LCB File No. R057-06

PROPOSED REGULATION OF THE STATE BOARD OF EDUCATION

Explanation: Matter in ***italics*** or underlined is new; matter in brackets ~~[ ]~~ or ~~stricken~~ is material to be omitted.

AUTHORITY: NRS 385.080 & (if necessary, provide other statutory authority)

Section 1. NAC389 is hereby amended as follows:

Section 2. NAC 389.592 ~~[Heating, air-conditioning and refrigeration]~~ ***Heating, Ventilation, Air Conditioning and Refrigeration***. (NRS 385.080, 385.110) ~~[A course of study in heating, air-conditioning and refrigeration must include instruction designed to teach the pupil to do the following:~~

~~1. Identify the parts used to maintain and repair a system for refrigeration.~~
~~2. Maintain and repair motors.~~
~~3. Name the different types of common wire.~~
~~4. Read blueprints and schematic drawings.~~
~~5. Measure and design a system for air-conditioning.~~
~~6. Identify parts and maintain and repair a system to provide heat.~~
~~7. Install a system of air-conditioning.~~
~~8. Repair compressors, evaporators and condensers.]~~

A course of study in heating, ventilation, air conditioning, and refrigeration must be designed so that students meet the following performance standards by the completion of an advanced program of instruction:

1. For the area of general safety, the student will demonstrate safe work practices while performing operations in the HVAC&R lab and/or internship program:

(a) Adhere to general shop and site safety rules as they apply to OSHA standards, including HVAC&R safety rule standards, fire drills, uses of fire extinguishers and blankets, classes of fires, and personal behaviors and attitudes in the working environment.

(b) Adhere to personal safety and work habits, including personal protective wear; the effects of substance abuse on safety; safe driving practices; proper lifting procedures; proper ladder safety usage; maintenance of a clean and orderly work area.

(c) Adhere to safe work practices in the handling of pressurized fluids, including the application of pressure relief devices; the proper storage and handling of refrigerants and oxygen, nitrogen, and acetylene bottles; follow procedures specified in Material Safety Data Sheets (MSDS), EPA specifications and other industry safety standards to handle, use, and dispose of pressurized fluids.

(d) Adhere to safe work practices in the handling of hazardous substances.

(e) Adhere to safe work practices with regard to electrical safety.

2. For the area of history, the student will demonstrate knowledge of the history of air conditioning and refrigeration and explore related career paths.

(a) Demonstrate understanding of the basics of the refrigeration cycle and its components.

(b) Demonstrate knowledge of the development of air conditioning as a part of the refrigeration process.

(c) Demonstrate understanding of the various heating systems.

3. For the area of thermodynamics and heat transfer, the student will understand thermodynamic properties and heat transfer and interpret their significance in air conditioning and refrigeration technology.

(a) Demonstrate understanding of the fundamentals of refrigeration and heating science.

(b) Explore the science of fluids and pressures as they relate to air conditioning and refrigeration.

(c) Demonstrate understanding of the relationship of the components of the refrigeration cycle.

(d) Use different methods of measurement systems.

4. For the area of hand tools and equipment, the student will demonstrate the proper use of hand tools and equipment common to the air conditioning and refrigeration industry.

(a) Identify and demonstrate the proper use of air conditioning and refrigeration related tools and equipment.

(b) Demonstrate the proper use of electrical meters.

(c) Demonstrate the proper use of refrigeration test instruments.

(d) Demonstrate the proper use of fossil fuel heating system measurement devices.

(e) Demonstrate the proper use of instruments necessary to determine proper airflow.

5. For the area of piping and piping practices, the student will demonstrate various brazing techniques to prepare and install piping.

(a) Demonstrate understanding of the proper tubing and piping requirements for air conditioning systems.

6. For the area of electricity, the student will demonstrate knowledge of electrical theory, measurement, circuitry and controls.

(a) Demonstrate a thorough understanding of basic electricity.

(b) Describe how electricity is generated and distributed.

(c) Identify and use specialty controls used in air conditioning and refrigeration systems.

7. For the area of refrigerant system components, the student will understand the purposes and uses of refrigeration cycle components to include metering devices; evaporators; compressors; condensers; accessories; and access fittings.

(a) Explain the functions and uses of metering devices.

(b) Understand how various types of evaporators function.

(c) Understand how various types of compressors function.

(d) Understand how various types of condensers function.

(e) Identify air conditioning and refrigeration system accessories and describe how they function.

(f) Demonstrate understanding of the function and operation of various access fittings.

8. For the area of gas controls, the student will demonstrate knowledge of the operation and diagnosis of gas control valves, regulators and fossil-fuel heating systems.

(a) Demonstrate the operation and function of various gas control valves.

(b) Understand the operation of fuel control systems.

(c) Install and operate residential control systems.

9. For the area of fossil heating systems, the student will demonstrate competency in the operation and maintenance of unitary and split fossil fuel fired heating systems.

(a) Service and operate a forced air heating system.

(b) Test and balance heating systems.

(c) Understand the function of humidity for air conditioning comfort systems.

10. For the area of air conditioning systems, the student will understand the process of heat transfer and the properties of air as applied to air conditioning applications.

(a) Understand the relationship between temperature and humidity as they affect comfort.

(b) Understand the operation of cooling systems as part of the refrigeration process.

(c) Troubleshoot an air conditioning system to determine and correct electrical and mechanical cooling problems.

11. For the area of air handling, the student will understand the principles and effects of airflow and duct design on air conditioning system operation.

(a) Understand the requirements of supplying air to an area to be environmentally controlled.

(b) Install and service air-filtering systems.

(c) Understand how various types of fan/blower systems operate.

12. For the area of electric motors, the student will understand the various types of electrical motors used in air conditioning systems.

(a) Understand the function, operation and service of motors used in air conditioning systems.

(b) Understand the various types of motors and motor components used in air conditioning systems.

(c) Understand the operation of three-phase motors.

13. For the area of electric heating systems, the student will demonstrate competency in the operation and maintenance of unitary and electrical heating systems.

(a) Operate and test an electric heating system.

14. For the area of heat pump systems, the student will demonstrate a working knowledge of reverse cycle heating systems and emergency heat applications.

(a) Understand the operation of heat pumps.

(b) Understand the various applications for the heat pump.

(c) Describe the functions of heat pump system controls and install basic heat pump controls.

15. For the area of commercial refrigeration, the student will apply acquired knowledge of refrigeration systems to food service applications, medical industries and transportation refrigeration.

(a) Understand the aspects of commercial refrigeration.

(b) Understand the use of multiple evaporators on a single system.

(c) Inspect and service commercial ice makers.

(d) Describe the operation of dispensing freezers.

(e) Inspect and service a commercial refrigeration system.

16. For the area of system load calculations, the student will calculate the cooling and heating requirements for an environmental living space.

(a) Calculate heat loss and gains through various insulating materials.

(b) Calculate heat loss through various construction materials.

(c) Calculate heat gains through various construction materials.

17. For the area of system installation and start-up, the student will perform installation and start-up procedures.

(a) Perform start-ups, check-out and operation performance of various heating systems.

(b) Perform start-ups, check-out and operation performance of various reverse cycle heating systems.

(c) Perform start-ups, check-out and operation performance of various cooling-only systems.

18. For the area of system servicing and troubleshooting, the student will use acquired knowledge to perform servicing and troubleshooting procedures.

(a) Troubleshoot and service mechanical system problems.

(b) Troubleshoot and service electrical system problems.

(c) Troubleshoot and service gas heating system problems.

(d) Troubleshoot and service problems in a reverse-cycle heating system.

(e) Troubleshoot and service problems in cooling-only systems.

19. For the area of preventative maintenance, the student will demonstrate knowledge of the various maintenance requirements and how to implement manufacturer's recommendations.

(a) Demonstrate maintenance requirements and implement manufacturer's recommendations.

20. For the area of refrigerant recovery, the student will demonstrate a thorough understanding of the guidelines and standards set forth by the U.S. Environmental Protection Agency (EPA) that governs refrigerant recovery.

(a) Demonstrate knowledge of the regulations that affect ozone depletion.

(b) Demonstrate refrigerant handling safety techniques while complying with EPA regulations.

(c) Demonstrate a thorough understanding of the methods of refrigerant recovery, recycling and reclamation.

(d) Demonstrate a thorough understanding of the use of equipment for refrigerant recovery, recycling and reclamation.

(e) Determine if an alternative refrigerant is applicable for retrofitting a specific system.

(f) Explain the different classes of refrigerants.

(g) Complete the EPA certification test standard 608.

21. For the area of employability skills, achieve workplace readiness, career development, and lifelong learning as demonstrated by the student's ability to:

(a) Demonstrate problem-solving skills.

(b) Demonstrate critical-thinking skills.

(c) Demonstrate the ability to speak, write, and listen effectively.

(d) Demonstrate the ability to select, apply, and maintain appropriate technology.

(e) Demonstrate leadership and teamwork skills.

(f) Demonstrate sound workplace ethics.

(g) Demonstrate the ability to effectively manage resources in high-performance workplaces.

(h) Demonstrate career planning and development skills.

(i) Demonstrate job retention and lifelong-learning skills.