Table 11-4
Mechanical Equipment and Unqualified Persons MADs from Overhead Lines and Equipment - Alternating-Current (AC) Systems: Calculated Values

Nominal Voltage[#] (Phase to Phase)	Calculated Minimum Clearance Distances[##]
50 kV or less	10 feet 0 inches (3.0 m)
51 - 72.5 kV	10 feet 8 inches (3.25 m)
72.6 - 121 kV	12 feet 4 inches (3.76 m)
138 - 145 kV	13 feet 2 inches (4.01 m)
161 - 169 kV	14 feet 0 inches (4.27 m)
170 - 242 kV	16 feet 5 inches (5.00 m)
345 - 362 kV	20 feet 4 inches (6.20 m)
400 - 420 kV	22 feet 4 inches (6.81 m)
500 - 550 kV	26 feet 8 inches (8.13 m)
765 - 800 kV	35 feet 0 inches (10.67 m)

[#] Voltage ranges per ANSI C84.1, table 1 (2020 ed.).
[##] Based on values calculated per 29 CFR 1910.333(c)(3)(iii)(A) (2014 ed.).
[###] See chapters 16 and 18. Crane and Derrick use in construction and maintenance will comply with 29 CFR 1926.1408 & 1410 (2014 ed.) and use table A in 29 CFR 1926.1408 for allowable distances during operation unless a minimum clearances is established under 29 CFR 1926.1410 rules.

Note:

[1] When an unqualified person is working in an elevated position near overhead lines or in a location that allows access from the ground near enough that a hazard might exist, the distances above must be maintained for the person and the longest conductive object or tool being used that may breach the distances listed above per 29 CFR 1910.333(c)(3)(i)(A) (2014 ed.).

[2] For mobile equipment transit beneath overhead lines with the structure lowered, subtract 6 feet 0 inches from the numbers above per 29 CFR 1910.333(c)(3)(iii)(A)(1) (2014 ed.).

[3] For properly rated insulated aerial lift equipment (for example, electrical bucket truck) operated by a QP, distance values in this table must be maintained for the uninsulated/grounded portion of the lift per 29 CFR 1910.333(c)(3)(iii)(A)(3) (2014 ed.).

11-10. Checklists and Forms.

ENG Form 6277, Energized Electrical Work Permit (EEWP) (non-mandatory) (https://www.publications.usace.army.mil/LinkClick.aspx?fileticket=s3qiL7RUX-0%3d&tabid=16438&portalid=76&mid=43543)

Chapter 12
Control of Hazardous Energy

The requirements of this chapter are applicable to contractors only.

Note. HEC activities for USACE-owned/operated facilities must be performed according to ER 385-1-31, in addition to any regional HECP and local supplements.

12-1. References.

a. ANSI/ASSP A10.44, Control of Energy Sources (Lockout/Tagout) For Construction and Demolition Operations (https://webstore.ansi.org/) (12-1.a)

b. ANSI/ASSP Z244.1, The Control of Hazardous Energy, Tagout and Alternative Methods (https://webstore.ansi.org/) (12-1.b)

c. ER 385-1-31, The Control of Hazardous Energy (https://www.publications.usace.army.mil/USACE-Publications/Engineer-Regulations/) (12-1.c)

d. NFPA 70E, Standard for Electrical Safety in the Workplace (https://www.nfpa.org/Codes-and-Standards) (12-1.d)

e. 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout) (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol5/pdf/CFR-2020-title29-vol5-sec1910-147.pdf) (12-1.e)

f. 29 CFR 1910.269, Electric Power Generation, Transmission, and Distribution (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol5/pdf/CFR-2020-title29-vol5-sec1910-269.pdf) (12-1.f)

g. 29 CFR 1910.333, Selection and Use of Work Practices (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol5/pdf/CFR-2020-title29-vol5-sec1910-333.pdf) (12-1.g)

h. 29 CFR 1915.89, Control of Hazardous Energy (Lockout/Tags-Plus) (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol7/pdf/CFR-2020-title29-vol7-sec1915-89.pdf) (12-1.h)

i. 29 CFR 1917.48, Conveyors (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol7/pdf/CFR-2020-title29-vol7-sec1917-48.pdf) (12-1.i)

j. 29 CFR 1918.64, Powered Conveyors (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol7/pdf/CFR-2020-title29-vol7-sec1918-64.pdf) (12-1.j)

k. 29 CFR 1926.64, Process Safety Management of Highly Hazardous Chemicals (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol8/pdf/CFR-2020-title29-vol8-sec1926-64.pdf) (12-1.k)

l. 29 CFR 1926.417, Lockout and Tagging of Circuits (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol8/pdf/CFR-2020-title29-vol8-sec1926-417.pdf) (12-1.l)

m. 29 CFR 1926.702, Requirements for Equipment and Tools (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol8/pdf/CFR-2020-title29-vol8-sec1926-702.pdf) (12-1.m)

n. 29 CFR 1926.950, General (Electric Power Transmission and Distribution) (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol8/pdf/CFR-2020-title29-vol8-sec1926-950.pdf) (12-1.n)

12-2. Definitions.

a. Affected Person. A person whose position requires them to operate or use a system that is under lockout or tagout or whose position requires them to work in an area where a system that is under lockout or tagout is being serviced or maintained. (12-2.a)

b. Authorized Individual Hazardous Energy Control (HEC). Someone who meets the criteria for a QP as defined in this manual (see paras 1-2 or 2-2, as applicable), who is designated in writing to request, receive, implement, and remove hazardous energy isolation procedures. (12-2.b)

c. Commingled. A term used to describe the cable runs within the electric power generation, transmission, and distribution facility (for example, cable trays, wiring ducts, conduit installations) in which the wiring from the utilization equipment (for example, lights, cafeteria equipment, sump pumps) is run together with wiring from power generation equipment (for example, boiler pumps, transformer fans, coal handling operations). (12-2.c)

d. Construction. Construction, alteration and/or repair, includes painting and decorating. (12-2.d)

e. Contractor Controlled Site. A system, site, or area clearly defined and accepted by the KO or COR, in which the contractor is responsible for the application of their Site-Specific Energy Control Plan (SSECP) and the development and use of hazard isolation procedures (HIPs). (12-2.e)

f. Energy Isolation Device. A physical device that prevents the transmission or release of energy. Includes but is not limited to manually operated circuit breakers, disconnect switches, slide gates, slip blinds, line valves, blocks, or similar devices, capable of blocking or isolating energy, with a position indicator. The term does not include push buttons, selector switches, and other control circuit type devices. (12-2.f)

g. Hazardous Energy. Any energy including but not limited to mechanical (for example, power transmission apparatus, counterbalances, springs, pressure, gravity), pneumatic, hydraulic, electrical, chemical, nuclear, and thermal (for example, high or low temperature) energies, which could cause injury to employees. (12-2.g)

h. Hazardous Energy Control Program (HECP). An organization's methods and mindset for the control of hazardous energy at the corporate level. The HECP document speaks in generalities and is intended to be all-encompassing. It covers all scenarios an organization may encounter. It does not contain information pertaining to a specific location. It includes definitions, roles and responsibilities, methods and procedures, training, program review, and reportable incident history. (12-2.h)

i. Hazard Isolation Procedure (HIP). A written step-by-step procedure for the control of hazardous energy pertaining to a specific task or work area that has the potential for the release of hazardous energy. This includes identifying all hazards associated with the work item, total number of isolation points, procedural steps for de-energizing and isolating with lockout, and requirements for testing the effectiveness of energy control measures. The HIP must also address the step-by-step procedures for the restoration of equipment. (12-2.i)

j. Incidental Individual. An individual who under normal circumstances, would not be in an area where a system is under lockout and/or tagout, but is required to enter or pass through such an area. (12-2.j)

k. Isolation. An activity that physically prevents the transmission or release of energy. (12-2.k)

l. Issuing Individual. Is a person with jurisdiction over an area or project, for example, they may be the operator in charge of a shift at a powerhouse or lock, the supervisory engineer of a project or facility, or other person having operational control or system to be placed under HEC procedures. (12-2.l)

m. Lockout. A form of HEC using the placement of a lockout device, according to established procedures, on an energy-isolating device to ensure that the energy-isolating device and the system being controlled cannot be operated until the lockout device is removed. (12-2.m)

n. Lockout Device. A device that uses a positive means, such as a key or combination lock, to hold an energy-isolating device in the safe position and prevent the energizing of a system. (12-2.n)

o. Maritime Industry. Includes the construction, repair, and scrapping of vessels, as well as the movement of cargo and other materials. (12-2.o)

p. Site-Specific Energy Control Plan (SSECP). A written plan for a specific location that clearly and specifically identifies the hazardous energy sources and outlines the scope, purpose, and procedures for periodic inspections, procedural steps for creating and updating HIPs, site specific training documents, and assignment of roles and responsibilities defined in the HECP. (12-2.p)

q. Stored Energy. Energy (for example, electrical, mechanical, chemical, hydraulic, pneumatic, gravitational) that might be found in a charge capacitor, a loaded spring, chemical solutions, flood control barrier, or other similar hazardous form. (12-2.q)

r. Tagout. A form of HEC procedure using the placement of a tagout device according to established procedures, on an energy-isolating device to indicate that the energy-isolating device and the system being controlled may not be operated until the tagout device is removed. (12-2.r)

s. Tagout Device. A prominent warning device, such as a tag with a means of attachment, which can be securely attached to an energy-isolating device according to established procedures to indicate that the energy-isolating device and system being controlled may not be operated until the tagout device is removed. (12-2.s)

12-3. Personnel Required Qualification/Training.

a. Prior to commencing activities on a project, provide training according to the SSECP. The training must include the purpose and function of the HIPs. The HIPs will be understood by individuals and the individual will possess the knowledge and skills required for the safe application, usage, and removal of energy-isolating devices. Document all training. Documentation will include names of individuals trained; the time, date, and locations of training; the name and qualifications of the trainer. (12-3.a)

b. Authorized Individuals. Each Authorized Individual must be trained in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the means and methods necessary for energy isolation and control. (12-3.b)

c. Affected Person. Each Affected Person must be instructed in the purpose and use of the HIPs. (12-3.c)

d. Incidental Individuals. All other individuals whose work operations are or may be in an area where energy control procedures may be utilized. These individuals must be instructed about the procedure and about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out. (12-3.d)

e. Tags. When tagout systems are used (that is, only when lockout is not possible), individuals must be trained in the limitations of tags (see para 12-8.b). (12-3.e)

f. Retraining. Retrain Authorized Individuals and Affected Persons in HIPs whenever any of the following conditions exists: (12-3.f)

(1) There is a change in job responsibilities or a change in systems or processes that present a new energy control hazard.

(2) A periodic inspection reveals, or there is reason to suspect the presence of, inadequacies in or deviations from the individual's knowledge or use of HIPs.

(3) A project runs for more than one year, and then annually thereafter.

g. The retraining must reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary. (12-3.g)

12-4. Roles and Responsibilities.
When working on or near any system that produces, uses, or stores hazardous energy, a SSECP is required.

a. USACE-owned/operated facilities and activities must comply with ER 385-1-31 and any regional HECP as well as local supplements in lieu of paragraph 12-4. (12-4.a)

b. On contractor-controlled sites: (12-4.b)

(1) When USACE employees are affected by the contractor managed SSECP (for example, QARs on construction sites), they must comply with the contractor's SSECP.

(2) The contractor will utilize the flowchart process included in figure 12-1 and the requirements of this chapter and ANSI Z244.1 to develop the site-specific requirements that must be included in the SSECP. When electricity is a potential energy source, the requirements of NFPA 70E apply. The contractor must submit the SSECP as part of their APP to the KO or COR for acceptance.

(3) Prepare a HIP for KO or COR approval prior to energization/de-energization or any activity that results in the accumulation or discharge of potential energy.

(4) The KO or COR and the prime contractor must ensure that their own personnel and sub-contractors understand and comply with the SSECP and HIPs. The prime contractor must coordinate the work to ensure all personnel affected by a hazardous energy are notified before starting any associated HIP.

(5) Review and update HIPS, as necessary, and submit them to the KO or COR with the AHA for each DFOW. HIPs cannot be initiated until these procedures have been accepted by the KO or COR.

(6) The prime contractor, as the controlling contractor, is responsible for the HIPs, periodic inspections, and training verification of all their sub-contractors. The prime and the sub-contractors must fully coordinate all HIP activities with one another throughout the planning and performance of work. Discuss and coordinate the procedures that will be used to ensure everybody is protected from hazardous energy.

c. When contractor work involving hazardous energy will be performed at or on a USACE-operated facility, the contractor must coordinate a meeting with the KO or COR, facilities personnel, and local SOHO on which of the following scenarios will be followed as it pertains to HEC. The meeting must be documented and provided to the local SOHO along with the KO or COR and issuing individual(s). (12-4.c)

(1) When the contractor is to adhere to a USACE HECP, the contractor must provide necessary equipment for LOTO and, depending on their specific job responsibilities, require site authorization and possess certain qualifications to perform specific work covered by a local USACE HEC program.

(2) When a contractor-controlled site is designated, the contractor's HECP must adhere to paragraph 12-4.

(a) USACE must inform the contractor in writing of any known special or unique hazards that are related to the machinery, equipment, or process to which the contractor could be exposed.

(b) The KO or COR and the contractor must fully coordinate all HEC activities with one another through the planning and implementation of these activities.

(c) Both parties must ensure that their own personnel understand and comply with rules and restrictions of the procedures agreed upon to be used for the job and ensure that their employees affected by the HEC activity are notified when transfer of HEC responsibilities occur.

(d) When there is more than one prime contractor on USACE properties, USACE must ensure coordination of all HEC activities and inform each contractor in writing of any crossover of HEC activities.

(e) To eliminate confusion or to clearly differentiate and standardize on contractor-controlled lockouts, USACE may require locks and tags that are coordinated with the site lock and tag system. Communication is a key element of a HECP and a clear lock and tag identity with assigned responsibility is important.

(f) USACE power generation and transmission projects must share information with the contractor according to 29 CFR 1926.950.

(3) Under certain circumstances, the AHJ (see chapter 11) may determine that the contractor is not considered a QP in terms of HEC (for example, painting of equipment) and USACE will be responsible for the procedures. Under this circumstance, the USACE project must obtain approval from the AHJ prior to initiating HEC activities.

(4) When USACE remains responsible for the HEC, the contractor must still be experienced in HEC and will determine if the equipment is in a safe condition, but may not be aware of the complete isolation procedure:

(a) USACE must establish and verify the equipment is in a safe condition.

(b) The contractor must verify the equipment is in a safe condition and place a lock at each isolation point.

(c) The contractor should be vetted or evaluated regarding their competence related to the control of hazardous energy by the AHJ or designated representative. A copy of the credentials used to vet the contractor must be kept with the local USACE HEC program for the duration the contractor is performing work at the project.

12-5. Inspection Requirements.

a. A preparatory meeting and inspection with the KO or COR and contractor personnel must be conducted to coordinate HEC activities. This meeting/inspection must be documented, and a copy maintained in the SSECP. (12-5.a)

(1) Individuals must be trained and tested prior to working on USACE facilities where the USACEs SSECP is in use to ensure they are knowledgeable of the procedures.

(2) Contractors must ensure that all of their employees and subcontractors are trained and knowledgeable in the SSECP.

(3) Where HEC procedures affect USACE and contractors, USACE and contractor Authorized Personnel must participate in the inspection to ensure that the SSECP and HIPs are in place and all individuals are properly trained.

b. Periodic Inspections. Authorized Individuals, other than the one(s) utilizing the energy control procedure being inspected that are knowledgeable in the SSECP and HIP, must perform periodic inspections to ensure that all Authorized Individuals are following the SSECP and HIP. (12-5.b)

(1) The periodic inspection must assess the following:

(a) The steps in the HIP are being followed.

(b) The individuals involved are carrying out their responsibilities under the HIP.

(c) The HIP is adequate to provide the necessary protection, and if inadequate, what modifications are needed.

(d) Be, or accompanied by, a Qualified Individual.

(2) Inspections must include a demonstration of at least one HIP while the clearance or lockout is in progress to ensure the HIP is being properly followed. Each type of HIP must be inspected annually.

(3) Conduct an interview of randomly selected Authorized Individuals performing the HIP to assess their knowledge of the policy, procedures, and their individual responsibilities.

(4) Document all periodic inspections. Identify any deficiencies identified and/or corrected. Include a copy in the SSECP.

(5) Corrective actions related to the individual HIPs will be communicated to all Affected and Authorized Individuals. Corrective actions related to the SSECP will require re-training of all individuals. (See para 12-3)

Note. It is recommended that emphasis be placed on conducting inspections when new contractors and/or employees start on a project, a new DFOW is entered, significant changes in the project energy systems (for example, pressurization of hydraulic or steam systems, change in electrical power systems), or any change that introduces a new potential energy source that results in changes to established procedures.

12-6. Activity Hazard Analysis (AHA) Requirements.
Develop AHAs according to paragraphs 1-6 or 2-6, as applicable. Additionally, AHAs involving HEC must adhere to the following:

a. When the activity requires the control of hazardous energy, a HIP for the activity being performed must be attached to and referenced in the AHA. An AHA by itself will not be considered a HIP. For AHAs that have been previously accepted by the KO or COR, the HIP alone must be submitted for review. (12-6.a)

b. When preparing the AHA, the HIP must also be reviewed by an Authorized Individual to ensure it is still valid and that there have been no changes in the configuration that would require a change in the HIP. (12-6.b)

c. The AHA and the HIP must be provided to and accepted by the KO or COR prior to performing these activities. (12-6.c)

12-7. Minimum Plan Requirements.

a. Site-Specific Energy Control Plan (SSECP). When a contractor SSECP is required for work on or near any system that produces, uses, or stores hazardous energy, the SSECP must be site-specific and developed according to figure 12-1 and ANSI Z244.4, and when electricity is a potential energy source, the plan must also include the required elements of NFPA 70E. The plan must clearly and specifically

outline the scope, purpose, authorization, roles and responsibilities, and techniques to be used to include the following: (12-7.a)

(1) Procedures to identify how, when, and who will develop or revise equipment-specific HIPs to address:

(a) New machine, equipment, or process acquisition.

(b) Changes to existing machines, equipment, or processes.

(c) Correction of identified HEC deficiencies and addition of any HEC improvements that can be generated.

(2) Procedures to establish responsibilities for ensuring that procedures accurately reflect the current requirement and are effective in controlling machine, equipment, or process hazardous energy.

(3) An inventory/index of all HIPs that includes the date the HIP was developed, reviewed, validated, and revised.

(4) Identification of any similar machine, equipment, or process that fall under the same HIP and identify how energy sources differ.

(5) Means of coordinating and communicating HEC activities with all site personnel to include contractor, sub-contractor, government, suppliers, public, visitors, or any other personnel that may be affected to ensure continuity of protection.

(6) Responsibilities for the placement, removal, and transfer of locks, tags, and other energy isolation devices.

(7) Responsibilities and means of accounting for placing and removing temporary protective grounds.

(8) Responsibilities and requirements for testing the system to verify the effectiveness of isolation and control.

(9) Coordination (that is, shift or schedule change) necessary to ensure total continuity of HEC protection during shift or personnel change.

(10) Details of emergency procedures.

(11) Procedural steps and responsibilities for daily and periodic inspections that are conducted to ensure that all requirements of the SSECP and HIP are being followed and documented. Document the inspections and specify on which system the HIP was inspected, the date of the inspection, the names of employees performing and included in the inspections, and any deficiencies in complying with the HIP. (See para 12-5)

(12) The means to enforce compliance with the SSECP.

b. Hazard Isolation Procedures (HIPs). HIPs must be developed for each unique machine, equipment, or process for the control of hazardous energy. The HIP must be posted at or near the point of use, or otherwise readily available for Authorized Individuals to review and use. An example of a non-mandatory HIP is provided in figure 12-2. The HIP must include the following: (12-7.b)

(1) A specific statement of the intended use of the procedure.

(2) Identification of the machine, equipment, or process.

(3) Listing of all required energy-isolating devices and the magnitude of each hazardous energy source and its location.

(4) Specific procedural steps for shutting down, isolating, blocking, securing, and relieving stored or residual hazardous energy.

(5) Specific procedural steps for the placement, removal, and transfer of lockout or tagout devices and the responsibility for them.

(6) Specific requirements for testing the machine or equipment to determine and verify the effectiveness of the lockout devices, tagout devices, and other energy control measures.

(7) A development, validation, and revision date.

12-8. General Requirements.

a. Energy Isolating Procedures. (12-8.a)

(1) The HIP for the machine, equipment, or process must be posted at or near the point of use, or otherwise be readily available for Authorized Individuals to review and use.

(2) Locks or other positive means of control must always be used when the energy isolation involves equipment that is accessible by the public.

(3) Before work (that is, servicing, maintenance, testing, installation, removal) is performed on or near any system that produces, uses, or stores hazardous energy in which the unexpected energization, startup, or release of stored energy could occur, an SSECP to include associated HIPs and AHAs must be developed and accepted by the KO or COR. The SSECP and associated HIPs and AHAs must be reviewed by all Authorized Individuals to ensure all energy sources are controlled and they understand the procedures to be followed. (See paras 12-4, 12-6, and 12-7)

b. Lockout and Tagout Devices. (12-8.b)

(1) Systems with energy isolating devices that are capable of being locked out must be locked out. If an energy isolating device is not capable of being locked out, the HIP must identify tagout procedures providing full personnel protection.

(a) Comply with all tagout requirements of this manual and of the HIP.

(b) Attach the tag to the same location, if possible, that the lock would have been attached. If this is not possible, then attach the tag as close as safely possible to the device and in a position that is immediately obvious to anyone attempting to operate the device.

(c) Employ additional means to provide a level of protection commensurate with that provided by a lock. For example, placement of the tag in a manner that inhibits operation of the energy isolating device, removal of an isolating circuit mechanism, blocking of a control switch, opening of an extra disconnecting device, removal of a valve handle to reduce the likelihood of inadvertent energizing.

(d) When only tags are used (the use of locks is not possible), instruct individuals in the following requirements and limitations of tags:

(d-1) Tags must be legible and understood by all Authorized, Affected, and Incidental Individuals.

(d-2) Tags and their means of attachment must be made of materials that will withstand the environments encountered in the workplace.

(d-3) Securely attach tags to energy isolating devices so that they cannot become inadvertently or accidentally detached during use.

(d-4) Do not remove tags without authorization of the Authorized Individual and never bypass, ignore, or otherwise defeat them.

(d-5) Tags are essentially warning devices affected to energy isolating devices and do not provide the physical protection of a lock. Tags may evoke a false sense of security.

(2) Only Authorized Individuals may perform LOTO.

(3) Notify all Affected Persons of LOTO before and upon completion of the application and removal of locks or tags.

(4) Locks and tags used for LOTO must:

(a) Be capable of withstanding the environment that they are exposed to for the maximum period of time the exposure is expected.

(b) Indicate the identity of the Authorized Individual applying the device.

(c) Be of a unique design or color to readily identify them as belonging to the LOTO program.

(d) Not be used for anything other than LOTO activities.

(e) Identify the person who applied the lock or tag. Locks may have a tag attached with the individual's name and/or photograph which will satisfy this requirement.

(f) Locks must be substantial enough to prevent removal without the use of excessive force or unusual techniques (for example, the use of bolt cutters).

(g) Tags must, in addition, meet all of the following requirements:

(g-1) Have a standardized (within a project) print and format.

(g-2) Be constructed and printed so that exposure to weather conditions, UV light, wet or damp locations, or corrosive environments will not cause the tag to deteriorate or the message to become illegible.

(g-3) Be attached by means that are: non-reusable, substantial enough to prevent inadvertent or accidental removal; attachable by hand; self-locking; non-releasable with a minimum unlocking strength of no less than 50 lbs. (22.7 kg); and have the basic characteristics of being at least equivalent to a one-piece, all environment-tolerant nylon cable tie.

(g-4) Warn against the hazardous condition resulting from system energization and include wording such as "DANGER - DO NOT START, OPEN, CLOSE, ENERGIZE, OPERATE".

(5) To eliminate confusion or to clearly differentiate and standardize contractor-controlled lockouts, USACE may require locks and tags that are coordinated with the site lock and tag system. Communication is a key element of a HEC Program and a clear lock and tag identity with assigned responsibility is important.

(6) Application and Removal of Lockout and Tagout Devices.

(a) Authorized Individual must ensure that all energy isolating devices needed to control energy to or within the system are identified and that the system is shut down, isolated, blocked and secured according to the HIP.

(b) Any system operated by a remotely controlled source must be completely isolated such that it cannot be operated by that or any other source.

(c) The Authorized Individual must affix a lockout and/or tagout device to each energy isolating device according to the HIP.

(d) Where there is a possibility of re-accumulation of stored energy to a hazardous level, continue to verify isolation until the energy control procedure is complete.

(e) Before starting work on systems that have been locked/tagged out, the Authorized Individual must verify that isolation and de-energization of the system have successfully been accomplished.

(7) TPGs, if applicable. Following the application of locks and/or tags to energy isolating devices, relieve or make safe all potentially hazardous or stored residual energy.

(a) Identify and account for protective grounds in the manner as identified in the contractor's SSECP and HIP.

(b) The Authorized Individual (or their designee) is responsible for ensuring the control of residual energy and for placing and removing TPGs according to the contractor's ESP (see chapter 11).

(8) Before LOTO devices are removed and energy restored to the system, the Authorized Individual must ensure that the following actions have been taken:

(a) The work area has been inspected and all nonessential items (for example, tools and materials) have been removed from the system, the system components are operationally intact, and all personnel have been safely positioned or removed from the area.

(b) All Affected and Incidental Individuals have been notified that the LOTO devices are about to be removed.

(9) Only the Authorized Individual who applied the LOTO device is permitted to remove such devices from the associated energy isolating devices. When the individual is not available, the device(s) may be removed by another Authorized Individual appointed by and under the direction of the contractor PM or contractor designated authority provided the following are complied with:

(a) The contractor ensures that the individual appointed to remove the LOTO devices is knowledgeable in the HIP applied.

(b) Such individual and the requirements for transferring removal authority to from the new Authorized Individual are identified in the SSECP. (See para 12-7.a)

(c) The contractor verifies that the Authorized Individual who applied the device is not at the facility.

(d) The contractor designated authority makes all reasonable efforts to contact the Authorized Individual to inform them that the LOTO devices are to be removed. If a group clearance is involved, then an attempt must be made to have all Affected Persons sign off on the clearance or they must be contacted by phone. If contact cannot be made, then the lift may only made if after all necessary precautions are taken.

(e) The Authorized Individual is immediately notified of the removal upon returning and prior to resuming any work.

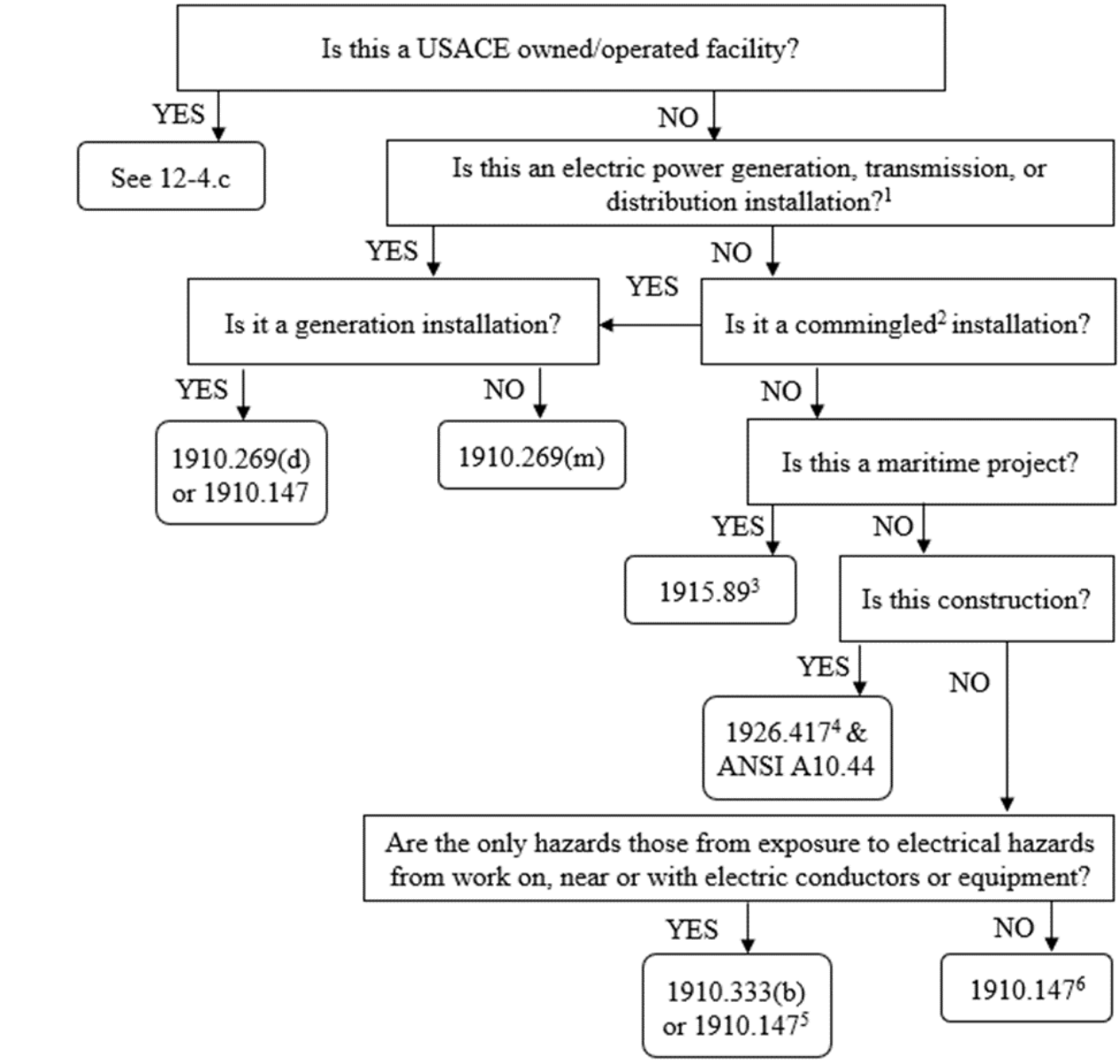
(10) Full Personnel Protection. When tagout is used in place of lockout, full personnel protection is provided when:

(a) The tagout device is attached at the same location as the lockout device would have been attached.

(b) All tagout-related requirements of this manual have been complied with.

(c) Additional means have been taken to provide a level of safety commensurate with that of a lockout device. Such additional means include the removal of an isolation circuit element, blocking of a control switch, opening, and tagging an extra disconnecting device (separated by distance), or the removal of a valve handle to reduce the likelihood of being energized.

12-9. Figures and Tables.



[1] If a generation, transmission, or distribution installation conforms to 29 CFR 1910.302 through 29 CFR 1910.308, the lockout and tagging procedure of 29 CFR 1910.333(b) may be followed for the electric shock hazards.

[2] This means commingled to the extent that the electric power generation, transmission, or distribution installation poses the greater hazard.

[3] For conveyors supplement with 29 CFR 1917.48(i) or 29 CFR 1918.649(k).

[4] For hazardous chemicals supplement with 29 CFR 1926.64 and 29 CFR 1926.702 for concrete and masonry construction.

[5] Paragraph (b)(2)(iii)(D) and (b)(2)(iv)(B) or 29 CFR 1910.333 still apply.

[6] Paragraph (b) of 29 CFR 1910.333 applies to any electrical hazards from work on, near, or with electric conductors and equipment.

Figure 12-1. Application of Relevant Standards to SSECP

Number of Isolation Points: 3	Hazard Isolation Procedure Flux Capacitor Location: Building 1	Last Inspection: 26AUG2020 By: Jon Doe

Purpose: This procedure establishes minimum requirements for the lockout of the Flux Capacitor whenever maintenance or service work is performed. The procedure is used by an Authorized Individual to ensure the machine is stopped, isolated from all potential energy sources, and locked out before any servicing and maintenance.

- Prior to starting the lockout procedure, notify all AFFECTED Persons in the work area
- Bring equipment to a neutral state utilizing normal stopping procedures

Energy Type and Source	Isolation Point	Method and Device	Reference
Electrical 480V	Breaker 1M at MCC6 in PP1	Move Breaker 1M to the off position. Verify indicator light is dark and attempt to start. Secure Breaker 1M with lock and tag and ensure breaker cannot be moved to "on" position. Time: Initials:	
Thermal 200C (Residual)	Wait 20+ minutes until heat from flux injectors has dissipated to less than 30C before proceeding	Isolation of Breaker 1M prevents flux from being heated by the flux capacitor. Verify flux temperature on gauge located on the West side of machine before servicing. Time: Initials:	
Water	Isolation valve is on North side of machine	Turn Valve 1047 to the off position. Verify water has been shut off by checking that flow has stopped at drain on North side of machine. Secure Valve 1047 with lock and tag. Time: Initials:	
Pneumatic	Isolation valve is on North side of machine	Turn Valve 1096A to the closed position. Verify air pressure has dissipated at the attached gauge. Secure Valve 1096A with lock and tag. Time: Initials:	
Hydraulic 800psi	Hydraulic pressure will automatically be released when electrical source Breaker 1M is disconnected	Ensure all hydraulic pressure has bleed off by verifying the change in pressure from 800psi to 0psi at the hydraulic relief valve located on the East side of the machine. Time: Initials:	

Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, as well as air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.

1. Ensure that the equipment is disconnected from the energy sources by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating controls or by testing to make certain the equipment will not operate.
2. Return operating controls to the neutral position after verifying the isolation of the equipment.
3. If possible, contact with electrical conductors could occur; Electrically Qualified Person must perform voltage test on all phases of the load side of the circuit to verify absence of voltage.

1. Ensure all tools and items have been removed.
2. Confirm that all employees are safely located.
3. Ensure the safety devices and guards are in place.
4. Verify the controls are in the neutral position.
5. Remove lockout devices and re-energize equipment.
6. Notify affected persons of the re-energization.

Written by:		Review by:	
Verified Effective by Testing:	By:	Title:	Effective Date:

Revision	Date	Revised by:	Description

Figure 12-2. Hazard Isolation Procedure (HIP) Example (non-mandatory)