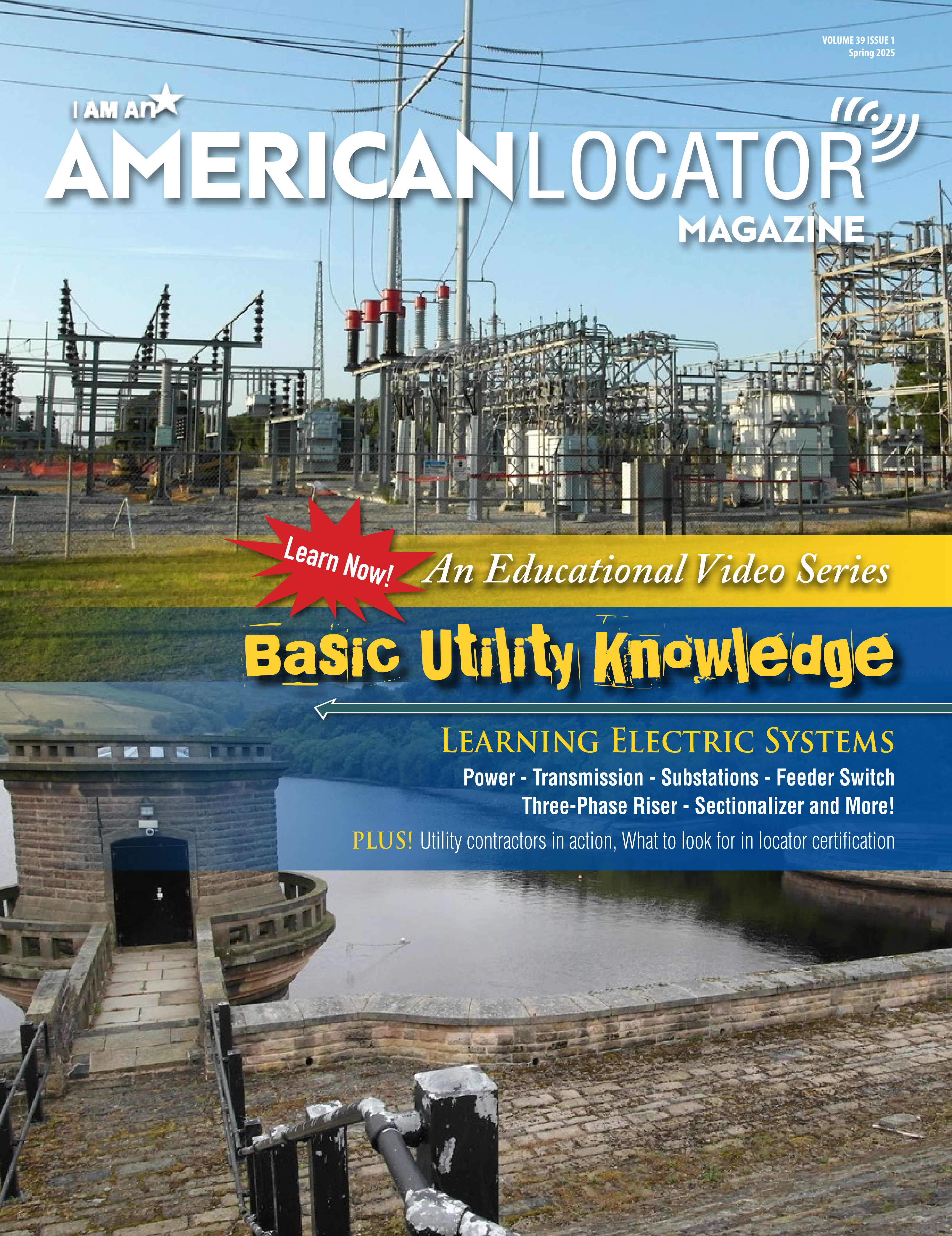
VOLUME 39 ISSUE 1
Spring 2025

I AM AN★ AMERICAN LOCATOR MAGAZINE



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Basic Utility Knowledge

LEARNING ELECTRIC SYSTEMS

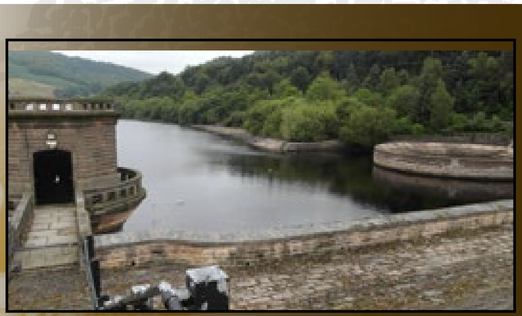
Power - Transmission - Substations - Feeder Switch
Three-Phase Riser - Sectionalizer and More!

PLUS! Utility contractors in action, What to look for in locator certification

I AM AN AMERICAN LOCATOR MAGAZINE
www.planetunderground.tv
VOLUME 39 ISSUE 1
Spring 2025

TOPIC HIGHLIGHTS

- GENERATION
- POWER
- UNDERGROUND TRANSMISSION
- MOVING ELECTRONS
- SUBSTATION
- FEEDER SWITCH
- FAULTS
- 3-PHASE RISER
- NEUTRAL
- SECTIONALIZER
- 3-PHASE TRANSFORMER



ON THE COVER

Imagine turbines with paddles at the bottom. The circular turbine spins when the water rushes past and spins the paddles. A hydroelectric plant will send its electricity to a step-up transformer.

Training begins, p. 14.

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I AM AN American Locator

Come on Down to Electric Avenue!

Getting to Know Electric: Part 1

How much do you need to know about the workings of a particular utility system to be able to locate it effectively? Perhaps the better question is, how much do you need to know about how the system works to protect a particular utility from damage? It's simple enough to answer that: the more people know, the better the results. The harder question to answer is this: where can you go to get basic information about the workings of distribution utility systems that can be applied directly to achieving more positive outcomes in locating and damage prevention? Look no further! That's why Planet Underground developed a video series aimed at providing easy-to-digest knowledge for the benefit of the construction, locating, utility and engineering industries. These videos come from for our Basic Utility Knowledge series.

Second only to gas, some of the most catastrophic accidents and injuries result from electric utility strikes. Underground electric lines are most often found in urban areas with densely packed infrastructure stretching for miles under a maze of buildings and transportation hubs, where the potential for mismarks and hitting abandoned lines is high. Maps may not always be accurate or up to date. Though this now is changing as locating and mapping technologies have advanced, there is more to do to enhance damage prevention.

Case Studies/Locator Tips

Two major electric utility contractors present an inside look into how they have tackled some important critical infrastructure projects and how damage prevention must always take center stage. Find also a guest article on key things to know when choosing a locator certification/training program. What does certification really mean?

A Guide to the Digital Edition

Look for links to locations on our website and other online resources that will provide additional information on locating concepts or ways to keep informed on new developments from *Planet Underground*. Look also for QR codes and links from our partner companies in ads in this issue. Links may be underlined, though in some cases they are not, and you can discover a link through hovering your cursor over a page, icon, button or URL in text. Most of the educational information in the E-Edition can also be found on our website, www.planetunderground.tv. Subscribers can view articles in either format, and we appreciate your feedback on any topic!

5000 FT 34 KV TWO WEEKS

Line of lay along parkway

by Mike Purpura, Electric Conduit Construction

Extending a 35 kV electric distribution powerline 5,000 feet to a new manufacturing plant

Speed to market is important to the commercial electric customer. This requires accurate bids and realistic schedules. In this case study, Electric Conduit Construction (ECC) was called on to extend a 35 kV electric distribution powerline 5,000' to a new manufacturing plant. The engineering had been completed, but not all right-of-way permits were secured. The manufacturing plant was ahead of schedule, and they needed power as soon as their construction was complete. ECC was given two weeks to extend this power line and install eleven splice boxes along the line of lay. The line of lay followed a road into an industrial park, passed under intersections and made a turn before terminating at the plant.

With a two-week deadline, ECC had to bore 500 ft. each day and install all splice boxes to keep the project on schedule. Ninety percent of the line of lay lent itself to horizontal directional drilling (HDD). There were eleven short sections leading to the splice boxes that were installed by the opencut method. The scope included placement of two six-inch conduits. One was for the 34 kV conductor and the other a spare for future use.

The ECC project manager and superintendent decided to use two HDD crews, a splice box crew and a pot-hole crew. The pot-hole crew deployed first and followed the locate marks for the first two drills. Locates identify non-target utilities, and it is ECC's policy to expose the utility and excavate deep enough to allow observation of the drill and reamer as they pass beneath the utility. This is an important step in damage prevention.

Potholing was done utilizing core boring equipment to open hard surfaces and then hydro-excavation to remove soil and expose utilities. Once all utilities on a bore segment were identified, drilling could begin, and the pothole crews could move to the next segment.

To speed the process, each HDD crew drilled approximately 450' shots towards each other. When the drill emerged from the exit pit, a 16" reamer was attached, along with the two six-inch conduits, and the reaming/pullback operation began. Ten shots were made with the final ending at the midpoint splice box.

Splice boxes were set by a crew utilizing an excavator for trenching and excavation of the area for the box. Open cut sections from the splice box created a path to connect rigid conduit to the HDPE conduit, pulled in by the drill rig. The hard pipe was then routed into the splice box and grouted.

When the drill and splice box work was completed, the cable was pulled into each splice box, terminations were made, and the customer's power was turned on. ECC returned to the site and restored all parkways, sidewalks, pavement, curbs and concrete.

Working with the electric utility customer, ECC coordinated multiple crews to perform the work in such a way that one task facilitated the next. By keeping the HDD crews focused on drilling and pulling back conduit, they met the customer's deadline and helped them meet the end user's deadline. ★

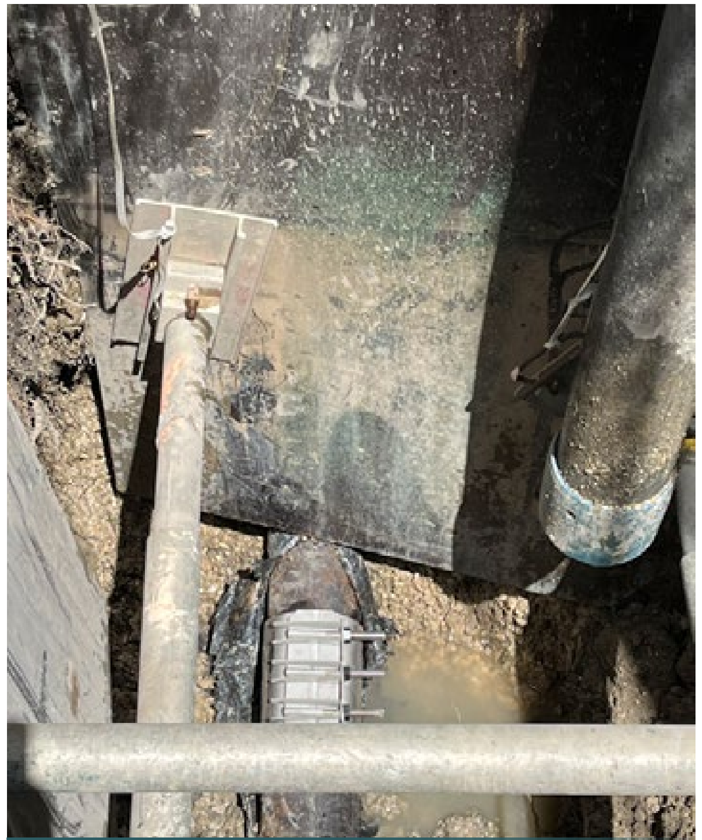
Slot trench to identify utilities

Potholing

Drill entry and drill exit pit

HDD set-up in parkway


Pulling conduit


Conduit connection in trench box


Conduit in open cut section


Connecting to pullback section


Riser on power pole


Splice box ready for backfill


Splice boxes with covers


Asphalt restoration

Electric Conduit Construction specializes in electrical, telecommunications, and fiber optic placement by underground or overhead techniques. To learn more, visit: electricconduitconstruction.com.

ELECTRIC CONDUIT
CONSTRUCTION

Electric Utility Case Study

Distribution Overhaul

Electric Cable Replacement Program (CRP) in Northern Illinois and Suburban Chicago


INTREN employees remove excess water and debris from trench to improve visibility of the work space.

By Joshua Turk, INTREN

> “Like any large-scale infrastructure project, the Cable Replacement Program faced challenges.”

PROJECT OVERVIEW

INTREN has been managing a Cable Replacement Program (CRP) in Northern Illinois and Suburban Chicago for over a decade, ensuring the safe and efficient replacement of underground residential distribution (URD) systems. This project involved full-scale planning, permitting, and a comprehensive communications program with municipalities and customers. To date, INTREN has successfully replaced over 6,000 miles of cable, often operating with over 44 drill rigs per day and at peak levels managing up to 52 drill rigs, including subcontractors.

DAMAGE PREVENTION & SAFETY MEASURES

INTREN is committed to implementing measures that maximize safety across all facets of our work. Damage prevention was a critical component of this project, and our team successfully executed several strategies:

Pre-Task Hazard Analysis & Job Briefing Process: The CRP team excelled in utilizing job briefings to emphasize pre-task hazard analysis. Each project phase began with a thorough assessment of potential risks, ensuring that all team members were aware of safety protocols and site-specific challenges.

Utilization of HP Toolbook: The team effectively used tools from the HP Toolbook, particularly the 4 Key Questions and STAR principles (Stop, Think, Act, Review), to enhance safety awareness and proactive decision-making on-site.

INTREN’s Rules to Dig By: Every day, crews incorporated INTREN’s Rules to Dig By as an additional damage prevention measure, reducing the risk of striking existing underground utilities and ensuring compliance with best practices.

Culture of Collaboration & Accountability: INTREN fostered a strong culture of collaboration among field crews, leadership, and subcontractors. This culture was integral to maintaining error-free performance and a heightened sense of responsibility across all levels of the organization.

CHALLENGES & SOLUTIONS

Like any large-scale infrastructure project, the Cable Replacement Program faced challenges, particularly with underground utility conflicts, permitting delays, and workforce training. INTREN successfully navigated these roadblocks using strategic solutions:

Underground Utility Conflicts: With extensive underground infrastructure already in place, identifying and avoiding existing utilities was a major challenge. By leveraging advanced utility locating technology and adhering to our Rules to Dig By, we minimized damages and kept operations on schedule.

Permitting & Municipal Coordination: Working with multiple municipalities required an efficient permitting process. INTREN implemented a dedicated communications team to streamline approvals and keep all management involved, reducing delays and enhancing community relations.

> “The safety of natural gas pipelines is constantly shifting, influenced by cutting-edge technology, updated regulations, and a growing recognition of the risks tied to pipeline damage.”

Workforce Development & Safety Compliance: Managing up to 52 drill rigs required a skilled and safety-conscious workforce. INTREN’s Green Hard Hat Mentoring Program was introduced to provide hands-on training for inexperienced employees. Additionally, continuous compliance and technical training ensured that all employees adhered to the highest safety standards.

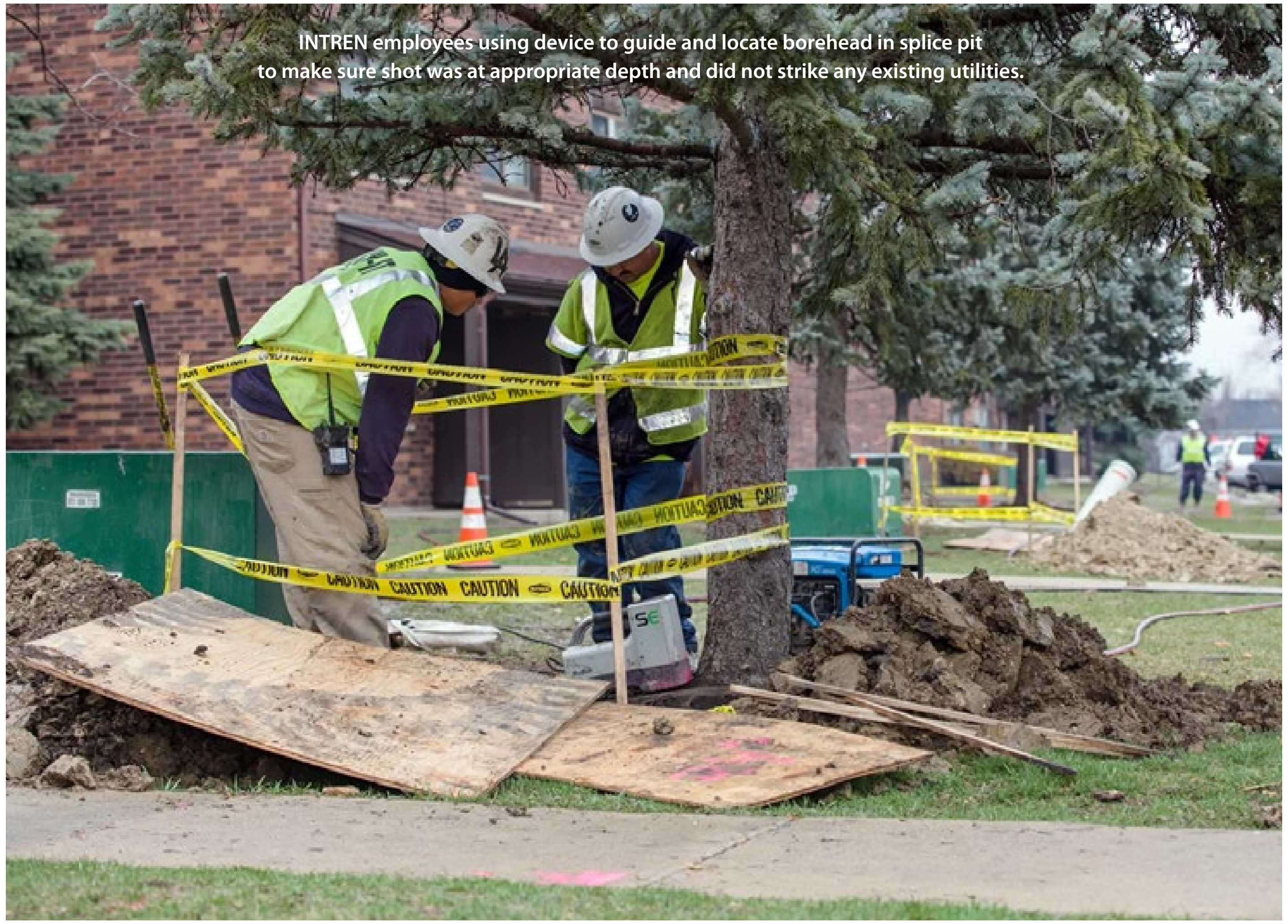
Leadership-Driven Safety Program: INTREN’s executive leadership drove a measured approach to safety, focusing on leading indicators and root cause analysis. Field audits were conducted at all levels, and targeted safety metrics were established to track progress and reinforce accountability.

RESULTS & IMPACT

Through meticulous planning, a safety-first approach, and a commitment to innovation, INTREN successfully executed the Cable Replacement Program with outstanding results:

- 6,000+ miles of URD cable replaced safely and efficiently
- Over 44 drill rigs operating daily, with peaks of 52 rigs
- Significant reduction in utility damages through proactive damage prevention
- Enhanced workforce development through mentoring, compliance training, and leadership engagement

INTREN’s Cable Replacement Program stands as a testament to the company’s unwavering commitment to safety, accountability, and efficiency. By integrating pre-task hazard analysis, safety tools, and a culture of collaboration, INTREN continues to set the standard for excellence in utility infrastructure projects. The program’s success highlights INTREN’s ability to manage complex electric projects while maintaining a steadfast focus on damage prevention, workforce safety, and operational excellence. Visit www.intren.com for more info.★


INTREN employees using device to guide and locate borehead in splice pit to make sure shot was at appropriate depth and did not strike any existing utilities.

Locator Certification: Let's Be Accurate

By Donald Richard, VP, Locate Management Institute

> "Certification requires substantial field knowledge and skills."

DEFINITIONS AND DISTINCTIONS

For more than 15 years, I have observed the locating and damage prevention industries struggle with inaccurate or vague definitions of locator certificates, certification, competency and qualifications which has lead to limited advocacy for locator certification programs.

To be accurate, there are important distinctions over the most often-confused terms certificate and certification.

- **Certificate—**verifies an individual complete a course or courses
- **Certification—**verifies that an individual has met a set of requirements or standards determined by a third-party assessment

CERTIFICATES MAY BE ISSUED TO MARK

- Attendance at a course or event
- Completion of a program
- Achievement of specific requirements (e.g., field assessment)

Training certificates (with some organizations misleadingly defining these as certifications) do not guarantee that the learner:

- Will obtain all the pertinent knowledge
- Can demonstrate the entire breadth of skills
- Can apply the knowledge and skills safely and properly in real-world situations

PARTICIPATION BADGES

We often wrongly assume that when a person obtains a certificate that they are competent. A person may have received an educational certificate or designation, but that does not mean they are competent. For example, a person may obtain a teaching degree, however it does not mean that the person is competent teaching in a classroom. A person may receive a certificate for locator training on direct connection methods, but that doesn't provide them with the knowledge or skills to solve tracing problems or overcome locating obstacles.

I often get asked, "What certification do I receive after completing your course?" My response has always been and will always be, "You don't get a certification. You get a certificate—a participation badge—stating that you attended or completed a course." Employers should be leery of training providers offering certification upon course completion.

INDEPENDENT ASSESSMENT

Some people think that certification is an entry point into locating or that certification is a one-time event, but that is not a true meaning of certification. A training program that provides foundational knowledge and skills is the entry point into locating. A standardized, independent, and unbiased locator certification program that culminates in a field assessment aims to ensure that a locator can use their skills to deliver optimum locating results regardless of employer or location. This benchmark, of ensuring a more competent locating workforce, has been proven financially successful by reducing damage to the underground infrastructure.

CONTINUING EDUCATION

Certification requires substantial field knowledge and skills and should not be considered a part of initial industry education and training. Certification recognizes the locator's ability to perform identifiable and quantifiable tasks. To maintain certification, an individual needs to be re-assessed or provide proof of continuing education (e.g., continuing education units or C.E.U.s) to the awarding organization at set intervals. Most industries commonly link a designation (i.e., name or title) with a certification to distinguish an individual from their industry peers.

COMPETENCY

Competence means successful demonstration of all competencies in the required criteria. The training program used to train a locator doesn't determine an individual's locating competency.

A Certificate of Competency (COC), or Certificate of Competence, verifies that a person can perform a task or specific set of tasks safely and skillfully. Certification is dependent on successful demonstration of these tasks. Regular assessment can identify any gaps.

MEASURE TO A BENCHMARK

Some employers will reason not to trust a third party in deeming their employees competent. They will determine their own level of competency. But who is deeming that employer competent or that they have the in-house expertise to do so? Are they stating their own competency based on their own self-assessment? Are they deeming their competency level is superior to an industry standard/benchmark? How are they determining that? It is possible that an employer may have a superior program, but at the very least, they need to measure against a benchmark/standard, because not all employers will deem competency to the same level nor will they have the expertise to educate, train or assess to such a benchmark/standard.

BEYOND CERTIFICATION

Attending a locator training course doesn't necessarily qualify a person to locate for a particular company. Successfully completing a competency-based locator certification program may not mean a person is qualified to perform all required locating tasks under all conditions for all work assignments. An employer will need to educate, train, and assess beyond the benchmark/standard.

For example, a locator may require several training tickets (e.g., WHMIS, H2S, First Aid) or learn specific processes or procedures

to work for a specific client. A locator field benchmark/assessment should evaluate knowledge, skills and behavior for locating and marking underground facilities, not how to respond to a request from a notification center or perform a company-specific process.

Therefore, it is imperative that employers include education, training, and assessment beyond a benchmark/standard to deem a person qualified. This includes measuring behavioral (e.g., people-based, and success-based) competencies at regular intervals.

While employers must ensure competency and qualification, most industries (e.g., airline, construction, electrical, human resources, information technology, marketing, medical, project management, quality assurance) recognize certification. It is time for the locating and damage prevention industries to do the same.

About the Author

Donald Richard collaborates with subject matter experts to develop locator competencies, standards, education and training courses, and assessment and certification programs in Canada, Australia, New Zealand, and the USA. He is a Board member of the Canadian Association of Pipeline and Utility Locating Contractors (CAPULC) and the Atlantic Canada Common Ground Alliance (ATLCGA). He is also the past-chair of (and continues to work on) the Canadian Common Ground Alliance (CCGA) Best Practices Committee. Donald is the driving force behind the Canadian Certified Locator program, provides educational services to the Certified Locator programs in the Australia and New Zealand, and supports the American Certified Locator program in the USA. **For more information visit:** https://locatemanagement.com/en/locator-certification. ★

"Certification verifies that an individual has met a set of requirements or standards determined by a third-party assessment."

Electric Generation

Electricity is produced at a power plant by spinning turbines. Expanding steam or the force of falling water spins the turbines. **(Figures 1-3)**.

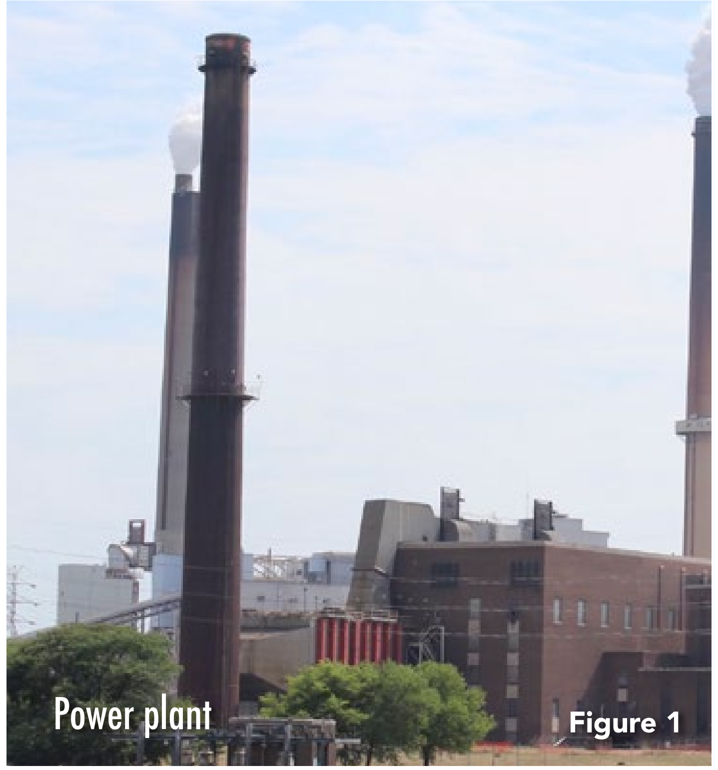


Figure 1

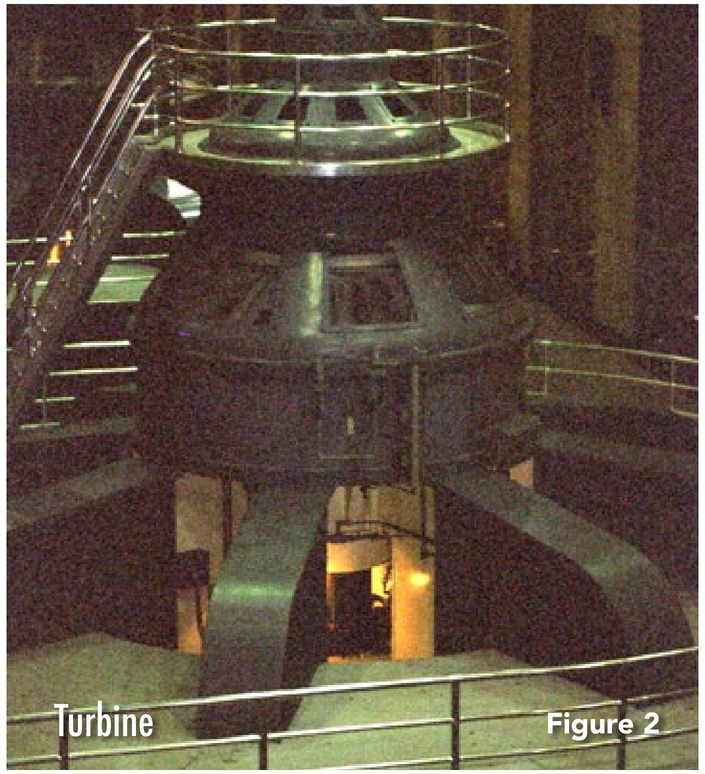


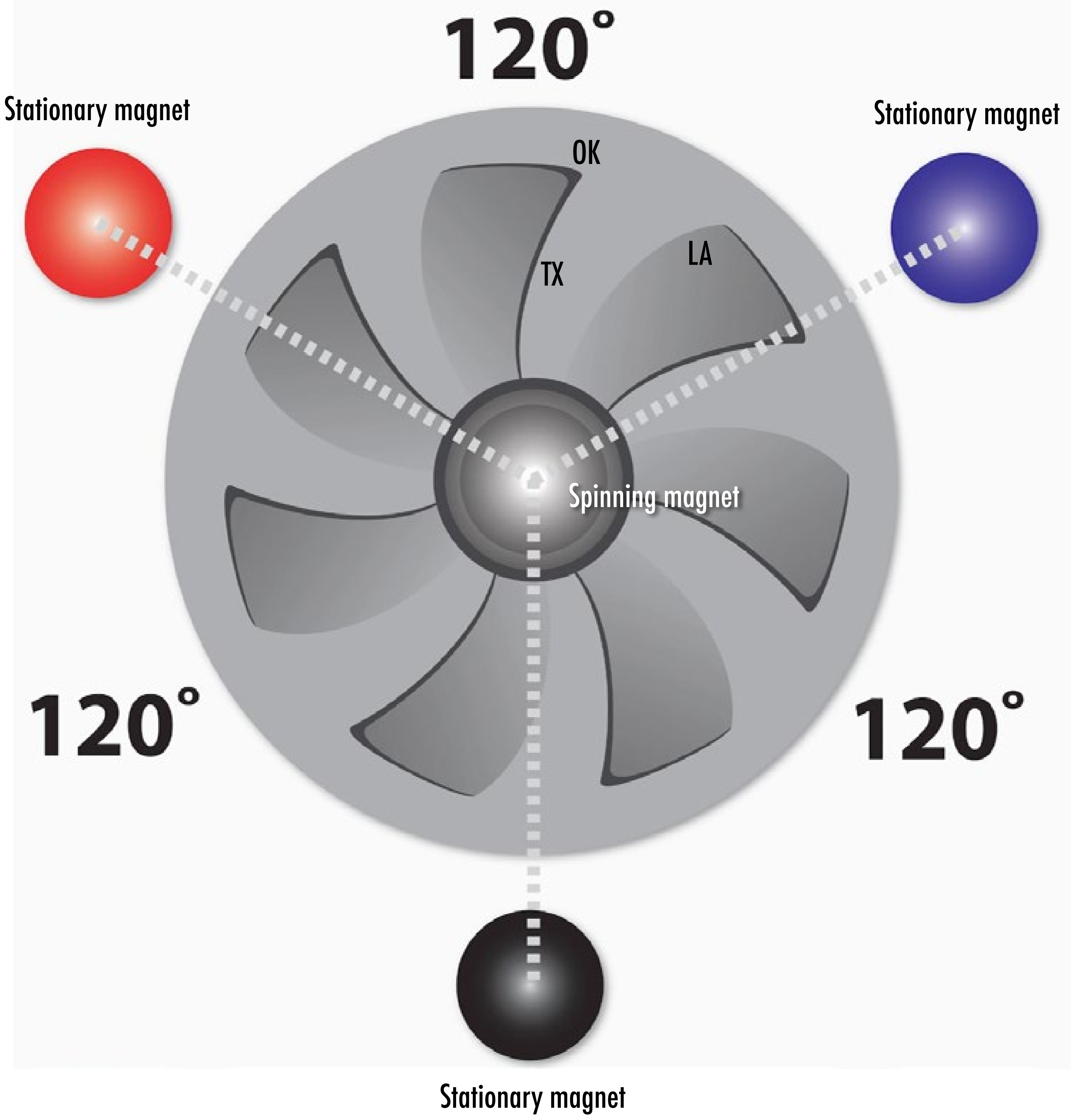
Figure 2

A transmission line right of way featuring many 3-phase transmission circuits. One such circuit is highlighted here.

Figure 3

Figure 4

A turbine is essentially a stationary magnet and a spinning magnet in close proximity **(Figure 4)**. This produces three streams of electricity that are offset 120 degrees from each other.

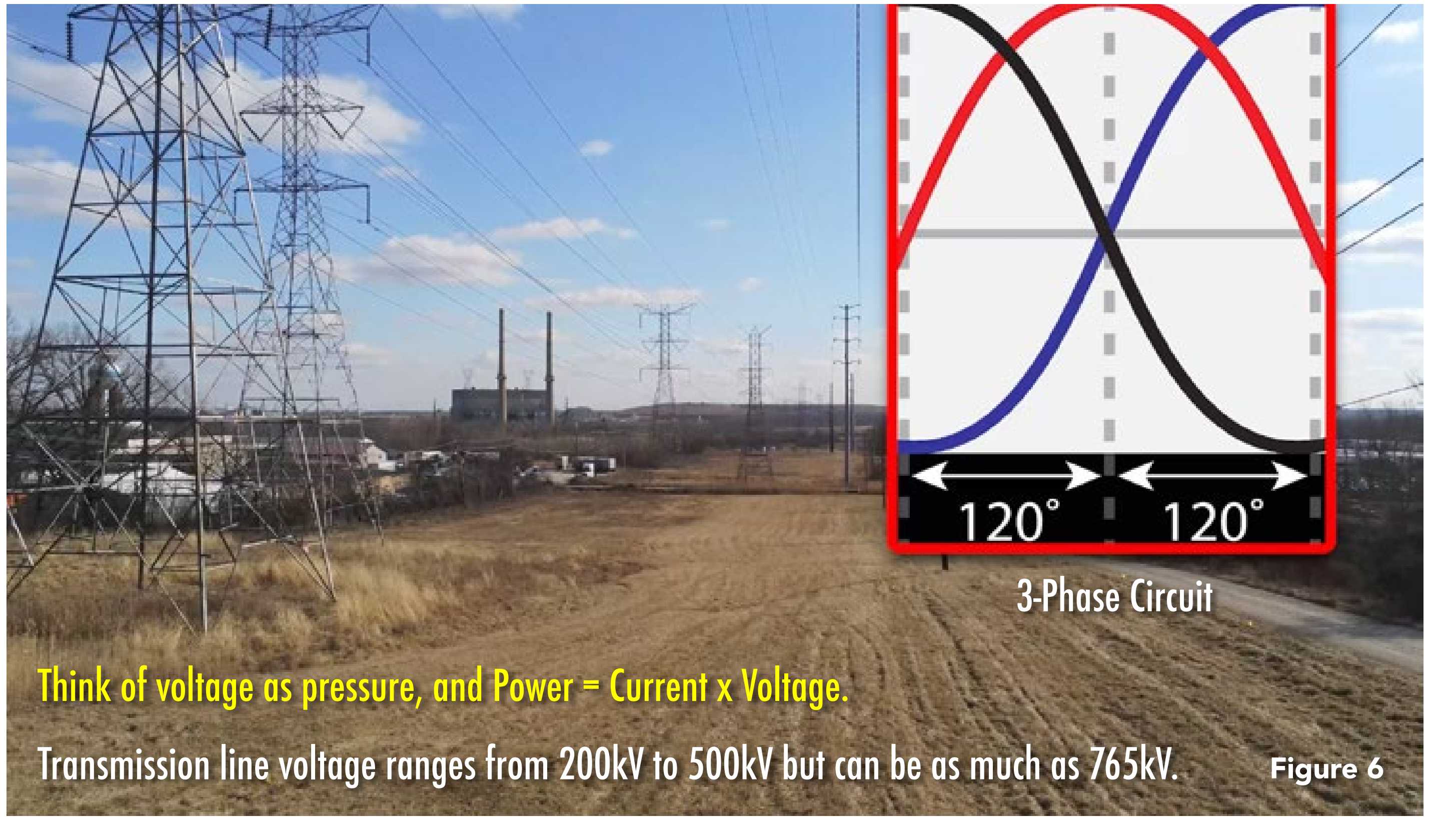


Electric Power

At the power plant, three streams of electricity are combined to create a 3-phase electrical circuit **(Figure 6)**. However, at the power plant, the voltage isn't particularly high, and a step-up transformer **(Figure 5)** is used to boost the voltage to transmission voltage levels.

Figure 5

Step-up transformer



3-Phase Circuit

Think of voltage as pressure, and Power = Current x Voltage.

Transmission line voltage ranges from 200kV to 500kV but can be as much as 765kV.

Figure 6

Hydroelectric power plant

Figure 7

POWER=CURRENT×VOLTAGE

This is a hydroelectric power plant **(Figure 7)**. The water behind the dam is higher than the water in front of the dam. The water is funneled down to the powerhouse **(Figure 8)**, where there are turbines that will spin due to the force of the water falling from a higher level to a lower level.

Imagine the turbines with paddles at the bottom. The circular turbine spins when the water rushes past and spins the paddles. A hydroelectric plant will send its electricity to a step-up transformer.

Anytime power is produced, there must be some form of energy to produce that power, whether it be solar, wind, water, natural gas fed, coal or nuclear. Something happens that causes the turbines to spin. Oftentimes, if it's not hydroelectric, then it will be heated water that produces steam, because as steam expands, it turns the turbine.

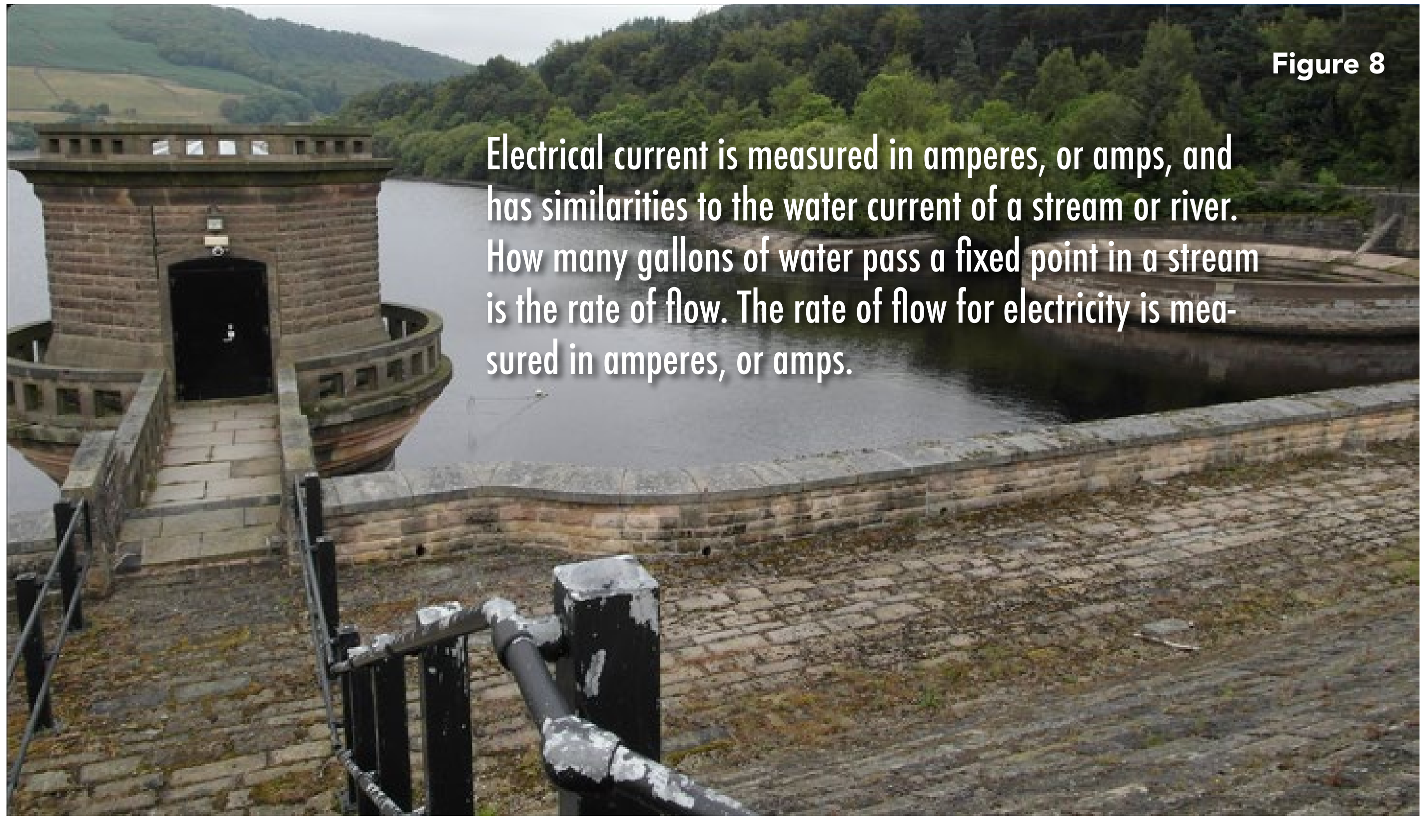


Figure 8

Electrical current is measured in amperes, or amps, and has similarities to the water current of a stream or river. How many gallons of water pass a fixed point in a stream is the rate of flow. The rate of flow for electricity is measured in amperes, or amps.

Electric Power

Power is the rate of doing work **(Figure 9)**, and it's measured in watts. The amount of power is unchanged as it travels through a substation, because as the substation's transformers reduce the voltage, the current increases.

Figure 9

An easy way to think about electrical current is to think about water flowing out a garden hose. Given the water pressure and the diameter of the hose, there is a certain rate of flow leaving the end of the hose **(Figure 10)**.

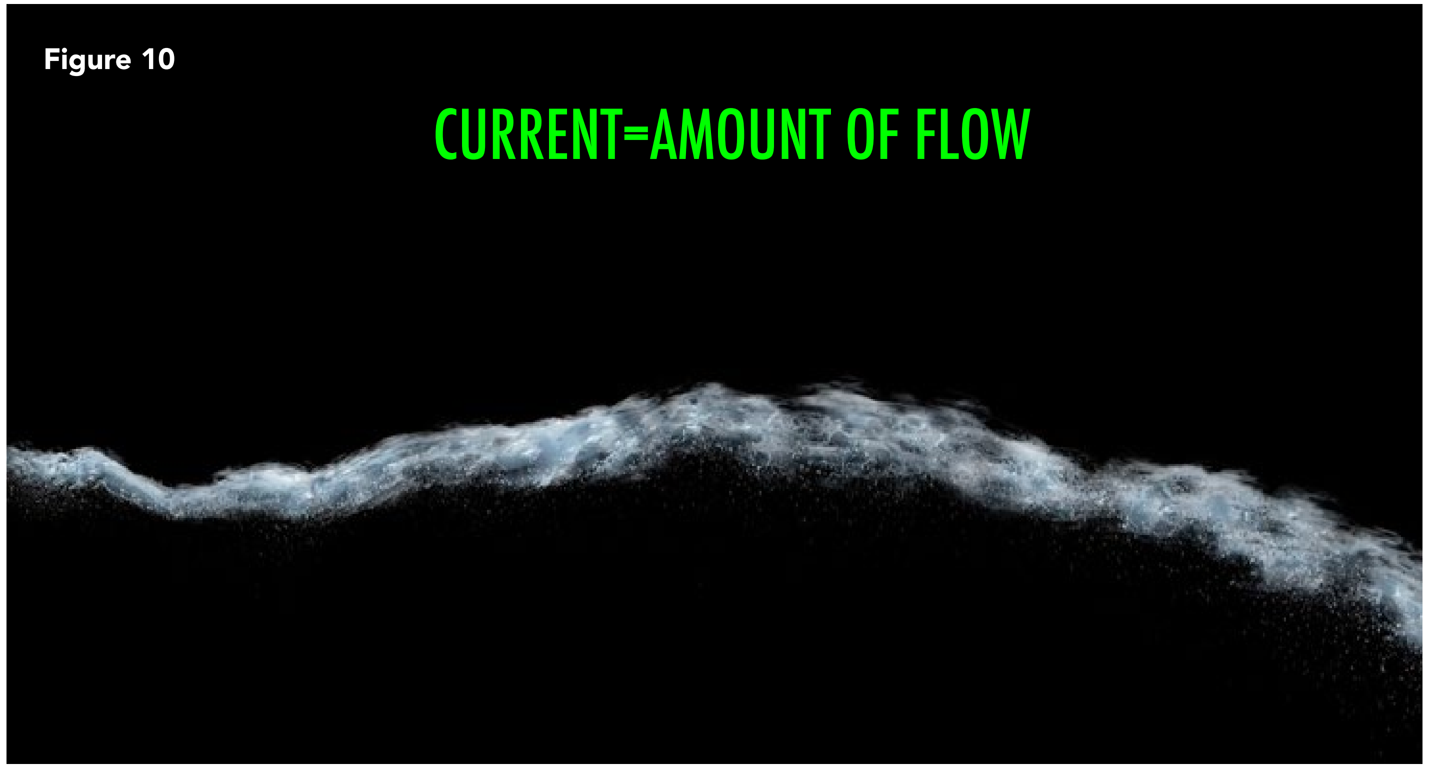
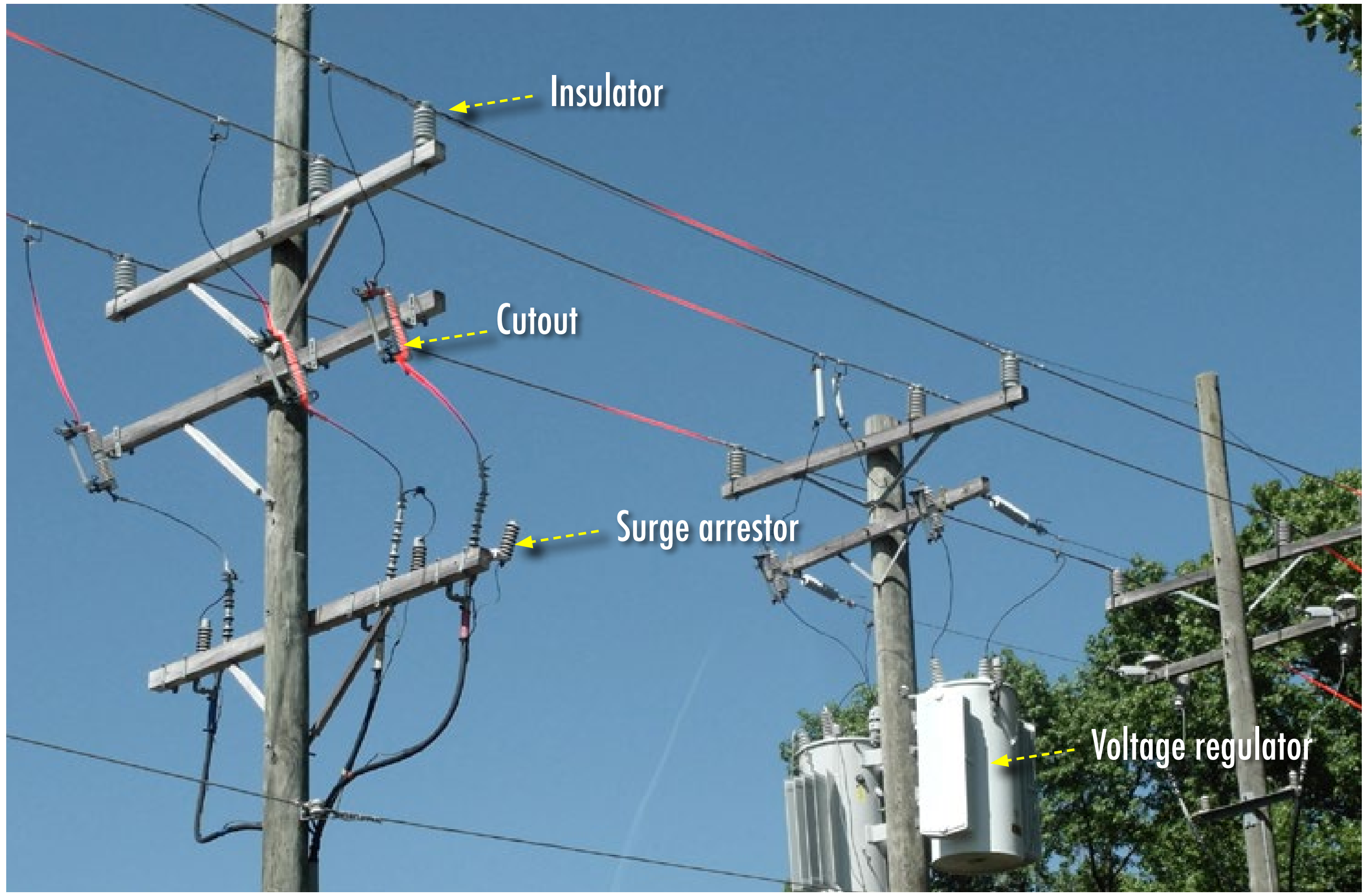


Figure 10



Similar to the water hose, the amount of electric flow **(Figure 11)** is based on the size of the conductor (cable) and the voltage.

If a garden hose takes one minute to fill up a five-gallon bucket **(Figure 12)**, how long would it take to for a larger fire hydrant hose to fill up the bucket?

How long would it take to fill up the bucket of water then?

Both your garden hose and the fire hydrant are under the same water pressure, but the difference in size of the hose is what changes the rate of flow. A larger conductor under the same voltage as a smaller conductor will have a larger rate of electric flow, or amps.


Figure 12

On the right is a 500kV transmission line, and on the left is a 230kV transmission line **(Figure 13)**.

Figure 13

In urban areas, 230kV may be used in an underground configuration.
Here, the aerial to 230 kV transitions to underground **(Figure 14)**.

Figure 14

Once underground, the 230 kV transmission line travels through a duct system **(Figure 15)**.

Figure 15

Oil-filled pipes pull heat away from the conductors. The oil is circulated by pumps to aid in dissipating the heat caused by the conductor's resistance to flow of electricity **(Figure 16)**.

Figure 16

Moving Electrons

Electric: Moving Electrons

TRAINING CENTER

The electric system moves electrons on conductors, and this movement is known as kinetic energy. When the electrons move on a wire, they bump into atoms of copper **(Figure 17)** or aluminum, which aren't moving. The transfer of this kinetic energy to the atoms that make up the wire produces heat. Too much heat on a conductor can cause sparks, fires or explosions.

Figure 17

This particular cable from a 3-phase underground circuit does not need circulating oil to dissipate heat due to the material surrounding the conductor **(Figure 18)**.

Figure 18

Electric Substation

A substation can best be thought of as a giant set of transformers **(Figure 19)**. Substations in cities **(Figure 20)** are part of a network of other substations permitting electricity to be rerouted when necessary.

Figure 19

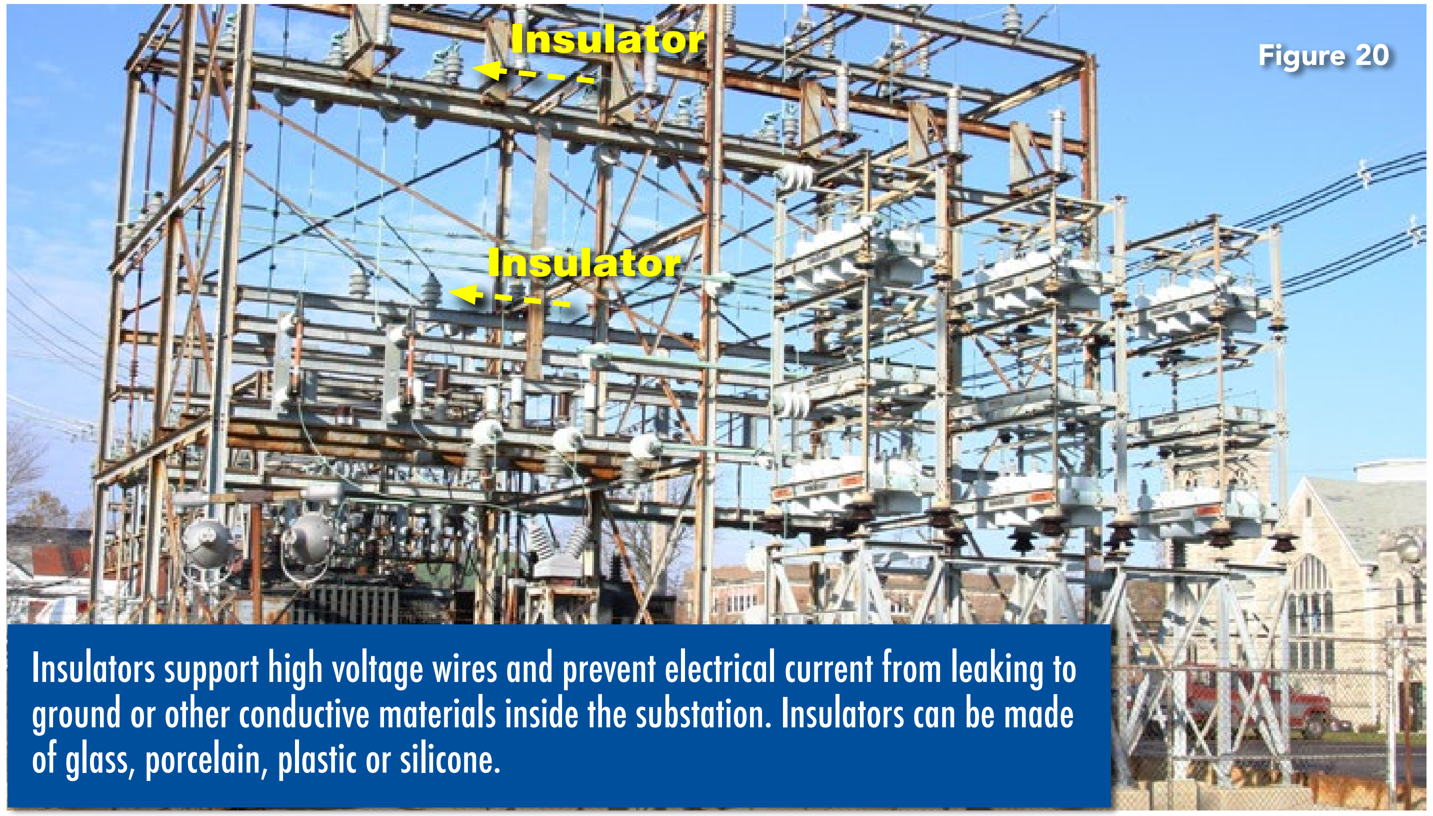


Figure 20

Insulators support high voltage wires and prevent electrical current from leaking to ground or other conductive materials inside the substation. Insulators can be made of glass, porcelain, plastic or silicone.

Figure 21

Low voltage circuits are used within substations to power metering equipment **(Figure 21)**. High voltage bushings use insulating properties to protect metal equipment. A surge arrester **(Figure 22)** diverts lightning and limits the voltage.

Figure 22

Electric Substation

69kV is what's known as a sub-transmission voltage in many electric distribution systems, although in some systems 69kV is considered a transmission voltage **(Figure 23)**. Here are the basic parts of a substation **(Figure 24)**.

Figure 23

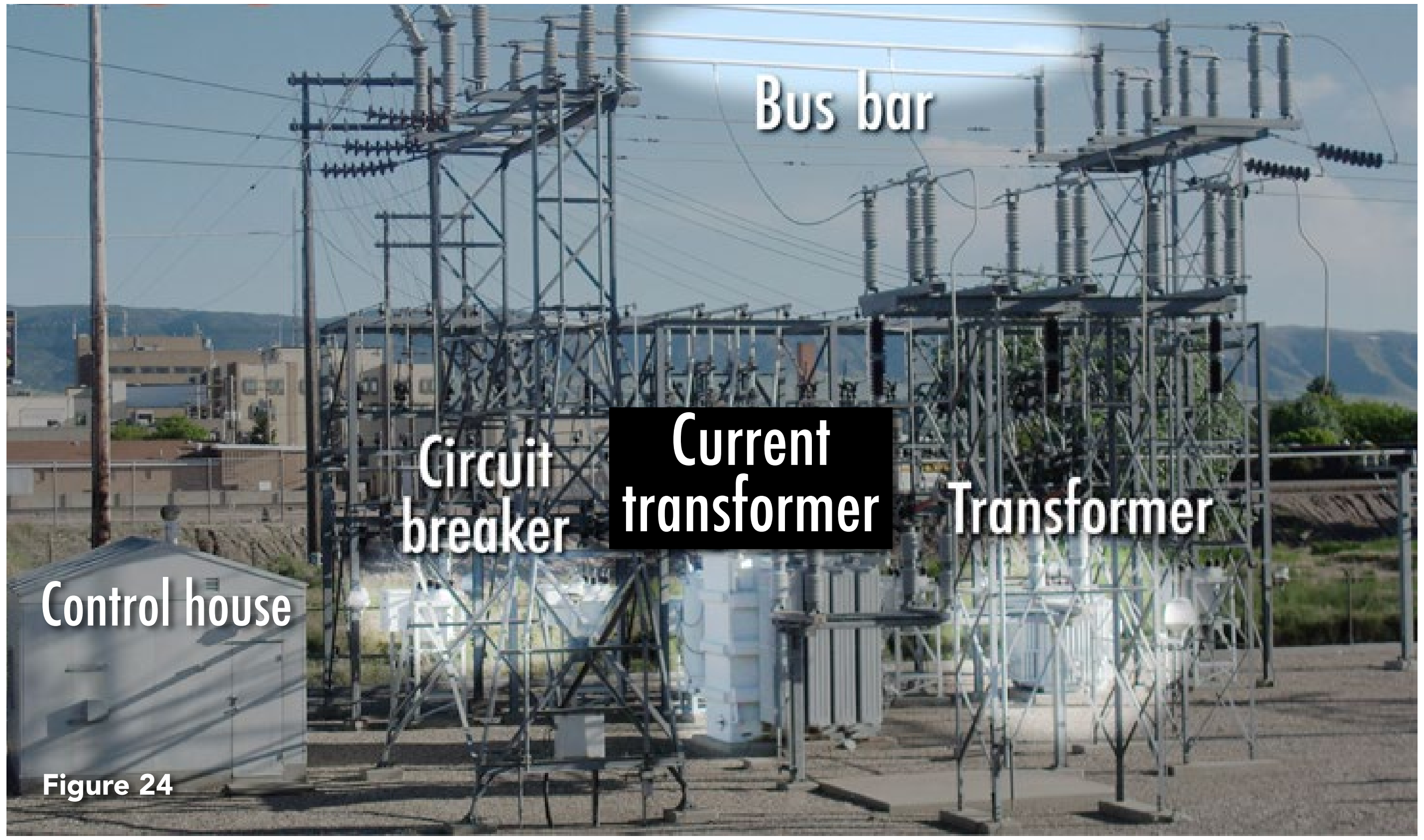


Figure 24

Bus bars are conductors that connect the aerial lines coming into the substation with the equipment inside the substation. Oil-filled circuit breakers protect the substation in case of an electrical overload. Transformers reduce the voltage, and voltage regulators ensure that the right amount of voltage leaves the substation **(Figure 25)**.

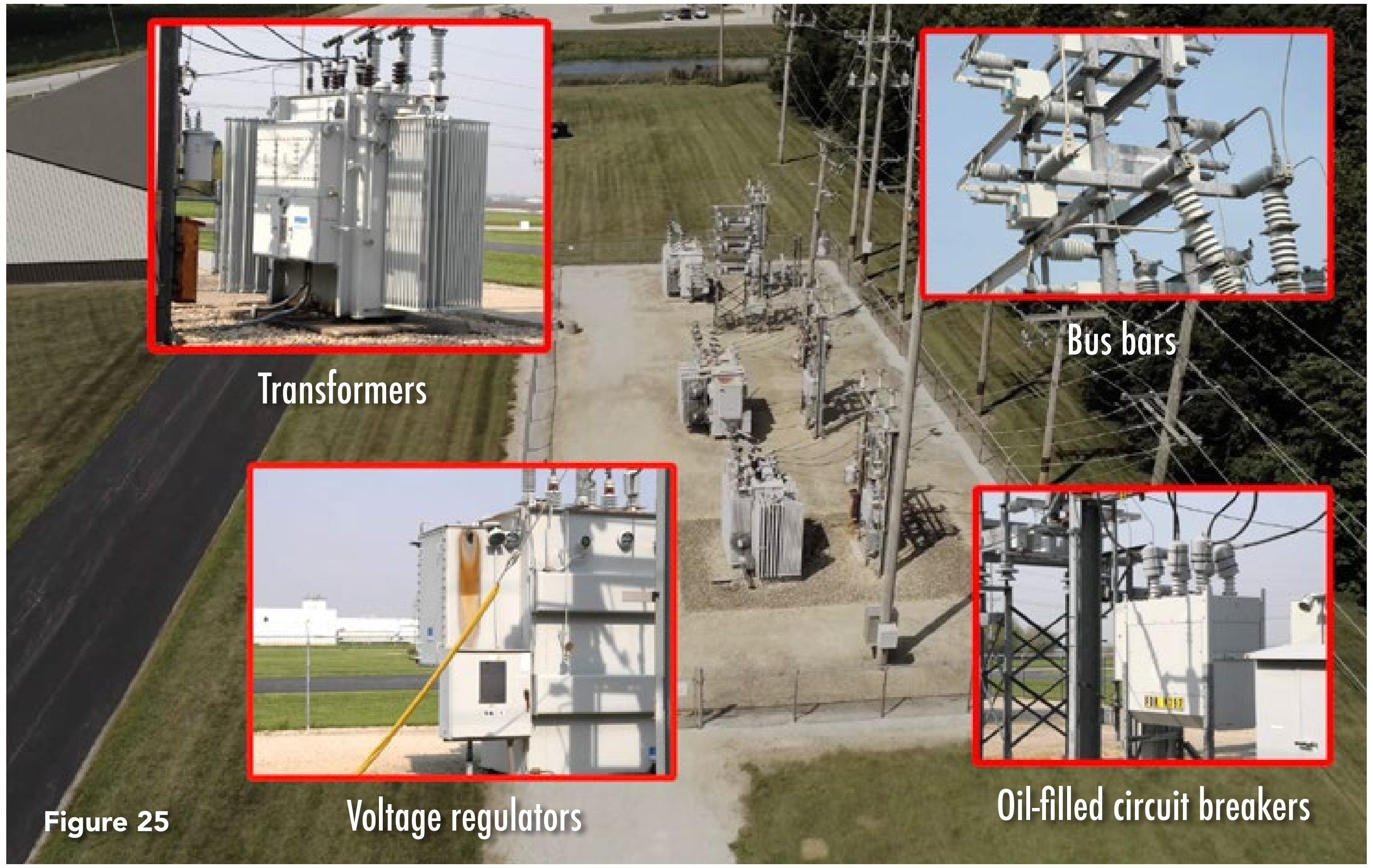


Figure 25

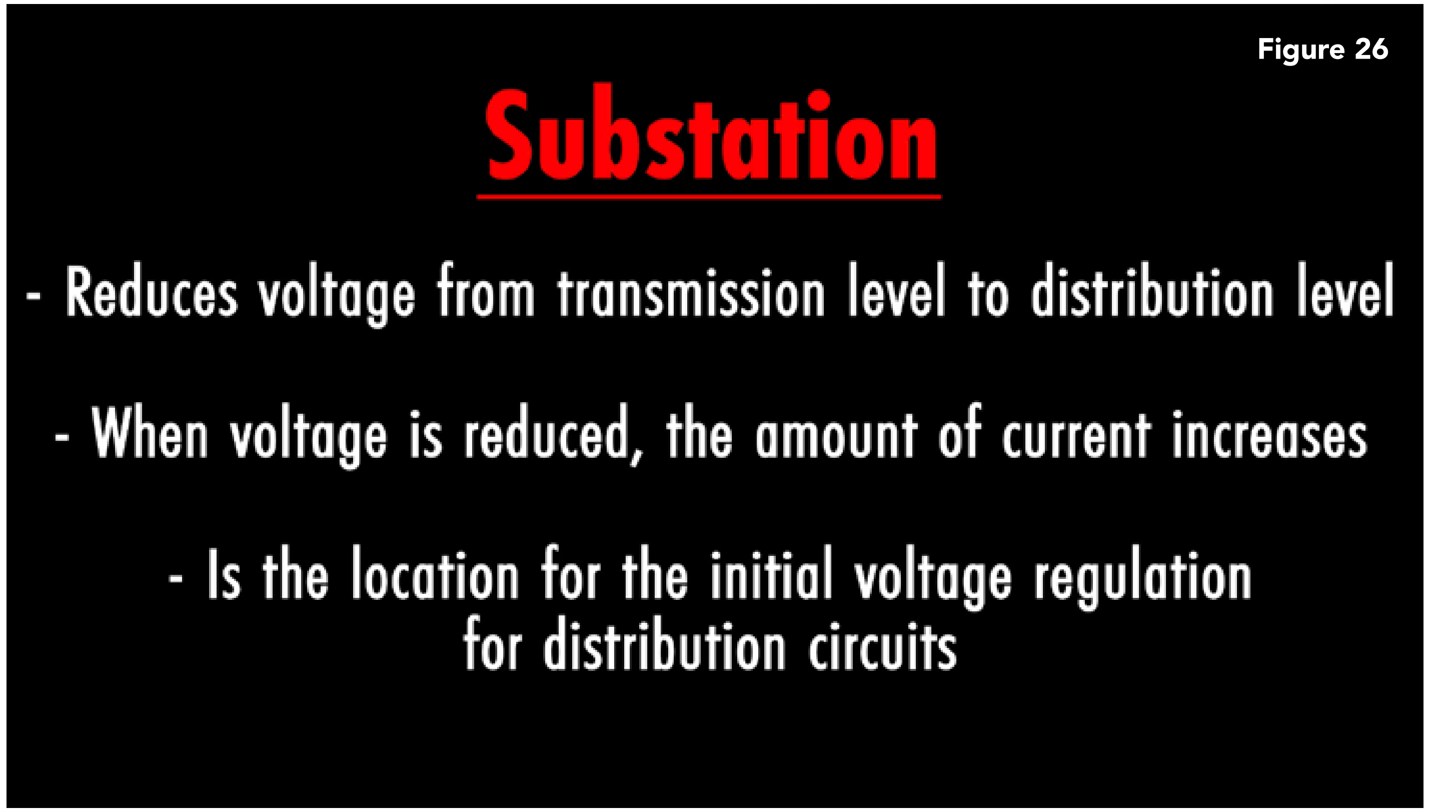


Figure 26

Substation

- Reduces voltage from transmission level to distribution level
- When voltage is reduced, the amount of current increases
- Is the location for the initial voltage regulation for distribution circuits

Electric: Feeder Switch

The purpose of a feeder switch is to open or close a feeder circuit **(Figures 27-28)**. Feeder circuits are the primary source of electricity leaving a substation. Not only are feeder switches located at substations, but also along aerial feeder lines.

Figure 27

Figure 28

A feeder switch is said to be gang-operated when it can be turned by hand at, or near, the ground **(Figures 29-30)**. A feeder switch can also be remote-controlled from an operations center **(Figure 31)**. The purpose of a feeder switch can be to isolate a segment of the distribution system in case of a fault, or to allow maintenance without impacting other parts of the electric system.

Figure 29

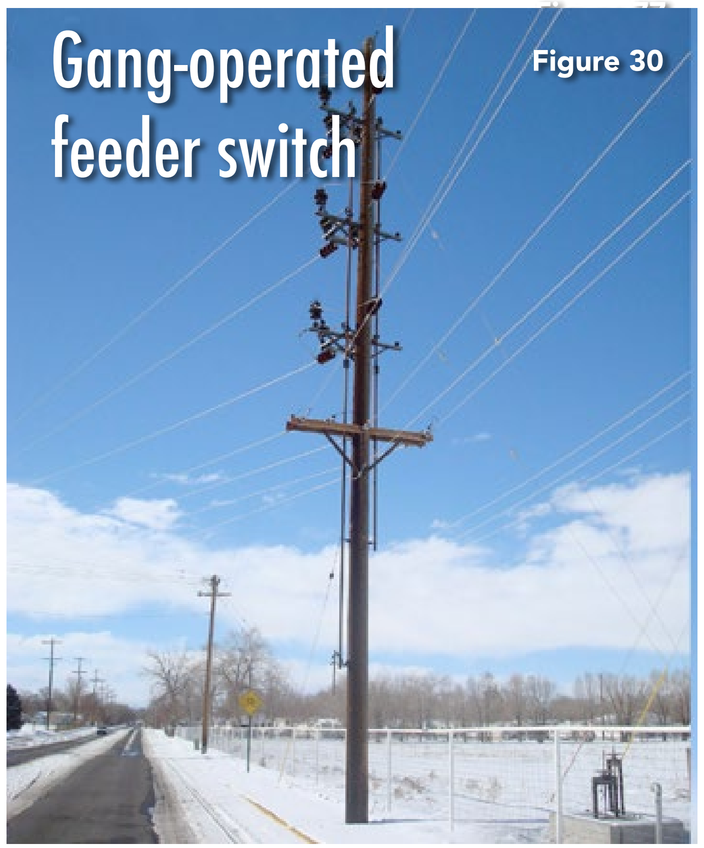


Figure 30

Figure 31

Figure 32

Faults are problems with the conductors **(Figure 32)**. With overhead lines there are transient faults, which are temporary issues such as: tree limbs coming into contact with the conductor, animal contact with the conductor, wind blowing conductors into each other, or lightning.

A recloser **(Figure 33)** interrupts fault current, but a recloser can restore current when the transient fault is cleared. A persistent fault is when electric current flows from a conductor direct to earth, or flows from one conductor to another.

Figure 33

Electric: 3-Phase Riser

A 3-phase primary is the continuation of three streams of electricity from the power plant, to the substation, to the feeder circuit, and to the 3-phase customer.

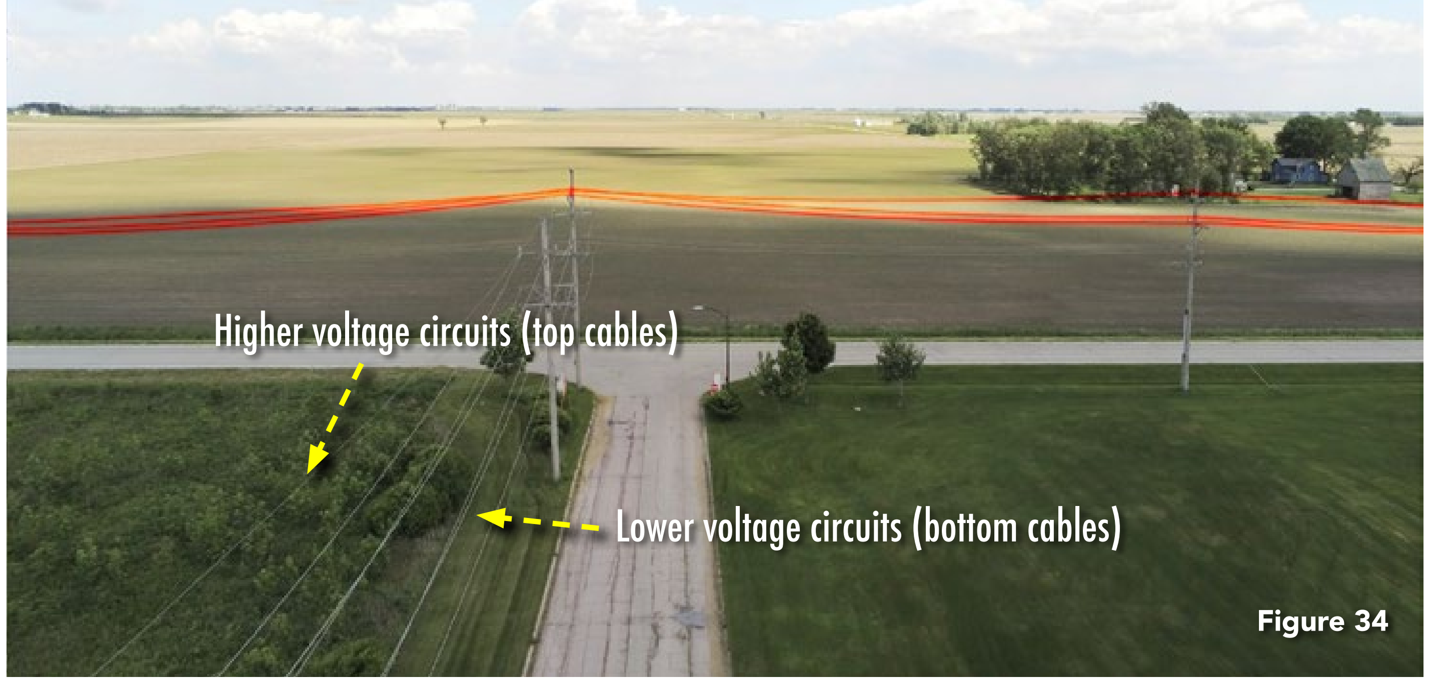


Figure 34

When a pole line is carrying multiple circuits, the highest voltage circuit is on top. On bottom are the lower or the lowest voltage circuits **(Figure 34)**. At this pole drop or 3-phase riser **(Figure 35)**, the transition from an aerial cable to an underground cable is made.

Figure 35

Cutouts are fuses that are designed to isolate the downstream part of a system in the result of an electrical overload, which is too much current on the line as a result of a transformer or customer circuit issue **(Figure 36)**. A cutout consists of a fuse and a switch.

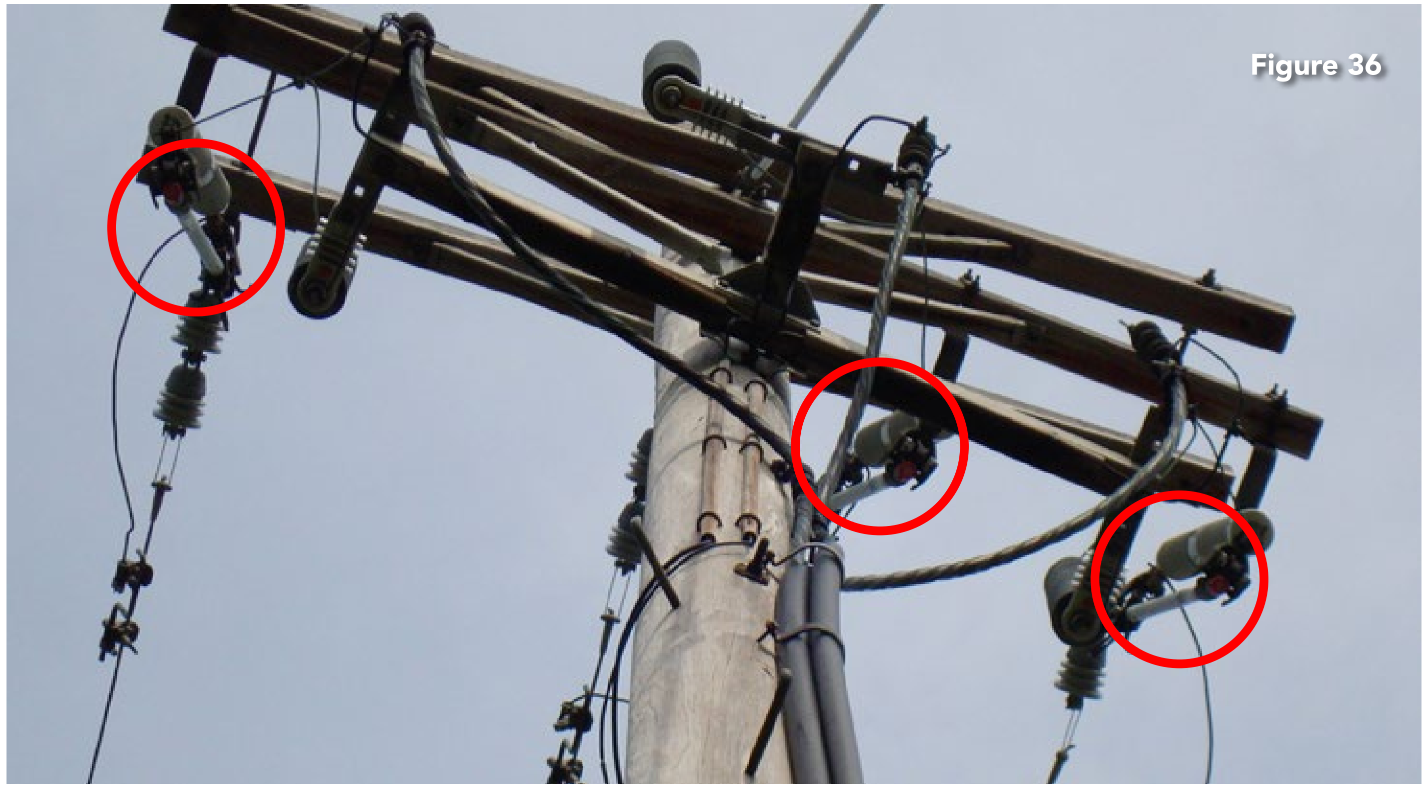


Figure 36

Downstream of the cutouts are surge arresters, which divert lightning, or overcurrents, to earth **(Figure 37)**.

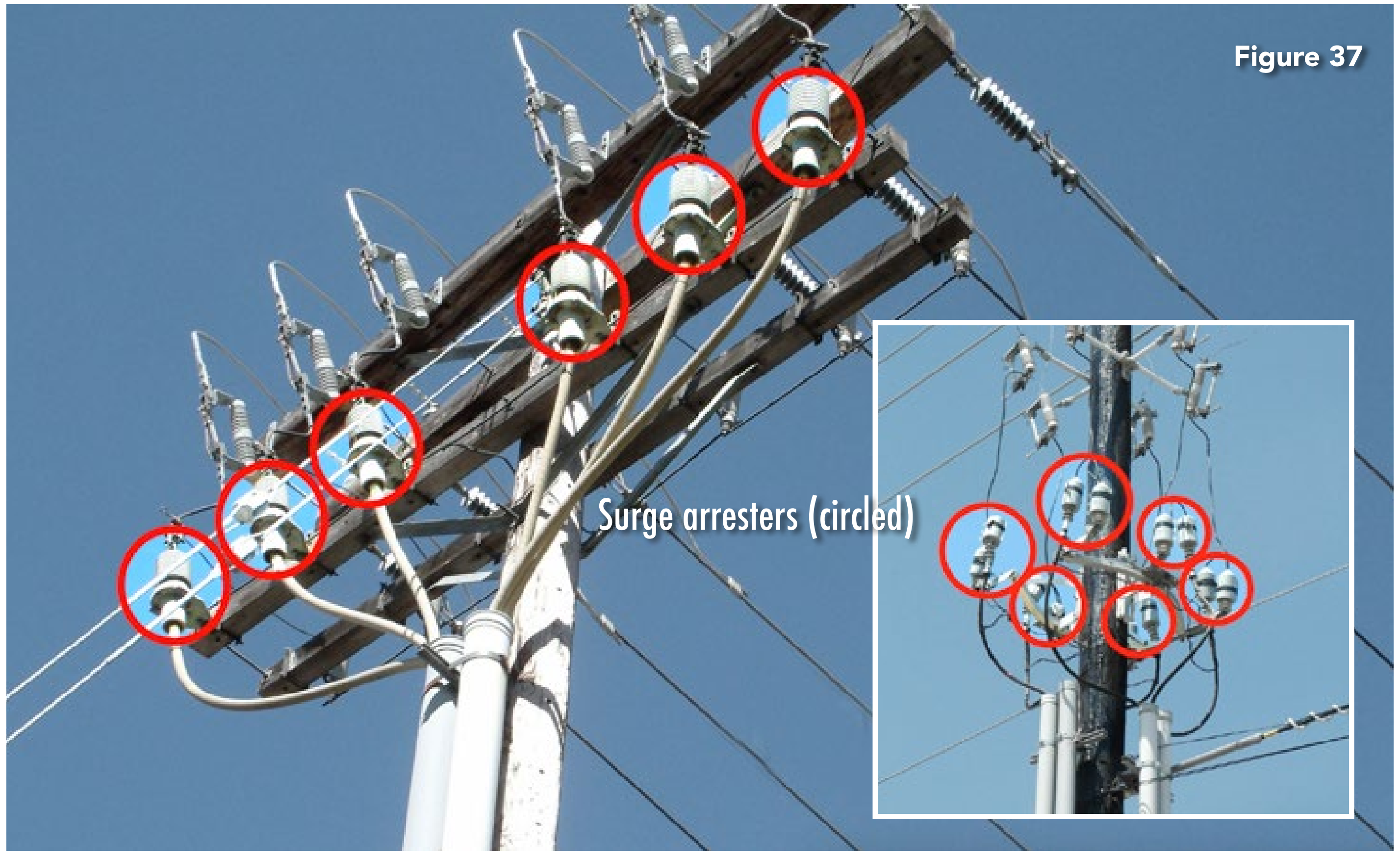


Figure 37

Electric: Neutral

The neutral **(Figure 38)** provides a metallic pathway back to the substation so that electricity can complete the circuit. A neutral also serves as a balancing point or a reference point of zero voltage. There is a concentric neutral on each of the three cables below, and they are bonded to the neutral wire, also shown below.

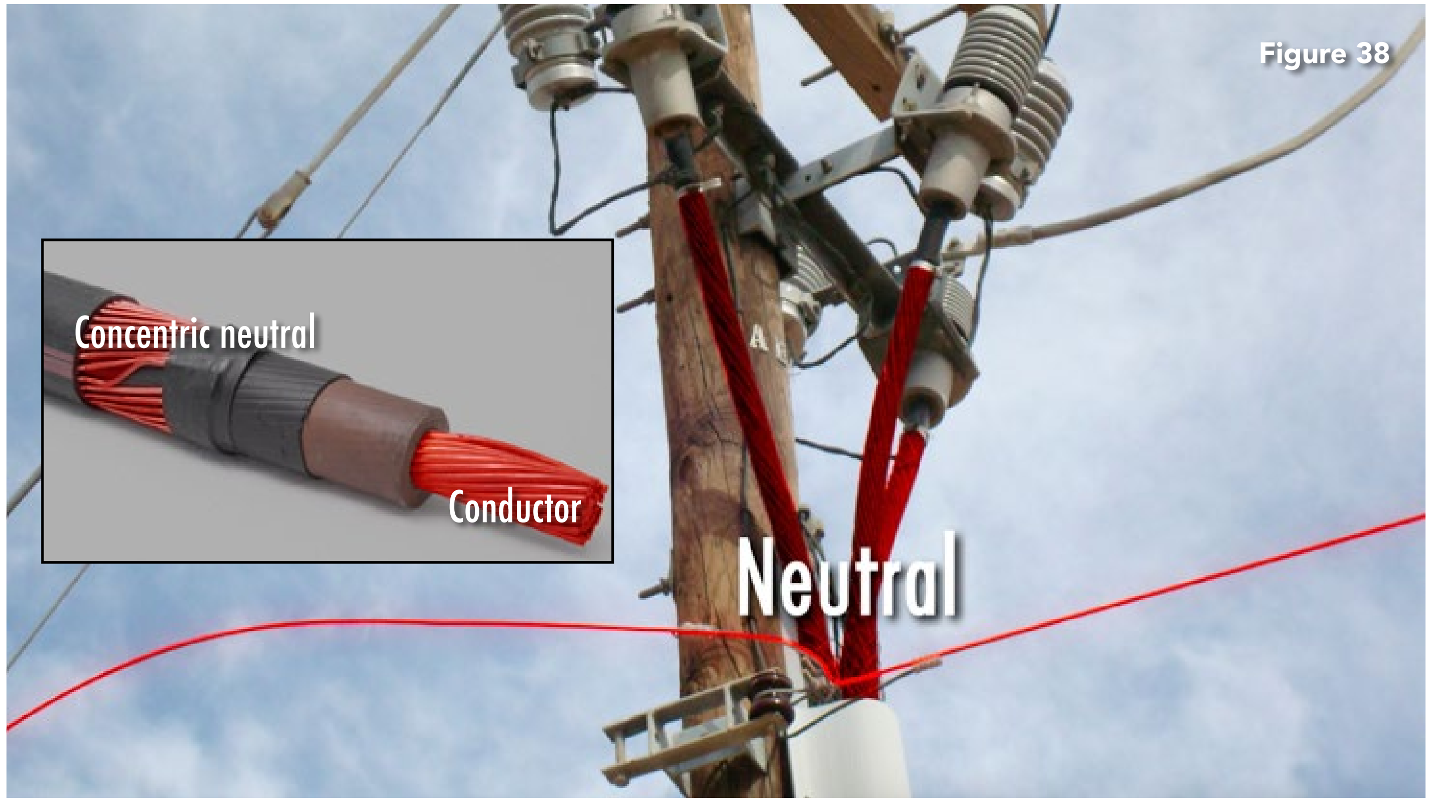


Figure 38

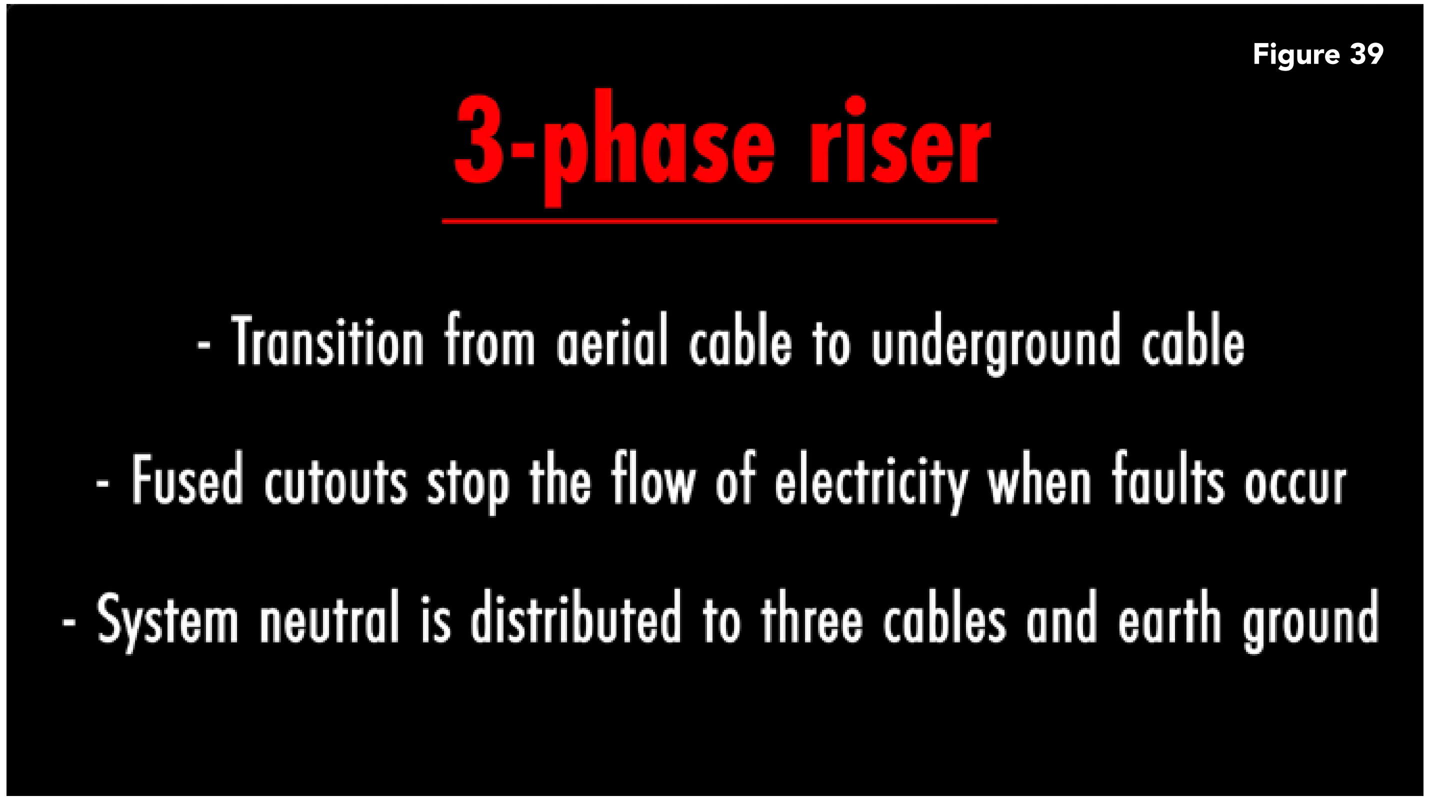


Figure 39

3-phase riser

- Transition from aerial cable to underground cable
- Fused cutouts stop the flow of electricity when faults occur
- System neutral is distributed to three cables and earth ground

Electric: Sectionalizer

A sectionalizer is like a tap. It's where cables can be spliced so that they feed different directions **(Figures 40-42)**.

Figure 40

Figure 41

Figure 42

Electric: 3-Phase Transformer


Figure 43

At a transformer **(Figure 43)**, 3-phase voltage of perhaps 13kV will be cut down to secondary voltage (less than 600 volts) for the customer's use. A handle and door are positioned on the right-hand side of a 3-phase transformer. The door opens to the secondary side of the transformer.

Here, primary voltage, or 13kV, will be cut down to secondary voltage for the customer. With three phases of electricity coming in, 3-phase customers are fed with three streams of electricity for secondary voltage **(Figures 44-45)**.


Figure 44

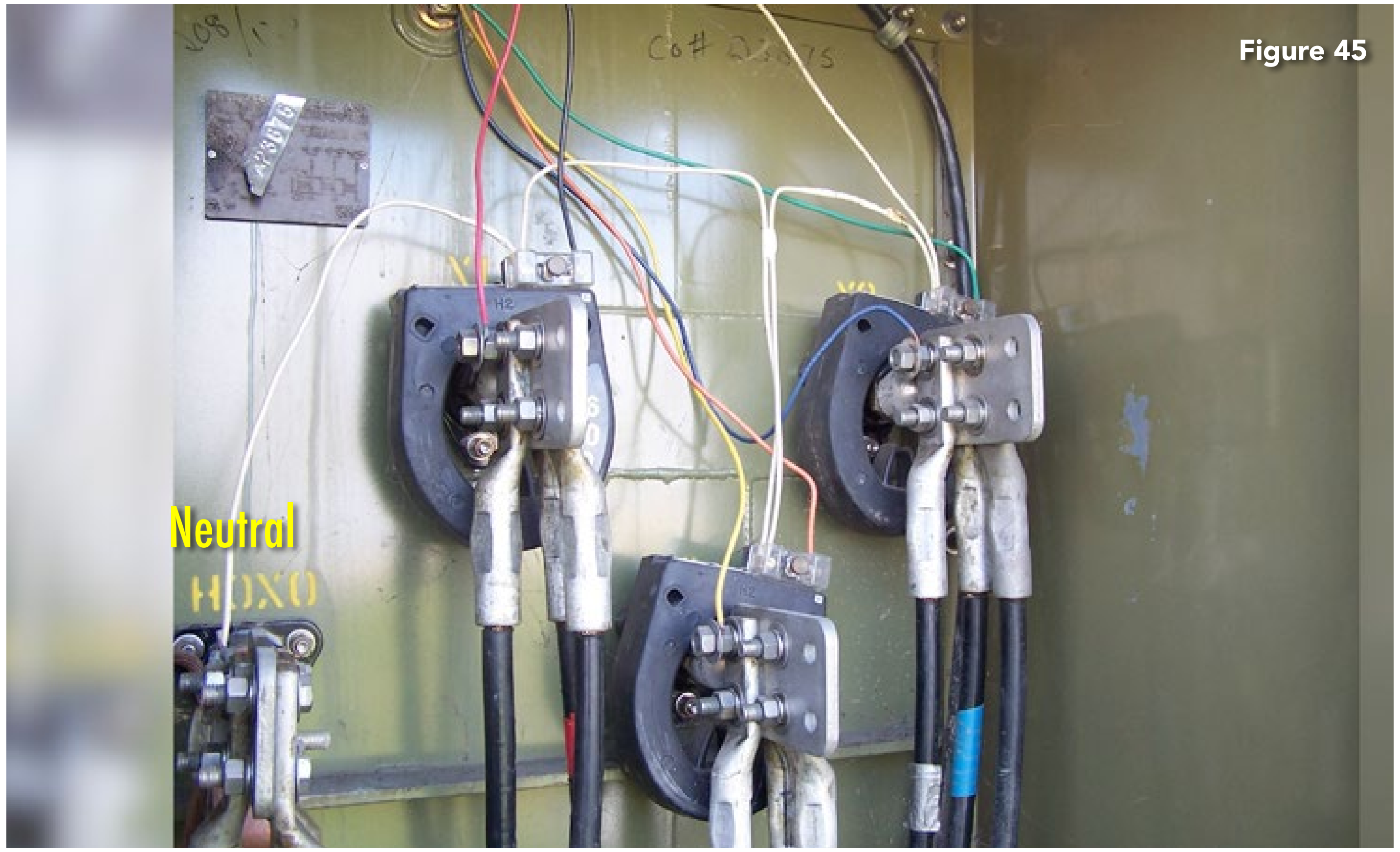


Figure 45

Generally, the secondary cables leaving a 3-phase transformer are owned by the customer, not the electric company. Leaving a 3-phase transformer are the three streams of electricity being fed by secondary voltage, as well as a fourth wire, the neutral **(Figure 45)**. On the back or sides of 3-phase transformers are fins filled with oil, which reduce heat caused by the resistance of the conductors **(Figure 46)**.


Figure 46

Sample Test Questions

1. How many electrical circuits are shown?

(A) Three
(B) Two
(C) Seven

2. Is this a radial feed or loop feed transformer?

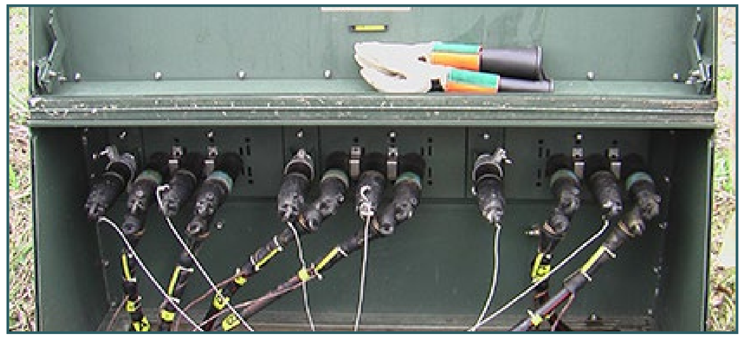
(A) Radial
(B) Loop

3. What happens at a substation?

(A) Power is decreased
(B) Power is increased
(C) Voltage is decreased

4. What doesn't a sectionalizer do?

(A) Reduce voltage
(B) Direct the flow of electricity
(C) Interrupt the flow of electricity



5. How many streams of electricity will go into the customer's premises?

(A) 1
(B) 3
(C) 4

6. How many streams of electricity will go into the customer's premises?

(A) 1
(B) 2
(C) 3

7. What's inside a switchgear that can interrupt electrical flow?

(A) Fuses
(B) Switches
(C) Fuses and switches

8. What voltage serves this enclosure?

(A) Primary
(B) Primary and secondary
(C) Secondary

Sample Test Questions

9. This is what?

(A) A Disconnect

(B) A feeder switch

(C) A switchgear

10. This is what?

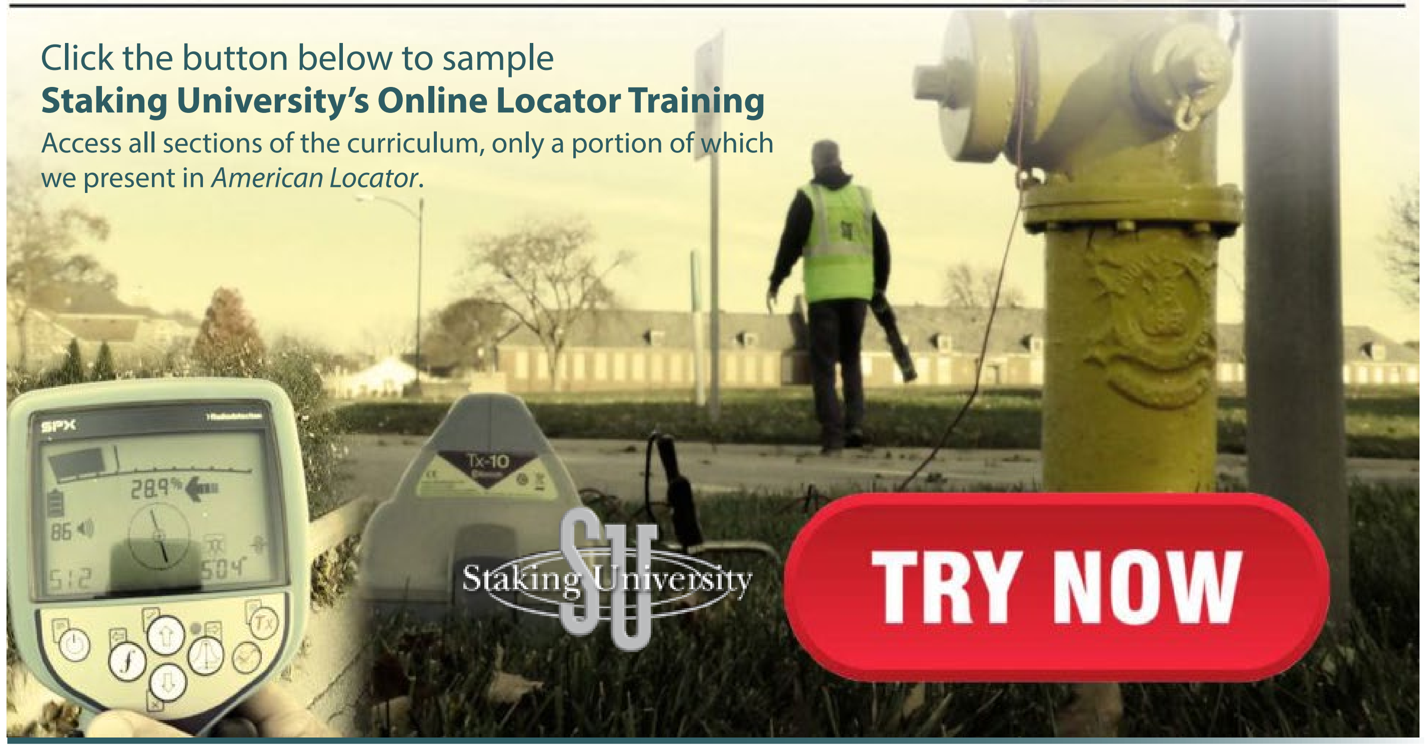
(A) A disconnect

(B) A feeder switch

(B) A switchgear

Answers

1. B, 2. A, 3. C, 4. A, 5. B, 6. B, 7. C, 8. C, 9. A, 10. B



Basic Utility Knowledge - Electric

Glossary of Terms

3-Phase Electric Circuit: three streams of high voltage electricity flowing on three separate wires

3-Phase Riser: the transition from an aerial cable to an underground cable where the underground cable travels down an electric pole

3-Phase Transformer: where primary voltage is reduced to secondary voltage for the commercial customer

Circuit breaker: an electrical safety device that can interrupt current flow and provide safety in case of an electrical overload or fault

Cutout: a fuse that is designed to isolate the downstream part of a system as the result of an electrical overload or fault

Fault: an unintentional connection between two parts of the electric system that interrupts the downstream flow of electrical current

Feeder switch: a switch located at substations or along higher voltage feeder lines that can open or close a feeder circuit

Ground: a metallic rod driven into earth utilized as a return-to-source path for electric current

Load break center: a version of a sectionalizer which can open a circuit under load utilizing an attachment for quenching an arc when a fuse holder is pulled

Loop feed system: a circuit that makes a physical loop that can feed electricity from two different directions depending on the opening and closing switches

Neutral: a cable or part of a cable designed to be continuously connected to earth so that electricity can flow back to its source in normal conditions and can flow into earth given an electrical overload or fault

Normal open: an open switch or fuse in a piece of equipment on a loop feed system where the current cannot flow past

Radial feed: Electricity can only be fed in a single direction due to the termination of the cable.

Recloser: interrupts fault current, or can restore current when a transient fault is cleared

Secondary: a cable that carries less than 600 volts

Secondary enclosure: a splice point of secondary voltage cables which can be a pit or a pedestal

Semiconductor: a part of an underground primary cable that insulates the energized conductor from the neutral

Single-phase primary: a single stream of high voltage electricity for homes, street lighting, traffic signals and telecom utility structures

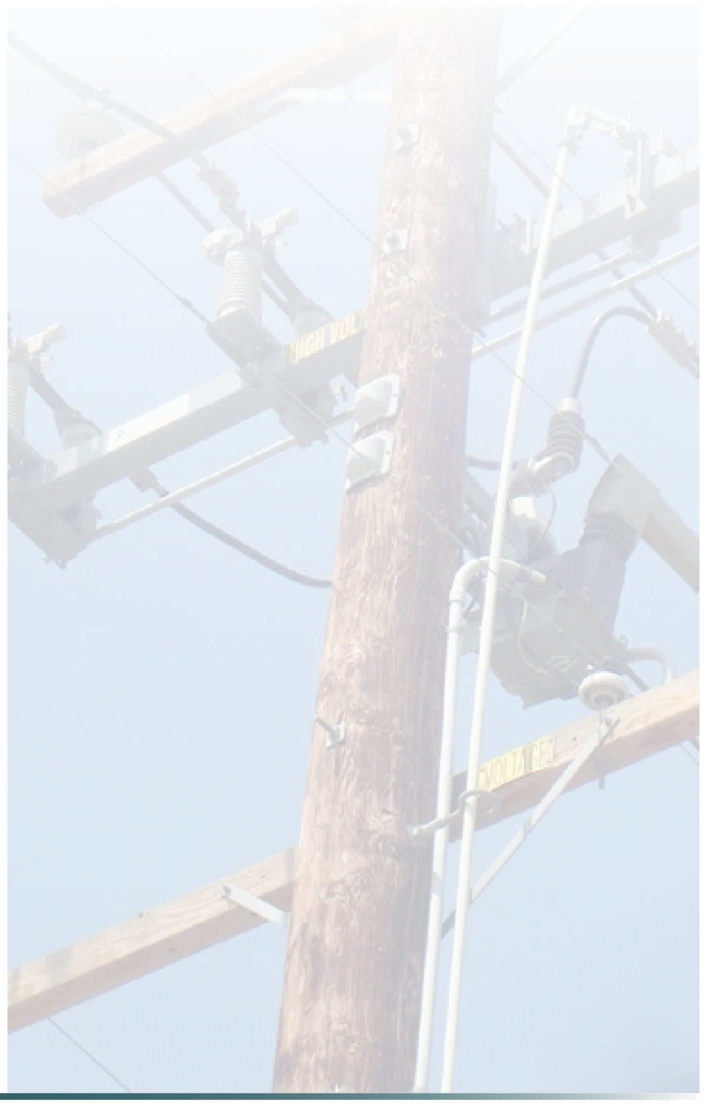
Substation: a large set of transformers and other equipment where higher voltages are reduced to lower voltage levels

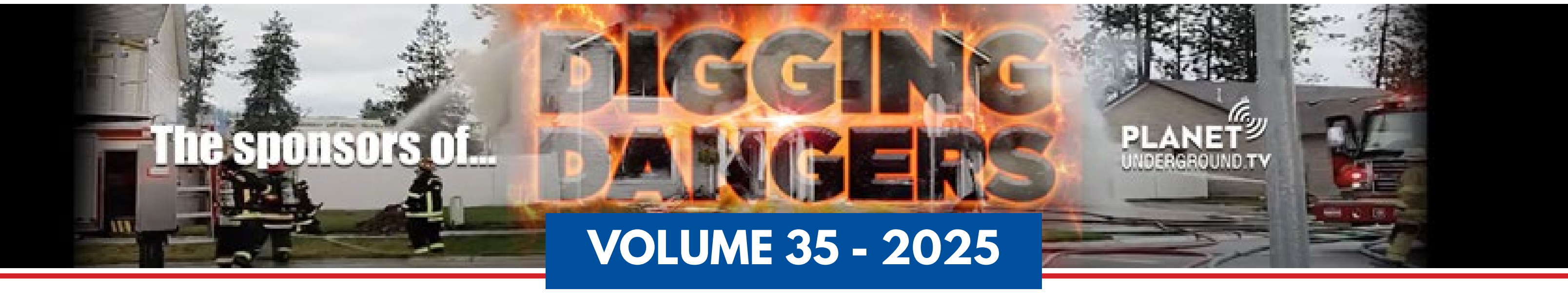
Switchgear: a structure containing fuses, circuit breakers, and switches that can isolate, redirect or cut off electrical current to certain segments of a distribution system

Turbine: a stationary magnet and a spinning magnet in close proximity that produces electricity

Voltage: can be considered to be electric pressure, but is the difference in electric potential between two points.

Voltage regulator: equipment that sets the proper voltage as electricity leaves a substation or at other points along the distribution system





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