BARN SYLLABUS

Yawgoog Scout Reservation

Revised
1.19.24

Contents

Electricity

Prerequsites: 2

- Req 2: Complete an electrical home safety inspection of your home, using the checklist found in the Electricity merit badge pamphlet or one approved by your counselor. Discuss what you find with your counselor.

Homework: N/A

Classwork: 1, 3, 4, 5, 6, 7, 8, 10, 11

Day 1:

- Take attendance and introduce yourself as their instructor.
- Check prerequisites for completion.
- Req 1:
  - Show how to rescue a person touching a live wire in the home.
    - Stay Safe: Do not touch the person directly, as the wire could still be live. Make sure you are not in contact with the ground or any conductive materials.
    - Cut the Power: If possible, disconnect the power source immediately. This could involve turning off the main breaker or unplugging the appliance, causing the issue.
    - Call for Help: Dial emergency services (911) for professional assistance.
    - Use a Non-Conductive Object: If necessary, use a non-conductive object (like a wooden broom handle) to carefully push the person away from the wire. Do not use your hands.
  - Show how to render first aid to a person who is unconscious from electrical shock.
    - Ensure Safety: Make sure the area is safe before approaching the person. Cut the power source if not done already.
    - Check Breathing and Pulse: If the person is unresponsive, check for breathing and a pulse. Perform CPR if necessary and you're trained to do so.

- Call for Help: Dial emergency services for professional assistance.
- Provide Care: Keep the person warm and comfortable while waiting for help. Do not move them if there's a possibility of a spinal injury.

- Show how to treat an electrical burn.
  - Cut the Power: Ensure the source of electricity is turned off to prevent further injury.
  - Cool the Burn: Gently cool the burned area with cold water for at least 10 minutes to reduce pain and prevent further damage.
  - Cover the Burn: Use a sterile, non-stick dressing to cover the burn to prevent infection.
  - Seek Medical Attention: Electrical burns can be serious. Seek medical help, especially for large burns or burns that penetrate deeper layers of skin.
- Explain what to do in an electrical storm.
  - Stay Indoors: Stay away from open fields, bodies of water, tall structures, and metal objects.
  - Avoid Water: Do not use sinks, showers, or baths during a storm, as lightning can travel through plumbing.
  - Unplug Electronics: Unplug sensitive electronics to protect them from power surges caused by lightning strikes.
  - Stay Informed: Monitor weather forecasts and take shelter until the storm passes.
- Explain what to do in the event of an electrical fire.
  - Use a Fire Extinguisher: If the fire is small and you have a Class C fire extinguisher (designed for electrical fires), you can attempt to put out the fire.
  - Cut the Power: If the fire is larger, turn off the power at the main breaker if you can do so safely.
  - Evacuate: If the fire is not easily controlled, evacuate the area and call emergency services.

        - Don’t Use Water: Do not use water to extinguish an electrical fire, as water conducts electricity and can make the situation worse.
- Req 6: Explain why a fuse blows or a circuit breaker trip. Tell how to find a blown fuse or tripped circuit breaker in your home. Show how to safely reset the circuit breaker.
    - Circuit breakers serve an important function in the power you get going into your buildings, they divide the power that comes into your house into smaller portions, preventing all the power that is connected to your house from flowing into a lightbulb. A circuit breaker will trip on several occasions, the most common being the following:
    - Overloading:
        - A circuit breaker will trip if too many appliances are plugged into the outlets, this is to prevent wires from overheating due to the electricity demands. If too much electricity is flowing through a breaker, it will automatically trip, preventing more power from flowing through the breaker until it is reset. Most breakers will say how many amps they can supply to appliances plugged into outlets on that breaker, it is important not to exceed this amount as it can damage the wiring and cause house fires.
    - Power Surge:
        - A power surge can trip a circuit breaker due to the influx of electrical energy into a circuit. Circuit breakers are designed to protect electrical systems and devices from overcurrent situations, which can potentially lead to overheating and fires. When a power surge occurs, typically caused by lightning strikes, sudden power restoration, or electrical faults, an abnormally high amount of voltage flows through the circuit. This surge of energy surpasses the circuit’s normal operating parameters, triggering the circuit breaker to quickly trip and interrupt the flow of electricity.
    - Locating Tripped Circuit Breaker:

- To locate a tripped circuit breaker, you must first locate the breaker box, if the location is unknow to you it is possible to find it by following wires back from the lights/outlets they are connected to. Once you find the breaker box you should open it and look at the switches. There are several types of circuit breaker and many of them act differently when tripped. Some circuit breakers have an indicator light that will shine when on, but most circuit breakers will instead have their on/off switch set to a middle position and the switches will be loose.

- Req 7: Explain what overloading an electric circuit means. Tell what you have done to make sure your home circuits are not overloaded.
  - Overloading a circuit occurs when we draw out more power than a circuit can safely supply, for example if we have a wire that can supply enough power to a 60-watt bulb and we plug in a 150-watt bulb that is an example of overloading, and the wire can overheat and cause a house fire or damage the light bulb. To prevent this, we have, you guessed it, circuit breakers. They trip when they detect an overload protecting our homes and appliances from damage and fires.

Day 2:

- Take attendance.
- Req 4: Explain the difference between direct current and alternating current.
  - Direct Current (DC) and Alternating Current (AC) are two different types of electrical currents that describe the flow of electric charge in a circuit. The key difference between them lies in the direction and pattern of how the electric charge moves.
  - Direct Current (DC)
    - In a direct current, electric charge flows continuously in one direction. The flow of electrons remains constant, with the negative terminal (where electrons accumulate) and the positive terminal (where electrons flow to) maintaining their positions. Batteries and most electronic devices, like laptops and cell phones, use direct current.
    - Pros of DC:
      - Easy to store in batteries.
      - Efficient for certain electronic devices.
      - Can be used in applications where a steady and constant flow of current is required.
    - Cons of DC:
      - Transmission over long distances is less efficient due to energy loss.
  - Alternating Current (AC):
    - In alternating current, the flow of electric charge periodically reverses direction. This means the electric charge alternates between flowing in one direction and then the opposite direction. AC is generated by power plants and easily transformed to different voltage levels using transformers, which is why it's preferred for long-distance transmission.
    - Pros of AC:
      - Efficient for long-distance transmission, as voltage levels can be easily transformed.
      - Suitable for a wide range of devices and appliances.

        - Voltage can be easily adjusted using transformers.
    - Cons of AC:
        - Less efficient for certain electronic devices that require a constant flow of current.
        - Generally, requires more complex circuitry compared to DC.
    - In summary, the primary difference between DC and AC is the direction of the electric charge's movement. DC has a consistent flow in one direction, while AC periodically changes direction. AC is favored for its efficiency in transmitting electricity over long distances, while DC is often used in applications where a steady and unidirectional flow of current is required.
- Req 10: Explain the following electrical terms: volt, ampere, watt, ohm, resistance, potential difference, rectifier, rheostat, conductor, ground, GFCI, circuit, and short circuit.
    - Ammeter: An instrument for measuring current in amperes.
    - Ampere: A unit measuring the strength of an electrical current, based on the number of electrons transferring past a given point per second.
    - Circuit: A loop-shaped path through which electric current travels from the source through some device using electricity, such as a lightbulb, and back to the source.
    - Short Circuit: A completed, low-resistance circuit that allows electrons to follow a shorter, unintended path back to the power source rather than follow the longer path that goes through the load. This occurs when bare wires touch each other; often results from worn insulation.
    - GFCI: A safety device designed to protect against electric shock by quickly interrupting the circuit when it detects a ground fault or leakage current. GFCIs are commonly used in areas where water and electricity could come into contact.
    - Circuit Breaker: A safety switch installed in a circuit to break the transfer of electricity when the current exceeds a set amount. Circuit breakers can be reset once "tripped."

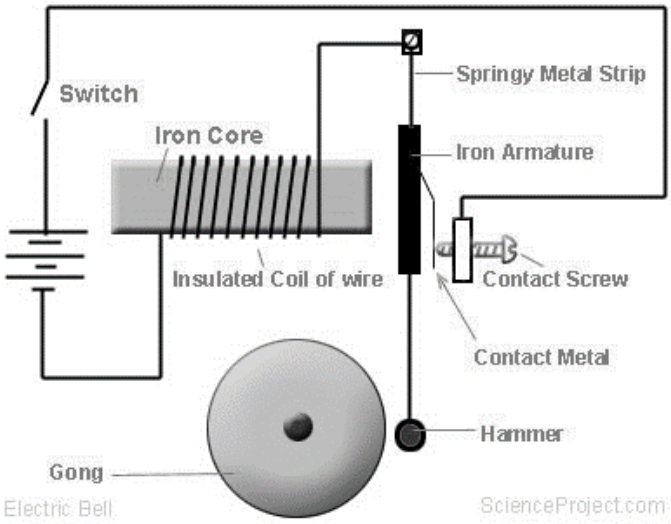
- Fuse: A safety device installed in a circuit to prevent an overload. Designed to melt or “blow” when current exceeds a set amount, it opens the circuit and stops the transfer of electricity.
- Conductor: A substance or device through which electricity passes. Most metals are good conductors of electricity, they allow electricity to travel through them with little resistance.
- Ground: To connect any part of an electrical wiring system to the ground or to another conducting body, such as a metal water pipe or a metal rod is driven into the earth.
- Grounding Wire: The conductor that grounds a metal component but does not carry current during normal operation.
- Hot Wire: Ungrounded conductor carrying electrical current. Usually identified by black or red insulation.
- Insulation: Covering of nonconducting material used on wires.
- Insulator: A material that does not conduct electricity, such as rubber or plastic.
- Watt: A unit that measures electrical power at the point where it is used in a circuit. One watt of power equals one volt of pressure times one ampere of current.
- Neutral Wire: The grounded conductor that completes a circuit by providing a return path to the source. Always identified by white or gray insulation.
- Ohm: A unit of measurement for electrical resistance to current. Ohm’s law states that the pressure of one volt will cause a current of one ampere to flow through a resistance of one ohm (Voltage = Current X Resistance).
- Overload: Condition in which an electrical circuit carries more current than it can safely handle.
- Resistance: The opposition against the free transfer of electrons in a conductor. Measured in ohms.
- Resistor: A device designed to restrict the transfer of current in (or introduce resistance into) an electric circuit.
- Rectifier: A device that converts alternating current (AC) to direct current (DC) by allowing current to flow in only one direction.

- Receptacle: The device that you plug electric cords into is sometimes called an outlet.
- Rheostat: A resistor built so that the current traveling through the circuit can be adjusted at will. Volume controls and dimmer switches are examples.
- Source: Point of supply, such as a generator or battery.
- Switch: Device to break the transfer of electricity. When the switch is on, the circuit is closed, and current may travel through it. When the switch is off, the circuit is open, and electricity cannot transfer.
- Volt: A unit of potential difference, or a unit of measurement of electrical pressure or force. Abbreviated V.
- Potential Difference: Also known as voltage, it is the difference in electric potential between two points in an electric circuit. It is the driving force that causes electric current to flow.
- Voltmeter: An instrument for measuring the difference in electric potential (electrical pressure) between two points.

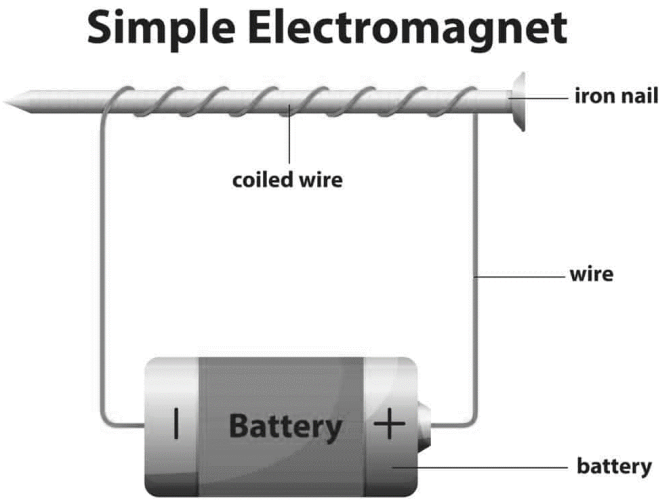
- Req 8: Make a floor plan wiring diagram of the lights, switches, and outlets for a room in your home. Show which fuse or circuit breaker protects each one.
  - Mapping out the wiring of the barn should be done in groups, form the scouts into groups of 3-4 and have them look at the breaker box. Make sure scouts don’t touch the breaker box at all, it is potentially dangerous and should be left to the staff if necessary. It is recommended that all the breakers be labeled so that way the scouts can match the wiring to the breakers without flipping them off.

Day 3:

- Take attendance.
- Req 5: Make a simple drawing to show how an electric bell works.



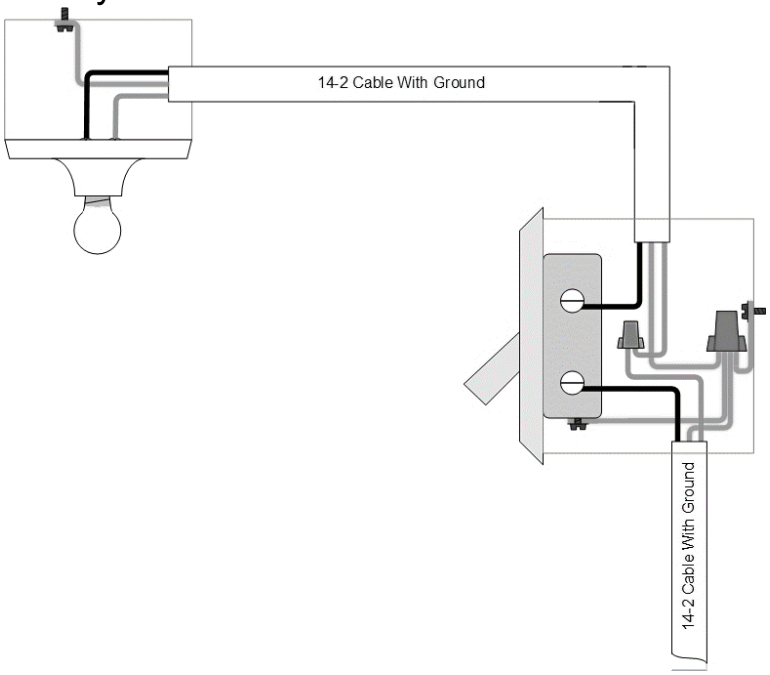
- Req 3: Make a simple electromagnet and use it to show magnetic attraction and repulsion.
  - Play a game with the Scouts to see who can make the most efficient and pick up the most paper clips.



- Req 11a: Connect a buzzer, bell, or light with a battery. Have a key or switch in the line.
  - Use demo board and supervise scouts as they connect the parts and test if it works.

Day 4:

- Take attendance.
- Check prerequisites for completion.
  - You can go around and do this while they are working on the drawings in the next step.
- Make a simple drawing to show how to build a single-pole, double-throw switch.
  - Check the drawing so the Scouts have the right idea going into the next activity.



- Req 11d: Build a single-pole, double-throw switch. Show that it works.
  - Use the set-up demo area and have the Scouts work in small groups on the task to wire the switch and light.
- Req 9a: Read an electric meter and, using your family's electric bill, determine the energy cost from the meter readings.
  - Walk to an electric meter somewhere in camp and discuss how to read it and where it may be found in their home.

Fingerprinting

Prerequsites: N/A

Homework: N/A

Classwork: 1, 2, 3, 4a, 5

Day 1:

- Meet on the Donal North Court under the carport and at the picnic table.
    - TPDH rain location.
- Take attendance and introduce yourself as their instructor.
- Req 1: Give a short history of fingerprinting. Tell the difference between civil and criminal identification.
    - Fingerprinting in history first dates back around the 14th century, when Persian government officials began validating documents using their fingerprints, almost like a signature at the bottom of a checkbook. Some documents reveal however, that some centuries before the Chinese were also using fingerprints in a less official format. There was an understanding of the uniqueness of fingerprints, Scientific studies didn't start until the late 18th century. With multiple Scientists opening studies across the world like Mark Twain, Henry Faulds, and Gilbert Thompson. The first use of Fingerprinting Science in a more criminal sense didn't start until 1892, with Juan Vucetich, an Argentinian Detective, opening the first criminal file based on the fingerprinting work of a one Francis Galton, a British Anthropologist. Using his database that he created, he was able to make the first fingerprint identification at a crime scene using the bloodied prints at a murder location, identifying the suspect shortly after.
    - What is the likelihood two people have the same fingerprint?
        - One in 64 billion.
        - The National Forensic Science Technology Center states that, "no two people have ever been found to have the same fingerprints — including identical twins."

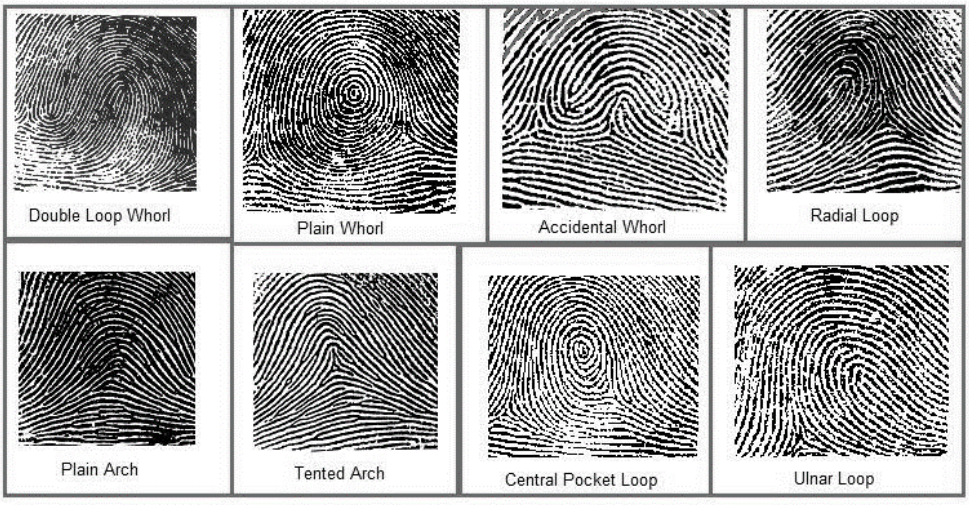
- Req 2: Explain the difference between the automated fingerprint identification systems (AFIS) now used by some law enforcement agencies and the biometric fingerprint systems used to control access to places like buildings, airports, and computer rooms.
  - Automated Fingerprint Identification System (AFIS) was developed to help police officers and government officials better identify the fingerprints of government employees and criminals. Using a fingerprint taken from a person, it cross checks them against the 10 prints it has of every person in the database, reaching an answer.
  - Biometric systems, like the iPhone, work much less reliably. Using a partial of one fingerprint, it checks it against the Print it has saved.
  - You can think of it like this; [AFIS] checks if John Doe's prints are the prints of John Doe, not Joe E. Scouts. [BIO] checks that John Does prints are John Doe's.
- Req 3a: Name the surfaces of the body where friction or papillary ridges are found.
  - The top layers of skin on your fingers, the palms of your hands, your toes, and the soles of your feet.
- Req 3b: Name the two basic principles supporting the science of fingerprints and give a brief explanation of each principle.
  - Individuality: Even identical twins have different fingerprints. Because the odds of any two people having the exact same fingerprints are so low, fingerprints are a great way to provide unique identification.
  - Permanence: Your fingerprints will never change. The papillary ridges that you are born with will grow but never differ in shape for the entirety of your life.
- Req 3c: Explain what it takes to positively identify a person using fingerprints.
  - There are experts who are trained to positively identify whether a person's set of fingerprints match the prints which are on file. This task is more difficult than it sounds, as the skin on the fingers and palms tends to be very flexible. The flexibility of one's skin causes even two fingerprints taken from the same

person, one after the other, to be different. However, these experts are trained to understand the causes of variation in order to determine whether the fingerprints are from the same person.

- To positively identify a person using fingerprints, ridge shapes are used as matching points between the prints on file and those of the suspect. An expert can explain the reasons for every one of the differences in the matching process. If there is even one unexplainable difference, an expert would conclude that the fingerprints were not from the same person.

- Req 5: Show your merit badge counselor you can identify the three basic types of fingerprint patterns and their subcategories.

- Req 4a: Make both rolled and plain impressions. Make these on an 8-by-8-inch fingerprint identification card.
  - Scouts take their fingerprints one at a time with the instructor, then immediately wipe the ink off their hands with a baby wipe.
- Req 5: Using the prints you took; identify the types of patterns you see.



Fire Safety

Prerequsites: 6a

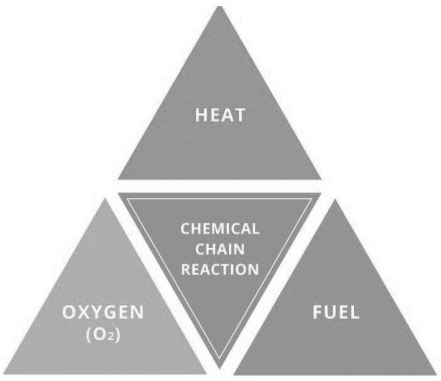
- Req 6a: Conduct a home safety survey with the help of an adult. Then do the following: Draw a home fire-escape plan, create a home fire-drill schedule, and conduct a home fire drill.

Homework: N/A

Classwork: 1, 2, 3, 4, 5, 6b, 6c, 6d, 6e, 6f, 6g, 6h, 7, 8, 9, 10, 11, 12, 13

Day 1:

- Take attendance and introduce yourself as their instructor.
- Check prerequisites for completion.
- Req 3: Name the most frequent causes of fire in the home and give examples of ways they can be prevented. Include a discussion about fires caused by smoking in the home, cooking, candles, fireplaces, and electrical appliances.
- Req 2: Explain the chemistry and physics of fire. Name the parts of the fire tetrahedron. Explain why vapors are important to the burning process. Name the products of combustion. Give an example of how fire grows and what happens.



- Req 1: Do the following:
  - Demonstrate the technique of stop, drop, cover, roll, cover your face, and cool. Explain how burn injuries can be prevented.
  - List the most frequent causes of burn injuries.
- Req 10d: Explain how to set up a campsite safe from fire.
- Req 10a: Explain the cost of outdoor and wildland fires and how to prevent them.

Day 2:

- Take attendance.
- Req 12: Determine if smoke detectors are required in all dwellings within your municipality. If so, explain which specific types are required. Tell your counselor what type of smoke detectors your house has or needs.
- Req 6b: Test a smoke alarm and demonstrate regular maintenance of a smoke alarm.
- Req 6c: Explain what to do when you smell gas and when you smell smoke.
- Req 6d: Explain how you would report a fire alarm.
- Req 6h: Explain what fire safety precautions you should take when you are in a public building.
- Req 7a: Demonstrate lighting a match safely.
- Req 7c: Demonstrate how to safely light a candle. Discuss with your counselor how to safely use candles.

Day 3:

- Take attendance and walk to the Tim O'Neil Field to meet the rangers and the fire truck.
- Req 11: Visit a fire station. Identify the types of fire trucks. Find out about the fire prevention activities in your community.
- Req 6e: Explain what fire safety equipment can be found in public buildings.
    - Tour of fire truck and explanation of equipment.
- Req 6f: Explain who should use fire extinguishers and when these devices can be used.
- Req 6g: Explain how to extinguish a grease pan fire.
- Req 10b: Demonstrate setting up and putting out a cooking fire.
- Fire Extinguisher Demo
- Req 13: Choose a fire safety–related career that interests you and describe the level of education required and responsibilities of a person in that position. Tell why this position interests you.

Day 4:

- Take attendance.
- Check prerequisites for completion.
- Req 8: Explain the difference between combustible and noncombustible liquids and between combustible and noncombustible fabrics.
- Req 9a: Describe for your counselor the safe way to refuel a liquid fuel engine, such as a lawn mower, weed eater, an outboard motor, farm machine, or an automobile with gas from an approved gas can.
- Req 9b: Demonstrate the safety factors, such as proper ventilation, for auxiliary heating devices and the proper way to fuel those devices.
- Req 1: Explain how to safely discard and store flammable liquids.
- Req 10c: Demonstrate using a camp stove and lantern.
- Req 7b: Demonstrate the safe way to start a charcoal fire.
- Req 5: List the actions and common circumstances that cause seasonal and holiday related fires. Explain how these fires can be prevented.
- Req 4: Explain the role of human behavior in the arson problem in this country.

Plumbing

Prerequsites: N/A

Homework: N/A

Classwork: 1, 2, 3, 4, 5, 6, 7, 8

Day 1:

- Take attendance and introduce yourself as their instructor.
- Req 1a: Describe how a properly working plumbing system protects your family's health and safety.
  - Keeps people healthy due to the water being clean vs. if the water was dirty with a messed-up plumbing system.
  - It protects your family from sickness, but it also protects them from water damage because if a pipe bursts due to the uncleanliness of the pipes it can destroy many things such as walls and floors which when broken can lead to people getting hurt.
- Req 1b: List five important local health regulations related to plumbing and tell how they protect health and safety.
  - Principle No. 1 - All Occupied Premises Must Have Potable Water.
    - All habitable buildings must be provided with a supply of potable water. Such a water supply shall not relate to unsafe or questionable water sources, nor shall it be subject to the hazards of backflow, backpressure, or back-siphonage.
  - Principle No. 2 - Adequate Water Required.
    - Plumbing fixtures, devices, and appurtenances must be supplied with water in sufficient volume and at pressures adequate to enable them to function properly under normal conditions of use.
  - Principle No. 3 - Hot Water Required.
    - Hot water must be supplied in all habitable buildings for plumbing fixtures which utilize hot water for sanitary or hygienic purposes.
  - Principle No. 5 - Dangers of Explosion or Overheating.

- Devices and appliances for heating and storing water must be so designed and installed as to guard against dangers from explosion or overheating.
- Principle No. 6 - Required Plumbing Fixtures.
  - To meet the basic prerequisites of sanitation and personal hygiene each dwelling shall include the following:
    - At least one toilet.
    - At least one lavatory.
    - At least one kitchen style sink.
    - At least one bathtub or shower compartment or shower unit.
    - Laundry Facility Requirements. A washing machine connection that consists of a piping arrangement that includes a cold-water supply, hot water supply, and a sufficient drain connection shall be provided in conformance with the following:
  - All buildings and structures other than residential dwellings that are intended for occupancy shall be equipped with sufficient sanitary facilities as outlined in 248 CMR 10.00.
  - Plumbing fixtures must be constructed of durable, smooth, nonabsorbent, and corrosion resistant material and must be free of concealed fouling surfaces.
- Req 1c: Describe the safety precautions you must take when making home plumbing repairs.
  - To do this it is recommended you go over some potential safety risks to start the lesson. This includes but is not limited to:
    - Electric wires
    - Hot Water
    - Sewage
    - Pathogens
    - Drowning
    - Chemicals
    - Sharp Pipes
    - Rust

- A good way to drive this info home is to set up the following example:
    - The old lady down the street has a burst pipe in their basement and needs someone to come fix it! Knowing that you are practically a master plumber they ask you to fix it! Then you go through the steps to repair a pipe with the kids giving suggestions. Try and follow the following formula.
        - You find where the leak is coming from.
        - Check for safety hazards. Feel free to make health risks during the scenario.
        - If safe clear the area.
        - You turn off the water.
        - You get tools to be able to repair the pipe.
        - You replace the pipe.
        - Turn the water back on to test if the fixing worked.
        - Clean up the mess that was created from fixing the pipe.

Day 2:

- Take attendance.
- Req 4: Identify and describe the use of each of the following: washer, retaining nut, plunger (rubber force cup), solder, flux, elbow, tee, nipple, coupling, plug, union, trap, drainpipe, and water meter.
    - When teaching this requirement instructors will try to limit the number of jokes made about “Retaining nuts” and “Nipples”. During this requirement use the demonstration board and have the scouts try and guess which piece is which
    - Washer- A spacer used on a bolt or screw.
    - Retaining nut- Nuts that are designed to loosen less when torque is applied or vibrating.
    - Plunger- A tool that is used to force air down a toilet and be able to unclog it.
    - Solder- Used to weld two pipes together.
    - Flux- A lubricant used to help connect pipes.
    - Elbow- A fitting at a 45-degree angle or 90-degree angle.

- Tee- A Fitting are used to connect three pipes.
- Nipple- Used to connect two threaded fittings.
- Coupling- Used to connect two unthreaded fittings.
- Plug- A fitting used to block the end of a pipe.
- Union- A fitting connecting unthreaded and threaded.
- Trap- Water fittings that allow one thing to go through usually liquids and not solids.
- Drainpipe- A pipe used to carry off sewage.
- Water Meter- A device that measures the intake and output of water from a house.

- Req 5: Name the kinds of pipe that are used most often in a plumbing system. Explain why these pipes are used.
  - For this requirement have scouts guess the pipes listed below, and when they guess correctly discuss the pipe, feel free to use the descriptions of each below:
    - Copper Pipes:
      - Have been a popular choice for plumbing for many years.
      - They are durable, resistant to corrosion, and can withstand high temperatures and pressures.
      - Copper pipes are commonly used for water supply lines and are known for their longevity.
      - Can be used for water and gas.
    - PEX Pipes:
      - Have gained popularity in recent years due to their flexibility and ease of installation.
      - They are lightweight, resistant to corrosion, and can expand to accommodate freezing water, reducing the risk of bursting.
      - PEX pipes are commonly used for both hot and cold-water supply lines.
    - PVC Pipes:
      - Polyvinyl chloride pipes are widely used for drainage and waste lines.
      - They are lightweight, durable, and resistant to chemicals and corrosion.

        - PVC pipes are relatively inexpensive and easy to install, making them a cost-effective choice for many plumbing applications.
        - Can be used for gas as well.
    - ABS Pipes:
        - Acrylonitrile butadiene styrene pipes are similar to PVC pipes and are primarily used for drainage and waste lines.
        - They are known for their strength, durability, and resistance to chemicals.
        - ABS pipes are commonly used in residential and commercial plumbing systems.
        - It is important to note that ABS pipes are actually illegal in California. This is because this pipe is made from a “Reground” plastic resin, causing some weak points in the piping.
    - Cast Iron Pipes:
        - Traditionally used for sewer and drainage systems in buildings.
        - They are extremely durable, have excellent sound insulation properties, and can handle high-pressure applications.
        - However, due to their weight and installation complexity, cast iron pipes are less commonly used today and have been largely replaced by PVC or ABS pipes.
    - Lead Pipes:
        - Historically used in plumbing systems due to their availability, ease of shaping, and durability.
        - However, it is important to note that the use of lead pipes in plumbing has been phased out in most countries due to the health risks associated with lead exposure.
- After discussing what types of pipes there are, give an example of some of them in use! Using the shower demo board open the demo and show them both the PEX and Copper pipes inside.

Day 3:

- Take attendance.
- To start the class split into groups of 3-4, make sure they know that today they will be working with dangerous materials that hurt the scouts if they are not careful.
- Then give each group a piece of paper and introduce requirement 2, let the scouts know when not soldering they are to be doing requirements 2a and 2b. The instructor will take one group to the pipe cutting station to do requirement 7, and the instructor will supervise the soldering for requirement. Have no more than two groups at a time cutting and soldering.
    - Req 2a: Make a drawing and explain how a home hot- and cold-water supply system works. Tell how you would make it safe from freezing.
    - Req 2b: Make a drawing and explain the drainage system of the plumbing in a house. Show and explain the use of drains and vents.
        - Let the scouts know if they need help there are diagrams, they can reference but not copy around the barn.
- Req 7: Under the supervision of a knowledgeable adult, solder three copper tube connections using a gas torch. Include one tee, two straight pieces, and one coupling.
    - To do this make sure you don't have too many scouts going at once, at most 2 groups cutting and soldering at once.
    - To cut the pipe instruct scouts to first mark off where they are cutting, for the plumbing merit badge that is two 2" segments and two 3" segments.
    - After scouts have marked their pipes instruct them to use the pipe cutters, to do this loosen the bottom screw on the pipe cutter and position the blades on the marked line, then tighten the bolt (make sure to tighten until the blade is firm but not denting the pipe) and twist. After 3 rotations tighten and twist again, repeat until pipe is cut.
    - The next step is cleaning the pipes, to do this use the "Outside Pipe Cleaner". To use the Outside pipe cleaner, place it on the

edge of a pipe and twist several times. Then using a wire brush, brush the insides of the couplings and “Tees”.

- After cleaning pipes, the next step is applying flux. To do this grab a flux brush and get some flux on it, then apply flux to the edges of the connectors and pipes and assemble the pipes.
- The next step is the actual soldering. To start, ensuring all the Scouts are wearing proper safety gear, which includes eye protection as well as gloves. Have the scouts fasten the pipe in the vice making sure they don’t oblong the pipe.
- Make sure that at least one staff member is present to supervise all use of the blowtorches!
- To solder have the scouts heat up the pipe with the blowtorch, let them know that if the flame turns green the pipe is too hot.
- Then when the pipe is hot, the scouts hold the solder to the pipe. The solder will melt when it touches the pipe if it is hot enough so no need to continue using the blowtorch.
- Repeat this process until all the joints are soldered.
- Then a Barn Staffer will remove the pipe using pliers and place it into the water bucket allowing it to cool.
- After the session staff will remove the pipe from the metal bucket and place it in the copper scrap bin.

Day 4:

- Take attendance.
- Req 6: Cut, thread, and connect two pieces of metal pipe.
  - Gather all the scouts around the pipe threader and start with some of the safety concerns.
    - Oil used is an irritant and getting it on your skin will cause irritation.
    - Metal splinters from touching tools without gloves
    - Cuts from sharp metal on the edge of the pipe
  - First the councilor will use the cutting oil making sure to not get any on their skin as it is a skin irritant.
  - Next the instructor will bore the pipe, to do this the instructor will apply pressure to the back of the bore and ensure the nob on

the ratchet has the arrow pointing to the right. And then twist the handle on the bore to the right and then to the left.
    - After the pipe is bored it is time to start threading the pipe to give the scouts a good place to start.
    - To do this make sure you are first wearing gloves make sure the arrow is pointing to the right and then begin to ratchet the dye onto the pipe push the pipe dye (Piece that thread pipe) onto the pipe while applying pressure (Moving the handle to the right will thread the pipe).
    - Once you have started the pipe threading, it is recommended allowing each scout to ratchet the dye 5 times each. If it is too difficult for the scouts apply more cutting oil.
    - To remove the dye and ratchet from the pipe swap the direction of the arrow to the left and then ratchet it until you can turn the dye to the left with your hands, then hand loosen the dye until the dye is no longer on the pipe.
    - To remove the threading, you need to use a pipe cutter. To do this line the pipe cutter as close to the threads as possible, then twist the pipe cutter around the pipe one time and tighten the handle one quarter rotation, repeat until threads have been cut off.
- Req 8a: Replace a washer in a faucet.
    - To do this have the scout unscrew the cap of the faucet and remove the rubber washer inside, then have them put it back in and re-screw the cap and the washer is replaced.
- Req 8b: Clean out the sink or lavatory trap.
    - Have the scouts twist the gear two times and that is how we clean the demo drain trap; it is a very easy requirement.
- Req 3: Show how to use five important plumber's tools.
    - We do this simply by teaching the badge (Blow torches, Ratchet, Dye, Plunger, and Solder).
        - Bring each tool back over, have them name it, its use, and how to keep it in good order and safe.
        - If the class is too short you can add time by going into more detail for each tool.