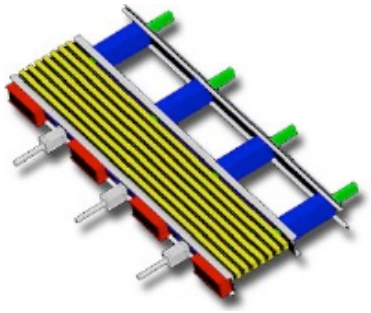
Wabo®XCel Modular

Multidirectional Large Movement Expansion Joint System

Features	Benefits
• Multidirectional movement	Unique separation of transverse and longitudinal movements
• Equidistance mechanism	New design controls spacing through the entire movement and velocity range expected in multidirectional environments
• Support system	Utilizes proven centerbeam/support bar load path configuration

DESCRIPTION:

The Wabo®XCel Modular is an expansion joint specifically designed to accommodate structural movements in all directions, repeatedly and reliably. The Wabo®XCel Modular is the product of a four-year research and development program, during which full scale performance tests were run at the University of California at Berkeley PEER Center. The test program isolated critical components and functions essential to successful long term multi-movement performance. Designed to smoothly handle the tens of millions of multi-directional movements imposed by flexible structures, the Wabo®XCel Modular has undergone successful multi-movement testing at speeds ranging from 1 to 60 inches per second, as well as numerous seismic simulations, with no observed damage. Though most conventional modular designs have some small limited transverse movement capability, they are generally unable to accommodate joint eccentricities in a high impact fatigue environment without displaying significant decreases in system reliability.



The increased robustness and functionality of the Wabo®XCel Modular allows the structure to translate and rotate freely in all directions without inducing additional stress to expansion joint components. The fast response of the XCel results in, for the first time, a modular joint that glides damage free with a structure's faster movement demands, such as those due to seismic, live loads, and wind loading.

The Wabo®XCel modular is a single support bar system consisting of vehicular load bearing centerbeams yoked onto support bars. The system is equipped with a positive control equidistance system, ensuring quick response times and increased equidistance component reliability. Seals fitted to tightly held steel lug tolerance housings are utilized in order to increase the integrity and reliability of the watertight seal system.

RECOMMENDED FOR:

- Important bridges required to provide secondary life safety
- Structures designated by a local emergency plan as critical
- Segmental, suspension, and long-span bridges
- Offshore structures
- Flexible structures requiring a high level of reliability
- Seismic movements

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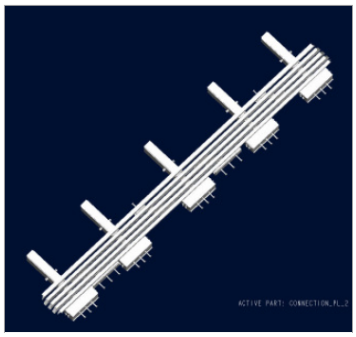
TECHNICAL DATA:

Multidirectional Movement Capability

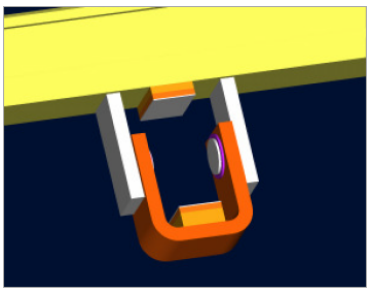
The Wabo®XCel modular is unique in its separation of movements. The transverse box accommodates transverse movement of the structure while longitudinal movements are accommodated within the longitudinal box. This movement separation reduces component demands, simplifying component design and increasing reliability.



Longitudinal (top) and transverse (bottom) boxes

Equidistance Mechanism (EM)

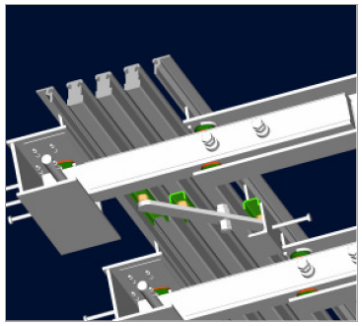
The Wabo®XCel is equipped with a positive control equidistance mechanism. Testing highlighted the limitations of spring based equidistance mechanisms in multi-movement environments. Among them included inadequate response times, sensitivity to yoke friction, component damage due to misalignment during joint eccentricity, failure chain reliability, and increased system fatigue stress ranges. The Wabo®XCel Modular EM overcomes these limitations, controlling spacing smoothly throughout the entire movement and velocity range expected in any multi-movement environment.



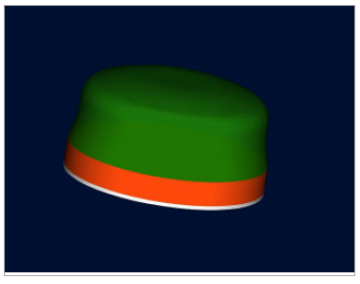
Yoke designed for increased reliability

Support System

The Wabo®XCel Modular is designed with the same center beam/support bar load path configuration that has proven itself successful in the field for decades in standard single support bar designs. Yokes have been designed to reduce centerbeam and yoke fatigue stresses, increase vehicular impact absorption, and provide a tighter more stable centerbeam to support bar connection. Modified support bearings allow for better vehicular impact absorption, allowing for stress free joint movements even at high speeds. Unlike standard modular bearings, XCel bearings have been designed and tested to perform under high rotations in a fatigue setting. For example, XCel bearings were selected for use on the Manhattan Bridge, where millions of large scale rotational cycles due to live load are expected.



Underside of the Wabo®XCel system, yokes hidden for clarity



Wabo®XCel high rotation bearing

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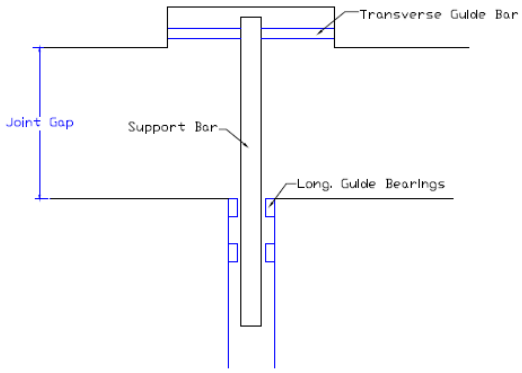
TECHNICAL DATA:

Fatigue Testing

The Wabo®XCel Modular successfully completed its fatigue testing in accordance with NCHRP-402.

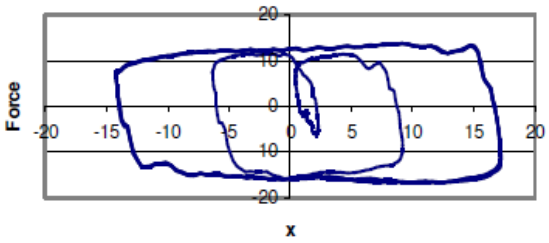
Separation of Movement

The separation of movement concept employed by the Wabo®XCel Modular system is illustrated to the right.



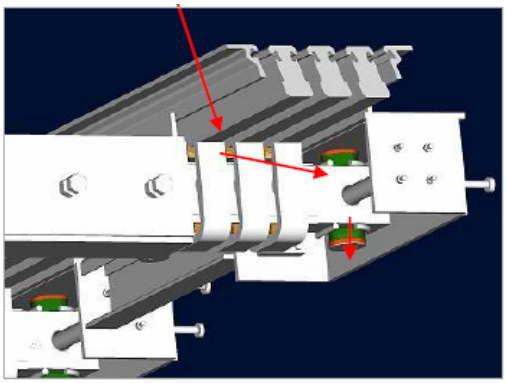
Seismic Test Results

Constant force versus displacement relationship ensures excessive force will not be transferred to the structure.



Load Path

Although the vehicular load path component types and materials remain the same as standard modulars, load path reliability is increased through the use of increased sections and high durability bearings. Load path is shown on the right with red arrows, support box bottoms not shown for clarity.



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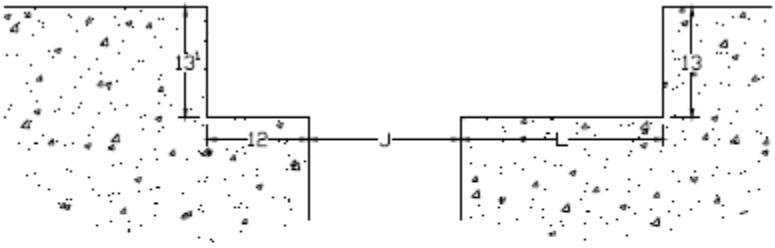
Blockout Data

"N" seals, "L" inches for common sizes. Column argument "SD" is service displacement (e.g. thermal, creep, etc.), Row argument "AD" is added displacement (seismic, margin, extreme event, etc.)



AD/SD	3	6	9	12	15	18	21	24
0	01, 18	02, 21	03, 24	04, 27	05, 30	06, 33	07, 36	08, 39
2	02, 20	03, 23	04, 26	05, 29	06, 32	07, 35	08, 38	09, 41
4	02, 22	03, 25	04, 28	05, 31	06, 34	07, 37	08, 40	09, 43
6	02, 24	03, 27	04, 30	05, 33	06, 36	07, 39	08, 42	09, 45
8	03, 26	04, 29	05, 32	06, 35	07, 38	08, 41	09, 44	10, 48
10	03, 28	04, 31	05, 34	06, 37	07, 40	08, 43	09, 46	10, 50
12	03, 30	04, 33	05, 36	06, 39	07, 42	08, 45	09, 48	10, 52
14	04, 32	05, 35	06, 38	07, 41	08, 44	09, 47	10, 51	11, 55
16	04, 34	05, 37	06, 40	07, 43	08, 46	09, 50	10, 53	11, 57
18	05, 36	05, 39	06, 42	07, 45	08, 48	09, 52	10, 55	11, 59
20	05, 38	06, 41	07, 44	08, 47	09, 51	10, 54	11, 58	12, 62
22	05, 40	06, 43	07, 46	08, 49	09, 53	10, 57	11, 60	12, 64
24	06, 42	06, 45	07, 48	08, 51	09, 55	10, 59	11, 63	12, 66

FOR BEST RESULTS:

- Install when concrete substrate is clean, sound, dry, and cured (14 day minimum).
- Do not allow any of the components to freeze prior to installation. Store all components out of direct sunlight in a clean, dry location between 50˚F and 90˚F.
- Shelf life of chemical components is 1 year.
- Periodically inspect the installed system and repair localized areas as needed. Consult a Watson Bowman Acme representative for additional information.
- Make certain the most current version of the product data sheet is being used. Please consult the website (www.watsonbowmanacme.com) or contact a customer service representative.
- Proper application is the responsibility of the user. Field visits by Watson Bowman Acme personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the jobsite.

RELATED DOCUMENTS:

Suggested additional requirements to standard modular specifications for multi-movement modulars are listed below. Please see a WBA representative for further details.

- Designed per AASHTO LRFD 2004
- Full scale system fatigue tests per NCHRP-402
- Component tests per NCHRP-467
- Full scale multi-movement dynamic prototype testing
- Prior multi-movement modular installations

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