2025

BRICS SKILLS COMPETITION
(BRICS+ FUTURE SKILLS & TECH CHALLENGE)

Building Information Modeling
BRICS-FS-06

Technical Description
(International Final)

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1. Project Introduction

1.1 Project Description

1.1.1 The Name of the Skills Competition

BRICS Vocational Skills Competition - Building Information Modeling (BIM) Event, abbreviated as BIM Event.

1.1.2 Skill Competition Description

The Building Information Modeling (BIM) Event of the 2025 BRICS Vocational Skills Competition is a team-based skills contest, where two participants work together to complete the tasks, which include architectural design, detailed design, and Engineering management. The competition content consists of two main parts: the creation of standardized BIM models and the application of BIM model analysis. It assesses the students' abilities to build BIM models through drawing recognition, design, and multi-disciplinary collaboration, and to use the completed BIM models for process simulation, detailed design, and construction site layout planning. The optimized BIM models are then used to generate construction drawings, AI visualizations, and animations.

The competition adopts a unified question-setting approach, with specific engineering project cases serving as the content for the contest. Competitors are required to conduct the competition based on the provided basic data of the engineering project. The competition aims to "display, communicate, learn, and improve." It adheres to the principles of integrating industry development needs with the talent cultivation of vocational colleges, and upholds the principles of openness,

fairness, and justice. The competition integrates industry standards and corporate requirements with the talent cultivation of vocational colleges.

The competition targets a wide range of industry occupational positions, including architectural engineering technical personnel, management engineering technical personnel, business professionals, and construction cost estimators, among others, thus covering a broad spectrum of professional roles. The competition highlights the core content of project management based on BIM (Building Information Modeling) technology, which includes the creation of BIM models for project management, construction organization design based on BIM, schedule management using BIM, cost management, and quality and safety management. These core elements encompass professional skills and knowledge in project management, construction organization design, cost estimation, and architectural engineering technology.

Through the competition, vocational colleges can align their future talent cultivation plans, curriculum design, course standards, practical teaching, and training base construction with industry standards in a targeted and directional manner. By taking industry standards, regulations, and employment demands as the starting point, they can develop course standards and build an applied talent cultivation standard that meets the needs of modern construction enterprises.

The competition platform uses a wide range of equipment and software with mature industry applications, and is supported by the international common technical platform, continue the BRICS Vocational Skills Competition platform to effectively ensure the reliability and fairness of the competition.

1.2 Purpose of the Competition

This event proactively captures the demand for technical and skilled talents in the context of the new era's economic development, transformation of economic growth models, and industrial upgrading. It closely aligns with the trend of higher education in cultivating highly skilled talents with new technologies, processes, and methods, effectively guiding vocational colleges to strengthen their professional education and teaching reforms. The event aims to boost the professional development of vocational colleges in cultivating skilled talents, showcase and enhance students' BIM modeling skills through competition, and familiarize them with the use of relevant BIM modeling software. It also seeks to improve the ability of teachers and students to establish BIM integrated entity model.

Ultimately, the event aims to achieve the goal of "promoting teaching and learning through competition," stimulating the enthusiasm of teachers and students in vocational colleges to actively participate in the learning of building technology. It enhances knowledge and skills in the areas of building assembly and digitalization, promotes the transformation and upgrading of the construction industry, and truly realizes the competition's goal of "being based on teaching, higher than teaching, and leading teaching."

I. The BIM Application Skills Competition serves as a vital platform for promoting the widespread adoption and application of BIM in educational institutions and accelerating the cultivation of talents in construction informatization. It is also an important practical platform for encouraging students to learn and apply BIM technologies.

II. Accelerate the construction of professional connotations and enhance the core competitiveness of the major. BIM technology, as an emerging information

technology in the construction industry, can drive vocational colleges to carry out and implement BIM-related work through the organization of BIM Application Skills Competitions. This not only promotes the cultivation of dual-qualified faculty teams in colleges but also facilitates the practical implementation of industry-university-research cooperation. Consequently, it propels teaching reforms, curriculum reforms, faculty development, and the cultivation of applied talents in colleges.

III. Build a stage for students to showcase their skills. The competition, through the application of BIM software series and based on real engineering cases, simulates actual working scenarios to the greatest extent possible. It facilitates BIM collaboration among architecture-related majors in higher education institutions, enhances the cultivation of students' core professional abilities, and improves their practical and innovative capabilities.

2. Skills Required for Participants

This technical description document specifies the knowledge, understanding, and specific skills required for BIM professionals, which represent best practices in technical and vocational performance internationally. It reflects the consensus of the BRICS countries on the demand for BIM-related work or roles.

This standard specification serves as a guideline for the training and preparation required for skills competitions.

This standard is divided into different sections, each of which is assigned a percentage of the total score to indicate its relative importance within the standard. This is commonly referred to as the "weight." The sum of all percentage scores is 100. The weights determine the distribution of points in the scoring scheme.

The scoring criteria should only assess the knowledge points listed in the

standard specifications. Under the constraints of the skills competition, the competition questions should comprehensively reflect this skill standard as much as possible. The skill competition standard is shown in Table 1.

Table 1: Competition Skill Standard

	Sub-item	Relative Importance(%)
1	Work Organization and Project Setup	5
	Contestants need to understand and be familiar with the following: – The various uses of BIM modeling – The composition of the basic BIM standards system – Current standards in use and recognized (ISO 19650-1, ISO 19650-2) – Current health and safety regulations – Technical terminology and symbols – Recognized IT systems and related professional design software – The necessity for information to be communicated with sufficient accuracy and clarity to convey design intent – The importance of effective communication and interpersonal skills – The importance of continuous learning and skill updates in the context of rapidly evolving new technologies – The role of providing innovative and creative solutions to problems and challenges encountered during project implementation – The significant impact of BEP (BIM Execution Plan) on deliverables and deadlines – The importance of the work brief to the client	
	Contestants should be able to: – Apply internationally recognized standards and those currently in use and industry-accepted. – Access and identify the coding libraries of standard components. – Use and interpret the technical terminology and symbols used to prepare and present information models, structures, and architectural drawings. – Utilize common IT systems and relevant professional design software to continuously produce high-quality designs and presentations. – Coordinate problem-solving. – Ensure compliance with the BIM Execution Plan (BEP) through effective communication with team members during the modeling process. – Describe the role and purpose of BIM to team members and other relevant competition personnel. – Explain complex technical issues to both experts and non-experts. – Provide creative solutions to problems and challenges encountered in the design process.	

	– Offer a range of visualization outcomes to accurately complete the briefing.	

	Sub-item	**Relative Importance(%)**
2	Modeling Software and Modeling Environment	5
	Contestants need to understand and be familiar with: – Computer operating systems – Peripheral devices used in the digital construction process – Specific technical operations within design software – Workflow of digital construction projects – Limitations of design software – File formats	
	Contestants should be able to: – Launch the equipment and activate the modeling software. – Set up and check peripheral devices. – Use computer operating systems and specialized software to proficiently create, manage, and store files for BIM projects in both local and common data environments. – Select the correct graphic package from screen menus or graphics. – Open and use BIM software in various ways. – Configure software parameters.	
3	Understanding of Design Proposals	10
	Contestants need to understand and be familiar with: – The information provided in the examination questions. – The importance of EIR (Employer's Information Requirements). – The importance of AIR (Asset Information Requirements). – Relevant and current industry standards. – How to work based on the BEP (BIM Execution Plan). – How to create and edit BIM information within the CDE (Common Data Environment) throughout the construction lifecycle. – The importance of file structure and sharing protocols within the CDE.	
	Contestants should be able to: – Explain the design proposal summary to determine: The objectives and requirements of each project item;	

	The client's goals; The project location. – Work in accordance with the BEP (BIM Execution Plan), the brief, and the EIR (Employer's Information Requirements) to meet the requirements of the examination question.	
Sub-item		**Relative Importance(%)**
4	Model Creation	50
	Contestants need to understand and be familiar with: – The software used in the modeling and collaboration process. – Relevant modeling software. – Methods for classifying model elements by discipline. – How to manage project information through visualization. – How to create models (both structural and architectural). – Principles of technical design. – How to access and use documents in a BIM project. – How to set up the model for collaborative files. – How to set the project location, orientation, and horizontal datum. – How to create the folder directory for WIP (Work in Progress). – The importance of information exchange at key stages of the project. – How to create models according to standards. – How to use three-dimensional visualization tools.	
	Contestants should be able to: – Open an appropriate project information model from the relevant directory in the CDE (Common Data Environment). – Populate project attributes using the given information. – Set up the model for collaboration. – Establish the project's location, orientation, and horizontal datum. – Establish the axis network for the structural and architectural specialties. – Develop the model based on the provided drawings. – Save the model according to the specified views. – Store all project information models in the CDE to facilitate access and use by other disciplines via the cloud platform. – Adhere to the requirements of the BEP (BIM Execution Plan) to ensure data sharing. – Utilize the cloud platform. – Output standard drawings as required. – Create 3D visualizations to illustrate the features of each building.	
Sub-item		**Relative Importance(%)**
5	Model Coordination	10
	Contestants need to understand and be familiar with:	

	– How to integrate BIM models from different disciplines. – How to conduct clash detection. – How to upload and save clash reports as required. – How to complete and document clash detection.		
	Contestants should be able to: – Integrate or divide BIM models across multiple disciplines. – Perform clash detection in accordance with the BEP (BIM Execution Plan). – Export all models according to the BEP and save them to the CDE (Common Data Environment). – Coordinate with other disciplines as per BEP standards and submit the integrated model. – Identify issues in the integrated project model through "model roaming." – Set up clash detection parameters, perform clash detection, and create clash reports for identified issues. – Add annotations to the identified issues. – Assign the issues to the corresponding BIM project manager. – Name the drawing files according to the BEP.		
6	Model Calibration		5
	Contestants need to understand and be familiar with: – How to modify the model. – How to generate drawings from structural and architectural models.		
	Contestants should be able to: – Update the project information model based on newly released documents. – Ensure that all project data are entered in accordance with the latest standards. – Add classification information to the model according to the BEP (BIM Execution Plan). – Export floor plans, large sample drawing, and elevations from the modified model. – Generate complex structural node details using the BIM model.		
7	Data Extraction and Management		5
	Contestants need to understand and be familiar with: – How to extract project data from BIM models. – How to create a shared parameter file for custom data requirements. – How to use custom data fields to create project information. – How to use filters and parameters to visually express custom data requirements.		
	Contestants should be able to: – Create a shared parameter file with custom parameters for selected building elements. – Develop filters to visually express custom parameter information on complex plans, sections, and three-dimensional cut surfaces. – Generate project information that includes custom parameters.		

	Sub-item	Relative Importance(%)
8	Model Visualization	5
	Contestants need to understand and be familiar with： – How to generate rendered images using BIM models. – How to create rendered animations using BIM models. – How to use combinations, backgrounds, and other software to provide clients with more realistic model presentations. – The impact of solar trajectories and time on the model.	
	Contestants should be able to: – Use appropriate software to create an accurate and comprehensive project information model for presentation purposes, including images, animation videos, and VR models. – Employ composition, lighting, and background techniques to achieve the best visual effects. – Add human figures and other components from the material library.	
9	Model Deepening	5
	Contestants need to understand and be familiar with: – The preparation of construction plans. – Conversion of file formats. – Importing and exporting files in different formats.	
	Contestants should be able to: – Export files in different formats using BIM software. – Complete construction plan simulations using BIM software. – Be capable of using BIM software to complete the demonstration of key and difficult construction techniques. – Backup project files.	

3. Competition Events

3.1 Competition Modules

	Module	Duration（min）	Score（%）	Weighting
Module A	Structural Discipline Modeling	210	40	
Module B	Architectural Design and	210	35	

	Innovation		
Module C	Construction Organization Design	120	25
	Total	540	100

3.2 Brief Description of the Module

Module Number	Sub-module	Scope of Work
Module A	CDE	1.Create a folder structure with CDE (Common Data Environment) functionality on the designated local network server. 2.When creating folders, ISO 19650-1/2 should be followed.
	Project Information	1.Complete the creation of project files and the allocation of project information based on the drawings. 2.Create floor levels and allocate project drawing files.
	Structural Modeling	1.Create the structural model of the project, including foundations, columns, beams, walls, slabs, stairs, etc. 2.Generate structural component drawings. 3.Populate attribute characteristics.

	Model Output	1.Merge the models, back up the output, and save it to the designated folder.
Module B	Model Linking	1.Link structure professional model.
	Architectural Modeling	1.Create architectural models of walls, doors, windows, and other architectural elements. 2.Populate the material properties of architectural components. 3.Generate architectural floor plans.
	Exterior Elevation Design	1.Integrate the design logic according to the scheme description. 2.Populate appropriate material properties based on the design logic. 3.Create the model according to the exterior elevation design. 4、Achieve model visualization through AI.
	Model Output	1.Merge the models, back up the output, and save it to the designated folder.
Module C	Schedule or Gantt Chart	1.Complete the schedule for the corresponding phase according to the requirements of the examination question and the drawings.
	Site Layout	1.Based on the provided drawings and site layout specifications, carry out the site layout and save it in DWG format. 2.Arrange the site model according to the

		construction site layout drawing.
	4D Schedule Simulation Animation	1.Create a 4D schedule simulation animation that includes all construction nodes and the site model, and link the components and site model files according to the construction schedule.
	Construction Process Simulation	1.Create the terrain and topography. 2.Apply human resources, materials, machinery, animations, and process nodes reasonably. 3.Set up camera angles for simulation.

3.3 Question-setting Method

The competition modules of this project consist of three independent modules that together form a complete project. The skills tested in different modules may include:

Common Data Environment;

Project Information Model;

Structural Modeling;

Architectural Modeling;

Facade Design;

AI Visualization;

Node Detailing;

Model Coordination;

Model Correction;

Data Extraction;

Site Layout;

4D Schedule Simulation;

Construction Process Simulation;

Animation and Photo Rendering;

Each module allows for a combination of the above skills, but each module must test different capabilities.

3.4 Propositional scheme

The reference sample questions will be published through the official website, and the formal competition questions will be modified by 30% based on the reference sample questions.

4. Competition Rules

4.1 Competition Participation Methods

1.Team competition, with each team consisting of 2 members.

2.The allocation of competition tasks is decided by the participants themselves.

3.Both on-site and remote formats are adopted.

4.2 Code of Conduct for Competition Participants

1.No contestant shall accept interviews related to the competition content from other organizations or individuals without the approval of the competition organizing committee during the competition period.

2.No contestant is allowed to disclose competition-related information privately without permission.

3.Contestants, team leaders, and instructors who violate the competition rules will be disqualified and notified.

4.Contestants' appearance, grooming, and attire must meet the requirements for safe and civilized production in enterprises.

5.All competition staff must wear the corresponding identification documents printed by the competition organizing committee and dress neatly.

6.Media personnel must obtain permission from the organizing leadership group of the host and comply with the arrangements and management of the on-site staff without affecting the competition.

7.Other unmentioned matters or emergencies will be interpreted or decided by the competition organizing committee.

4.3 Grading and Announcement of Results

1. The score management procedure follows the requirements of the organizing committee. The evaluation and management of the participating teams' scores are conducted through a rigorous process.

2. Score Evaluation

The scoring for this project is divided into two parts: measurement and assessment. Measurement scores are based on objective data, while assessment scores are based on subjective judgment.

The assessment is divided into four levels, with a fair and consistent scale generated for each level, and judgments must correspond to the scale: Detailed guidance criteria (standards) for each sub-item (text, images, artificial products, or separate guidance notes) are proportionally represented as follows:

Performance below industry standards

Performance meeting industry standards

Performance exceeding industry standards in specific aspects

Performance fully exceeding industry standards and rated as excellent

Under the leadership of the competition expert group and the supervision of the oversight group, the scoring work for the competition is the responsibility of the competition judges, with the specific process as follows:

(1) Result Scoring

The competition results submitted by the contestants are evaluated and scored based on the competition evaluation criteria.

(2) Encryption and Decryption

After the head judge formally submits the scoring results for the competition position numbers (competition work numbers) and verifies them for accuracy, the encryption judge, under the supervision of the oversight personnel, decrypts the results layer by layer. This competition adopts reverse decryption. After decryption is completed and verified against the contestants' identity information, the encryption judge returns the contestants' identification documents (such as contestant certificates) to the contestants.

(3) Spot Check and Recheck

To ensure the accuracy of the scoring, the oversight group rechecks the scores of all participating teams (contestants) ranked in the top 30% of the total competition scores. Additionally, they conduct spot checks on the remaining scores, with a coverage rate of no less than 15%. Any errors found during the recheck must be promptly communicated to the head judge in writing, who will then correct the scores and sign for confirmation. If the error rate in rechecking and spot-checking exceeds 3%, it is considered a non-low-probability event, and the judging panel must recheck all scores.

(4) Announcement

The host organizes a closing ceremony to announce the competition results.

4.4 Judging Method

This competition adopts the "Integrated Judging and Teaching" method. Each participating team will send one instructor who, after training, will participate in the scoring of the competition. Experts will be hired from non-participating institutions or enterprises to take full responsibility for the judging and management of the competition.

5. Competition-Related Facilities and Equipment

5.1 Technical Platform Standards for Competitions

The technical platform standards need to fully meet the requirements of the competition skill standards and present the competition results.

## 5.2 Competition Environment Requirements

There are no special requirements.

5.3 Competition Equipment List

Designated Software for the Competition			
Serial Number	**Name**	**Version**	**Provider**
1	ALLPLAN	2023	Hangzhou Xiyu Technology Co., Ltd.
2	BIMPOP	V1.0	
Contestant Workstation			
Consumables/Tools/Office Supplies (2 Workstations/1 Teams)			

Serial Number	**Name**	**Technical Description or Website Link Containing Technical Description**	**Unit**	**Quantity**
1	Computer Desk (Double-person Desk)	140x70x75cm	Piece	1
2	Chair	54x42x77cm	Piece	2
3	Computer (including mouse, keyboard, and monitor)	CPU: Intel Core i7-13700 or above Memory: At least 16GB Storage: At least 256GB Graphics Card: NVIDIA GeForce RTX 2070 or above USB Ports: At least 4 ports Dual Monitors: Supported Network Card: Gigabit Ethernet	Set	2
4	Camera		Piece	2
5	Ethernet cable	Cat6 UTP	Box	2
6	First Aid Kit		Piece	1

Serial Number	**Requirements (Instructions)**
1	The minimum area of a working position is 12 square meters (4m x 3m)
2	Power supply for each workstation: 220V
3	Power Strip with 3 Outlets and 6 USB Ports (Total of 1 Units)
4	One network interface will be provided for each working position (a total of 2 interfaces)
5	The camera's view must cover the competition area.

Other Public Requirements for the Competition Venue	
Serial	**Requirements (Instructions)**

Number	
1	The minimum total area of the space is 20 square meters
2	Computer Network Connection (100 Mbit/s)

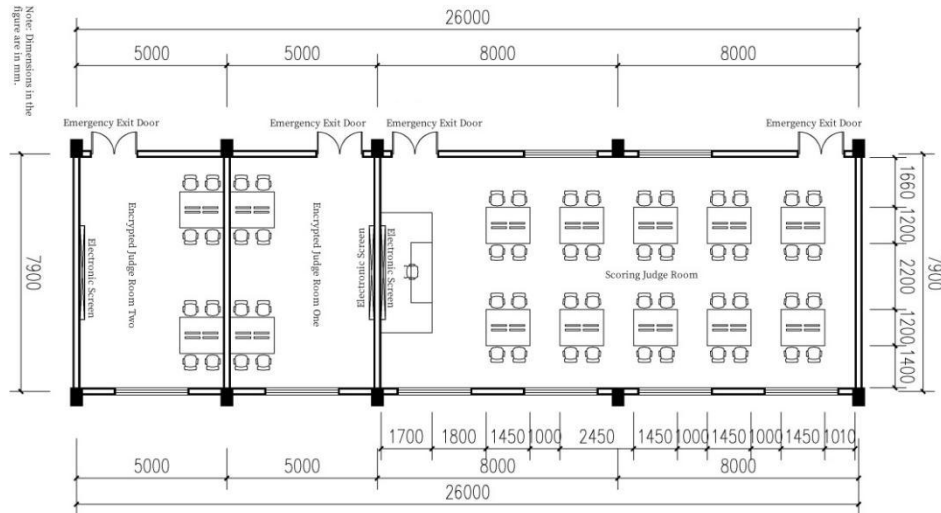# 6. Requirements for Competition Venue Layout

The layout of the competition area is shown in Figure 1.
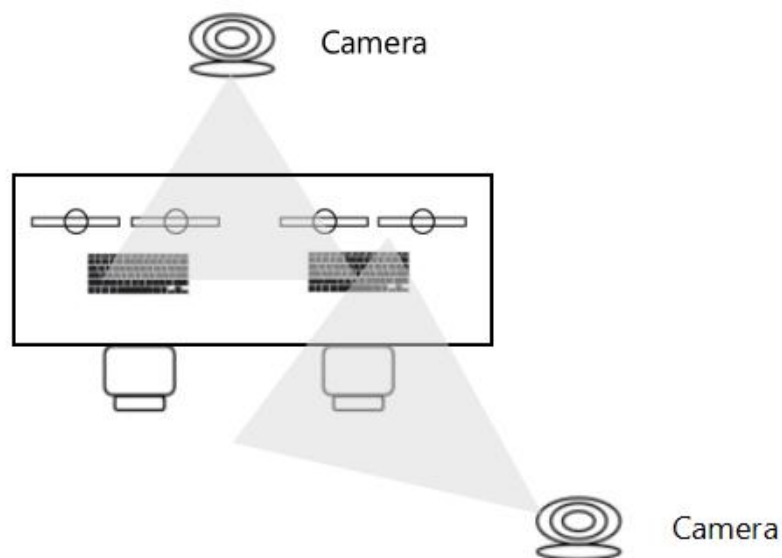
Figure 1: Layout of the Competition Area and Workstations

The layout of the Scoring Room and Encryption Room is shown in Figure 2.

Figure 2: Layout of the Scoring Room and Encryption Room

7. Health and Safety

Event Safety is a prerequisite for the smooth conduct of all activities in a skills competition and is a core issue that must be considered in the preparation and operation of the event. The organizing committee of the competition will take effective measures to ensure the personal safety of participants, instructors, coaches, experts, judges, technical support staff, and volunteers during the competition.

I. Safety Prevention Measures

1. Participants should confirm whether the competition equipment is safe and in good condition as stipulated, strictly follow the rules and operating procedures of the competition venue to ensure personal and equipment safety, accept supervision and warnings from judges, and compete in a civilized manner.

2. Participants should thoroughly understand the performance parameters of each competition equipment to ensure its normal use.

3. Participants should avoid touching the 220V power sockets on the competition workstation to ensure electrical safety.

4. Based on the situation of the participating teams, an additional 5%-10% of hardware equipment should be prepared to prevent hardware failures from affecting the competition.

5. To avoid sudden power outages, the organizing unit should prepare a generator or a backup power supply plan to ensure the normal progress of the competition.

II. Safety Management Requirements

1. The executive committee of the competition must organize a special team to inspect the competition venue, accommodation, and transportation before the competition and propose clear requirements for safety work. The layout of the competition venue and the equipment within it should comply with national safety regulations. If necessary, a simulation test of the competition venue can be conducted to identify potential issues. The host institution must eliminate safety hazards in accordance with the requirements of the executive committee before the competition.

2. A cordon should be set up around the competition venue to prevent unauthorized personnel from entering. There should also be dedicated personnel to guard the area to prevent accidents.

3. The host institution should prepare and implement an emergency response plan in advance, clearly define the system and plan, and equip emergency medical personnel and facilities.

4. The executive committee of the competition should work with the host unit to develop a crowd control plan for the open competition area and experience zone. In

addition to clear signage, additional guides should be added, and backup channels should be opened.

5. During the competition, the host unit of the competition must increase staff in key positions of venue management to conduct continuous safety inspections and establish a safety management log.

6. When participants enter their competition positions and competition judges and staff enter their workplaces, the host unit of the competition has the responsibility to remind and urge participants and judges not to carry communication devices, photographic or recording equipment, and to prohibit the use of unauthorized tools. If necessary, the competition venue should provide and manage these tools uniformly. The competition may also be equipped with security inspection equipment to inspect personnel entering important areas of the competition venue.

III. Living Conditions

1. The accommodation arranged during the competition should have a valid hotel or lodging business license.

2. The competition organizing committee and the host unit must ensure the traffic safety of participants, instructors, judges, and staff during the competition.

3. The safety management of each competition should strictly comply with national laws and regulations to protect personal privacy and personal freedom.

IV. Emergency Response

In the event of an accident during the competition, the person who discovers it should report to the competition executive committee immediately and take measures to prevent the situation from escalating. The competition executive committee should immediately activate the emergency plan to resolve the issue and

report to the National Competition Organizing Committee. In the event of major safety or health issues, the competition can be suspended, and the decision to suspend will be made by the National Competition Organizing Committee.

V. Penalty measures

1. If a competition experiences a major accident, the hosting unit's qualification to host the competition will be revoked.

2. If a major accident is caused by a participating team, their competition eligibility will be canceled.

3. If a participating team is found to have violated the rules and the warnings and prompts from the venue staff prove ineffective, the chief referee may, upon approval and signature, disqualify the team from continuing the competition.

4. If competition staff violate regulations, they will be held accountable according to the relevant system. If the violation is severe and causes a major accident, the judicial authorities will pursue corresponding legal responsibilities.

8. Appeals and Arbitration

The competition adopts a two-tier arbitration mechanism, with an Arbitration Committee established at the competition zone level and an Arbitration Working Group at the event level. The Arbitration Working Group operates independently under the leadership of the event executive committee.

(1) Teams may appeal to the Arbitration Group regarding issues such as equipment, computer software and hardware, competition tools and supplies, competition officiating, venue management, and improper conduct of staff that do not comply with the event regulations. The team leader is the primary appellant.

(2) To initiate an appeal, the team leader must submit a written appeal report, personally signed, to the Arbitration Working Group. The appeal report should provide a detailed and factual account of the issue, including the phenomenon, time of occurrence, individuals involved, and basis for the appeal. Appeals not submitted in writing will not be accepted.

(3) Appeals must be filed within 2 hours after the competition ends (when all competition content for the participants is completed). Appeals filed after this period will not be accepted.

(4) The Arbitration Working Group will organize a review within 2 hours of receiving the appeal report and promptly inform the appellant of the review results in writing. If the appellant still has objections to the review results, the team leader may appeal to the Arbitration Committee of the competition zone. The decision of the Arbitration Committee is final.

(5) The arbitration result must be signed for by the appellant personally; no proxy is allowed. If the appellant leaves the designated time and place without signing for the result, it will be considered as a voluntary withdrawal of the appeal.

(6) The appellant may withdraw the appeal at any time.

(7) The appellant must provide accurate information and strictly follow the appeal procedures. No extreme actions that disrupt the order of the competition venue will be tolerated under any circumstances.