Seismic vulnerability of buildings in the Vienna basin – a case study

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The framework

Research projects founded by FP7:

- SYNER-D
- NERA

Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation
The asset management platform EQVIS
Some numbers about the database

- The 767 Buildings are divided into:
  - Vienna 8th District: 183 Buildings - NERA 2014
  - Vienna 20th District: 547 Buildings - SYNER-G 2014
  - Wiener Neustadt: 12 Buildings - Projekt NERA 2014
  - Innsbruck: 10 Buildings - Projekt NERA 2014
  - St. Pölten: 15 Buildings - Projekt NERA 2014
The survey procedure

Building Structural Surveys
The flow-chart

- Input User Form: VBA

  - Database: Excel Table

  - Export engine: VBA

  - Automatic reporting: Excel writes into

» Outputs:
  » The Web database of buildings
  » The Word Catalogues
The visual inspections

Building Structural Surveys
Devices

- Tablet Computer & Visual Basic for Application
- Brimos Recorder
- Digital Camera
- Laser Telemeter
- Measuring Tape
- Post-Keys
The VBA User Form

Building Structural Surveys
<table>
<thead>
<tr>
<th>Address:</th>
<th>Street / No.: Schloßgasse</th>
<th>PLZ: 1080</th>
<th>Construction Year: 1901</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photographic information:</td>
<td>from: 200 to 211</td>
<td>GPS-Coordinates: 46.21355, 16.35.3403</td>
<td></td>
</tr>
<tr>
<td>Building Usage:</td>
<td>Masonry</td>
<td>RC</td>
<td>Steel Frame</td>
</tr>
<tr>
<td>Construction Type:</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Persons/Dwelling Units:</td>
<td>Number of Dwelling Units: 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground Plan:</td>
<td>Corner Building</td>
<td>Adjacent Buildings: right</td>
<td></td>
</tr>
<tr>
<td>Elevation:</td>
<td>Number of Floors (Inclusive Ground Floor): 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facade:</td>
<td>Number of Windows and Doors: 36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width 1 Width 2:</td>
<td>17.1 m</td>
<td>12 m</td>
<td></td>
</tr>
<tr>
<td>Non-Structural Members:</td>
<td>Chimneys:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detailed Facade Elements:</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition:</td>
<td>Cracks in the Facade: None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of Arches or Vaults:</td>
<td>No access</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antemates/ Irregularities:</td>
<td>Contouring part</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More:</td>
<td>Very nice, innenhof, no Lift.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Screenshots
ID Number of the buildings

Example building number 004310800103

0043 1080 0103

Austria country code  ZIP  building number
Screenshots

- **Input window**
  - **Construction Type**
  - Building Age
  - Floors
  - **Attic space added**
  - Cellar
  - **Soft story**
  - Chimneys
  - No. of windows and doors
  - **Facade design**
  - **Detailed facade elements**
  - Sculptures / Statues
  - Damage on the roof
  - Presence of arch or vaults
  - **Cracks in the facade**
  - Humidity / Efflorescence

![New Building Input Window](image-url)
Construction Type

» Constr. Type
   » Masonry
   » Reinforced concrete
   » Steel frame
Soft story

A soft story is a floor where most of the interior walls are missing due to the space needed.

For example shops or cafes
Facade design

» Facade design

none  simple  detailed  very detailed
Detailed facade elements – sculptures / statues

» Detailed facade elements
  » Number of facade elements

» Sculptures / statues
  » Number of sculptures / statues

» It can be used to estimate costs
Cracks in the facade

» Cracks in the facade
Humidity / Efflorescence
Storage of the information

New Building

Oper.: [Dropdown] Date: 13.09.2013 Time: 12:49

1. Constr. Type: [Dropdown]
2. Overall facade design:
   - [Radio] none
   - [Radio] simple
   - [Radio] detailed
   - [Radio] vary
3. Constr. Year:
4. Period: [Input] 1781-1848
5. Building Age:
6. Detailed facade elements:
   - [Radio] none
   - [Radio] < 3
   - [Radio] 3-6
   - [Radio] > 6
7. Floors:
   - [Radio] D
8. N. of floors: [Input] 3
9. Attic space added:
   - [Radio] Under constr.
   - [Radio] Yes
   - [Radio] No
10. Cellar:
    - [Radio] Souterrain
    - [Radio] Yes
    - [Radio] No
11. Soft story:
    - [Radio] Yes
    - [Radio] No
12. Chimneys:
    - [Radio] none
    - [Radio] < 3
    - [Radio] 3-6
    - [Radio] > 6
    - [Radio] not visible
13. N. of wind. and doors:
14. Sculptures/Statues:
    - [Radio] none
    - [Radio] < 3
    - [Radio] 3-6
    - [Radio] > 6
15. Damage on the roof:
    - [Radio] not acc.
    - [Radio] none
    - [Radio] few
    - [Radio] many
16. Presence of arch or vaults:
    - [Radio] Yes with chain
    - [Radio] Yes
    - [Radio] No
17. Grades in the facade:
18. Humidity/Efflorescence:

Click somewhere to validate

Buttons:
- Clear Form
- XLS in backg.
- << Back
- Next >>
- Save
- Cancel last save
- VCE
The web database

Building Structural Surveys

http://bit.do/vcebuildings
http://bit.do/bison
## Screenshots

### The created DB – Summary table

![Image of a spreadsheet](image-url)
Screenshots

» The created DB – Summary map
Screenshots

» Additional map: building location
Screenshots

» …and in the main folder are automatically created:
Screenshots

... and in the main folder are automatically created:
Screenhots

» Signal processing
Screenshots

» Photos of the external and internal visual inspection and the position of the sensor
Thank you for the attention!