

# ELECTRICIAN/4: INDUSTRIAL (360 Hours)

Course No.: 72-75-65

## 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. WORKPLACE SAFETY REVIEW (2 hrs)

- \_\_\_\_\_ 1. Review workplace safety procedures
- \_\_\_\_\_ 2. Review first aid applicable to electricians
- \_\_\_\_\_ 3. Demonstrate CPR
- \_\_\_\_\_ 4. Pass written safety exam

### B. WIRING TECHNIQUES (100 hrs)

- \_\_\_\_\_ 1. Review construction of wire
- \_\_\_\_\_ 2. Review sizing capacities
- \_\_\_\_\_ 3. Auto/boat, marine & industrial wiring
- \_\_\_\_\_ 4. Wire selection process for planned use
- \_\_\_\_\_ 5. Review and demonstrate splices
- \_\_\_\_\_ 6. Review and demonstrate connections
- \_\_\_\_\_ 7. Review & demo solderless connections
- \_\_\_\_\_ 8. Review basic electrical box installation
- \_\_\_\_\_ 9. Installation techniques for conduits
- \_\_\_\_\_ 10. Wiring basic commercial-type circuits
- \_\_\_\_\_ 11. Techniques for working on energized circuits
- \_\_\_\_\_ 12. Discuss/demo good housekeeping practices
- \_\_\_\_\_ 13. Function/features of various lighting systems
- \_\_\_\_\_ 14. Operation of various lighting systems
- \_\_\_\_\_ 15. Features/functions of listed devices
- \_\_\_\_\_ 16. Operations of listed devices
- \_\_\_\_\_ 17. Reasons for grounding
- \_\_\_\_\_ 18. Terms relating to grounding systems
- \_\_\_\_\_ 19. Identify the general types of faults
- \_\_\_\_\_ 20. Types of grounding electrode systems
- \_\_\_\_\_ 21. Terms regarding grounding systems
- \_\_\_\_\_ 22. NEC requirements & interpretations
- \_\_\_\_\_ 23. Different sizes of conductors and electrodes
- \_\_\_\_\_ 24. Install electrodes/conductors/connection
- \_\_\_\_\_ 25. Impact of soil conditions on earth grounding
- \_\_\_\_\_ 26. Procedures for earth resistance testing
- \_\_\_\_\_ 27. Procedures for ground fault protection
- \_\_\_\_\_ 28. Differences: insulation, isolation, & elevation

- \_\_\_\_\_ 29. Differences: grounding, grounded, & bonding
- \_\_\_\_\_ 30. Special circumstances
- \_\_\_\_\_ 31. Differences in various diagrams & schematics
- \_\_\_\_\_ 32. Make diagrams based on given schematics
- \_\_\_\_\_ 33. Create drawings using appropriate scale
- \_\_\_\_\_ 34. Conditions that require specialty systems
- \_\_\_\_\_ 35. Fire alarm systems and components
- \_\_\_\_\_ 36. Operation of various fire alarm systems
- \_\_\_\_\_ 37. Code requirements for fire alarm systems
- \_\_\_\_\_ 38. Answer specific questions using the NEC
- \_\_\_\_\_ 39. Discuss/demo installation of fire alarms
- \_\_\_\_\_ 40. Alarm initiating and indicating devices
- \_\_\_\_\_ 41. Multiplexing of fire alarm system components
- \_\_\_\_\_ 42. System areas & methods used to protect them
- \_\_\_\_\_ 43. Demo appropriate wiring device/methods
- \_\_\_\_\_ 44. Use manuals to start-up & check out system
- \_\_\_\_\_ 45. Use manuals for maintenance/troubleshooting
- \_\_\_\_\_ 46. Various security systems and components
- \_\_\_\_\_ 47. NEC requirements for security systems
- \_\_\_\_\_ 48. Answer security systems questions using NEC
- \_\_\_\_\_ 49. Demo multiplexing of system components
- \_\_\_\_\_ 50. System areas & methods used to protect them
- \_\_\_\_\_ 51. Demo appropriate wiring security systems
- \_\_\_\_\_ 52. Use manuals to start-up & check out system
- \_\_\_\_\_ 53. Use manuals for maintenance/troubleshooting
- \_\_\_\_\_ 54. Voice, data, TV & signaling systems
- \_\_\_\_\_ 55. Proper cabling systems required for systems
- \_\_\_\_\_ 56. Installation & connection for cables & devices
- \_\_\_\_\_ 57. Defects & errors can degrade system
- \_\_\_\_\_ 58. Use manuals for maintenance/troubleshooting
- \_\_\_\_\_ 59. Describe lightning protection systems
- \_\_\_\_\_ 60. Describe fiber optic systems
- \_\_\_\_\_ 61. Describe controls for HVAC systems

**C. ALTERNATING CURRENT THEORY REVIEW (6 hrs)**

- \_\_\_\_\_ 1. Review definition of alternating current
- \_\_\_\_\_ 2. Review theory behind AC generators
- \_\_\_\_\_ 3. Define transformer
- \_\_\_\_\_ 4. Review various types of connections
- \_\_\_\_\_ 5. Measuring transformer parameters

**D. AC/DC MOTORS AND GENERATORS (50 hrs)**

- \_\_\_\_\_ 1. Describe AC motors
- \_\_\_\_\_ 2. Describe DC motors
- \_\_\_\_\_ 3. Differentiate between AC and DC motors
- \_\_\_\_\_ 4. Methods to identify windings in DC motors
- \_\_\_\_\_ 5. Describe methods for providing listed items
- \_\_\_\_\_ 6. Create block diagrams
- \_\_\_\_\_ 7. Starting/operating characteristics for motors
- \_\_\_\_\_ 8. Define listed terms/items
- \_\_\_\_\_ 9. SCR controls for DC motors
- \_\_\_\_\_ 10. Describe AC generators
- \_\_\_\_\_ 11. Describe DC generators
- \_\_\_\_\_ 12. Differentiate between AC & DC generators
- \_\_\_\_\_ 13. List characteristics of single-phase motors
- \_\_\_\_\_ 14. List types of single-phase motors
- \_\_\_\_\_ 15. List characteristics of poly-phase motors
- \_\_\_\_\_ 16. List types of poly-phase motors
- \_\_\_\_\_ 17. Discuss cause of motor losses
- \_\_\_\_\_ 18. Differences: single- & poly-phase motors
- \_\_\_\_\_ 19. Physical construction of various motors
- \_\_\_\_\_ 20. Ways to gain information about motors
- \_\_\_\_\_ 21. Describe "power factor"
- \_\_\_\_\_ 22. Demo proper techniques for installation
- \_\_\_\_\_ 23. Demonstrate code calculations
- \_\_\_\_\_ 24. Proper wire type and size for various motors
- \_\_\_\_\_ 25. Connecting multispeed & reversible motors

**E. SINGLE-PHASE MOTORS (40 hrs)**

- \_\_\_\_\_ 1. List the parts of a split-phase motor
- \_\_\_\_\_ 2. Explain the action of the two windings
- \_\_\_\_\_ 3. Explain the action of the capacitor in motor
- \_\_\_\_\_ 4. Split-phase motors vs. capacitor-start motors
- \_\_\_\_\_ 5. Use of starter capacitor & centrifugal switch
- \_\_\_\_\_ 6. Checking the running or starting capacitor
- \_\_\_\_\_ 7. Maintenance areas particular to single-phase
- \_\_\_\_\_ 8. Series motors vs. split-phase motors
- \_\_\_\_\_ 9. Greater maintenance areas in series motors

**F. THREE-PHASE MOTORS (60 hrs)**

- \_\_\_\_\_ 1. Identify parts of an alternator
- \_\_\_\_\_ 2. Function of various parts of an alternator
- \_\_\_\_\_ 3. Relate power out to power required
- \_\_\_\_\_ 4. Compare alternator to synchronous motor
- \_\_\_\_\_ 5. Possible maintenance trouble points

- \_\_\_\_\_ 6. List operating cautions for motors
- \_\_\_\_\_ 7. Major measurements for troubleshooting
- \_\_\_\_\_ 8. Simple preventative maintenance program
- \_\_\_\_\_ 9. Delta power distribution system
- \_\_\_\_\_ 10. Wye power distribution system
- \_\_\_\_\_ 11. Identify phase relationships in 3-phase systems
- \_\_\_\_\_ 12. Calculate current and power in wye systems
- \_\_\_\_\_ 13. List cautions to be observed in wye systems
- \_\_\_\_\_ 14. Main parts of a 3-phase induction motor
- \_\_\_\_\_ 15. Draw a typical rotor, identifying parts
- \_\_\_\_\_ 16. Draw a typical stator, identifying parts
- \_\_\_\_\_ 17. Rotating magnetic field and its effect on rotor
- \_\_\_\_\_ 18. Analyze starting and running current
- \_\_\_\_\_ 19. Describe "single-phasing"
- \_\_\_\_\_ 20. Describe nameplate information on motors
- \_\_\_\_\_ 21. Connect motors for high and low voltages
- \_\_\_\_\_ 22. Rule for reversing three-phase motors

**G. TESTING PROCEDURES ON LIVE CIRCUITS (10 hrs)**

- \_\_\_\_\_ 1. Checking procedures for motor control circuits
- \_\_\_\_\_ 2. Proper testing procedures on time clocks
- \_\_\_\_\_ 3. Connecting switching and lighting controls
- \_\_\_\_\_ 4. Proper procedures for testing motor starters

**H. MOTOR CONTROL (50 hrs)**

- \_\_\_\_\_ 1. List various types of starters
- \_\_\_\_\_ 2. Describe manual starters
- \_\_\_\_\_ 3. Describe magnetic starters
- \_\_\_\_\_ 4. Describe pilot devices
- \_\_\_\_\_ 5. Use of thermostats and float/light switches
- \_\_\_\_\_ 6. Demonstrate basic control circuits
- \_\_\_\_\_ 7. Describe three-phase controls
- \_\_\_\_\_ 8. Describe DC controllers
- \_\_\_\_\_ 9. Describe deceleration as it applies to motors

**I. TROUBLESHOOTING AND MAINTENANCE (40 hrs)**

- \_\_\_\_\_ 1. List at least 3 principles of maintenance
- \_\_\_\_\_ 2. Three ways of correcting existing problems
- \_\_\_\_\_ 3. Preventing the recurrence of a problem
- \_\_\_\_\_ 4. Identify principles of troubleshooting
- \_\_\_\_\_ 5. Demo logical thought when troubleshooting
- \_\_\_\_\_ 6. Participate in class troubleshooting project
- \_\_\_\_\_ 7. Good recordkeeping when troubleshooting

**J. RESOURCE MANAGEMENT REVIEW (2 hrs)**

- \_\_\_\_\_ 1. Review definitions of related terms
- \_\_\_\_\_ 2. Importance of managing listed resources
- \_\_\_\_\_ 3. Examples of effective resource management
- \_\_\_\_\_ 4. Benefits of effective resource management