



2026

BRICS SKILLS COMPETITION

(BRICS+ FUTURE SKILLS & TECH CHALLENGE)

Industrial Robot Digital Twin Technology Application

BRICS-FS-40

Technical Description (Online_International Final)

June, 2026



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1. Event Overview

1.1 Basic Information About the Competition

Event Name : 2026 BRICS Skills Competition(BRICS+ Future Skills & Tech Challenge)

Event Name: Industrial Robot Digital Twin Technology Application

Event Number: BRICS-FS-40

Format (People/Participants): 2 participants

Event Type: China Regional International Competition

1.2 item description

The competition focuses on industrial robot digital twins and uses the automotive wheel hub production process as its core task framework. It evaluates participants' skills in virtual debugging of industrial robot systems, assesses teams' comprehensive professional competencies—including planning, organization, and teamwork—and emphasizes innovation capabilities and practical operational skills to enhance students' vocational competence and employment readiness.

1.3 Purpose of the competition

To implement President Xi Jinping's important instructions on skilled talent development, and to better promote the spirit of model workers, labor, and craftsmanship throughout society, we aim to inspire more workers, especially the younger generation, to

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pursue a path of skill development and serve the country through their skills. This initiative also seeks to cultivate more highly skilled, versatile talents and master craftsmen, thereby promoting employment, entrepreneurship, and high-quality development in our country. Additionally, to further implement the spirit of the BRICS countries' 'Xiamen Declaration,' 'Johannesburg Declaration,' 'Brasilia Declaration,' and 'Moscow Declaration' regarding skill development and innovation, and to jointly advance the cooperation of the second golden decade of BRICS countries, this competition is organized.

The competition aims to assess the contestants' professional skills in industrial robot system layout, script programming, debugging, and virtual simulation debugging, as well as their professional qualities such as teamwork, quality control, and safety awareness. It also evaluates the contestants' technical application in system integration product operation and maintenance services. Using real industrial application scenarios as task carriers, the competition thoroughly tests the contestants' problem analysis, handling, and implementation capabilities when facing complex work tasks, showcasing their comprehensive professional qualities and skill application levels.

2. Competitors need to have the ability

2.1 Basic knowledge to be mastered

- 1) Industrial robot technology knowledge;
- 2) Knowledge of mechanical installation and debugging;
- 3) Electrical installation and commissioning knowledge;

- 4) Knowledge of pneumatic control technology;
- 5) Sensor technology knowledge;
- 6) PLC control and application knowledge;
- 7) Knowledge of intelligent vision detection technology;
- 8) HMI human-machine state technical knowledge;
- 9) Knowledge of structured programming and virtual simulation technology;
- 10) CNC system (CNC) application knowledge;
- 11) Knowledge of industrial network technology application;
- 12) Safety operation procedures and professional code of conduct.

2.2 Basic skills to be mastered

1) Skills in digital twin and virtual debugging software, including methods of virtual debugging;

2) The use method of industrial robot system, including parameter setting, system calibration, typical program design;

3) The use of vision, including communication setting, typical programming, etc.;

4) The use method of PLC system, including input and output connection, communication method, typical program design;

5) Application of industrial network technology, including network basic architecture, networking method, communication protocol, data acquisition and processing;

6) Application of industrial network technology, including network basic architecture, networking method, communication protocol, data acquisition and

processing;

7) Installation, commissioning, maintenance and maintenance of general mechanical and electrical equipment.

3. Competition items

3.1 Competition module

The competition is conducted in teams of two over a duration of 2.5 hours.

Participants independently complete the task requirements and their scores are averaged based on both members' performances.

module	assignment
module A	Simulation environment construction
	Manual debugging of integrated system
	Integrated system virtual joint debugging

3.2 Competition description

Module A: virtual debugging of industrial robot system

Module A-1 Simulation environment construction (model scene construction, part definition, address matching and other tasks in the virtual simulation software)

Module A-2 Manual debugging of integrated system (manual debugging of hardware buttons and virtual environment through PLC training box)

Module A-3 integrated system virtual joint debugging (by writing PLC and touch screen programs, the industrial robot program simulation is completed in the virtual

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simulation software, and finally the overall joint debugging is completed to complete the tasks of hub production storage, grinding, logo installation, processing, testing and sorting)

3.3 Competition method

The 2026 BRICS Skills Competition(BRICS+ Future Skills & Tech Challenge) does not establish separate age categories for individual events. All participants aged between 16 (born before January 1, 2010) and 35 (born after January 1, 1991)—including students and faculty members from vocational colleges (including higher vocational institutions and technical schools), undergraduate universities, as well as employees of enterprises and public institutions—are eligible to register. Candidates who have previously won first place in the finals of any event at previous editions of the competition are prohibited from registering as competitors for the same event in 2026.

Each participating team consists of competitors, coaching experts, and team support personnel (team leader), with competitors and coaching experts being mandatory members. For single-person events, each team may register only one coaching expert; for multi-person events, the limit is two coaching experts per team. Within the same team, a coaching expert and a competitor cannot be the same individual.

3.4 Competition process

Table 1: Competition Workflow Schedule

Competition	time	item	participant	place
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Day				
first day	8:00-8:30	Participants have entered the competition meeting room.	Judges for the participating teams	Tencent Meeting (tentative)
	8:30-8:40	Start the file compression package for the test questions	Judges for the participating teams	Tencent Meeting
	8:40-8:45	Open a screen recording software on your computer.	Competing Teams	Tencent Meeting
	8:45-9:00	Uncompress and decode	Competing Teams	Tencent Meeting
	9:00-11:30	Start Competition	Competing teams, referees, and event supervisors	Tencent Meeting
	11:30-11:40	The competition has ended. Participants have recorded the scoring demonstration videos as required.	Competing Teams	Tencent Meeting
	11:40-12:30	Submit competition result files and screen	Competing Teams	邮箱

		recordings		
Note: The actual schedule of the competition guide is subject to change				

4. Assessment of achievements

4.1 Principles of scoring criteria formulation

The competition questions and scoring criteria are jointly designed by experts from the BRICS Skills Development and Technological Innovation Competition Executive Committee, relevant enterprises and industries, and educational institutions. The evaluation standards, scoring methods, and detailed scoring rules are formulated based on the principles of scientific rigor, fairness, and practicality. These standards also integrate the assessment of professional skills with professional ethics, with a total score of 100 points.

4.2 Scoring method

1. The competition referee group is responsible for the evaluation of the competition results, and there is a chief referee who is fully responsible for the referee and management of the competition.

2. The contestants shall operate according to the requirements of the task book, and the contents that need to be confirmed by the judges must be raised and confirmed by the judges, otherwise no points will be awarded.

3. The judging group shall evaluate the results in accordance with the principles of "fairness, impartiality, openness, science, standardization, transparency and no objection",

based on the on-site records of the judges, the task book of the participants and the scoring standards.

4. There are two types of scoring methods: process scoring and result scoring. The results shall be evaluated according to the on-site records of the judges, the task book of the competition for the participants and the scoring standards. All scoring materials shall be signed by the corresponding judges and players and confirmed by the chief referee.

5. The division of judges shall be responsible for the chief referee. Judges without corresponding enforcement tasks shall not enter the player's workstation. Players shall display the functions described in the scoring items according to the instructions of the judges.

4.3 Scoring rules

The competition score will adopt a combination of qualitative and quantitative methods to objectively and fairly evaluate the scores of each task. In order to ensure the objectivity of the competition evaluation, for each set of competition questions, the scoring standards will be customized, and the scoring items will be detailed as much as possible to every detail, reducing the proportion of subjective judgment, so as to ensure the objectivity and fairness of the competition.

Table 2 Competition module distribution table

module	Evaluation items	Scored points	proportion
A	Simulation environment construction	1、The virtual environment is built and placed in the same way as the real environment	10%

		2、 Correctly set the initial state of the software 3、 Correctly define the state machine for the cylinder 4、 Correctly define the sensor 5、 Correctly define the indicator light 6、 Correctly complete the signal address match 7、 Establish communication correctly	
	Manual debugging of integrated system	1、 The virtual debugging scene cylinder action is controlled by an external button 2、 Control the virtual debugging scene indicator light by external button 3、 Alarm such as safety grating and buzzer is realized	5%
	Integrated system virtual joint debugging	1. Complete the virtual simulation and joint debugging task of one or more hub production and processing process	20%

Note: The weightings of each indicator may be slightly adjusted during the actual competition.

5.Skill Management and Communication

5.1 panel

The Expert Panel consists of the Chief Expert, Deputy Chief Experts, and member experts, responsible for jointly revising relevant technical documents for this competition.

The institution of the Chief Expert may not send a team to participate in this event.

5.2 jury

The BRICS Vocational Skills Competition adopts a "Chief Expert Responsibility System," under which the chief expert may also serve as the presiding judge. Members of the judging panel are selected from among experts at participating institutions and enterprises nationwide who possess extensive teaching and practical experience; they participate in officiating only after undergoing unified training and passing evaluation by the expert panel, and strictly adhere to the conflict-of-interest avoidance rules. The judging panel is divided into three distinct roles—confidential judges, on-site judges, and scoring judges—each performing specific duties without overlapping responsibilities, and all operating under the supervision of the arbitration committee throughout the process.

5.3 Arbitration Panel

The arbitration panel consists of third-party supervisors who oversee the entire adjudication process, conduct random checks and reviews of results, handle written appeals from participating teams, organize reconsiderations, investigate and address violations during the competition, thereby ensuring fairness and impartiality.

5.4 Technical Support Team

Composed of technical personnel from the supporting organization and key technical staff from the platform provider, this team is fully responsible for ensuring the stable operation of the competition platform, performing equipment debugging, resolving technical issues, and providing technical support to guarantee the system's reliability,

security, and smooth functioning.

5.5 Event Implementation Working Group

Composed of staff from the Chinese organizing, executive, co-organizing, and technical support units of the BRICS Vocational Skills Competition, this team is responsible for all aspects of event execution, including competition organization, training implementation, publicity promotion, results statistics, and logistical coordination, ensuring the event proceeds as planned.

5.6 Official Communication

For any questions regarding competition registration, hardware/software preparation, or exam environment setup before the event, participating organizations may join the dedicated drone operation competition discussion group for inquiries. Training discussions, communications during and after the competition can also be conducted through the official communication group.

Official QQ Group: 654811629 (All participating organizations are advised to carefully verify the sources of information within the group and exercise caution against fraud).

6. Competition Environment

6.1 Overall Environmental Requirements

Project	Name	Configuration/Version	Remarks
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		Requirements	
Hardware Preparation	Computer	CPU model I5-7700 or higher, memory of 16 MB or more, dedicated graphics card of 2 GB or higher, and available storage hard drive capacity greater than 100 GB	The computer has a camera and can connect to the internet.
	PLC module	Siemens 1200 series CPU, model not specified	Self-provided power supply for the PLC
	HMI	The Siemens series may be compatible with other Siemens-model communication devices.	Self-provided power supply for the HMI
	2 Ethernet cables	Ensure a communication connection based on actual needs	-
Software Preparation	PQFactory	Latest Version on the Official Website	-
	Botu Software	v15 v16	-
	Tencent Meeting	Official Website Version	-

	EV screen recording	Official Website Version	-
	Text Processing Software	-	-

6.2 Competition Workstation Requirements

1. Create a suitable competition environment that is quiet, independent, and free from distractions;
2. Ensure stable power supply;
3. Maintain a stable network connection;
4. Test all hardware and software in advance.。

6.3 Technology Platform

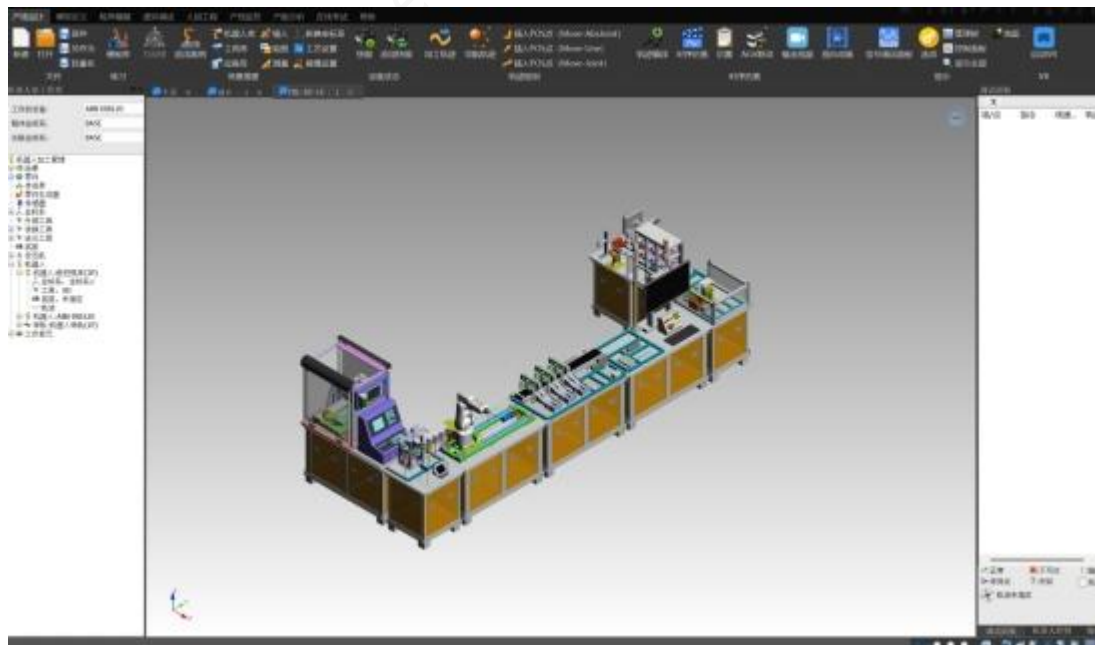




Figure 2: Schematic diagram of the competition platform

6.4 Technology Platform Requirements

order number	name	Contains modules
1	computer	Intel i5-8700 CPU (8th generation, 2.8 GHz clock speed, 6 cores) or higher; 8 GB or more of RAM; 500 GB or greater storage capacity; Windows 10 operating system
2	PLC	(1) Built-in PROFINET; (2) High-speed I/O and onboard analog inputs with motion control capabilities that minimize space requirements and the need for additional I/Os, two pulse generators for pulse width applications, and up to six high-speed counters; (3) The CPU module features built-in onboard I/O points providing 6–14 input points and 4–10 output points for DC, relay, or analog signals, with signal boards mounted on the CPU

		front panel offering additional I/O options.
3	HMI	The ideal entry-level solution for simple HMI applications • Integrated with TIA Portal engineering configuration • Compatible with SIMATIC HMI Smart Panels and existing SIMATIC HMI Simplified Panels (4-inch and 6-inch models) • Flexible scalability across HMI application scenarios • High-resolution wide-screen displays with 64,000 colors and adjustable brightness • Innovative user interface featuring new controls and enhanced usability • Intuitive touch-and-button operation • Support for multiple PLC interfaces • PROFIBUS or PROFINET compatible • Archiving via USB drive
4	PQFactory	This software enables free customization of various equipment components including robots, cylinders, sensors, and more. All fundamental production line devices can be independently defined, supporting comprehensive virtual simulation without blind spots. It supports multiple PLC signal types such as numerical values and Boolean signals, enabling real-time communication with PLCs and physical analog devices. Within the software, users can simulate actual production line equipment—including robots, cylinders, modules, sensors, and CNC machines—for programming and debugging tasks, accurately replicating device operations and signal transmission. This solution significantly reduces time and cost investments for factory production lines by eliminating the need to purchase complete physical equipment. Additionally, the underlying architecture employs OpenGL-based advanced graphics components and modular development to minimize reliance on

		proprietary code. The user-friendly interface utilizes established tools like Microsoft Visual Studio, offering intuitive operation and rapid simulation of device behaviors with high accuracy. As a powerful yet easy-to-use virtual debugging tool, it delivers exceptional performance efficiency.
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7.competition papers

The sample paper is consistent with the official paper in terms of question type, distribution ratio of knowledge points and skill points covered, proportion of free creative content, and layout of the paper, with no more than 30% change.

8. Complaints and arbitration

8.1 Complaints and Arbitration

1. The competition shall establish an arbitration working group, which shall carry out its work under the leadership of the competition organizing committee and be responsible to the competition organizing committee.

2. Duties of the arbitrators

- (1) Familiar with the competition rules and regulations of the event.
- (2) Keep abreast of the progress of the competition.
- (3) Accept written appeals from each team.
- (4) Conduct in-depth investigation on the accepted appeal and make objective and fair collective arbitration.

8.2 Procedure for appeal and arbitration

1. Each team shall appeal to the arbitration working group against any instrument, equipment, tooling, materials, articles, computer software and hardware, competition tools and supplies, competition enforcement, venue management, competition results, or irregular behavior of the staff that does not conform to the regulations of the competition.

2. The subject of appeal shall be the guiding expert of the participating team.

3. When the appeal is started, the guiding expert shall submit a written appeal report signed by himself to the arbitration working group. The report shall fully and truthfully describe the phenomenon, time of occurrence, personnel involved and basis for appeal of the appeal event. Non-written appeal shall not be accepted.

4. The appeal should be filed within 2 hours after the end of the competition. It will not be accepted if it exceeds 2 hours.

5. The arbitration working group of the competition shall organize a review within 2 hours after receiving the appeal report and inform the appellant in writing of the review result in time. If the appellant still has objections to the review result, the guiding expert may appeal to the arbitration committee of the competition area. The arbitration result of the arbitration committee of the competition area is the final result.

6. The complainant shall not refuse to accept the arbitration result for any reason; shall not take drastic actions to disrupt the order of the court for any reason; the arbitration result shall be signed by the complainant and cannot be collected on behalf of the complainant; if the complainant leaves at the agreed time and place, it shall be deemed to have abandoned the appeal by himself.

9.Competition Guidelines

(一) Contestant Guidelines

Contestants must truthfully provide their personal information in accordance with the requirements; failure to do so will result in disqualification from the competition.

Participants must present a uniformly printed competition certificate and valid identification documents to attend the event, and participate according to the specified time, order, and venue for each event category.

All participants must thoroughly study and understand the competition-related documents, strictly adhere to event regulations, follow instructions, comply with arrangements, and participate in a civilized manner.

All participants must strictly adhere to safety operating procedures and civilized production regulations, properly maintain equipment and instruments at the competition venue, and refrain from causing any damage to such facilities. In the event of a serious safety incident, the participant's eligibility will be immediately revoked upon approval by the chief referee.

Participants are prohibited from bringing any electronic devices, communication equipment, or other materials into the competition venue.

During the competition, operations must not be initiated until the start signal is received. Each team shall complete their tasks at designated stations; cheating is strictly prohibited.

Upon completion of the competition, participants must immediately cease operations and wait in the workstation area, away from the workbench. All materials and

tools shall be neatly arranged on the work platform; departure is permitted only after verification by staff. No materials may be taken away upon leaving the venue.

When submitting their competition results, participants must sign the competition record form filled out by the judges to confirm.

All participating teams must attend the opening/closing ceremonies, team leader draw session, venue orientation sessions, and other scheduled events for this competition on time.

Any matters not covered herein shall be determined by the on-site judging panel.

(二) Guidance for Experts

(1) Guiding experts (teachers) should develop training programs in accordance with the professional teaching plan and competition regulations, provide meticulous guidance to participants, cultivate their comprehensive professional competencies and strong professional ethics, overcome utilitarian mindsets, and avoid learning solely for the sake of competitions or substituting competition-based learning for substantive education.

(2) Guiding experts (teachers) should promptly review the notices and content related to each competition category on the official event website, thoroughly study and master the rules, technical specifications, and venue requirements for each category, and assist participants in completing all necessary technical and competitive preparations prior to the event.

(3) Guiding experts (teachers) shall ensure proper insurance arrangements for participants in accordance with the competition regulations and actively provide safety education to them.

(4) Guiding experts (teachers) must not violate competition regulations by entering

the venue or disrupting the normal conduct of the event.

(5) If a participating team has objections to the competition proceedings, the team leader shall submit a written report to the event arbitration working group within the specified timeframe.

(6) Regarding the arbitration decision appealed against, the team leader shall take the lead in complying with and implementing it, while providing proper guidance to the athletes. Participants shall not withdraw from the competition due to appeals or dissatisfaction with the handling decision; otherwise, such behavior will be deemed as withdrawal.

10.Competition Recognition Award

(1) Certificate Issuance: Participating teams will receive an award certificate jointly issued by the Indian organizers and the Chinese organizers.

(2) Reward mechanism for provincial/regional selection competitions (excluding those organized solely by provincial departments): Awards are determined based on actual competition results of participating teams, with the distribution as follows: 10% first prizes, 20% second prizes, 30% third prizes, and the remainder as excellence awards. Upon completion of the competition, the Indian organizer and the Chinese organizer jointly issue electronic international award certificates corresponding to each prize category.

(3) International Finals Reward Mechanism

1. Gold, Silver, Bronze and Excellence Medals: Based on the unified rankings of

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BRICS plus participating national teams, the top six domestic and international teams will receive corresponding gold, silver, or bronze medals along with certificates; offline teams that achieve outstanding results without winning medals will be awarded an Excellence Medal and certificate (up to three teams per category).

The medal awarding criteria are as follows: (1) The top-performing national team from each participating country qualifies for the gold medal ranking, with the highest-ranked team receiving the gold medal; (2) Apart from gold medalists, the best-performing national team from each country qualifies for the silver medal ranking, with the top two teams earning silver medals; (3) Beyond gold and silver medalists, the best-performing national team from each country qualifies for the bronze medal ranking, with the top three teams receiving bronze medals; (4) Offline participants who achieve outstanding results but do not win gold, silver, or bronze medals will receive a merit medal (up to three teams); (5) Online international participants will not receive physical medals but only corresponding certificate awards.

2. For Chinese teams participating in the China regional international finals, first prizes, second prizes, and third prizes will be awarded according to the rounding principle: first prizes account for 10%, second prizes for 20%, and third prizes for 30%, accompanied by corresponding international award certificates. The remaining awards are excellence awards.

3. Other Awards: (1) Issue International Referee Certificates to referees participating in officiating; (2) Award International Outstanding Guidance Expert Certificates to advisory experts of teams that won first or second prizes; (3) Present a "Outstanding Contribution Award" plaque and certificate to organizations that made

outstanding contributions to organizing the competition; (4) Award an "Excellent Organization Award" certificate to organizers of provincial or regional selection competitions who actively facilitated participation, conducted pre-competition selection training sessions, and ensured no violations or disciplinary offenses occurred during the event.

4. Participants whose team's total score in the Skills Passport competition reaches 60 points (out of 100) or higher may voluntarily apply for a Grade A "Skills Passport" certificate (see subsequent application notice for details).

11.Provisions for Handling Violations

To uphold strict competition discipline and ensure the openness, fairness, and impartiality of the event proceedings, the following measures will be taken against violators: 1. Participants found to meet ineligible registration requirements, engage in identity fraud or falsification shall have their eligibility revoked upon verification by the Competition Office; award winners shall have their awards revoked, be required to return all certificates and prizes, and this decision shall be publicly announced through media channels.

2. Participants with any of the following behaviors will receive a zero score: (1) illegally consulting books, notes, notesheets or other materials during the examination period.

(2) Cheating behaviors such as whispering, peeking, or giving hints within the examination room.

(3) The use or carrying of communication devices during the competition.

(4) After the referee announces the end of the competition in accordance with the rules, participants still forcibly attempt to answer questions or perform tasks.

(5) Refusing to comply with the referee's decision, disrupting competition order, interfering with the course of the event, and engaging in particularly egregious conduct.

(6) Other violations of competition rules, including failure to heed advice.

3. Participants shall not operate any non-competition-related instruments or equipment. In case of damage to such equipment, the responsible institution shall bear compensation liability (depending on the severity of the incident). Participants who engage in deliberate destruction of instruments or equipment, or other serious violations, shall be referred to the competent authorities for legal action.

4. For non-participating members of representative teams who violate disciplinary rules, penalties ranging from warnings to public reprimands will be imposed depending on the severity of the offense; further, the competition organizing committee may decide whether to notify their respective institutions based on the circumstances.

5. For referees or staff members who violate competition rules, the chief referee shall, upon verification by the provincial competition organizing committee, issue a warning or revoke their qualifications depending on the severity of the violation.

6. For athletes who violate operational procedures by failing to wear protective equipment, the referee shall promptly correct such violations and deduct corresponding points from their performance score as appropriate.

7. Prior to participating in the competition, contestants shall undergo a safety inspection. Any identified issues must be addressed promptly; unresolved problems

should be reported immediately to the judges, who will make appropriate determinations and coordinate solutions as needed. Only after completing all preparatory tasks and obtaining judicial approval may actual operations commence. For any safety hazards not detected by the contestants, judges shall promptly point them out and deduct corresponding points from their operational scores at their discretion.

