

Protective Shelter for the Thousand Buddha Cliff of Guangyuan, Sichuan Province. 2011-2022

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Abstract: The protective shelter designed for the Thousand Buddha Cliff in Guangyuan addresses a critical condition in heritage conservation: intervention on an open-air sacred site where sculptural, symbolic and landscape values are inseparable. Carved over several centuries into a limestone cliff, the Buddhist statues have long been exposed to climatic agents, resulting in progressive material decay while remaining a visible and meaningful landmark within the cultural landscape. Rather than enclosing the site within a sealed structure, the project adopts a strategy based on passive environmental control and minimal physical interference. A large-span, semi-enclosed architectural skin filters rain, light and airflow while maintaining visual continuity with the cliff and its surroundings. Developed through successive design phases and tested by a full-scale pilot section, the shelter demonstrates how environmental protection can be achieved without suppressing the perceptual and symbolic presence of the site. The architecture operates as a mediating layer between conservation requirements and cultural visibility. By reinterpreting traditional construction principles and spatial references without literal imitation, the project reframes the experience of the Buddha Cliff as both protected heritage and living place of contemplation. The Guangyuan intervention thus exemplifies an architectural approach in which preservation, landscape and transmission of meaning are held in deliberate tension, transforming conservation constraints into a generative design condition.

Keywords: *Stone sculpted heritage, Sacred landscape, Heritage protection and visibility*

The Thousand Buddha Cliff of Guangyuan, in Sichuan Province, represents one of the most significant ensembles of stone sculpted Buddhist sculpture in China. Extending approximately 200 metres along a natural sandstone cliff on the banks of the Jialing River – along an ancient cultural route connecting Chengdu and Xi'an – the site comprises over 400 niches and grottoes containing nearly 7,000 sculpted figures. Carved continuously from the Northern Wei dynasty (5th century AD) to the late Ming dynasty, with a particular concentration during the Tang period (7th-10th centuries), the statues constitute an exceptional corpus in the history of Chinese Buddhist art.

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Beyond their artistic value, the sculptures are inseparable from the landscape that hosts them. For centuries, they have been directly exposed to climatic agents – wind, rain, thermal excursion – that have progressively eroded both the sandstone substrate and the surviving traces of polychromy. Precisely because of this vulnerability, the Guangyuan Buddha Cliff was among the first cultural heritage sites to be officially protected at national level in 1961, and a specific Conservation Plan was legislated in 2008. From the outset, the client – the Art Museum of the Thousand Buddha Cliff, together with the Guangyuan Municipality – identified the need for a protective architectural intervention capable of mitigating environmental decay without compromising the visibility and symbolic presence of the site.

The urgency of intervention became increasingly evident as ongoing weathering continued to cause irreversible loss of sculptural material. Rather than proposing a fully enclosed structure, the design team – coordinated by the Cultural Heritage Conservation Centre of Tsinghua University Design Institute – developed a strategy based on environmental passivity and minimal interference. From the earliest concept design in 2011, the project rejected solutions relying on full glazing and mechanical climate control, which would have entailed high construction and maintenance costs as well as a substantial environmental burden. Instead, a semi-closed, permeable protective shell was proposed, capable of filtering sunlight and wind while remaining fully impermeable to rainwater.

This approach was tested through the construction of a full-scale Test Section, completed in 2014 on the northernmost portion of the cliff. Continuous monitoring of climatic conditions before and after the installation demonstrated the effectiveness of the strategy: temperature fluctuations were reduced, rainwater erosion was eliminated, and ventilation proved sufficient to prevent humidity-related decay. The Test Section thus provided empirical validation for a conservation model based on passive environmental control rather than technological enclosure, aligning the project with internationally recognised principles of heritage conservation.²

Structurally, the shelter was conceived as a large-span steel system spanning the cliff without touching the sculpted surface. Early design versions relied on tubular steel trusses anchored in the riverbanks and over the ridge above the cliff, ensuring complete physical separation from the

2. ICOMOS 2005.

heritage fabric. As the project evolved, the structural system was progressively refined to reduce its visual impact and to better integrate with the three-dimensional geometry of the shell. In the 2019 revision, the truss system was replaced by a lighter network of inclined steel tubular beams forming a triangular mesh, significantly reducing the perceived “industrial” character of the structure and allowing it to merge more closely with the envelope geometry.

The most distinctive architectural choice concerns the envelope of the shelter. Drawing inspiration from traditional clay-tile roofing systems, the external skin is composed of overlapping tiles laid without cement mortar, allowing air and light to penetrate while ensuring complete protection from rain. Different laying patterns were developed according to surface inclination: vertical and steeply inclined planes maintain controlled gaps for ventilation, while flatter roof surfaces adopt overlapping arrangements to prevent wind-driven rainfall infiltration. The tile pattern recalls historical filtering screens used in Chinese gardens and pavilions, as well as the scale-like textures associated with natural and symbolic imagery.³

On the interior, the spatial experience is deliberately shaped to evoke the atmosphere of traditional Chinese temples. Steel structural elements are partially concealed by layers of bamboo and timber bars. The steel columns and beams are painted red in reference to temple architecture, restoring a sense of warmth and material continuity. Suspended wooden boardwalks and observation platforms replace earlier stairways carved into the cliff, which had posed risks both to visitors and to the sculptures themselves. In this way, the project reorganises access and perception without altering the physical substance of the heritage.⁴

A crucial design challenge concerned the degree of visual exposure of the cliff from the river and the opposite bank. Historically, the Buddha statues had always been visible from afar, functioning as landmarks within the landscape. Responding to this cultural expectation, the final design version – approved in 2021 – adopts a hybrid façade system. The shelter is articulated as a composition of smaller, pagoda-like roof elements, partially lifted to allow framed views of the largest grottoes while maintaining environmental protection. This solution reinterprets earlier, now-removed “pagoda-style” protective roofs that had been added during

3. LIANG 2005 (1984).

4. Rowe, Kuan 2005 (2002), pp. 7-26.

the twentieth century, acknowledging their role in the collective memory of the site while translating them into a contemporary architectural language.

The resulting image is that of a continuous architectural skin lying along the cliff, its layered surfaces recalling both the natural stratification of the rock and the symbolic figure of the dragon – a recurrent motif in Chinese cultural imagery. Yet beyond its formal appearance, the shelter operates as a mediating device: it simultaneously preserves the fragile sculptural heritage and reactivates the contemplative and ritual dimension of the site. Architecture here does not compete with the carved figures but frames their perception, negotiating between environmental necessity and cultural visibility.

Through its reliance on passive systems, reversible construction techniques and references to local building traditions, the Guangyuan shelter exemplifies an architectural approach in which conservation, landscape and cultural transmission are inseparable. The project does not resolve the tension between protection and exposure; rather, it makes this tension productive, transforming it into the very condition of its architectural relevance.

References

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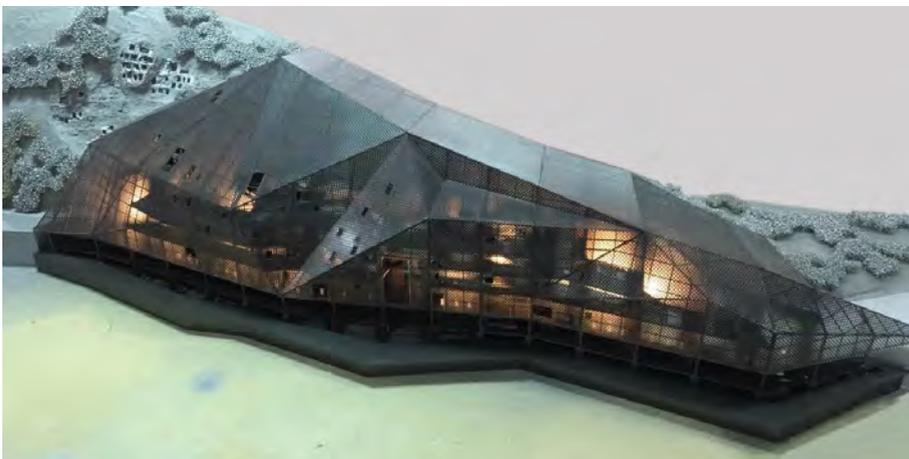
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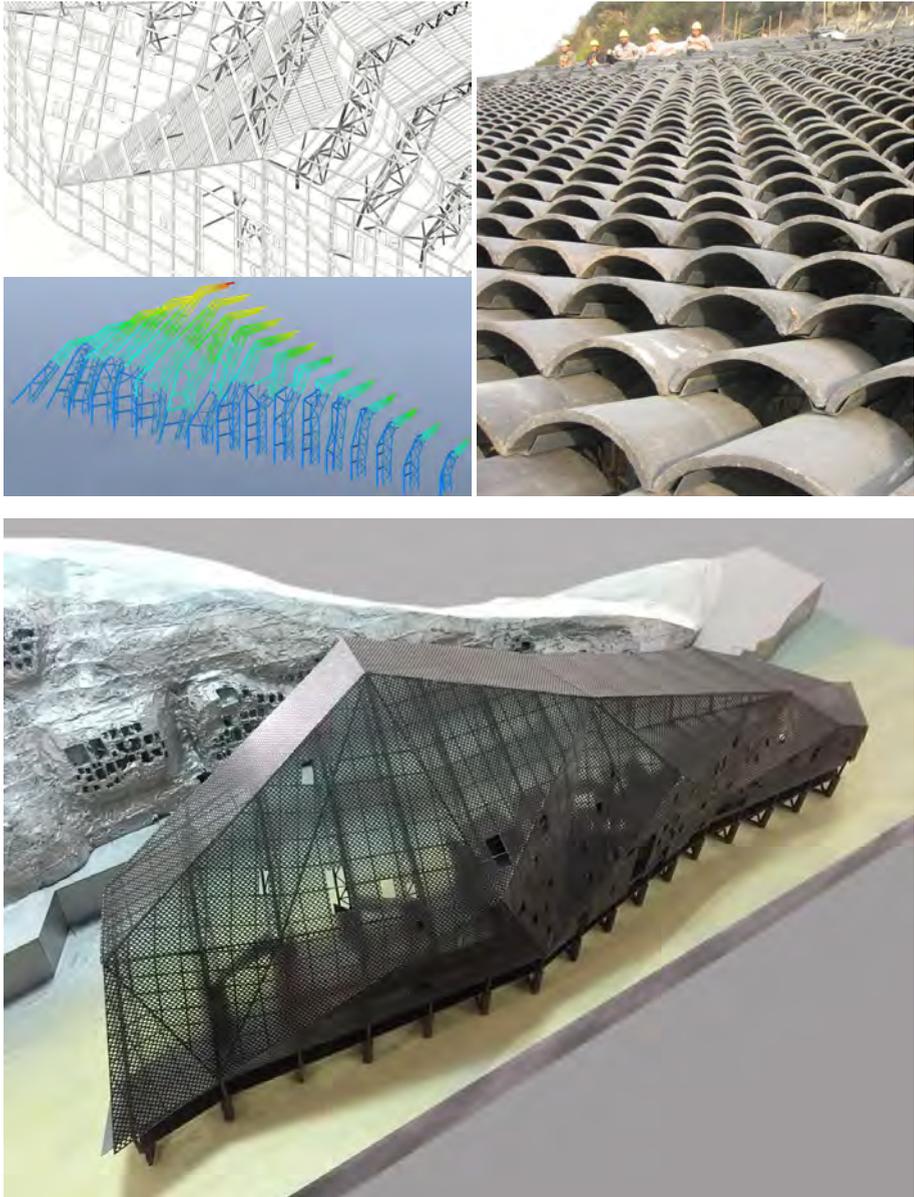
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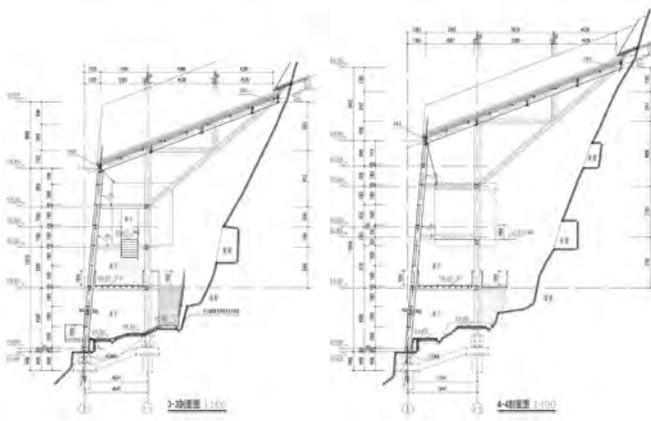


Fig. 1-2. Thousand Buddha Cliff in the 1960s, Buddha grottoes as of today.

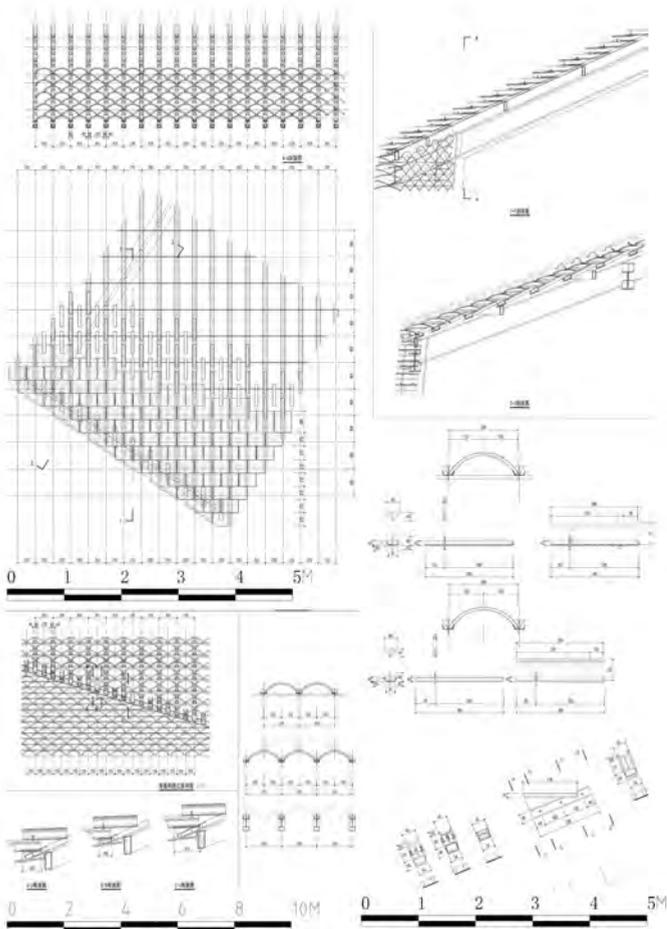


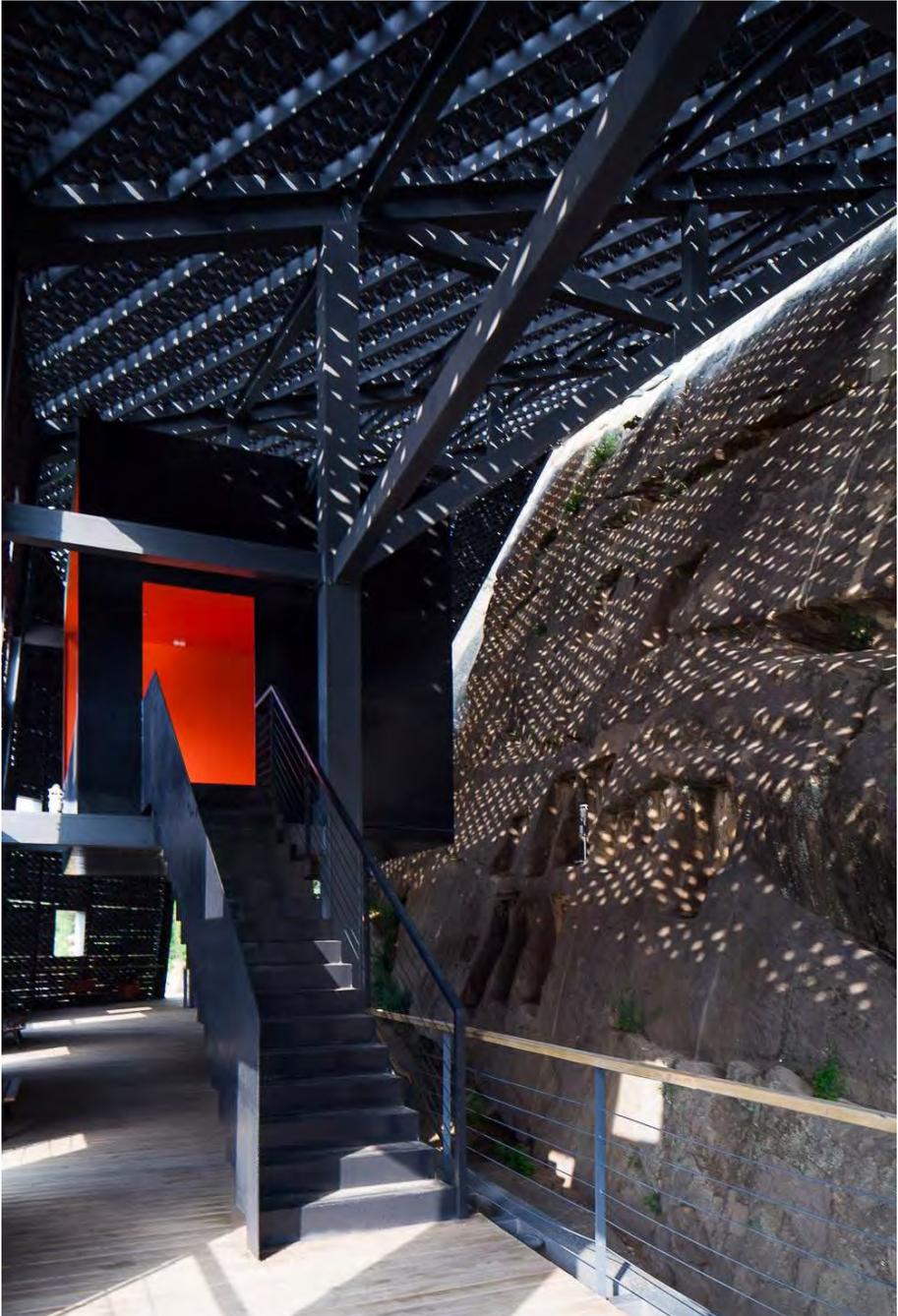


*Thousand Buddha Cliff of Guangyuan, Sichuan. 2011-2022.
Fig. 3-8. Overview from West, Initial version (2011) Photo collage, Model from West, Studies of the steel structure, Test Section completed roof tiling, Model from North.*



5. Details - Grey Tile Curtain Wall





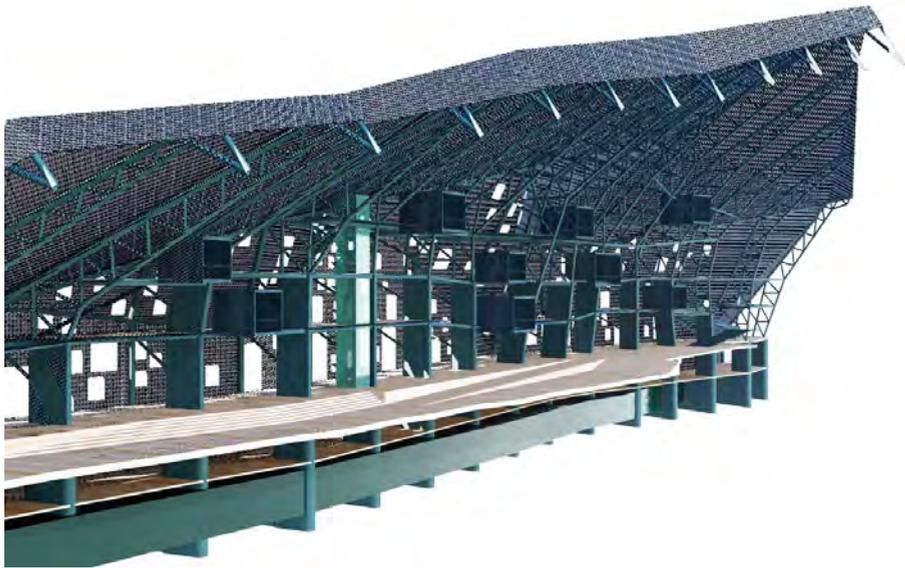
Thousand Buddha Cliff of Guangyuan, Sichuan. 2011-2022.

Fig. 9-II. Test Section (2016). Cross sections, Roof and curtain wall details, Inner space and observation box.



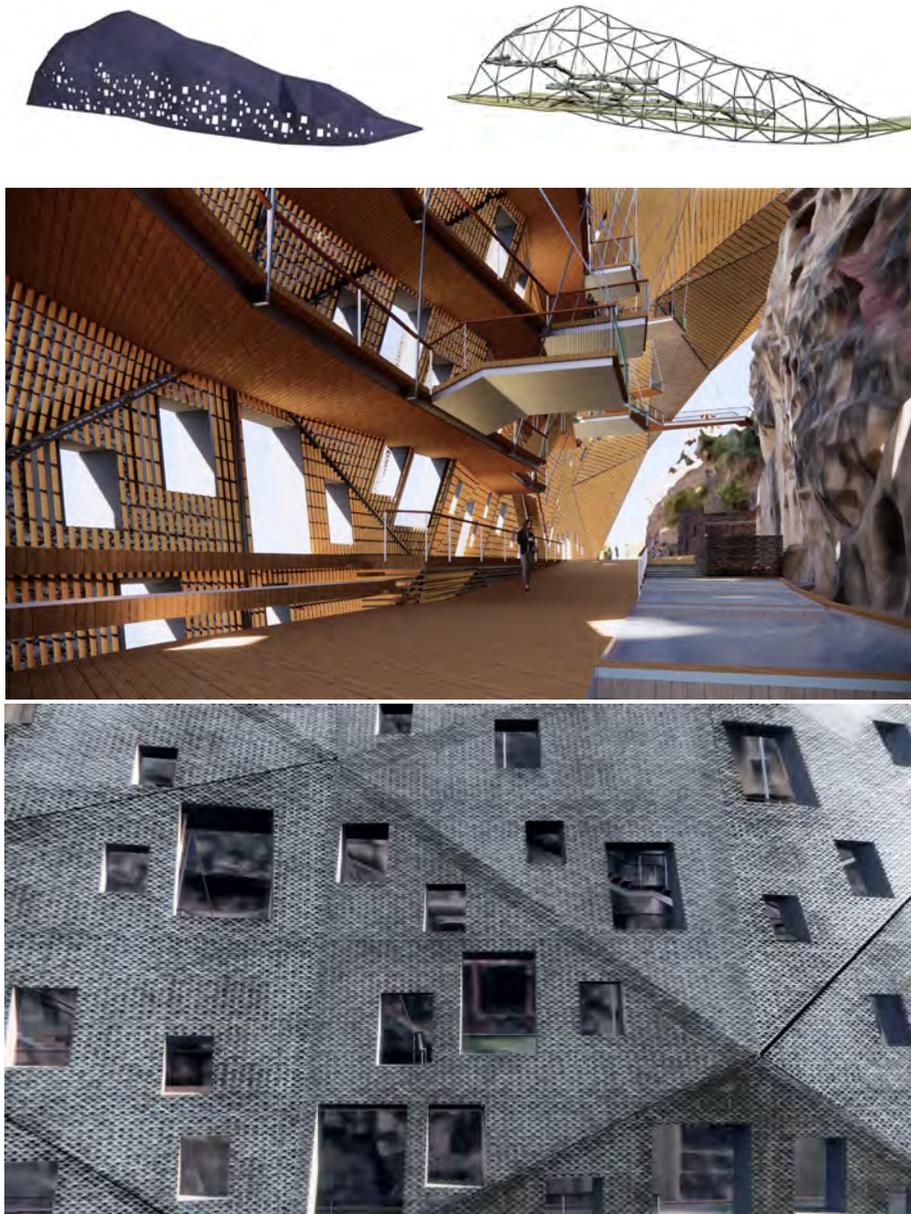


*Thousand Buddha Cliff of Guangyuan, Sichuan. 2011-2022.
Fig. 12-16. Test Section (2016). Inner space boardwalk, Frontal view from opposite bank, South entrance,
North curtain wall and exit path; Second Version (2017) Frontal rendering.*





*Thousand Buddha Cliff of Guangyuan, Sichuan. 2011-2022.
Fig. 17-20. Second Version (2017) Inner space, Interior rendering, Cross section, Photo collage.*





*Thousand Buddha Cliff of Guangyuan, Sichuan. 2011-2022.
Fig. 21-25. Third Version (2019) Curtain wall and Structure, Interior rendering, Curtain wall rendering,
Photo collage from West - daylight, Photo collage from West - nightlight.*





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Fig. 26-30. Frontal overview in the 1990s, Fourth Version (2021) Frontal renderings, Curtain wall renderings.





*Thousand Buddha Cliff of Guangyuan, Sichuan. 2011-2022.
Fig. 31. Interior space renderings.*



*Rizhao Science and Technology Museum, Rizhao, Shandong Province. 2014-2020
Fig. 1. Overview towards South.*