

Standard Operations Guideline

Electrical Safety

By: Leo Zimmerman
zimmerlo@email.uc.edu

I. PURPOSE

This purpose of this procedure is to establish a standard approach for Granbury Volunteer Fire Department personnel responding to downed power lines, fires in manholes, vaults, transformers, substations or if power lines become involved in a structural fire.

II. POLICY

These guidelines have been established when it is determined that an electrical emergency exists or is part of another emergency.

III. GENERAL INFORMATION

Power lines can come in contact with the ground as a result of storm related activity, fire, or vehicles striking power poles. In all cases, the potential for electrical shock/electrocution and secondary fire must be considered

IV. ELECTRICAL SAFETY

Electricity always seeks its lowest level or ground. It will travel any path it can as it seeks a ground. A direct path to ground is when contact is made between something energized and a portion of your body such as your hand, arm, head, or other body part. An indirect path to ground happens when you are holding something or touching an object that is in contact with something energized. This could include tools or other equipment you may be holding or when touching a fence, vehicle, or other object that may be in contact with something energized

A. *Gradient Voltage (Step and Touch Potential)* - When power lines are down they will energize the ground around them. For Example: point of ground contact could be 700 volts. This voltage will lessen as it radiates out from this point; for example, 400 volts. If your feet are in areas where there is a voltage difference, you could complete the circuit and be the source to ground. This is called "step potential." This danger could be indicated by a tingling sensation

in the feet and serve as a warning to back away from the area.

- B. Always assume that downed power lines are “**energized**” or “**HOT**”.
- C. Always assume that telephone or television wires are “**energized**” – they may be in contact with “**HOT**” wires.
- D. Even after power is cut off and the downed lines are de-energized be cautious. Lines can become re-energized again by automatic re-closing devices. A de-energized line can also become re-energized because of its proximity to an energized line that can cause feedback through the de-energized line. Until on-site power company personnel verify that the lines are de-energized always assume they are “**HOT**”.
- E. When cutting lines or if lines break and fall from the poles overhead be aware that power lines have a tendency to have “**REEL**” memory and may roll back on itself unexpectedly.
- F. Do not use pike poles, non-rated ropes and/or non-rated equipment to handle downed lines.
- G. Use caution when spraying water on or around energized electrical equipment. Hose streams conduct current! Never spray directly into the power lines or anything energized. Use a fog spray at the base of the pole for electrical pole fires. Your primary responsibility is to protect the surrounding area.
- H. Avoid standing in puddles of run-off water during firefighting operations when energized equipment may be involved nearby.
- I. Ensure that all metal objects, jewelry, etc. have been removed prior to working with any energized electrical item.
- J. If it is necessary for a Granbury Volunteer Fire Department person to move and/or cut energized electrical wires an observer safety person shall be present during the entire operation. The responsibility of the observer safety person is as follows:

Observer Safety Person - A worker who is currently qualified in first aid and CPR and whose responsibility is to observe the electrical work and warn workers of dangerous conditions that the performer may not see, the observer safety person should not be involved in the associated work. Additional responsibilities are:

- Present prior to the start of the job,
- Ensure rescue equipment is available including defibrillator,
- Don appropriate PPE and FPE to facilitate rescue,
- Give worker being observed your complete attention,
- Initiate emergency notification and life saving actions.

V. ELECTRICAL PROTECTIVE GEAR / CLOTHING

- A. Work clothing should include long sleeve shirt/lab coat with a minimum arc thermal performance value (ATPV) rating of 5 cal/cm^2 and pants of 100% untreated natural fabric such as cotton.
- B. Undergarments should be of 100% untreated natural fabric. Incidental amounts of elastic is permitted.
- C. When weather conditions warrant that outer wear be worn these garments should be FRC if exposed to electrical arc or flash hazard.
- D. Flame Resistant Clothing (FRC) long sleeve shirts are required when working within the flash protection boundary of an exposed energized source rated equal to or greater than 120 vac/125 vdc.
- E. Voltage rated rubber gloves with leather protectors are considered appropriate for flash protection as well as shock protection.
- F. Gloves that are flame resistant and have the correct ATPV can be used in place of voltage rated rubber gloves and leather protectors for flash protection only.
- G. FRC that becomes contaminated with oil, grease, paint, combustible material or torn should be removed from service until it is cleaned or repaired.
- H. Heavy-duty leather work shoes/boots normally provide a significant degree of protection to the feet.

VI. ELECTRICAL FIREFIGHTING

- A. Do not attempt to extinguish power pole fires using water unless life is threatened or if the pole is at risk of structural failure or if directed by on-site power company personnel.
- B. Power should be disconnected prior to fighting any electrical fire. This is the best option.
- C. CO₂ or dry chemicals are the NFPA recommended method for extinguishing electrical fires.
- D. If a structure fire involves energized electrical equipment, service or wires, the power to the building should be shut-off.
- E. Electrical vault fires should be extinguished only after all power has been disconnected.

- F. Anytime power is disconnected by the Granbury Volunteer Fire Department the appropriate power company personnel shall be notified.

VII. PROCEDURES

A. SIZE-UP.

1. Determine the type of electrical problem and request the appropriate power company to respond.
2. Give dispatcher the proper location of incident (pole number, etc.).
3. Set up an operational perimeter. Request Police Department assistance when necessary. (Rule of thumb establishing electrical incident operational perimeter is to maintain the distance of one complete span of wires on either side of fallen wires.) This perimeter should always be manned with sufficient personnel such that from one man post to the next is within eyesight to ensure that no unauthorized personnel enter the restricted area until the power is disconnected by the appropriate power company.
4. Park apparatus outside of operational perimeter.

B. DOWNED POWER LINES

1. Consider all downed wires as “**energized**”.
2. Locate both ends of downed wires.
3. Place apparatus away from downed lines and power poles. Consider additional lines may fall during response.
4. Secure the area and deny entry. Operational safety perimeter fences, vehicles, guardrails, railroad tracks and puddles of water that may become energized.
5. Granbury Volunteer Fire Department personnel should not move wires unless necessary to rescue victims and should only do so after all safety precautions have been observed and when the individual(s) are properly trained and qualified in the use of electrical PPE and working with energized equipment.
6. Standby and ensure the public is kept away until the power company de-energizes the power lines.

C. DOWNED POWER LINES ON VEHICLES

1. Consider all downed wires as “**energized**”.
2. Do not touch vehicle(s).

3. Instruct occupants to remain inside the vehicle until the power is secured by the power company and they are instructed that it is safe to exit the vehicle.
4. Place apparatus away from downed lines and power poles. Consider additional lines may fall during response.
5. Secure the area and deny entry. Operational safety perimeter fences, vehicles, guardrails, railroad tracks and puddles of water that may become energized.
6. If an occupant is severely injured and either requires immediate medical attention or it is required to remove the occupants from the vehicle prior to power company arrival, Granbury Volunteer Fire Department personnel may pull the wires free of the vehicle only after all safety precautions have been observed, the proper safety clothing (full turnout gear and face shield or goggles) and electrical equipment (dielectrically rated clamp sticks, cutters, etc.) is utilized and when the individual(s) are properly trained and qualified in the use of electrical PPE and working with energized equipment.
7. Ensure that non-rated equipment, ropes or pike poles are not used to handle downed power lines.
8. Standby and ensure the public is kept away until the power company de-energizes the power lines.

D. SUB-STATIONS AND TRANSFORMERS

1. Do not walk under transformers as they may contain PCB's or burning oil. Transformers may suddenly explode and eject hot or burning oil into the surrounding area.
2. Place apparatus away from exposure area.
3. Secure the area and deny entry.
4. Protect exposures.
5. Consider overhead lines that may become involved or fall from their location due to on overhead transformer or large sub-station equipment being involved.
6. Standby and ensure the public is kept away until the power company de-energizes transformer or equipment.

E. UNDERGROUND VAULTS

1. Consider all underground vaults to contain “**energized**” wires or equipment.
2. Do not open shutters on vaults as this may cause an explosion by igniting trapped flammable gases.
3. Stand clear of all manhole covers. Explosions or increased pressure due to fire effects inside of underground vaults may cause manhole covers to blow off. Covers are known to fly approximately 150 feet under these conditions.
4. No Granbury Volunteer Fire Department personnel are permitted to enter any underground electrical vault containing **energized** wires for any reason.
5. After confirmation by on-site power company personnel that all electrical wires and equipment have been de-energized, Granbury Volunteer Fire Department personnel may enter the **de-energized** vault to effect rescue operations.
6. When entering a confirmed de-energized vault Granbury Volunteer Fire Department personnel must be in full protective gear, including a manned lifeline.
7. Granbury Volunteer Fire Department personnel shall wear SCBA’s when entering an electrical vault. Toxic gases may have formed as a result of the fire and are trapped inside the vault.

F. WIRE CUTTING

1. No Granbury Fire Department personnel may attempt to cut or de-energize wires by any means unless directed by the on-site incident commander and only in the case of immediate life threatening danger to the public or fire department personnel. Personnel may proceed only after it is verified that the power company response may be delayed or that the response time may be insufficient to protect personnel.
2. Any Granbury Volunteer Fire Department personnel requested to perform energized wire cutting activities shall be appropriately trained in the process and all electrical safety precautions.
3. Wear the necessary electrical protective equipment including helmet with face shield and full turnout gear. All protective equipment and clothing shall be tested and approved for use with high voltage electrical equipment to ensure that it is flame retardant in accordance with federal electrical safety standards.

4. Cutting shall be confined to the “low side”, 480 volts and less with cutters rated greater than 480 volts.
5. When cutting wire at the pole, cut the power side first and as high in the air as possible. Cut each wire at different lengths to avoid arcing.
6. When cutting the service lines to a structure, cut power at drip loops located at the entrance head. Do not cut the ground (center) wire. Turn head to avoid sparks and flash when cutting.

VIII. APPROVAL

This standard operating procedure has been approved and adopted.

Fire Chief

Date

Training Captain

Date