

# Apprentice Lineworker Training



On-Site/On-Demand  
Four-Year Career Development Program



# Minnesota Municipal Utilities Association's Mission:

*To unify, support, and serve  
as a common voice for municipal utilities.*



## MMUA Training Center Mission Statement:

*To promote, perform, and enhance safe work environments in our municipal utilities,  
with the willingness to learn and pass on the passion of the craft.*



# MMUA Apprentice Lineworker Training Program

**On-site instruction.**

**Maximum hands-on experience on your system.**

Municipal electric utilities, which are relatively small compared to others in the industry, face particular challenges in developing and maintaining a highly skilled workforce. This need for skilled employees is the primary reason MMUA developed the Apprentice Lineworker Training program.

The program is designed to bolster the ranks of municipal lineworkers with those most likely to make a long-term commitment to their local utility.



Municipal utilities have told MMUA that the lineworker they are most likely to keep is a promising person with local roots. If that person can be hired and trained locally, there is a good chance the utility—given good management and competitive wages—can keep that employee for many years.

“This program lets us select and train our own municipal electric lineworker,” said MMUA Director of Training and Safety Mike Willetts.



The MMUA standard has been validated by the Minnesota Department of Labor and Industry (DOLI). Working closely with DOLI should smooth state compliance reviews of

your apprenticeship program. This leads to a streamlined process, since the MMUA standard is consistent with standards throughout the industry. Apprentices enrolled in the MMUA program will ‘journey out’ with a nationally recognized credential, that will ensure mastery of essential base competencies.

Unique features of the MMUA program include:

- The MMUA course allows the municipal utility employee who wants to learn more about the lineworker’s trade to receive professional training from experienced instructors, right at the utility site.



- Program timing is flexible and hands-on work will be done primarily at your site. This allows the utility to get a lot of work out of its employee and allows the employee to concentrate on training—typically two days per quarter.
- In addition, each utility is eligible for complimentary registration for up to two students each year to the following MMUA schools: Meter, Overhead, Underground, and Transformer, as well as the Meter School Pre-Conference & the Transformer School Pre-Conference.

**Participation at these Schools/Pre-Conferences is expected each year a student is enrolled, and the hours count toward training.**

- The schools provide an opportunity for students to concentrate on a technical project while gaining insight on how another utility might approach a situation. Some testing will also be done at the MMUA Training Center in Marshall, a 17-acre facility featuring overhead and underground electric systems and outdoor and indoor training areas.
- Students are given a cutting-edge academic program along with extensive hands-on training. The instruction involves classroom and outdoor hands-on activities. Safety is of utmost importance and is stressed tirelessly.
- Apprentice lineworkers meet, work and learn under the tutelage of MMUA’s Apprenticeship Instructor James Monroe, a licensed journeyman lineworker with years of linework and teaching experience.

## ***Real Training. Real Work. Real Benefits.***

Much of the apprenticeship training program involves work on your utility system. In some cases, two or more municipal utilities have come together to train and work on one of the municipal systems.

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*The program has been approved by the U.S. Department of Labor and the Minnesota Department of Labor and Industry.*

The program has a price, a lineworker noted, but hiring a contractor to do the work can also be expensive, and the local lineworkers would miss the hands-on training experience. The training/work makes lineworkers more capable and more valuable to their communities. The work also leads to a sense of accomplishment and pride in their utility system.

“MMUA is working to keep costs down while providing a quality product,” said Willetts. “We put the program on at your utility, using your equipment, in your time slot, serving your customers. It’s the best way to learn your system. It lets the apprentice who wants to learn more about the lineworker’s trade receive professional training from an experienced instructor right at the utility site.” It is also possible to save some money, by getting together with a

neighboring municipal utility.

Lineworkers involved in the program are uniformly appreciative of the experience. They like the training, which isn’t so much like training but rather more like working under the guidance and mentorship of an experienced, linework instructor—which is what Monroe is.

Along with the hands-on training, students work on a nationally-recognized lineworker’s correspondence training course. MMUA works with correspondence course providers to tailor the learning to the individual student.





# Top-notch Instruction

**Primary instructor James Monroe brings more than a decade of linework experience to your training!**

In July 2018, MMUA hired James Monroe as its primary Apprenticeship Instructor and Job Safety & Training Instructor.

Monroe, a journeyman lineworker, came to MMUA from New Ulm Public Utilities, where he was employed as a lineworker for approximately 12 years. While at New Ulm, he performed a variety of job duties and maintained his Journeyman License to meet all regulations. He planned layout and installations, diagnosed and corrected malfunctions, operated a variety of tools and equipment, among other duties.

Monroe also participated in many MMUA schools and workshops, and served as an instructor for the Underground Schools from 2014-2017.



He also has experience in storm repair and mutual aid, and has responded to snow and ice storms and tornadoes in Minnesota and Hurricane Irma in Florida.

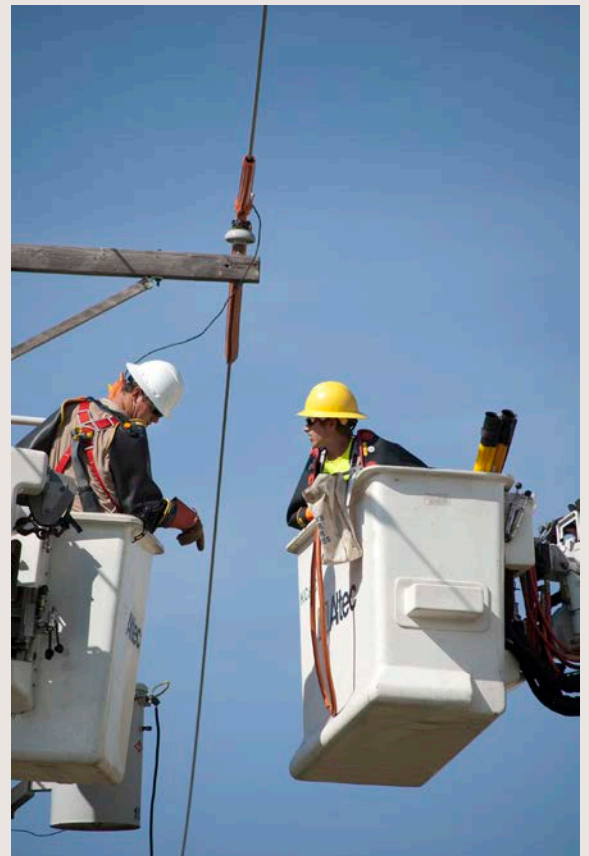
Monroe earned his powerline diploma from Minnesota West Community and Technical College in May 2006. Prior to that, he worked for Carr's Tree Service in Sleepy Eye from 2002-2005.

Monroe credits MMUA with influencing his career. He enjoys getting to know the people and

the various municipal utilities around the state. Monroe brings a commitment to maintaining and operating electrical systems for the community in the most efficient and safest way possible. He is eager to work with your utility and to contribute to the growth and development of the next generation of municipal electric lineworkers.

## Learn From the Pros

Annually, each utility enrolled in the program is eligible for two complimentary registrations for enrolled students to four MMUA Schools.





**Sign up for the MMUA Apprentice Lineworker Training Program and receive complimentary registration for two enrolled students annually, to the following four schools:**

## Meter School

### February

Students that attend the Meter School will be given expert instruction that will assist them in keeping the metering of their system as accurate as possible. The students will practice safe and efficient work practices.



## Underground School

### May

The Underground School includes a varied degree of technical training to provide an educational experience for all levels of expertise. This school is open to Apprentice and Journeyman. Some classes that have been offered in the past include: Underground Maintenance, 600 Amp Connection, Cable and Fault Locating, 600 Amp Feeder Installation, Cable Installation and Replacement, and others.



## Overhead School

### September

Students have the opportunity to get first-class instruction on overhead. This school is open to Apprentice and Journeyman. Classes that have been offered in the past are Ropes and Rigging, Spacer Cable Switch Installation, Single-Phase Conversion, Overhead Maintenance, Double Circuit Conversion, and Transmission Rubber Gloving 34.5-41.6 KV.



## Transformer School

### December

This school is open to Apprentice and Journeyman. Comments from past attendees include: "Great class!" and "Very well taught." The school gives students a good understanding of the following topics related to transformers: basic three-phase connections, delta connection, wye connection, open delta connection, and three-phase troubleshooting. Primary instructor is Scott Meinecke from IREA.



# Overview of Program Courses

## Basic Electrical Theory

### Course Description

Students learn basic fundamentals of electrical theory.

### Text and References

Basic electrical principles, applied mathematics, and the APPA Safety Manual.

### Course Goals

The following goals will be addressed in this course:

- |                                      |                           |
|--------------------------------------|---------------------------|
| 1. Electrical theory 101             | College                   |
| 2. Applied mathematics 101           | 4. Electrical systems 101 |
| 3. Introduction to Northwest Lineman | 5. First aid              |

## Pole Climbing/Construction

### Course Description

Pole climbing is optional but recommended offering. Students learn climbing techniques, free-hand and with safety strap. They also learn installation and removal of poles and line hardware.

### Course Focus

Lab skills are the course focus.

### Text and References

Shoemaker & Mack, "The Lineman's and Cableman's Handbook," latest edition, McGraw-Hill Publishing Co. Applicable Module NLC/PDP program.

### Course Goals Include:

- |                                       |  |
|---------------------------------------|--|
| 1. Maintain pole climbing equipment   | strap method                                 |
| 2. Shape gaffs                        | 12. Frame single crossarm                    |
| 3. Inspect pole                       | 13. Frame double crossarm                    |
| 4. Sound test pole                    | 14. Install both single and double crossarms |
| 5. Tool belt safety strap replacement | 15. Hardware poles                           |
| 6. Pole quadrant                      | 16. Dig holes                                |
| 7. Pole rake                          | 17. Pull poles                               |
| 8. Hand line, slings                  | 18. Use pole trailer                         |
| 9. Crossarm hitches                   | 19. Set poles                                |
| 10. Climb pole free-hand              | 20. Align poles                              |
| 11. Climb pole safety                 | 21. Plumb poles                              |
|                                       | 22. Rake poles                               |
|                                       | 23. Tamp poles                               |

## Three-Phase AC Circuits and Transformer Banking

### Course Description

The wye and delta circuit fundamentals, neutral on grounded wye lines, delta lines, three-phase transformer connections using single-phase transformers.

### Text and References

Shoemaker & Mack, "The Lineman's and Cableman's Handbook," latest edition, McGraw-Hill Publishing Co. Applicable Module NLC/PDP program.



### Course Goals

The following goals will be addressed in this course:

- |                                |  |
|--------------------------------|--|
| 1. Grounded wye primary        | 13. Midpoint grounded delta secondary      |
| 2. Three-phase circuits        | 14. Open wye primary                       |
| 3. Ungrounded wye primary      | 15. Three-phase volt amps                  |
| 4. Wye circuits                | 16. Open delta primary                     |
| 5. Delta circuits              | 17. Ungrounded open delta secondary        |
| 6. Ungrounded delta primary    | 18. Open connections                       |
| 7. Three-phase power           | 19. Polarity markings                      |
| 8. Grounded wye secondary      | 20. Phase identification                   |
| 9. Line-to-line voltage        | 21. Balanced load                          |
| 10. Line-to-neutral voltage    | 22. Unbalanced loads                       |
| 11. Ungrounded delta secondary | 23. Feed back                              |
| 12. Line current               | 24. Midpoint grounded open delta secondary |
|                                | 25. Grounding bank                         |





# Electrical Distribution I

## Course Description

The care, maintenance and use of company and personal tools. Elementary knots and use of single slings will also be covered.

## Course Focus

Lab skills are the focus of this course.

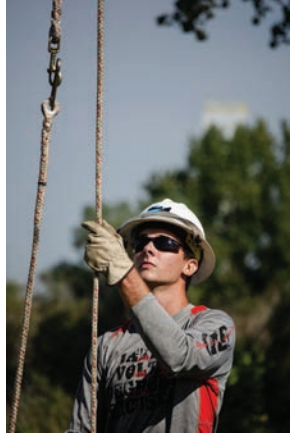
## Text and References

Shoemaker & Mack, "The Lineman's and Cableman's Handbook," latest edition, McGraw-Hill Publishing Co. Applicable Module NLC/PDP program.

## Course Goals

The following goals will be addressed in this course:

- |                             |                               |
|-----------------------------|-------------------------------|
| 1. Frame single-phase poles | 8. Tie square knot            |
| 2. Frame two-phase poles    | 9. Tie half hitch             |
| 3. Frame three-phase poles  | 10. Install strain insulators |
| 4. Install guy dead ends    | 11. Tie bowline knot          |
| 5. Install down guys        | 12. Over current protection   |
| 6. Install overhead guys    | 13. Over voltage protection   |
| 7. Install ground rods      | 14. Barrel armor              |



10. Armor rod conductor
11. Use hand ties
12. Use manufactured ties
13. String two phase and three phase lines



# Electrical Distribution III

## Course Description

Building overhead lines, stringing and sagging conductors, ties and tying, application of guys and guying, building OCR stations, capacitor banks, three-phase power banks, installing underground distribution lines, connecting sectional cabinets and pad-mounted transformers, tools, application. This course also covers chain saw safety, field maintenance, use of saws from an aerial device, and trimming trees.



## Course Focus

Lab skills will be the focus of this class.

## Text and References

Shoemaker & Mack, "The Lineman's and Cableman's Handbook," latest edition, McGraw-Hill Publishing Co. Applicable Module NLC/PDP program.

## Course Goals

The following goals will be addressed in this course:

- |  |   |
|--|---|
| 1. Build single-phase overhead lines   | 9. Install 15 KV URD elbow                        |
| 2. Build two-phase overhead lines      | 10. Install 15 KV URD terminator                  |
| 3. Build three-phase overhead lines    | 11. Connect single-phase, pad-mounted transformer |
| 4. Pull angle guys                     | 12. Loop system for URD                           |
| 5. Pull dead end guys                  | 13. Radial system for URD                         |
| 6. Build single-phase overhead service | 14. Install single-phase junction boxes           |
| 7. Underground cable preparation tools | 15. Install three-phase junction boxes            |
| 8. Splice 15 KV URD cable              |   |

# Electrical Distribution II

## Course Description

The installation and change out of single-phase transformers and overhead primary and secondaries.

## Course Focus

Lab skills will be the focus of this class.

## Text and References

Shoemaker & Mack, "The Lineman's and Cableman's Handbook," latest edition, McGraw-Hill Publishing Co. Applicable Module NLC/PDP program.

## Course Goals

The following goals will be addressed in this course:

- |                               |                                 |
|-------------------------------|---------------------------------|
| 1. Install protective grounds | 5. Install anchors with jumpers |
| 2. Sag wire                   | 6. Tension guys                 |
| 3. Install stringing blocks   | 7. String single phase          |
| 4. Make connections           | 8. Use sag targets              |
|                               | 9. Dead-end conductor           |



16. Identify and mark URD cables
17. Install three-phase transformers
18. Isolate, test, and ground URD cables
19. Underground cable locating and fault finding
20. Underground cable maintenance and safety
21. Perform pole top rescue
22. Perform aerial basket rescue
23. Install armor rod
24. Install hand ties
25. Install manufactured ties
26. Build capacitor bank
27. Build three-phase



- overhead service
28. Build open wye/open delta bank
29. Build wye/delta power bank
30. Build wye/wye power bank
31. Describe before digging precautions
32. Chain saw safety
33. Use and operation of chain saw
34. Use aerial line

## Care & Use of Insulated Equip.

### Course Description

The application, care, and use of rubber goods, insulated cover-up use. Also covers transformer changeouts, cross arm changeouts, pole changeouts, and conductor transfers.

### Course Focus

Lab skills will be the focus of this class.

### Text and References

Shoemaker & Mack, "The Lineman's and Cableman's Handbook," latest edition, McGraw-Hill Publishing Co. Applicable Module NLC/PDP program.

### Course Goals Include:

- |   |   |
|---|---|
| 1. Field test rubber gloves and sleeves | 9. Describe field care of rubber gloves |
| 2. Check rubber blankets                | 10. Use rubber gloves                   |
| 3. Check lines hose                     | 11. Install rubber blankets             |
| 4. Rubber glove dielectric test         | 12. Position bucket truck               |
| 5. Ozone effects                        | 13. Install truck grounds               |
| 6. Install insulator hoods              | 14. Install rubber coverup              |
| 7. Use nylon strap hose                 | 15. Potential cover-up procedure        |
| 8. Describe classes of                  |   |



- |  |  |
|--|--|
| 16. Phase-to-ground potential            | pole                                       |
| 17. Phase-to-phase potential             | 24. Cut in single-phase dead end           |
| 18. Safe working distances               | 25. Cut in three-phase dead end            |
| 19. Change pin type insulator            | 26. Splice out single-phase dead end       |
| 20. Change dead end suspension insulator | 27. Splice out three-phase dead end        |
| 21. Change angle suspension insulator    | 28. Transfer single-phase conductors       |
| 22. Change out cross arm                 | 29. Transfer three, three-phase conductors |
| 23. Change out dead end                  | 30. Use phasing sticks                     |

## Protective Equipment

### Course Description

Covered in this course will be function, operation and types of fuses, circuit breakers, oil circuit reclosers and sectionalizers, types of distribution arrestors and safety.

### Course Focus

Lab skills are the focus of this course.

### Text and References

Shoemaker & Mack, "The Lineman's and Cableman's Handbook," latest edition, McGraw-Hill Publishing Co. Applicable Module NLC/PDP program.

### Course Goals Include:

- |                                      |  |
|--------------------------------------|--|
| 1. Quick fuse                        | OCR station                              |
| 2. Time delay fuse                   | 11. Sectionalizer                        |
| 3. Button type fuse                  | 12. Fuse coordination                    |
| 4. Link type fuse                    | 13. Describe safety precautions          |
| 5. Bayonet type fuse                 | 14. Change out oil circuit reclosers     |
| 6. Oil circuit breaker               | 15. Basic lightning arrestor             |
| 7. Single-phase oil circuit recloser | 16. Install distribution arrestors       |
| 8. Three-phase oil circuit recloser  | 17. Lightning electrical characteristics |
| 9. Build single-phase OCR station    |  |
| 10. Build three-phase                |  |



## Electrical Lineworker Course Review

### Course Description

- Hands-on Proficiency Testing
- Final Academic Testing

## Enrollment

To enroll a trainee ("student") in MMUA's Apprentice Lineworker Training program, the student must be employed or sponsored by a municipal utility.

The following forms are required to be considered for enrollment:

- 1) MMUA Trainee Enrollment Application
- 2) MMUA Commitment Letter
- 3) Northwest Lineman College Enrollment Application

## Administration

MMUA's Apprentice Lineworker Training program is administered by a professional training staff with extensive electrical utility experience. MMUA maintains student registration files and payment information, as well as student records concerning program activity, completion dates, grades, and reporting official information. All course materials, lessons, texts, and supplemental material will be furnished.

## Certification and Credit

Students successfully completing the program will receive MMUA's certificate of completion. In addition, a student who complete the program will be credited through Dennis Merchant or Northwest Lineman College for the completion of their four-year apprenticeship program.

## Grading and Course Evaluation

Student performance will be converted to points based on performance objectives for each class. Each class is worth a total of 1,000 points, with the exception of the "Care and Use of Insulated Equipment" and "Protective Equipment" classes, which have 600 points possible. Grades for classroom and field work are given by the instructor. Grades are based on a student's academic ability, following instructions and safety procedures, proper handling of tools and equipment, and the ability to perform specific tasks.

## Expectations of Enrolled Student

MMUA's Apprenticeship Instructor, will be at your utility approximately 2 days a quarter to work side-by-side the student(s) on your system, on your projects. In addition to the on-site instruction, student is expected to:

- Take an active role in classroom and task training opportunities offered at MMUA's Training Center. At a minimum, enrolled students need to attend the following schools annually: Meter, Overhead, Transformer, and Underground. The schools offer a student the opportunity to work as a member of a team, gaining valuable insight as they collaborate with lineworkers from other utilities and learn from experienced instructors.
- Diligently pursue coursework and complete/pass all necessary testing in order to advance in the program.
- Follow all applicable safety rules/regulations as required by APPA Safety Manual, NESC and OSHA 1910.269 including Subpart V. Note that each student must have a valid driver's license.

## 2023 Fee Schedule\*

### Year 1

|                                  |                |
|----------------------------------|----------------|
| - <b>Fee Per Utility</b>         |                |
| 150 hours of instruction time    | <b>\$8,898</b> |
| - <b>Fee Per Student</b>         |                |
| Materials and supplies           | <b>\$500</b>   |
| Apprenticeship program Module #1 | <b>\$662</b>   |

### Year 2

|   |                |
|---|----------------|
| - <b>Fee Per Utility</b>                            | <b>\$9,398</b> |
| 150 hours of instruction time, materials & supplies |                |
| - <b>Fee Per Student</b>                            |                |
| Apprenticeship program Module #2                    | <b>\$662</b>   |

### Year 3

|   |                |
|---|----------------|
| - <b>Fee Per Utility</b>                            | <b>\$9,398</b> |
| 150 hours of instruction time, materials & supplies |                |
| - <b>Fee Per Student</b>                            |                |
| Apprenticeship program Module #3                    | <b>\$662</b>   |

### Year 4

|   |                |
|---|----------------|
| - <b>Fee Per Utility</b>                            | <b>\$9,398</b> |
| 150 hours of instruction time, materials & supplies |                |
| - <b>Fee Per Student</b>                            |                |
| Apprenticeship program Module #4                    | <b>\$662</b>   |

\*Fee schedule/fees subject to change without notice.

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**Attendance at the following schools, held at MMUA's Training Center in Marshall, is expected every year enrolled in the program.** Hours apply toward Apprentice training. **MMUA will waive the registration fee for up to two enrolled students per utility to each of these schools:**

- Meter School & Pre-Conference
- Overhead School
- Transformer School & Pre-Conference
- Underground School

**Total SAVINGS per utility, per year:**  
**\$2,090 (1 student) / \$4,180 (2 students)**

**Take Note: MMUA's testing standards are higher than those for Northwest Lineman College.**

MMUA requires scoring 80% or better for passing grades on all Northwest Lineman College exams for this program. Scoring below 80% on an exam for this program is considered a failed exam and the exam must be retaken until a passing score of 80% or better is obtained.

**For more information about this program please contact Mike Willetts**  
**Director of Training and Safety**  
[mwwillets@mmua.org](mailto:mwwillets@mmua.org)  
**(612) 802-8474**



# The MMUA Training Center



MMUA has developed a state-of-the-art training center in Marshall, on a 17-acre campus.

The Training Center affords the opportunity for valuable, hands-on, technical training in a variety



of disciplines, including many aspects of electric and gas utility operations, confined space and excavation.



The Training Center includes two substations, transmission, and overhead/underground electric distribution infrastructure. A variety of indoor training can also be accommodated, including extensive metering scenarios.

MMUA regularly partners with the American Public Power Association and the Minnesota Rural Electric Association in presenting training programs. Utility workers from across the nation and around the world have received quality technical training at the MMUA Training Center.

The Training Center is located at 1004 Michigan Road, Marshall, MN 56258.



The MMUA Apprentice Lineworker Training Program includes annual complimentary registration for up to two students per utility to the following schools—Meter, Overhead, Transformer and Underground.



This is a partial view of the MMUA Training Center, located at 1004 Michigan Road, Marshall, MN. The training field features more than 80 pole structures, 2 substations, and 2 underground vaults on 17 acres.



**Proudly serving Minnesota's municipal utilities since 1931.**

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