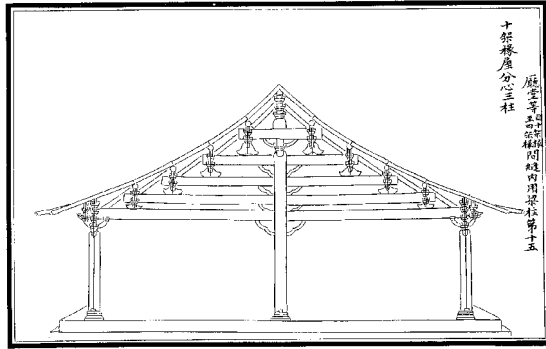
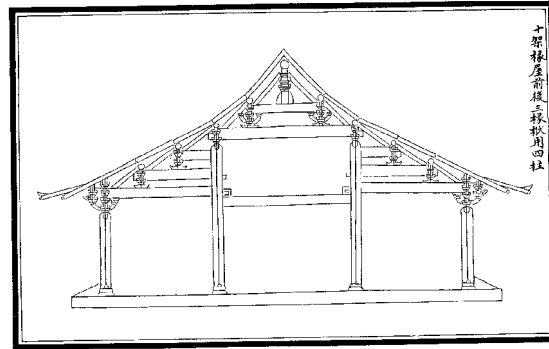


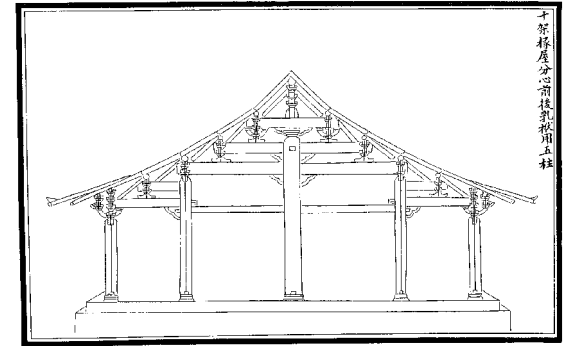
Figure 1. The rules for determining the roof section, known as *juzhe*, as drawn by Liang (1983, 265). With these rules, and given the depth and type of building, the correct roof section can be calculated.



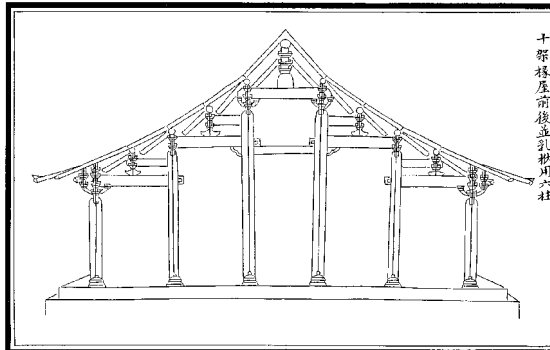
a. *Shijia chuan wu, fen xin, [yong] san zhu*. 10-rafter building, centrally divided, [with] 3 columns.



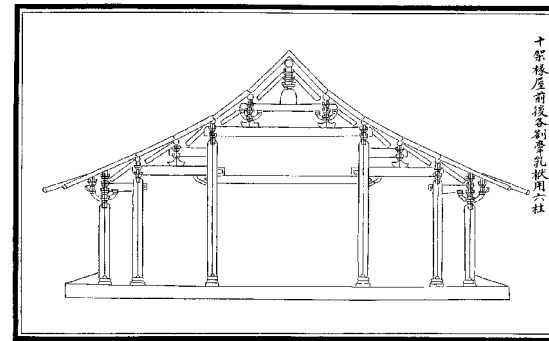
b. *Shijia chuan wu, qian hou sanchuan fu, yong si zhu*. 10-rafter building, a 3-rafter beam in front and in back, with 3 columns.



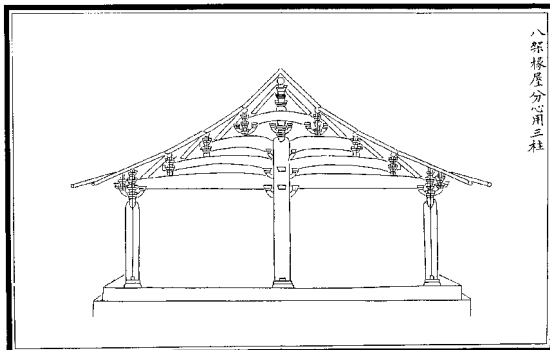
c. *Shijia chuan wu, fen xin, qian hou rufu, yong wu zhu*. 10-rafter building, centrally divided, a 2-rafter beam in front and in back, with 5 columns.



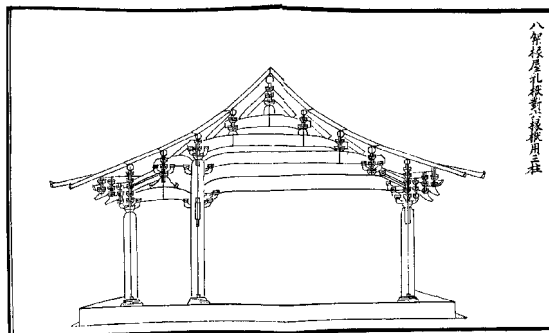
d. *Shijia chuan wu, qian hou bing rufu, yong wu zhu*. 10-rafter building, 2 2-rafter beams in front and in back, with 5 columns.



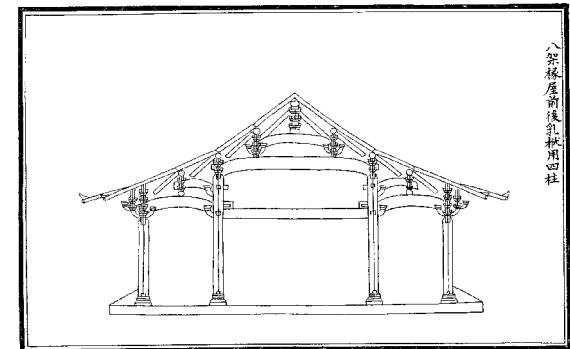
e. *Shijia chuan wu, qian hou ge zhaqian rufu, yong liu zhu*. 10-rafter building, 1- and 2-rafter beams both in front and in back, with 6 columns.



f. *Bajia chuan wu, fen xin, yong san zhu*. 8-rafter building, centrally divided, with 3 columns.

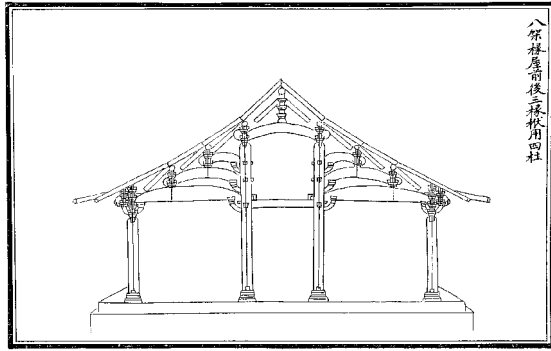


g. *Bajia chuan wu, rufu dui liuchuan fu, yong san zhu*. 8-rafter building, a 2-rafter beam abutting a 6-rafter beam, with 3 columns.

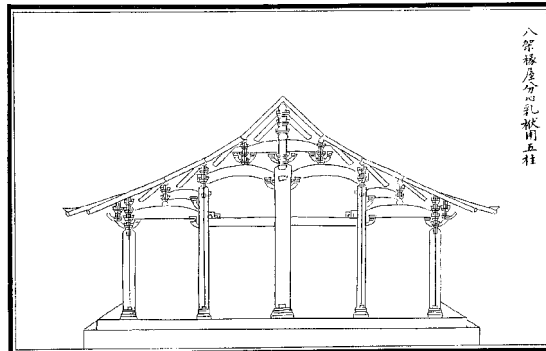


h. *Bajia chuan wu, qian hou rufu, yong si zhu*. An 8-rafter building, a 2-rafter beam in front and in back, with 4 columns.

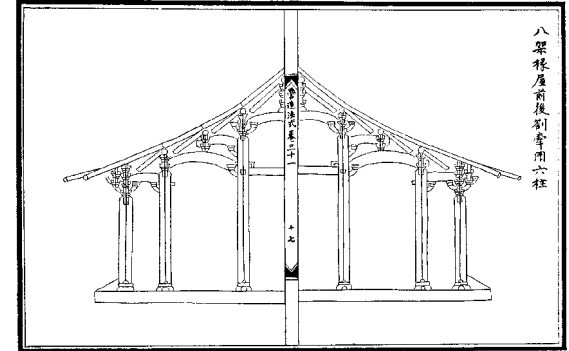
Figure 2. The 18 *ting tang* sections, with descriptions (Liang 1983, 313–321).



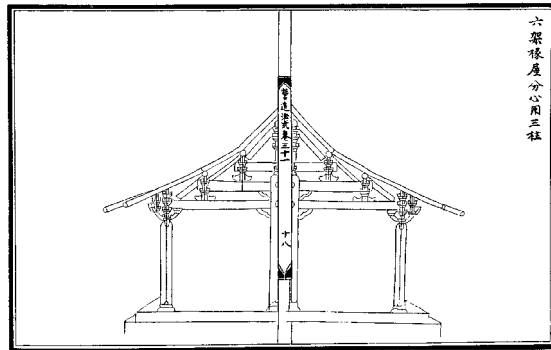
i. *Bajia chuan wu, qian hou sanchuan fu, yong si zhu*. 8-rafter building, a 3-rafter beam in front and in back, with 4 columns.



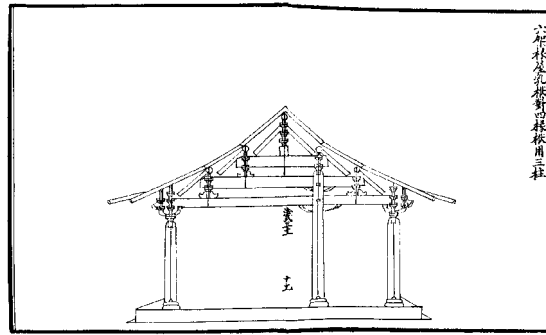
j. *Bajia chuan wu, fen xin, qian hou rufu, yong wu zhu*. 8-rafter building, centrally divided, a 2-rafter beam in front and in back, with 5 columns.



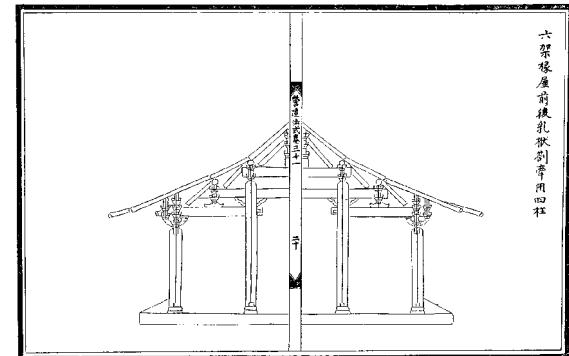
k. *Bajia chuan wu, qian hou zhaqian [rufu], yong liu zhu*. 8-rafter building, a 1- and a 2-] rafter beam in front and in back, with 6 columns.



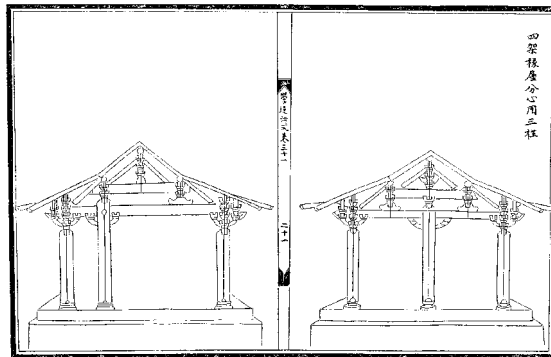
l. *Liujia chuan wu, fen xin, yong san zhu*. 6-rafter building, centrally divided, with 3 columns.



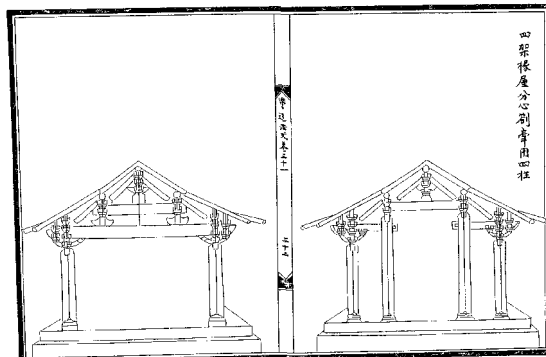
m. *Liujia chuan wu, rufu dui sichuan fu, yong san zhu*. 6-rafter building, a 4-rafter beam abutting a 2-rafter beam, with 3 columns.



n. *Liujia chuan wu, qian hou rufu, yong si zhu*. 6-rafter building, a 2-rafter beam in front and in back, with 4 columns.



o. Left: [*Sijia chuan wu, zhaqian dui sanchuan fu, yong san zhu*. 4-rafter building, a 1-rafter beam abutting a 3-rafter beam, with 3 columns.] Right: *Sijia chuan wu, fen xin, yong san zhu*. 4-rafter building, centrally divided, with 3 columns.



p. Left: [*Sijia chuan wu, tongyan, yong er zhu*. 4-rafter building, clear span, with 2 columns.] Right: *Sijia chuan wu, qian hou zhaqian, yong si zhu*. 4-rafter building, a 1-rafter beam in front and in back, with 4 columns.

Figure 2, continued.

Initial shape	$\begin{array}{c} \cdot \\ \cdot \square \cdot \\ \cdot \end{array}$	$\square \cdot \xrightarrow{1} \begin{array}{c} \cdot \\ \square \square \cdot \\ \cdot \end{array}$	$\cdot \xrightarrow{2}$
Initial description n	1	$n \leftarrow n + 1$	$n \leftarrow n$

Figure 3. A simple grammar that generates patterns of squares plus a description of the number of squares in the pattern. It consists of an initial design (consisting of an initial shape and an initial description) and two design rules (consisting of a shape subrule and a description subrule).

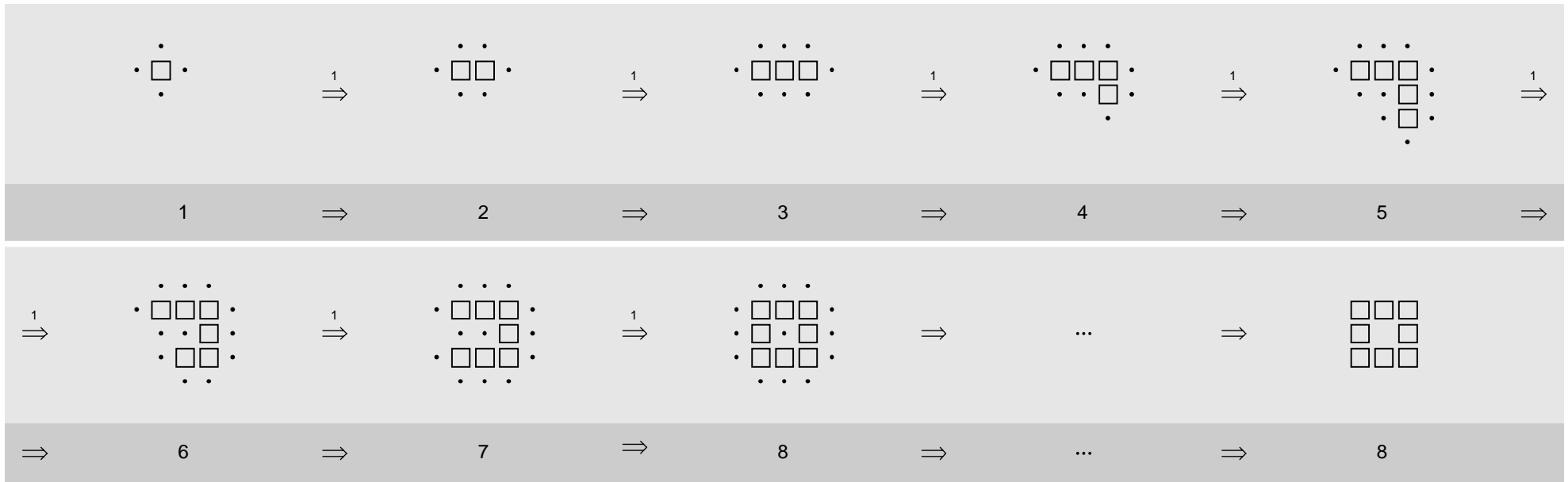


Figure 4. Derivation of a pattern consisting of 8 squares, and the description 8, using the square grammar in figure 3. We apply rule 1 seven times, transforming the pattern and the description each time. (Transformations are separated by a double arrow with the number of the rule applied.) Also part of the derivation is the erasing of the dots; this is not of interest to us, so we leave it out.

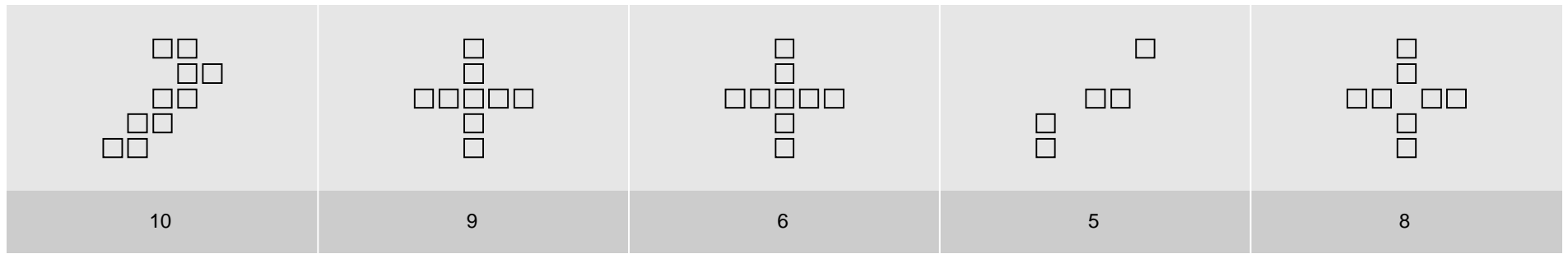


Figure 5. Five designs of squares. The first and second designs are legal, because they can be derived by the grammar. The other designs cannot, and therefore are illegal.

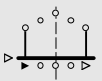
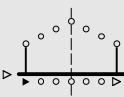
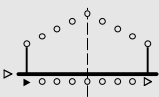
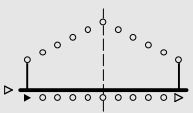
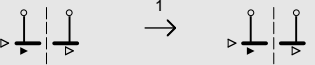
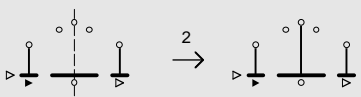
initial s_4		initial s_6		initial s_8		initial s_{10}	
initial c_{a4} initial c_{b4} initial c_{c4}	<i>sijia chuan wu</i> \emptyset <i>yong er zhu</i>	initial c_{a6} initial c_{b6} initial c_{c6}	<i>liujia chuan wu</i> \emptyset <i>yong er zhu</i>	initial c_{a8} initial c_{b8} initial c_{c8}	<i>bajia chuan wu</i> \emptyset <i>yong er zhu</i>	initial c_{a10} initial c_{b10} initial c_{c10}	<i>shijia chuan wu</i> \emptyset <i>yong er zhu</i>
initial e_{a4} initial e_{b4} initial e_{c4}	4-rafter building \emptyset with 2 columns	initial e_{a6} initial e_{b6} initial e_{c6}	6-rafter building \emptyset with 2 columns	initial e_{a8} initial e_{b8} initial e_{c8}	8-rafter building \emptyset with 2 columns	initial e_{a10} initial e_{b10} initial e_{c10}	10-rafter building \emptyset with 2 columns
	1		2				
$c_b \leftarrow$ <i>tong yan</i>		$c_b \leftarrow$ <i>fen xin</i> $c_c \leftarrow$ <i>yong n + 1 zhu</i>					
$e_b \leftarrow$ clear span		$e_b \leftarrow$ centrally divided $e_c \leftarrow$ with $n + 1$ columns					

Figure 6. Section grammar for *ting tang*. It consists of four initial designs – of 4-, 6-, 8-, and 10-rafter buildings – and 14 rules. Each design consists of a section (shape), a 3-part Chinese description, and a 3-part English description.

<p>$C_b \leftarrow C_b$, <i>qian zhaqian</i> $C_c \leftarrow C_c$, <i>yong n + 1 zhu</i></p>	<p>$C_b \leftarrow C_b$, <i>qian rufu</i> $C_c \leftarrow C_c$, <i>yong n + 1 zhu</i></p>	<p>$C_b \leftarrow C_b$, <i>qian sanchuan fu</i> $C_c \leftarrow C_c$, <i>yong n + 1 zhu</i></p>	<p>$C_b \leftarrow C_b$, <i>qian sichuan fu</i> $C_c \leftarrow C_c$, <i>yong n + 1 zhu</i></p>
<p>$e_b \leftarrow e_b$, 1-rafter beam in front $e_c \leftarrow e_c$, with $n + 1$ columns</p>	<p>$e_b \leftarrow e_b$, 2-rafter beam in front $e_c \leftarrow e_c$, with $n + 1$ columns</p>	<p>$e_b \leftarrow e_b$, 3-rafter beam in front $e_c \leftarrow e_c$, with $n + 1$ columns</p>	<p>$e_b \leftarrow e_b$, 4-rafter beam in front $e_c \leftarrow e_c$, with $n + 1$ columns</p>
<p>$C_b \leftarrow C_b$, <i>qian wuchuan fu</i> $C_c \leftarrow C_c$, <i>yong n + 1 zhu</i></p>	<p>$C_b \leftarrow C_b$, <i>qian liuchuan fu</i> $C_c \leftarrow C_c$, <i>yong n + 1 zhu</i></p>		
<p>$e_b \leftarrow e_b$, 5-rafter beam in front $e_c \leftarrow e_c$, with $n + 1$ columns</p>	<p>$e_b \leftarrow e_b$, 6-rafter beam in front $e_c \leftarrow e_c$, with $n + 1$ columns</p>		
<p>$C_b \leftarrow C_b$, <i>hou zhaqian</i> $C_c \leftarrow C_c$, <i>yong n + 1 zhu</i></p>	<p>$C_b \leftarrow C_b$, <i>hou rufu</i> $C_c \leftarrow C_c$, <i>yong n + 1 zhu</i></p>	<p>$C_b \leftarrow C_b$, <i>hou sanchuan fu</i> $C_c \leftarrow C_c$, <i>yong n + 1 zhu</i></p>	<p>$C_b \leftarrow C_b$, <i>hou sichuan fu</i> $C_c \leftarrow C_c$, <i>yong n + 1 zhu</i></p>
<p>$e_b \leftarrow e_b$, 1-rafter beam in back $e_c \leftarrow e_c$, with $n + 1$ columns</p>	<p>$e_b \leftarrow e_b$, 2-rafter beam in back $e_c \leftarrow e_c$, with $n + 1$ columns</p>	<p>$e_b \leftarrow e_b$, 3-rafter beam in front $e_c \leftarrow e_c$, with $n + 1$ columns</p>	<p>$e_b \leftarrow e_b$, 4-rafter beam in back $e_c \leftarrow e_c$, with $n + 1$ columns</p>
<p>$C_b \leftarrow C_b$, <i>hou wuchuan fu</i> $C_c \leftarrow C_c$, <i>yong n + 1 zhu</i></p>	<p>$C_b \leftarrow C_b$, <i>hou liuchuan fu</i> $C_c \leftarrow C_c$, <i>yong n + 1 zhu</i></p>		
<p>$e_b \leftarrow e_b$, 5-rafter beam in front $e_c \leftarrow e_c$, with $n + 1$ columns</p>	<p>$e_b \leftarrow e_b$, 6-rafter beam in back $e_c \leftarrow e_c$, with $n + 1$ columns</p>		

Figure 6, continued.

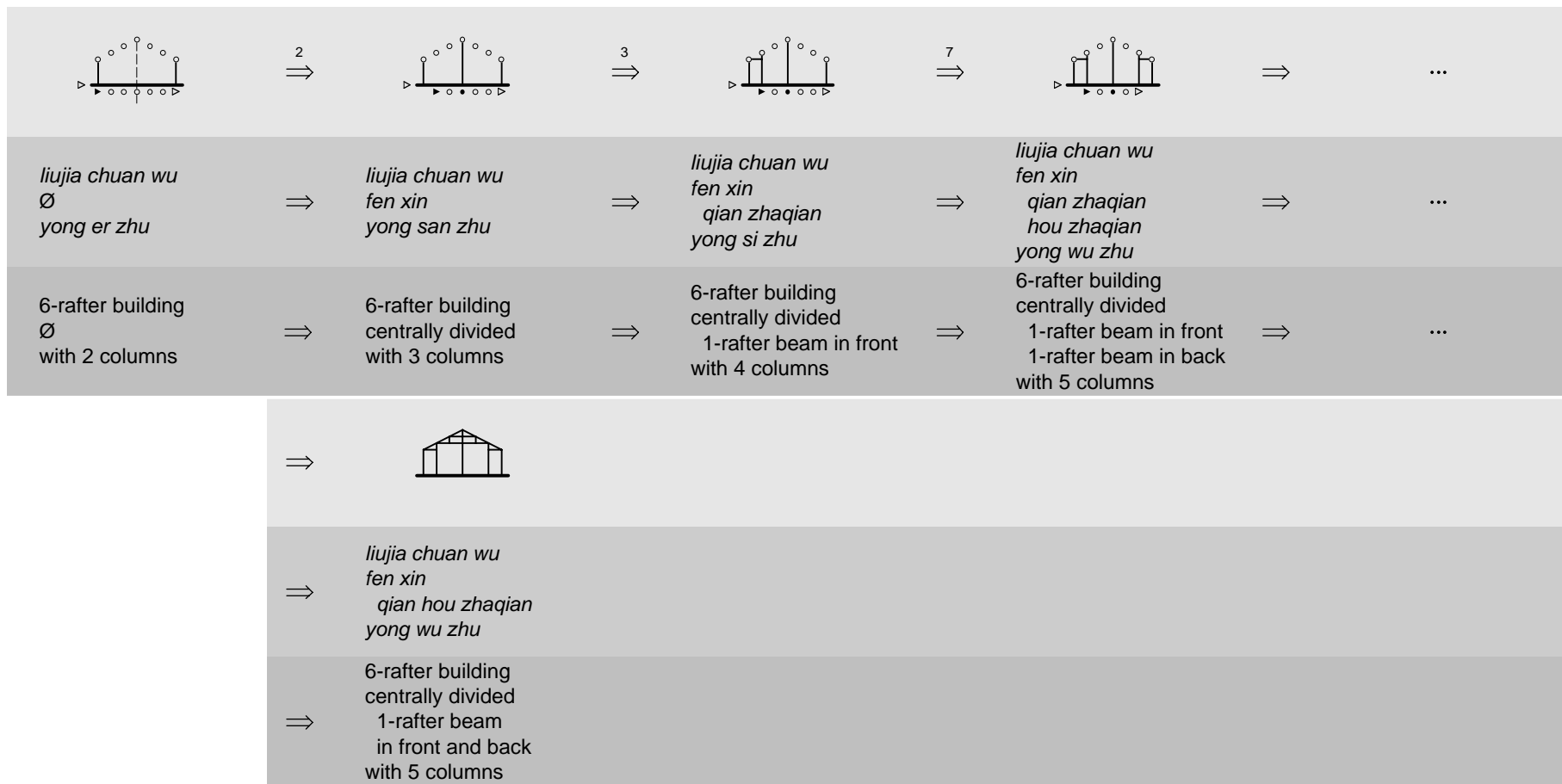
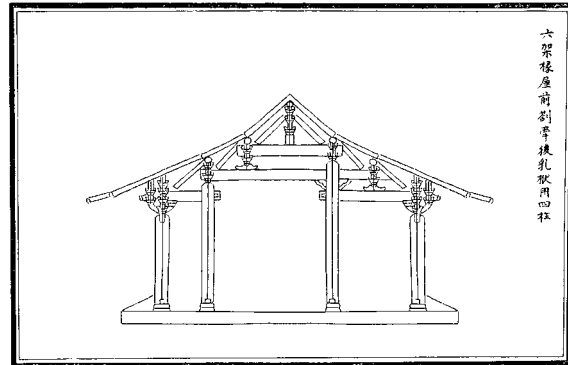
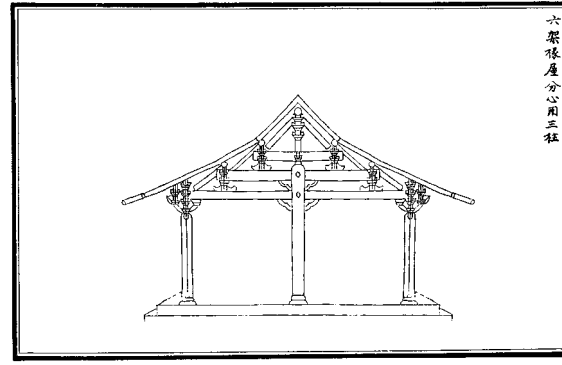


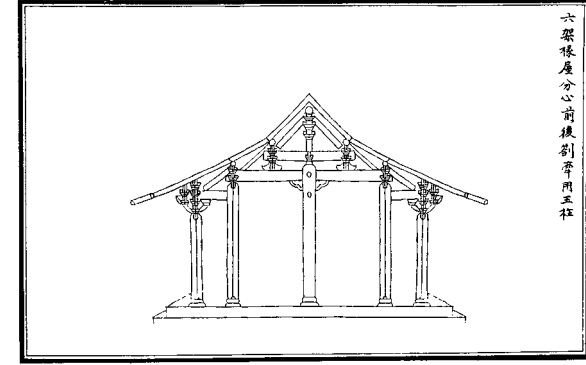
Figure 7. Derivation of a 6-rafter *ting tang*, centrally divided, 1-rafter beam in front and in back, with 5 columns. We apply rules 2, 1, and 7 to establish the distinctive features. We omit the process of cleaning up the labels and descriptions. It is shown in figure 8, redrawn as in the *Yingzao fashi*.



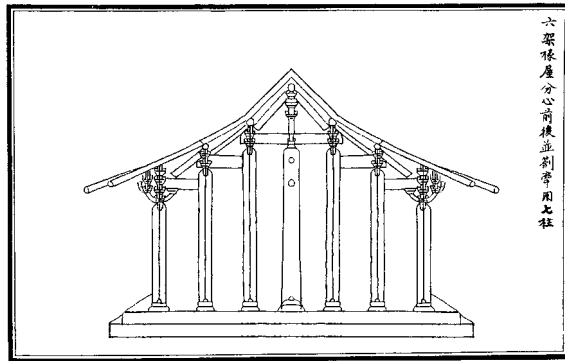
a. *Liujia chuan wu, qian zhaqian hou rufu, yong si zhu*. A 6-rafter building, a 1-rafter beam in front, a 2-rafter beam in back, with 4 columns.



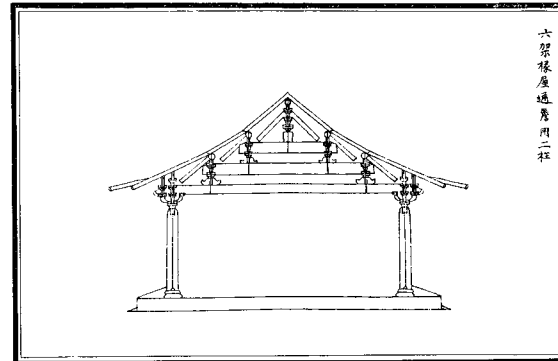
b. *Liujia chuan wu, fen xin, yong san zhu*. A 6-rafter building, centrally divided, with 3 columns.



c. *Liujia chuan wu, fen xin, qian hou zhaqian, yong wu zhu*. A 6-rafter building, centrally divided, a 1-rafter beam in front and in back, with 5 columns.



d. *Liujia chuan wu, fen xin, qian hou bing zhaqian, yong qi zhu*. A 6-rafter building, centrally divided, 2 1-rafter beams in front and in back, with 7 columns.



e. *Liujia chuan wu, tong yan, yong er zhu*. A 6-rafter building, clear span, with 2 columns.

Figure 8. Five 6-rafter sections derived with the grammar. Whether or not they are legal is for the user of the grammar to determine. The third section is derived in figure 7.