

Garmong Construction Services					
<i>EMPLOYEE SAFETY POLICY HANDBOOK – Electrical Safety</i>					
Last Revised:	February 7, 2012	By	Douglas Mahurin, MS, CSP	This Copy Printed:	2/7/2012 3:38:00 PM

ELECTRICAL SAFETY REQUIREMENTS

Electrical Safe Work Practices

No employee will work in proximity to any energized electrical power circuit that the employee could contact the electrical power circuit in the course of their work unless the employee is protected against electrical shock by deenergizing the circuit and grounding it or by guarding it effectively by insulation or other means.

Cords & Plugs – all cords will be **inspected and tagged** as outlined in the Tools and Equipment.

1. Avoid damaging, do not allow scissor lift to drive over cords.
2. Do not use flexible cords to raise/lower equipment
3. Don't use staples to fasten extension cords
4. Visually inspect portable cords & plug equipment daily.
5. Repair defective/damaged equipment if possible, or tag and send to the shop.
6. Plug and receptacle contacts must mate properly.
7. Cords must have equipment grounding conductor – must be fed from a GFCI.
8. Adapters interrupting the continuity of the grounding connection may not be used.
9. Do not alter plugs and receptacles.
10. Use GFCI pig tails unless the power supply is on GFCI breakers.
11. Dry hands before using electrical equipment.
12. Insulate when handling wet cords.

Ground Fault Circuit Interrupters

1. GFCI's required on all electric powered tools/equipment.
2. Use GFCI at the source of temporary power.

Portable Electric Equipment

1. All tools (unless double insulated) must contain an equipment grounding conductor that is connected to the tool frame and through the supply cord back to the service enclosure.
2. Portable electric hand tools should always be handled in a manner that will not damage the tool. DO NOT use the flexible cord as a means of raising/lowering tools.
3. Inspect portable electric tools/cords each shift before using for defects or damage. If defective, repair immediately or tag out of service & send to shop. Do not use any tool if you cannot read the label.
4. GFCI's must be used.
5. Ladders must have non-conductive side rails in areas where the employee or ladder could contact exposed energized parts. Only fiberglass ladders are to be used when working on or around energized equipment. Maintain minimum approach distances when using ladders.

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Temporary Power

- Temporary power distribution panels must be secure, the breakers must be labelled, all holes or punch outs must be covered so that there are no openings in the panel that expose employees to energized parts. Card board is not an adequate insulator for an energized electrical panel.
- Wiring methods used to supply temporary power must be protected from traffic. If power feed is on the ground, wires must be run through conduit. If power is supplied overhead, wires must be protected from abrasive surfaces.
- Romex is not approved for temporary wiring where the wire may be repeatedly moved, exposed to traffic or other hazards on the ground. Example where a temporary receptacle is mounted to a wood free standing upright and the upright is moved throughout the day to allow construction traffic.
- Employees must not be exposed to uninsulated wires under 7' in height from the walking surface. Junctions in electrical wiring under 7' must be protected by a junction box.
- Receptacle boxes must be of the weatherproof type or otherwise protected from inclement weather if so exposed. Receptacles must be mounted and not allowed to lay on the floor or ground where they could be exposed to spills or other water accumulations.
- **Extension cords** shall be designed for hard or extra hard usage and should be routed overhead as much as possible. Cords must be routed as to prevent as much traffic as possible over the cord. If the cords are run through a doorway or other pinch points, they will be protected from damage. Cords must be protected from scissor lift or other motorized equipment traffic. Cords must not be run over metal base plates that expose the cords to a shear point. Extension cords shall not be fastened with staples, hung from nails, or suspended by wires.

Temporary Lighting

- All lamps used for general illumination shall be protected from accidental contact or breakage.
- Temporary lights shall not be suspended by their electrical cords unless their cords are designed for such purpose. Temporary lighting shall not be suspended by exposed conductors and wire nuts.
- At least 10 foot candles of lighting will be provided in all work areas.

OVERHEAD POWERLINES

Personnel performing work or other activities in the vicinity of overhead power lines or exposed energized conductors shall not approach nor permit equipment or objects to approach the power line or conductor closer than the safe limit of approach distance specified below:

The Superintendent Shall:

- Contact the operator of the overhead power line or exposed electrical or exposed electrical conductor to determine the operating voltage of the line or conductor; some utility owners require a permit approval process and/or a crossing agreement is in place.
- Erect temporary warning signs at approaches to overhead lines on both sides of the power lines, when practicable.
- Examine the work area to determine that safe limits of approach distance can be maintained

Minimum Safe Limits of Approach for Non - Qualified Employees	
Voltage (Phase to Ground)	Minimum Distance (Feet)
Under - 50,000 volts	10
50,000 - 120,000 volts	15
120,000 - 150,000 volts	20
250,000 - 350,000 volts	25
over 350,000 volts	30

If work or other activities is are being carried out within 20 feet in any direction of a power line, provide a safety watch (spotter) to ensure the minimum distances are maintained. The spotter shall ensure that anyone approaching the power lines is aware of its presence, and may be necessary at offloading sites, material storage and transit routes as well as on the worksite.

The heights of the line will be verified by non physical means to assure warning signs and devices are set at the correct height.

Overhead power lines shall be identified with signs placed approximately 26 feet on either side of the overhead power line, six feet above grade and in view of equipment traveling either direction under the power line. Add the voltage and the height to the signage when known.

Signs shall be installed before the work commences, and be maintained throughout construction activities.

A guard consisting of a non-conductive pole on each side of the R.O.W. connected by a non-conductive rope shall be installed twenty (26) feet away from and on each side of the overhead power line and four feet (4') below the elevation of the power lines, when possible. All underground facilities shall be located prior to the installation of the guard poles, in order to prevent damage to existing facilities. The height of the non-conductive rope shall be pre-determined and in accordance with minimum safe limits of approach.

Note: All measurements are approximate. The intention on this requirement is to make the overhead power lines visible and keep workers in the area of overhead power lines aware of the existing hazard. Warning lines and posts must be erected within the property boundaries. The Cushing site has existing power lines in the north and east sides of the property. Warning lines cannot be placed in the public road so the north and east warning line will be approximately 5 feet north of the power lines

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All overhead lines shall be considered to be an energized line unless and until the person owning such line or the electrical utilities authorities confirm that it is not an energized line and it has been visibly grounded.

Loading and unloading of large HE prohibited when under or near an overhead power line.

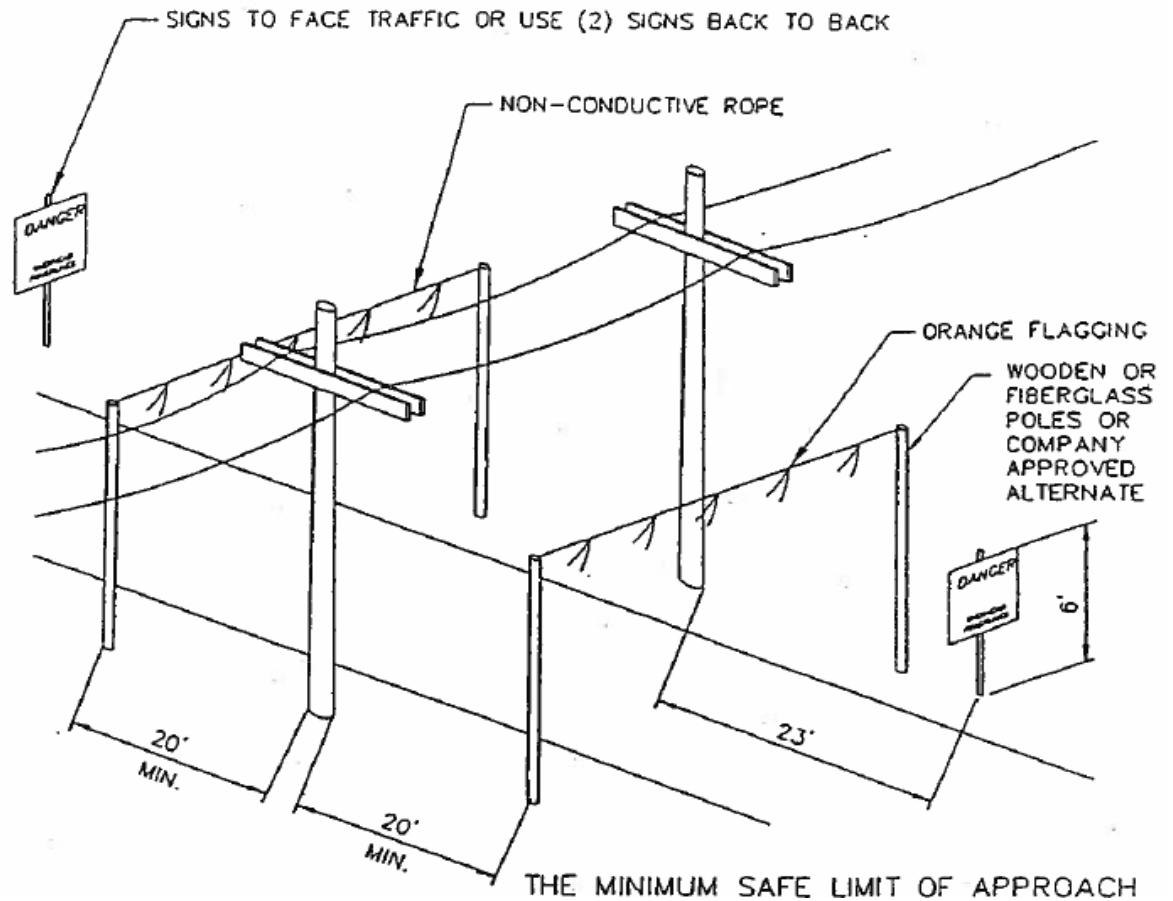
Workers may not work, or operate equipment within 25 feet of an overhead power line, unless they are cleared to do so by a competent Electrical Utility Representative, who will define the minimum safe clearance distance to be adhered to. The 25 foot distance may be insufficient for high voltage power lines greater than 500Kv. Consult the Electrical Utility Representative.

Work around power lines should only be done during daylight hours or with adequate artificial lighting. Poor visibility conditions (rain, snow, fog) may dictate modifications to work.

If earth or other materials are being piled under the power lines, the Designated Representative will ensure that the minimum safe clearance is not infringed upon.

Dump trucks and track hoes must not travel with raised boom/box in the proximity of a power line.

Drawing for reference only, actual dimensions and measurements are found in text above.



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Lock Out/Tag Out

Prior to working on any piece of equipment all potential energy sources must be identified and isolated. A Safe Work Permit must be issued by the superintendent prior to the starting of work. Employees will be trained on the elements of this program and the proper applications of the site specific lockout tag out requirements.

Scope

These procedures must be used by all employees authorized to service or maintain equipment to ensure that machines or equipment is completely isolated from all potentially hazardous energy sources. All employees affected in any way by servicing and maintenance activities must also be knowledgeable of lockout/tag out procedures.

Definitions

Authorized Person is a person who implements a lockout or tag out procedure on equipment and/or piping to perform service or modifications.

Affected Person is someone whose job it is to use, operate, or be in the area of a machine or pipe on which service or modification is being performed under lockout conditions.

Clear is action taken to clear personnel from equipment or piping during the “trying” step to ensure that no injury or equipment damage will occur if this equipment or piping is energized. All is clear prior to trying it out.

Designated Employee is a knowledgeable employee designated by management to conduct lockouts.

Energy Isolation is the disconnection or isolating of piping or equipment and the bleeding of stored energy and potential energy such as gravity, pressure, etc.

Energy Isolation Devices include, but not limited to valves, fuses, circuit breakers, disconnect switches, plugs, flanges, or blocking stops.

Equipment is any tool, machine, piping, vessel, or wire.

Lock-Out is a red sturdy padlock with one key.

Locking Devices are any accessory, which involves the alignment of two holes, that when secured with a lock prevents the switching or changing of position on an energy isolation device.

Point of Operation is the area of piping and/or equipment where the actual work takes place.

Release is authorization given to those individuals to work on deactivated equipment.

Secure is performing this procedure on a lockout point.

Stored Energy is residual or available energy including but not limited to electrical, hydraulic, pneumatic, chemical, thermal, gravitational, or mechanical energy.

Tryout is verification that the equipment has been properly deactivated or isolated.

Deactivation and/or Isolation

Once it has been determined that a piece of equipment needs to be locked out for service, modification, line opening, or guard removal, the authorized person shall be notified for lockout.

The authorized person shall notify the Jones-Blythe Superintendent of the need to shut down and lockout the required piece of equipment.

The authorized person shall review the equipment or system to determine the energy isolation points and that the possibility of stored energy can be eliminated. If there is any doubt concerning this review, he shall review the situation with the owner’s representative.

The authorized person will have completed, with the Superintendent, a Daily Safety Task Analysis and a Safe Work Permit.

The authorized person will then begin shutting down of the equipment or system in an orderly manner. As the system is being isolated, he shall lockout each point of energy isolation, using a tagged locking device and a lock.

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- ✓ If a locking device cannot be installed, a tag must be used in lieu of a lock, providing at least one additional safety measure that provides the safety equivalent of a lock is in place. These may include but are not limited to the removal of fuses, opening of additional switches, etc.

Once all points of energy isolation have been locked out, the authorized person shall then begin bleeding the stored energy or pressure. This may be done through the use of flanges, vents, drains, equipment brakes, lowering loads or counter balances, release of springs, etc.

After all energy isolations have been done and locking devices installed, try to engage those items which have been locked out to ensure that the equipment cannot start or energize.

- ✓ Situations may exist when an effective “try” cannot be made to lock out a piece of equipment because the of interlocks in the circuits. In these cases, the authorized person shall contact Jones-Blythe for assistance.

Once the equipment has been isolated and locked out the authorized person shall notify the affected personnel that they can now place their lock on the locking device. Prior to the affected person attaching their lock to the locking device, he shall ensure to himself that the isolation points are in the deactivated or closed positions and verify that the equipment is secured. The affected employee shall keep their key for their lock as long as the lock is in use.

Lockout Gang Boxes

If there are enough devices to be locked out that the general foreman and the superintendent agree, the items may be locked out by a single locking device or devices. The key(s) for these locking devices will be put into a gang box and then all personnel working in the area with attach their lock to the gang box that contains the key(s) to the devices. This way each worker may apply only one lock but in effect lock out the entire system. The general foreman and the superintendent will have control over this process. All affected employees will be trained in this method when used.

Lockouts Continuing Beyond One Shift

The designated employee shall review all lockouts at energy isolation points, hazards which may exist, and the status of the job with both the oncoming designated employee and the superintendent prior to the removal of his lock. If no hazard exists, the affected employee shall remove his lock and tag before he leaves the project.

If a hazard to personnel or equipment would exist by the removal of the lock, the oncoming craft shall install his lock at all isolation points, then clear the equipment and try to energize equipment before beginning work. If there is no shift change, the authorized person will notify the superintendent that the lockout will remain on the equipment.

Lock Removal and Re-Energizing of Equipment

The following requirements shall be met in order before equipment is energized, even temporarily. The authorized person shall conduct inspections as necessary to verify that all tools, jumpers, blocks, and similar devices have been removed so that the equipment can be safely energized or pressurized. Affected employees that may be exposed to the energizing of the equipment shall be warned to stay clear of the equipment.

The individual who applied it shall remove the lock and tag.

In the event an affected employee is absent or an unidentified lock is found on a lockout device, a qualified person may remove his lock, after a Lock Removal Permit is filled out (attachment XIV), if:

- ✓ The supervisor is sure that the individual is not on site
- ✓ Reasonable efforts to contact the individual have been made
- ✓ When the individual returns to work, he is to be notified immediately that his lock was removed and the status of the equipment before he begins to work in the area. The employee shall sign the lock removal permit, which is kept on file in the job trailer.

After all locks are removed, the area cleared, the authorized personnel shall realign the switches, valves, etc. to the condition prior to the lockout or as directed by the Superintendent.

The Safety Work Permit is then returned to the Superintendent.

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Lockout, Tagout, and Tryout Procedure Checklist

	Prepare Survey the system. Locate and identify all energy isolating devices.
	Complete the Daily Safety Task Analysis with the Superintendent and complete the Safe Work Permit
	Notify all affected employees of the lockout/tag out procedure to be implemented
	Shutdown the system by normal stopping procedures
	Isolate the machine or equipment from stored energy sources. Restrain or dissipate stored energy by repositioning, blocking, bleeding down.
	LOTO the energy isolating devices with assigned locks and tags
	Tryout: ensure all personnel are clear. Tryout normal operating controls. Ensure machines or equipment will not energize. CAUTION: Return all operating controls to the “neutral” or “off” position after tryout.
	Begin The system is now locked out, work may begin

Restart

	Inspect after completion of work: inspect machine/equipment for proper assembly, remove all tools and materials, reinstall all guards and safety devices
	Notify: ensure all employees are clear of system. Notify all affected employees of the restart.
	Remove persons who applied lockout/tag out devices shall remove them.
	Start up: the system is now ready for normal operation. Startup machines/equipment and return the Safe Work Permit to the Superintendent.

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Energized Electrical Work Program

Safety related work practices shall be employed to prevent electrical shock or other injuries resulting from either direct or indirect electrical contacts when work is performed near or on equipment or circuits, which are or may be energized. The specific safety related work practices shall be consistent with the nature and extent of the associated electrical hazards.

Live parts to which an employee may be exposed shall be de-energized before the employee works on or near them, unless Jones-Blythe can demonstrate that de-energizing introduces additional or increased hazards or is unfeasible due to equipment design or operational limitations. The appropriate personal protective equipment must be used.

Live parts that operate at less than 50 volts to ground need not be de-energized if there will be no increased exposure to electrical burns or to explosion due to electrical arc. Examples of increased or additional hazards include removal of illumination for the work area.

If the exposed live parts are not de-energized, other safety related work practices shall be used to protect employees who may be exposed to the electrical hazards involved. Such work practices shall protect employees against contact with energized circuit parts directly with any part of their body or indirectly through some other conductive object. The work practices that are used shall be suitable for the conditions under which the work is performed and for the voltage level of the exposed electrical conductors or circuit parts.

Only qualified workers shall work on or near exposed electrical equipment, circuits, and/or lines.

Definitions

On – is defined as an internal contact with an energized circuit, part, or conductor.

Near- is defined as close enough to expose any employee to any electrical hazard.

Arc Flash- is a short circuit through the air.

High Voltage is A.C. voltage above 1000 volts, phase-to-phase.

Low Voltage is A.C. voltage 51 to 1000 volts phase-to-phase and D.C. systems less than 50 volts.

Qualified Person is one who by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project. Such as employee can safely work on an energized circuit and will be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools, etc.

Unqualified Person is a person who has little or no background or training in exposed electrical areas/situations. This may include a previously qualified electrician exposed to new functions that he may be unfamiliar with.

Procedures

De-energizing Equipment

Safe procedures for de-energizing circuits and equipment shall be determined before the circuits and equipment are de-energized by the qualified person.

A Daily Safety Task Analysis must be completed and a Safe Work Permit must be obtained by the qualified person from the Superintendent.

The circuits and equipment to be worked on shall be disconnected from all electrical energy sources. Control circuit devices such as pushbuttons, selector switches, and interlocks may not be used as the sole means for de-energizing circuits or equipment. Interlocks for electrical equipment may not be used as a substitute for lockout and tagout procedures. Stored electrical energy that might

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endanger personnel shall be released. Capacitors shall be discharged and high capacitance elements shall be short circuited and grounded if the stored electrical energy might endanger personnel.

Stored non-electrical energy and devices that could re-energize electric circuit parts shall be blocked or relieved to the extent that the circuit parts could not be accidentally energized by the device.

A lock and a tag shall be placed on each disconnecting means used to de-energize circuits and equipment on which work is to be performed. The lock shall be attached so as to prevent persons from operating the disconnecting means unless they resort to undue force or the use of tools. Lockout/tag out/tryout procedures shall be followed from the lockout/tag out/tryout program.

Energized Electrical Work

Only after determining and demonstrating that de-energizing an electrical circuit or piece of equipment introduces additional or increased hazards or the circuit or equipment is unable to be locked out due to equipment design or operational limitations shall work be energized.

Employees working on live parts that operate more than 50 volts to ground shall follow specific safety related work practices to protect themselves from electrical hazards.

Only qualified persons shall work on energized circuits or equipment. Qualified persons shall work safely on energized circuits using:

- Special precautionary techniques
- Designated personal protective equipment
- Insulating and shielding materials
- Insulated tools

Personal protective equipment will be available for all electricians working on energized equipment and circuits.

Any job needing high voltage or low voltage tool kits shall contact the Superintendent.

Glasses, tools, and gloves shall be suitable for the conditions under which the work is to be performed and for the voltage level of the exposed electrical conductors or circuit parts. High voltage kits will contain the following items:

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- Safety Glasses

- Face shields

- Flame retardant coat

- High voltage blanket that is retested annually

- Ground sticks that are retested annually

- 1000 volt gloves with leather protector and bag that are tested every six months

- insulated tool kit containing the needed items

Employees shall use electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work performed. Protective equipment shall be maintained in a safe, reliable condition and shall be periodically inspected or tested.

When working near exposed energized conductors or circuit parts, employees shall use appropriate insulating equipment and materials to prevent electric shock, arc, or flash.

Employees shall insulate themselves from ground to prevent electric shock.

Employees shall use proper insulating tools or handling equipment if they may make contact with such conductors or parts.

Visually inspect conductors, bushings, and other electrical items for defects to prevent electrical shock.

Where work requires exposure to 440 volts or more between phases, two or more qualified employees shall work together.

Portable ladders shall have non-conductive side rails.

Conductive articles of jewellery and clothing may not be worn if they might contact exposed energized parts. However, those articles may be worn if they are rendered non-conductive by covering, wrapping, or other insulating means.

Where live parts represent an electrical contact hazard, employees must be qualified to perform housekeeping duties at such close distances to the live parts that there is a possibility of contact.

Where lack of illumination or an obstruction precludes observation of the work to be performed, employees shall not perform tasks near or enter spaces exposed to energized parts. Employees shall not reach blindly into areas, which may contain energized parts.

Approach Distances for Qualified Employees – Alternating Current

Voltage Range (phase-to-phase)	Minimum Approach Distance
300V and less	Avoid Contact
Over 300V, not over 750V	1 foot, 0 inches
Over 750V, not over 2kV	1 foot, 6 inches
Over 2kV, not over 15kV	2 feet, 0 inches
Over 15kV, not over 37kV	3 feet, 0 inches
Over 37kV, not over 87.5kV	3 feet, 6 inches
Over 87.5kV, not over 121kV	4 feet, 0 inches
Over 121kV, not over 140kV	4 feet, 6 inches

Training

All employees shall be trained and familiar with the safety related work practices discussed throughout this written program and OSHA requirements.

Qualified persons shall, at a minimum, be trained and familiar with the following:

- The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.
- The skills and techniques necessary to distinguish the nominal voltage of exposed live parts
- The clearance distances specified in the corresponding voltages to which the qualified person will be exposed.