TECTONUS
RESILIENT SEISMIC SOLUTIONS

DMAX
Seismic Brace

DMAX INTRODUCTION & DESIGN GUIDE

DECREASE DEMAND
MAXIMIZE SAVINGS

With high damping and low overstrength, DMAX braces allow engineers to reduce structural actions by up to 50%, unlocking significant cost savings in structure and foundations, and creating more usable space. Ultimately DMAX provides a stronger, safer and more efficient building to the delight of owner and occupier.

Application

- Can be used in any braced frame building – BRB, EBF, CBF
- Straight swap for a BRB in terms of performance (drift etc)
- Quoted and supplied as a full-length brace, pin to pin.

Advantages

- High damping ~50%
- Low overstrength – 1.15
- No yielding elements
- Comparable price to leading BRB suppliers.

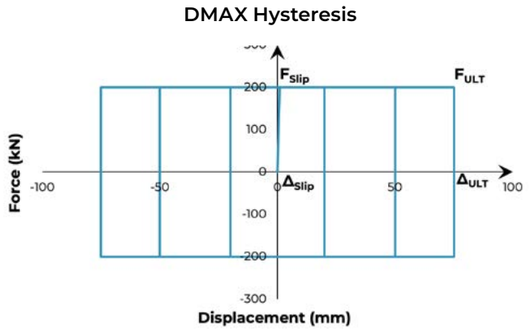
CUSTOMER TESTIMONIAL

“The system’s high effective damping and lower overstrength factor have allowed us to achieve significant cost savings across the entire lateral system, including braces, columns, diaphragms, and foundations.”

Nathan Watson, Director – DHC Structural + Civil

STRAIGHT SWAP FOR A BRB, EBF OR CBF

- E-P-P (Elastic-Perfectly-Plastic) hysteretic performance
- Highest possible damping ratio
- Proprietary material on friction surfaces
- Individually performance tested
- No maintenance required
- No replacement post-event as there will be no damage to the brace.



DMAX vs Other Bracing Systems

The following table shows the impact of ductility and overstrength on the structural actions for different bracing systems. It assumes the same overall structural performance (in terms of response drifts, accelerations etc) and that DMAX ductility has been maximized via non-linear time history analysis.

CASE	DESIGN WITH BRBs	DESIGN WITH EBFs	DESIGN WITH DMAX BRACES
Brace capacity (kN)	1000	1000	750
Overstrength factor for Capacity Design	1.6 to 2.5 (case by case)	1.4 to 1.7 (case by case)	1.15 (all the time)
Force demand in the capacity protected element (kN)	1000*1.6 = 1600 (min.)	1000*1.4 = 1400 (min.)	750*1.15 = 863

OSHPD/HCAI TESTING

Location: ATLSS Engineering Research Center, Lehigh University, PA, USA.

Tectonus DMAX is on track to be the first friction based damper to meet stringent HCAI protocols.

To be used in California hospitals, seismic devices must be tested according to HCAI (formerly OSHPD) protocols which are widely regarded as the most stringent tests in the USA.

Funded by the client and overseen by Degenkolb engineers, the test programme was carried out at Lehigh University between July '24 and Feb '25. Twenty prototypes ranging from 40 to 180 kips (178 to 801kN) were tested in three phases. The loading phase of the testing was only started when the damper temperature was within 70 ±5°F.

The number and amplitudes of the cycles are detailed as follows:

Dynamic loading phase

- 10 cycles at 20% of the maximum displacement +/- 1.1" (+/- 27 mm)
- 5 cycles at 40% of the maximum displacement +/- 2.1" (+/- 53 mm)
- 3 cycles at 80% of the maximum displacement +/- 4.2" (+/- 106 mm)

Stroke verification phase

- 3 cycles at 100% of the maximum displacement +/- 5.3" (+/- 133 mm)

Wind loading phase

- 2000 cycles at 70% of the specified slip resistance

The dynamic and wind loading phases were conducted at a frequency of 0.65 Hz.

Unique dynamic performance with a tolerance lower than +/-15% tested at Lehigh Structures lab, US

ASCE07-16 TESTING

Location: Auckland University of Technology Structures Lab, Auckland, New Zealand.

DMAX demonstrates stable performance and velocity independence.

The lateral stability of the new generation DMAX brace is provided by an external jacket as a robust anti-buckling mechanism. This results in less steel, a slimmer profile and lower overall brace cost (patent pending).

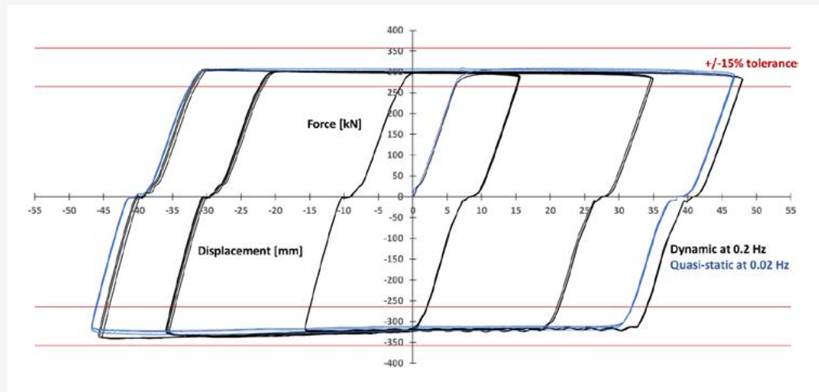
To demonstrate the dynamic performance of Tectonus DMAX brace, a full-scale testing has been conducted at the Structures Lab of the Auckland University of Technology using a MTS dynamic actuator.

The loading protocol was specified as per ASCE07-16 providing a rigorous testing regime (at the frequency of 0.2Hz).

The number and amplitudes of the loading cycles were:

- 10 cycles at +/-17mm **(37.5% of the maximum displacement)**
- 5 cycles at +/-34mm **(75%)**
- 3 cycles at +/-45mm **(100%)**

Consistent dynamic performance of Tectonus DMAX brace showing tolerance lower than +/-15% as well as velocity independence when compared to quasi-static testing (as per ASCE 7 requirements)



DMAX BRACE INFORMATION

METRIC

PRODUCT CODE	CAPACITY	DISPLACEMENT RANGE	Brace approx. steel hollow section for different lengths (mm)			
	kN	mm	**4.0m-6.0m**	**6.0m-8.0m**	**8.0m-10.0m**	**10.0m-12.0m**
DMAX-100	50 to 100	± 25 to 250	100x100	—	—	—
DMAX-150	100 to 150	± 25 to 250	115x115	125x125	—	—
DMAX-200	150 to 200	± 25 to 250	130x130	140x140	150x150	—
DMAX-250	200 to 250	± 25 to 250	145x145	155x155	165x165	180x180
DMAX-300	250 to 300	± 25 to 250	160x160	170x170	185x185	195x195
DMAX-400	300 to 400	± 25 to 250	180x180	195x195	205x205	220x220
DMAX-500	400 to 500	± 25 to 250	200x200	215x215	230x230	245x245
DMAX-600	500 to 600	± 25 to 250	220x220	235x235	250x250	270x270
DMAX-800	600 to 800	± 25 to 250	240x240	260x260	275x275	295x295
DMAX-1000	800 to 1000	± 25 to 250	260x260	280x280	300x300	320x320
DMAX-1200	1000 to 1200	± 25 to 250	280x280	300x300	325x325	345x345
DMAX-1500	1200 to 1500	± 25 to 250	305x305	330x330	350x350	375x375
DMAX-2000	1500 to 2000	± 25 to 250	330x330	355x355	380x380	405x405
DMAX-2500	2000 to 2500	± 25 to 250	360x360	390x390	415x415	445x445
DMAX-3000	2500 to 3000	± 25 to 250	390x390	420x420	450x450	480x480
DMAX-3500	3000 to 3500	± 25 to 250	420x420	450x450	485x485	515x515
DMAX-4000	3500 to 4000	± 25 to 250	450x450	485x485	520x520	555x555
DMAX-4500	4000 to 4500	± 25 to 250	500x500	540x540	575x575	615x615
DMAX-5500	4500 to 5500	± 25 to 250	—	590x590	635x635	675x675
DMAX-6500	5500 to 6500	± 25 to 250	—	—	690x690	740x740
DMAX-7500	6500 to 7500	± 25 to 250	—	—	—	800x800

IMPERIAL

PRODUCT CODE	CAPACITY	DISPLACEMENT RANGE	Brace approx. steel hollow section for different lengths (in)			
	kips	in	**13ft-20ft**	**20ft-26ft**	**26ft-33ft**	**33ft-39ft**
DMAX-100	11 to 22	± 1 to 10	3.9x3.9	—	—	—
DMAX-150	22 to 34	± 1 to 10	4.5x4.5	4.9x4.9	—	—
DMAX-200	34 to 45	± 1 to 10	5.1x5.1	5.5x5.5	5.9x5.9	—
DMAX-250	45 to 56	± 1 to 10	5.7x5.7	6.1x6.1	6.5x6.5	7.1x7.1
DMAX-300	56 to 67	± 1 to 10	6.3x6.3	6.7x6.7	7.3x7.3	7.7x7.7
DMAX-400	67 to 90	± 1 to 10	7.1x7.1	7.7x7.7	8.1x8.1	8.7x8.7
DMAX-500	90 to 112	± 1 to 10	7.9x7.9	8.5x8.5	9.1x9.1	9.6x9.6
DMAX-600	112 to 135	± 1 to 10	8.7x8.7	9.3x9.3	9.8x9.8	10.6x10.6
DMAX-800	135 to 180	± 1 to 10	9.4x9.4	10.2x10.2	10.8x10.8	11.6x11.6
DMAX-1000	180 to 225	± 1 to 10	10.2x10.2	11.0x11.0	11.8x11.8	12.6x12.6
DMAX-1200	225 to 270	± 1 to 10	11.0x11.0	11.8x11.8	12.8x12.8	13.6x13.6
DMAX-1500	270 to 337	± 1 to 10	12.0x12.0	13.0x13.0	13.8x13.8	14.8x14.8
DMAX-2000	337 to 450	± 1 to 10	13.0x13.0	14.0x14.0	15.0x15.0	15.9x15.9
DMAX-2500	450 to 562	± 1 to 10	14.2x14.2	15.4x15.4	16.3x16.3	17.5x17.5
DMAX-3000	562 to 674	± 1 to 10	15.4x15.4	16.5x16.5	17.7x17.7	18.9x18.9
DMAX-3500	674 to 787	± 1 to 10	16.5x16.5	17.7x17.7	19.1x19.1	20.3x20.3
DMAX-4000	787 to 899	± 1 to 10	17.7x17.7	19.1x19.1	20.5x20.5	21.0x21.9
DMAX-4500	899 to 1012	± 1 to 10	19.7x19.7	21.3x21.3	22.6x22.6	24.2x24.2
DMAX-5500	1012 to 1236	± 1 to 10	—	23.2x23.2	25.0x25.0	26.6x26.6
DMAX-6500	1236 to 1461	± 1 to 10	—	—	27.2x27.2	29.1x29.1
DMAX-7500	1461 to 1686	± 1 to 10	—	—	—	31.5x31.5

DESIGN GUIDANCE

To assess project feasibility, replace the BRB or other bracing element and use the following DMAX factors:

	USA	CANADA	NEW ZEALAND
Ductility	8 (R)	4.8 (R_dR_o)	3.5 (μ)
Overstrength	1.15	1.15	1.15

Further modelling and analysis can be done to quantify the impact of increased ductility.

How to model in ETABS, SAP2000 and PERFORM3D

- ETABS and SAP2000, use ‘Plastic-Wen’ Link element
- PERFORM3D, use ‘Inelastic Bar’ element with E-P-P properties

ETABS SAP2000 Perform 3D

CUSTOMER TESTIMONIAL

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We found Tectonus very knowledgeable and supportive throughout the process. These guys are easy to collaborate with, and they talk the same ‘’seismic expert’’ language with TEKTON.

Ioannis Prionas, CEO – TEKTON Consulting Engineers

DELIVERY

Production Testing

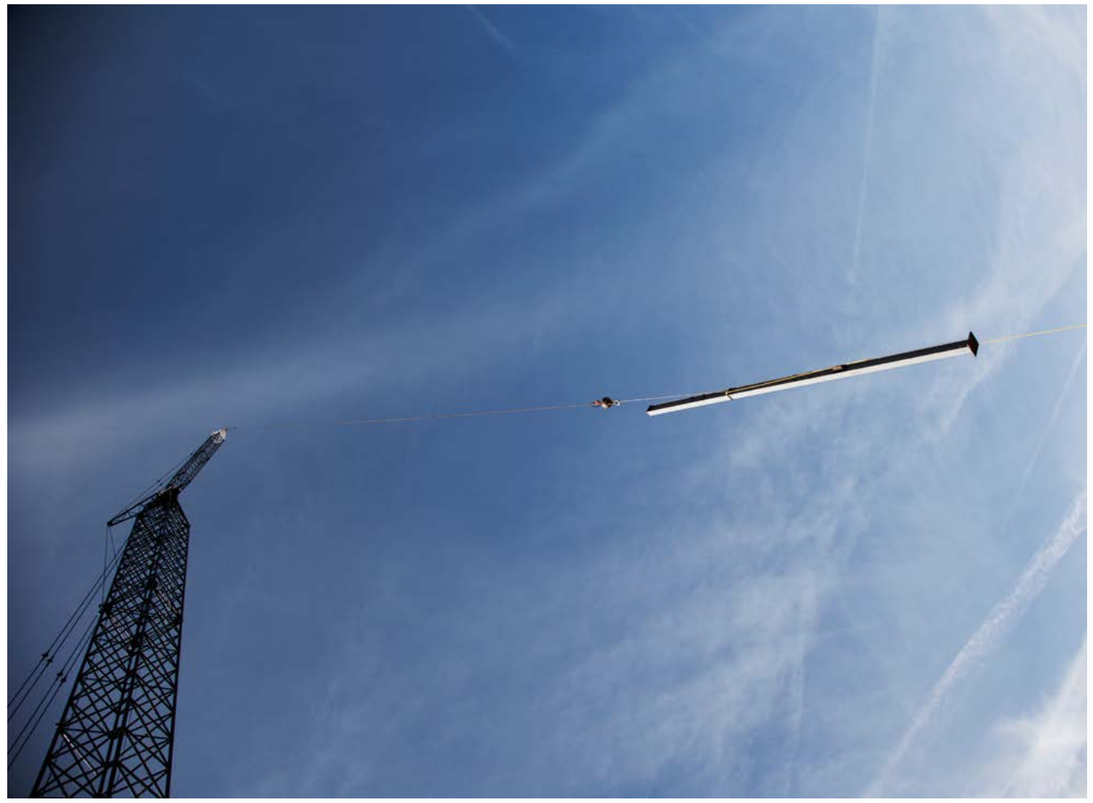
Every single damper module is tested to the design level earthquake before shipment.

- Unlike BRBs which are yieldable every DMAX brace can be tested to the engineer’s design level earthquake
- Each brace is supplied with a test certificate to assure engineer and owner of the device quality and performance.

In Construction

Installation of a DMAX brace is more like a conventional steel brace than a BRB.

- Tolerances better than AISC approved 1/32”
- Length adjustment possible by shimming during installation
- Lower weight due to hollow section – no concrete filling
- Braces come primed and ready to paint
- Fire retardant paint is optional.



About Tectonus

- Founded by engineering experts from the University of Auckland, New Zealand.
- 1000s of devices installed across 30+ projects in NZ, US, Canada, Japan.
- Devices assembled and tested at our 14,000 sq ft facility in Auckland.
- ISO 9001 certified and compliant with ASCE-7, ASCE-41, OSHPD, EC8, NZS1170.5

HELPING STRUCTURAL DESIGNERS CREATE VALUE FOR THEIR CLIENTS

High cost of construction is a drag on development in high seismic regions. At the same time, building to code doesn't specifically address damage and downtime should a future earthquake strike. Most clients would welcome enhanced seismic resilience provided it doesn't cost any more than the conventional approach.

We've spent the last decade working with structural designers to perfect a set of technology tools that allow them to reduce construction costs and provide for a more resilient structure. Tectonus DMAX is the culmination of these efforts, designed to reduce structural actions by up to 50%, yet costing the same as conventional bracing systems like BRBs, EBFs and CBFs.

We support structural designers to optimize their designs for cost, compliance and constructibility and we're proud to have worked with some of the leading names in the field.

rjc

DHC STRUCTURAL | CIVIL

RUAMOKO solutions CONSULTING STRUCTURAL ENGINEERS

Degenkolb

Structure Design

Fast+Epp

Get Technical Support

1. Contact us for a no obligation discussion so we can understand your project, objectives and to see if we can help.
2. We work with your structural engineering models, add our technology, and run the analysis. This results in a performance report, specification, and a price.
3. We support you through detailed design, approvals and permitting – our engineers will be on hand to answer any questions that arise.
4. When the building goes ahead, the contractor orders the devices from us which are delivered with individual test certificates.

Talk to an expert.

info@tectonus.com
NZ ph – 0800 866 871
US ph – +1 888 440 9717

TECTONUS
RESILIENT SEISMIC SOLUTIONS

Specialists in seismic engineering, we are driven to set a higher standard for earthquake resilience. Let's work together to make our cities and communities safer.

New Zealand

18 Greenpark Rd
Penrose
Auckland 1061
T. 0800 866 871

E. info@tectonus.com

USA / Canada

T. +1 888 440 9717
E. info@tectonus.com