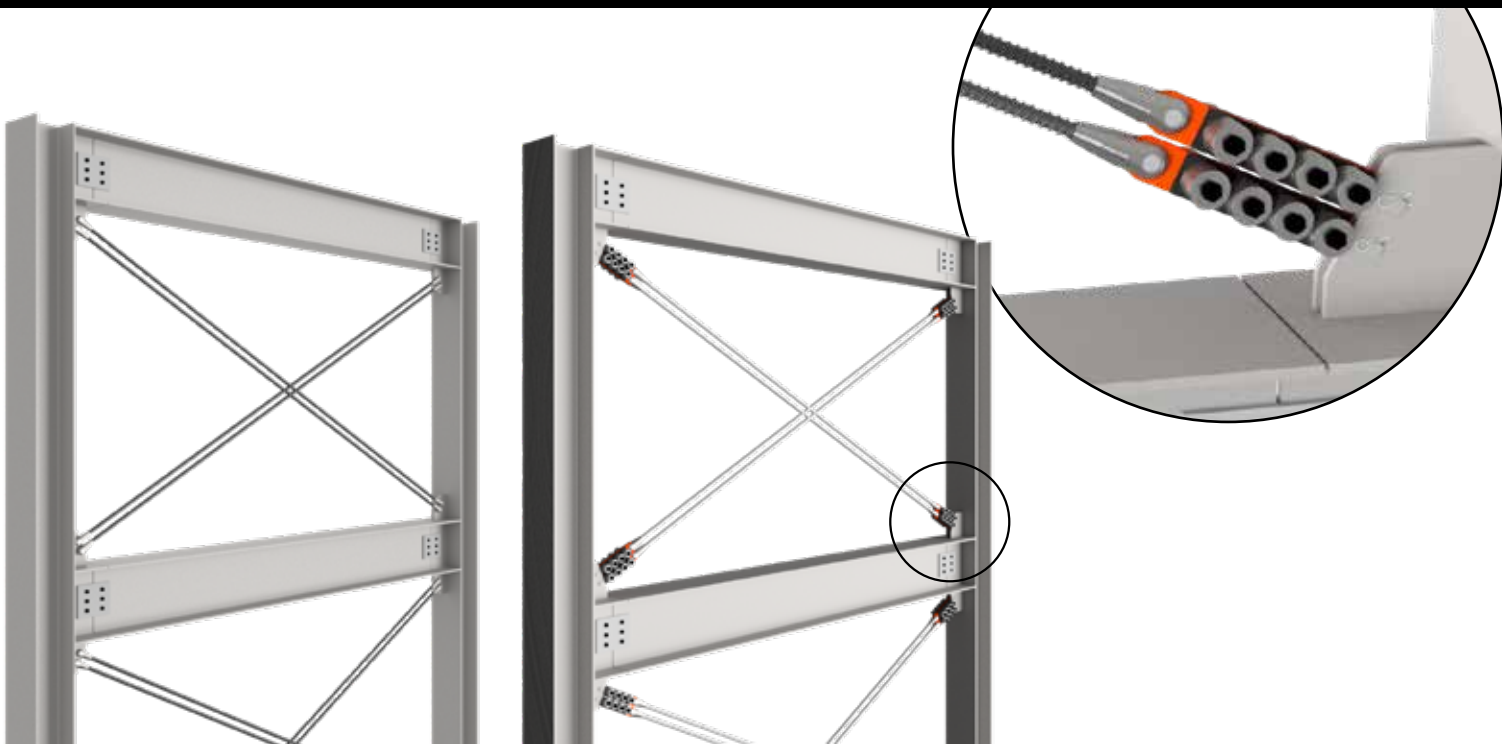


RETROFIT CATALOGUE

CUTTING EDGE SEISMIC PROTECTION TECHNOLOGY



SEISMIC RETROFIT

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.

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

COST POSITIVE



EARTHQUAKE PRONE BUILDINGS

Earthquake-prone buildings are those likely to collapse causing injury or death, or damage to any other property, during or following a moderate earthquake. A moderate earthquake is one that would generate the level of shaking that would be used to design a new building at the site.

THE RISK IF STRUCTURES ARE NOT PREPARED

In New Zealand, earthquake-prone buildings are defined as those that fail to meet 34% of the current New Building Standard (NBS). Those that are assessed at being between 34% and 67% of NBS are considered as “earthquake-risk” buildings. Therefore, the risk of injury or death in an earthquake-risk building is lower than an earthquake-prone building, but the risk of damage to the building still remains high resulting in costly repairs.

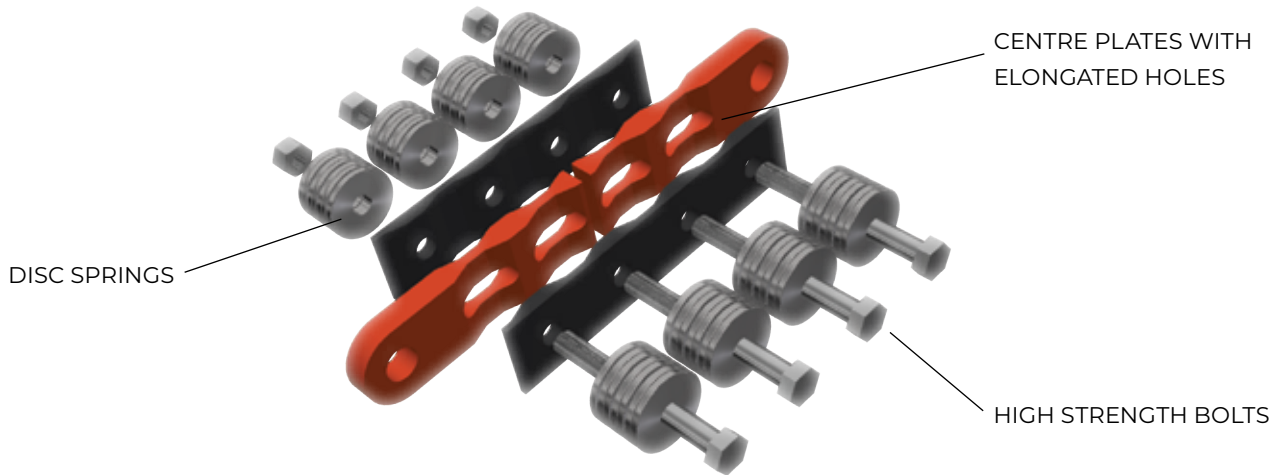
Percentage of New Building Standard (%NBS)	Alpha rating	Approx. risk relative to a new building	Life-safety risk description
>100	A+	Less than or comparable to	Low risk
80-100	A	1-2 times greater	Low risk
67-79	B	2-5 times greater	Low to Medium risk
34-66	C	5-10 times greater	Medium risk
20 to <34	D	10-25 times greater	High risk
<20	E	25 times greater	Very high risk

TECTONUS STRENGTHENING SOLUTIONS

PROTECTING AGAINST EARTHQUAKES & AFTERSHOCKS

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.



The RSFJs provide self-centring and energy dissipation all in one compact connection requiring no post-event maintenance and providing the building with full capacity to resist the aftershocks.

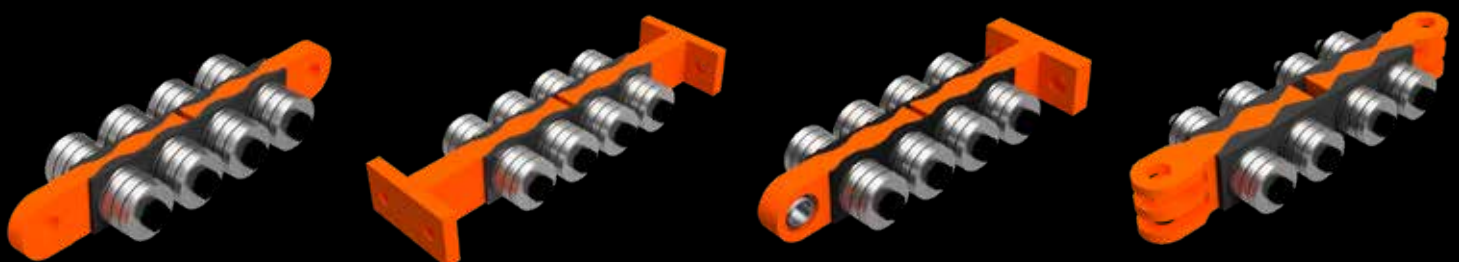
Based on the need for structural strengthening in seismic prone zones, Tectonus products provide a wide range of solutions for different lateral load resisting systems (LLRSs) which significantly improve the building performance.

RSFJ ADVANTAGES

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

TECTONUS PRODUCT SUITE

Tectonus seismic connections are compact and scalable - ideal for new or retrofit projects. Depending on the project, a new member with an RSFJ can be installed or an existing member can be used adding the RSFJ.



RSFJ - TBRACE

RSFJ - BRACE

RSFJ - SHEARWALL

RSFJ - MRF

TENSION ONLY BRACES

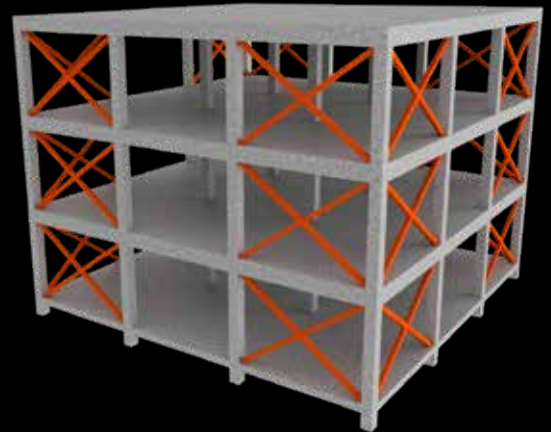
RSFJ - TBRACE

Braces in a tension-only braced frame are commonly rods or bars designed to resist tension.

Since the resistance of the braces acting in compression is ignored in the design, tension-only braced systems must be direct-acting and concentrically framed.

This type of brace is a common lateral load resisting system (LLRS) in warehouses, non-ductile and limited ductile structures.

Simply add the RSFJ T-brace to existing rods or bars to strengthen the structure. The resulting system offers damping, re-centring and does NOT require post event maintenance making it an ideal simple long-term bracing solution.



ADVANTAGES

- Ductility of the structure will increase significantly
- Yielding of the original elasticity designed system is eliminated
- Rods or bars yielding is eliminated
- NO pinching effect as there is no yielding
- The added ductility to the system will result in a reduction of the seismic load.
- Other members and foundation may not need to be strengthened.

USE EXISTING RODS OR BARS

INSERT TBRACE INTO EXISTING LLRS

The tension only brace eliminates out of plane buckling of the compression member.

Different RSFJ connection ends can be provided to accommodate different braces.



BRACED FRAMES

RSFJ - BRACE

Braces made of structural steel sections can work effectively both in tension and compression (T/C).

Braced frames provide high stiffness and strengthening braced frames with RSFJs brings many advantages



ADVANTAGES

- Brace replacement not required following seismic events
- Ductility of the structure will increase significantly.
- NO residual drift
- Yielding of the original elasticity design system is eliminated
- The added ductility to the system will result in a reduction of the seismic load.
- Other members and foundation may not need to be strengthened.



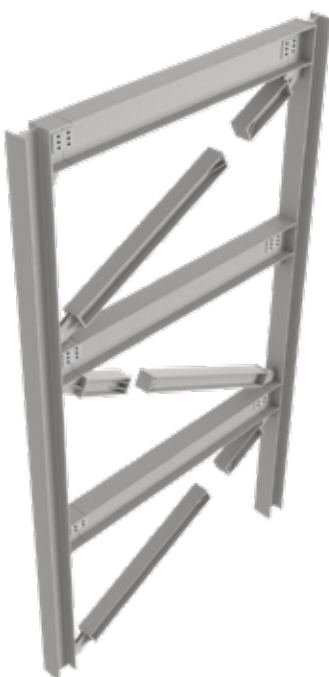
FOR LARGE LATERAL LOADS

SIGNIFICANT DUCTILITY
IN TENSION & COMPRESSION

USE EXISTING BRACES

CUT AND INSERT

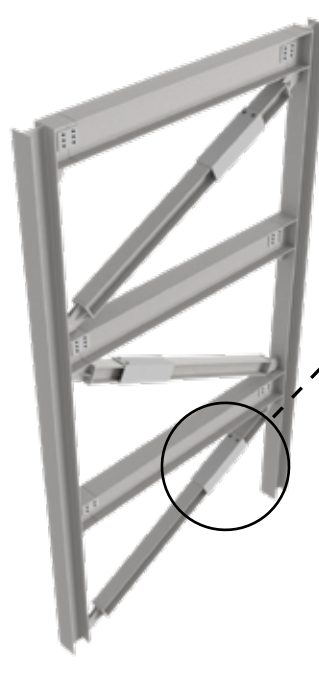
The RSFJ brace can be inserted into an existing steel section. Jacket over RSFJ connection prevents buckling.



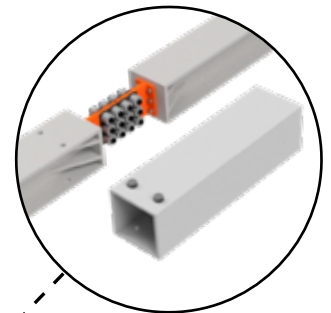
CUT BRACE



INSERT RSFJ



PROTECT



ROCKING SHEARWALLS & COLUMNS

RSFJ - SHEARWALL

Shear walls resist in-plane lateral forces through cantilever action. During an earthquake, shearwalls experience damage due to yielding of the reinforcement and concrete crushing.

RSFJ - Shearwall greatly strengthens the structure with many advantages.

ADVANTAGES

- Ductility of the structure increases
- NO residual drift
- NO yielding of damper
- NO post event maintenance
- The added ductility to the system will result in a reduction of the seismic load



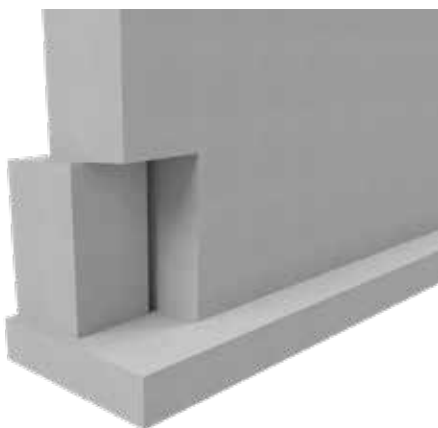
USE EXISTING SHEARWALLS

CUT BASE & CORNERS

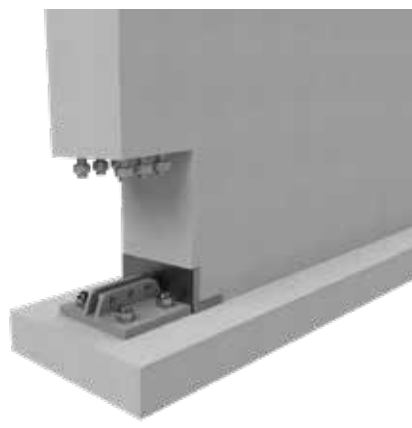
Conventional shearwalls in earthquake prone structure can be retrofitted by disconnecting the wall from the base and adding RSFJs at the corners. The result is an efficient rocking shearwall with high energy dissipation. One other option of retrofitting a shearwall is to affix the RSFJs to the sides of the shearwall through corebels.

HIGH ENERGY DISSIPATION

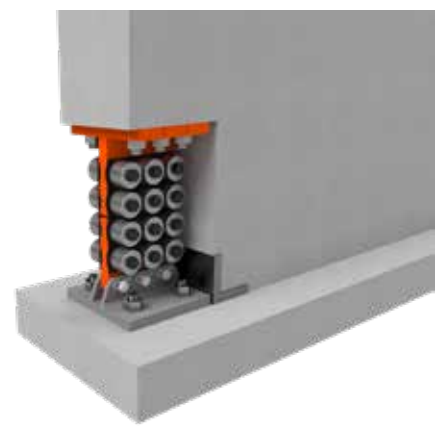
By using the RSFJ - Shearwall, high ductility can be achieved for the structure in addition to significantly reducing damage due to yielding.



CUT & REMOVE SECTION



INSERT ANCHORAGE



FIT RSFJ

MOMENT RESISTING FRAMES

RSFJ - MRF

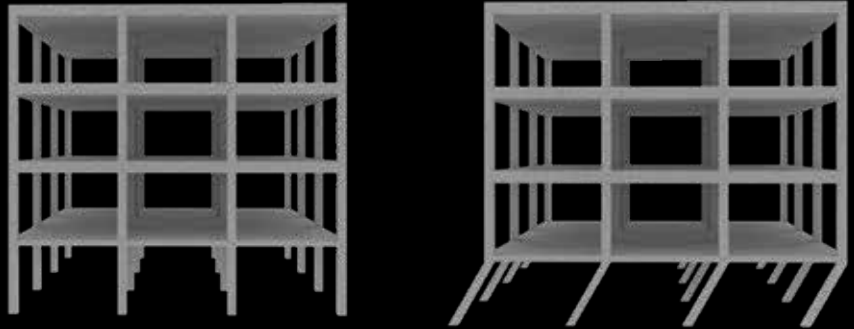
A lack of walls on the first storey to accommodate large openings (such as garages or commercial store-fronts) create a discontinuity in lateral strength, stiffness and stability between the first and upper stories. This is known as the soft storey effect.

During an earthquake, this discontinuity exposes the first story to a high deformation.

The RSFJ - MRF is an ideal retrofit solution to strengthen the existing moment resisting frame.

ADVANTAGES

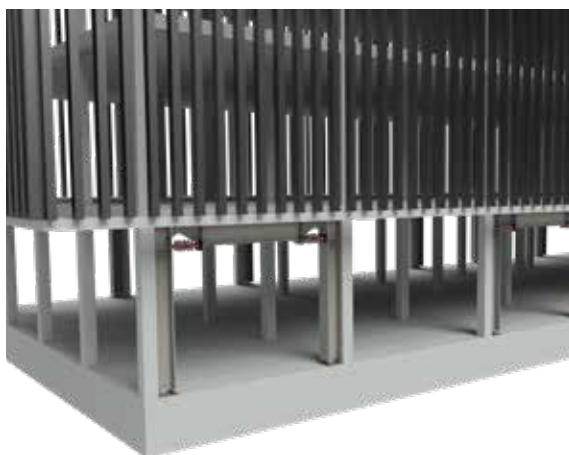
- NO soft storey effect
- Ductility of the structure increases
- NO residual drift



SOFT STOREY SOLUTION

The Tectonus RSFJ - MRF is an ideal solution to retrofit structures with soft storey.

The structural damage avoidance RSFJ - MRF consists of 2 columns, a beam, and RSFJs. The RSFJ - MRF is fitted into an opening and provides the required resistance to avoid the soft storey.



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

