

**High School Graduation Years 2019, 2020 and 2021
Electrical and Power Transmission Installers, Other
CIP 46.0399
Task Grid**

Proficiency Level
Achieved:
(X) Indicates
Competency
Achieved to Industry
Proficiency Level

| Unit/Standard Number | | |
|----------------------|---|--|
| | Secondary Competency Task List | |
| 100 | BASIC SAFETY | |
| 101 | Inspect and use personal protective equipment | |
| 102 | Identify causes of job site accidents. | |
| 103 | RESERVED | |
| 104 | RESERVED | |
| 105 | Properly don fall protection | |
| 106 | Identify four classes of fire extinguishers | |
| 107 | Confirm circuits are de-energized before working on them. | |
| 108 | Perform lockout/tagout. | |
| 109 | Inspect and use ladders | |
| 110 | Complete jobsite hazard analysis form | |
| 111 | Identify Arc-flash hazards and protection | |
| 160 | Identify and follow the Electrical and Network Cabling Technology Program's rules and procedures | |
| 161 | Identify organizations that set safety, building, and material standards such as U.L., NEMA, BOCA, and OSHA | |
| 162 | OSHA 10 hour Careersafe Certification | |
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| 200 | HAND TOOLS | |
| 201 | Use screwdrivers. | |
| 202 | Use pliers. | |
| 203 | Use keyhole/drywall saw. | |
| 204 | Use hydraulic knockout/punch tool. | |
| 205 | Use a tape measure. | |
| 206 | Use wire strippers. | |
| 207 | Use wire cutters. | |
| 208 | Use utility knife. | |
| 209 | Use torpedo level. | |
| 210 | Use a hammer. | |
| 211 | Use a conduit reamer. | |
| 212 | Use a hacksaw. | |
| 213 | Use a roto-split. | |
| 214 | Use adjustable or non adjustable wrenches. | |
| 215 | Use ratchet and sockets. | |
| 216 | Use nut drivers. | |
| | | |
| 300 | POWER TOOLS | |
| 301 | RESERVED | |
| 302 | Use electric hammer drill. | |
| 303 | Use reciprocating saw. | |
| 304 | Use portable hand-held band saw. | |
| 305 | RESERVED | |

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|----------------------|--|--|
| 306 | Use a drill. | |
| 307 | RESERVED | |
| 308 | RESERVED | |
| 309 | RESERVED | |
| 310 | Use oscillating multi purpose tool. | |
| 311 | Use impact driver. | |
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| 400 | BLUEPRINT READING | |
| 401 | Identify types of blueprint plans. | |
| 402 | Identify blueprint symbols. | |
| 403 | Interpret blueprint plans. | |
| 404 | RESERVED | |
| 405 | Develop electrical details on a residential blueprint. | |
| 406 | Use a measuring tool to scale. | |
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| 500 | ANCHORS AND SUPPORTS | |
| 501 | Identify, select and install various types of anchors and supports. | |
| | | |
| 600 | RESIDENTIAL CABLING TECHNOLOGY | |
| 601 | Install non-metallic (NM) Cable for connection to an electrical device. | |
| 602 | Install metal-clad cable (MC). | |
| 603 | RESERVED | |
| 604 | RESERVED | |
| 605 | Terminate a coaxial cable. | |
| 606 | RESERVED | |
| 607 | RESERVED | |
| 608 | RESERVED | |
| 609 | Identify telecommunications cable types. | |
| 610 | Terminate an RJ45 connector. | |
| 611 | Install SE cable. | |
| 660 | Demonstrate proper terminations and splicing techniques | |
| 661 | Install Underground feeder (UF) cables | |
| 662 | Acheive C-Tech Certification | |
| 663 | Identify components of the fiber optic termination kit | |
| 664 | Explain Fiber optic concepts | |
| 665 | Identify fiber optic system components | |
| 666 | Describe installation procedures for fiber optic cables | |
| 667 | Testing fiber optic connectors and connections | |
| 668 | Installing fiber optic connectors | |
| | | |
| 700 | SWITCHES AND RECEPTACLES CIRCUITS | |

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| 701 | Install a duplex receptacle. | |
| 702 | Install a single pole switch. | |
| 703 | Install a 3-way switch. | |
| 704 | Install a 4-way switch. | |
| 705 | Install a split-wired duplex receptacle. | |
| 706 | Install a Ground Fault Circuit Interrupter (GFCI) Receptacle. | |
| 707 | Install an Arc-Fault Circuit Interrupter (AFCI). | |
| 708 | Install a time control switch. | |
| 709 | Install a range receptacle. | |
| 710 | Install a dryer receptacle. | |
| 760 | Wire a photo transmitter and photo receiver to control two lights | |
| 800 | FIXTURES | |
| 801 | Install surface-mounted lighting fixture. | |
| 802 | Install recessed lighting fixtures. | |
| 803 | Install a ceiling fan. | |
| 804 | Install LED lighting. | |
| 805 | Identify IC and non-IC recessed lighting fixtures. | |
| 860 | Install exit and emergency lighting | |
| 861 | Explain operation and construction of incandescent lighting | |
| 862 | Explain operation and construction of florescent fixtures, ballasts, and lamps. | |
| 863 | Explain the operation of and install sodium, metal halide, quartz, and halogen fixtures | |
| 900 | RACEWAYS | |
| 901 | Install Electrical Metallic Tubing (EMT). | |
| 902 | Install Poly-Vinyl Chloride conduit (PVC). | |
| 903 | Identify surface metal and non-metal raceways (Wiremold). | |
| 904 | Identify flexible raceway. | |
| 905 | RESERVED | |
| 906 | RESERVED | |
| 907 | RESERVED | |
| 908 | Bend a stub 90°. | |
| 909 | Bend an offset. | |
| 910 | Bend a back to back 90°. | |
| 911 | Cut, ream and deburr raceway systems. | |
| 912 | Install conductors in a raceway system. | |
| 960 | Install Rigid Metal Conduit | |
| 961 | Install Flexible Metal Conduit | |
| 1000 | WIRED DEVICES | |
| 1001 | Install a hard wired smoke detector. | |

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| 1002 | Install door-bell system. | |
| 1003 | Trim out electrical devices. | |
| 1004 | Install an occupancy sensor. | |
| 1005 | Install a photocell. | |
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| 1100 | TESTING EQUIPMENT | |
| 1101 | Use a multimeter. | |
| 1102 | Use a continuity tester. | |
| 1103 | Use a plug-in circuit tester. | |
| 1104 | Use a clamp-on ammeter. | |
| 1105 | RESERVED | |
| 1106 | Use a circuit tracer. | |
| 1107 | Use a network cable tester. | |
| 1108 | Apply Ohm's/Watt's Law calculations to electrical applications. | |
| | | |
| 1200 | ELECTRICAL SERVICE | |
| 1201 | Install an overhead service. | |
| 1202 | Identify parts of an underground service. | |
| 1203 | RESERVED | |
| 1204 | RESERVED | |
| 1205 | RESERVED | |
| 1206 | RESERVED | |
| 1207 | RESERVED | |
| 1208 | RESERVED | |
| 1209 | Identify types of safety disconnect switches. | |
| 1210 | Terminate a service panel/load center. | |
| 1260 | Install a panel with a manual transfer switch | |
| 1261 | Identify a panel with an automatic transfer switch | |
| 1262 | Make a live service connection. | |
| | | |
| 1300 | NATIONAL ELECTRICAL CODE | |
| 1301 | Identify the purpose of the National Electrical Code (NEC). | |
| 1302 | Use Chapter 9 Tables. | |
| 1303 | Use the NEC as a reference to questions and competencies that students perform for all electrical installations. | |
| 1304 | Identify the publisher of the National Electrical Code (NEC). | |
| 1305 | Identify the code cycle of the National Electrical Code (NEC). | |
| 1306 | Identify NFPA70E (Arc Flash). | |
| | | |
| 1400 | GREEN TECHNOLOGY | |
| 1401 | Identify renewable energy sources. | |
| 1402 | Identify procedures for installing a wind turbine system. | |

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| 1403 | RESERVED | |
| 1404 | Identify procedures for installing a solar energy source system. | |
| 1405 | RESERVED | |
| 1406 | RESERVED | |
| 1407 | Evaluate the demand and consumption of electrical energy. | |
| | | |
| 3000 | AC/DC FUNDAMENTALS | |
| 3060 | Identify electrical parts and their symbols | |
| 3061 | Demonstrate the generation of AC and DC electricity | |
| 3062 | Identify the parts of a complete circuit | |
| 3063 | Describe atomic structure of copper and aluminum | |
| 3064 | Identify and differentiate between conductors and insulators | |
| 3065 | Convert from metric units to decimal units | |
| 3066 | Define voltage, current, and resistance | |
| 3067 | Use Ohm's Law to calculate unknown values of voltage current and resistance | |
| 3068 | Trace and calculate the distribution of power, voltage, current, and resistance in a combination circuit | |
| 3069 | Demonstrate the effects of magnetism and electromagnetism | |
| 3070 | Explain the construction and operation of DC generators and AC single and three phase alternates | |
| 3071 | Use trigonometry to calculate phase angles in AC circuit | |
| 3072 | Describe the construction and operation of inductors | |
| 3073 | Calculate inductance and inductive reactance | |
| 3074 | Calculate resistive and inductive circuits | |
| 3075 | Describe the construction and operation of capacitors | |
| 3076 | Calculate resistive and capacitive circuits | |
| 3077 | Calculate resistive, inductive, and capacitive circuits | |
| 3078 | Describe how to calculate and improve power factor in an AC circuit | |
| 3100 | INSTALLATION OF RELAYS | |
| 3160 | Describe the operation of electromechanical and solid state relays | |
| 3161 | Connect a electromechanical relay for 24 volt control and switching | |
| 3162 | Connect a relay for 24 volt control and 120 volt switching | |
| 3163 | Connect a start stop station to control a relay sealed in | |
| 3164 | Connect two start stop stations to control a relay | |
| 3165 | Connect two start stop stations to control two relays | |
| 3166 | Connect two relays that are electrically interlocked | |
| 3167 | Connect three relays that are electrically interlocked | |
| 3168 | Connect two relays with push-button interlock | |
| 3169 | Wire a door and window alarm system using relays | |
| 3170 | Connect a timing relay controlling a light | |
| 3171 | Connect a timing relay with instantaneous contacts controlling two lights | |
| 3172 | Connect three timing relays to control a traffic signal | |
| 3173 | Wire a traffic signal with a photo sensor to control a left turning arrow | |

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| 3174 | Wire a traffic signal with a train signal interruption | |
| 3175 | Connect a time off relay | |
| 3176 | Wire a solid state relay to control a heater circuit with thermostat | |
| 3200 | MOTORS AND CONTROLS | |
| 3260 | Explain the operation and application of various motor configurations | |
| 3261 | Wire a single pole switch controlling a single phase motor | |
| 3262 | Connect a hand-off-automatic switch to a single phase motor | |
| 3263 | Install a drum switch controlling a single phase motor | |
| 3264 | Wire a start stop station controlling a single phase motor | |
| 3265 | Install two start stop stations controlling a single phase motor | |
| 3266 | Connect two start stop stations controlling a single phase motor | |
| 3267 | Wire two start stop stations controlling two single phase motors | |
| 3268 | Install two start stop stations controlling two single phase motors that are electrically interlocked | |
| 3269 | Wire a 208 volt motor controlled by a 120 volt coil using a transformer | |
| 3270 | Install a single phase motor being controlled by a time delay relay | |
| 3271 | Wire a jog button controlling a single phase motor | |
| 3272 | Wire two jog buttons controlling two single phase motors that are electrically interlocked | |
| 3273 | Connect two single phase motors controlled by push button interlock | |
| 3274 | Install a single phase motor controlled by a start stop station using mechanical breaking | |
| 3275 | Connect a 120 volt single phase motor controlled by a 24 volt thermostat | |
| 3276 | Describe the operation and applications of three phase squirrel cage induction motors | |
| 3277 | Describe the operation and applications of a three phase wound round motor | |
| 3278 | Describe the operation and applications of a three phase synchronous motor | |
| 3279 | Wire a three phase motor with an across the line starter | |
| 3280 | Wire a three phase motor with a drum switch | |
| 3281 | Wire a three phase motor with a start stop station | |
| 3282 | Wire a three phase motor with two start stop stations | |
| 3283 | Wire two three phase motors with two start stop stations | |
| 3284 | Wire two three phase motors with electric interlock | |
| 3285 | Wire two three phase motors with push button interlock | |
| 3286 | Wire a three phase motor with a jog button | |
| 3287 | Wire two three phase motors with two jog buttons and electrical interlock | |
| 3288 | Wire a three phase motor for plugging | |
| 3289 | Wire a three-phase motor using an AC frequency drive | |
| 3600 | PROGRAM AND OPERATE PROGRAMMABLE CONTROLLERS | |
| 3660 | Identify and describe the purpose, construction and applications of a PLCs | |
| 3661 | Convert between the decimal, binary, and hexadecimal numbering systems | |
| 3662 | Describe addressing and wiring techniques of PLC inputs and outputs | |
| 3663 | Program and wire all of the relay tasks as prescribed in DUTY J | |
| 3664 | Program and wire simple timing circuits | |

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| 3665 | Program and wire simple counter circuits | |
| 3666 | Program and wire shift register circuits | |
| 3667 | Program and wire sequencer circuits | |
| 3668 | Program and wire analog circuits used in process control | |
| 3700 | TRANSFORMERS | |
| 3760 | Explain the basic principles of single phase transformer | |
| 3761 | Wire a step-down and a step-up transformer | |
| 3762 | Connect a transformer for additive and subtractive polarities | |
| 3763 | Construct a distribution transformer from two 120 volt single phase transformers | |
| 3764 | Explain the basic principles of three phase transformer design and operation | |
| 3765 | Explain the basic principles of wye and delta transformer design | |
| 3766 | Connect three single phase transformers to form one three phase transformer for wye-wye, delta-wye, delta-delta, and wye delta operation | |
| 3900 | PURCHASING AND ESTIMATING | |
| 3960 | Interpret prices from vendor's catalogs | |
| 3961 | Fill out a purchase requisition | |
| 3962 | Estimate the cost of a small job | |
| 3963 | Determine best price using quotes | |
| 4000 | FIRE AND SECURITY SYSTEMS | |
| 4060 | Install smoke detectors, strobe lights, and horns | |
| 4061 | Install programmable and non-programmable fire alarm panel | |
| 4062 | Install security system using discrete components hard wired | |
| 4063 | Install security system with programmable features | |
| 4100 | PROFESSIONAL DEVELOPMENT | |
| 4160 | Join and participate in a CTE student organization (Skills USA) | |
| 4161 | Plan and conduct Skills USA meetings | |
| 4162 | Participate in a professional development program | |
| 4163 | Complete a job application form | |
| 4164 | Prepare a resume | |
| 4165 | Participate in a mock job interview | |
| 4166 | Write a letter of application | |
| 4167 | Identify career and training opportunities | |