

# **Future-ready buildings: Increase smart assets today to prepare an effective building renewal tomorrow**

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## **SUMMARY**

Come si potrebbe intervenire su una struttura affinché si agevolino i vari interventi futuri? È possibile creare una “carta d’identità” degli edifici con tutti i dettagli? Vediamolo insieme.

I geometri quotidianamente s’imbattono in problematiche riguardanti lo stato di salute di un fabbricato, non considerando molto spesso che chi verrà dopo potrebbe avere esigenze abbastanza simili. Pertanto, perché non utilizzare l’ampio spettro di nuove tecnologie digitali a disposizione per creare una storia personale di ogni immobile che sia quanto più completa e dettagliata possibile in ogni sua parte in modo da non perdere nessun passaggio della sua evoluzione, partendo dal primissimo stadio embrionale fino ad arrivare allo stato attuale delle cose.

How is it possible to intervene on a structure in order to facilitate future interventions? Is it possible to create an 'identity card' for buildings with all the details? Lets see it together. Every day surveyors come across problems concerning the condition of a building, very often not considering that those who will come after may have quite similar needs. Therefore, why not use the broad spectrum of new digital technologies at our disposal to create a personal history of each property that is as complete and detailed as possible in every part so that no step of its evolution is missed, starting from the very first embryonic stage and ending with the current state of affairs.

## **1. INTRODUCTION**

Fortunately, nowadays we can rely on the use of new technologies and the experience gained over time by the professional figure of the technician to achieve this goal. The combination of these two elements can make it possible for the client to totally immerse himself in the virtual reality of his building, use it to locate any information about it from when it was designed until present, and continue to update this sort of identity card whenever a change of considerable interest is made.

## **2. THE CASE STUDY**

The case study relates the renovation of an apartment on the mezzanine floor of a terraced

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building, using the available technological equipments including laser scanners, thermo-cameras, drones and any other necessary tools that allowed us to stop the hands of the clock whenever a scan was performed. Each scan taken, each piece of data collected, can be considered as a new layer that rests on top of the pre-existing one. As the surveyor, or whoever, inserts new parameters and details of the building in question, he thickens this network of substrates that will create the identity card of the structure.

### **2.1 Technique employed**

Two laser scanners Leica RTC360 and Leica BLK360 were used for the creation of this digital model of the building. first, a scan of the actual state of the building was performed to have the 0 or starting point. Then, other scans were made at each salient or significant stage of the works, which compared to a classical classification (with traditional instrumentation and photographs) turns out to be complete and objective because everything present in the range of action of the 3D laser scanner is detected without any distinction. that is, not only some characteristic points of the object are chosen to be detected, but we refer to everything present in the range of action from the instrument. This practice proves to be very suitable for the survey and spatial representation of particularly complex structures such as an evolving construction site.

*The image below represents our zero point or starting point with the orthophotomosaic view of the point cloud.*



Planimetry - Phase 0



Section - phase 0

The importance of establishing a zero point is crucial because the scanner, in the case study under consideration, was not connected to any known coordinates so it will work with the cloud-on-cloud superposition method. In the case of a new construction or with the insertion of cornerstones with known coordinates it will be necessary to geo reference the model on them each time scans are performed.

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Demolition – Phase 1

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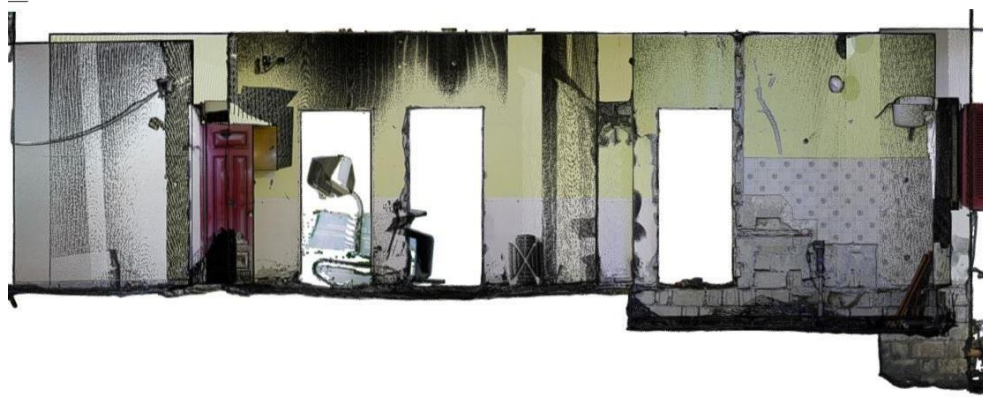
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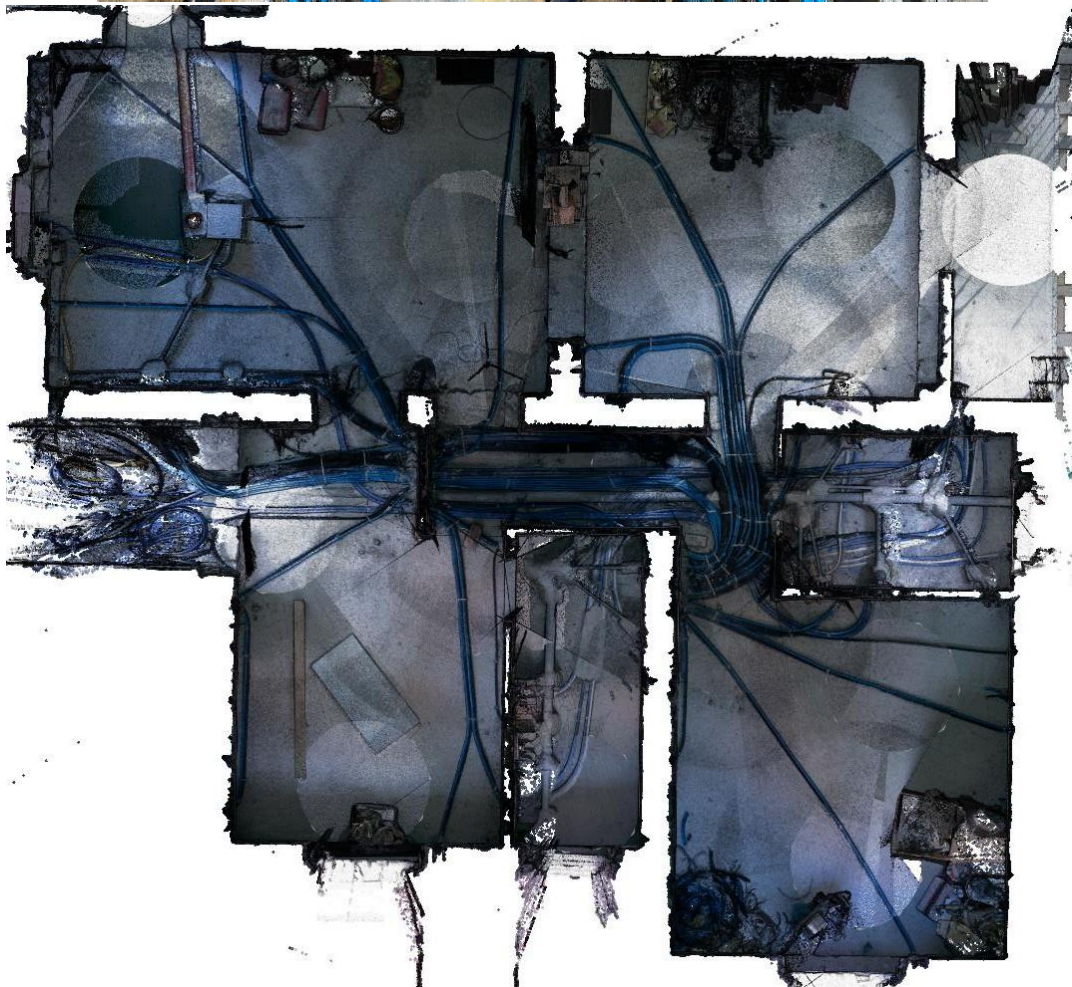


Planimetry - Phase 1



Section – Phase 1

At this stage, individual scans were made for each room and then reconnected at the end of all processing since each room required different processing times



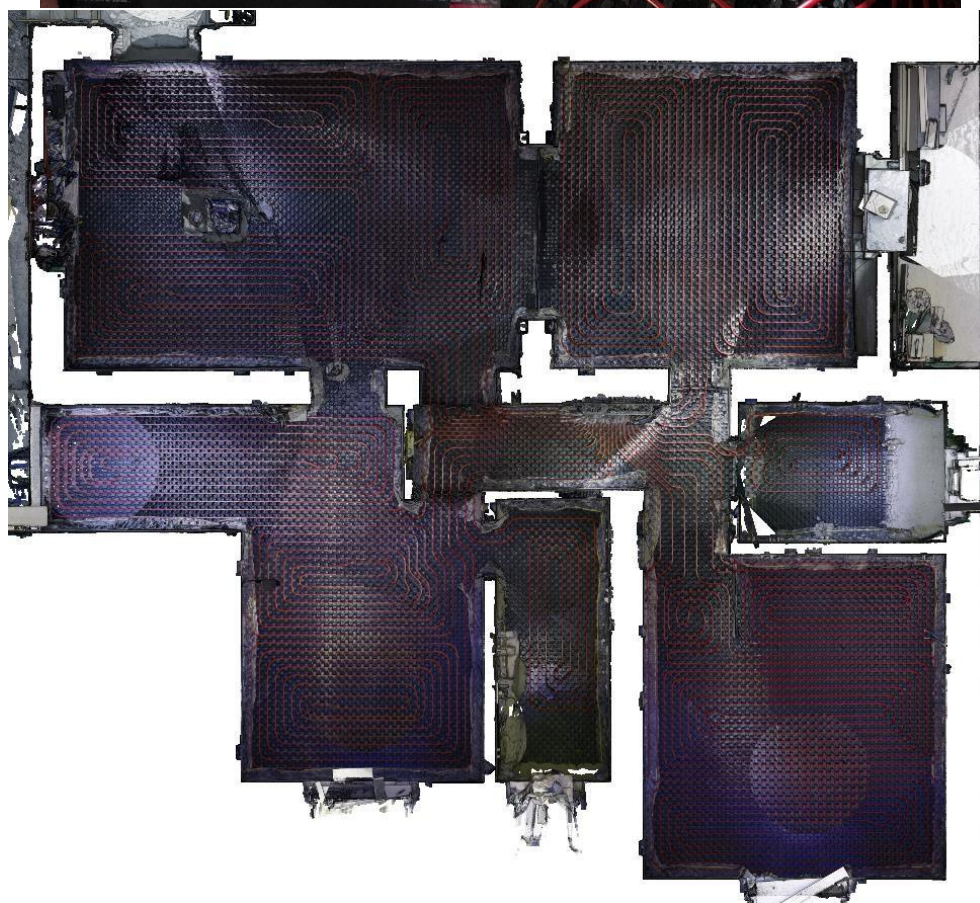
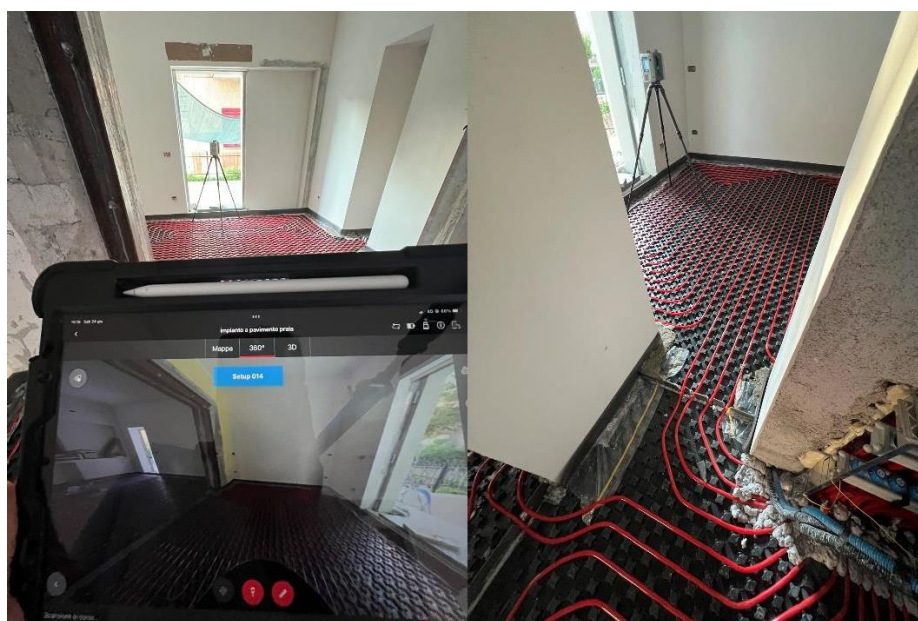
Phase 2 - Reconstruction of electrical and plumbing systems

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Phase 3 - Underfloor heating and cooling system

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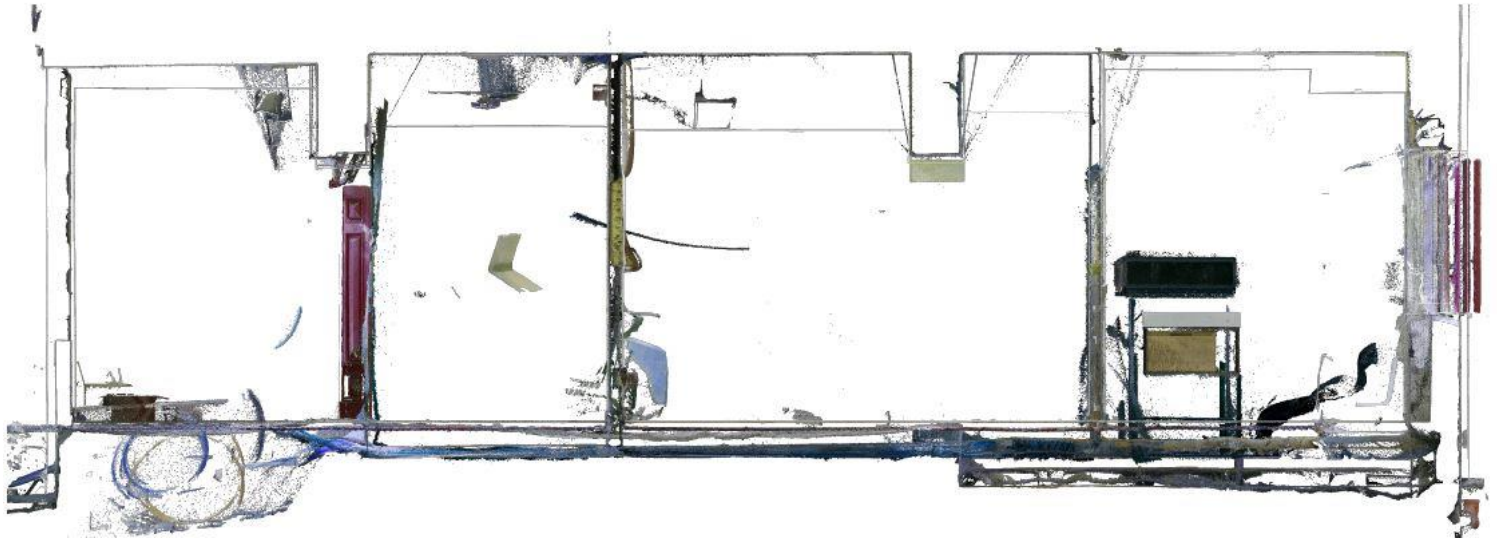
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The most important step is the survey of high-tech plants. Their exact location will be necessary in case of maintenance or renovation of the building, but also in cases of routine management to prevent from creating damage during the various required works. In the given case, the electrical and plumbing systems are located at minus 30 cm (11,81 in) from the floor level 0, while the insulating mat for the floor system is located at minus 10 cm (3,93 in) from the floor level 0.



Phase 4 - Laying of floor screed and floor finis





Section – Phase from 0 to 4

In the last stage as we can see from the section shown above, we have clearly visible all the stratigraphy and location of each work after the floor has been laid.

## 2.2 Significance of the digital property file

Every time a building renovation or new construction project is carried out, multiple photographs and measurements of the progress of the work are taken, sometimes even delaying its completion. With this methodology, a chronology of all the work is kept without losing any details and there is the possibility of being able to go back, check and study it all conveniently from the office, or simply hand over a digital copy to the final client.

## 3. CONCLUSION

In conclusion it can be stated that by using this methodology of surveying and thus 3D acquisition, the sorting and placing of all photos can be facilitated, simplifying the evolution of the property over the years. The set of all scans produced and merged can be easily transferred to an external storage device. 2D maps and orthophotos can be created. The whole can be handed over along with the property in case of sale or simply stored for ongoing updating.

With the hope that in the future this technology use will be increasingly accessible.



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