Refrigeration Air Conditioning and Heat Pump (RACHP) DRAFT 3

Design and Applications Engineer Higher Level Apprenticeship

1. Typical job titles -

Refrigeration or Air Conditioning: Design Engineer, Applications Engineer, Technical Sales Engineer, Project Engineer, Technical Support Engineer, Research & Development Engineer, Consulting Engineer, Systems Engineer, Environmental Engineer.

2. Occupational profile -

- The RACHP Design and Applications Engineer is a specialist occupation responsible for the design and selection of systems and technologies in a range of engineering applications (eg production, distribution, storage or display of products and food and building or process climate control).
- Engineers are responsible for interpreting customers' cooling requirements, taking into account changing technologies and regulatory requirements. They are responsible for ensuring a system delivers efficient, reliable, safe and low environmental impact cooling.
- This requires practical experience and advanced knowledge of complex technologies and their use within a wide range of manufacturing and design applications.
- Engineers at this level often work internationally and may have to specify equipment or manage contracts working across International design standards.
- This occupation requires rigorous and substantial training to achieve full competence in order to demonstrate specialist knowledge and experience gained by seeing projects through to completion. This will involve off-the-job training in association with a University.
- Apprentices must gain sufficient transferrable skills to perform this role in an employer of any size or sub-sector. The employers are considering a delivery method that would include work placements in different types of organisation to ensure this transferability of skills.

3. Requirements: Knowledge, Skills and Behaviours –

Knowledge	What is required
Legislation, Regulations and Standards	• Thorough knowledge of how to design systems in accordance with relevant UK or international standards, technical and environmental legislation including health & safety, environmental protection, working with pressure systems, electrical circuits and flammable substances. • Working knowledge and commitment to complying with industry Codes of Practice and other sources of up to date information and advice on technical safety and legislation related to their work.
Underpinning principles	• Sound understanding of impact on systems design of thermodynamics, gas laws, psychometrics, fluid flow, heat transfer, heating and cooling integration, electricity, properties of refrigerant fluids and lubricants, mechanical fluid handling and local conditions/requirements. • Sound understanding of refrigeration cycles. • Awareness of issues and opportunities of integrated utilities, acoustics and vibration, materials properties, and balancing heating and cooling demands.
Data analysis	• How diagrams, calculations, tools, charts, tables and formulae are used in the design process. Appreciation of data use in commissioning, and fault finding.
System design fundamentals	• Understanding how individual components should be integrated into an effective system including hydraulic pipework. • Integration with specialist consultants involved in the design process including architects, building services, heating and ventilation and structural engineers
Planning	• Critical path project planning, resourcing, costing & financial awareness.
Sustainability	• Understanding of total environmental impact of RACHP systems, including total life cycle costing, direct and indirect carbon emissions. • Maximise the opportunity for heat recovery, the integration of heating and cooling, and minimising cooling/heat loads. • Up to date knowledge of new and emerging technologies and design principles to reduce the environmental impact of equipment/systems.

Skills	What is required
Safe working practices	• Plan and manage the work of all members of a design team with due regard to safe working practices and assessment of risks.
Computer literacy	• Ability to use software (eg Excel, CAD), charts, tables for modelling, component and pipe sizing, preparing load calculations, and to prepare and interpret design drawings.
Project and team management	• Interpreting end user requirements, applications and processes to prepare, propose and adjust suitable design options and specifications. • Participating in and managing multidisciplinary teams involved in the design process. • Strong communications and presentations skills.
Application of design process	• To follow through on design process to ensure the delivery to meet customer requirements. • Use of control strategies, troubleshooting methodology, control logic and sequencing.
Sustainable system operation	• Interpreting system operating parameters to ensure efficient performance against design expectations and to achieve measurable and sustained reductions in carbon emissions**.**
Behaviours	**What is required**
Safety management	• Manage and apply safe working practices - take responsibility for assessing, managing, mitigating and avoiding risk throughout the design process to themselves, colleagues, the public and the environment.
Ethical	• Positive ethical approach and behaviours in line with professional engineering Codes of Conduct. • Manages projects and their own work in an ethical manner.
Personal responsibility	• Takes responsibility for work and interactions with colleagues, customers, suppliers or subcontractors. • Attention to detail, following procedures, planning and preparation, verifying compliance. • Applies an evidence based approach to problem solving and addressing technical challenges. • Able to adapt to changes in conditions, technologies, situations and a wide variety of different working environments.
Communicates at all levels	• Uses a range of communications methods effectively. • Able to present and discuss problems with work colleagues, customers and interdisciplinary teams.
Personal and social skills	• Committed to high personal standards at work; to their own continuous professional development and to applying principles of sound engineering and sustainability of engineering systems.

4. Duration – Typically 36 months would be required to gather sufficient practical experience and follow design projects through to completion as evidence of competence.

5. Mandatory Qualifications – Typically candidates would have already achieved a Level 3 (equivalent to A Level) Maths or technical qualification before starting. Apprentices will need to have achieved Level 2 (equivalent to GCSE at A,B,C) English and Level 3 Maths prior to completing the apprenticeship.

6. Link to professional registration

This standard is designed to meet the professional standards of the Engineering Council for registration as an Incorporated Engineer (IEng) in partnership with the Institute of Refrigeration and CIBSE.

7. Level – The apprenticeship has been set at Level 5 due to the high levels of managerial responsibilities and extensive knowledge and application of advanced engineering practice.