

ELECTRIC MOTOR CONTROLS (360 Hours)

Course No.: 72-75-70

COMPETENCY CHECKLIST

Student Name _____

Teacher Name _____ School Site _____

Start Date _____ Completion Date _____ Certificate Date _____

Teacher Signature _____ Student Signature _____

(Signatures verify completion of course competencies)

A. SAFETY & REVIEW OF FUNDAMENTALS (15 hrs)

- _____ 1. Safe work procedures in the classroom
- _____ 2. Proper operating of electrical equipment
- _____ 3. Correct use of the voltage tester
- _____ 4. Precautions when using any meter
- _____ 5. Describe the megohmmeter and its use
- _____ 6. Clamp-on ammeter & demo its proper use
- _____ 7. Identify motors by nameplate information
- _____ 8. Proper connections for various motors
- _____ 9. Components fundamental to maintenance
- _____ 10. Ability to follow written/spoken instructions
- _____ 11. Ability to read/apply reference text material
- _____ 12. Pass safety test with 100% accuracy

B. MANUAL MOTOR STARTERS (10 hrs)

- _____ 1. Fractional horsepower manual motor starters
- _____ 2. Three-phase manual motor starters
- _____ 3. Code approved vs. not approved items
- _____ 4. On, off, and tripped positions of starters

C. MAGNETIC FULL VOLTAGE STARTERS (200 hrs)

- _____ 1. Describe the basic operation of a starter
- _____ 2. Single- vs. three-phase starters
- _____ 3. Describe various sizes of motor starters
- _____ 4. Standard numbering of NEMA devices
- _____ 5. IEC devices and their numbering system
- _____ 6. Disassemble and rebuild starters
- _____ 7. Internal parts of starters & their function
- _____ 8. Wire starter in given circuits & test circuits
- _____ 9. Correct wiring of the overload switch(es)
- _____ 10. Ways and means of starting/stopping motors
- _____ 11. Discuss/demo operation of a magnetic coil
- _____ 12. Describe the use of controllers
- _____ 13. Correct sizing of magnetic starters/controllers
- _____ 14. Magnetic starters vs. controllers

- _____ 15. Aspects of overload protective devices
- _____ 16. Draw schematics for various control circuits
- _____ 17. Discuss/demo use of interlocking methods
- _____ 18. Discuss/demo reversing/sequential controllers
- _____ 19. Define jogging, inching, and plugging
- _____ 20. Multiple start-stop control & selector switches
- _____ 21. Discuss/demo use of phase failure relays
- _____ 22. Demo various speed control techniques
- _____ 23. Variable frequency drive systems
- _____ 24. Aspects of variable frequency drive systems
- _____ 25. Describe characteristics of PLC
- _____ 26. Discuss the aspects of PLCs
- _____ 27. Demo installation procedures of PLCs
- _____ 28. Discuss function of a CPU
- _____ 29. Describe need for various memory types
- _____ 30. Describe different memory sizes
- _____ 31. Difference between use & storage memory
- _____ 32. Discuss need for a back-up battery
- _____ 33. Define concept of peripheral devices
- _____ 34. Function of various peripheral devices
- _____ 35. Describe characteristics of timers
- _____ 36. Function/operation of timers
- _____ 37. Describe characteristics of counters
- _____ 38. Function/operation of counters
- _____ 39. Describe characteristics of sequencers
- _____ 40. Function/operation of sequencers
- _____ 41. Locate info in service manual: start-up
- _____ 42. Locate info in service manual: maintenance
- _____ 43. Locate info in service manual: testing
- _____ 44. Interpret schematics for listed devices
- _____ 45. Describe characteristics of switches
- _____ 46. Function/operation of switches
- _____ 47. Describe characteristics of relays
- _____ 48. Function/operation of relays
- _____ 49. Describe characteristics of contactors

- ___ 50. Function/operation of contactors
- ___ 51. Describe characteristics of pilot devices
- ___ 52. Function/operation of pilot devices
- ___ 53. Describe characteristics of sensors
- ___ 54. Function/operation or sensors
- ___ 55. Describe characteristics of transformers
- ___ 56. Function/operation of transformers
- ___ 57. Describe purpose of ladder diagrams
- ___ 58. Draw a ladder diagram
- ___ 59. Create listed mechanical connections
- ___ 60. Use of process control systems and devices

D. MOTOR OVERLOAD DEVICES (30 hrs)

- ___ 1. Starting and running current of a motor
- ___ 2. Effects of overloading a motor
- ___ 3. Correct current/voltage from nameplate info
- ___ 4. Service factor of the motor
- ___ 5. Identify overload relay
- ___ 6. Function of the overload relay
- ___ 7. Position of the overload heaters
- ___ 8. Number of overload heaters to applications
- ___ 9. Select correct heaters from charts/nameplates
- ___ 10. Explain wiring to the overload switch devices
- ___ 11. Wire overload devices correctly in circuits

E. CONTROL PILOT DEVICES (20 hrs)

- ___ 1. Identify various control devices
- ___ 2. Operation of various control devices
- ___ 3. Pilot duty as applies to these devices
- ___ 4. Polarity warning on certain devices
- ___ 5. Select devices according to given specs
- ___ 6. Differentiate between relays and contactors
- ___ 7. Use correct nomenclature for relay parts
- ___ 8. Identify common time delay devices
- ___ 9. Operation of various time delay devices
- ___ 10. Application of time delay devices in circuits
- ___ 11. Identify components by schematic symbols
- ___ 12. Identify symbols in drawings before wiring
- ___ 13. Wire components in given circuit diagrams
- ___ 14. Test and troubleshoot simple control circuits

F. TWO-WIRE CONTROL CIRCUITS (20 hrs)

- ___ 1. General principle of two-wire control
- ___ 2. Safety concerns with two-wire control circuit
- ___ 3. Select proper components for use w/circuit
- ___ 4. Wire and troubleshoot given circuits
- ___ 5. Identify and use the HOA circuit
- ___ 6. Add additional components to given circuits

G. THREE-WIRE CONTROL CIRCUITS (20 hrs)

- ___ 1. Explain low voltage release
- ___ 2. Components needed for 3-wire control circuits
- ___ 3. Common names for holding contacts
- ___ 4. Identify numbered terminals: holding contacts
- ___ 5. Three ways the circuit is stopped
- ___ 6. Number of wires needed between enclosures
- ___ 7. Draw elementary wiring diagrams
- ___ 8. Draw line and wiring diagrams
- ___ 9. Wire given circuits and troubleshoot them
- ___ 10. Draw and wire multiple station control circuits
- ___ 11. Add components to these circuits as directed

H. SEPARATE CONTROL CIRCUITS (20 hrs)

- ___ 1. Use of transformer in separate control circuit
- ___ 2. Components to create separate control circuit
- ___ 3. Changes to circuit when using transformer

I. RESOURCE MANAGEMENT REVIEW (5 hrs)

- ___ 1. Review listed terms related to topic
- ___ 2. Importance of managing listed resources
- ___ 3. Examples of effective management in industry
- ___ 4. Benefits of effective resource management

J. EMPLOYABILITY SKILLS (20 hrs)

- ___ 1. Industry standards for employment
- ___ 2. Range of organizations within the industry
- ___ 3. Knowing industry at different levels
- ___ 4. Job specifics for various positions
- ___ 5. Sources for employment information
- ___ 6. Working conditions and pay scales
- ___ 7. Economics that have an impact on industry
- ___ 8. Prepare cover letter and resume
- ___ 9. Complete application forms
- ___ 10. Role-play basic interview skills
- ___ 11. Discuss work habits required to hold a job
- ___ 12. Proven methods of working with others
- ___ 13. Steps to effective jobsite management
- ___ 14. Attending professional development/training