2012 – 2013

Florida Department of Education
Curriculum Framework

Program Title: **Electrical Distribution Technology**
Career Cluster: **Energy**

	AS	AAS
CIP Number	16646030101	0646030101
Program Type	College Credit	College Credit
Standard Length	65 Credit Hours	65 Credit Hours
CTSO	SkillsUSA	SkillsUSA
SOC Codes (all applicable)	49-9051	49-9051
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm	
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp	
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp	

Purpose

The purpose of this program is to prepare students for employment as utility electrical line workers, or in related work on private industry owned and operated electrical distribution systems. Workers in this industry are employed by public power, cooperative or municipal utilities, privately owned systems such as the mining industry and electrical distribution system contractors.

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Energy career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Energy career cluster.

The content includes but is not limited to safety and safe work practices; fundamentals of electricity and electrical formulae; study of utility practices and basic utility business models; leadership, communications and interpersonal skills; electrical transmission/distribution substation operation; installation, maintenance and operation of overhead and underground electrical distribution systems; electrical service metering and the application of electrical test instrumentation used in the industry. The program is broad in its scope employing industry recognized levels of training progression and performance objectives. The introduction of basic technology in each learning component and progressive employment of the program content will bring the student from novice ground man to the proficiency level of journeyman line worker.

Program Structure

This program is a planned sequence of instruction consisting of 65 credit hours.

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

This program includes 21 semester hours of college level general education courses. The general education components include oral and written communications skills, basic computer skills, college algebra computation skills, problem solving, critical thinking and interpersonal skills. These general education skills are included to insure the graduate is capable of succeeding in an industry that is rapidly and consistently employing new and advanced technologies. In addition, the advanced thinking and problem solving skills are not only valuable to the graduate's future learning opportunities but an employer desired skill set as well. The general education components of the program are statewide transferable credits toward other college level programs.

Career and Technical Student Organization (CTSO)

SkillsUSA, Inc. is the appropriate career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's IEP or 504 plan or postsecondary student's accommodations plan to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their postsecondary service provider. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Articulation

To be transferable statewide between institutions, this program must have been reviewed, and a "transfer value" assigned the curriculum content by the appropriate Statewide Course

Numbering System discipline committee. This does not preclude institutions from developing specific articulation agreements with each other.

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The AAS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS. The standard length of this program is 65 credit hours according to Rule 6A-14.030, F.A.C.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS/AAS degree program includes the following College Credit Certificates:

Electrical Distribution Technology Advanced (0646030102) – 50 Credit Hours
Electrical Distribution Technology Basic (0646030103) – 24 Credit Hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate general safe work practices promulgated under Federal, State and industry regulation.
02.0 Demonstrate rescue, CPR and lifesaving strategies particularly related to the industry.
03.0 Demonstrates proficiencies in rigging pole climbing and basic pole framing.
04.0 Demonstrate proficiencies working with insulating “hot-sticks” tools, protective cover-up materials, and insulated rubber gloving techniques.
05.0 Demonstrate proficiencies in setting distribution poles.
06.0 Demonstrate proficiencies installing overhead line equipment.
07.0 Demonstrate proficiencies in applying electrical formulae and electric test equipment.
08.0 Demonstrate proficiencies in constructing new underground electrical distribution systems.
09.0 Demonstrate proficiencies in constructing/re-conductoring overhead electrical distribution systems.
10.0 Demonstrate techniques for maintenance of overhead facilities.
11.0 Demonstrate techniques for maintenance of underground facilities.
12.0 Demonstrate an understanding of a variety of utility business models representing the industry.
13.0 Understand electrical metering technology, utility data collection and control technologies.
14.0 Demonstrate safe switching, sectionalizing and isolation of electrical distribution circuits.
15.0 Demonstrate safe work practices in electrical transmission and distribution substations.

16.0 Demonstrate proficiencies in applied electrical theory.
17.0 Demonstrate proficiency in utility construction equipment operation and maintenance.

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Florida Department of Education
Student Performance Standards

Program Title: **Electrical Distribution Technology**
CIP Numbers: **A.S. 1646030101, A.A.S. 0646030101**
Program Length: **65 Credit Hours**
SOC Code(s) : **49-9051**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The AAS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS. At the completion of this program, the student will be able to:

01.0 Demonstrates general safe work practices promulgated under federal, state and industry regulation--The student will be able to:

- 01.01 Discuss and describe function and mission of OSHA and an employer's Safety Organization.
- 01.02 Research, generally interpret and apply sections of a "Safe Work" practice manual.
- 01.03 Research, generally interpret and apply OSHA safe work practices.
- 01.04 Discuss safe trenching, excavation, shoring and confined space practices.
- 01.05 Discuss the applied safe work practices when given a scenario.
- 01.06 Discuss safe truck driving and pole and equipment trailer practices.
- 01.07 Understand the process of obtaining the State of Florida CDL-A Permit License.

02.0 Demonstrates rescue, CPR and lifesaving strategies particularly related to the industry--The student will be able to:

- 02.01 Describe the rescue and life saving requirement training for line workers as promulgated under OSHA.
- 02.02 Evaluate potential hazards for rescue planning in tailboard sessions.
- 02.03 Identify the standby equipment for job site safety/rescue preparedness.
- 02.04 Evaluate safety/rescue equipment for worthiness.
- 02.05 Evaluate a first aid kit for completeness.
- 02.06 Evaluate and administer first aid.
- 02.07 Effectively initiate professional lifesaving 911 response in an emergency situation.
- 02.08 Describe the processes for organizing a rescue response team.
- 02.09 Perform as the incident commander in a rescue response.
- 02.10 Perform CPR alone and as a team on adults, children and infants.
- 02.11 Describe the process and perform a rescue of an injured person from an aerial platform.
- 02.12 Describe the process and perform a rescue of an injured person from pole top or structure.
- 02.13 Describe the process and perform a rescue of an injured person from a manhole.

03.0 Demonstrates proficiencies in rigging, pole climbing and basic pole framing--The student will be able to:

03.01 Discuss and explain how ropes are manufactured.
03.02 Discuss the construction of and application of rope.
03.03 Distinguish between rope types and applications.
03.04 Demonstrate proper care and maintenance of ropes.
03.05 Apply and tie knots for a variety of rigging requirements.
03.06 Discuss and demonstrate the effect of rigging multiple sheave blocks.
03.07 Rig a variety of sheaved blocks.
03.08 Demonstrate proper rope splicing techniques.
03.09 Apply hoist to a variety of lifting situations.
03.10 Demonstrate care, maintenance and operation of cable, chain and strap hoist.
03.11 Demonstrate rigging for pulling/tensioning down guys.
03.12 Demonstrate rigging for lifting equipment and poles.
03.13 Demonstrate inspection, care, maintenance and application of a variety of slings.
03.14 Demonstrate the application and rigging of gins and saddles.
03.15 Discuss and demonstrate the dynamics of compound rigging.
03.16 Discuss the care and maintenance of pole climbing equipment.

04.0 Demonstrate proficiencies working with insulating “hot-sticks” tools, protective cover-up materials, and insulated rubber gloving techniques--The student will be able to:

04.01 Demonstrate hot line rigging of strap hoist with sticks.
04.02 Demonstrate wire tying with a tie stick.
04.03 Demonstrate operating an energized switch with a switch stick.
04.04 Describe the function of and properly operate a “Load Buster,” load break tool.
04.05 Simulate stick lifting of a hot phase conductor.
04.06 Demonstrate stick installed temporary insulating cover.
04.07 Demonstrate transferring a dead-end with sticks.
04.08 Perform hotline stick insulator and arrestor change-outs.
04.09 Demonstrate installing a jumper with sticks.
04.10 Demonstrate installing a stirrup with sticks.
04.11 Demonstrate gloving a stirrup installation.
04.12 Demonstrate covering energized lines with sticks.
04.13 Demonstrate installing blankets with sticks.
04.14 Demonstrate covering energized lines with gloves.
04.15 Cover a single phase transformer installation using gloving techniques.
04.16 Demonstrate a dead-end transfer using gloving techniques.
04.17 Demonstrate phase tying with gloves.
04.18 Demonstrate installing a jumper using gloving techniques.
04.19 Demonstrate a dead-end transfer from a baker board using gloving techniques.
04.20 Discuss safety considerations for gloving of energized conductors.

05.0 Demonstrates proficiencies in setting distribution poles—The student will be able to:

05.01 Discuss and identify different types of and applications of line support structures.
05.02 Identify ratings and manufacturer of structures by reading the pole “brand”.
05.03 Stake and layout a new project for pole setting by reading a construction blueprint.
05.04 Demonstrate proficiencies in setting a variety of pole anchor systems.
05.05 Install a variety of pole guy anchor types.
05.06 Discuss wind loading and pole stresses.

05.07 Discuss and identify pole failure modes.
05.08 Discuss and properly install and test pole/structure grounding installations.
05.09 Layout the tools and equipment needed to install a full size utility pole.
05.10 Excavate for and install a wood, fiberglass, concrete, or steel pole using a digger-derrick material handler truck.
05.11 Execute a dead-man and push brace installation.
05.12 Demonstrate canting, tamping and raking of distribution structures.
05.13 Identify transmission structure types.
05.14 Identify cross arm, alley arm, arm less, and vertical pole head construction using pole top pin-and-insulators and post-type-insulators.
05.15 Discuss joint-use utility provisions and clearances.

06.0 Demonstrates proficiencies installing overhead line equipment--The student will be able to:

06.01 Use a field work order print/drawing and a standards manual to apply distribution construction standards for installing overhead line equipment.
06.02 Determine the general voltage class for which a pole line is rated by observation of installed insulator hardware.
06.03 Apply the correct insulators for a distribution line installation.
06.04 Apply the correct surge arrestors for a distribution line installation.
06.05 Discuss the correct use of surge arrestors with respect to their unique operating voltage characteristics.
06.06 Install and wire surge arrestors in a variety of applications and configurations.
06.07 Discuss the reasons for various overhead insulator design configurations.
06.08 Discuss lightning arrestor technologies.
06.09 Classify distribution class switches and disconnects by current, voltage and style.
06.10 Install and operate distribution class disconnects in pole, arm and inline installations.
06.11 Classify a variety of load break rated disconnect switches.
06.12 Install a variety of distribution class cross arms.
06.13 Discuss the safety considerations regarding operating and switching aerial circuit breaker and recloser devices.
06.14 Demonstrate the operating technology for single and three phase reclosers and regulators.
06.15 Discuss the common failure modes for circuit breakers, reclosers, and capacitors.
06.16 Install and safely operate single and three phase reclosers and regulators.
06.17 Demonstrate the procedure for removing a regulator from service.
06.18 Install single phase transformers and three phase transformer banks.
06.19 Install and safely operate single and three phase distribution class capacitor banks.
06.20 Remove single and three phase capacitor banks from service.
06.21 Discuss supervisory and stand alone control schemes for distribution class field installed capacitor banks.
06.22 Discuss the application and operation of primary and secondary voltage capacitors on alternating current systems.
06.23 Install a single phase and three phase pole mounted recloser.
06.24 Install a pole mounted and platform mounted regulator bank.
06.25 Install single and three phase capacitor banks.

06.26 Install a variety of three phase banked transformers.

07.0 Demonstrates proficiencies in applying electrical formulae and electric test equipment—The student will be able to:

07.01 Demonstrates understanding of alternating current theory.
07.02 Demonstrates understanding of direct current theory.
07.03 Demonstrates understanding of measurement of electromotive force.
07.04 Demonstrates understanding of measurement of electrical current.
07.05 Demonstrate measurement techniques to obtain volt-amps, watts, and power factor.
07.06 Explain the fundamentals of operation and demonstrate electrical measuring equipment.
07.07 Apply electrical formulae to solve electrical computations.
07.08 Demonstrate a variety of cable location equipment.
07.09 Demonstrate proficiency in cable testing of primary and secondary UG cables.
07.10 Demonstrate understanding of high potential testing procedures.
07.11 Demonstrate proficiency in ground resistance testing.
07.12 Demonstrate proficiency in “ringing” cable connections.
07.13 Demonstrate proficiency of transformer testing.
07.14 Demonstrate understanding of insulating oil test.
07.15 Demonstrate understanding of testing of rubber goods.
07.16 Demonstrate testing of streetlight ballast and components.
07.17 Demonstrate testing of controllers and controller components.

08.0 Demonstrate proficiencies in constructing new underground electrical distribution systems--The student will be able to:

08.01 Demonstrate safety considerations regarding trenching and underground installations.
08.02 Identify soil conditions for trenching planning according to OSHA regulations.
08.03 Assemble material and equipment to construct a URD single phase radial installation.
08.04 Demonstrate knowledge of reading construction work order drawing (blueprint reading) for an underground URD loop system.
08.05 Demonstrate direct burial and conduit installation of URD primary and secondary cable.
08.06 Differentiate between classes and sizes of primary and secondary cables.
08.07 Demonstrate proper storage and handling of primary and secondary cable.
08.08 Demonstrate underground cable installation methods using open excavation and subsurface boring techniques.
08.09 Splice/terminate a variety of types of XLPE and rubber insulated primary cables.
08.10 Install single phase, open-delta, and three phase underground transformers.
08.11 Demonstrate safe grounding procedure for1Ø and 3Ø underground cable.
08.12 Discuss the application and wiring of overhead transformers for use in vaults and in enclosures.
08.13 Perform primary cable terminations on a 3 phase loop fed transformer or switch pad.
08.14 Discuss the various types of pre-fabricated and cast-in-place transformer and switchgear pads / foundations / and vaults.

08.15 Install single and three phase riser pole mounted underground cable terminations (potheads) in conjunction with aerial switch or fuse devices.
08.16 Install single phase URD service, conduit riser and meter box connections.
08.17 Discuss old and new technologies associated with underground cable fault finding systems (DC, TDR, VLF-AC, Partial Discharge, etc.).

09.0 Demonstrate proficiencies in constructing/re-conductoring overhead electrical distribution systems--The student will be able to:

09.01 Demonstrate planning a new overhead line construction project.
09.02 Demonstrate planning the re-conductoring of an existing three phase line.
09.03 Identify and plan for safety of the public during wire pulling operations.
09.04 Identify and perform tree trimming to facilitate the installation of conductors.
09.05 Layout the equipment required for a conductor pulling operation.
09.06 Lead the safety planning and grounding aspects of re-conductoring a three phase line.
09.07 Plan and safely execute a variety of hot-line “fanning” operations for pulling conductors.
09.08 Plan and properly position/set poles for re-conductoring change outs and transfers.
09.09 Plan and properly execute covering of existing utilities.
09.10 Install running blocks and equipment for pulling conductors.
09.11 Set up and operate overhead conductor pulling tensioning equipment.
09.12 Demonstrate knowledge of line sagging tools.
09.13 Properly perform phase tensioning, transfer to insulators and tying in of conductors.
09.14 Safely and properly install and remove mechanical jumpers.
09.15 Plan and safely remove abandoned conductors.

10.0 Demonstrates techniques for maintenance of overhead facilities--The student will be able to:

10.01 Demonstrate change out of a variety of distribution class cross-arms.
10.02 Demonstrate maintenance of distribution class disconnects in pole, arm, and inline installations.
10.03 Demonstrate maintenance of single and three phase reclosers and regulators.
10.04 Demonstrate maintenance of single and three phase distribution class capacitor banks.
10.05 Demonstrate maintenance to system grounding conductors and connections.
10.06 Demonstrate re-lamping and maintenance of lighting systems.
10.07 Demonstrate proficiency of a variety of insulator change-outs.
10.08 Demonstrate proficiency of pole change-outs.
10.09 Demonstrate proficiency in switch and arrestor maintenance and change-outs.
10.10 Demonstrate proficiency in pole and pole line inspection.
10.11 Demonstrate proficiency in transformer inspection, maintenance and change-outs.

11.0 Demonstrates techniques for maintenance of underground facilities--The student will be able to:

11.01 Demonstrate replacement of a single phase pad mounted transformer.

11.02 Demonstrate both primary and secondary voltage splicing techniques.
11.03 Demonstrate the basic techniques associated with making an insulating tape splice on a primary URD cable.
11.04 Demonstrate the basic techniques necessary to make a lead-to-solid dielectric primary cable transition splice.
11.05 Demonstrate the procedure to replace a blown element in a transformer bayonet style fuse holder.
11.06 Demonstrate leakage gradient fault finding equipment on secondary faulted cable.
11.07 Demonstrate inspection and maintenance on a pad mounted transformer.
11.08 Demonstrate inspection and maintenance on UG sectionalizer switches.
11.09 Demonstrate a safe procedure for replacing a fuse element in a live-front pad mounted distribution transformer.

12.0 Demonstrates an understanding of a variety of utility business models representing the industry--The student will be able to:

12.01 Demonstrate understanding of basic utility management elements.
12.02 Demonstrate an understanding of cooperative, municipal, and investor owned power provider models.
12.03 Demonstrate an understanding of role of associations such as the Electric Cooperative Associations, the American Public Power Association, and investor owned power providers.
12.04 Demonstrate an understanding of the role of associations such as the Electric Cooperative Association, the American Public Power Association, and the Edison Electric Institute.
12.05 Demonstrate understanding of history of power company development, regulation and legislation.
12.06 Demonstrate an understanding of deregulation of the electric power provider industry.
12.07 Demonstrate an understanding of regulatory agencies that govern utility operations, such as FERC, EPA, USDA, and State PSC.
12.08 Demonstrate an understanding of differences in the economics of operation between cooperative, municipal, and investor owned power providers.
12.09 Demonstrate an understanding of cost of delivered goods and common pricing structures for residential, commercial and industrial service.
12.10 Demonstrate understanding of inter and intrastate mutual aid agreements.
12.11 Demonstrate an understanding of “wheeling”, purchase power and leased system agreements.
12.12 Demonstrate an understanding of pole line management.
12.13 Demonstrate an understanding of GPS and GIS technologies.

13.0 Understands electrical metering technology, utility data collection and control technologies--The student will be able to:

13.01 Demonstrate setting a single phase residential meter.
13.02 Demonstrate setting a three phase socket-type meter into a meter base.
13.03 Demonstrate setting a three phase A-base meter and current transformers.
13.04 Size and apply the correct equipment for a primary metering installation.
13.05 Install a three phase distribution class metering installation.
13.06 Wire the line side of a single phase UG meter base.

13.07 Wire the line side of a three phase open delta UG meter base.
13.08 Wire the line side of a three phase wye UG meter base.
13.09 Discuss the technology behind three phase distribution class metering.

14.0 Demonstrates safe switching, sectionalizing and isolation of electrical distribution circuits--The student will be able to:

14.01 Demonstrate switching/sectionalizing of a three phase overhead line.
14.02 Demonstrate proper execution of a distribution switching order.
14.03 Plan a distribution switch order.
14.04 Demonstrate switching/sectionalizing a three phase line with regulators.
14.05 Plan and execute a three phase live front loop sectionalizing operation.
14.06 Demonstrate parking of a UG primary dead-front elbow.
14.07 Plan and execute a three phase dead front loop sectionalizing operation.
14.08 Plan and execute a handle operated switching pad sectionalizing operation.

15.0 Demonstrate safe work practices in electrical transmission/distribution substations--The student will be able to:

15.01 Demonstrate a functional knowledge of a substation one line diagram.
15.02 Plan and execute a complete substation switching order.
15.03 Identify all equipment in a typical substation.
15.04 Read and identify the name plate data on substation equipment.
15.05 Describe the function of and components of a recloser relay unit.
15.06 Read and diagnose targets and lockout mode of a substation recloser.
15.07 Change out a recloser relay unit.
15.08 Place a substation recloser in non-automatic operation.
15.09 Safely operate a gang operated air break transmission class switch.
15.10 Describe the component parts of various air/oil/vacuum/gas insulated substation circuit breaker technologies.
15.11 Discuss the procedure to safely execute a buss tie closure and the transfer of individual circuit breaker loads.
15.12 Demonstrate knowledge of a typical SCADA control system.
15.13 Check and service a substation battery bank.
15.14 Demonstrate testing and replacing a distribution class sand fuse.
15.15 Rack out a substation recloser.
15.16 Prepare a procedure to take a substation regulator out of service and then safely return it to service.
15.17 Execute the procedure to reset a tripped off recloser.
15.18 Restore power to an off line substation.
15.19 Discuss how to read and evaluate a remote status recloser controller and switchboard operator.

16.0 Demonstrate proficiency in applied electrical theory substations—The student will be able to:

16.01 Demonstrate an understanding of the history of electricity.
16.02 Demonstrate an understanding of static electricity and lightning.
16.03 Demonstrate an understanding of parallel and series circuits.
16.04 Demonstrate knowledge of the theory of electrical induction.
16.05 Demonstrate knowledge of AC and DC electric theory.

16.06 Demonstrate an understanding of the properties of an electrical arc.
16.07 Demonstrate understanding of the component parts of a transformer.
16.08 Demonstrate understanding of the process of electricity generation.
16.09 Demonstrate an understanding of the concept of transmitting electric power.
16.10 Demonstrate understanding of the principal of operation of an electric motor.
16.11 Demonstrate an understanding of the theory of capacitance.
16.12 Demonstrate the theory of electrical reactance and resistance.
16.13 Demonstrate an understanding of kW and kVA and the fundamental principles of electric energy.
16.14 Identify classes of insulators and conductors.
16.15 Demonstrate basic low voltage control wiring safety and installation.

17.0 Demonstrate proficiency in utility construction equipment operation and maintenance— The student will be able to:

17.01 Demonstrate safe work practice for operating machinery.
17.02 Demonstrate routine daily inspection to trucks and mobile equipment.
17.03 Inspect hydraulic systems for operational integrity.
17.04 “Fly” a boom for safety inspection.
17.05 Demonstrate understanding of dielectric testing of an insulated boom section.
17.06 Clean and maintain dielectric bucket liners and boom insulators.
17.07 Maintain and install vehicle grounds.
17.08 Safely jump start a vehicle.
17.09 Inspect equipment for safe operational conditions.
17.10 Safely load, secure and unload a variety of equipment from a drive-on trailer.
17.11 Read a load lifting chart.
17.12 Plan a lift.
17.13 Accurately give hand signals to a boom truck operator.
17.14 Set up an aerial truck for operation.
17.15 Safely operate an aerial lift truck.
17.16 Safely operate a boom truck.
17.17 Safely operate a pole-hole digger truck.
17.18 Safely operate an operator seated trenching machine.
17.19 Safely operate a walk behind trencher.
17.20 Safely operate a backhoe.
17.21 Safely operate a horizontal boring machine.