



BRICS
2022 CHINA

2022 BRICS Skills Competition

(BRICS Future Skills Challenge)



TECHNICAL DESCRIPTION

Industrial Design Technology (Offline)

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1. Introduction

1.1 Name and description of skill competition

1.1.1 Name of the Skill Competition

Industrial Design Technology

1.1.2 Description of skills competition

The organization of the offline competition of Industrial Design Technical Competition of 2022 BRICS Skills Competition is based on the task content of industrial design. The offline competition of is an individual skill.

Industrial design technology as an activity includes elements of art, marketing, design and technology. The goal of industrial design technology is to create easy-to-use products with a modern look. Industrial design is a type of artistic design that is oriented towards the mass production of products. Because industrial design is inseparable from the network, especially the future network of BRICS countries.

In 2019, the G20 summit meeting of BRICS countries joint initiative proposed "in infrastructure in the Internet space, security, data protection, formulate the international prevailing rules, to build peace, security, network space" for the future of the network, according to the declaration of "encouraging in poverty reduction, industrial transformation in the areas of digital network to share best practices. We stress the importance of continuing BRICS cooperation on science, technology, innovation and entrepreneurship, including the requirements of the BRICS Partnership on New Industrial

Revolution, the Innovation BRICS Network, and the BRICS Research Institute for Future Networks, The introduction of future network verification access points based on our own intellectual property rights and voted by the member states of the ISO/IEC International Standards Organization (ISO/IEC TR29181-2<< Naming and Addressing >> TR29181-5<< security >>) in this competition, which will lay the foundation for further large-scale application. Based on the design project (its separate phases) according to existing ISO/IEC international standards and other standards and market requirements.

The design project (its separate stages) is carried out in paper, board, tablet computers as well as computer graphics and future networks according to existing ISO, other standards and market requirements. Design is inextricably linked to the technical and constructive process of product creation, and industrial design professionals are required to possess the following job skills:

(1) By providing industrial products using 3D scanners for reverse engineering assessment, including: geometric shape reverse, process reverse, material reverse, etc.

(2) Product design thinking and hand-drawn expression. The establishment of future-oriented product design concepts, through the hand-drawn design idea sketch to the system product design structure.

(3) Using computer aided design platform software, industrial product design, 2D, 3D modeling production. Finally, the shape, structure, material and color of the product are displayed in detail on the computer through the sketch

and final effect drawing.

(4) Through 3D printing, numerical control programming and product processing, assembly verification.

(5) Verify the designed products and obtain product source tracing through the future network.

1.2 Relevance and significance of this document

This document contains information on the standards required for the skills competition, as well as the evaluation principles, methods and procedures governing the competition.

Every expert and competitor must know and understand this technical description. In the event of any conflict between the technical instructions in different languages, the English version shall prevail.

2 Skill standards

2.1 General description of skill standards

Skill standards specify knowledge, understanding, and specific skills that are internationally best practice in technical and career performance. It will reflect a global consensus on the representation of the relevant job role or occupation in industry and enterprise.

The skills competition is intended to reflect international best practice as described by the skills standard, and the extent to which it can be achieved. As such, the standard is a guide to the training and preparation required for the skills competition.

The standard is divided into different sections with titles and reference numbers.

Each section is assigned a percentage of the total score to indicate its relative importance in the standard. This is often referred to as a "weight." The total score for all percentages is 100. The weights determine the allocation of points in the scoring scale.

The scoring scheme measures only the skills listed in the criteria. They will reflect the criteria as fully as possible within the constraints of the skills competition.

The marking scheme will be based on the points assigned in the criteria to the extent realistically possible. A 5% variation is allowed, but the weights assigned by the standard specifications are not to be changed.

2.2 Skills Description

Part	Weight (%)
Safety and health	5
The competitor must know and understand: Safety when using materials; Safety instructions.	
Competitors should be able to: Comply with labor protection laws and regulations; Follow safety precautions for personal and cyber security; Schedule work hours;	

<p>Maintain order in the workplace;</p> <p>Reasonable and economical use of materials provided and safe use of computers and networks.</p>	
<p>Communication skills</p>	<p>10</p>
<p>Competitors need to know and understand:</p> <p>Principles of working with clients and how to consider their needs in design;</p> <p>Various target markets and design elements that are appropriate for each market direction;</p> <p>Customer beliefs;</p> <p>Building the structure of an effective presentation;</p> <p>Ways to influence the audience;</p> <p>Document structure;</p> <p>BRICS Skills Competition rules.</p>	
<p>Competitors should be able to:</p> <p>Work with clients;</p> <p>The task of understanding;</p> <p>It is beneficial to emphasize the positive attributes of the project;</p> <p>Clarify and protect your design decisions;</p> <p>Competently present your project;</p>	

<p>Culture of presentation;</p> <p>Expressing ideas;</p> <p>Establish a reporting structure;</p> <p>Maintenance time;</p> <p>Present the project from a monetization perspective;</p> <p>Convince the advantages of proposing a solution;</p> <p>Deployment to answer questions;</p> <p>Retaining the audience during the presentation;</p> <p>Take an interest in your project;</p> <p>Respond adequately to questioned elements;</p> <p>The ability to speak the customer's language;</p> <p>Follow the rules of the competition;</p> <p>Cooperate with the bidding documents.</p>	
Visualize the modeling in the program	25
<p>Competitors need to know and understand:</p> <p>Professional software;</p> <p>Drawing software for design document unified system;</p> <p>International design document system;</p> <p>Load calculation method.</p> <p>Network security mechanisms and usage methods.</p>	
<p>Competitors should be able to:</p>	

<p>Use autonomous and controllable future networks;</p> <p>Creating 3D models;</p> <p>Texturing the model based on design decisions;</p> <p>Create high quality static and dynamic visualizations;</p> <p>Creating 3D objects in software;</p> <p>Modify existing 3D objects;</p> <p>Set the light environment;</p> <p>Select favorable viewing angles for rendering;</p> <p>Configure the physical interaction of the object;</p> <p>Set the scale scale;</p> <p>Consider the environmental characteristics of the material;</p> <p>Using ESKD system as reference;</p> <p>Using computer programs for drawing;</p> <p>Prepare drawings and print them out;</p> <p>Calculate the mass of the object;</p> <p>Perform load calculations;</p> <p>Correctly select the direction needed to calculate the load;</p> <p>Drawing according to the developed 3D model;</p> <p>Fill out technical documents;</p> <p>Create 3D models in software;</p> <p>Repeat the model without changing other software;</p> <p>Using textures;</p>	
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<p>Show the lights and camera;</p> <p>In 2D graphics;</p> <p>Apply effects and layers to work;</p> <p>Mix music;</p> <p>Create camera overlay</p> <p>Record the assembly/disassembly steps</p> <p>Start the object in motion;</p> <p>Create demo photos;</p> <p>Create a video;</p>	
Artistic skills	20
<p>Competitors need to know and understand:</p> <p>Color;</p> <p>Properties of visual materials;</p> <p>Composition law;</p> <p>Layout;</p> <p>Temporal features.</p>	
<p>The competitor should be able to:</p> <p>Execute a sketch of the project, revealing its essence;</p> <p>Search for color decisions;</p> <p>Correctly balance composition;</p> <p>Depict any shapes and materials;</p>	

<p>Create bright and expressive sketches;</p> <p>Convey a message to the audience;</p> <p>Display the color scheme of the item;</p> <p>Show the general structure of the object (layout);</p> <p>Choose an informative and artistically advantageous rendering Angle;</p> <p>Write the demo video;</p> <p>Create simultaneous video series.</p>	
Project skills	30
<p>Competitors need to know and understand:</p> <p>Design principles;</p> <p>Principles for developing concepts and individual elements of design projects;</p> <p>Technical standards;</p> <p>Characteristics of modern materials;</p> <p>Modern trends in materials and molding;</p> <p>The appropriateness of material use;</p> <p>Corrected ergonomic principles;</p> <p>Technology and process flow;</p> <p>The influence of technical features on the appearance of objects;</p>	

<p>And the influence of materials and structures on the mass of objects.</p>	
<p>The competitor should be able to:</p> <p>Reflect the requirements of traditional knowledge in the target of development;</p> <p>Developing new objects;</p> <p>Develop a decent design in a fixed time frame;</p> <p>Determine the functional and decorative features of the object;</p> <p>Provide the best options for improving the object's properties;</p> <p>Repeat design decisions and work towards style;</p> <p>Developing projects for mass production;</p> <p>Correct draft ideas;</p> <p>Explain the characteristics of the object and use it when formulating the task;</p> <p>Draw conclusions about its positive and negative nature;</p> <p>Analyze the object through the specified parameters;</p> <p>Accurately formulate ideas and rank sentences by meaning;</p> <p>Provide explanatory notes for items;</p> <p>Use accurate measurements;</p> <p>Choose an idea that can be replicated within a given time</p>	

<p>frame;</p> <p>Consider the psychophysiological properties of the material;</p> <p>Arrange objects in a specified style;</p> <p>Select materials effectively in style according to the terms of the technical specifications.</p>	
<p>Prototyping skills</p>	<p>5</p>
<p>Competitors need to know and understand:</p> <p>Methods and types of prototyping;</p> <p>The nature of the sculpture material;</p> <p>Type of bonding joint;</p> <p>And the effect of the prototyping stage on product formation.</p>	
<p>Competitors should be able to:</p> <p>Use a prototype as a product development tool;</p> <p>Use models, sculpting tools, and prototyping tools;</p> <p>Prepare 3D models for printing;</p> <p>Configure the printer for a specific print;</p> <p>Being able to start printing 3D models on a 3D printer;</p> <p>Modify the printed prototype;</p> <p>Perform the materials provided by the part prototype;</p> <p>Use the properties of the layout material;</p> <p>Reproduce the form of a given object;</p>	

Carefully execute the prototype; Execute the layout in any material according to the task.	
Product validation and product traceability acquisition	5
Competitors need to know and understand: The Future Network; Integrated big data format.	
Competitors should be able to: Use the Future Network; And use the all-in-one big data format for product verification and traceability.	

3 Scoring Scheme

3.1 Scoring Method

This competition will be scored online by the judging team. In case of cheating or other violations during the competition, the judges will deal with the violations according to the players, and cancel the score in serious cases.

3.2 Scoring Rules

1. The person with the highest total score will rank first;
2. If the total score is the same, the student with the highest score will be ranked first in the order of module C, Module A, module B, module E, module D, module F, and module G.

If the priority cannot be ranked according to the above two rules, the

candidate with the shorter cumulative time will be ranked first.

3.3 Evaluation Basis

During the design process of the competition, the selection of criteria and evaluation methods will be determined through the scoring scheme and test items.

Evaluation basis, including but not limited to:

Reverse tool usage.

Correctness and standardization of hand-drawn and visual modeling.

Proficiency in using CrownCAD platform.

3D printing and post-processing, NC programming and product processing.

Product verification and product source tracing.

4 projects

4.1 Project format/frame

A project is made up of seven relatively independent and linked modules:

Module A: Data acquisition, data processing

Module B: Reverse 3D modeling

Module C: Forward modeling and Innovative design

Module D: 3D Printing and Post-processing

Module E: Numerical control programming and Product processing

Module F: Assembly verification

Module G: Product verification and source tracing

4.2 Project time allocation and score weight

The module	Duration (min)	Point weight (%)
Module A: Data acquisition, data processing	120	15
Module B: Reverse 3D modeling	120	15
Module C: Forward Modeling and Innovative design	240	40
Module D: 3D Printing and post-processing	120	5
Module E: Numerical control programming and product processing	210	15
Module F: Assembly verification	120	5
Module G: Product verification and tracing source acquisition	30	5
A combined	960	100

4.3 Job content and requirements for each module

The industrial design Technology competition is composed of seven modules, including: data acquisition, data processing, reverse 3D modeling, forward modeling and innovative design, printing and post-processing, numerical control programming and product processing, assembly verification, product verification and source tracing to comprehensively examine the industrial design technical ability of the competitors.

Module Number	Module Name	Operating range
A	Data acquisition, data processing	<p>3D scanning device and accessories are used to scan the physical objects specified by the job to obtain the point cloud data, and the obtained point cloud is selected accordingly. The point cloud file is saved after removing the noise and redundant points.</p>
B	Reverse 3D modeling	<p>Using the data collected in module A, CrownCAD software is used to build A 3D digital model for the external surface of the object.</p>
C	Forward modeling and innovative design	<p>Use the given parts engineering drawing to carry out the forward 3D modeling of the product, and combine the relevant knowledge to carry out the structural and functional innovation design according to the requirements of the task book. Hand-drawn brief engineering drawing and 3D modeling using CrownCAD.</p>

D	Printing and post-processing	The module B reverse modeling file is used to print the samples with the 3D printing equipment specified in the field, and the printed samples are removed for support, surface dressing and other post-processing to ensure that the quality of the parts meets the requirements.
E	Numerical control programming and product processing	According to the three-dimensional digital model established by module C and the processing conditions of machine tools, cutting tools and blanks specified in the field, the technology of the specified samples is analyzed, the processing process is formulated, the processing procedure card is prepared, and the numerical control processing program is prepared according to the formulated process using automatic programming software.
F	Assembly validation	The samples obtained by adding or reducing materials are assembled as a whole with other physical bodies to verify the effect of

		innovative design.
G	Product verification and tracing source acquisition	Verify and obtain the product traceability of the designed products through the future network.

4.4 Project Announcement

The project will be announced on the competition website or by other means approved by the organizing committee.

4.5 Project Changes

Before the competition, the project will be changed by 30%.

5.Skills management and communication

5.1 the panel

The Skills Expert group consists of the chief expert, deputy chief expert and expert members, who are responsible for jointly revising the technical documents of the remote final of this competition and daily skills management.

5.2 Discussion Forum

Before the competition, the participants can enter the forum section of the industrial design technology training competition platform for feedback on the hardware and software preparation, examination environment deployment and other related questions. The training and communication of the competition, before, during and after the competition will also be carried out through the

forum.

Online communication will be conducted using instant messaging tool WhatsApp (alternative: wechat International edition) and conference tool Zoom (alternative: Tencent Conference International edition).

6.Safety requirements

Comply with the hardware and software environment safety requirements of competition venues.

7.Materials and equipment

7.1 List of infrastructure

The list of infrastructure details all the equipment and facilities to be prepared by the participants, see "List of Infrastructure for the Offline Finals of the 2022 BRICS Skills Competition".

7.2 Site and workstation layout

7.2.1 Test location layout requirements

The test place table should be arranged in a quiet, non-interference, well-lit and non-blocking environment. The test computer should be placed in the middle of the test place table, a seat for one person should be placed in the test place table, and the national flag should be placed on the test place table.

7.2.2 Requirements for the layout of mobile monitoring equipment

The center line of mobile monitoring device 1 is required to be at a 45°

Angle with the plane of the competition operation display, which can monitor the competition operation display and the side face of players. The monitoring distance is guaranteed to be within 1 meter around the test position, and the height is about 1.5 meters.

Mobile monitoring device 2 is placed on the test table, and its center line is required to be at a 45° Angle to the match operation display plane. It is required to present the complete match picture of the monitor to the maximum extent (the match picture of the monitor should be filled with the picture of the mobile monitoring device 2 as much as possible).

Compaction name: Industrial Design Technology

Workstation's area: 5 m²

Workstation's layout:

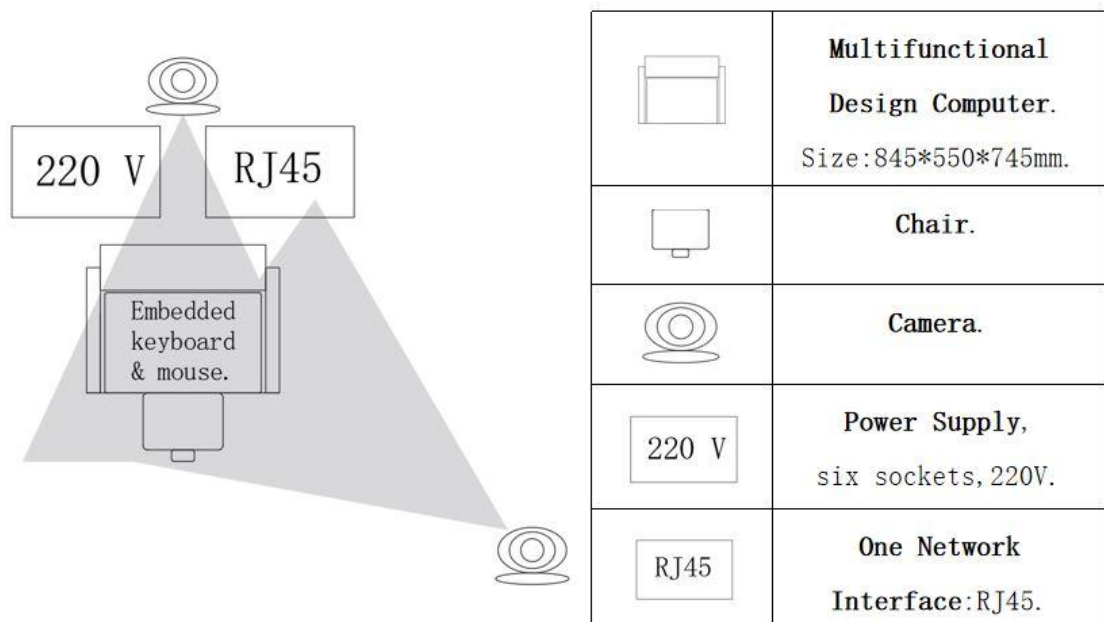


FIG. 7.1 Layout of match table units

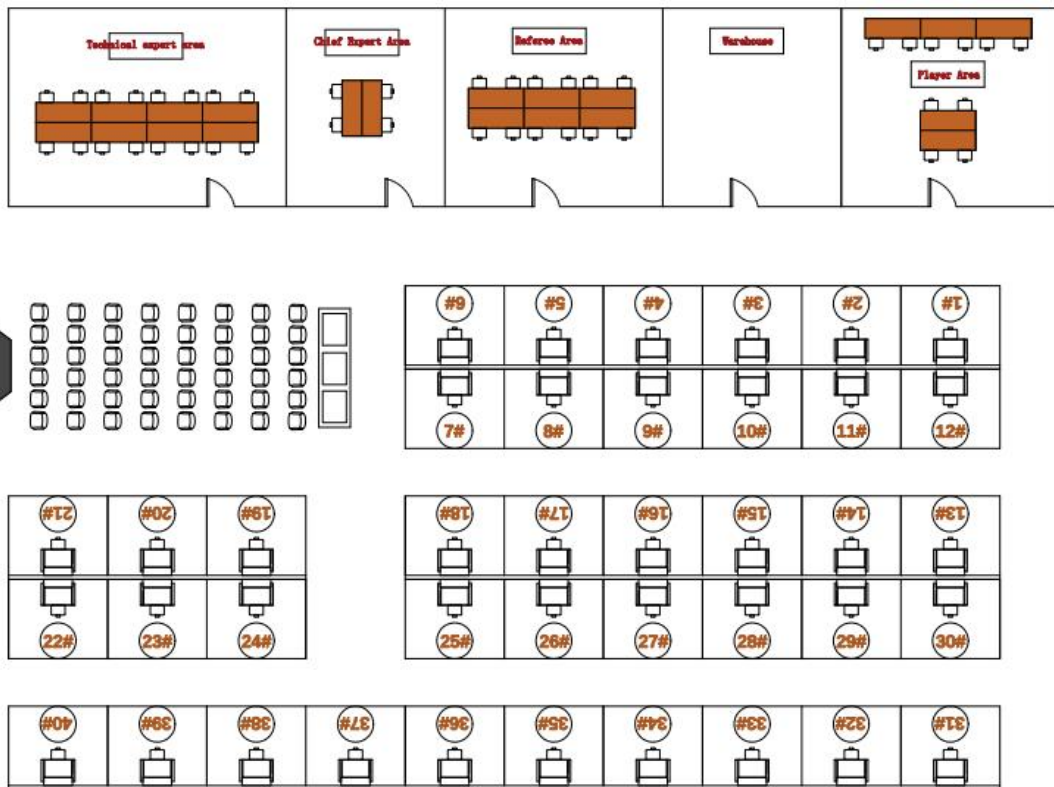


Figure 7.2 Overall layout of race positions

7.3 Materials and equipment prohibited in the skill area

Any materials and equipment brought by the participant should be declared (presented) to the expert. The expert may prohibit the use of any item that is not relevant to the performance of the task or that may give an unfair advantage to a competitor.