

# PRODUCT CATALOGUE

CUTTING EDGE SEISMIC PROTECTION TECHNOLOGY



# REVOLUTIONARY SEISMIC PROTECTION

## TECTONUS

### A FUTURE MORE RESILIENT

Tectonus offers next generation seismic connections that significantly improve the performance of earthquake-prone buildings. Unlike traditional systems, Tectonus focuses on providing a system that does NOT need repair or replacement following an event - providing long term structural protection.

Earthquakes pose a great threat to social and economical welfare - costing society at every event. Traditional seismic systems often require costly post event maintenance or complete replacement following a seismic event - in some cases leaving the structure at risk for aftershocks whilst awaiting maintenance.

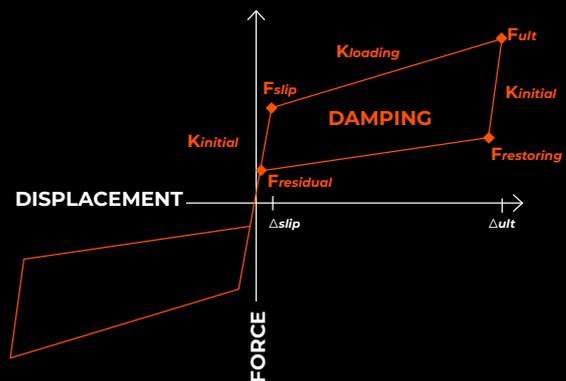
Through effective energy dissipation and self centring functionality of the Tectonus connections, structures are able to withstand earthquake sequences without replacement or structural repairs.

LIFE SAFETY | NO REPAIR OR REPLACEMENT | MINIMISE BUSINESS DISRUPTION

### LIMITLESS POTENTIAL

The RSFJs compact and scalable configuration offers design freedom for any application.

The compact joint is exceptionally scalable and can be implemented in all types of projects of various materials and configurations.

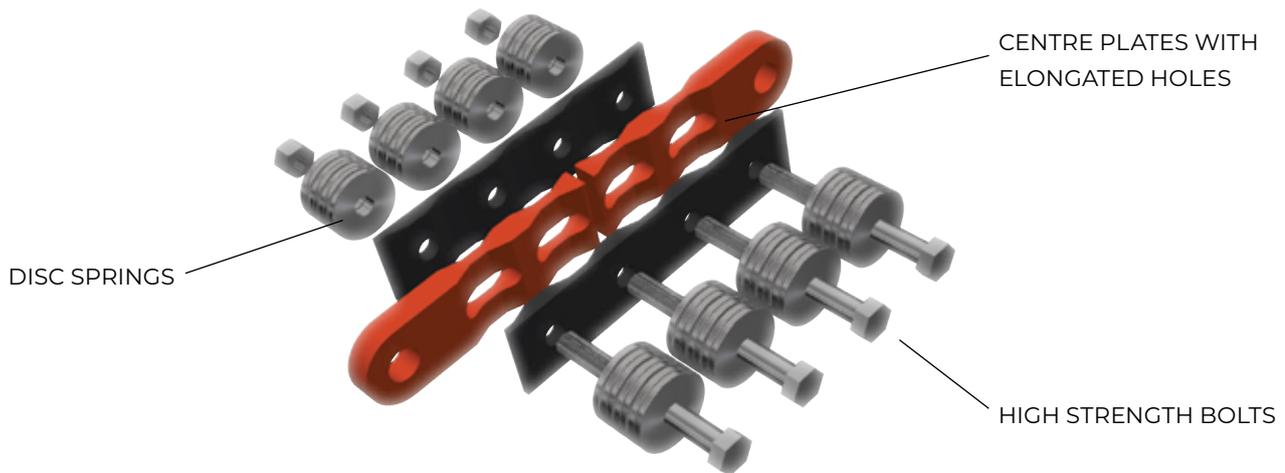


### ADVANTAGES

- / EFFECTIVELY DISSIPATES ENERGY
- / SELF-CENTRING
- / CONTINUED DAMAGE AVOIDANCE
- / NO POST EVENT MAINTENANCE REQUIRED
- / APPLICABLE TO ALL TYPES OF BUILDINGS
- / COST-EFFECTIVE
- / RETROFIT
- / COMPACT
- / EASY IMPLEMENTATION
- / STRUCTURAL HEALTH MONITORING

## THE RSFJ TECHNOLOGY

The Resilient Slip Friction Joint (RSFJ) consists of 2 outer plates and 2 centre plates with elongated holes. The outer cap plates and the centre slotted plates are grooved and clamped together with high strength bolts and disc springs.



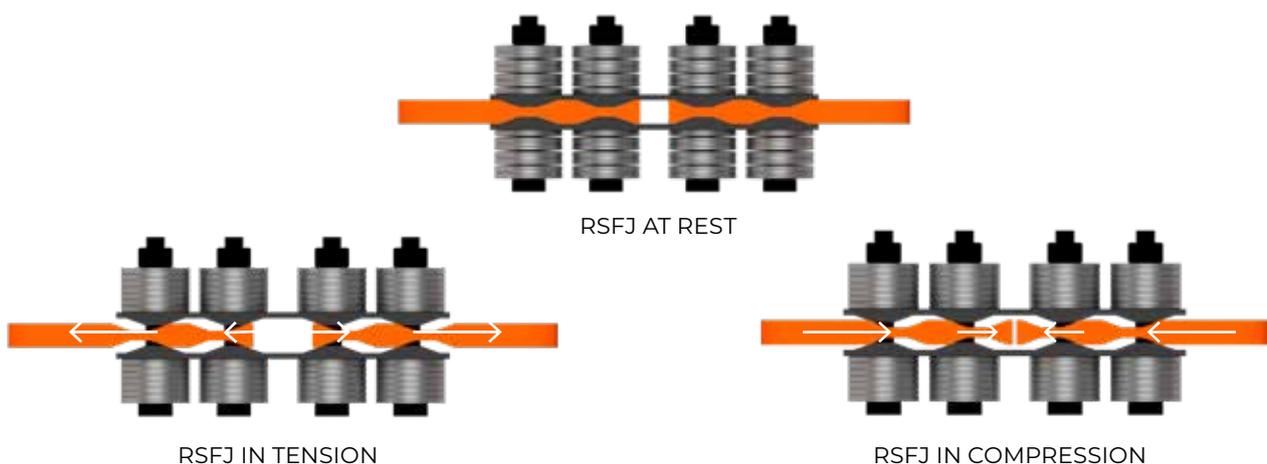
## KEY CHARACTERISTICS OF THE RSFJ

- / Bolts only work in tension
- / Gap in centre allows for compression deformation
- / Cap plate can't "jump" the ridge
- / All parts remain within their elastic range up to  $F_{ult}$
- / At  $F_{ult}$ , disc springs are fully flattened
- / RSFJ returns to its original "rest" position every time

## HOW IT WORKS

When the applied joint force overcomes the frictional resistance between the sloped bearing surfaces, the centre slotted plates start to slide and energy will be dissipated through friction during cycles of sliding.

The patented shape of the plate ridges along with the use of disc springs and high strength bolts provide the desirable self-centring characteristic. The angle of the grooves is designed such that at the time of unloading, the reversing force induced by the elastically compacted disc springs is larger than the friction force acting between the facing surfaces. Therefore, the system is recentred upon unloading.



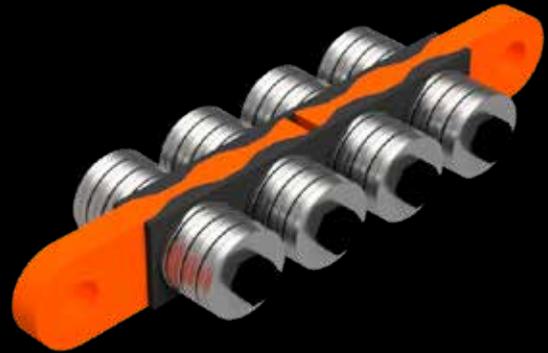
## DESIGN WITH EASE

The RSFJ can be easily integrated in the structural analysis and design softwares ETABS or SAP2000. It allows the designer to accurately calibrate the parameters according to the requirements of the project. In ETABS or SAP2000, the RSFJ load displacement behaviour can be easily modelled by choosing the "Damper-Friction Spring" type link element.

Refer to the RSFJ Structural Modelling Guide for more information.

# TENSION ONLY BRACES

## RSFJ-TBRACE



SELF CENTRING | NO POST EVENT MAINTENANCE | LONG TERM PROTECTION

### ADVANTAGES

- / Self-centring & NO post event maintenance
- / Can be installed in parallel to increase the capacity
- / Arrives on site ready for installation
- / Installation can be carried out by a 2 person team
- / Length of diagonal brace can be adjusted for site imperfections
- / NO out of plane buckling

### APPLICATIONS

New and retrofit projects, and can be implemented to all types of buildings;

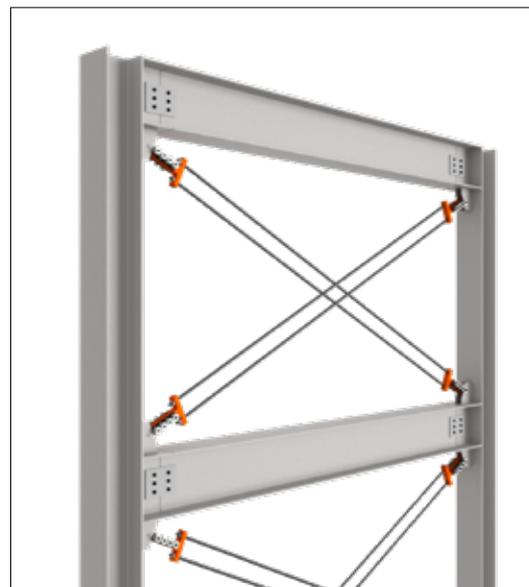
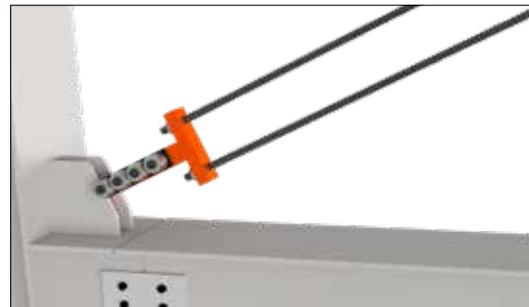
Steel, timber, concrete, or a hybrid of any.

- / Multi story
- / Industrial applications
- / Industrial pallet racks

PIN END



T - END

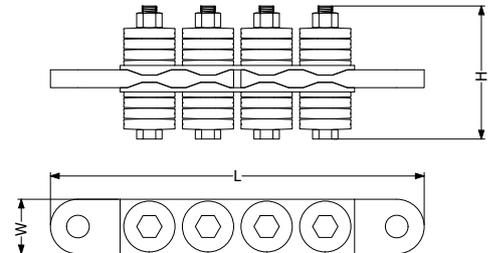
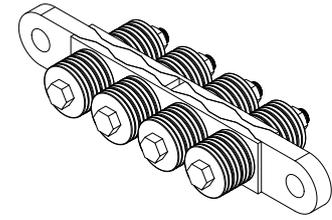


## DIMENSIONS

The dimensions of the RSFJ products mostly depend on the demand deflection. To support the application of RSFJs in a wide range of brace sizes, the RSFJ products are provided up to 4 different ranges of deflections:

- S = up to 25mm
- M = 25mm to 50mm
- L = 50mm to 75mm
- X = 75mm to 100mm.

The following table shows the approximate dimensions of RSFJ products.



PRODUCT CODE	NO. OF BOLTS ( $N_b$ )	L (MM)	W(MM)	H [MM]
RSFJ-TH2	2			
RSFJ-TH4	4	$2N_b \ell + 200$	100mm	$4\ell + 150$
RSFJ-TH6	6			

Note: For S,M,L and X Categories of deflection,  $\ell$  equals 25 mm, 50mm, 75mm, and 100mm respectively.

## DESIGN SPECIFICATIONS

The joint hysteresis damping ratio ranges from 15% to 20% for Category A and 10% to 15% for Category B. The required deflection is to be defined considering the deflection limits. Please follow the RSFJ Structural Modelling Guide for the recommended design procedure.

PRODUCT CODE	$F_{ult}$ (comparable to ULS) [kN]	$F_{slip}$ [kN]	$F_{restoring}$ [kN]	$F_{residual}$ [kN]	Deflection Limit	$\Delta_{ult}$ (comparable to ULS) [mm]
<b>CATEGORY A 15% TO 20% HYSTERESIS DAMPING</b>						S (up to 25mm) M (25mm to 50mm) L (50mm to 75mm) X (75mm to 100mm)
RSFJ-TH4-200	200	100	34	17	S, M, L, X	
RSFJ-TH4-250	250	125	77	38	S, M, L	
RSFJ-TH4-300	300	150	117	58	S, M	
RSFJ-TH6-350	350	175	94	47	S, M, L, X	
RSFJ-TH6-400	400	200	136	68	S, M, L	
RSFJ-TH6-450	450	225	176	88	S, M	
<b>CATEGORY B 10% TO 15% HYSTERESIS DAMPING</b>						
RSFJ-TH2-200	200	100	96	48	S, M, L	
RSFJ-TH2-250	250	125	131	66	S, M	
RSFJ-TH2-300	300	150	163	82	S	
RSFJ-TH4-350	350	175	156	78	S, M, L	
RSFJ-TH4-400	400	200	193	97	S, M	
RSFJ-TH4-450	450	225	228	114	S	

/ Products could be applied as multiple joints in a modular pattern to achieve larger capacities. Customised products can also be supplied, satisfying any targeted capacity and deflection.

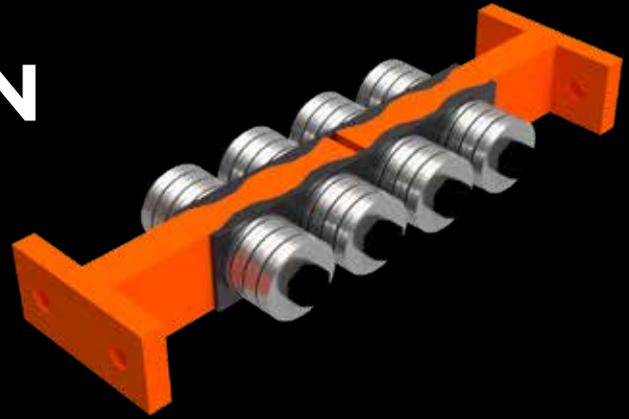
/ Joints are designed to provide deflection with self-centring even beyond  $\Delta_{ult}$  (as a secondary fuse) with  $\Delta_{max} = 1.5 \Delta_{ult}$  and  $F_{max} = 1.25F_{ult}$ .

/ Given the slight non linearity at the joint slip stage, the  $F_{slip}$  is determined as the intersect of the straight lines matching the initial and second stiffness of the flag-shaped curve.

/  $\Delta_{slip}$  (comparable to SLS) is kept to be about 1mm, 1.5mm and 2mm for 2-bolt, 4-bolt and 6-bolt RSFJs, respectively (excluding the deflection resulting from the attachments such as pins, brackets and anchor bolts).

# TENSION & COMPRESSION BRACE

## RSFJ-BRACE



SELF CENTRING | NO POST EVENT MAINTENANCE | LONG TERM PROTECTION

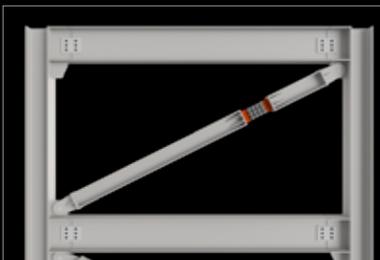
### ADVANTAGES

- / Self-centring
- / No post event maintenance
- / Can be installed in parallel to increase the capacity
- / Arrives on site ready for installation (no secondary steps required)
- / Length of diagonal brace can be adjusted for site imperfections

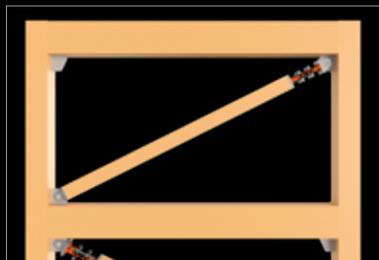
### APPLICATIONS

- New and retrofit projects, and can be implemented to all types of buildings;
- Steel, timber, concrete, or a hybrid of any.
- / Multi story
  - / Industrial applications
  - / Industrial pallet racks

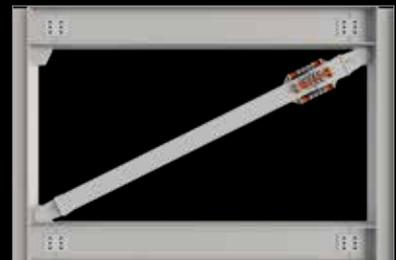
VERSION 1



VERSION 2



VERSION 3

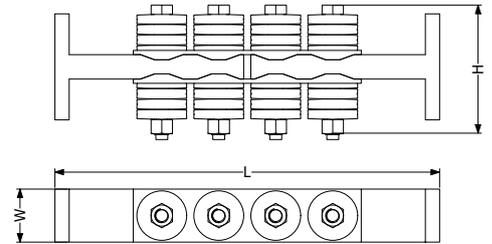
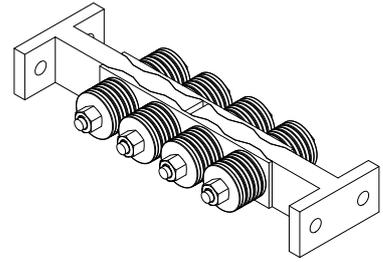


## DIMENSIONS

The dimensions of the RSFJ products mostly depend on the demand deflection. To support the application of RSFJs in a wide range of brace sizes, the RSFJ products are provided up to 4 different ranges of deflections:

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The following table shows the approximate dimensions of RSFJ products.



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RSFJ-BH2	2			
RSFJ-BH4	4	$2N_b \ell + 200$	100mm	$4\ell + 150$
RSFJ-BH6	6			

Note: For S,M,L and X Categories of deflection,  $\ell$  equals 25 mm, 50mm, 75mm, and 100mm respectively.

## DESIGN SPECIFICATIONS

The joint hysteresis damping ratio ranges from 15% to 20% for Category A and 10% to 15% for Category B. The required deflection is to be defined considering the deflection limits. Please follow the RSFJ Structural Modelling Guide for the recommended design procedure.

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RSFJ-BH4-200	200	100	34	17	S, M, L, X	
RSFJ-BH4-250	250	125	77	38	S, M, L	
RSFJ-BH4-300	300	150	117	58	S, M	
RSFJ-BH6-350	350	175	94	47	S, M, L, X	
RSFJ-BH6-400	400	200	136	68	S, M, L	
RSFJ-BH6-450	450	225	176	88	S, M	
<b>CATEGORY B 10% TO 15 % HYSTERESIS DAMPING</b>						
RSFJ-BH2-200	200	100	96	48	S, M, L	
RSFJ-BH2-250	250	125	131	66	S, M	
RSFJ-BH2-300	300	150	163	82	S	
RSFJ-BH4-350	350	175	156	78	S, M, L	
RSFJ-BH4-400	400	200	193	97	S, M	
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/ Products could be applied as multiple joints in a modular pattern to achieve larger capacities. Customised products can also be supplied, satisfying any targeted capacity and deflection.

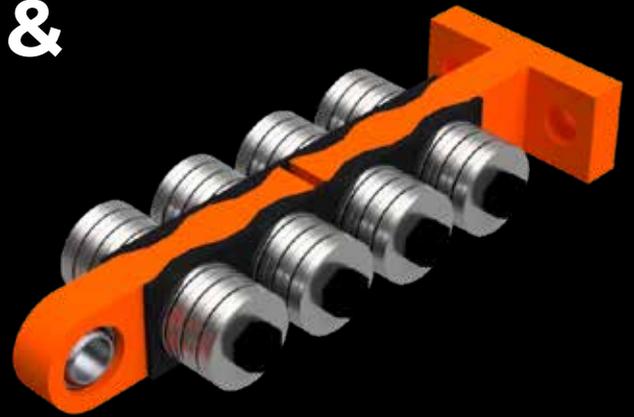
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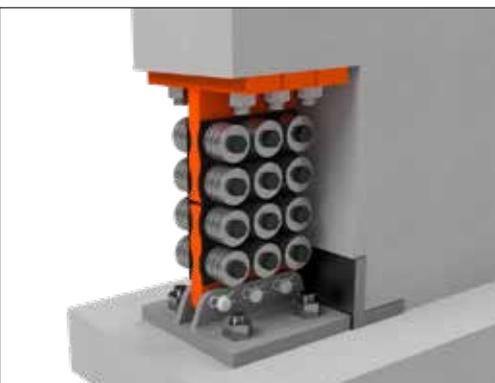
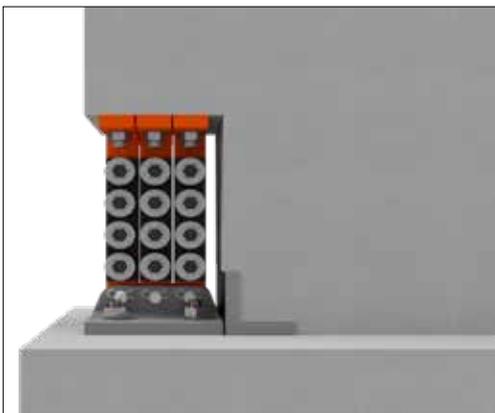
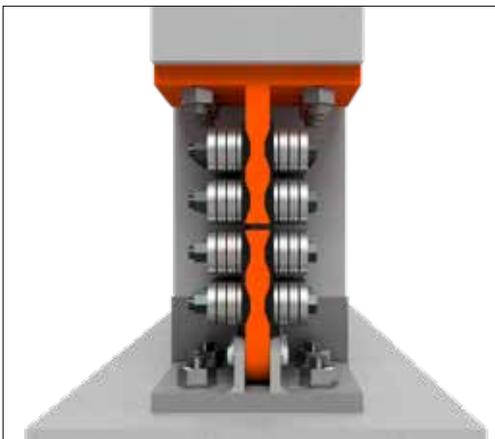
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# SHEARWALLS & COLUMNS

## RSFJ – SHEARWALL



SELF CENTRING | NO POST EVENT MAINTENANCE | LONG TERM PROTECTION



The RSFJ-Shearwall connections acts as a hold down for shearwalls and columns, allowing displacements both in plane and out of plane.

### ADVANTAGES

- / Self-centring
- / No post event maintenance: Reduced costs when considering earthquake sequences
- / Scalability: can be installed in groups to increase the capacity
- / Arrives on site ready for installation (no secondary steps required)
- / The pin and swivel bearing allow for +/- 5% rotation

### APPLICATIONS

New and retrofit projects, and can be implemented to all types of buildings; steel, timber, concrete, or a hybrid of any.

- / Multi story
- / Industrial applications



## DIMENSIONS

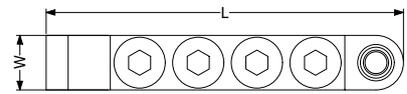
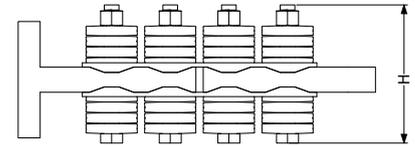
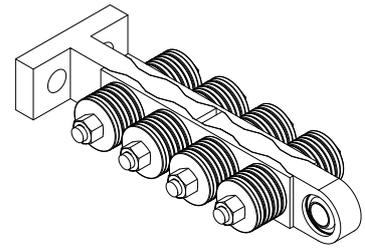
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RSFJ-SH6	6			

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RSFJ-SH4-300	300	150	117	58	S, M		
RSFJ-SH6-350	350	175	94	47	S, M, L, X		
RSFJ-SH6-400	400	200	136	68	S, M, L		
RSFJ-SH6-450	450	225	176	88	S, M		
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RSFJ-SH4-350	350	175	156	78	S, M, L		
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/ Products could be applied as multiple joints in a modular pattern to achieve larger capacities. Customised products can also be supplied, satisfying any targeted capacity and deflection.

/ Joints are designed to provide deflection with self-centring even beyond  $\Delta_{ult}$  (as a secondary fuse) with  $\Delta_{max} = 1.5 \Delta_{ult}$  and  $F_{max} = 1.25F_{ult}$ .

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# MOMENT RESISTING FRAMES

## RSFJ-MRF



SELF CENTRING | NO POST EVENT MAINTENANCE | LONG TERM PROTECTION

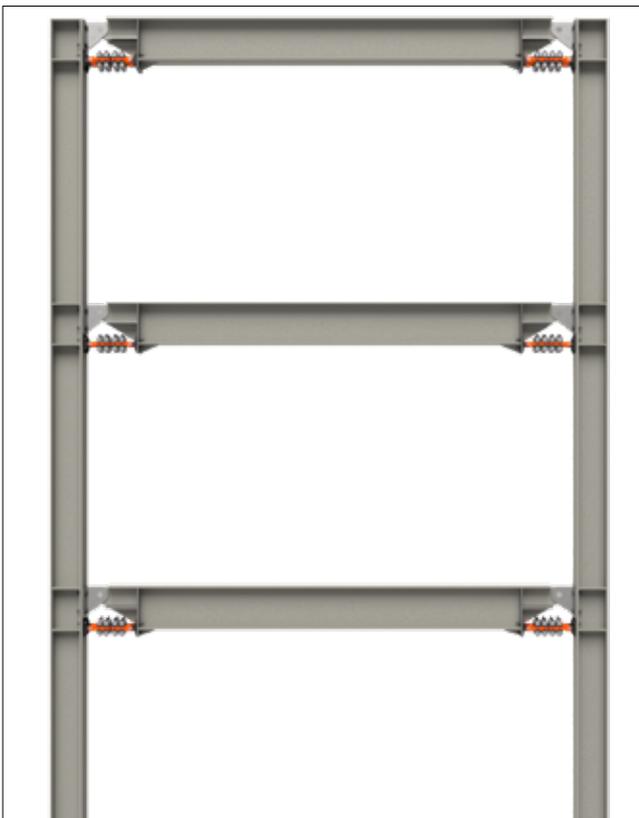
### ADVANTAGES

- / Self-centring
- / No post event maintenance: Reduced costs when considering earthquake sequences
- / Scalability: Can be installed as single unit or combined with others to increase the capacity
- / Arrives on site ready for installation

### APPLICATIONS

New and retrofit projects, and can be implemented to all types of buildings; steel, timber, concrete, or a hybrid of any.

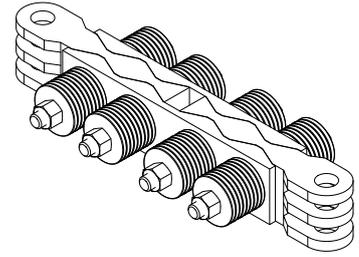
- / Multi story
- / Portal frames



## DIMENSIONS

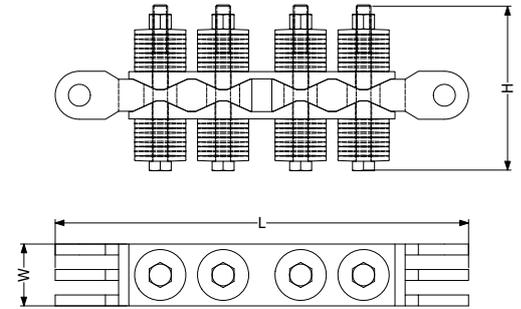
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RSFJ-MH6	6			



Note: For S,M,L and X Categories of deflection, ℓ equals 25 mm, 50mm, 75mm, and 100mm respectively.

## DESIGN SPECIFICATIONS

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# CONTACT US

## TECHNICAL SUPPORT SERVICES & PROJECT ESTIMATES

**0800 866 871**

**GENERAL** / [info@tectonus.com](mailto:info@tectonus.com)

**SALES** / [sales@tectonus.com](mailto:sales@tectonus.com)

**TECHNICAL & DESIGN** / [technical@tectonus.com](mailto:technical@tectonus.com)

The experienced engineering team at Tectonus is available to provide more details and assistance for RSFJ structural modelling upon request.

