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Preface

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Abstract: The second edition of ACES brings together interdisciplinary studies addressing emerging challenges in intelligent infrastructure, construction technology, built heritage, material behavior, energy-responsive buildings, and extraterrestrial engineering environments. The contributions demonstrate how retrieval-augmented and agentic large language models can support bridge operation and maintenance, construction quality assessment, and knowledge-driven engineering decision-making. Other studies examine the conservation and contemporary interpretation of traditional wooden architecture and urban industrial heritage landscapes, while investigations into lightweight building envelopes and grid-interactive commercial buildings explore energy performance and climate-responsive design. The volume also presents experimental and numerical analyses of fractured sandstone under water immersion and freeze-thaw conditions, together with research on thermal coring, water-vapor phase transitions, and oxygen production from lunar regolith. In addition, AI-IoT solutions for smart venues and urban traffic are discussed. Collectively, these studies illustrate the growing integration of artificial intelligence, experimental mechanics, heritage studies, energy systems, and space-resource engineering in the development of advanced and adaptable civil infrastructure.

Keywords: intelligent infrastructure; retrieval-augmented generation; large language models; bridge operation and maintenance; construction quality assessment; built heritage; industrial heritage landscapes; fracture mechanics; sandstone behavior; building energy performance; AI-IoT systems;

1. Conference introduction

The Advanced Civil Engineering Symposium (ACES 2026) was held from July 22 to 24, 2026, in Xi' an, China, bringing together researchers, engineers, and industry professionals to discuss emerging developments in civil engineering. The symposium featured six keynote presentations addressing a broad range of topics, including fiber-optic FRP self-sensing technologies, probabilistic assessment of progressive-collapse resistance, fault diagnosis and safety monitoring of tunnel boring machines, evidence-based design rules, and prefabricated concrete structures in high-seismicity regions.

A diverse workshop program further expanded the scope of the symposium. The workshops focused on AI-driven tunnel and underground engineering, intelligent life-cycle management of shield tunnels, seismic resilience of modular and traditional timber structures, advanced structural-performance evaluation, urban-infrastructure collapse prevention, high-performance FRP composites, green construction materials for harsh environments, carbon capture and smart management in green buildings, and the application of new materials and artificial intelligence in civil engineering. Through these



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activities, ACES 2026 promoted interdisciplinary discussion and collaboration across structural engineering, underground infrastructure, construction materials, artificial intelligence, heritage conservation, and sustainable urban development. The symposium also provided opportunities for academic exchange and industry engagement, supporting the development of innovative, resilient, and intelligent civil infrastructure systems.

1.1. Scope of this conference

The scope of ACES 2026 includes, but is not limited to, the following areas, which reflect the latest developments and interdisciplinary integration in modern civil engineering, intelligent construction, and urban infrastructure systems:

- Civil Engineering
- Structural Engineering
- Geological Engineering
- Seismic Engineering
- Bridge and Tunnel Engineering
- Road Engineering and Transportation Systems
- Municipal Engineering
- Water Supply and Sewerage Engineering
- Hydromechanics
- Ocean and Port Engineering
- Disaster Prevention and Mitigation Engineering
- Construction Technology and Management
- Engineering Geology and Soil Mechanics
- Intelligent Construction
- Smart Buildings and Urban Infrastructure
- Smart Transportation and Intelligent Transportation Systems
- Internet of Things for Infrastructure Monitoring
- Computer Simulation and Data-driven Engineering Analysis
- Advanced Control Theory and Engineering Algorithms
- Smart Environment and Urban Monitoring
- Interdisciplinary Applications in Modern Infrastructure Systems

1.2. Peer review statement

All papers included in the proceedings of the Advanced Civil Engineering Symposium (ACES 2026), held from July 22 to 24, 2026, in Xi'an, China, were presented at the symposium. By submitting this proceedings volume, the proceedings editors confirm that:

- The peer-review process was coordinated by the proceedings editors in accordance with established academic standards, ensuring fairness, rigor, and scientific integrity throughout the evaluation process. Appropriate measures were taken to maintain the quality and reliability of all published contributions.
- Each submission was reviewed by qualified expert referees, who provided independent, objective, and constructive evaluations to support the improvement of the manuscripts.

– The final acceptance or rejection decisions were made exclusively by the proceedings editors, based on the scientific merit, originality, and relevance of each paper to the scope and objectives of ACES 2026.

Proceedings editors:

Prof. Wenbing Wu, China University of Geosciences, China

Type of review: single-blind review

Number of submissions received: 40

Number of submissions accepted: 14

Number of reviews received: 80

Number of reviewers: 16

Average number of reviews per paper: 2

2. Organization

2.1. General Chair

Kai Qian, Guilin University of Technology, China

Wei Guo, Central South University, China

Liu Jin, Beijing University of Technology, China

2.2. Co-Chairs

Xuanming Ding, Hunan Institute of Engineering, China

Wei Xu, Kunming University of Science and Technology, China

Longjun Xu, Jiangnan University, China

Hua Huang, Xi'an Technological University, China

2.3. Conference committee

Technical Chairs

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Peng Wang, Kunming University of Science and Technology, China

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Yulin Zhan, Southwest Jiaotong University, China

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Marco Cimillo, Xi'an Jiaotong-liverpool University, China

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Zhan Shu, Shanghai University, China

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Xiao Liu, Yunnan Design Institute Group, China

Dat Doan, Auckland University of Technology, New Zealand

Cristoforo Demartino, Zhejiang University, China

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Jiaxiang Lin, Guangdong University of Technology, China
Yongchang Guo, Foshan University, China
Zhe Xiong, Guangdong University of Technology, China
Lin Chen, Chongqing University, China
Weihua, Fang, Ministry of Water Resources, China
Xiaolong Tong, Hunan Institute of Science and Technology, China
Fu Xu, Xiangtan University, China
Liqiang Jiang, Central South University, China
Zhongkai Huang, Tongji University, China
Bin Feng, Guangdong Mechanical & Electrical Polytechnic, Department of Logistics, China

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We sincerely thank all authors, participants, scholars, researchers, and engineers for their valuable contributions and active engagement in the academic exchange. Their research and discussions enriched the symposium and the present proceedings. We are also indebted to the members of the Technical Program Committee and the reviewers for their time, expertise, and rigorous evaluations, which helped maintain the academic quality and integrity of the published volume.

Our sincere thanks are further extended to the keynote and invited speakers for sharing their research achievements and professional insights. Finally, we acknowledge the publisher for its support in the publication and dissemination of these conference proceedings.