PROJECT: ECOLOGICAL AND INNOVATIVE TECHNOLOGIES FOR RECOVERING INDUSTRIAL AREAS FROM LCA AND ENERGY EFFICIENCY POINT OF VIEW

2020-1-RO01-KA203-080223

PRACTIAL APPLICATIONS 3D SCANNING IN CONSTRUCTION

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ROMANIA GREEN BUILDING COUNCIL
Rybaki17
Co-funded by the Erasmus+ Programme of the European Union

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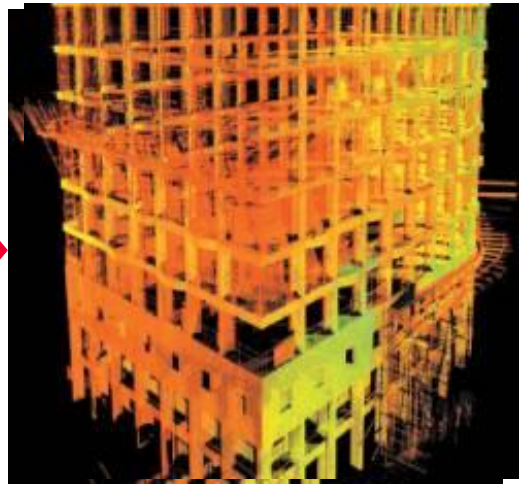
GENERAL CONTENT

1. What is 3D scanning?
2. Practical applications – scanner use
3. Practical applications – working with the Arhicad programm
4. Conclusions

1.What is 3D scanning?

- 3D reality capture is a process of scanning and capturing any site, for example plants, buildings or crime scenes, in a 3D digital model, combining measurements and imagery.
- As technology has become smaller - capturing every detail with millimeter precision, more accessible and more automated, capturing 3D reality has become more accessible and used in many applications.

From Reality to 3D Data



1.What is 3D scanning?

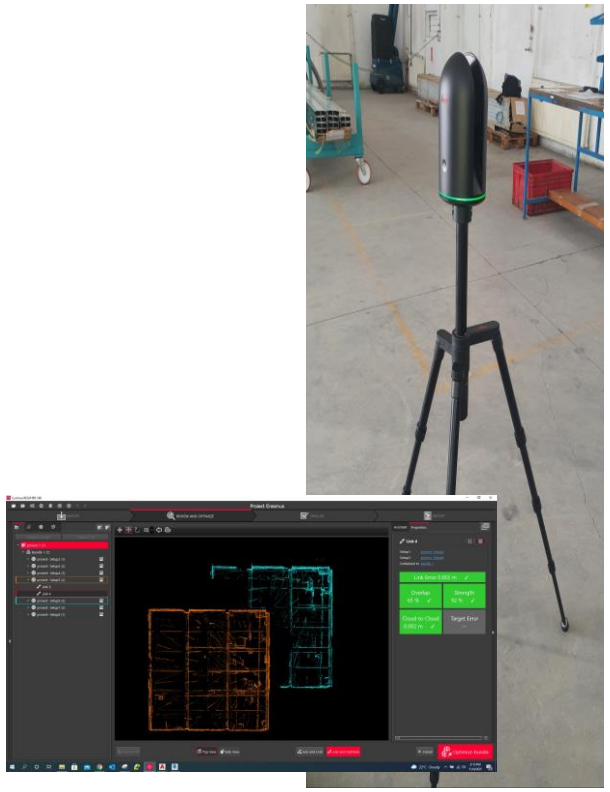
A 3D laser scanning system consists of a laser scanner, a PC (tablet), phone and scanning, transfer and processing software.

The device provides:

-Fast, accurate, complete, remote 3D data collection

-Full panoramic, full colour

-TPS/GPS compatible



2. Practical applications – scanner use

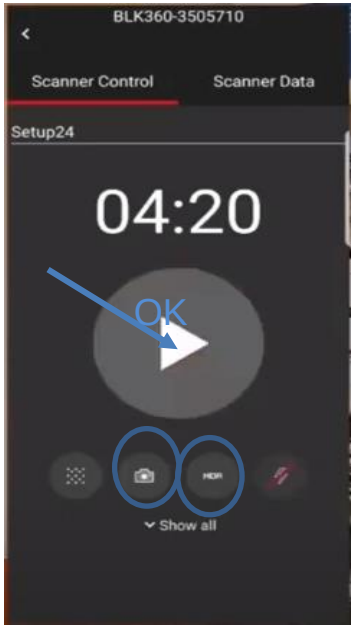
- The hall is located in the industrial area of Brasov, it was built in the 60's. It is part of a bigger building.
- It is to be renovated and will have a new destination.
- The hall will be scanned inside

2. Practical applications – scanner use

The 3D scanner uses lasers to identify the geometry of an object. To make this possible it is necessary to install the application for connecting to the scanner. This is the application needed to obtain the point cloud (it is also possible to process data with this application) on your phone/tablet/laptop - in this case Cyclone Field 360.

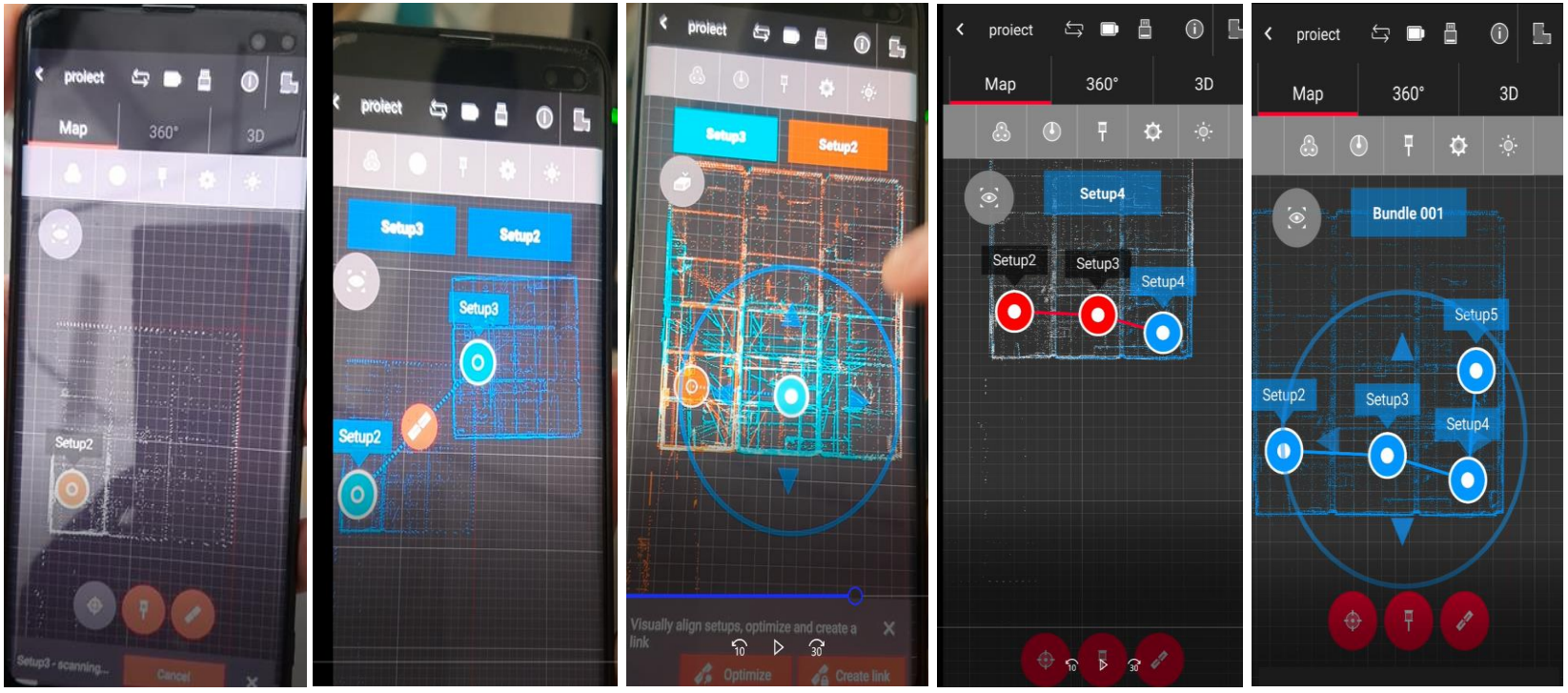
The app is designed to make scanner operation and field data quality control as simple and intuitive as possible.

The settings for the scanner are made: resolution and panoramic image acquisition.



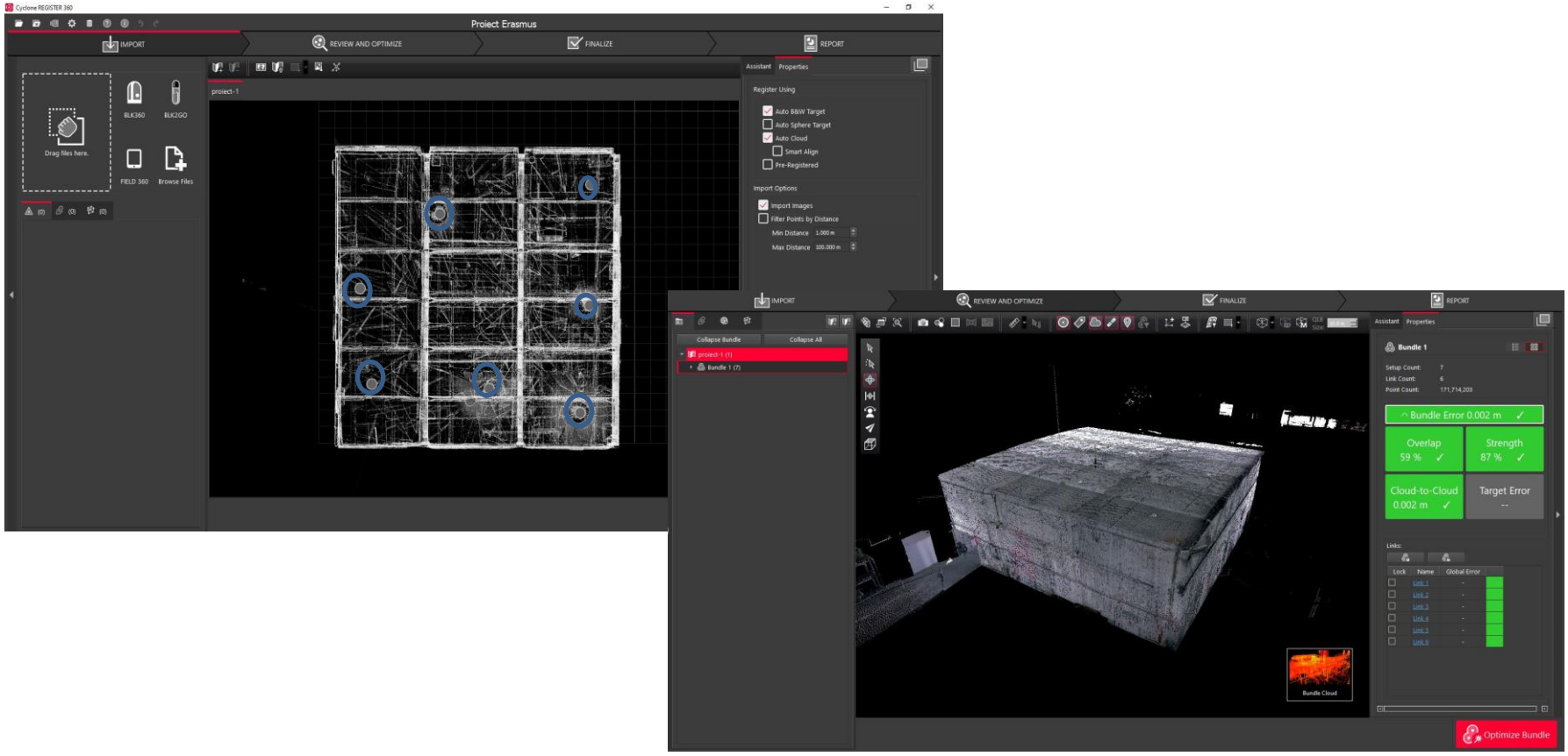
2. Practical applications – scanner use

The device scans the surface, the surface is **divided** into smaller areas. and after each scan the scanned surfaces are **aligned**. We will move the scanner to several points to get detailed information of the building. The number of areas is chosen according to the quantity and quality of information needed for the project. At the end, all surfaces are aligned.



2. Practical applications – scanner use

The millimetric accuracy and the very high density of measured points allow to obtain quality information. In this case, 7 scans were performed to obtain the required deliverables.

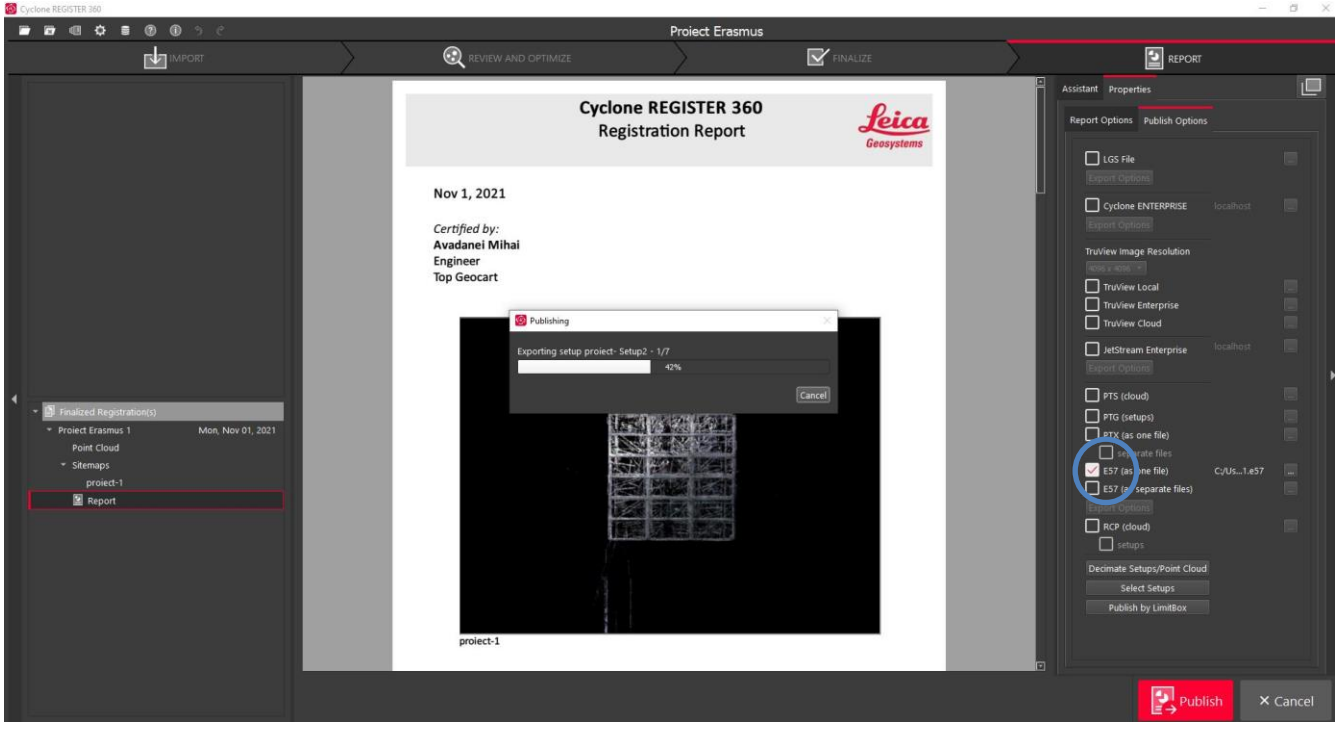


2. Practical applications – scanner use

POINT CLOUD -It is the primary product resulting from the process of scanning, recording, georeferencing, cleaning, filtering and decimation.

Delivery is usually made in the following format:

1.*.rcp - compatible with Autodesk Recap (free software in the free version)
2. *.e57 - compatible with most software on the market



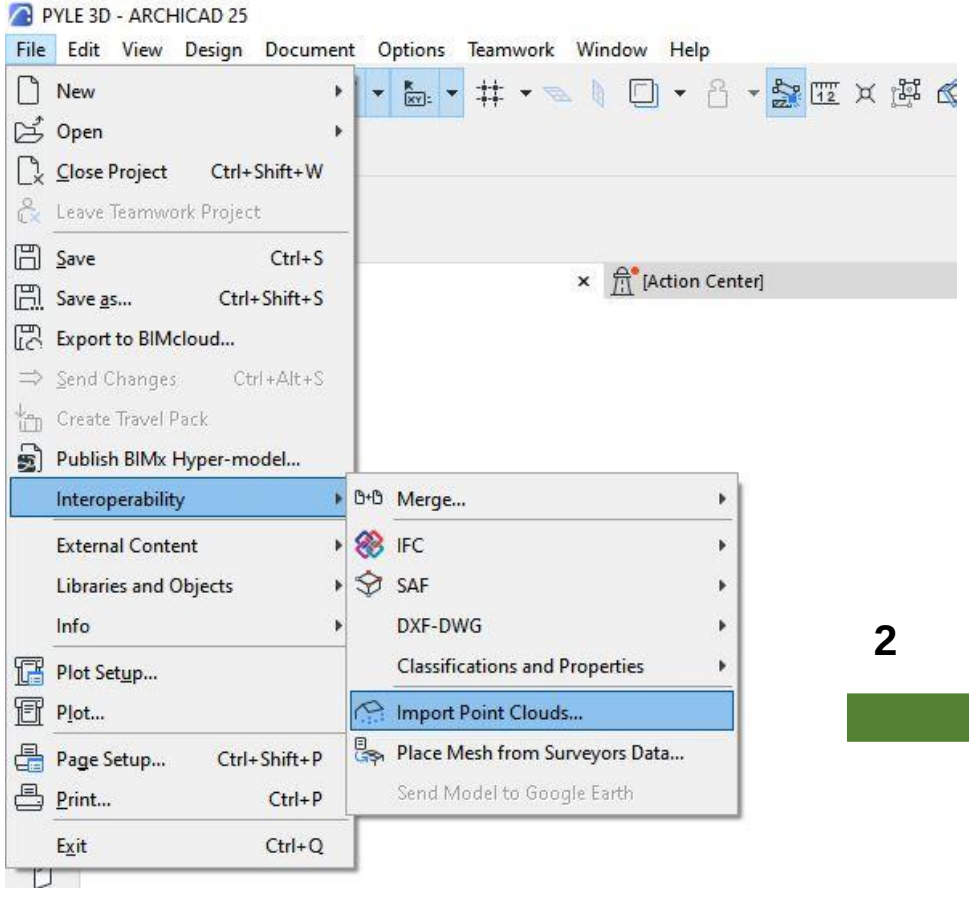
3.Practical applications – cloud of points in the Arhicad program

The point cloud will help us in 3D modelling and in obtaining:
- 3D model, textured mesh (BIM)
- 2D surveys: level plan, facades, sections, plan
-flatness of floors, verticality of pillars

Steps:
1. Arhicad programme opens
2. The point cloud is imported

GRAPHISOFT Archicad 25

1



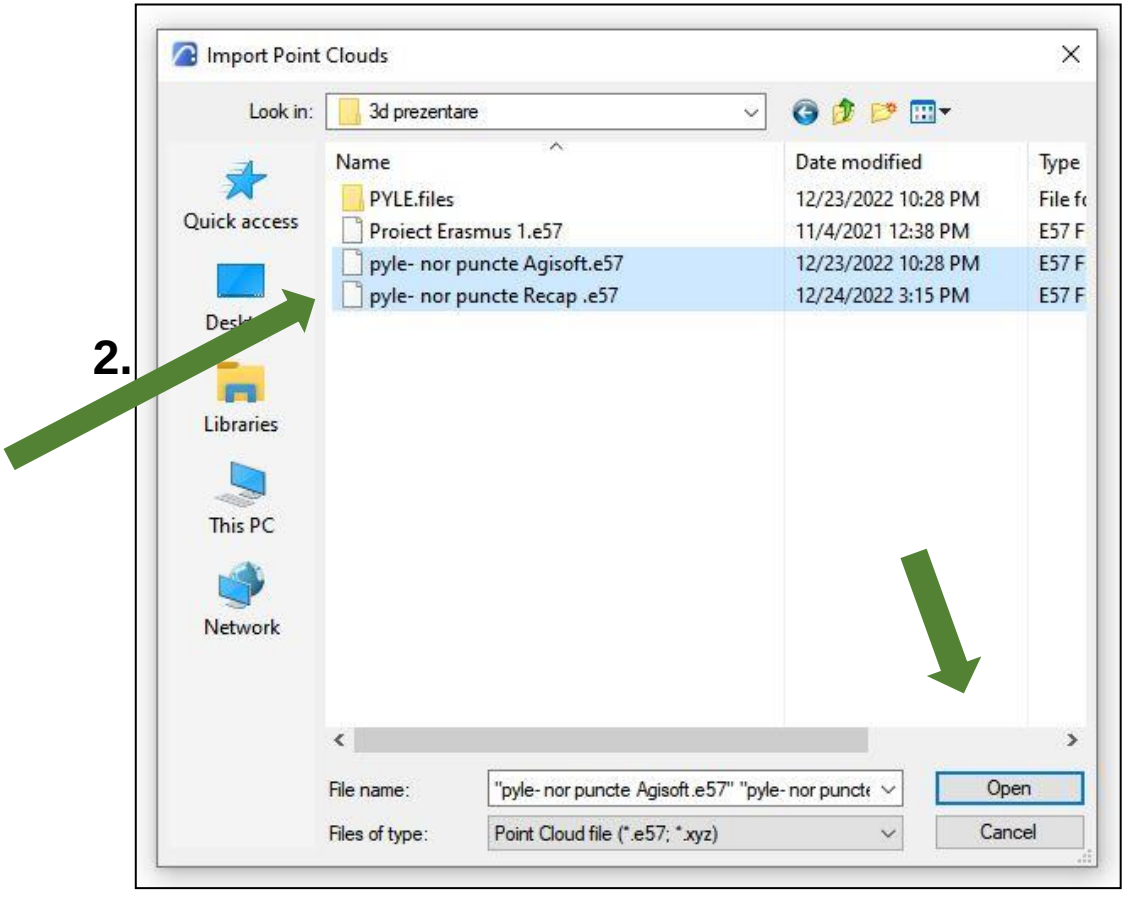
2

3.Practical applications – working with the Arhicad programme

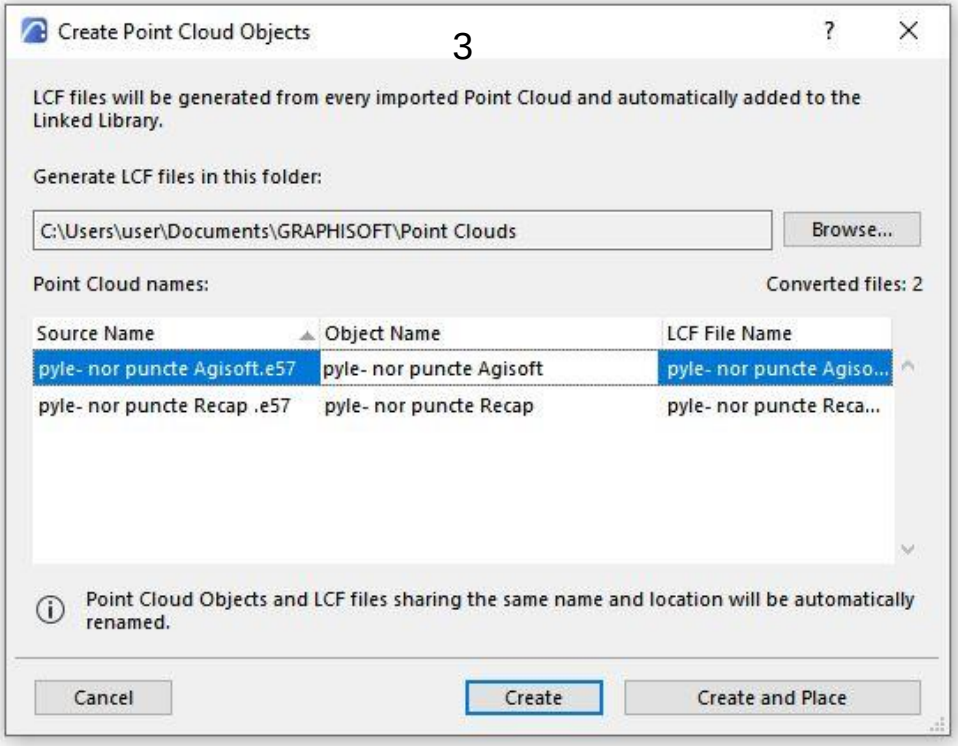
We have 2 files that we will import:

- a drone point cloud file photogrammetry (outdoor scan) (Drona presentation, Photogrammetry flashcard).

-a point cloud file obtained by 3D scanning inside the building - recap.E57

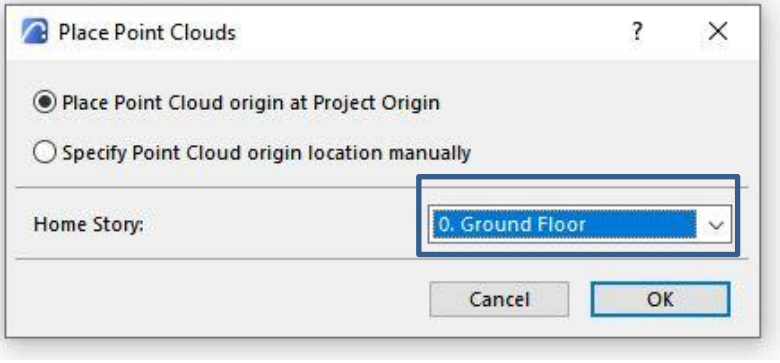


3. Practical applications – working with the Arhicad programme



The point cloud obtained by drone and processed by Agisfoft software (see Drone flashcard).

3



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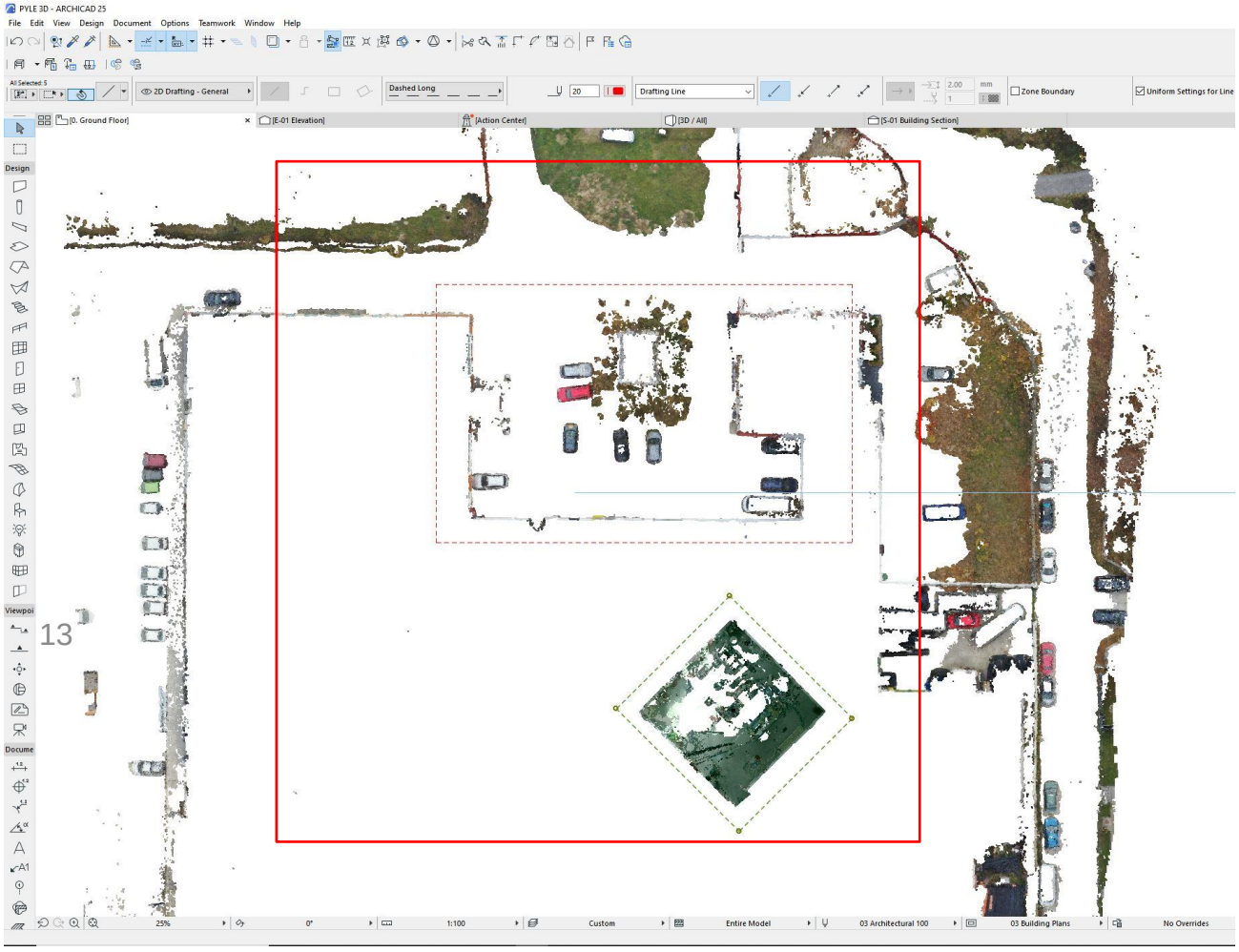
3. Practical applications – working with the Arhicad programme

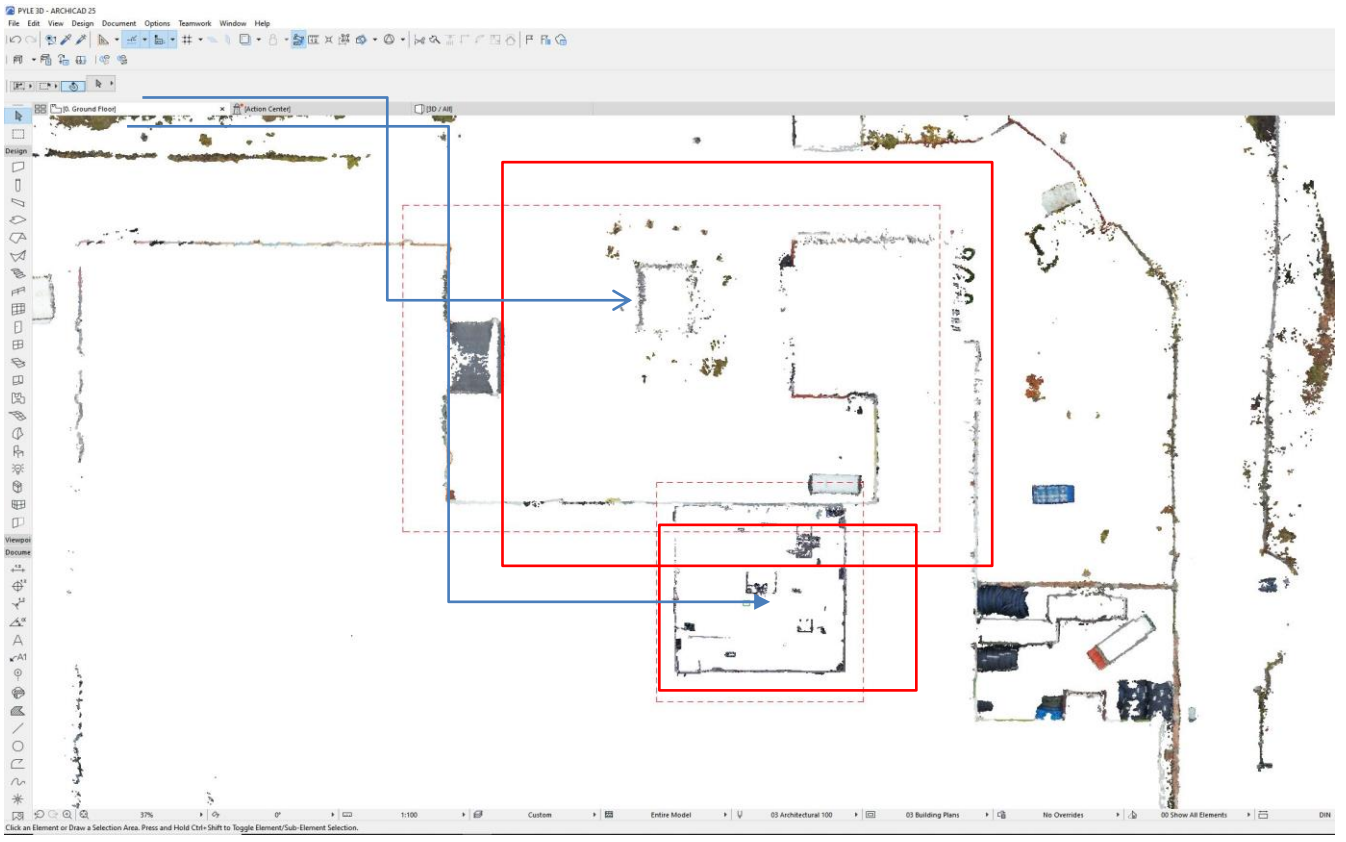


The 2 files are placed in the work page.

3.Practical applications – working with the Arhicad programme

The two files are aligned in the plane in the X-Y direction (the cloud points obtained with the drone and the one obtained with the 3D scanner)

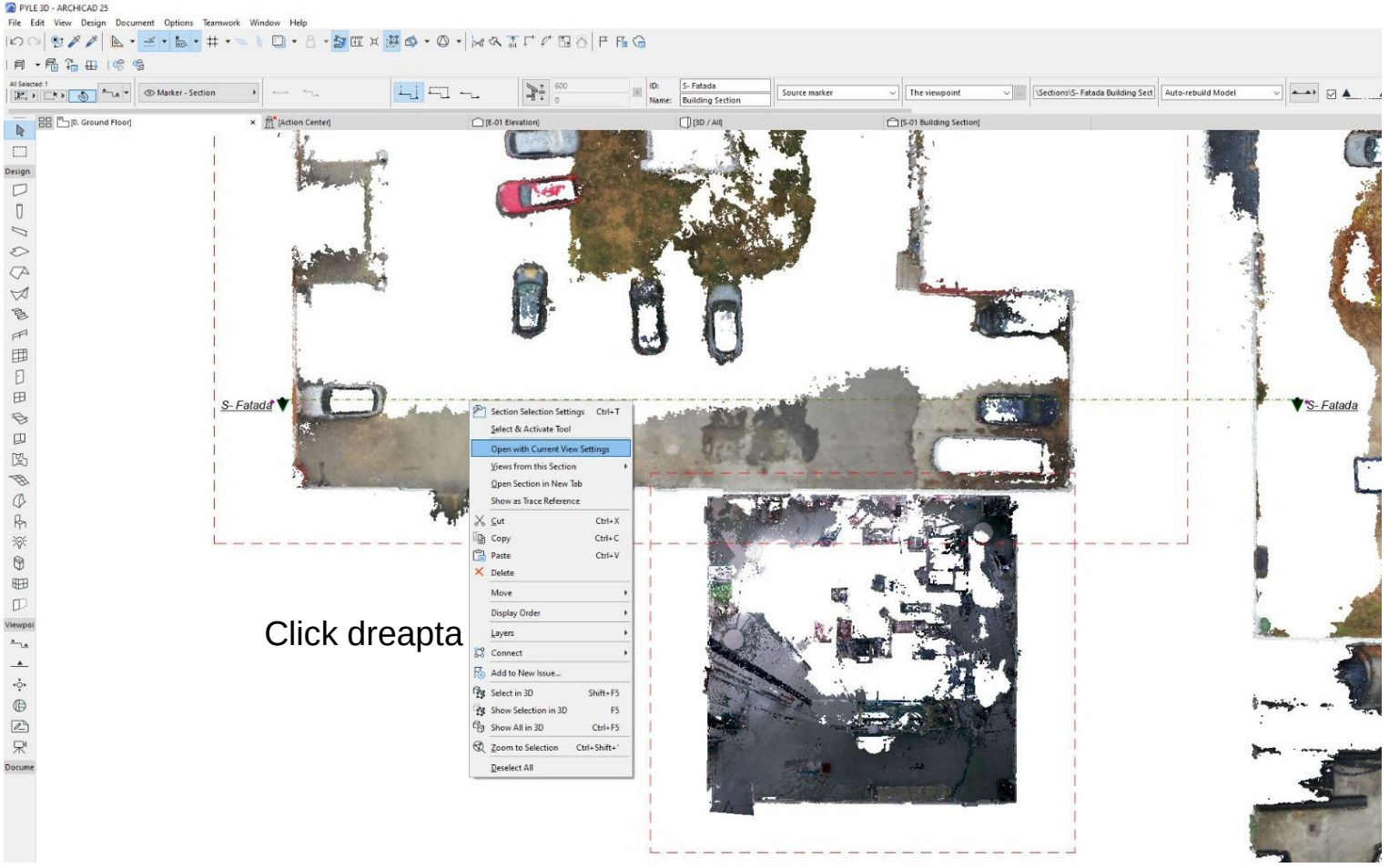
5



3.Practical applications – working with the Arhicad programme

6

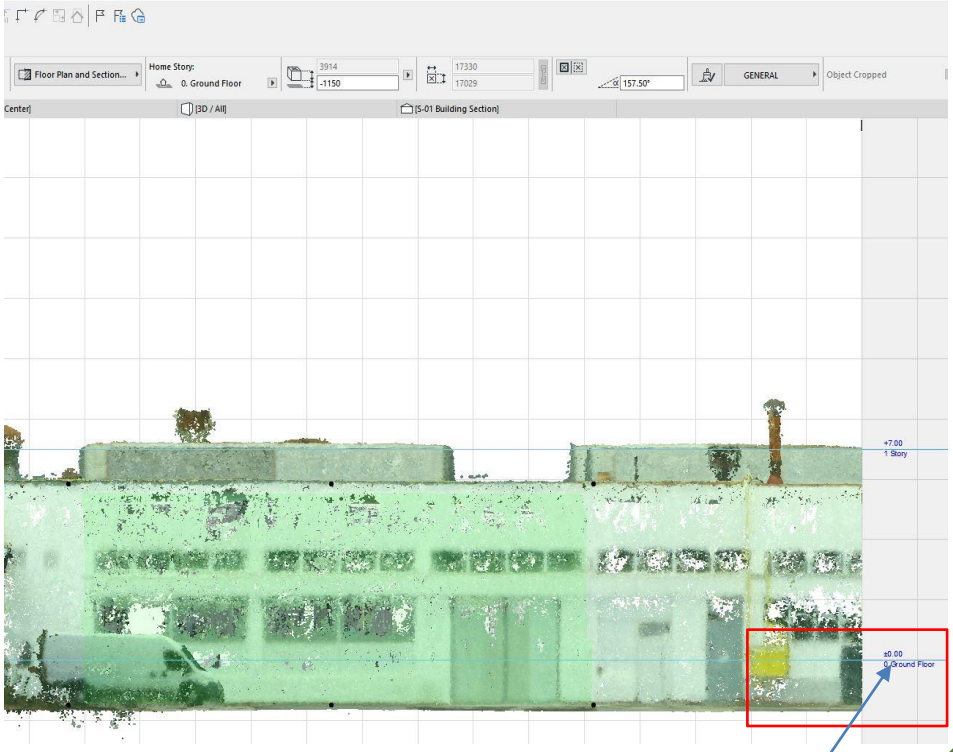
We make a section through the point cloud obtained by superposition and establish the zero coordinate in the vertical plane.



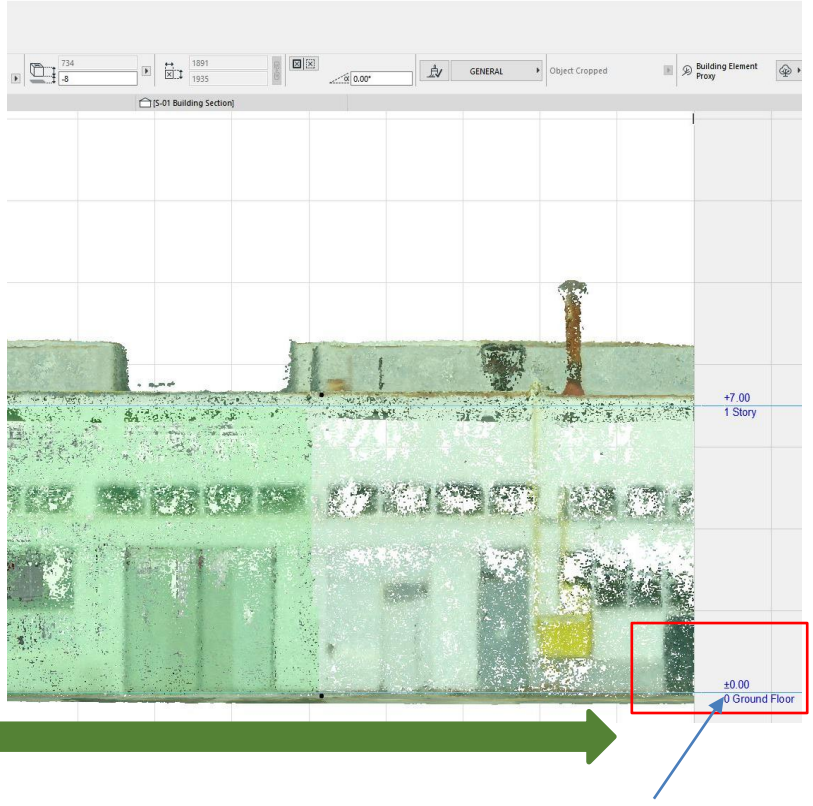
Click dreapta

3. Practical applications – working with the Arhicad programme

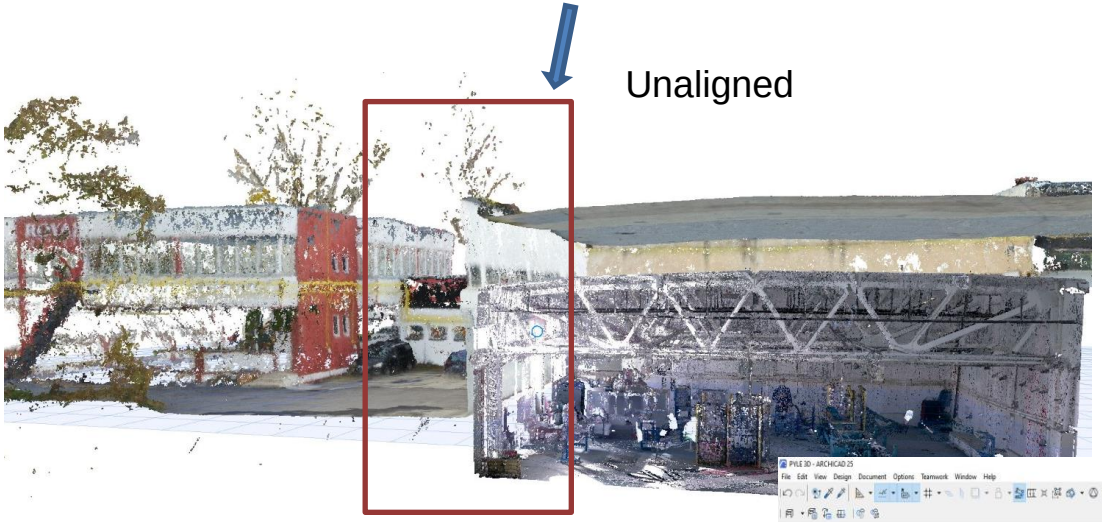
In the vertical plane we align the two objects to obtain zero level.

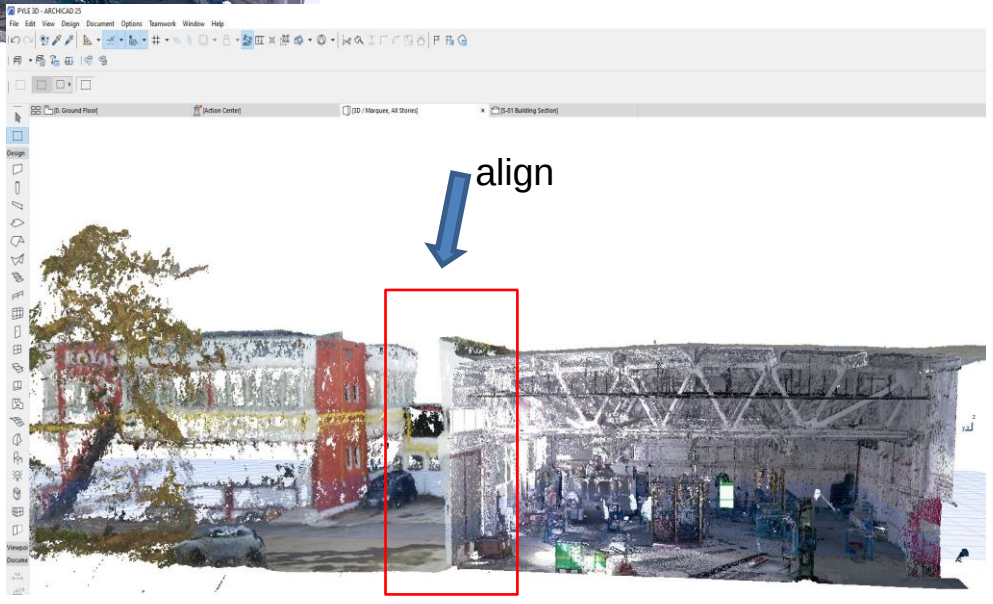


Drag the line



3. Practical applications – working with the Arhicad programme



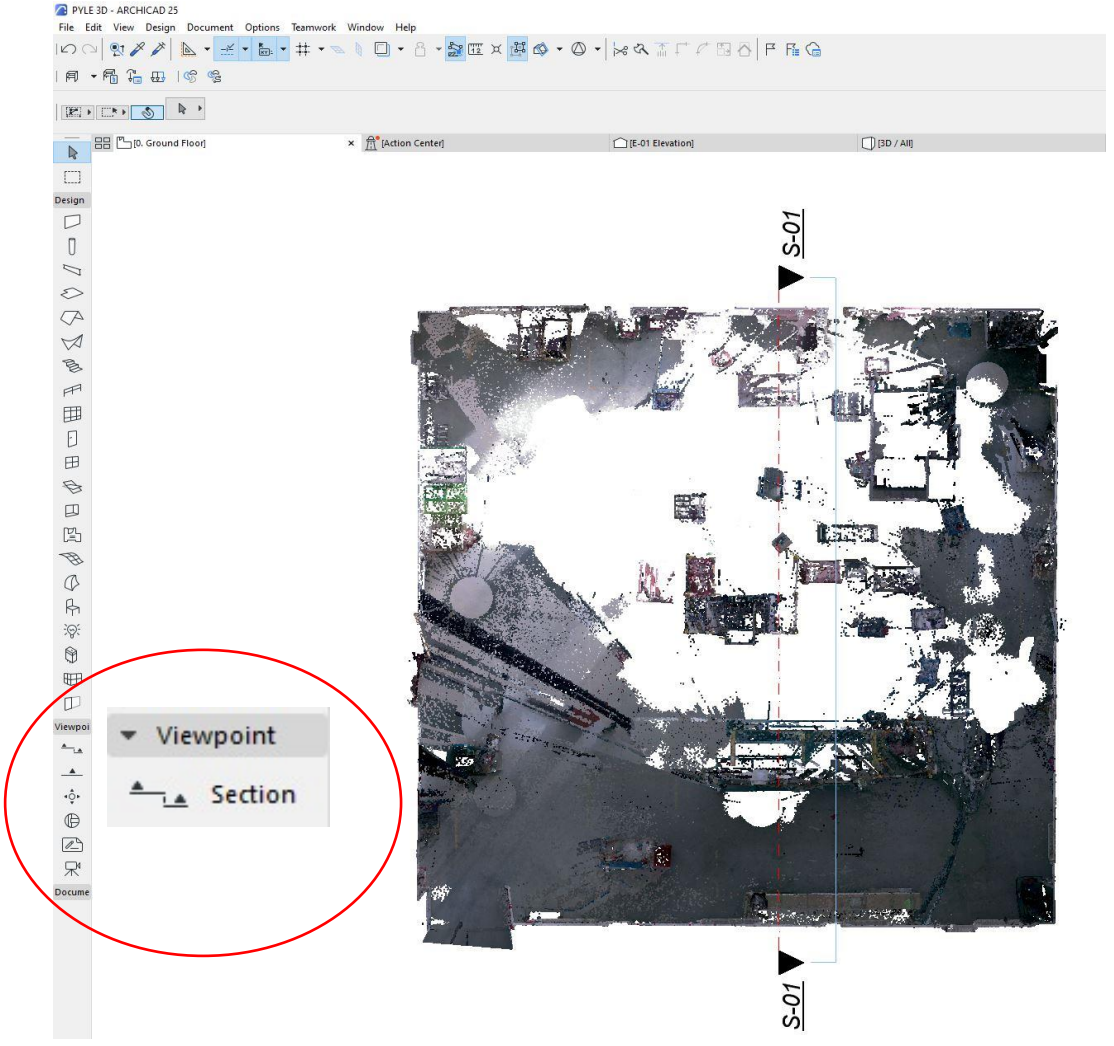


3.Practical applications – working with the Arhicad programme

3D modeling

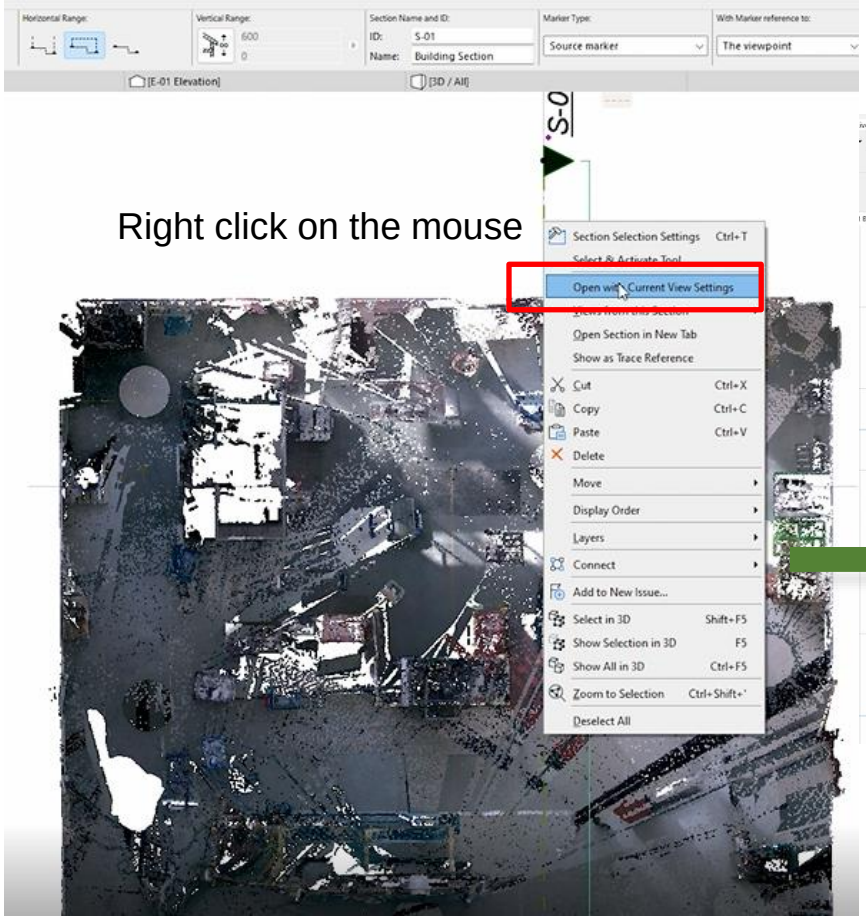
To 3D model building elements (resistance structure, all the constructive elements of the building). we use the point cloud information .

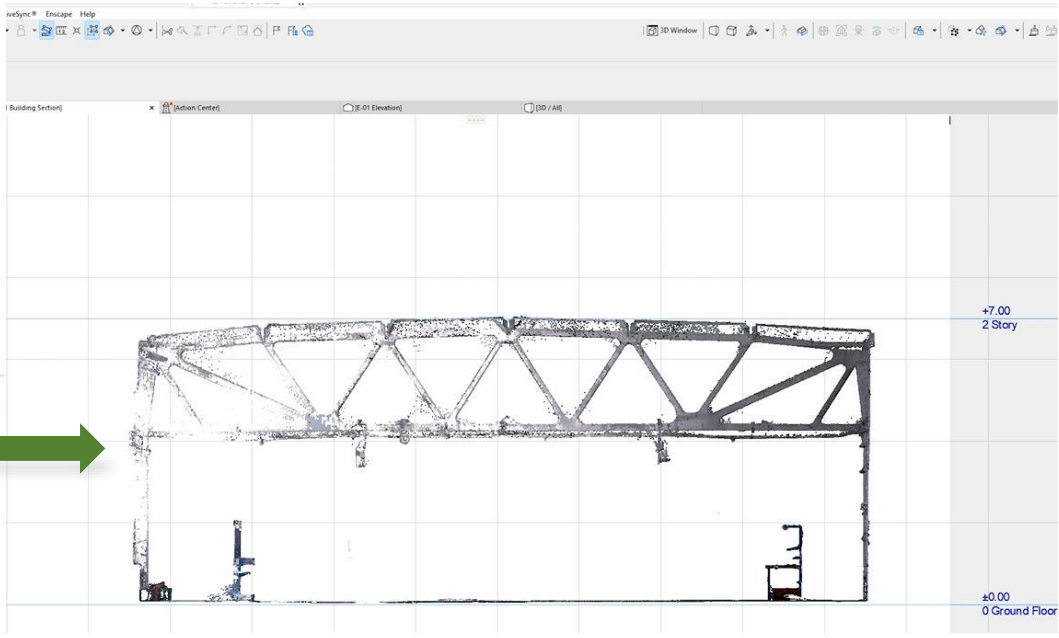
Establish the sectioning route through the point cloud. S-01



3.Practical applications – working with the Arhicad programme

New view opens with the cross section through the building, you can see the details of the resistance structure - the beam.



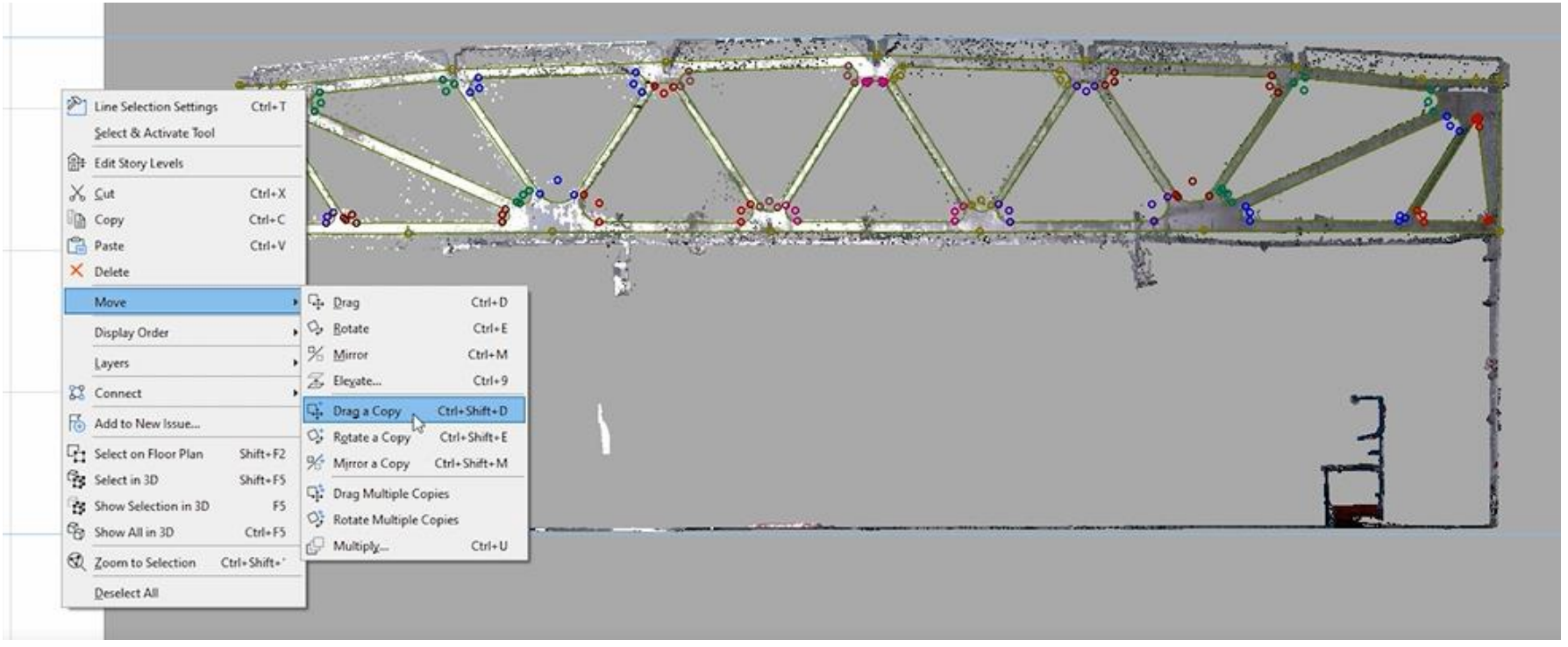


3.Practical applications – working with the Arhicad programme

We use the drawing commands to get the outline of the beam. (video)

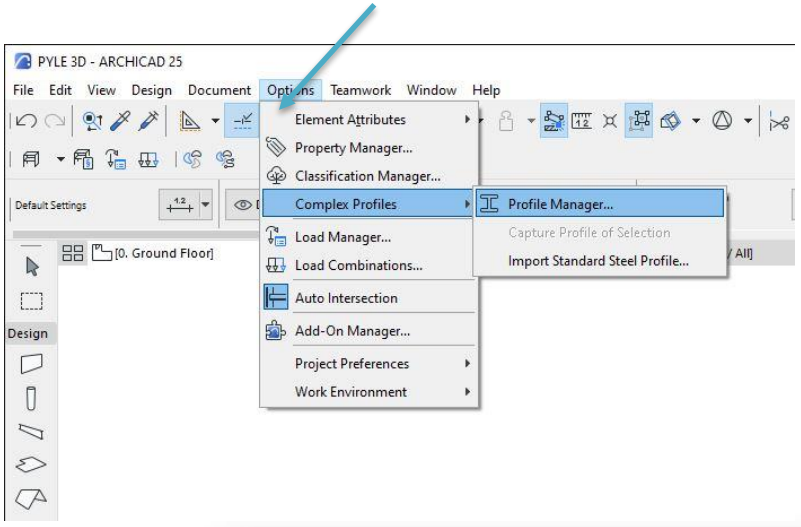
3.Practical applications – working with the Arhicad programme

Right click and copy the drawing obtained.



3.Practical applications – working with the Arhicad programme

We will draw the beam in 3D



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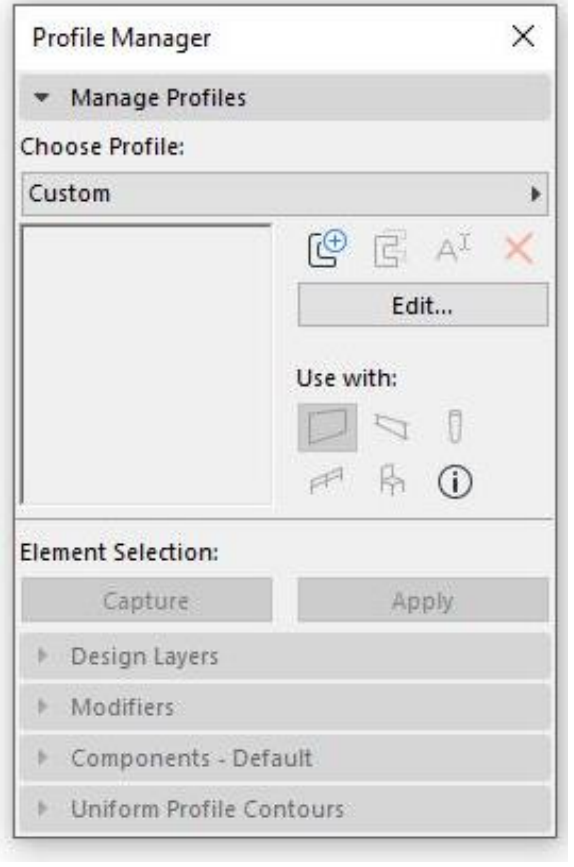

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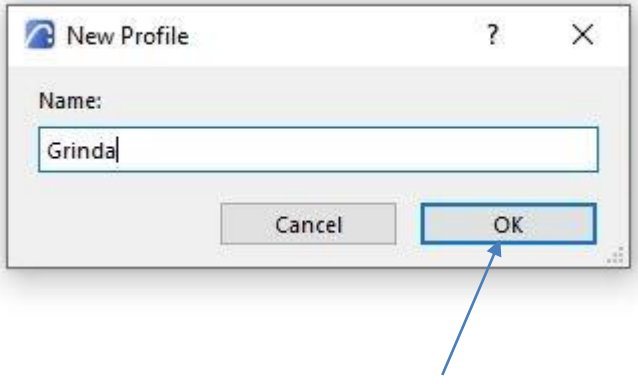
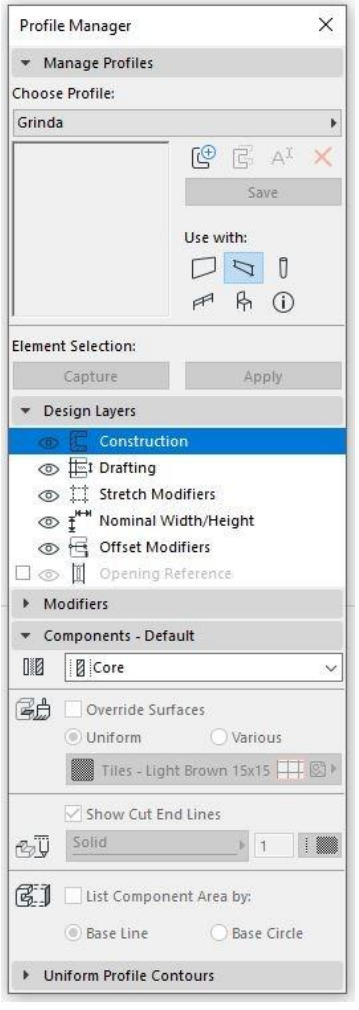
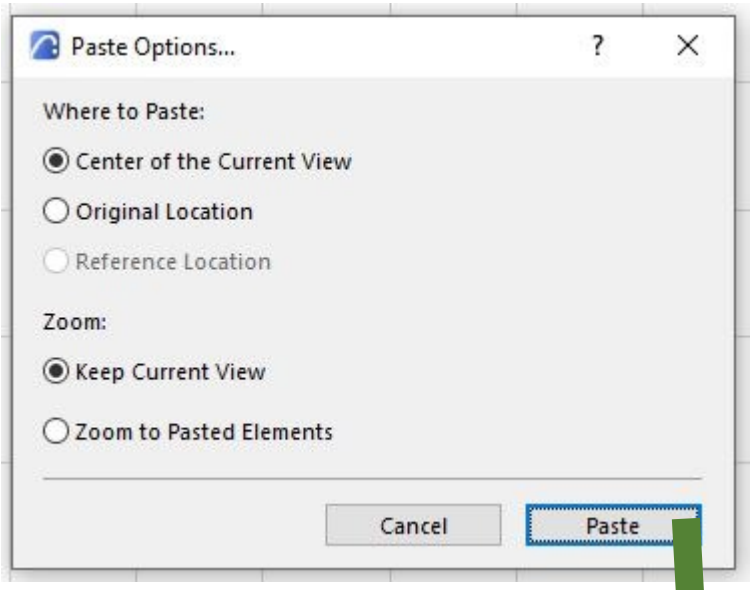


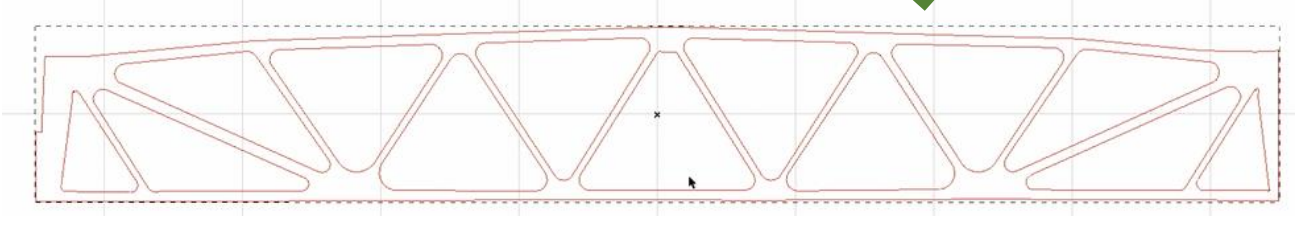
3.Practical applications – working with the Arhicad programme

3



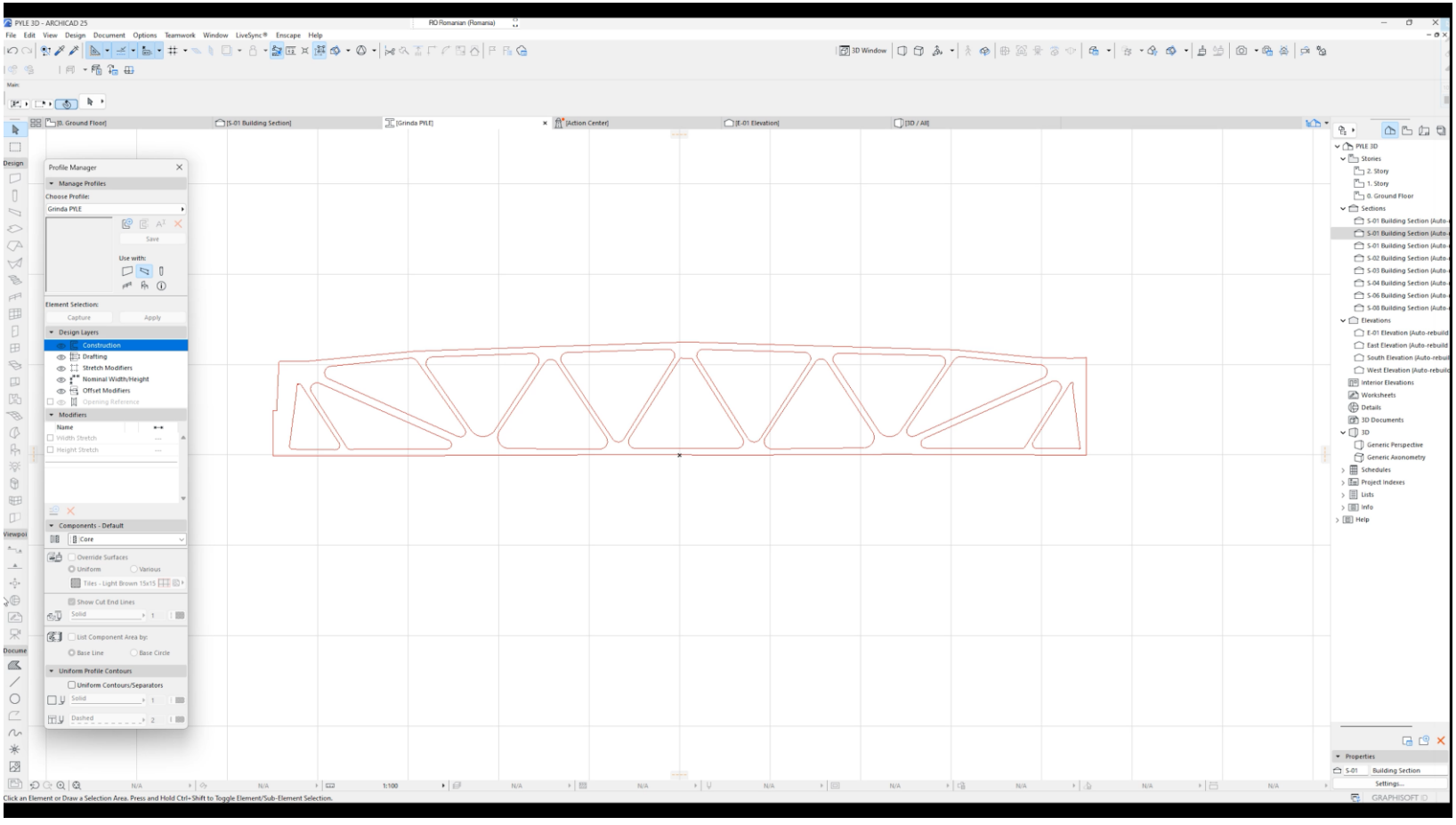
Right click; and choose the option to paste





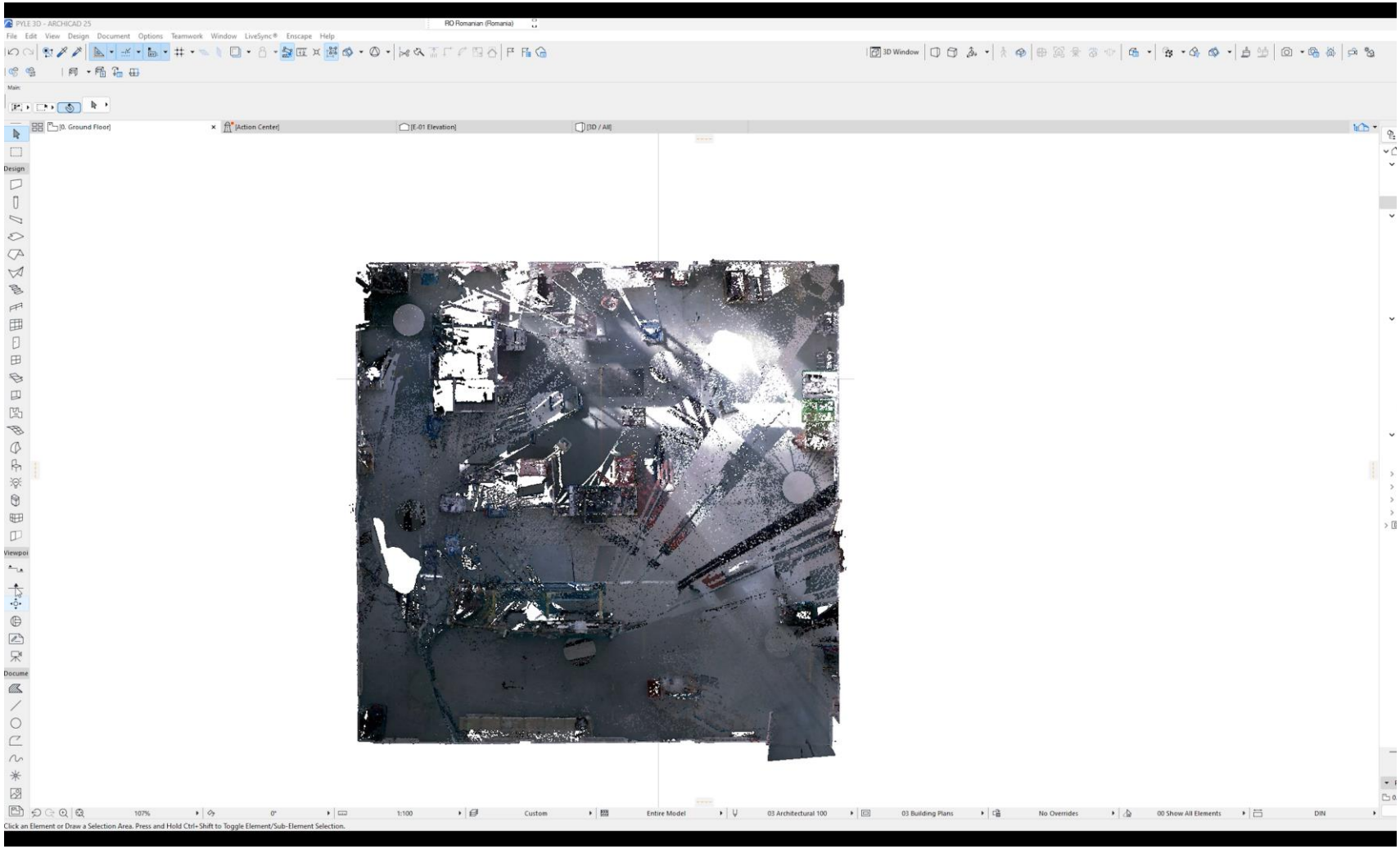
3.Practical applications – working with the Arhicad programme

Video 3D – the profile of the beam is sanded and the gaps are cut out.



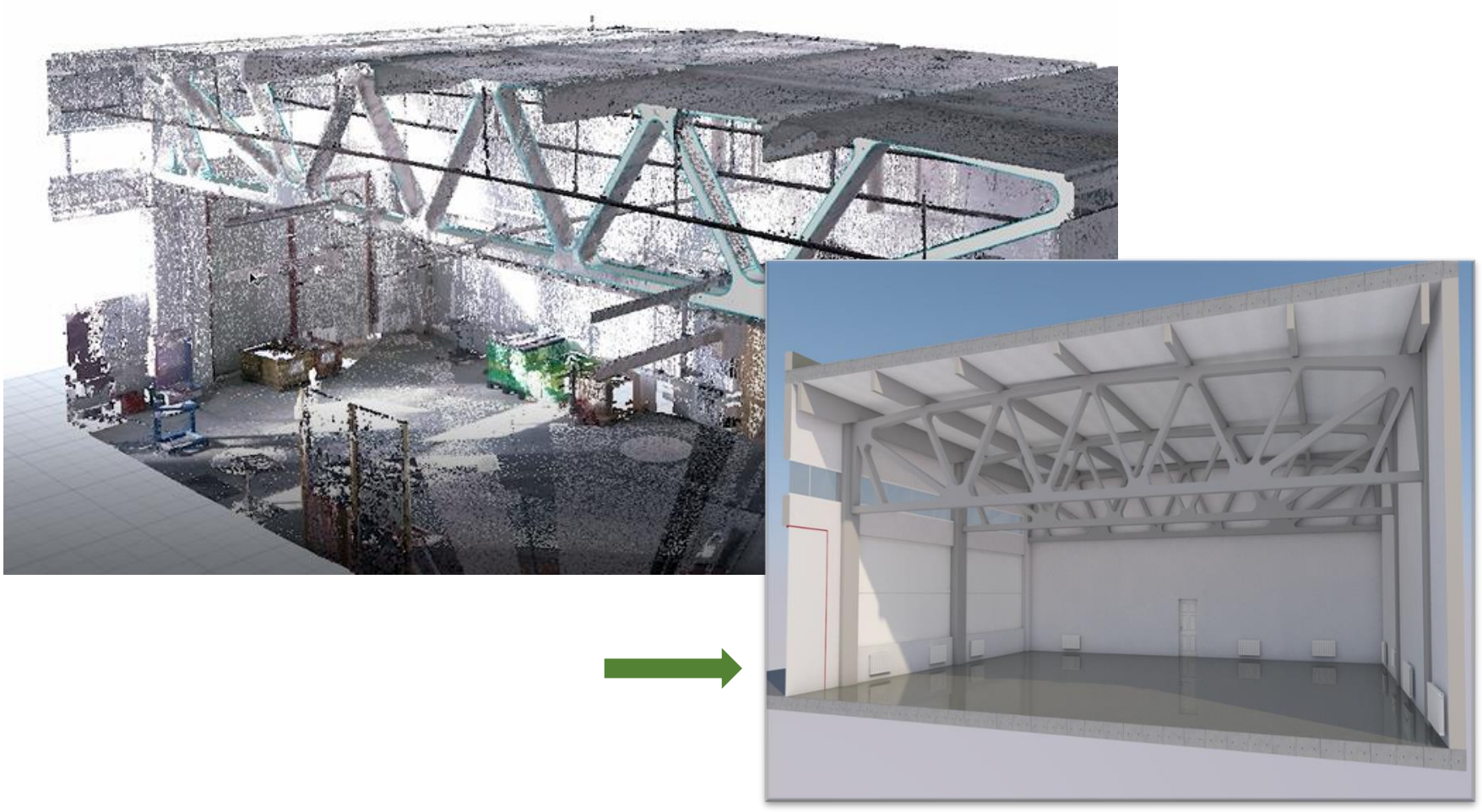
3.Practical applications – working with the Arhicad programme

Video – a database is created with the known characteristic elements of the beam.



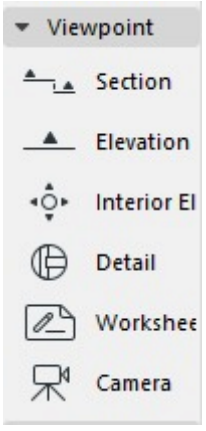
3.Practical applications – working with the Arhicad programme

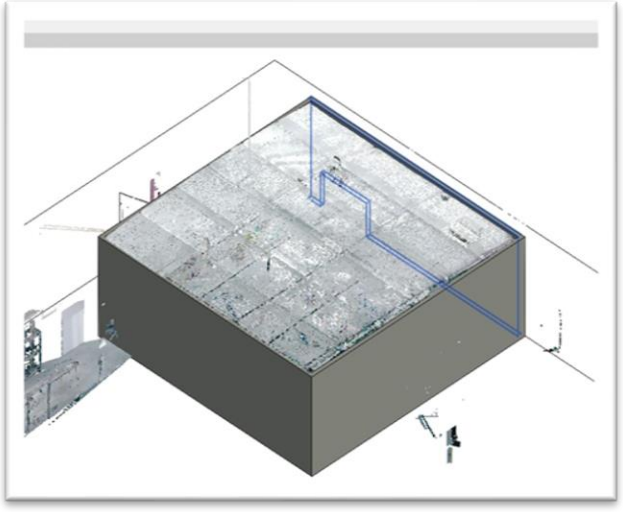
Every building element can be processed: doors, windows, pillars, walls.

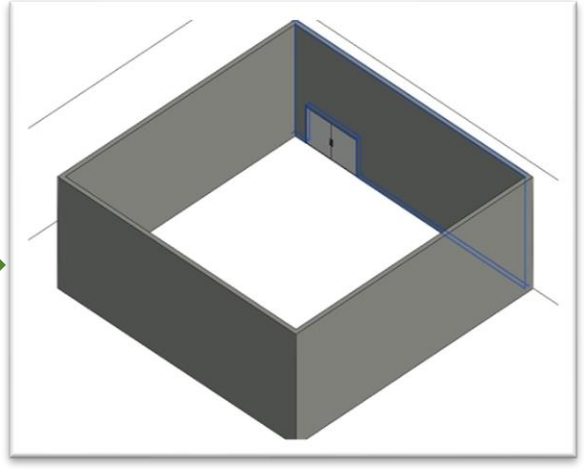


3.Practical applications – working with the Arhicad programme

2D surveys: level plan, facades, sections plan.
We use the drawing commands for get all the deliverables

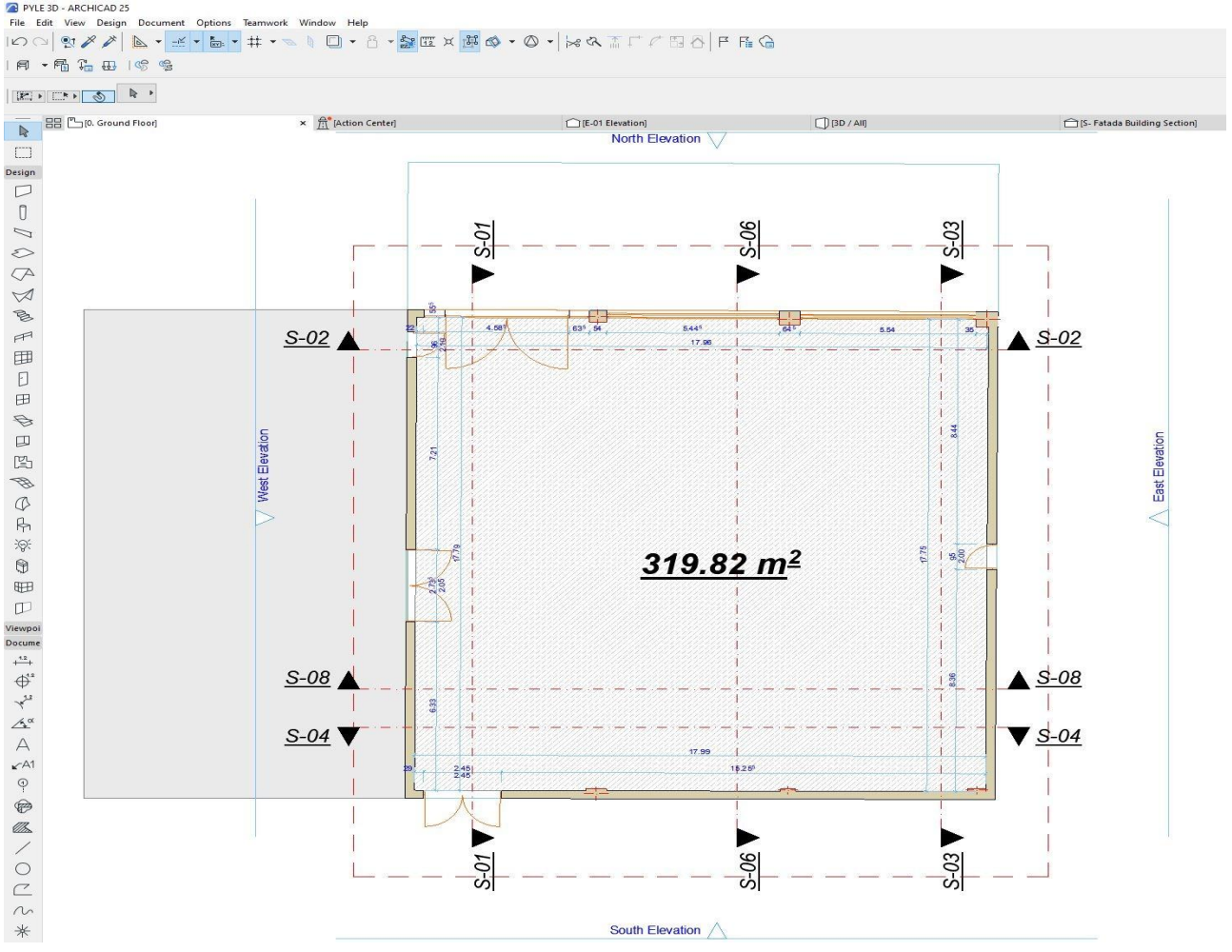






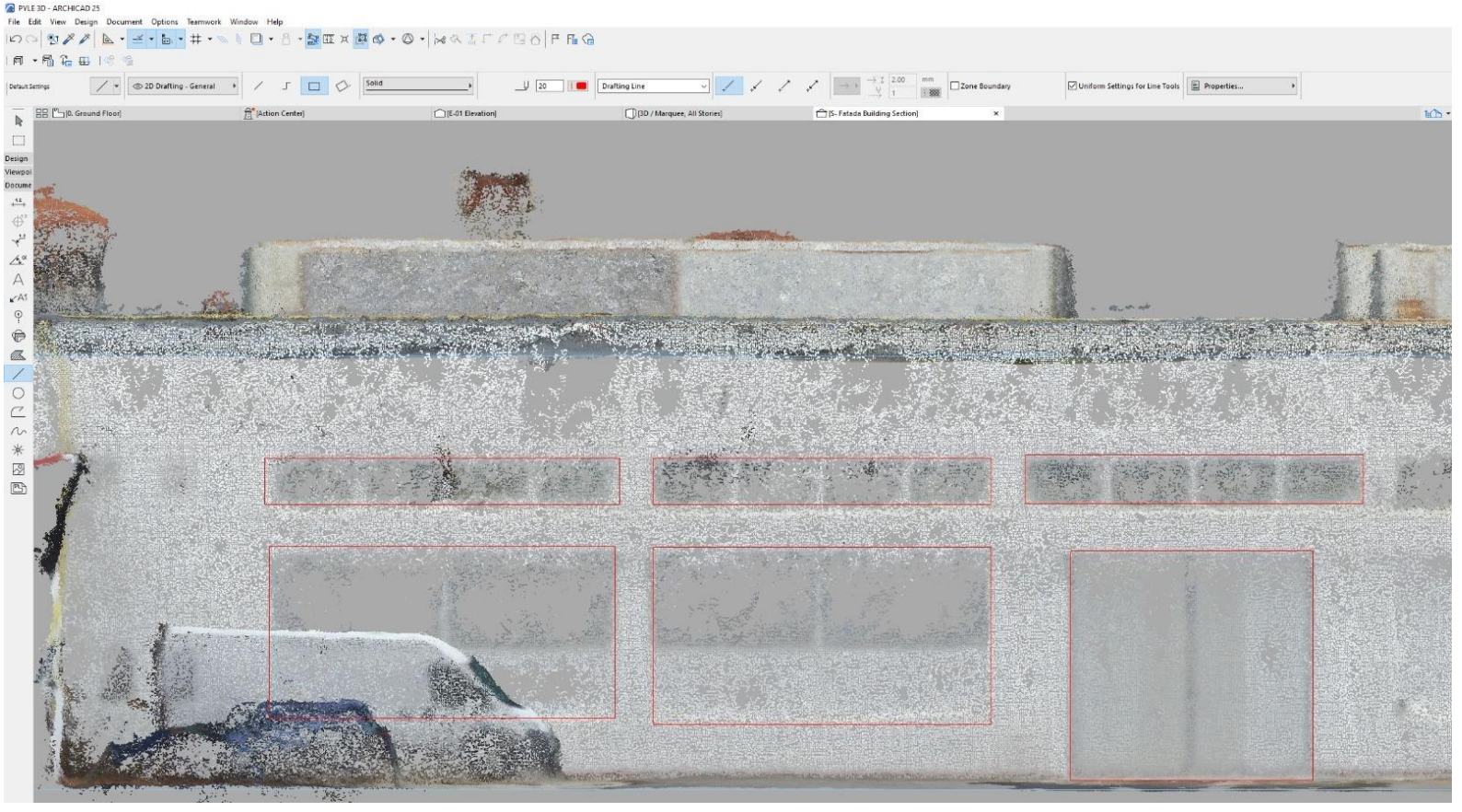
3.Practical applications – working with the Arhicad programme

It is possible to work on the point cloud, use the drawing commands and get horizontal representation of the hall.



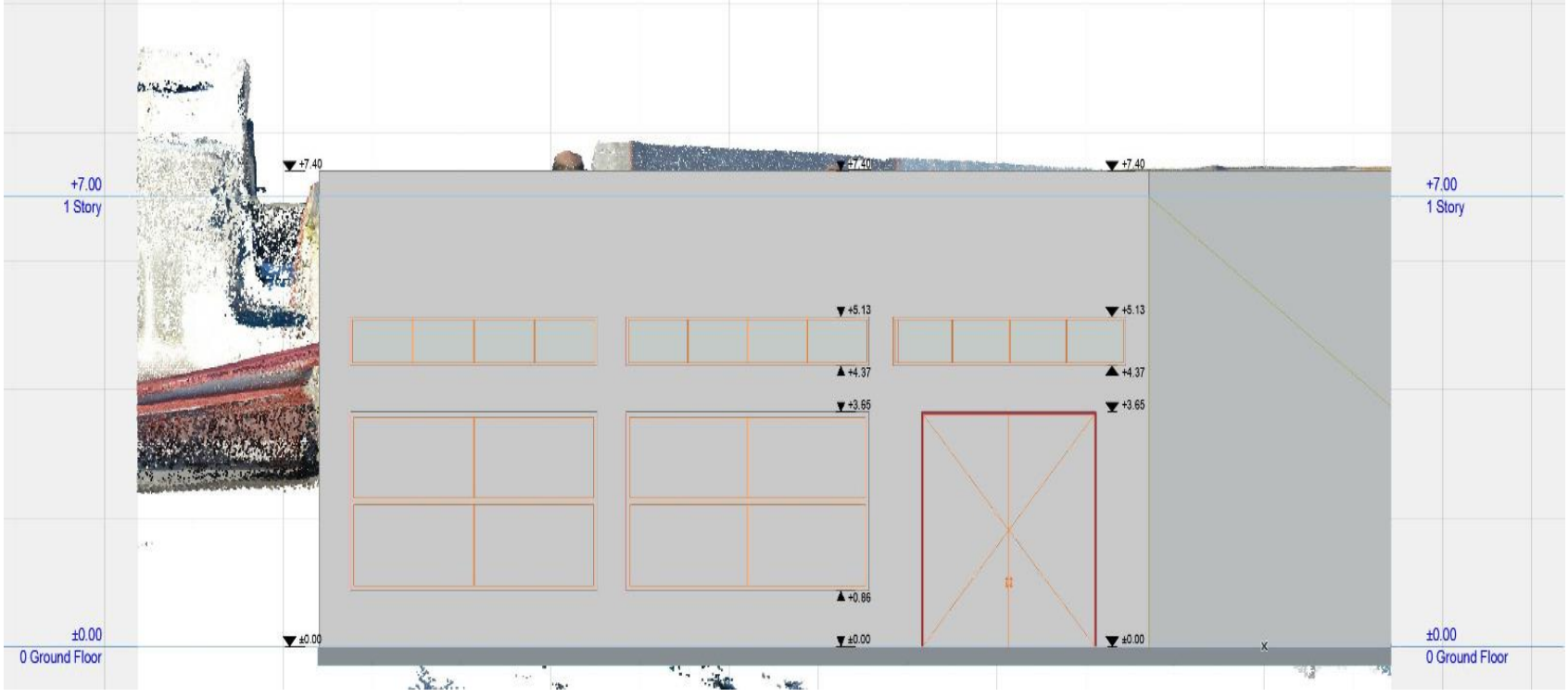
3.Practical applications – working with the Arhicad programme

We use the point cloud to draw facades.



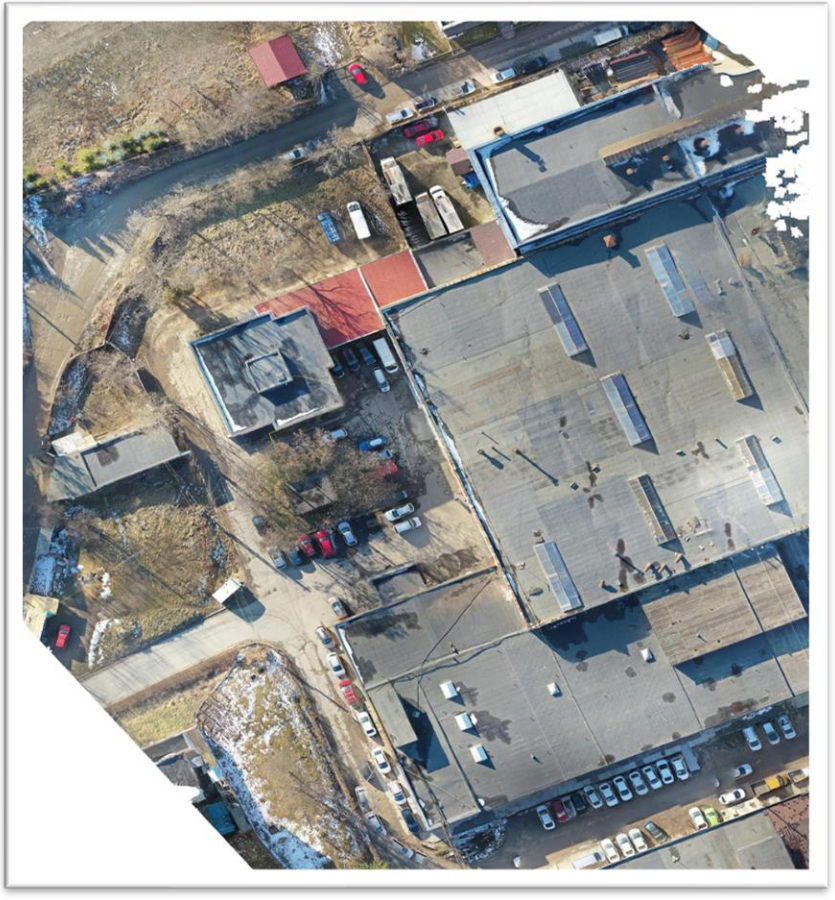
3.Practical applications – working with the Arhicad programme

We use 2D work commands to obtain the architectural plan



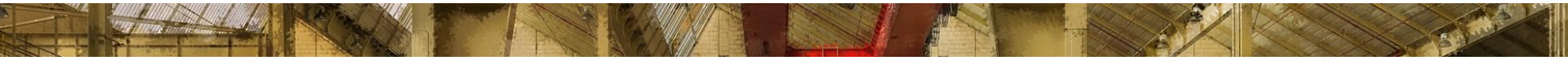
3.Practical applications – working with the Arhicad programme

To draw the site plan we use the orthophotoplan. It is composed of a mosaic of geometrically corrected aerial photographs and can be used to measure actual distances.



3.Practical applications – working with the Arhicad programme

Drawing up the situation plan.
It was done using the commands specific to 2D work: line, hashes, dimensions, objects.



4. Conclusions

ADVANTAGES

- Field teams can measure from locations that minimize contact with hazardous areas;
- There is no need to move equipment or stop the technological process to take measurements;
- Lower measurement and data acquisition costs for engineering and surveying work;
- The level of detail is defined according to the project requirements;
- Easy redesign, 3D technology can restore a flaw in the original design and benefit in the correct alignment of the desired parts.
- Generate results (coordinates, areas, volumes, sections, profiles) with very high productivity;

RECOMMENDATIONS

- The devices used: laptop, desktop computer, require certain configurations, in order to process the information.
- The persons involved in these activities need knowledge of the use of software that can be used to provide deliverables and notions and construction and installations.

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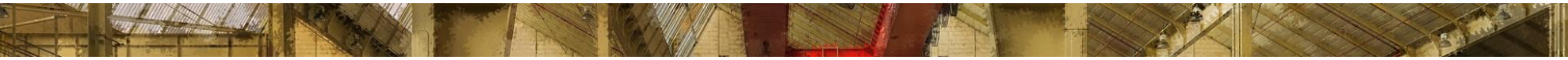

References

1.https://melny.ro/scanare-3d/?gclid=EAIaIQobChMIiITq6- c_AIVktd3Ch3sZgHfEAAYASAAEgLfEPD_BwE#
2.www.topgeocart.ro

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CONTACT

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