PROPOSED REGULATION OF THE

STATE BOARD OF EDUCATION

LCB File No. R057-06

April 20, 2006

EXPLANATION – Matter in ***italics*** is new; matter in brackets **[**~~omitted material~~**]** is material to be omitted.

AUTHORITY: §1, NRS 385.080 and 385.110.

A REGULATION relating to education; prescribing performance standards for a course of study in heating, ventilation, air-conditioning and refrigeration; and providing other matters properly relating thereto.

Section 1. NAC 389.592 is hereby amended to read as follows:

389.592 A course of study in heating, ***ventilation,*** air-conditioning and refrigeration must **[**~~include instruction designed to teach the pupil to do~~**]** ***be designed so that pupils meet*** 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.~~**]** ***performance standards by the completion of an advanced program of instruction:***

1. For the area of general safety, demonstrate safe work practices while performing operations in the heating, ventilation, air-conditioning and refrigeration laboratory or internship program, or both, as demonstrated by the pupil's ability to:

(a) Adhere to general shop and site safety rules associated with the heating, ventilation, air-conditioning and refrigeration industry, including:

(1) The Occupational Safety and Health Act;

(2) Fire drills;

(3) The proper use of fire extinguishers and fire blankets;

(4) The classification of various types of fires; and

(5) Personal behaviors and attitudes appropriate for the working environment;

(b) Comply with personal safety and work habits associated with:

(1) Personal protective wear;

(2) The affect of substance abuse on safety;

(3) Practices for safe driving;

(4) Procedures for proper lifting;

(5) Proper and safe use of ladders; and

(6) Maintenance of clean and orderly work areas;

(c) Adhere to safe work practices in the handling of pressurized fluids associated with:

(1) The application of pressure relief devices;

(2) The proper storage and handling of refrigerants, oxygen, nitrogen and acetylene bottles; and

(3) The ability to follow procedures specified in Material Safety Data Sheets, the specifications of the Environmental Protection Agency and other industry safety standards for the handling, use and disposal of pressurized fluids;

(d) Comply with safe work practices in handling hazardous substances; and

(e) Comply with safe work practices regarding electrical safety.

2. For the area of the history of air-conditioning and refrigeration, demonstrate knowledge of the history of air-conditioning and refrigeration and explore related career paths, as demonstrated by the pupil's ability to understand:

(a) The basics of the refrigeration cycle and its components;

(b) The development of air-conditioning as a part of the refrigeration process; and

(c) Various heating systems.

3. For the area of thermodynamics and heat transfer, understand thermodynamic properties and heat transfer and interpret the significance of thermodynamic properties and heat transfer in air-conditioning and refrigeration technology, as demonstrated by the pupil's ability to:

(a) Understand the fundamentals of refrigeration and heating science;

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

(c) Understand the relationship of the components of the refrigeration cycle; and

(d) Use different methods of measurement systems.

4. For the area of hand tools and equipment, demonstrate the proper use of hand tools and equipment common to the air-conditioning and refrigeration industry, as demonstrated by the pupil's ability to:

(a) Identify tools and equipment related to air-conditioning and refrigeration;

(b) Properly use tools and equipment related to air-conditioning and refrigeration;

(c) Properly use electrical meters;

(d) Properly use refrigeration test instruments;

(e) Properly use fossil fuel heating system measurement devices; and

(f) Properly use instruments necessary to determine proper airflow.

5. For the area of piping and piping practices, demonstrate various brazing techniques to prepare and install piping, as demonstrated by the pupil's ability to understand proper tubing and piping requirements for air-conditioning systems.

6. For the area of electricity, demonstrate knowledge of electrical theory, measurement, circuitry and controls, as demonstrated by the pupil's ability to:

(a) Understand basic electricity;

(b) Describe how electricity is generated and distributed; and

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

7. For the area of refrigerant system components, understand the purposes and uses of refrigeration cycle components, including, without limitation, metering devices, evaporators, compressors, condensers, accessories and access fittings, as demonstrated by the pupil's ability to:

(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; and

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

8. For the area of gas controls, demonstrate knowledge of the operation and diagnosis of gas control valves, regulators and fossil fuel heating systems, as demonstrated by the pupil's ability to:

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

(b) Understand the operation of fuel control systems; and

(c) Install and operate residential control systems.

9. For the area of fossil fuel heating systems, demonstrate competency in the operation and maintenance of unitary and split fossil fuel-fired heating systems, as demonstrated by the pupil's ability to:

(a) Service and operate a forced-air heating system;

(b) Test and balance heating systems; and

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

10. For the area of air-conditioning systems, understand the process of heat transfer and the properties of air relating to air-conditioning applications, as demonstrated by the pupil's ability to:

(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; and

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

11. For the area of air handling, understand the principles and effects of airflow and duct design on the operation of an air-conditioning system, as demonstrated by the pupil's ability to:

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

(b) Install and service air-filtering systems; and

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

12. For the area of electrical motors, understand the various types of electrical motors used in air-conditioning systems, as demonstrated by the pupil's ability to understand the:

(a) Function, operation and service of motors used in air-conditioning systems;

(b) Various types of motors and motor components used in air-conditioning systems; and

(c) Operation of three-phase motors.

13. For the area of electrical heating systems, demonstrate competency in the operation and maintenance of unitary and electrical heating systems, as demonstrated by the pupil's ability to operate and test an electrical heating system.

14. For the area of heat pump systems, demonstrate a working knowledge of reverse cycle heating systems and emergency heat applications, as demonstrated by the pupil's ability to:

(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

(d) Install basic heat pump system controls.

15. For the area of commercial refrigeration, demonstrate knowledge of refrigeration systems for food service, medical industries and transportation applications, as demonstrated by the pupil's ability to:

(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; and

(e) Inspect and service a commercial refrigeration system.

16. For the area of system load calculations, understand how to calculate the cooling and heating requirements for an environmental living space, as demonstrated by the pupil's ability to calculate heat loss and heat gains through various insulating and construction materials.

17. For the area of system installation and start-up, demonstrate knowledge of procedures for installation and start-up, as demonstrated by the pupil's ability to inspect and perform check-out procedures to start and operate safely various:

(a) Gas heating systems;

(b) Reverse cycle heating systems; and

(c) Cooling systems.

18. For the area of servicing and troubleshooting systems, demonstrate knowledge of how to perform procedures for servicing and troubleshooting, as demonstrated by the pupil's ability to troubleshoot and service problems in:

(a) Mechanical systems;

(b) Electrical systems;

(c) Gas heating systems;

(d) Reverse cycle heating systems; and

(e) Cooling systems.

19. For the area of preventative maintenance, demonstrate knowledge of the various requirements for maintenance and how to implement recommendations of the manufacturer.

20. For the area of refrigerant recovery, demonstrate a thorough knowledge of the guidelines and standards established by the United States Environmental Protection Agency that govern refrigerant recovery, as demonstrated by the pupil's ability to:

(a) Understand the regulations that affect ozone depletion;

(b) Demonstrate refrigerant handling safety techniques while complying with applicable laws and regulations;

(c) Understand the methods of refrigerant recovery, recycling and reclamation;

(d) Understand 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; and

(g) Successfully complete the Technician Certification Test offered by a Technician Certification Program that has been approved by the Environmental Protection Agency.

21. For the area of skills necessary to obtain employment, achieve competence in workplace readiness, career development and lifelong learning, by demonstrating:

(a) Skills necessary for problem solving;

(b) Skills of critical thinking;

(c) The ability to speak, write and listen effectively;

(d) The ability to select, apply and maintain appropriate technology necessary for a career;

(e) Skills of leadership and teamwork;

(f) An awareness of the ethical behavior appropriate for the workplace;

(g) Effective management of resources in high-performance workplaces;

(h) Skills necessary for the planning and development of a career; and

(i) Skills necessary for retention of a job and continuation of learning throughout a career.