical deflection is limited to 0.070” under service loading and 0.035” under fatigue loading at maximum opening width, excluding seismic. Seismic slide plate system is allowed to become inelastic for maximum joint opening, including seismic movement under all loading conditions. The system is designed such that the slide plate remains in place and viable during and after a seismic event.
7. All stresses related to fatigue resistance and endurance limits are within the design limit criteria of the seismic slide plate expansion joint system.

## Quality AssurancE

1. Pre-construction Meeting – the General Contractor, Engineer/Architect, Concrete Subcontractor, Manufacturer’s Representative and Certified Contractor, will conduct a pre-construction meeting to discuss blockout construction, joint gap settings, concrete elevations, flatness (critical) and construction phasing. This meeting shall be held prior to any con­crete placement at expansion joint blockouts and may be held in conjunction with the concrete pre-pour meeting.
2. Joint Opening Adjustment – the concrete contractor shall contact the Engineer of Record to confirm the nominal joint opening adjustment requirements on each day of concrete placement. (Best practice is to incorporate a temperature adjustment table on the contract drawings. This will assist the concrete subcontractor to properly set the structural joint opening at time of concrete pour. Joint openings should be calculated and dsiplayed in five [5ºF] degree increments based on a temperature range of -20ºF to 120ºF [adjust for project].
3. EXPANSION JOINT BLOCKOUTS – vibrate all formwork then float and trowel concrete before final cure to remove all air pockets, voids and spalls. All concrete substrate deviations and deficiencies shall be repaired with a structural repair material approved for use with expansion joints by the repair material manufacturer in writing. Submit to the engineer of record for approval. (95% of all new construction concrete blockouts require remediation which is why this is a key to long term performance)Non-complaint blockouts shall be considered major defects.
4. CONCRETE WASH - elevations two feet out on each side of the expansion joint shall be elevated above the finished deck surface thereby creating a downward slope allowing water to flow away from the expansion joint. (best practice design incorporates an elevated concrete wash with a downward slope ensuring water drains away from the expansion joint and doubles as a speed bump thereby extending the service life).
5. Pre-installation Inspection – the General Contractor, Engineer, Architect, Manufacturer’s Representative and Certified Installer, will conduct a pre-installation project site inspection. The General Contractor shall provide a field report that summarizes the project conditions and any remedial action necessary to correct field conditions (substrate, joint size, non-parallel sidewalls, vertical offsets, etc.) that may affect expansion joint system performance.
6. Service Condition – Installation Contractor to ensure that anticipated service conditions (loads, type of traffic, movement, vertical offsets, etc) specified for this project are clearly defined and communicated to the manufacturer prior to start of product manufacturing.
7. PRODUCT HISTORY – submit product history consisting of successful performance of five (5) installations in place over the previous five (5) years under similar project loads, traffic frequency, footprints, and joint sizes. Installations shall have experienced at least moderate levels of traffic.
8. EXPERIENCE – a factory trained, and “certified” installation contractor shall install the specified expansion joint systems. The installation contractor shall provide proof of certification from manufacturer and proof of participation in manufacturer’s continuing education program.
9. Mockups – build one mockup for each expansion joint style as specified herein to demonstrate aesthetic standards and to set quality standards for materials and execution. Minimum 10-feet for each. Approval of mockups does not constitute acceptance of deviations. Use step-by-step layering method thereby exposing individual components to establish the quality standard for specific joint type installation. Subject to compliance items listed below, approved mockup may become part of completed work. (Mockups should remain in place until the end of the project to allow installers to reference proper concrete preparation, proper joint opening dimensions, and acceptable tolerances)
10. Inspect representative areas of Work and discuss condition of substrate, and other preparatory work performed by other trades.
11. Review Contract Document requirements and approved submittals.
12. Review inspection and testing requirements.
13. Evaluate environmental conditions and procedures for managing unfavorable site conditions.
14. Resolve deviations or differences between existing site conditions, Contract Documents, and the Manufacturer's Specifications.
15. General Contractor to document deviations and remediation agreements and then prepare and issue a Quality Assurance Field Report to all parties.

(proper training is the key to the process of understanding minimum substrate standards for a proper expansion joint installation)

## COORDINATION

##  (Expansion joints are typically one of the last purchases on a construction project. However, proper joint opening construction is one of the first quality control items on a project. By selecting the expansion joint manufacturer at the beginning of the project the necessary quality assurance measures can be implemented in a timely manner.)

1. General Contractor shall award expansion joint contract prior to concrete substrate placement to allow quality control coordination as described in section 1.04.
2. Schedule for work in this section shall be planned to allow sufficient time for submittals to be approved and timely production and delivery by manufacturer.
3. General Contractor to coordinate installation of products and systems with interfacing and adjoining construction to provide a suitable and quality installation.
4. Installation Contractor working with the General Contractor shall ensure project vehicular and equipment load requirements are communicated to the expansion joint manufacturer prior to production.

## PRODUCT Delivery, Storage, and Handling

* 1. Deliver products to site in manufacturer’s original, unopened, labeled containers and store under cover in a dry location until installed.
	2. Inspect materials upon arrival. Notify manufacturer within two business days of any damage caused during delivery and handling.
	3. Store components in original containers off the ground in a clean and dry location. Ensure temperature or moisture sensitive components are stored in a tempered location.
	4. General Contractor to provide protective covering on all installed finished surfaces. Protection is required to guard against damage during construction.

## WARRANTY

1. The Manufacturer and Certified Installer jointly warrant to the Owner that the expansion joint system shall be free from manufacturing, material, and installation defects for a period of one (1) year from the date of installation, based on specified movements and design conditions and when installed in accordance with manufacturer’s guidelines and recommendations. The General Contractor assumes responsibility for deficiencies due to concrete and substrate defects.

(longer warranties are available on a project by project basis – contact MM Systems)

## PART 2 – PRODUCT

* 1. MANUFACTURER
1. Furnish and install expansion joints as noted herein and as indicated on the contract drawings as manufactured by MM Systems, 50 MM Way, Pendergrass, GA, 30567 Phone 706.824.7500 / www.designassist@mm.systems / Web [www.mm.systems](http://www.mm.systems)
2. Basis of Design (Product Standard) – the contract documents are based on project specific designs by MM Systems as specified to establish a standard of quality. Other manufacturers offering products having equivalent characteristics may be considered for future projects but will not be considered for this project due to insufficient product evaluation time.
3. Single Source Limitations – obtain all expansion joints from single manufacturer. (single source responsibility provides essential coordination of loading, waterproofing and life safety fireproofing requirements)

* 1. GENERAL
1. Furnish MM Systems BIS Series Bolt-In Seismic Expansion Joint System with the following required design features:
	1. THERMAL MOVEMENT - capable of accommodating +/-2 inches of thermal expansion and contraction.
	2. SEISMIC MOVEMENT - capable of accommodating +/-50% accelerated seismic multidirectional movement without stress to system components.
	3. DIFFERENTIAL vertical displacement - minimum of 1/2-inch required.
	4. SLIDE PLATE COVERS – cover plate width and thickness engineered to accommodate both seismic movement and vehicular impact loads. Cover must be able to displace and return to its natural position after a seismic occurrence.
	5. SAFE WALKING SURFACE – provide slip resistant walking surface in conformance with ADA Guidelines and ASTM-F1637 Standard Practice for Safe Walking Surfaces.
	6. Seismic Centering Bar – shall have solid aluminum spherical ball ends that lock, slide, and rotate freely in the base frame. A stainless-steel bolt shall connect the cover plate through a rubber impact damper secured by a coil tension spring. Spacing shall be no greater than 18 inches on center.
	7. Rubber sound dampers – provide in base frame to prevent metal to metal vibration.
	8. LokCrete elastomeric concrete – (recommended) edge void material required to structurally secure base frame to concrete deck.
	9. Rubber Gutter – continuous fabric reinforced 60-mil EPDM rubber adhered to concrete deck with Microwaterseal waterproofing adhesive and secured with the aluminum base frame.
	10. Microwaterseal Tape – provide waterproofing mastic to create a watertight seal between the concrete deck and the rubber gutter.
	11. FLEXIBLE Drain Tube Assemblies – allows excess moisture and water to drain from the rubber gutter system. Space apart at a maximum of 50 feet.
	12. Slide Plate Cover Connectors – metal splice plate connectors shall adjoin the butt connection between slide plate covers and slip plate connectors shall be spaced no greater than 50 feet apart to the underside of the slide plate covers to allow thermal volume change forces along the length of the expansion joint system.

(Historically, 80% of joint sizing problems are a result of the lack of coordination during the initial construction of the structural joint opening. The ideal time to measure the joint opening is at the coldest temperature when the joint is at its widest point. Confirming the as-built dimensions will allow for proper sizing of the expansion joint assembly.)

* 1. Components and Materials

(Elastoprene is a theromplastic rubber with specailly formulated additives providing enhanced elasticity and UV resistance)

1. Aluminum Extrusions - Material to conform to properties of ASTM B221, alloys 6063-T5, 6005A-T6, 6061-T6.
2. Aluminum Plate – ASTM B209, alloys 6061-T6, 5052-H32.
3. Rubber Gutter – Flexible EPDM Rubber, Class I, ASTM D4637, 60 mils (minimum).
4. Fasteners – provide manufacturer’s recommended fasteners required for assembly and installation designed to withstand design loads.
5. Accessories - provide necessary assembly hardware required for complete installation.
	1. Life Safety – Fire Barrier Systems (as required)
6. Provide PyroFlex Fire Barrier Systems (PF Series), as manufactured by MM Systems. Supply fire-resistive barrier systems that have ratings equal to or greater than the rating of adjacent construction when tested in accordance with ASTM E1966 and ASTM E119. Provide specified (2, 3 or 4 hour) rated fire barrier expansion joint assembly.
7. Designed for specified dynamic structural movement without material degradation or fatigue when tested according to ASTM E 1399. Tested in maximum joint width condition with a simulated field splice.
8. Fire Barrier System shall have been tested to the maximum joint opening as defined by ASTM E1399 which meets or exceeds the maximum joint opening required by the project design requirements.
9. Tested and listed by a nationally accredited independent testing laboratory in accordance with UL 2079, or ASTM E1966. Include hose stream test where applicable.
	1. Fabrication
10. Metal Frames and Plates – extruded base frames shall be shipped in standard 10 foot lengths and slide plate covers shall be shipped in longest available lengths. All profiles shall be cut to length at jobsite and miter cut where required in the field to conform to directional changes.
11. Rubber Gutter – shall be shipped in the longest practical continuous length in manufacturer’s standard shipping carton. Microwaterseal Waterproofing Tape supplied in 50-foot rolls.
12. LokCrete Elastomeric Concrete – ship in manufacturer’s approved containers shrink wrapped on wooden pallets.
13. Wall Mount (slab-to-wall condition) – aluminum ball and socket extrusions shall be shipped in standard 10 ft. lengths and shall be cut to length on jobsite where required.
14. Fire Barriers (if required) – Ship manufacturer’s standard assembly for the required hourly rating with ends prepared for field splicing. Assemblies shall be miter cut in the field to accommodate changes in direction.
15. Aluminum Base Frame - ship in standard 10 ft. lengths and cut to length at jobsite as required. All profiles shall be field miter cut to conform to directional changes unless otherwise contracted with expansion joint manufacturer. All anchor holes shall be field drilled in accordance with manufacturer’s drawings. Spacing shall be a maximum of 18” o.c.
	1. Finishes
16. Aluminum Slide Plates - top surface of aluminum slide plate shall have slip-resistant raised pattern profile and standard mill finish.
17. Aluminum base frames shall be supplied in standard mill finish.
18. Recessed Extension Plates shall be standard mill finish.
19. LokCrete Elastomeric Concrete (as required) - shall be supplied in standard black.

## PART 3 – EXECUTION

* 1. Installation
1. Preparation of the Work Area
2. The contractor shall provide properly formed concrete blockouts and expansion joint openings constructed to the exact dimensions and elevations shown on manufacturer’s standard system drawings or as shown on the contract drawings. Deviations from these dimensions will not be allowed without the written consent from the engineer of record.
3. Actual field conditions of existing expansion joint blockouts may be deeper and wider than the proposed new expansion joint system as detailed on the contract drawings. Blockout size shall be corrected by filling it with an approved structural concrete patching material or elastomeric concrete. When blockout size is smaller it shall be made larger by saw cutting. Shimming is not allowed.
4. The base of the blockout recess must be formed level and at the same elevation across the joint. Any edge or area in need of repair shall utilize structural concrete repair materials approved by the engineer of record.
5. Elevations on each side of the structural expansion joint opening shall be identical.
6. The finished concrete deck two feet out on each side of the expansion joint opening shall be elevated sufficiently to create a concrete wash with a downward slope ensuring water drains away from the expansion joint. (best practice design incorporates an elevated concrete wash with a downward slope ensuring water drains away from the expansion joint and doubles as a speed bump thereby extending the service life).
7. Install expansion joint system in strict accordance with the manufacturer's typical details and instructions along with the advice of their qualified representative. Top deck installations require all aluminum frames to be sealed with a silicone sealant. Refer to Manufacturers Installation Guide for step-by-step installation instructions.
8. Elastomeric Concrete Blockout Filler Installation
9. The contractor shall clean the concrete blockout of all contaminants by abrasive blasting immediately prior to installation of expansion joint system. Concrete form release agents, water repellents, laitance, surface dirt, rust, old sealants and other surface treatments and protective coatings must be removed from the blockout substrate surface in order to obtain the proper elastomeric concrete bond.
10. Do not install elastomeric concrete until the concrete has been air-dried at temperatures at or above 45 degrees F. for a minimum of 28 days. The concrete must have a measured moisture content that is below 4 percent. The blockout area must be completely dry prior to placement of the elastomeric concrete. Blockouts requiring the use of structural repair materials must be cured for 72 hours. Blow out the area thoroughly using compressed air.

(contact MM for link to Install Videos and / or for date of the next Contractor Certification College where specifiers and installers are welcome to attend)

* 1. Clean and Protect
1. Protect the system and its components during construction by work from other trades.
2. Where required, install temporary protection over joints.
3. Do not remove protective coverings until work in adjacent areas is complete.
4. Prior to project closeout, clean exposed surfaces with a suitable cleaner that will not harm or attack the finish of the concrete or system.

END OF SECTION