Federal Wage System Job Grading Standard for High Voltage Electrician, 2810

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WORK COVERED

This standard covers nonsupervisory work involved in installing, testing, repairing, and maintaining high voltage electric power-controlling equipment and/or distribution lines. The work requires knowledge of electrical principles, procedures, materials, and safety standards governing electrical systems above 600 volts. In addition, the work requires general mechanical skills and knowledge, and in some cases may require knowledge of electronic principles as they pertain to electronic control circuitry. In some situations, the work includes testing, repairing, and maintaining electric-generating equipment in co-generation facilities.

This standard cancels and supersedes the Job Grading Standard for Electrician (High Voltage), 2810, issued in June 1973.

WORK NOT COVERED

This standard does not cover work that primarily involves:

- Installing, maintaining, and repairing electrical wiring systems, fixtures, controls, and equipment on board ships or in industrial, residential, or office buildings. (See Job Grading Standard for Electrician, 2805.)

- Controlling the generation or distribution of electric power at power generating plants, power distribution centers, and substations. (See Job Grading Standard for Electric Power Controlling, 5407.)

TITLES

Jobs graded by this standard at grade 10 and above are titled *High Voltage Electrician*.

Jobs graded below grade 10 (other than helper and intermediate jobs) are titled *High Voltage Electrical Worker*.

GRADE LEVELS

This standard describes two levels of nonsupervisory work at grades 8 and 10. This standard does not describe all possible grades at which jobs might be established. If jobs differ substantially from the skill and knowledge and other work requirements described in the standard, they may be graded above or below the levels described based upon sound job grading methods.

HELPER AND INTERMEDIATE JOBS

Helper jobs are graded by the Office of Personnel Management Job Grading Standard for Trades Helper Jobs. The grade 8 level described in this standard **DOES NOT** apply to jobs that are part of a planned program of training and development of skills for advancement to a higher grade. Such trainee jobs are covered by the Office of Personnel Management Job Grading Standard for Intermediate Jobs. Grade 10 in this standard is to be used as the full performance or journey level in applying the Intermediate Job Grading Table.

NOTES TO USERS

Ongoing technological advancements in the field of electronics will continue to have an impact upon the switches, circuit breakers, controls systems, and other circuit elements found in high voltage electrical distribution systems. As a consequence, work within this occupation, in certain situations, may require knowledge of electronic principles ranging from a practical understanding to a working knowledge. However, in determining appropriate grade levels for work within this occupation, it is essential to note that the level of electronics knowledge required of high voltage electrical workers and high voltage electricians is significantly less than that required of electronics workers and mechanics at comparable grade levels.

The standard describes a journey level work situation that includes work in substations/power-generating facilities and on electrical distribution lines. Some installations rotate their high voltage electricians through both situations, while other installations maintain separate crews for each situation. Regardless of how management decides to structure the work, grade 10 is the journey level grade.

In some work situations, the most experienced or senior high voltage electricians have been assigned higher grades based on the performance of leader-like duties. When these duties meet the criteria for coverage in the Job Grading Standard for Leader, the high voltage electricians should be graded as work leaders (WL). In those situations where the duties do not meet the criteria for coverage under the Leader standard, they must *substantially exceed* the grading criteria in *all* factors described in this standard to be graded above the journey level (i.e., grade 10) in this standard.

HIGH VOLTAGE ELECTRICAL WORKER, GRADE 8

General: Grade 8 high voltage electrical workers work as part of electrical teams or line crews to perform routine installation, maintenance, and repairs on electric power control equipment, distribution lines, or electric-generating equipment. As directed by a higher grade employee, grade 8 high voltage electrical workers:

- Work on power cables, transformers, insulators, and control equipment such as switches, circuit breakers, and panels. This includes collecting transformer oil samples that are tested for contamination as well as cleaning up contaminated sites;

- Install and connect transformers on hangers and platforms, making hot taps and splices;

- Install underground cable, conduit, and ductwork. Install transformers; string lights and power wires on cross arms and through ducts and manholes; make electrical connections; and splice cables;

- Erect and replace poles; perform rigging on high voltage motors, transformers, and compressors;

- Use and maintain various hand and power tools of the trade; and

- May operate aerial trucks and associated equipment.

Skill and Knowledge: Grade 8 high voltage electrical workers must be familiar with high voltage electrical components and have knowledge of wiring and where and how controls are installed and operated. Grade 8 workers must have:

- Knowledge of basic electrical theory such as Ohm's Law and series and parallel circuits in order to understand and interpret instructions and assignments;

- Skill to use common electrical test devices such as ohmmeters, voltmeters, meggers, and continuity checkers to perform basic checks for continuity, resistance, voltage, opens, shorts, insulation breakdowns, and grounds;

- Skill to do common tasks of the trade such as pulling cable using beckets, messengers, and fair leads; splicing cable using splicing sleeves, insulating tape, lead sleeves, and resin sealing compounds;

- Skill to assist higher grade employees to work on energized high voltage electrical systems using safety equipment such as hot sticks, rubber blankets, and insulated gloves;

- Skill to diagnose commonly encountered problems such as locating defective switches or blown fuses;
- Working knowledge of types and sizes of wire/cable and the National Electrical Safety Code;

- Skill in reading commonly used drawings and diagrams of distribution networks and equipment interconnections; and

- Skill to work safely under hazardous conditions such as working in the presence of high voltage conductors when working aloft or when working in cramped quarters such as on underground lines or in power facility switching banks.

Responsibility: Grade 8 high voltage electrical workers receive detailed instructions from their supervisor or a higher grade worker. Decisions and judgments are controlled through specific, well-established work methods and procedures. They work independently on routine and repetitive work assignments but a supervisor is usually available for advice during work progress. Work is subject to review in progress and upon completion by a higher grade worker or supervisor.

Physical Effort: Grade 8 high voltage electrical workers frequently perform moderately heavy lifting, pulling, and carrying of equipment and material weighing up to 18 kilograms (40 pounds) and occasionally, they lift or pull heavy cables and equipment weighing more than 23 kilograms (50 pounds) with the help of weight handling equipment or with assistance from other workers. They use block and tackle, pulleys, or other lifting devices. They crouch, stand, kneel, and stoop while installing, repairing, or testing electrical equipment in confined spaces such as enclosed switch gear, or in structures such as overhead bus and conduit assemblies. Workers at the grade 8 level work above ground from aerial bucket trucks and poles, at ground level, and in trenches, or manholes. Work requires bending, stooping, climbing, and standing for long periods while installing, repairing, and testing electrical equipment in manholes and on overhead distribution lines.

Working Conditions: Grade 8 high voltage electrical workers work indoors and outdoors. They are exposed to danger from explosions of equipment and cables in manholes and vaults, as well as danger from high voltage electrical shock, burns from solder, broken bones, cuts, and bruises. They are exposed to heat and noise when working in substations or power-generating facilities, to extremes of weather when working outdoors, and to unpleasant odors and wet slippery surfaces when working in manholes. They are subject to electrical burns while working around high voltage electrical lines, broken bones from falls from poles, and strains from awkward work positions. They are exposed to chemicals such as insulation oil from transformers and oil switches. They use protective devices such as earplugs, safety hats, and nonconductive gloves and footwear.

HIGH VOLTAGE ELECTRICIAN, GRADE 10

General: Grade 10 high voltage electricians install, modify, test, repair, troubleshoot, and maintain transformers, converters, regulators, cables, switches, circuit breakers, mechanical and electronic recording instruments, mechanical and electronic control systems, and other circuit elements found in substations and/or power-generating facilities, as well as the electrical portions of generators. Grade 10 high voltage electricians install, modify, connect, inspect, troubleshoot, and repair overhead and underground electrical distribution lines serving an activity or group of activities such as a military base. They service lines, substations, transformers, insulators, capacitor equipment, lightning arresters, reclosers, switches, fuses, ground connects, and similar equipment. Grade 10 high voltage electricians perform all or a variety of the following:

- Install, modify, and replace generation and distribution equipment in substations, power-generating facilities, transformer vaults, and/or distribution centers;

- Clean, adjust, and repair electrical equipment such as air and oil circuit breakers and remote control supervisory and telemetering equipment;

- Construct and install rigid conduits. Pull in conductors, assemble bus bars, and phase out and connect conductors;

- Troubleshoot distribution circuits and generating and controlling equipment to locate and correct the causes of outages and improper operation. Make emergency cutouts and substitutions of power lines and equipment, sometimes working on distribution systems when they are energized;

- Visually check the work of contractors for compliance with contract specifications on new construction;

- In some installations, they program and monitor electronic control equipment and operate computerized diagnostic and digital test equipment as part of high voltage electrical system maintenance and troubleshooting duties;

- Troubleshoot overhead and underground cable systems to locate shorts, opens, grounds, crosses, electrolysis damage, capacitance imbalance, or cable breaks. Locate and mark electrical underground utilities prior to excavation;

- String wires and hoist conductors up to the cross arms. Pull wires to proper tension or sag based on space, length, type and size of conductors, prevailing temperature, and loading district. Install and pull cable underground from source of feed-through ducts;

- direct the installation of poles and replacement of cross arms;

- check condition of transformers, switches, capacitor equipment, and cables. Test insulating oil from transformers and oil switches for breakdown and contamination. Check transformer operating temperatures and voltage at secondary terminals and make repairs to defective, loose, or corroded connections;

- Visually check for cracks or breaks in walls of manholes or vaults. Pump water from manholes, remove debris, and repair ground bonds. Check ground wire connections and cables for cracks, breaks, corrosion, and punctures;

- Maintain street and airfield lighting systems; and

- Maintain, repair, and replace traffic signals and controllers.

Skill and Knowledge: Grade 10 high voltage electricians have comprehensive trade knowledge of electrical principles and system operations. Grade 10 high voltage electricians have:

- Knowledge of commonly used high voltage electric power- generating and distribution equipment such as generators, transformers, switches, circuit breakers, recording instruments, and control systems;

- Skill to replace and adjust mechanical contacts and tripping and time-delay intervals of circuit breakers and relays, using feeler gages, dressing tools, and timing devices or to program electronic relays, timers, and trips using microprocessor programming equipment;

- Skill to plan and carry through the troubleshooting and repair of high voltage generating, controlling, and distribution systems, such as repairing switch gear, installing and hooking up transformers, locating defects in cables, or selecting materials to make installations or repairs;

- Skill to read and understand circuit diagrams of interconnects such as the generators, buses, switches, and circuit breakers in a power-generating facility or the feeders, substations, transformers, and interconnections of a distribution system, in order to diagnose problems in the electrical system. In some installations, they have skill to read electronic schematics in order to diagnose problems in the electronic control circuitry;

- Skill in the use of test equipment such as: oscillators, meggers, phase sticks, phase rotation meters, digital test equipment, and cable locating and fault finding equipment;

- Skill to diagnose and determine corrective action for electric power-controlling equipment such as switch gear, transformer banks, and circuit breakers in substations and power-generating facilities;

- Knowledge of the complete distribution system of the activity including normal routing, parallel feeders, possible interconnections, and capacity of lines and equipment;

- Knowledge of transformers, series and parallel circuits, line loading, line losses, and dielectric or conductive operating limitations of equipment, in order to calculate circuit values, determine when operating limitations of equipment are exceeded, or recognize excessive current flow or other signs of improper systems;

- Knowledge of the National Electric Safety Code and of types and sizes of wires/cables, conduits, transformers, and other electrical equipment and circuit elements, and the skill to integrate them into electrical systems and equipment worked on to insure proper operation;

- Skill to read circuit diagrams and perform troubleshooting layout, and complete installation, modification, and repair on high voltage distribution systems such as repairing switchgear, installing transformers, and locating defects in cables;

- Skill to splice wires/cables by removing insulation, scraping clean, twisting together and soldering, or connecting conductors with mechanical connectors, splicing clamps, and tape. Skill to form and seal various types of cable joints such as straight, bridge, cap sleeve, vertical, disc, or knuckle joints. May splice lead covered cable;

- Working knowledge of electronics to troubleshoot and replace circuit boards in the controls of equipment such as electronic reclosers and other similar devices;

- Skill in the use of hot-line tools and protective equipment such as wire tongs, wire tong supports, insulated tension links, tie sticks, insulated hoods/covers and tools, and rubber gloves, sleeves, and insulating blankets; and

- Skill to install, maintain, and repair street and airfield lighting systems, and traffic signals and controllers.

Responsibility: Grade 10 high voltage electricians receive work assignments from a supervisor or leader. They plan the sequence of work and determine the nature of maintenance or repair needed. They are responsible for determining the effects that alterations will have on the total system and for insuring that lines and equipment function properly. Work is subject to spot-checks during progress and upon completion by a supervisor for compliance with instructions. They report to the supervisor all special occurrences such as emergency outages and corrective actions taken to maintain service. They may also be responsible for providing technical assistance to lower grade workers.

Physical Effort: Same as grade 8 level.

Working Conditions: Same as grade 8 level.