
Case Study 5.4: Cheomseongdae Observatory, Republic of Korea

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Presentation and analysis of the site

Geographical position: 839–1, Inwang-dong, Gyeongju City, North Gyeongsang Province, Republic of Korea.

Location: Latitude 35° 50′ 7″ N, longitude 129° 13′ 9″ E. Elevation 44m above mean sea level.

General description: Cheomseongdae is a 9.17m-high stone tower that has long been renowned as the oldest astronomical observatory in the Far East. Dating back to the Silla period (57 BC–AD 935), it is comprised of three parts: a stylobate, a cylindrical body resembling a bottle, and a top whose shape when viewed from above is that of the Chinese character 井. It is located near to the royal tomb of King Naemul of Silla

Inventory of the remains: The cylindrical body consists of 27 layers of stones, each stone resembling a fan. A square hole in the middle three (13th to 15th) tiers faces slightly east of south. In contrast to the skilfully trimmed exterior, the inside wall is not elaborately carved, with the rear parts of stones sticking out. Below the hole the interior is entirely filled with rubble, while the upper part is empty. From each of the four corners on the top, the ends of two interlocking stones protrude. There are also protruding ends on the 19th to 20th and 25th to 26th tiers, making it possible to set up a ladder in and out of the building for observation.

History of the site: It was constructed during the reign of Queen Seondeok (AD 632–647).

Cultural and symbolic dimension: The body of the tower comprises 365 stones, symbolising the days of a year, and the 27 tiers probably reflect that fact that Queen Seondeok was the 27th monarch of the Silla Kingdom. Twenty-eight, the number generated when the stylobate is included, corresponds to the 28 constellations of East Asia, and if the two-tier top is also added, the number increases to 30, which is the number of days in a lunar month. Each of the sections above and below the central hole comprises 12 tiers, which calls to mind the 12 months and the 24 solar terms.

Given that seasonal change was highly important in making decisions on agriculture, astronomy was particularly significant at the time when Cheomseongdae was constructed. Also, given the importance of astrology at the time, astronomical observation was surely closely linked to politics. Accordingly, there would have been great interest in astronomical observations in Silla, and Cheomseongdae was constructed against this background.

Authenticity and integrity: Cheomseongdae has retained its original appearance for about 1300 years since its establishment in the 7th century. The structure is now slightly tilted to the north-east but the original shape is mostly intact. However, the instruments used for observation and observatory records have not been passed down, so the exact methods of taking observations are not known today.

Documentation and archives: According to an old document, “the structure is made for men to climb up by entering through the centre”. This implies that one could enter the structure with a ladder, climbing in and out of the building to observe the sky.



Fig. 5.4.1. Cheomseongdae observatory viewed from the north-east. © National Research Institute of Cultural Heritage, Republic of Korea

Present site management

Present use: The site is open to visitors.

Protection: Cheomseongdae is designated National Treasure no. 31 and under government protection according to Korea's Cultural Heritage Protection Act. Any kind of construction activity taking place within a 500m radius, and hence which could affect the historic site, has to gain the approval of the head of the Cultural Heritage Administration in consultation with the Cultural Heritage Committee.

State of conservation: The site is well preserved and managed. The National Research Institute of Cultural Heritage, an organization affiliated to the Cultural Heritage Administration of Korea, has conducted a variety of safety inspections at annual intervals since 1981. The institute's strategy for conserving Cheomseongdae is concerned with structural displacement and cracks, the vertical displacement of foundation stones, and ultrasound compressive strength. In 2007, a system was installed that takes measurements every hour and, in 2009, an overall survey was carried out with a three-dimensional scanner. In addition, the exterior of the structure is washed regularly and the moss removed.

Context and environment: Cheomseongdae forms part of a provincial historical district that includes several major historic sites such as Half Moon Fortress (Banwolsong), Heavenly Horse Tomb (Cheonmachong), and the Pond of Geese and Ducks (Anapji), all of which reveal the scenic beauty of the thousand-year-old capital of Silla.

Archaeological/historical/heritage research: The stone tower at Cheomseongdae was first recognised as an observatory by Wada Yuji, a Japanese meteorologist, in the early 20th

century. In a report entitled “A theory for Cheomseongdae in Gyeongju”, published in *Joseon Observatory Academic Report* in 1910, he presented a theory that people might have set up an observation balloon such as Honcheoneui, an astronomical clock, on a wooden structure at the edifice.

A Korean scholar, Hong i-seup, argued in his book *Science History of Joseon* that the Silla Kingdom made their astronomical observations independently and presented Cheomseongdae as evidence, saying that it was the oldest observatory of its kind extant in the East. Hong Sa-jun, who was the first to survey and study the stone building using scientific techniques, argued that people made observations of astronomical phenomena lying on their backs inside the building.

At first, Cheomseongdae was firmly believed to have been an astronomical observatory. However, some dissenting views emerged in the 1960s. Yi Yong-beom argued instead that it was simply an altar modelled on Mount Sumi, which is of great importance in Buddhism. Park Seong-rae, while acknowledging Cheomseongdae to be an observatory in the broad sense, argued that it was actually an altar constructed to respect the sacred god of agriculture.

Main threats or potential threats to the sites: Thanks to its location near to several major historic sites in Gyeongju, Cheomseongdae is relatively safe from landscape damage caused by development projects in the city. However, the observatory is affected by aging and weathering, in common with other cultural properties built in stone. Among the main causes of damage are environmental changes such as air pollution, weathering caused by chemical interactions between the rock and water, and structural imbalance caused by ground subsidence.

Management, interpretation and outreach: The observatory structure is now owned by the Korean government, and the Gyeongju municipal government is primarily responsible for its management. Along with signboards and leaflets, a year-round tour guide service is provided free of charge, with an aim to enhancing visitors’ understanding of the observatory.

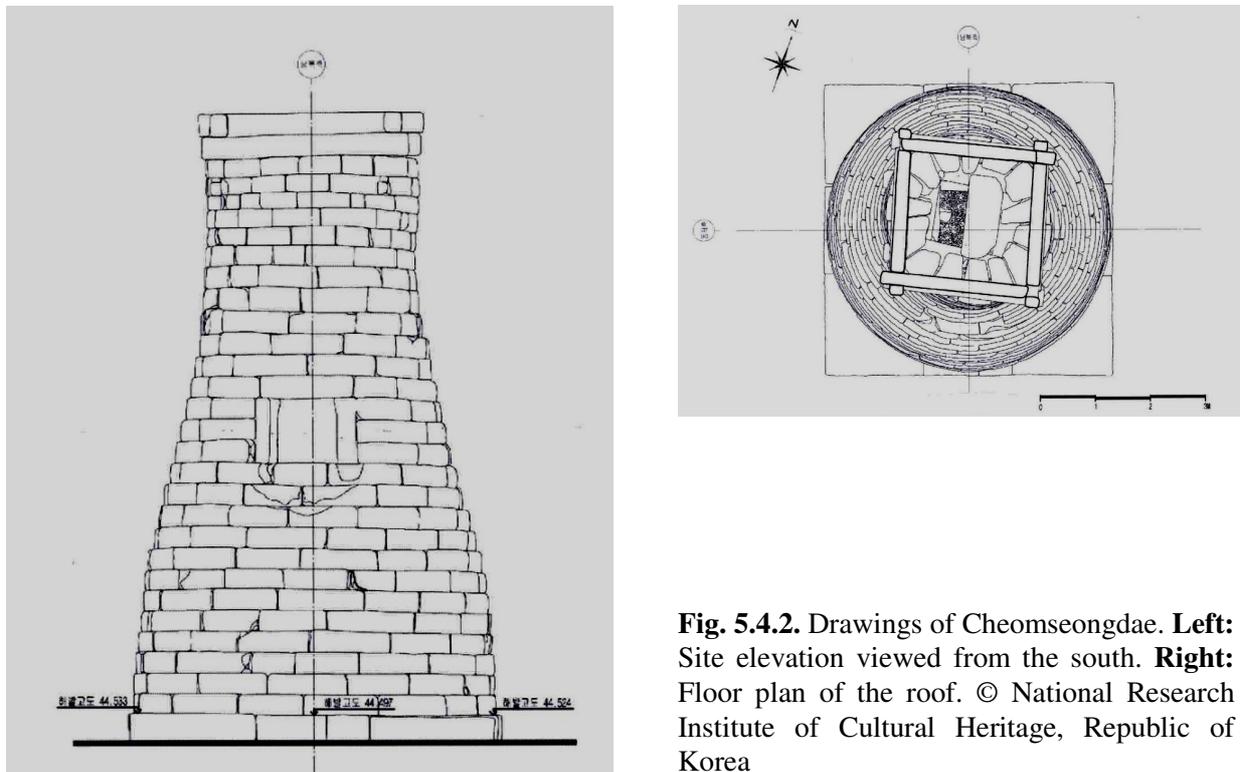


Fig. 5.4.2. Drawings of Cheomseongdae. **Left:** Site elevation viewed from the south. **Right:** Floor plan of the roof. © National Research Institute of Cultural Heritage, Republic of Korea