Electrical Hazards Avoidance

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Electric Hazards

One of the greatest hazards encountered by tree workers

- Electric lines present at many jobsites.

- Direct or indirect contact
  - Shock
  - Electrocution
  - Serious burns

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Electric Hazards

Many in our industry fail to solicit or receive proper training

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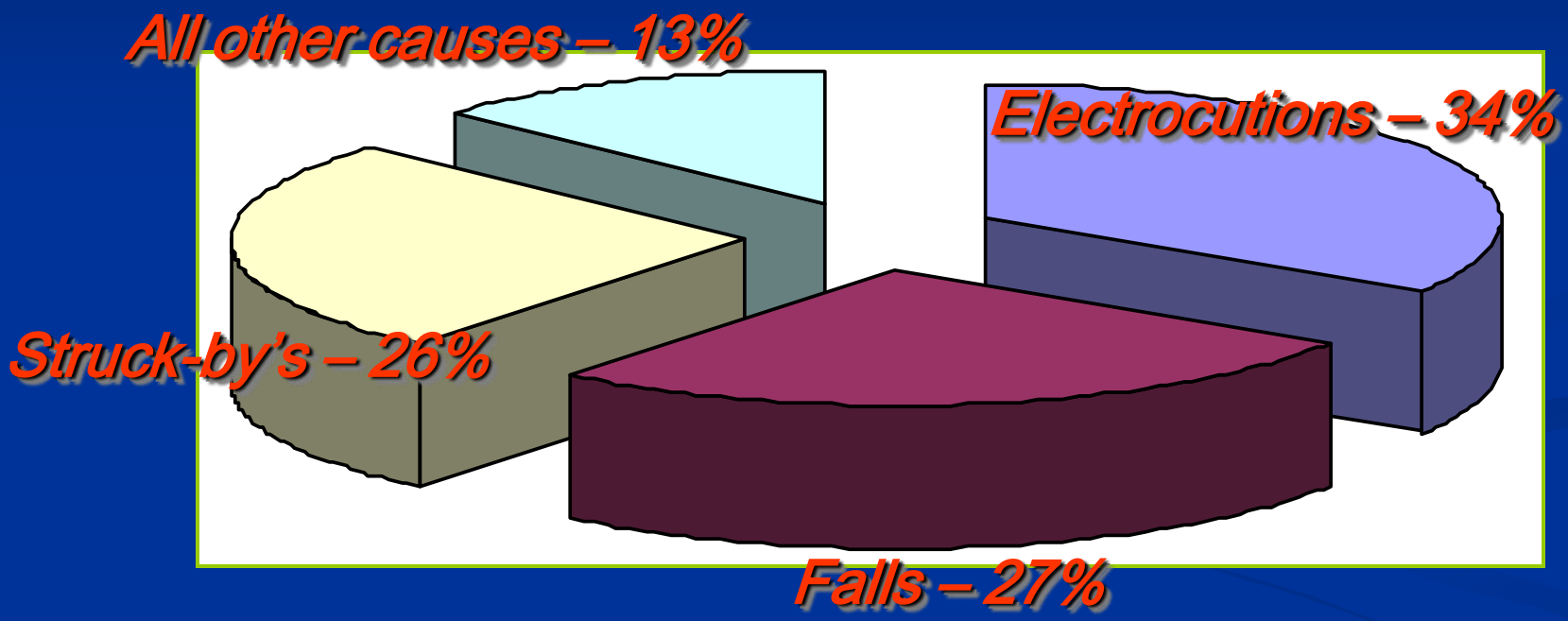
Causes of Fatal Accidents



Between 1984 and 2002, federal OSHA recorded 106 fatalities in tree care.

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State and Federal Laws require training for workers who may encounter electric lines

- OSHA
- ANSI

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Attend EHAP Program

- Inform you about hazards when working around energized conductors
- Help you meet compliance requirements

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Laws and Regulations

OSHA (Federal and State) and ANSI Z133.1

- All personnel must read, understand and be capable of effectively applying the applicable sections of OSHA and ANSI Z133.1 prior to conducting any work.

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OSHA General Duty Clause

Restrict job assignments near energized electrical equipment to employees who are "certified"

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OSHA Requirements

OSHA 1910.268(q): Regulates telecommunications line clearance workers:

- "Employees engaged in pruning, trimming, removing, or clearing trees from lines shall be required to consider all overhead and underground electrical power conductors to be energized with potentially fatal voltages, never to be touched (contacted) either directly or indirectly."

OSHA Requirements

OSHA 1910.333 and 1910.269:

- Cover workers near <u>any</u> energized electrical conductor during normal tree care operations
- Requires employers to document electrical hazard training

OSHA Requirements

OSHA 1910.269: It is the responsibility of the employer to "certify" the competency of their employees . . .

- Job orientation and training
- EHAP course completion
- Other documented training (ex. climbing, pruning, rigging, emergency response)
- Supervised OJT training
- Demonstrate knowledge and proficiency

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OSHA Requirements

Other sections of OSHA, are also focused on line clearance work:

- 1910.269(a), (b), (c), (g), (j), and (p)
- 1901.67 (c) (2) (ix) and (3)
- 1910.151(b) and 1910.332.

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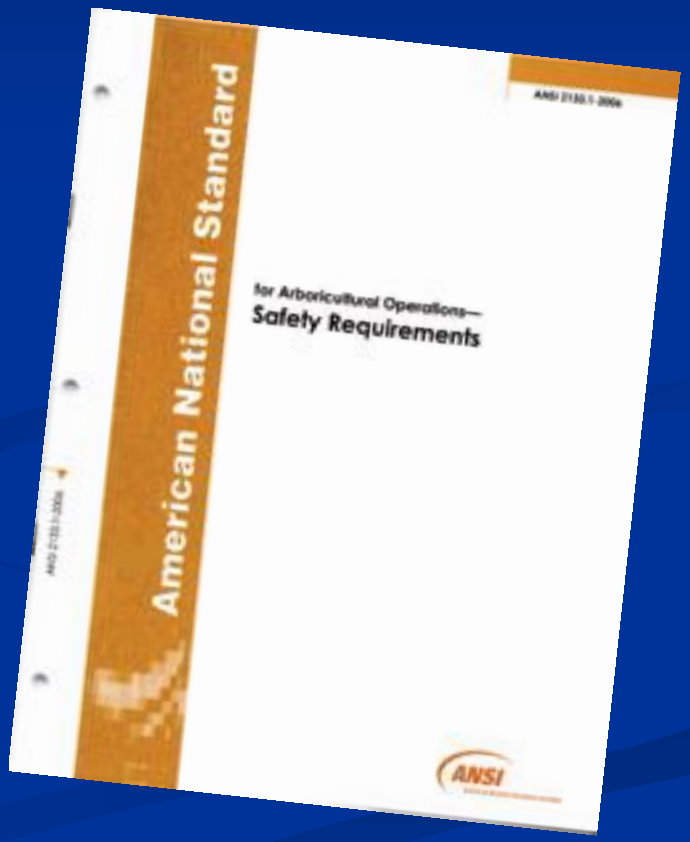
ANSI Requirements

ANSI Z133.1-2006

- Safety Standard for Arboricultural Operations
- Tree care industry's consensus safety standard
- Referenced by OSHA and has force of law
- Annex B describes training required to achieve Qualified Line Clearance Arborist



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Key Definitions

Electrical conductor: "any overhead or underground electrical device capable of carrying an electrical current, including communications wires and cables, power lines, and other such fixtures or apparatus."

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Key Definitions

Electrical hazard: "an object or situation that poses risk of injury or death due to direct or indirect contact with an electrical conductor… specific minimum approach distances based on the arborist's or worker's level of training… shall be followed."

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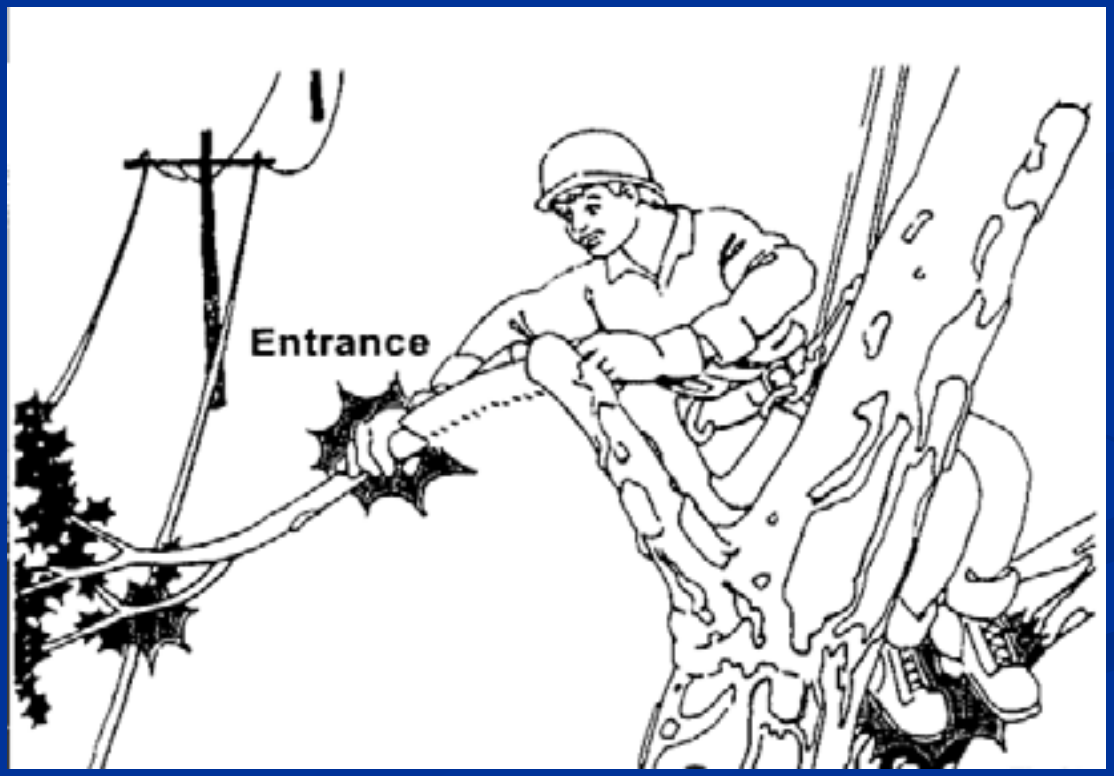
Key Definitions

Indirect electric contacts: When a conductive object in contact with person contacts energized electrical equipment permitting electricity to pass through the object and then through the person to the ground



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Key Definitions

Qualified Arborist: "An individual who, by possession of a recognized degree, certification, or professional standing, or through related training and on-the-job experience, is familiar with the equipment and hazards involved in arboricultural operations and who has demonstrated ability in the performance of the special techniques involved."

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Key Definitions

Qualified Line Clearance Arborist: "An individual who, through related training and on-the-job experience, is familiar with the equipment and hazards in line clearance and has demonstrated the ability to perform the special techniques involved. This individual may or may not be currently employed by a line-clearance contractor."

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Key Definitions

Qualified Line Clearance Arborist Trainee: "An individual undergoing on-the-job training under the direct supervision of a Qualified Line Clearance Arborist. In the course of such training, the trainee becomes familiar with the equipment and hazards in line clearance and demonstrates ability in the performance of the special techniques involved."

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Qualified Line-Clearance Arborist

To work within 10' of energized distribution voltage equipment (< 50kV - extra high voltage > distance)

- Related training and on-the job experience
- Familiar with hazards in line-clearance
- Demonstrated ability to perform special techniques

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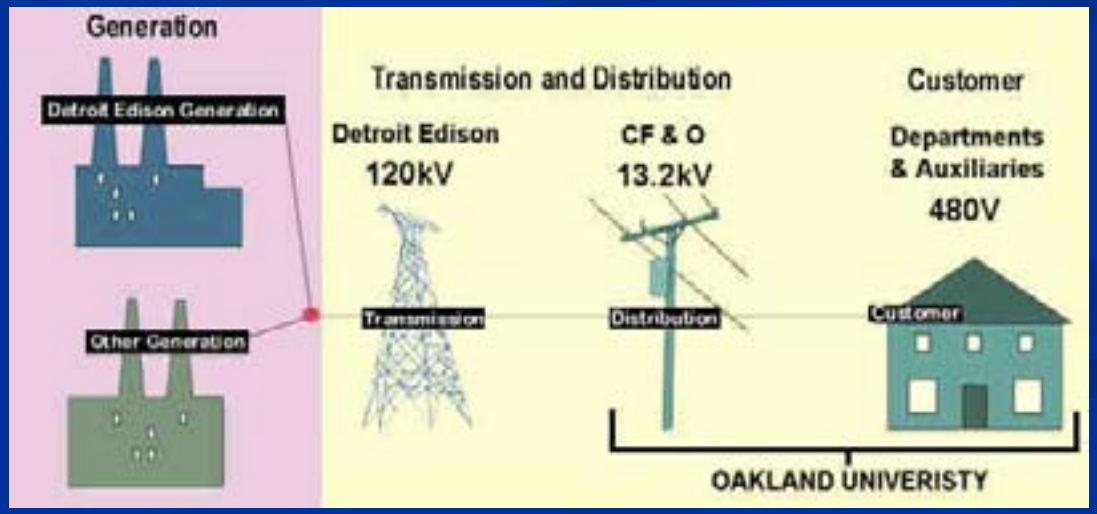
Qualified Line-Clearance Arborist

Qualification requires understanding of electricity

- How electricity works
- Recognize construction and hardware
- How utility system functions
- Special conditions and procedures required when working near energized wires
- Voltage = Minimum Approach Distance
- Demonstrated knowledge how to conduct work safely.



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Training Requirements

Employees know and understand how to apply basic electrical knowledge topics

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Training Requirements

Ensure employees able to identify the lines and equipment on a utility pole and structure

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Training Requirements

Ensure employees possess a working knowledge and proficiency in work safety standards and practices applicable to their job assignment

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Electrical Terms and Measures

Understand basic electrical behavior to best manage safety

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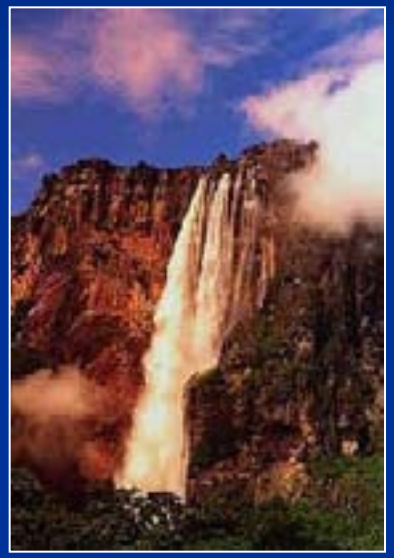
Volts

Voltage measures electrical pressure or force, not unlike water pressure generated by falling water



High voltage is similar to the high water pressure of a tall waterfall.

High voltage (used for transmitting electricity over long distances), like the force of a high waterfall, is extremely dangerous.

Low voltage can be compared to the low pressure of a small waterfall.

Low voltages, used in delivering electricity to the home - though dangerous - have less force than high transmission voltages

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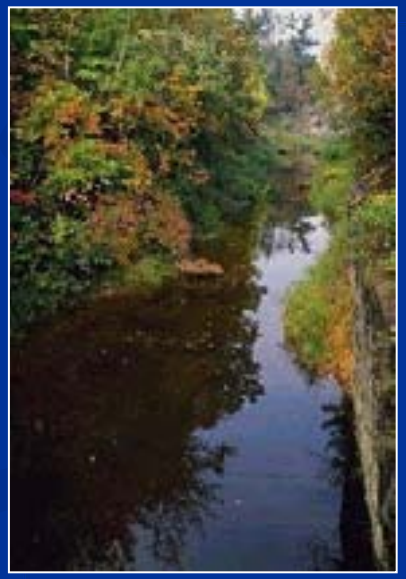
Amperes

Amperes (amps) measure the volume or current flow of electricity, not unlike the volume of water flowing in a river

High amperage is similar to a river carrying a large volume of water.

Some electrical devices (in the home, electric stoves and air conditioners) draw a large amount of current. They have a high amperage.



Low amperage can be compared to the flow of water in a small creek.

Small electrical devices, like clocks, have a small amperage.

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Resistance (Ohms)

Ohms measure the resistance of a material to carrying electrical current.

High resistance reduces the flow of current through a conductor, not totally unlike the effect of a rough riverbed.

Low resistance does not impede the flow of current through a conductor.

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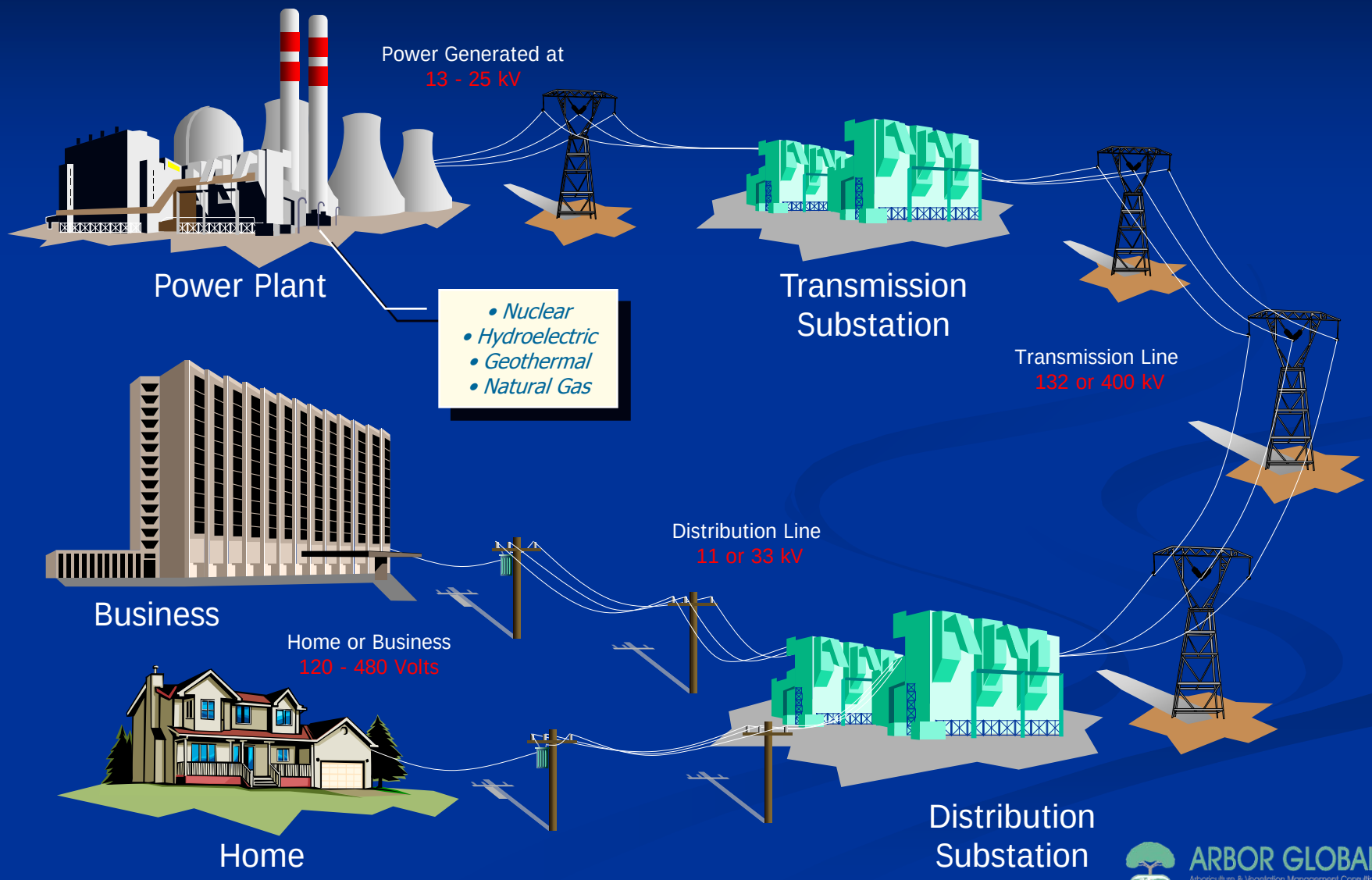
Typical Electric System



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Transmission Line

- Carries high amounts of energy
- Operates at ultra high voltages (100 kV-525 kV or above)
- Usually on steel or concrete towers, but also very tall wood structures

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Substations

Large power transformers at transmission and distribution substations step down high voltages to sub-transmission and distribution voltage levels (4kV-100 kV)

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Primary Distribution Line

- Usually on wood poles or buried underground
- Typically, 2.4 kV-34.5 kV
- Delivers electricity to individual communities and industry

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Service Drop

- Goes from last pole into house or business
- Carries 120-600 volts
- Cable, TV and telephone have service drops
- Often buried underground

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Utility Pole Configuration

- Electric lines located highest on pole
  - Multiple voltages - highest voltage highest position
- Communications lines located lower

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Knowledge Requirement

Must recognize hardware to be able to:

- Understand equipment functions and energized status; and
- Conform to laws and regulations; and
- Comply with employer's safety requirements

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Conductor/Wires

Covered Cable

- Secondary
- Primary
- Shielded (insulated)
  - Do not trust covering

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Insulators

Voltage indicated by insulator:

- Number
- Size
- Height of post or pin

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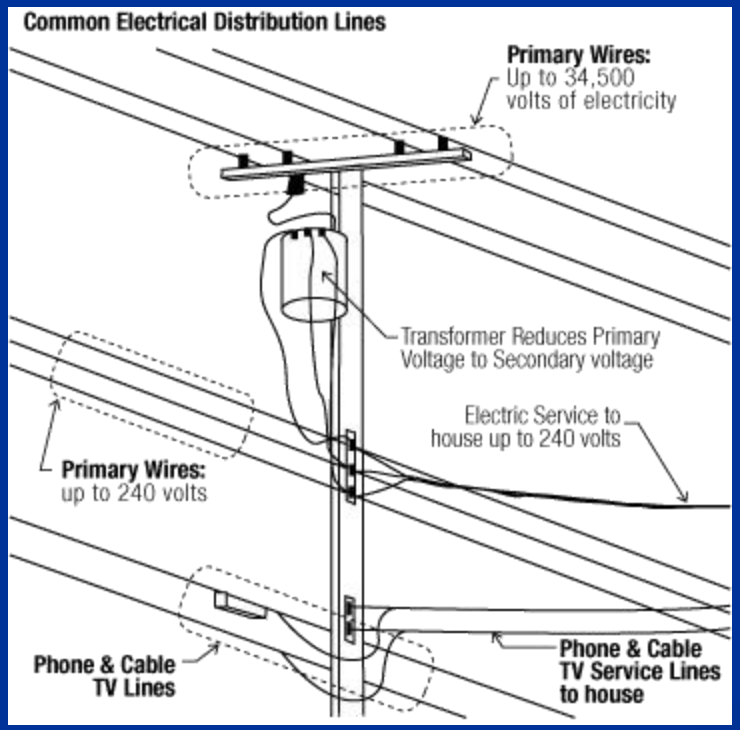
Telephone/Cable TV Line

Located under electric secondary lines

- Telephone usually on top
- Cable TV lowest line on pole



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Electrical Hazards

Electrical energy is constantly seeking a path to ground

People and trees are excellent paths

- People are best path

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