Activity Hazard Analysis (AHA) — Temporary Electrical Power

Overall RAC: **M** · SAMPLE formatted to EM 385-1-1 (15 March 2024) and ENG Form 6206 (SEP 2024) conventions. Adapt every step, hazard and control to actual site conditions; requires competent-person preparation, SSHO review and Government acceptance before the definable feature of work begins (EM 385-1-1 2024, para 2-6). Contracts solicited before 15 March 2024 remain governed by the 2014 edition — verify which edition your contract cites.

JOB STEPS	HAZARDS	CONTROLS	RESIDUAL RAC
Mobilization: design temporary power system, obtain sketch acceptance, and stage the AHA	Undocumented or unapproved system energized — circuits with unknown voltages, protection, and grounding create shock and fire exposure for every trade on site	• Prepare a sketch of the proposed temporary power distribution system showing the location, voltages, and means of protection of all circuits (receptacles, disconnecting means, grounding, GFCIs, lighting circuits) and submit it to the USACE supervisor for approval or acceptance by the KO/COR before any temporary power is installed (11-8.m(1)). • Attach the accepted sketch and the AHJ acceptance documentation to this AHA (11-6.k) and update both whenever the system is modified. • Develop the Electrical Safety Plan per NFPA 70E covering this work before mobilization (11-7.a). • Document the task-specific shock risk assessment and arc flash risk assessment in the AHA for each task with those exposures (11-6.c, 11-6.d).	L
	Unqualified workers performing or working near electrical tasks	• Designate the Qualified Person(s), Electrical by name on this AHA; QPs must be trained to NFPA 70E and hold licensure required by the state or host nation (11-3.b). • Provide electrical safety training from an electrically qualified source to all employees exposed to electrical hazards, covering hazard recognition and the safety-related work practices for their task assignments (11-3.a). • Restrict installation, modification, and troubleshooting of the temporary system to QPs; unqualified persons stay outside established approach boundaries (11-3.c).	L
Set, fuel, and bond portable generators	Electric shock from improperly grounded/bonded generator or unprotected generator receptacles	• Bond the generator neutral to the frame of the generator and/or vehicle and provide GFCI protection on all receptacles of portable and vehicle-mounted generators used for construction (11-8.l(1)(c), per NFPA 70 445.20(B) and 590.6(A)(3)). • Do not apply the 29 CFR 1926.404(b)(1)(ii) 5 kW generator GFCI exception — USACE does not recognize it (11-8.l(1)(c) Note); use portable GFCIs only on generators manufactured or remanufactured before 1 Jan 2011, connected per 11-8.l(1)(a)-(b). • Verify the manufacturer's marking showing whether the neutral is bonded to the frame, and re-mark the generator after any field modification of the bonding (11-8.l(1)(e)). • Have a QP inspect the generator installation against the accepted sketch before energizing (11-5.h).	L
	Carbon monoxide accumulation from generator exhaust	• Locate generators outdoors, downwind, and away from doors, windows, and air intakes of occupied structures and trailers. • Prohibit generator operation inside buildings, conexes, or excavations; where placement near work areas is unavoidable, monitor CO in adjacent occupied spaces.	L
	Fire or burns during refueling	• Shut down the generator and allow it to cool before refueling; refuel from approved safety cans only. • Keep a rated fire extinguisher at the generator location and maintain clear space around the unit.	L
Install distribution panels, feeders, and receptacles (de-energized)	Contact with energized conductors while tying into an existing energized source	• De-energize the source, apply lockout/tagout under the project Hazardous Energy Control Program before making terminations (Ch 12; 29 CFR 1926.417). • Have a QP verify the absence of voltage with a voltage detector rated and designed for the system before touching conductors (11-8.d). • Treat all conductors as energized until tested; use insulated tools inspected before each use (11-5.b).	L

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	Downstream shock exposure from missing ground-fault protection	• Provide GFCI protection for personnel on all 125-volt, 15-, 20-, and 30-amp receptacle outlets providing temporary power during construction (11-8.l(9)), using UL 943 Class A devices (11-8.l(9)(b)). • Protect receptacles that are not part of permanent wiring with integral-GFCI receptacles, receptacles downstream of a GFCI receptacle, or GFCI-type circuit breakers (11-8.l(9)(d)); use a portable GFCI as near as practicable to any permanent-wiring receptacle used for temporary power that is not already GFCI protected (11-8.l(9)(e)). • Where GFCIs are incompatible with equipment (for example, concrete vibrators) or unavailable for the rating, implement an AEGCP meeting para 11-7.b instead (11-8.l(9)(h)).	L
	Blocked access/egress at electrical equipment during an arc flash event	• Provide and maintain NFPA 70 working space around panels and disconnects; keep a minimum 24-inch escape path when equipment doors are open (11-8.i). • Mount panels off the ground on stable supports and keep the working space free of stored material.	L
Test and energize the temporary distribution system	Latent wiring faults (reversed polarity, open ground, high ground resistance) shocking downstream users	• Test the temporary distribution system for acceptable polarity, ground continuity, and ground resistance before initial use and again before use after any modification (11-5.e, 11-8.m(2)). • Measure ground resistance at installation, record the measurement, and provide a copy to the USACE supervisor/KO or COR (11-8.m(3)). • Test all GFCI devices before initial use and before use after modification (11-8.l(9)(b)); inspect new or modified equipment for code-compliant installation before it is energized (11-5.h).	L
	Arc flash during initial energization or switching	• Complete the arc flash risk assessment for the energization task and document it in the AHA (11-6.d). • Only the QP operates disconnects and breakers during energization, wearing arc-rated PPE and voltage-rated gloves selected per the risk assessment and inspected before each use (11-5.a). • Clear all non-essential personnel from the arc flash boundary before closing devices; energize one section at a time following the accepted sketch.	M
Install temporary wiring and temporary lighting	Equipment or personnel contacting low-strung temporary wiring	• Maintain vertical clearances for temporary wiring at 600V or less: 10 ft above grade, sidewalks, and platforms; 12 ft over vehicular areas; 15 ft over truck-traffic areas; 18 ft over public streets, alleys, roads, and driveways (11-8.m(4)). • Insulate wires from their supports and route wiring away from travel paths and lifting operations (11-8.m(6)(d)).	L
	Shock or lacerations from temporary lighting strings and broken lamps	• Protect all lamps for general illumination from accidental contact or breakage, ground all metal-case sockets, and immediately replace exposed empty sockets and broken bulbs (11-8.m(7)). • Do not suspend temporary lights by their cords unless designed for that suspension (11-8.m(7)(c)). • In outdoor or wet locations, use lighting strings with lamp sockets and plugs permanently molded to hard-service cord insulation (11-8.m(6)(c)); in wet or conductive spaces such as tanks and sumps, use lighting rated 12 volts or less, or 120-volt lights protected by a GFCI (11-8.m(7)(e)). • Provide illumination meeting the 29 CFR 1926.56(a) minimum intensities in all work and access areas (11-8.m(7)(a)).	L
	Shock from receptacles and cord equipment in wet locations	• Enclose receptacles used in wet locations in weatherproof enclosures effective whether or not a plug is inserted (11-8.m(6)(b)). • Use only listed equipment where portable electric equipment or flexible cords are used in highly conductive, inundated locations (11-8.h(1)). • Use submersible pumps only where designed for the purpose, installed and tested by a QP, with UL 943 Class A GFCI protection when personnel are or could be in the water (11-8.m(6)(a)).	L

JOB STEPS	HAZARDS	CONTROLS	RESIDUAL RAC
Daily operation and maintenance of the temporary power system	Damaged cords, plugs, and cord-connected tools in service	• Inspect all portable flexible cords and cables before use each shift; remove damaged or defective equipment from service immediately (11-5.d). • Use attachment plugs constructed to endure rough use and equipped with strain relief (11-8.h(2)); use the NEMA standard plug/receptacle configuration for the voltage and amperage (11-8.h(4)). • Test GFCIs monthly and document the tests; test portable-type GFCIs for functionality before each use (11-5.e, 11-8.m(2)). • Provide GFCI protection on all circuits serving portable and semi-portable electric tools such as saws, air compressors, and welding machines (11-8.l(9)(a)).	L
	Loss of ground-fault protection where an AEGCP substitutes for GFCIs	• Implement the written AEGCP per 29 CFR 1926.404, submitted to and approved by the USACE supervisor or accepted by the KO/COR before use (11-7.b). • Visually inspect all cord sets, plugs, receptacles, and cord-and-plug equipment before each day's use; remove failed equipment from service (11-7.b(2)(a)-(b)). • Perform continuity and terminal connection tests before first use, after repair, after suspected damage, and at intervals not exceeding 3 months (6 months for fixed, protected cord sets and receptacles), and document all results with dates and the responsible individual (11-7.b(2)(c), 11-7.b(3)). • Designate the AEGCP Competent Person by name to implement and enforce the program on site (11-7.b(4)).	L
Modify circuits and troubleshoot faults	Shock and arc flash while working on or near energized parts	• De-energize and apply LOTO under the Hazardous Energy Control Program as the default method for all modifications; verify absence of voltage before work (Ch 12; 11-8.d; 29 CFR 1926.417). • Limit justified energized work (for example, testing and troubleshooting) to QPs working under the energized-work requirements of para 11-8.e, inside established shock and arc flash boundaries with PPE per the documented risk assessments (11-6.c, 11-6.d). • Inspect insulating gloves and arc flash PPE before each use and insulated tools before each use (11-5.a, 11-5.b). • Retest the system for polarity, ground continuity, and ground resistance before returning any modified section to service (11-5.e).	M
	Arcing while connecting or disconnecting plugs above 240 volts under load	• Make physical attachment of plugs into receptacles rated over 240 volts only with the circuit de-energized per Chapter 12, unless the load is switched off with an integral disconnect, a local disconnect under the sole control of the person attaching the plug de-energizes the receptacle, or the receptacle is protected by an RCD opening at no more than 30 mA within 400 ms (11-8.h(3)).	L
Demobilization: de-energize, remove, and close out the temporary system	Contact with circuits assumed dead during removal, including generator backfeed	• De-energize the system section by section, apply LOTO at each source, and have a QP verify absence of voltage before conductors are handled (Ch 12; 11-8.d). • Physically disconnect generators from the system and verify no backup or temporary generator can backfeed circuits being removed; temporary backup generators must operate through a transfer switch, never as an unswitched tie (11-8.l(1)(d)). • Remove temporary wiring and equipment in reverse order of installation and update the sketch/AHA record as sections come out (11-8.m(1)).	L
	Manual handling and housekeeping injuries during teardown	• Coil and remove cords and lighting strings as circuits are cleared to eliminate trip hazards; do not drag energized cords. • Use two-person lifts or material handling equipment for panels, transformers, and cable reels; wear leather gloves for cable handling.	L

Equipment To Be Used

• Portable and towable generators (neutral bonded, GFCI-protected receptacles per 11-8.l(1)(c))

• Temporary power distribution panels and portable GFCI distribution boxes (spider boxes), UL 943 Class A GFCI devices

• Hard-service flexible cords and cord sets with strain-relief plugs (NEMA configurations per 11-8.h)

• Temporary lighting strings with molded sockets for wet/outdoor locations; low-voltage (12V) lighting for conductive spaces

• Voltage detector/multimeter rated for the system, receptacle circuit tester, and ground resistance tester

• Insulated hand tools, voltage-rated gloves, and arc-rated PPE per the shock and arc flash risk assessments

• Lockout/tagout locks, tags, and devices per the project HECP (Ch 12)

• Weatherproof receptacle enclosures and cord protection/elevation hardware

Training Requirements

• Electrical safety training for all employees exposed to electrical hazards, delivered by an electrically qualified source to the level of work performed (11-3.a)

• Qualified Person (Electrical) training to NFPA 70E, with demonstrated skills and any state/host-nation licensure for installing or removing conductors, equipment, or raceways (11-3.b)

• Safety-related work practices training for Unqualified Persons working near electrical hazards (11-3.c)

• Contact release and emergency response training for employees working on or near exposed energized conductors or circuit parts (11-3.d), plus first aid/CPR/AED responders identified in the AHA (11-6.l)

• Hazardous energy control (LOTO) training under the project HECP (Ch 12)

• AEGCP implementation training for the designated Competent Person where an AEGCP is used (11-7.b(4))

Inspection Requirements

• Test the temporary distribution system for polarity, ground continuity, and ground resistance before initial use and before use after any modification; record ground resistance and provide a copy to the USACE supervisor/KO or COR (11-5.e, 11-8.m(2)-(3))

• Test fixed GFCIs monthly and document the tests; test portable-type GFCIs for functionality before each use (11-5.e, 11-8.m(2))

• Inspect all portable flexible cords and cables before use each shift (11-5.d)

• Inspect insulating gloves and arc flash PPE before each use (11-5.a) and insulated tools and equipment before each use (11-5.b)

• Inspect new or modified equipment to verify code-compliant installation before energizing (11-5.h)

• Where an AEGCP is used: daily visual inspections of cord sets, plugs, and receptacles, plus documented continuity and terminal connection tests before first use, after repair or suspected damage, and at least every 3 months (11-5.c, 11-7.b(2)-(3))

Competent / Qualified Person Requirements

• Qualified Person (QP), Electrical — NFPA 70E-trained, designated by name in the AHA, for all installation, testing, energization, modification, and removal of the temporary system (11-3.b; named designation per 2-6.d(4)(g))

• AEGCP Competent Person — one or more CPs designated to implement and enforce the Assured Equipment Grounding Conductor Program at each site where it is used in lieu of GFCIs (11-7.b(4))

• Authorized employees for lockout/tagout under the project Hazardous Energy Control Program (Ch 12)

• Personnel trained in contact release, first aid/CPR/AED, identified in the AHA (11-3.d, 11-6.l)

References

- EM 385-1-1 (2024) Ch 11 — Electrical
- EM 385-1-1 (2024) 11-3 — Personnel Required Qualification/Training
- EM 385-1-1 (2024) 11-5 — Inspection Requirements (11-5.d flexible cords each shift; 11-5.e system testing and monthly GFCI tests)
- EM 385-1-1 (2024) 11-6 — Activity Hazard Analysis (AHA) Requirements
- EM 385-1-1 (2024) 11-7.b — Assured Equipment Grounding Conductor Program (AEGCP)
- EM 385-1-1 (2024) 11-8.l(1) — Generators (GFCI protection and neutral bonding per NFPA 70 445.20(B) and 590.6(A)(3))
- EM 385-1-1 (2024) 11-8.l(9) — GFCI Protection for Personnel (all 125-V, 15/20/30-A and greater receptacles)
- EM 385-1-1 (2024) 11-8.m — Temporary Wiring and Lighting
- EM 385-1-1 (2024) Ch 12 — Control of Hazardous Energy
- 29 CFR 1926 Subpart K (1926.400–.449) — Electrical
- 29 CFR 1926.404(b)(1) — Ground-fault protection for employees on construction sites
- 29 CFR 1926.405 — Wiring methods, components, and equipment for general use
- 29 CFR 1926.417 — Lockout and tagging of circuits