U.S. Department of Labor Employment and Training Administration Office of Apprenticeship (OA) Washington, D.C. 20210	Distribution: A-541 Headquarters A-544 All Field Tech A-547 SD+RD+SAA+; Lab.Com	Subject: New Apprenticeable Occupation: Wireless Technician Code: 200.1
Symbols: DSNIP/KAJ	ApprenticeshipUSA	Action: Immediate

PURPOSE: To inform the staff of OA, State Apprenticeship Agencies (SAA), Registered Apprenticeship program sponsors, and other Registered Apprenticeship partners of a new apprenticeable occupation:

> Wireless Technician
> O*NET-SOC Code: 49-2021.01
> RAPIDS Code: 2038CB
> Type of Training: Competency-based

BACKGROUND: Mr. Scott Kisting, Vice President of Midwest Underground Technology Inc. on behalf of Telecommunications Industry Registered Apprenticeship Program submitted the following occupation: Wireless Technician for apprenticeability determination.

Wireless Technician will be added to the List of Occupations Recognized as Apprenticeable by OA when the list is reissued. A suggested Work Process Schedule and Related Instruction Outline are attached.

If you have any questions, please, contact Kirk Jefferson, Apprenticeship and Training Representative at (202) 693-3399.

ACTION: OA staff should familiarize themselves with this bulletin and the attached Work Process Schedule and Related Instruction Outline, as a source for developing apprenticeship standards and/or providing technical assistance.

NOTE: This bulletin is being sent via electronic mail.

Attachments

- [WORK PROCESS SCHEDULE - WIRELESS TECHNICIAN](#)

WORK PROCESS SCHEDULE
WIRELESS TECHNICIAN
O*NET-SOC CODE: 40-2021.00   RAPIDS CODE: 2038CB

ON-THE-JOB LEARNING

Description: The Wireless Technician is a supervised member of a team performing general installation, provisioning, maintenance, troubleshooting/fault isolation and restoration activities of essential wireless systems.

On the Job Competencies:

	Evaluation	*COMPONENT 1*	*COMPONENT 2*	*COMPONENT 3*
Safety Training • **OSHA 10 (Telecom)** • **Personal Protection Equipment(PPE)** • **CPR/First Aid/Blood Borne Pathogens (BBP)** • **Radio Frequency (RF) Radiation Safety and Awareness** • **Electrical and Grounding Safety** • **Job Site Safety Analysis (JSA)**	Competency-based, written, and or practical	Baseline training	Intermediate training	Completion/Mentor's verification
Industry Knowledge • **Telecommunications Fundamentals** • **Digital Communications and Internet Protocol (IP) Fundamentals**	Competency-based, written, and or practical	Baseline training	Intermediate training	Completion/Mentors verification certification

• **Introduction to Wireless Communications** • **Introduction to Microwave and Radio Transmission Systems and DAS (Distributed Antenna Systems) Electrical/Power System Fundamentals**				
Technical Skills • **Equipment/System Installation** • **Equipment/System Monitoring, Testing and Maintenance** • **Equipment/System Troubleshooting and Repair** • **Job Site Management and Security** • **Job Site Process and Operations** • **Material Handling**	Competency-based, written, and or practical	Baseline training	Intermediate training	Completion/Mentors verification certification
Operate Machines, Equipment, Tools and Software (METS)	Competency-based, written, and or practical	Baseline training	Intermediate training	Completion/Mentors verification certification
Operate Motor Vehicles and Equipment • **Knowledge of proper DOT regulations if applicable** • **Load securement**	Competency-based, written, and or practical	Baseline training	Intermediate training	Completion/Mentors verification certification

Wireless Technician Descriptions

Safety Training

- *OSHA 10 (Telecom)* – Currently there are 10 hour courses that are tailored to telecommunications work. These 10 hour courses are the primary means to be used. However, until such a time as the TIRAP Board is able to work with OSHA to have a new 500 course in place, we will be recognizing a construction-based 10 hour course. Knowledge of wireless site safety is critical in understanding how to perform work on company assets. This course will provide the information and knowledge to ensure a safe work environment. Apprentices will receive a card showing they have completed the course.

- *Personal Protection Equipment (PPE)* - Each Apprentice must be trained in the inspection, care and use of PPE for the particular SOW and hazards addressed through their use. While the Apprentice is being trained in PPE inspection, care and use, they are to be under direct supervision of an on-the-job mentor at all times, enabling them to draw on the competencies of the on-the-job mentor as they develop experience in the inspection, care, and proper use of PPE. Examples of PPE used by an Apprentice include: hard hat, proper footwear, eye/face protection, hearing protection, and fall protection equipment. This list is not exclusive or exhaustive as the SOW may require the supervisory, on-the-job mentor to engage other types of engineering controls or safety measures.

- *Cardiopulmonary resuscitation (CPR)/First Aid/Blood Borne Pathogens (BBP)* – This course is recognized as completed as long as it meets or exceeds the requirements of the American Red Cross or American Heart Association. The Apprentice must achieve certification in accord with at least one of these two programs.

- *Radio Frequency (RF) Radiation Safety & Awareness* – This course is designed to enable the Apprentice to have an understanding of the RF-related hazards and the ability to understand basic antenna types, RF patterns and potential for exposure. Apprentice(s) will also be trained in the use of a RF meter along with the bands that it is designed to monitor. Testing shall be both a written exam and demonstration of the proper use of an RF monitor. This training shall meet or exceed the requirements of all current Federal Communications Commission-Office of Engineering and Technology (FCC OET) Bulletins with regards to Human Exposure levels. This course will also cover the fundamental science, exposure and protection methods concerning electromagnetic frequency (EMF) and electrostatic discharge (ESD) safety.

- *Electrical and Grounding Safety* – This course is designed to teach basic electrical skills, AC and DC power distribution systems, power safety procedures, generator and battery operations, testing and maintenance. The Apprentice will also learn the fundamentals of Grounding Safety Standard Installation to include general grounding theory, types of grounding, components, surge protection, ground resistance measurements etc.

- *Jobsite Hazard Analysis (JHA)* – A primary goal is that the Apprentice understands the necessity of the project SOW comprehension and the subsequent jobsite hazards the SOW could expose the Apprentice or other crew member to as a part of performing the SOW. Apprentice must be able to communicate the hazards outlined in a JHA and identify the means necessary to abate the hazard and/or PPE use required to protect against these hazards. The Apprentice will also understand company and vendor accident reporting procedures. Proper planning allows for quality work in an efficient manner, and it is through this planning that the Apprentice will be able to ensure safety for themselves as well as the other members of the team. Testing will involve written exams requiring the Apprentice to demonstrate their understanding of the jobsite hazards and appropriate steps to mitigate those hazards.

Industry Knowledge

- *Telecommunications Fundamentals* – The Apprentice will develop an understanding and working knowledge of the following:

  - Telephony fundamentals and telecommunication industry overview
  - Circuit types, circuit switched and fiber optic networks
  - General telephony equipment including Digital Signal Cross-Connect (DSX) bays/chassis/panels, *Channel Service Units/Data Service Units (*CSU/DSU) repeater systems, smart jacks, Bit Error Rate Testers (BERT), etc.
  - Understanding and knowledge of backhaul technologies and testing procedures
  - Ability to learn Original Equipment Manufacturer (OEM) products as technology evolves

- *Digital Communications and Internet Protocol (IP) Fundamentals* – The Apprentice will develop an understanding and working knowledge of the following:

  - Data communication/transmission fundamentals and industry overview
  - Networking basics, equipment and LAN/WAN architecture
  - IP protocol stack, networking fundamentals, IP addressing, mobile IP

- *Introduction to Wireless Communications* – The Apprentice will develop an understanding and working knowledge of the following:

  - Wireless communication fundamentals and specifics of current and proposed U.S. wireless systems
  - Elements of radio system design, interference, cell coverage, frequency management and channel assignment
  - Call processing, propagation loss, multipath fading and methods of reducing fades, error correction requirements and techniques*,* modulation methods, microcell issues, etc.
  - Introduction to Long Term Evolution (LTE) and VoLTE (Voice over LTE) Systems

- *Introduction to Microwave and Radio Transmission Systems and DAS (Distributed Antenna Systems)* - The Apprentice will develop an understanding and working knowledge of the following:

  - The theory of microwave technology and radio systems
  - Types of multiplexing including analog, time-division multiplexing (TDM), code division multiple access (CDMA) and others
  - Operation and maintenance of transmission line pressurization systems
  - Distributed Antenna System (DAS) fundamentals and components

- *Electrical / Power System Fundamentals* – The Apprentice will learn about the work practices to be used during the operation and maintenance of electric power generation, transmission, and distribution facilities. The standard includes requirements relating to enclosed spaces, hazardous energy control, working near energized parts, grounding for employee protection, work on underground and overhead installations, line-clearance tree trimming, work in substations and generating plants, and other special conditions and equipment unique to the generation, transmission, and distribution of electric energy.

Technical Skills

- *Equipment / System Installation* – The Apprentice will be educated and trained to assist in the proper commissioning and installation of all wireless site equipment:

  - Antenna, base transceiver stations (BTS), DAS/small cell components and associated network elements
  - Single/multi-mode fiber and coaxial cable to include RF interconnects, cable terminations and fusion splicing
  - T1/IP cross connects, circuit commissioning/decommissioning, CSU/DSU provisioning
  - Install, terminate and test RF interconnecting cabling
  - RF Meter usage
  - Perform equipment installation inspection, power up, and acceptance testing
  - Read and understand technical manuals to determine equipment which meets established requirements
  - Understand electro static discharge (ESD) safety and equipment protection procedures

- *Equipment / System Monitoring, Testing and Maintenance* – The Apprentice will learn and apply new skills to assist in monitoring, testing and maintaining all wireless site equipment:

  - Provide daily preventive maintenance of wireless site equipment including small cells, macro sites, DAS systems and Wi-Fi hubs

- o Perform system testing for network outages and integrity using scanners, spectrum analyzers, and other electronic test equipment
- o Understand, interpret and calibrate results for test equipment such as T1/IP, power, conductivity and earth ground resistivity meters, and smart clocks/frequency counters
- o CDMA system functionality (forward, reverse, paging channel , power control, soft hand-off, capacity), call processing and sequencing, message flow, and critical/sub states
- o CDMA communications system analyzers and testing measurements: carrier feed through, average and channel power, timing and phase, pilot time offset, error vector magnitude (EVM) and RF overlay
- o Conduct antenna and cable sweep testing and analysis
- o Maintain and inspect test equipment, tools and supplies for continuous use
- o Perform scheduled and on-demand maintenance routines
- o Understand tower lighting system operations and management

- *Equipment / System Troubleshooting and Repair* - The Apprentice will learn and apply new skills to assist with fault isolation, troubleshooting, remedying and/or repairing all wireless site equipment:

  - o Locate, test, adjust, repair and replace malfunctioning and inoperative equipment
  - o Use troubleshooting techniques to identify, isolate and resolve network anomalies and failures
  - o Use troubleshooting techniques to identify, isolate and resolve hardware/software and air interface malfunctions utilizing multiple test equipment on various products and technologies
  - o Respond to and resolve T1/IP, microwave and network alarms and outages
  - o RF sweep testing and PIM monitoring
  - o Ethernet backhaul testing (IPBH)
  - o Data capture and packet analysis

- *Job Site Management and Security* – The Apprentice will learn security policies and practices for the physical security of wireless sites and equipment:

  - o Perform general physical security and routine site/grounds inspections
  - o Check and verify environmental settings; report and/or remedy issues
  - o Proactively help to ensure complete physical security of all wireless elements

- *Job Site Process and Operations* – The Apprentice will gain proficiencies by working with, and learning from, management and other Technicians by assisting them with daily site operations and management responsibilities:

  o Comply with standard operating procedures and policies
  o Understand and follow safety and escalation procedures
  o Document and record daily activities and events using BTS logs with accuracy and completeness
  o Utilize appropriate cell site software/systems to provide and obtain necessary information and reports
  o Accommodate changes in work schedule (expediting new sites, outages, site integration changes, project delays, etc.)

- *Material Handling* - All material must be handled appropriately. Size, weight and structure of materials will require different methods and equipment as appropriate, to handle safely. The Apprentice will also be trained in the proper storage of materials. Due to the remote nature of the work sites it is important that the Apprentice be instructed in the requirements that some materials are weather sensitive, some are prone to theft and some could be blown away and create damage or loss. Transporting materials is a daily consideration in telecommunications so the Apprentice must also learn proper loading and tie down of various types of materials. It is important for the Apprentice to understand and come to competency through on the job experience. Apprentices will be trained and tested in:

  o Hazardous material awareness and safety
  o Loads on vehicles
  o Tagging a load
  o Planning for securement of a load on a structure
  o Proper lifting to avoid injury. Use mechanical advantage, buddy system, or rigging

Operate Machines, Equipment, Tools and Software (METS)

The Apprentice will be educated in the proper use, storage and maintenance of all job related tools. They will understand the potential hazards as well as the safety precautions to prevent those hazards from occurring. Machinery, equipment, tools and systems may include:

  o Machinery - transportation and operation of specific wireless site machinery/equipment
  o Hand Tools - ESD, diagnostic and testing tools
  o Ladders - non-conductive standard, step and extension ladders
  o Information Systems - company and vendor asset, network operations and trouble ticketing systems

Operate Motor Vehicles and Equipment

Apprentices that are assigned to projects and/or job sites that require operation of a motor vehicle will be educated in the following:

- o *Knowledge of Applicable DOT Regulations* - Training will cover DOT requirements and exemptions that apply to our industry. All driving Apprentices will be trained in the use of the vehicles that will be used and other equipment that may be required for the operation of the vehicle. Testing includes a written exam and a driver test under the supervision of an on-the-job mentor.

- o *Load Securement and Safety* - The Apprentice will learn how to properly place and secure loads on vehicle and while in transport.

RELATED INSTRUCTION OUTLINE
WIRELESS TECHNICIAN
O*NET-SOC CODE: 49-2021.00   RAPIDS CODE: 2038CB

The Wireless Technician Apprenticeship Program is comprised of a minimum of 144 hours related classroom instruction, which will be completed over a term of one-year (1).

Description: Related instructional courses provide technical ability and a basic understanding of the telecommunication/wireless industry. The following are courses to be completed during the term of Apprentice and under direct supervision of an on-the-job mentor:

<u>Core Skills:</u>	<u>Approximate Hours</u>
1. OSHA 10 Hour	10
2. Hazard Assessment and Communication	30
3. RF Assessment and Exposure	15
4. First Aid/CPR	10
5. DOT Driver Rodeo	10
6. Introduction to Standards	10

TOTAL HOURS: 85

Course Description

OSHA 10 Hour: This is a version of the OSHA 10 hour course that is provided by a trainer that has been authorized to perform instruction from OSHA. This 10 hour course is specifically targeted to the Telecommunications Industry and has emphasis placed upon fall hazards.

Hazard Assessment and Communication: An introduction to the various structures that work will be performed on. Based upon the SOW and the type of structure it is being applied to the hazard's may change and this requires the ability to understand that there is a hazard and it must be communicated to the rest of the team.

RF Assessment and Exposure: PPE is not enough. It is important for there to be an understanding of the hazard associated with RF and the ability to work as part of a team to communicate the hazard and means of abatement or use of PPE for protection.

First Aid/CPR: These courses follow the agendas established by Red Cross/American Heart Association.

DOT Driver Rodeo: Travel from one site to another is one of the greatest risks that face workers in this industry. This course will take the Apprentice through the DOT rules and regulations for the industry. Specific emphasis is placed upon proper rest, vehicle inspection, trailer inspection and backing, merging in and out of traffic, and what to do in the event of an emergency.

Introduction to Standards: During this portion the Apprentice is introduced to some of the critical standards for the industry. ANSI/TIA 222 G, ANSI/TIA 1019A, FAA 7460, FCC OET documents, are a few of the standards that are covered regarding their use. As an example the 1019A is used during the modification of an existing structure and this is to be reviewed with the Apprentice so that they have an understanding of how to use these standards as reference documents.