

MODULE TITLE	COMMERCIAL REFRIGERATION SYSTEM DESIGN 2
Nominal Duration	One module
Module Code or Number	EB148
Module Purpose	This module provides the student with the knowledge and skills necessary to effectively carry out the various design aspects of commercial refrigeration systems. Students will be able to specify the type of refrigeration system suitable for a given application, select system components from manufacturer's data, determine system operating characteristics and select appropriate automatic controls systems. This module will build on the skills and knowledge acquired in the module "Commercial Refrigeration Systems Design 1".
Relationship to Competency Standards	This module will be modified in line with the requirements of the National Metals and Engineering Standards When they become available. The module contains the knowledge and skills identified and agreed by all States and Territories. It has been developed on the assumption that these will be reflected in the Standards.
Prerequisites	EA143 Energy Management Systems for Commercial Refrigeration. EA149 Commercial Refrigeration Systems Design 1.
Summary of Content	Commercial refrigeration system types. medium and low temperature applications, operating conditions, system operating and service requirements, refrigerant types, components, multiple evaporator systems, multiple temperature systems, multiple compressor (rack) systems, two stage compressors, multiplex systems, defrost requirements and methods, electric defrost systems, hot gas defrost systems, cool gas defrost systems,

Manufacturer's data,

rating tables,
selection tables,
catalogues.

Operating characteristics

Effects of temperature glide with blended refrigerants,
Ph Charts,
Refrigerating Effect,
Heat of compression,
Heat Rejected on High Side of the System,
Required mass flow rate of refrigerant,
Volume flow rate at various points in system,
Theoretical compressor power,
Required condenser capacity.

Review automatic controls

refrigerant regulating valves
solenoid valves,
expansion valves,
pressure regulating valves,
cycling controls
pressure-stats,
thermo-stats,
defrost controls
monitoring and alarm controls
energy management systems,
refrigeration automation systems.
control strategies,
control modes.

Delivery

This module contains learning outcomes that will require both theory and practical instruction. As such, it will require resources to facilitate both on and off the job delivery strategies.

These strategies may involve:

*co-operative registered off-the-job provider/
employer delivery sharing available resources.

*delivery by an employer who is sub-registered as an off-the-job provider, with qualified trainers in-house using resources to facilitate on and off-the-job delivery.

*off-the-job objectives should focus on the industry context while on-the-job objectives should reflect application within enterprise operations.

Assessment instruments will need to be developed by the module provider. These instruments will need to reflect consistency with stated module learning outcomes and related assessment criteria.

Student records will be the responsibility of the off-the-job provider and where more than one off-the-job provider is involved, formal processes for transfer of student information must be established.

Learning outcomes

On completion of this module the learner will be able to:

Learning outcome 1

Specify the type of refrigeration system suitable for a given application.

Assessment criteria

- 1.1 List commercial refrigeration system types and applications and the system requirements of each.
- 1.2 Determine and list the criteria that should be considered when specifying the type of refrigeration system suitable for a given application.
- 1.3 For a variety of given applications, specify suitable refrigeration system types.

Conditions

Normally learning will take place on-the-job and in the classroom or other suitable study environment.

During learning, access to relevant texts, Australian standards, codes, and regulations as well as examples of similar projects/selections.

Assessment method

Short answer test,
Projects/Assignments.

Learning outcome 2

Select system components from manufacturer's data,

Assessment criteria

- 2.1 List all system components required to complete a range of commercial refrigeration systems.
- 2.2 Using manufacturer's data select all system components for a range of commercial refrigeration systems.

Conditions

Normally learning will take place on-the-job and in the classroom or other suitable study environment.

During learning, access to manufacturer's data, selection tables, catalogues, relevant texts, as well as examples of similar projects/selections.

Assessment method

Short answer test,
Projects/Assignments.

Learning outcome 3

Determine system operating characteristics.

Assessment criteria

- 3.1 For a particular system, and given expected ambient conditions, establish the expected high and low side pressures, room/evaporator temperature and conditions, running times, power consumption.
- 3.2 Plot refrigeration cycle on pressure/enthalpy diagram including likely operating suction superheating, liquid subcooling and pressure drop.
- 3.3 Using a cycle plot on a Ph diagram and given refrigeration load, determine likely system operating characteristics.

Conditions

Normally learning will take place in the design office, classroom or other suitable study environment.

During learning, access to relevant texts, references and Ph charts should be available.

Assessment method

Short answer test,
Assignments.

Suggested Learning Resources

Actrol Parts Catalogue & Technical Manual.

ASHRAE. ASHRAE Handbook, Fundamentals.
Atlanta

ASHRAE. ASHRAE Handbook, Refrigeration Systems and Applications SI Version. Atlanta

Boyle. Australian Refrigeration and Air Conditioning. Trust publications.

Copeland. Copeland Refrigeration Manual Part 1 - Fundamentals of Refrigeration, Part 2 - Refrigeration System Components, Part 4 - System Design.

Danfoss Automatic Controls Catalogue.

Dossat R.J. Principles of Refrigeration. SI Edition.,
McGraw-Hill.

Kirby Refrigeration Supply Catalogue & Technical Manual

Lovelock Luke Refrigeration Catalogue

NATSPEC (latest edition). Natspec Volume 6 - Services Control Monitoring Security, Refrigeration, Heating, Air Handling.

Standards Australia-Latest Editions to be used:

AS1677 Refrigeration Systems.

Stoecker W.F., Jones J.W., 1982. Refrigeration and Air Conditioning, McGraw-Hill.

Additionally further information may be sourced from;

Journal Articles.

Manufacturer's data and selection tables.