Test Project

Part A - Module descriptions and Competitors instructions

Refrigeration and Air Conditioning

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WSC2026_TP38_en

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Introduction to Test Project

This Test Project was developed by Independent Test Project Designers.

Part A – Module descriptions and Competitors instructions will be released by WorldSkills International to the Experts, Interpreters, and Competitors one month prior to the Competition to enable it to be translated into the Competitors preferred language.

Part B – Specifications and drawings will be released by the Skill Competition Manager to the:

1. Experts at the Competition (C-4)
2. Competitors at the Competition (C-2)

This Test Project reflects the best international practice as described by the Technical Description and the WorldSkills Occupational Standards. The Test Project's Marking Scheme will for the most part assess and allocate marks to those skills that are set out in the WorldSkills Occupational Standards.

Description of project and tasks

The Test Project is a series of standalone modules.

There are four (4) modules to complete in the 15 hours of Competition over four (4) days.

MODULE	TIME ALLOWED
Module A - System installation and commissioning	3 hours 30 minutes
Module B - Refrigeration systems electrical fault-finding	2 hours 15 minutes
Module C - Component fabrication and brazing	2 hours 15 minutes
Module D - Refrigeration system fault finding and repair	7 hours

Competitors, please note the following mandatory requirements:

Only **Part A** and **Part B** paperwork is **permitted** in your Competition work area.

No additional materials of any kind are allowed. This includes but is not limited to personal notes, pressure/temperature charts, other manufacturer's literature, printed or handwritten reference materials, or any other **unauthorized** written or printed documents.

Part A and Part B paperwork must always remain on-site. They must not be copied, photographed, scanned, or transmitted in any form, including digital or verbal transmission.

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Instructions to the Competitor

Time allowed for each module

To enable all Competitors to complete the modules, they must carry them out in the times allocated in the competition timetable. For modules A, C and D, a work area pack-up and toolbox inspection time of 15 minutes is scheduled in the total timetable competition time. A STOP WORK call will be announced to start pack-up.

Modules B and **C** will be completed on day **C4** with ALL Competitors on site at the same time, sharing tools and equipment but not the booth space.

Check points

While pipework and electrical wiring system are being installed, the Competitor is free to work autonomously in a safe manner with respect to assessments being completed during (live marking) and outside of competition time.

Competitors **MUST** advise the Experts when they have completed certain tasks, and they **MUST** also perform some tasks in the presence of the Experts, as specified in the Test Project documents.

Therefore, at various points in this Competition, you must inform the relevant Experts to observe and check your work by placing the required coloured card or light button (K6) on your workstation identification.
Once checked, the Experts must place their initial in a progress box (or on your paperwork) as per the example below along with the day number and time.

EXPERT SIGN OFF	
Install Refrigeration major components Day No._____ Time: _____	Expert 1 Initials and Country: Expert 2 Initials and Country: Expert 3 Initials and Country:

Information concerning safety requirements

During the Competition and in the Competition area, all Competitors **MUST** follow the safety rules listed in the Technical Description which are summarized below along with the local Health, Safety, and Environment requirements of the host country.

SHOES

- Fully enclosed safety shoes or boots, oil/acid resistant soles with protective toe caps must be always worn.

CLOTHING

- Legs must be always covered, by either long work trousers or overalls.
- Upper body must be always covered.
- Arms must be covered with long sleeves within the workstation.

SAFETY GLASSES

- Must be worn when necessary to protect your eyes.
- Must be worn when brazing, soldering, filing, reaming, cutting, drilling, grinding, and using refrigerant, dry nitrogen and testing for voltage/current.

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GLOVES

- Suitable hand protection must be worn when brazing, using refrigerants, cutting, filing, drilling or pressure testing.
- Electrical protection gloves must be worn when testing a **live** circuit.

ELECTRICAL

- Competitors must **NOT** switch on (apply power) to any **Test Project** electrical equipment until they receive permission from an Expert, except for the use of hand power tools.

UNSAFE ATTIRE OR PRACTICES

- Any Competitor that is identified by **two** (2) Experts at the **same time** as not wearing the correct Personal Protective Equipment (PPE) or is engaging in any unsafe practice or the misuse of tools and equipment will be stopped and advised on the correct safety practice. The Experts will record this on the Competitor's Health, Safety, and Environment report and will result in a loss of marks.
- If the unsafe working practice is repeated, the Experts will **STOP** the Competitor and report the issue to the Chief Expert. The Competitor will not be allowed to continue until the safety issue is resolved. The Competitor will lose associated safety marks. If the Competitor continues to ignore the safe working practice, they will be removed from the workshop for a safety briefing for ten minutes by the host country Health, Safety, and Environment representative, the time taken to complete the Safety briefing will be a part of the Competitor's Competition time.



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Module A – System installation and commissioning [C1]

Maximum time allowed – 3 hours 30 minutes

Timing

Competitors are to complete the installation on day C1 of the Competition as listed below.

Competition day C1 (3 hours 15 minutes work and 15 minutes toolbox pack-up time at the end) Total 3 hours 30 minutes.

Overview

Competitors are responsible for completing the full installation and commissioning of a self-contained refrigeration/ air conditioning system. You must complete the job using your own knowledge, skills, and professional judgement – consistent with WorldSkills International Standard Assessment Guide (SAG), safe work practices, environmental responsibilities, and Original Equipment Manufacturer (OEM)/system best practices. You are expected to complete all work in a safe, professional manner, maintaining cleanliness, system integrity, and environmental compliance throughout. Where applicable, you must present tasks for progressive assessment and notify the Experts according to the coloured card/light system at your workstation before safely progressing onto the next step.

Assessment

Competitors will be assessed as per Technical Description and the WorldSkills Occupational Standards with weighting on the commissioning and operation of the project. Each task will be assessed by the Experts during Competition time and/or at the end of the allocated day even if the Competitor has not completed it.

Scope

You are required to:

- Install all refrigeration and air conditioning components in accordance with the provided drawings and specifications.
- Build the system to a professional standard, ensuring correct positioning, orientation, support, accessibility, cleanliness, and mechanical integrity.
- Deliver a completed refrigeration circuit that reflects correct pipe sizing, routing, vibration control, insulation quality, and moisture/contaminant prevention.
- Complete all electrical installation work to a standard appropriate for safe energization, conforming to correct polarity, earthing, protection, segregation, and enclosure requirements.
- Demonstrate that the installed system is safe, leak-tight, dry, electrically compliant, and environmentally responsible.
- Perform all tasks associated with system integrity verification, dehydration, refrigerant charging, and preparation for commissioning using appropriate methods and accepted industry practice.
- Once electrical safety is assured, you are ready to bring the system into full operation and commission it against the Test Project design requirements.

EXPERT SIGN OFF	
Refrigeration system installation – Completed Day No._____ Time: _____	Expert 1 Initials and Country: Expert 2 Initials and Country: Expert 3 Initials and Country:

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Commissioning requirements

When the system is ready for operation, you must:

- Notify the Experts before connecting power and energizing the system.
- Start and operate the system while monitoring its operation and recording system conditions.
- Adjust refrigerant charge as needed to obtain stable, efficient, and safe operation aligned with the Test Project Part B design values.
- Verify superheat, liquid subcooling, operating pressures, airflow conditions, and delivered temperatures.
- Complete the Commissioning Report accurately and professionally as per the Test Project Part B Module specifications in the report form supplied.
- After completing the commissioning, leave the unit operational and remove gauges.

EXPERT SIGN OFF	
Refrigeration system commissioning – Completed Day No._____ Time: _____	Expert 1 Initials and Country: Expert 2 Initials and Country: Expert 3 Initials and Country:

Competitor recordings

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Module B – Refrigeration systems electrical fault finding [C4]

Maximum time allowed – 2 hours 15 minutes (2 hours work and 15 minutes pack-up time at the end.)

Start time:	**Experts:**			**Competitor:**
Finish time:	**Experts:**			**Competitor:**
Time taken:	**Experts:**			**Competitor:**

The Competitor and Expert will record the START and FINISH TIMES on the table above for this module.

Scope

This task is to be carried out, and the report filled in by Competitors under supervision by Experts. There are electrical faults on the refrigeration/air conditioning system per the Test Project Part B module specifications drawings and information.

Timing

All Competitors are to complete this module on Competition **Day C4**

Drawings

Refer Test Project Part B, Report findings, Specifications and drawing:

- Fault finding system's specifications and drawings.
- Refrigeration system's electrical fault finds report answers per the Test Project Part B Module specifications.

Assessment

Experts will mark this module progressively while you are carrying it out. Competitors will receive additional points for completing this module in less than the allocated time with all faults correctly identified with correct test readings, and correct testing processes as defined in the Marking Scheme.

EXPERT SIGN OFF	
Electrical fault find – Assessed Day No._____ Time: _____	Expert 1 Initials and Country: Expert 2 Initials and Country: Expert 3 Initials and Country:

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Module C – Component fabrication and brazing [C4]

Maximum time allowed – 2 hours 15 minutes (2 hours work and 15 minutes pack-up time at the end.)

Start time:	**Experts:**			**Competitor:**
Finish time:	**Experts:**			**Competitor:**
Time taken:	**Experts:**			**Competitor:**

The Competitor and Expert will record the START and FINISH TIMES on the table above for this module.

START TIME: _____ **FINISH TIME:** _____

Scope

The Competitors are required to fabricate copper tubing components per the drawing provided in the Test Project Part B Module specifications drawings and information.

Timing

All Competitors are to complete the copper tubing component fabrication on **Competition Day C4,** and it will be marked later that day, whether completed or not in the allocated time.

Drawings

Refer Test Project Part B, drawing: Component fabrication drawing

Assessment

Competitors will be assessed as per Technical Description. The marking scale will reflect dimensions and tolerances for assessment in addition to the quality of brazed joints. The finished component will be pressure tested by the Experts as part of the assessment. Competitors will receive additional points for completing this module in less than the allocated time, as defined in the Marking Scheme.

Instructions

You must inform the relevant Experts when you have completed this fabrication module.

Experts' comments

EXPERT SIGN OFF	
Fabrication - Completed Day No._____ Time: _____	Expert 1 Initials and Country: Expert 2 Initials and Country: Expert 3 Initials and Country:

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Module D – Refrigeration commissioning (C2) and fault finding and repair (C3)

Maximum time allowed – 7 hours (3 hours 15 minutes work and 15 minutes toolbox pack-up time at the end of each day)

Overview

Competitors are responsible for completing the commissioning of a self-contained refrigeration/ air conditioning system by the end of **C2**. Use the "Commissioning report" per the Test Project Part B module specifications to record your system final operation. On day **C3** you will use the same unit for the refrigeration fault find and repair task. You must complete the task using your own knowledge, skills, and professional judgement – consistent with WorldSkills International Standard Assessment Guide (SAG), safe work practices, environmental responsibilities, and OEM/system best practices. You are expected to complete all work in a safe, professional manner, maintaining cleanliness, system integrity, and environmental compliance throughout. Where applicable, you must present tasks for progressive assessment and notify the Experts according to the coloured card/light system at your workstation before safely progressing onto the next step.

Assessment

Competitors will be assessed as per Technical Description and the WorldSkills Occupational Standards with weighting on the commissioning and operation of the project. Each task will be assessed by the Experts during competition time and/or at the end of the allocated day even if the Competitor has not completed it.

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Module D – Task 1 Refrigeration system commissioning (C2)

Competition day C2 (3 hours 15 minutes work and 15 minutes toolbox pack-up time at the end) Total 3 hours 30 minutes.

Scope

Task 1 – Commission and confirm system operation (C2)

Your first responsibility is to evaluate the pre-installed refrigeration system and determine whether it is correctly assembled, safely prepared, and ready for commissioning. Using the drawings and specifications provided in Test Project Part B, following WorldSkills International SAG, safe work practices, environmental responsibilities, and OEM/system best practices, you must:

- Confirm that the installed pipework, components, and electrical connections match the Test Project Part B module specifications documentation.
- Evaluate the system's state, including its holding-pressure condition, electrical installation condition, and overall readiness for commissioning procedures.
- Confirm and record relevant baseline information such as holding pressure or other system indicators appropriate for initial system assessment.
- Release nitrogen safely and responsibly once assessment requirements are met.

All work must be completed with system cleanliness, safety, and environmental responsibility always demonstrated. Notify Experts using the coloured card/light protocol whenever their presence is required for verification for safe progression.

Confirm and record the "holding pressure" of Nitrogen charged

Confirm the holding pressure of the Unit

UNIT HOLDING PRESSURE	QUANTITY	UNIT
Holding pressure:		□ kPa □ psi □ bar □ kg/cm2
Any leaks **detected**?		□ Yes □ No

Competitor recordings

_____
_____
_____
_____
_____
_____
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_____

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Commissioning requirements

When the system is ready for operation, you must:

- Notify the Experts before connecting power and energizing the system.
- Start and operate the system while monitoring its operation and recording system conditions.
- Adjust refrigerant charge as needed to obtain stable, efficient, and safe operation aligned with the Test Project Part B module specifications design values.
- Verify superheat, liquid subcooling, operating pressures, airflow conditions, and delivered temperatures.
- Complete the Commissioning Report, column One (1) accurately and professionally per the Test Project Part B module specifications.
- After completing the commissioning, leave the unit operational and remove gauges.

EXPERT SIGN OFF	
Refrigeration system commissioning – Completed Day No._____ Time: _____	Expert 1 Initials and Country: Expert 2 Initials and Country: Expert 3 Initials and Country:

Competitors' recordings

Module D – Task 2 Refrigeration system fault find and repair (C3)

Timing

Competition day C3 (3 hours 15 minutes work and 15 minutes toolbox pack-up time at the end) Total 3 hours 30 minutes.

Competitors are to complete the unit fault find and repairs on day C3 of the competition as listed below.

Fault find and repair requirements

With the system operational, follow WorldSkills International SAG, safe work practices, environmental responsibilities, and OEM/system best practices.:

- Start and operate the system while monitoring its operation and recording system conditions.
- Once the system refrigeration fault has been accurately identified, list your answer and recordings to justify your reasoning in Test Project Part B.
- Plan and implement the repair using safe work practices, WorldSkills International SAG, OEM expectations, and professional refrigeration service techniques.
- Verify that the repaired system is mechanically and electrically safely completed.
- Bring the system into operation and optimize system performance.
- Complete the Commissioning Report, column Two (2) in Test Project Part B once the system is operating close to design conditions.
- All work must be completed with system cleanliness, safety, and environmental responsibility always demonstrated. Notify Experts using the coloured card/light protocol whenever their presence is required for verification for safe progression.

EXPERT SIGN OFF	
Refrigeration fault find and repair – Completed Day No._____ Time: _____	Expert 1 Initials and Country: Expert 2 Initials and Country: Expert 3 Initials and Country:

Competitor recordings

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