



Global Seismic Data

BUILDING SEISMIC INSIGHTS

Protecting Lives
Improving the Economy

INFORMATION BOOKLET
Structural Health Monitoring System™

About Us

Global Seismic Data is a New Zealand based Software-as-a-Service (SaaS) company providing structural health monitoring of building movement and behaviour.

Our data allows informed decisions to be made in near-to-real time for: Life safety, building structural health, reductions in business interruption and business continuity.



Designed by kiwis for the world

Earthquakes are recognised as a workplace hazard which can jeopardise your safety causing significant financial and social upheaval instantly. With our systems and by working together, we can save lives and lessen the impact on the economy.

Our priority is to ensure your business receives the vital data required to determine your building status. This also improves decision-making affecting life safety outcomes before an event.

Working towards smarter cities

Our solution demonstrates how the Structural Health Monitoring System™ (SHMS) is advancing the benefits of smart city and proprietary technical solutions in cities with a clear path to pre/post-quake resilience investment around:

- Risk
- Readiness
- Response, and
- Recovery deployment.

With our systems and by working collaboratively with our industry partners, we can be better prepared, saving lives and lessening the impact on the economy when an earthquake hits.

The problem

- Earthquakes are a global hazard which pose a threat to life and cause significant business interruption and social upheaval.
- In many cases, outdated sensor systems make building performance assumptions based on ground motion sensors not even located in a building.
- Traditional building occupancy decisions are largely based on engineer's inspection which could take weeks or months to complete.
- Accurate building performance data would enable rapid informed decision-making. Until now, this has been too expensive to be widely deployed.

Our Solution

- To improve health and safety within our cities, Global Seismic Data has developed a Structural Health Monitoring System™ (SHMS) for buildings and homes.
- Our SeismicDataSensors™ (SDS), which are installed in buildings, record and process data during an earthquake and relay this information to engineers for evaluation in near-to-real time.
- Engineers can then make a determination on whether or not the building remains safe to occupy, or if any further seismic inspection is needed.
- Rapid informed decisions on building occupancy reduces costly business interruptions, prevents unnecessary evacuations, improves life safety decision-making, helps with co-ordination of the emergency response and promotes HSWA compliance.

How it works

1. Trademarked sensors are strategically placed within a building.
2. Sensors relay seismic movement within millimetre accuracy to our cloud-based data centre 24/7. Spectra data is measured and analysed, measuring a buildings structural health - like an ECG check for buildings.
3. Engineers and building owners have access to real-time and historical data in order to assess:
 - Immediate needs in a live event, allowing decisions on building occupancy to stay or evacuate; or
 - To plan and futureproof for safety and economic recovery and to identify workplace hazards.

SeismicDataSensors™

- Wireless or wired communication (2G/3G/4G, WiFi or Ethernet).
- +/-8g Tri-Axial Accelerometers.
- External GPS antenna for accurate timing.
- Optional UPS for at least 48 hour backup power or POE.
- Trigger threshold based data recording, with synchronised recording throughout the building.
- Regular sensor performance metrics for quick diagnostic.
- Near-to-real time upload data in your hands within minutes!



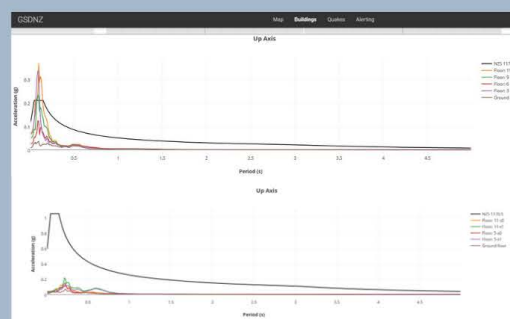
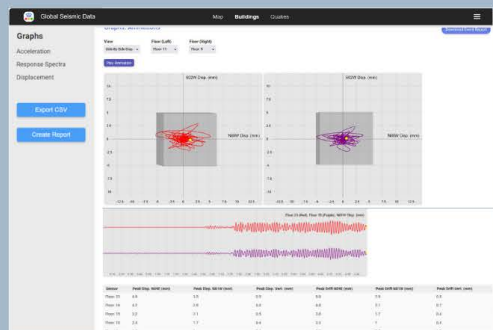
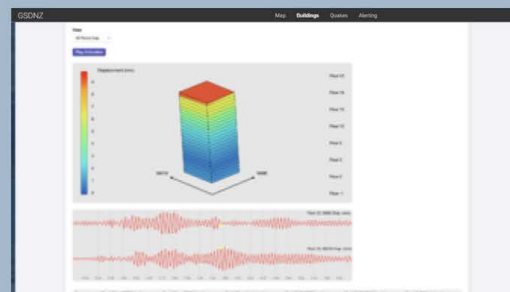
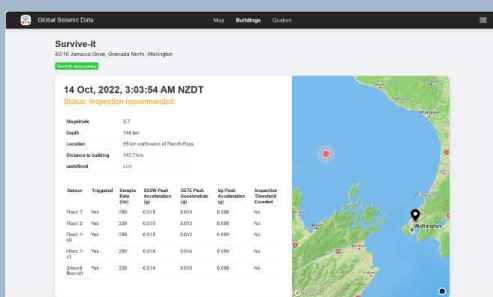
Data Verification - BRANZ

- BRANZ is an independent research organisation that uses an evidence-based approach to improving the performance of the New Zealand building system. We transform insightful research into trusted, accessible, and actionable knowledge. For more information go to www.branz.co.nz.
- BRANZ has been commissioned to compare the test outputs from our Commercial and Urban SeismicDataSensors™ against input from their Moog actuator operating known displacements and frequencies.
- A summary of the BRANZ full 19-page sensor testing report (ST15525-001-01 9 March 2022) is available on request.



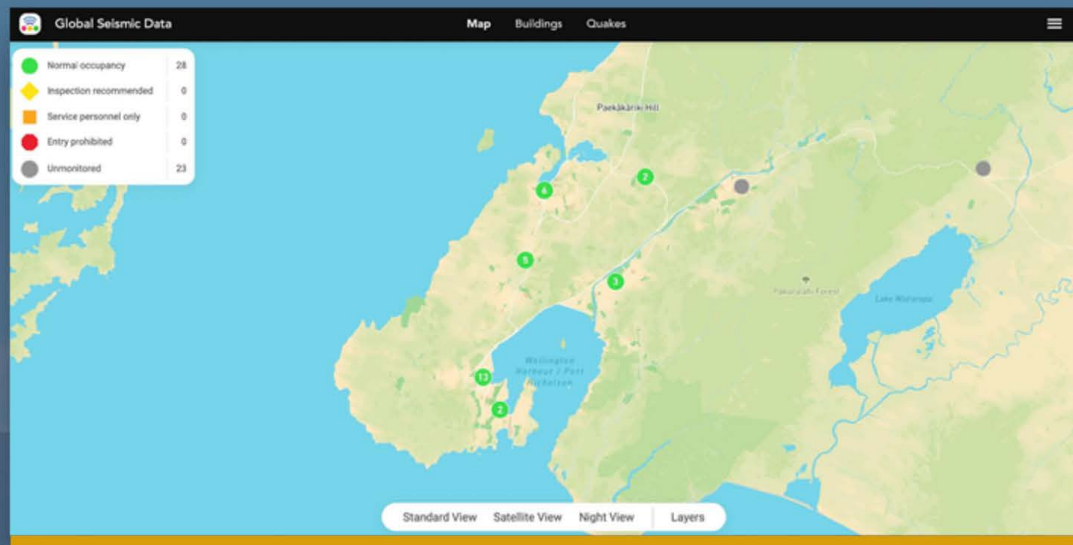
GSD website

Global Seismic Data's website provides a summary of real-time seismic data featuring various tools and information to support with making informed decisions.



Building Portfolio

- View building portfolio as either a map or grid.
- Provides a quick overview of building status following a major earthquake.
- View fault lines, tsunami zones, and earthquake prone buildings on the map.



Building Events & Alerting

- Each building has a list of recorded events which have exceeded the trigger threshold.
- Email alerts are sent out for each event that is linked to a GeoNet or USGS quake.
- Click on an event to view data.
- Events that require an inspection are highlighted.
- Downloadable PDF event report available.

The screenshot shows the 'Buildings' view for a specific building named 'Survive-it' located at '42/16 Jamaica Drive, Grenada North, Wellington'. The building's status is 'Normal occupancy'. Below the header, there are tabs for 'Events & Inspections', 'Wind Data', 'Building Information', 'Sensors', and 'Documents'. The 'Events & Inspections' tab is active, showing a table of seismic events. The table has columns for Date, Triggered Sensors, S33W Peak (g), S57E Peak (g), Up Peak (g), MMI, Perceived Shaking, Potential Damage, Status, and GeoNet. The events are listed in descending order of date, with the most recent event on top. The status of each event is indicated by a color-coded dot: green for 'Thresholds not set' and yellow for 'Inspection recommended'.

Date	Triggered Sensors	S33W Peak (g)	S57E Peak (g)	Up Peak (g)	MMI	Perceived Shaking	Potential Damage	Status	GeoNet
29 February, 2024, 5:23 AM	3	0.002	0.002	0.001	2	Weak	None	Thresholds not set	
29 February, 2024, 5:18 AM	4	0.006	0.006	0.003	3	Weak	None	Thresholds not set	
13 February, 2024, 3:39 PM	4	0.008	0.008	0.002	3	Weak	None	Thresholds not set	
25 January, 2024, 3:18 AM	3	0.002	0.003	0.001	2	Weak	None	Thresholds not set	
20 January, 2024, 5:25 PM	4	0.010	0.011	0.004	3	Weak	None	Thresholds not set	
23 December, 2023, 3:27 AM	4	0.003	0.003	0.001	2	Weak	None	Thresholds not set	
9 December, 2023, 1:11 PM	4	0.004	0.004	0.002	2	Weak	None	Thresholds not set	
9 December, 2023, 8:25 AM	4	0.014	0.014	0.005	3	Weak	None	Thresholds not set	
6 December, 2023, 10:56 AM	Engineer inspection carried out - All clear								
24 October, 2023, 11:07 AM	4	0.005	0.005	0.002	3	Weak	None	Thresholds not set	
3 October, 2023, 8:55 AM	4	0.007	0.007	0.006	3	Weak	None	Thresholds not set	
30 August, 2023, 4:21 PM	3	0.002	0.002	0.001	2	Weak	None	Inspection recommended	

Building Status

- When an earthquake occurs, if a sensor records an acceleration that exceeds its threshold (set by the engineer), the building's status will change from Normal occupancy to Inspection recommended.
- When this occurs, engineers do a desktop or on-site assessment, and either change status back to Normal occupancy or another restricted access.

Building status

Normal occupancy

If sensor thresholds are set, this status means there has not been any significant shaking to warrant an inspection.

Inspection recommended

There has been significant shaking to warrant an engineer inspection.

Service personnel only

An engineer inspection has been carried out and it has been determined that this building may have some structural damage. Only service personnel may enter.

Entry prohibited


An engineer inspection has been carried out and it has been determined that this building has significant structural damage. No one should enter this building.

Unmonitored

This building is current not being monitored.

Building & Sensor Information

- Information such as building period, % NBS, sensor locations, trigger thresholds, and sensor status can be viewed.
- Engineers can set building information, alerting thresholds, floor heights, and NZS1170.5 parameters.
- Building documents such as floor plans and sensor images can be uploaded and viewed.



Global Seismic Data

Map

Buildings

Quakes

Survive-it

42/16 Jamaica Drive, Grenada North, Wellington

Normal occupancy ⓘ

Events & Inspections

Wind Data

Building Information

Sensors

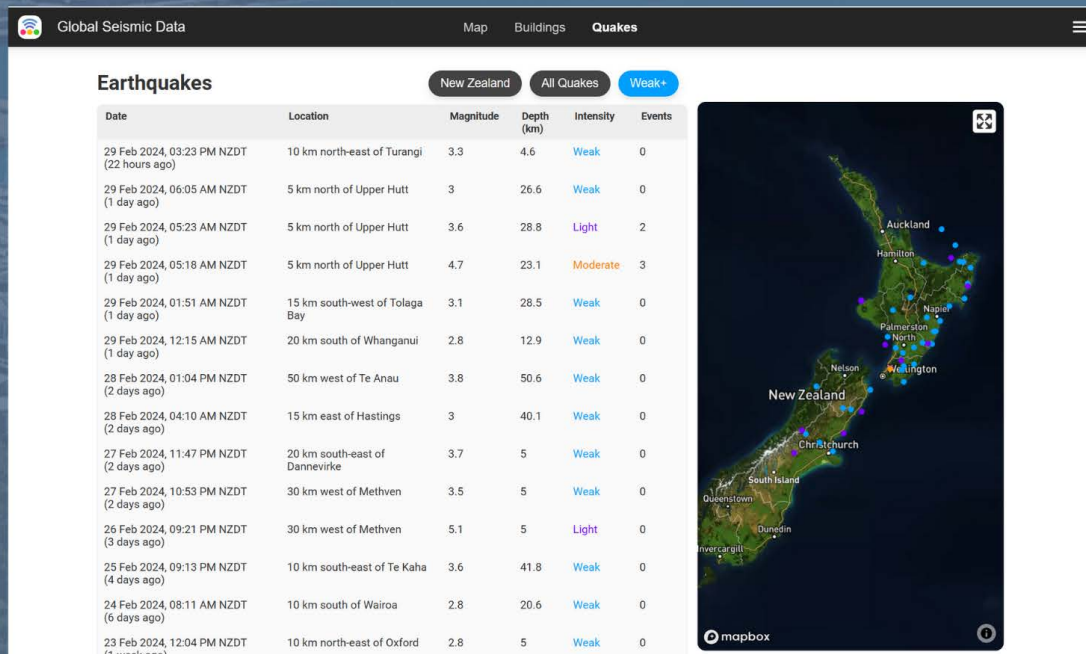
Documents

Sensors ⓘ

Name	Floor	Last Connection	Location S33W (m)	Location S57E (m)	Floor Height (m)	Horizontal Trigger Threshold (g)	Vertical Trigger Threshold (g)	Orange Threshold (g)	Red Threshold (g)
SDS61	Floor 1	2024-03-01 11:45:09	Not set	Not set	Not set	0.0017	0.0017	Not set	Not set
SDS70	Floor 1	2024-03-01 11:20:08	Not set	Not set	0.01	0.0017	0.0017	Not set	Not set
SDS98	Floor 1	2024-03-01 11:20:08	Not set	Not set	Not set	0.0017	0.0017	2.0	4.0
SDS31	Ground	2024-03-01 11:45:09	Not set	Not set	0.0017	0.0017	0.0017	Not set	Not set

Earthquake Information

- List of earthquakes are provided from either GeoNet or USGS.
- Click on an earthquake for a performance summary of your building portfolio.
- Performance summary can highlight building inspection status for major earthquakes.



Global Seismic Data | Map | Buildings | **Quakes**

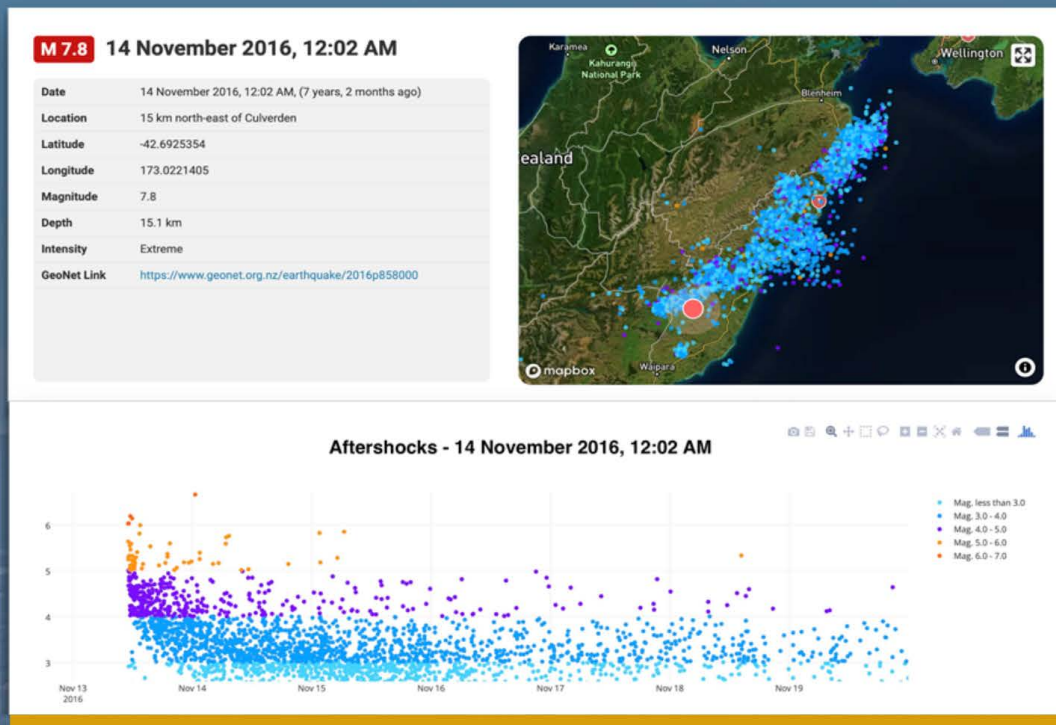
Earthquakes | New Zealand | All Quakes | Weak+

Date	Location	Magnitude	Depth (km)	Intensity	Events
29 Feb 2024, 03:23 PM NZDT (22 hours ago)	10 km north-east of Turangi	3.3	4.6	Weak	0
29 Feb 2024, 06:05 AM NZDT (1 day ago)	5 km north of Upper Hutt	3	26.6	Weak	0
29 Feb 2024, 05:23 AM NZDT (1 day ago)	5 km north of Upper Hutt	3.6	28.8	Light	2
29 Feb 2024, 05:18 AM NZDT (1 day ago)	5 km north of Upper Hutt	4.7	23.1	Moderate	3
29 Feb 2024, 01:51 AM NZDT (1 day ago)	15 km south-west of Tolaga Bay	3.1	28.5	Weak	0
29 Feb 2024, 12:15 AM NZDT (1 day ago)	20 km south of Whanganui	2.8	12.9	Weak	0
28 Feb 2024, 01:04 PM NZDT (2 days ago)	50 km west of Te Anau	3.8	50.6	Weak	0
28 Feb 2024, 04:10 AM NZDT (2 days ago)	15 km east of Hastings	3	40.1	Weak	0
27 Feb 2024, 11:47 PM NZDT (2 days ago)	20 km south-east of Dannevirke	3.7	5	Weak	0
27 Feb 2024, 10:53 PM NZDT (2 days ago)	30 km west of Methven	3.5	5	Weak	0
26 Feb 2024, 09:21 PM NZDT (3 days ago)	30 km west of Methven	5.1	5	Light	0
25 Feb 2024, 09:13 PM NZDT (4 days ago)	10 km south-east of Te Kaha	3.6	41.8	Weak	0
24 Feb 2024, 08:11 AM NZDT (6 days ago)	10 km south of Wairoa	2.8	20.6	Weak	0
23 Feb 2024, 12:04 PM NZDT (1 week ago)	10 km north-east of Oxford	2.8	5	Weak	0

New Zealand map showing earthquake locations.

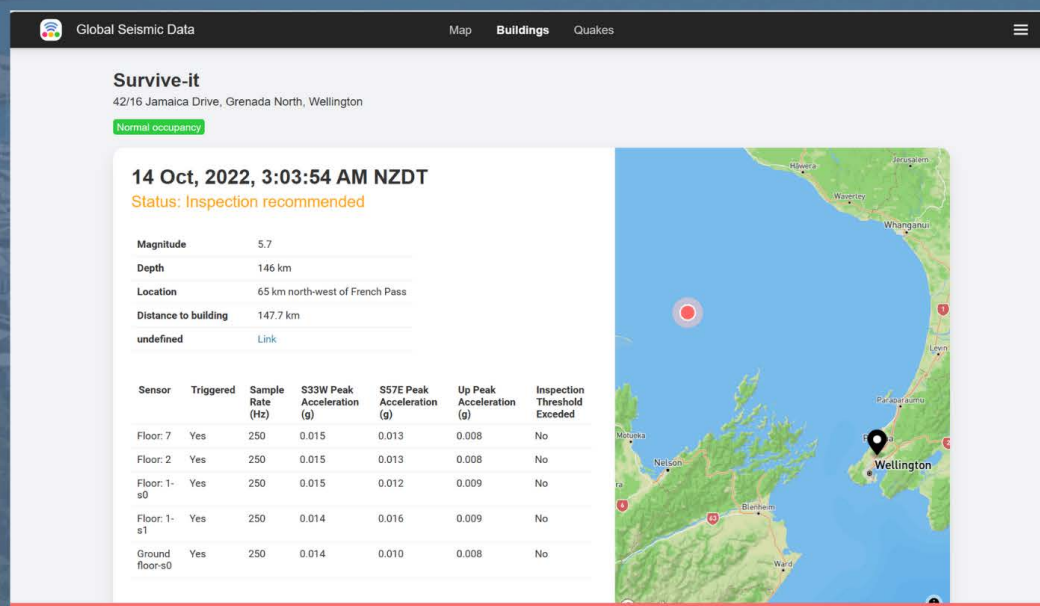
Earthquake Information - Aftershocks

- Aftershocks are determined in near-to-real time for each earthquake.
- Map shows impact of aftershocks over a geographical area.
- Additional graph shows frequency and magnitude of aftershocks over time.



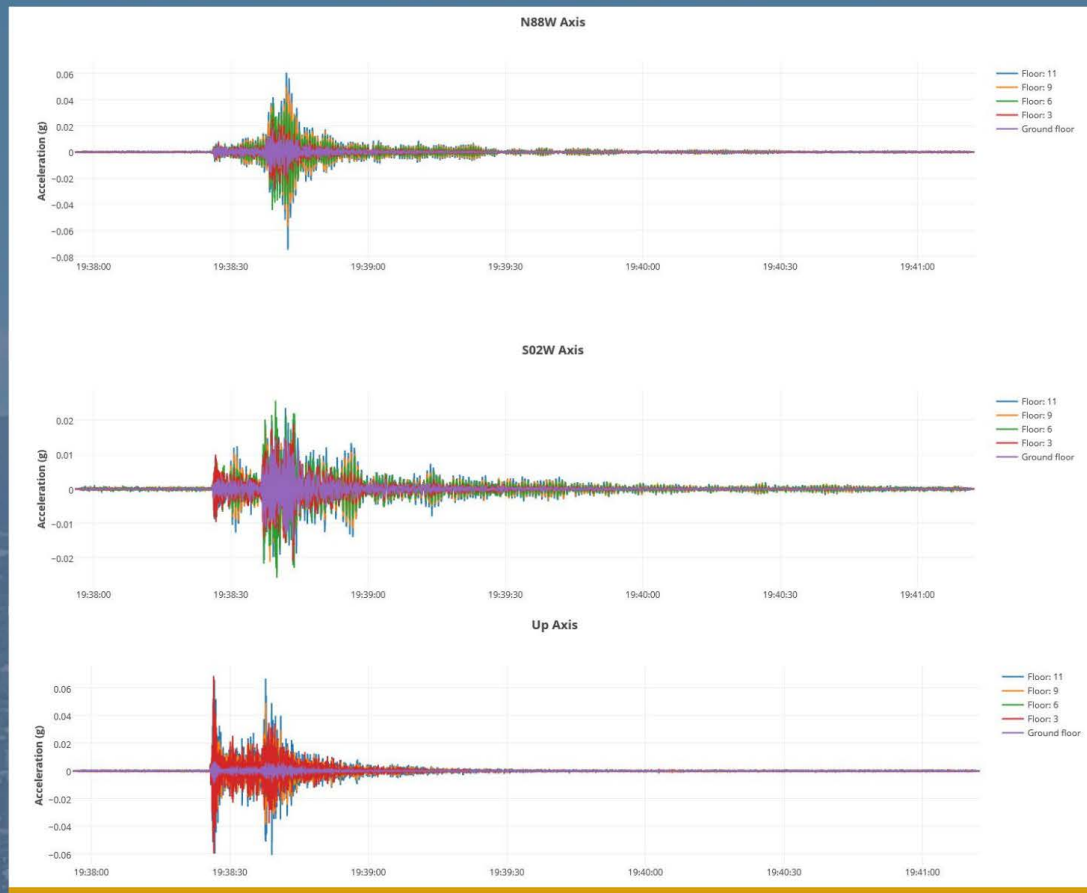
Data & Graph Types

- Acceleration
- Velocity
- Displacement
- Inter-storey Drift
- Rotation
- Response Spectra
- Fourier Amplitude
- Building Frequency



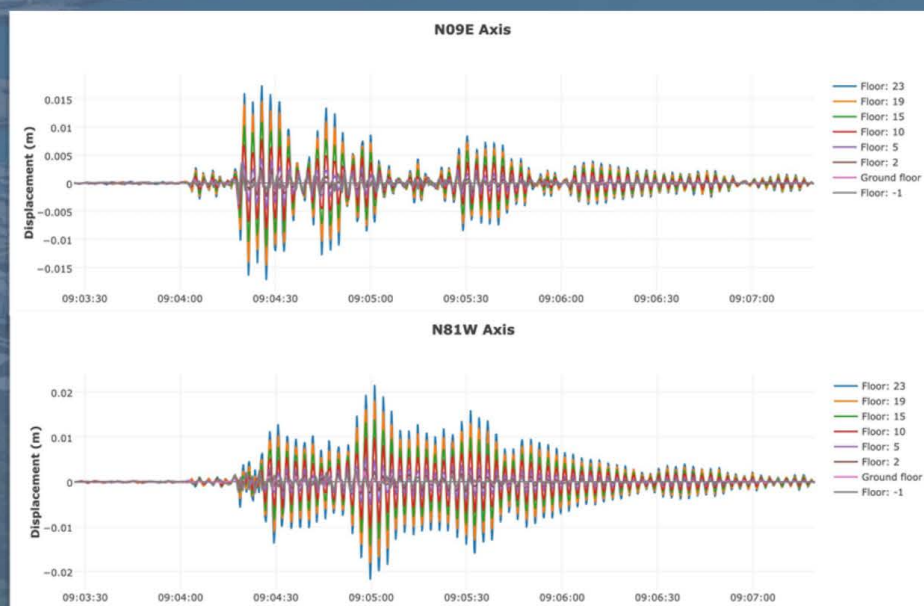
Acceleration

- Acceleration data is recorded by each sensor at 250 samples per second.
- Can select each floor to view them individually.
- Band-pass filtered and unfiltered data are available.



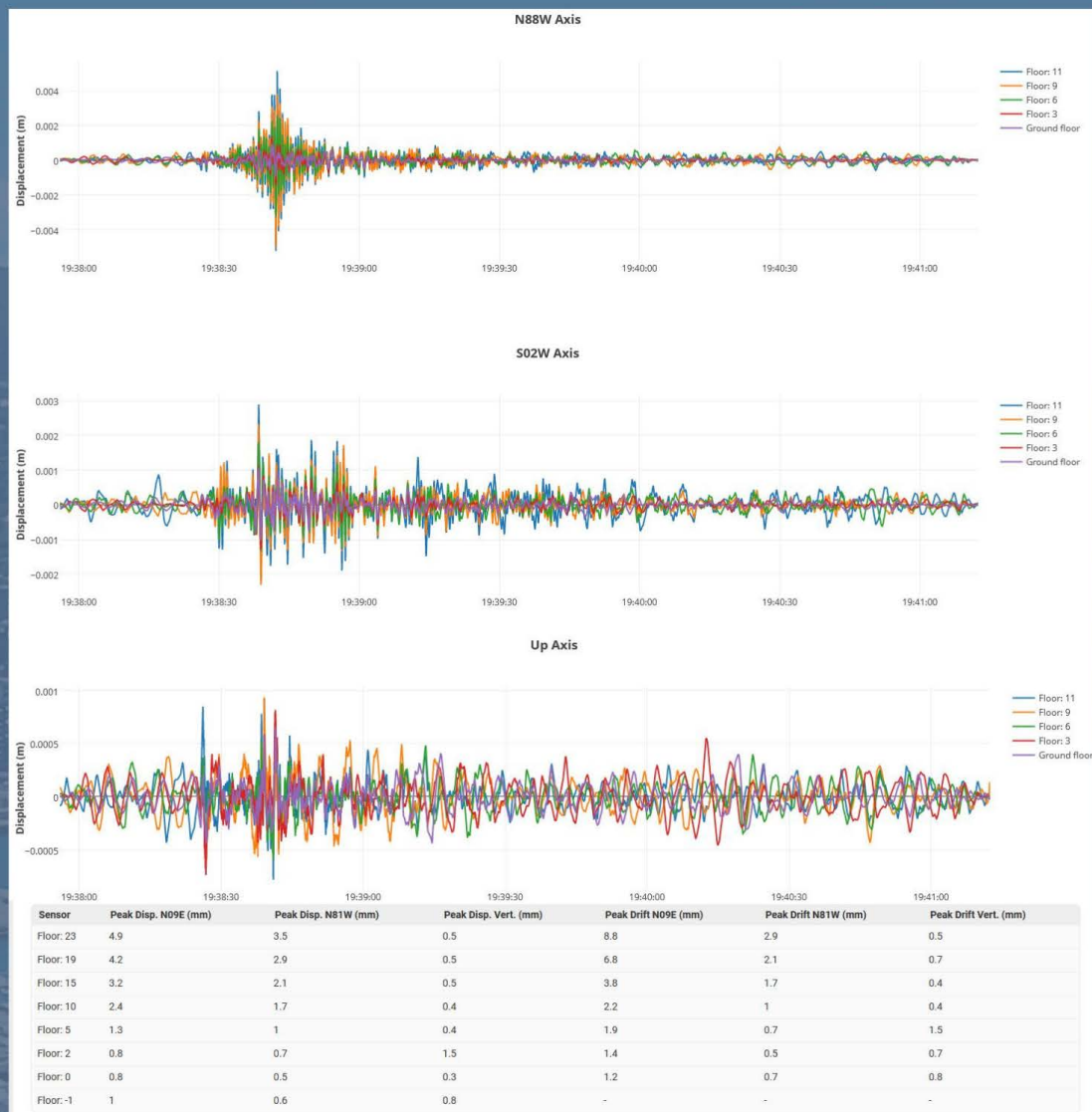
Velocity & Displacement

- Velocity and displacement graphs are provided by integration of acceleration data.
- A band-pass filter is used to remove noise and focus on wanted frequencies.
- These graphs can be indicative of damage to the structure.
- Alternate options allow for the displacement data to be displayed as inter-storey drift or relative to ground.



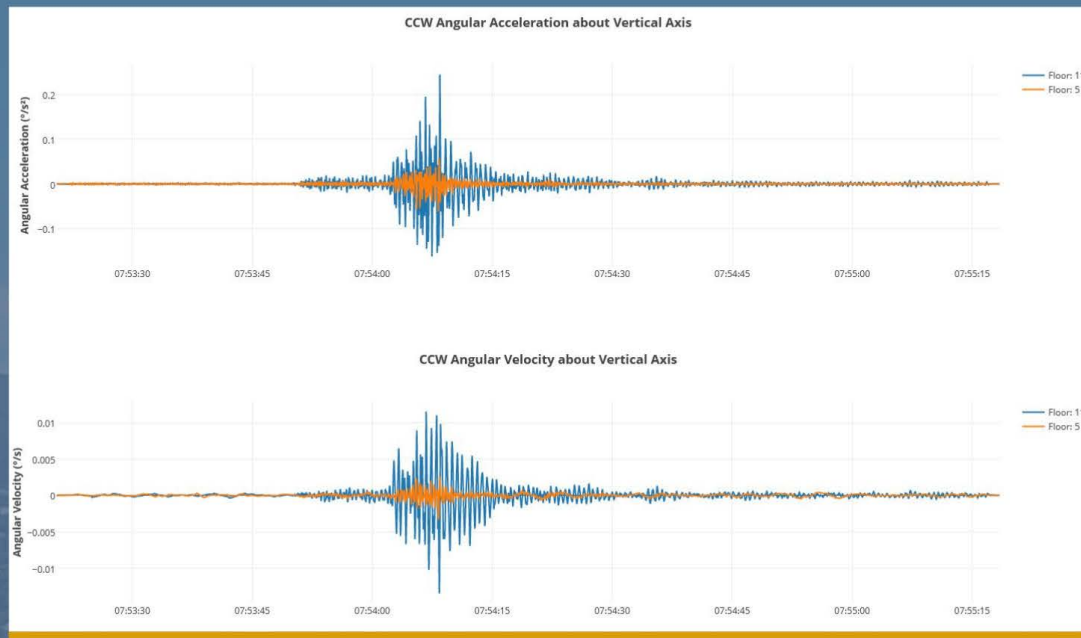
Displacement: Inter-storey drift

- Inter-storey drift displays the difference in displacement between each subsequent floor.
- GPS is used to ensure the timestamps for comparison between floors are accurate.
- Inter-storey drift can be displayed as a percentage of floor height, if the floor heights are known.



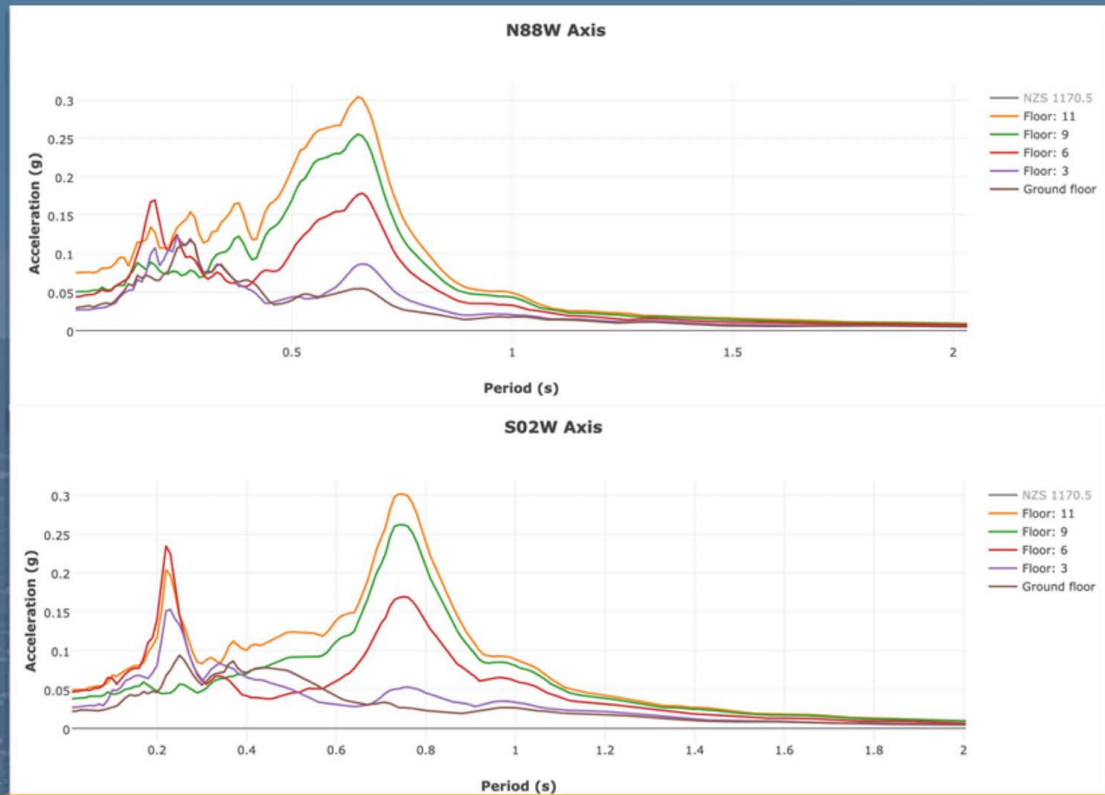
Rotation

- Rotation around the vertical axis can be determined if there are two sensors installed on the same floor.
- Angular acceleration, velocity, and displacement data is provided.



Response spectra

- The response spectra is a tool used to describe the peak acceleration response of a structure over a set of specified periods for each event.
- The response of floors above ground can be used to determine the natural period of the structure.



NZS1170.5 Hazard spectra curve

The NZS1170.5 standard defines a hazard spectra curve for which the ground response spectra can be compared with:

- A ground response spectra which exceeds the NZS 1170.5 hazard curve can indicate that the design forces of the structure have been exceeded.
- The NZS 1170.5 hazard spectra curve is defined by four inputs:
 - Soil Type (A, B, C, D, or E)
 - Hazard Factor
 - Return Period Factor
 - Distance to the nearest major fault.

Graphs: Response Spectra

[Export CSV](#)[Download Event Report](#)

Damping (%)

5

Hazard Spectra Options:

NZS 1170.5

On

Soil Type

B

Hazard Factor

0.4

Return Period Factor

1.0

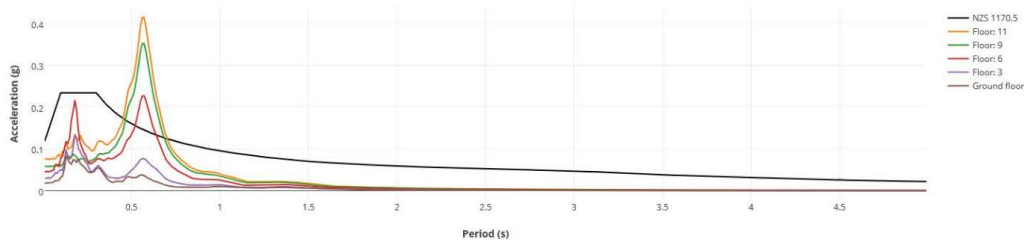
Near-Fault Distance (km)

1.1

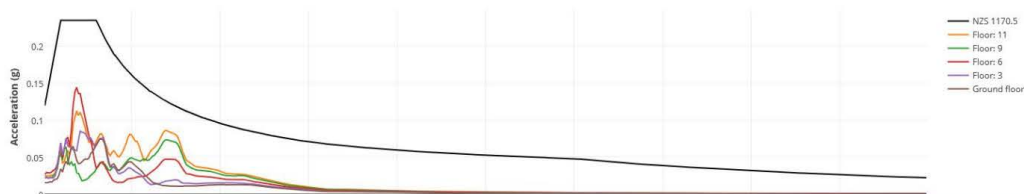
The NZS 1170.5 hazard spectra curve defaults can be set [here](#).

[Reload Graphs](#)

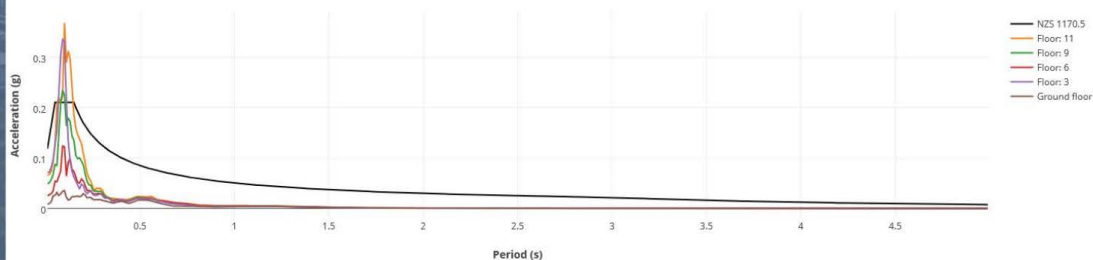
N88W Axis



S02W Axis

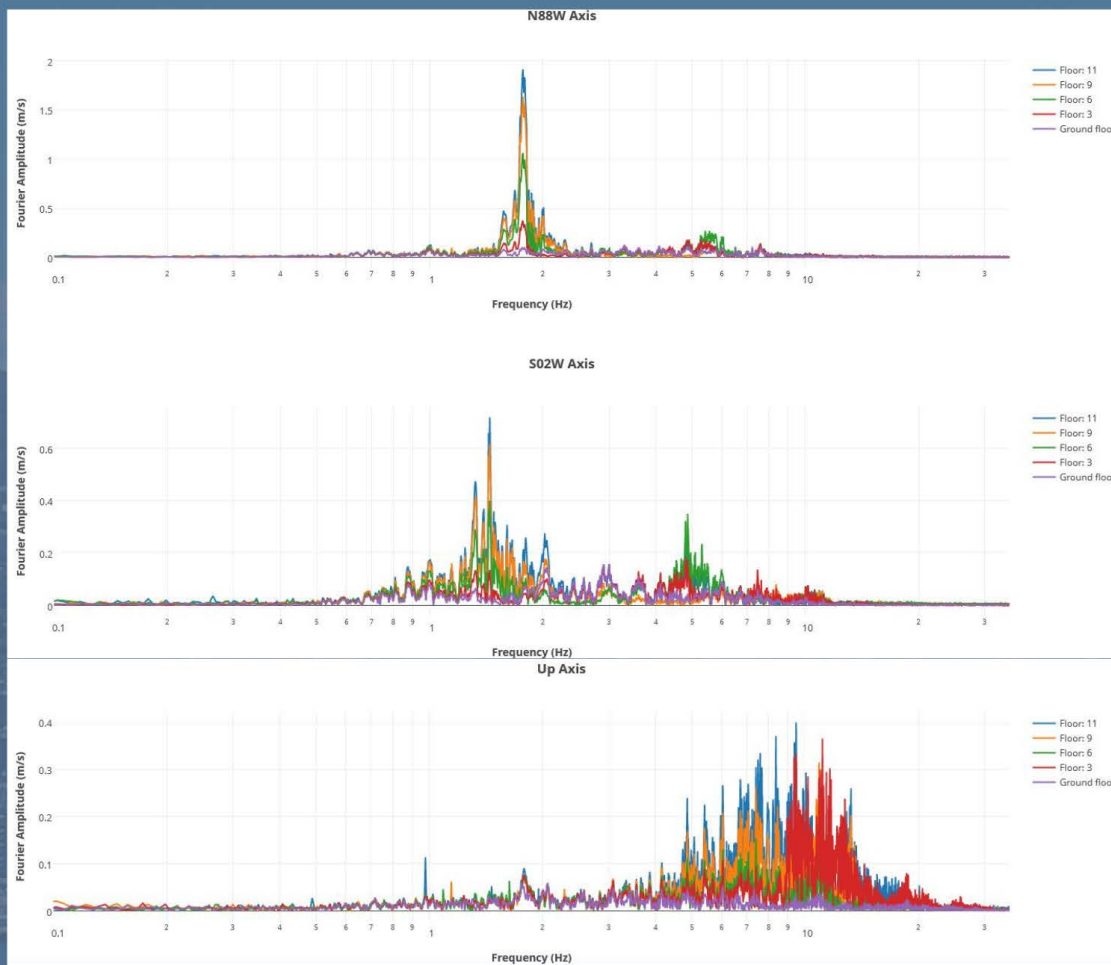


Up Axis



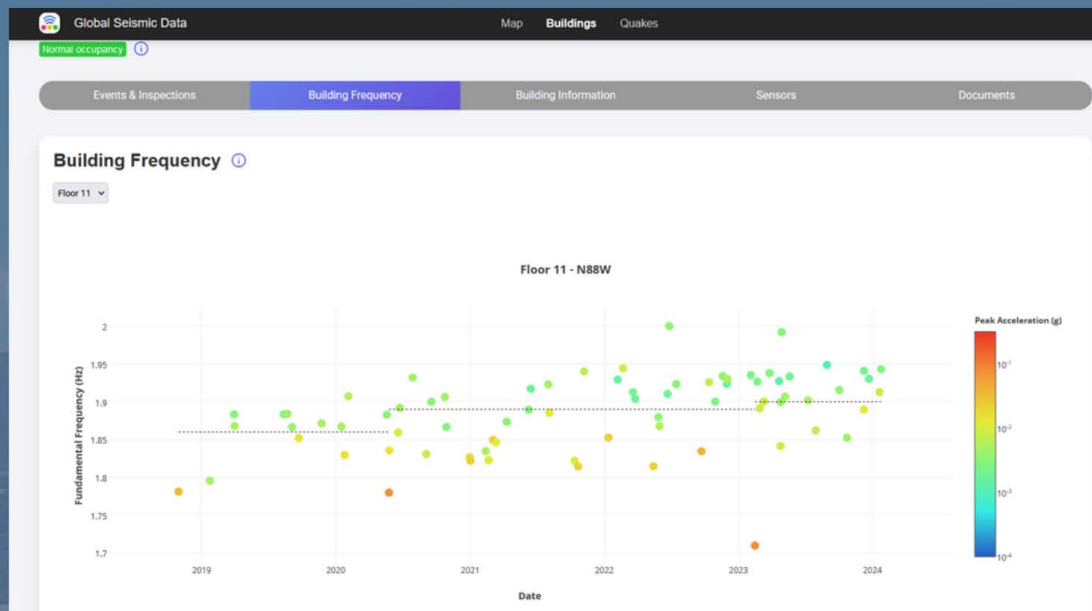
Fourier Amplitude

- Fourier Amplitude graphs provide information about the frequency content of the recorded data for each floor.
- The peaks and relationships between each floor in the Fourier Amplitude graphs can indicate different modes and natural frequencies for the building.

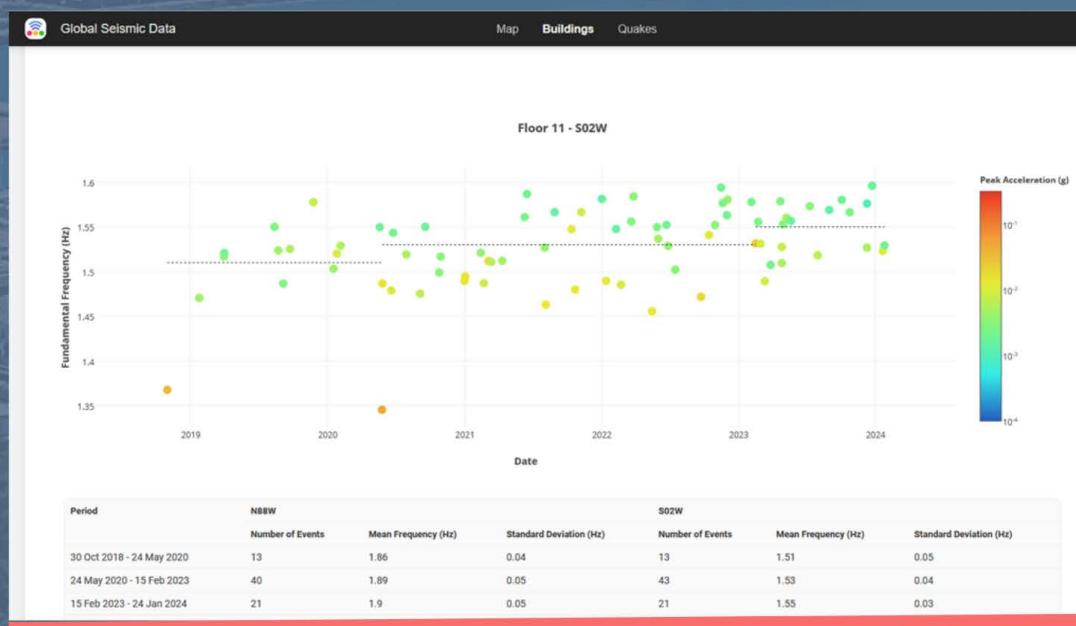


Building Frequency

- The Building Frequency tab displays fundamental frequencies of the building as determined by each event recorded in the building.
- Fundamental frequencies are calculated for each event by the maximum ratio between the Fourier Amplitude of the top and ground floors of a building.

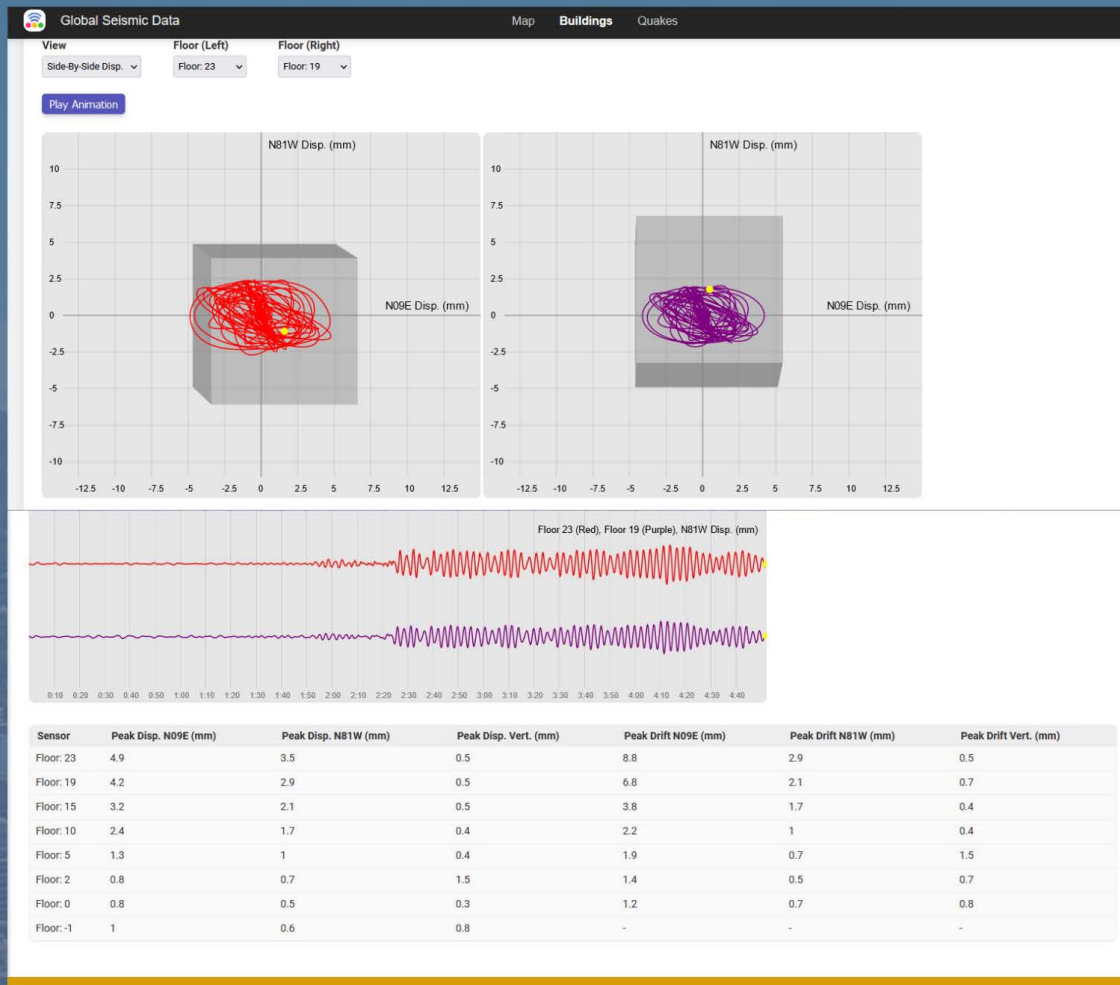


- The natural frequency of a building is determined by the average of fundamental frequencies recorded from events in the building.
- A drop in the average fundamental frequency of a building following a large earthquake can indicate structural degradation.



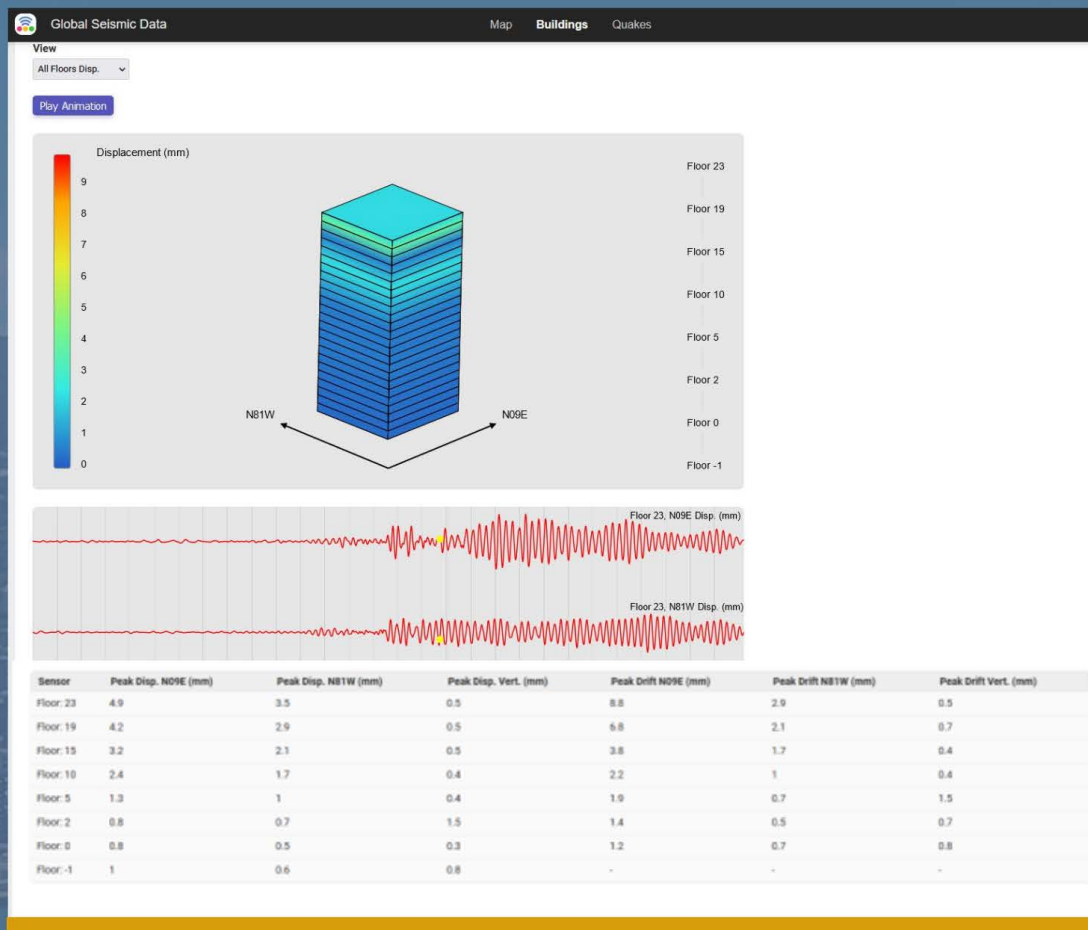
Animations: Displacement Scratchpad

- The displacement scratchpad animation shows the horizontal movement of a sensor in the building from a top-down perspective.
- Show either a single floor or a side-by-side comparison.



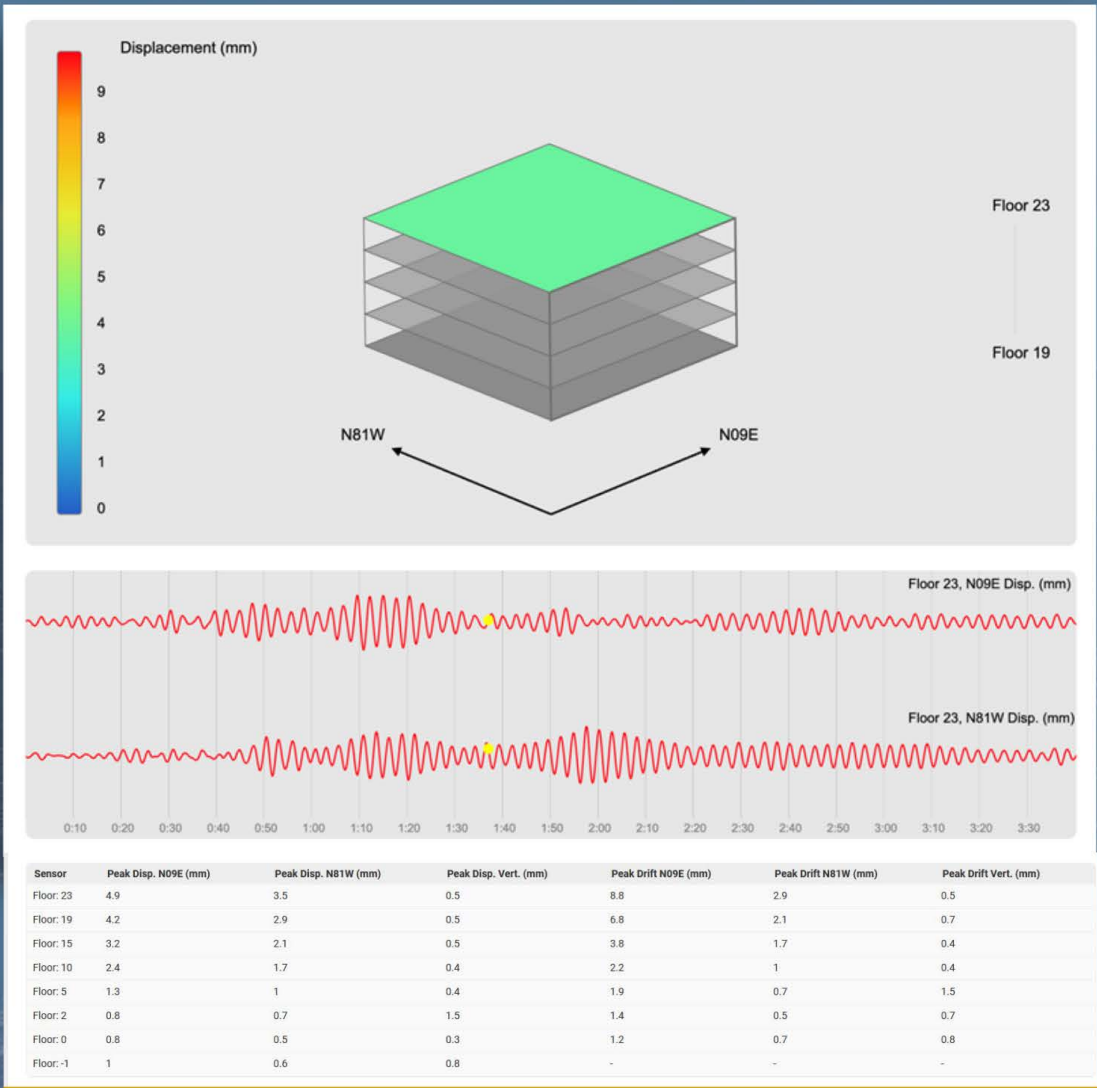
Animations: Displacement Heatmap

- The displacement heat map animation shows the movement recorded throughout the building.
- Displacement is shown of the two horizontal axes.
- The colour is based on the scale of movement.



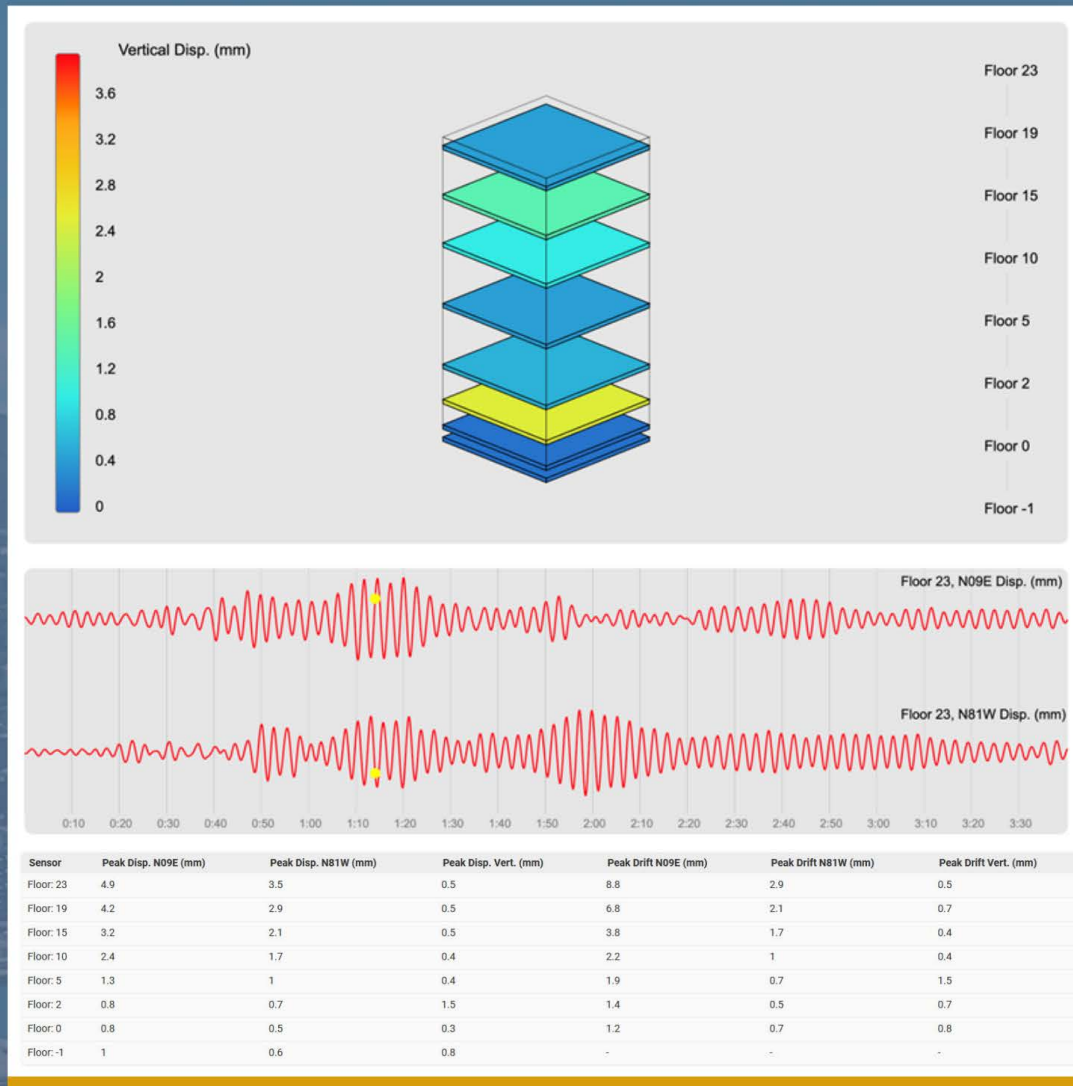
Animations: Inter-Storey Drift

- The Inter-Storey Drift animation shows the movement of a floor relative to a floor above.
- A table of peak displacements and drift recorded can be viewed.



Animations: Vertical Displacement

- The animation shows the vertical movement throughout the building.
- Click on any trace points to fast forward and see movement.



Event Report

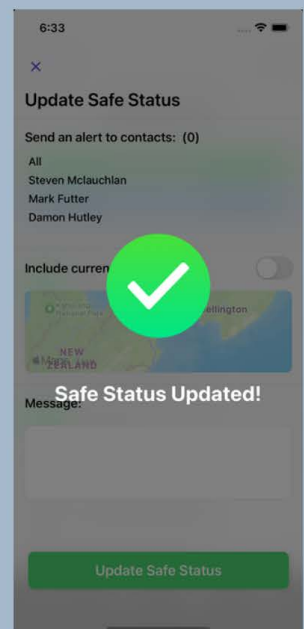
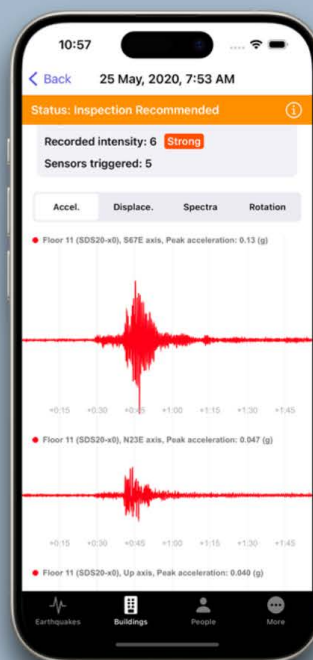
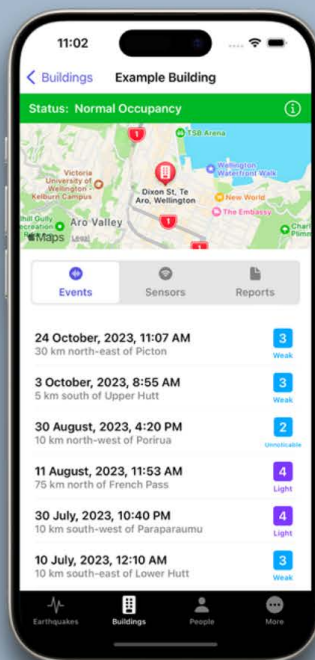
- Downloadable PDF report available for events that are linked to a GeoNet or USGS quake.
- Contains data and graphs including acceleration, displacement, inter-storey drift, response spectra and more.



GSD Mobile App



- View data, events and graphs including acceleration, rotation, displacement, inter-storey drift, response spectra and more.
- View building status and receive notifications when building status changes.
- Create or view damage reports for your building.
- View large datasets of earthquakes and aftershocks.
- Receive customised notifications for earthquakes.
- Record damage found throughout your building after an earthquake occurs.
- View large dataset of earthquakes from multiple sources.
- View list of aftershocks calculated from a larger earthquake.
- Send felt reports or 'I am safe' messages to family/friends after an earthquake occurs.
- Available for iOS and Android.



Key Points

- Provides 24/7 structural health monitoring on the movement and behaviour of buildings and infrastructure.
- Low cost, low maintenance system.
- Minimise business disruption and improve business continuity.
- Improve workplace health and safety, and assist with emergency response.
- Data available in near-to-real time with email alerting.
- Data for engineers including acceleration, inter-storey drift, response spectra and more.
- Animations for visualisation of building performance during an earthquake.
- Traffic-light system for building status based on sensor data and engineer inspection.
- Sensor communications provided by cellular, Wi-Fi or Ethernet connection.
- UPS available to provide greater than 48 hours backup power.
- Sensor units have been calibrated and certified by BRANZ.
- Real-time sensor monitoring for quick diagnostics and maintenance.
- Mobile apps – iOS and Android.



Global Seismic Data NZ Limited

Contact Us

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