



POLITECNICO
DI TORINO

Dipartimento di
Architettura e
Design

Master in Architecture for
Sustainability
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Thesis Title

**Gardella's Lost Legacy:
The Church of Alessandria.**

Study, 3D documentation and
Analysis

Students

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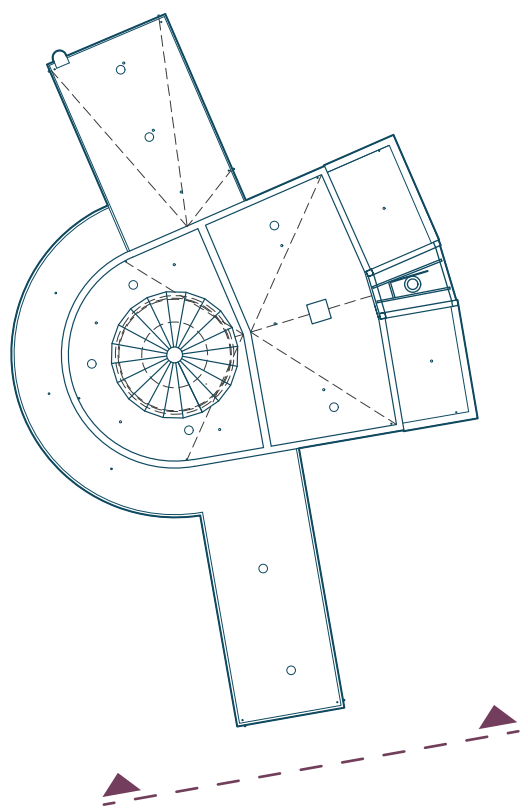
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Board No. 10

- 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 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

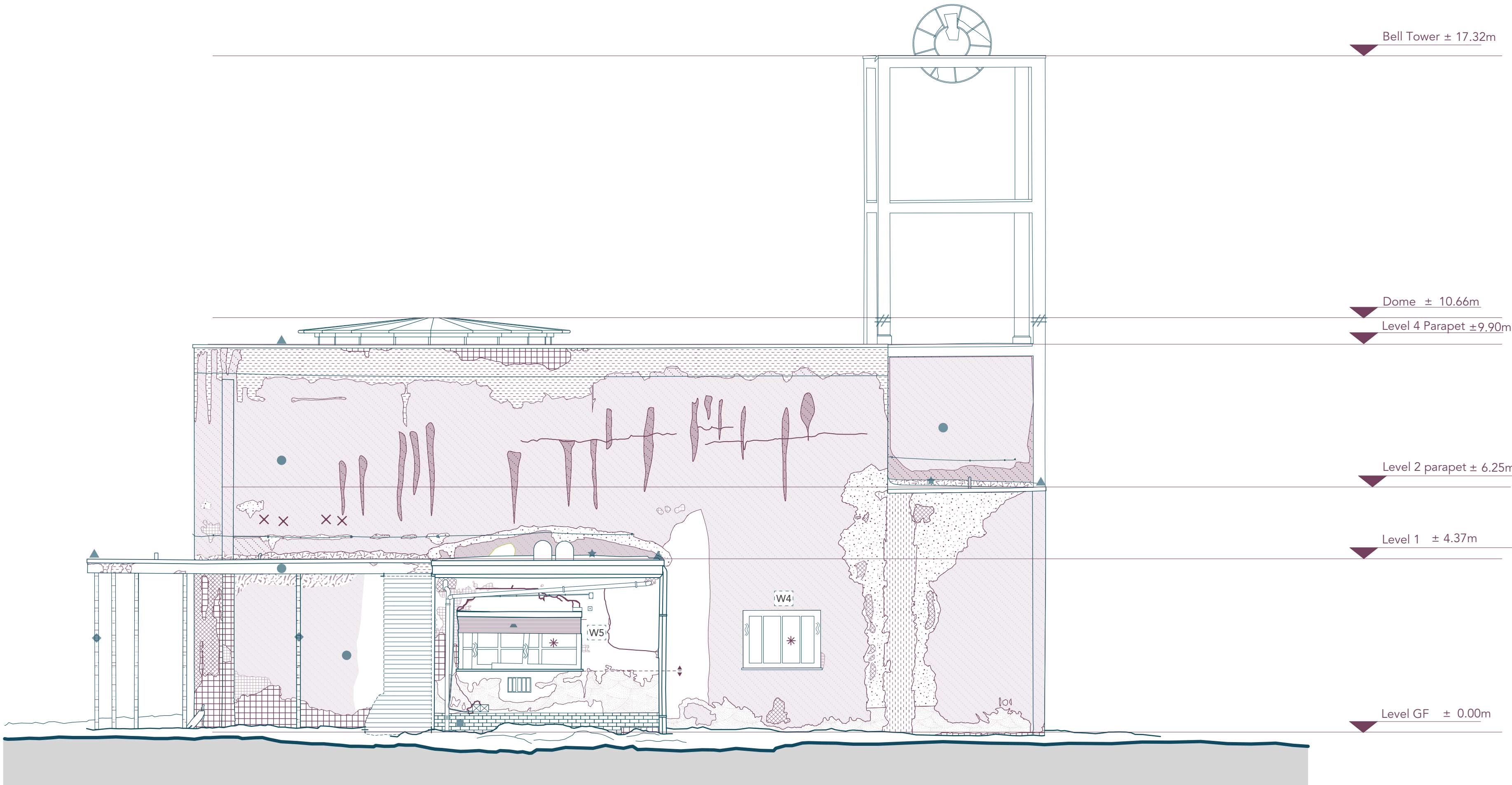
- Corrosion on Metal columns

Biological Colonization

- Biological colonization

Superficial Deposit

- Signs of dirt and grime



South Facade

1 2 5 10

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.
- Underlying 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