

48-747 Shape Grammars

THE PALLADIAN GRAMMAR

analytic shape
grammars are
intended for a
particular style

criteria for
authoring a
successful analytic
grammar for style
are spelled out by
Stiny and Mitchell

clarify the underlying **commonality of structure** and appearance manifest for the buildings in the corpus;

supply the **conventions and criteria** necessary to determine whether any other building not in the original corpus is an instance of the style; and

provide the **compositional machinery** needed to design new buildings that are instances in the style.

language → **style** ← shape grammar

Andrea Palladio *I Quattro Libri dell'Architettura*

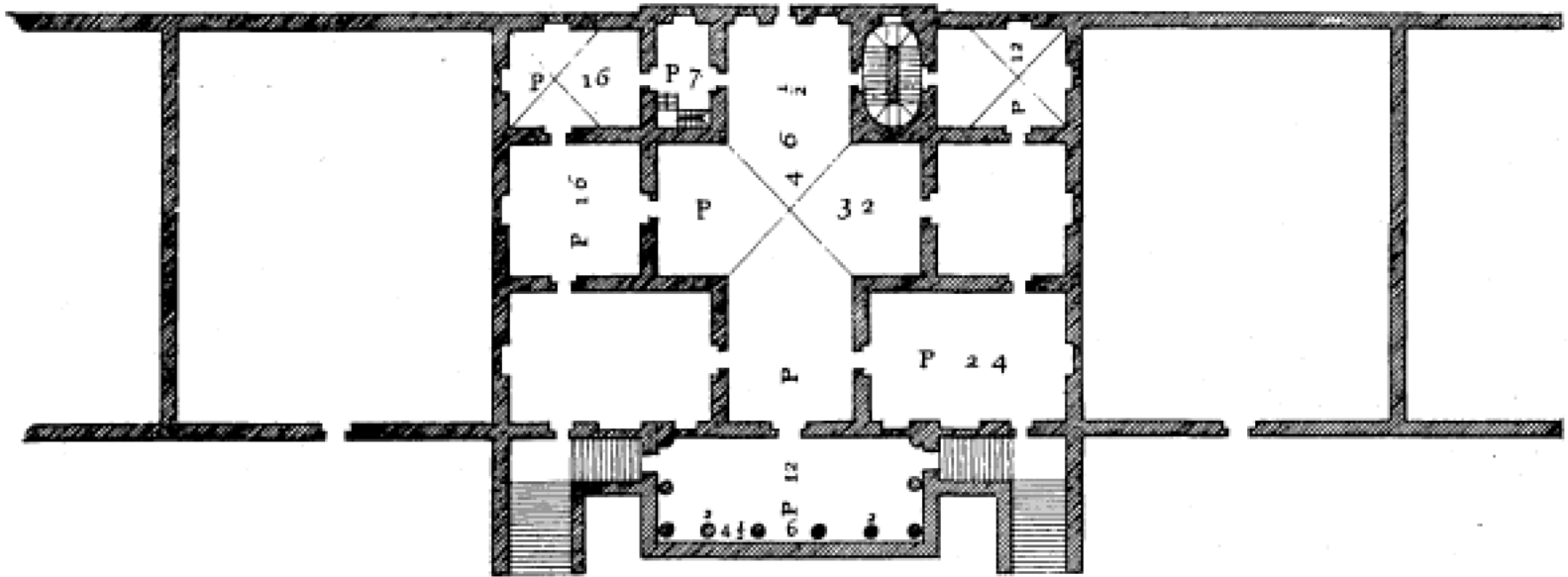
The Four Books of Architecture, tr. Issac Ware, 1737

The Four Books on Architecture, tr. Robert Tavernor and Richard Schofield, 2002

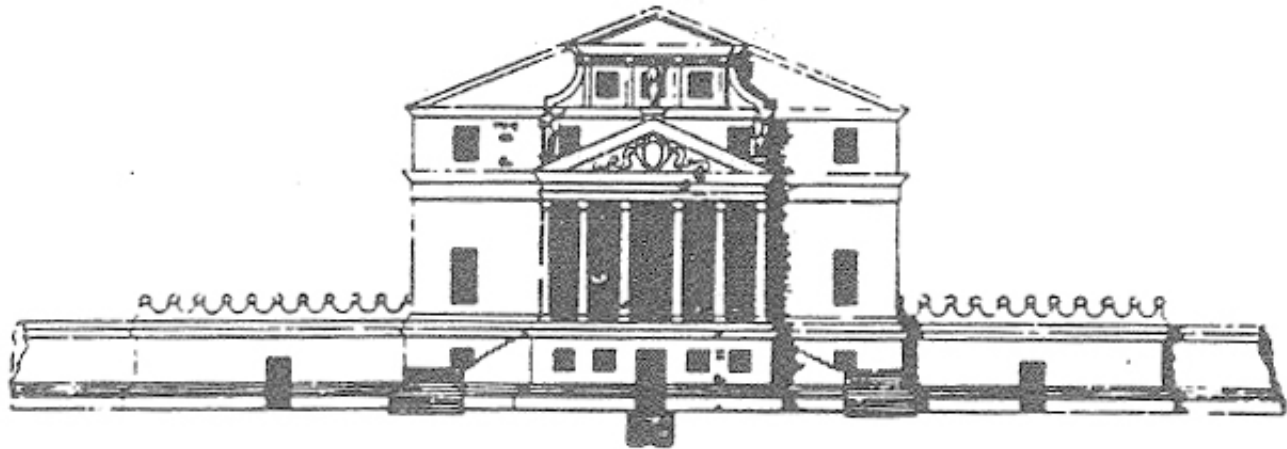
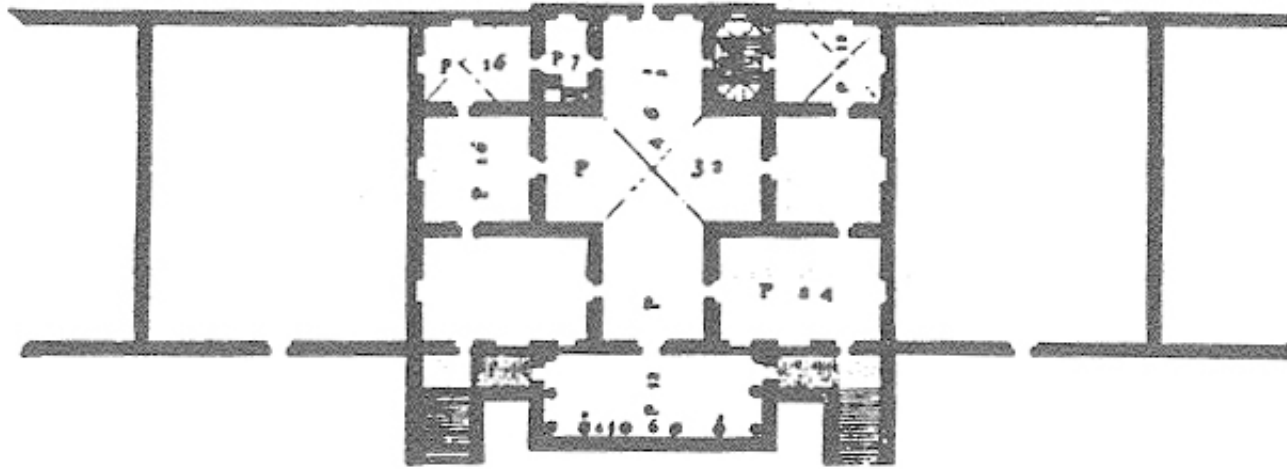
the sources

*“And though variety and novelty may please everybody, one should not, however, do anything that is contrary to the laws of this art, and contrary to what reason makes obvious; so we can see that the ancients also made variations, but they never departed from certain universal and essential rules of this art, as we shall see in my **book of antiquities.**”*

Andrea Palladio, *The Four Books on Architecture*, pp 56
tr. Robert Tavernor and Richard Schofield



exemplar – the villa Malcontenta



exemplar – the villa Malcontenta

Nicolò and Alvise Foscari – two brothers – commissioned Palladio a residence – La Malcontenta – worthy of the one of the most famous families in town.

Palladio created a villa that appears isolated and imposing like a castle. It is built upon an exceptionally high footing, which makes up for the impossibility of creating a basement, but most of all underlines the building's monumental look. As the celebratory aspects dominate, farm buildings are hidden from view.

Circa 1554

Villa Foscari «La Malcontenta»



Source:
<http://www.lamalcontenta.com/index.php/en/>

<http://www.lamalcontenta.com/index.php/en/>

Villa Foscari «La Malcontenta»

grid definition

exterior wall realignment

room layout

interior wall realignment

principal entrances-porticos and exterior wall inflections

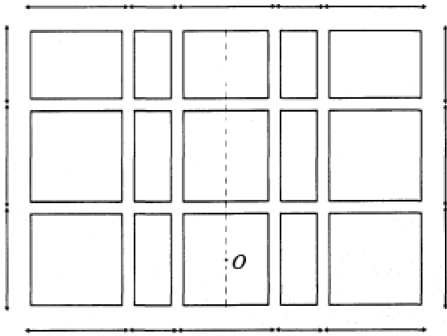
exterior ornamentation- columns

windows and doors

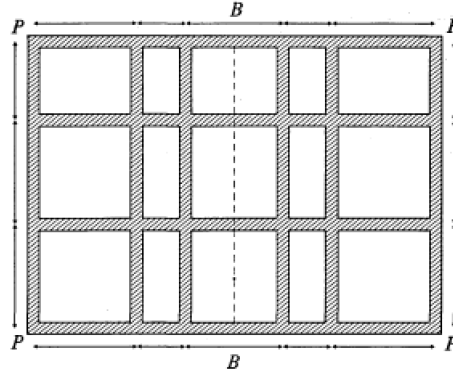
termination

stages in shape grammar

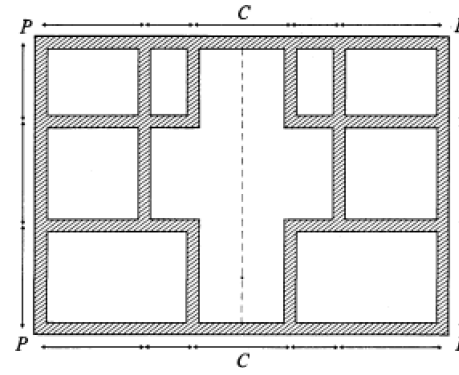
1 grid



2 exterior wall

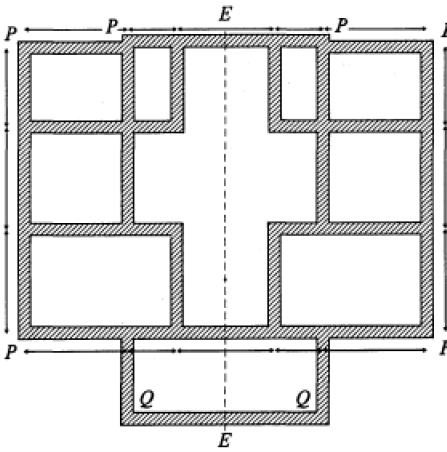


3 room layout

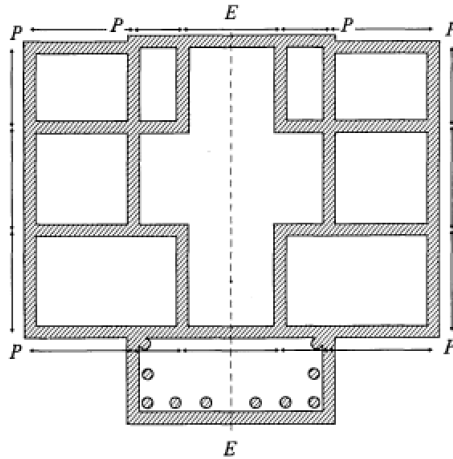


4 realignment

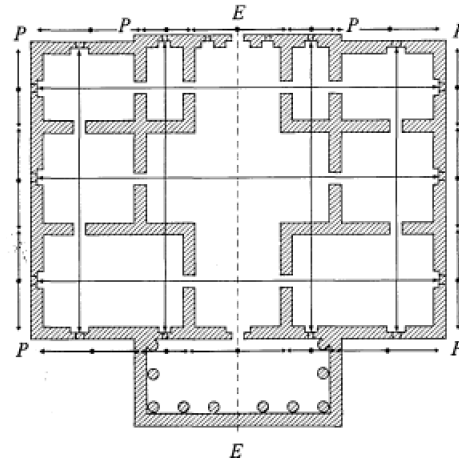
5 entrances



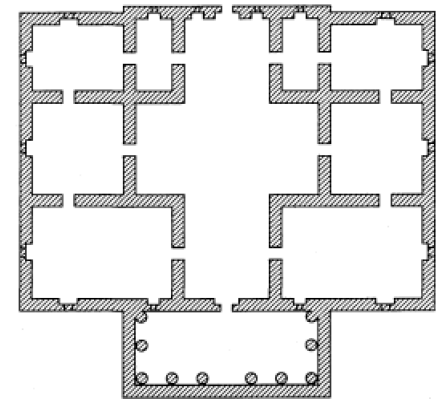
6 exterior ornament



7 windows + doors



8 termination



the stages in the grammar – *pictorially*

A vicentine foot

“This line with which the following buildings are measured is half a Vicentine foot [*piede vicentino*].

The foot is divided into 12 inches and each inch into 4 minutes [*minuto*]”

Palladio, pp. 79

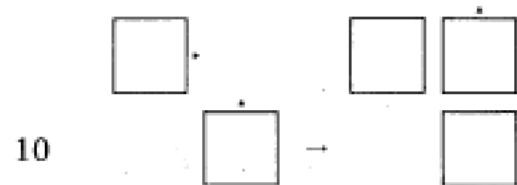
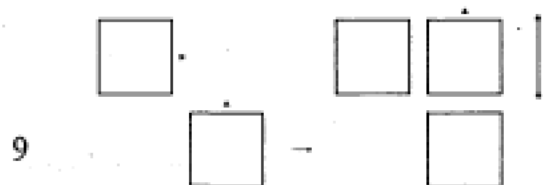
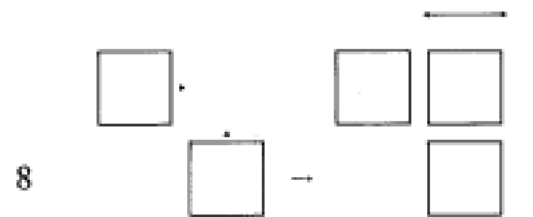
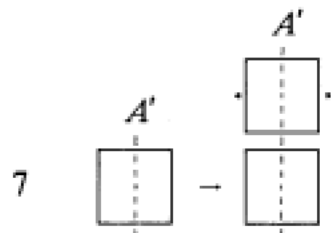
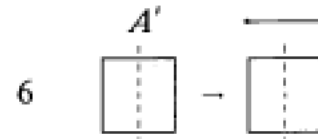
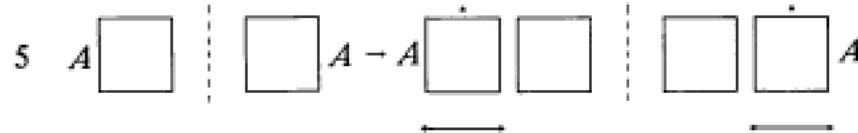
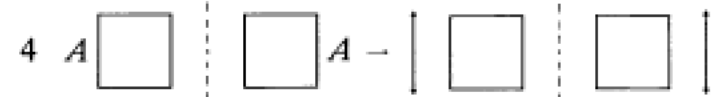
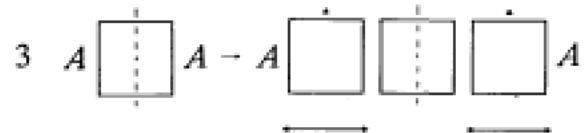
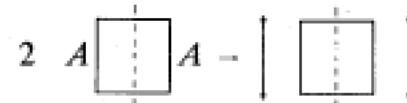
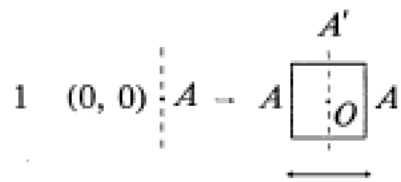
system of measurement

axial symmetry

“Rooms [*stanza*] must be distributed at either side of the entrance and the hall, and one must ensure that those on the right correspond and are equal to those on the left so that the building will be the same on one side as the on the other and the walls will take the weight of the roof equally; ...”

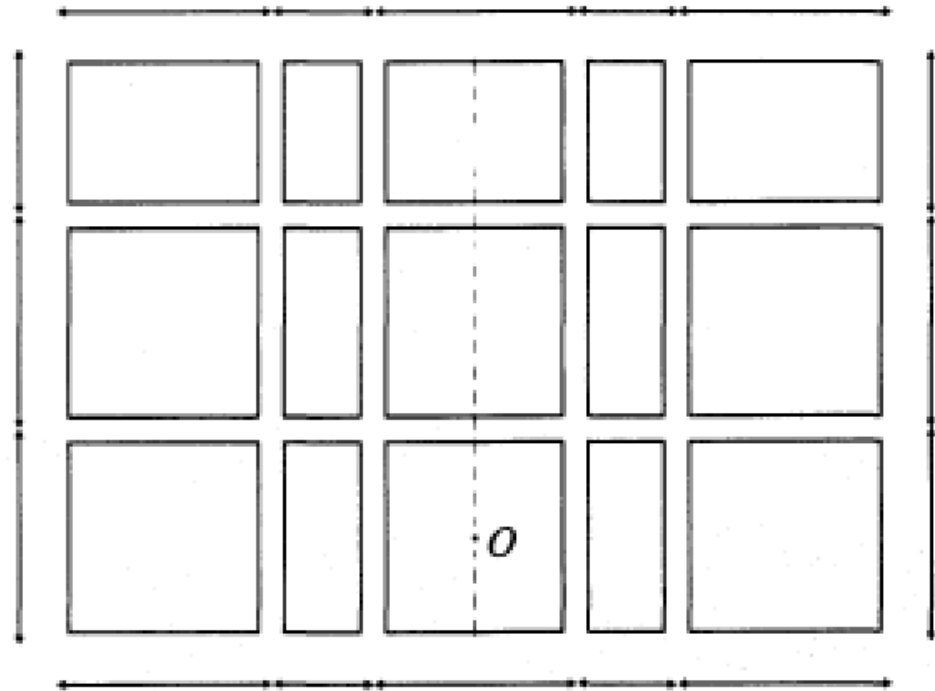
Palladio, pp. 57

grid definition



1. the rules for generating a tartan grid

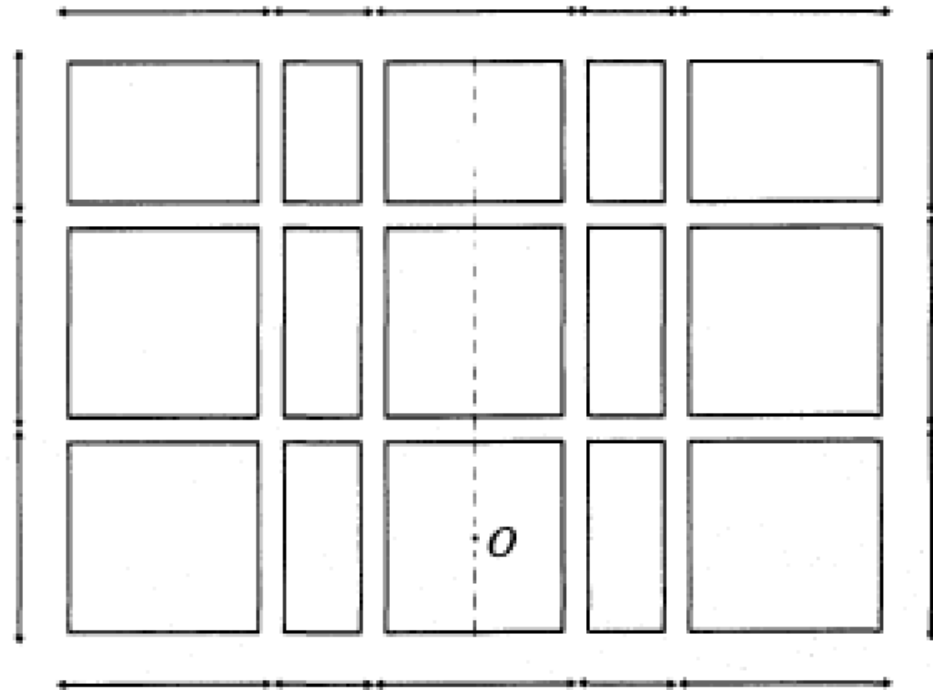
“There are seven types of room that are the most beautiful and well-proportioned and turn out better; they can be made circular [*ritundo*], though these are rare; or square [*quadrato*]; or their length will equal the diagonal of the square [*quadrato*] of the breadth; or a square [*quadrato*] and a third; or a square [*quadrato*], and a third; or a square and a half; or a square and two-thirds; or two squares.”



1. grid definition

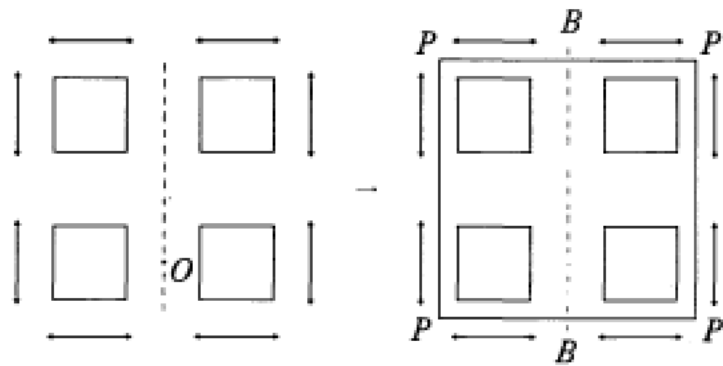
To ensure bilateral symmetry, to fix wall thickness at a constant value, and to incorporate proportioning rules simultaneously, it is necessary to associate parameters and parametric expressions with the grid generation rules and with the rules specified in the following stages.

∴ Parameterization of rules in this stage is most critical.

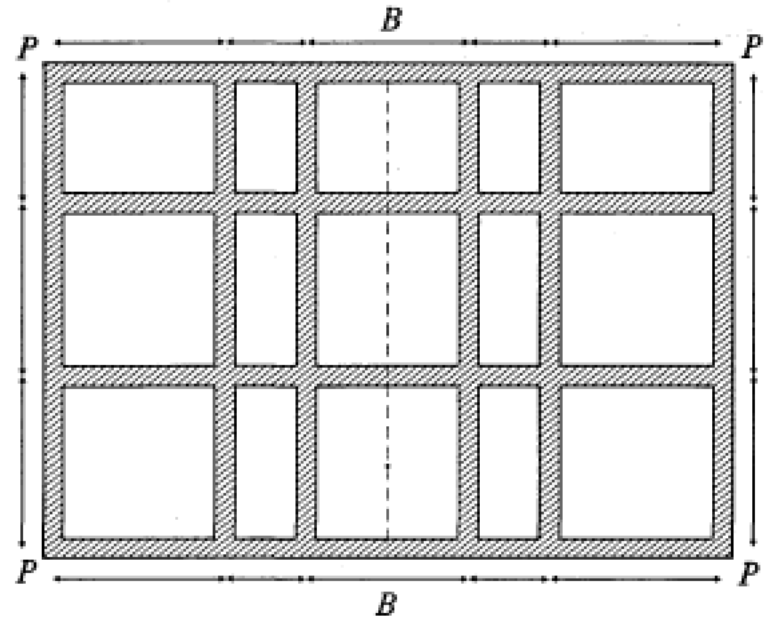


1. grid definition

11



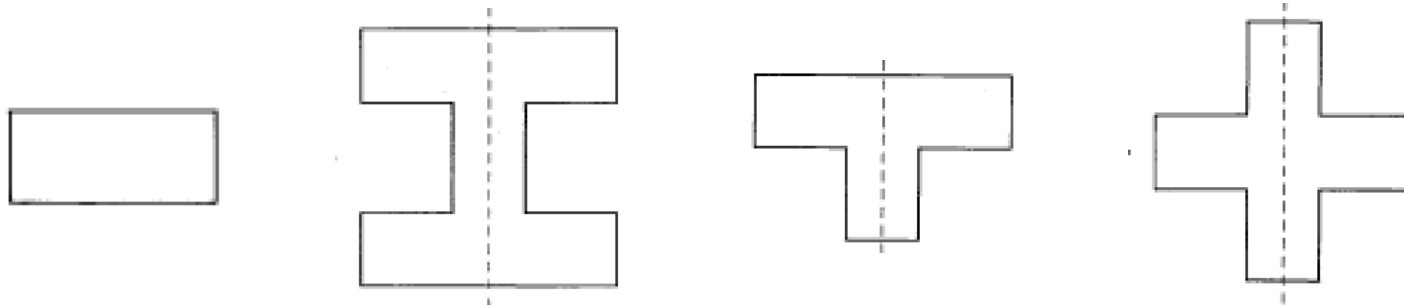
Rule for generating exterior walls



Underlying wall pattern for the
Villa Malcontenta

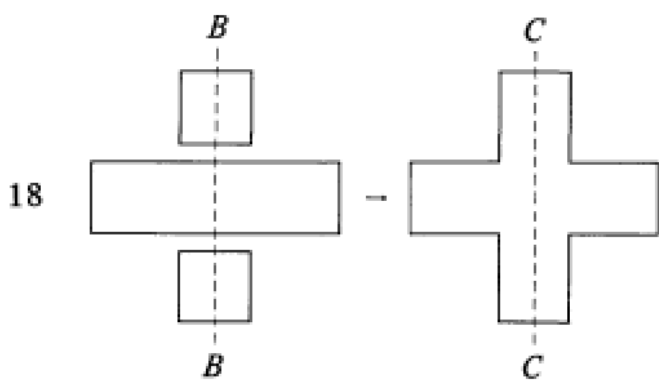
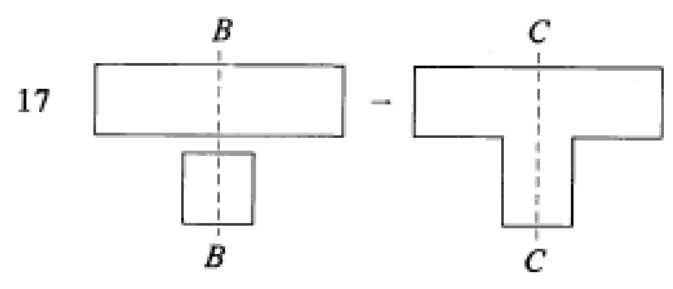
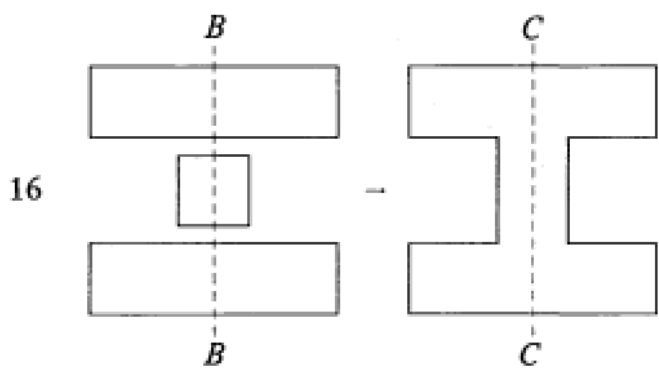
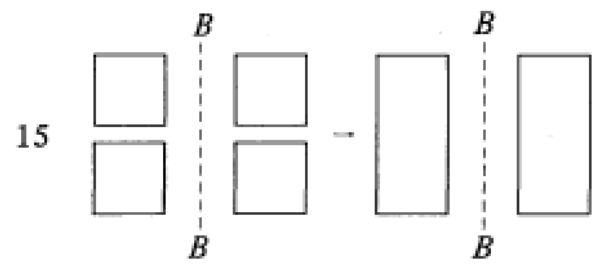
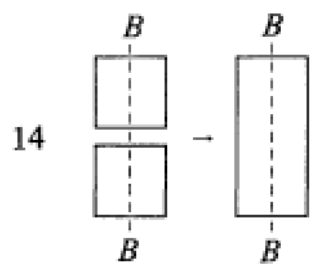
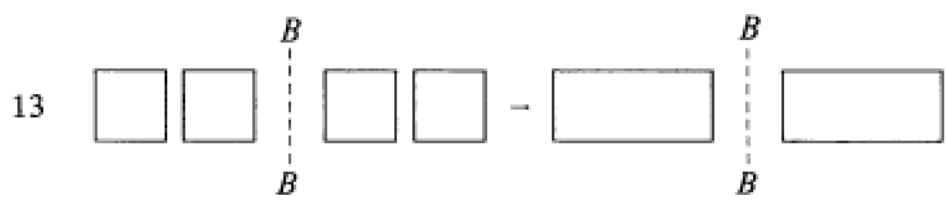
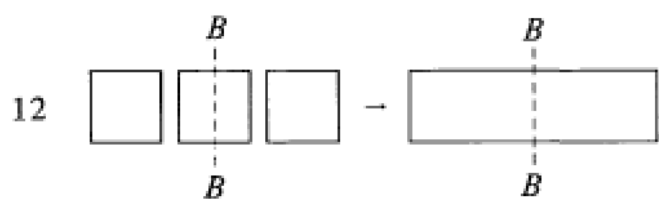
2. exterior wall definition

The interior spaces in Palladio's uniaxial villa plans may be **rectangular**, **I-shaped**, **T-shaped**, or **+-shaped**.



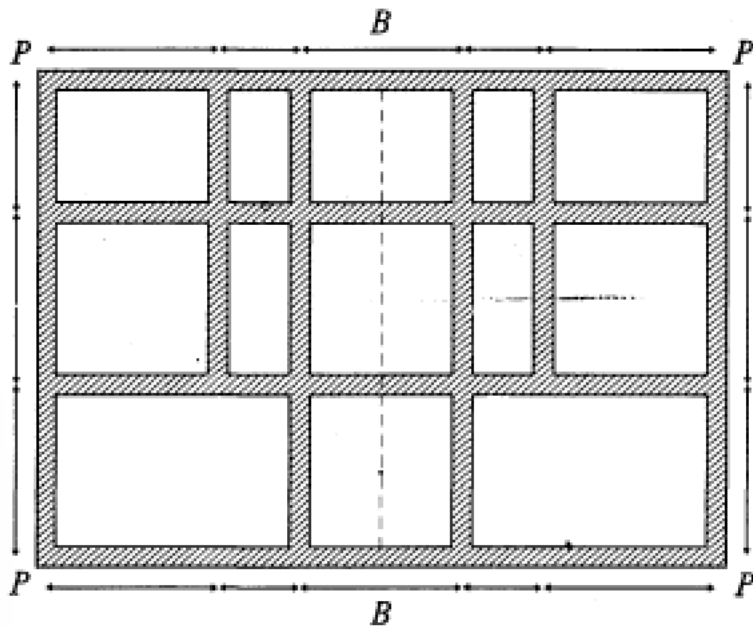
Notice that **a plan can have at most one** nonrectangular space and that this space must be bisected by the north-south axis of the coordinate system – because of bilateral symmetry

3. room layout

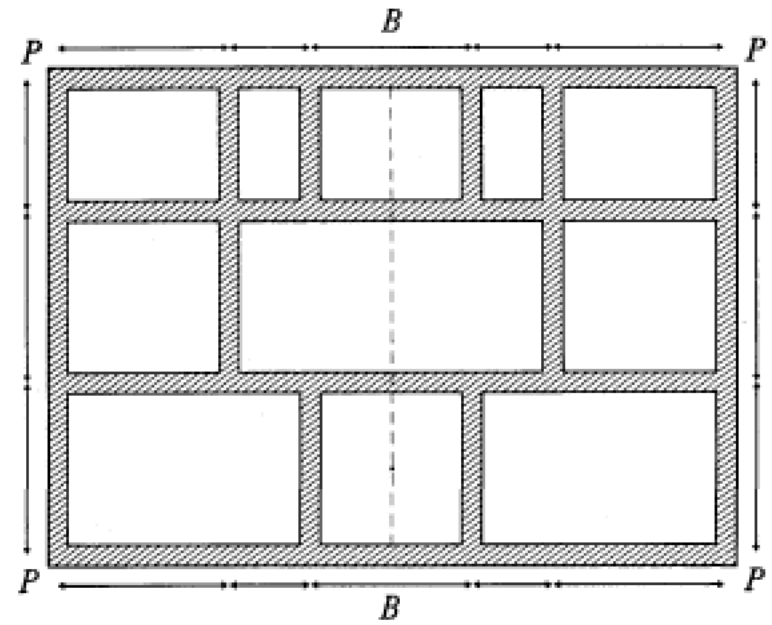


19 $\langle s_\emptyset, \{(0, 0): B\} \rangle \rightarrow \langle s_\emptyset, \{(0, 0): C\} \rangle$

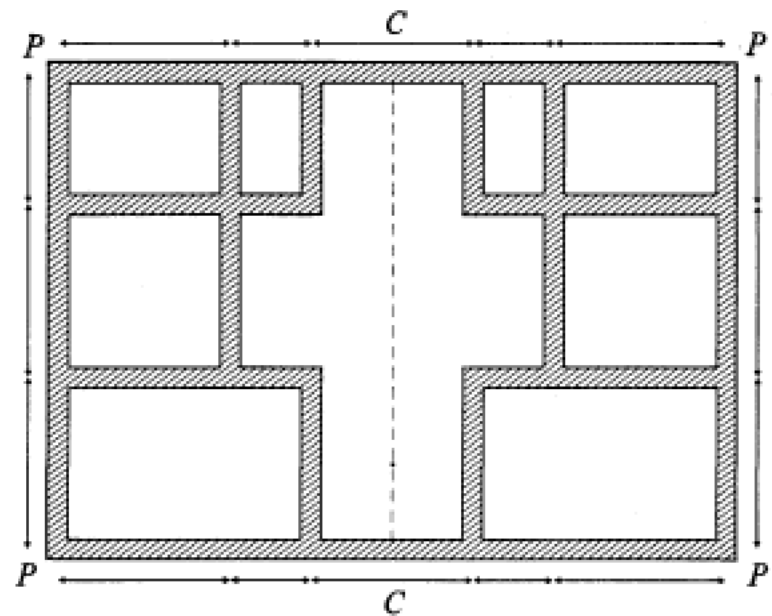
3. room layout



rule 12
 \Rightarrow

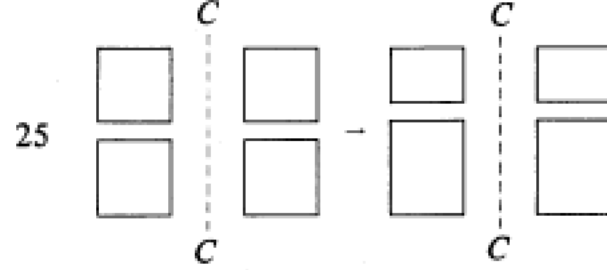
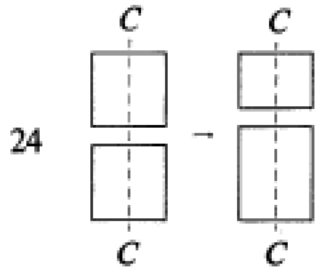
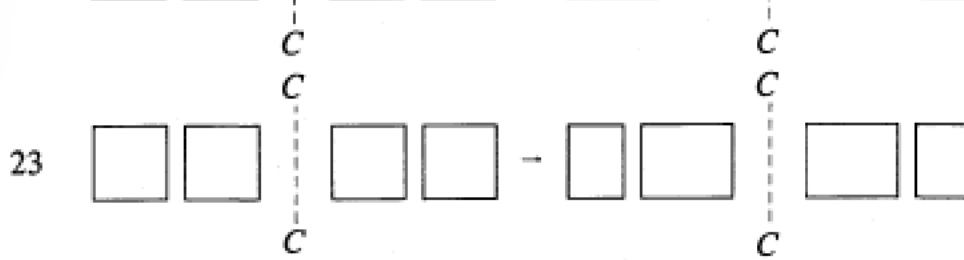
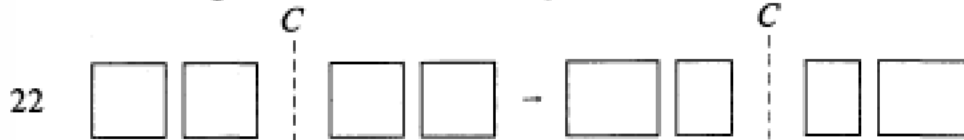
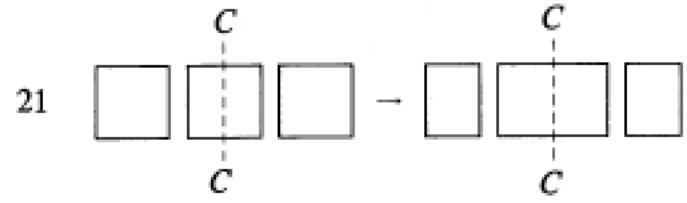
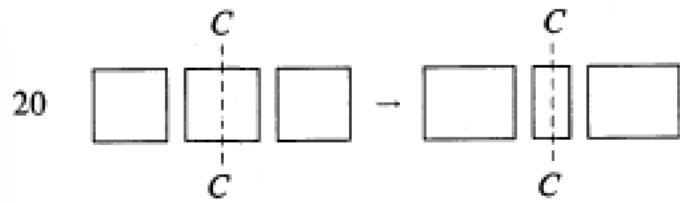


\Downarrow rule 18



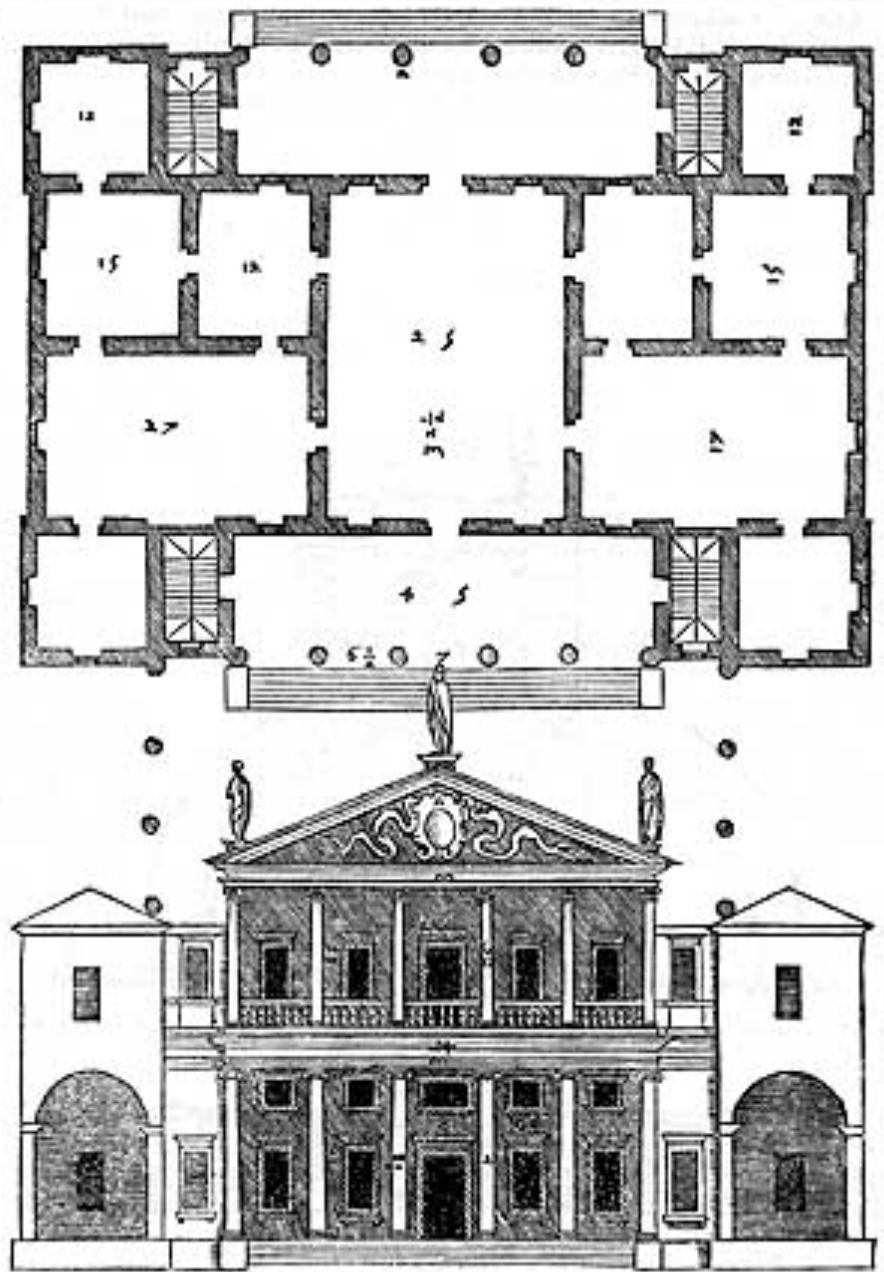
Generation of the room layout for
 the Villa Malcontenta

3. room layout



Rules for realigning interior walls

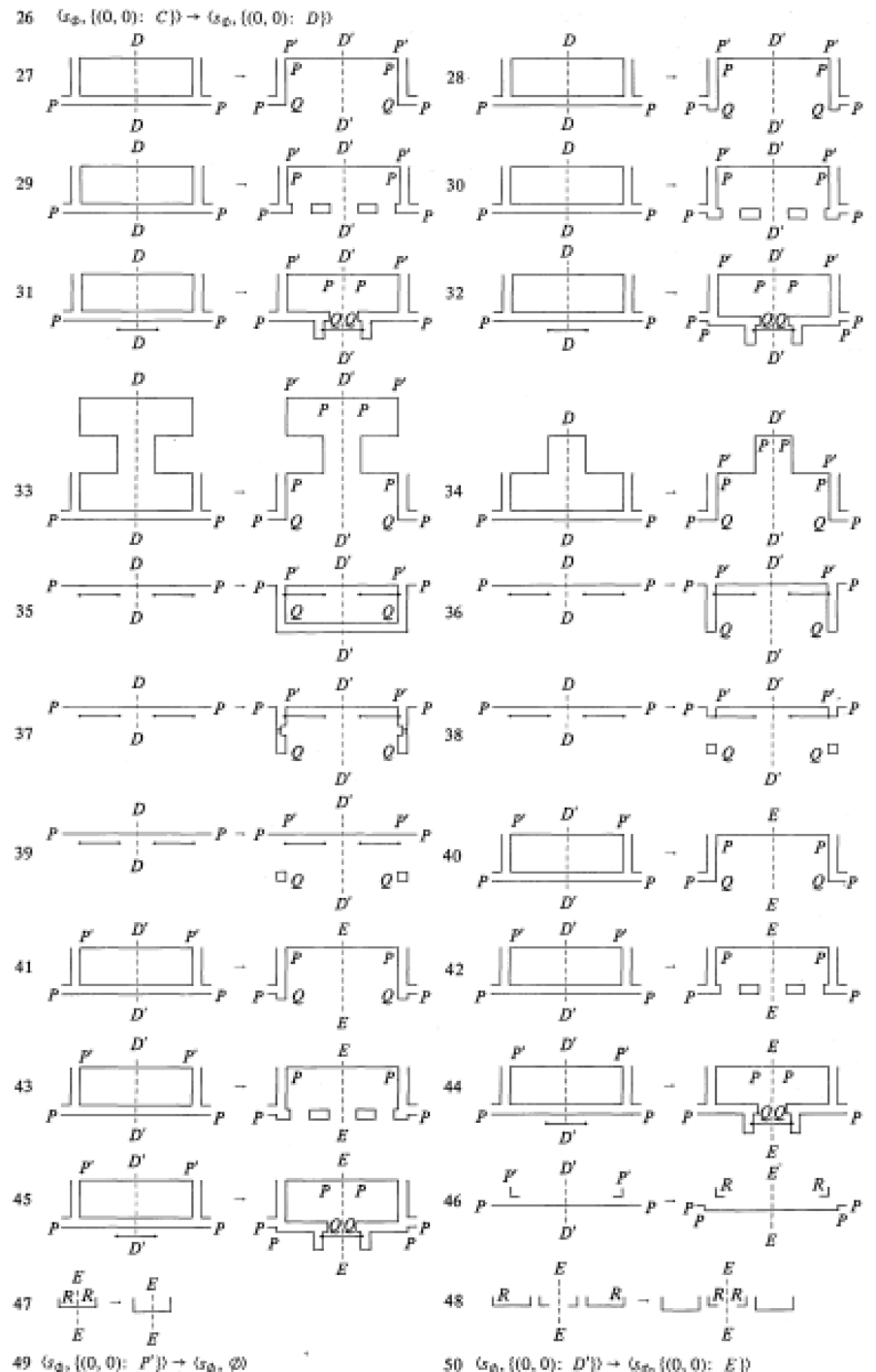
4. interior wall realignment



Villa Valmarana in Lisiera

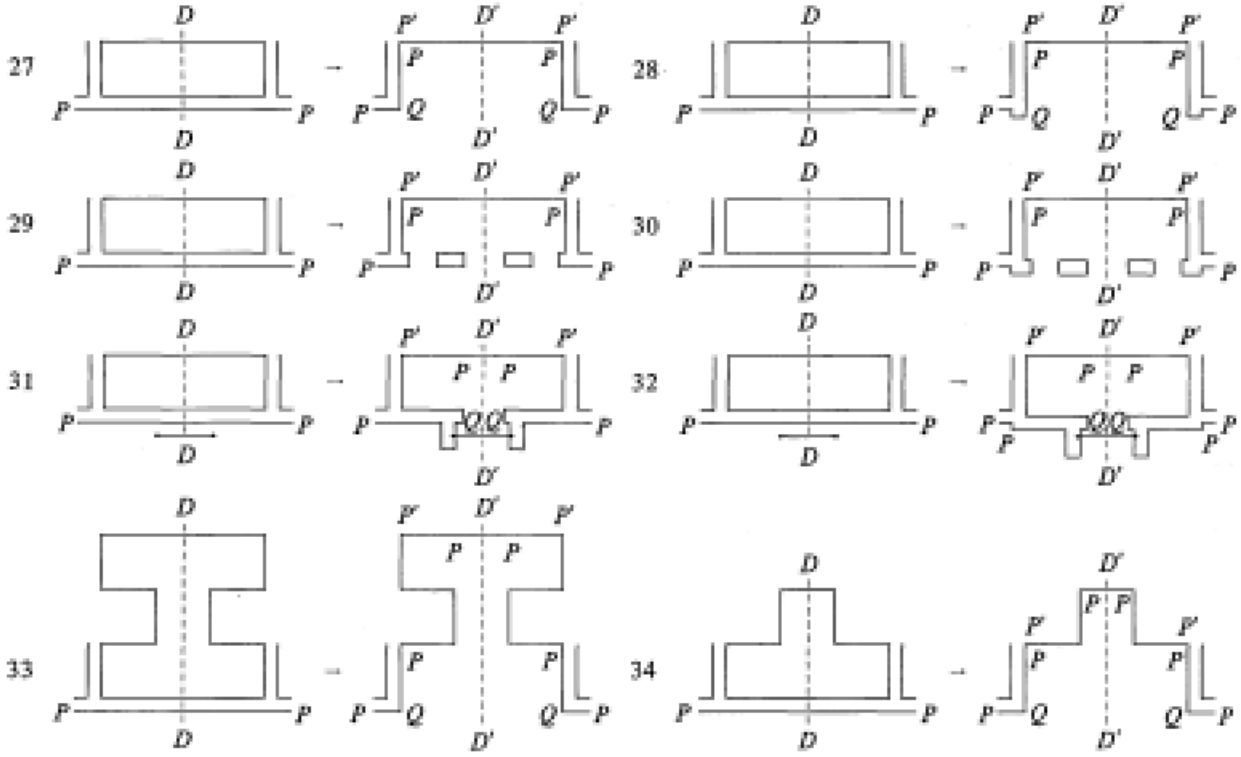


Villa Valmarana



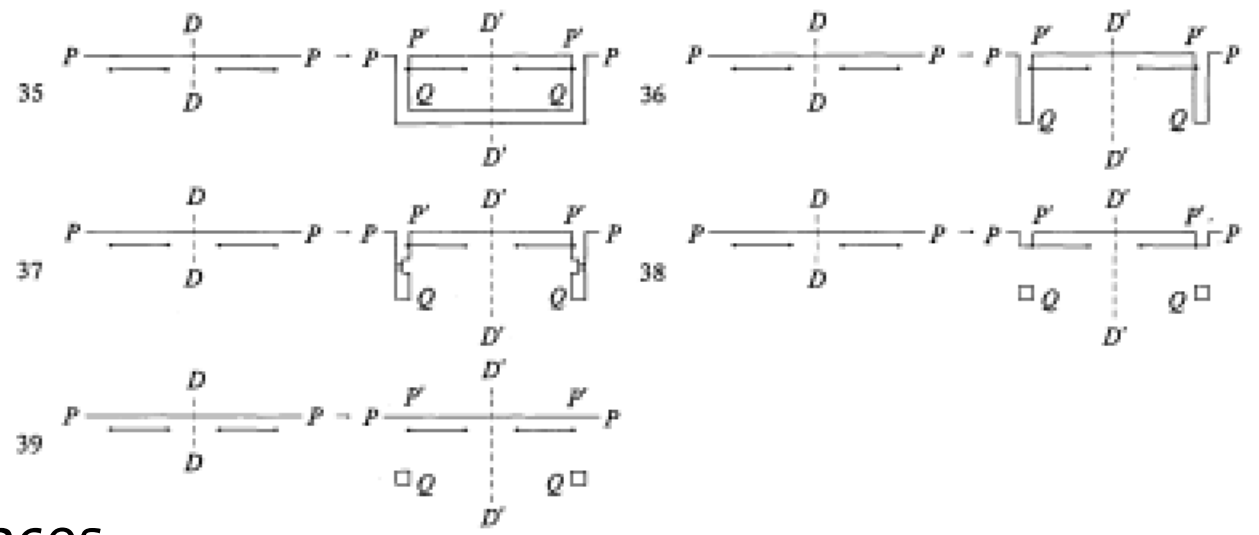
5. principal entrances porticos and inflections

26 $(x_{\pm}, \{(0, 0): C\}) \rightarrow (x_{\pm}, \{(0, 0): D\})$

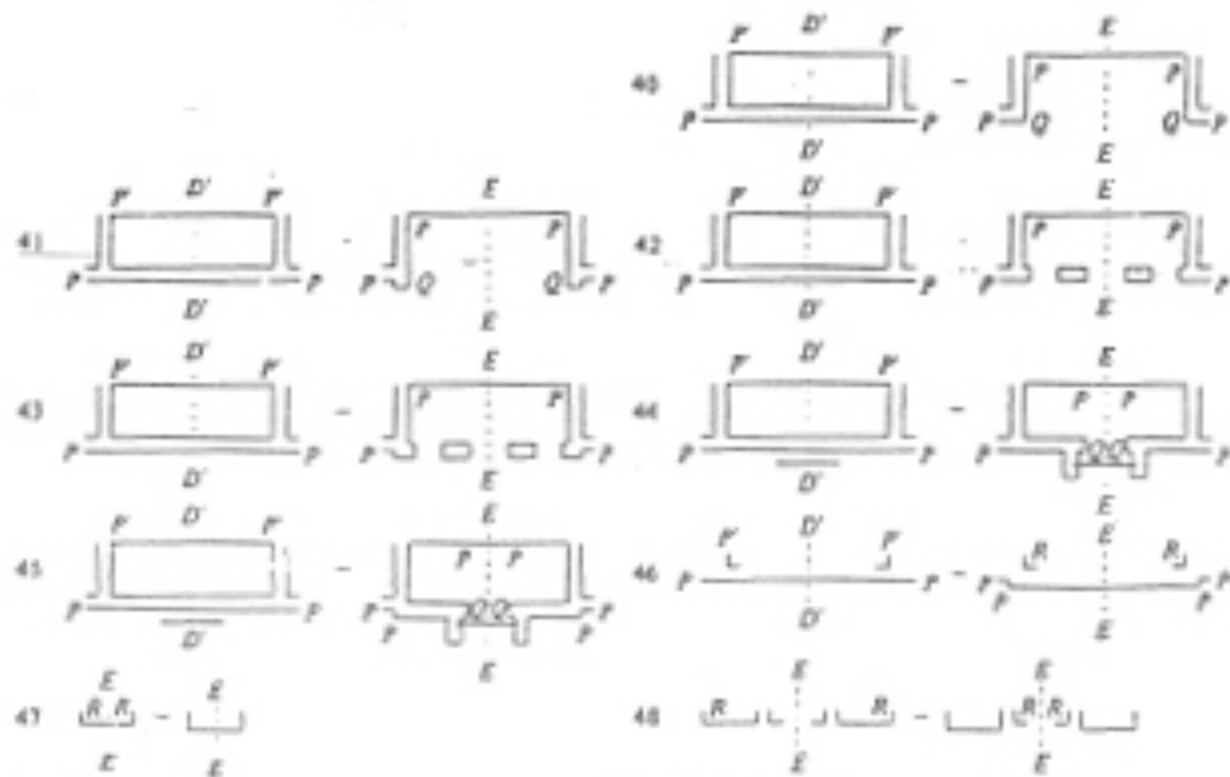


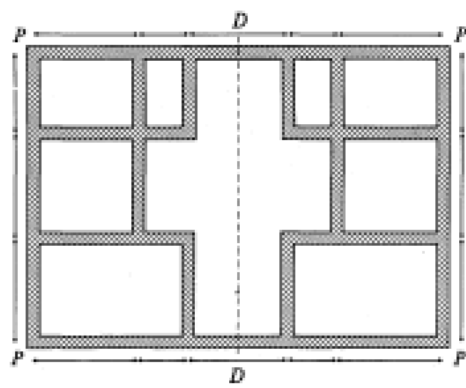
portico in antis

portico prostyle

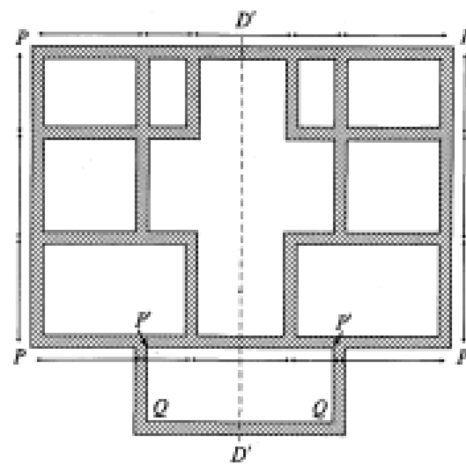


5. principal entrances

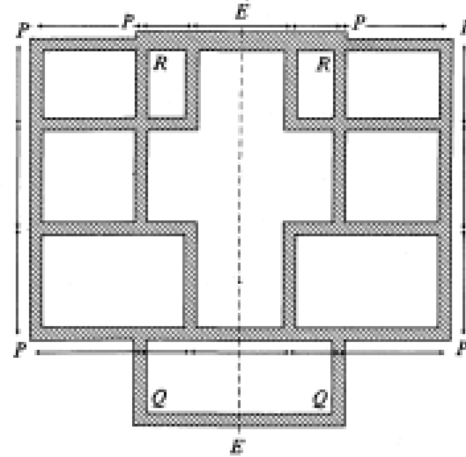




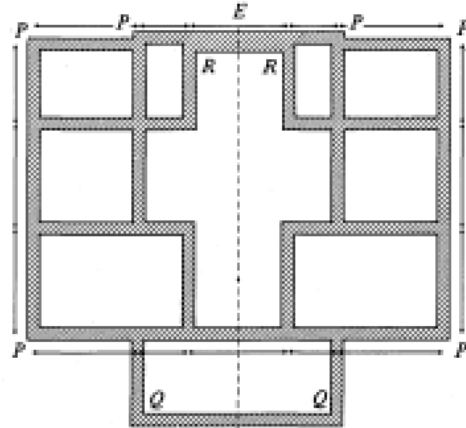
rule 35
⇒



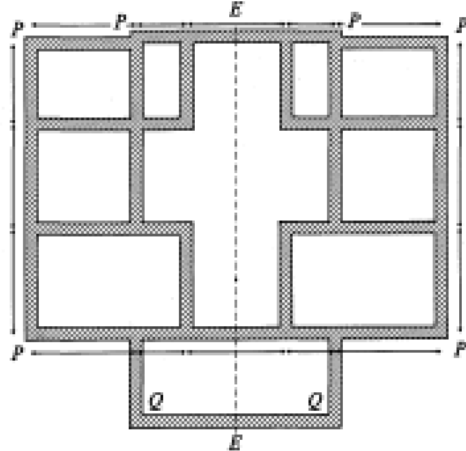
rule 46
⇓



rule 48
⇐



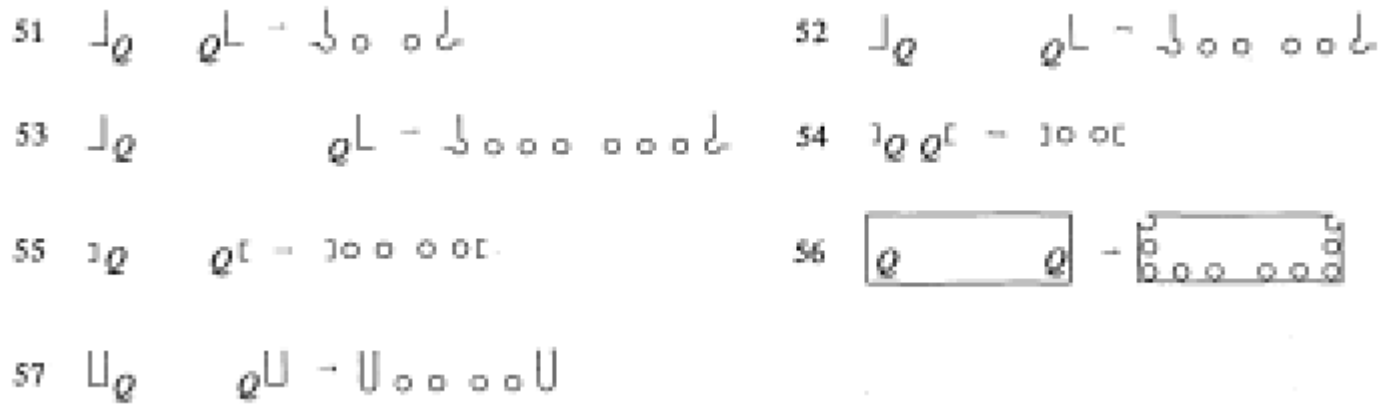
rule 47
⇓



Generation of the portico and wall inflection for the Villa Malcontenta

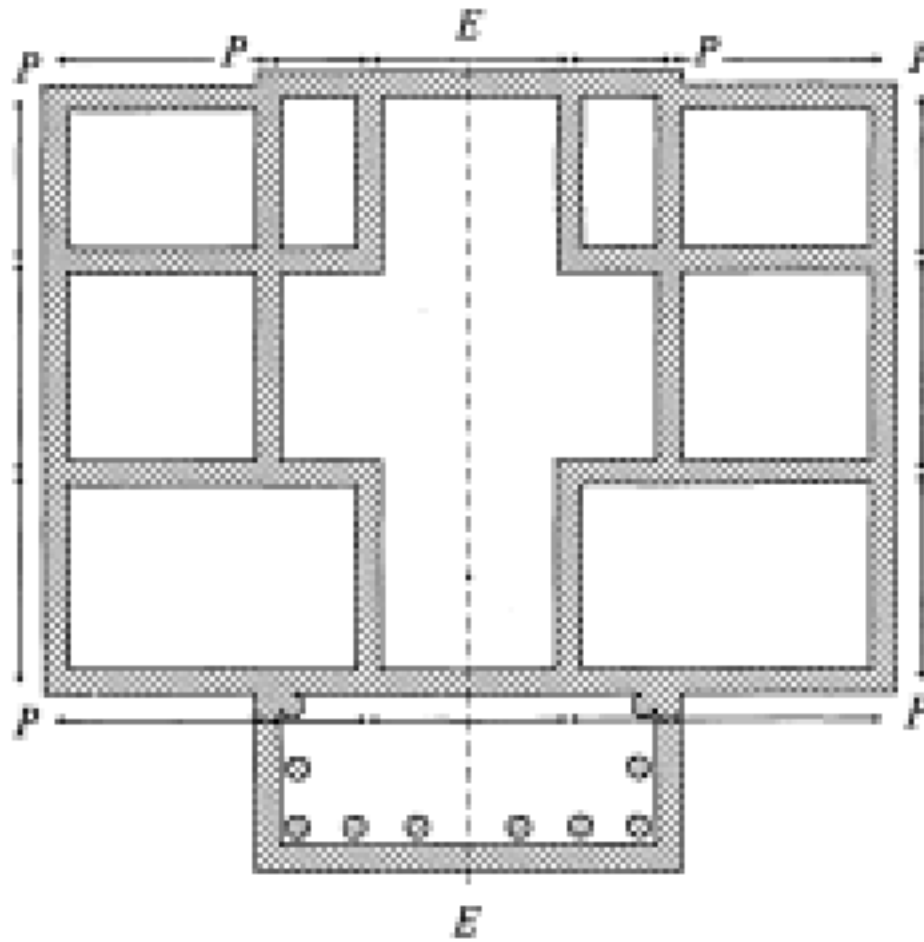
5. principal entrances

“Now that we have talked of walls by themselves [*muro semplici*], it is appropriate to move on to their ornaments, of which columns, when located properly and in proportion to the whole building, are by far the most important that can be applied to a building.” (pp. 17)



Rules for finishing porticos by the addition of columns

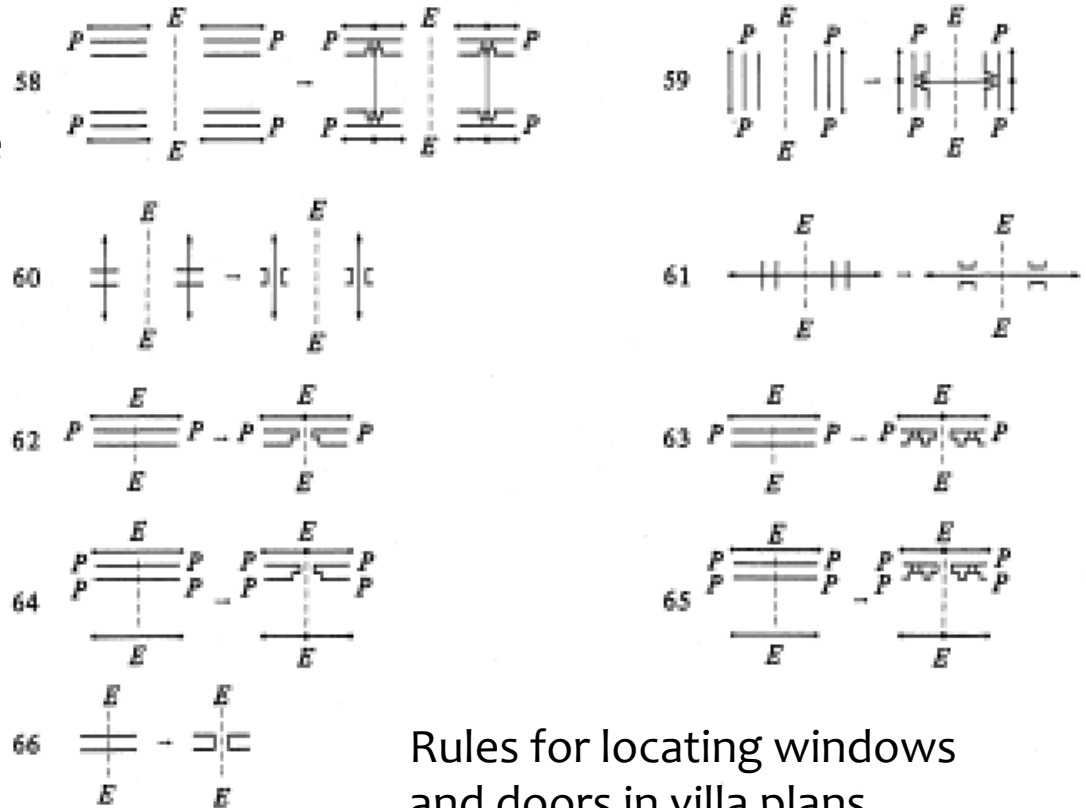
6. exterior ornamentation



Addition of columns for the Villa Malcontenta

6. exterior ornamentation

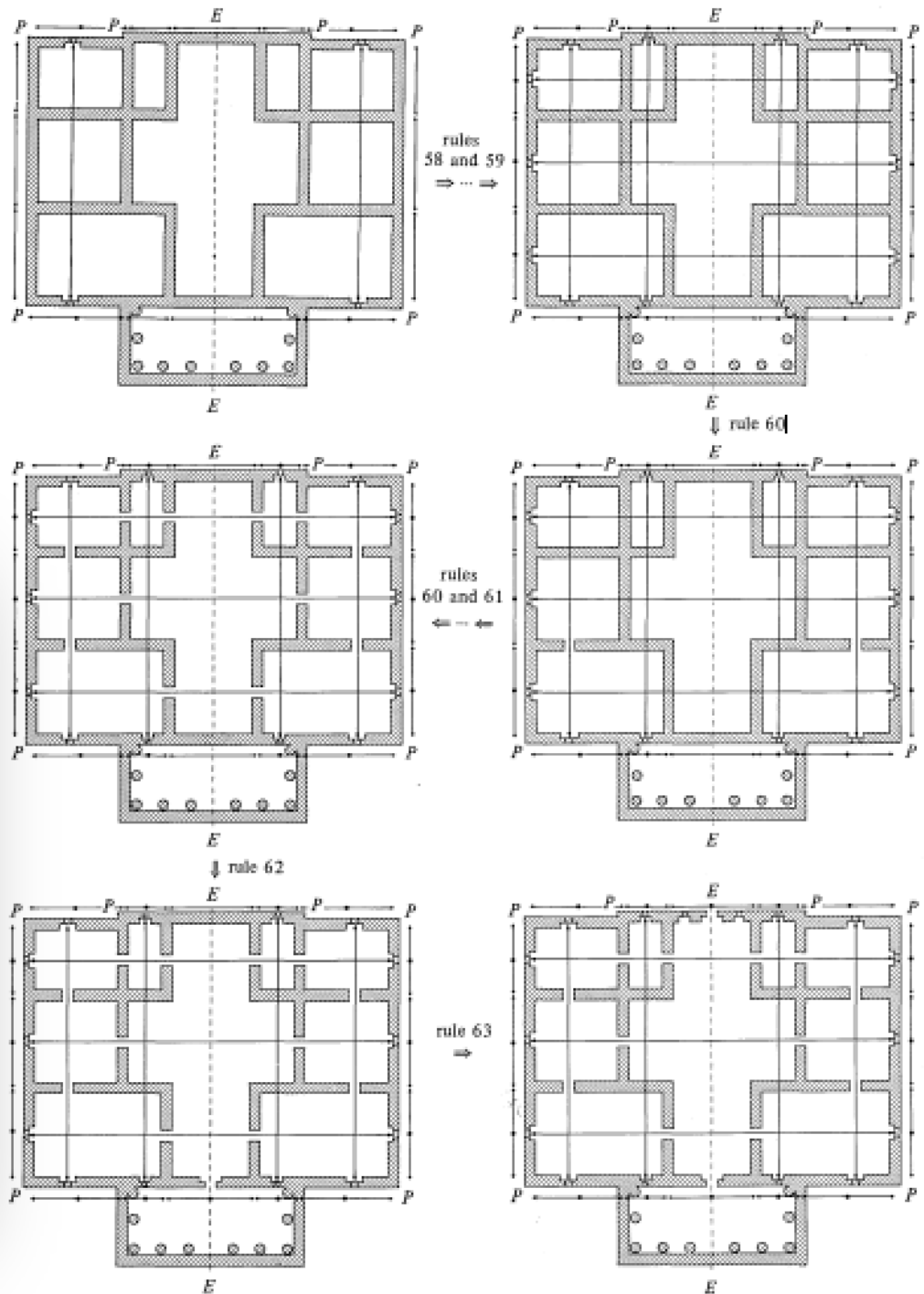
"The windows on the right hand ought to correspond to those on the left, and those above directly over them that are below; and the doors likewise ought to be directly over one another, that the void may be over the void, and the solid upon the solid, and all face one another, so that standing at one end of the house one may see to the other, which affords both beauty and cool air in summer, besides other conveniences" (page 31).



Rules for locating windows and doors in villa plans

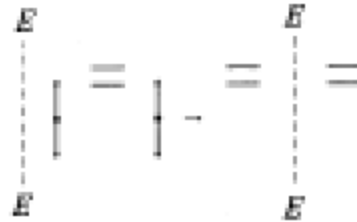
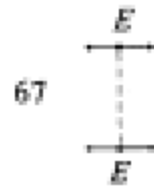
7. windows and doors

Generation of the windows and doors in the Villa Malcontenta

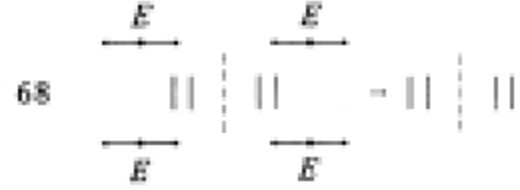


7. windows and doors

Termination rules



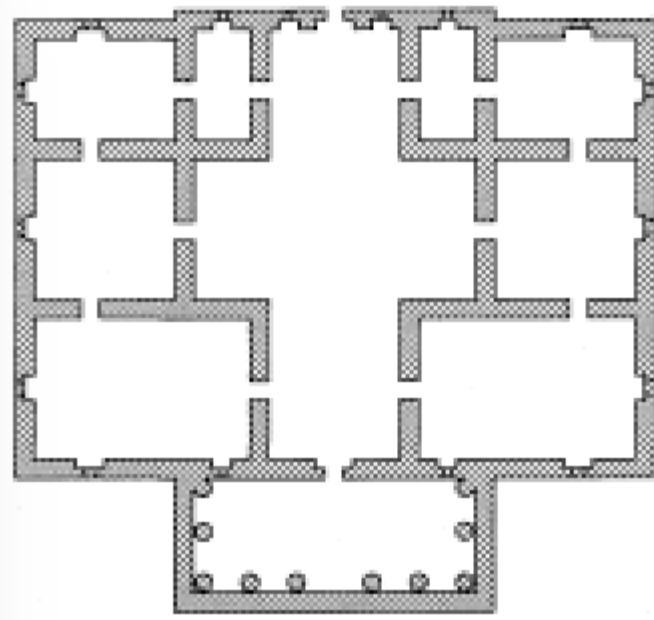
71 $(s_{\emptyset}, \{(0, 0): P\}) \rightarrow (s_{\emptyset}, \emptyset)$



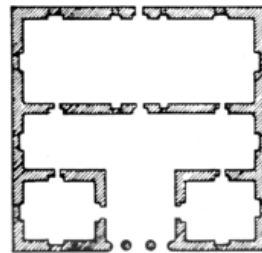
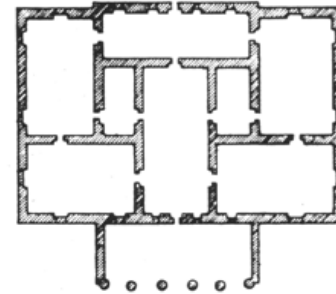
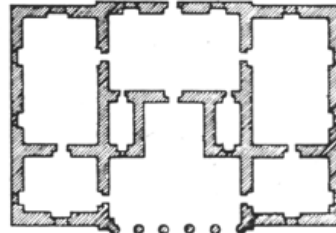
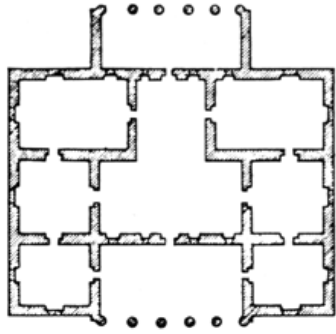
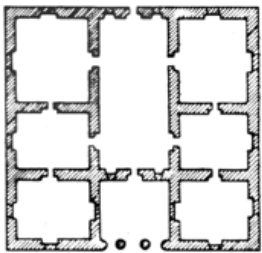
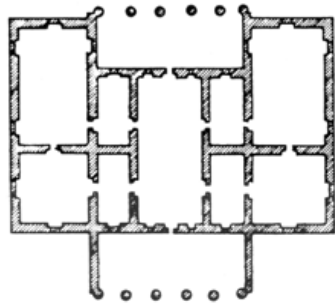
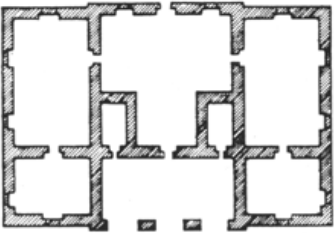
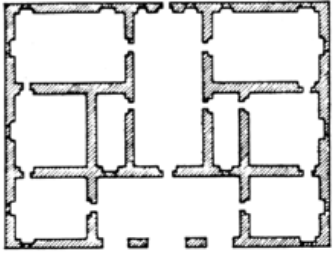
70 $\longrightarrow (s_{\emptyset}, \emptyset)$

72 $(s_{\emptyset}, \{(0, 0): E\}) \rightarrow (s_{\emptyset}, \emptyset)$

The final plan generated for the Villa Malcontenta



8. termination



real or fake?