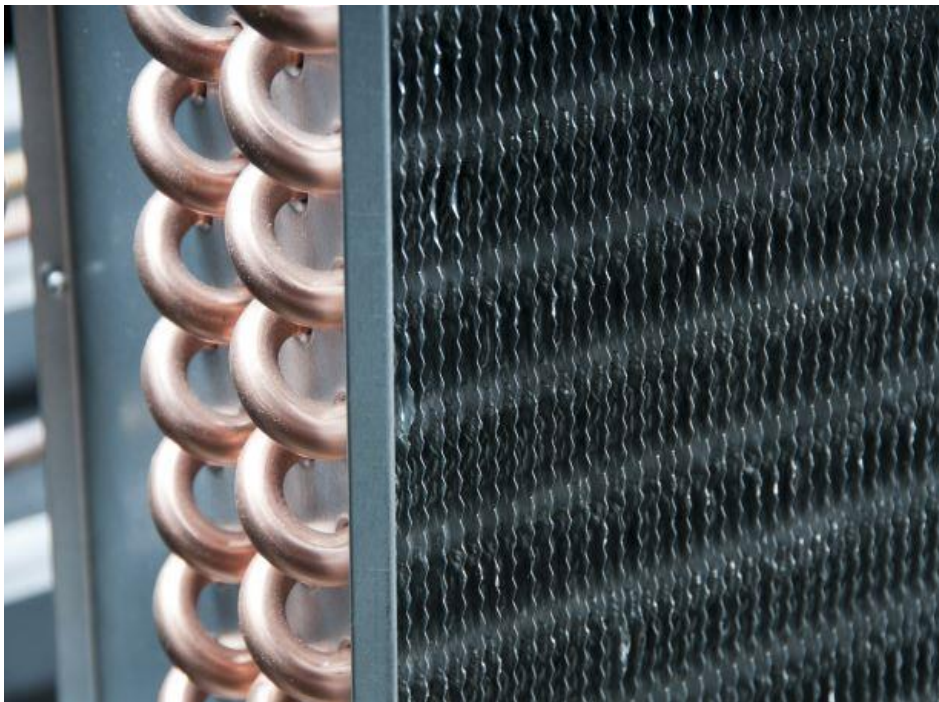


WorldSkills UK RACHP Competition Manual



“Quality In Everything That We Do”

The aim of this manual is to provide advice and guidance to all stakeholders in the preparation for all stages of the refrigeration, air conditioning and heat pump WorldSkills UK National Competition.



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1. Sector Overview

Refrigeration and air conditioning is closely associated with other sectors of the construction and transportation industries and is equally affected by rapid change in these sectors, including growing environmental trends, changing technologies and legislation.

There is a direct relationship between the nature and quality of the product and service required and the resulting cost; therefore, the Refrigeration Air Conditioning and Heat Pump (RACHP) sector of engineering covers a wide range of products and services and continues to expand.

It is also essential for the refrigeration and air conditioning technician to meet high quality and constantly improving standards of service delivery to comply with the requirements of a greener environment, the customer expectations whilst maintaining growth for not only their business but for themselves.

This manual is designed to provide a clear path to follow from pre-registration selection to the UK National finals and potentially beyond.

2. Occupational Profile

The Refrigeration Air Conditioning and Heat Pump (RACHP) Engineering Technician is a specialist occupation involved in planning, preparing and safely carrying out work activities in process, product and space cooling. Knowledge must be transferrable between any of the core activities of refrigeration, air conditioning or heat pumps and the skills of concentration, precision, accuracy, and attention to quality and detail at every step in the process are crucial.

The work is carried out in a variety of applications essential for key UK business activities such as food production, product distribution, retail storage and display, transport and office climate control, manufacturing processes (e.g. petrochemical, pharmaceutical), IT/Datacentres and medical/healthcare services temperature and environmental control.

The key activities are the design, installation, routine maintenance, reactive service, commissioning and de-commissioning of Refrigeration, Air Conditioning and Heat Pump systems. Technicians require a thorough competency in their understanding of the engineering principles of thermodynamics and the vapour compression cycle in order to perform operations. A fully competent technician works without immediate supervision and liaises effectively with other trades and with end users.

Environmental, legislation and technology changes mean that the requirements for technicians in this sector are constantly evolving. European and UK Safety and Environmental legislation are key drivers in rapid technology changes in the sector which is responsible for an estimated 10% of UK greenhouse gas emissions and 16% of electricity use. RACHP Engineering Technicians have important responsibilities for the safety of themselves, work colleagues and the public as well as minimising the environmental impact of cooling systems.

3. Qualifications & Pathways

The only legislative requirement to work with fluorinated gas within the RACHP sector is an individual F-Gas qualification.

However, while we would like to believe that this qualification guarantees consistent high-quality performance from an operative, it unfortunately does not. Therefore, recognised apprenticeship(s) that includes a term of theoretical study along with practical skills training are available.

Apprenticeship standard is available from Institute for Apprenticeships and Technical Education:
<https://www.instituteforapprenticeships.org/>

- Refrigeration air conditioning and heat pump engineering technician

Qualifications available from City and Guilds: <https://www.cityandguilds.com/>

- NVQ Level 2 Diploma in Installing and Maintaining Refrigeration Systems
- NVQ Level 2 Diploma in Installing, Testing and Maintaining Air-Conditioning and Heat Pump Systems
- NVQ Level 3 Certificate in Servicing and Maintaining Air-Conditioning and Heat Pump Systems
- NVQ Level 3 Certificate in Installing and Commissioning Air-Conditioning and Heat Pump Systems
- NVQ Level 3 Diploma in Servicing and Maintaining Refrigeration Systems
- NVQ Level 3 Certificate in Installing and Commissioning Refrigeration Systems

Qualifications available from Scottish Qualifications Authority:
<https://www.sqa.org.uk/sqa/70972.html>

- Install, Commission and Maintain Air Conditioning Systems SCQF level 6
- Install, Commission and Maintain Air Refrigeration Systems SCQF level 6

After successful completion of an apprenticeship programme there is the potential to pursue several progression routes which can lead to:

- Installation technician working towards managerial position
- Service and maintenance technician working towards managerial position
- Contract engineer working towards managerial position
- Project engineer working towards managerial position
- Commissioning engineer working towards managerial position

Once sufficient experience has been gained, further progression could be towards business ownership or consultancy services.

4. Competition Entry Criteria

Eligibility for candidates to register for the WorldSkills UK competition is as follows:

- This is an individual competition, open to candidates who are 16 years of age and over
- Candidates require to be in an employed status
- Candidates require to be working towards a recognised qualification in refrigeration/air conditioning/heat pumps or have achieved such a qualification within the previous 12 months, from the date of competition registration
- Has or will have achieved, a recognised F-Gas category 1 certificate prior to the regional event
- Candidates must not have more than 3 years industry experience, excluding the apprenticeship duration, at the time of registration
- There is no restriction on the maximum number of candidates that are allowed to participate from each organisation in this competition

WorldSkills UK Competition Stages



5. Pre-Registration Selection (Fabrication 1)

This process requires the collaboration of colleges, training providers or employers to identify candidates who they believe to have the correct skills, aptitude and behaviours to progress throughout the competition.

A pre-registration selection skills event requires to be undertaken by the college, training centre or employer, where a fabrication must be produced to identify the candidate's appropriate skillset. A pipework fabrication drawing, marking schedule and material list will be provided which will allow a candidate to complete the fabrication within a fixed time.

It is recommended that candidates scoring 60% and above can put forward for registration for the WorldSkills UK competition.

This skills event will be administered and self-marked by the colleges, training providers or employers. Marking schedules for candidates that are being put forward for registration require to be retained for a period of 6 months from the date of the skills event. Completed marking schedules may be requested by WorldSkills UK or the Competition Organising Partner at any point during the competition.

Once selected for registration, the candidate and their employer require to confirm agreement and commitment to ensure that, if successful, the employer will support the candidate, and that the candidate will be available and willing to progress through each stage of the competition. This agreement and commitment is achieved by agreeing to the WorldSkills UK terms and conditions.

6. Guidance for Appropriate Candidate Identification

In order to assist in selecting the most appropriate candidate for the WorldSkills UK competition, a list of attributes and requirements has been compiled to support the identification of an ideal entrant. Although it is understood that a candidate may not possess every single attribute listed, the goal is for the candidate to exhibit as many of these qualities as possible.

This list is not exhaustive, it serves as a guideline to ensure that individuals who have the greatest potential to excel and represent the RACHP sector in the competition.

- Able to operate specialist tools such as vacuum pump, recovery unit, nitrogen equipment for pressure testing
- Able to operate flame brazing equipment such as oxygen and propane/acetylene, MAPP gas
- Demonstrates accuracy when taking and applying measurements
- Understands RAC theory of basic system operation
- Motivated in the further education environment
- Motivated in the working environment
- Demonstrates adaptation to changing environments
- Maintains a calm demeanor when working under pressure
- Maintains a calm demeanor when problem solving
- Anticipates before acting
- Motivated to complete work within time schedules
- Produces quality work to standards
- Demonstrates good communication skills
- Demonstrates good interpersonal skills
- Demonstrates a high level of capability and flexibility
- Demonstrates confidence
- Demonstrates a professional attitude
- Demonstrates responsibility for own work
- Commitment to continued professional development
- Respectful of others
- Encouraging and supportive employer

7. Competition Registration

Once the identity of the candidate's appropriate skillset has been confirmed, those wishing to participate can register for the WorldSkills UK competition. The registration process opens late February/early March each year and typically runs for a four week period.

Registration details and information can be found at:

<https://www.worldskillsuk.org/competitions/refrigeration/>

All online registrations require to be submitted prior to the advertised closing date.

All candidates registered will receive a notification by email that they require to complete registration by agreeing to the WorldSkills UK terms and conditions.

This agreement to the terms and conditions is mandatory and forms part of the General Data Protection Regulations and Data Protection rules.

If the candidate does not agree then their registration is not complete, and their details cannot be shared with the Competition Organising Partner and as a result this will end their participation in the competition.

8. Pre-Qualifier Selection

During the month of April, all successful candidate registrants will be invited to undertake a pre qualifier selection test. This test will be in the form of an invigilated online multiple-choice question paper designed to demonstrate the candidate's knowledge.

The highest scoring candidates will qualify to attend the WorldSkills UK Qualifier Heat(s).

9. Training (Fabrication 2)

It is recommended that the candidates qualifying to attend the WorldSkills UK Qualifier Heat(s) undertake a staged process of training to include:

- Fabrication of pipework
- Pressure testing
- Evacuation
- Charging and recovery of refrigerants

A fabrication training test, complete with tools and material list and a marking schedule has been designed for colleges, training providers and employers to help prepare candidates for the qualifier heat. The fabrication training test includes a fabrication task to assess the candidate's ability to create offset bends and evaluate their knowledge of pressure testing. The completed fabrication can also be used to demonstrate evacuation.

Colleges, training providers and employers can request the documentation for the fabrication training test from the Competition Organising Partner.

10. WorldSkills UK National Qualifier Heat(s)

The WorldSkills UK National Qualifier Heat(s) will be held at a suitable identified venue(s).

The purpose of the WorldSkills UK National Qualifier Heat(s) is to evaluate the proficiency and expertise of the candidates, up to eight of the highest scoring candidates, who have achieved the 50% and above benchmark, will be invited to compete at the WorldSkills UK National Final.

In the event of tied scoring at the completion of the qualifier heat(s), then the results from the pre-qualifier selection test can be utilised to assist in decision making.

The typical set up of a National Qualifier Heat will be:

Time	Activity
08:00	Arrival
08:15 – 08:30	Induction and competition introduction
08:30 – 09:00	Familiarisation with tools, material and equipment
09:00 – 11:30	Skills competition task A or B – 2.5 hours
11:30 – 12:30	Lunch
12:30 – 13:00	Familiarisation with tools, material and equipment
13:00 – 15:30	Skills competition task A or B – 2.5 hours
15:30 – 16:30	Marking and feedback to candidates
16:30 – 17:00	Depart

All candidate output from the tasks will be assessed by the judges against a marking schedule, a typical overview of a marking schedule for a National Qualifier Heat will be:

Weighting	Aspect	Criteria	Maximum marks
1	C	Electrical Wiring & Control Fault Finding	12
2	D	Pressure Testing & Evacuation (refrigeration)	14
3	E	Charging Refrigerant (emission control)	16
4	F	Refrigeration System Commissioning (efficient setup)	20
5	B	Refrigerant Recovery (emission control)	16
6	A	Pipework Fabrication	22
		Total marks	100

The marking schedule may be revised for an annual cycle of the competition but will be consistently applied across all National Qualifier Heat(s) within a cycle.

Safety is paramount during the competition. Therefore, if a judge determines that a competitor has breached or is about to breach a safety critical factor then that judge has the authority to stop that particular task immediately. The competitor will not be able earn any further marks for that task.

10.1. Core Competences

The WorldSkills National Qualifier Heat(s) is designed to allow the competitor to demonstrate the following skills and knowledge:

- Work safely
- Follow detailed work plans and instructions
- Perform calculations
- Measure, cut and fabricate with materials used in RACHP industry
- Assemble pipe work and components to prescribed instructions
- Join materials using non-permanent mechanical fixing methods (flare)
- Join materials using permanent non mechanical methods (braze, solder)
- Pressure test pipe work and components to BSEN 378 standard
- Evacuation to industry standards
- Test control wiring and basic components for electrical faults
- Interpret simple ladder/connection wiring diagrams for RACHP systems
- Correct use of tools, materials and components used in the RACHP industry
- Completion of commissioning sheets and F-Gas records (communication)
- Refrigerant Recovery, Charging, Leak testing and record completion (F-Gas cat 1)
- Analyse information to overcome challenges (problem solve)
- Analyse system operation and use test instruments to fault find

10.2. Overview of Competition Tasks

Pipework Fabrication

Candidates are expected to maintain a safe working environment and use a systematic approach to complete a fabrication according to a detailed drawing, within a specified timeframe.

The fabrication utilises both permanent (brazed) and non-permanent mechanical joints (flared), including various pipe bending techniques and flame brazing of fittings using both 15% and 40% silver/copper alloy to create a sealed system that will undergo pressure testing.

Soft copper pipe, along with additional materials and components will be provided.

Electrical Testing and Fault Finding

Candidates are expected to maintain a safe working environment whilst undertaking electrical testing and fault finding, which can be on the same system utilised for refrigerant handling.

The system needs to be tested to ensure it does not trip out the main power breaker when energised.

Functional tests must confirm that no voltage is present before testing for earth continuity.

All terminations require to be checked, and an electrical test record completed.

Refrigerant Handling

Candidates are expected to maintain a safe working environment whilst handling refrigerants when working on an existing system. The activities undertaken will be recovery, pressure testing, evacuation and adding refrigerant into the system, during the competition these activities may be prescribed in any order.

Specific documents will be required to be completed to record and provide evidence of the actions undertaken, such as:

- F-Gas Records
- Pressure Test Record
- Evacuation Test Record
- Commissioning Test Record

Refrigerant must not be contaminated by adding any non-condensable gasses during recovery and charging must demonstrate best practice to avoid refrigerant emissions to atmosphere.

10.3. Judging

To ensure the integrity and standard of the competition, the WorldSkills UK National Qualifier heat(s) will be judged by independent industry personnel against a consistent marking schedule. External verification of the National Qualifier heat(s) will be conducted by WorldSkills UK staff.

10.4. Additional Guidance

A competition training guide is available from the Competition Organising Partner which contains useful hints and tips for what the judges are looking for and the quality of work and tolerances connected to the marking schedule.

11. WorldSkills UK Final Preparation

A one day training event will be organised for those competing in the final, the training will be designed to enhance the competitor's preparation for the WorldSkills UK Final. This training will be scheduled for September/October with additional details provided closer to the event.

The training event will be supported by WorldSkills UK, Competition Organising Partner and Sponsors. The typical makeup of the event may be:

- WorldSkills UK competition brief, detailing the expectation and management of the WorldSkills UK Final
- WorldSkills UK competition rules and requirements
- Health and Safety requirements for the duration of the competition
- RACHP system principles training for efficient system set up
- Flame brazing training for similar and dissimilar metals
- Electrical installation

12. WorldSkills UK Final

The WorldSkills UK Final is held in the month of November each year, the competition generally runs over a three day period with the candidates expected to arrive the day prior to the start, in order to undertake an induction and familiarisation session.

Candidates will be competing for the individual gold medal and the RACHP UK award, sponsors also provide awards for all taking part in the competition.

13. Beyond the WorldSkills UK Final

The WorldSkills UK national finals serve as part of the selection process for WorldSkills International competitions, identifying potential UK squad members for future WorldSkills competitions.

WorldSkills International training managers will be onsite at competitions, monitoring the performance of age-eligible candidates. Those who demonstrate exceptional skills, passion, and drive may be invited to train for EuroSkills and/or WorldSkills international competitions.

For full eligibility details, visit the WorldSkills International website at www.worldskills.org. Age-eligible candidates will be notified during the competition.

Candidates not eligible for international events may join the Champions programme, offering continued involvement and opportunities to inspire the next generation by engaging with schools, colleges, and events.

Alternatively, if you're interested in training, consider supporting WorldSkills UK by helping organise and run the National finals.

Get inspired and join Team UK today!

14. Judges Top Tips

Preparation and Practice

A successful competitor must be confident, calm and self-assured when competing. Practice skills and techniques thoroughly to achieve the desired standards and results, minimising any unexpected issues.

Time Management

Effective time management is crucial for completing tasks efficiently. Focus on working smart rather than fast. Practice adhering to the allocated times and handling pressure to perfect timings. Running out of time during a competition will result in lost marks.

Planning

Develop individual plans for completing each task, work methodically and even write them down to aid preparation. Copying another competitor is not beneficial.

Organisation

Ensure all stages of a task can be completed efficiently by organising all necessary equipment and materials in advance.

Health and Safety

It is everyone's responsibility to ensure the use of appropriate personal protective equipment (PPE) for each task and to maintain safe working practices.

Clean and Tidy

Maintaining a tidy work area enhances efficiency and eliminates hazards. Ensure that all work presented to the judges is clean and ready for final assessment.

Understanding

Thoroughly read the instructions to ensure a clear understanding of the requirements and don't hesitate to ask questions to seek clarification.

Concentration

If a part of the task has not went to plan, do not dwell on it, draw a line under it and proceed with the next task. Concentrate on the marks that can be gained not on what marks that might have been lost.

Enjoy

Reaching the WorldSkills UK Qualifier Heats is a significant achievement and a source of pride. Make the most of the experience attending a WorldSkills competition.

Further top tips can be found in the "Competition Technical Handbook for WorldSkills UK National Qualifier" which is available from the Competition Organising Partner.

15. Competition Rules and Code of Conduct

To ensure the display of the expected standards, practices and rules, all candidates are required to be fully aware and act in accordance with the following competition rules and code of conduct. This aims to ensure fairness, transparency, and equality, and must be observed at all competitions organised by the Competition Organising Partner (COP) and its associates. Breaches of these rules may lead to the exclusion from the competition.

The following competition rules and code of conduct are in addition to those applied by WorldSkills UK.

1. Candidates are expected to always demonstrate exemplary and professional conduct, in their work practices, communication with judges, communication with the skills team and other candidates or general members of the public. This applies to any activity or location associated with the competition such as, competition venue, accommodation, restaurant
2. Dress code is smart casual
3. The design and specification of all competition tasks are the property of the COP. Unauthorised copying, use or removal is not permitted unless prior written permission has been obtained from the COP
4. The COP and its sponsors/supporters reserve the right to prohibit any unauthorized use of promotional materials within the competition area
5. Candidates may be required to cover the cost of accommodation and travel to and from the competition venue
6. Where accommodation is provided by the COP and its sponsors/supporters, it is for competitor sole use only
7. Where accommodation is provided by the COP and its sponsors/supporters, high standards of occupancy is expected, damages and/or breakages that may occur are the responsibility of the competitor
8. Candidates are required to be punctual for the start and duration of the competition day
9. Candidates will be provided with an identification badge this requires to be worn when outside of the competition area
10. The use of alcohol and non-prescribed drugs is not permitted at any time during a competition event
11. Candidates shall always observe health and safety requirements
12. All accidents and sickness shall be brought to the attention of the COP
13. It is the responsibility of the competitor to use and wear the appropriate personal protective equipment during the competition event
14. Smoking and or vaping is only permitted within approved designated areas
15. Mobile telephones or recording devices cannot be used within the competition area unless authorised by the COP

16. All breaks shall be taken away from the competition area. Breaks should not be used to view other competitor's work/work area
17. Candidates shall not discuss competition drawings or tasks with any third party during the competition timeframe
18. Candidates shall not get involved in conversations with third parties during the competition timeframe
19. Candidates may only leave the competition area for designated breaks, any person wishing to leave the stand at any other time should obtain permission from the COP
20. Candidates are prohibited from using pre-drawn plans/templates/photos within the competition area
21. Candidates shall not borrow tools or test equipment from another competitor unless authorised by a judge
22. Candidates must request that a judge witnesses specific test procedures during the competition
23. Candidates shall ensure that all working areas are left clean and tidy at the end of each day
24. Photographs or video taken during the competition by the COP and its sponsors/supporters may be used for marketing and promotional purposes, prior consent from candidates will be obtained.
25. Where required, WorldSkills UK will provide arbitration to any disputes identified