



POLITECNICO
DI TORINO

Dipartimento di
Architettura e
Design

Master in Architecture for
Sustainability
A.Y. 2024 - 2025

Thesis Title

Gardella's Lost Legacy: The Church of Alessandria.

Study, 3D documentation and
Analysis

Students

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Supervisors

Supervisor:
Filiberto Chiabrando
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Francesco Novelli

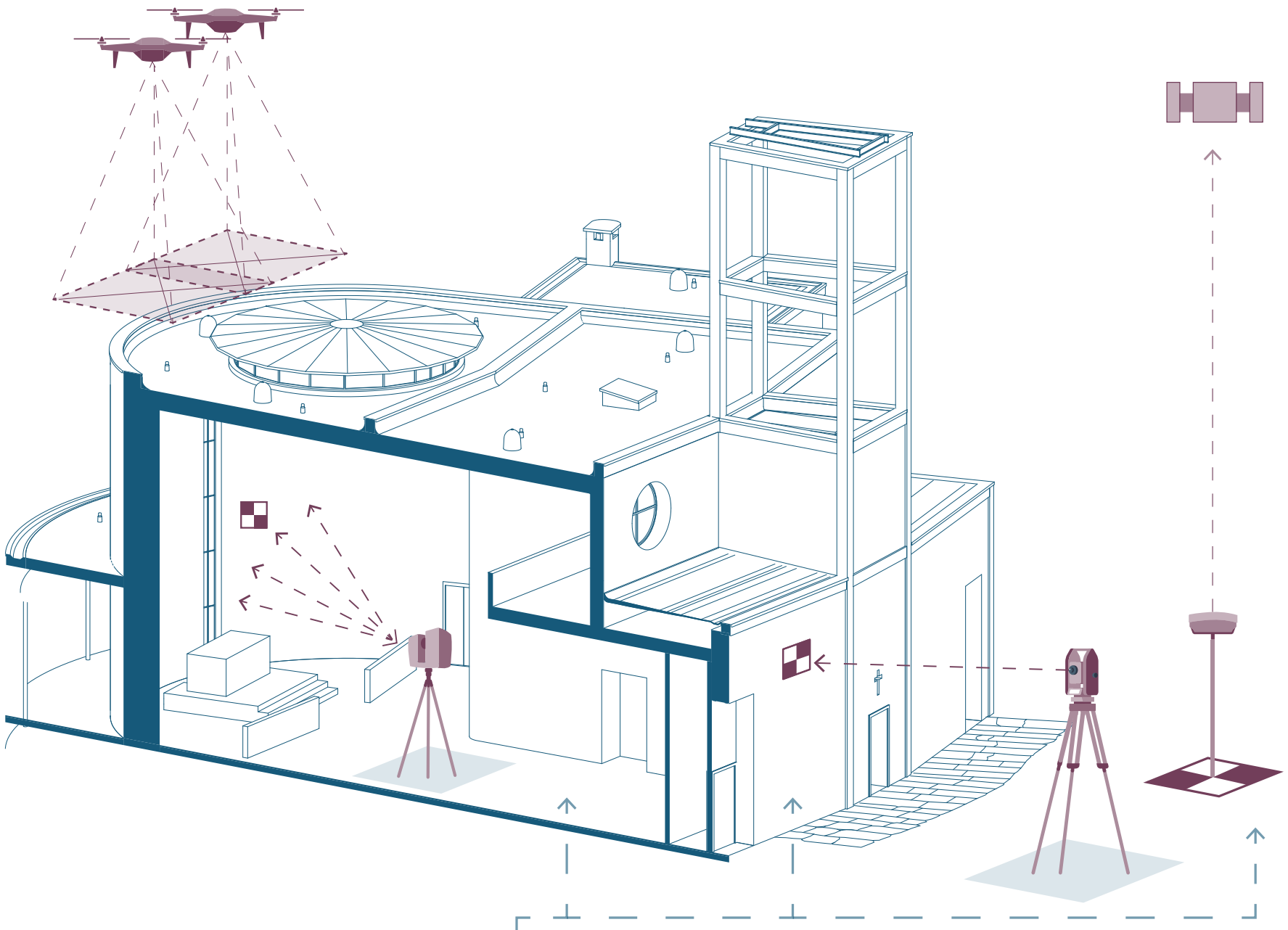
Board A

- TERRITORIAL CONTEXT
- GEOMATICS SURVEY
- 2D DOCUMENTATION
- HBIM DOCUMENTATION
- MATERIAL ANALYSIS
- CURRENT STATE OF
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AND SOLUTIONS
- THE PROPOSAL

The Church Building



Surveying Technologies Utilized



Ground Control Points (GCPs)

GCPs are precise points with known geographic coordinates used to align 3D models to coordinate systems, ensuring spatial accuracy, correcting distortions, and enhancing data integration. For Gardella's church, GCPs were used to georeferenced the 3D model by aligning images with real-world coordinates. They were strategically placed inside the church, on the facade, and across the surrounding terrain for accurate alignment.

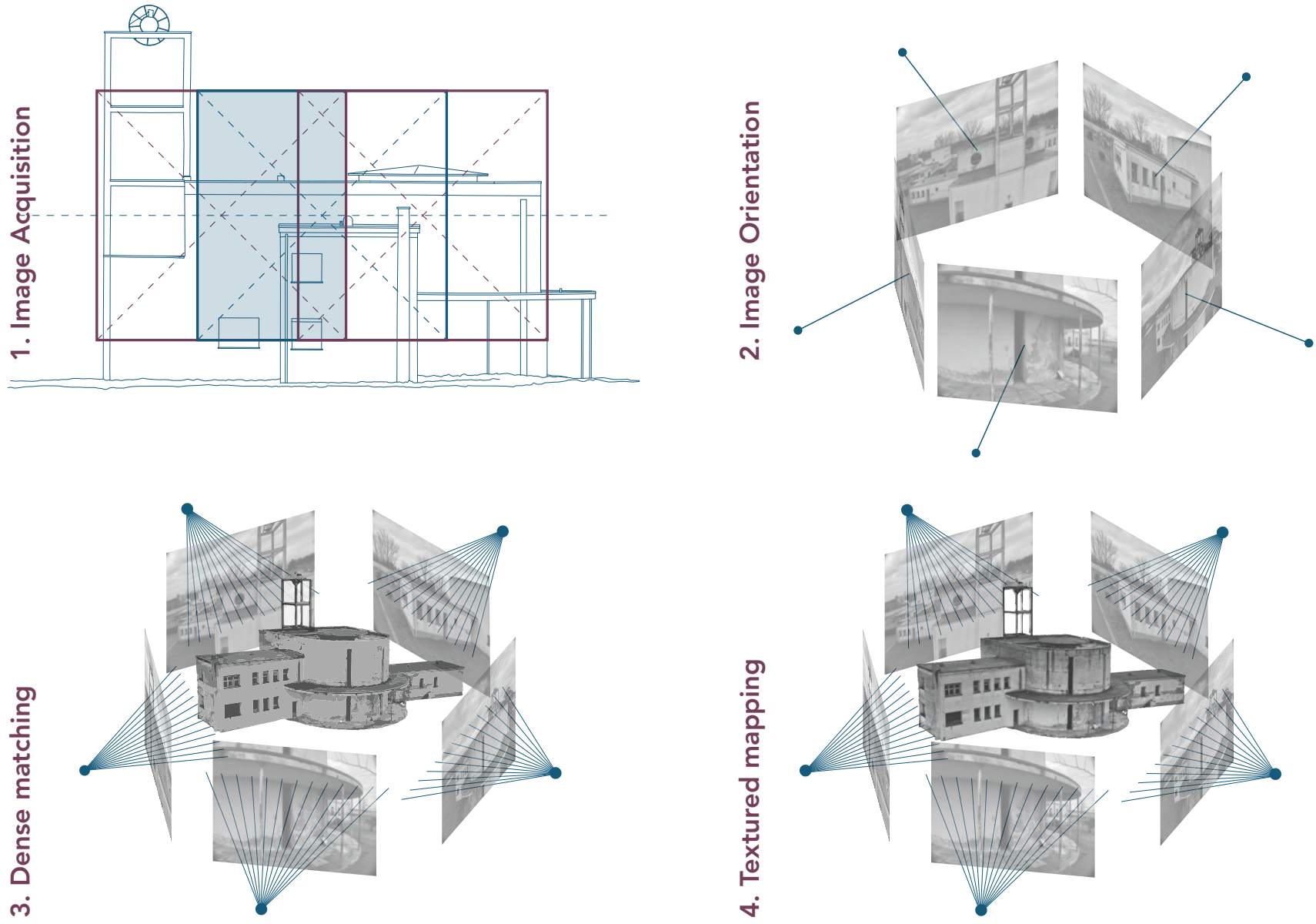
Total station

The total station is a geodetic instrument that measures horizontal and vertical angles and distances to generate precise 3D coordinates within a reference system. In heritage building analysis, it captures high-precision spatial data necessary for modeling, documentation, and conservation. During the survey, a **Leica Viva TS16** Total Station was used to measure GCPs on the church facade, the terrain, and the interior, ensuring the accuracy of georeferenced data.

UAV - Based photogrammetry

UAV-based photogrammetry uses drones equipped with cameras to capture aerial images that are processed into 3D models. This method is widely used for documenting large or hard-to-reach areas due to its ability to capture details with high precision and efficiency. However, in this study, the technique was chosen primarily because it is non-invasive, making it ideal for preserving the integrity of the heritage building during the survey. A **Mavic 3M** drone was used in this study, equipped with a 20 MP RGB camera and an RTK module for centimeter-level positioning. The drone captured detailed images of the church's exterior and its immediate surroundings, helping to create a precise and georeferenced 3D model

Structure from Motion - SfM

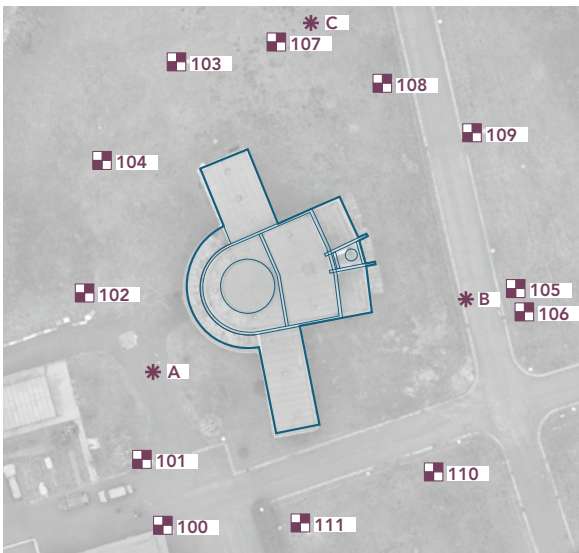


Structure from Motion (SfM) is a digital technique that generates three-dimensional (3D) models from two-dimensional (2D) images captured from various perspectives. It allows the documentation of complex geometries and architectural details by identifying key points in images and reconstructing their spatial position. It is particularly important in heritage building analysis because it is non-invasive, flexible, and produces detailed models with high accuracy. In the study of Gardella's church, SfM was used to process images and create a precise 3D model reflecting its geometry and conservation state.

Initial Data

GCPs - Eidotype

For terrain and church's facade



GCPs - Coordinates

Terrain markers: 100 - 111
Church's facade markers: P01 - P22

Information provided:
Longitude
Latitude
Height

Processing the Data

Step 1: Importing the data from images

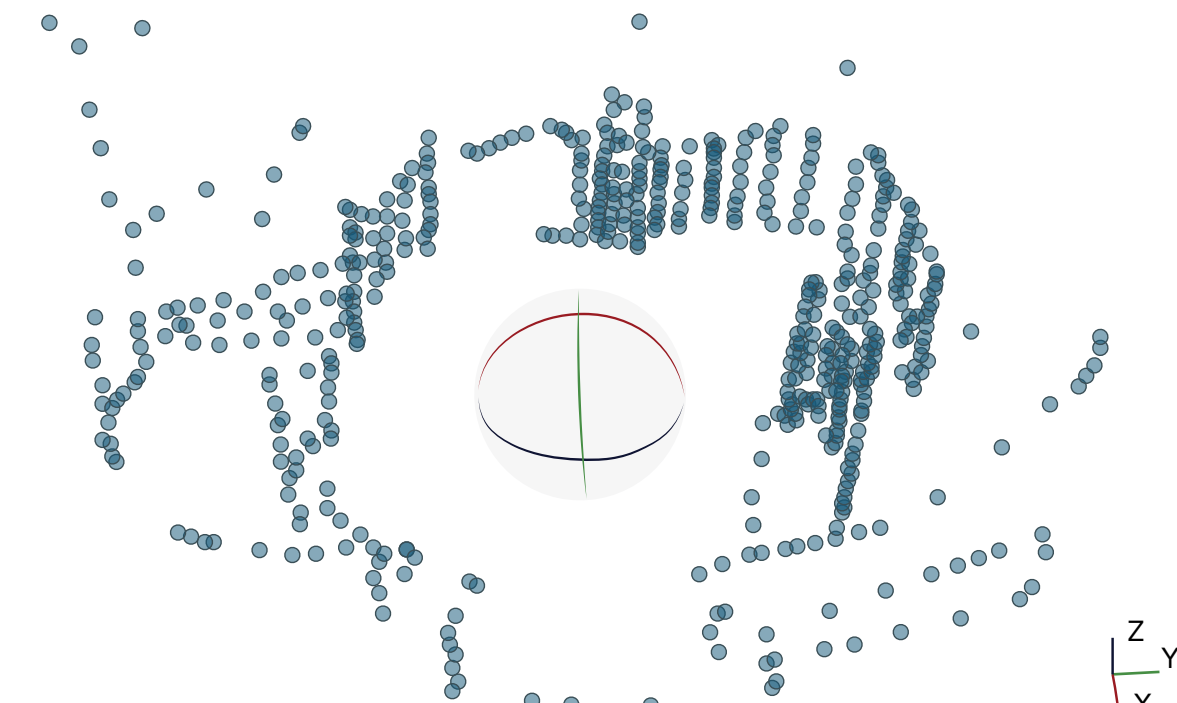
- Images captured during UAV surveys are uploaded. These were collected through two flight plans at different altitudes and distances. Each image brings information as follows:

Property	Value
Frame 1	
Path	C:/Users/XXX/XXX
Resolution	5280 X 3956
Colors	3 Bands, uint8
Date & time	2024:02:23 11:51:02
Model	M3M
Focal length	12.29
F-Stop	F/2.8
ISO	100
Shutter	1/500
35mm focal	24

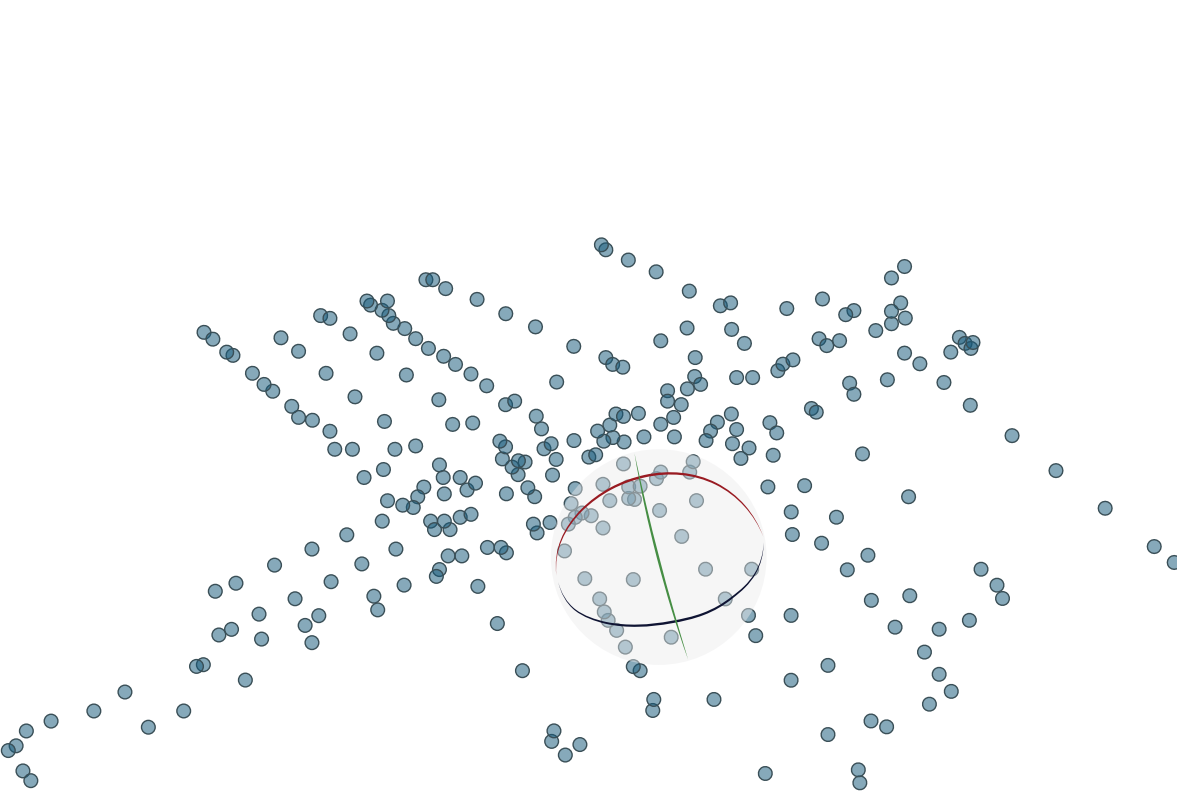
Cameras	Long.	Latitude	Altitude(m)	Accuracy(m)
<input checked="" type="checkbox"/> DJI...	8.616606	44.939324	137.86200	10.00000
<input checked="" type="checkbox"/> DJI...	8.616609	44.939330	137.85700	10.00000
<input checked="" type="checkbox"/> DJI...	8.616625	44.939324	137.89200	10.00000
<input checked="" type="checkbox"/> DJI...	8.616656	44.939313	137.82600	10.00000
<input checked="" type="checkbox"/> DJI...	8.616655	44.939313	137.33200	10.00000
<input checked="" type="checkbox"/> DJI...	8.616657	44.939313	137.52700	10.00000

Cameras	Yaw (°)	Pitch (°)	Roll (°)	Accuracy(°)
<input checked="" type="checkbox"/> DJI...	289.700	84.300	0.000	10.00000
<input checked="" type="checkbox"/> DJI...	299.700	84.300	0.000	10.00000
<input checked="" type="checkbox"/> DJI...	300.100	84.300	0.000	10.00000
<input checked="" type="checkbox"/> DJI...	300.100	84.300	0.000	10.00000
<input checked="" type="checkbox"/> DJI...	300.100	84.300	0.000	10.00000
<input checked="" type="checkbox"/> DJI...	300.100	84.300	0.000	10.00000
<input checked="" type="checkbox"/> DJI...	300.100	84.300	0.000	10.00000

- The images are divided into two chunks: Aerial close range and aerial range, representing the different datasets.



Imported images without alignment in Aerial close range chunk. 0 POINTS.



Imported images without alignment in aerial range chunk. 0 POINTS.

Step 2: Alignmet of Photos

- During the process of alignment the software processes the imported images to identify key points and matches them across images to generate tie points.
- These tie points help to build a sparse point cloud that provides a basic structured and orientation of the photographed scene giving a numerical and visual output.

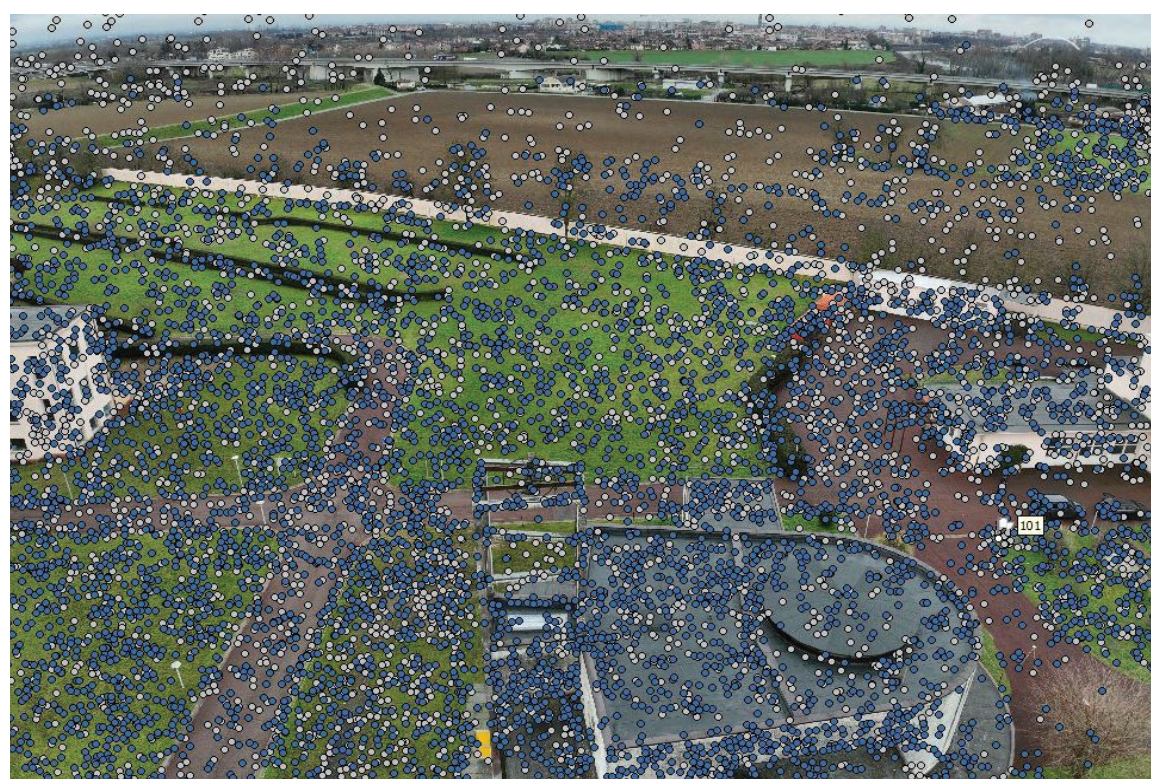
- Parameters choosen to optimize camera alignment:

High accuracy
Generic preselection.

During the process of alignment

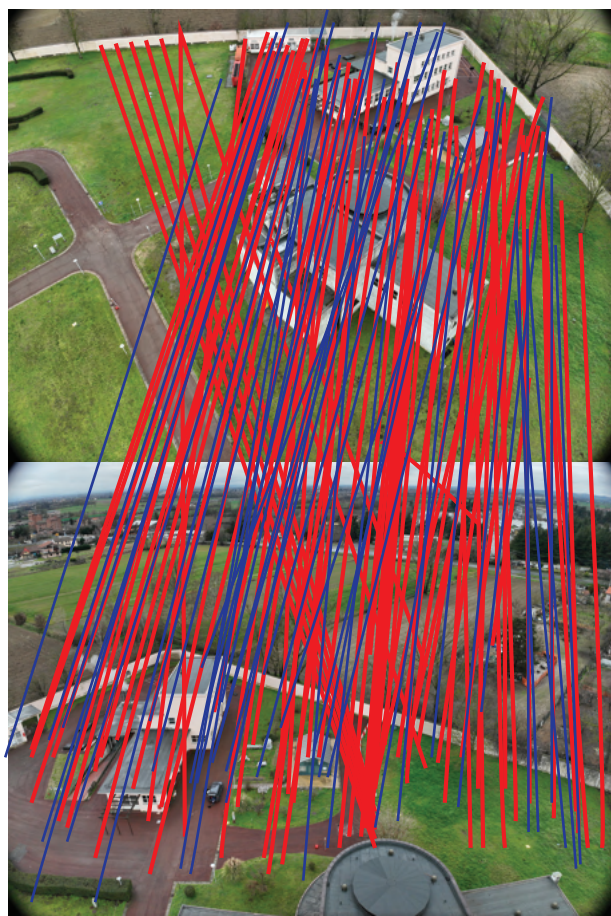
Outputs after alignment

Software Metashape identifying key and tie points. After it the tie point will pass through a process of valid and invalid.



During the process:

- Key Points
- Tie Points
- Valid Points
- Invalid Points



Camera

Camera model: M3M
Focal lenght: 12.29 mm
Resolution: 5280 X 3956
Pixel size: 3.36 x 3.36 µm
Precalibrated: Yes

Aerial Close Range Images

Icon: ●
Number of images: 709
Flying altitude: 6.98 m
Ground resolution: 2.63 mm/pix

Aerial Range Images

Icon: ●
Number of images: 322
Flying altitude: 59.8 m
Ground resolution: 1.19 cm/pix

Information Provided:

EXIF metadata: Longitude,
latitude, altitude, date and time, model,
focal length, ISO, shutter.
No EXIF: Colors band, resolution.

Aerial Close Range

Number of Images	709
Flying altitude	6.98 M
Ground Resolution	2.63 mm/pix
Coverage Area	8.29e + 03m2
Camera stations	709
Tie points	266,532
Projections	2,068,254
Reprojection error	0.978 pix

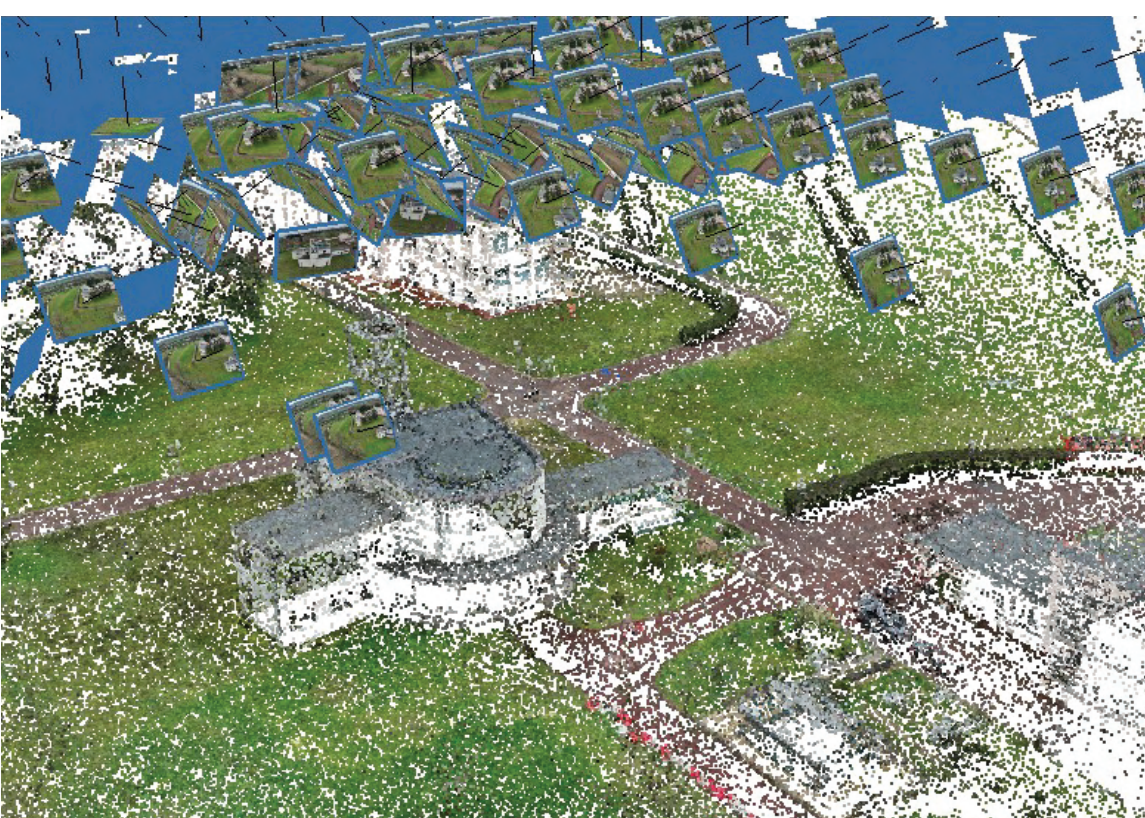
Aerial Range

Number of Images	322
Flying altitude	59.8 M
Ground Resolution	1.99 cm/pix
Coverage Area	0.113 km2
Camera stations	322
Tie points	458,181
Projections	2,151,474
Reprojection error	0.757 pix

Sparse Point Cloud of Aerial close range
458,181 points



Sparse Point Cloud of Aerial range
263,532 points





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Processing the Data

Step 3: Loading data for Georeferencing

- Import the coordinates of the GCPs that were obtain using the Total Station into Metashape software to improve the quality and precision of the sparse point cloud after the alignment of images.
- The import was carried out using the following parameters:
 - Coordinate system: Local coordinates (m)
 - Rotation angle: Yaw, pitch, roll
 - Delimiter: Semicolon
 - Columns: Rotation box checked
 - Each marker carried the following info: Label, X, Y, and Z coordinates.

After importing the GCPs

Aerial Close-Range Chunk: 22 markers
Aerial Range Chunk: 10 markers

Identification		Coordinates			Number of images the marker has been manually placed.		
Marker	X(m)	Y(m)	Z (m)	Accuracy (m)	Error (m)	Projections	Error (pix)
<input checked="" type="checkbox"/> 100	469719.692	4976257.951	91.286	0.005000	0	0	0.000
<input checked="" type="checkbox"/> 101	469716.914	4976267.433	91.197	0.005000	0	0	0.000
<input checked="" type="checkbox"/>
Total Error				< 0.1			
Control Points							
Check Points							

Error (pix): mean square root for the reprojection error for the marker, calculated over all images where the marker has been placed. Works as an indicator of the discrepancy a marker can have.

Aim: Less than 1 cm

Step 4: Georeferencing - Placing markers

- Two methods were employed to place markers. These markers help ensure proper alignment and identify errors related to the model's precision.



- Guided approach**
The software automatically projects the markers onto the model. They need manual verification before being used in calculations.
- Manual approach**
Manually placed through "Place a marker" tool. Marked with a green flag once confirmed.

- Both chunks initially used guided approach, followed by the manual approach implemented gradually as follows:

- Places three markers in three different images
- Use the "update transform" tool
- Project each marker in five images
- Use the "optimize camera" tool
- Create checkpoints and increase markers' projections

Results after implementing manual apporahc

- 1 & 2. Total error after placing three markers in three different images and use the update transform tool. This tool is used to recalculate and update the global transformation a chunk based on changes made to the georeferencing. By suing this tool any changes done in the markers is reflected in the 3D Model.

Marker	X(m)	Y(m)	Z (m)	Accuracy (m)	Error (m)	Projections	Error (pix)
<input checked="" type="checkbox"/> 100	0.005000	0.001933	3	0.654
<input checked="" type="checkbox"/> 101	0.005000	0	0	0.000
<input checked="" type="checkbox"/> 102	0.005000	0	0	0.00
<input checked="" type="checkbox"/> 103	0.005000	0.001942	3	0.646
<input checked="" type="checkbox"/> 104	0.005000	0	0	0.000
<input checked="" type="checkbox"/> 105	0.005000	0	0	0.000
<input checked="" type="checkbox"/> 106	0.005000	0.002118	3	0.793
<input checked="" type="checkbox"/> 107	0.005000	0	0	0.000
<input checked="" type="checkbox"/> 108	0.005000	0	0	0.000
<input checked="" type="checkbox"/> 109	0.005000	0	0	0.000
<input checked="" type="checkbox"/> 110	0.005000	0	0	0.000
<input checked="" type="checkbox"/> 111	0.005000	0	0	0.000
Total Error				0.001999			
Control Points							
Check Points				0.701			

- 3. The markers help to correct image distortion caused by the camera lens. This is why this third step of increasing projections was taken. After placing the markers, the update transform tool was used again.

Marker	X(m)	Y(m)	Z (m)	Accuracy (m)	Error (m)	Projections	Error (pix)
<input checked="" type="checkbox"/> 100	0.005000	0.017149	5	0.704
<input checked="" type="checkbox"/> 101	0.005000	0.008605	5	0.635
<input checked="" type="checkbox"/> 102	0.005000	0.007726	5	0.401
<input checked="" type="checkbox"/> 103	0.005000	0.015505	5	0.727
<input checked="" type="checkbox"/> 104	0.005000	0.006294	5	0.486
<input checked="" type="checkbox"/> 106	0.005000	0.013646	5	0.980
<input checked="" type="checkbox"/> 107	0.005000	0.010781	5	0.782
<input checked="" type="checkbox"/> 108	0.005000	0.008839	5	0.831
<input checked="" type="checkbox"/> 109	0.005000	0.008852	5	0.592
<input checked="" type="checkbox"/> 110	0.005000	0.007963	5	0.574
<input checked="" type="checkbox"/> 111	0.005000	0.005883	5	0.582
Total Error				0.010723			
Control Points							
Check Points				0.681			

- 4. To reduce the error per chunk, the optimize camera alignment tool was used. This command performs a full bundle adjustment procedure on the aligned photogrammetric block, simultaneously refining exterior and interior camera orientation parameters and triangulated tie points coordinates. The adjustment is made based on all available measurements. The next parameters were chosen:

Fit f	Fit k1	Fit k2	Fit k3	Fit k4	Fit p1	Fit p2	Fit b1	Fit b2	Fit additional correctoons
<input checked="" type="checkbox"/> 100	0.005000	0.017358	5	0.611		
<input checked="" type="checkbox"/> 101	0.005000	0.010937	5	0.580		
<input checked="" type="checkbox"/> 102	0.005000	0.005874	5	0.240		
<input checked="" type="checkbox"/> 103	0.005000	0.013363	5	0.399		
<input checked="" type="checkbox"/> 104	0.005000	0.008324	5	0.357		
<input checked="" type="checkbox"/> 106	0.005000	0.010900	5	0.729		
<input checked="" type="checkbox"/> 107	0.005000	0.008636	5	0.480		
<input checked="" type="checkbox"/> 108	0.005000	0.005967	5	0.435		
<input checked="" type="checkbox"/> 109	0.005000	0.010299	5	0.462		
<input checked="" type="checkbox"/> 110	0.005000	0.008816	5	0.487		
<input checked="" type="checkbox"/> 111	0.005000	0.006766	5	0.391		
Total Error				0.010277				0.487	
Control Points									
Check Points									

Marker	X(m)	Y(m)	Z (m)	Accuracy (m)	Error (m)	Projections	Error (pix)
<input checked="" type="checkbox"/> P01	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P02	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P03	0.005000	0.000610	3	0.253
<input checked="" type="checkbox"/> P04	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P05	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P06	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P07	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P08	0.005000	0.000619	3	0.411
<input checked="" type="checkbox"/> P09	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P10	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P11	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P12	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P13	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P14	0.005000	0.000631	3	0.263
<input checked="" type="checkbox"/> P15	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P16	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P17	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P18	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P19	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P20	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P21	0.005000	0	0	0.000
<input checked="" type="checkbox"/> P22	0.005000	0	0	0.000
Total Error				0.000620			
Control Points							
Check Points				0.317			

Marker	X(m)	Y(m)	Z (m)	Accuracy (m)	Error (m)	Projections	Error (pix)
<input checked="" type="checkbox"/> P01	0.005000	0.004613	5	0.670
<input checked="" type="checkbox"/> P02	0.005000	0.007414	5	0.684
<input checked="" type="checkbox"/> P03	0.005000	0.009255	5	1.524
<input checked="" type="checkbox"/> P04	0.005000	0.007411	5	0.546
<input checked="" type="checkbox"/> P05	0.005000	0.007304	5	0.475
<input checked="" type="checkbox"/> P06	0.005000	0.010496	5	0.592
<input checked="" type="checkbox"/> P07	0.005000	0.010150	5	0.731
<input checked="" type="checkbox"/> P08	0.005000	0.019292	5	0.546
<input checked="" type="checkbox"/> P09	0.005000	0.013527	5	0.468
<input checked="" type="checkbox"/> P10	0.005000	0.008285	5	0.411
<input checked="" type="checkbox"/> P11	0.005000	0.013128	5	0.658
<input checked="" type="checkbox"/> P12	0.005000	0.008851	5	0.271
<input checked="" type="checkbox"/> P13	0.005000	0.011368	5	0.469
<input checked="" type="checkbox"/> P14	0.005000	0.008326	5	0.351
<input checked="" type="checkbox"/> P15	0.005000	0.006125	5	0.618
<input checked="" type="checkbox"/> P16	0.005000	0.007698	5	0.475
<input checked="" type="checkbox"/> P17	0.005000	0.002028	2	0.165
<input checked="" type="checkbox"/> P18	0.005000	0.007041	5	1.031
<input checked="" type="checkbox"/> P19	0.005000	0.005634	5	0.499
<input checked="" type="checkbox"/> P20	0.005000	0.009843	5	0.622
<input checked="" type="checkbox"/> P21	0.005000	0.009687	5	0.409
<input checked="" type="checkbox"/> P22	0.005000	0.012505	5	0.380
Total Error				0.009674			
Control Points							
Check Points				0.637			

Marker	X(m)	Y(m)	Z (m)	Accuracy (m)	Error (m)	Projections	Error (pix)
<input checked="" type="checkbox"/> P01	0.005000	0.007130	5	0.362
<input checked="" type="checkbox"/> P02	0.005000	0.009383	5	0.371
<input checked="" type="checkbox"/> P03	0.005000	0.006792	5	0.398
<input checked="" type="checkbox"/> P04	0.005000	0.004133	5	0.756
<input checked="" type="checkbox"/> P05	0.005000	0.002732	5	0.355
<input checked="" type="checkbox"/> P06	0.005000	0.008382	5	0.241
<input checked="" type="checkbox"/> P07	0.005000	0.010262	5	0.546
<input checked="" type="checkbox"/> P08	0.005000	0.011952	5	0.360
<input checked="" type="checkbox"/> P09	0.005000	0.011349	5	0.348
<input checked="" type="checkbox"/> P10	0.005000	0.007777	5	0.276
<input checked="" type="checkbox"/> P11	0.005000	0.009592	5	0.512
<input checked="" type="checkbox"/> P12	0.005000	0.007444	5	0.422
<input checked="" type="checkbox"/> P13	0.005000	0.010855	5	0.331
<input checked="" type="checkbox"/> P14	0.005000	0.008627	5	0.317
<input checked="" type="checkbox"/> P15	0.005000	0.006425	5	0.193
<input checked="" type="checkbox"/> P16	0.005000	0.006032	5	0.375
<input checked="" type="checkbox"/> P17	0.005000	0.001717	2	0.131
<input checked="" type="checkbox"/> P18	0.005000	0.005390	5	0.340
<input checked="" type="checkbox"/> P19	0.005000	0.005576	5	0.318
<input checked="" type="checkbox"/> P20	0.005000	0.009245	5	0.658
<input checked="" type="checkbox"/> P21	0.005000	0.008560	5	0.336
<input checked="" type="checkbox"/> P22	0.005000	0.010741	5	0.471
Total Error				0.008179			
Control Points							
Check Points				0.412			

Step 4: Georeferencing - Placing markers



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Processing the Data

Step 6: Building 3D Products

Dense Cloud

It is a three-dimensional representation comprising millions of densely distributed points, each with precise spatial coordinates and color information. When creating a dense cloud, the software generates a depth map.

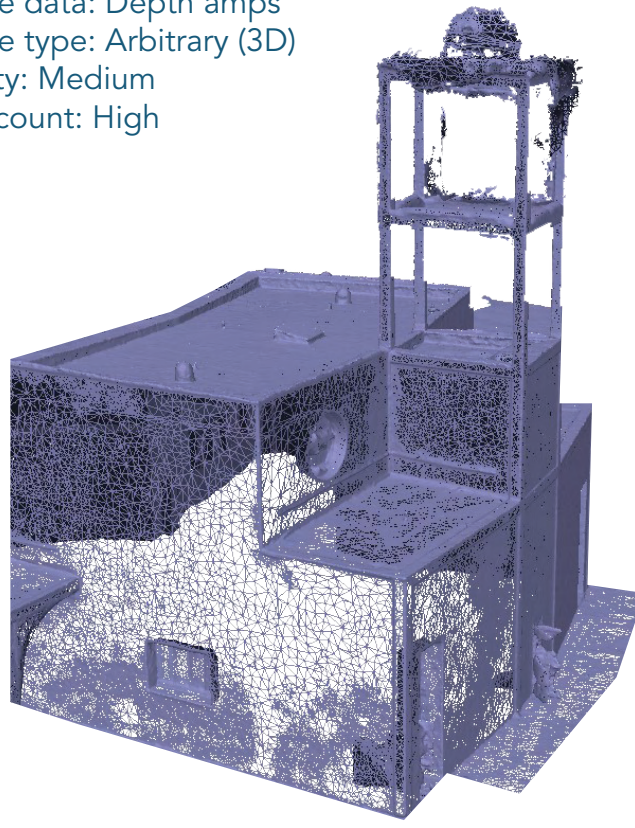
Quality: Medium
Depth filtering: Mild



Mesh Cloud

It is a three-dimensional representation composed of a network of polygons, typically triangles, that form a continuous surface

Source data: Depth amps
Source type: Arbitrary (3D)
Quality: Medium
Face count: High



Textured Cloud

It is a three-dimensional representation of the studied object where the original images are projected and mapped onto the geometry

Texture type: Diffuse map
Source type: Images
Mapping mode: Generic
Blending mode: Mosaic
Texture size: 8192 x 1

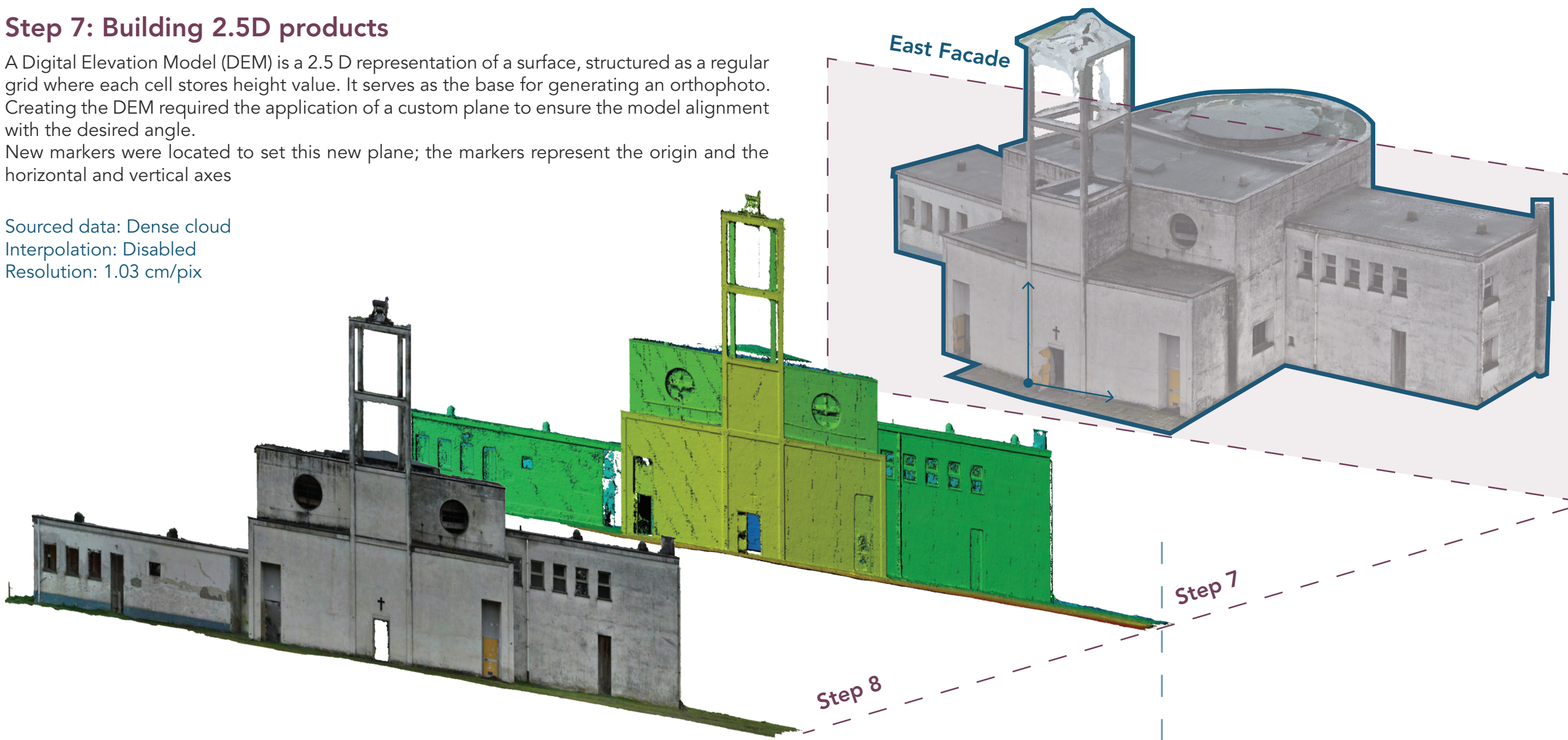


Step 7: Building 2.5D products

A Digital Elevation Model (DEM) is a 2.5 D representation of a surface, structured as a regular grid where each cell stores height value. It serves as the base for generating an orthophoto. Creating the DEM required the application of a custom plane to ensure the model alignment with the desired angle.

New markers were located to set this new plane; the markers represent the origin and the horizontal and vertical axes

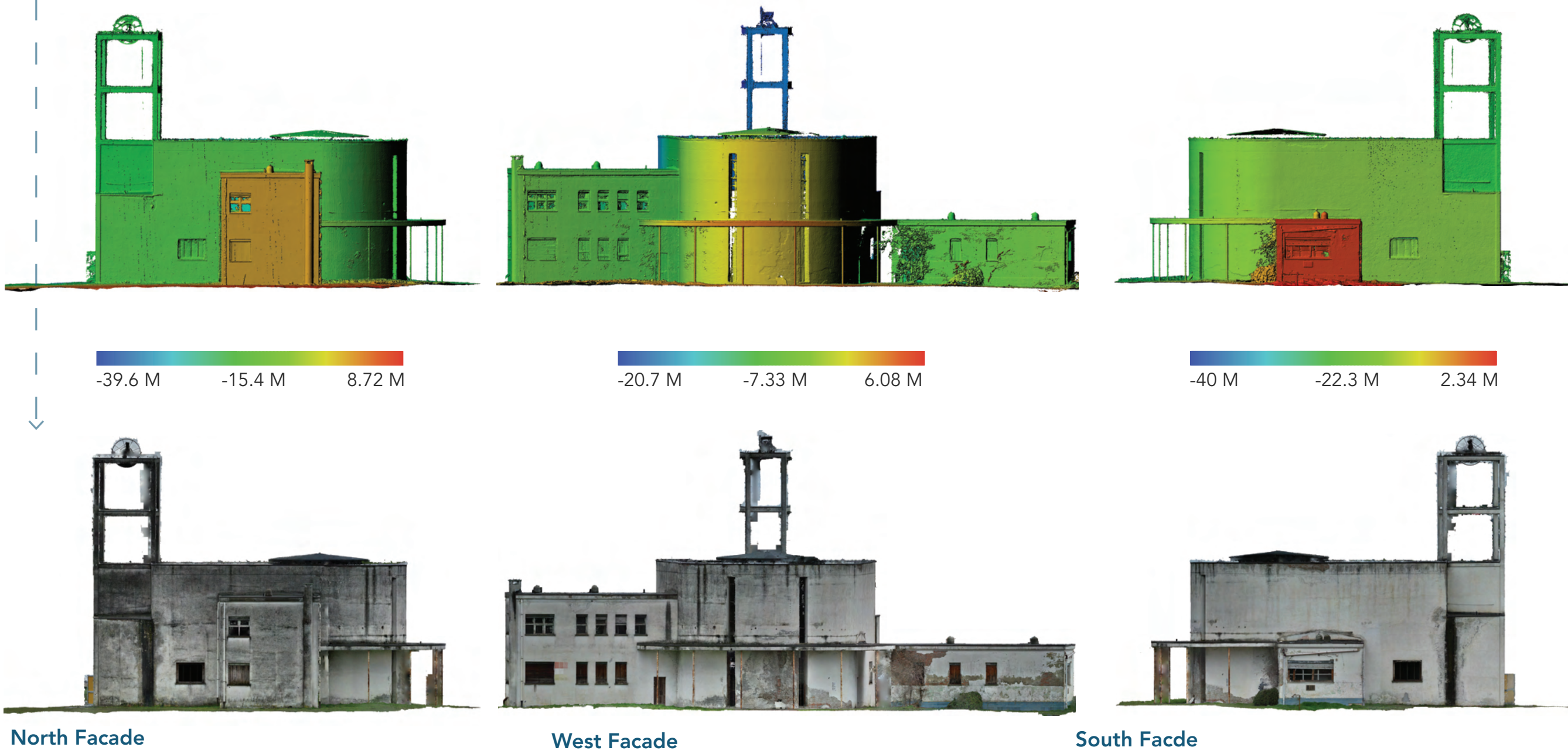
Sourced data: Dense cloud
Interpolation: Disabled
Resolution: 1.03 cm/pix



Step 8: Building Orthophotos

The orthophoto is a combined image created by the projection of the original images seamlessly merged on top of the object surface and transformed into the selected projection. An orthophoto is an invaluable tool for documenting Cultural Heritage, as it combines radiometric data with precise measurement, enabling comprehensive and accurate representation of the analyzed object

Surface: DEM
Blending mode: Mosaic
Enable hole filling: activated



Step 8: Building Orthophotos

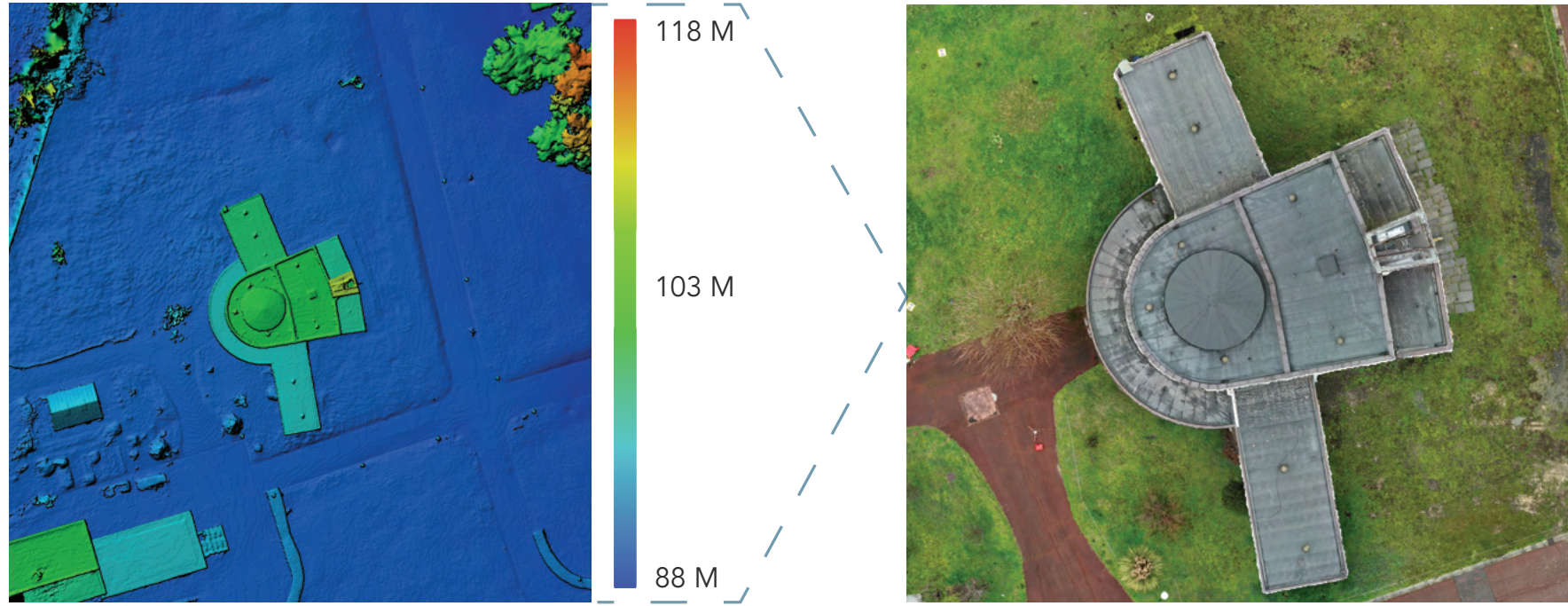
To choose the quality of the orthophoto, there must be taken into account, the scale at which the orthophoto will be working (analyzed) and the ground resolution of the initial images.

Aerial Close range-chunk

Ground resolution: 2.63 mm/pix
Orthophoto pixel size: 1 cm/pix

Aerial Close range-chunk

Ground resolution: 1.99 cm/pix
Orthophoto pixel size: 2 cm/pix



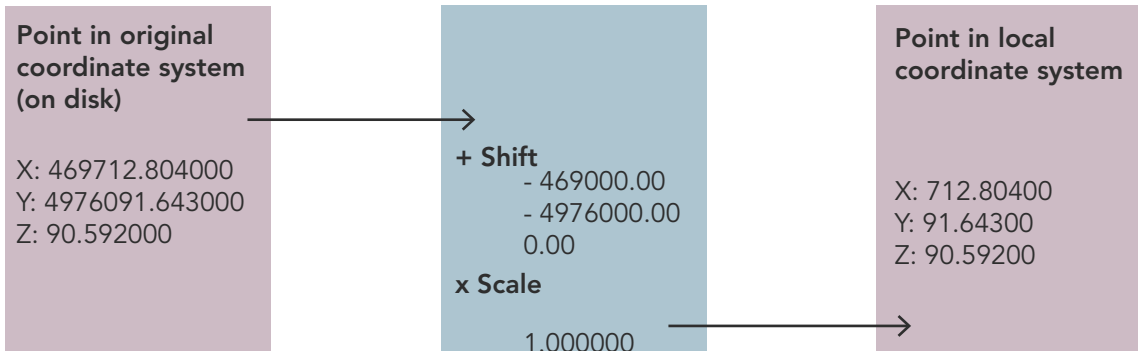
Step 9: Merging in Cloud Compare

Align the point clouds which were acquired through different capture methods, such as drone-based photogrammetry (used to obtain the aerial and aerial close-range cloud) and ground-based laser scanning (LiDAR) used for the interior of the church.

- The drone-based clouds were manipulated as follows:
- Global shift and scale
 - Cleaning the clouds
 - Distance computation analysis and Merging

1. Global shift and scale

Applied to prevent numerical precision loss when handling very large georeferenced coordinates by shifting the data to a more manageable local system without affecting its spatial relationships.



2. Cleaning the clouds

Removing unwanted points to improve data quality, facilitate analysis, and optimize storage. Each cloud is cleaned separately before merging. Different strategies were used as:

> Interactive Segmentation

Manually selection by drawing a 2D polygon to remove points inside or outside the region of interest.

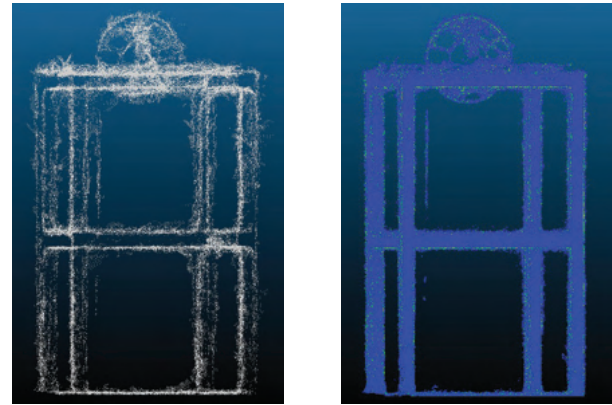
- Create polygon
- Segment in



> Filter by value

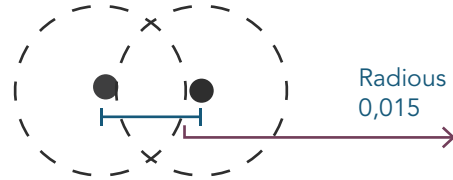
Separating points based on scalar fields like surface variation, intensity, number of neighbor, planarity, etc.

- Unwanted points
- Remaining points



> Remove Duplicate points:

Eliminates redundant points based on a specified minimum distance between points.



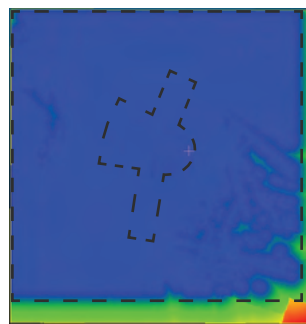
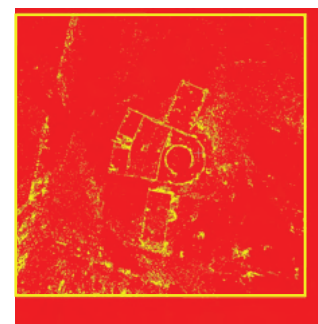
3. Distance computation analysis and Merging

> The Cloud-to-Cloud distance (C2C) tool

It calculates the euclidean distance between each point in a compared cloud (red) and its nearest point in a reference cloud (yellow). This tool helps to verify the alignment between the clouds.

Defying the role

- Aerial cloud
- Aerial-Close cloud

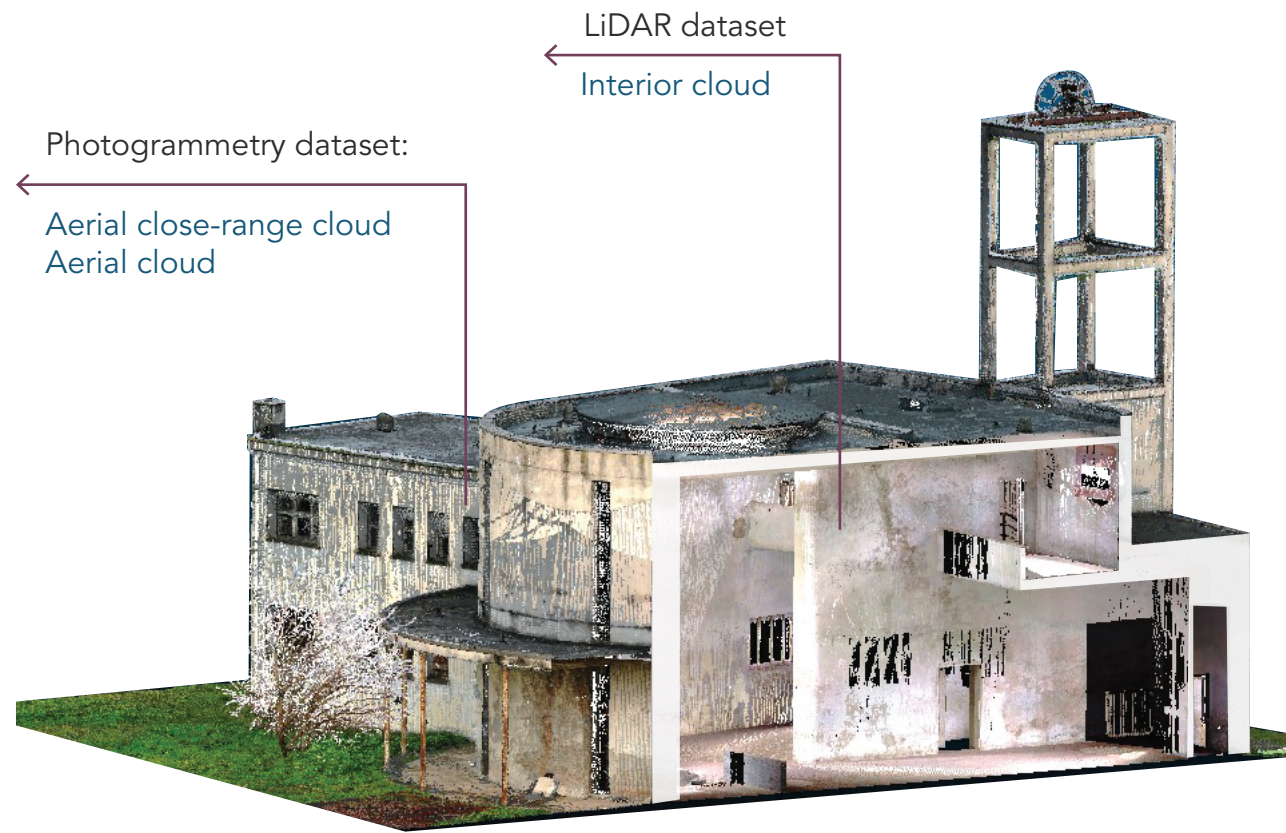


Results

0.00 M 16.56 M

> Merging

Is the process of combining multiple point clouds into a single dataset while preserving key metadata such as RGB colors, scalar fields, and georeferencing information.



Digital Plotting in 2D and 3D

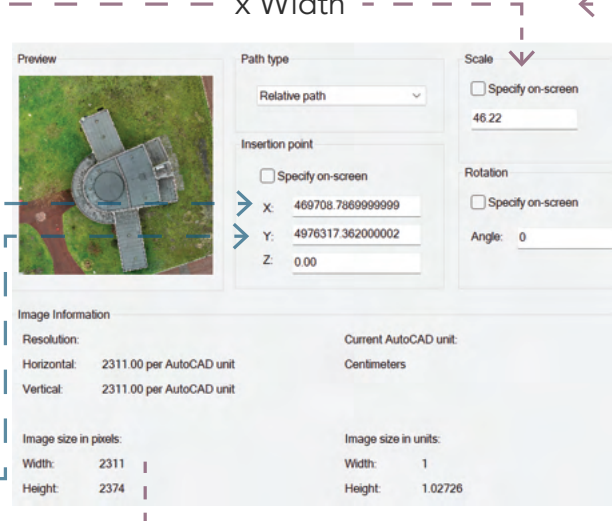
The creation of precise 2D documentation for Ignazio Gardella's Church exemplifies the integration of modern geomatics technologies with traditional architectural drafting principles. This process focused on generating scaled plans, sections, and elevations, emphasizing accuracy and compliance with architectural and heritage preservation standards. This process is divided into two phases, depending on the input sources utilized for its execution.

Input source: Orthophoto

Programs used: Autocad
Outputs: Roof plan - Elevations

When exporting the orthophoto from Metashape, the "Write World File" checkbox is selected, which will be used when importing image into AutoCAD to maintain spatial accuracy and correct scale as follows:

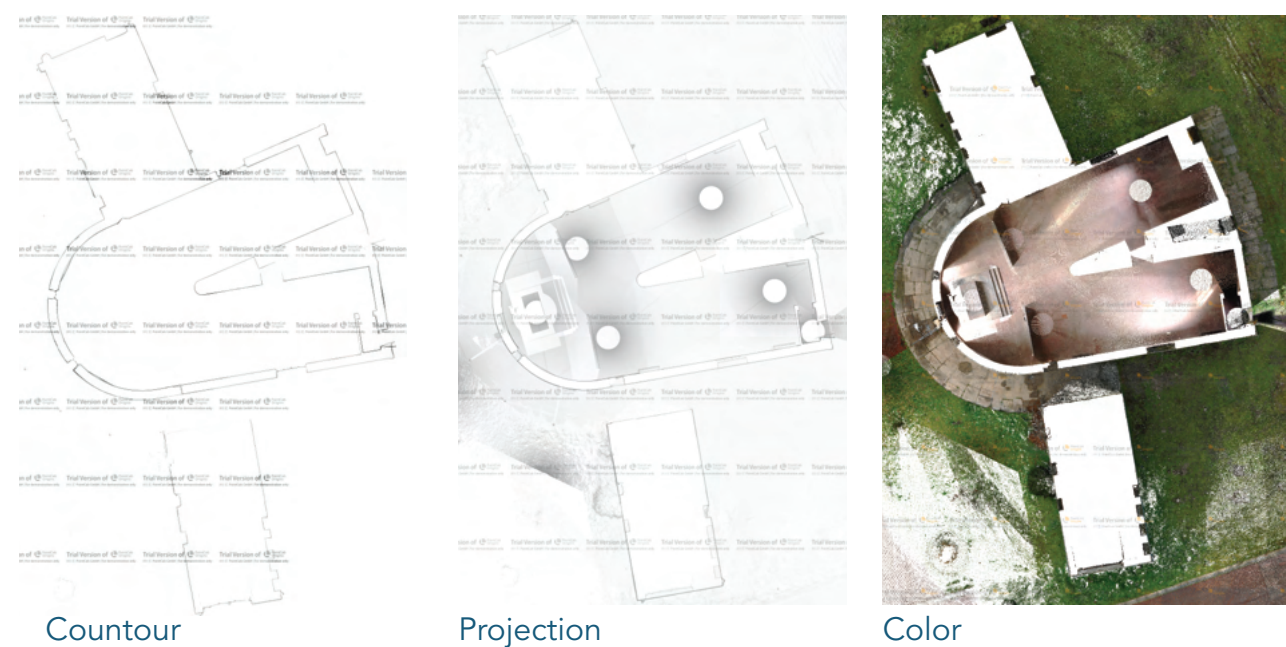
- Pixel size in the X - direction:
- Rotational term
- Rotation term
- Pixel size in the Y - direction
- X - Coordinate of the upper left corner
- Y - Coordinate of the upper left corner



Input source: Dense Cloud

Programs used: PointCap - Autocad
Outputs: Ground and first floor plan - Sections

PointCap is specialized software for processing and interpreting georeferenced point clouds obtained from CloudCompare. The data remains intact throughout the workflow, ensuring no loss of spatial accuracy when transferred to PointCap and later exported to AutoCAD. The results were classified into three categories, allowing for a detailed analysis of the building's plans and sections.





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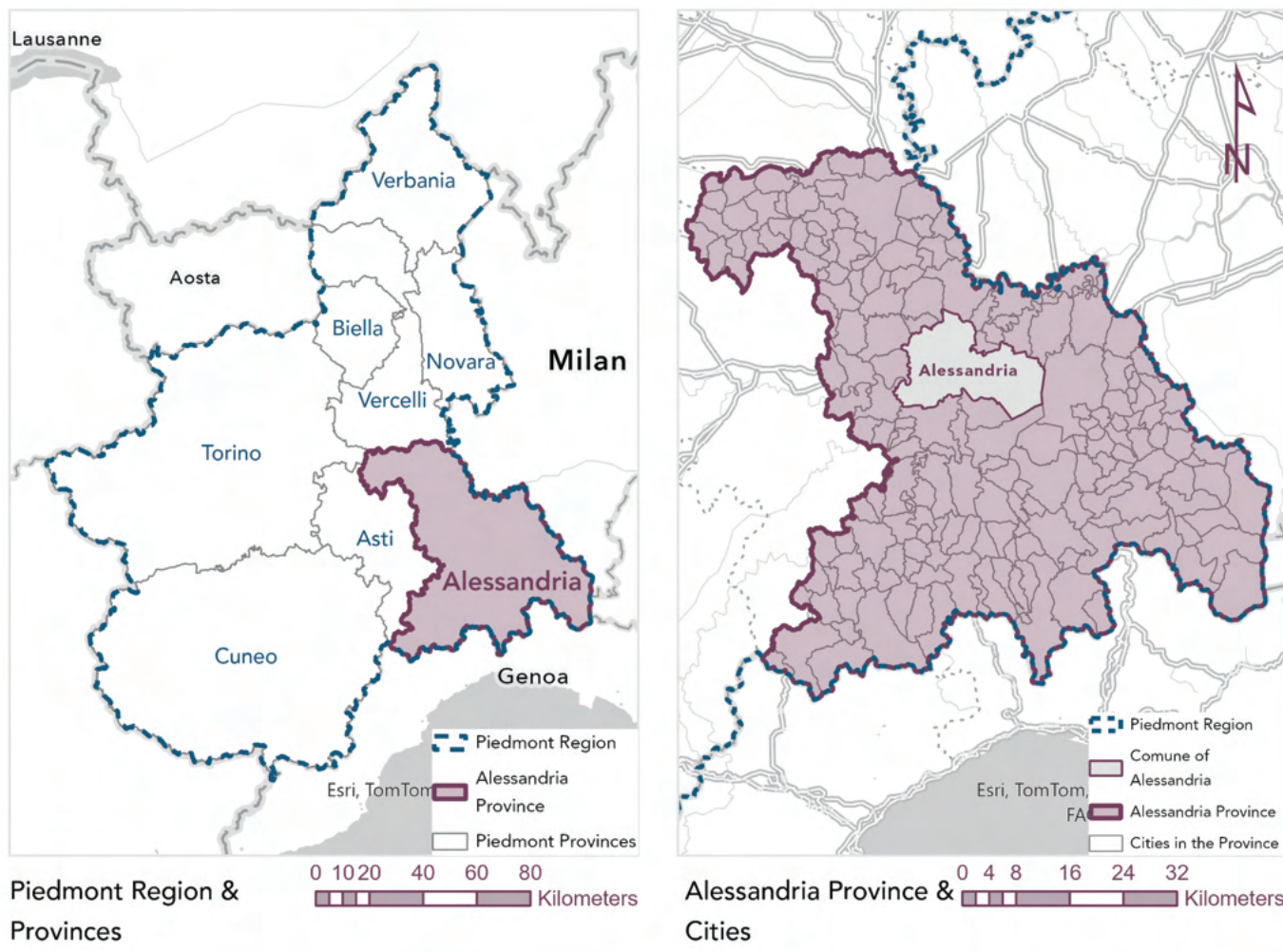
Supervisors

Supervisor:
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Co-Supervisor:
Francesco Novelli

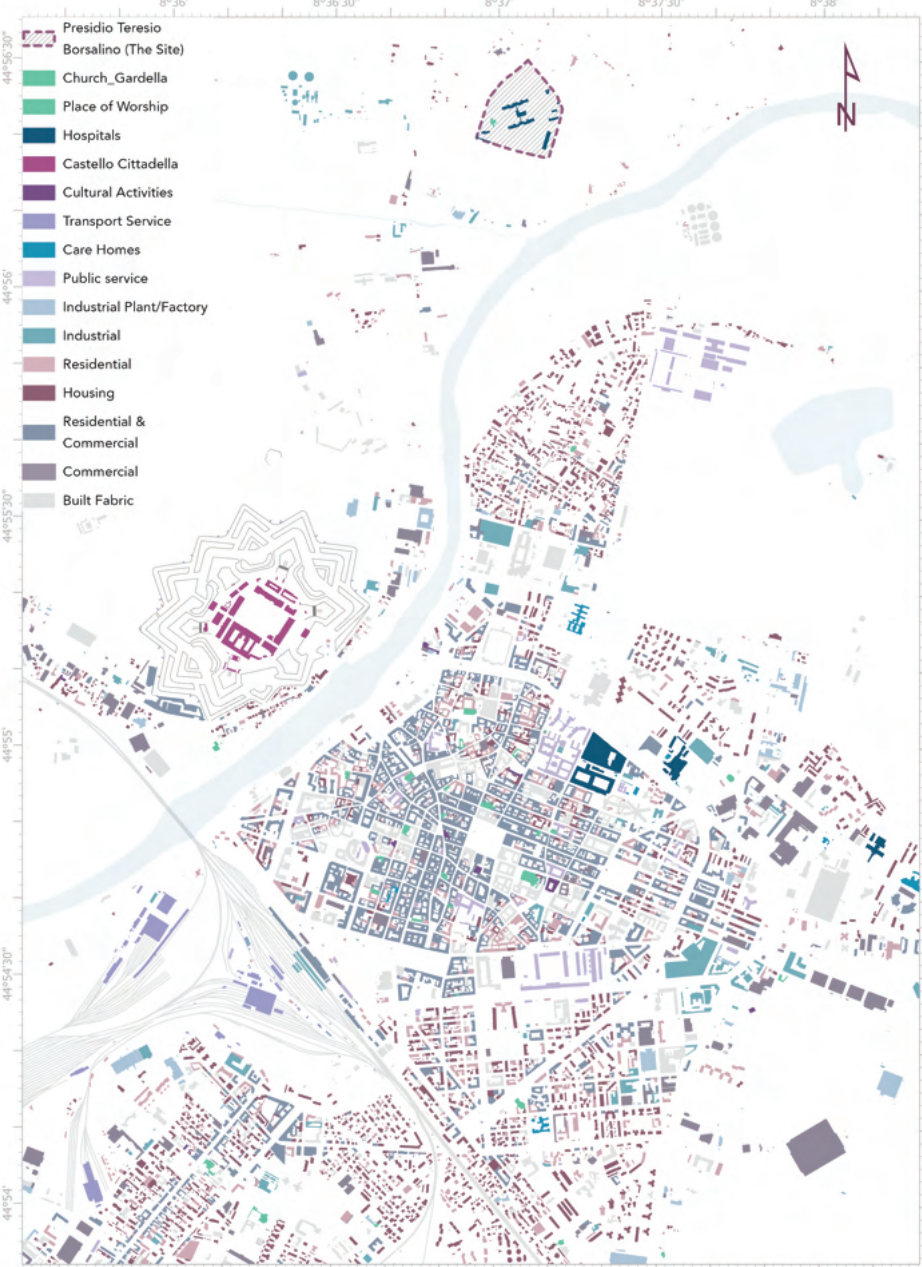
Board No. 01

- TERRITORIAL CONTEXT
- GEOMATICS SURVEY
- 2D DOCUMENTATION
- HBIM DOCUMENTATION
- MATERIAL ANALYSIS
- CURRENT STATE OF
CONSERVATION ANALYSIS
AND SOLUTIONS
- THE PROPOSAL

The Church Building



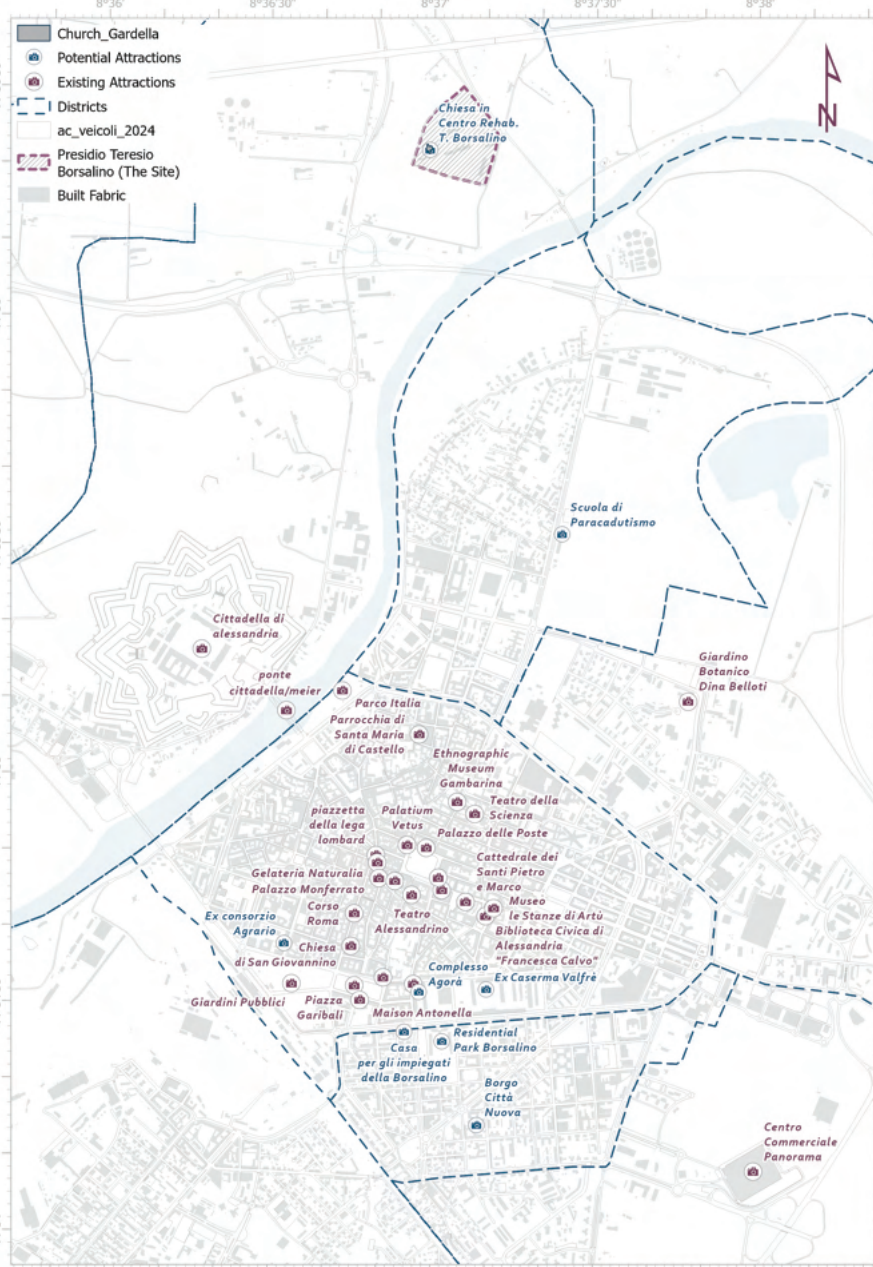
Map 1: Alessandria City and Districts



Map 2: Land Use



Map 2: Vegetation
and Green Areas



Map 3: Existing and
Potential Landmarks



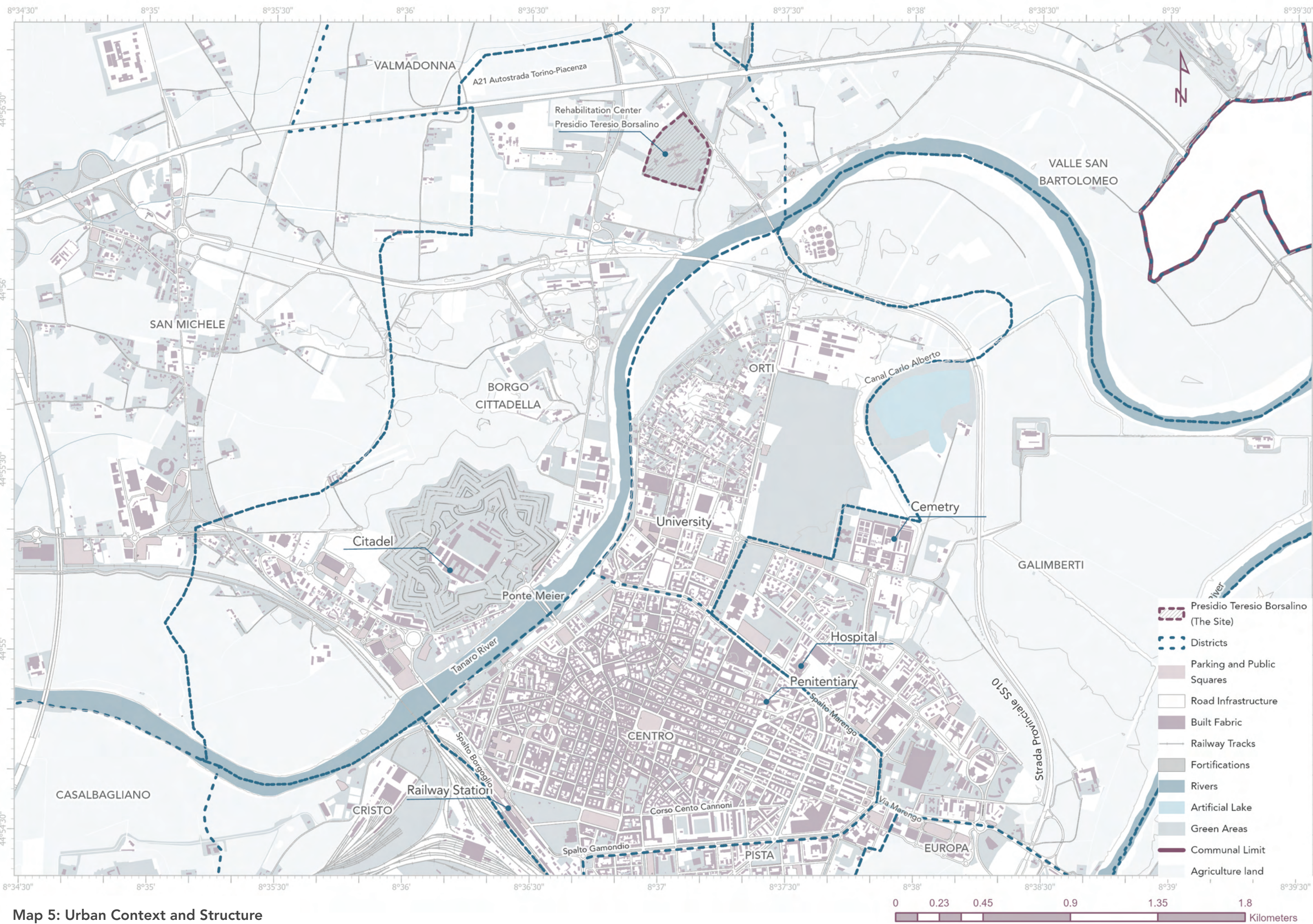
Map 4: Urban Connectivity

The Sanatorium is situated within the district of Borgo Cittadella of Alessandria which was previously a part of Orti district. The location of the districts can be referred to in Map 1. Alessandria city itself is located approximately 90 kilometers southeast of Turin and 70 kilometers northwest of Genoa, making it a well-connected node within the Piedmont region. As indicated in the land use map , the city centre is dominated by commercial and residential buildings typologies, whereas the site of Borsalino is isolated with a few sheds and barns as well as single family houses in its surroundings. The most important typologies to notice are the Hospitals and the Places of worship, since that is the typology of the case study.

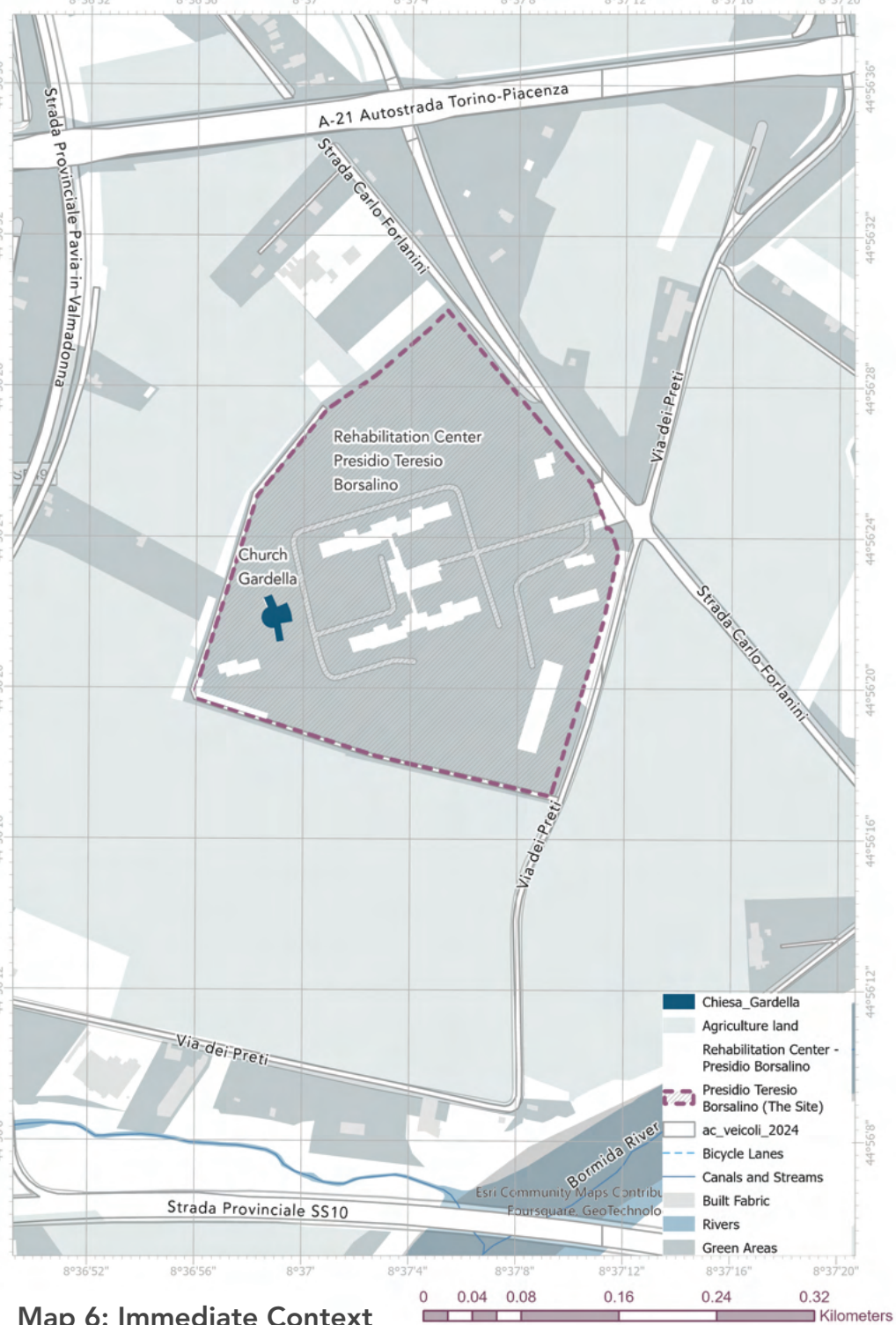
The location of the sanatorium was deliberately chosen to be within the pine forest along the banks of Tanaro River emphasizing the integration of natural elements for therapeutic purposes. The current scenario of the sanatorium and the city's surroundings depict that more than 70% of the land of the city is dedicated to agriculture, farming and pastures. The area's high productivity is driven by the cultivation of cereals, fruits, vegetables, vineyards, and the raising of livestock such as poultry, sheep, pigs, goats and horses. The above depicts the comparison of agriculture, forest, pastures and green spaces within the area of interest.

Above map indicates key landmarks within the city centre and the vicinity. They include the existing landmarks such as citadel, Meier bridge, Post office building, piazzetta della lega etc, and some potential landmarks have been proposed based on their twentieth century architectural significance. These potential landmarks celebrate Alessandria's modern history and deserve to be appreciated in the same way. The territorial study looks at a larger potential of urban development in Alessandria on the basis of undermined modern heritage. The map of attractions highlight this opportunity within the city which can help create a new identity for the city as well as for the Sanatorium complex with intervention of the church.

The sanatorium is located approximately 3 kilometres northeast of Alessandria's city center. This proximity ensures convenient access to urban amenities while maintaining site's semi-isolated character which was essential in the past for the health-care facility related to Tuberculosis. The map shows the network of transportation infrastructure which connects Alessandria to other major cities via railways and highways, including the motorway of A21 and A26. It can also be noted that there is only one bridge which can be crossed by foot and the site is directly connected to the public transport stop which can help in arriving to the city centre in 20-25min

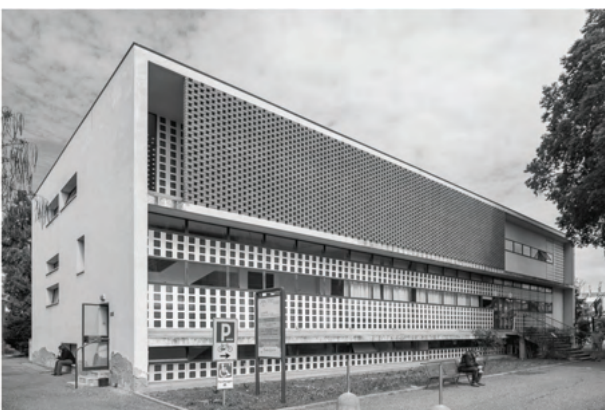


Map 5: Urban Context and Structure



Map 6: Immediate Context

The sanatorium complex is located at the conjunction of Strada Carlo Forlanini and Via dei Preti as shown in Figure 7. It is spread over nearly 96,000 square meters, with 5,325 square meters dedicated to buildings, 22,000 square meters for roads, and 67,675 square meters for green areas. The central building houses patient wards, diagnostic and treatment rooms and a range of services (Montanari 1989, 32). The auxiliary buildings include nurse's quarters, Director's Residence, a small Chapel, Laundry, garbage and other service buildings. At present, there is also a sensory garden in the facility and a greenhouse right behind the chapel building.



Anti Tuberculosis Dispensary - 1934



Provincial Laboratory of Hygiene and
Prophylaxis - 1939



Casa Per gli impiegati dello Borsalino - 1952



Agora Complex - 1984



Hospice Divine Providence 1928



Palazzo delle Poste - 1939 - 1941



Borgo Città Nuova - 1995



Residential Park Borsalino - 1987



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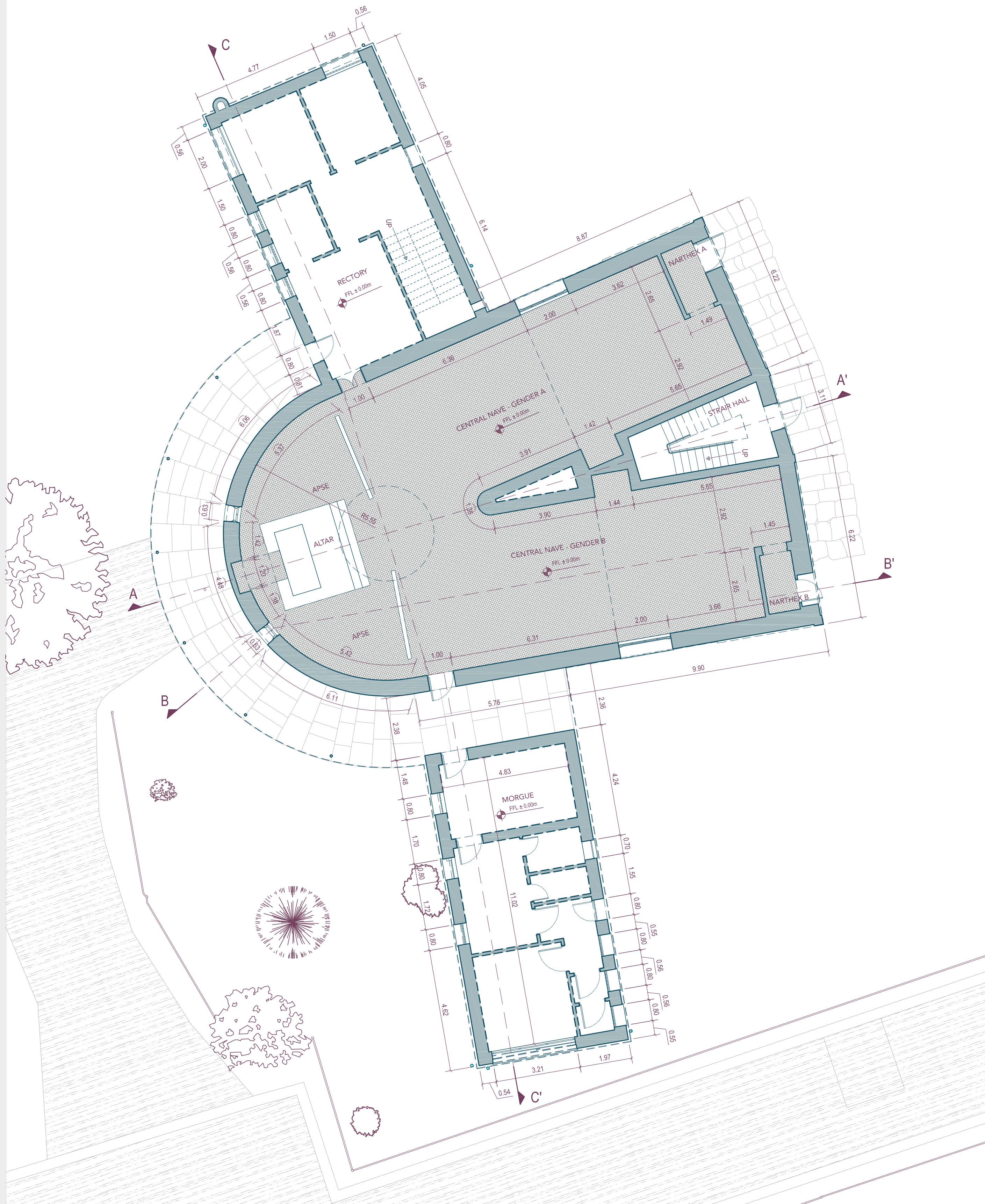
Supervisors

Supervisor:
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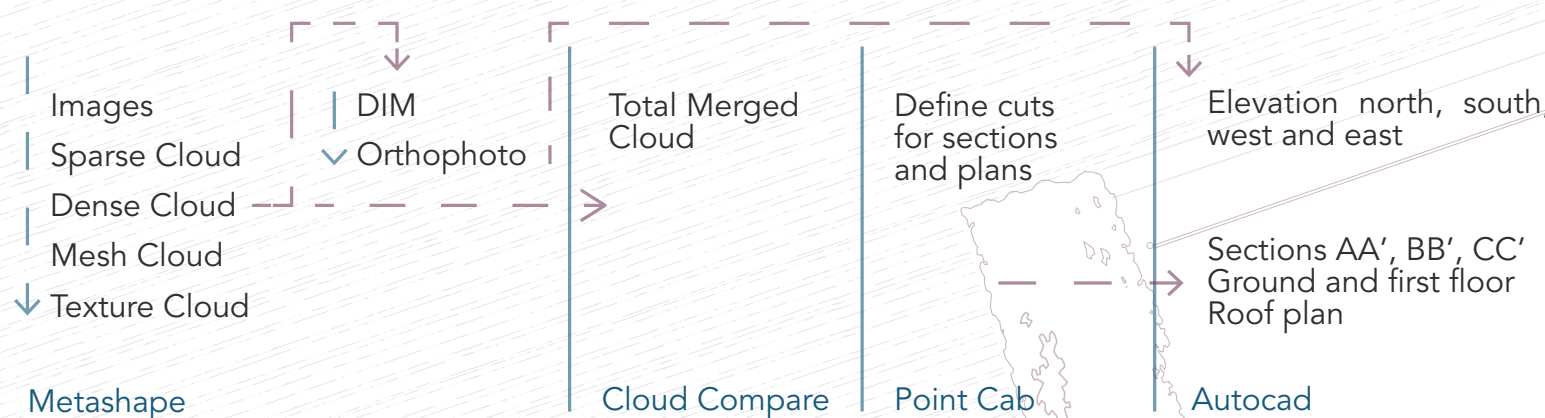
Board 02

- ☐ TERRITORIAL CONTEXT
- ☐ GEOMATICS SURVEY
- ☒ 2D DOCUMENTATION
- ☐ HBIM DOCUMENTATION
- ☐ MATERIAL ANALYSIS
- ☐ CURRENT STATE OF
CONSERVATION ANALYSIS
AND SOLUTIONS
- ☐ THE PROPOSAL

The Church Building

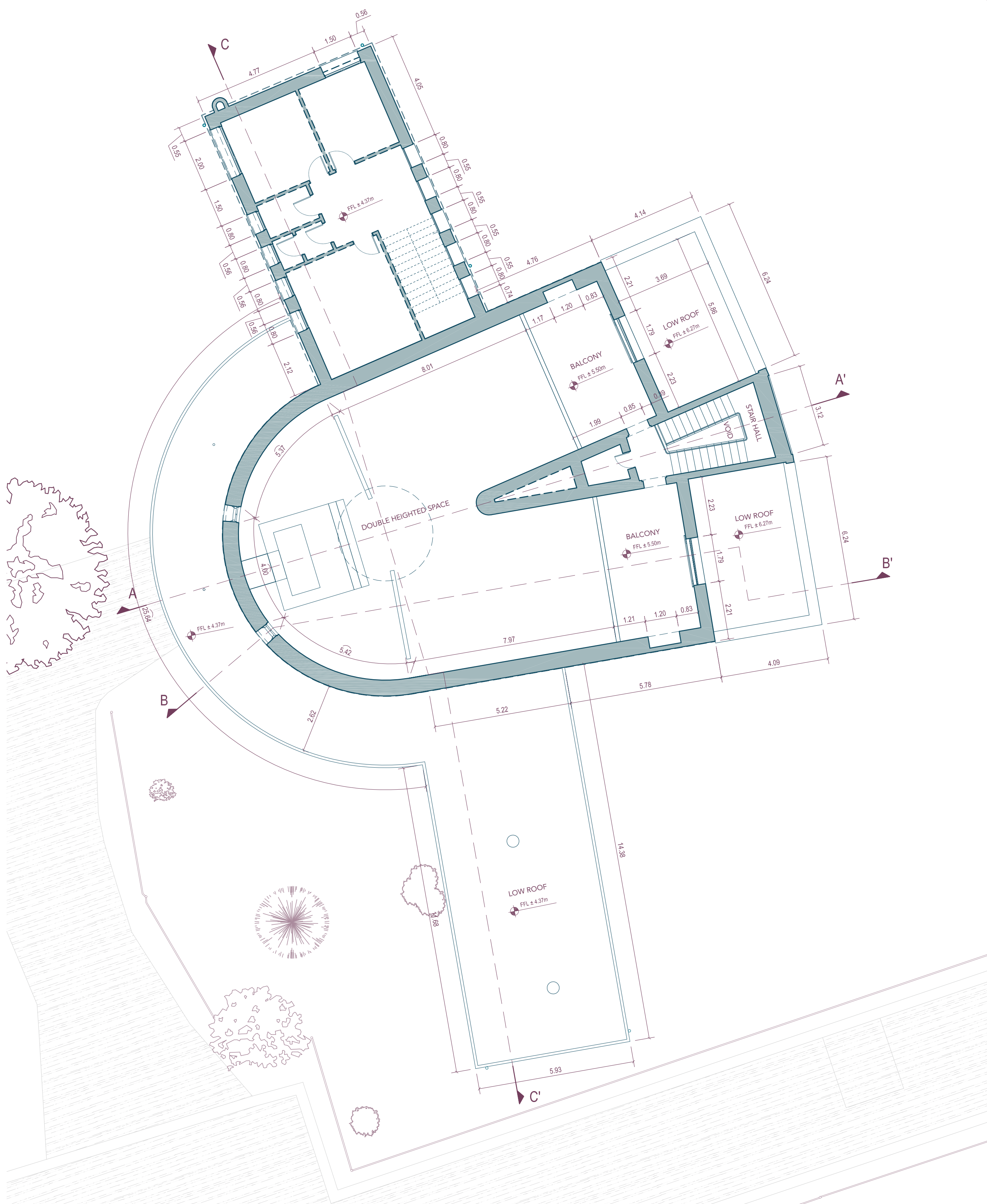


Workflow



Ground Floor

Scale 1:100



LEGEND OF LINE TYPES AND SYMBOLS

- | | | | |
|-----------|--|--|---------------------------|
| — | Definitive wall section | | Stone pavement - outdoor |
| - - - | Hypothesized walls section | | Terracotta tiles - indoor |
| - . - . - | Objects, doors frames, beams, etc above the section plan | | Columns |
| - . - . - | Hypothesized staircase | | Plumbing pipes |
| — | Door / window frames in section | | |

First Floor

Scale 1:100





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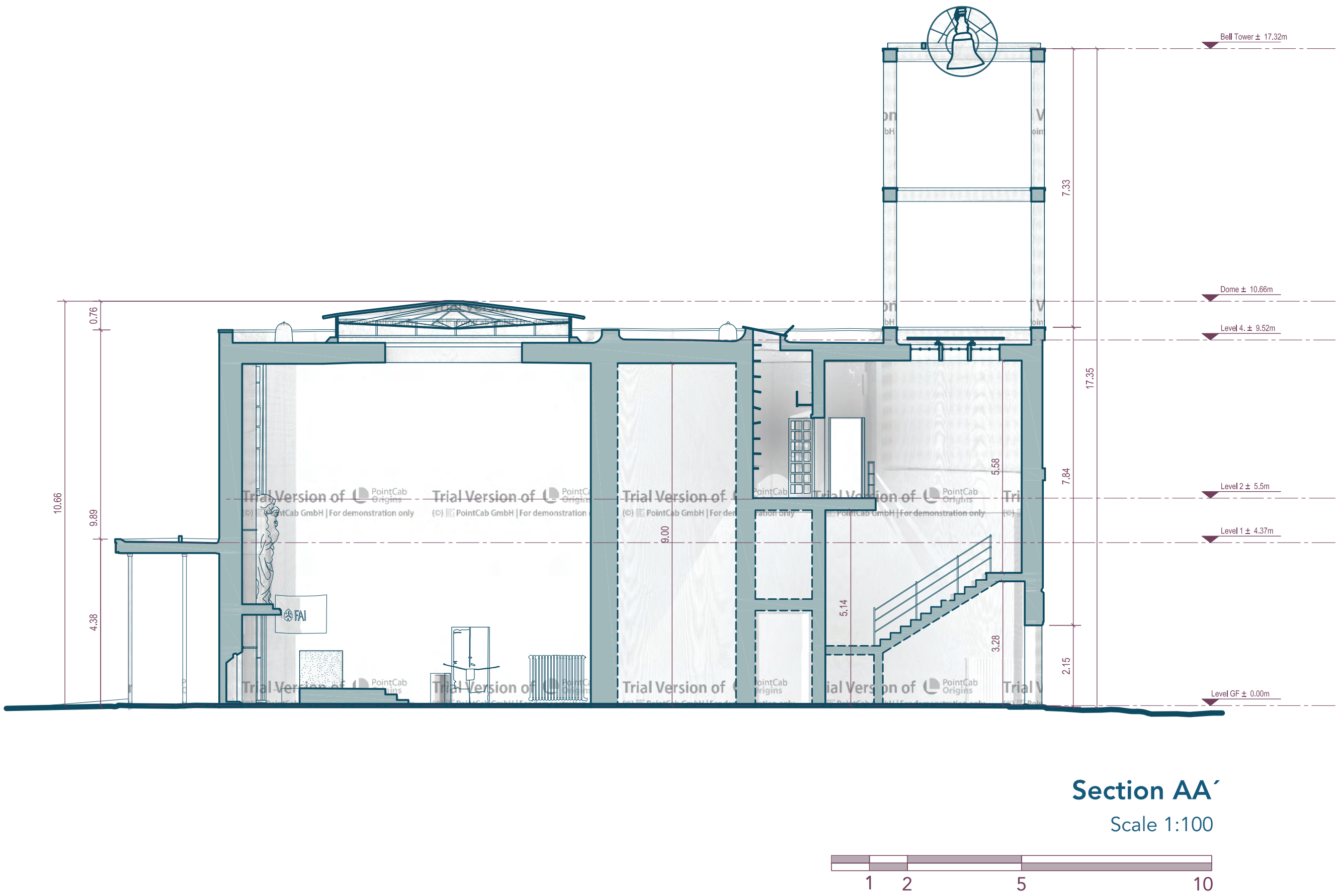
Supervisors

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Board No. 03

- TERRITORIAL CONTEXT
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The Church Building



LEGEND OF LINE TYPES AND SYMBOLS

- Projection lines under dome structure
- Slope lines
- Drain system
- Plumbing pipes
- Technical outlets
- Anchor points
- Metal coping
- Bituminous waterproof membrane
- Technical chimney
- Dome structure

LEGEND OF LINE TYPES AND SYMBOLS

- Definitive wall section
- Hypothesized walls section
- Polished grain chancel rail
- Polished grain stone altar





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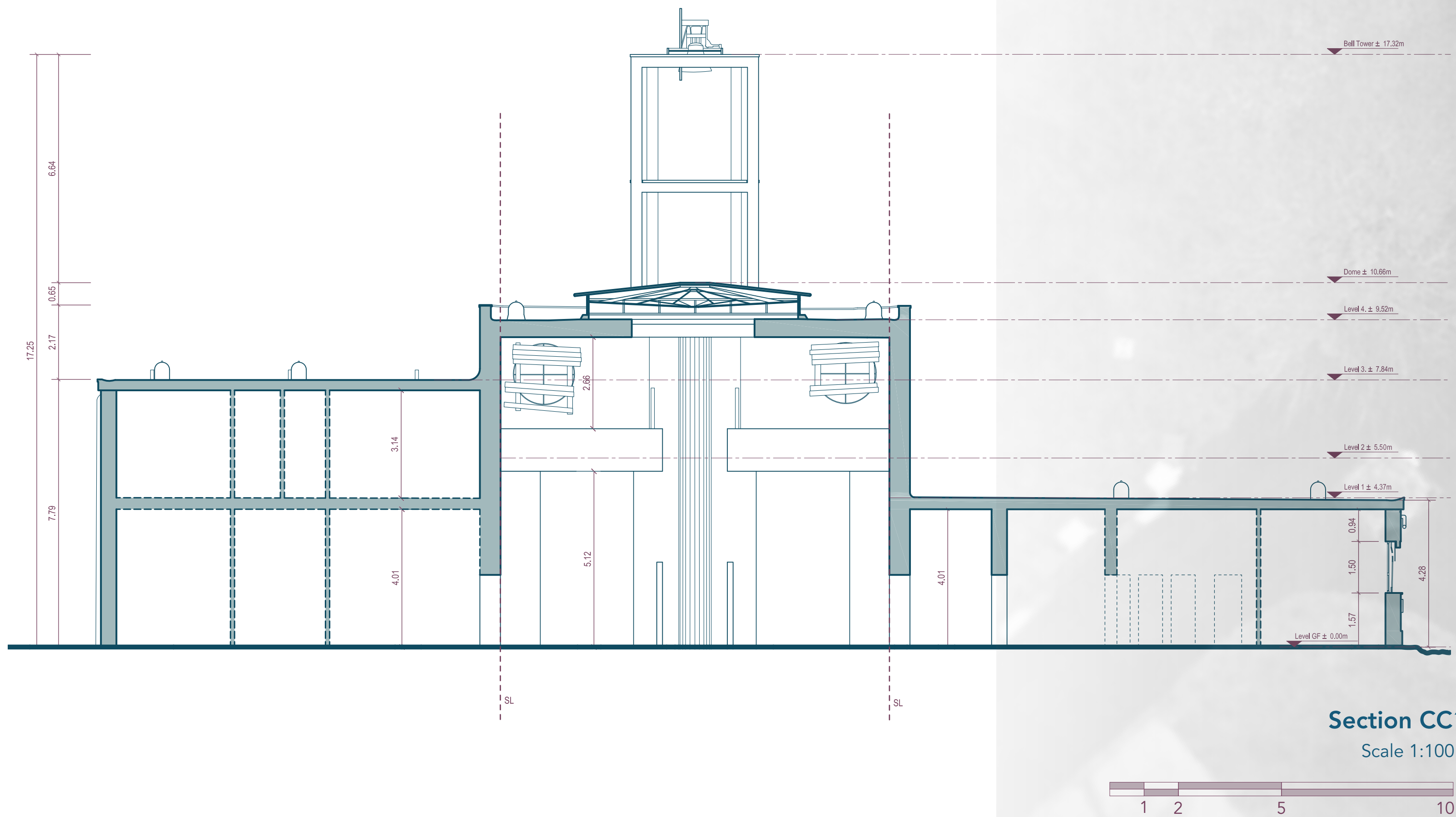
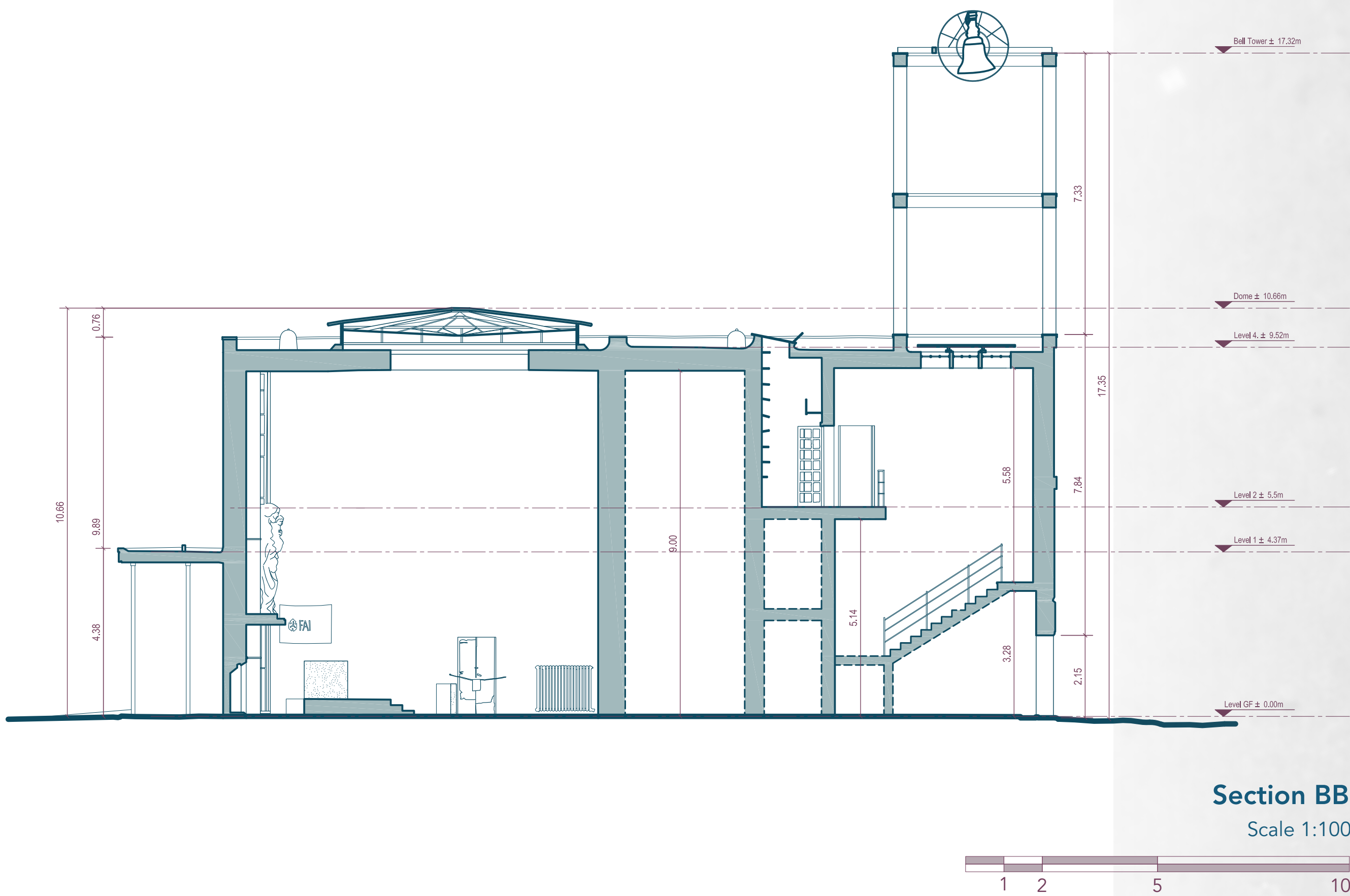
Supervisors

Supervisor:
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Francesco Novelli

Board No. 04

- TERRITORIAL CONTEXT
- GEOMATICS SURVEY
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The Church Building





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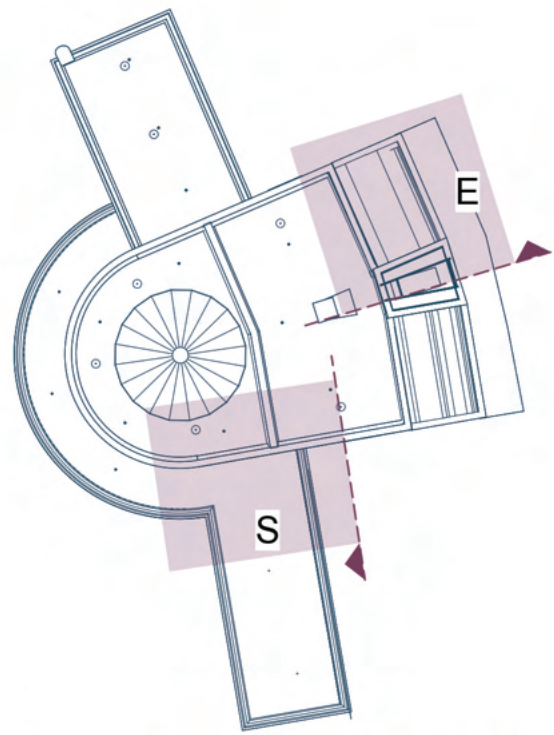
Supervisors

Supervisor:
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Francesco Novelli

Board No. 05

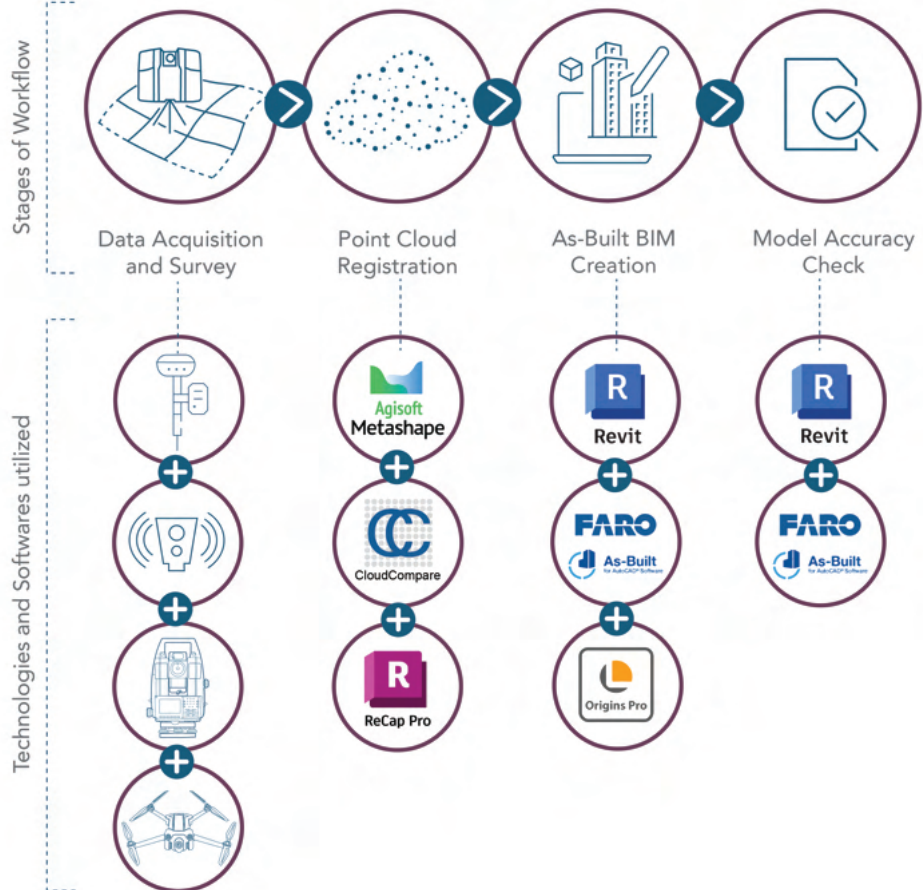
- ☐ TERRITORIAL CONTEXT
- ☐ GEOMATICS SURVEY
- ☐ 2D DOCUMENTATION
- ☒ HBIM DOCUMENTATION
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- ☐ CURRENT STATE OF
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AND SOLUTIONS
- ☐ THE PROPOSAL

The Church Building

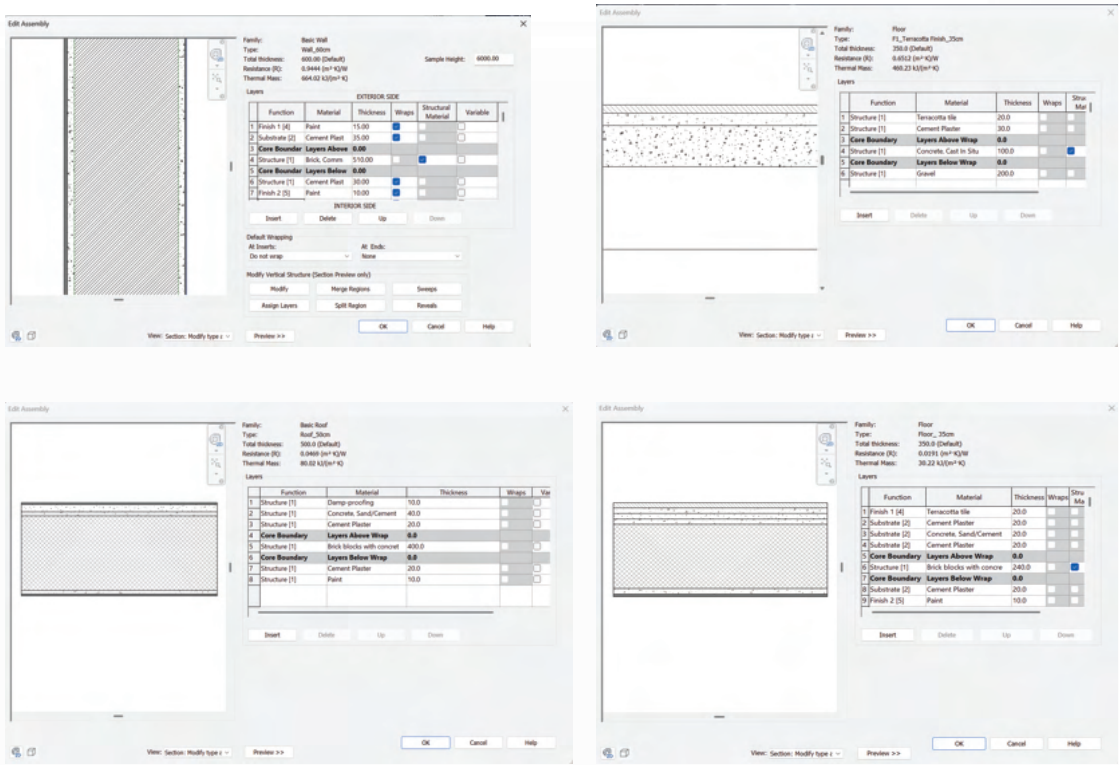


K01 Key Plan_East & South
1 : 400

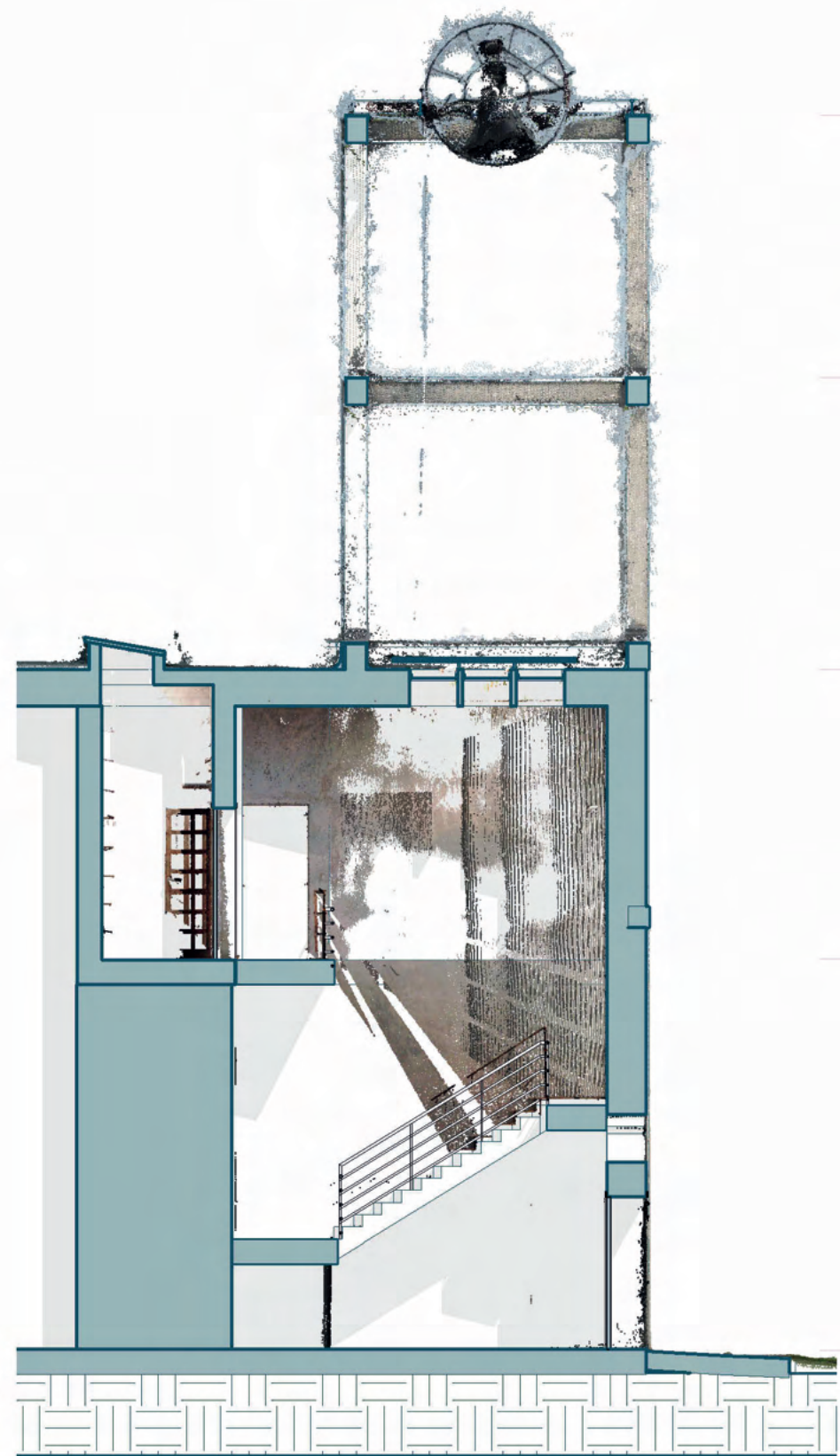
Modeling Scan - to - BIM Approach.



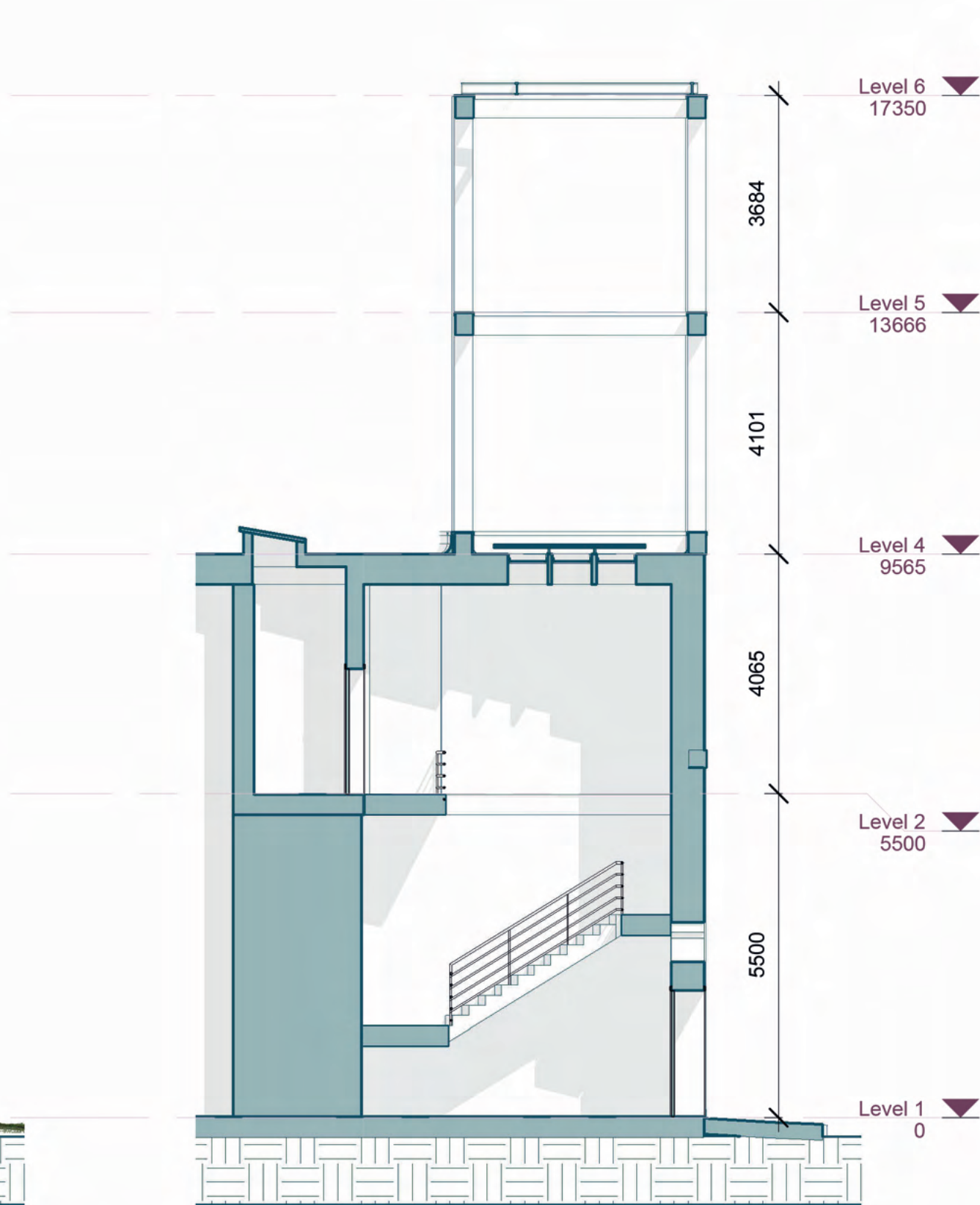
Materials and Stratification



East Wall Section Cut - Comparison of Point Cloud (walls, floors & roof) with 3D model

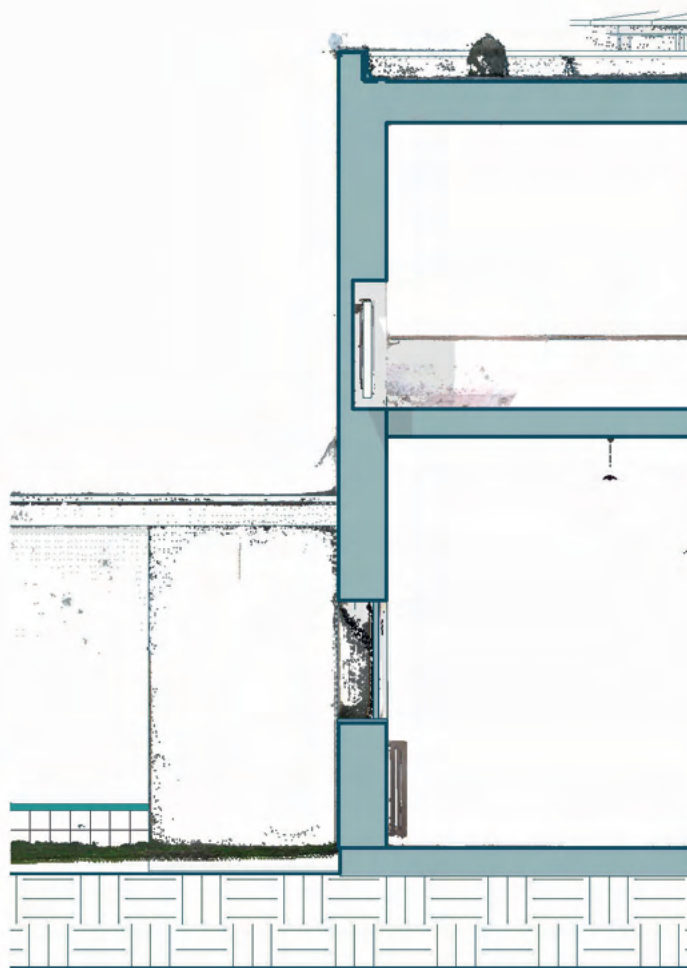


E01 East Wall Section_Point Cloud
1 : 100

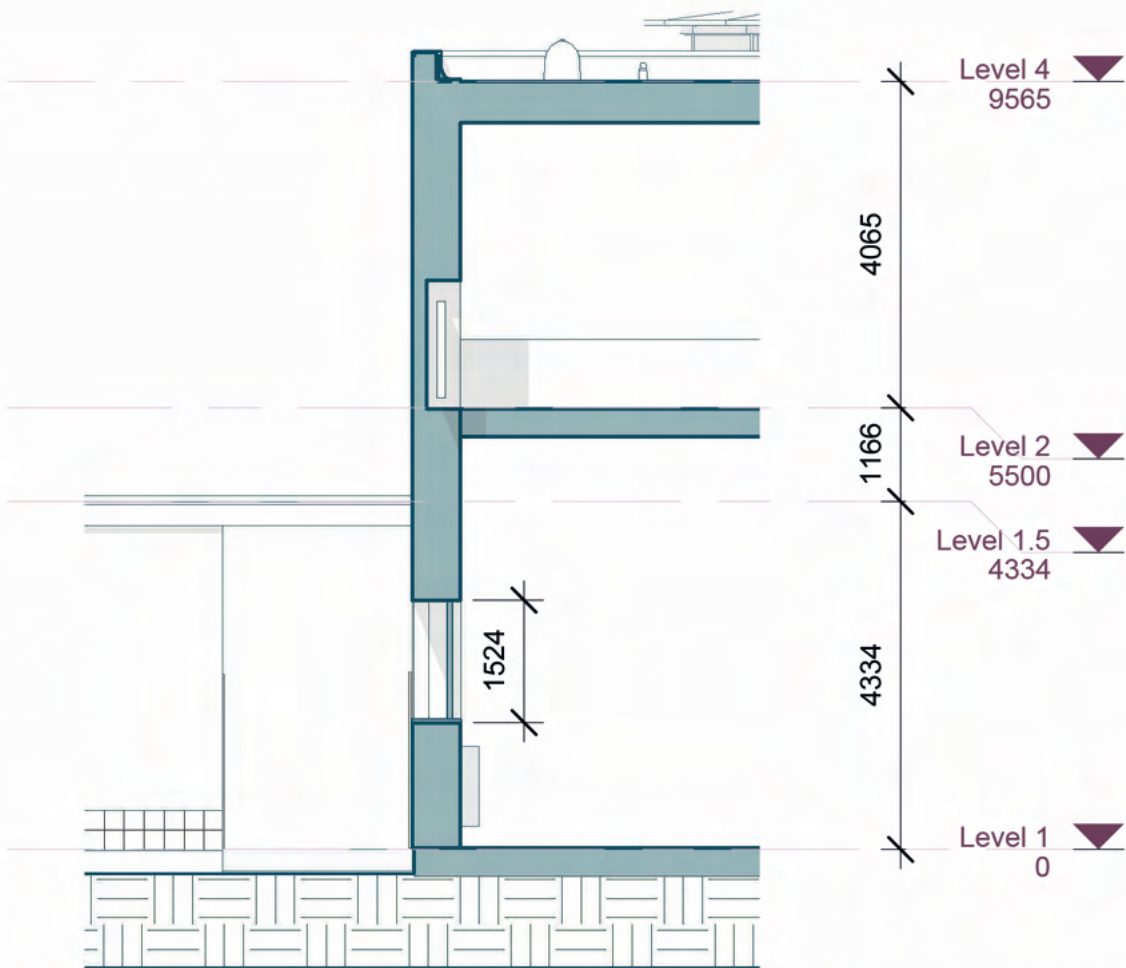


E02 East Wall Section
1 : 100

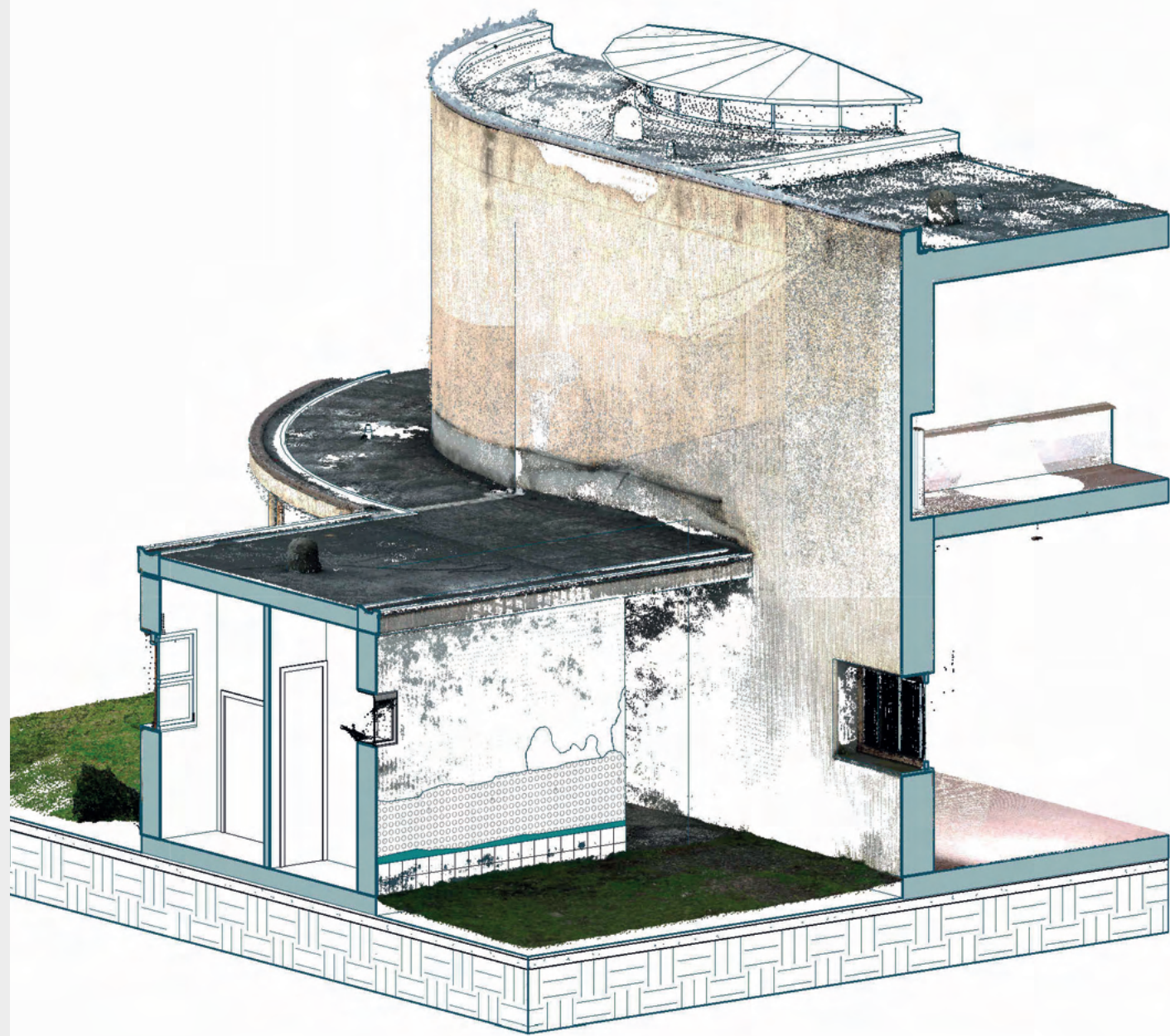
South Wall Section Cut - Comparison of Point Cloud (walls, floors and roof) with 3D model



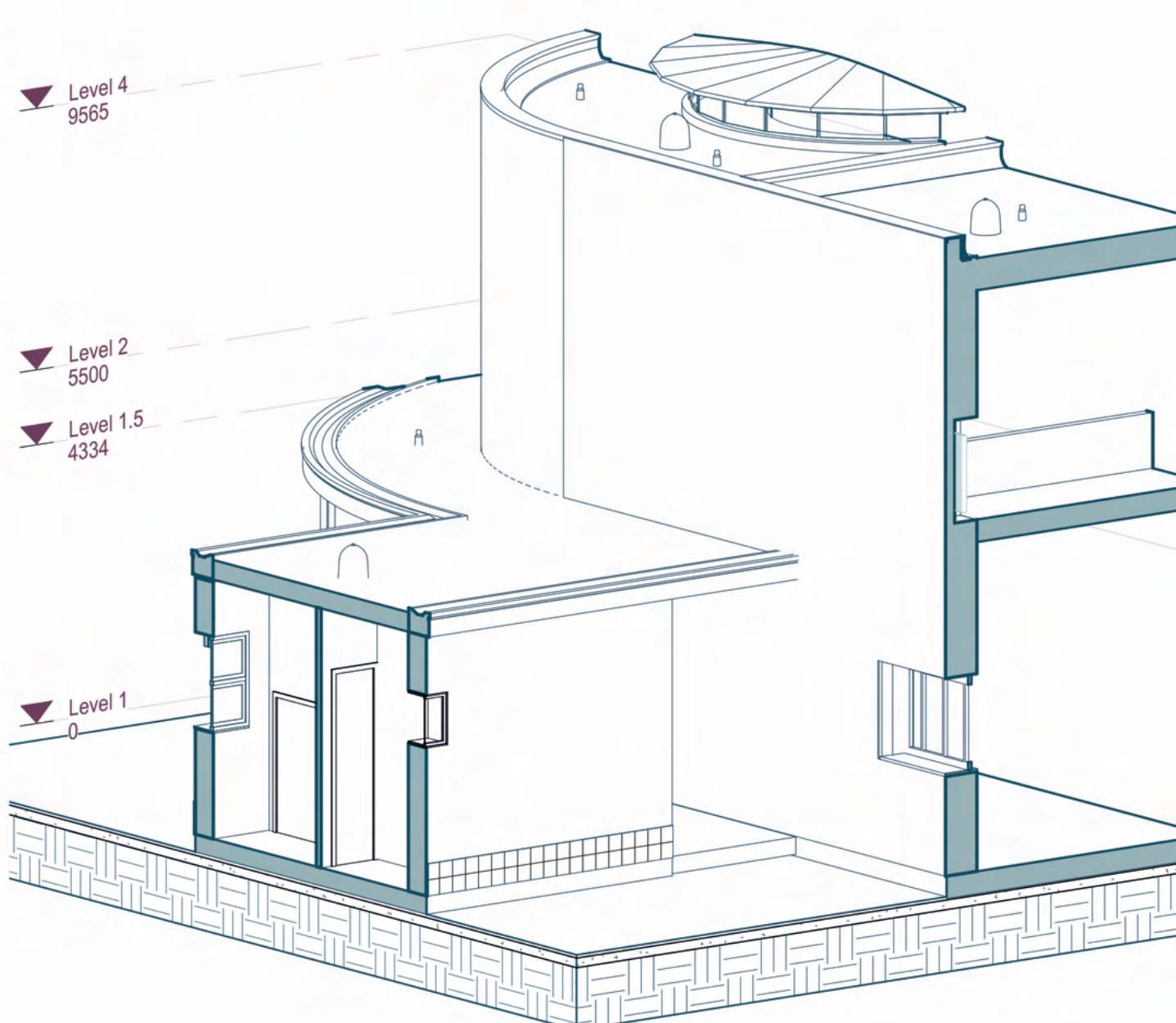
S01 South Wall Section_Point Cloud
1 : 100



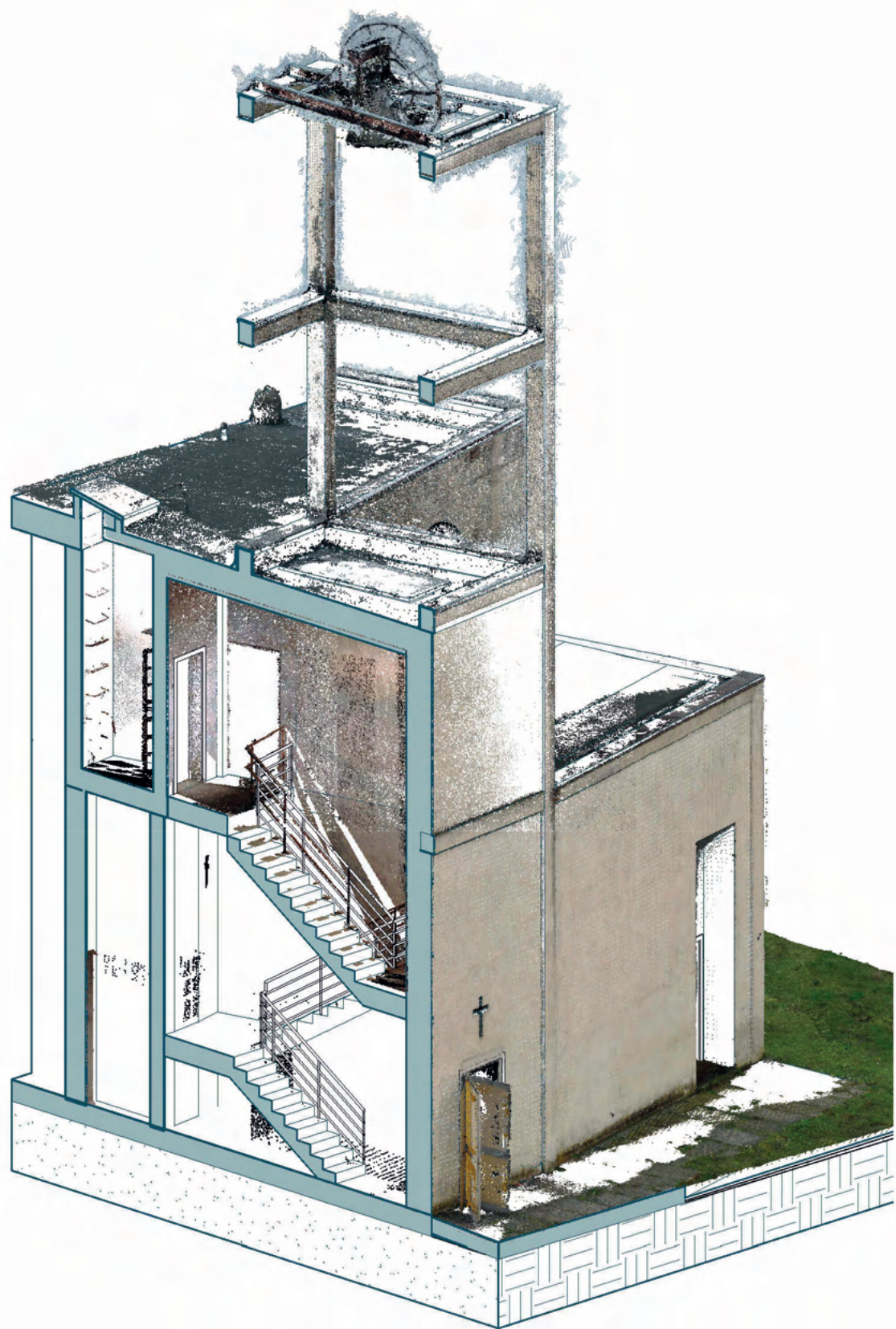
S02 South Wall Section
1 : 100



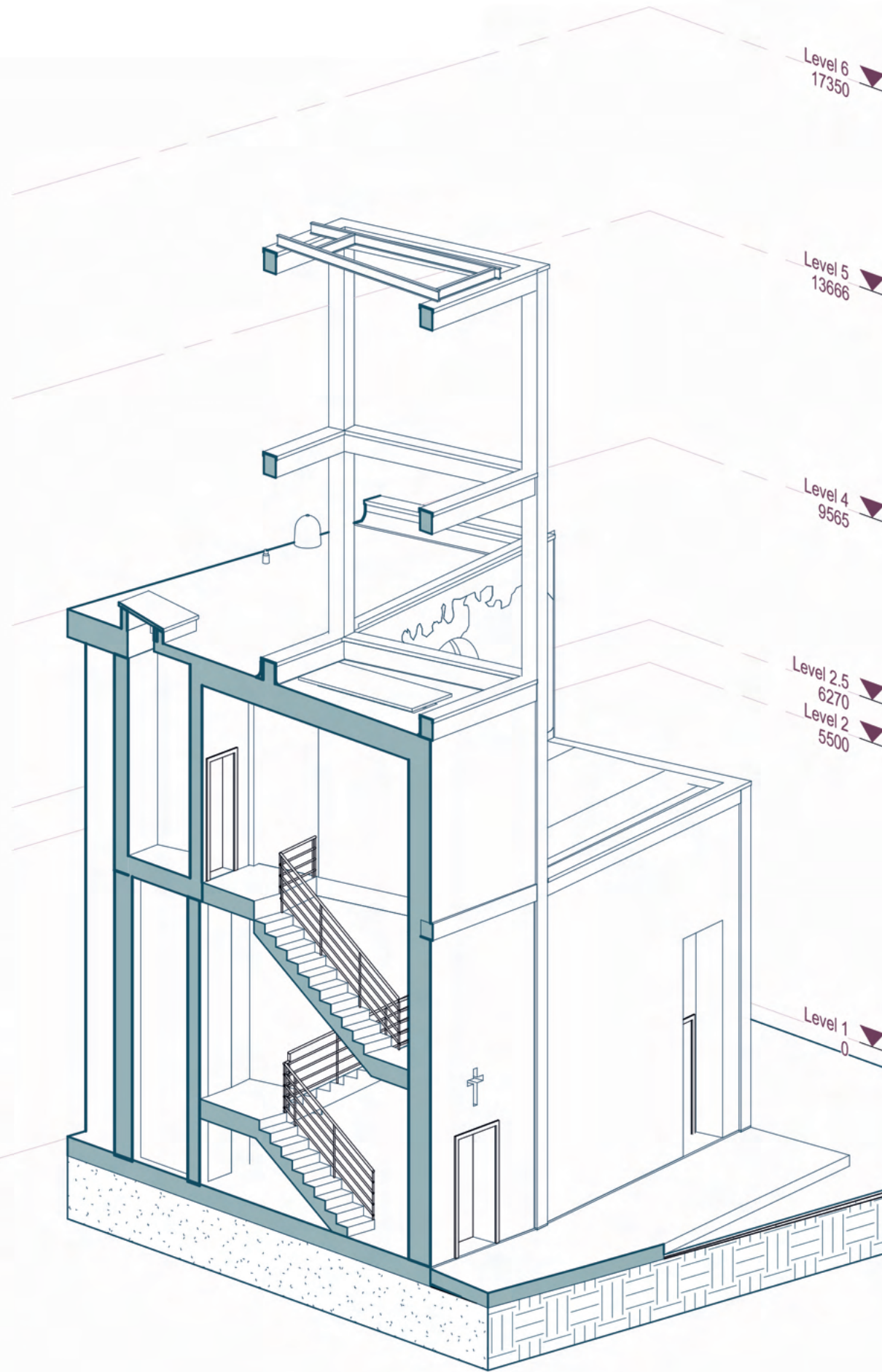
S03 South Walls_3D+Point Cloud



S04 South Walls_3D



E03 East Walls_3D+Point Cloud



E04 East Walls_3D



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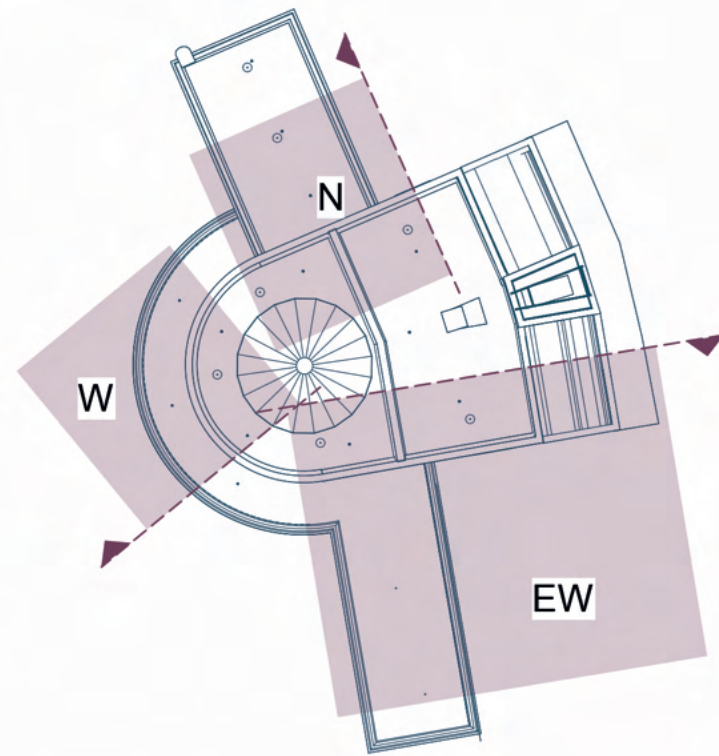
Supervisors

Supervisor:
Filiberto Chiabrando
Co-Supervisor:
Francesco Novelli

Board No. 06

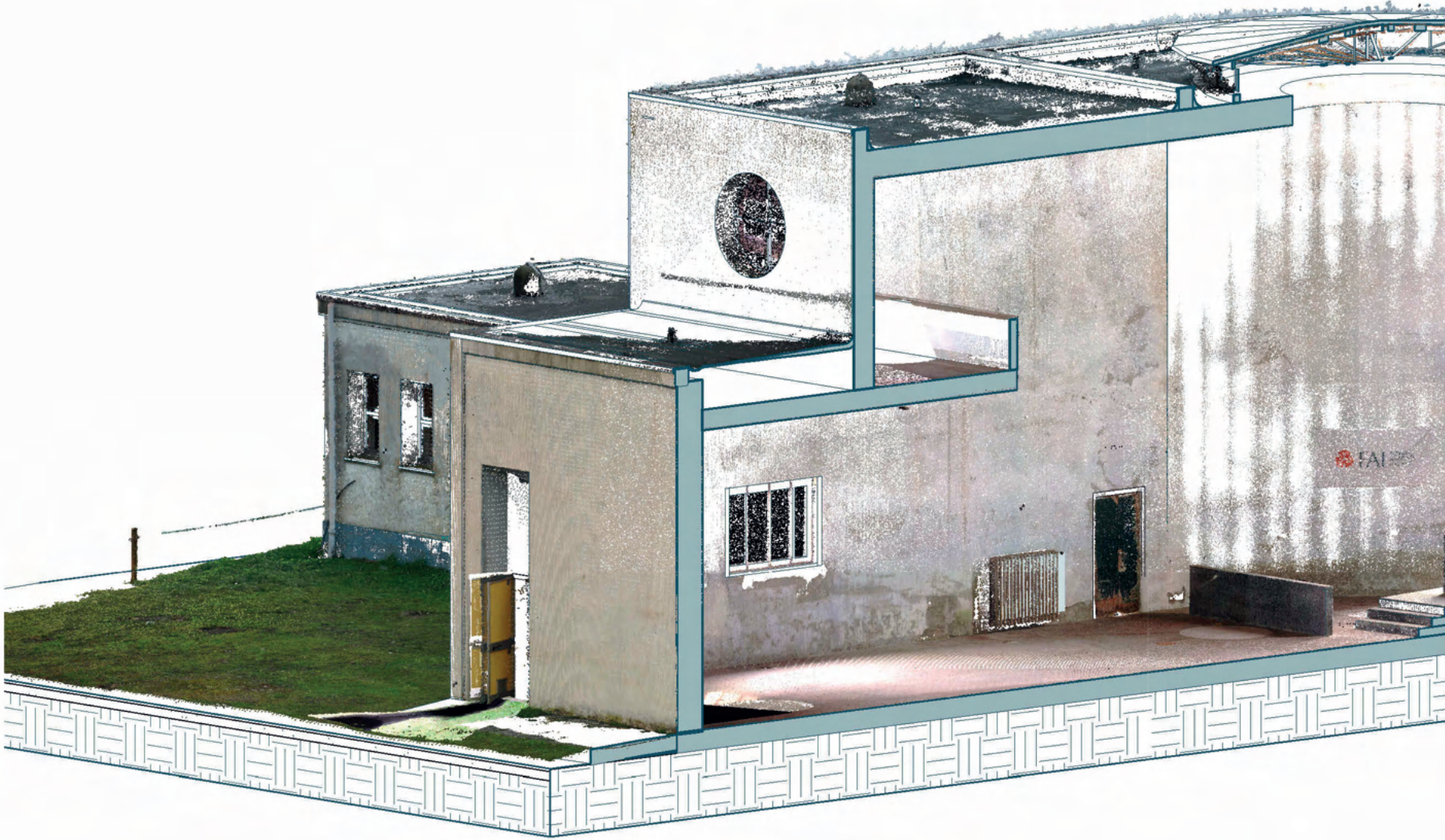
- ☐ TERRITORIAL CONTEXT
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The Church Building

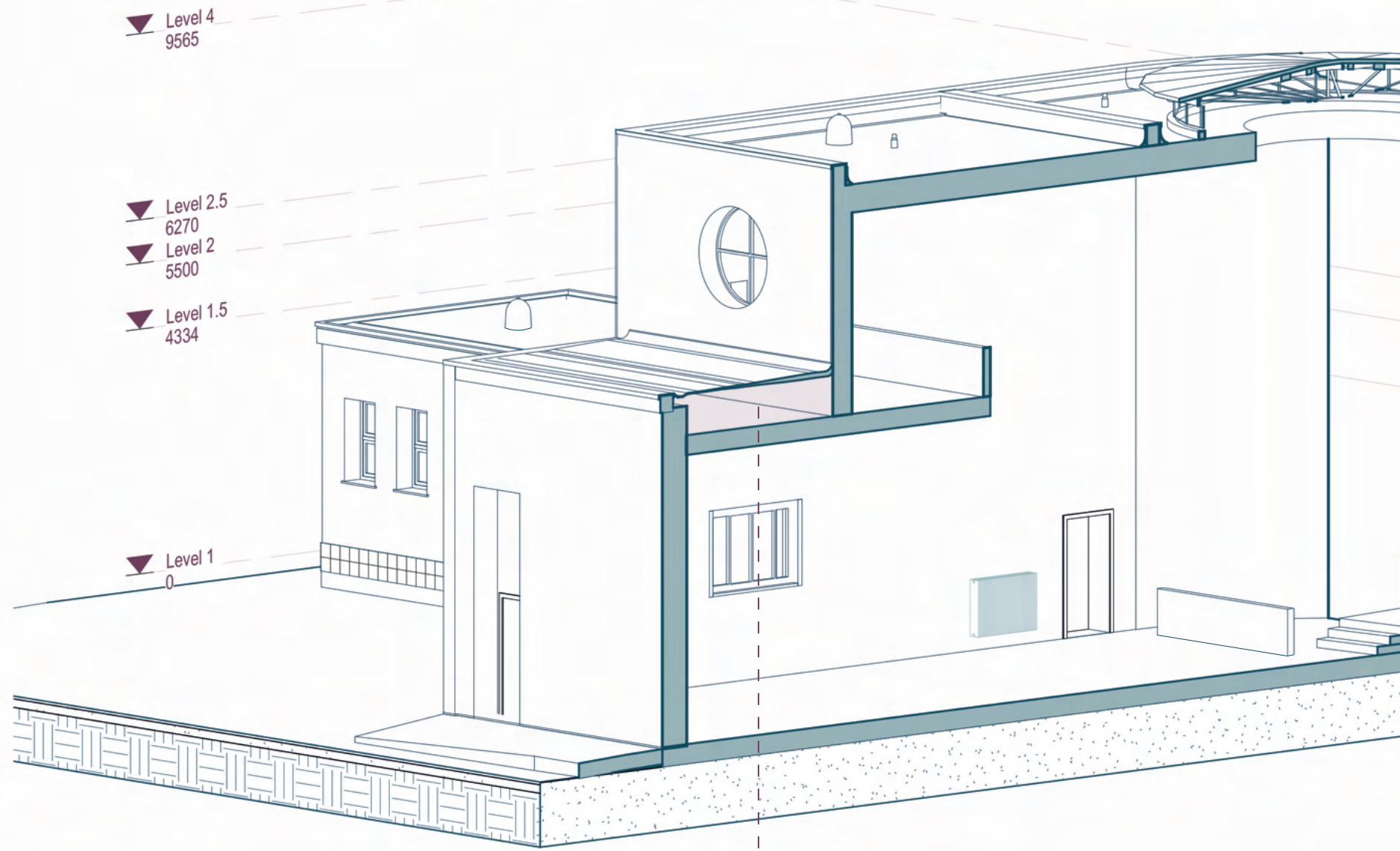


K02 Key Plan_East, West & North
1: 400

East West 3D Section Cut - Comparison of Point Cloud (interior & exterior) with 3D model



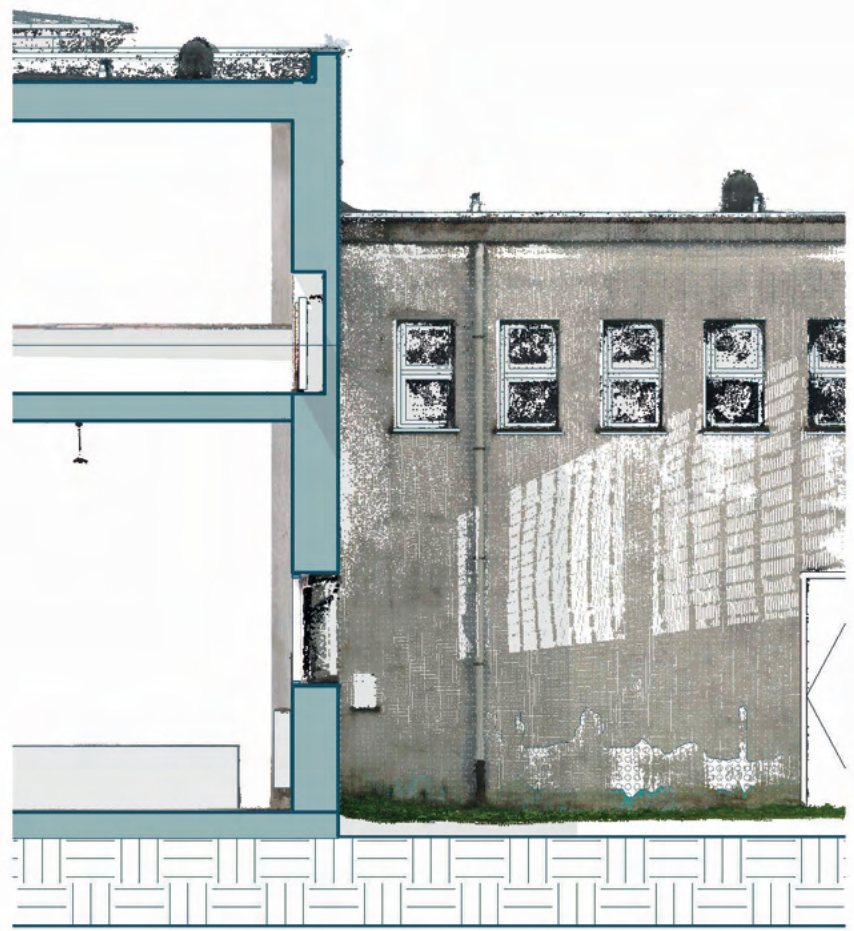
EW01 East West_3D+Point Cloud



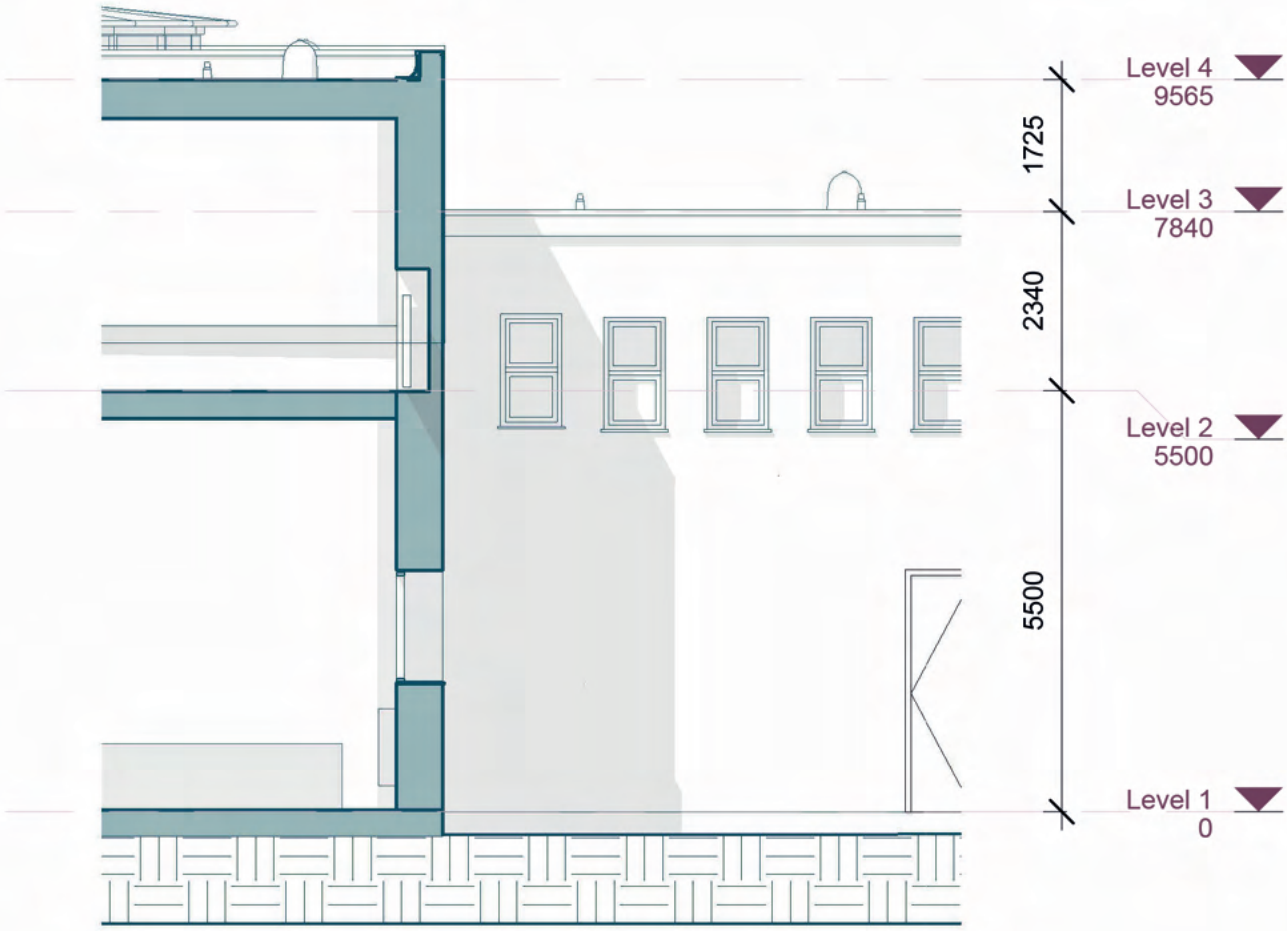
EW02 East West_3D

Missing Structural
Information regarding this
space

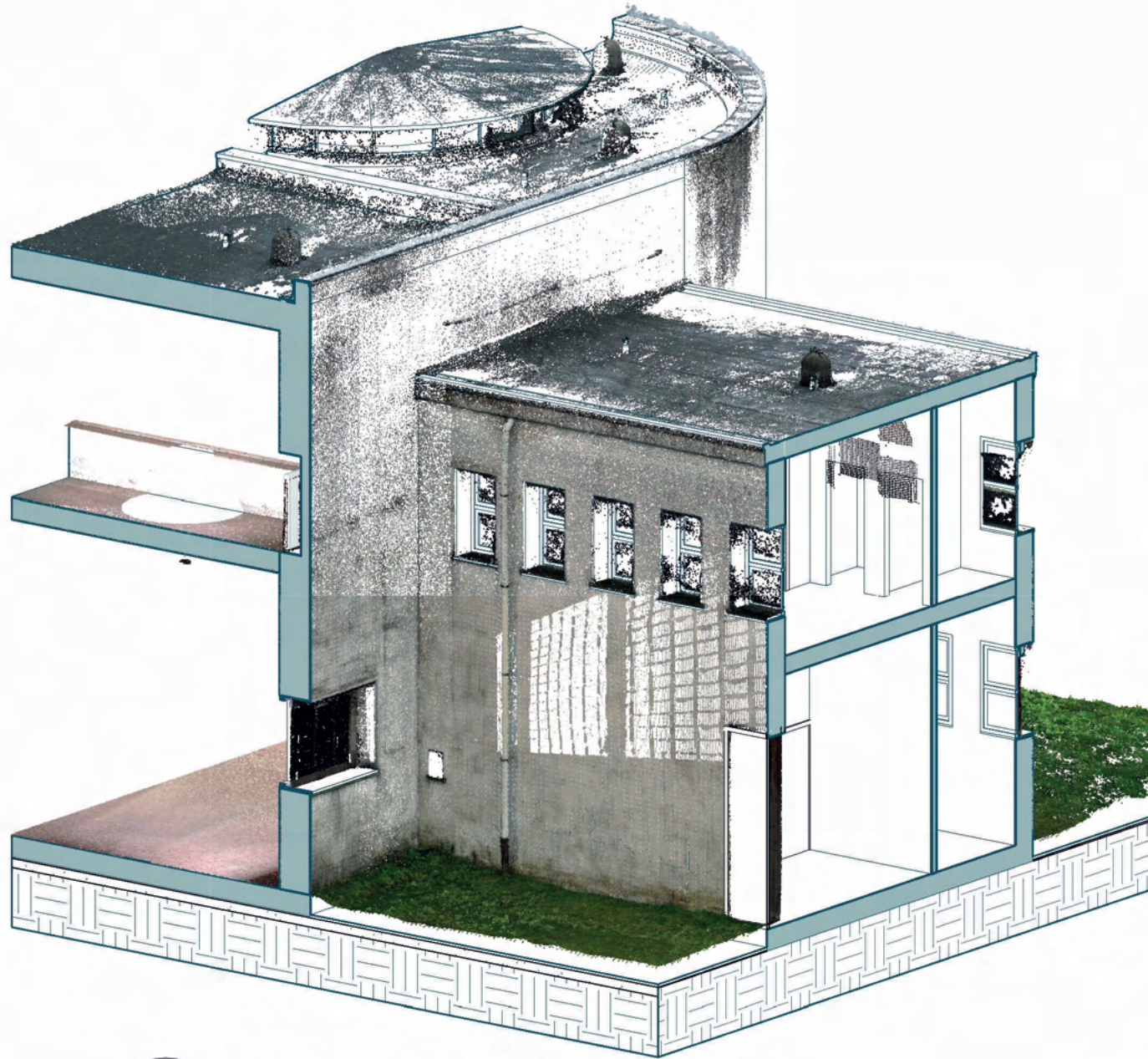
North Wall Section Cut - Comparison of Point Cloud (walls, floors & roof) with 3D model



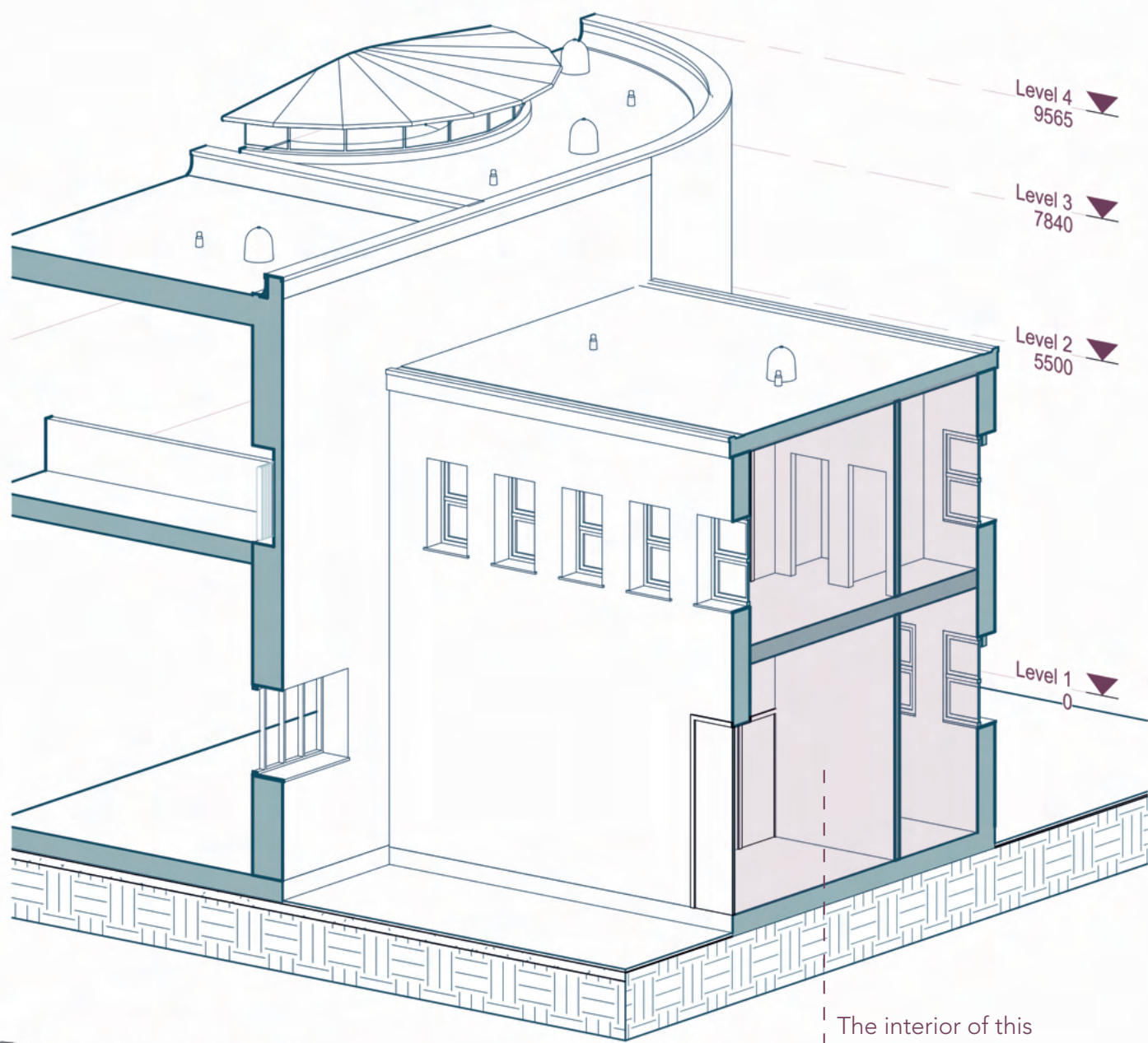
N01 North Wall Section_Point Cloud
1: 100



N02 North Wall Section
1: 100



N03 North Wall_3D+Point Cloud



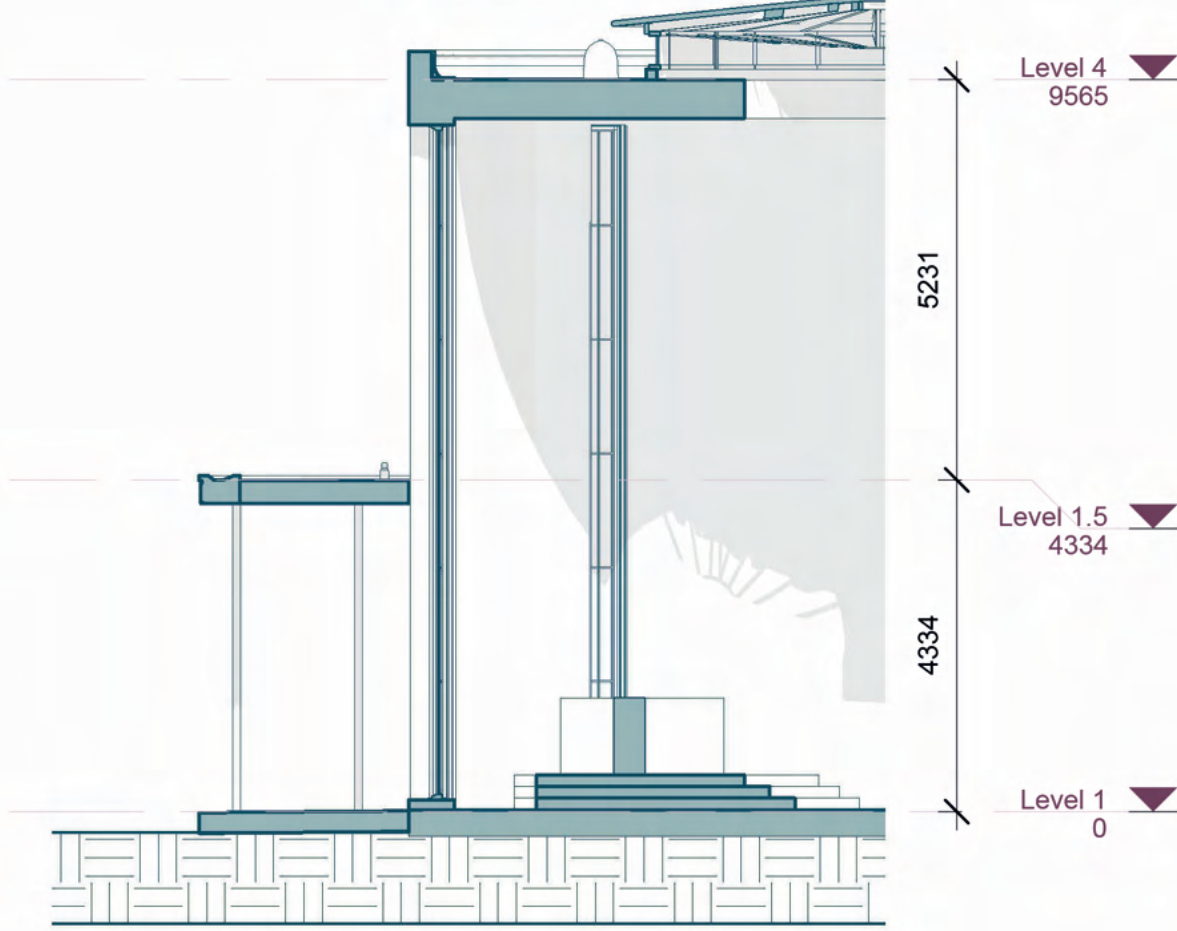
N04 North Wall_3D

The interior of this
space is Hypothesized.
As this was not
scanned.

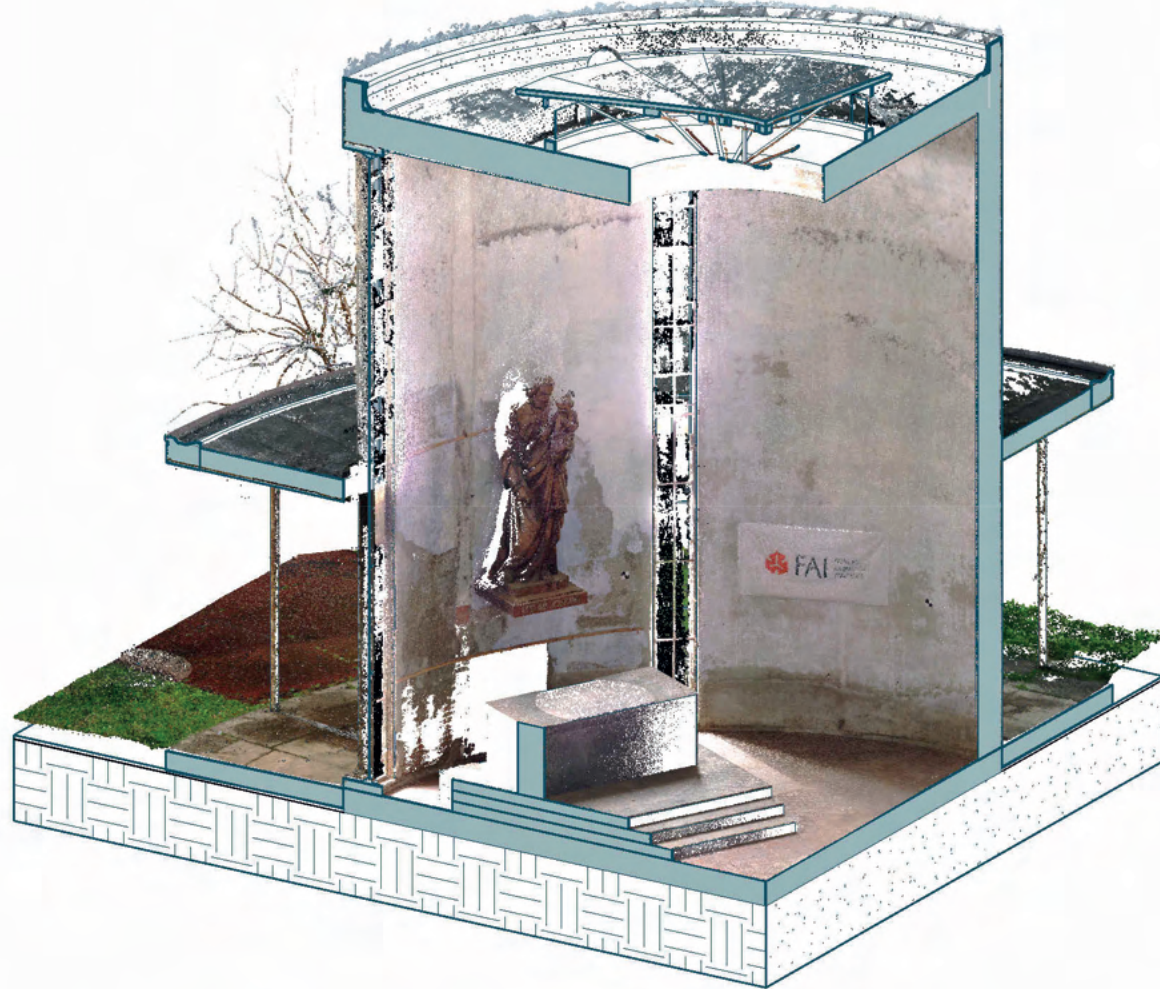
West Wall Section Cut - Comparison of Point Cloud (walls, floors & roof) with 3D model



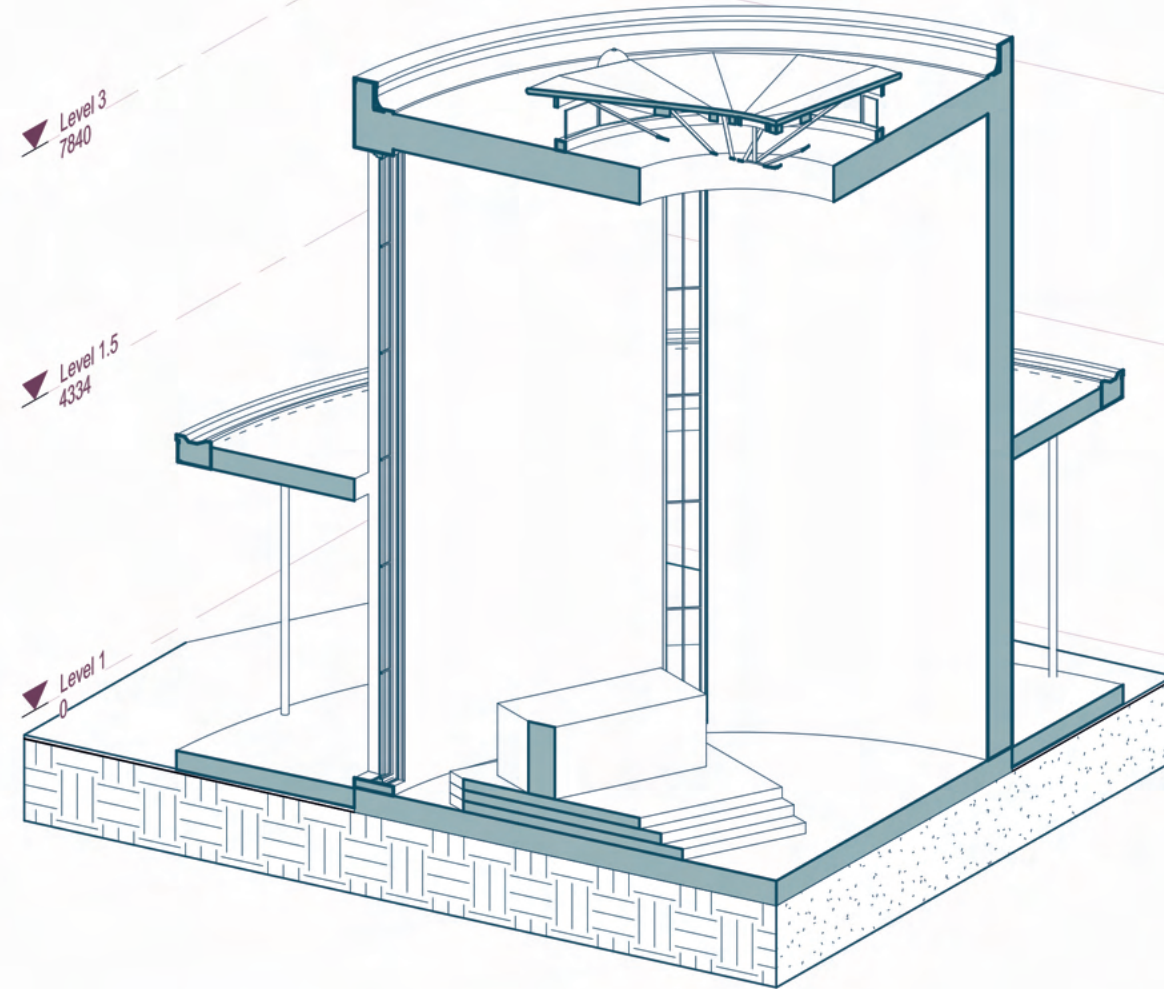
W01 West Wall Section_Point Cloud
1: 100



W02 West Wall section
1: 100



W03 West Wall_3D+Point Cloud



W04 West Wall_3D



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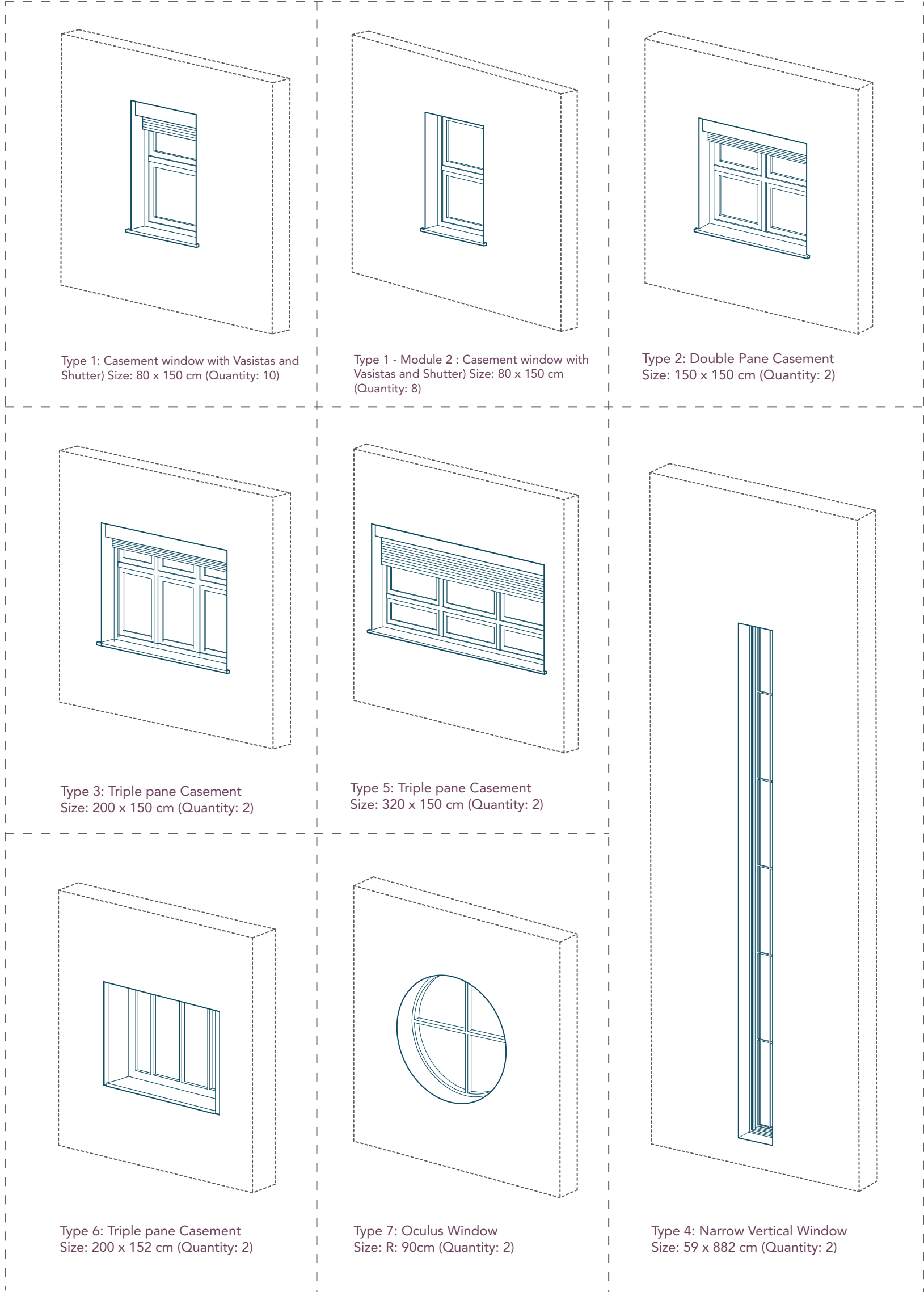
Board No. 07

- ☐ TERRITORIAL CONTEXT
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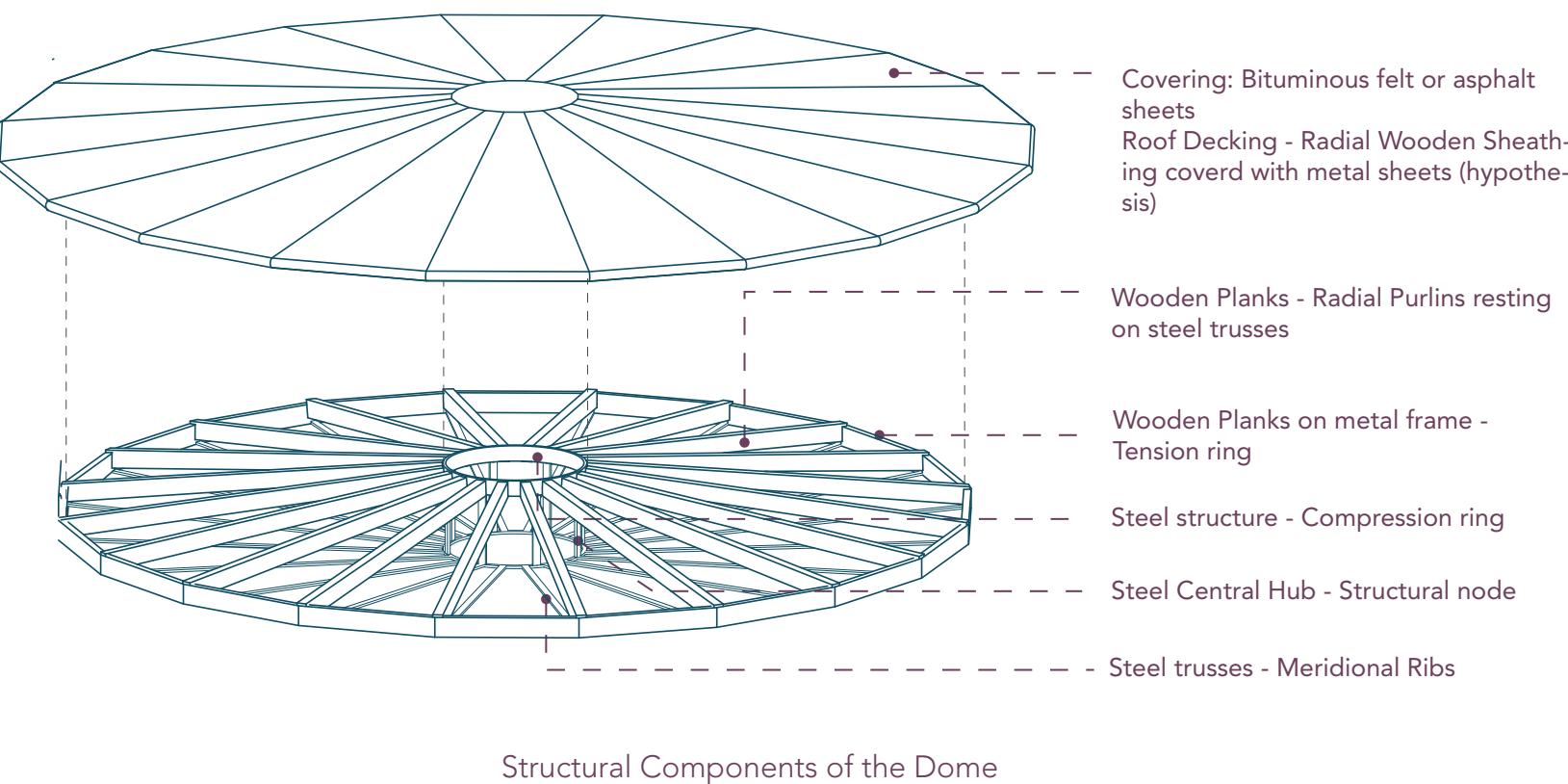
The Church Building



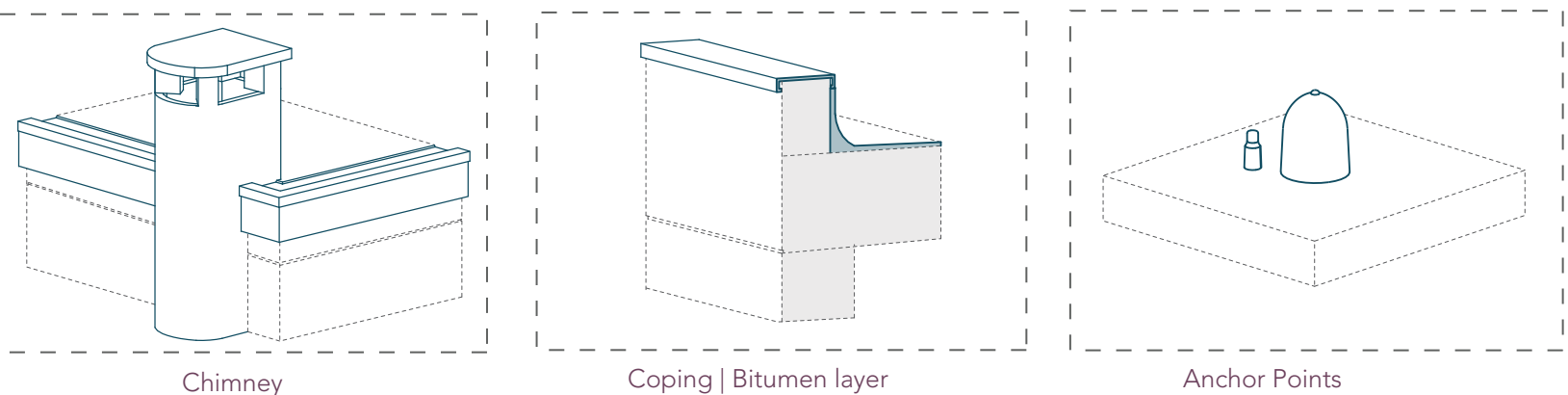
WINDOWS - Loadable and Generic Model Families



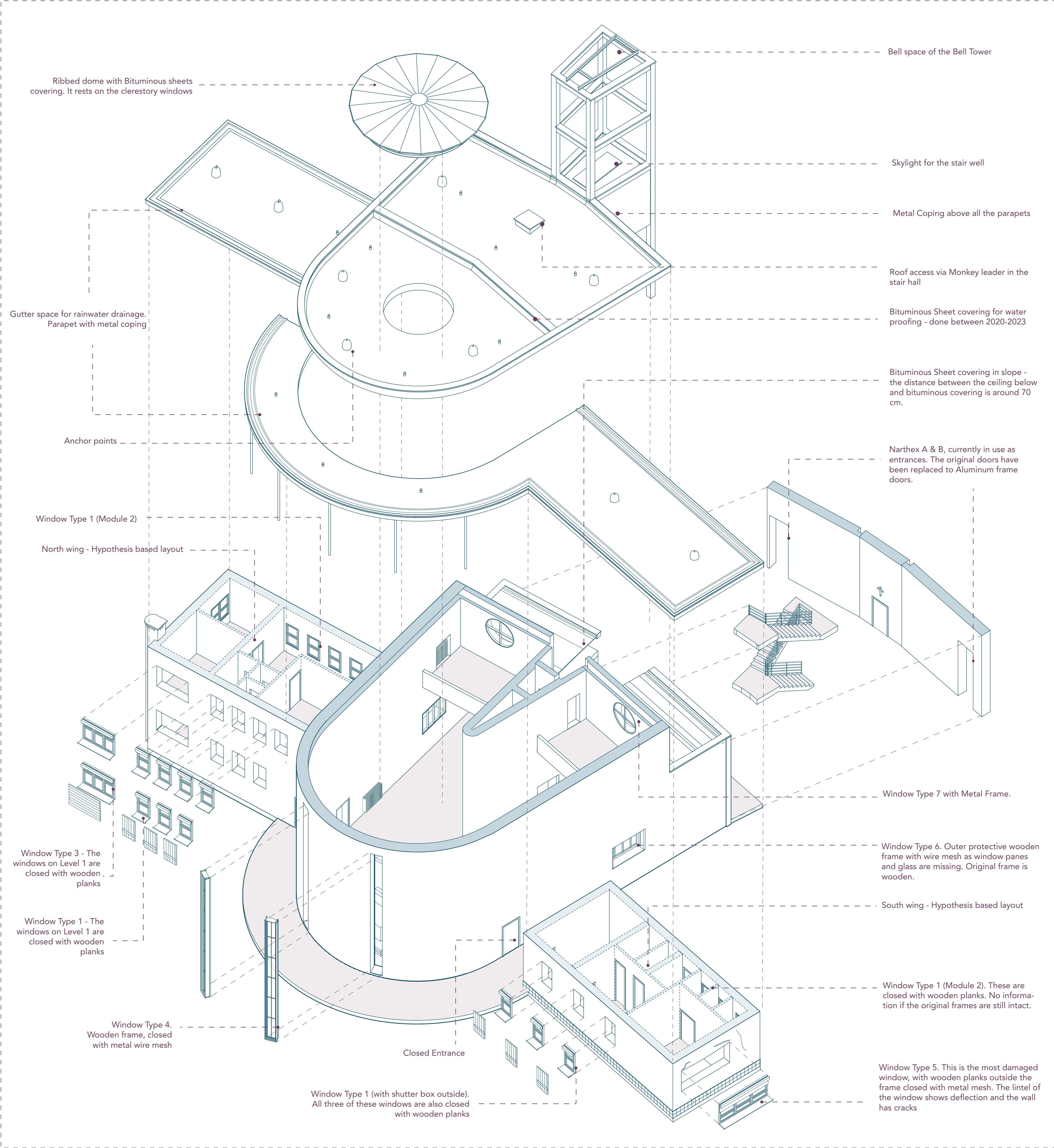
DOME - Meteric Generic Model Family



Miscellaneous



3D Exploded Axonometric of the Church





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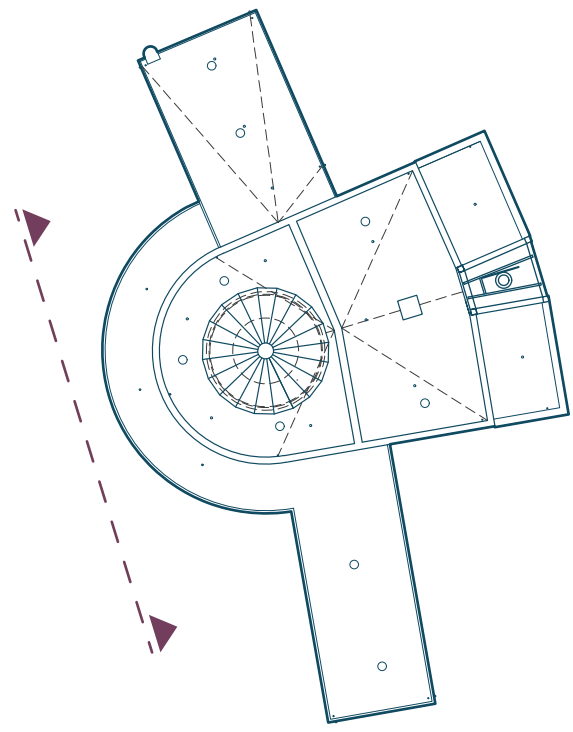
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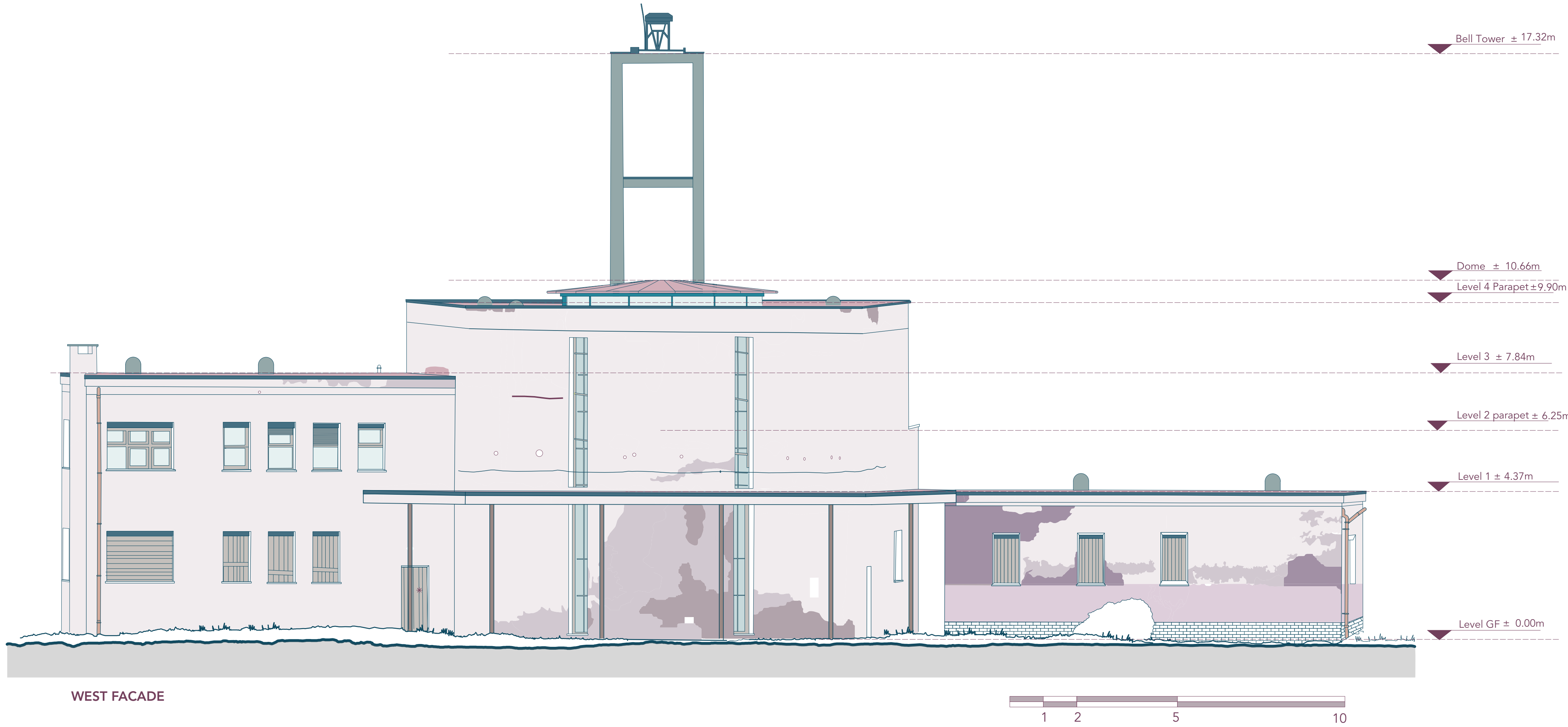
Board No. 08

- TERRITORIAL CONTEXT
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The Church Building



Key Plan
Scale: 1:400



Load Bearing Elements	
Cross weave bond Four headed	Gothic bond Two headed
<p>This hypothesis is based on the thickness of these walls. The four headed cross weave bond is up to 50cm thick and these walls are from 50cm to 60cm thick. This synthesis proves that these are solid brick walls which support the large open space and ceiling of the altar.</p> <p>The bond however, seems a little irregular at certain places but the overall structure is intact.</p>	<p>The interior of this area was not surveyed but the exposed brick bond allowed to determine the thickness of these walls, which in design documentation is set to 30 cm. The Block weave bond gives a brick wall of 25 cm excluding finishes.</p> <p>Parts of the perimeter walls of this wing has cracks and fissures, indicating structure has been compromised.</p>

Steel & Concrete Elements	
Reinforced Concrete Elements	Steel Columns
<p>Found in Bell Tower, Chimney, and roof anchor elements</p>	<p>6 Steel columns of 5 cm radius supporting roof of Ambulatory</p>
Building Services	
Drainage Pipes	
<p>The drainage pipes on the facade seem to be in plastic, very similar to PVC. Comparing with old photos of the church, these pipes are seemingly original and have not been replaced.</p>	

Wall Finishes			
Paint on Plaster Type 1	Paint on Plaster Type 2	Exposed Plaster Layer	Ceramic Tiles
<p>Typical Paint finish found on the facade. The texture of finish is different from that of Type 2 which is apparent in the photographs of how the paint layer has been detached.</p> <p>For this reason, a differentiation is highlighted which can be due to different types of plasters used.</p> <p>This texture suggests use of cement plaster for these surfaces.</p>	<p>The texture of surface suggests that a different kind of plaster has been used on this surface. The float and scratch coat in the degraded parts suggest a lime based or soft cement based plaster used in this area. The peeling paint layer suggests the issue of rising damp and the structure is in dire need of restoration.</p>	<p>All three layers, that is, the scratch coat, float coat and the finish coat are exposed. Flaking layers of paint can be seen in these areas. Overall the condition of finishes are severely deteriorated causing various forms of detachment and disintegration.</p> <p>From the photographic analysis, the plaster seems to be of Type 1, which is cement based (hypothesis).</p>	<p>At the base of South wing there are ceramic tiles, which seem to have been an addition to form a damp proof course. This addition does not seem to have a greater impact on the rising damp situation as can be seen from the condition of degradation.</p> <p>These tiles do not go with the rest of the design language of the building, hence can be removed with proper solution for damp proofing.</p>

Window Finishes		
Wood	Glass	Metal wire mesh
<p>Wood is used in almost all the windows of this building. All the windows on the ground floor are closed with wooden planks, probably during the restoration attempts from 2020 - 2023. These wooden planks are already showing signs of degradation. The window frames on the upper floors are still intact with great signs of decay and gaps.</p>	<p>Some of the windows in the upper floors still have glass intact, if not fully, parts of broken glass can be seen. Shutter boxes in metal can be seen above the window frames of the windows facing West and South facade. They do not appear in the East Facade. It may have been an intentional design move by the architect Gardella, for the purpose of allowing sunlight from the East.</p>	<p>Some of the windows on the ground floor, and especially the two narrow full height windows behind the naves are closed with the metal wire mesh for safety. In some photo documentations from 2020, the window glass seems to be intact, it may have been damaged and removed after this time during the restoration attempt.</p>

Roof and Other Finishes		
Metals	Metal Frame	Bitumen sheets on roof
<p>Metal has been utilized in various parts of the building, such as, the coping, the structure of bell in the bell tower, the covering of the dome etc.</p> <p>The coping, as shown in the picture, covers all the parapet walls, however, it seems to have been a much later addition. Even with the addition of coping, the parapets show serious forms of degradation linked to dripping water.</p>	<p>The studies of early 20th century architecture suggests that metal window frames began to be used in the first half of 20th century as window frames.</p> <p>With the amount of corrosion seen on these frames, it can be assumed that these frames are of metal and not aluminium.</p> <p>The structure of the dome is very innovative and light weight. The glass in some parts of the frame still seems intact.</p>	<p>Roofs of all three blocks of the church have recently been renovated with the addition of Bitumen layer at the top for water proofing. This addition could have been fruitful for stopping water penetration to the interior of the building, but for the facade, there appears to have been further degradation due to the addition of this layer, especially biological growth.</p>



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The Church of Alessandria.**
Study, 3D documentation and
Analysis

Students

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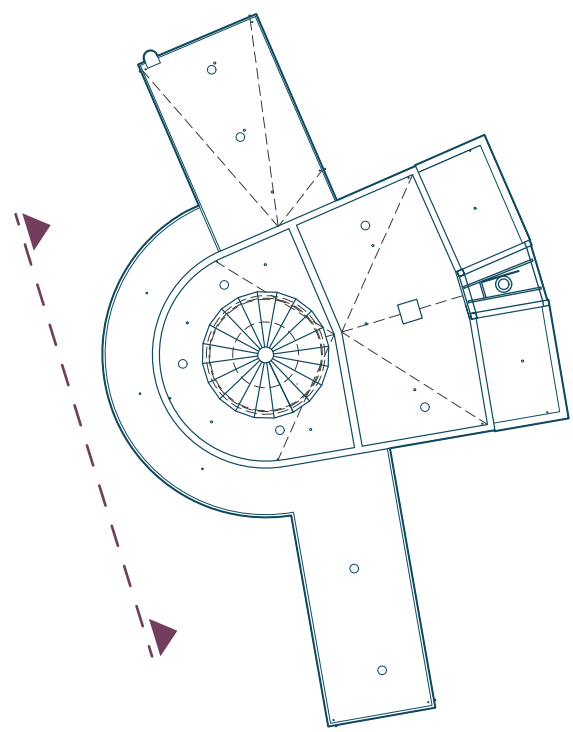
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Board No. 09

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- CURRENT STATE OF
CONSERVATION ANALYSIS
AND SOLUTIONS
- THE PROPOSAL

The Church Building



Key Plan
Scale: 1:400

LEGEND

DEGRADATION & SYMBOLS

- Plaster change demarcation line
- Visually blocked area
- Wall Perforations
- Scratches/abrasions on paint
- Missing Element
- Medium Intensity Cracks
- Severe Intensity Cracks

Detachement

- D1 Minor - Peeling paint
- D2 Moderate - Exposed plaster

Gap (Lacuna)

- Exposed bricks due to loss of continuity of mortar and paint

Chromatic alteration

- C1 Minor - Continuous surface with tonal variations.
- C2 Moderate - Continuous surface with tonal variations.
- C3 Severe - strong discoloration stains

Chromatic Sampling

- Testing area for Paint finishes

Rising Damp

- Rising damp causing Detachment

Moisture Stains & Leakage (Colatura)

- Moisture causing detachment
- Moisture Stains due to dripping (leaking) water on surface
- Moisture Stains with Biological Colonization

Metallic Corrosian

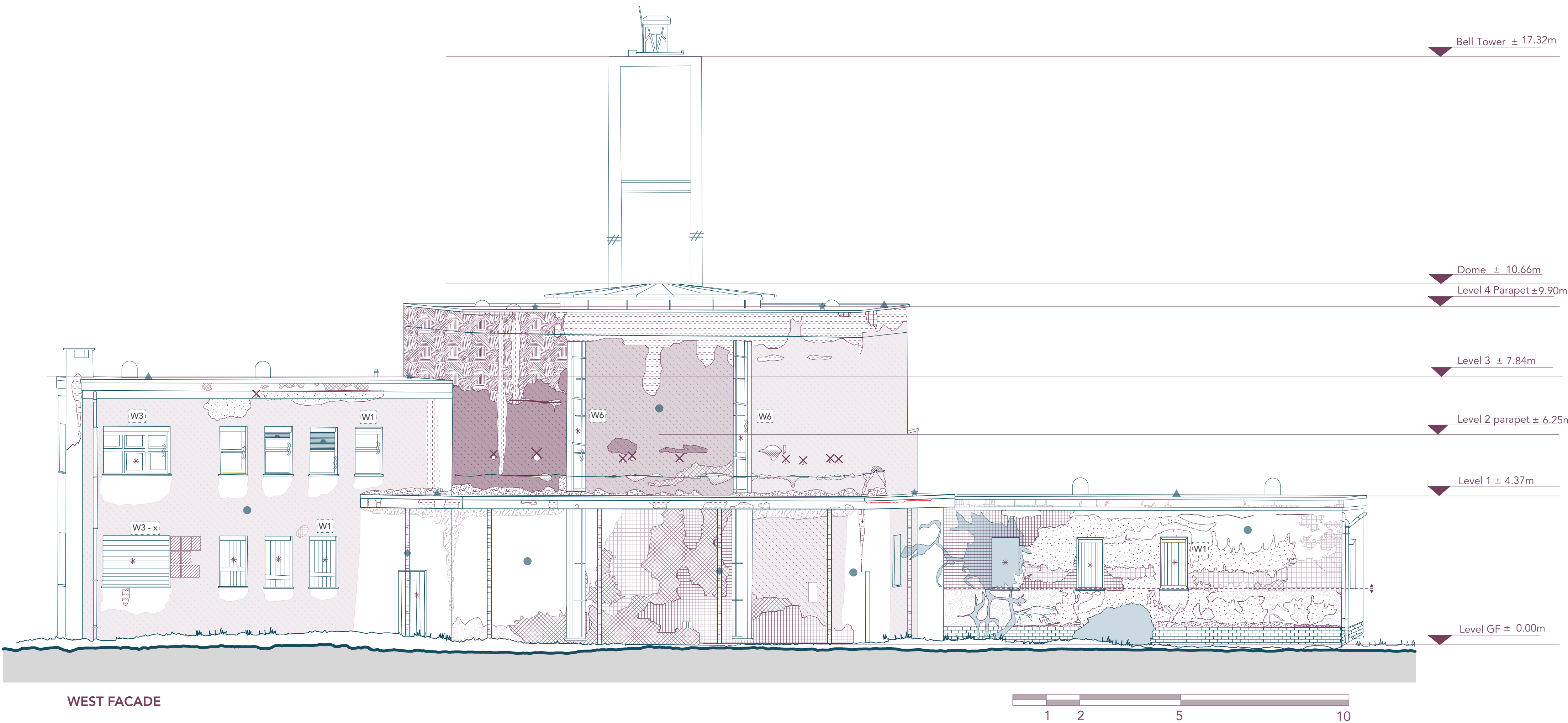
- Corrosian on Metal columns

Biological Degradation

- Biological colonization
- Presence of Vegetation
- Microbial Growth

Superficial Deposit

- Signs of dirt and grime



List of Materials		
Symbol	Photo	Material
●		Brick Wall with plaster and paint finish
■		Ceramic tiles
★		Bituminous water-proof membrane
▲		Metal coping
⋈		Wooden window frames
#		Concrete Columns
▵		Wooden shutters
◆		Steel Columns
		Wooden planks

Building Services & Systems		
Symbol	Photo	Material
		Anchor points
		PVC Pipes (exposed)
		Safe-line for restoration works (hypothesis)
		Technical outlets
		Chimney

Degradation Analysis			
Pattern/Symbols	Photo	Degradation and Description	Causes
West Facade Degradation		Missing Elements in Windows Window (58.9 x 882 cm), indicating material loss as the <i>glass is missing</i> and they are closed with wire mesh. The wooden frame has dark greenish and black spots along the grains indicating <i>moss, algae, or fungi growth</i> . Fine cracks, particularly in areas exposed to direct sunlight and moisture are visible. <i>Peeling or flaking paint</i> , exposing raw wood underneath. <i>Moisture stains</i> can also be seen on the frame.	Biological growth is due to constant exposure to moisture and rain infiltration, with weakening or unsealed joints / lack of protective coatings. Repeated wetting and drying cycles causing cracks. Detachment of finishing paint is also due to environmental condition and aging. Missing glazing component, causing water ingress to the interior.
		Window (200 x 150 cm) are similar to other window sills in the building, the growth of algae, moss or mildew are apparent also here, as indicated by greenish and blackish spots. Extensive detachment of paint visible on the frame revealing raw wood. Hardware of the window seems to be broken leading to no proper closure of the shutter or the window casement fixtures.	Reasons of decay in W7 and W8 are similar to those mentioned for other windows.
		The size of the window is same as W7. This window is covered with wooden panels/planks, which are not part of the original design (similar to W1). The original window frame is either missing or degraded to an extent that it needs to be covered with panels to save it. The added planks are also weathered and show signs of biological growth, which is also visible in the window sill, suggesting neglect or inadequate maintenance.	
Surface Degradation		Chromatic Sampling This is not considered as a degradation type, instead an intervention method used to test and match the original or intended paint layers for restoration purposes. If executed improperly, they may leave patches unprotected, which can expose the underlying plaster or masonry to weathering. However, in this case, the sampling is rightfully applied to the least degraded wall.	It often involves removing existing paint layers, leaving the plater or masonry temporarily unprotected. It is done because, as the analysis shows, almost all the building finishes have been degraded and have been exposed to chromatic alteration. However, to promptly address the issue, the final finishes must be decided sooner.
Moisture related Degradation		Rising Damp Causing Detachment The degradation visible includes significant peeling and flaking of the wall's paint layer, exposing the underlying plaster. The deteriorated wall shows multiple types of detachment and growth of moss and algae.	The observed degradation can be attributed to rising damp, which causes moisture to ascend through the wall via capillary action. This phenomenon is often exacerbated by the absence or failure of a damp-proof course DPC, poorly drained soil near the structure, or a high groundwater level. If it is not treated, over time the absorbed moisture dissolves more salts within the wall materials causing further degradation.
		Moisture stains Causing Detachment The moisture stain surrounding the central dark streak is lighter in color, with a grayish tone, spreading across a wider area on both sides. The irregular edges and discoloration suggest moisture has seeped into the wall's surface layers, likely saturating the plaster or paint. This area shows signs of surface deterioration, such as minor peeling or roughness.	Caused by the presence of water or moisture in the material, moisture stains are characterized by color changes, usually darker than the original material, and may be accompanied by phenomena such as efflorescence, surface cohesion loss, or biological growth. These stains indicate underlying issues like infiltration, condensation, or rising damp and usually appear irregular, depending on the source and path of the water.
		Moisture stains due to dripping water (Colatura) Dark moisture stains on the upper portion of the wall, particularly concentrated beneath the metal coping. The discoloration appears as streaks and patches, suggesting water dripping. The stains are darker in some areas, indicating prolonged exposure to water.	The moisture stains are due to water dripping water from the parapet causing stain under the metal coping. This could result from inadequate waterproofing or improper installation of the coping, allowing rainwater to seep beneath or flow over its edges. Repeated exposure to dripping water leads to moisture accumulation and stains on the wall surface, and the absence of proper drainage exacerbates the problem.

Solutions & Interventions

- Use biocidal solution or essential oil to clean the moss, algae or fungi (such as, quaternary ammonium compounds or natural thyme oil).
- Natural wood fillers can be used for superficial cracks and for structural cracks, low viscosity epoxy consolidant can be used. It is necessary to ensure structural integrity and replacing any broken or loss wooden sections.
- Removal of flaking paint with non-abrasive chemical stripper or scraper.
- Sand the surface of the frame to prepare for new coatings. It should be protected by application of linseed oil based primer followed by breathable micro-porous paint.
- Finally to replace the glass and re doing the seal between frame joints and masonry opening.

- Same solutions as above for treating the wood
- The existing glazing condition must be checked in order to decide if it needs replacement.
- The hardware of the window must be replaced in case the existing hardware are no longer workable.

- Ensuring that sampling areas are finalized by matching the appropriate paint or coating as determined by the testing process.
- Application of the chosen finish uniformly across the facade to restore aesthetic and functional integrity.

- Gently cleaning the wall using dry-brushing method. Water based cleaning must be avoided as it can dissolve salts and push them further into masonry.
- A temporary superficial layer of lime based plaster maybe applied to absorb the salts and protect underlying masonry.
- Drainage around the base of the building should be improved by sloping the ground away from the structure and installing channels to divert water away. This is feasible also in case of flooding.
- It is necessary to introduce a chemical damp proof course by injecting hydrophobic silicone resins or lime compatible injection mortars into masonry to create a barrier against rising water.
- Finally, removing degraded plaster and using salt resistant and breathable plaster. Paint finish should be mineral based.

- After resolving the main source of moisture in the wall, in this case, rising damp, the surface should be cleaned using mild detergent solution or pH neutral cleaning agent. For this building, since the walls are structurally compromised, manual brushes should be used to avoid further damage.
- After the wall completely dries, a hydrophobic, breathable treatment like silane or siloxane-based water repellents can be applied to prevent further water penetration.
- Breathable plaster should be used, such as lime based systems to allow trapped moisture to evaporate- Lime wash or mineral based paints for finishing will allow vapor permeability.

- Replacing the existing coping with a design that includes a minimum overhang of 3-5 cm beyond the wall surface. A drip groove underneath the coping is necessary to break the surface tension and redirect water. Materials should be weather resistant, such as terracotta, zinc or stone with proper sealing. Coping should have a slope of 5-10 degrees to direct rainwater away from the parapet. Drip edge can be designed along the underside of the parapet (while keeping the integrity of the original design) to avoid direct water contact with the walls.
- The surface should be cleaned and protected with hydrophobic coating (after testing its compatibility with plaster) as explained in the steps earlier and finally the plaster and paint finishes should be applied as explained.

* The degradation types and solutions continue on the next boards



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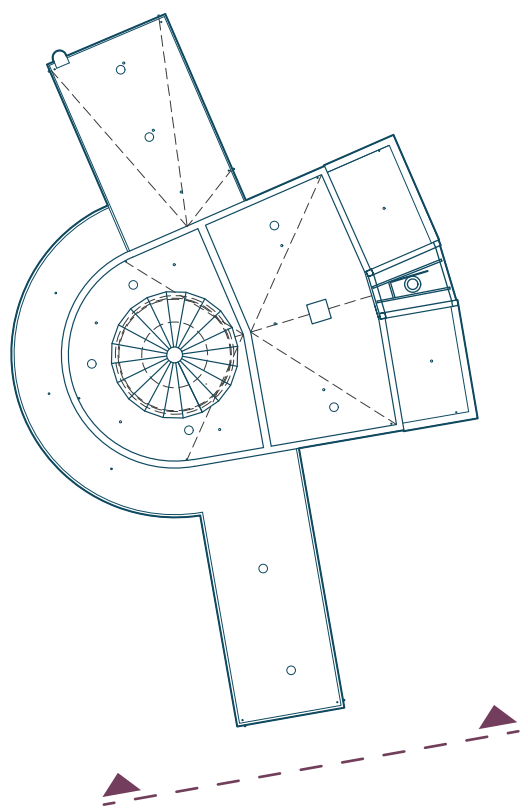
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Board No. 10

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The Church Building



Key Plan
Scale: 1:400



LEGEND

DEGRADATION & SYMBOLS

- Plaster change demarcation line
- Visually blocked area
- Wall penetrations
- Scratches on paint
- Missing Element
- Cracks - Medium Intensity
- Fissures - Severe Intensity

Detachment

- D1 Minor - Peeling paint
- D2 Moderate - Exposed plaster

Gap (Lacuna)

- Exposed bricks due to loss of continuity of mortar and paint

Chromatic alteration

- C1 Minor - Continuous surface with tonal variations.
- C2 Moderate - Continuous surface with tonal variations.
- C3 Severe - strong discoloration stains

Rising Damp

- Rising Damp causing detachment

Moisture Stains & Leakage (Colatura)

- Moisture Stains due to dripping water on surface (colatura)
- Moisture Stains (colatura) with Biological Colonization
- Moisture stain causing detachment

Metallic Corrosian

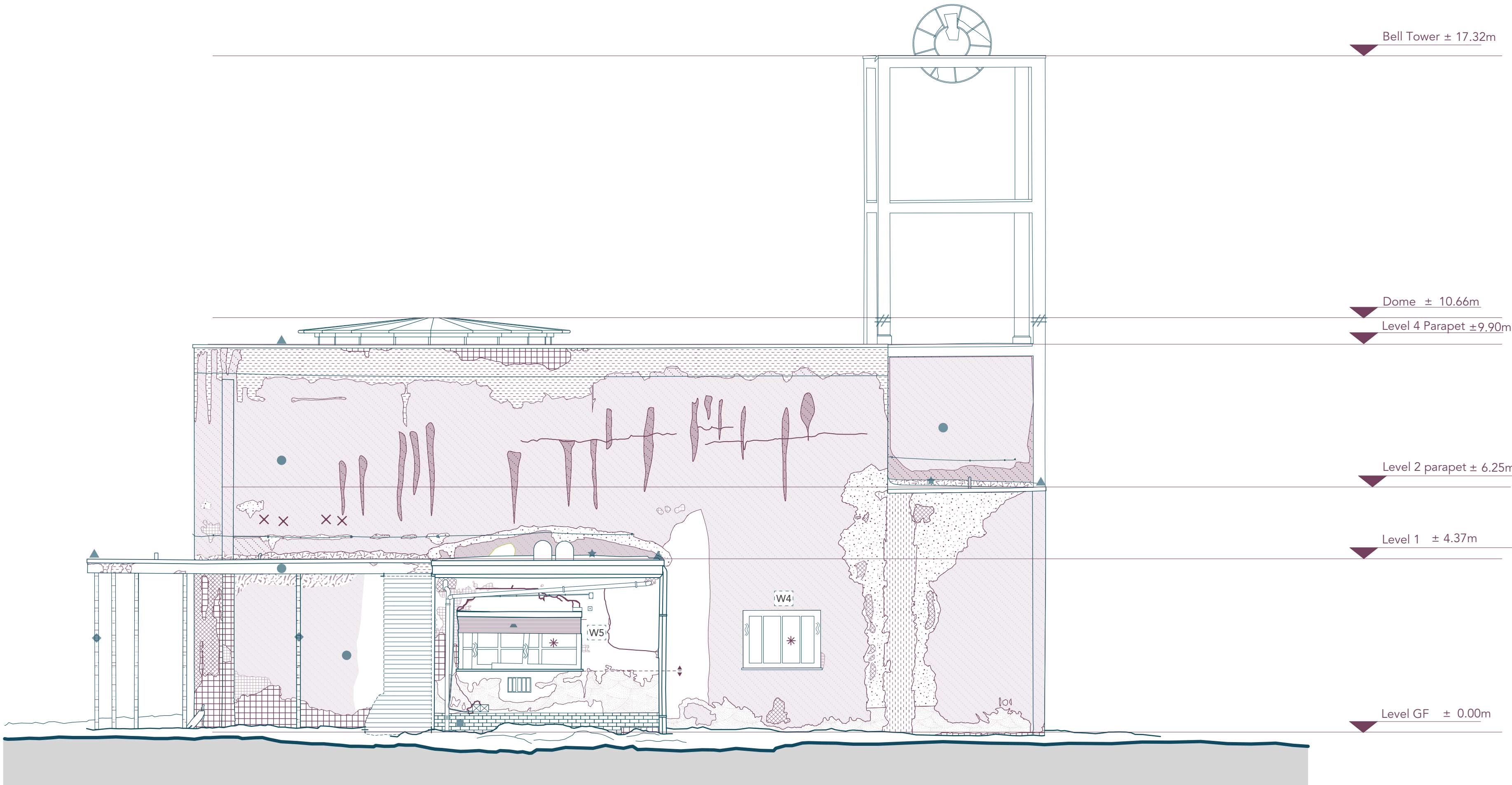
- Corrosion on Metal columns

Biological Colonization

- Biological colonization

Superficial Deposit

- Signs of dirt and grime



South Facade

List of Materials		
Symbol	Photo	Material
		Brick Wall with plaster and paint finish
		Ceramic tiles
		Bituminous water-proof membrane
		Metal coping
		Wooden window frames
		Concrete Columns
		Wooden shutters
		Steel Columns

Building Services & Systems		
Symbol	Photo	Material
		Metal ventilation grille
		Wiring connection box
		Utility electrical box
		Anchor points
		PVC Pipes (exposed)
		Safeline for restoration works (hypothesis)
		Electrical conduit
		Technical outlets

Degradation Analysis			
Pattern/Symbols	Photo	Degradation and Description	Causes
South facade Windows		Missing Elements in Windows The window (size 218 x 150 cm) consists of an inner frame, likely the original, and a larger wooden frame with a mesh installed in front of it to provide protection. The inner frame shows signs of wear but appears to have been preserved. The outer one exhibits discoloration. The metal mesh is intact but dirty, while the sill shows biological growth. The glass panes are missing, leaving the structure vulnerable.	The windows are in constant exposure to environmental factors, and when combined with a lack of maintenance, these elements accelerate the deterioration of the frames and facilitate the growth of moss or algae on the sill due to persistent moisture accumulation. The absence of glass may be due to vandalism, structural movement, or environmental factors.
		This window (size 320 x 155) is lacking of pane glasses but posses an inner wooden frame, an outer wooden frame holding a metal mesh, and a wooden rolling shutter above the opening. The white frame shows peeling paint and gaps, while the wooden frame and shutter are weathered, with discoloration and cracks. The sill shows biological growth and there are significant structural cracks above this window showing problems with lintel beam.	Caused by long-term exposure to environmental elements such as rain, sunlight, humidity, and fluctuating temperatures. The absence of glass increases its vulnerability to these factors. The wooden elements have likely suffered due to the lack of protective coatings and regular maintenance. The biological growth on the sill indicates the presence of persistent moisture, which likely accumulates due to exposure to rainwater.
Disintegration & Detachment		D1 Minor Detachment - Peeling paint The paint layer exhibits detachment from the plaster surface, with sections curling, flaking, or completely missing. Edges of the detached paint are jagged, and the surface underneath often shows signs of discoloration, dampness, or roughness. The remaining paint appears brittle and uneven, indicating a loss of adhesion to the underlying surface.	Levels of moisture in the wall, due to rising damp, and inadequate waterproofing. The type of paint used may not be compatible with the plaster or previous paint layers (e.g., oil-based paint over a water-based primer or vice versa). These reasons leads to weak bonding and eventual peeling over time.
		D2 Moderate Detachment - Exposed plaster The paint layer has completely detached in some areas, exposing the underlying plaster. The exposed plaster shows, rough texture, and potential signs of minor degradation or cracking. The boundary between the detached paint and the intact surface is irregular, with adjacent paint peeling or curling at the edges.	Prolonged exposure to water through rising damp, leaking structures, or condensation can weaken both the paint and plaster. Moisture is penetrating the plaster, causing crumbling, disrupting the paint's adhesion, leading to detachment. Over time, the plaster layer may develop cracks, crumble, or weaken due to natural aging, freeze-thaw cycles, or exposure to moisture.
		Lacuna (Gap) - Exposed bricks due to loss of continuity of mortar and paint The plaster layer is entirely missing in certain areas, exposing the underlying brick substrate. The exposed brickwork shows surface weathering, discoloration, and slight mortar degradation between bricks. Adjacent to the lacuna, the plaster exhibits flaking and cracking, suggesting ongoing deterioration.	Exposed brickwork is the advanced stage of degradation. It seems to be due to the rising damp and prolonged exposure to the moisture. Environmental conditions, such as exposure to freeze-thaw cycles, harsh winds, & UV radiation, could have degraded the exposed plaster layer and mortar joints for it to fully detach from the surface exposing bricks.
Surface Degradation		Chromatic Alteration - C1 Minor Subtle discoloration or variation in tone compared to the surrounding facade. appears as slightly darker patches, with no sharp boundaries or significant textural change. These alterations are more evident in areas of the facade likely subjected to slightly different environmental conditions, such as UV light or water retention.	Water absorption due to inadequate waterproofing or retention in porous materials. Deposition of airborne pollutants and dirt, which adhere to damp surfaces. Incomplete drainage from rainwater runoff, leaving behind dirt and moisture residues. It can also be due to UV radiation breaking down the pigments in the paint. It has led to Aesthetic disruption and indication of moisture retention, which can lead to deeper material damage over time.
		Chromatic Alteration - C2 Moderate The facade shows more pronounced discoloration compared to C1 alterations, characterized by vertical streaks, darker patches, and uneven shading. The streaks can either be water runoff or the superficial scratches. The background surface shows widespread subtle darkening, indicating general weathering or pollutant accumulation.	Same as above. In addition, The scuff-like marks may result from incidental contact with objects (e.g., tools, ladders, or maintenance activities) or superficial dirt streaks from nearby activity.
		Chromatic Alteration - C3 Severe decolorization This type displays severe discoloration, characterized by dark streaks, diffuse stains, and localized spots of intense discoloration.	Persistent water infiltration and runoff causing saturated materials darken in color, and water runoff causes streaking and staining. Loss of cohesion in the plaster or concrete due to freeze-thaw cycles, chemical reactions, or sustained exposure to environmental stressors.

Solutions & Interventions

- Removal of moss, algae, and dust with a solution of water and mild detergent. A biocidal treatment is needed for preventing regrowth of moss.
- The original and the added wooden frames need to be examined for structural soundness and checking insect infestation or rot. The temporary metal mesh maybe removed for further restoration treatment of the window.
- Epoxy wood consolidant can be applied to a mild decay of wood for consolidation. Crack and gaps in wood to be filled with wood fillers. Then any existing surface finish must be removed and the primer should be applied for moisture and weather resistance. Paint the surface using oil based paint and then glass maybe added according to the requirement.

- Determining the purpose of planks, either it is structural or protective? Then the inspection of added planks for rot, and insect damage must be done. The planks already look damaged and degraded, hence, upon inspection, if they do not serve a structural purpose, they must be removed to avoid further damage to the original frame. If necessary for structural reasons, they must be replaced.
- The original frame needs to be adequately repaired and reinforced as mentioned for other windows. If the planks are necessary, the replacing planks should follow the aesthetics.
- The rest of the process follows the same procedure as already explained for other wooden window frames.

- Mechanical scraping with a soft blade can be used to remove peeling paint . For stubborn areas, natural paint stripper can be used but it must ensure to not affect the underlying plaster.
- Underlaying plaster must be inspected for cracks, detachment, or salt efflorescence using visual inspection and moisture mapping. Weak areas must be consolidated with lime grout injection and reapplying missing sections of plaster using hydraulic lime mortar (match the original).
- The surface must be clean and dry before applying the primer and the final paint must be selected as per original aesthetic achievement requirement.

- Through cleaning using soft brushes (since the structure of this wing is compromised).
- re-pointing of eroded mortar joints and stabilizing edges with lime based consolidant. Hydraulic lime mortar with natural pozzolans should be used to fill the gaps. Natural pozzolanas helps in areas exposed to higher mechanical stress or water infiltration, which is the case of this wall.
- Paint to match the original one (preferably lime based)
- For long term moisture management, improve drainage, seal cracks and apply siloxane-based water repellent on the masonry by brushing or spraying.

- First step involved conducting a chromatic investigation using NDT spectrophotometric analysis to assess the extent and nature of color variations across the facade. This will ensure a precise understanding of the degradation mechanisms and original color values identification.
- Careful removal of the degraded layers of paint with soft brushing or mechanical dry cleaning with low pressure air jets. This process should ensure no damage to the substrate.
- Preparation of the substrate (if needed)
- Repainting the whole surface, since the chromatic alteration is visible everywhere.

- The degraded layer should be removed following methods given above, in addition, a poultice-based cleaning paste can be applied to absorb deeper stains without introducing excess moisture.
- Biological growth to be treated using biocidal treatment with natural ingredients.
- Plaster consolidation
- Repainting the facade

- In this scenario, the rest of the process remains the same. However, a poultice-based cleaning solution seems more relevant to draw out deep yellow stains caused by moisture, mineral deposits or pollutants.
- The whole surface must be repainted.

* The degradation types and solutions continue on the next boards



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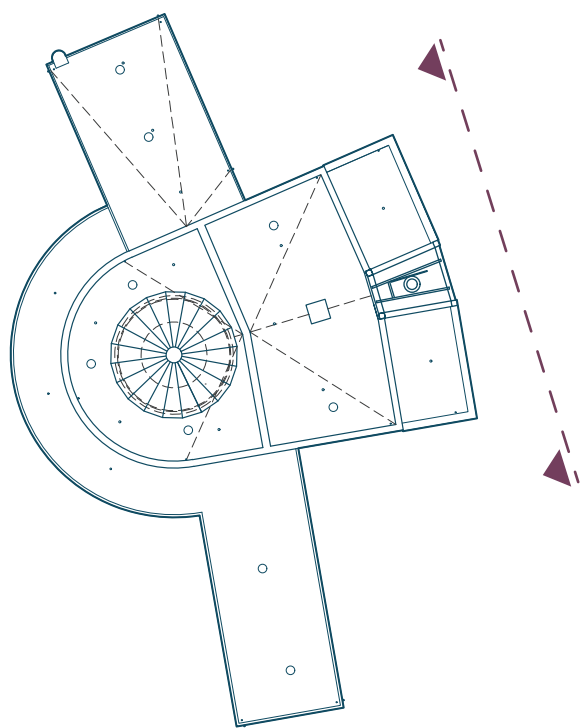
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The Church Building



Key Plan
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LEGEND

DEGRADATION & SYMBOLS

- Plaster change demarcation line
- Visually blocked area
- Wall Perforations
- Scratches/abrasions on paint
- Missing Element
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- Fissures - Severe Intensity

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- Rising Damp causing Detachment

Moisture Stains &Leakage (Colatura)

- Moisture Stains due to dripping water on surface
- Moisture Stains with Biological Colonization
- Moisture causing detachment

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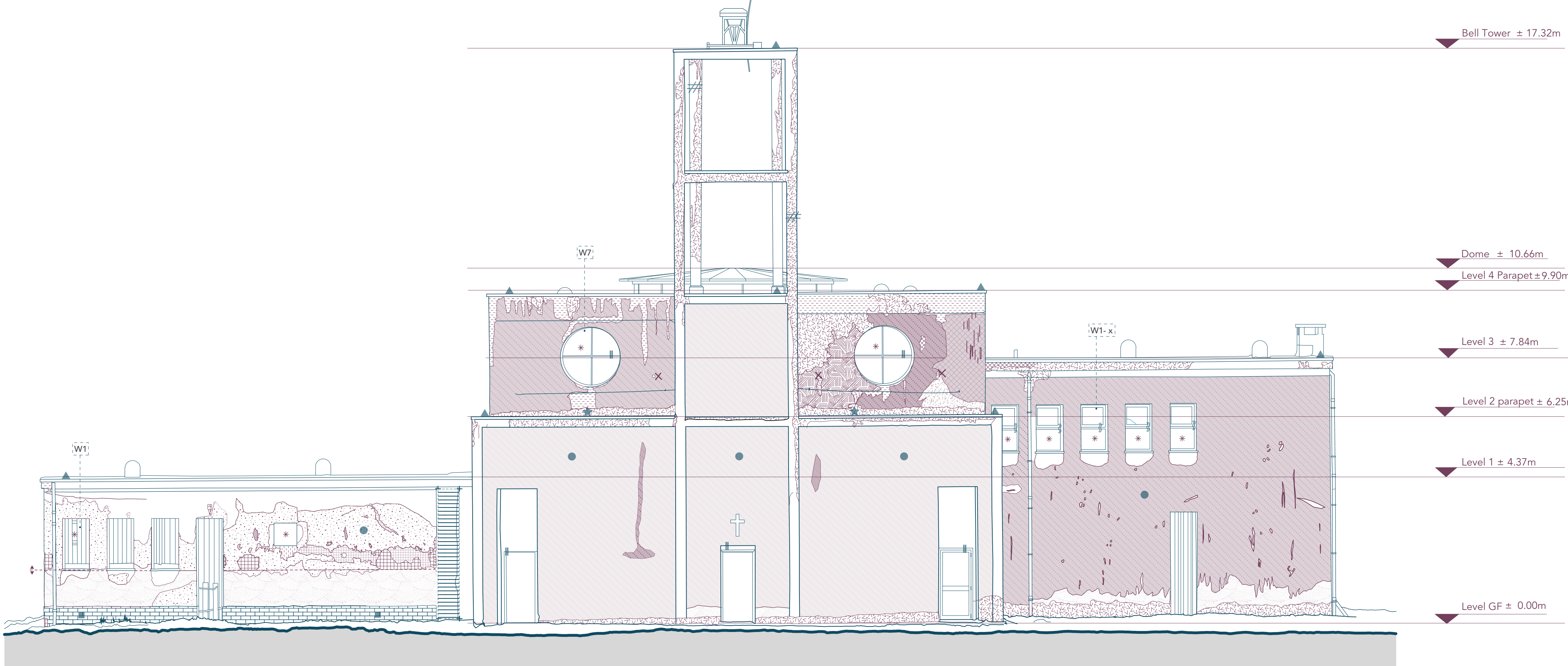
- Corrosion on Metal columns

Biological Colonization

- Biological colonization
- Microbial growth

Superficial Deposit

- Signs of dirt and grime



EAST FACADE

List of Materials and Elements		
Symbol	Photo	Material
●		Brick Wall with plaster and paint finish
■		Ceramic tiles
★		Bituminous water-proof membrane
▲		Metal coping
}}		Wooden window frames
#		Concrete Columns
		Metal Frame
		Wooden planks

Building Services & Systems		
Symbol	Photo	Material
		PVC Pipes (exposed)
		Safeline for restoration works (hypothesis)
		Chimney
		Anchor points

Degradation Analysis			
Pattern / Symbols	Photo	Degradation and Description	Causes
East Facade Windows	W1*	Missing Elements in Windows These windows of size 80 x 150 cm of the south wing are covered with wooden planks. The planks were installed during 2020-2023 restoration probably as a temporary measure to prevent further damage or intrusion while awaiting permanent restoration or replacement of the original frames and glass. The window is a circular opening (90 cm diameter) with remnants of an original metal grid and wooden planks installed inside, likely for temporary closure. The metal grid is intact but exhibits potential <i>corrosion, visible as dark discoloration and possibly rust</i> . The boards show signs of weathering, with uneven coloration and potential warping or deterioration due to exposure to moisture. The edges of the circular opening display staining, moss/algae growth, and surface erosion, particularly along the bottom edge.	The windows were likely left open for an extended period due to vandalism, structural decay, or deferred maintenance, leaving the church vulnerable to weather and environmental damage. The <i>absence of glass and frames</i> over time allowed water and moisture to penetrate the interior and exterior surfaces, leading to, peeling plaster, and biological colonization (<i>visible staining below the windows</i>).
	W7*	The windows are missing the glass and lack of protective coating on the metal grid causing exposure to environmental moisture leading to rust and corrosion, which is evident from the discoloration. The accumulation of rainwater at the base of the circular frame (<i>visible from the dark, damp area and moss growth</i>) has caused moisture-related damage to the concrete and surrounding materials.	
	W1-x*	W1-X windows of size 80 x 150 cm are most likely similar to W1 (original design). The frames are deteriorated, with visible cracking, uneven surfaces, and discoloration likely caused by weathering and lack of maintenance. Some panes appear intact but dirty, while others seem <i>broken or missing</i> . The sill, likely made of stone or concrete, show dark discoloration and moss/algae growth, indicating prolonged moisture exposure.	The missing or broken glass is likely due to either <i>vandalism, structural movement, or environmental impact</i> (e.g., strong winds or falling debris). The discoloration and moss growth on the sills suggest pooling or absorption of water, causing moss and algae growth and leading to plaster degradation
Material Incompatibility		Plaster change demarcation line This part of the facade shows two types of plaster applications. The upper part of the mortar appears smoother and more uniform in texture (likely a cement based mixture). There are visible patches of plaster detachment but overall holds better integrity. The lower part exhibits more pronounced degradation and moisture related damage (likely a lime-based or weaker cement lime mixture). There is also discoloration or possible erosion of plaster in lower part and worse material cohesion.	The two mortars reflect two different times of application, with material quality or composition varying due to factors such as local availability or cost. The lower line of mortar may indicate a repair or restoration phase, where a different, potentially less durable or more porous mortar was used, possibly to address earlier degradation due to rising damp issues.
Structural Degradation	×	Wall Perforations The holes appear small and localized, with dark discoloration or staining around them. The staining suggests potential water ingress, or material seepage from within the wall. They are relatively uniform in spacing and alignment, suggesting an <i>intentional or structural purpose</i> . The discoloration below the holes hints at potential water seepage, mold, or biological growth , indicating moisture-related issues	These holes may have been created to anchor structural elements (e.g., scaffolding, signage, or bracing) during construction or previous repair work that began in 2020. Over time, the absence of proper sealing allowed moisture ingress, leading to staining and potential internal degradation.
		Scratches/abrasions on paint The black marks are irregular and vertical to slightly diagonal. Some are thin and linear, while others are broader or smudged. They appear scattered across the wall surface, with a higher density in certain areas, suggesting external forces or contact with objects. The wall has an uneven finish, and the scratches are superficial, likely not penetrating deeply into the plaster or render.	The marks could result from physical contact with sharp or abrasive objects, such as scaffolding, ladders, or tools scraping against the wall during construction, maintenance, or repair activities. The irregularity and variety in depth/width of the scratches suggest accidental or unintentional abrasion.
	~	Crack - Medium Intensity The crack appears as a horizontal fissure that extends below the parapet-wall junction but does not exhibit significant displacement or crumbling. The formation of these cracks can be linear or rectilinear and their proper intensity can be tested through a series of structural analysis performed by experts.	Major causes can be Thermal expansion and contraction - Daily and seasonal temperature fluctuations can cause materials to expand and contract at different rates. This cyclic movement creates tensile stresses at rigid connections, such as the parapet-wall junction. Water Ingress and Freeze-Thaw Cycles can be another reason. Since there is an obvious rising damp from the ground, this can be due to Settlement or Structural Movement of the foundations as they cause horizontal cracking.
	~	Fissures - Severe Intensity Diagonal Cracks: Typically caused by differential settlement or structural movement, Horizontal Crack: Likely due to thermal stress or weakened structural elements, especially near load concentrations. The cracks show advanced propagation and connect multiple points, indicating compromised structural integrity. Some areas show detachment of plaster, which exposes the underlying masonry to environmental damage.	Foundation movements leading to differential settlement may have caused tensile stresses in the upper masonry layers, leading to diagonal cracks. The alignment of diagonal cracks suggests stress redistribution due to an unstable load-bearing element. It can also be due to the inadequate structural reinforcement in areas like window lintels or slab-wall junctions leading to shear or tensile failures. Other reasons are same as above aggravated to a worse condition

Solutions / Interventions	
<ul style="list-style-type: none">- In these windows, apparently, the whole frame of the windows are missing, hence they need to be replaced with new ones, keeping in mind their thermal properties. The design of the frames and window aesthetics must match the original design. Careful procedure must be taken in order to remove temporary closure with planks and structural durability of the lintel of openings must be tested and fixed before intervention of new windows. A permanent solution for window sills must be planned to avoid water accumulation.	
<ul style="list-style-type: none">- Removing debris and dirt from the metal frame and plaster in the opening using soft brushes and a low-pressure water spray.- Cleaning the metal bars with a wire brush or rust-removal tools to eliminate surface corrosion. Then treating the metal bars to stabilize corrosion and applying corrosion resistant primer to protect from future rusting.- Finally, the desired size of glass can be added to the frame based on the required thermal properties.	
<ul style="list-style-type: none">- First, wood must be inspected for rot and insect intensification and areas of high moisture content must be identified. The frame's structural integrity must also be tested to detect any weak spots.- After removing dust and debris, wood must be repaired for any damages identified (for example, applying wood consolidation agent) and parts of frames beyond repair must be replaced.- The old paint must be removed with help of chemical paint stripper and a suitable primer must be applied to the surface to protect against UV damage. In addition, existing hardware of the windows must also be examined.- Broken or damages glass to be removed, and new glass (ensuring thickness of the frame) must be added.	
<ul style="list-style-type: none">- Conducting laboratory tests to confirm the composition of both plasters and performing moisture mapping to identify areas of trapped water or capillary rise in lower section.- Cement based plasters are not compatible with lime based materials and are less permeable, hence in case it is used in the upper section, it is necessary to remove it carefully without damaging the masonry.- After cleaning the surface, a lime based plaster can be used for both upper and lower section for better compatibility and for enhanced durability, aggregates and pozzolanic additives can be added.	
<ul style="list-style-type: none">- Cleaning the stained surface using Biocidal cleaner to remove Biological growth and discoloration around the perforations.- For rust and other salty deposits, a neutral pH rust remover or poultice with clay and distilled water can be used. There is no apparent efflorescence around the holes, but it is still a good solution to extract salts, just in case.- Holes can then be filled with a suitable lime based mortar, with fine aggregates for structural voids. For smaller perforations, lime putty filler can be used for a finer finish.- final steps are using suitable lime based surface plaster and final paint finish as per aesthetic requirement.	
<ul style="list-style-type: none">- Cleaning of the surface using low pressure water washing and soft natural-bristle brush to remove surface dirt and loose particles without damaging plaster. For persistent grime in scratches areas, mild, non-ionic detergent can be used by diluting in water.- For filling and repair, lime-based filler mortar can be used which is compatible with the original plaster. For example, Hydraulic lime mixed with fine sand. The areas of scratches must be filled with small trowel or palette knife, ensuring smooth texture. To fill shallow abrasions, lime slurry can be filled in abraded areas.- Final surface finishing as per original aesthetics.	
<ul style="list-style-type: none">- Performing structural assessment using Non-destructive techniques such as; Thermograohy or ground penetrating radar to detect moisture or voids. Crack monitors to be used to assess the crack's behaviors over time.- To repair the crack, first cleaning and removal of dirt and debris is required. To fill the crack, it needs grout injection, preferably Hydraulic lime based for material compatibility. It should be injected under low pressure to stabilize internal masonry voids without creating rigid zones.- After this, the surface needs to be re done with polymer-modified lime mortar, which provides flexibility to withstand further thermal stresses. For finishing, breathable lime based plaster is suggested with paint finish to match the original aesthetics.- Conduct a structural analysis using non-invasive techniques as mentioned above.- Install carbon fiber mesh or steel helical bars across the diagonal and horizontal cracks to stabilize the masonry and restore tensile strength.- Secondly, the cleanliness of the cracks and injection of Hydraulic Lime based grout which will allow to consolidate the masonry without compromising breath-ability. In addition, Pozzolan-Enhanced Lime Grouts provides additional strength while maintaining the material compatibility of pure lime, it is a better option for filling larger voids.- For long term solution, discreet expansion joints near structural weak points may be added.	

* The degradation types and solutions continue on the next boards



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Supervisors

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Board No. 12

TERRITORIAL CONTEXT

GEOMATICS SURVEY

2D DOCUMENTATION

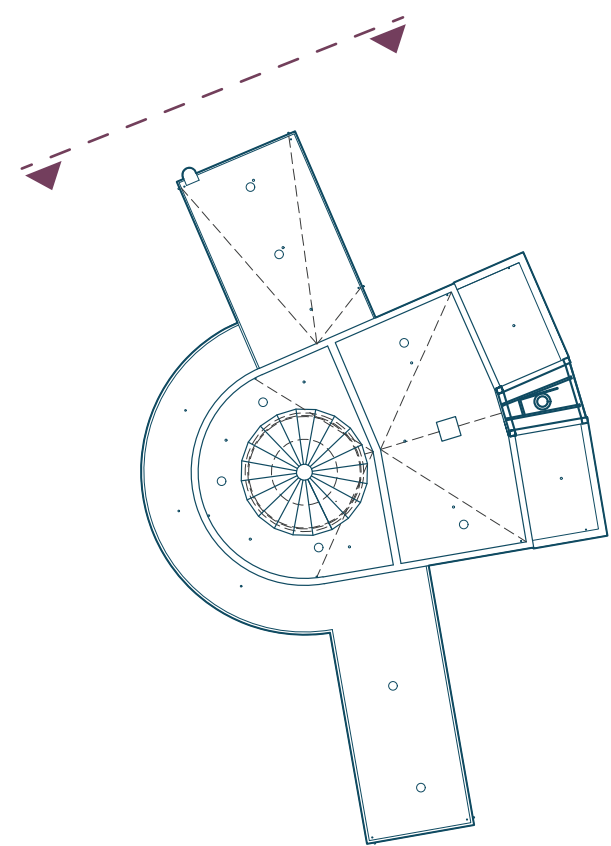
HBIM DOCUMENTATION

MATERIAL ANALYSIS

CURRENT STATE OF
CONSERVATION ANALYSIS
AND SOLUTIONS

THE PROPOSAL

The Church Building



Key Plan
Scale: 1:400



LEGEND

DEGRADATION & SYMBOLS

- Plaster change demarcation line
- Visually blocked area
- Wall Perforations
- Scratches/abrasions on paint
- Missing Element
- Medium Intensity Cracks
- Severe Intensity Cracks

Detachement

- D1 Minor - Peeling paint
- D2 Moderate - Exposed plaster

Gap (Lacuna)

- Exposed bricks due to loss of continuity of mortar and paint

Chromatic alteration

- C1 Minor - Continuous surface with tonal variations.
- C2 Moderate - Continuous surface with tonal variations.
- C3 Severe - strong discoloration stains

Chromatic Sampling

- Testing area for Paint finishes

Rising Damp

- Rising damp causing Detachment

Moisture Stains & Leakage (Colatura)

- Moisture causing detachment
- Moisture Stains due to dripping (leaking) water on surface
- Moisture Stains with Biological Colonization

Metallic Corrosian

- Corrosion on Metal columns

Biological Degradation

- Biological colonization
- Presence of Vegetation
- Microbial Growth

Superficial Deposit

- Signs of dirt and grime

NORTH FACADE

List of Materials		
Symbol	Photo	Material
		Brick Wall with plaster and paint finish
		Bituminous water-proof membrane
		Metal coping
		Wooden window frames
		Concrete Columns
		Wooden shutters
		Steel Columns
		Wooden planks

Building Services & Systems		
Symbol	Photo	Material
		Anchor points
		PVC Pipes (exposed)
		Safe-line for restoration works (hypothesis)
		Technical outlets
		Chimney

Degradation Analysis			
Pattern/Symbols	Photo	Degradation and Description	Causes
North facade windows		Missing Elements in Windows This Window (150 x 144 cm) shows similar pattern of deterioration as other windows in the north wing. Here there is visible weathering of wood with possible cracking or splitting. Paint layers are peeling or detached completely in certain areas. Glass panes are missing in the upper left and lower openings. The hardware seems to be broken exposing the interior to environmental factors. Biological growth on window sills and adjacent wall degradation	Continuous exposure to rain, wind and temperature fluctuations causing degradation of wood. Poor sealing / absence of glass has let moisture enter, accelerating wood decay, algae and moss growth. Failure of maintenance and lack of protective coating causing paint peeling. Lack of sunlight towards the north facade, worsening the moisture condition.
		Same size as W9, all the windows on ground floor are temporarily closed with wooden planks as original frame may have been deteriorated due to prolonged exposure to environmental factors or in case of missing elements like glass as in the windows on the upper floor.	Similar reasons of closure as explained for other windows closed with planks.
Moisture related		Moisture stains with biological colonization Vertical black streaks originating from the parapet area and extending downward, suggesting dripping water (colatura) and organic residue. In this case, moss patches and darkened greenish areas hint at the presence of mold or algae colonies, often caused by continuous damp conditions. In case of North Facade, there is a patch of exposed brickwork, suggesting detachment of plaster.	The lack of effective coping and drainage system in the parapet area has let water to run along the wall for long period of time. Dripping water leaves mineral residues and provides a suitable environment for algae or mold to grow. Moisture has also facilitated the growth of microorganism and black fungi. Lack of hydrophobic or protective coatings has allowed water to infiltrate and detach the plaster.
Biological Degradation		Biological Colonization Persistent degradation at the wall base with visible dark greenish discoloration, mainly at the grass-line. It shows presence of moss and algae patches indicating moisture exposure. A clear demarcation between the green-stained area and the rest of the wall indicates interaction with soil moisture. Prolonged moisture exposure has led to biological colonization.	There are multiple causes of this, firstly it is rising damp, a capillary action drawing water from the ground into plaster. Secondly, poor water drainage near the wall, or absence of DPC layer. Thirdly, the consequence of above two factors have allowed biological growth, encouraging moss, algae and fungal growth. The last factor is proximity to vegetation and soil, adding organic matter and promoting microbial colonization.
		Presence of Vegetation Plant and moss growth are visible, particularly in cracks and deteriorated plaster areas on the East and North facade. Vegetation appears to root within openings in the brick or mortar joints. Moisture and organic matter accumulation are evident, facilitating biological colonization and damage to the structure	Existing cracks and voids in plaster or masonry provide entry points for plant roots to anchor. Poor maintenance of parapet or coping above allows water infiltration, encouraging vegetation. Prolonged dampness, insufficient drainage, insufficient exposure to sunlight and absence of biocidal or hydrophobic coatings are all the factors allowing the growth of vegetation.
		Microbial Growth This is only apparent on the north facade. The irregular pattern of dark and light spots are the characteristics of microbial growth. Areas of surface erosion likely caused by reduced sun exposure and poor drainage on the north facade. This type of degradation is linked to chemical damage of the cementitious material such as production of organic acids, sulfuric acid or other compounds which degrade the material.	Damp environment of the surface promoting microbial growth causing chemical damage to the surface. Porous surface of plaster retaining water. Lack of maintenance and accumulated organic matter and environmental pollutants on the surface contributing to soiling and discoloration.
Surface Degradation		Metallic Corrosion Uniform rusting across the surface of the columns. Visible dark orange and brown streaks are characteristics of advanced corrosion. Seems the columns can be structurally compromised due to neglected corrosion and advanced oxidation.	Absence of anti corrosive finish, leaving steel exposed. High humidity and temperature fluctuations, coupled with rain exposure and ground moisture are promoting corrosion. Aging of material can be another reason of deterioration as columns from 1932 have exceeded their protective lifespan. Lastly, poor water drainage / slope of the pavement also leaves the columns in direct contact with water accelerating rusting.
		Superficial Deposit In the corners of roof and wall joints, under the ambulatory ceiling, there are visible deposits of dirt, animal excretion, nesting material or pollutants causing dark marks on the finishes. There seem to be the spider webs as well. These deposits are non biological in nature but result from the presence of animals or insects.	Spiders, or other insects using corner for shelter, depositing organic material like webs, egg sacs or droppings. Since the area is protected from direct sunlight, it is an ideal place for animal colonization. In addition, with winds, there is accumulation of dust and grime causing spots on the surface. Lack of regular cleaning has left long term marks on the finishes.

Solutions & Interventions	
<ul style="list-style-type: none">- Removal of moss, algae, and dust with a solution of water and mild detergent. A biocidal treatment is needed for preventing regrowth of moss.- The original and the added wooden frames need to be examined for structural soundness and checking insect infestation or rot. The temporary metal mesh maybe removed for further restoration treatment of the window.- Epoxy wood consolidant can be applied to a mild decay of wood for consolidation. Crack and gaps in wood to be filled with wood fillers. Then any existing surface finish must be removed and the primer should be applied for moisture and weather resistance. Paint the surface using oil based paint and then glass maybe added according to the requirement.- Planks should be disassembled with care and the original situation of frames should be analyzed before any intervention. If the planks need to be maintained for a long time, then the maintained of these planks is necessary as they appear to be weathering already with constant exposure to environmental factors.- The biological growth on the sill needs urgent addressing as it can cause decay also in the rest of the elements of the windows. - The process is already explained in other cases.	
<ul style="list-style-type: none">- Using soft brushes or low pressure water jets to clean off moss and algae deposits, without damaging the intact plaster.- application of bio-cleaning solution to kill existing biological growth and prevent regrowth. Using biocide with low VOC (such as QACs, or Hydrogen peroxide) for removal and further growth.- Degraded plaster should be removed and replaced with new plaster matching with the old one. Lime based grout or mortar should be used to seal cracks and prevent water infiltration.- Hydrophobic coating maybe applied to the exposed brick or plaster to reduce moisture penetration.- Improved coping and/or drip edges to improve the drainage situation of the area.	
<ul style="list-style-type: none">- Using biocides (as mentioned above) to remove existing moss algae and fungi.- Injecting a silane-siloxane based damp proofing treatment into masonry to block rising damp.- Installation of drain near the perimeter walls or improving the slopes of the pavement to avoid direct water contact/ accumulation with the walls.- Application of hydrophobic coating as explained earlier.- Removing vegetation / plant growths near the base to limit organic deposits and root related damage.	
<ul style="list-style-type: none">- Carefully removing vegetation manually, ensuring roots are completely extracted to prevent regrowth. For deeper roots, inject herbicide into the root system to kill the vegetation while avoiding damage to substrate.- Applying biocidal treatment after root removal to kill residue organic matter.- Sealing of cracks and joints with a compatible mortar to restore wall surface.- Replacing degraded plaster with breathable plaster to ensure compatibility.- The rest of the solutions are same as those for biological colonization.	
<ul style="list-style-type: none">- Treating the surface with biocides to neutralize microbial activity.- Application of ammonium-based or hydrogen peroxide solutions to remove stains caused by microbial byproducts.- Preference should be given to Bio based cleaning agents with bio active molecules which are environment friendly- Application of hydrophobic coatings.- Improvement of drainage and reducing surface exposure to standing moisture to minimize recurrence.	
<ul style="list-style-type: none">- Use of wire brushes or sandblasting to remove loose rust and prepare the surface for treatment. Chemical cleaning can also be used for rust removal (such as phosphoric acid). They also stabilize the surface.- For corrosion inhibition, anti corrosive coatings maybe applied. The primer with zinc-rich formulations to protect the steel from further oxidation to be applied first, and then covering the primed surface with epoxy based topcoat for long term corrosion resistance.- Enhancing the drainage and assessing the structural stability of the columns for long term solutions.	
<ul style="list-style-type: none">- Use of soft brush or vacuum to remove spider webs, nests or animal deposits without damaging the surface.- They should be dry cleaned as using water can damage the finishes and the organic matter may cause staining.- Check the area for physical / superficial damages caused by animal activity, such as micro cracks or detachment, and repair those areas.- As the finishes of the overall surface of Ambulatory has multiple detachments and chromatic alterations, it needs to be re plastered/ finished again.- Using non-toxic, water based insect repellents suitable for building surfaces can help deter re colonization.	





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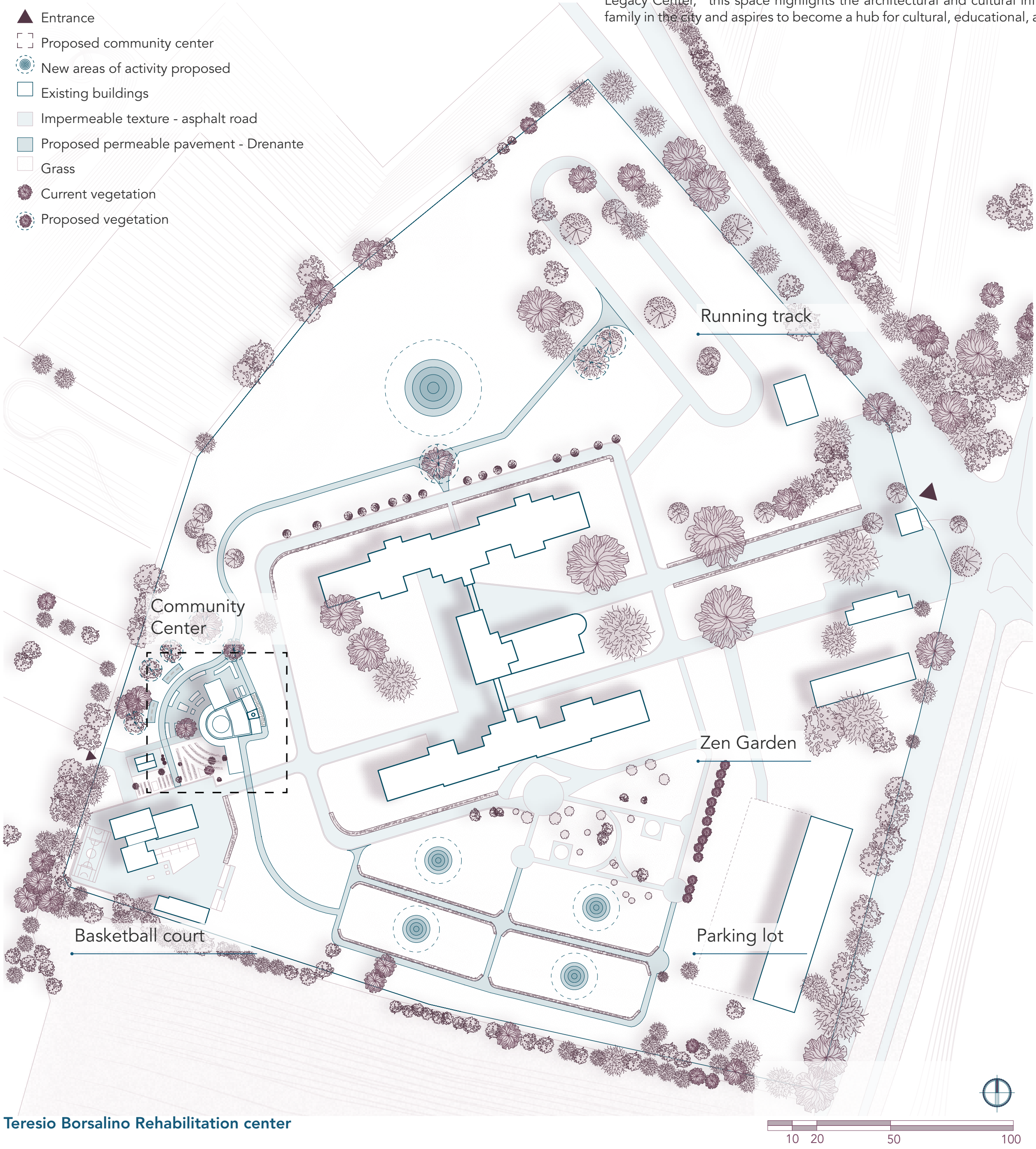
Legacy Center as a design proposal

Documenting a heritage building is crucial not only because it aids in its preservation but also because it encourages us to envision new potential uses for the structure. In this context, the Gardella Church requires a redefined function, as its former role no longer aligns with the needs of its contemporary environment. By endowing the church with renewed significance, its active utilization is promoted, thereby ensuring its sustained upkeep.

Master Plan - Teresio Borsalino Presidio intervention

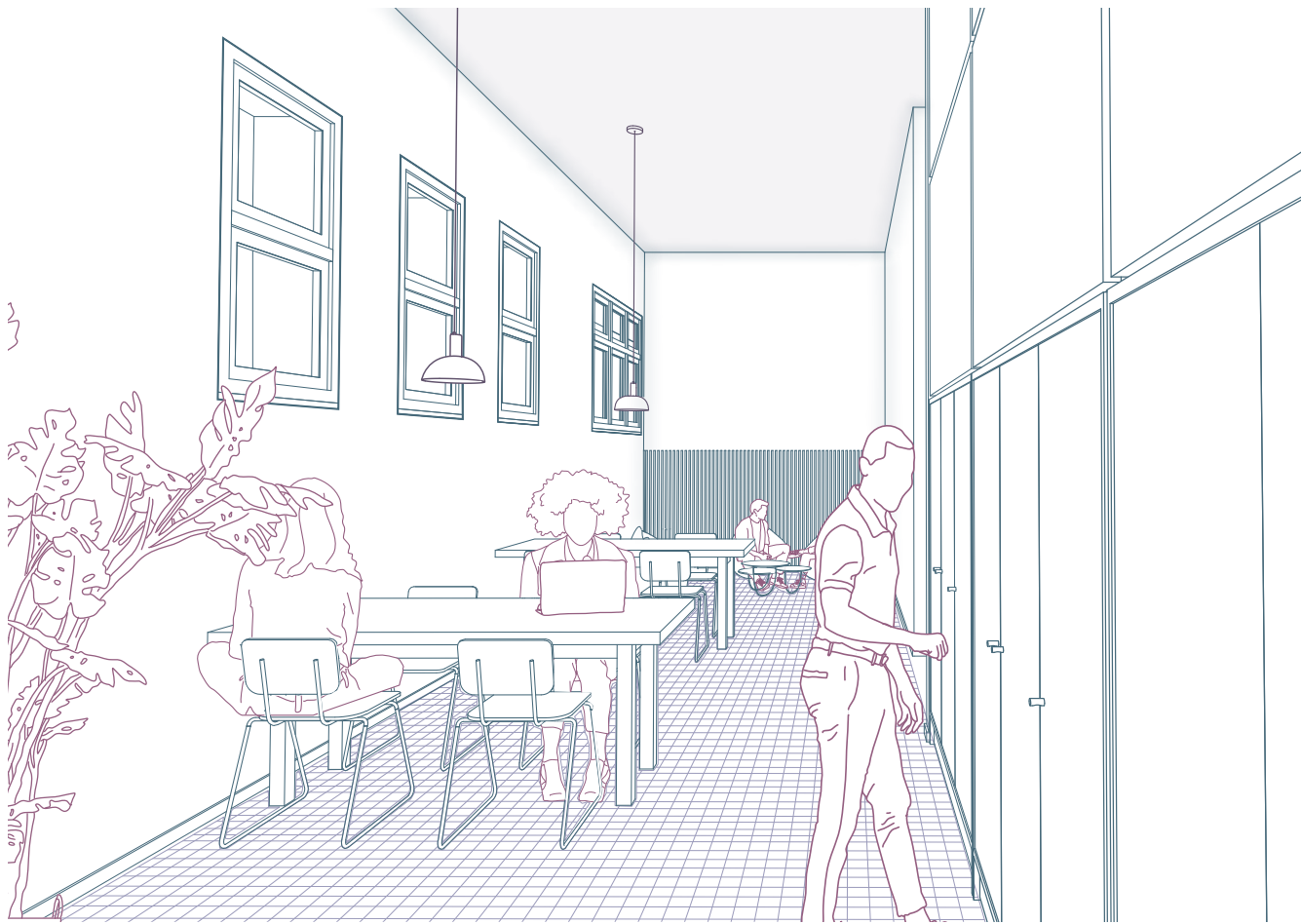
The master plan for the Teresio Borsalino complex is designed to create attractive spaces that complement the facility's operational requirements. Currently, the complex features two sports areas, and a Zen area is under development. Consequently, the proposal includes the creation of an additional activity zone and the revitalization of the area surrounding the church

- Entrance
- Proposed community center
- New areas of activity proposed
- Existing buildings
- Impermeable texture - asphalt road
- Proposed permeable pavement - Drenante
- Grass
- Current vegetation
- Proposed vegetation



Teresio Borsalino Rehabilitation center

Collaborative Workspace



Ignazio Gardella church Intervention

The proposal aims to re-signify the Church of Ignazio Gardella, preserving its historical value while integrating it with contemporary needs to ensure its continued use. It envisions transforming the church into a publicly accessible community center, keeping Gardella's legacy—an essential figure in Italian architecture and Alessandria's urban development—open to all. Named "The Legacy Center," this space highlights the architectural and cultural influence of the Gardella family in the city and aspires to become a hub for cultural, educational, and reflective activities.

Cold Kitchen - Coffee room

