= Architecture of the Song dynasty =

The architecture of the Song dynasty (960 ? 1279) was noted for its towering Buddhist pagodas , enormous stone and wooden bridges , lavish tombs , and extravagant palaces . Although literary works on architecture existed beforehand , architectural writing blossomed during the Song dynasty , maturing into a more professional form that described dimensions and working materials in a concise , organized manner . In addition to the examples still standing , depictions in Song artwork , architectural drawings , and illustrations in published books all aid modern historians in understanding the architecture of the period .

The professions of architect , master craftsman , carpenter , and structural engineer did not have the high status of the Confucian scholar @-@ officials during the dynastic era . Architectural knowledge had been passed down orally for thousands of years , usually from craftsman fathers to their sons . There were also government agencies and schools for construction , building , and engineering . The Song dynasty 's building manuals aided not only the various private workshops , but also the craftsmen employed by the central government .

= = City and palace = =

The layout of ancient Chinese capitals , such as Bianjing , capital of the Northern Song , followed the guidelines in Kao Gong Ji , which specified a square city wall with several gates on each side and passageways for the emperor . The outer city of ancient Bianjing was built during the reign of Emperor Shenzong to a rectangular plan , almost square in proportions , about 6 km (3 @.@ 7 mi) from north to south and 7 km (4 @.@ 3 mi) from west to east . The south wall had three gates , with Nanxun Gate in the center , Chenzhou Gate to the east , and Dailou Gate to the west . The other walls had four gates each : in the east wall were Dongshui Gate (at the southern end) , Xinsong Gate , Xinchao Gate , and North @-@ East Water Gate ; in the west wall Xinzheng Gate , West Water Gate , Wansheng Gate , and Guzi Gate ; and in the north wall Chenqiao Gate (at the eastern end) , Fengqiu Gate , New Wild Jujube Gate and Weizhou Gate . The gates in the center of each of the four sides were reserved for the emperor ; these gates had straight passages and only two sets of doors , while the other city gates had zigzag passages and were guarded by three sets of doors .

The Song artist Zhang Zeduan 's painting Along the River During the Qingming Festival depicts the Dongshui Gate in detail : the building on top had a five @-@ ridged roof with a shallow slope in the Song dynasty style , supported prominently by two sets of brackets (dougong) . The lower bracket assembly rested on the city gate to form a wooden foundation , while the upper assembly supported the roof , similar to the dougong in an extant Song building , the Goddess Temple in Taiyuan . This method of using bracket assemblies to support superstructure was specified in Li Jie 's 12th @-@ century building manual Yingzao Fashi as pingzuo (literally " flat base ") .

The city wall itself was built with rammed earth , a technique also detailed in Yingzao Fashi , vol . III , " Standards for Moat , Stronghold and Masonry Work " :

Foundation : For every square chi , apply two dan of earth ; on top of it lay a mixture of broken brick , tile and crushed stones , also two dan . For every five @-@ cun layer of earth , two men , standing face to face , should tamp six times with pestles , each man pounding three times on a dent ; then tamp four times on each dent , two men again standing face to face , each pounding twice on the same dent ; then tamp two more times , each man pounding once . Following this , tamp the surface with pestles or stamp with feet randomly to even out the surface . Every five @-@ cun layer of earth should be compressed to three cun ; every three @-@ cun layer of brick and stone to one and a half cun .

Rammed @-@ earth walls during this time were tapered : the thickness of the wall is greatest at the base and decreases steadily with increasing height , as detailed in Li Jie 's book .

During the Song dynasty , the city of Bianjing had three enclosures : the outer city wall , the inner city wall , and the palace at the center . The inner city was rectangular , with three doors on each side . The palace enclosure was also rectangular , with a watch tower on each of the four corners . It

had four main gates : Xihua Gate to the west , Donghua Gate to the east , Gongchen Gate to the north , and Xuande Gate , also known as Duan Gate or Xuandelou , at the south . Xuande Gate had five @-@ paneled doors , painted red and decorated with gold tacks ; its walls were lavishly decorated with dragon , phoenix and floating @-@ cloud patterns to match the carved beams , painted rafters and glazed @-@ tile roof . There were also two glazed dragons , each biting an end of the rooftop ridge , its tail pointing to the sky . The symbolic function of these chi wei was explained in Yingzao Fashi :

There is a dragon in the East Sea , whose tail (wei) is similar to that of a sparrow @-@ hawk (chi) ; it stirs up waves and causes rainfall , so people put its likeness on the rooftop to prevent fire . However , they misnamed it " sparrow @-@ hawk tail " (chi wei) .

Running southward from Xuande Gate was the Imperial Boulevard , about two hundred paces wide , with the Imperial Corridors on either side . Merchants opened shops in the Corridors until 1112 , when they were banned . Two rows of black fencing were placed at the center of the boulevard as a barrier to pedestrians and carriages . Along the inner sides of the fences ran the brick @-@ lined Imperial Water Furrows , filled with lotus . About 400 m (1 @,@ 300 ft) south from Xuande Gate , the Bian River intercepted the Imperial Boulevard , which crossed it over the stone Zhou Bridge , balustraded and flat @-@ decked . This design of a boulevard with a stone bridge crossing a river was later imitated in the Forbidden City . During spring and summer , mingled peach , plum , pear and apricot trees adorned the banks of the Bian with a variety of flowers .

= = Buddhist pagodas = =

Following the reign of the Han dynasty , (202 BC ? 220 AD) , the idea of the Buddhist stupa entered Chinese culture , as a means to house and protect scriptural sutras . During the Southern and Northern Dynasties period , the distinctive Chinese pagoda was developed , its predecessors being the tall watch towers and towering residential apartments of the Han dynasty (as inferred from models in Han @-@ era tombs) . During the Sui (581 ? 618) and Tang (618 ? 907) periods , Chinese pagodas were developed from purely wooden structures to use articulated stone and brick , which could more easily survive fires caused by lightning or arson and were less susceptible to decay . The earliest brick pagoda that remains extant is the Songyue Pagoda , built in 523 , and a typical example of a Tang @-@ era stone pagoda is the Giant Wild Goose Pagoda , constructed in 652 . Although Buddhist influences on China waned after the late Tang period , numerous Buddhist pagoda towers were built during the Song dynasty . Tall Chinese pagodas were often built in the countryside rather than within a city 's walls , largely to avoid competition with the cosmic @-@ imperial authority embodied in the cities ' drum- and gate @-@ towers . The Giant Wild Goose Pagoda , built in a city ward of what was southeastern Chang 'an , is among the exceptions .

The Iron Pagoda of Youguo Temple in Kaifeng earned it name from the iron @-@ grey color of the glazed bricks forming the tower . Originally built of wood by the architect Yu Hao , it was struck by lightning and burned down in 1044 , during the Northern Song period . In 1049 the pagoda was rebuilt as it appears today , under the order of Emperor Renzong of Song . This 13 @-@ story pagoda , structured on an octagonal base , is 56 @.@ 88 meters (186 @.@ 6 ft) tall . Its glazed tile bricks feature carved artwork of dancing figures , solemn ministers , and Buddhist themes (see gallery below) .

The period also featured true cast @-@ iron pagodas , such as the Iron Pagoda of Yuquan Temple (Jade Springs Temple) , Dangyang , Hubei Province . Built in 1061 , it incorporates 53 @,@ 848 kg (118 @,@ 715 lb) of cast iron and stands 21 @.@ 28 m (69 @.@ 8 ft) tall . Imitating contemporary wooden , stone , and brick pagodas , the pagoda features sloping eaves and an octagonal base . Another iron pagoda was constructed in 1105 , Jining , Shandong , and was cast layer by layer in octagonal sections , standing 78 feet high . Several such cast iron pagodas exist in China today .

The Liuhe Pagoda , or Six Harmonies Pagoda , is another example of Song @-@ era pagoda architecture . It is located in the Southern Song capital of Hangzhou , in Zhejiang Province , at the foot of Yuelun Hill facing the Qiantang River . Although the original was destroyed in 1121 , the

current tower was erected in 1156 and fully restored by 1165 . It stands 59 @.@ 89 m (196 @.@ 5 ft) tall , and was constructed from a red brick frame with 13 stages of wooden eaves . Because of its size , the pagoda served as a permanent lighthouse to aid sailors at night (as described in Hangzhou Fu Zhi) .

The Zhengjue Temple Pagoda in Pengxian County of Sichuan Province (near Chengdu) is a brick pagoda that was built between 1023 and 1026 , according to inscriptions running along its first storey . It has a square base on a sumeru pedestal , thirteen stories totaling 28 m (92 ft) in height , and multiple layers of eaves similar in style to the earlier Tang pagodas of Chang 'an , the Giant Wild Goose Pagoda and the Small Wild Goose Pagoda .

Wood @-@ and @-@ brick hybrid pagodas were also built . The first four floors of the octagonal , 42 m (138 ft) Lingxiao Pagoda of 1045 are brick (with wooden eaves) , while from the fifth floor up it is entirely made of wood . Even pagodas made of stone or brick featured architectural elements that were typical of Chinese wooden buildings ; for example the Pizhi Pagoda , built from 1056 to 1063 , uses the dougong brackets typical of wooden architecture to hold up pent , shingled roofs and tiers . Both of these pagodas feature interior staircases , although the Lingxiao Pagoda 's only reaches to the fourth floor , and the Pizhi Pagoda 's to the fifth . However , the Pizhi Pagoda features winding exterior stairs that provide access to the ninth and topmost floor .

Although the Pagoda of Fogong Temple is the tallest extant wooden pagoda , the tallest Chinese pagoda built in the dynastic era that remains standing is the Liaodi Pagoda . Completed in 1055 , it is 84 meters (276 ft) tall , with an octagonal base on a large platform , surpassing the 69 @-@ meter (226 ft) Qianxun Pagoda , which had held the record since its construction in the 9th century by the Kingdom of Dali . Although the Liaodi Pagoda served its religious purpose as a Buddhist landmark in the Kaiyuan Monastery of Ding County , Hebei province , its great height gave it another valuable function , as a military watch tower that was used to observe movements of the Liao enemy . Beside their utility in surveillance , pagoda towers could also serve as astronomical observatories ; one such is the Gaocheng Astronomical Observatory , built in 1276 and still standing today .

Yunyan pagoda

= = Temples = =

It was not uncommon for wealthy or powerful families to facilitate the construction of large temple complexes , usually by donating a portion of their family estate to a Buddhist sect . Often the land already contained buildings that could be re @-@ purposed for religions use . The Fei (?) family of the town of Jinze , located just west of Shanghai , converted a mansion on their property into a Buddhist sutra @-@ recitiation hall , and later built several other religious buildings around the hall . This spurred a boom in temple construction in the area , causing Jinze to become a major center of the White Lotus sect of Buddhism , which in turn spurred the construction of more temples and lead the town to become a significant location within the Song . The nearby town of Nanxiang gained prominence shortly after the fall of the Song in large part to the construction of temples and other religious buildings , which spanned the entire Song empire .

Apart from stimulating the development of urban areas , temples and religious buildings featured a number of unique aesthetic and structural features . The Temple of the Saintly Mother (???) and the Hall of Sacrifice of the Jin Temple (??) , located in a southeastern suburb of Taiyuan City , Shanxi province , are extant examples of early Song architecture . The Temple of the Saintly Mother is the main building of the Jin Temple , first built in the period between 1023 and 1032 and renovated in 1102 . It has a double @-@ eaved roof with nine ridges , and two dragon @-@ heads with wide @-@ open jaws biting the ends of the main ridge . The roof is supported by massive dougong brackets corresponding to drawings in Yingzao Fashi . The eaves of the Temple of the Saintly Mother curve upward slightly at each end , a characteristic of Song architecture . The columns of the façade , decorated with dragons that coil around the shafts , become progressively taller with increasing distance to either side of the central pair . The building has a porch around it , the sole example of such a structure ; another unique feature of the site is a cross @-@ shaped bridge that leads to the Goddess Temple .

The Trinity Hall of Xuan Miao Temple (???) , situated in the heart of Suzhou city , is another example of Song architecture . In 1982 , it was established as a National Heritage Site by the Chinese government .

The Jingling Palace (??? , Jingling Gong) , a temple to the legendary Yellow Emperor located near modern @-@ day Qufu , was built in the 11th century . It was subsequently destroyed near the end of the Yuan dynasty . However , several other structures in Shou Qiu , the complex that Jingling Palace was situated in , remain intact . Two giant tortoise @-@ borne steles flank what was the entrance to the palace . One of the two steles , the Stele of the Sorrow of 10 @,@ 000 , is at 52 meters (171 ft) high , the tallest unmarked stele in the country . A large pyramid constructed of rounded stone blocks , the symbolic tomb of the Yellow Emperor 's son Shaohao , is located outside the Shou Qiu complex . Another important large tortoise @-@ borne stele of the same period has been preserved at the Dai Miao of Mount Tai .

= = Bridges = =

Bridges over waterways had been known in China since the ancient Zhou dynasty . During the Song dynasty , large trestle bridges were constructed , such as that built by Zhang Zhongyan in 1158 . There were also large bridges made entirely of stone , like the Ba Zi Bridge of Shaoxing , built in 1256 and still standing today . Bridges with pavilions crowning their central spans were often featured in such paintings as the landscapes of Xia Gui (1195 ? 1224) . Long , covered corridor bridges , like the 12th @-@ century Rainbow Bridge in Wuyuan , Jiangxi province , which has wide stone @-@ based piers and a wooden superstructure , were also built .

While serving as an administrator for Hangzhou , the poet Su Shi (1037 ? 1101) had a large pedestrian causeway built across the West Lake , which still bears his name : Sudi (??) . In 1221 , the Taoist traveler Qiu Changchun visited Genghis Khan in Samarkand , describing various Chinese bridges encountered on the way there through the Tian Shan Mountains , east of Yining . The historian Joseph Needham quotes him as saying :

[The road had] " no less than 48 timber bridges of such width that two carts can drive over them side by side " . It had been built by Chang Jung [Zhang Rong] and the other engineers of the Chagatai some years before . The wooden trestles of Chinese bridges from the ? 3rd century [BC] onwards were no doubt similar to those supposed to have been employed in Julius Caesar 's bridge of ? 55 [BC] across the Rhine , or drawn by Leonardo , or found in use in Africa . But where in + 13th century [AD] Europe could a two @-@ lane highway like Chang Jung 's have been found ?

In Fujian Province , enormous beam bridges were built during the Song dynasty . Some of these were as long as 1 @,@ 220 m (4 @,@ 000 ft) , with individual spans of up to 22 m (72 ft) in length ; their construction necessitated moving massive stones of 203 t (203 @,@ 000 kg) . No names of the engineers were recorded or appear in the inscriptions on the bridges , which give only the names of local officials who sponsored them and oversaw their construction and repair . However , there might have been an engineering school in Fujian , headed by a prominent engineer known as Cai Xiang (1012 ? 1067) , who had risen to the position of governmental prefect in Fujian . Between 1053 and 1059 , he planned and supervised the construction of the large Wanan Bridge (once called the Luoyang Bridge) near Quanzhou (on the border of the present @-@ day Luojiang District and Huai 'an County . This bridge , a stone structure similar to a number of other bridges found in Fujian , still stands , and features ship @-@ like piers bound to their bases using mucilage from oysters as an adhesive . It is 731 m (2 @,@ 398 ft) in length , 5 m (16 ft) in width , and 7 m (23 ft) in height . Another famous bridge near Quanzhou , the Anping Bridge , was constructed between 1138 and 1151 .

Other examples of Song bridges include Guyue Bridge , a stone arch bridge in Yiwu , Zhejiang Province . The bridge was built in 1213 , the sixth year of the Jiading Era in the Southern Song dynasty . Song @-@ era pontoon bridges include the Dongjin Bridge , 400 m (1 ? 4 mi) long , which may still be seen today .

= = Tombs of the Northern Song emperors = =

Located southwest of Gongyi city in Gongxian County , Henan province , the large tombs of the Northern Song number about one thousand , including individual tombs for Song emperors , empresses , princes , princesses , consorts , and members of the extended family . The complex extends approximately 7 km (4 @.@ 3 mi) from east to west and 8 km (5 @.@ 0 mi) from north to south . The construction of the complex began in 963 AD , during the reign of the first Song ruler , Emperor Taizu of Song , whose father is also buried at the site . The only Northern Song emperors not buried there are Emperor Huizong of Song and Emperor Qinzong of Song , who died in captivity after the Jurchen invasion of northern China in 1127 . Lining the spirit ways of the tomb complex are hundreds of Song sculptures and statues of tigers , rams , lions , horses with grooms , horned beasts and mythical creatures , government officials , military generals , foreign ambassadors , and others featured in an enormous display of Song @-@ era artwork .

The layout and style of the Song tombs resemble those found in the contemporary Tangut kingdom of the Western Xia , which also had an auxiliary burial site associated with each tomb . At the center of each burial site is a truncated pyramidal tomb , each having once been guarded by a four @-@ walled enclosure with four centered gates and four corner towers . About 100 km (62 mi) from Gongxian is the Baisha Tomb , which contains " elaborate facsimiles in brick of Chinese timber frame construction , from door lintels to pillars and pedestals to bracket sets , that adorn interior walls . " The Baisha Tomb has two large separate chambers with conical ceilings ; a large staircase leads down to the entrance doors of the subterranean tomb .

= = Literature = =

During the Song dynasty , previous works on architecture were brought to more sophisticated levels of description , as in Yili Shigong , written by Li Ruogui in 1193 AD . One of the most definitive works , however , was the earlier Mu Jing (" Timberwork Manual ") , ascribed to Yu Hao and written sometime between 965 and 995 . Yu Hao was responsible for the construction of a wooden pagoda tower in Kaifeng , which was destroyed by lightning and replaced by the brick Iron Pagoda soon after . In his time , books on architecture were still considered a lowly scholarly achievement due to the craft 's status , so Mu Jing was not even recorded in the official court bibliography . Although the book itself was lost to history , the scientist and statesman Shen Kuo wrote of Yu 's work extensively in his Dream Pool Essays of 1088 , praising it as a work of architectural genius , saying that no one in his own time could reproduce such a work . Shen Kuo singled out , among other passages , a scene in which Yu Hao gives advice to another artisan @-@ architect about slanting struts in order to brace a pagoda against the wind , and a passage in which Yu Hao describes the three sections of a building , the area above the crossbeams , the area above ground , and the foundation , and then proceeds to provide proportional ratios and construction techniques for each section .

Several years later Li Jie (?? ; 1065 ? 1110) published Yingzao Fashi (" Treatise on Architectural Methods " or " State Building Standards ") . Although similar books came before it , such as Yingshan Ling (" National Building Law ") of the early Tang dynasty (618 ? 907) , Li 's book is the earliest technical manual on Chinese architecture to have survived in full .

= = = Yingzao Fashi = = =

Yingzao Fashi is a technical treatise on architecture and craftsmanship written by Li Jie , an architect and official at the Directorate of Buildings and Construction . Li completed the book in 1100 , and presented it to Emperor Zhezong of Song in the last year of his reign . His successor , Emperor Huizong of Song , had Li 's treatise officially published three years later , in 1103 , for the benefit of foremen , architects , and literate craftsmen . The book was intended to provide standard regulations , to not only the engineering agencies of the central government , but also the many workshops and artisan families throughout China who could benefit from using a well @-@ written government manual on building practices .

Yingzao Fashi included building codes and regulations , accounting information , descriptions of

construction materials , and classification of crafts . In its 34 chapters , the book outlined units of measurement , and the construction of moats , fortifications , stonework , and woodwork . For the latter , it included specifications for making bracketing units with inclined arms and joints for columns and beams . It also provided specifications for wood carving , drilling , sawing , bamboo work , tiling , wall building , and decoration . The book contained recipes for decorative paints , glazes , and coatings , also listing proportions for mixing mortars used in masonry , . brickwork , and manufacture of glazed tiles , illustrating practices and standards with drawings . His book outlined structural carpentry in great detail , providing standard dimensional measurements for all components used ; . here he developed a standard eight @-@ grade system for sizing timber elements , known as the cai @-@ fen system of units , which could be universally applied in buildings . About 8 % of Li Jie 's book was derived from pre @-@ existing written material on architecture , while the majority of the book documented the inherited traditions of craftsmen and architects . The Yingzao Fashi provided a full glossary of technical terms that included mathematical formulae , building proportions , and construction techniques , and discussed the implications of the local topography for construction at a particular site . He also estimated the monetary costs of hiring laborers of different skill levels from various crafts on the basis of a day 's work , in addition to the price of the materials they would need and according to the season in which they were to be employed .

= = Architecture in Song artwork = =