Activity Hazard Analysis (AHA) — Underground Utility Installation

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, dig permit, and utility locates	Striking unlocated underground utilities (electric, gas, communications, water, fuel) during initial ground disturbance	• Obtain a dig permit from the installation public works organization or other authority having jurisdiction before starting any excavation work, processed through the USACE supervisor, KO, or COR (25-8.f(1)) • Contact utility companies and responsible authorities (811 one-call plus the installation utility shop) to locate and mark all underground utilities, and allow them to direct or assist with protection (25-8.f(2)) • Review as-built drawings and supplement marks with independent locating (electromagnetic locator or ground-penetrating radar) where records are incomplete • Have the Excavation CP develop the Excavation and Trenching Plan for any excavation 5 ft or deeper and submit it for approval/acceptance before work begins (25-7)	L
	Encountering unexploded ordnance (UXO) on former range or munitions response areas	• Where explosives, unexploded munitions, or military ordnance are known or suspected, obtain certification that surface and subsurface UXO has been surveyed, cleared, and disposed of by UXO disposal personnel before excavating (25-7.g, 25-8.g(2)) • If a suspect item is uncovered, stop work, evacuate the area, and notify the KO/COR and installation emergency services	L
Site setup, traffic control, and perimeter protection	Public, vehicles, or equipment falling into the open excavation	• Install Class I perimeter protection (guardrail system per Ch 21) where the excavation is exposed to the public or to vehicles/equipment; protection guarding against traffic must be designed by a Qualified Person to withstand impact forces (25-8.h(1)) • Install substantial stop logs or barricades where vehicles or mobile equipment operate adjacent to the excavation, and use a ground guide (25-8.e(1)) • Implement the traffic control measures identified in the Excavation and Trenching Plan (25-7.c(6))	L
	Workers struck by delivery trucks and equipment during offloading	• Keep workers clear of vehicles being loaded or unloaded to avoid being struck by spillage or falling material (25-8.e(2)) • Require high-visibility apparel for all employees exposed to equipment or vehicular traffic (25-8.e(4)) • Use a dedicated ground guide and an exclusion zone around swing radii	L
Mechanical excavation with potholing near marked utilities	Excavator contact with an energized electrical line or pressurized gas line	• Physically verify utility location by non-destructive means (hand digging or vacuum excavation) before any mechanical excavation within 3 ft of the marked location, and neutralize the utility system (25-8.f(3)) • Excavate with caution as operations approach the utility location until the exact location is found (25-8.f(4)) • Protect workers from the utility and protect the exposed utility from damage or displacement with supports and barriers (25-8.f, 25-8.f(5)) • If an unidentified line is struck, evacuate the trench, stop equipment, and notify the utility owner and emergency services before resuming work	M
	Cave-in of trench walls during excavation	• CP inspects and tests soil conditions to classify the soil before the start of each shift and as conditions warrant, and documents the results (25-5.b) • Slope, bench, shore, or shield every excavation 5 ft or deeper; do not enter unprotected trenches (25-8.a) • Place spoil and materials at least 2 ft from the excavation edge or retain them so they cannot fall in (25-8.d(3)) • CP conducts documented inspections before each shift, throughout the shift, and after every rainstorm or hazard-increasing event (25-5.a)	M

JOB STEPS	HAZARDS	CONTROLS	RESIDUAL RAC
	Workers struck by excavator bucket or suspended loads	• Do not raise, lower, or swing loads over or adjacent to personnel in the excavation without substantial overhead protection; keep personnel at a safe distance until the load is placed (25-8.e(3)) • Treat any excavator hoisting rigged loads as load handling equipment and follow Ch 16 (25-8.e Note) • Maintain positive communication between the operator and a designated ground guide	L
Install protective systems and enter the trench	Protective system failure or cave-in during entry	• Install trench shields and shoring according to the manufacturer's tabulated data; sloping, benching, or shoring for excavations over 20 ft deep must be designed by a Registered Professional Engineer (25-7.c(2)) • CP examines any damaged protective system material or equipment to evaluate suitability for continued use before it goes back in service (25-4.a(5)) • Keep all workers inside the protected zone of the shield; never enter the trench outside the box • If evidence of possible cave-in, protective system failure, or other hazardous condition appears, remove workers and stop all work in the excavation until precautions are implemented (25-8.a(7))	M
	Fall into trench or inability to exit quickly	• Provide stairs, ramps, or ladders in excavations over 4 ft deep, spaced so no more than 25 ft of lateral travel is required, with at least two means of exit (25-8.h(5)) • Extend access ladders from the trench bottom to at least 3 ft above the surface (25-8.h(7)) • Provide walkways or bridges with standard guardrails where personnel or equipment cross the excavation (25-8.h(4))	L
	Hazardous atmosphere in the trench (sewer gas, fuel-contaminated soil, oxygen deficiency)	• Test the air before the start of each shift, or more often if directed by the CP, in excavations 4 ft or deeper where oxygen deficiency or gaseous conditions are known or suspected, and maintain a log of results at the work site (25-5.c) • Ventilate the trench and re-test before re-entry when readings exceed action levels • CP evaluates the need for continued air monitoring as work progresses (25-4.a(7))	L
	Water accumulation undermining trench walls	• Use diversion ditches, dikes, or other means to keep surface water out of the excavation (25-8.c(1)) • Do not work in the excavation while water is accumulating unless the hazard is controlled (25-8.c(2)); an RPE must plan and direct pumping or drainage measures (25-8.c(2)(a)) • Provide emergency power and CP monitoring when continuous groundwater control equipment is required (25-8.c(2)(b)); see the companion dewatering AHA	L
Pipe and conduit installation, bedding, and connections	Increased worker exposure during connection activities (bent over, kneeling, head-down in the trench)	• Address workers' increased exposure during piping connection activities in this AHA as required by 25-6.a, including body position and reduced escape ability • Rotate connection tasks and use mechanical pipe-alignment aids to limit time spent kneeling below grade • Verify the protective system and egress locations before each connection sequence (25-6.b)	L
	Struck-by or crushed-by during pipe hoisting and placement	• Rig pipe with inspected slings and hardware per Ch 15; excavators hoisting rigged pipe are load handling equipment under Ch 16 (25-8.e Note) • Keep all personnel out of the trench and clear of the load path until the pipe is landed and blocked; use taglines for control (25-8.e(3)) • Chock and block stockpiled pipe so it cannot roll into the excavation (25-8.d(2))	L
Tie-in to existing energized or pressurized utilities	Uncontrolled release of hazardous energy (electrical contact, pressurized water/gas release) when breaking into a live system	• Attach the equipment-specific Hazard Isolation Procedure (HIP) to this AHA and reference it; an AHA by itself is not a HIP (12-6.a) • Submit the AHA and HIP to the KO or COR for acceptance before performing tie-in work (12-6.c) • Apply lockout/tagout under the Site-Specific Energy Control Plan by trained Authorized Individuals (12-7.a, 12-3), and verify that isolation and de-energization have been accomplished before opening the system (12-8.b(6)(e)) • Neutralize the utility system before working within 3 ft of it (25-8.f(3)) and coordinate shutdowns with the utility owner through the USACE supervisor/KO/COR	M

JOB STEPS	HAZARDS	CONTROLS	RESIDUAL RAC
Manhole and vault entry (confined space work)	Hazardous atmosphere, engulfment, or entrapment inside manholes and utility vaults	• Treat manholes and vaults as confined spaces and follow Ch 34 entry procedures, including the permit process and an Attendant maintaining communication with Entrants (25-8.g(1), Ch 34) • Use only personnel trained as Entrants, Attendants, and Entry Supervisors per 34-3 • Conduct documented pre-entry inspections of atmospheric testing and monitoring equipment (with calibration documentation), ventilation equipment, retrieval/rescue equipment, and access ladders (34-5.a, 34-5.b, 34-5.f, 34-5.h) • Install an isolation barrier to prevent liquids or free-flowing solids from entering the space during the work (34-8.g(2)), and lock out and tag out energized equipment serving the space per Ch 12 • Stage non-entry retrieval equipment (tripod and winch) and confirm rescue procedures before entry (25-7.i)	M
Backfill, compaction, testing, and demobilization	Workers in the trench struck or buried during machine backfilling and compaction	• Remove all personnel from the trench before machine backfilling over or adjacent to their position; maintain the protective system until workers are clear • Use a ground guide and high-visibility apparel for all work around compaction and loading equipment (25-8.e(1), 25-8.e(4)) • Remove trench shields progressively as backfill rises; never pull shoring with workers in the unprotected excavation	L
	Open excavations left accessible after work hours	• Backfill excavations as soon as possible (25-8.h(3)) • Barricade or cover all remaining pits, shafts, and similar openings (25-8.h(2)) • Maintain perimeter protection and warning devices until final restoration is complete (25-8.h(1))	L

Equipment To Be Used

• Hydraulic excavator / backhoe (also serves as LHE when hoisting rigged pipe — Ch 16)

• Vacuum excavation truck or hand-digging tools for utility verification (25-8.f(3))

• Electromagnetic utility locator / ground-penetrating radar

• Trench shields, hydraulic shoring, and manufacturer tabulated data

• Ladders and access ramps meeting 25-8.h

• Calibrated multi-gas atmospheric monitor with documented calibration (25-5.c, 34-5.a)

• Ventilation blower and ducting (34-5.b)

• Confined space retrieval equipment — tripod, winch, full-body harnesses (34-5.h, 25-7.i)

• Lockout/tagout locks, tags, and isolation devices (Ch 12)

• Class I/II/III perimeter protection, stop logs, and traffic control devices (25-8.e, 25-8.h)

• Pipe rigging: slings, shackles, taglines (Ch 15)

• Dewatering pump with emergency power source where continuous operation is required (25-8.c(2)(b))

• PPE including high-visibility apparel (Ch 5, 25-8.e(4))

Training Requirements

• Competent Person (Excavation): training, knowledge, and experience in soil analysis, use of protective systems, Ch 25, and 29 CFR 1926 Subpart P; able to detect cave-in conditions, protective system failures, and hazardous atmospheres; authority to stop work (25-3.a)

• Rescue personnel trained on the rescue procedures identified in the Excavation and Trenching Plan (25-3.b, 25-7.i)

• Confined space training for Entrants, Attendants, and Entry Supervisors, with retraining triggers per 34-3.a

• Hazardous energy control training for Authorized Individuals on the SSECP and HIPs, including documented training records (12-3.a)

• Equipment operator qualification for excavation machinery per 18-3 (referenced by 25-7.d)

• AHA review and signature by every involved employee before starting work (2-6.d(2))

Inspection Requirements

• CP documented inspection of each excavation, adjacent areas, and protective systems before each shift, throughout the shift as work dictates, after every rainstorm or hazard-increasing event, when fissures/sloughing/seepage/bulging appear, when size or spoil piles change, and on any indication of change in adjacent structures (25-5.a)

• CP soil classification testing before the start of each shift and as conditions warrant, documented and maintained for the life of the project (25-5.b)

• Air testing prior to each shift (or more often as the CP directs) in excavations 4 ft or deeper where oxygen deficiency or gaseous conditions are known or suspected, with a log maintained at the work site (25-5.c)

• Documented pre-work inspection of confined space equipment: atmospheric monitor with calibration record, ventilation, PPE, fall protection, lighting, entry/egress ladders, barriers, and rescue equipment (34-5)

• Periodic inspections of energy control procedures by an Authorized Individual not using the procedure being inspected (12-5.b)

• Daily mobile equipment walk-around inspections per Ch 18

Competent / Qualified Person Requirements

• Competent Person, Excavation — develops this AHA and the Excavation and Trenching Plan, performs soil classification and documented inspections, and must be onsite at all times while excavation or trenching work is performed (25-4.a, 25-4.a(9)); the AHA must identify the CP and their credentials (25-6.c)

• Qualified Person — designs Class I perimeter protection against vehicle/equipment intrusion and equipment access ramps (25-4.b)

• Registered Professional Engineer — required for sloping/benching or support system design over 20 ft depth, excavation below adjacent footings, and planning/directing dewatering measures (25-4.c)

• Confined Space Entry Supervisor and trained Attendants/Entrants for manhole and vault entry (34-3.d, 34-3.e, 34-3.f)

• Authorized Individuals for lockout/tagout under the Site-Specific Energy Control Plan (Ch 12, 12-3)

References

• EM 385-1-1 (2024) Ch 25 — Excavation and Trenching

• EM 385-1-1 (2024) 25-6 — Activity Hazard Analysis (AHA) Requirements — AHA developed by the Competent Person

• EM 385-1-1 (2024) 25-7 — Minimum Plan Requirements — Excavation and Trenching Plan (mandatory at depths of 5 ft or more)

• EM 385-1-1 (2024) 25-8.f — Underground Utilities — dig permits, utility locates, physical verification within 3 ft, neutralizing the utility

• EM 385-1-1 (2024) Ch 34 — Confined Space (manhole and vault entry)

• EM 385-1-1 (2024) Ch 12 — Control of Hazardous Energy (utility tie-ins)

- 29 CFR 1926 Subpart P (1926.650–.652) — Excavations
- 29 CFR 1926.651(b) — Specific excavation requirements — underground installations (utility locates)
- 29 CFR 1926.652 — Requirements for protective systems