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Teaching Gen Z Civil Engineers

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3D scanning for optimized historic building restoration

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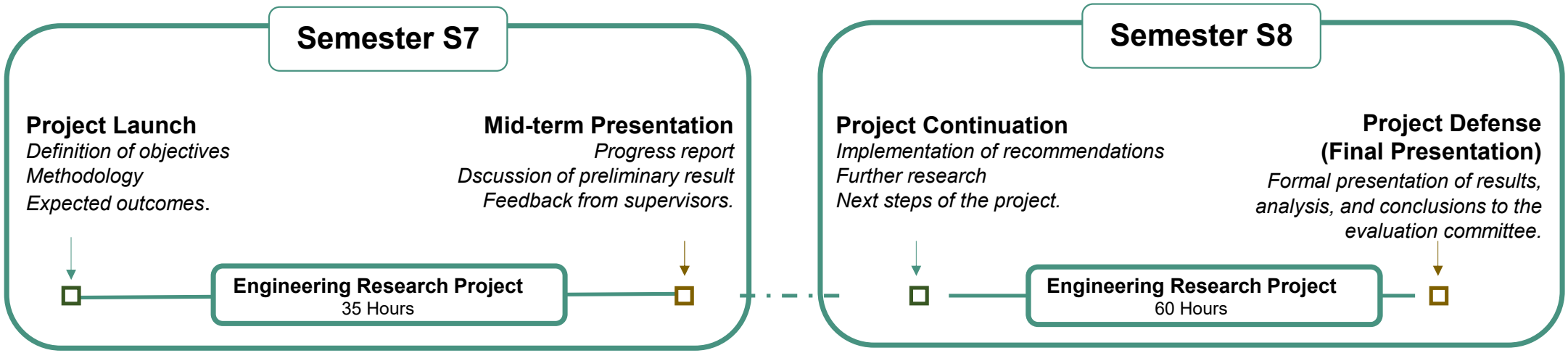
CONSTRUCTEURS D'UN NOUVEAU MONDE

1. Learning through projects at ESTP
2. Context
3. Objective
4. Studies to be carried out
5. Survey carried out in the field
6. Post-processing and visualization
7. Perspectives
8. Pedagogical perspectives

1. Learning through projects at ESTP

During the second year of the engineering cycle, students will work on a project for a total of 95 hours.

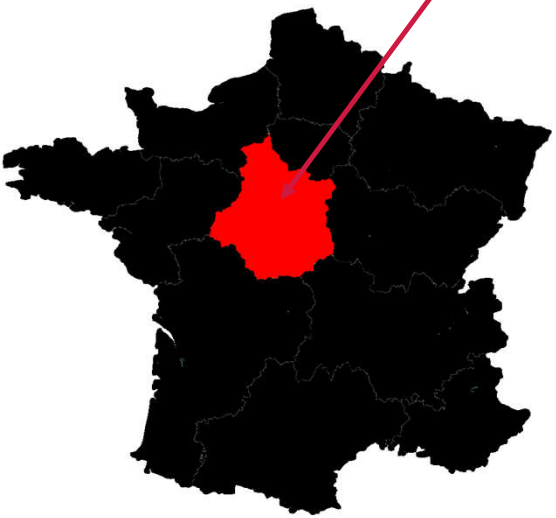
Mentoring Projects in Teams of 4



- ❑ Discover the world of research and development in companies and research laboratories
- ❑ **Implement the identified methodology :** data collection, structural calculations, laboratory experiments, field surveys

2. Context

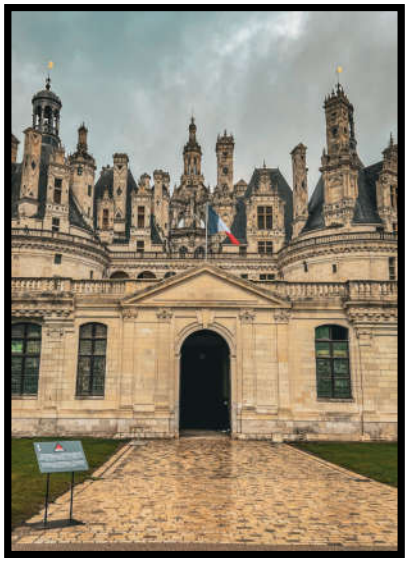
Centre-Val de Loire



France

Centre-Val de Loire is home **to famous historic castles and churches**

Chateau de Chambord



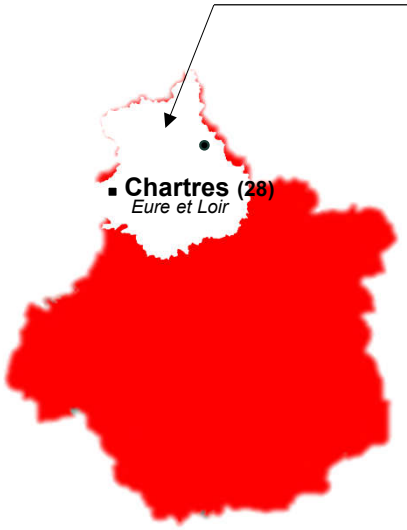
Chateau de Chennonceau

Many abandoned heritage sites remain in urgent need of restoration with no plans in place.

Château de villedieu-sur-indre

2. Context

Mittainvilliers-Vérigny



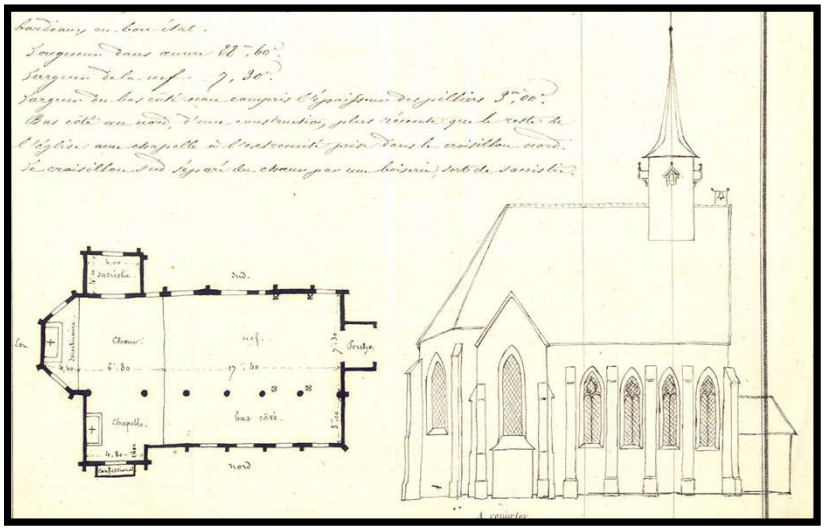
Centre-Val de Loire

The Saint Rémi Church in Vérigny, recently listed as a historical monument, has undergone several previous restorations over the centuries, each using different materials.

Some documents from **1852 - 1854** are preserved at the Eure-et-Loir Departmental Archives, **but no plans exist for 3D modeling [1]**

Saint Remi Church

Existing architectural drawings of the church [2][1]

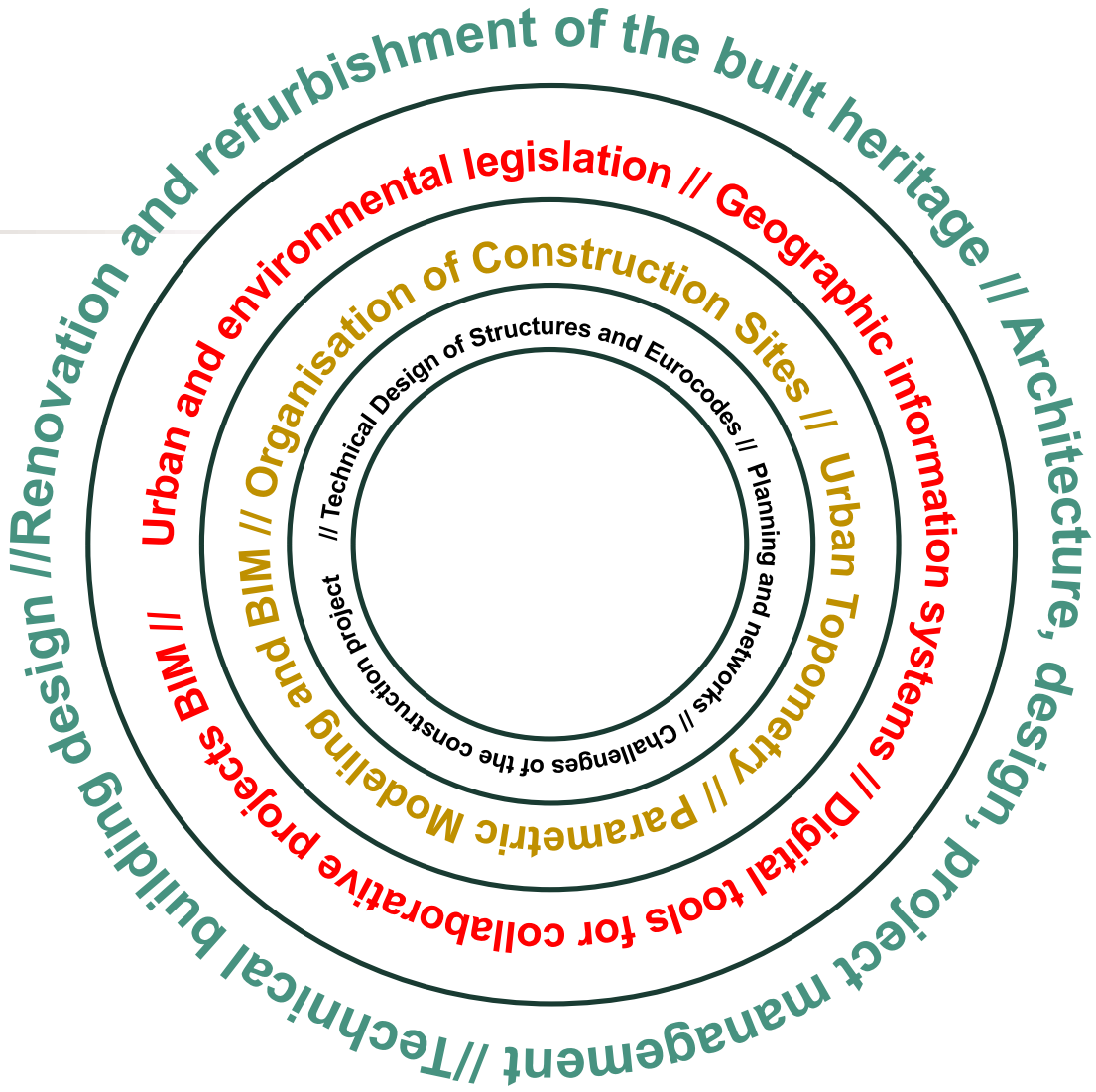


3. Objective

As engineering students, how can you contribute to the preservation of the church through laser scanning and 3D building analysis?

4. Studies to be carried out

During **the first** and **second year** of the engineering cycle, students have learnt different skills such as :



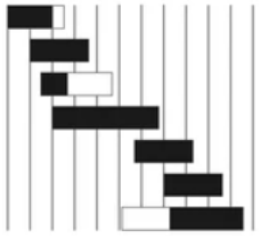
First Year : S5 S6 **Second Year :** S7 S8

4. Studies to be carried out

Studies to Conduct:

Documentary study on techniques and the state of the art
Documentary research on the church in collaboration with archaeologists

Gantt chart schedule
Planning
Timeline
Task allocation



GANTT CHART

Church scanning
3D capture
Laser scanning,
Documentation

3D rendering
Model reconstruction
Visualization
Digital assembly

5. Survey carried out in the field

Site prepared and geodetic points established using differential GPS for alignment.

Leica GPS GNSS data

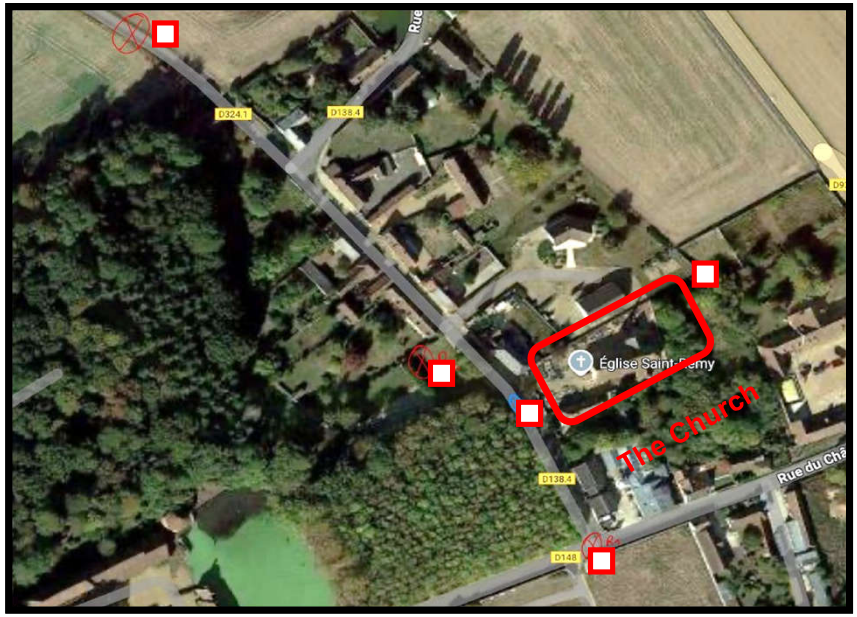
Georeferencing the survey area.

Leica CS20 field controller

Record and manage geospatial data

3D coordinates and GDOP values projected on a base map to ensure full coverage of Saint-Rémi Church.

- **Positions of GPS points on the map**



5. Survey carried out in the field

3D laser scanning survey captures detailed point clouds of the building for modeling

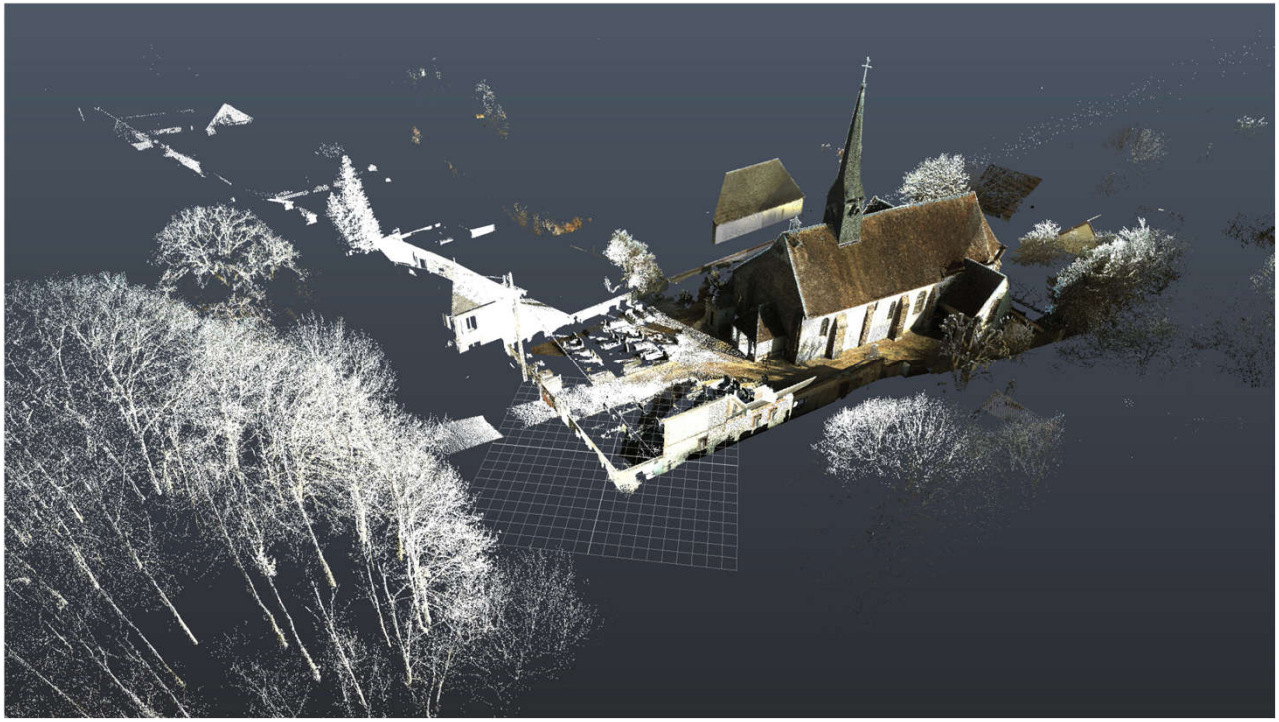
Around the church

Inside the church

6. Post-processing and visualization

The 3D modeling process begins with post-processing the consolidated point cloud (Cyclone, Recap Pro) followed by importing the data into AutoCAD.

Final 3D Model of Saint-Rémi Church



7. Perspectives

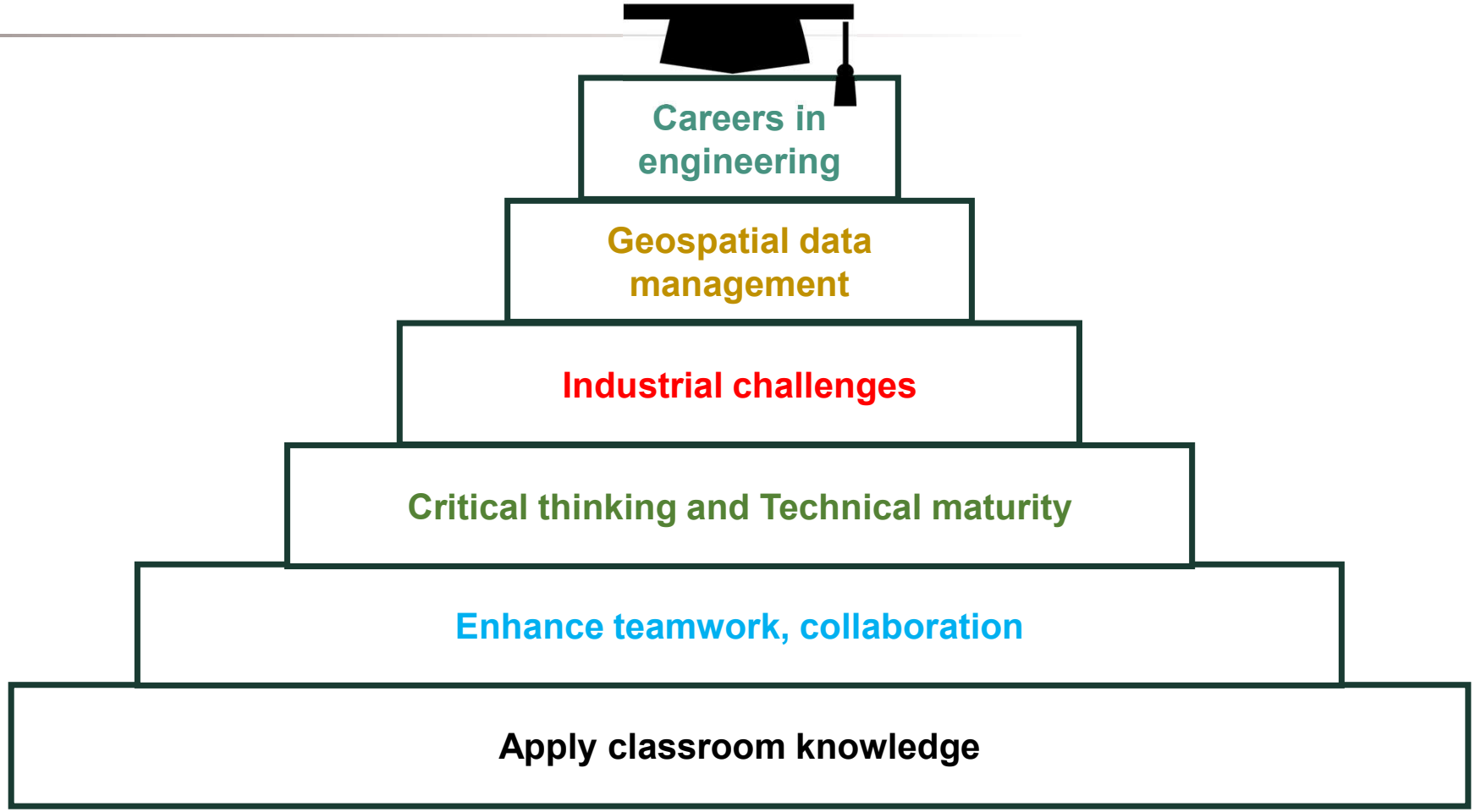
Identification of the different materials used
(concrete, coatings, wood, stone)

Identification of priority works in consultation with the heritage authorities

MONUMENT HISTORIQUE

Research to determine the best materials for restoration
Coordination with the Chief Architect of French Historical

8. Pedagogical perspectives



Thank you for your attention

References

[1] https://www.chartres-metropole.fr/actualites/detail/mittainvilliers-verigny-cest-toute-une-histoire#:~:text=L'%C3%A9glise%20Saint%2DR%C3%A9mi%20de%20V%C3%A9rigny&text=C'est%20vers%201550%2C%20sans,chapelle%20fun%C3%A9raire%20des%20seigneurs%20locaux.

[2] https://archives28.fr/archives-et-inventaires-en-ligne/fonds-iconographiques/plans-deglises-1-o?arko_default_621f4ca584311--ficheFocus=&arko_default_621f4ca584311--filtreGroupes%5Bmode%5D=simple&arko_default_621f4ca584311--filtreGroupes%5Bop%5D=AND&arko_default_621f4ca584311--filtreGroupes%5Bgroupes%5D%5B0%5D%5Barko_default_621f4cbc00fae%5D%5Bop%5D=AND&arko_default_621f4ca584311--filtreGroupes%5Bgroupes%5D%5B0%5D%5Barko_default_621f4cbc00fae%5D%5Bq%5D%5B%5D=&arko_default_621f4ca584311--filtreGroupes%5Bgroupes%5D%5B0%5D%5Barko_default_621f4cbc00fae%5D%5Bq%5D%5B%5D=verigny&arko_default_621f4ca584311--filtreGroupes%5Bgroupes%5D%5B0%5D%5Barko_default_621f4cbc00fae%5D%5Bextras%5D%5Bmode%5D=popup&arko_default_621f4ca584311--from=0&arko_default_621f4ca584311--resultSize=25&arko_default_621f4ca584311--contenuIds%5B%5D=484955&arko_default_621f4ca584311--modeRestit=arko_default_621f4ccae7cb3