

# Bruges Concert Hall, BE



## Building Isolation

CDM-CHR Springboxes 4 Hz



**Architect** Robbrecht & Daem  
**Owner** City of Bruges  
**General Contractor** De Nul  
**Acoustic Consultant** Arup Acoustics (UK)  
**Stability Engineering** Studium  
**Building Mass** 460MN

Bruges, the "Cultural Capital of Europe in 2002", can boast a new Concert Hall complex right in the middle of one of Europe's most beautiful cities. The complex has an internationally recognised Concert Hall seating 1300 people, a Chamber Hall for 250 people, a walk-in foyer, two rehearsal rooms and ample artist accomodation. The Concert Hall is designed as a multi-functional space and also can be used for theatre, dance and conferences.

The Concert Hall complex is directly adjacent to an extremely busy traffic underpass and built above an existing car park. Arup Acoustics carried out an extensive vibration survey and predicted that re-radiated noise levels in the Concert Hall would be clearly audible without treatment. The required resonant frequency to resolve this problem was 8Hz. An added problem was that the existing car park, which the Concert Hall complex was built on, had slabs that had resonant frequencies between 8 and 10Hz. Predictions suggested that if an 8Hz solution was used then vibration levels could be amplified to perceptible levels. Arup Acoustics therefore specified a 4Hz Pre-compressed Spring solution to solve both problems.

In the completed building it was not possible to measure the intrusive noise levels above the background of PNC18.

### Design Specifications

Vertical resonance frequency	4 Hz (+/- 10%)
Load range per box	500 – 1200 kN
Coil resonance frequency	>200 Hz
Vertical resonance frequency of any isolated block	outside range 20 – 80 Hz
Maximum vertical load	2*design load (G+Q/3)
Vertical failure deflection	< 30 mm
Precompression	0.8*dead load
Maximum lateral deflection	+/- 5 mm
Maximum lateral load	design load/3
Temperature range (at least 50 years)	-10 / +35°C
Humidity	0 – 100%

The building was built on Pre-compressed Springboxes CDM-ISO-CHR types B3/B4/B4L/B6/B9/B10L



Precompression of a B10 springbox CDM-ISO-CHR B9 springbox

Tests were carried out at Gent University to check the spring deflection during a 2 hour fire.



Before the test



After the test



The « tuning » spring (18,5kN) can be placed into the « structural » spring (73,6kN)

## CASE STUDY – CDM-ISO-STRUCTURE

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