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## **Competition for augmented and virtual reality competition**

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## Foreword

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The issuing body of this document shall not be held responsible for identifying any or all such patent rights.

This document was proposed and prepared by BRICS Standardization Working Committee for Skills and Technology.

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# Competition for augmented and virtual reality competition

## 1 Scope

This document specifies the basic requirements, safety regulations, assessment proportion, competition performance evaluation and award setting for the contest of enhancement and virtual reality, including but not limited to the resource requirements for personnel, site and equipment for the contest of enhancement and virtual reality.

This document is applicable to the holding and organization of augmented and virtual reality competitions.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

#### **virtual reality**

through computer-generated immersive 3D environments, users can interact naturally with the virtual world through head mounted devices and other means, gaining an immersive experience

### 3.2

#### **rendering**

process of processing a virtual scene to produce an output consistent with human perception (visual, auditory, haptic, etc.)

### 3.3

#### **release**

process of enabling data to be discovered by users through the provision of metadata, the normalization of digital information, and the transmission of data to one or more servers

### 3.4

#### **interface elements**

series of elements in the virtual reality application software system that meet the user interaction requirements, such as windows, dialog boxes, models, text, menus, graphics, buttons, etc

## 4 Competition overview

### 4.1 Name

Augmented and virtual reality.

### 4.2 Name of occupation

The code and name of the occupation name (type of work) involved in the competition are 2-02-10-14 virtual reality engineering technicians, 4-04-05-11 virtual reality product designers, and the national occupational skill standard level is above Level 3. The reference code in the international standard classification of occupations (ISCO-08) and the names are ISCO-082512 for software developers, ISCO-082166 for graphic and multimedia designers.

### 4.3 Participants

#### 4.3.1 Requirements for age

Over 16 years of age and under 50 years of age without gender restrictions.

#### 4.3.2 Group mode

Each team has 6 participants, including 2 players, 2 coaches, 1 translator and 1 leader.

#### 4.4 Competition organization mode

The competition is conducted in the form of "online+offline" mixed deployment; The competition works (work pieces) shall be subject to "on-site centralized evaluation", which shall be uniformly evaluated by the scoring judges in the event organizer.

### 5 Basic requirements

#### 5.1 Augmented and virtual reality skill standard specification (WSSS)

In skill competitions, the professional level of contestants is determined by evaluating their actual performance in mastering augmented and virtual reality technologies. Standard specifications are clearly divided into several parts defined by titles and reference numbers. Each section will be assigned a certain percentage of scores to indicate its importance in the skill standard specifications. The sum of all score ratios is 100.

The scoring scheme and competition items only evaluate the skills specified in this skill standard specification. They will reflect the requirements of skill standards and specifications as fully as possible under the prescribed conditions of the skills competition. The description and proportion of each skill module in the skill standard specification are shown in table 1.

**Table 1 Augmented and virtual reality skill standard specification**

| No. | Skill module                     | Knowledge requirement  | Skill requirement  | Percentage (%) |
|-----|----------------------------------|--|--|----------------|
| 1   | Work organization and management | <p>Current and virtual augmented reality industry related health and safety regulations</p> <p>Recommended practices and information published by the equipment supplier</p> <p>Terms and symbols related to virtual augmented reality technology</p> <p>Terms used in virtual augmented reality industry jobs</p> <p>Habitually save working backup to avoid file damage</p> <p>Virtual augmented reality industry work practices</p> | <p>Promote safe and civilized operation in the workplace</p> <p>Capable of installing, setting, using and all professional software and hardware equipment</p> <p>Be able to apply recommendation specifications and information published by software and hardware equipment suppliers</p> <p>Compliance with professional standards and specifications during development</p> <p>Capable of team communication and division of work to complete work tasks</p> <p>Be able to plan VR works under specific topics, and prepare standardized planning documents meeting industry standards based on theoretical knowledge of VR project development, relevant technical standards and practical knowledge of project development</p> | 5              |

Table 1 (continued)

| No. | Skill module                                      | Knowledge requirement  | Skill requirement   | Percentage (%) |
|-----|---|--|---|----------------|
| 2   | Design and production of virtual model            | 3D modeling software installation and basic settings<br>Common functions and application process of 3D modeling software<br>Principles of 3D model construction<br>Basic operation and specification knowledge of UV<br>Basic operation and specification knowledge of materials<br>Basic operation and specification knowledge of texture<br>3D model optimization method<br>3D model format and its characteristics  | Capable of installing 3D modeling software<br>Model design through 3D modeling software<br>UV treatment of models<br>Material setting for model<br>Texture rendering of models<br>Optimize the topology, material, texture and capacity of the model<br>Be able to export the model to the format required by the VR engine   | 20             |
| 3   | Rendering and making of virtual model             | 3D rendering software installation and basic settings<br>Common functions and application process of 3D rendering software<br>Principles of 3D model rendering<br>Basic operation and specification knowledge of configuration scene and light source<br>Basic operation and specification knowledge of setting camera parameters<br>Basic operation and specification knowledge of rendering<br>Optimization method of rendering effect<br>Output basic operation and specification knowledge of various images | Capable of installing 3D rendering software<br>Ensure proper illumination effect of the model by adding and adjusting lights<br>Control the perspective and depth of rendering by adjusting the camera position and focus<br>Capable of setting rendering parameters and obtaining rendering effect<br>It can further improve the image reality and visual effect through such post-processing work as coloring, texture mapping, shadow, reflection and motion blurring<br>Capable of exporting rendered images to required formats (e.g. JPEG, PNG, etc.) for use in various applications | 20             |
| 4   | Development of virtual product cognitive function | Software development process and standards<br>Types of software development materials<br>Types and functions of software development function instructions<br>Type and application of software UI<br>Common human-computer interaction function<br>Writing process and main contents of planning document<br>Cross-platform release process<br>Function test and optimization  | Be able to complete virtual scene design and development<br>Be able to complete software UI design and development<br>Complete cognitive function design and development<br>Capable of completing text and voice function design<br>Capable of completing human-computer interaction function design<br>Complete the preparation of design documents<br>Cross-platform release of cognitive   | 25             |

**Table 1** (continued)

| No. | Skill module                                      | Knowledge requirement  | Skill requirement   | Percentage (%) |
|-----|---|--|---|----------------|
| 4   | Development of virtual product cognitive function | -  | function module<br>Be able to test the function module of the cognitive function module software<br>Optimize software functions of cognitive function module  | -              |
| 5   | Development of virtual product operation function | Basic concept and classification of software UI<br>Basic motion principle and parameter action<br>Classification and main parameters of animation and particle special effects<br>Communication function content and development process of common hardware equipment<br>Technical requirements for target platform<br>VR user experience<br>Program BUG processing method<br>Cross-platform release process<br>Function test and optimization | Capable of completing the development of relevant functions of interface elements<br>Capable of completing text and voice function development<br>Capable of basic motion function development<br>Capable of completing combined motion function development<br>Capable of developing parameterized motion functions<br>Capable of setting animation and particle special effects | 30             |

## 5.2 Training requirements

### 5.2.1 Training standards

In order to ensure the quality of the competition and the absolute safety of the actual operation, all participants must participate in the training conducted by the organization designated by the competition committee. Learn the relevant standard operation of safety protection measures and competition tools, and participate in the competition after passing the training examination.

### 5.2.2 Training time

The training time shall not be less than 48 hours and can be completed in a modular manner using both online and offline methods.

### 5.2.3 Training contents

The training contents of the completion task is shown in table 2.

**Table 2 Training contents of the competition task**

| No. | Contents  | Time             |
|-----|---|------------------|
| 1   | Safety operation specification for augmented and virtual reality development technology | 4 learning hours |
| 2   | Case analysis of designing and making virtual models                                    | 8 learning hours |
| 3   | Case analysis of virtual model rendering production                                     | 8 learning hours |
| 4   | Case analysis of cognitive function development of virtual products                     | 8 learning hours |
| 5   | Virtual product operational function development and case analysis                      | 8 learning hours |

**Table 2** (continued)

| No. | Contents  | Time             |
|-----|---|------------------|
| 6   | Interpretation of augmented and virtual reality competition rules | 4 learning hours |
| 7   | A typical case study of augmented and virtual reality events      | 8 learning hours |

#### 5.2.4 Qualification of trainers

Have or above associate professional technical title or above professional qualification of technician, and be proficient in the professional knowledge and operational skills related to the occupation involved in the competition.

Participate in the training conducted by the organization designated by the competition organizing committee, pass the training examination and obtain the qualification of "enhancement and virtual reality technology trainer".

## 6 Competition content

### 6.1 Competition task

The competition is divided into four tasks, with a total time of 14 hours, as follows:

Task 1: Design and production of virtual model (3 hours)

The competitors design and make virtual models according to the understanding and requirements of the competition contents. Use modeling software to complete model building, UV processing, material setting and texture setting. This task mainly assesses the product design, material processing and model building capabilities of competitors.

Task 2: Rendering and production of virtual model (3 hours)

The competitors design and render virtual models according to the understanding and requirements of the competition contents. Use rendering software to complete model scene configuration, light source setting, camera setting and parameter adjustment. This task mainly assesses the rendering design, light processing, texture rendering and other capabilities of the player.

Task 3: Cognitive function development of virtual products (4 hours)

The competitors design the product expression mode and content according to the understanding and requirements of the competition content, and use the virtual reality development engine to complete the functional development of the product structure and principle introduction. The task mainly assesses the player's reading and design ability, virtual reality graphic text, voice, UI interface interaction and other functional development capabilities.

Task 4: Development of virtual product operation function (4 hours)

The competitors design the virtual reality interaction function of the product operation process according to the understanding and requirements of the competition content, and use the virtual reality development engine to complete the complete operation process function development of the product. The task mainly assesses the virtual reality function planning and design ability of the player, virtual reality scene roaming, camera control, object motion, particle special effect, trigger response UI interface interaction and other function development capabilities.

### 6.2 Score specific gravity

The specific score gravity can see table 3.

**Table 3 Score proportion of competition task**

| Task   | Task name   | Percentage (%) |
|--------|---|----------------|
| Task 1 | Design and production of virtual model            | 20             |
| Task 2 | Rendering and making of virtual model             | 20             |
| Task 3 | Development of virtual product cognitive function | 30             |
| Task 4 | Development of virtual product operation function | 30             |
| Total  |   | 100            |

### 6.3 Duration of competition

The competition duration can see table 4.

**Table 4 Duration of the competition task**

| Task   | Task name   | Duration (min) |
|--------|---|----------------|
| Task 1 | Design and production of virtual model            | 180            |
| Task 2 | Rendering and making of virtual model             | 180            |
| Task 3 | Development of virtual product cognitive function | 240            |
| Task 4 | Development of virtual product operation function | 240            |
| Total  |   | 840            |

### 6.4 Issue release

The expert group shall release the competition sample questions and scoring standards on the official website of the competition one month before the formal competition to ensure 80% of the questions are consistent with the formal competition and 80% of the questions are consistent with the idea.

The open competition sample questions shall be officially announced no later than 15 days before the competition, and the official competition information platform shall release the competition sample questions to the participants.

### 6.5 Confidentiality requirements

The final contest will be determined by the chief expert, who will be responsible for the printing, storage, collection and recovery of the contest.

## 7 Evaluation criteria

### 7.1 Judgment principle

Based on the principle of "fairness, fairness, openness, science and innovation", the event expert group and the judging group are responsible for the evaluation of the event results. Comprehensively evaluate the competitors from design, equipment operation to civilized production, etc.

### 7.2 Evaluation score

Scoring method of evaluation points: 4 judges are in one group, and one of them is a rotational judge, i.e., the judges in the same group score, and cannot score their own competitors. The 3 judges score separately, give the weight score for one player's assessment item, get the average weight score and calculate the actual score. The difference between the weight points of judges can be less than or equal to 1 point. If it exceeds 1 point, it is necessary to make an evaluation reason statement for the assessment items of the player, and give a reasonable score under the consideration and supervision of the adjudicator.

table 5 shows the weight and weight of evaluation.

**Table 5 Weight and weight of evaluation**

| Weight score | Description of requirements  |
|--------------|--|
| 0            | In all respects below industry standards, including "no attempt" or unacceptable |
| 1            | Meet industry standards  |
| 2            | Meet industry standards and in some respects exceed standards                    |
| 3            | To reach the excellent level expected by the industry                            |

### 7.3 Measurement points

Scoring method of measurement score: set several scoring groups according to the task, each group is composed of 4 judges. All judges in each group shall discuss together, and only one point shall be given after agreement on the actual score of the player in this item. See table 6 for an example of measurement score.

**Table 6 Example of measurement scoring**

| Type                   | Example   | Maximum score | Correct score | Incorrect score |
|------------------------|---|---------------|---------------|-----------------|
| Full or zero           | For a practical function of picture in picture, the score is 1, and there are only two possibilities for the player to score: full score or zero score        | 1             | 1             | 0               |
| Deduct from full score | There are 10 key points to realize a certain statistical function, 2 points for the maximum, and deduct 0.2 point if one point fails to meet the requirements | 2             | 1.2           | 0.8             |
| Increment from zero    | There are 5 requirements for a process display function, with a maximum score of 5 points, and 1 point for each meeting the requirements                      | 5             | 2             | 3               |

### 7.4 Evaluation and measurement score distribution

The evaluation score (subjective) and measurement score (objective) are allocated for the preparation of scoring scheme and competition task, and the specific score distribution is shown in table 7.

**Table 7 Assignment of task evaluation and measurement scores**

| Task   | Task name   | Weight score | Measurement scoring | Total |
|--------|---|--------------|---------------------|-------|
| Task 1 | Design and production of virtual model            | 4            | 16                  | 20    |
| Task 2 | Rendering and making of virtual model             | 4            | 16                  | 20    |
| Task 3 | Development of virtual product cognitive function | 6            | 24                  | 30    |
| Task 4 | Development of virtual product operation function | 6            | 24                  | 30    |
| Total  |   | 20           | 80                  | 100   |

### 7.5 Scores ranking

The person with high total score ranks first.

If the total score is the same, according to the order of task 4, task 3, task 2 and task 1, the task with higher performance ranks first.

If all tasks have the same results, the chief expert shall make a judgment and determine the final rank.

### 7.6 Result release

The referee marks the end of the signature, the final confirmation by the chief expert shall be handed over to the contest organizing committee unified public announcement.

## **7.7 Awards setting**

### **7.7.1 Certificates**

The outstanding teams will be granted a certificate of award issued by the competition committee.

### **7.7.2 First prize, second prize and third prize**

Based on the participating countries and final bench marking results, the teams participating in the international final of this competition shall be provided with 10% of the first prize, 20% of the second prize and 30% of the third prize (rounded to the nearest decimal point). If the winning proportion is exceeded due to the parallel results, it shall be submitted to the competition organizing committee for approval.

### **7.7.3 Gold, silver and copper medals**

The teams winning the first prize will be awarded with gold, silver and copper medals. The detailed rules for awarding are as follows:

- a) The team ranked first in the first prize will win the gold;
- b) In addition to the gold team, 40% of the teams win silver and 60% win copper. Rounded to the nearest decimal point).

### **7.7.4 Other awards**

Issue an award certificate for the experts and judges participating in the award; provide the coaches who win the first and second prize teams with "excellent coaches" certificates; the organization making outstanding contributions to the competition will be awarded the "Outstanding Contribution Award".

## **7.8 Technical review**

The basic points of technical review (summary) are as follows:

- a) Competition purpose, technical standards and evaluation. Composition of competition tasks, proportion among tasks and main purpose of task arrangement. Main technical standards and requirements for each task proposition. The process, rule, method and case analysis of judgment;
- b) Analysis on competition of participants. Analyze the overall competition results and the specific performance of the participants. Through the comparative analysis of the competition results (works) of the participants, summarize the skill highlights and problems reflected in the competition process, and put forward opinions and suggestions;
- c) Analysis of development trend of virtual augmented reality. It includes the introduction to the leading development of the industry and the occupation, and the analysis of the future development trend. It can be introduced from the regional economic demand for the industry, the technical skill requirements of the industry for talents, the development and change trend of the industrial technical skills and other aspects, so that the participants can fully understand the industry and the career development direction, playing a certain guiding and revealing role.

## **8 Judges**

### **8.1 Composition of the referees**

#### **8.1.1 Chief expert**

The chief expert is appointed as the head of the refereeing team.

#### **8.1.2 Deputy chief expert**

Set up a deputy chief expert to assist the chief expert to ensure the efficient operation of the evaluation work.

#### **8.1.3 Other referees**

In principle, each team is required to produce a referee.

#### **8.1.4 Competition expert**

Five competition experts should be set up to assist the chief experts to complete the competition proposition, referee training, on-site refereeing, competition work judgment, competition supervision and arbitration, equipment debugging and maintenance.

### **8.2 Duties of a referee**

#### **8.2.1 Role of the chief expert**

The chief expert is mainly responsible for the overall guidance and supervision of the judging activities of the event. He shall coordinate the work of the team members such as the deputy chief expert, the expert, the referee, the team leader and the interpreter to ensure the smooth judging process, timely and effective communication of information. Before the competition shall be responsible for the organization and development of competition questions and criteria, and the final competition questions and criteria for validation and confirmation. In the event of any judge dispute, the chief expert shall immediately intervene to ensure a fair and speedy resolution of the matter. Organize the technical summary and comments after the competition.

#### **8.2.2 Duties of deputy chief expert**

The deputy chief expert shall automatically take over the duties of the chief expert in the event that the chief expert is unable to perform his or her duties for any reason, so as to ensure continuity in the evaluation process.

#### **8.2.3 Other referee duties**

Other referees participate in the on-site and scoring of the competition, participate in pre-competition training and technical discussion, and master the technical rules of the competition. They should participate in the discussion and formulation of evaluation criteria, assist in solving technical problems in the evaluation process, and provide professional advice.

#### **8.2.4 Duties of competition experts**

The main responsibilities of the competition specialist shall be as follows;

- a) Proposition work: responsible for the completion of the competition questions (including sample questions, papers and test library) design, proposition work. Propositional experts are responsible for the confidentiality of the contest questions. They should sign the confidentiality agreement and not disclose the contest questions and related contents in any improper way
- b) Referee training: organize the referee training before or during the competition, focusing on the rules and regulations closely related to the refereeing work, including: competition rules, competition content, competition technology platform, scoring methods, scoring standards, performance management processes, safety precautions and safety emergency plans;
- c) On-site refereeing: according to the arrangement of the chief expert, complete the refereeing work. Mainly responsible for recording, encryption, process scoring (professionalism), maintenance of order, etc.
- d) Judging: judging the entries according to the arrangement of the chief expert. The scoring process is conducted independently by at least 5 referees. After removing one highest and one lowest score, the arithmetic mean of the remaining scores will be taken as the final score of the participating team (contestant). Assign 2 scorers to keep score;
- e) Equipment debugging and maintenance: according to the chief expert arrangement, do a good job in technical support and competition equipment maintenance;
- f) Supervision and arbitration: supervise the preparation, organization and implementation of the competition throughout the whole process, accept the written complaints of each participating team and make objective and fair collective arbitration after in-depth investigation to ensure the implementation of the competition system, so as to promote the fair, just, safe and orderly conduct of the competition. Be responsible for the confidentiality of competition results.

### **8.3 Selection and production of referees**

The chief expert shall be selected through direct transfer or selection. The chief experts to be selected shall be selected by the organizing committee of the contest according to the selection conditions. The deputy chief expert shall be nominated by the chief expert to the contest organizing committee for approval and record. Referees will recommend 1 referee for each team in principle. If the number of referees can not meet the needs of the work, the referee should be no later than 2 weeks before the competition made by the referee to increase the selection of referees. After discussion by all the referees and approved by more than 2/3, it will be submitted to the organizing committee for examination and approval.

## **8.4 Management of referees**

### **8.4.1 Training of referees**

The specific content of the referee training shall be as follows:

- a) Training content: the latest development of augmented and virtual reality technology, international evaluation standards, evaluation system operation, ethics and crisis management;
- b) Training methods: using a combination of online and offline methods, including theoretical learning, case analysis, practical exercises, etc. ;
- c) RRB- examination and verification: after the training, through the written examination and practical operation assessment, to ensure that the referees to meet the standards of induction.

### **8.4.2 Referee's assessment**

The referees' assessment requirements shall be as follows:

- a) Evaluation cycle: A Comprehensive Assessment of referees' professional competence, impartiality, teamwork and ethics during and after the competition;
- b) Evaluation method: after the contest, under the guidance of the contest organizing committee. Organize staff, experts, referees and other personnel to evaluate the work of the chief expert through online means, and the chief expert to evaluate the work of the deputy chief expert, expert, referee and staff;
- c) Application of the results: the evaluation was carried out according to three grades: A (excellent) , B (fair) and C (poor) . The evaluation results will be used as a reference for referees to participate in similar competitions in the future. Those who perform well will be commended, and those who fail will be guided or adjusted.

## **9 Team leader**

### **9.1 Team leader setting**

One team leader shall be assigned to each team.

### **9.2 Team Leader's duties**

Team leaders shall be responsible for the day-to-day management and discipline of their respective teams and ensure that the rules and order of the competition are observed. Act as a liaison between the team and the referees, helping to convey information and answer questions from the team about the rules of the game.

## **10 Translators**

### **10.1 Settings for translation**

Each team shall have 1 translator.

### **10.2 The duties of a translator**

Interpreters shall provide multilingual translation services to ensure communication between teams from non-native speaking countries, referees and staff. To help cross-cultural understanding, to ensure the accuracy of the information in the evaluation process, reduce the misunderstanding caused by language differences.

## 11 Technical platform

### 11.1 Hardware environment

#### 11.1.1 Hardware equipment list

The specific hardware environment is shown in table 8.

**Table 8 Hardware environment specification**

| No. | Device name    | Quantity | Others                             |
|-----|----------------|----------|------------------------------------|
| 1   | Computer       | 2        | See the table below                |
| 2   | Work station   | 2        | Size not less than 120 * 60cm      |
| 3   | Head phone     | 2        | Headphone for ordinary computer    |
| 4   | USB flash disc | 4        | Storage capacity not less than 32G |

#### 11.1.2 Minimum reference configuration of computer

The minimum reference configuration of computer is as follows:

- Processor: intel i7-8700;
- Memory: 16G and above;
- Graphic card: GTX1050ti and above;
- At least 1 serial port, 2 USB ports and 1 network port;
- Hard disk space: Hard disk spare capacity not less than 500G SSD;
- Display: double-screen LCD.

#### 11.1.3 Maximum reference configuration of computer

The maximum reference configuration of computer is as follows:

- Processor: intel i7-11700;
- Memory: 32G and above;
- Display card: RTX3070 and above;
- At least 1 serial port, 2 USB ports and 1 network port;
- Hard disk space: hard disk spare capacity not less than 500G SSD;
- Display: double-screen LCD.

### 11.2 Software name

#### 11.2.1 Operating system

Harmony PC, Win10 64-bit, Astra Linux, Linux\_Mint, etc.

#### 11.2.2 Modeling and rendering software

Dmax, Maya, Photoshop, etc.

#### 11.2.3 Development engine

Veryengine Virtual Reality Engine, Unity 2023 LTS, Unreal Engine 5, MRTK, OpenXR, Unity MARS, Vuforia, etc

#### 11.2.4 Browser

Browser with 3D rendering module, such as 360 security browser, Google Chrome, etc.

#### 11.2.5 Text processing software

MS-Office, WPS-Office, CalliSuite, Adobe Reader, etc.

### 11.3 Hard (soft) parts for online competition environment

#### 11.3.1 Hardware

The specific hardware for online competition environment is shown in table 9.

**Table 9 Hardware for online competition environment specification**

| No. | Device name         | Quantity | Other                                |
|-----|---------------------|----------|--------------------------------------|
| 1   | monitor workstation | 2        | Ordinary computer                    |
| 2   | Surveillance camera | 2        | Ordinary camera                      |
| 3   | Printer             | 1        | Printer, printing competition papers |

#### 11.3.2 Software

The specific software for online competition is as follows.

- Online conference software: Zone, Tencent Conference, etc;
- Video streaming software: OBS Studio, XSBroadcast, Wirecast, FFmpeg, MediaStream Recorder, GSstreamer, etc;
- Other supporting software for project design: Red Dragonfly screenshot wizard FastStone Capture, Screen recording software, etc.

## 12 Site

### 12.1 Site environment

The requirements for the competition site environment are as follows:

- Stable water, electricity, air source and power supply emergency equipment;
- The headroom shall not be less than 3.5m, with good day lighting, lighting and ventilation. The ambient temperature and humidity shall comply with the equipment use regulations, and the all-around CCTV monitoring environment shall be provided;
- The area of the match position is over 20 m<sup>2</sup>, which is isolated from each other. The player can carry out the competition independently without being affected by the outside world;The width of the main channel of the venue is more than 2m, meeting the safety emergency evacuation standard.
- The theoretical examination area meets the standard of standard classroom setting.

### 12.2 Site layout

The requirements for the competition site layout are as follows:

- Public service areas such as maintenance service, medical service and life supply stations are set up in the competition field to provide services for players and participants;
- The competition area is provided with such functional areas as player operation area, competition preparation area, judgment area, scoring area, material preparation area, confidentiality room, expert room and technical support area.
- The reference layout of competition station is as follows: The offline competition standby station shall not be less than 10% of the participating teams;At least one station shall be reserved for online competition.

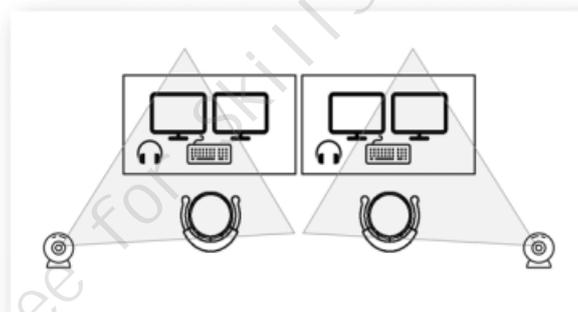


Figure 1 Layout of offline competition station



Figure 2 Layout of online competition workstation

### 12.3 Site management

The requirements for the competition site management are as follows:

- Set up warning lines and safety areas around the venue to prevent irrelevant personnel from entering;
- Observe and interview personnel in the safe passage;
- At the end of each stage (task) competition, when the participants leave the venue, the chief expert organizes to check the facilities, equipment, competition works, tools, materials, etc. of each station, and uniformly arrange the demobilization;
- For equipment requiring initialization and parameter restoration, the chief expert, together with experts and judges, shall deal with it to ensure the consistency of the competition environment.

## 13 Competition safety

### 13.1 Safety training

The safety director organizes all judges, staff and players to receive safety training, and can participate in the competition only after passing the training examination. Safety training should include guidelines for using VR devices, prevention of motion sickness, time limits for use, and space safety tips.

### 13.2 Safety facilities

The requirements for the competition safety facilities are as follows:

- The arrangement of the venue, equipment and equipment in the venue shall comply with the safety regulations. Construct in strict accordance with safe construction standards;
- Necessary safety isolation measures and safety passageways shall be provided in the field, and

complete emergency treatment facilities such as fire extinguishing facilities shall be provided. Safety operation procedures shall be posted at obvious positions, and safety evacuation signs shall be set;

- c) Security check equipment shall be set at the entrance of the game field, and it is prohibited to carry unauthorized articles.

### 13.3 Event plan

The event organizer shall prepare emergency plan for vehicle safety measures, emergency plan for food safety measures, emergency plan for fire safety accidents, emergency plan for injury accidents, emergency plan for equipment accidents, emergency plan for power supply accidents, etc. Drill in advance to handle various possible emergencies to ensure the smooth progress of the event.

#### 13.3.1 Fire fighting plan

Each competition venue shall be provided with a fire fighting access plan, indicating the safe entrance and exit, the direction of the safe passage and the location of the fire hydrant. During the competition, each competition venue shall arrange special personnel to take charge of the fire emergency treatment in the whole process. Once a hidden fire situation is found, the participants shall be evacuated immediately and the fire shall be put out in time.

#### 13.3.2 Power supply plan

Standby power supply shall be prepared for each competition field. After the power supply failure of the main power supply circuit, the standby power supply shall be started immediately and the power supply department shall be requested for power assistance.

#### 13.3.3 Medical plan

Each game field is equipped with a medical staff. In case of minor injury, immediately disinfect and bind up. In case of serious condition, immediately send to the nearest hospital for treatment after simple treatment.

#### 13.3.4 Equipment plan

At least 10% of the stand-by work decks are designed for the competition field. In case of equipment failure, technicians shall repair the equipment first. If the equipment cannot be repaired in a short time, the stand-by computer shall be used.

#### 13.3.5 Project task plan

Three sets of competition questions shall be set, and the chief expert shall draw and determine the competition questions 10 minutes in advance on the competition site.

#### 13.3.6 Emergency treatment

In case of accidents during the competition, the discoverer shall report to the chief expert at the first time, take measures to avoid the situation from expanding, immediately start the plan to solve and report to the organizing committee. In case of major safety problems, the event can be suspended and the details shall be reported to the organizing committee.

#### 13.3.7 Punishment measures

The punishment measures for competition are as follows:

- a) If a major safety accident is caused by the participating team, the winning qualification will be canceled;
- b) If there is a major potential safety accident of the participating team, and the prompt and warning of the venue staff are invalid, the qualification of the team to continue the competition can be canceled;
- c) If the personnel violate the rules, investigate the responsibility according to the corresponding system. If the circumstances are severe and cause major safety accidents, the judicial authority shall investigate the corresponding legal responsibility.

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