



Vibration monitoring, Cáceres, Spain



Case study

December 2019

Vibration monitoring of the Casa Paredes in Cáceres (Spain)

Abstract

The Casa (palace) de los Paredes-Saavedra is an old building built during the Renaissance located in the historical centre of Cáceres, a small city in the Western part of Spain. The palace is shown in Figure 1, while the location of Cáceres in Spain is shown in Figure 2.

Due to the high value of the artistic and architectural heritage of the historical centre of Cáceres, during the renovation work on the Casa de los Paredes-Saavedra a vibration monitoring system was required to control possible damage on adjacent buildings.

The vibration monitoring is performed with a MR3000C and a ROCK device and the data are compared to the Spanish norm UNE 22-381 in the Syscom Cloud Software (SCS). Immediate corrective actions are taken by the construction company if the thresholds of the norm are exceeded.

Monitoring Summary

Project:	Casa Paredes, Cáceres (Spain)
Objective:	Vibration monitoring of buildings adjacent to the Casa Paredes
Duration:	4 months
Devices:	1 MR3000C & 1 ROCK
Software:	SCS cloud software (scs.syscom-instruments.com)
Output:	Near real-time data notifications and PDF reports coming from SCS, and comparison with the UNE 22-381 norm.

Key Notes - Casa de los Paredes-Saavedra

City:	Cáceres (Spain)
Address:	Calle Ancha
Period:	Renaissance

The Paredes-Saavedra house, renovated in the 16th century, has the remains of an older uncovered tower, two granite mullions and Gothic windows. The façade has a semicircular arch and radiant voussoirs, a motif that is also repeated in the window above it. Inside the building there is a colonnaded courtyard.

Source: <https://cacereshistorica.caceres.es/>



Figure 1. External view of the Casa de los Paredes-Saavedra.

Source: <https://avuelapluma.es/>

Monitoring configuration

Two vibration monitoring units from Syscom are installed in buildings next to the Casa Paredes to evaluate the vibrations transmitted by the construction works.

The devices are a MR3000C and a ROCK, both with internal velocity meter. Both devices are completely autonomous systems, with PPV (peak particle velocity) recording and 4G communication features. The location of the instruments is shown in Figure 3, while the ROCK is shown in Figure 4.

The ROCK is quickly installed in the building with no power, since its internal battery allows an autonomy of about 6 months, covering the entire duration of the project.

After a quick installation on site, both devices measure velocities and send the data to the SCS cloud software in a dedicated project.

The trigger and alarm thresholds are shown in Table 1.

Table 1. Threshold used during the monitoring, for all axes.

Threshold	Value
Trigger	4 mm/s
Alarm	UNE 22-381, historical structures



Figure 2. Localization of Cáceres on the map of Spain.

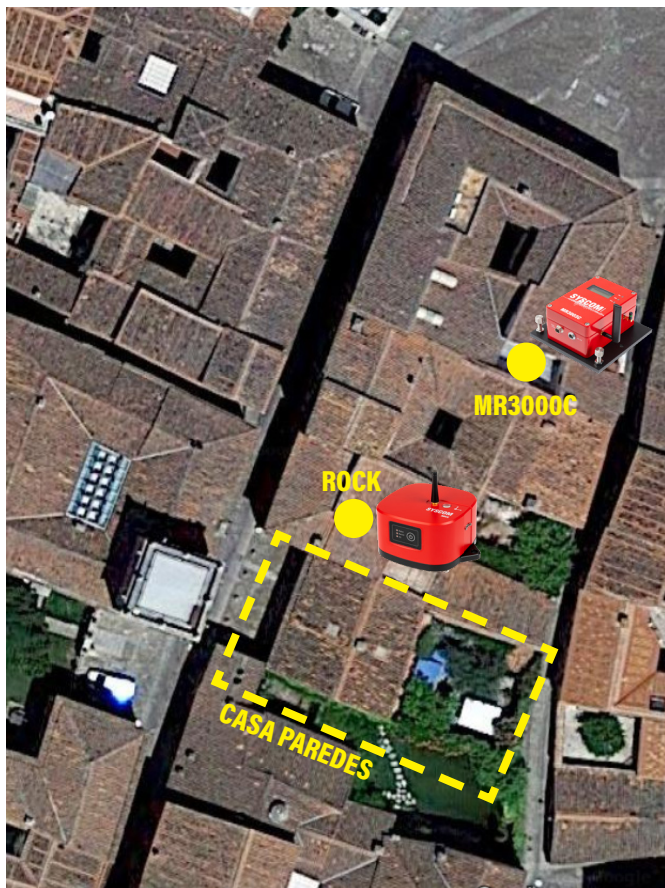


Figure 3. Location of the measuring units.



Figure 4. ROCK device.

Results

If any of the alarm thresholds is exceeded, the SCS cloud software sends immediately a notifications by e-mail and SMS to the selected recipients.

The e-mail contains also a PDF report with the data recorded about the event and the graphical comparison with the UNE 22-381 standard.

In Figure 5, the background data of the ROCK device during the whole monitoring period is shown.

Some vibrations due to renovation works exceeded the trigger threshold and created an event. One of them is shown in Figure 6, when a heavy machine working at a high frequency (around 130 Hz) excited the surrounding building monitored by the ROCK device. The values are compared automatically with the UNE 22-381 standard (Figure 7), showing that the limits are respected.

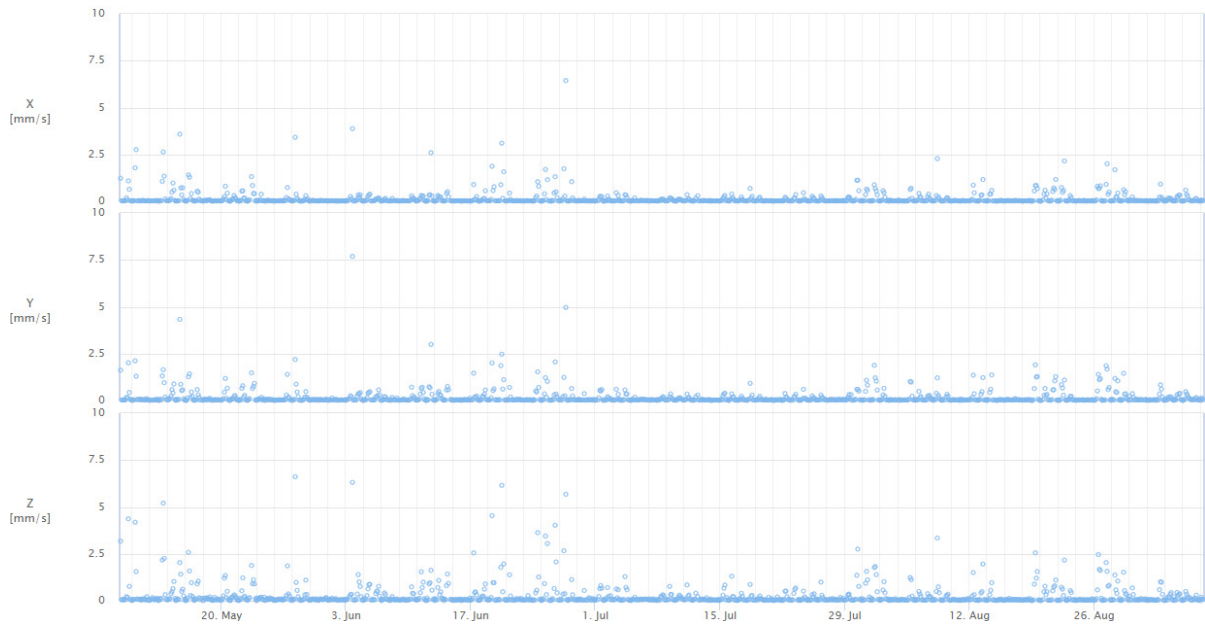


Figure 5. Background recording of the ROCK device during the 4 months of monitoring.

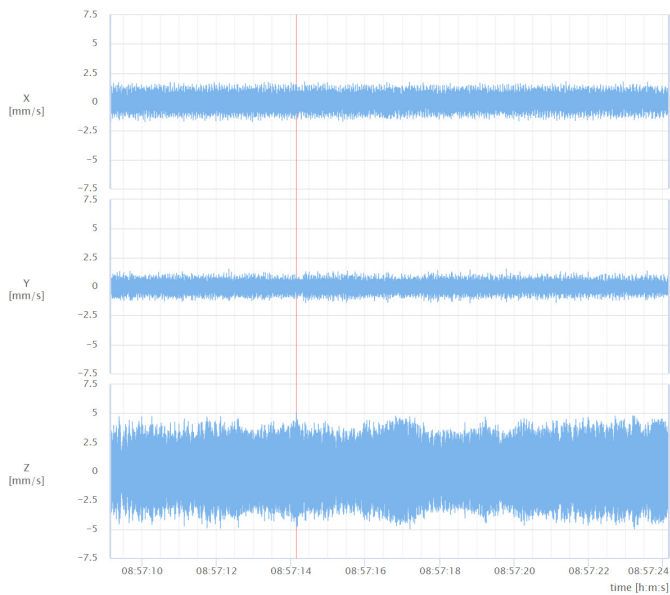


Figure 6. Time history of an event the 28th of May.

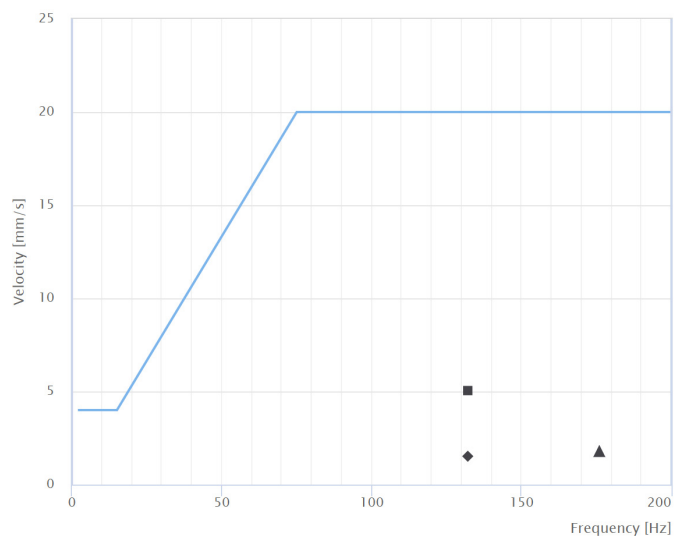


Figure 7. Comparison plot with the Spanish norm UNE 22-381.

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.

www.syscom.ch

Conclusion

With the solution given by MR3000C/ROCK and SCS cloud software, the construction company obtained an effective vibration monitoring allowing them to have continuous near real-time information about the levels generated during the complete work at Casa Paredes.

In case of vibrations exceeding the UNE 22-381 norm, they were immediately informed via e-mail and SMS, in order to take corrective measures in time.

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

