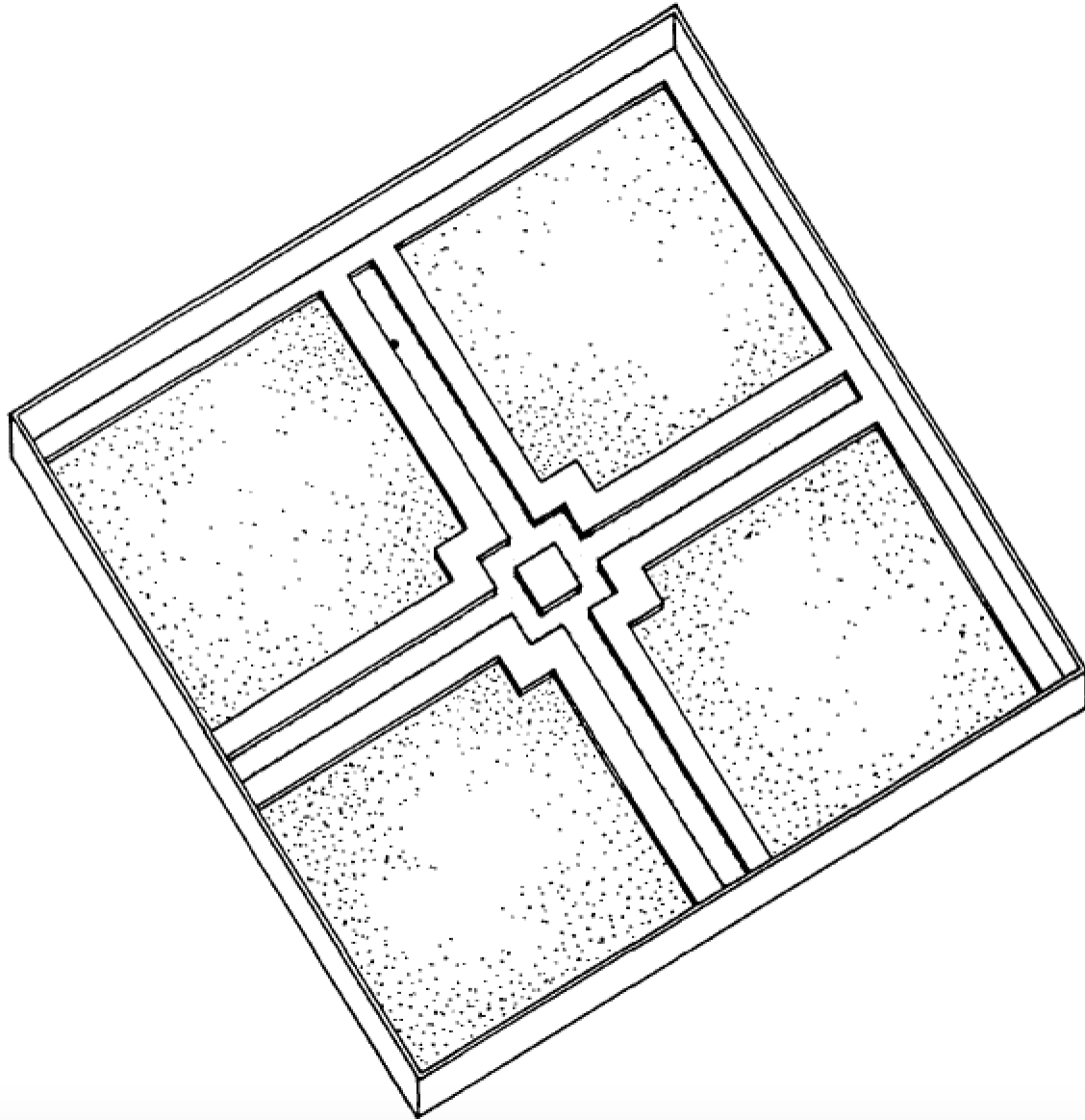


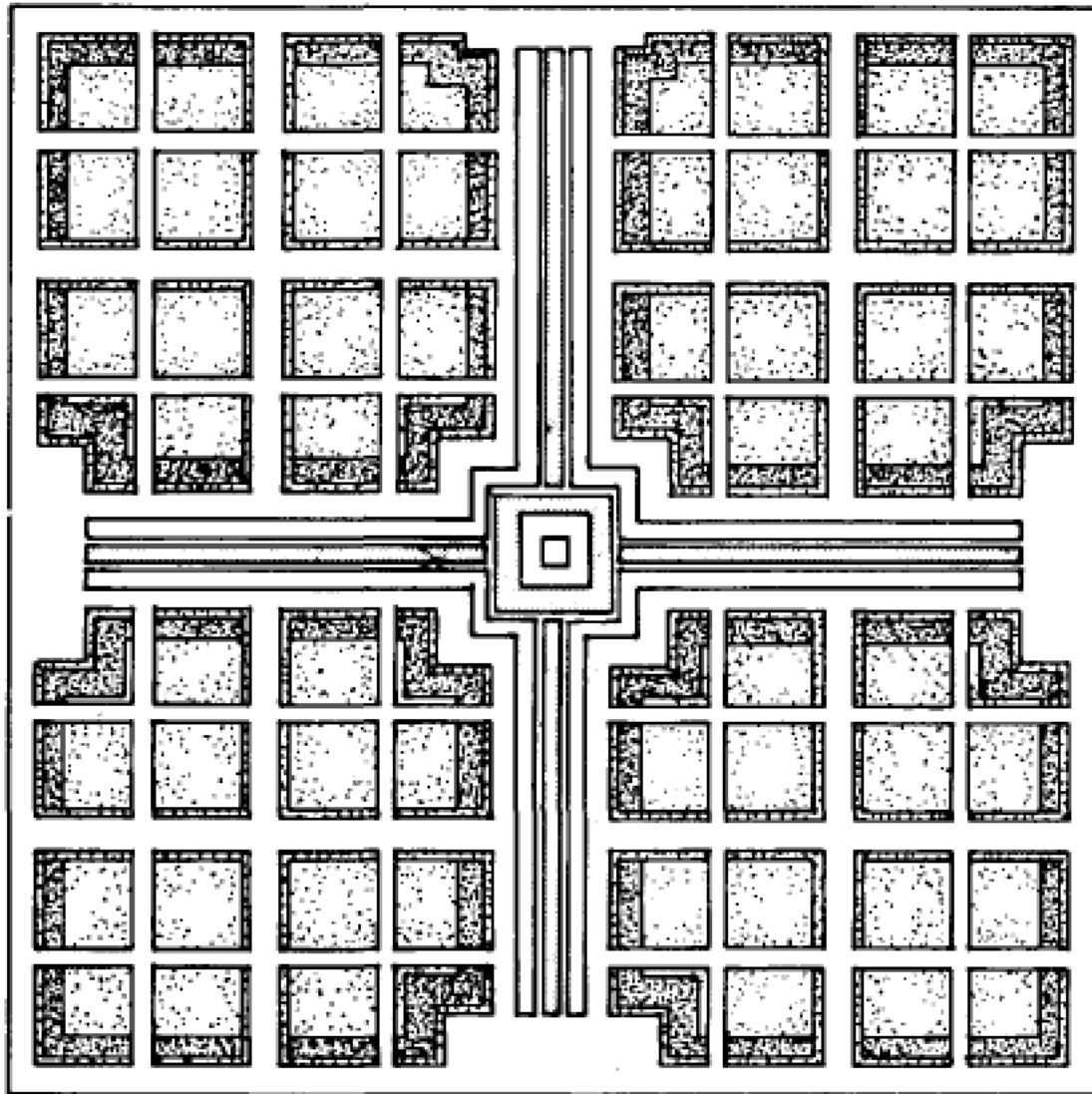
48-747 Shape Grammars

Mughal Gardens

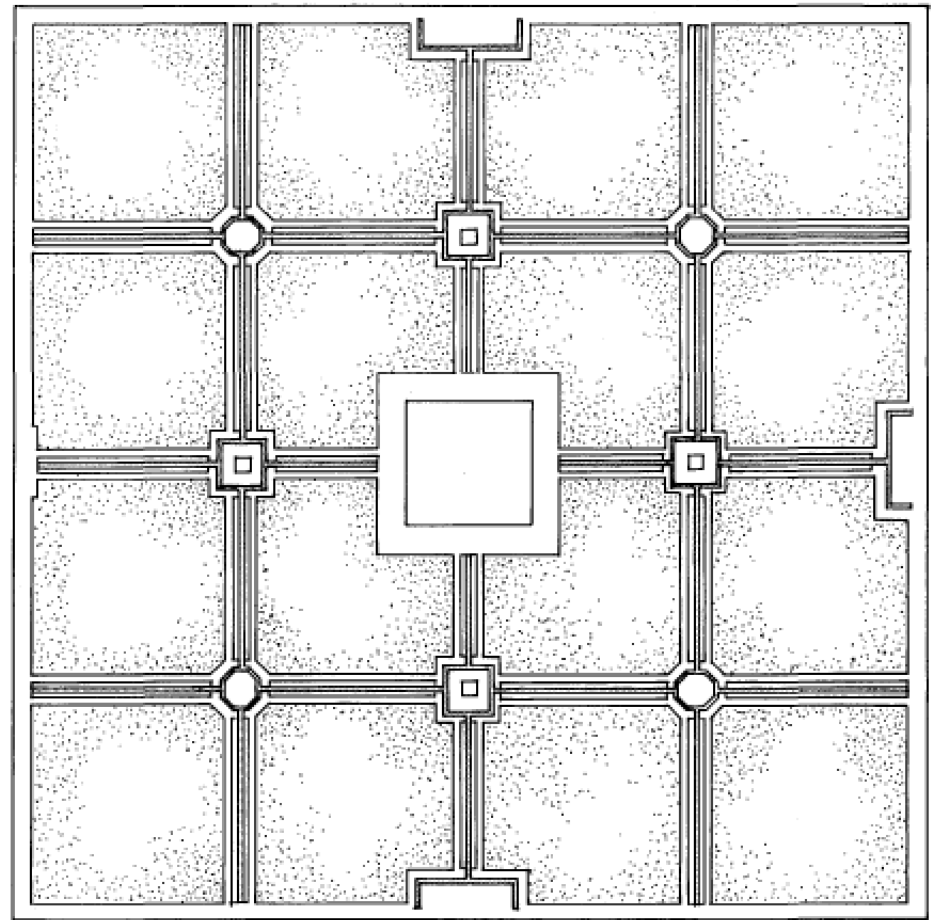
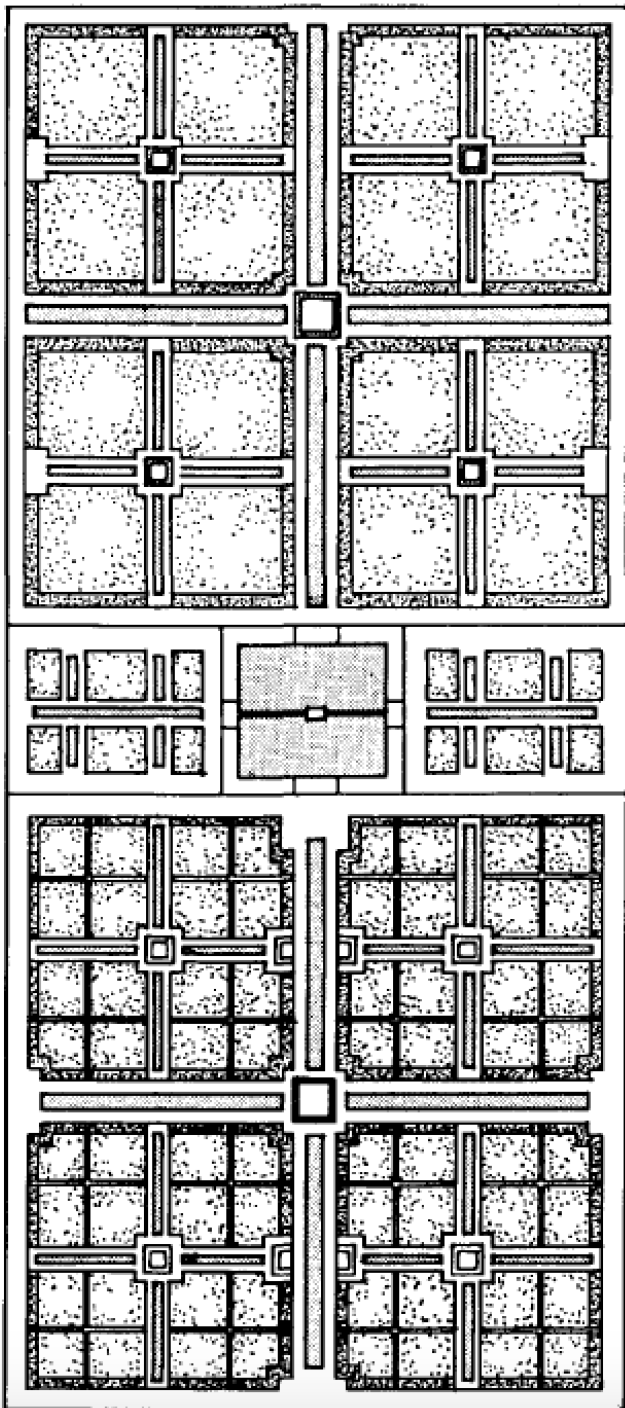
Analyze the source



Charbagh



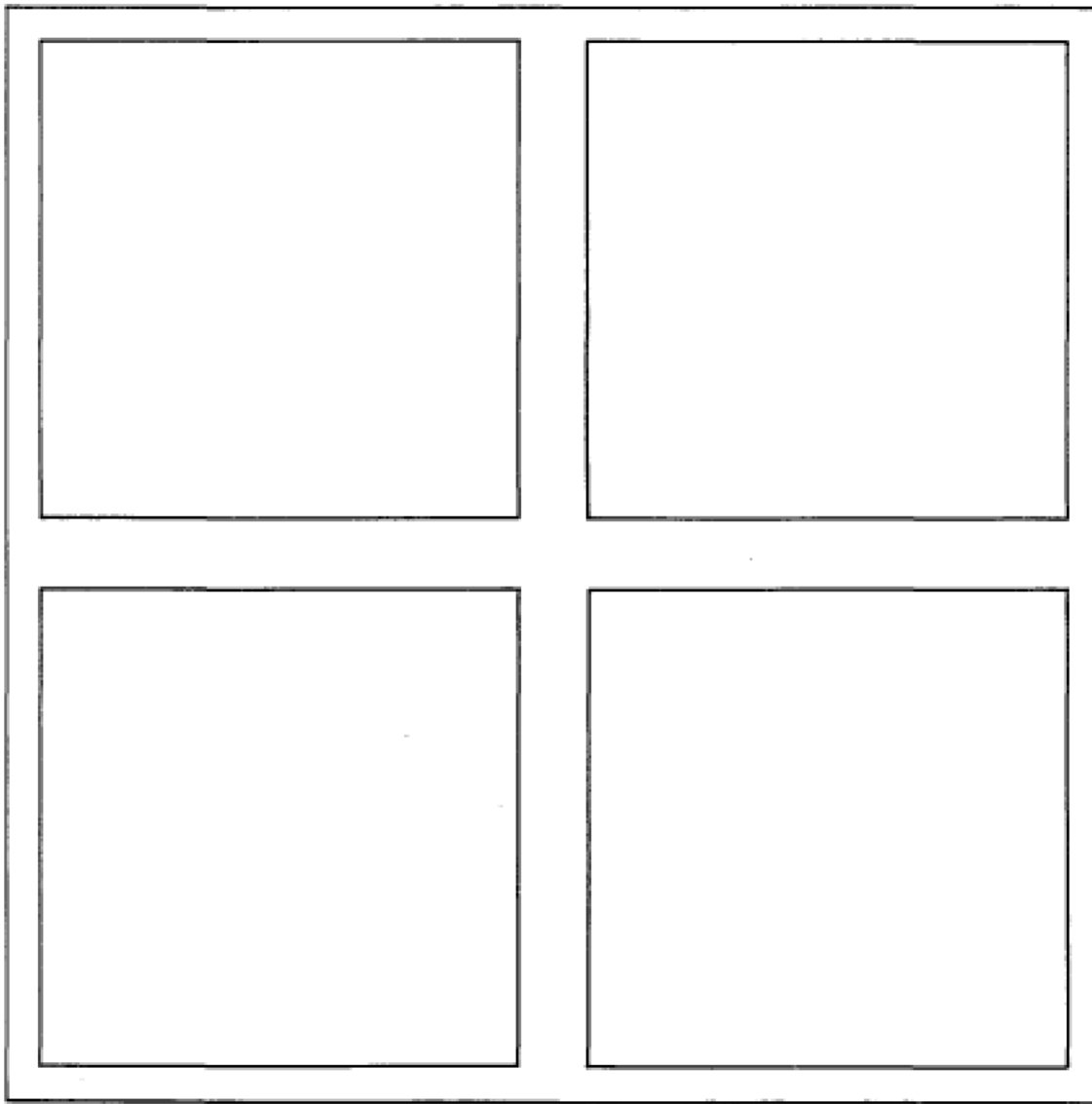
The garden at Taj Mahal, Agra



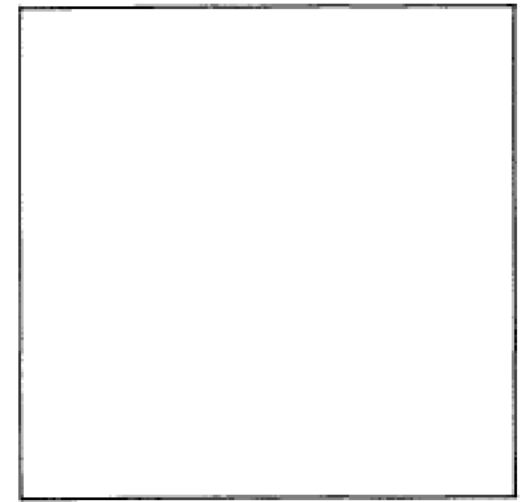
Lahore

(left) *Shalimar Bagh*

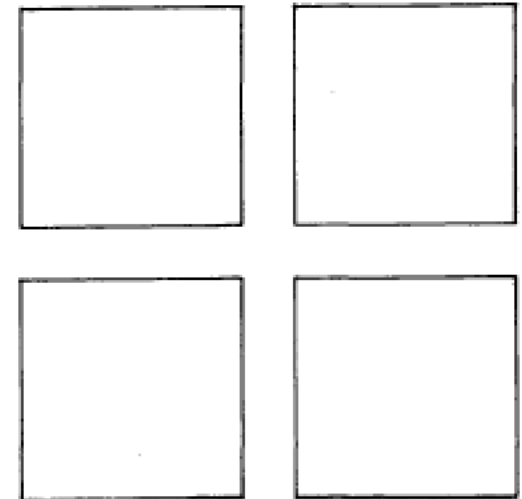
(above) *Jahangir's Tomb in Shahdara*



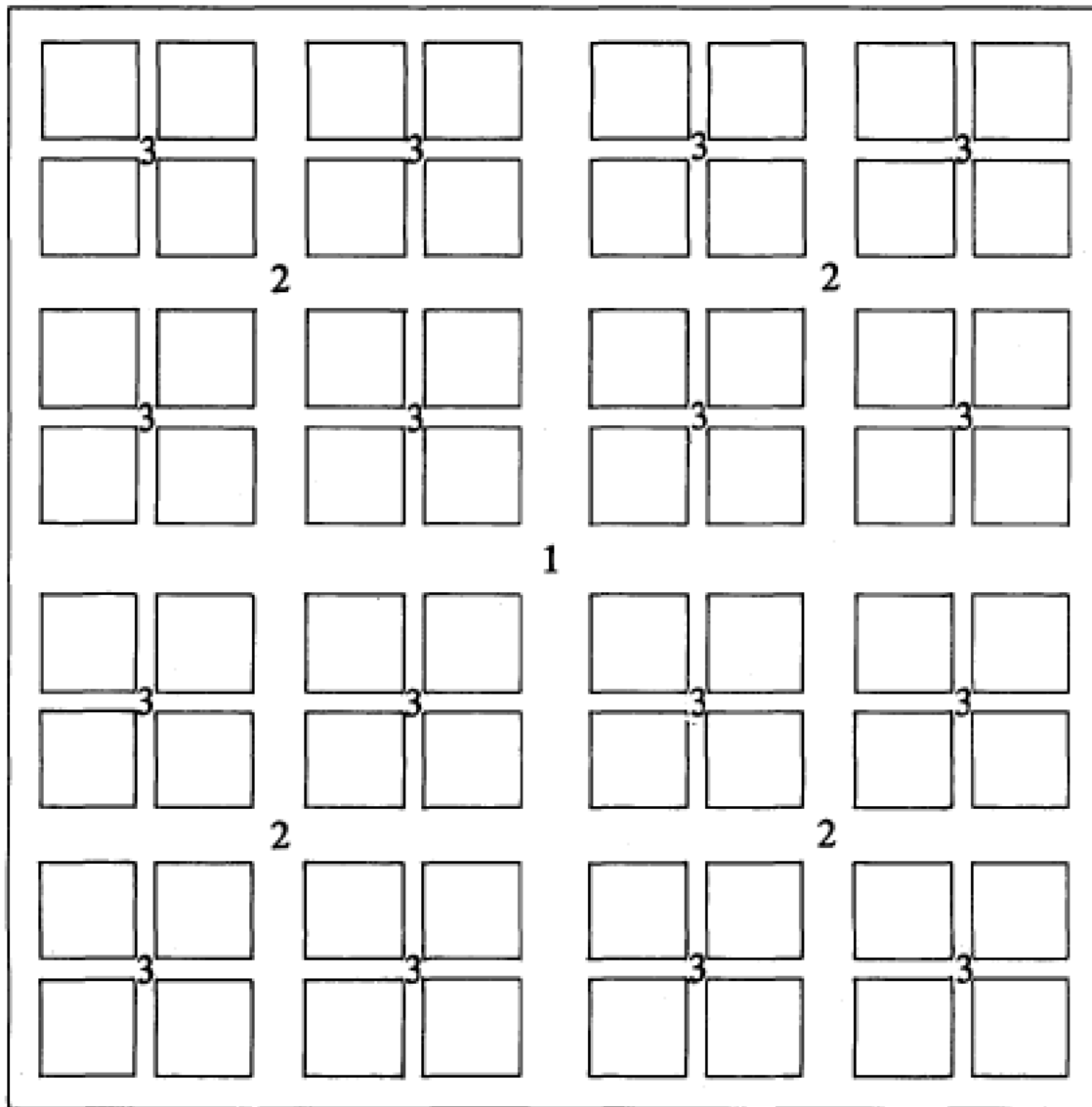
site parti



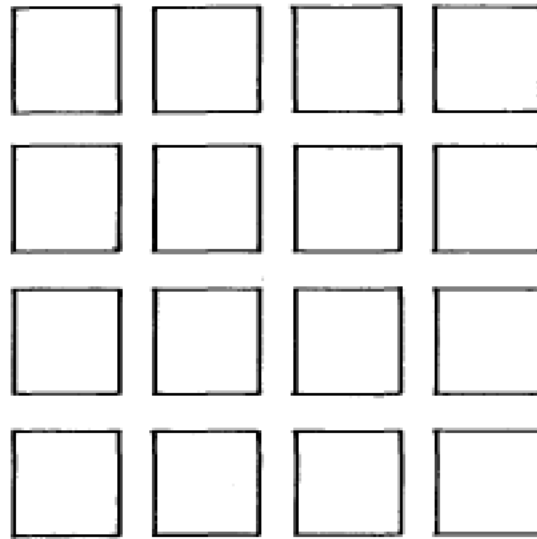
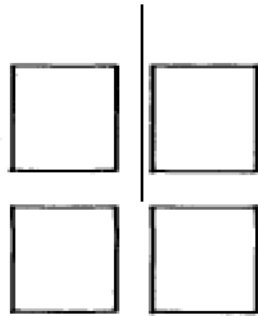
(a) Initial square



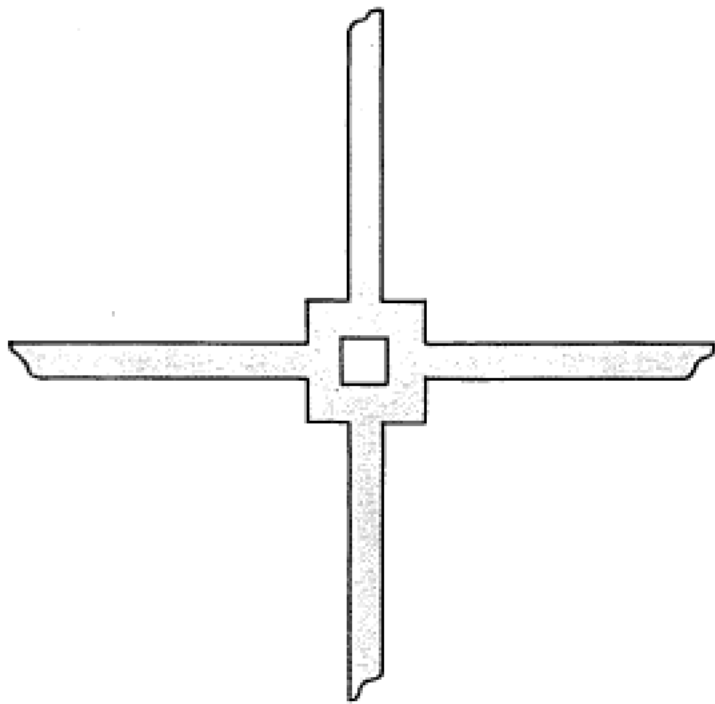
(b) Subdivision



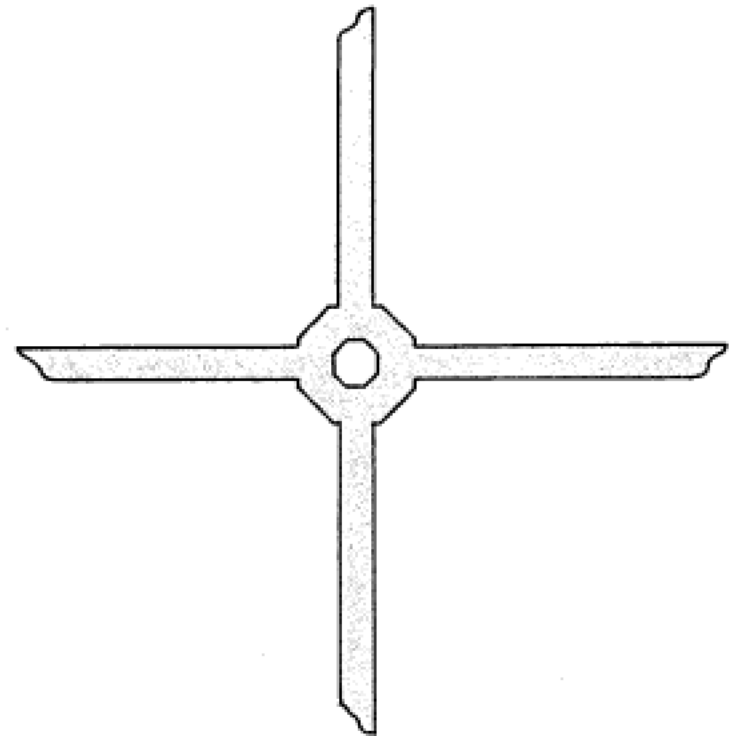
site parti for a charbagh



increasing articulation of a site parti

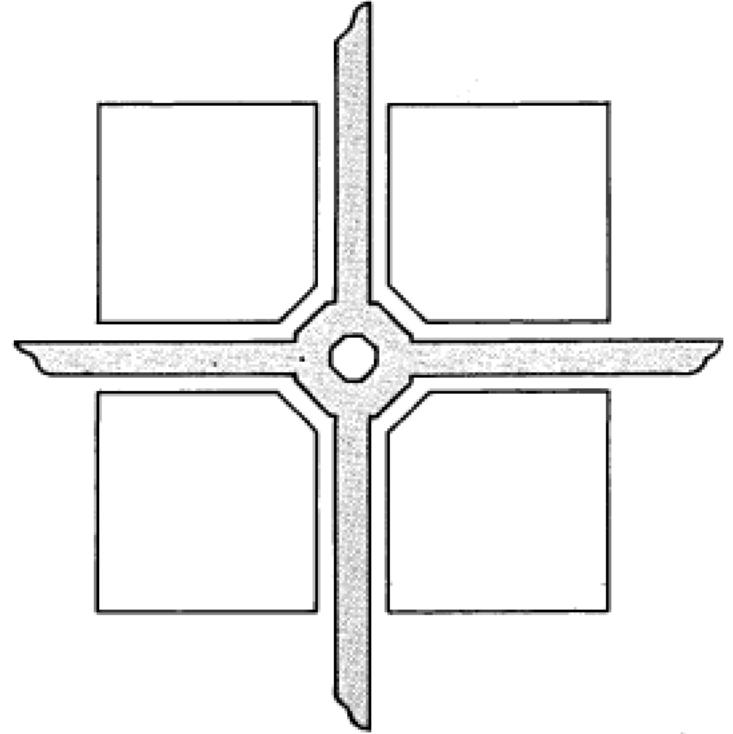
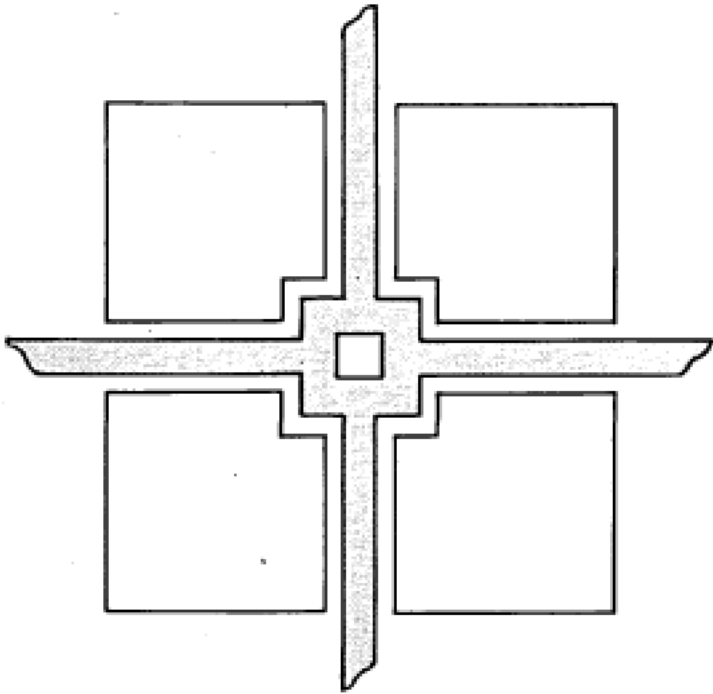


(a)

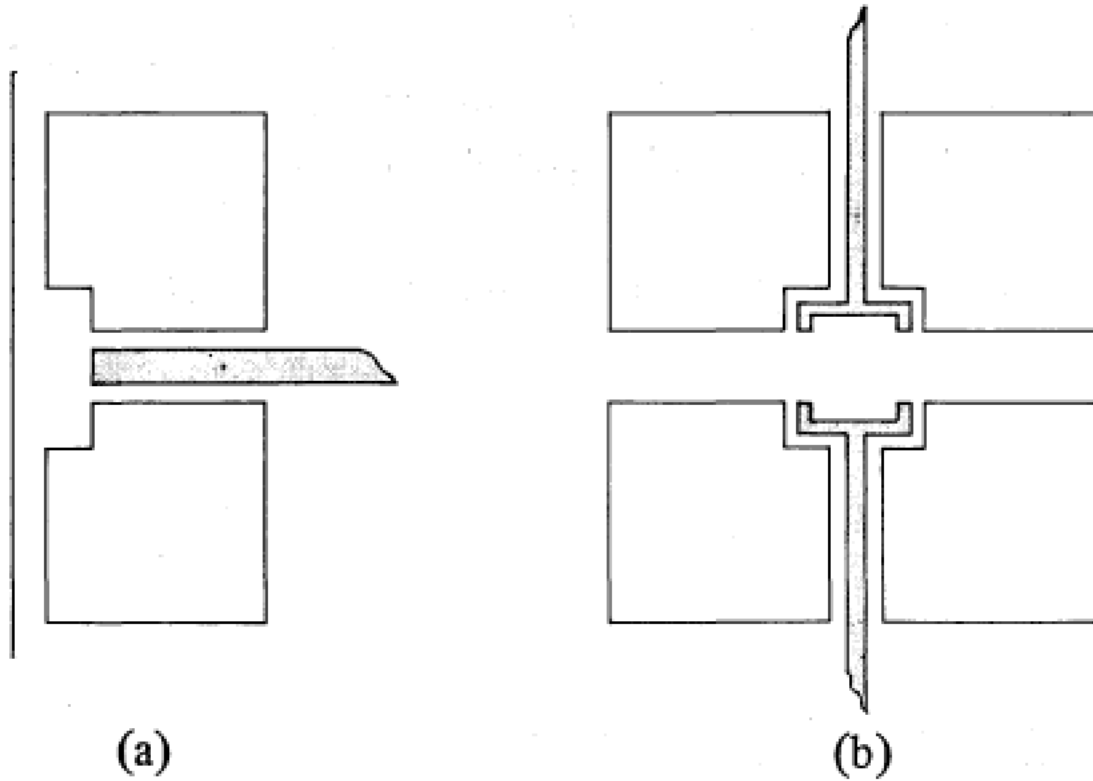


(b)

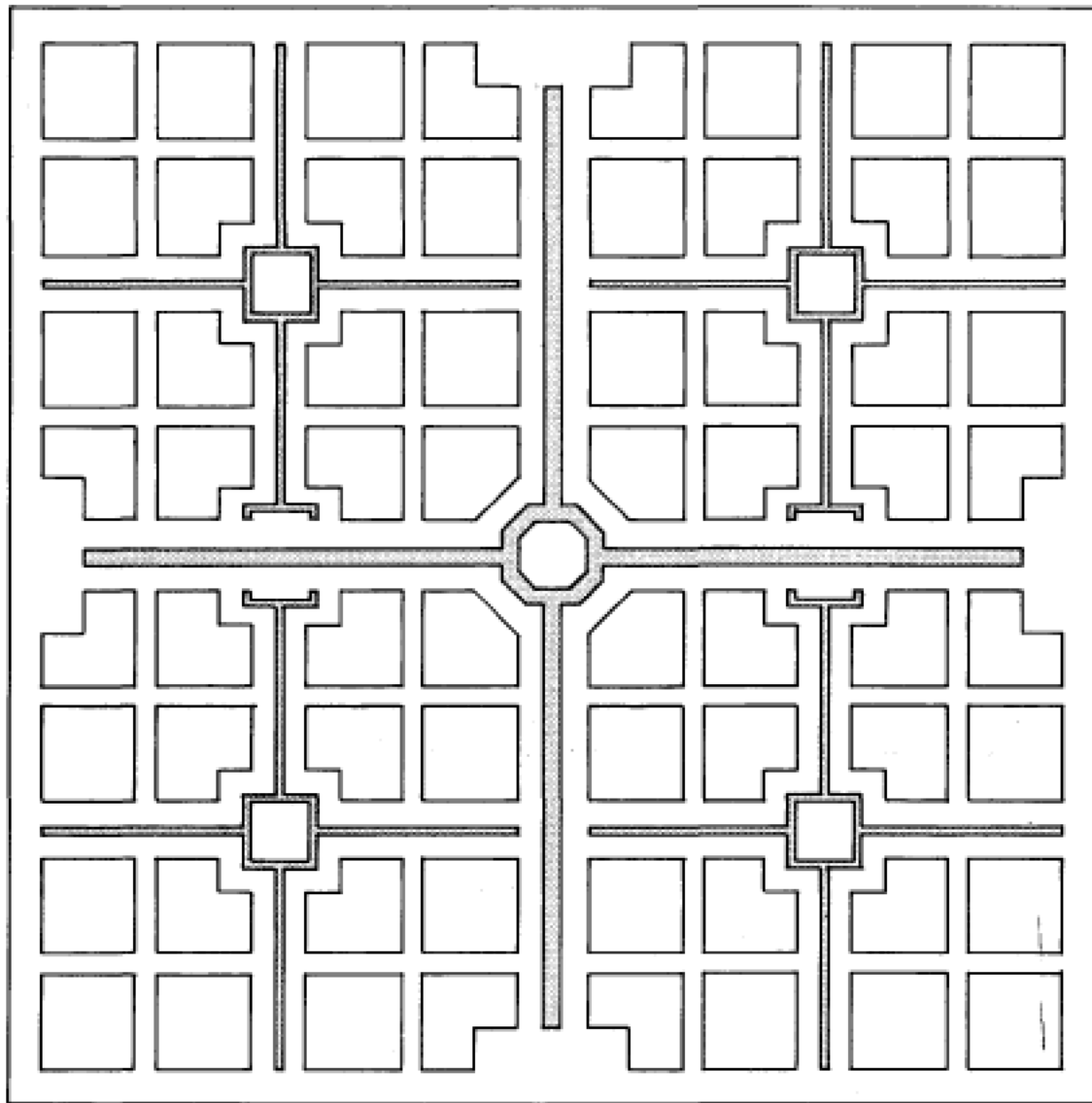
Square and octogonal motifs for canal systems



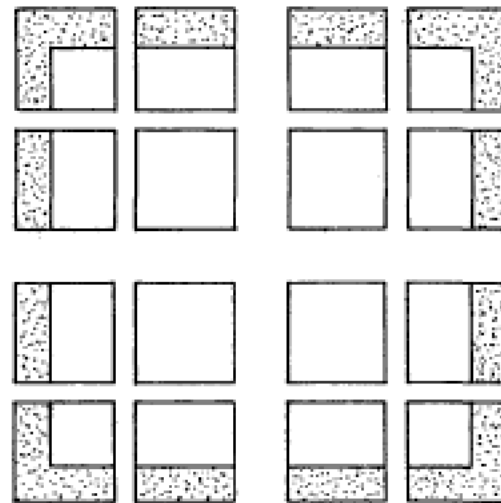
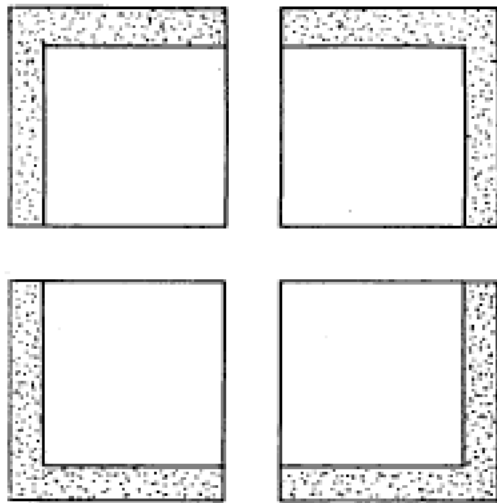
inserting a canal in a site parti



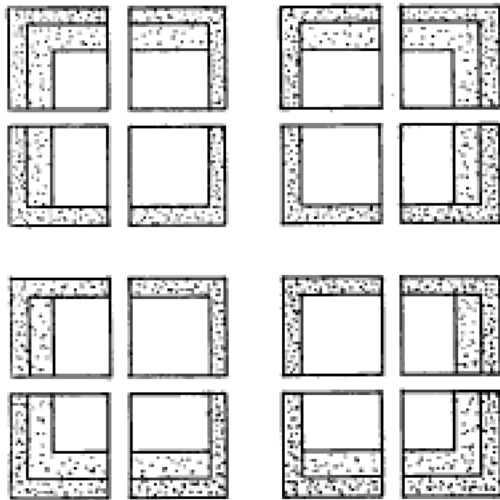
Motifs for ornamenting the ends of canals



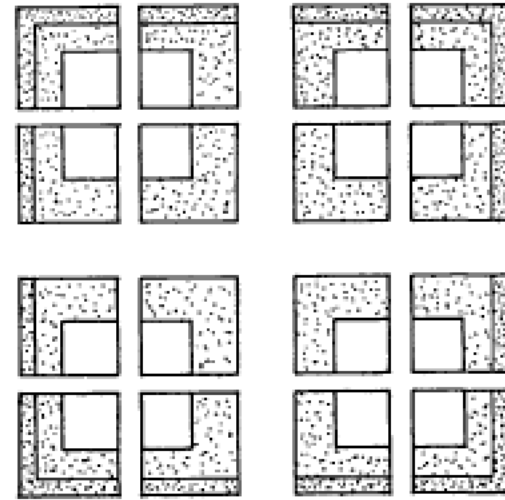
A possible arrangement of canal systems in a site parti



borders

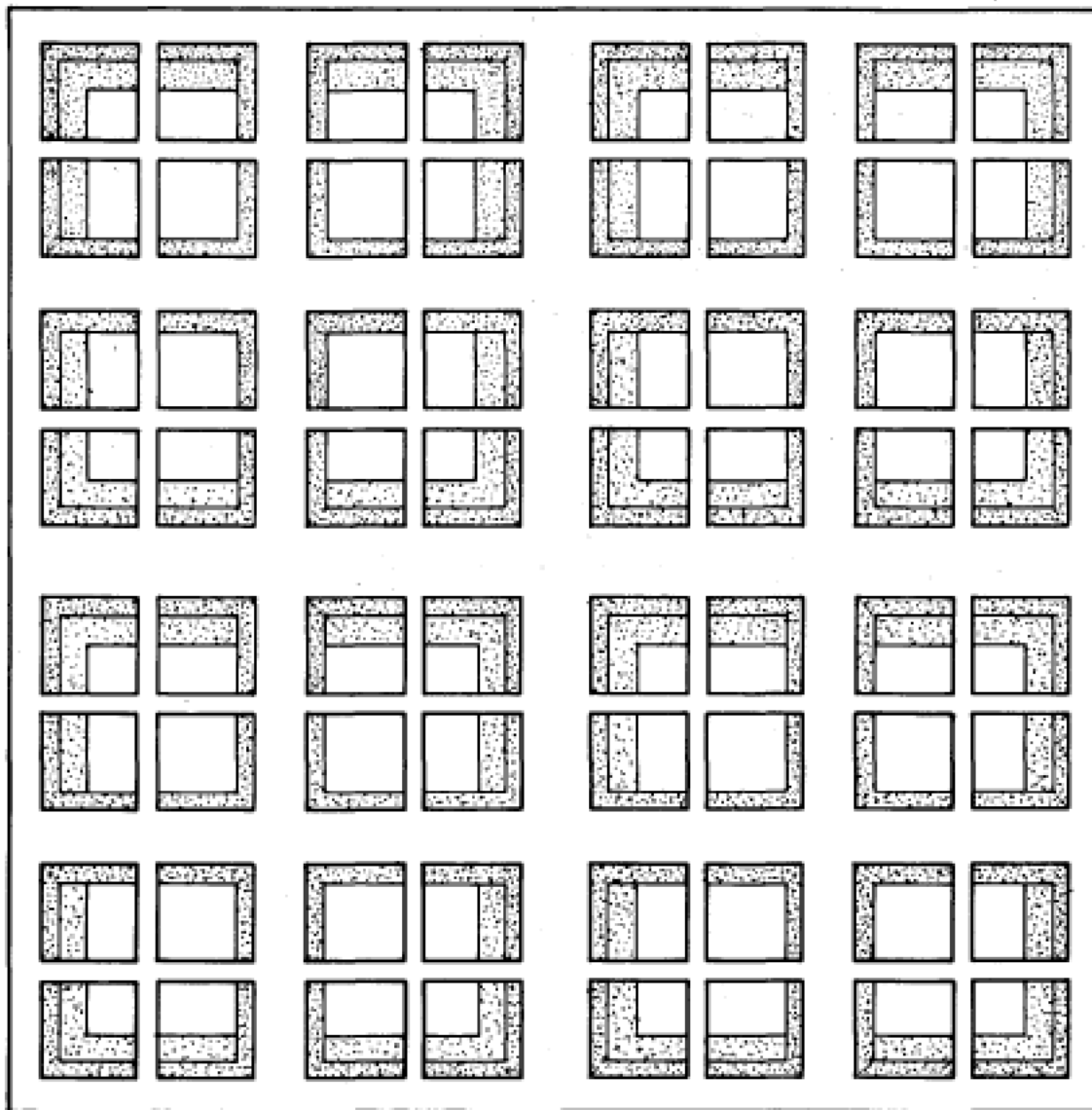


(a) Case 1



(b) Case 2

interaction of borders

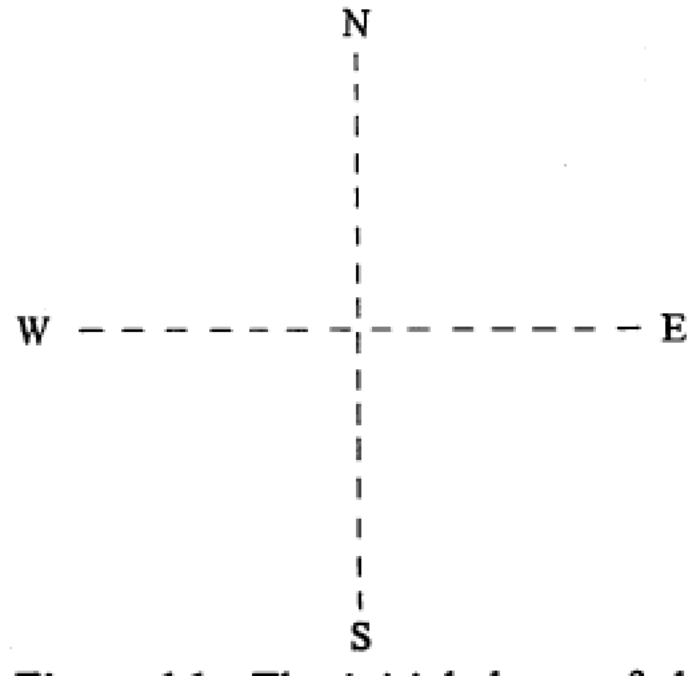


A possible arrangement of borders in a site parti

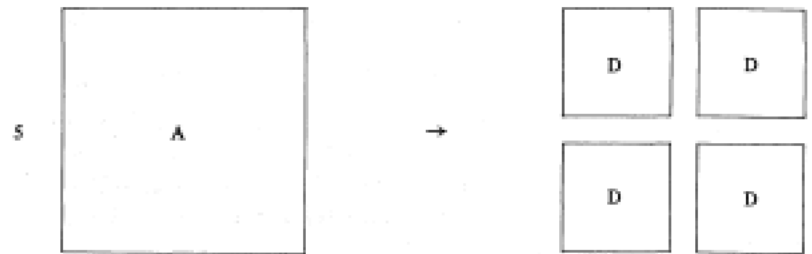
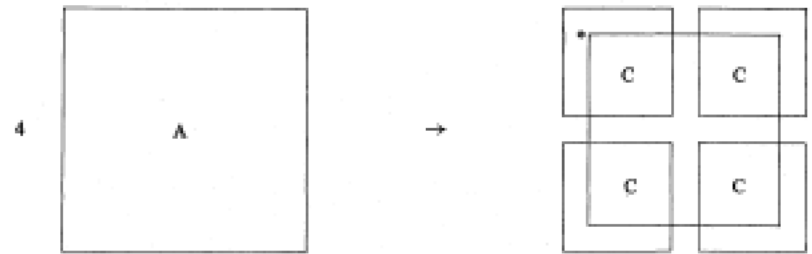
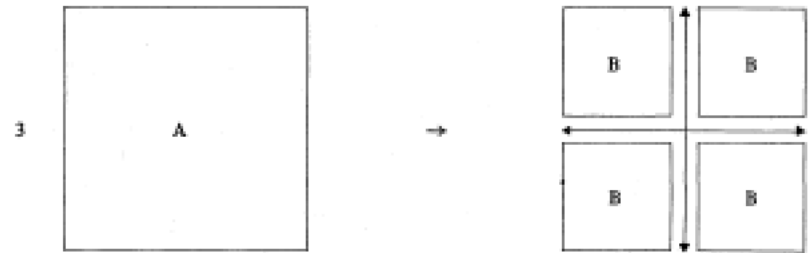
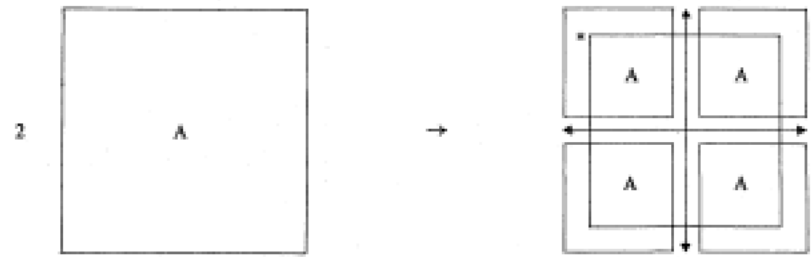
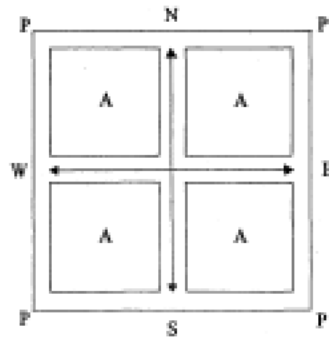
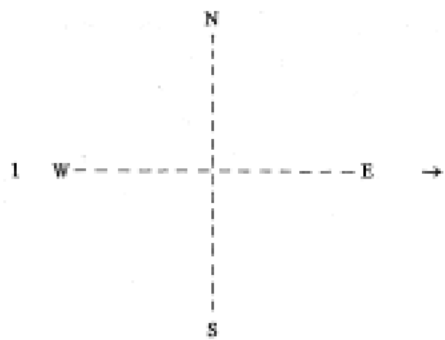
Develop the grammar

1. *The ken grid (schemata 1-4)*
2. *Wall placement (schema 5)*
3. *Location of the ro (hearth) without a daime (three-quarter mat) (schemata 6-9)*
4. *Location of the daime, sodekabe, nakabashira, tana, and ro (schemata 10-12)*
5. *Location of the tokonoma (picture recess) (schemata 13-15)*
6. *Adding a space adjacent to the tokonoma (schema 16)*
7. *Entrances (schemata 17-36)*
8. *Tatami arrangement (schemata 37-41)*

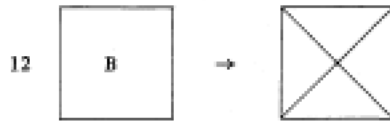
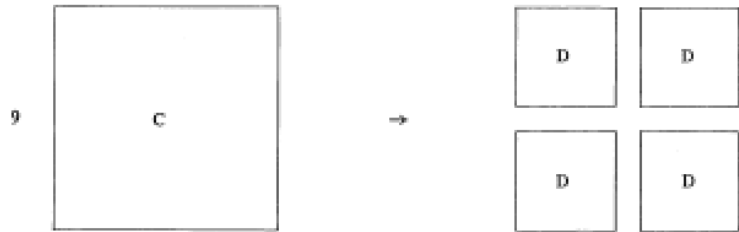
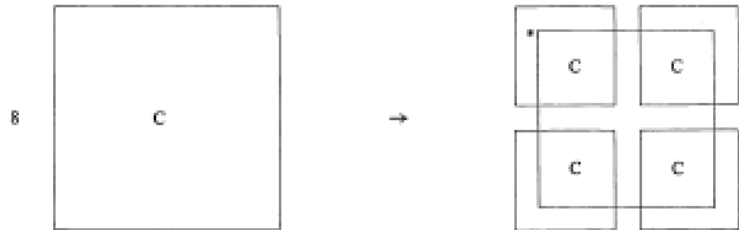
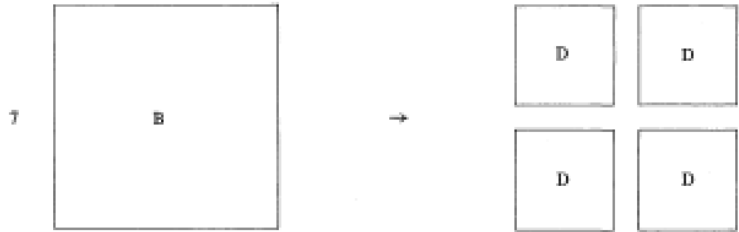
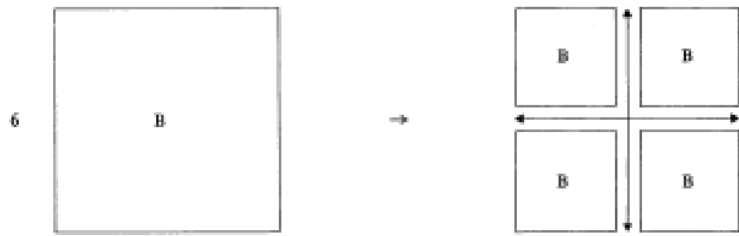
The grammar



Initial shape



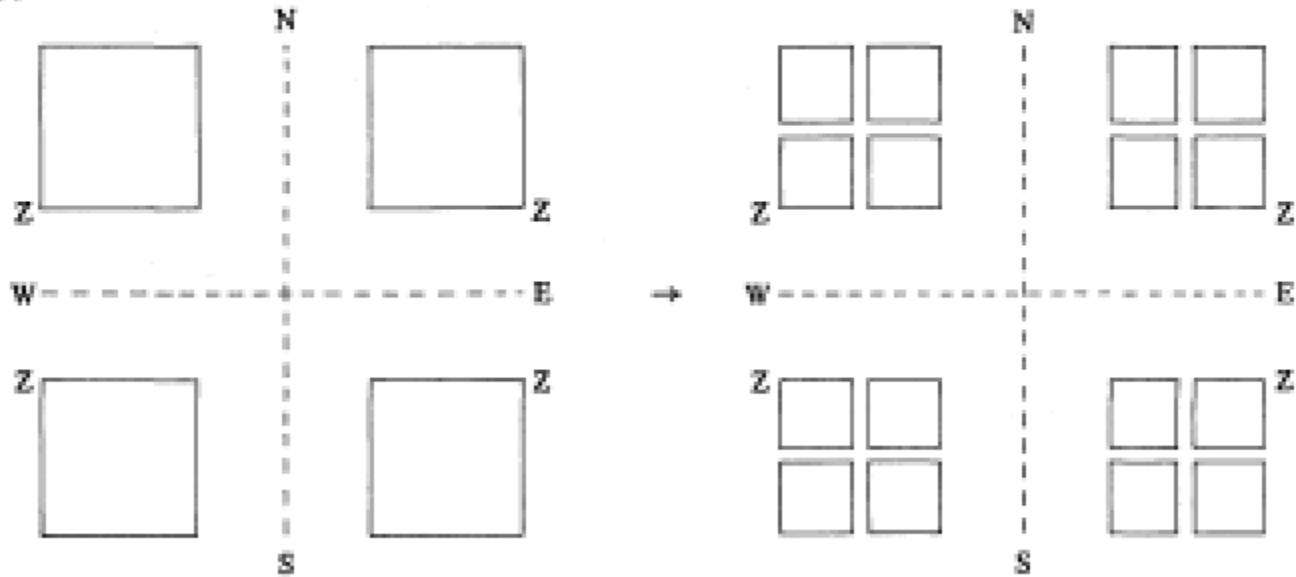
Shape rule schemata applied in stage 1 of the *char-bagh* generation process



stage 1 rules (continued)

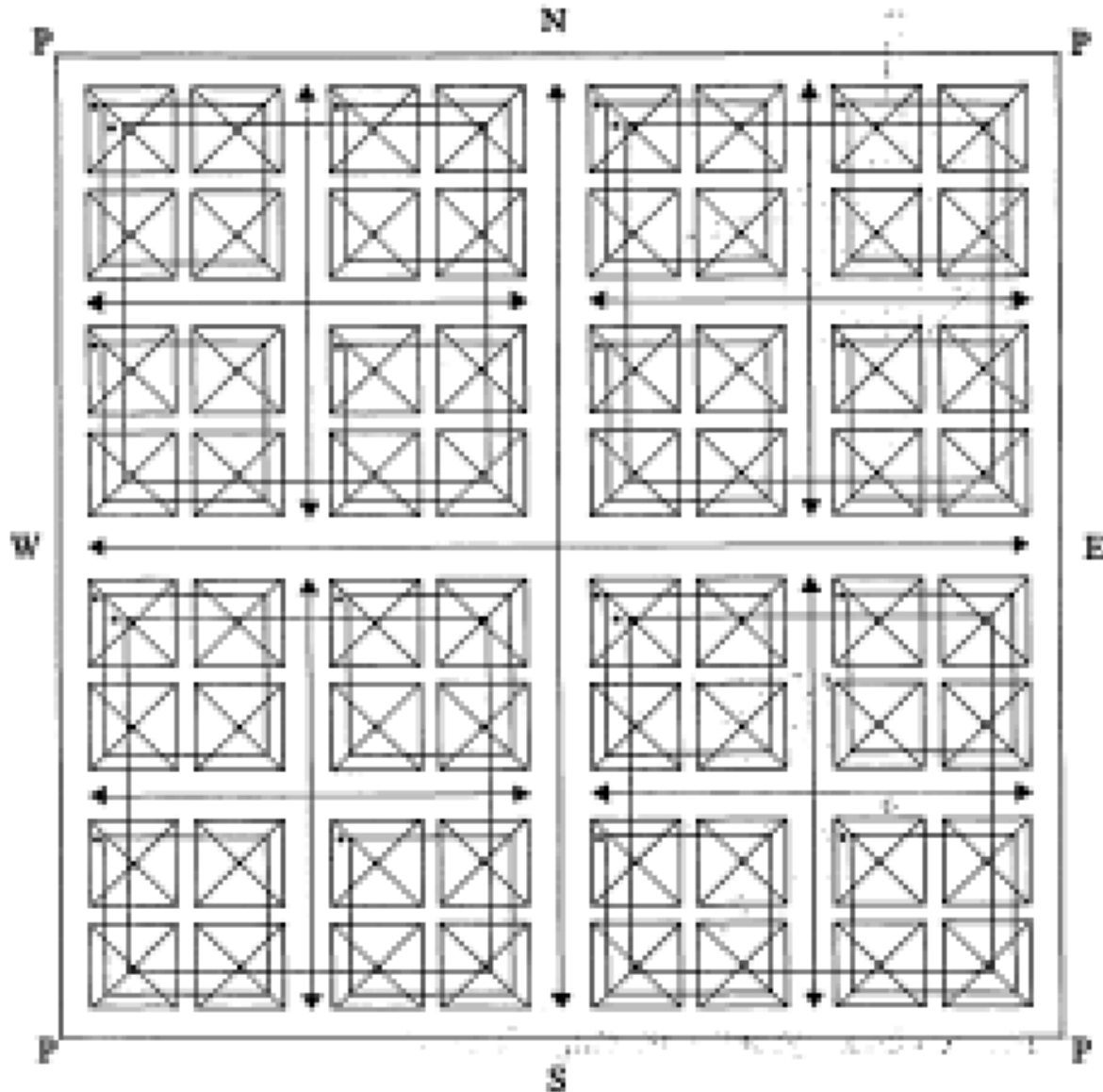


(a) Original shape rule schema

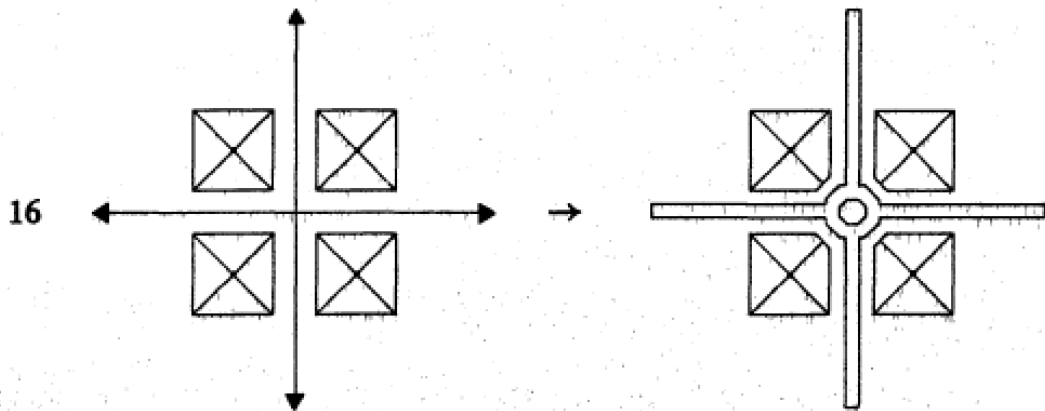
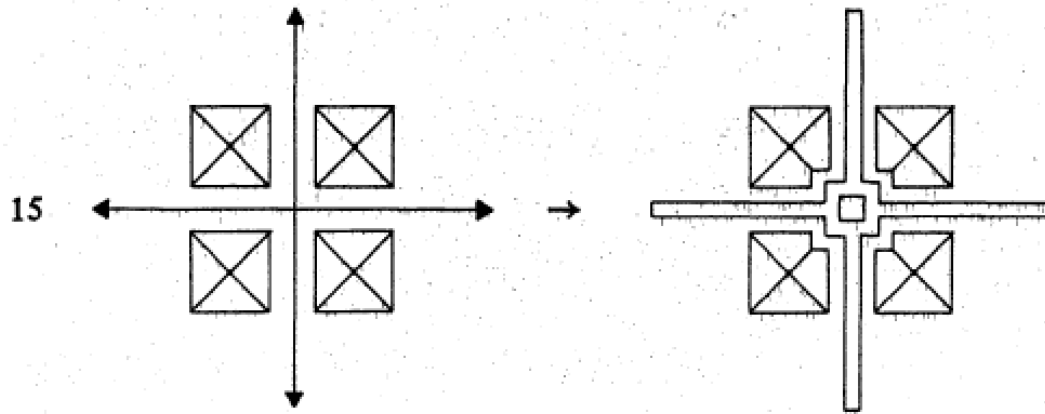


(b) Redefined shape rule schema

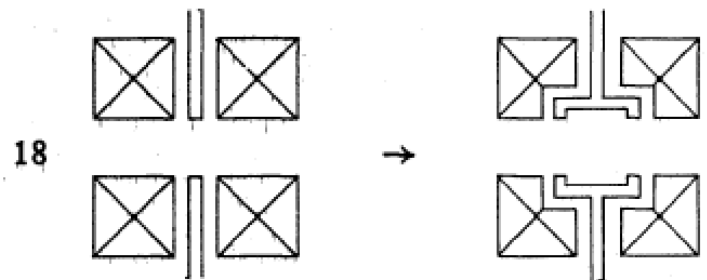
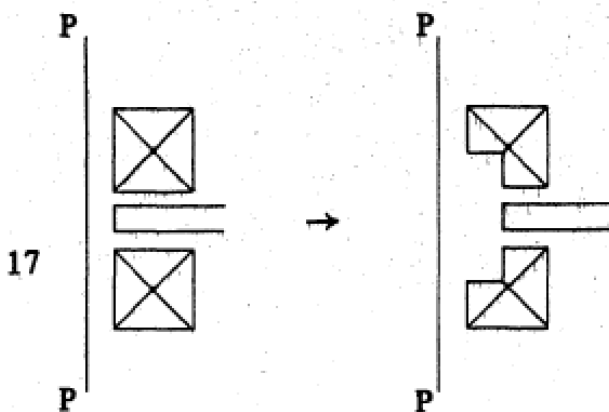
redefining schemata 2-10 to ensure bilateral symmetry

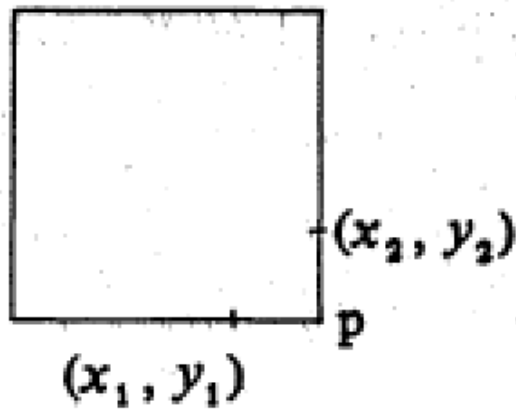


A completed site parti with intended occurrences of canal systems and borders produced by applying schemata 1-14.

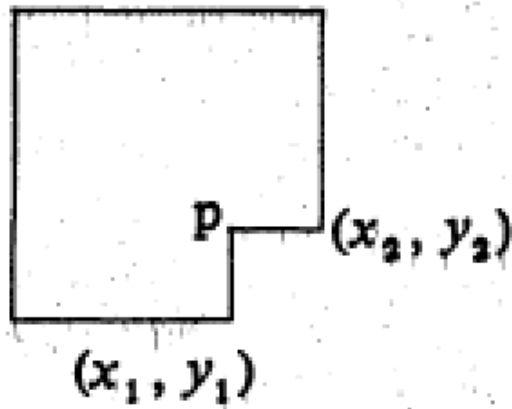


Shape rule
 schemata applied
 to insert canal
 systems in stage 2
 of the *char-bagh*
 generation process

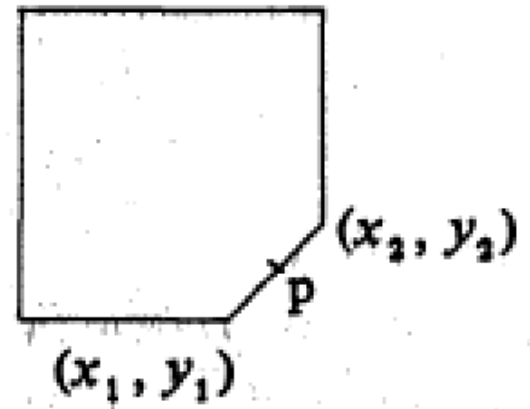




$$p = (x_2, y_1)$$

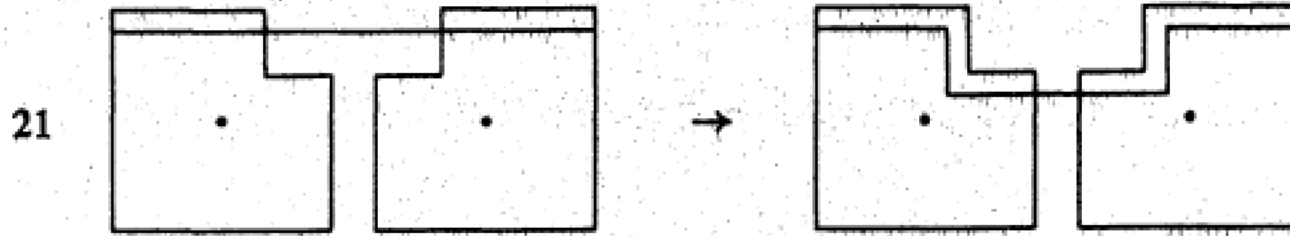
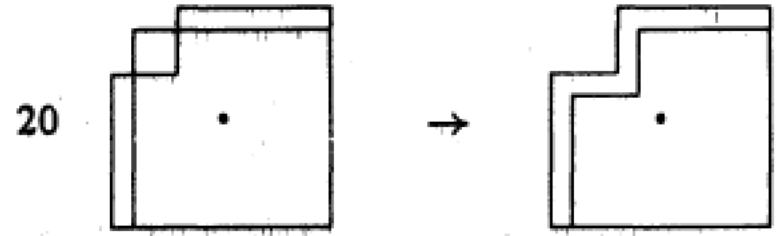
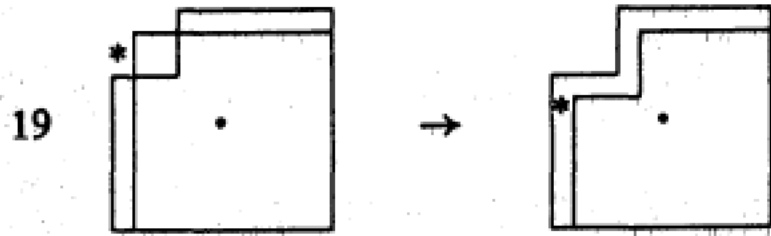


$$p = (x_1, y_2)$$

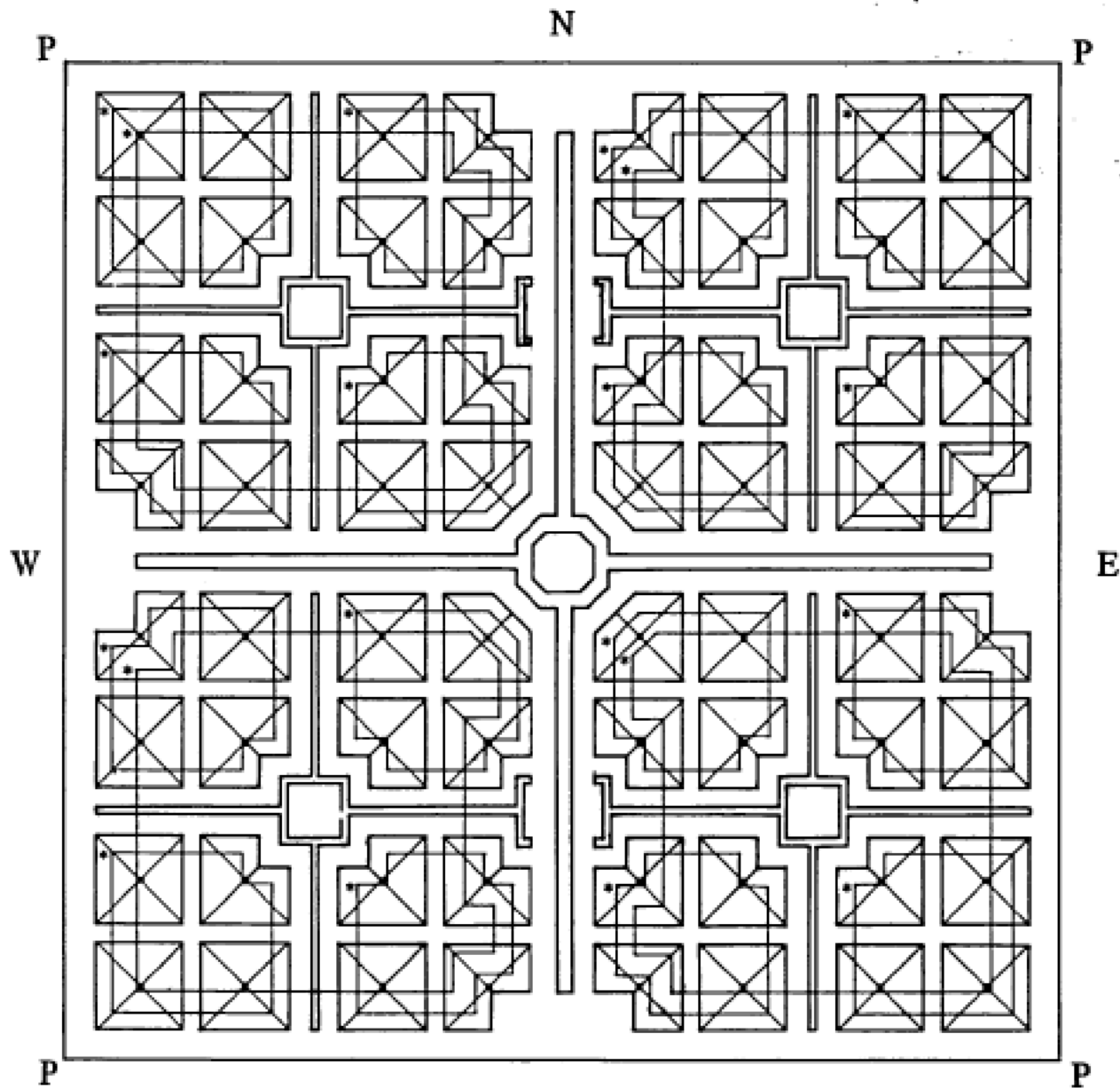


$$p = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Parameterizing the corners of squares to allow for inflections

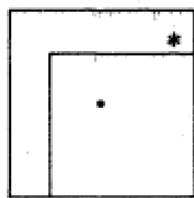
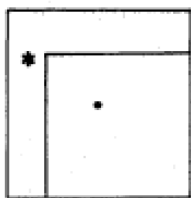


Examples of shape rule schemata used to alter borders passing through squares with inflected corners

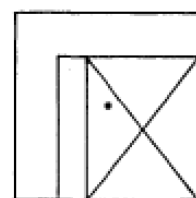
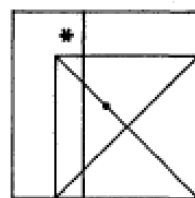


One possible result of applying ^Sschemata 15-18 and 19-21 to insert canal systems in the stage 1 ground plan of figure 19

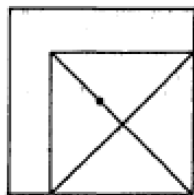
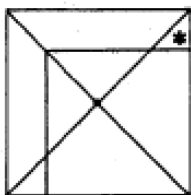
22



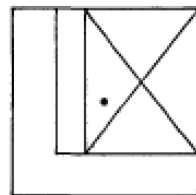
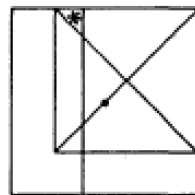
27



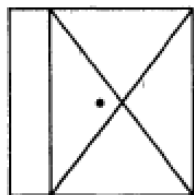
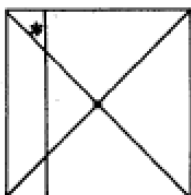
23



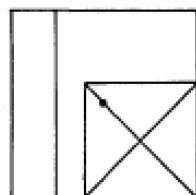
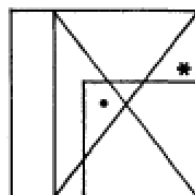
28



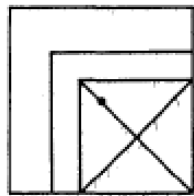
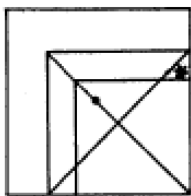
24



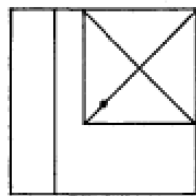
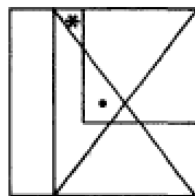
29



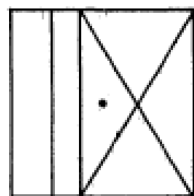
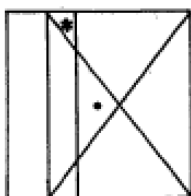
25



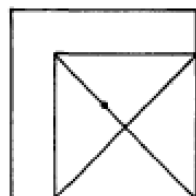
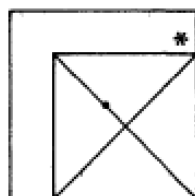
30

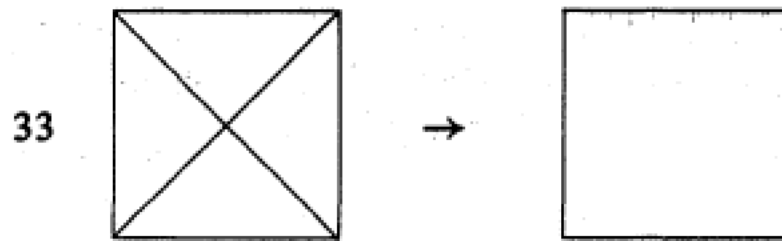
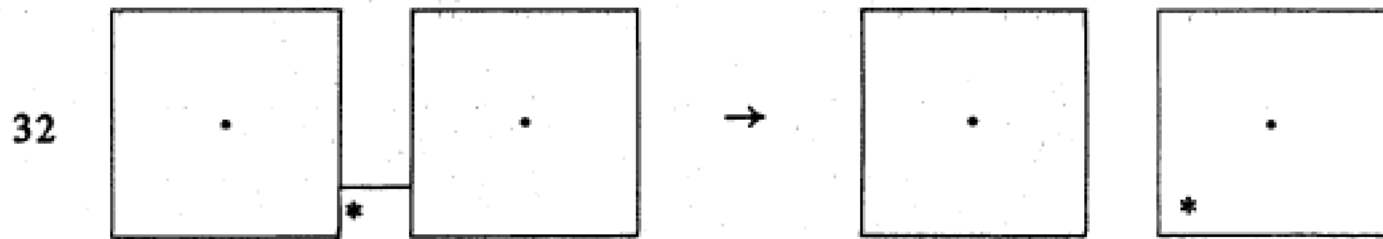


26

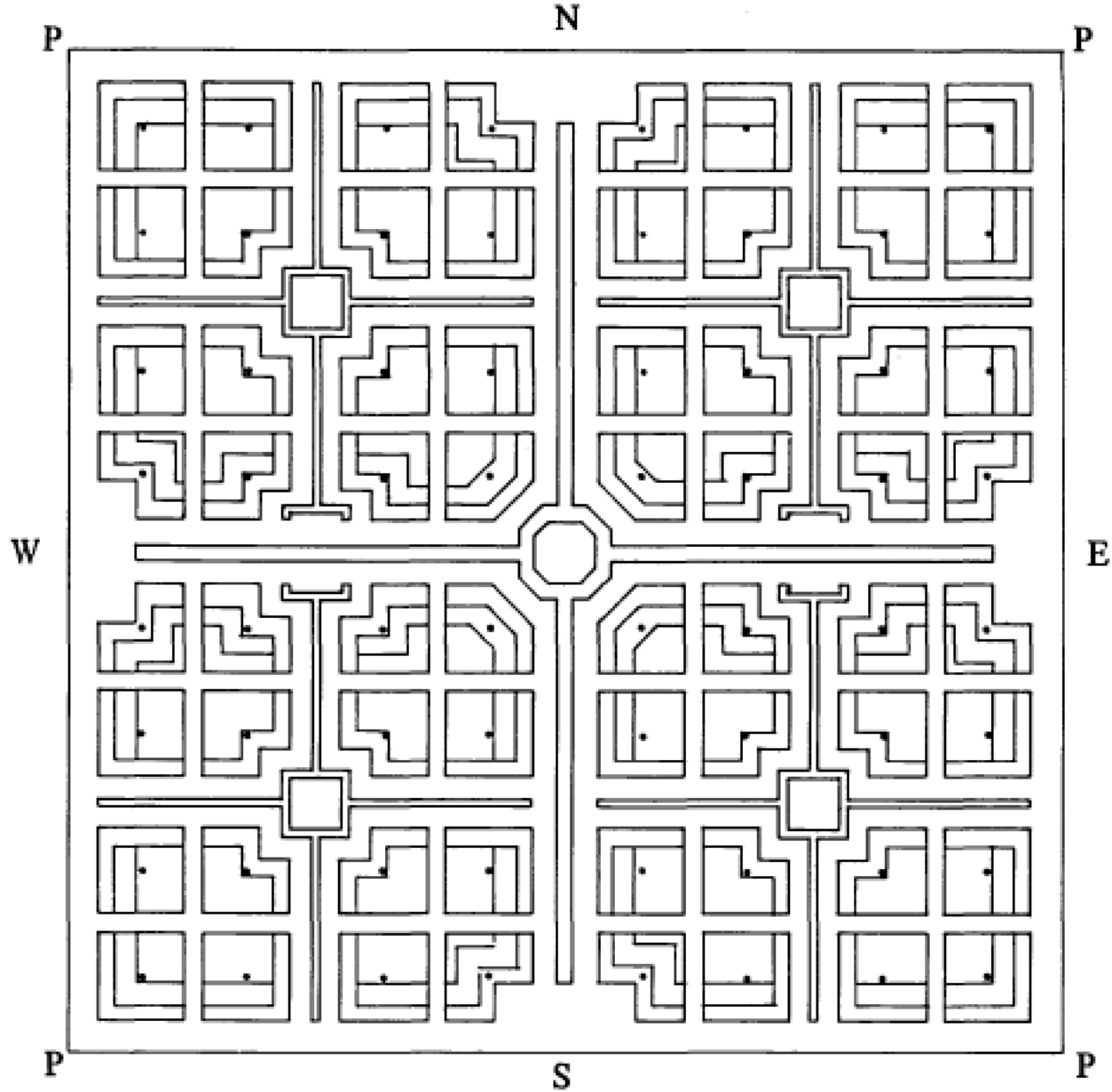


31

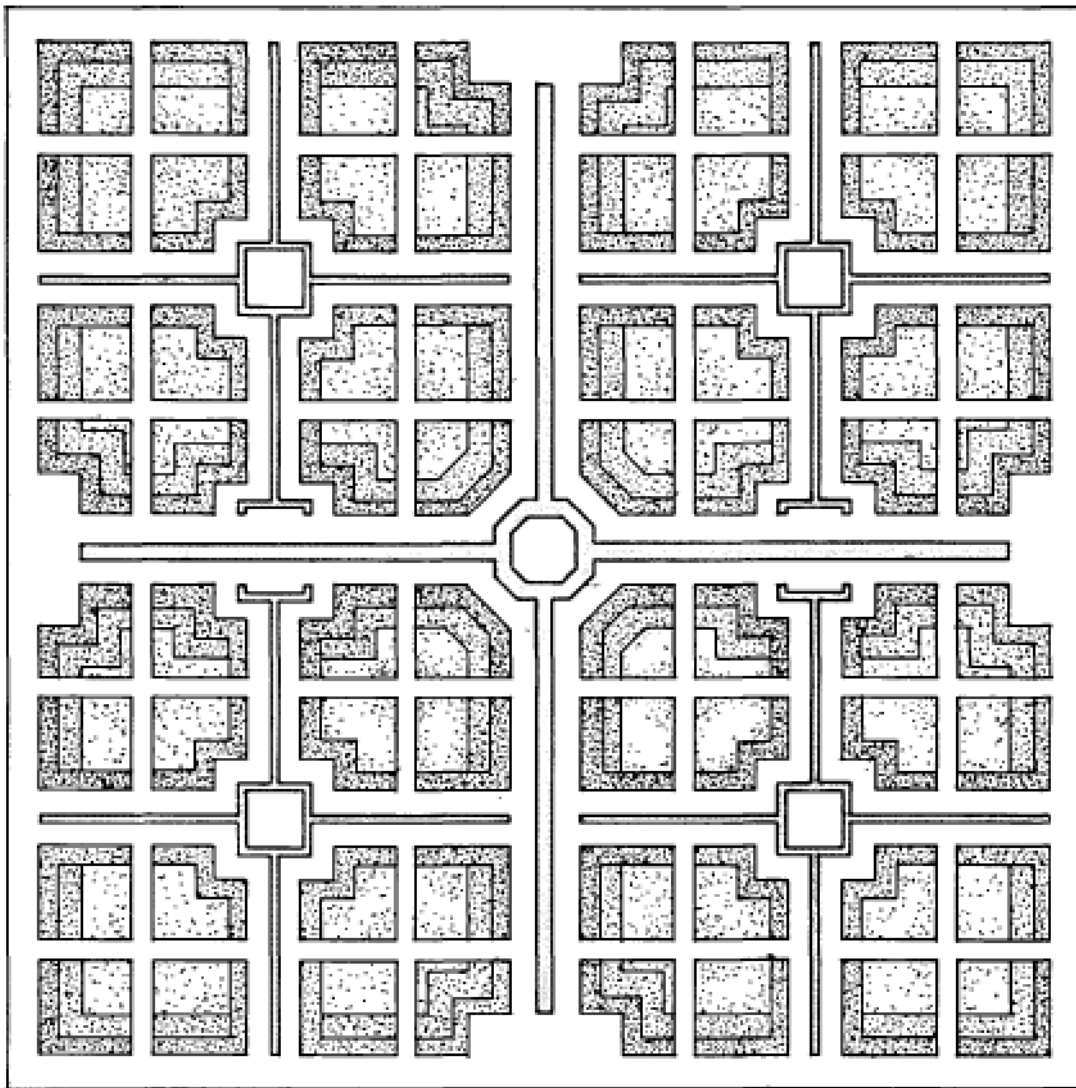




Shape rule schemata applied to determine borders in stage 3 of the char-bagh generation process



The result of applying schemata 22-33 to determine borders in the stage 2 ground plan of figure 22



- 34 $\langle s_\phi, \{(0, 0): \bullet\} \rangle \rightarrow \langle s_\phi, \emptyset \rangle$
- 35 $\langle s_\phi, \{(0, 0): N\} \rangle \rightarrow \langle s_\phi, \emptyset \rangle$
- 36 $\langle s_\phi, \{(0, 0): S\} \rangle \rightarrow \langle s_\phi, \emptyset \rangle$
- 37 $\langle s_\phi, \{(0, 0): E\} \rangle \rightarrow \langle s_\phi, \emptyset \rangle$
- 38 $\langle s_\phi, \{(0, 0): W\} \rangle \rightarrow \langle s_\phi, \emptyset \rangle$
- 39 $\langle s_\phi, \{(0, 0): P\} \rangle \rightarrow \langle s_\phi, \emptyset \rangle$

the completed *char-bagh*