Publishable executive summary

This deliverable (D2.3) aims at identifying toolset of capturing, measurement and diagnostic systems for self-inspection in buildings under construction. The development of these solutions is based on quality and energy-related experiences in use cases aiming at assessing the KPIs identified in WP1 based on the following measurement aspects:

- thermal aspects;
- acoustic aspects;
- airtightness aspects;
- humidity aspects;
- geometrical aspects.

D2.3 (this deliverable) presents a scientific description of the measurement devices and procedures. The real measurements taken during the lab, factory and field testing are presented in the associated deliverables in WP5.

Thermal aspects have been assessed by measuring thermal parameters via an IR thermal camera. A market analysis of the main IR cameras has been performed in order to evidence different models on the basis of costs and performances. IR camera has been intensively used in the past decades for thermal bridges visualization. INSITER proposes to enhance the techniques by exploiting numerical FEM models in order to use IR thermal data for estimating thermal transmittance of building elements. As far as thermal bridge is concerned, it has been demonstrated that IR camera thermal distribution maps can be exploited for the evaluation of the quantitative effect of thermal bridges on the overall transmittance of the building element.

Acoustic aspects have been evaluated by measuring sound intensity fields with the SIEMENS tool called SoundBrush and sound pressure level with the Beamforming system. The main advantage of the acoustic tools selected in INSITER is the functionality that measured acoustic data are accompanied by their position in space. For sound intensity data SoundBrush allows also to capture its angular orientation. Those data are easily interfaced with 3D modelling software. The acoustic tools are employed in INSITER also for sound transmission loss evaluation and acoustic leakage localization.

Because the frequency range of the acoustic measurement systems selected is below 10 kHz the wavelength of the sound wave allows at identifying gaps and leakage of at least 40 mm. For smaller gaps, INSITER proposes the use of ultrasonic detectors whose frequency range is between 20 kHz and 100 kHz and therefore fissures up to 4 mm can be identified.

Concerning 3D laser scanner it is widely accepted as essential tool for geometrical errors identification. In INSITER this instrument will be used also for humidity detection.

Having defined the tools proposed by INSITER, the second objective is to interface solutions between various equipment for integrated use in self-inspection processes. This deliverable demonstrates how the toolset data can be connected in the BIM, which is the real interoperability platform, through 3D modelling. Specifically:

- it has been illustrated how thermal maps are georeferenced by QR based positioning systems
- the integration of sound intensity and sound pressure data respectively into 3D modelling software has been demonstrated

- an approach to georeferenced airtightness maps has been proposed
- the interfacing of acoustic, thermal and 3D scanner data have been realized and the effectiveness of the solutions have been verified.

This deliverable (D2.3) presents the methods aimed at improving their “inter-connection” based on 3D modelling software, which can be easily transposed in BIM platforms. The next deliverable D2.4 will be dedicated to the improvement of accuracy related with indoor and outdoor positioning during on-site construction.