

ACRIB training specification for flammable refrigerants (Classification A2L, A2, & A3)

Purpose of this specification

This document has been prepared by representatives of refrigeration, air conditioning and heat pump trade associations and professional institutes to provide a specification against which national qualifications and assessments may be developed. Permission to use this specification and to identify any resulting training course, qualifications or assessment products as having been developed in accordance with the ACRIB industry specification may be granted subject to written permission of the ACRIB Board.

It is a requirement that anyone undertaking training based on this specification already holds an F-Gas Certificate. This specification is designed to support **knowledge-based** assessment, candidates already having conducted practical assessment in F-Gas certification. Assessment organisation developing qualifications or delivery centres delivering training may develop complementary specifications for practical assessments. See note on Assessment in Appendix 1.

Scope

Understand properties of and the application of **all** A2L, A2 and A3 class flammable refrigerants. Including:

- RAC system installation, testing, servicing and maintenance techniques
- Specific requirements when using different refrigerant classifications in various applications

Assessment specification

1. *Understand the different classes of flammability as recognised by legislation, safety standards such as BS EN 378, ISO5149, BS EN 60335 and manufacturers' instructions. Understand specific health and safety requirements which apply to A2, A2L, A3 refrigerants used in stationary Refrigeration, Air Conditioning and Heat Pumps systems.*

Assessment criteria

The learner can:

1.1 identify the hazards associated with these refrigerants:

- flammability
- low boiling point
- asphyxiation
- LFL
- UFL
- sources of ignition
- practical limits
- density

1.2 state and identify the commonly used refrigerant designations (eg "R" numbers, toxicity and flammability class)

1.3 state the requirements of specific risk assessments

1.4 identify the appropriate fire extinguishers for work on RACHP systems

2. Understand the legislative and organisational procedures for installation, servicing, maintaining and de-commissioning of these refrigerants in RACHP systems

Assessment criteria

The learner can:

- 2.1 state the appropriate sources of health and safety information when installing, servicing, maintaining and de-commissioning of RACHP systems
- 2.2 state the regulations, codes of practice, and industry recommendations appropriate to the installation, servicing, maintaining and de-commissioning of RACHP systems, including working with refrigerants
- 2.3 state the location classification and charge limits for RACHP systems
- 2.4 state charge size limitations for human comfort cooling and heating for air conditioning systems.

3. Understand the differences between different refrigerant classes in a variety of RACHP systems

Assessment criteria

The learner can:

- 3.1 identify the specific system features and components which apply to RACHP systems:
 - electrical devices
 - electrical enclosures
 - associated electrical devices (including devices specifically designed for use with flammable refrigerants)
 - compressors (including starter and associated electrics)
- 3.2 identify the features and characteristics of:
 - critical charge systems
 - oil compatibility
- 3.3 state the properties, advantages and disadvantages of different classes of refrigerants including:
 - leakage implications (direct and indirect)
 - thermodynamic properties
 - cooling capacity and energy efficiency
 - density
 - odour
- 3.4 explain why these refrigerants are not suitable for retro-filling
- 3.5 identify typical applications of RACHP systems

4. Understand the procedures for planning and preparing for work on RACHP systems

Assessment criteria

The learner can:

- 4.1 state the requirements for completing a risk assessment for work on RACHP systems
- 4.2 state the requirements for creating and maintaining a safe working area
- 4.3 identify appropriate tools and equipment for work on RACHP systems.

5. Be able to plan and prepare for work on RACHP systems

Assessment criteria

The learner can:

- 5.1 understand the location specific requirements of risk assessment
- 5.2 establish and maintain a safe working area

5.3 select tools, equipment and PPE for work on RACHP systems which are suitable for the refrigerant (including but not limited to refrigerant detector, ventilation fan, vacuum pump and recovery unit)

6. Understand the specific requirements for installing and testing RACHP systems

Assessment criteria

The learner can:

- 6.1 identify access category as designated in safety standards (BS EN 378, ISO 5149)
- 6.2 understand that maximum refrigerant charge is based on location classification
- 6.3 understand that the calculation of the maximum charge is based on the toxicity and practical limit
- 6.4 understand the use of calculations to determine the system specific maximum charge
- 6.5 state the methods and procedures for:
 - strength testing
 - tightness testing
 - leak testing
 - evacuation and dehydration
- 6.6 state the procedures for charging refrigerant into systems
- 6.7 state the procedures for determining when charge is correct
- 6.8 state the records to be completed prior to handover
- 6.9 state the requirements for system labelling
- 6.10 understand the importance of following manufacturers' installation instructions
- 6.11 specify the information that should be provided to customers, including:
 - operation of system and controls
 - using only appropriately trained servicing personnel
 - restrictions on the relocation of equipment
 - compliance with the F-Gas Regulation where appropriate

7. Understand service and maintenance procedures

Assessment criteria

The learner can:

- 7.1 identify manufacturers' recommended replacement components for the following:
 - electrical devices
 - electrical enclosures
 - associated electrical devices
 - compressors (including starter and associated electrics)
- 7.2 state the importance of maintaining the integrity of certified electrical equipment
- 7.3 state appropriate methods for accessing and sealing RACHP systems
- 7.4 specify the requirements for recovering refrigerant with regard to safety and environmental implications (including situations where it may be safe to vent less than 0.15kg of hydrocarbon refrigerant to atmosphere)
- 7.5 state the requirements for the safe use of recovery machines
- 7.6 state the requirements for the safe use of vacuum pumps

8. Be able to service and maintain RACHP systems

Assessment criteria

The learner can:

8.1 calculate the safe fill weight for the recovery cylinder (density difference between refrigerants)

The learner understands how to:

8.2 connect equipment in preparation for recovery

8.3 recover refrigerant to a prescribed pressure

8.4 follow a procedure by which they purge the circuit with inert gas (eg oxygen free nitrogen OFN), evacuate the circuit to a pressure of 0.3 abs, purge the circuit a second time with inert gas (eg OFN)

8.5 remove the specified component while monitoring lower flammability level

8.6 replace the specified component while purging OFN through pipework if brazing

8.7 prove system is leak tight (containment)

8.8 evacuate to below 2000 microns

8.9 re-charge with specified refrigerant weight

8.10 run system and check operation

8.11 remove charging equipment

8.12 seal system and complete leak test with appropriate equipment

The learner can:

8.13 complete service records as appropriate.

9. Understand the decommissioning procedures for RACHP systems

Assessment criteria

The learner can:

9.1 identify the safe procedures for handling, storage and disposal or recovery of refrigerant and other potentially hazardous materials

9.2 identify work sequences for decommissioning and making a system safe in accordance with appropriate industry procedures and manufacturers' instructions



Appendix 1 – Training Delivery and Assessment

1.1 Organisations wishing to use this specification must have in place processes to:

- Develop qualifications and assessments (theoretical and if required practical) based on this specification.
- Issue Certificates to those who pass assessments clearly stating that the qualification meets the ACRIB specification.
- Inspect and approve Training organisations who might wish to deliver the qualifications to ensure that they meet the recommended technical requirements of assessors below.
- Manage quality assurance and standardisation of delivery and assessment by Training providers to authenticate assessments and ensure independence of decision making such as monitoring and reporting procedures by training providers and both internal and external verification processes.
- Consult with industry on qualification content, delivery and assessment methods on an on-going basis and update these based on any changes made to this specification by industry in the future.

1.2 Organisations delivering training to this specification must meet these minimum requirements for Training delivery staff:

- Evidence of technical knowledge in RACHP to Level 3 or above, including evidence of their competence to deliver training for all classifications of flammable refrigerants.
- Evidence of having worked in a RACHP technical occupation within the past 10 years (eg refrigeration, air conditioning or heat pump technician, service/maintenance engineer, installer).
- Membership at any level of a relevant professional engineering institute is required to demonstrate that they are actively keeping their knowledge of technical developments in RACHP up to date.
- Must hold a nationally recognised qualification in assessment such as Level 3 Certificate in Assessing Vocational Achievement (earlier qualifications are accepted provided they are supported with evidence of CPD to the current standard).
- Training centres used for instruction or assessment must have access to suitable equipment and safety processes in place to deliver practical training to this specification.



Appendix 2 – About ACRIB

Trade associations and professional institutes operating in the RACHP sector are brought together under the ACRIB umbrella to represent all aspects of the RACHP industry. ACRIB's scope includes manufacturers, contractors, scientists and a range of end users in building services, construction, cold storage, transport, distribution, industrial and commercial refrigeration, and heat pumping.

The aims and objectives of ACRIB are pursued through committees and working groups, all of which report to the Board. The three main areas of activity are: environment and energy, education and training and technical safety and standards. Its activities include:

- Operating a widely recognised safe refrigerant handling certification scheme as part of the Engineering Services SKILLCard scheme
- Maintaining active membership of EPEE, the European Partnership for Energy and the Environment
- Working with employers, the Department for Business Energy and Industrial Strategy, Department for Communities and Local Government and Awarding organisations City & Guilds, BESA and Logical on qualification development and quality assurance matters
- Responding to issues such as system efficiency and safety, performance standards, food safety and safety at work, Government consultations and inquiries
- Advising UK Government on the implementation of regulations and legislation through regular liaison with DEFRA and the Environment Agency

Air Conditioning and Refrigeration Industry Board member organisations



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Company number 3136325

VAT registration 143 0867 21