48-747 Shape Grammars

GRAMMAR OF PRAIRIE HOUSES

"Consistency in grammar is therefore the property – solely – of a well-developed artist-architect. Without that property of the artist-architect not much can be done about your abode as a work of Art. Grammar is no property of the usual owner or occupant of the house. But the man who designs the house must, inevitably speak a consistent thought-language in his designs. It properly may be and should be a language of his own if appropriate. If he has no language, so no grammar, of his own, he must adopt one; he will speak some language or other whether he so chooses or not."

Frank Lloyd Wright, *The Natural House,* pp 182-83

First –

To reduce the necessary parts of the house and the separate rooms to a minimum, and make all come together as enclosed space …

Second –

To associate the building as a whole with its site by extension and emphasis of planes parallel to the ground …

Third –

To eliminate the room as a box and the house as another …

organic architecture

11 prairie houses identified

Superficial features defocused
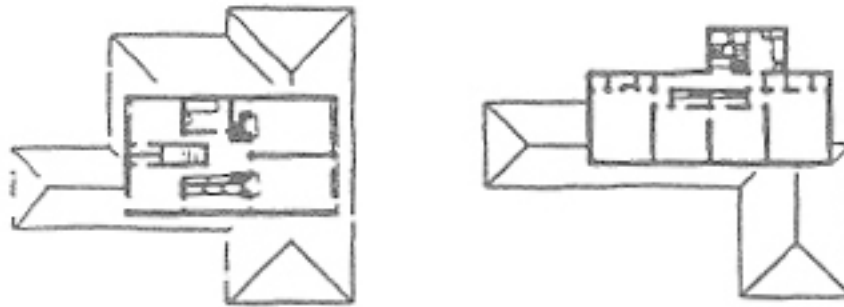
Hearth and fireplace

Function zones

Living, service and bedroom areas

Arranged as blocks

Lines used to articulate walls, ceilings, screens between areas
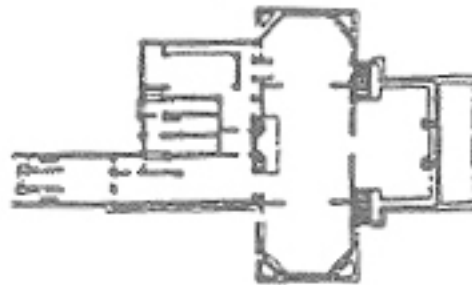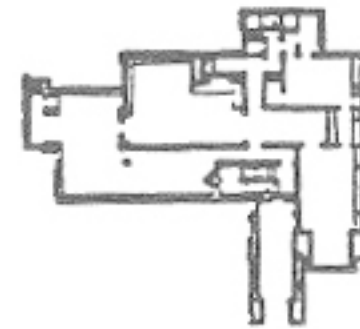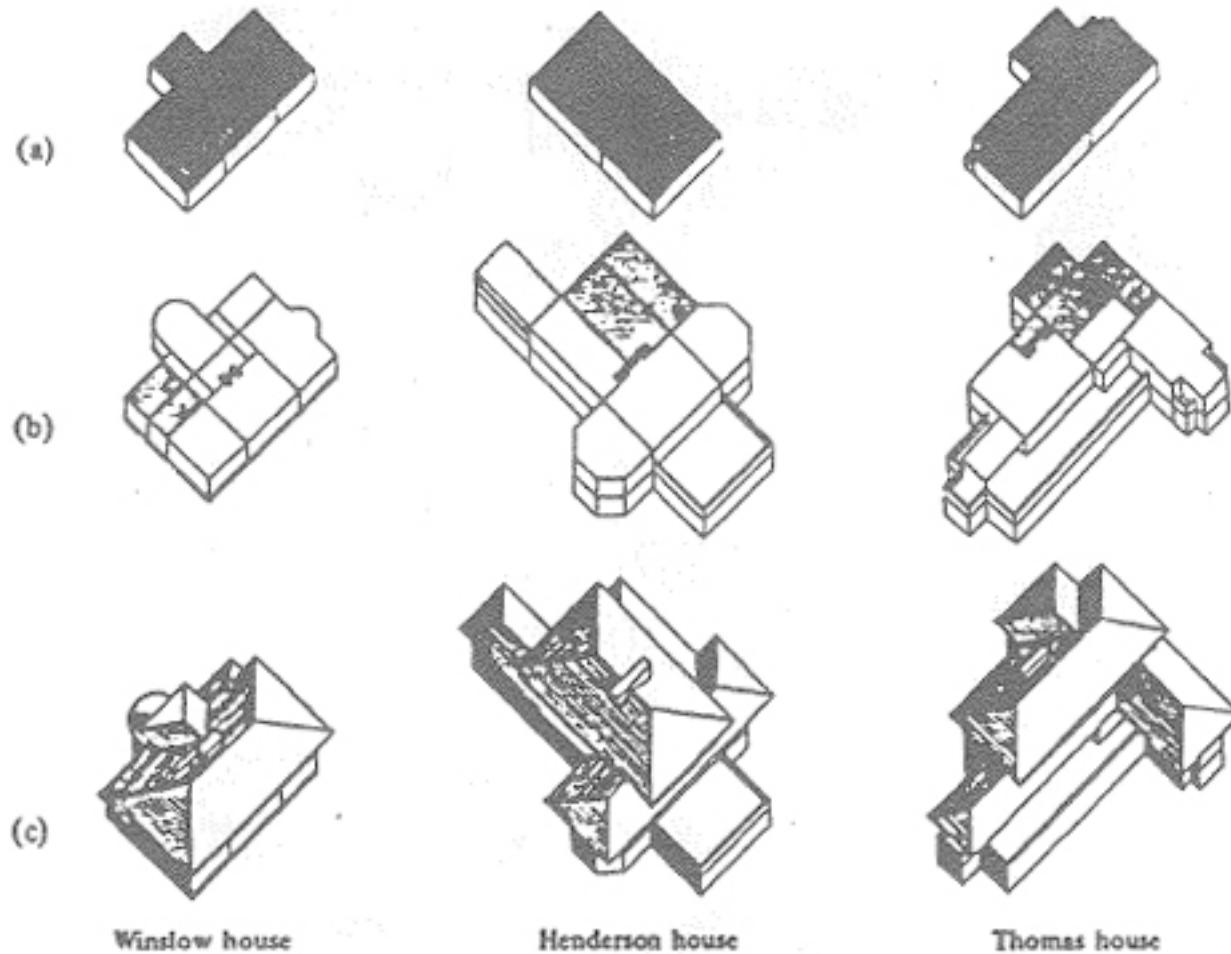
examine a corpora

(a)

(b)

(c)
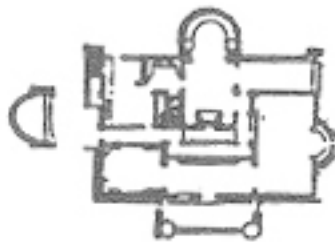
Winslow house, 1898   Henderson house, 1901   Thomas house, 1901

the corpora: exterior view, bedroom floor plan, main floor plan

(a)

(b)

(c)

Winslow house   Henderson house   Thomas house

the corpora: bedroom floor, main floor, exterior
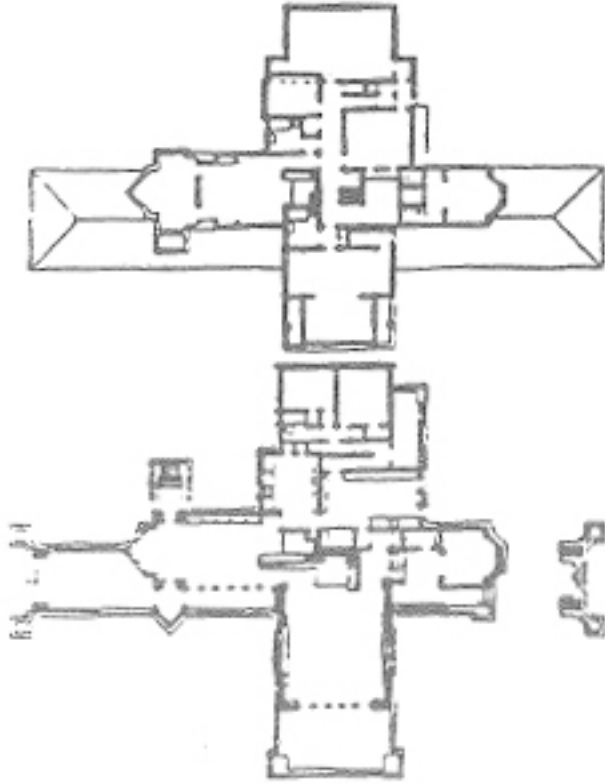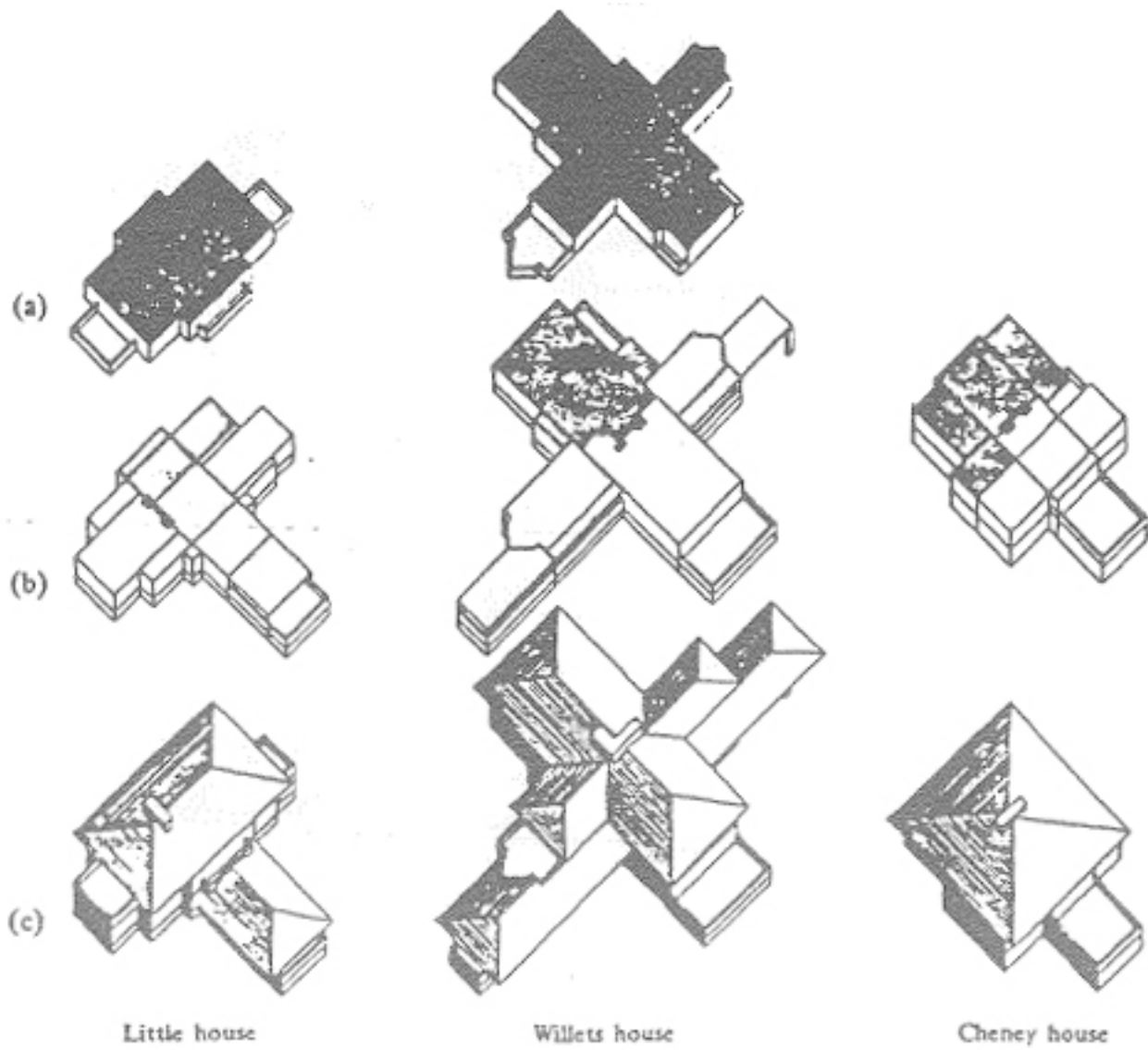
(a)
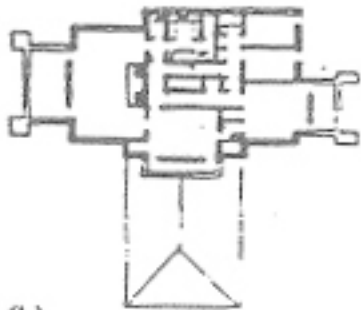
(b)

(c)

Little house, 1902   Willets house, 1902   Cheney house, 1904
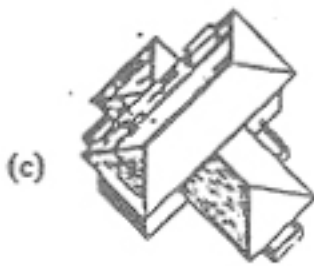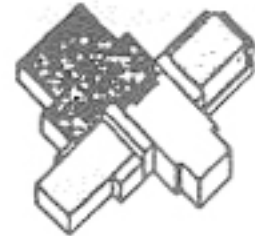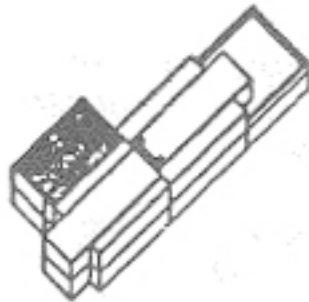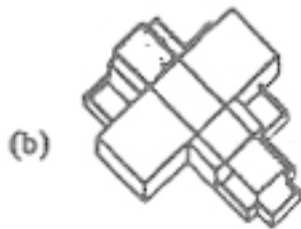
2

(a)

(b)

(c)

Little house   Willets house   Cheney house

(a)

(b)

(c)

Martin house, 1904   Tomek house, 1907   Roberts house, 1908
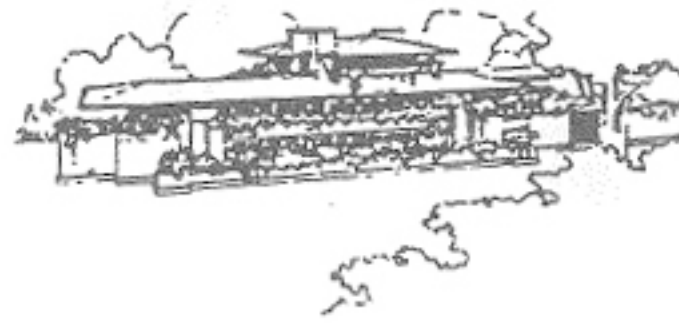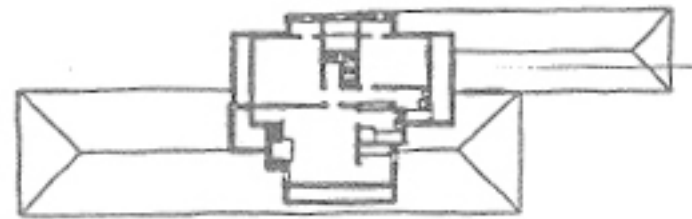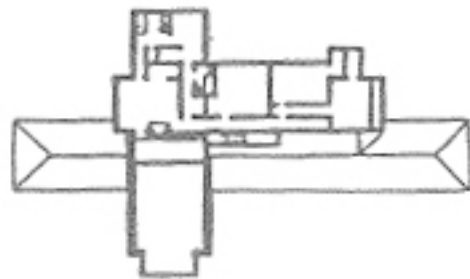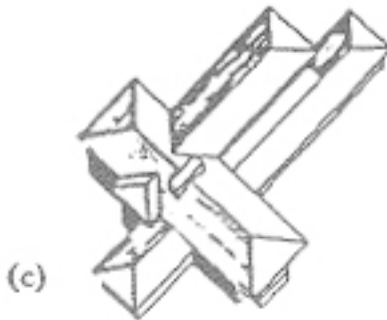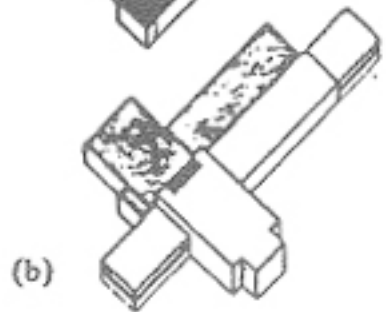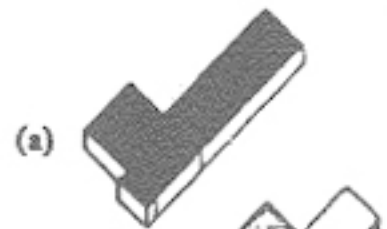
3

(a)

(b)

(c)
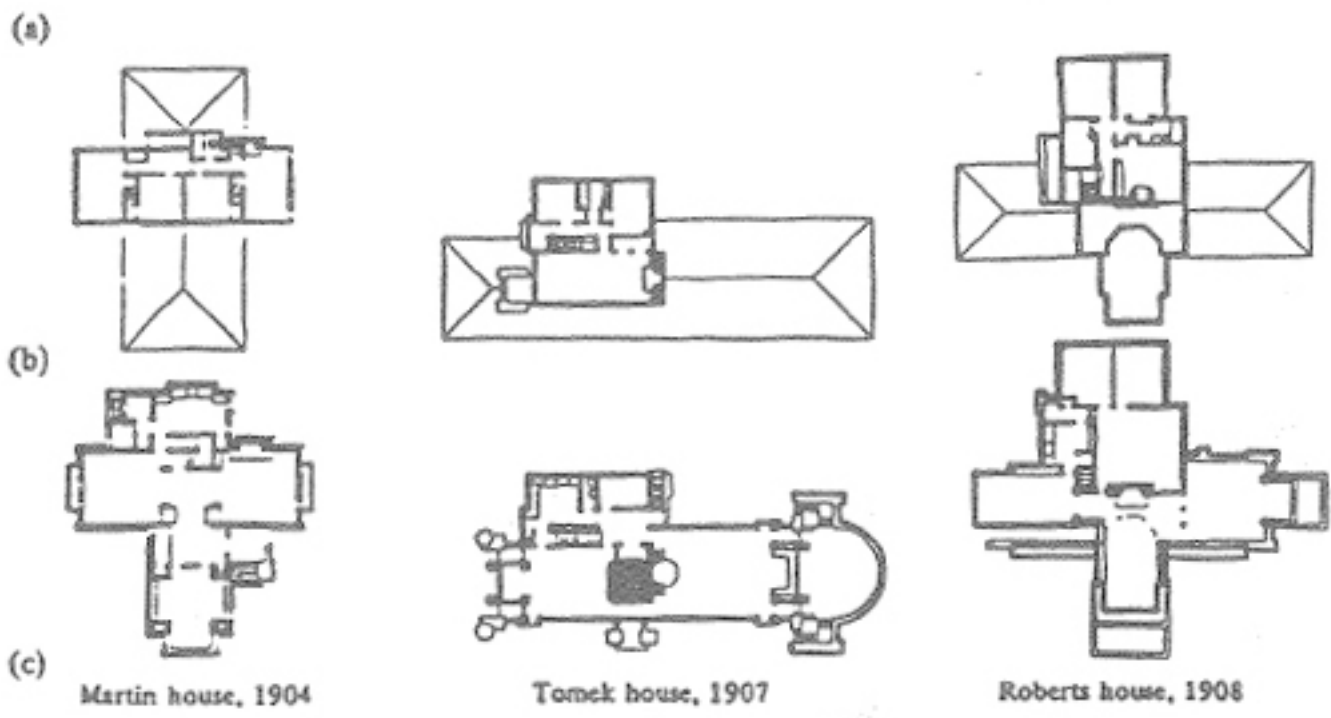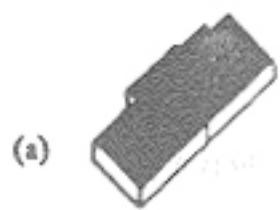
Martin house   Tomek house   Roberts house
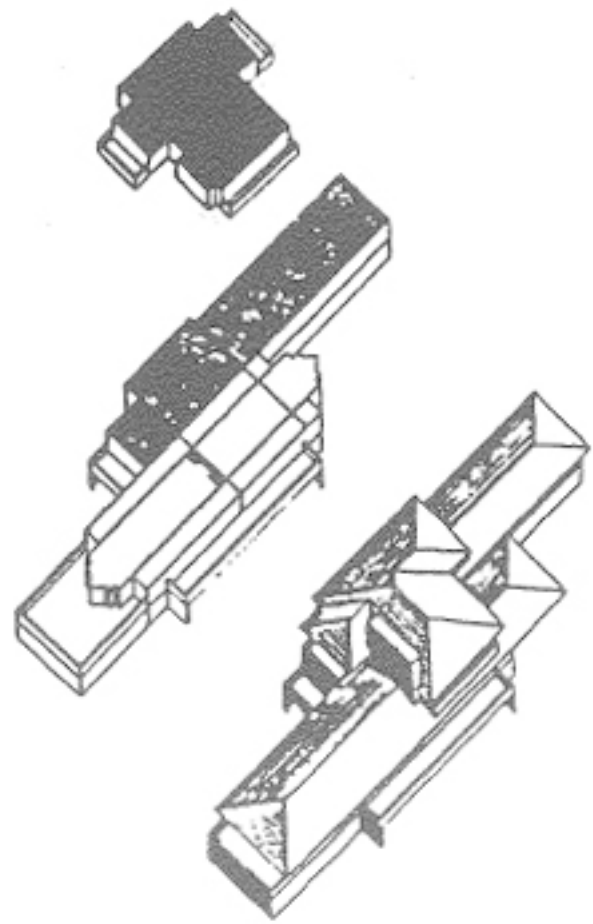
(a)

(b)
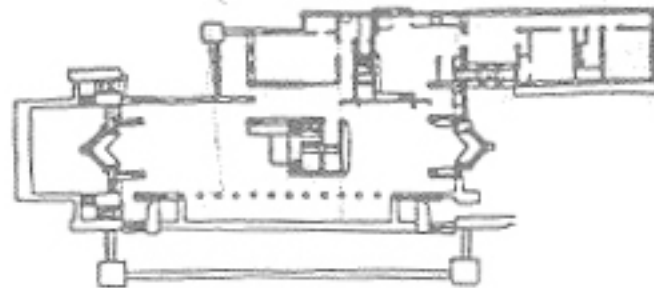
(c)

Baker house, 1909   Robie house, 1909

4

(a)

(b)

(c)

Baker house

Robie house

"Instead of lean, brick chimneys, bristling up from steep roofs to hint at "judgment" everywhere I can see necessity for one only, a broad generous one, or at most, for two, these kept low down on gently sloping roofs or perhaps flat roofs. The big fireplace below, inside, become now a place for a real fire, justified the great size of this chimney outside. A real fireplace at that time was extraordinary. There were then 'mantels' instead. A mantel was a marble frame for a few coals or a piece of wooden furniture with tile stuck in it and a 'gate', the whole set slam up against the wall. The 'mantel' was an insult to comfort, but the *integral* fireplace became an important part of the building itself in the houses I was allowed to build out there on the prairie. It refreshed me to see the fire burning deep in the masonry of the house itself."

the fireplace is central

"So I declared the whole lower floor at one room, cutting off the kitchen as a laboratory, putting servants' sleeping and living quarters next to it, semi-detached, on the same floor, screen various portions in the big room, for certain domestic purposes– like dining or reading, or receiving a formal caller. There were no plans like these in existence at the time and my clients were pushed toward these ideas as helpful to a solution of the vexed servant-problem. Scores of doors disappeared and no end of partition. They liked it, both clients and servants. The house became more free as "space" , and more livable, too. Interior spaciousness began to dawn."
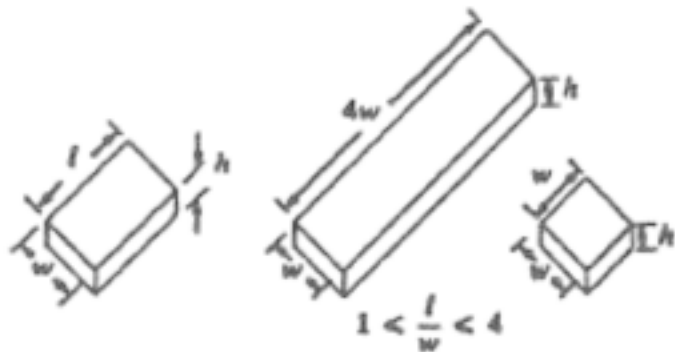
abolition of rooms per se

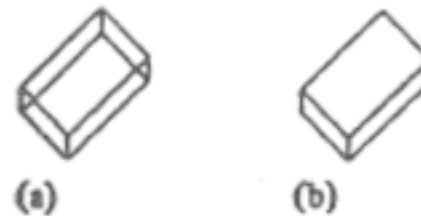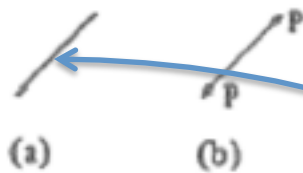Figure 3. Parameters for the main vocabulary element.

$1 < \dfrac{l}{w} < 4$

Figure 4. Graphic conventions for hidden lines.

(a)

(b)

P

P

(a)

(b)

convention for lines

double thick line

Rules 1-18

1-2 Locating the fireplace – single or double hearth

3-6 adding a living zone

7 adding a service zone (used once)
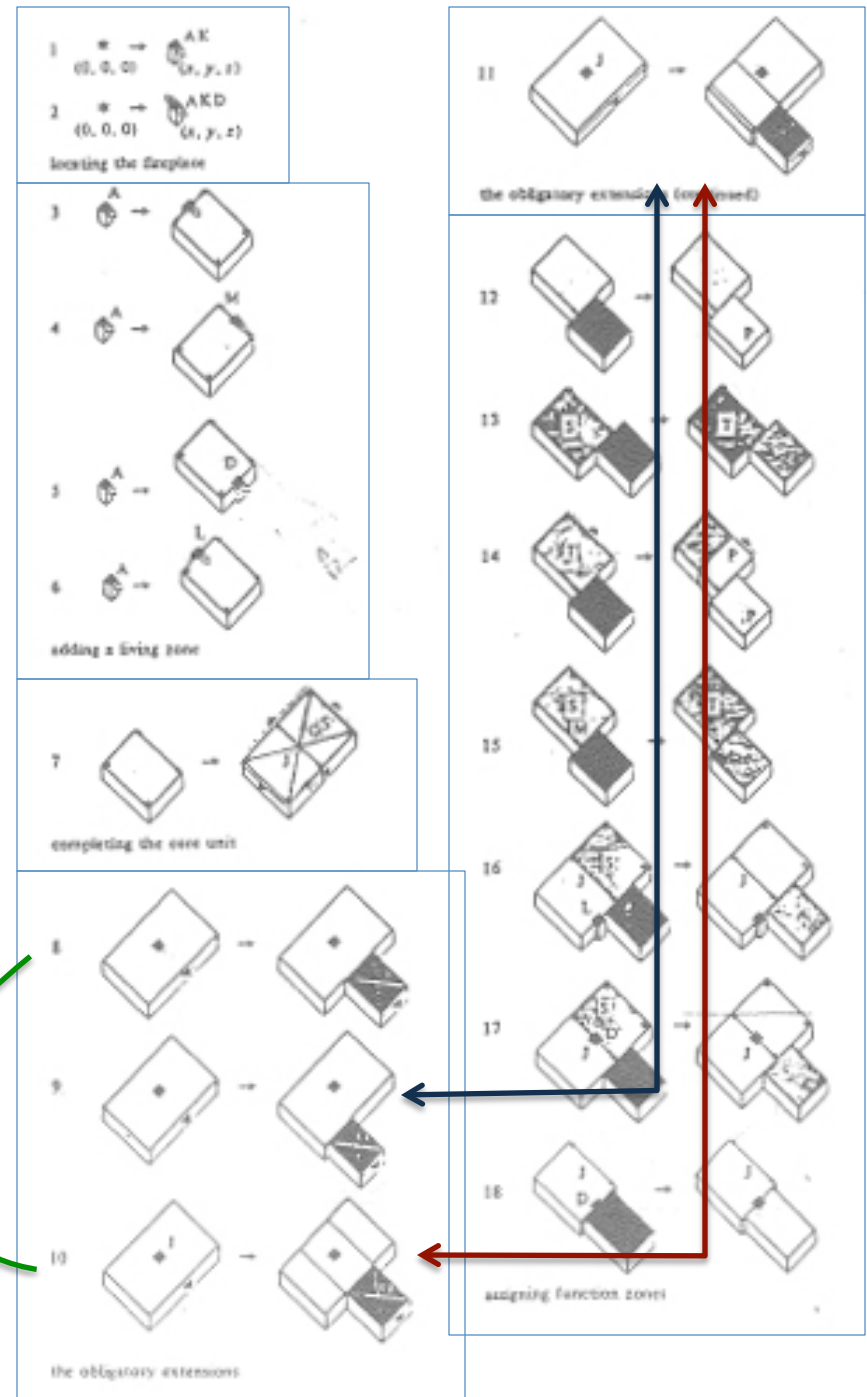
8-11 fixes obligatory extension

12-18 assigning function zones

10-11 aligned with the fireplace on one side

8,10 aligned with the middle third

9, 11 positioned to one side
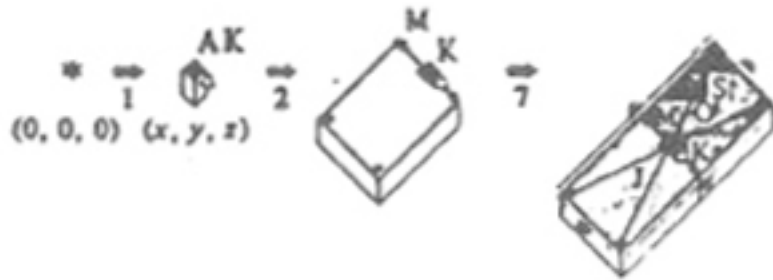
basic composition

Figure 7. Generation of a design. Shape rule schemata are applied to the initial shape to establish a core unit. Numbers under the double-stemmed arrows indicate the schemata applied.
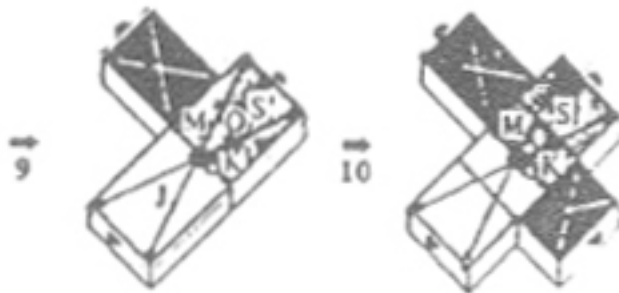

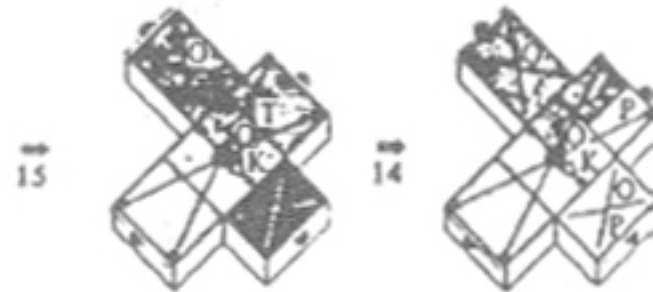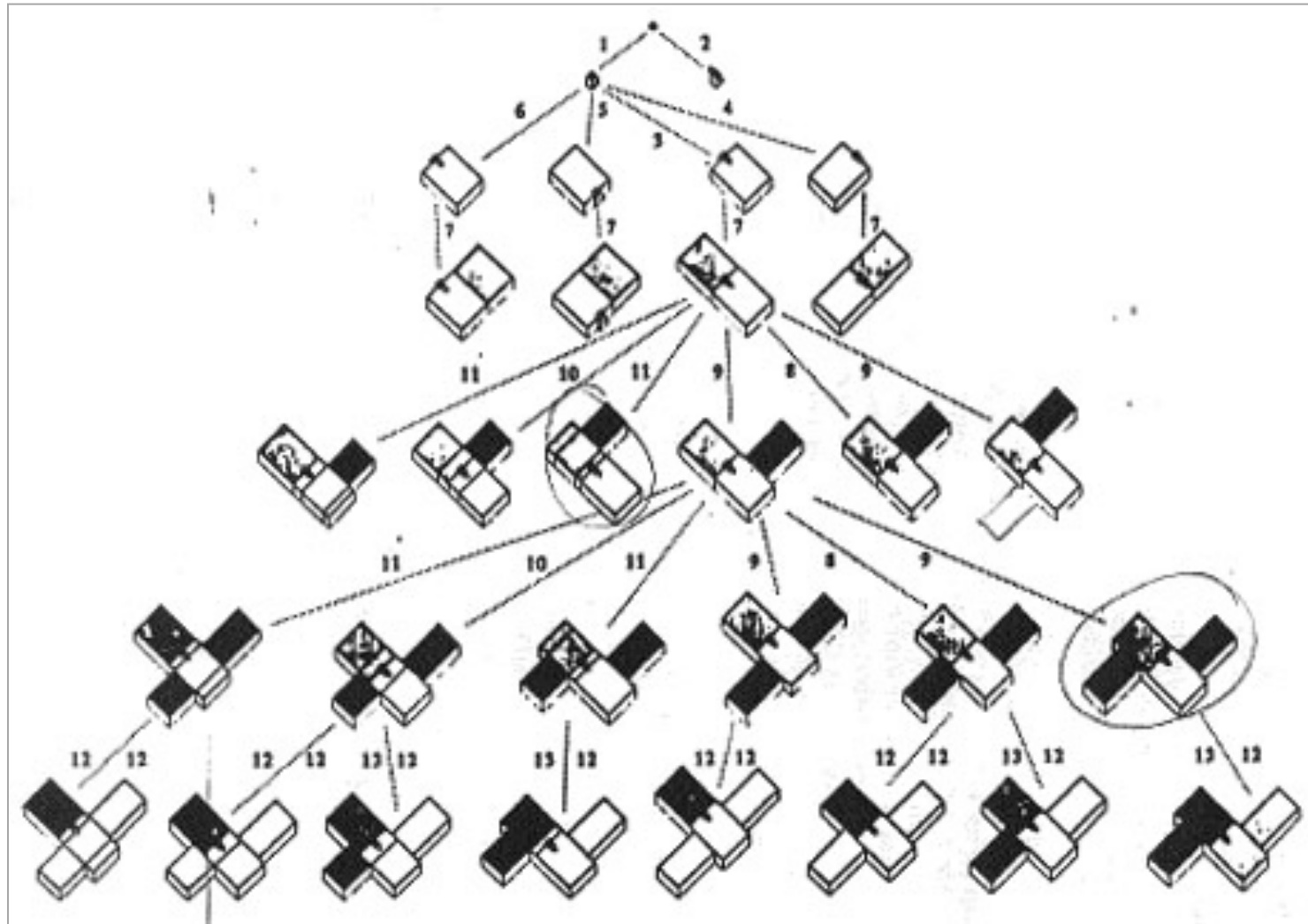Figure 8. Generation of a design continued: obligatory extensions to the core unit are fixed.

Figure 9. Generation of a design continued: functions are assigned to functionally undistinguished black-toned blocks.

Initial design

tree of generation ≈ the language of prairie houses

•1

Henderson, Willets, Baker

•2

•3

•4

•5

Cheney
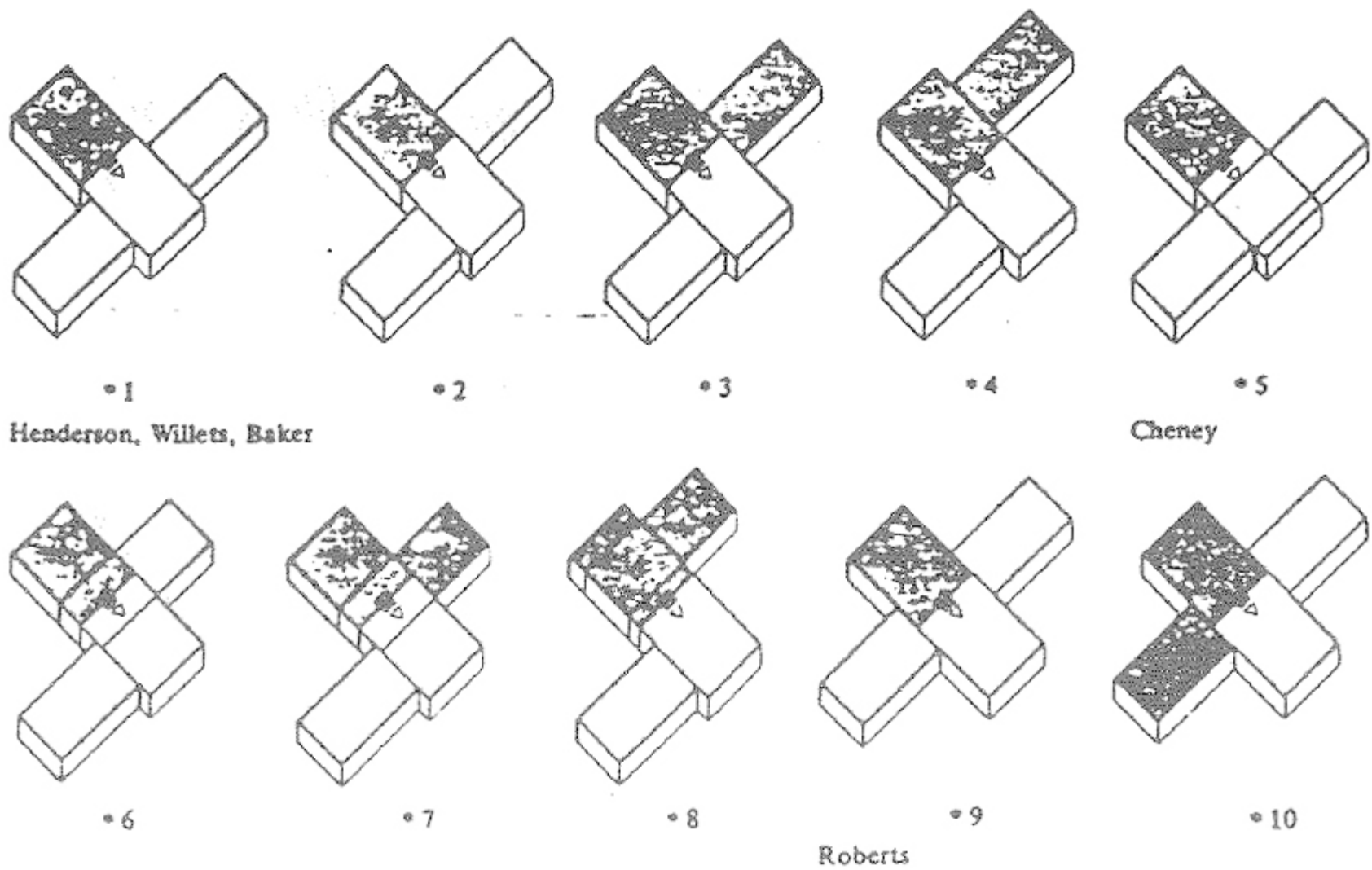
•6

•7

•8

•9

•10

Roberts

Figure 11. Catalogue of basic compositions. The basic compositional form for each house in the corpus is identified. The asterisk indicates that the layout is suitable for double-height living-zone arrangements.

Rules

19-22 Adding to concave corners

23-24 Adding porches

26-34 interior details of the main floor

35-40 basement formation

41-47 Adding terraces

48-53 Exterior details: main floor

54-55 creating portes cocheres

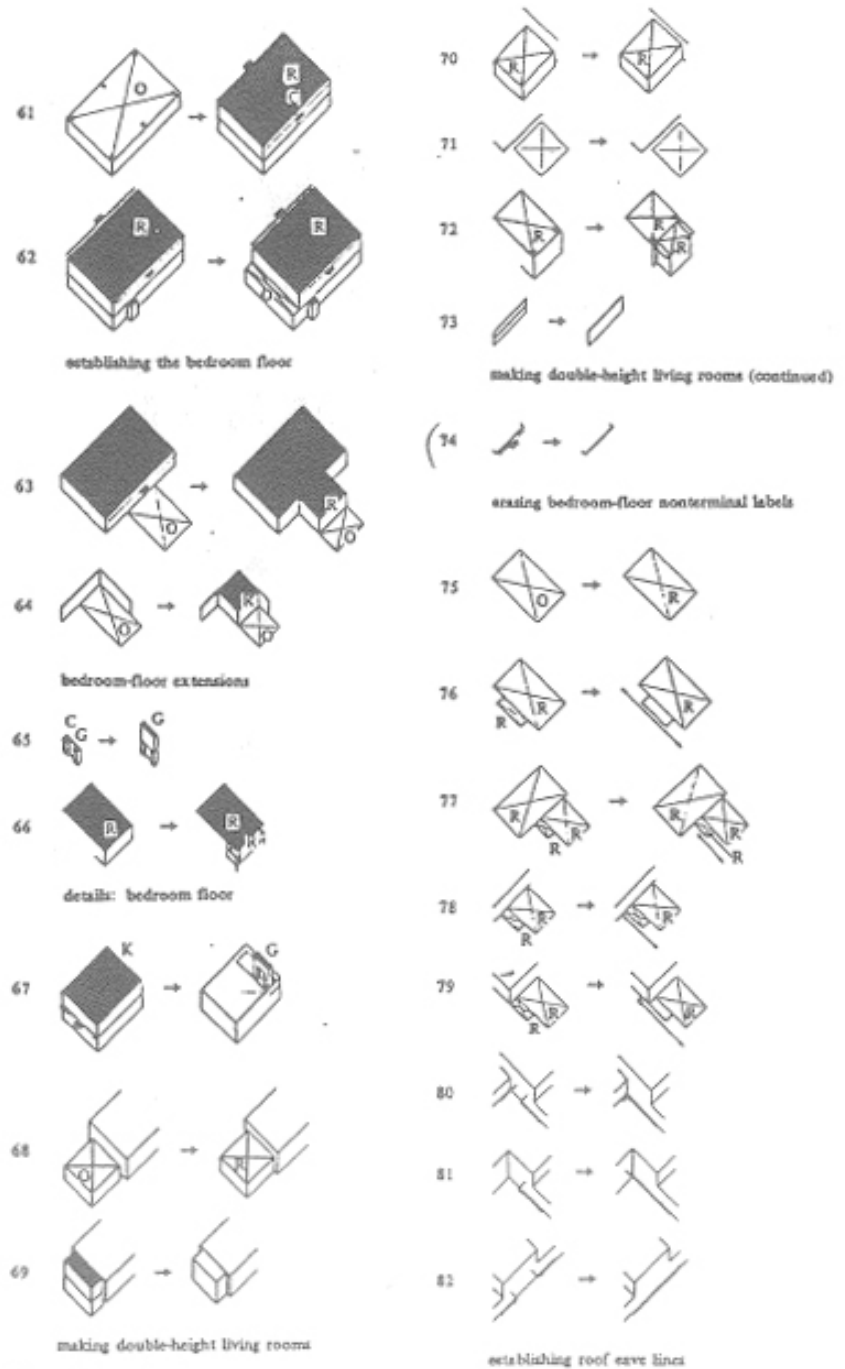**remaining rules** – ornamenting the basic composition

61 establishing the bedroom floor

62

63 bedroom-floor extensions

64

65

66 details: bedroom floor

67

68 making double-height living rooms

69

Figure 12 (continued)

70

71

72

73 making double-height living rooms (continued)

74 erasing bedroom-floor nonterminal labels

75

76

77

78

79

80

81

82 establishing roof eave lines

Rules

remaining rules – ornamenting the basic composition

83

84

creating balconies

85

86 $G_o . \{(0, 0, 0): \bullet\}) \rightarrow G_o . \emptyset)$

erasing nonterminal labels

87

88

89

90

roof formation

Figure 12 (continued)

91

92

93

94

95
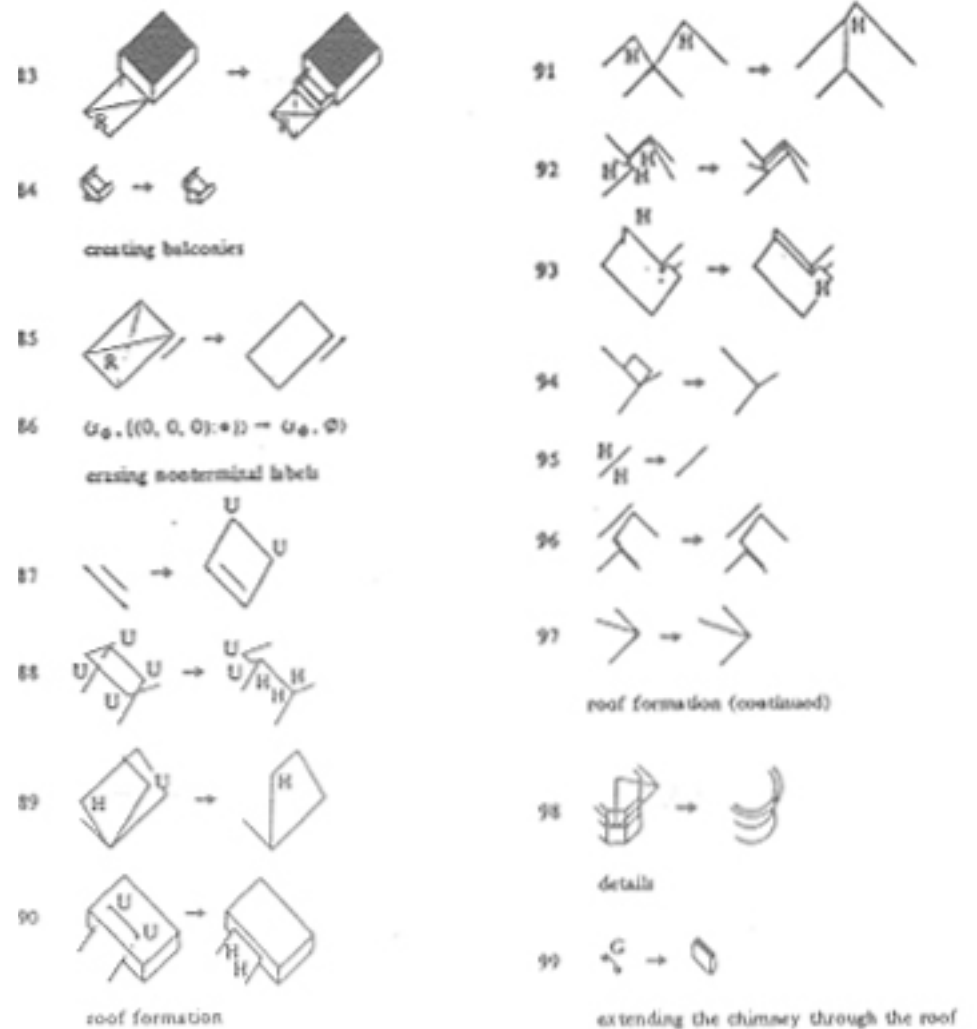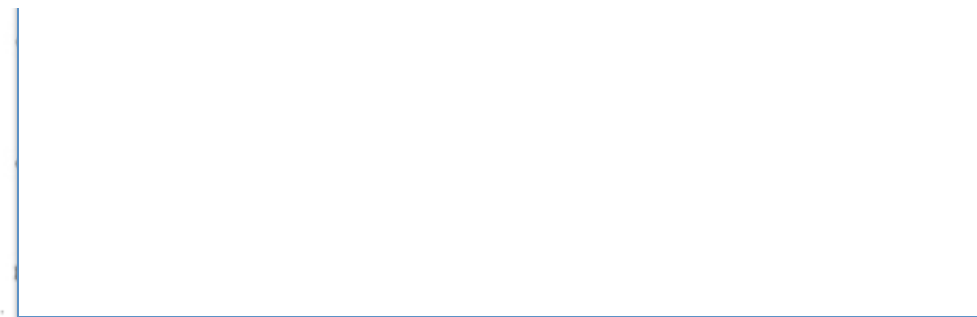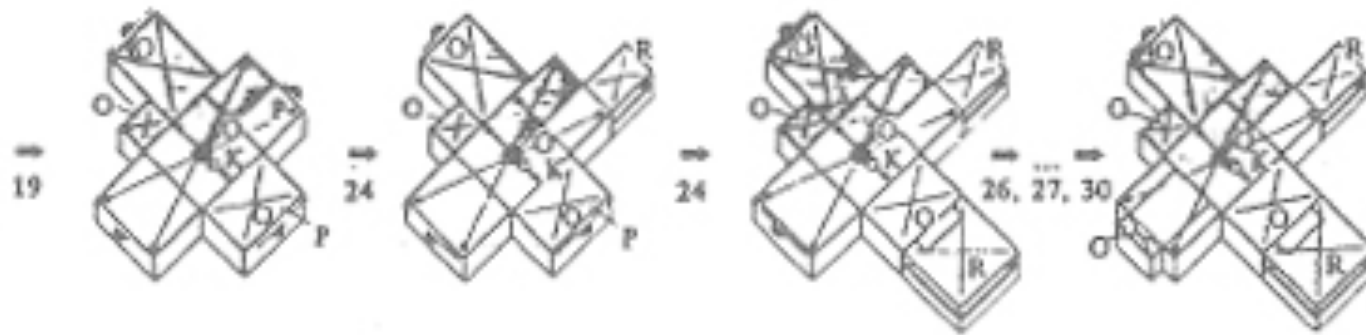
96

97

roof formation (continued)

98

details

99

extending the chimney through the roof

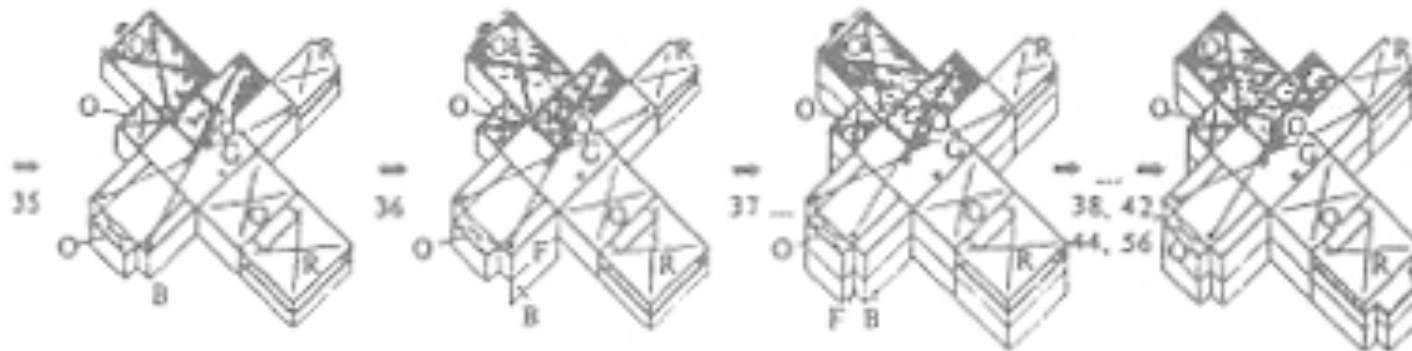Figure 13. Generation of a design continued: the design is ornamented with blocks in external concave corners, porches, and various interior details.

Figure 14. Generation of a design continued: a basement is specified and a terrace is added.

generation
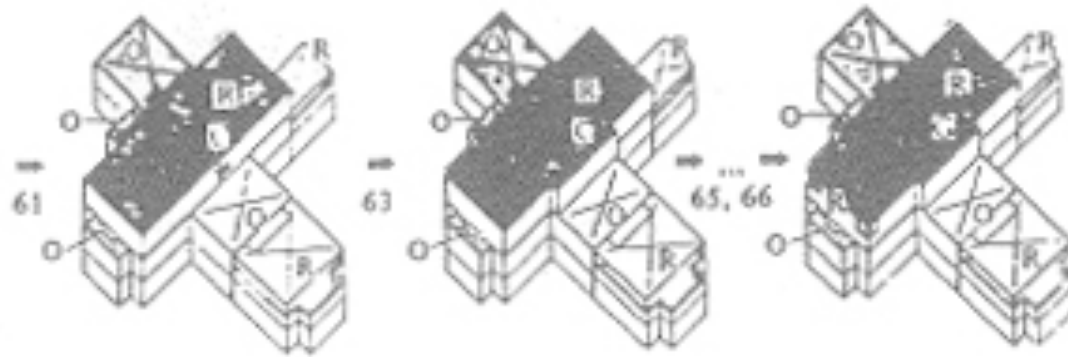
Figure 15. Generation of a design continued: the bedroom level is added.

generation
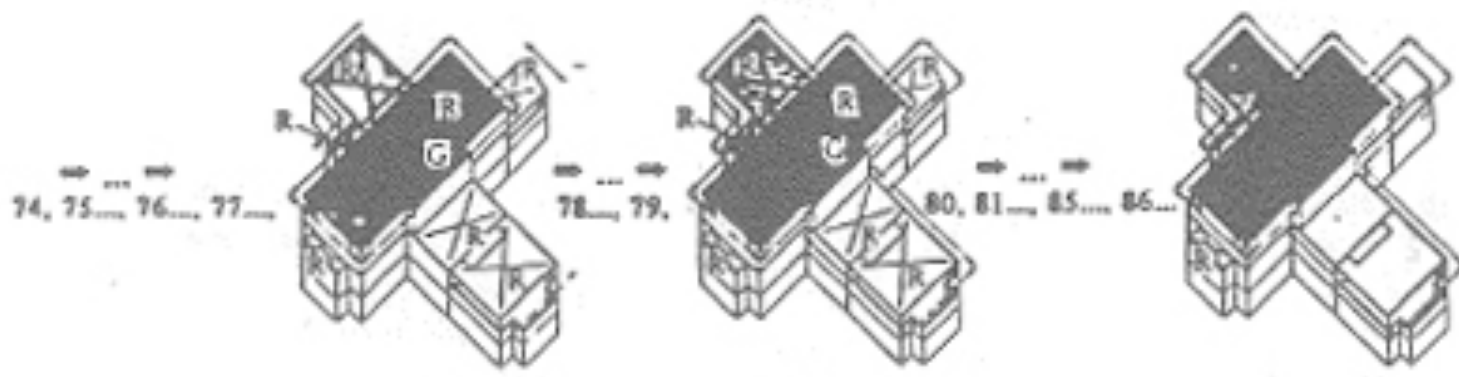
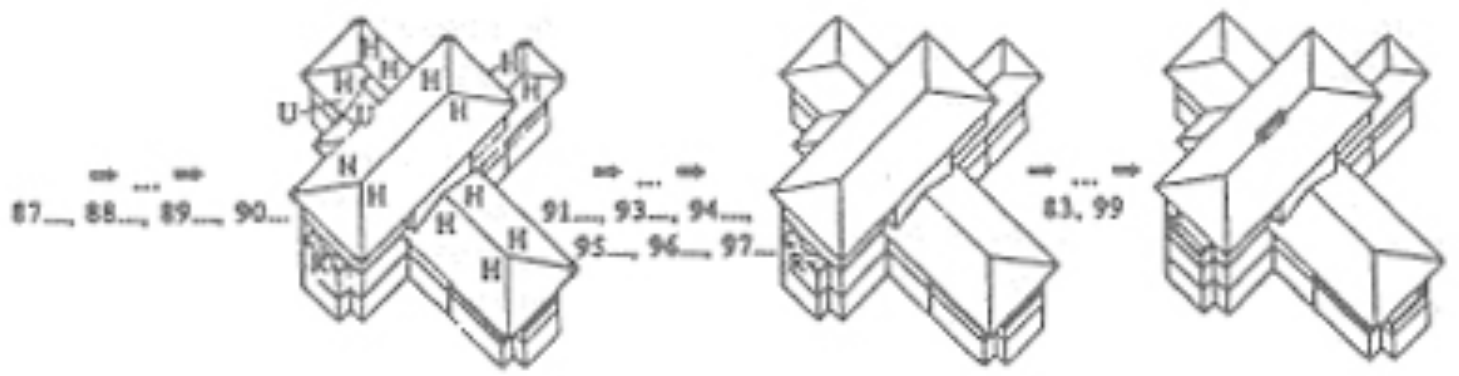Figure 16. Generation of a design continued: the eaves line is established and unused labels are erased.

Figure 17. Generation of a design continued: a balcony is added, the roof is formed, and the chimney is extended. The design is now complete.

generation
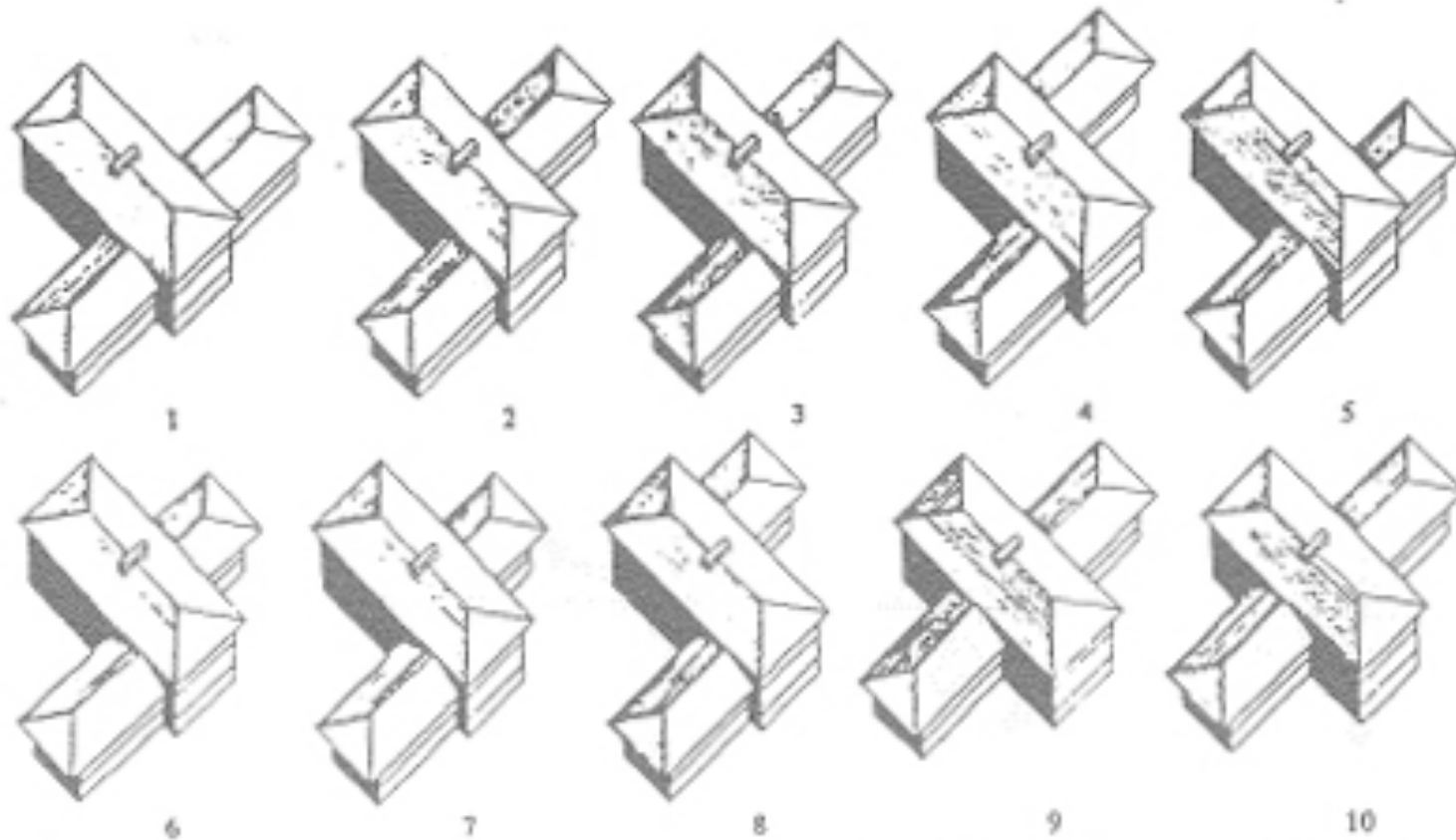
Figure 18. Catalogue of the 'simplest' two-storey designs derived from the basic compositions of figure 11. The shading is added for clarity and is not produced by the grammar.

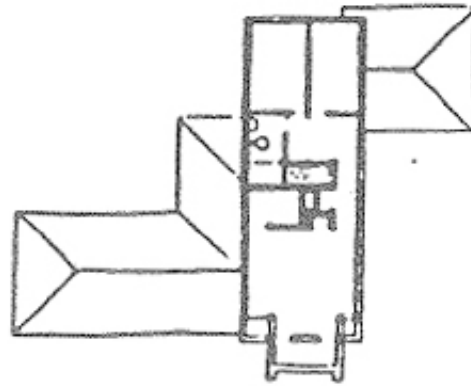catalog of simplest two storey designs
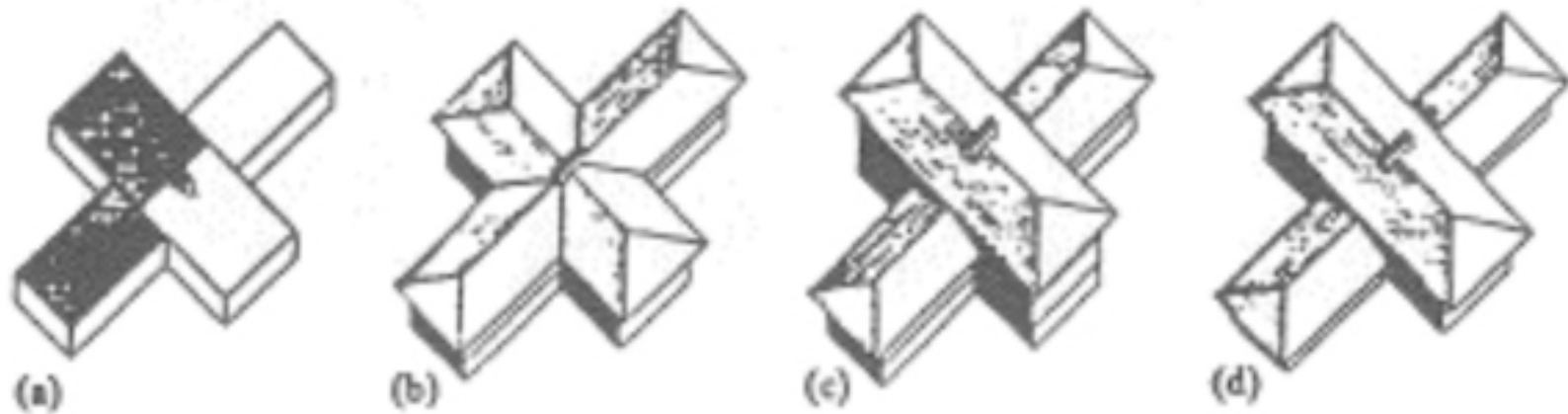
Figure 19. At least two, and in some cases three, types of designs can be derived from any one basic composition. For example, the basic compositional form (catalogue number 10) shown in (a) may lead to (b) a single-storey design, (c) a double-storey design or, (d), a double-height living-space design.
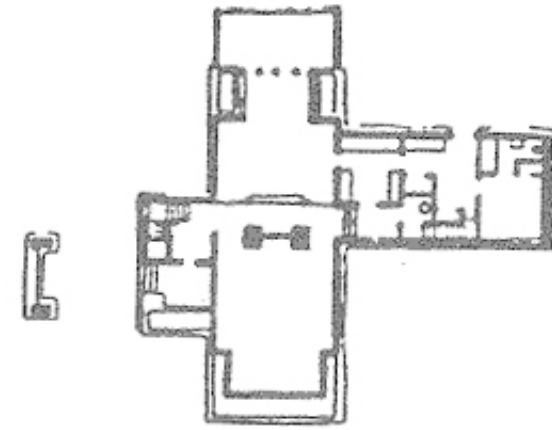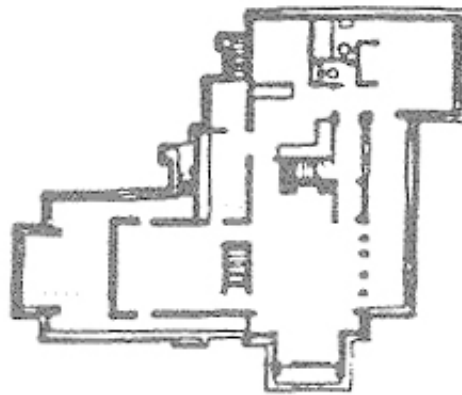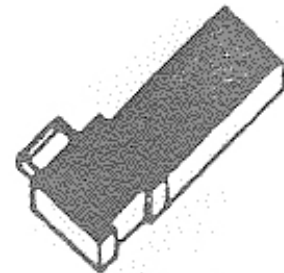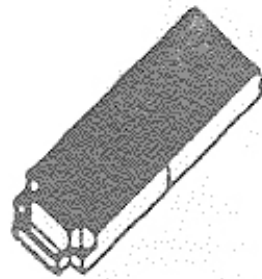
generation is not unique
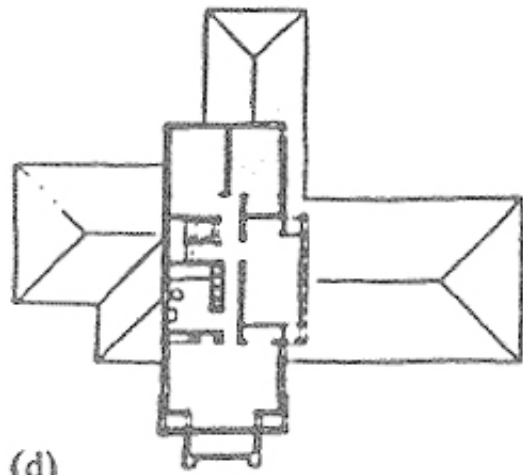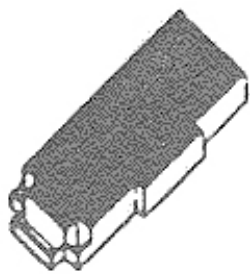
(d)
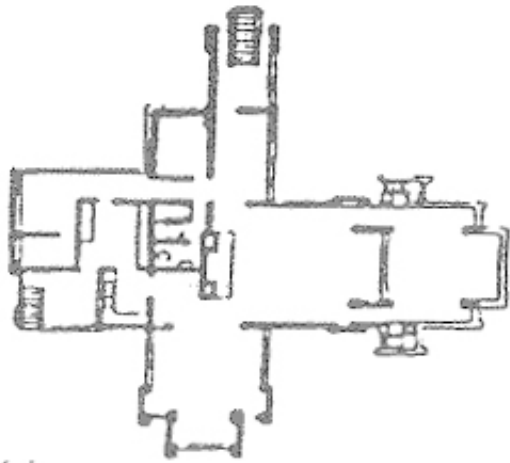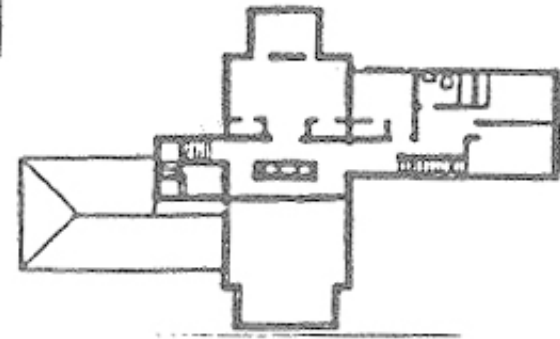
(e)

Stiny house
Cat. No. 46

Mitchell house
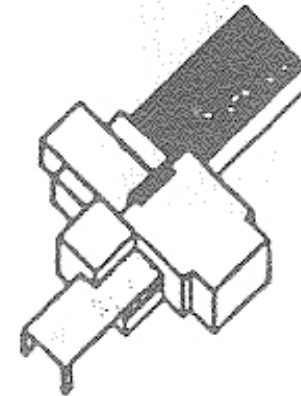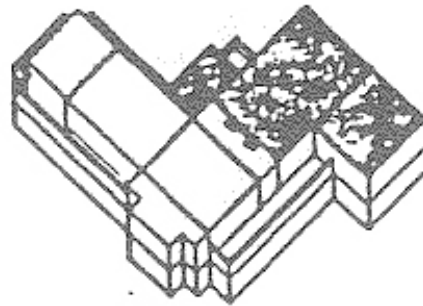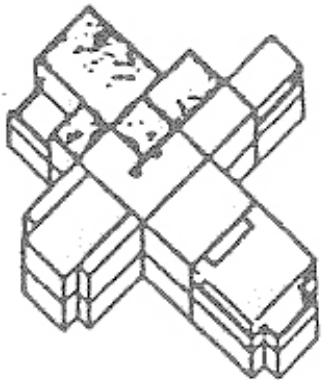Cat. No. 23

March house
Cat. No. 78

Figure 20. Three new designs as generated by the grammar: (a) bedroom level, (b) main floor level, (c) external form; and the detailed plans (d) bedroom floor plan, (e) main floor plan.

new designs

(a)

(b)

(c)