SYSCOM Instruments

Demolition monitoring,
Bonn Center,
Bonn, Germany

Case study

June 2017

Vibration monitoring of Bonn Center demolition with MR3000C and MR3000BLA

Abstract

The Bonn Center was a commercial center in Bonn, in the western part of Germany. It was built in 1968-1969 and it had a height of 60 m. Recently the municipality of Bonn decided to replace it by a new center and its demolition was programmed for Sunday 19th of March 2017.

Since the Bonn Center is located in the centre of the city, the municipality decided to monitor the blast-induced effects on some surrounding structures, in particular two residential buildings, a hotel and the building of the International Paralympic Committee.

Parallel to the official measurements done by the blasting company, four additional monitoring devices made by SYSCOM are used to record the velocities in three directions and the air pressure in the measurement point closest to the demolition site.

The data are analyzed by means of the SCS (Syscom Cloud Software), where the comparison with the German norm DIN 4150-3 is automatically and quickly performed.

KEY FACTS

Objective:	Vibration monitoring of buildings close to the demolition site of the Bonn Center
Date:	March 19th, 2017
Location:	Bonn (Germany)
Meas. points:	4
Instrumentation:	3 MR3000C with internal triaxial velocity sensor and external battery pack
	1 MR3000BLA with external triaxial velocity sensor and air pressure microphone
Analysis:	SCS Cloud Software (**scs.syscom-instruments.com**)
Regulation:	DIN 4150-3 (Germany) – Vibration at foundation - Residential buildings
Output:	Comparison of the maximum velocities and frequencies with the limits of the DIN 4150-3 norm

Figure 1. The Bonn Center few minutes before the demolition.

Monitoring configuration

The demolition of the Bonn Center is performed on 19th March of 2017. In Figure 1, the building few minutes before the demolition is displayed.

The vibration monitoring is done on 4 different points close to the demolition zone, according to the map in Figure 2. The instruments in the different locations are shown in Figure 3, while the devices used and the distances from the demolition zone are listed in Table 1.

In Figure 4, successive time instants related to the demolition of the Bonn center are represented. They are taken from the Bonn Marriott Conference Hotel.

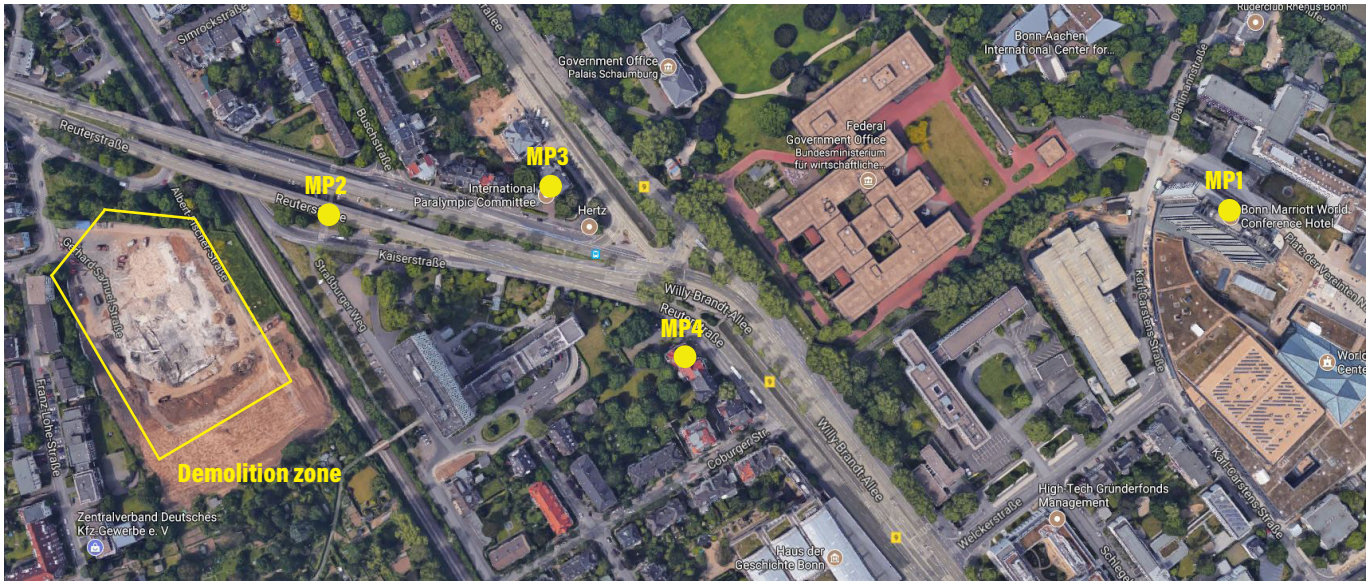
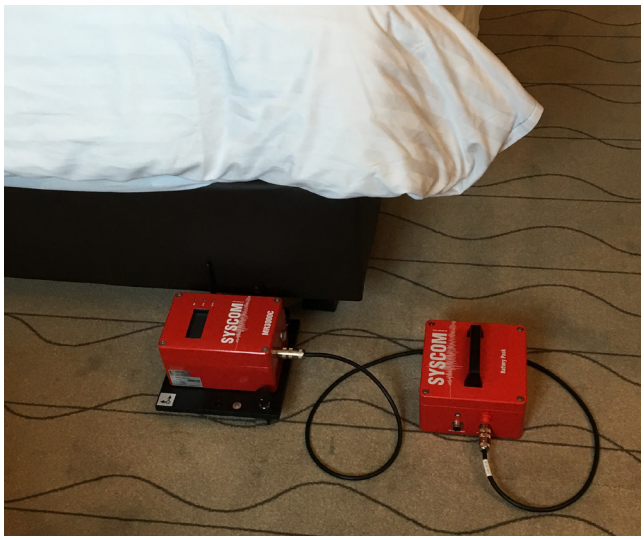


Figure 2. Map with the demolition zone and the measurement points.

a) 

b) 

c) 

d) 

Figure 3. Instruments installed for the vibration monitoring: MR3000C in MP1 (a); MR3000BLA in MP2 (b), MR3000C in MP3 (c) and MR3000C in MP4 (d).

Table 1. Location, distance and device for each measurement points.

Meas. point	Location	Distance from site	Device
MP1	Bonn Marriott Conference Hotel, inside a room	160 m	MR3000C
MP2	Residential building, close to an external wall	40 m	MR3000BLA
MP3	International Paralympic Committee, on the stairs of the cave	70 m	MR3000C
MP4	Residential building, on external stairs	80 m	MR3000C

t=0 s **t=3 s** **t=6 s** **t=9 s**

Figure 4. Successive instants of the Bonn Center demolition, seen from the Bonn Marriott Conference Hotel.

Figure 5. Time histories recorded in MP1, in the Bonn Marriott Conference Hotel, during the demolition of the Bonn Center.

Three MR3000C and one MR3000BLA are used for the vibration monitoring. The MR3000BLA is installed in the point closest to the demolition site, to measure also the air pressure. The microphone is oriented in the direction of the explosion.

The MR3000C in MP1 is installed in a room inside the Bonn Marriott Conference Hotel, while the instruments in the other locations are installed close to the foundations of each building, in order to measure the vibrations transmitted from the ground to the structures. For this reason, the values recorded are compared to the limits defined by the German standard DIN 4150-3, concerning vibrations at foundation for residential buildings.

All the instruments are installed temporarily during the demolition and are powered by a battery.

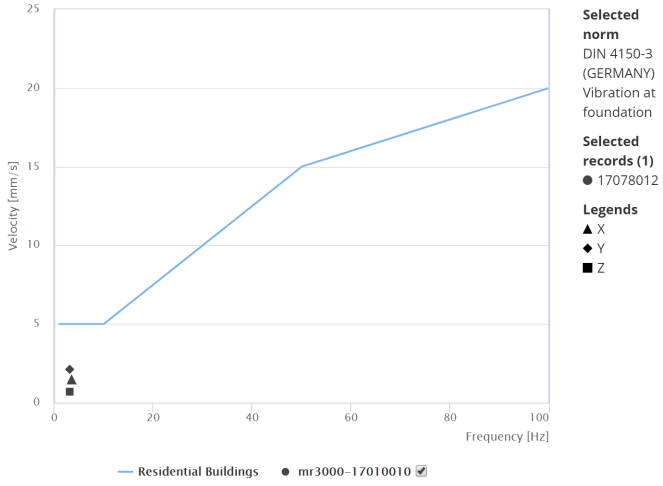


Figure 6. Comparison of the velocities/frequencies of the event recorded in MP1 with the limits of DIN 4150-3 for residential buildings at foundation.

Data analysis with Syscom Cloud Software

The analysis of the data is done with the SCS cloud software. In Figure 5, the time histories recorded in MP1 are displayed. The Bonn Marriot Conference Hotel shows significant vibrations for a duration of about 12 seconds.

The maximum velocity peaks recorded and the dominant frequencies calculated by means of the FFT do not exceed the limits defined by the DIN 4150-3 norm, as can be seen in Figure 6, which relates to a successful blast.

Conclusion

The demolition of a building in a city center has a significant impact on the surrounding structures, where vibration instruments should be installed to check if the velocity values are compliant to the reference norm, in order to ensure that the demolition works do not cause any structural damage.

The SCS cloud software (**scs.syscom-instruments.com**) allows to automatically analyze the data from the devices and to compare them with the limits defined by the German norm DIN 4150-3.

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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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