

Vibration monitoring, Torres Colón, Madrid, Spain



Case study

May 2021

Vibration monitoring in the Torres Colón in Madrid

Abstract

The Torres Colón (Columbus Towers) are two important buildings of the city of Madrid in Spain. *Luis Vidal + Architects* has designed the remodelling project of the Torres Colón to turn them into a new architectural icon for the city of Madrid.

The remodelling project will enhance the structural solution designed in the 1970s. The building will maintain the original hanging structure in its entirety, modifying the design and exterior architecture to adapt it to the new needs of the 21st century. The renovation also proposes the elimination of the building's current „socket“. Taking advantage of this space, the building will have four new floors of offices.

The new Torres Colón will be the first high-rise office building in Spain to be considered a Nearly Zero Energy Consumption Building (NECB).

Grupo Alava, commercial partner of Syscom in Spain, is responsible for the vibration and seismic monitoring in the towers, in order to check that any construction work (during renovation) or earthquake (during normal operation) do not impact the structure integrity of the building. The solution with MR3000C devices connected to the SCS cloud software is chosen, to have an automatic remote monitoring of the vibrations on site.

Project summary

City:	Madrid (Spain)
Address:	Calle de Génova, 2
Project dates:	2019-2022
Architect:	Luis Vidal + Arquitectos
Customer:	Mutua Madrileña
Surface:	20.298 m ²
Height:	117 m

Monitoring summary

Objective:	Monitor the accelerations on critical locations of the structures, first related to renovation works and successively related to the seismic monitoring
Devices:	4 MR3000C with internal MS2008+ triaxial accelerometer and internal 4G modem
Installation:	Vertical, on the wall
Locations:	At ground floor and at 25 th floor in both towers
Output:	Automatic comparison with maximum allowed levels, by means of PDF reports automatically sent by the SCS cloud software



Figure 1: The Torres Colón

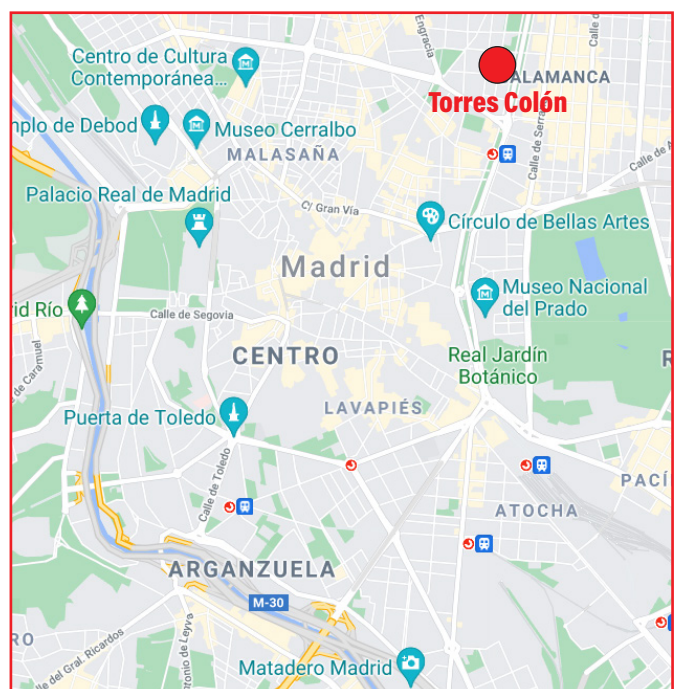


Figure 2: Map of Madrid with the location of Torres Colón.

The monitoring

The monitoring is carried out at four measuring points, 2 per each tower, at the same floors:

- MP1: Tower 1, ground floor
- MP2: Tower 1, 25th floor
- MP3: Tower 2, ground floor
- MR4: Tower 2, 25th floor

The instruments in MP1 and MP2 are shown respectively in Figure 3 and Figure 4.

A MR3000C with internal triaxial accelerometer is installed in all measurement points. The instrument has an internal 4G modem allowing to transfer all data automatically to the cloud software SCS (<https://scs.syscom-instruments.com/>) The SCS offers a complete vibration monitoring including:

- PDF event reports sent automatically as soon as a high vibration is detected in one of the locations
- PDF background reports sent every month, according to the monitoring specifications
- Email alarm notification sent in case of system state of health problem and alarm threshold exceedance

At the beginning of the monitoring two weeks are dedicated to the study of the current levels on site. Then the trigger threshold is set to 100 mg for all devices. The two alarm levels are configured between 100 mg and 300 mg, according to the location of the instrument and the proximity with a vibration source.

Results

The background monitoring during the month of April 2021 is shown in Figure 5. It is interesting to notice that:

- at this stage, the main source of vibrations are the renovation works inside the building, mainly demolition works, and that the higher vibrations occur during week-days. Moreover the Easter holidays at the beginning of the month are highly visible.
- The work intensity is not always homogeneous in all locations measured. The higher intensity is reached during the last week of the month, at MP1.

An event recorded in the last week of April 2021 on MP1 is shown in the Figure 6.

Conclusion

A total of four accelerometers are installed in the Torres Colón, in order to first monitor the vibrations produced by the renovation works and successively for the seismic monitoring of the structures.

The remote vibration monitoring solution, based on 4 MR3000C devices and the SCS for automated data processing, enables continuous evaluation of acceleration levels.

On one side, the instruments are easy to install and need a very limited periodic maintenance, and on the other side the complete solution (with the SCS cloud software) allows people being informed in near real-time about the exceedance of the acceleration thresholds fixed at each location.



Figure 3: MP1, at the ground floor of Tower 1.



Figure 4: MP2, at the 25th floor of Tower 1.

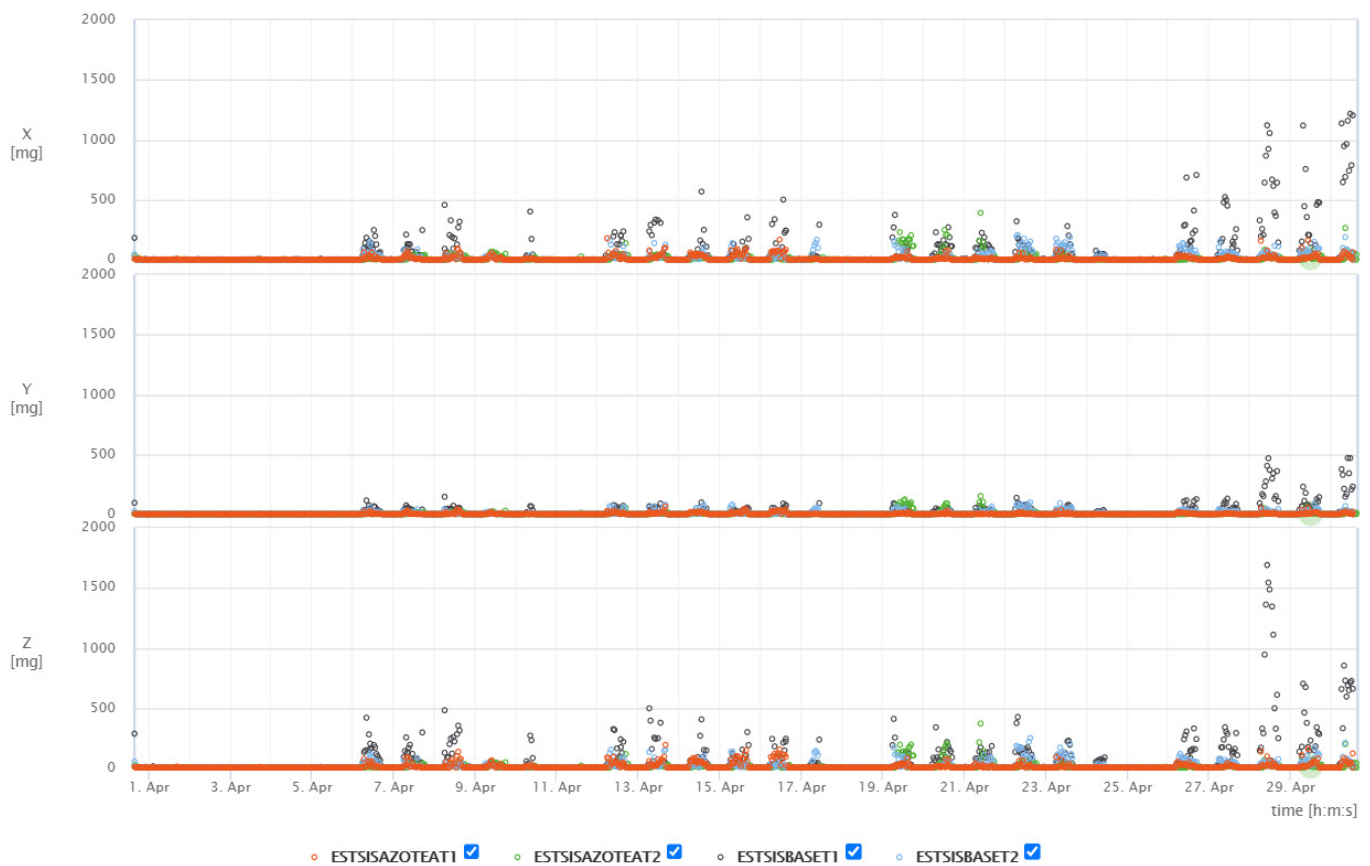


Figure 5. Background monitoring during the month of April 2021 for the four measurement points.

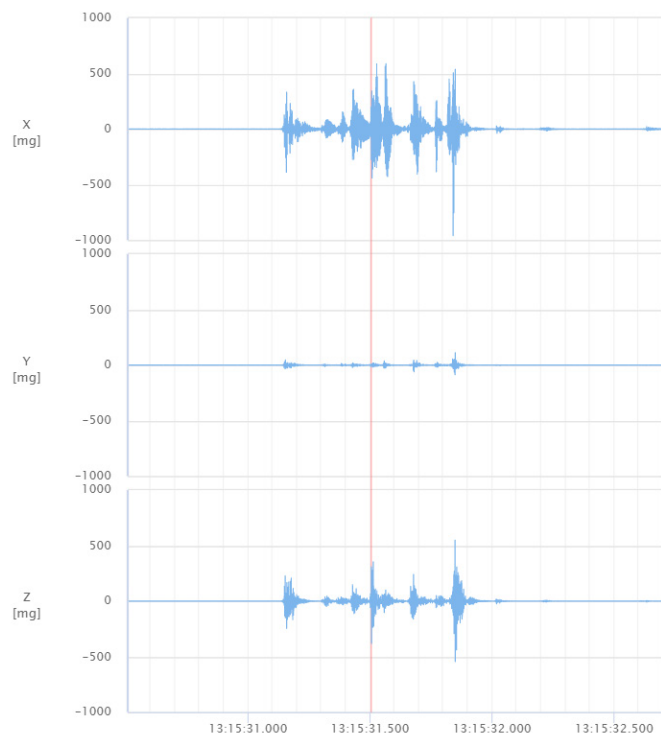


Figure 6: An event occurred on MP1.

Special thanks to Grupo Alava who allowed us to write this case study.



About Syscom

SYSCOM Instruments is part of Terra Insights platform of trusted monitoring technology brands. Terra Insights is the industry's first, end-to-end sensor to cloud data delivery platform that supports proactive, risk-informed decision making and monitoring. SYSCOM Instruments SA is a leading supplier of vibration and seismic monitoring equipment for the civil engineering and safety markets, in particular for nuclear power plants and LNG plants. The reputation of SYSCOM Instruments SA is based on the reliability of its products, resulting from a meticulous control of all aspects of design and production.

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