

A GRAMMAR OF TAIWANESE TEMPLES

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Abstract. Many different types of traditional Chinese buildings share quite similar architectural forms. This paper extends a shape grammar for Taiwanese vernacular dwellings (Chiou and Krishnamurti, 1995a,b,c; 1996) to the traditional temple designs. Our grammar was derived from considerations of the traditional processes of design and construction of Taiwanese vernacular dwellings, and from cultural influences. The processes for temple design and construction were similar; consequently, a temple grammar can be derived from this grammar. In this paper, we do so by augmenting the latter with additional rules that take into consideration specific changes to the spatial form that distinguish the traditional temples.

1. Traditional Processes of Design and Construction

Many different types of traditional Chinese buildings share quite similar architectural forms (Fletcher, 1950). For instance, a plan of a *san-he-yuan*¹ (or *he-yuan*, courtyard) might have been used for a temple, a house, an official *ya-men* (government office in imperial China), and even the imperial palace. A further point of similarity is that all traditional buildings followed a similar process of design and construction. This process is fully described in Chiou (1996).

2. The Grammar of Taiwanese Vernacular Houses

The grammar of Taiwanese vernacular dwellings (Chiou and Krishnamurti, 1995b) was derived from the considerations of the traditional design and

¹ The phonetic spellings for Chinese words in the paper are from *Learner's Chinese-English Dictionary* (8th edition) and correspond to the Pinyin system.

construction process, taking into account other cultural influences. The grammar consists of 17 stages with a total of 138 rules. TABLE I provides a comparison between the traditional design and construction process and the stages of the grammar.

TABLE I: A comparison between the design/construction process and the grammar of Taiwanese vernacular houses

Design and Construction Process		Rule Stages	
1	Examine site, choose auspicious orientation	Initial Shape	
2	Negotiate (artisan, owner, [geomancer])	1	Establish the fortunate measurements
3	Decide upon the 'form'		
4	Purchase materials		
5	Break ground (ceremony)		
6	Mark layout on site		
		2	Generate the central room in the principal building
		3	<i>Add doors and windows to the central room</i>
		4.	Generate the plan of the main building
		5.	<i>Add openings to rooms in a main building</i>
		6	<i>Replace doors and windows by their icons</i>
		7	Generate a courtyard in front of a main building
		8	Generate the plan of a secondary building
		9	Compute the fortunate dimensions of a main building which is in front of a courtyard
		10.	Compute the fortunate dimensions of a main building which is in front of a courtyard
		11	Generate a secondary building which surrounds the first building
		12	Generate another kind of secondary building that is connected by a passing room to the end room of a main building
		13	<i>Add openings to room to the secondary buildings</i>
7	Construct platforms	14	Generate platforms
8	Construct main walls		
9	(Erect main walls) place main beams		
10	Construct roof and mortar walls	15	Create roofs
		16	Modify the lines in plan to three-dimensional walls
11	Clean up	17.	Termination
12	Thank gods (ceremony)		

3. Temples

The temple is an important building type in Chinese architecture (Liang, 1984). Apart from obvious religious reasons, a temple was and still is regarded as the total embodiment of the history of a local community and its society, its traditional popular arts, its building technology, and not least of all, people's conceptions. Temples were important and very influential in Chinese traditional culture and to its architecture, a role that was not dissimilar from those of early Western churches. We focus here only on the salient aspects of the basic temple style relevant to the scope of this paper.

3.1. TEMPLE ARCHITECTURE

Temple architecture employed many, if not most, of the principles of Chinese traditional architecture – modules, axial planning, framework systems, and spatial organization. There were more rituals and taboos during the construction phase; the design and construction of temples followed along much the same lines as vernacular houses (Chiou and Krishnamurti, 1995c). Because gods were almost all humanized, there was no reason to build temples in a different manner to the way houses were built. When the Chinese wished to distinguish and differentiate between what was sacred and all else, they chose to use elaborate ornaments (Thompson, 1989). Even so, there are some marked distinctions between temples and houses. From a grammatical view point, the following are some of the relevant differences.

3.1.1. Temple Rank

The rank of a temple reflected the status of its principal god or deity. Gods were ranked according to a bureaucracy associated with the spirits. During the *Qing* dynasty, regulations were established to stipulate the scale and size (purlin) of an officer's house and his office (see TABLE II). The *jian* (bay) and *jia* of a building indicated the owner's social or political status. Likewise, a (principal) god of a higher rank would have a larger and higher temple. The scale and size of temples in imperial China that were built by the emperor or the government were subject to prescribed regulations. On the other hand, for local temples or those built by the populace, rank depended on the following four considerations.

TABLE II: Building *jian*'s and *jia*'s during the *Qing* dynasty

Officer Hierarchy	Entrance Hall ^a	Principal Building ^b
dukes, princes, 1st and 2nd <i>pin</i>	3 <i>jian</i> , 5 <i>jia</i>	7 <i>jian</i> , 9 <i>jia</i>
3rd to 5th <i>pin</i>	3 <i>jian</i> , 3 <i>jia</i>	5 <i>jian</i> , 7 <i>jia</i>
6th to 9th <i>pin</i>	1 <i>jian</i> , 3 <i>jia</i>	(3 <i>jian</i> , 5 <i>jia</i>)

a. The front-most main building in which the *ming jian* served as entrance.

b. The rear-most main building where the altar was usually located

(i) The number of doors

The number of doors in the front of a temple - i.e., in the entrance or gate hall – reflected its rank. Usually, five-door temples were of the highest rank. The more popular temples in Taiwan tended to have three doors. The number of doors was related to the number of bays; in fact, the former was generally no more than the latter.

(ii) The number of main buildings

The more main buildings a temple had the higher up it was on the hierarchical order.

(iii) The height of the main building

The height of its main building reflected the temple's rank. The higher the temple the higher its rank, the more difficult it was to construct, and thereby,

more costly. Higher temples were dedicated only to gods from amongst the highest ranks. The height of a temple is one of the fortunate dimensions (Chiou and Krishnamurti, 1995a) and unlike houses, for temples, measurements had to be fortunate in both *Lu Ban* feet and inches.

(iv) Orientation

The orientation of a temple was important, because the Chinese believed it brought good fortune to the entire local community. Orientation was determined by *feng-shui* (Feuchtwang, 1974; Chiou, 1991; Chiou and Krishnamurti, 1997) Generally, a temple was oriented towards a southerly direction though not directly. The due south orientation was reserved for the emperor. Thus, most houses and temples would have had their orientation shifted slightly towards an easterly or westerly direction were it, originally, have been determined to be due south. Some Taiwanese temples face a westerly direction, because their builders thought that the gods could then face towards their home town – of the builders and of the gods – on the mainland.

3.1.2. Plan

Plans for temples are similar to those of the vernacular houses. Recent research (Lee, 1986) suggests that there were four basic temple plan types. These types all derive from the plan of a *he-yuan*. Figure 1, taken from Lee (1983), shows some of the different temple layout designs found in Taiwan. Space limitation prevents further elaboration.

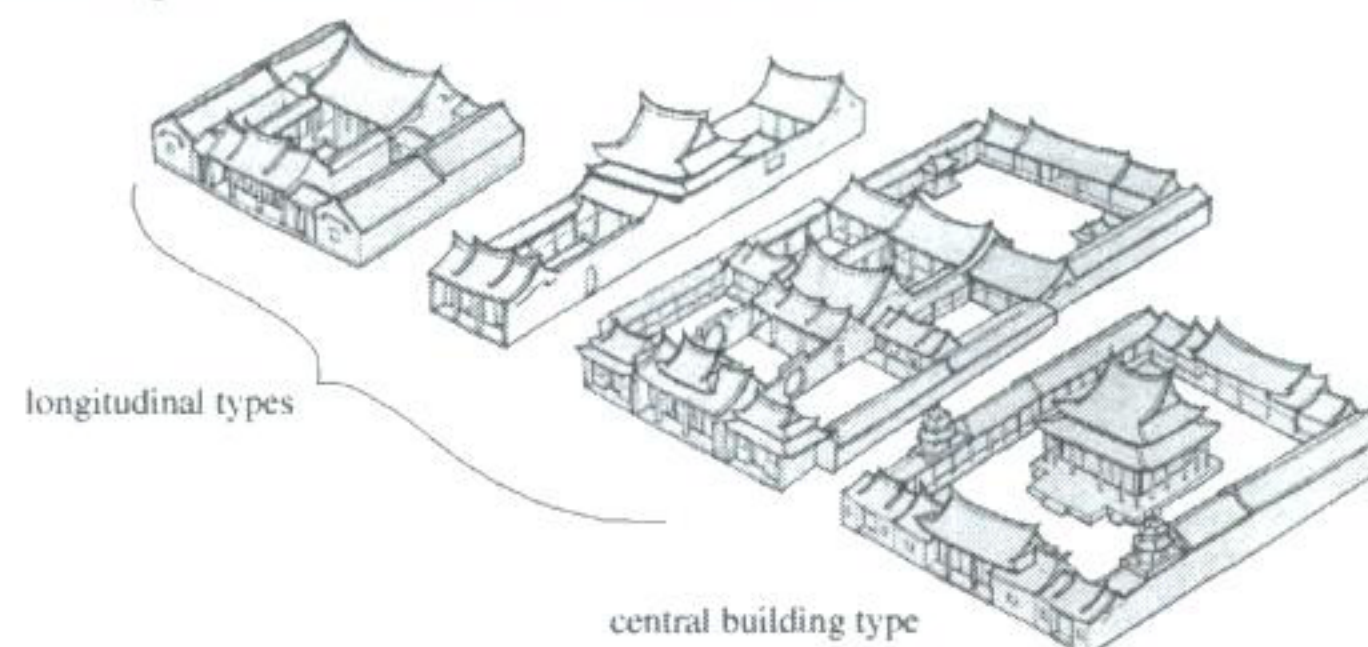


Figure 1 Different types of temple layout. (After Lee, 1983: 28)

3.1.3. Framework System

The framing system used in a temple was, usually, either *tai-liang* (column-beam-and-strut) or *die-dou*. This differs from the more common *chuan-dou* (column-and-tie) system used in houses (Chiou and Krishnamurti, 1995c). In temples, there are, usually, no partition walls between the central (*ming*) bay and *ci* bays. Between *ming* and *ci* bays, the framing system *tai-liang* or *die-dou* was used, which allowed the space for worship to be extended across to the *ci* bays. In the central bay, the two *tai-liang* or *die-*

dou frames were made up of four key-pillars (*si-dian-jin-zhu*), which defined the space for worship.

3.1.4. Roof

The most striking aspect of the temple is its roof which was colorful with rich decorations. The most popular roof type for temples was *xie-shan* or the multi-roof form of *xie-shan*. For smaller or lower ranking temples, the *ying-shan* roof form was used (see Figure 2). In higher ranking temples the ridges of roofs were usually extended to be even higher allowing for more decorations

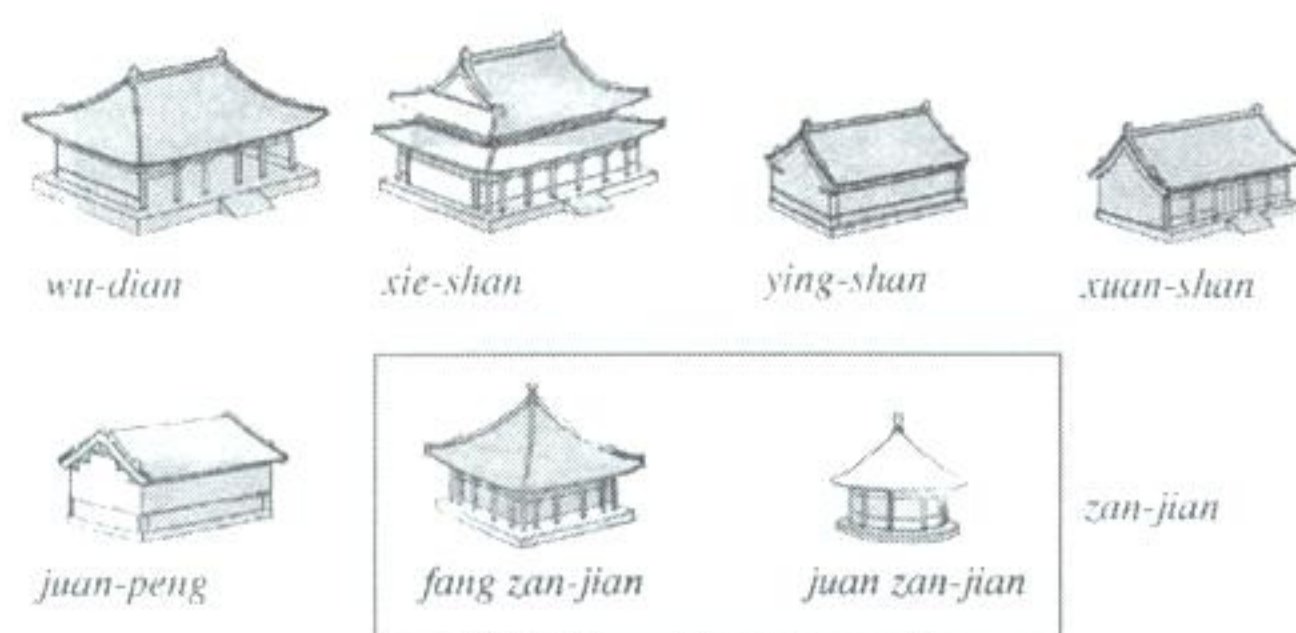


Figure 2 Various types of roofs. (After Liu, 1984: 383)

3.1.5. Design and Construction Process

The design and construction for temples was similar to that of the dwellings except more rituals and taboos were incorporated into the process (Knapp, 1989, 1990; Chiou and Krishnamurti, 1995c). Apart from official temples, such as those for Confucius, a temple was usually built and decided by the leaders of the local community.

These are other differences between temples and vernacular houses. The following are other relevant features in temple architecture such as auxiliary buildings and decorations that we have not considered in our grammatical analysis.

4. A Temple Grammar

The temple grammar is derived by augmenting the grammar for vernacular dwellings (Chiou and Krishnamurti, 1995b) with rules that take into account the specific changes to the spatial form that distinguish the traditional temples. We classify these rules into three categories: A, B, and C. Shape rules of category A pertain to the plan types that are specific to temples, namely, the longitudinal and central building types. Shape rules of category B relate to the framing system used in constructing temples. Shape rules of

category C consider certain specific characteristics of temples such as porches, verandahs and the relationship of the end-room to the secondary buildings.

4.1. SHAPE RULES FOR DEALING WITH SPECIAL TEMPLE LAYOUTS

For temple layouts of the longitudinal and central building types, rules are defined to extend the courtyard to the rear. Unlike dwellings the principal building of a temple is not the rear-most. For convenience, all main buildings to the rear of the principal building are referred as *rear-main buildings*.

Four shape rules, A1 through A4, shown in Figure 3, create rear courtyard enclosures. In addition, the scale bar used to record the number of main buildings $\Phi\Phi$ is also decreased by a single unit.

Rule A1 creates a rear courtyard connecting with the two end rooms with openings (generally doors) to the rear. The constraints on the x -coordinates x_3 and x_4 are such that these can not have values that lie within the openings P if the rooms have other openings. The label Y denotes a courtyard. Rule A2 creates a rear courtyard connecting with the two rooms adjoining the end rooms and which also have openings to the front. The constraints on the x -coordinates x_3 and x_4 are the same as in rule A1. Rule A3 creates a rear courtyard connecting the two rooms adjoining the end rooms with no openings to the rear. Rule A4 generates a large rear courtyard; the secondary buildings enclose both the courtyard and the main building. This shape rule can be applied to generate the central building type in which the principal building is isolated from the other buildings.

Rule A5, shown in Figure 4, initiates the generation of a rear-main building. The rule specifies the basic dimensions for the design. The procedures to determine the dimensions of the building are similar to those described in Stages 1 and 9 of the grammar for vernacular. There are other constraints imposed on this building of which, perhaps, the most important is its height, which must be lower than that of the principal building, but may be higher than previously generated rear-main building. Assuming that the dimensions of the previous rear-main building are, say, h , d , and w . Let the corresponding dimensions for this new building be h' , d' , and w' . Let the height of the principal building be H . We then have the following constraints:

$$h' = f_h(\text{orientation}, h) \text{ and } h' < H.$$

$$w' = f_w(\text{orientation}, w) \text{ and possibly } w' \leq h' \text{ and } w' \leq w.$$

$$d' = f_d(\text{orientation}, d) \text{ and } d' \approx 1.3 \times h' \text{ and } d' < d.$$

For convenience, we may assume $w' = h'$ and $d' = 1.3 \times h'$. In the shape rule A5, the position of label \underline{U}_r is determined from the position of \underline{C} .

Rules A6 and A7, shown in Figure 5, each generate the central bay (room) located on the symmetrical line. Rule A6 creates the central bay in the rear-main building. Rule A7 generates a room with a front porch, where d' , the depth of the rear porch, is usually one stride less than the value given by the stride measure. Both shape rules also specify a raised platform, and associate the label, λ , with it. Labels α and β respectively identify the positions for the front and rear roofs to be specified by a later rule. The marker of the rear-main building and labels Z 's are shifted to align the rear wall of the central bay. This is simply a technical convenience that permits the applications of certain shape rules from the grammar of vernacular houses. In each rule, label \underline{U}_r is replaced by label \underline{C} to signify the central bay of a new rear-main building.

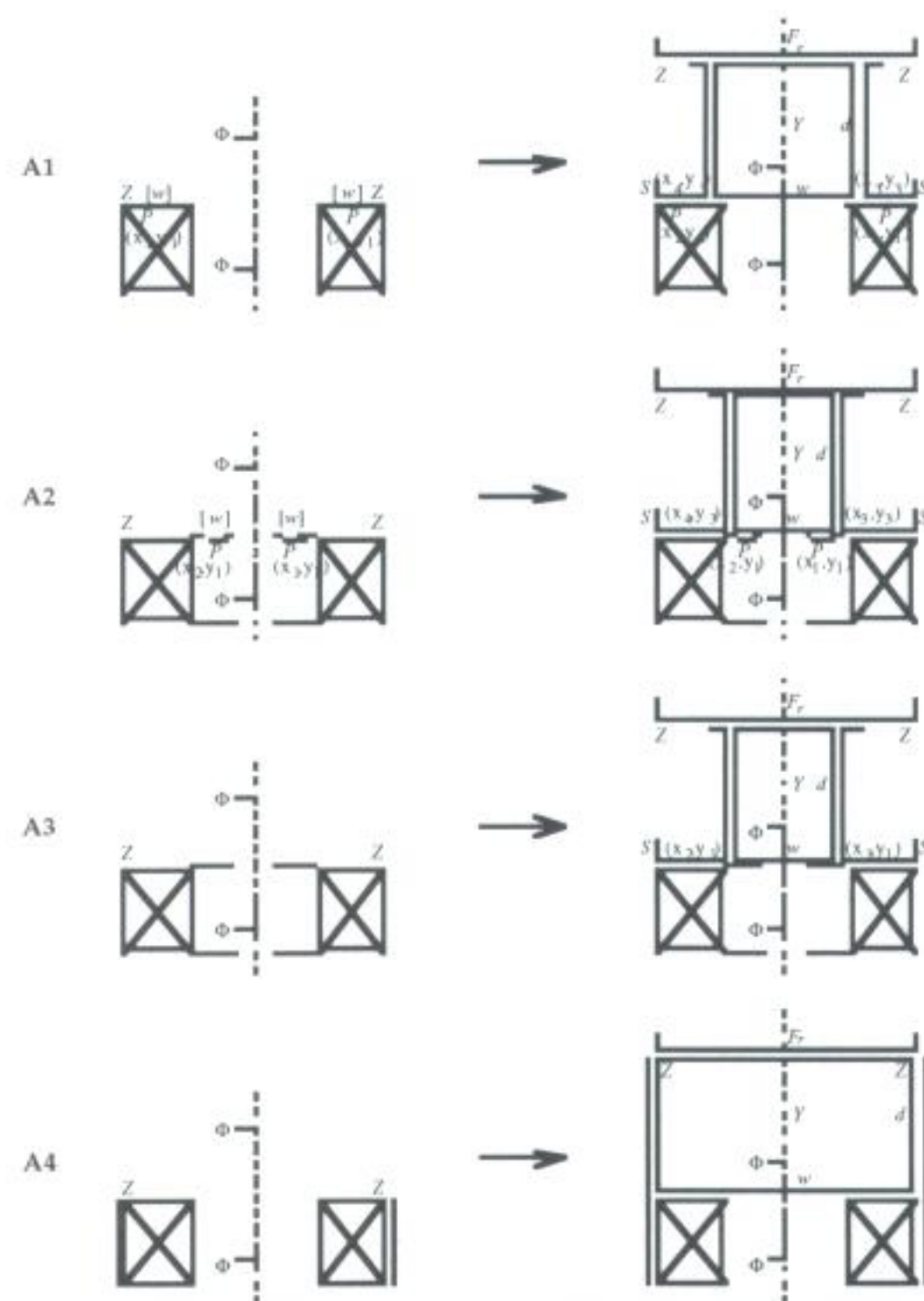


Figure 3 Shape rules for generating courtyards enclosed by inner secondary buildings.

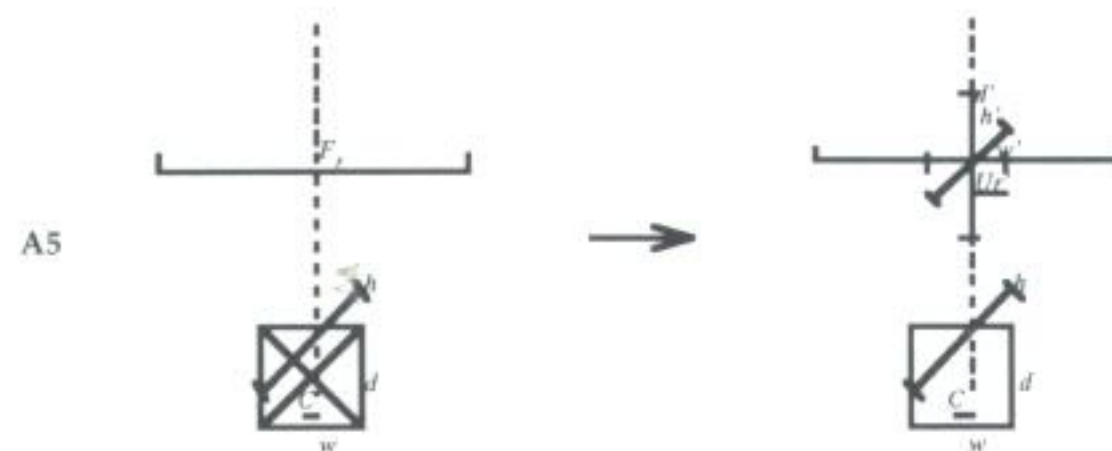


Figure 4 Calculate the fortunate dimensions of a new main building.

Shape rules A8, A9, and A10, given in Figure 6, add two rooms to the rear-main building. Rules A9 and A10 are terminating rules in that they can be used to generate the end rooms of the building. In rule A10, the end room is an open space. Basically, these three rules are minor modification of rules 72, 73, and 74 owing to the fact that the front label is not needed for the rear-main building.

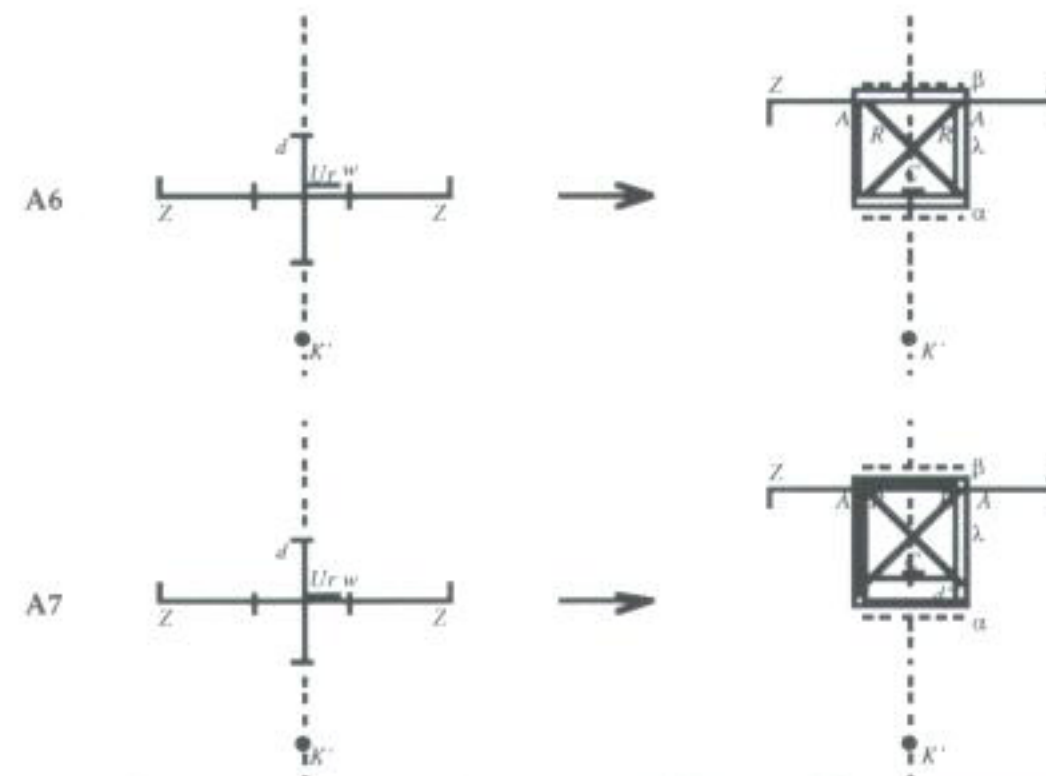


Figure 5 Shape rules for generating the central bay of a rear-main building.

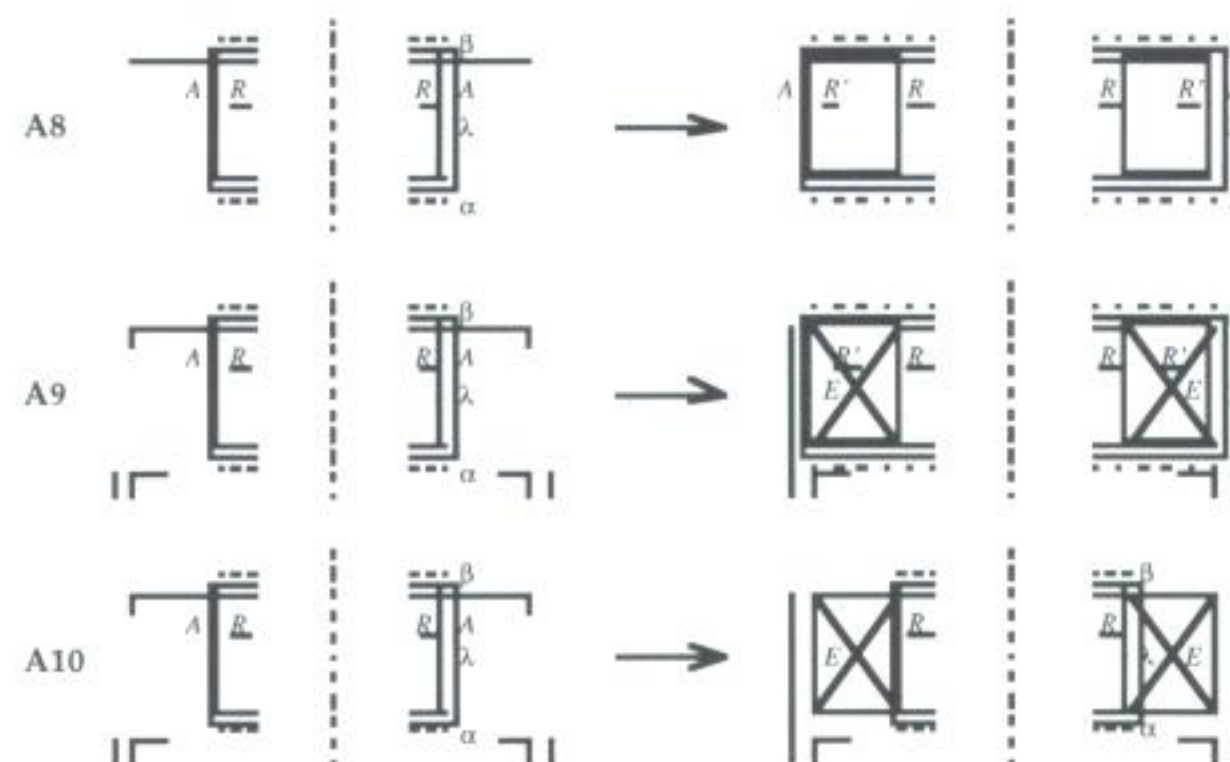


Figure 6 Shape rules for generating rooms in a rear-main building.

4.2. SHAPE RULES FOR DEALING WITH THE FRAMING SYSTEM

For vernacular houses, each bay corresponded to a room. This is expressed within the shape rules by a thick line segment which essentially represents a wall between the *ming* and *ci* bays. In the case of temples, this thick line may be considered to be representative of the framing system. At any rate, a line simply indicates a 'partition' which may be considered to represent either a frame or a solid wall.

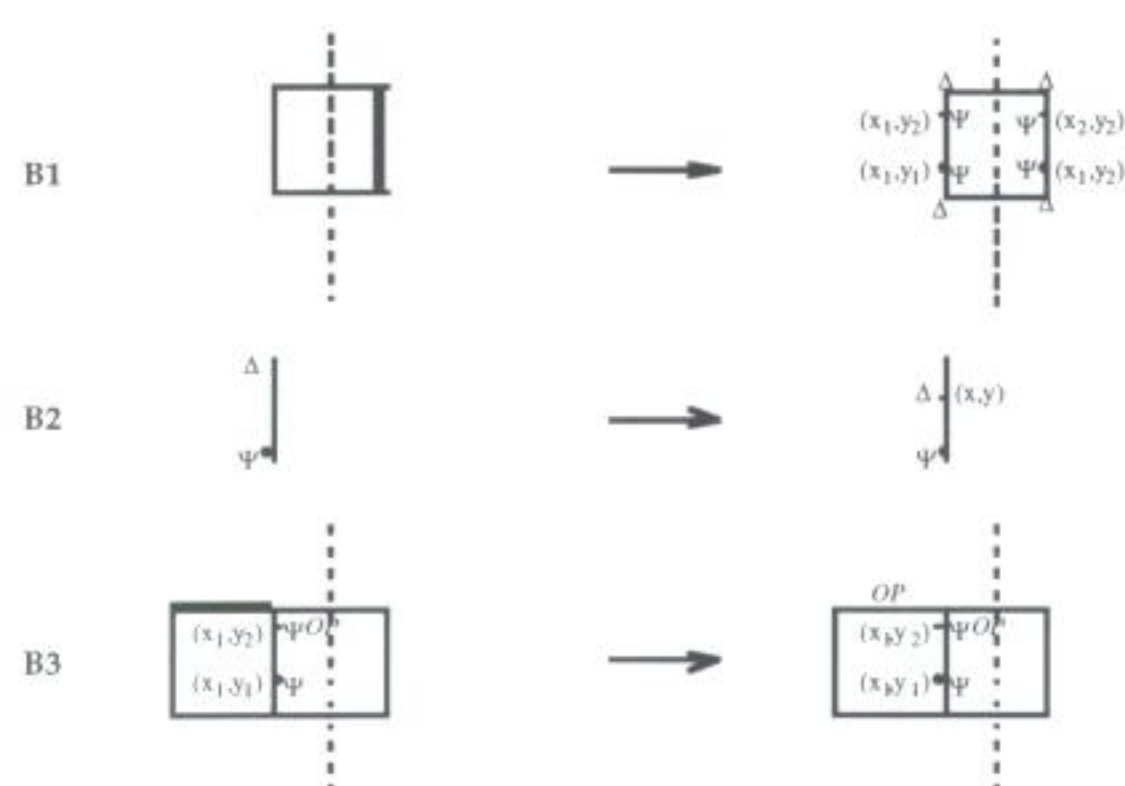


Figure 7 Shape rules to account for the framing system.

Rules B1, B2, and B3, given in Figure 7, changes the indication of a line from a representation of a solid wall to that of a frame. Rule B1 is applicable to the central bay of a main building which extends its space to three bays. This rule changes the partition (solid) wall to a framing system, namely, *tai-liang* or *die-dou*. In this rule, the four points (labels Ψ 's) are the main structure of the central bay and indicate the four key-pillars. These four points (in the principal building) define the worship space. Rule B2 arbitrarily adds one more column between labels Ψ and Δ . This rule is used for refining the frame structure. Rule B3 refines the spaces next to the central bay. It extends the semi-open space across one more bay from the central bay if the line as a representation of a 'wall' is changed to that of a frame.

4.3. SHAPE RULES FOR DEALING WITH PORCHES AND VERANDAHS

The following rules though particular to temples, might apply to certain traditional houses. The main reason for introducing these rules is that in temples the end room of a main building may have a porch, and that the rear wall of the end room generally has a door that connects to the rear-main building.

Rules C1 through C8, shown in Figure 8, are derived from rules 43 through 50 (see Stage 7 of the grammar for vernacular dwellings in Chiou and Krishnamurti, 1995b). These rules consider verandahs or porches to the front.

Rules C1 and C5 create a courtyard that connects the two end rooms which have openings to the front. The constraints on the x-coordinates x_3 and x_4 are such that these can not have values that lie within the openings P if the rooms have other openings. Label Y denotes a courtyard. Rules C2 and C6 create a courtyard to connect the two rooms adjoining the end rooms which also have openings in the front. The constraints on the x-coordinates x_3 and x_4 are the same as in rule C1. Rules C3 and C7 create a courtyard

that connects the two end rooms which have no openings to the front. Rules C4 and C8 create a courtyard that connects the two rooms adjoining the end rooms which have no openings to the front.

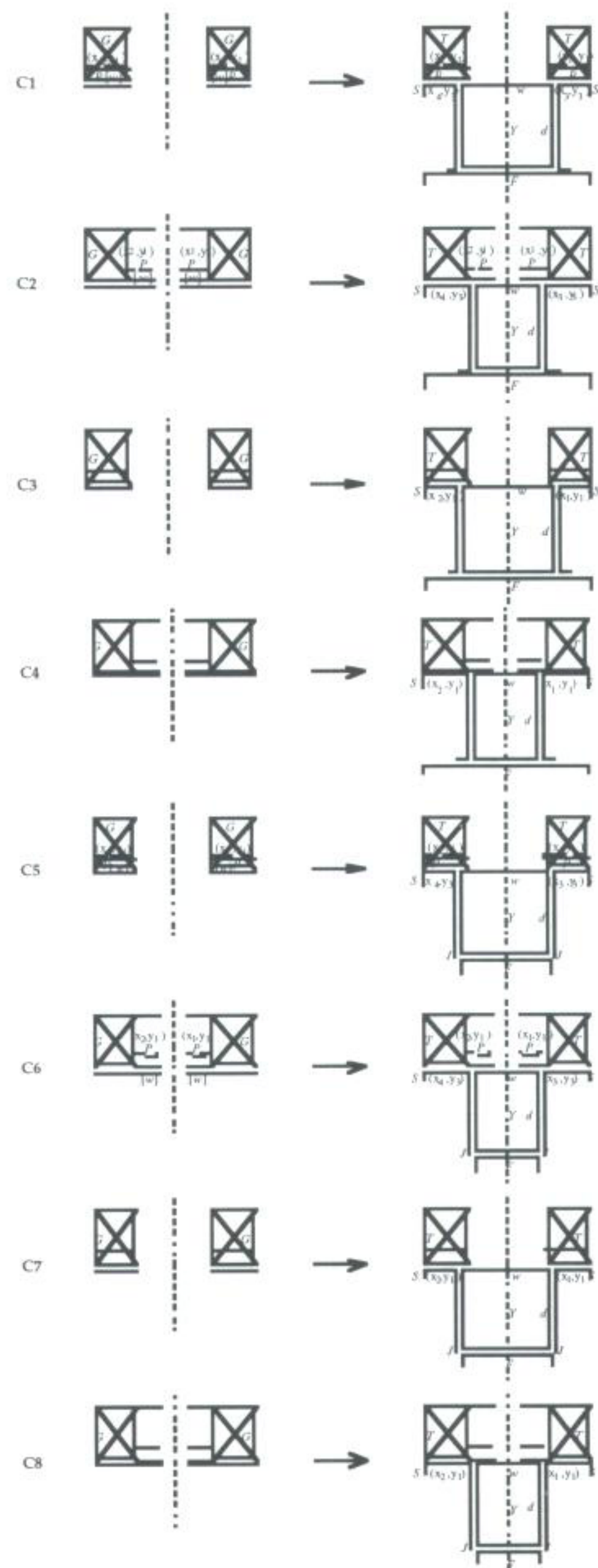


Figure 8 Shape rules for generating courtyards enclosed by inner secondary buildings.

Rule C9, shown in Figure 9, is introduced to account for the case of an end room with a porch, and creates a passing room to connect it to the secondary building. Rules C10 and C11, also in Figure 9, change the label w (window) to D (door) for accessing the inner secondary building through the end bay (room).

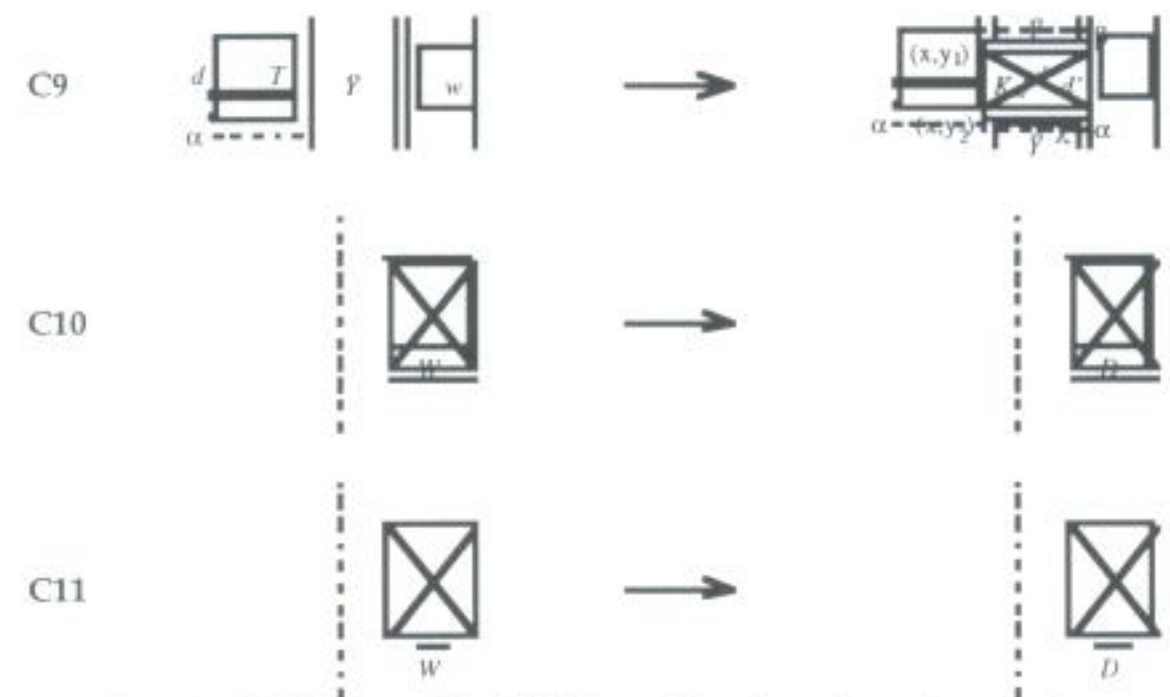


Figure 9 Modified and additional rules for the end room.

5. An Example: The Yin-shan-si Temple

The temple grammar is illustrated through an example of an existing Taiwanese temple. The *Yin-shan-si* (*Yin-shan* Temple), located in *Dan-shui*, Taipei, Taiwan, was built in circa A.D. 1822 by a small group of migrants from *Ting-zhou*, *Fu-jian*. The principal deity of the *Yin-shan-si* is a Buddha called *Ding-guang-fo*. The orientation of the *Yin-shan-si* is west. The *Yin-shan-si* is a typical middle-size and well-preserved temple in Taiwan. The layout of the temple is basically a longitudinal type. The temple, shown in plan in Figure 10, has two main buildings, four secondary buildings, and three bays in the principal building. Four steps in the generation of the temple highlighting the shape rules in this paper are shown in Figure 11.

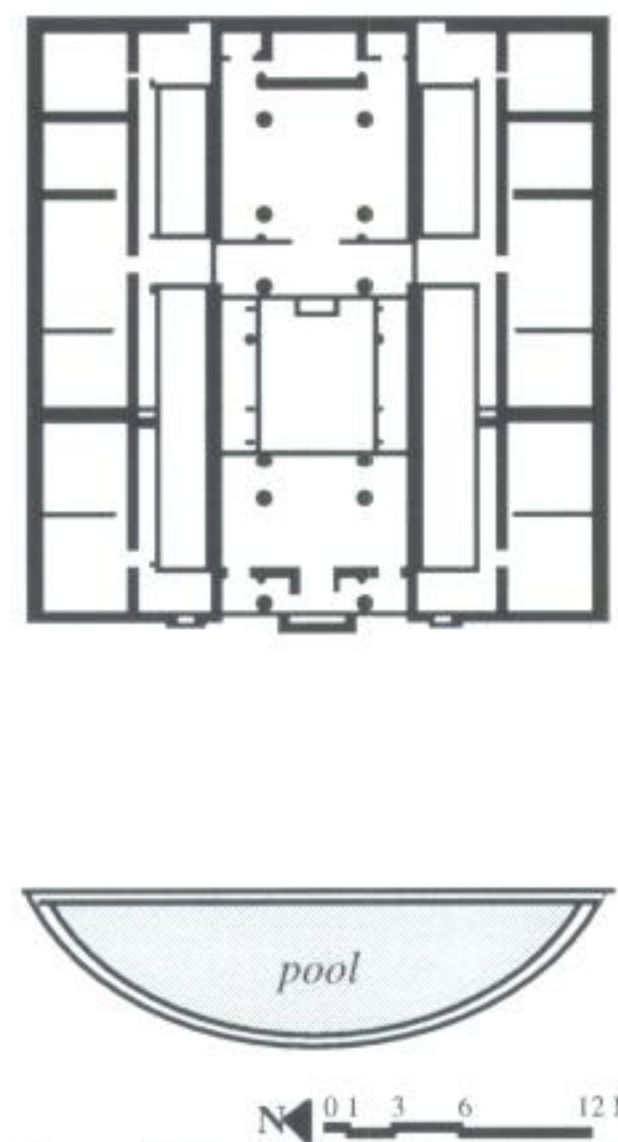


Figure 10 The plan of Yin-shan-si. (After Lee, 1980: 155)

6. Conclusion

In practice, temple architecture is much more complicated than the temple grammar we develop here. The temple is rich in variation. Although temple design follows almost the same architectural principles as houses, in practice, artisans (temple builders) were not afraid to relax some of these principles. However, it should be possible to generate those variations by providing additional shape rules. Whether this would add significantly to an understanding of the basic Chinese traditional style of design and temple architecture is debatable.

The temple grammar presented here outlines the general design of traditional temples and provides the basis for an explanation for temple architecture. The grammar further reiterates a view that we have expressed elsewhere, namely, that the Chinese designed grammatically (Chiou & Krishnamurti, 1995c, 1996). Moreover, the grammar emphasizes the notion of reusability which is ubiquitous to Chinese architecture and one that differs distinctly from early modern Western architectural dictum. Reusability is a distinguishing feature of Chinese traditional architecture and reflects the basic Chinese belief that space is flexible and man is adaptive.

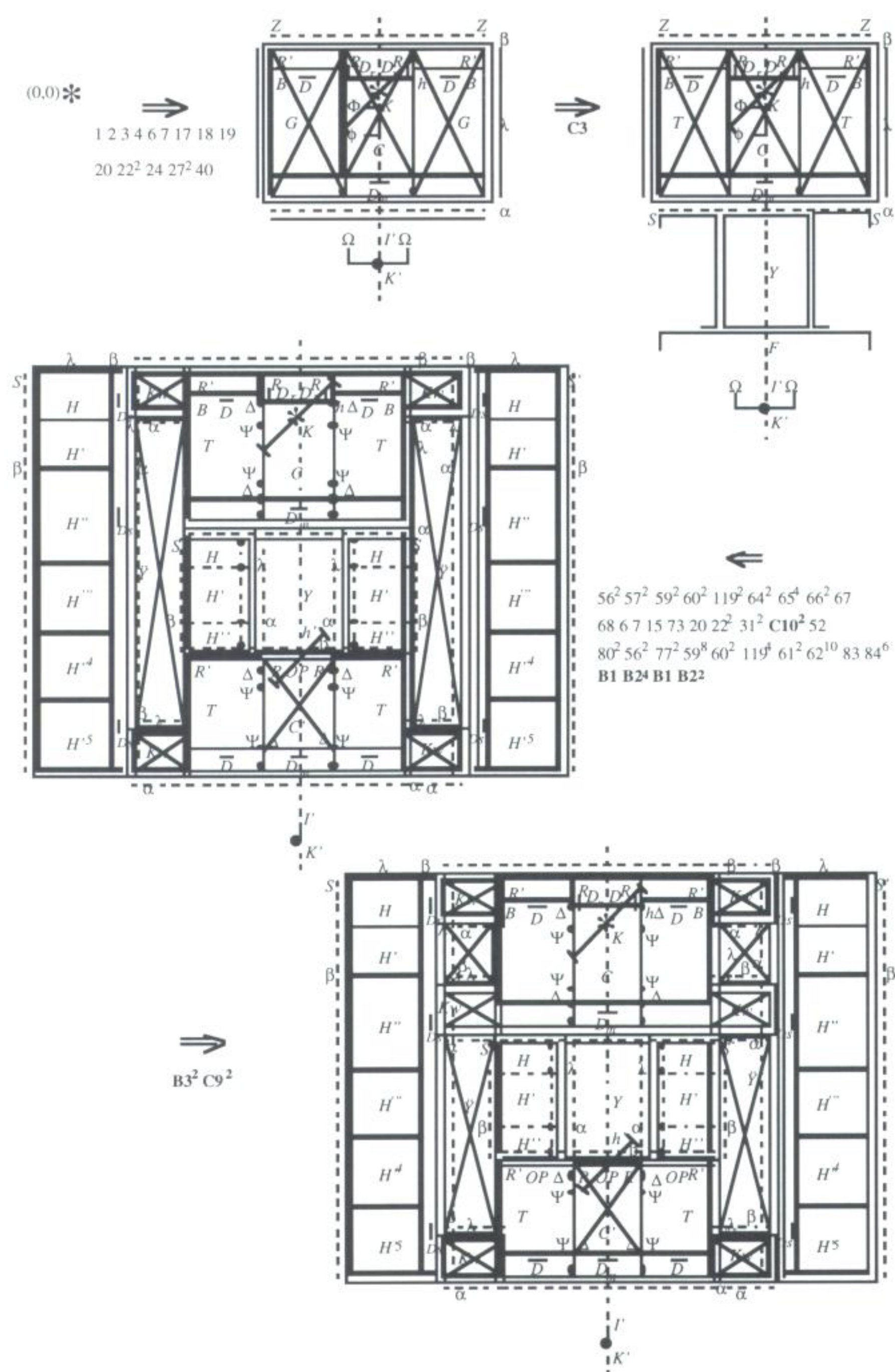


Figure 11 Some steps in the derivation of the plan of Yin-shan-si.

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² For the Chinese resources, the mark (†) indicates that the Chinese author name is transliterated corresponding to the Pinyin system. Furthermore, if the English title is not available in the resource, both Chinese character transliteration and English translation (without italicized) are provided.

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