



IPO Curriculum (Ice Plant Operator)
Curriculum Version: 2024.1

Developed in accordance with
Syllabus Version dated: Nov 2022

This curriculum document is prepared by IPECC and is intended to elaborate on the information found in the SOPEEC / ACI syllabi.

The SOPEEC / ACI syllabi are the official governing document for SOPEEC examinations. The curriculum documents are developed and approved by IPECC members as a reference document for SOPEEC examinations. These documents are accepted by SOPEEC and ACI, and are posted on the IPECC website, www.ipecc-canada.ca.

To view the official SOPEEC / ACI syllabi, refer to the SOPEEC web site.
www.sopec.org

Note that this curriculum document is designed to exactly mirror the layout of the syllabus. Any deviation from the list format and contents of the syllabus is considered an error that must be remedied by IPECC.

To this end, the syllabus statements are printed in this document as a series of colour-coded headers, with indents demarking the various list levels of the syllabus.

The only information that is ADDED by the curriculum document is the curriculum objectives. These are the displayed in WHITE cells, as the lowest list items. The curriculum objectives are numbered in order, with this order assigned by IPECC.

EXAM PART
01. Act, Regulation and Codes
01. Relevant Jurisdictional Legislation
01. Explain the purpose and scope of your Jurisdictional Act and Regulations pertaining to Arena Operators and Pressure Equipment
02. CSA B52 (Current edition) Mechanical Refrigeration code
01. Discuss the history of how codes and standards became necessary in the pressure equipment field
02. Examine the content and use of the CSA-B52 Mechanical Refrigeration Code
03. Summarize the CSA B52 Code requirements for refrigeration plant machinery rooms
03. CSA Z94.4 Selection, Care and Use of Respirators
01. Explain the care of respirators
02. Illustrate safe use of respirators as it relates to Arena Operators
04. CEPA E2 Regulations
01. Outline the CEPA E2 regulations with regards to emergency planning
02. Administration
01. Basic Communication
01. Discuss effective written and verbal communication skills, including the use of two-way radios
02. Discuss Maintenance Management Systems, including work requests and work orders for Arena operations
03. Discuss the purpose, revision, and control of Standard Operating Procedures
03. Elementary Science
01. Elementary Mathematics
01. Compare basic SI units, matching associated symbols for unit prefixes
02. Perform unit analysis in simple problems
03. Perform conversions both within and between SI and Imperial units.
04. Differentiate the components of a circle, circumference, area, and diameter
05. Convert between commonly used volume units
06. Calculate the surface area and volume of a rectangular tank
07. Calculate the surface area and volume of a cylinder
02. Elementary Applied Mechanics
01. Define mass, force, acceleration, velocity and weight
02. Perform simple calculations involving force, pressure, work, power, and energy
03. Perform basic calculations involving gauge and absolute pressure
03. Elementary Thermodynamics
01. Define the first two laws of Thermodynamics
02. Define heat and specific heat and perform sensible heat calculations
03. Compare the expansion of solids and liquids
04. Differentiate the three modes of heat transfer with reference to heat exchangers
05. Describe the general design and construction of typical heat exchangers
06. Describe heat transfer of fluids and how they affect the operation of a heat exchanger, including fouling, leakage, and vapour locking

07. Outline heat exchanger inspection, maintenance, and operation, including placing them in service and removing them from service
04. Elementary Chemistry
01. Explain fundamental chemistry principles employed in Arenas
05. Electrical Principles
01. Explain basic electricity principles employed with electrical circuits
04. Safety
01. Basic Plant Fire Protection
01. Discuss the theory, terminology and the life safety issues associated with fires.
02. Explain the applicable classes of fires, and describe the types of fire extinguishing media and how they act on these fires
03. Identify typical locations of portable fire extinguishers and fire alarms found within an Arena
04. Discuss the visual checking of portable fire extinguishers
05. Describe the layout, and operation of standpipe and sprinkler systems
02. Personal Safety
01. Define, give examples of, and describe common Arena hazards
02. Describe the importance of Standard Operating Procedures (SOPs) and safety concerns
03. Describe common occupational health and safety (OH&S) programs found in Arenas
04. Explain the guidelines and requirements set forth by CSA and other related jurisdictions relevant to a typical Arena
05. Illustrate the use of respiratory protection appropriate to the refrigerant in use
03. Refrigeration Safety
01. Refrigeration Hazard
01. Identify the potential hazards in an Arena with regards to refrigerant liquid or gas, and ventilation
02. Gas Detection and Monitoring
01. Illustrate refrigeration system leak test procedures
02. Outline the safety procedures when gas detection alarms are activated, automatic and manual
03. Gas Exposure Limits
01. Differentiate the limits for different exposure limits in ammonia and other refrigerants
04. Electrical Safety
01. Describe circuit accessories, including switches, relays, fuses, breakers, disconnects, and receptacles
02. Explain the importance of the CSA approval and markings for electrical appliances
05. Basic WHMIS
01. Discuss the WHMIS system
02. Outline the essential components required in the WHMIS systems
03. Illustrate the safe handling and storage of gas cylinders in an Arena
04. Explain the safe handling of Hydrocarbons

05. Environmental
01. Gas Detection and Monitoring
01. Recognize potential environmental impact from a refrigerant release
02. Environmental Reporting (CEPA E2)
01. Identify who is responsible for reporting an accidental chemical release
03. Environmental impact of refrigerants
01. Outline the procedures to safely return plant to operation
02. Compare the difference between Accidental or Emergency release of refrigerant and the appropriate response
03. Summarize the Montreal Protocol and other related protocols related to Ozone Depletion Potential (ODP) and Global Warming Potential (GWP) of refrigerants
06. Principles of Refrigeration
01. Types of Refrigerants
01. Differentiate how refrigerants are classified by CSA-B52
02. Explain how to identify the refrigerant an operator is likely to be working with in an Arena
03. Identify common signage for refrigerants in Arenas
02. Basic Refrigeration Cycles
01. Explain how the basic compression refrigeration cycle works
02. Identify the equipment used in a basic refrigeration cycle
03. Identify the equipment commonly used in Arenas
04. Identify the components commonly used in an Arena
01. Direct
01. Identify the different components in a direct system
02. Sketch the refrigeration cycle for a direct system
02. Indirect
01. Identify the various components of an indirect glycol or brine system
02. Sketch the refrigeration cycle for an indirect system
07. Refrigeration Equipment and Components
01. Compressors
01. Compare the types of reciprocating, screw, and scroll compressors
02. Describe gas compression systems
03. Compare how a compressor operates with various refrigerants
04. Identify the safety controls on a compressor
05. Differentiate between the requirements of a log book and the service report
06. Identify who performs maintenance on compressors
02. Oil Separators
01. Discuss the basic guidelines for oil separation and safe removal from piping or vessels on ammonia refrigeration systems
03. Compressor Lubrication
01. Explain the concept of lubrication
02. Outline the purpose of a lubricant
03. Identify the two types of lubricant typically used
04. Condensers

01. Explain the function and operating principle of the Condenser
01. Air Cooled
01. Explain the principle and operation of air cooled condensers
02. Evaporative
01. Explain the principle of operation of evaporative condensers
03. Shell and Tube
01. Explain the principle and operation of shell and tube condensers, and the conjunction with cooling towers
05. Cooling Towers
01. Explain the principle of operation of fluid coolers
02. Explain the principle of operation of cooling towers and compare how they differ from fluid coolers
03. Explain the water treatment required for cooling water
06. Evaporators
01. Flooded and Dry Systems
01. Explain the operating principles of evaporators in a system
02. Shell, Tube, and Plate Evaporators
02. Outline the design and construction of shell & tube Evaporators
03. Outline the design and construction of plate Evaporators
03. Chillers
04. Explain the operation of each type of Chiller
04. Surge Drums
05. Explain the importance of a Surge Drum
06. Explain the function of a suction accumulator
07. Metering Devices
01. Explain the operation of metering devices
02. Describe the function of metering devices typically used in an Arena
03. Examine the application of various types of controls
01. Orifices and capillaries
01. Outline where orifices and capillaries are used
02. Hand expansion valves
01. Outline where hand expansion valves are used
03. Thermostatic expansion valves
01. Outline where Thermostatic expansion valves are used
04. High side floats
01. Explain the operation of High side floats
05. Low side floats
01. Explain the operation of Low side floats
08. Cooling Coils
01. Headers and Layouts
01. Outline the materials used in headers and the connected piping
02. illustrate a typical layout of heating and cooling piping
03. Outline the maintenance required
04. Describe how a typical slab is constructed

09. Brine Pumps
01. Brine Pumps
01. Identify the equipment used in a Brine system
02. Describe the components of a Brine system
03. Conclude the necessity of Brine pumps
02. Types of Brine
01. Identify the components of a driver and pump assembly
02. Compare the standard types of mechanical seals
03. Explain the purpose of the brine pump
03. Provision for brine volume change
01. Explain the cause of a volume change in the Brine system
02. Outline the purpose of an Expansion Tank
04. Brine Testing
01. Summarize the requirements for annual brine testing
02. Identify the equipment used in brine testing
01. Specific Gravity / Hydrometers
01. Explain Specific Gravity and it's importance
01. Specific Gravity / Hydrometers
02. Outline the purpose of a Hydrometer
02. Acidity and Alkalinity Measurement
01. Compare Acidity and Alkalinity measurements along with their application
08. Refrigeration Controls and Instrumentation
01. Fundamental Measuring Devices
01. Identify the basic fundamentals of measuring devices utilized in an Arena
01. Temperature
01. Explain the application and processing of temperature measurements
02. Pressure
01. Explain the application and processing of pressure measurements
03. Flow
01. Explain the application and processing of flow measurements
02. Basic Operational Controls
01. Explain the necessity of Basic Operational controls
02. Identify the controls required for safe operation
03. Basic Safety Controls
01. Identify the safety controls required in an Arena
09. Electrical
01. Basic Function of Electrical Components
01. Explain the function of a disconnect
02. Explain the function of a circuit breaker
03. Explain the function of a fuse
02. Dangers of Electric Motors
01. Analyze the impact various conditions can have on electric motors
02. Illustrate when a lockout/tagout procedure would be implemented
03. Describe arc-flash hazards associated with opening and closing switch gear

04. Compare motor types and outline bearing care (dust and lubrication), and troubleshooting of motors
03. Electrical Metering and Demand
01. Demonstrate the proper method to read and record current and power readings from various types of electrical meters
02. Explain the significance of the power demand readings
10. Refrigeration System Operation and Maintenance
01. Checks
01. Log Books
01. Identify who is responsible for the log books
02. Explain the purpose of log book records and the information that can be collected from plant operation
02. Check Sheets
01. Identify who is responsible for check sheets
02. Explain the purpose of check sheets and the information that can be collected from plant operation
03. Explain the importance of trending information captured in check sheets and the action to be taken if parameters are outside of normal operating conditions
02. Dangers
01. List the potential dangers in an Arena
02. Outline preventative measures for potential dangers
03. Summarize the hazards of oil in, along with adding oil to or removing oil from, a compressor
04. Discuss the actions that should be taken in an emergency
03. Safety Devices and Functions
01. Identify the system safety devices typical to an Arena and dehumidification systems
02. Identify the safety devices specific to compressors
03. Identify the safety devices specific to the refrigerant side of the plant
04. Identify the safety devices specific to the brine side of the plant
05. Identify the safety devices specific to dehumidifiers
06. Identify the safety devices specific to the water side of the plant
04. Troubleshooting
01. Summarize typical problems encountered within the operation of an Arena
02. Summarize typical maintenance problems encountered with Arenas
05. Procedures
01. Identify typical problems related to Arena refrigeration systems
02. Explain typical resolutions related to Arena refrigeration systems
03. Describe the communication required with contractors
04. Describe the communication required with management
05. Identify the documentation the operator should be familiar with, including the emergency contact numbers that should be in place
06. Identify the people that are typically responsible and need to be contacted during an emergency, appropriate to local jurisdictions

07. Summarize your role towards the safe and effective operation of an Arena
08. Summarize the obligations and duties of the Arena operator