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Dom Hans van der Laan

Analysis

A matter of scale

Methods of Analysis &
Imagination
Graduation studio



St. benedictusberg Abbey
Personal photograph taken in the
St. benedictusberg Abbey

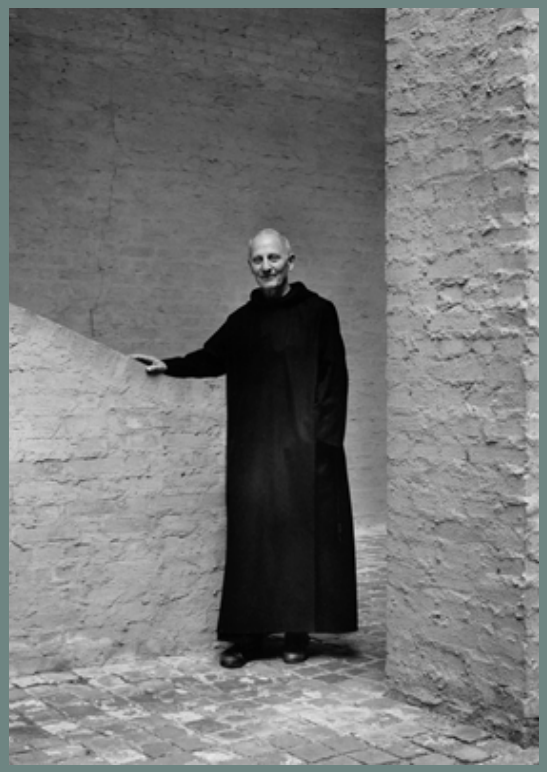
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Dom Hans van der Laan (1904–1991) was a Dutch Benedictine monk and architect. Despite initially studying architecture at Delft University, he was concerned about contemporary architecture and left his secular life in 1927 to join a convent.Inside the cloister, he made his most significant discovery: the Plastic Number. Unlike the well-known Golden Ratio, which operates in two dimensions, Van der Laan's approach is a three-dimensional mathematical ratio based entirely on how the human mind perceives sizes and spatial proportions.

Because of his monastic commitment, Van der Laan built very little during his lifetime, yet his few completed works are legendary. His undoubted masterwork is the St. Benedictusberg Abbey in Vaals, Netherlands, which exemplifies his architectural ideology. This design serves as a physical refuge that bridges the gap between mathematics, raw materials, and the human spirit.

Theoretical Framework

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1.1 Plastic number

Unlike the Golden Ratio, which is rooted in the geometry of the natural world, the Plastic Number is derived from human spatial perception. We comprehend space by relating it to tangible elements; for example, the width of a room can be instinctively defined by the number of floor tiles stretching across it. Van der Laan observed that while we measure when dimensions vary, we count when confronted with identical, repeating parts.

The Plastic Number serves as a tool to help the observer mentally measure and grasp a space. To establish this system, Van der Laan had to determine the minimum threshold at which the human eye can easily differentiate between two distinct sizes. He discovered this fundamental ratio to be 3:4.

Similarly, he defined the 1:7 ratio as the maximum limit at which two elements still maintain a dimensional relationship. Beyond this threshold, the connection is lost; within it, the elements achieve what he termed “nearness”, a state of spatial harmony where objects distinctly belong to one another.

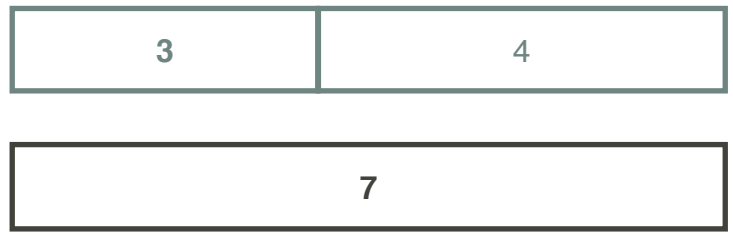


figure 1.1 plastic number
illustration of the plastic number ratio

Roosenberg Abbey Entrance



figure 1.2 plastic number example
Illustration of how the plastic number is applied to the entrance of the Roosenberg abbey.

1.2 Proportional System

The Plastic Number defines a sequence of values spanning from 1 to 7, with each step increasing in size by the constant ratio of 3:4. This mathematical progression yields a scale of eight primary values that architects can use to compose harmonious forms, a sequence Van der Laan called the authentic order of size (represented by the green bars on the right).

To expand design possibilities without disrupting this spatial harmony, Van der Laan introduced a secondary scale: the derived values. Each authentic measure is paired with a corresponding derived measure, calculated at exactly 6/7 of the authentic value. By interleaving these two sets of numbers, the system provides a richer, more flexible palette of proportions while maintaining a strict, cohesive rhythm throughout the architecture.

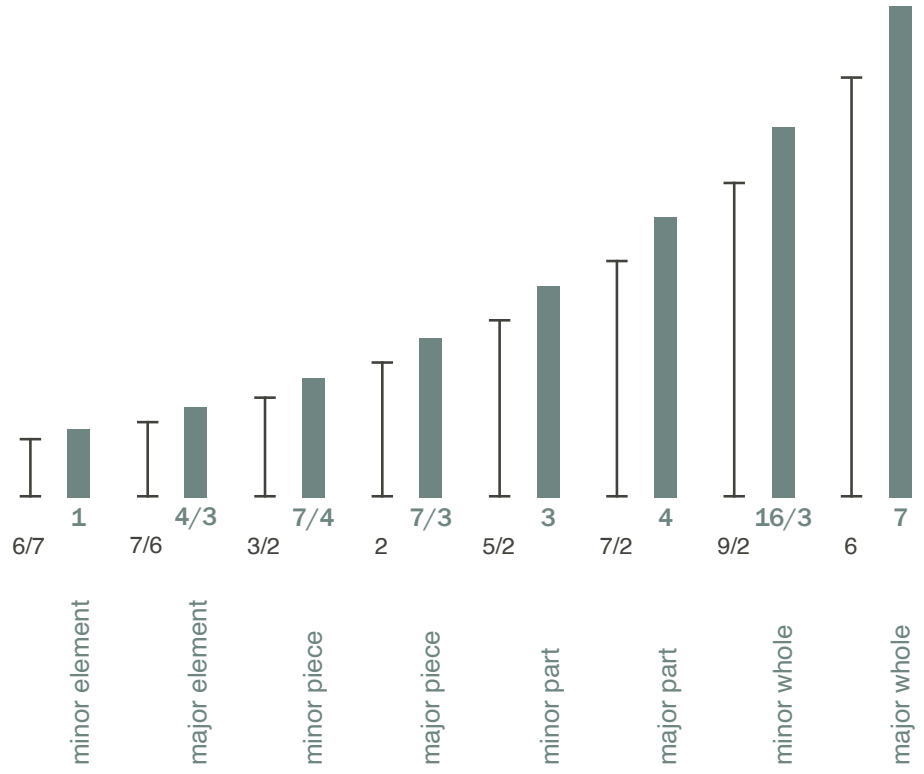


figure 2.1 proportional system
proportions are porportionally increased in size in steps of 3:4, with the biggest difference of 1:7

1.3 Orders

Dom Hans van der Laan structured the architectural design process around a nested hierarchy of four spatial scales, or “orders.” Moving from the largest macro-scale down to the smallest micro-detail, these nested layers are: the domain, the court, the cell, and the wall.

As illustrated on the right page, these distinct orders can be organized and configured in multiple different ways depending on how they relate to one another. For example, a single small order can be nested perfectly in the center of a larger one to create an inward focus, or it can be pushed to an asymmetric corner to maximize the remaining open area.

Furthermore, as shown in the lower two diagrams an array of individual wall or cell orders can be arranged into a continuous square configuration. By linking these smaller elements along a perimeter, the architecture establishes a rhythmic border that encloses and defines a larger central courtyard.

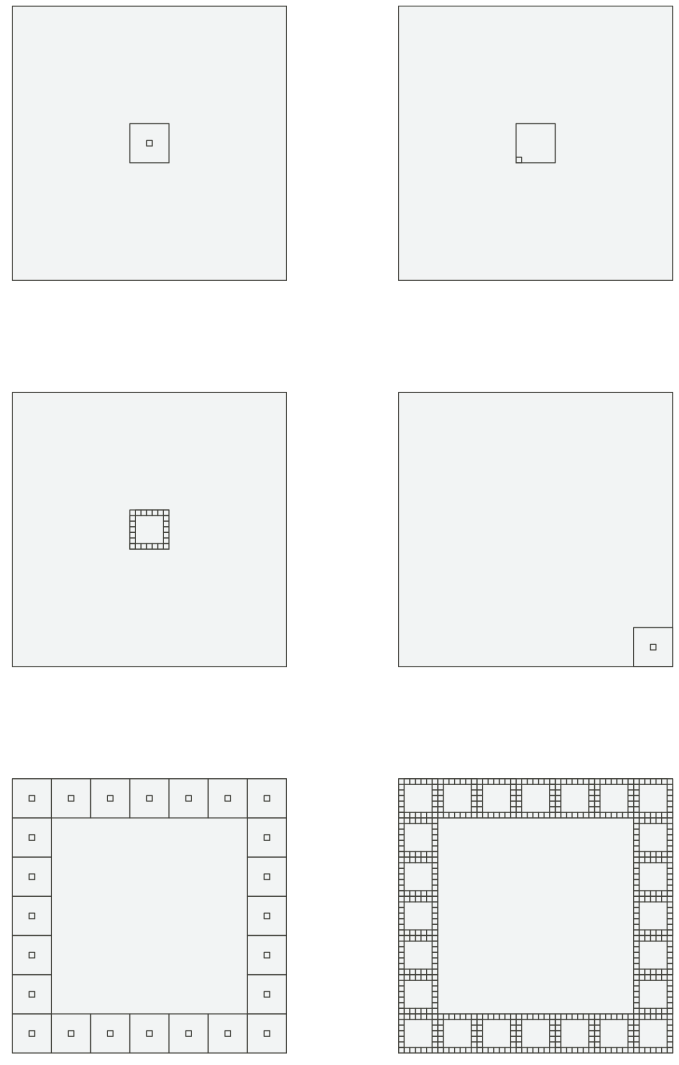


figure 3.1 arragnments of domain, court and cell
the differen orders can be arranged in multiple different ways and are related to each other with a maximum difference of 1:7

1.4 Measurement system

Van der Laan synthesized his theories of spatial orders and proportions into a concrete, project-specific measurement system for every building he designed. Rather than relying on standard commercial metrics, each project received its own tailored dimensional grid that accounted for every single measurement within the domain.

To initialize this system, the architect must first establish a single base value. In Van der Laan's practice, this determining factor is almost always the wall thickness of the project.

Once this initial dimension is set, the entire building generates itself outward. The wall thickness serves as the unit value (1/7), and through the 3:4 ratio, unlocks the scale of the eight authentic and derived measures. This localized matrix is then used to dictate the dimensions of every column, room, courtyard, and plot boundary, ensuring that the entire physical structure is bound together by a single, unified DNA.

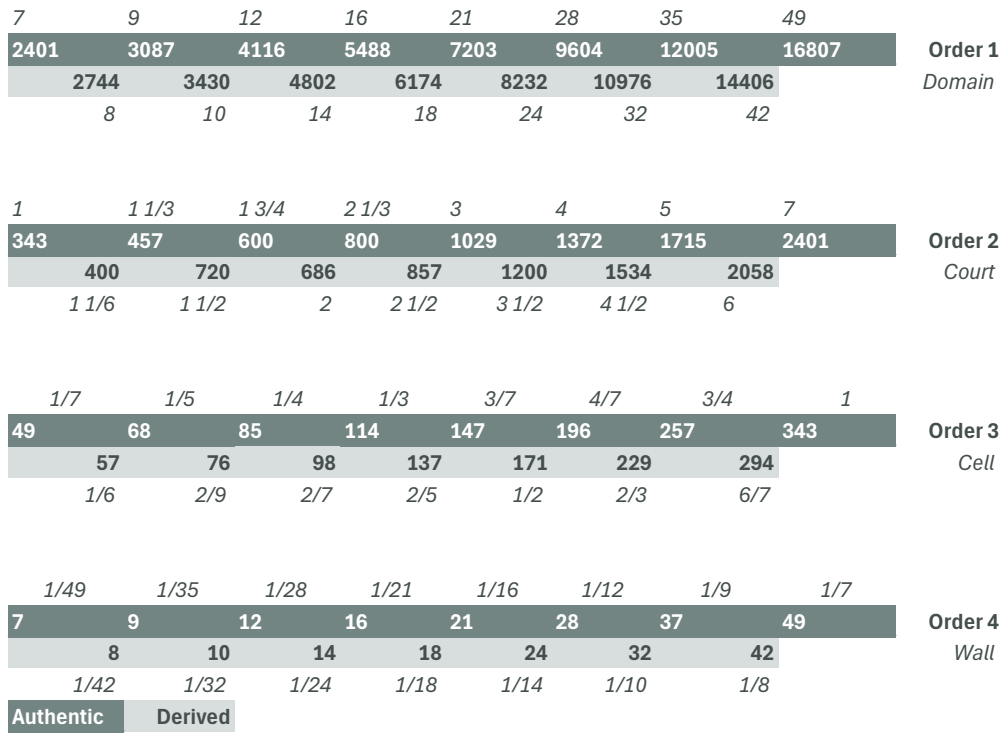


figure 4.1 Measurement system example
Measurement system based on a wall thickness of 49 cm (1/7 vlaue), which influences the dimensions accross the orders

1.5 Column spacings

To introduce openings and create a rhythmic flow within a wall, Dom Hans van der Laan developed two distinct methods, the first of which relies on a system of five column spacings.

These specific intervals are directly derived from the bay rhythm, the heart to heart distance between columns. Instead of treating columns as arbitrary objects, the physical width of each column is precisely scaled according to its mathematical relationship to this overarching bay rhythm.

When working within this system, forcing elements onto a grid is not the priority. For instance, if a design calls for smaller windows on an upper floor, the centerlines of those upper windows might not perfectly align with the centers of the larger window openings or columns directly beneath them. However, because every part is independently bound to the exact same Plastic Number proportions, the facade never feels chaotic. The structure inherently maintains its visual balance and organic equilibrium, proving that mathematical harmony runs deeper than mere vertical alignment.

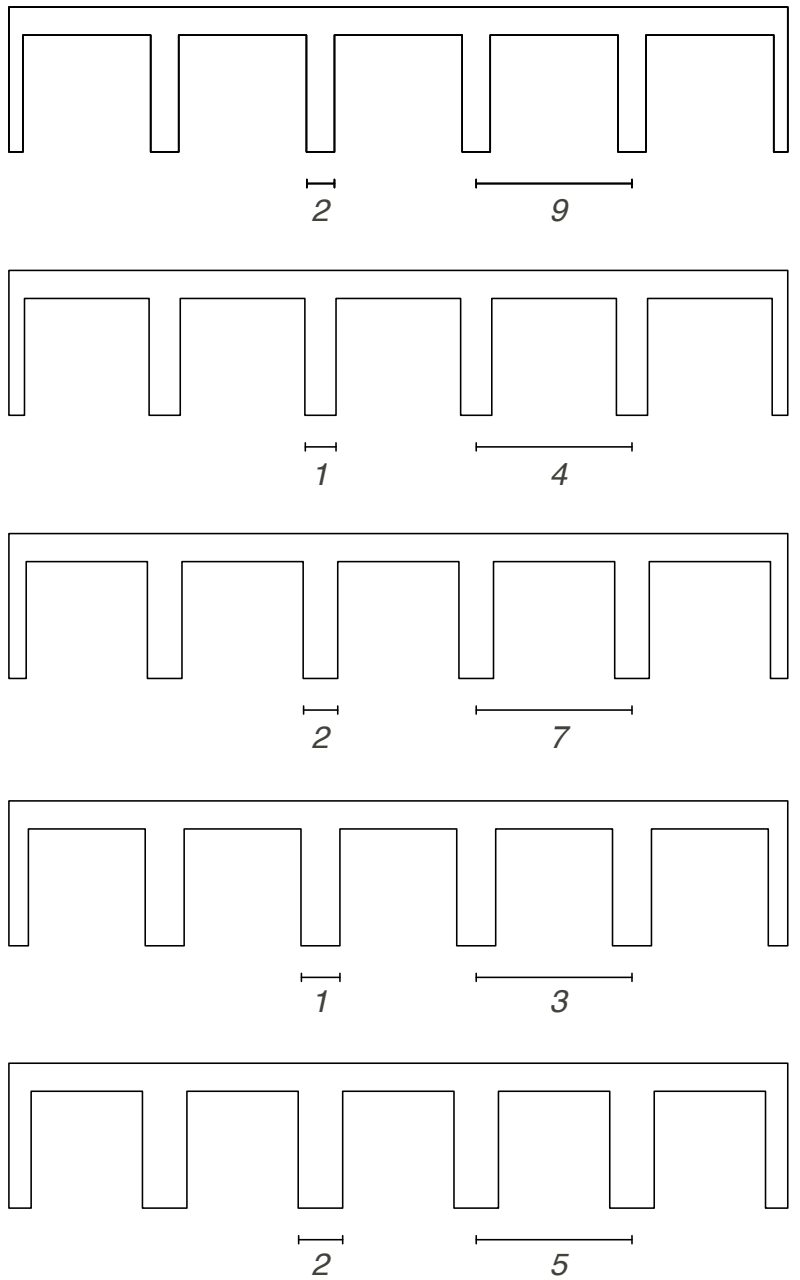


figure 5.1 Column spacing
Options of column spacing according to van der laans proportional theory.

1.6 Window openings

The second system consists of five window arrangements. Within Van der Laan's philosophy, a window is fundamentally conceived as a void, a clean puncture or "hole" within a solid wall, rather than an assembly of structural piers and lintels that build the wall up.

Just like column spacings, the scale of a window opening is mathematically compared to the baseline bay rhythm. However, because they are perceived as entirely different architectural elements, windows follow a distinct set of proportions than columns. Columns are active, load-bearing masses that physically shape and define the wall, whereas windows are passive apertures that puncture it. By calculating window voids through their own distinct subset of Plastic Number ratios, the wall retains its massive, protective presence even when opened up to light.

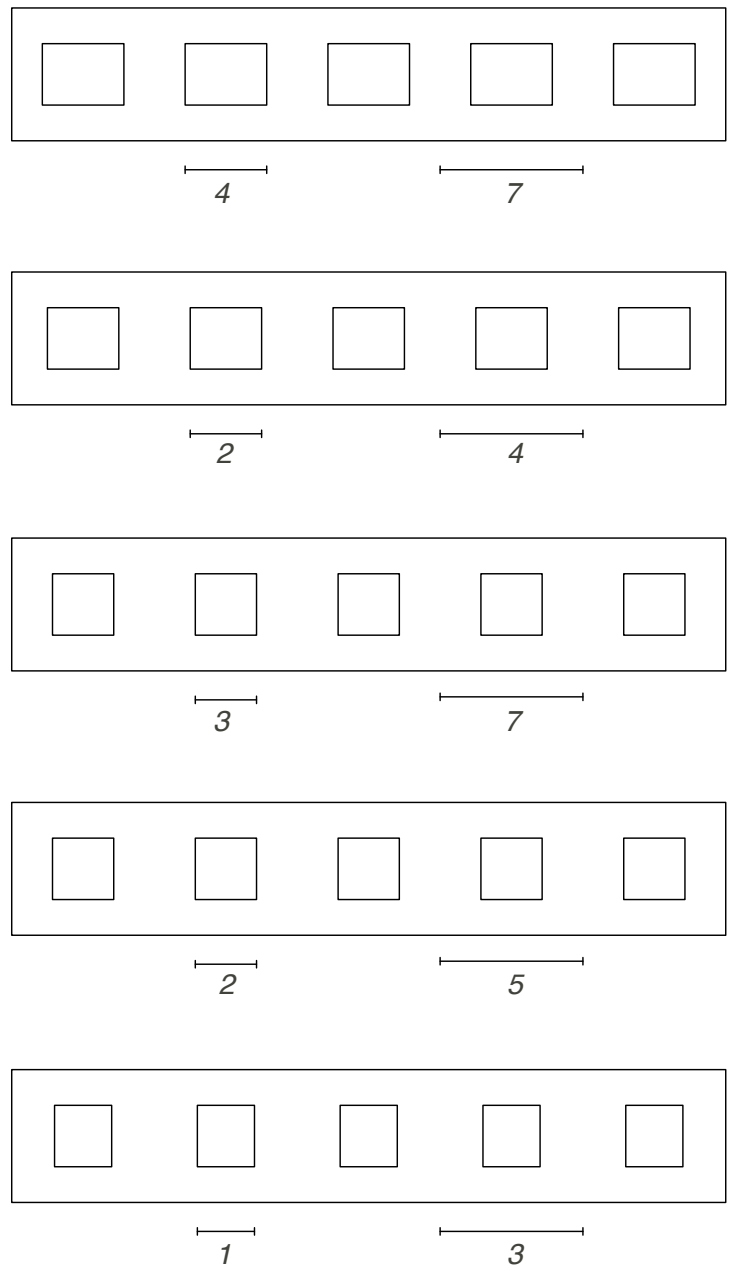


figure 5.1 Wall openings
Options of wall openings according to van der laans proportional theory.

1.7 Superposition

In Van der Laan's system, the maximum width of any given room is strictly bound by the thickness of its enclosing walls. The moment a space becomes wider than seven times its wall thickness, it breaches the threshold of "nearness."

To overcome this limitation and design expansive rooms without losing spatial cohesion, Van der Laan introduced the concept of superposition. This technique inserts intermediate thresholds into a large room. These thresholds act as "transparent walls," where the width of the smaller zone effectively establishes a new, larger baseline to calculate the dimensions of the broader space.

In practice, these internal boundaries can be defined by subtle changes in ceiling height, shifts in floor material, or the introduction of a colonnade. For example, a solid exterior wall's thickness determines the maximum width of a side aisle or colonnade. The width of that colonnade then acts as a new "virtual wall thickness," which in turn mathematically unlocks a much wider central nave. By layering these proportions on top of one another, even the most monumental spaces remain anchored to the human scale.

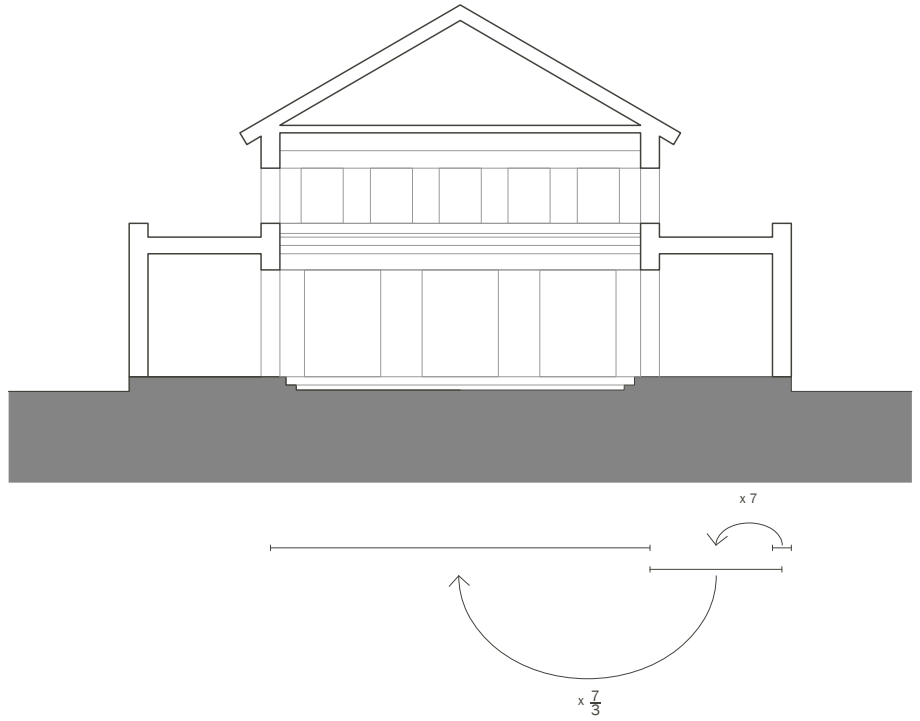


figure 7.1 Superposition illustration
the thickness of the wall is superimposed on the gallery, which is in turn superimposed on the nave

1.8 Juxtaposition

While superposition works to layer individual elements into a single, interconnected whole, juxtaposition is employed to clearly define the boundaries between spatial units. Instead of blending spaces together, juxtaposition focuses on sharpening their individual identity

By placing architectural elements side-by-side rather than nesting them, their autonomy is completely preserved, even as they contribute to a larger, unified composition. Van der Laan identified the octagon as a primary manifestation of this principle. Unlike a circle, which creates a continuous, unbroken curve, an octagon is formed by the deliberate positioning of separate, flat wall segments. Each wall maintains its independent direction, yet together they unite to frame a singular interior space.

Ultimately, the use of juxtaposition ensures that a building is not perceived as an overwhelming, undifferentiated volume. Instead, it is experienced as a rhythmic collection of distinct yet harmonious spaces, allowing the inhabitant to grasp the architecture through a clear, sequential encounter with its parts

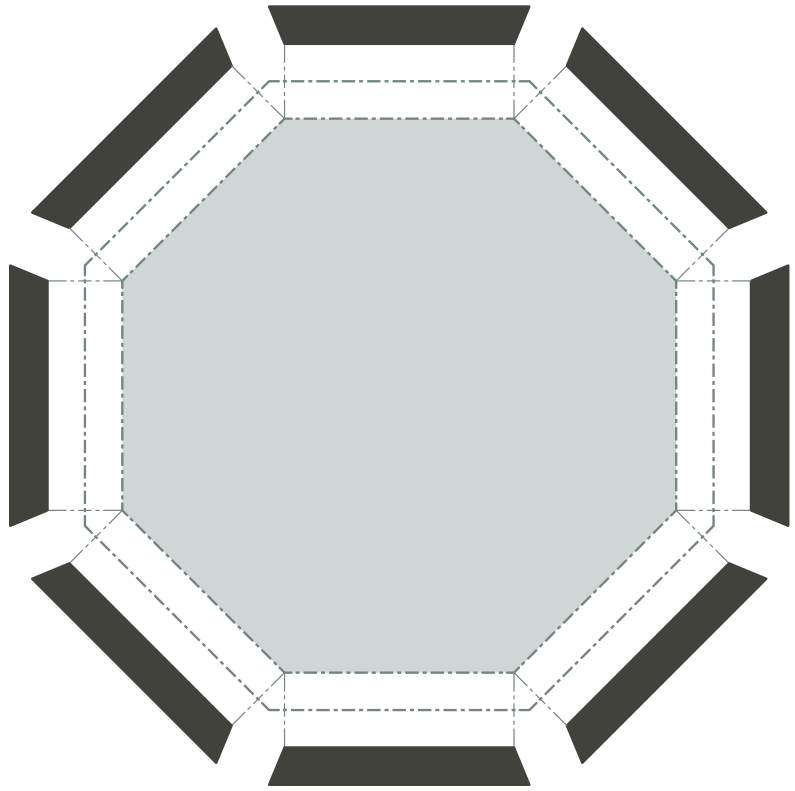


figure 7.1 Juxtaposition illustration
Juxtaposition created by arranging autonomous, discrete wall segments (black) to define a singular interior volume (blue)

1.9 Light

Light serves as a vital instrument for accentuating thresholds within Van der Laan's designs. By deliberately contrasting a darker, compressed space with a highly luminous one, he demarcates separate architectural zones. This sharp interplay of shadow and illumination clarifies the individual identity of each room while visually reinforcing the underlying proportional logic of the floor plan.

Furthermore, light functions as a guiding force in his spatial strategy. By orchestrating a sequential journey where dim, transitional thresholds consistently open up to brighter, more expansive volumes, Van der Laan establishes an intuitive sense of routing. This sensory narrative naturally directs the inhabitant through the architecture, transforming the simple act of moving from one room to the next into a clear, rhythmic experience.

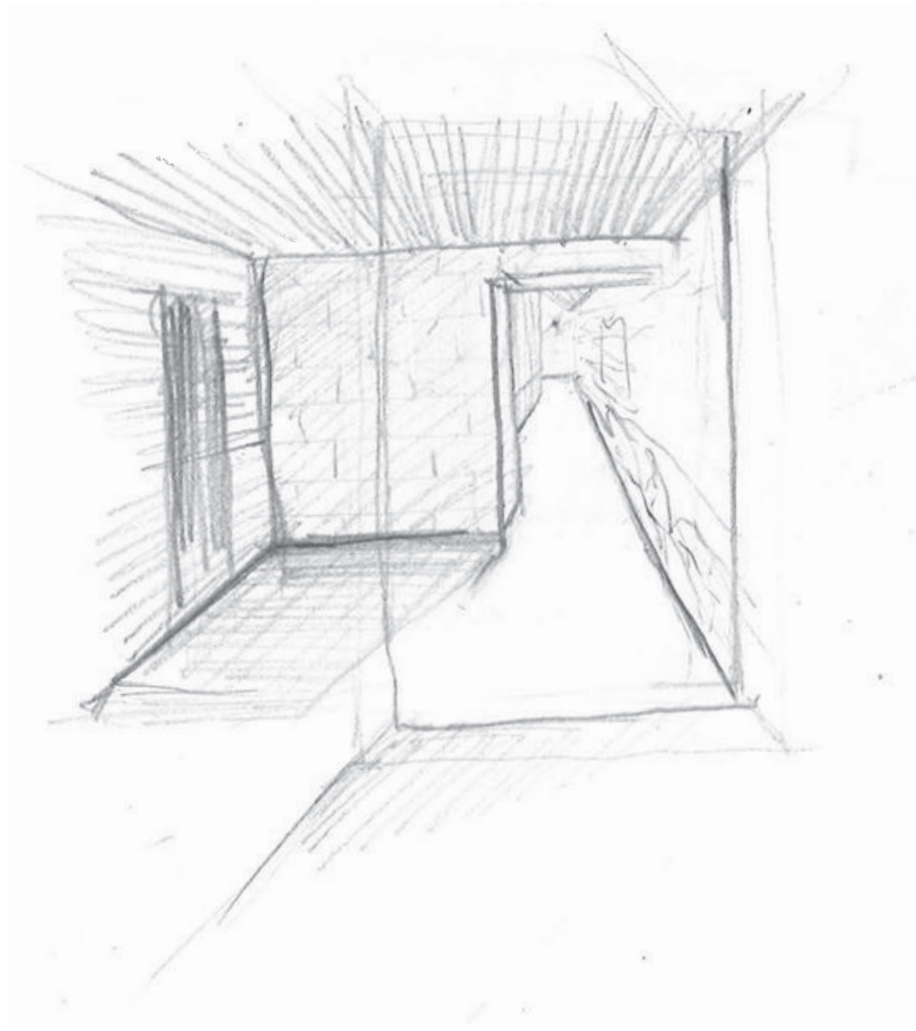


figure 8.1 Light as a guide
A dark transition zone leading to a brighter space, guiding the visitor towards the main spaces.

Case study Analysis

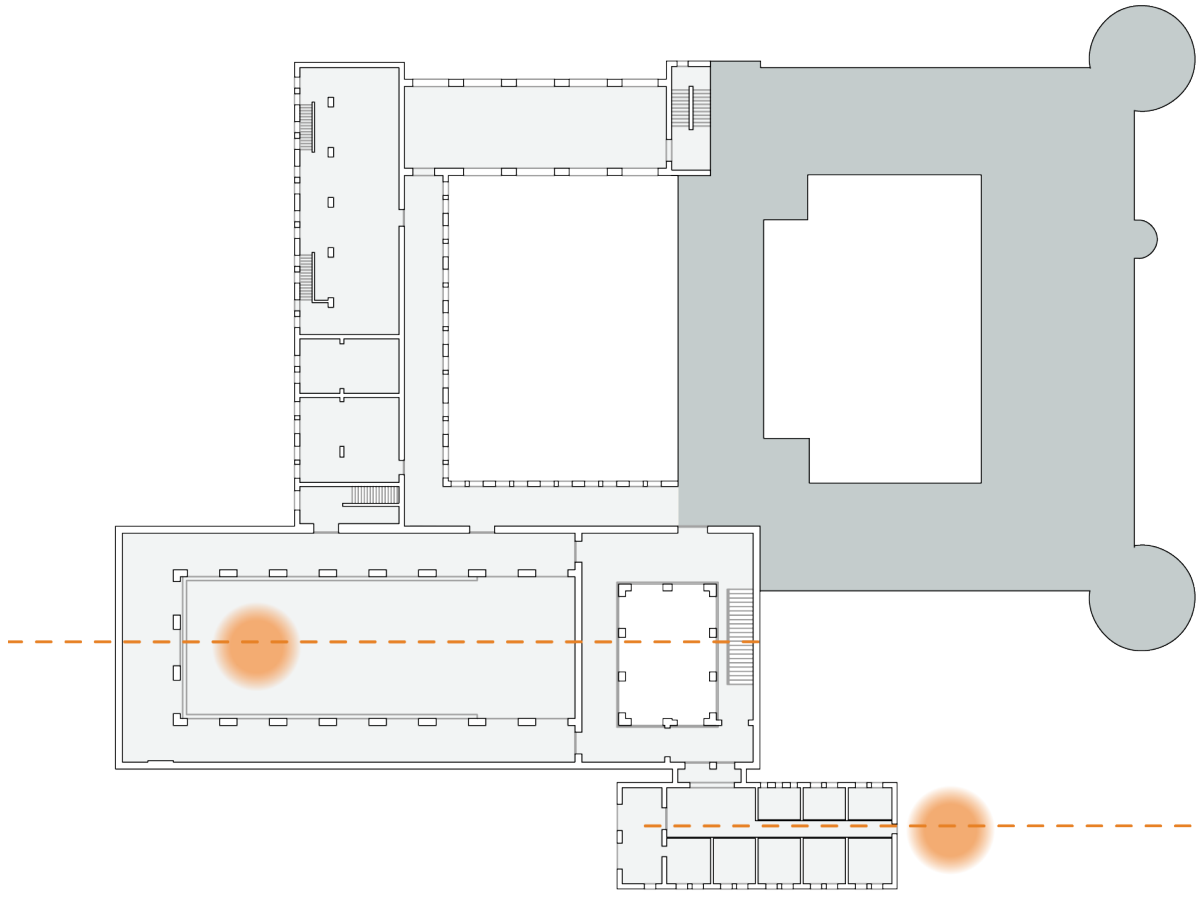
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2.1 St. benedictusberg Abbey
2.2 Jos Naalden’s house
2.3 Roosenberg Abbey
2.4 Church Martinique

2.1 St. benedictusberg Abbey



Entrance to the Abbey



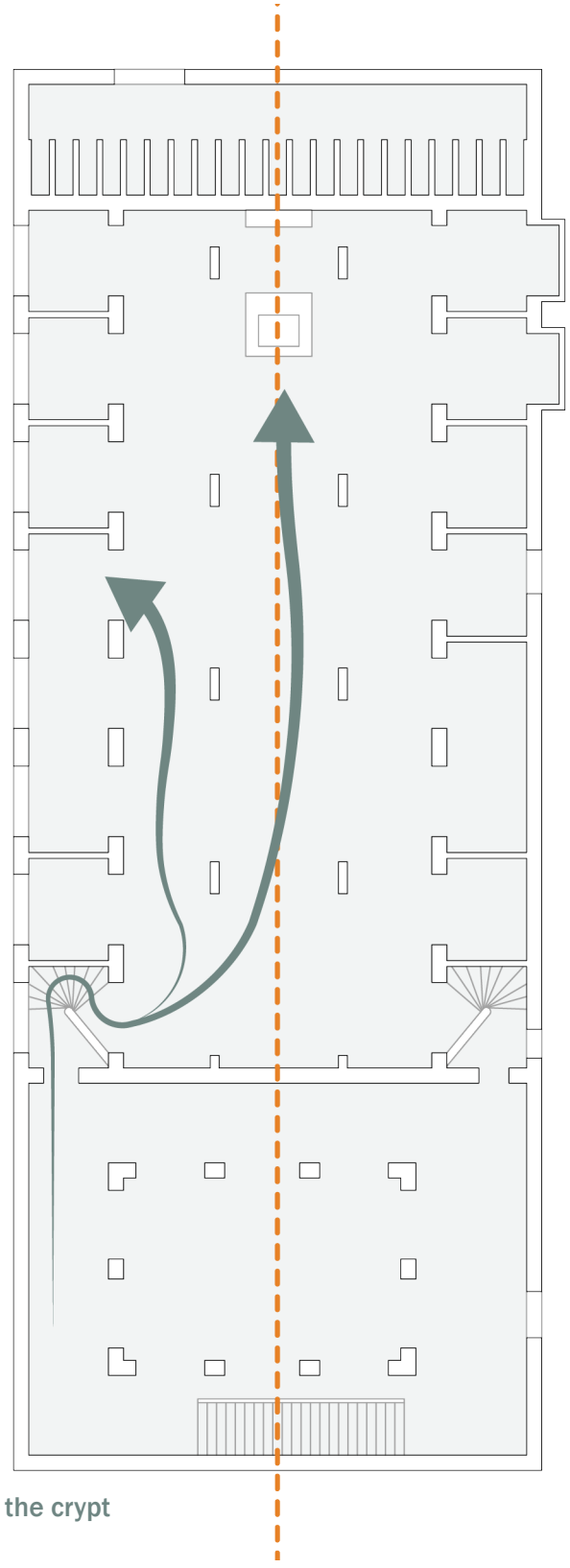
Floorplan of the Abbey



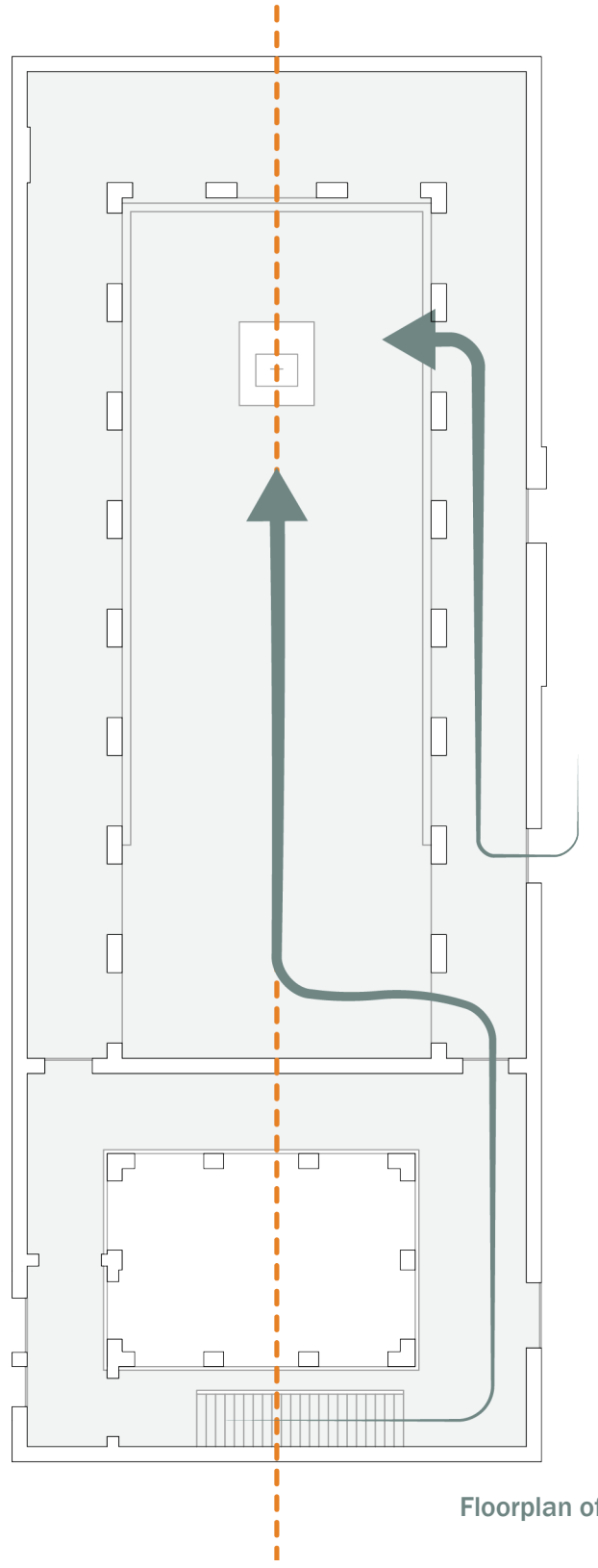
Crypt interior



Church interior



Floorplan of the crypt



Floorplan of the church

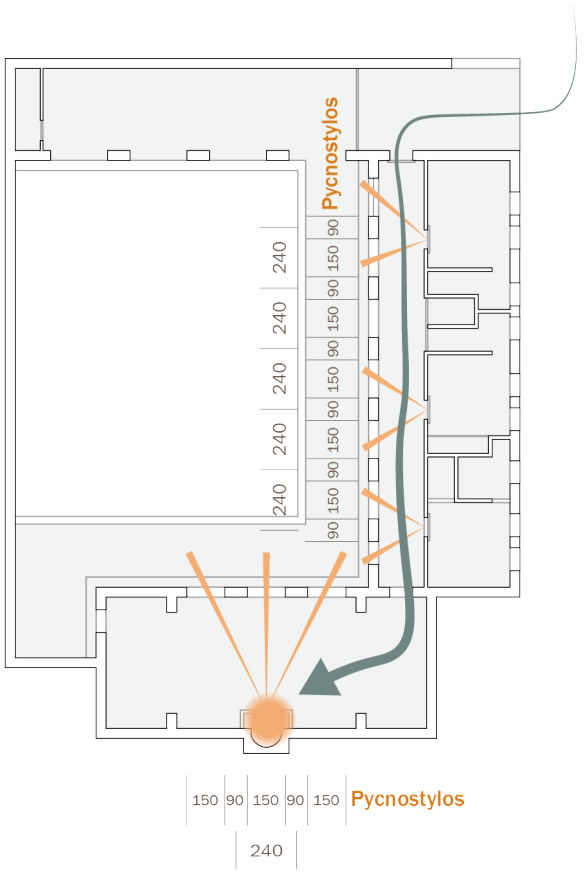


Stairs in the courtyard

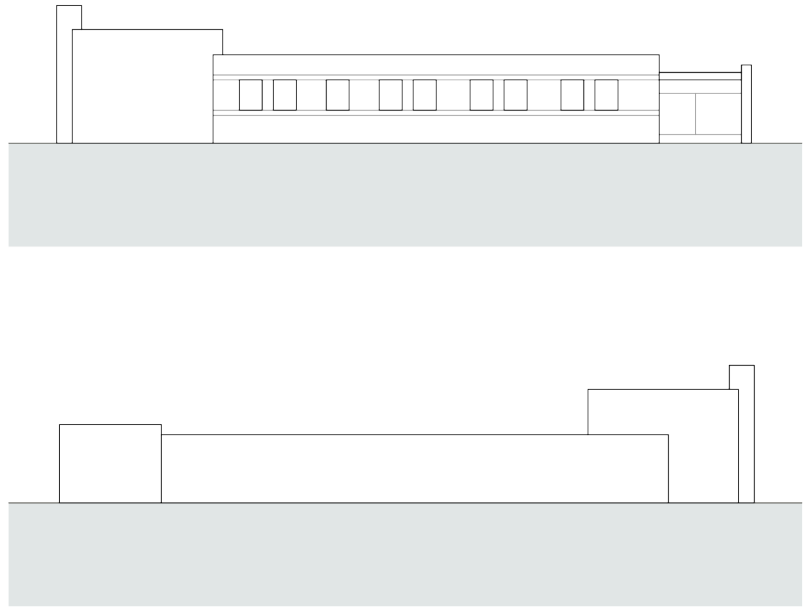


Light in the church

2.2 Jos Naalden’s house

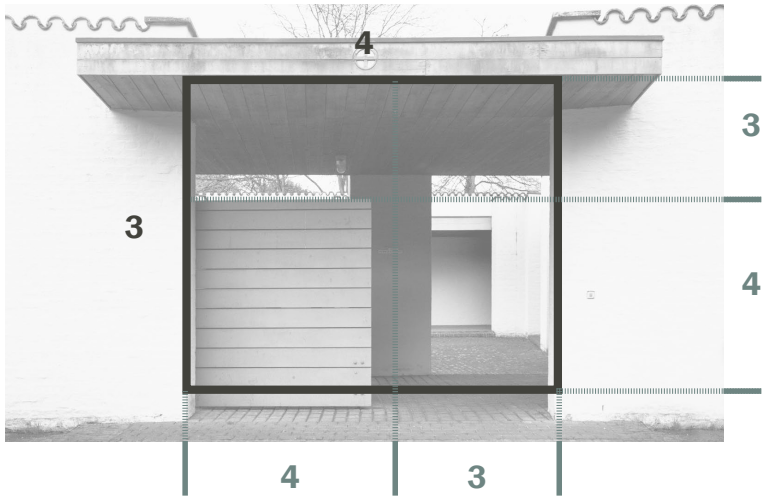


Floorplan of the house

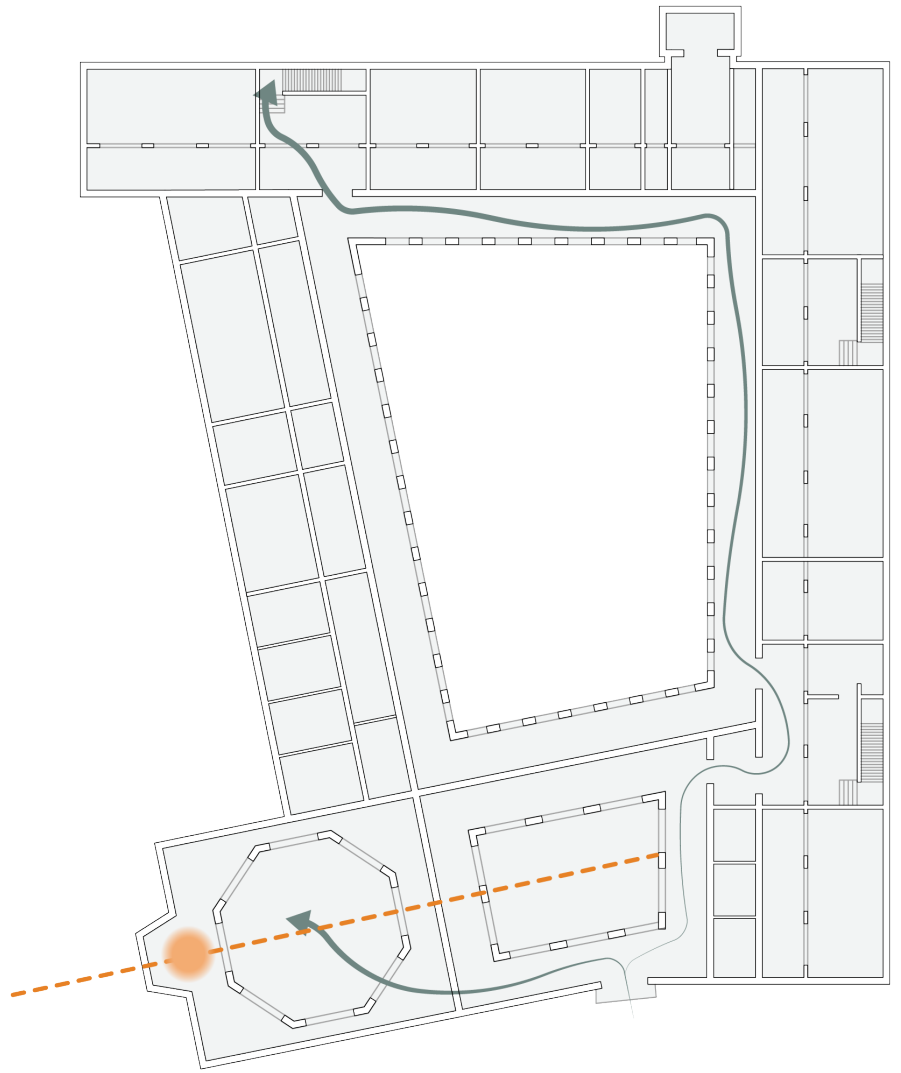


Elevations of the house

2.3 Roosenberg Abbey

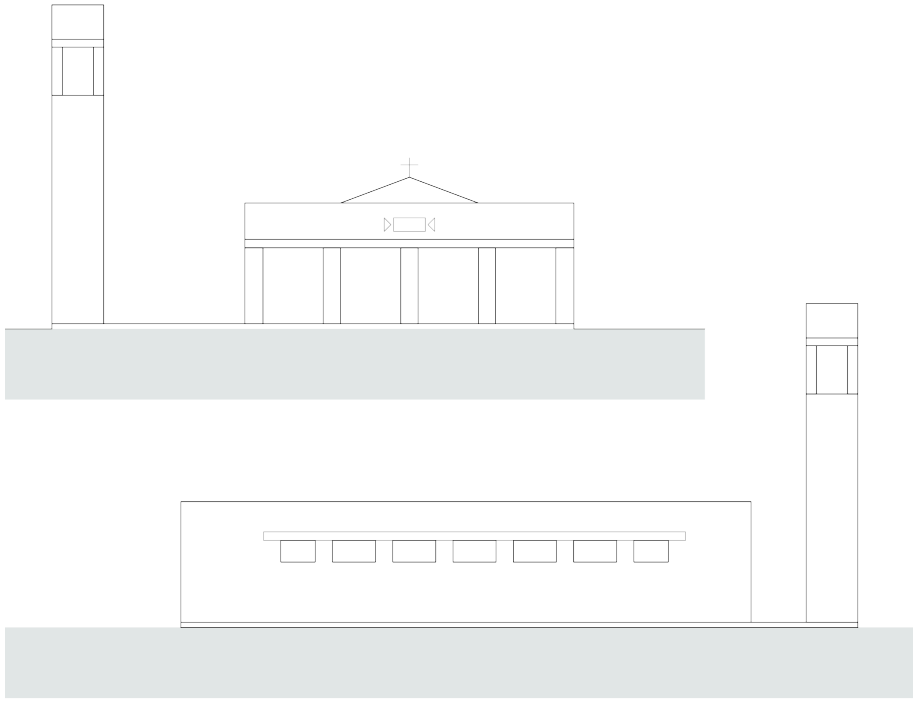


Entrance to the Abbey

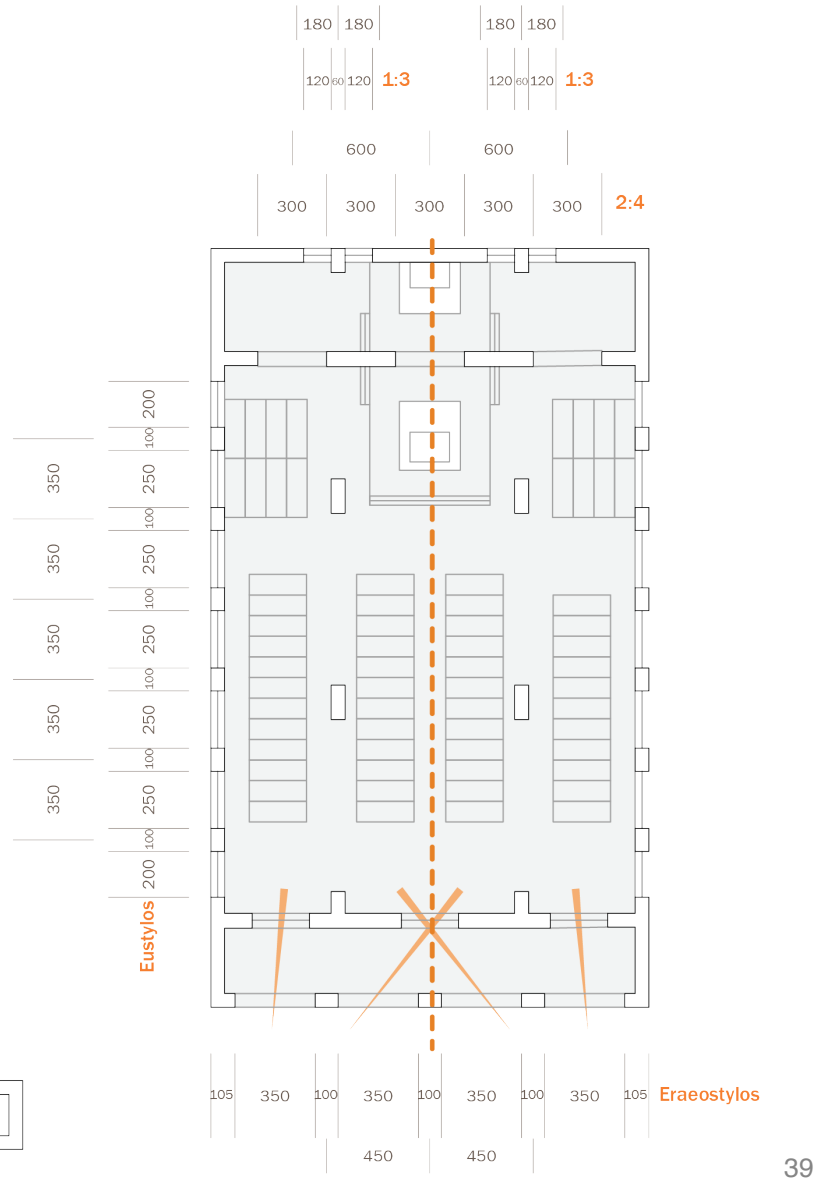


Floorplan of the Abbey

2.4 Church in Martinique



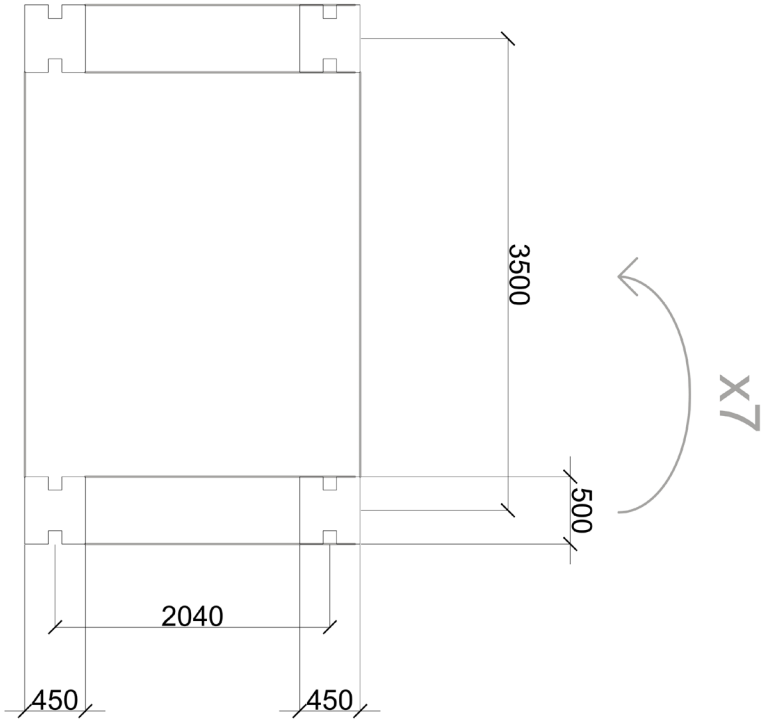
Elevations of the Church



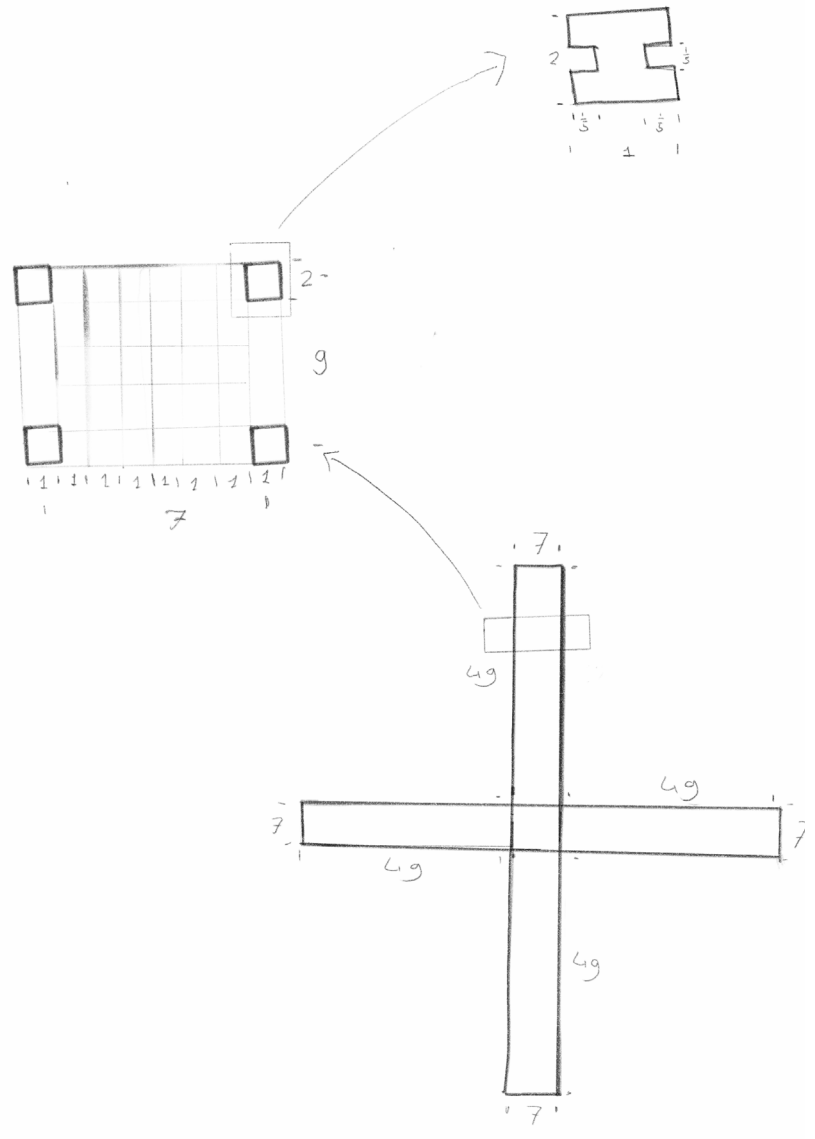
Floorplan of the Church

Sources

- Voet, C. (2017). Dom Hans van der Laan A House for the Mind.
- Theory & Practice – Dom Hans van der Laan. (2019, 13 februari). Dom Hans van Der Laan. https://domhansvanderlaan.nl/theory-practice/



Proportional system of colonnades



Proportional system through the scales