

4.0 Hazard Communication



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HAZARD COMMUNICATION PROGRAM

The purpose of this program is to ensure that potential hazards and hazard control measures for chemicals used by KE&G are understood by KE&G employees.

The written program is available for employee review at any time. It is located in Sierra Vista, Arizona and the Safety Manager's office in Tucson. A copy of the program will be provided to any employee or employee representative, upon request. Additional job sites may also request a copy of the HAZCOM program.

CONTAINER LABELING:

The KE&G Purchasing Agent will verify that all containers received for use by this company will:

- Be clearly labeled as to the contents, matching identification on SDS;
- Note the appropriate hazard warnings;
- List the name and address of the manufacturer.

No containers will be released for use until the above data is verified.

COR

SuperClean Anything Cleaner
 MSDS #: 84945 PPE: Gloves
 Mix: 1oz./32 oz.
 Super Chemical Corporation
 123 Chemical Drive
 New York, NY 34344
 Emergency Phone: 800-555-5555

Target: Lungs, Stomach
Contents:
 Sodium Chloride, Benzene, Petroleum

Directions:
 IF SWALLOWED: Induce vomiting, contact physician.
 IF SKIN CONTACT: Wash thoroughly with cold water and soap, contact physician if irritation occurs.

ABC Cleaning Corporation

ZEP MANUFACTURING COMPANY
 Safety Data Sheet Products Group, Inc.
 P.O. Box 2014
 ATLANTA, GA 30301
 1-877-747-7277

Material Safety Data Sheet
 and Safe Handling and Disposal Information

Section 1. Chemical Product and Company Identification
 Product name: ZEP RUST REMOVER
 Product Code: 1470 Date of Issue: 01/01/01
 Version: 1.00 Supersedes: 01/01/01
 Product Use: Rust Remover
 Emergency Telephone Numbers: For MSDS Information: Acety Specialty Products Group, Inc. Compliance Services 1-877-482V-ZEP
 For Medical Emergency: CHEMTREC (877) 541-2323 Toll Free - All Calls Recorded
 For a Transportation Emergency: CHEMTREC (800) 424-9300 - All Calls Recorded in the District of Columbia (202) 462-7676
 Prepared by: Compliance Services Group Acety Specialty Products Group, Inc. 123 Chemical Drive, New York, NY 34344

Section 2. Composition, Information on Ingredients

Name of Hazardous Ingredients (10% or greater)	CAS #	% by Weight	Exposure Limits
Hydrochloric Acid	7647-01-0	10%	TLV-TWA (10 mg/m ³) TLV-STEL (15 mg/m ³) STEL 1 mg/m ³

Section 3. Hazard Identification

Hazard Effects	Hazardous Effects	GHS	
		Pictogram	Hazard Statement
Toxic	Hazardous if inhaled (respiratory). Skin contact may produce severe irritation. Corrosive.		H302: Harmful if swallowed
Eye	Hazardous in case of eye contact (irritation). Eye exposure may cause severe and permanent eye injury. Causes severe eye irritation.		H314: Causes severe eye irritation
Respiratory	Hazardous if inhaled (respiratory). Inhalation of the spray may produce severe irritation of the respiratory tract, the mucous membranes of the nose and throat. Liquid in spray may produce severe temporary irritation of the mucous membranes of the nose and throat. May be fatal if inhaled.		H332: Irritating to the respiratory tract

Section 4. First Aid Measures

Eye Contact: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if necessary.

Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention if irritation develops.

Inhalation: If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If breathing is difficult, give oxygen. Get medical attention if irritation develops.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If effects persist, a physician should be consulted.

SAFETY DATA SHEETS:

Copies of SDS's for all hazardous chemicals to which employees may be exposed will be kept at each job site. Subcontractors will also provide a listing of all chemicals being utilized. Also:

- SDS's for the new chemicals are available;
- SDS's will be available for review by all employees during each work shift;
- A complete copy of this program will be inserted in the Safety Manual
- Copies will be available on request.

EMPLOYEE TRAINING AND INFORMATION:

Each employee will be provided the following information and training before working in areas where hazardous chemicals exist. In addition if a new hazardous material is introduced into the work place, affected employees will be given new information and training concerning that material.

Minimum Information Provided:

- All operations and locations in the work area where hazardous chemicals are present and used.
- The location and availability of the written hazard communication program, including lists of hazardous chemicals used and related material safety data sheets (MSDS).

- The method the company will use to inform employees of potential hazards of non-routine tasks (jobs that are not routine for an individual because of infrequency, location or type).

Minimum Training Provided:

- Methods and observations used to detect the presence or release of a hazardous chemical in the work area (such as company monitoring programs, continuous monitoring devices, visual appearance, odor or other characteristics of hazardous chemicals).
- The physical and health hazards of chemicals in the assigned work area.
- The measures to take to protect against such hazards, including specific company procedures concerning work practices, emergencies and care and use of protective equipment.
- Details of the KE&G Hazard Communication Program, including explanation of the labeling system, the Safety Data Sheets and how to obtain the use of the appropriate hazard data.

Upon completion of the training, each employee will sign a form acknowledging receipt of the written hazard communication program and related training.

HAZARDOUS NON-ROUTINE TASKS:

If KE&G employees are required to do hazardous non-routine tasks, such as welding in confined spaces or cleaning of tanks, the employer must address how the employees doing the work will be informed about the specific hazards to which they will be exposed, what personal protective equipment will be provided and who will be responsible to oversee the operation or operations.

INFORMING KE&G:

It is the responsibility of all subcontractors to provide KE&G and their employees with the following information:

- Hazardous chemicals to which they may be exposed while on the job site;
- Measures the employees may take to lessen the possibility of exposure;
- Steps the subcontractor has taken to lessen the risks;
- Where the SDS's are for chemicals to which they may be exposed;
- Procedures to follow if they are exposed.

SUBCONTRACTORS INFORMING EMPLOYEES:

Contractors entering this work place with hazardous materials will supply KE&G with SDS's covering those particular products the subcontractor may expose KE&G employees to while working at this site.

PARTIAL LIST OF HAZARDOUS CHEMICALS IN THE WORK PLACE:

- Acetylene
- Anti Freeze (Propylene Glycol)
- Concrete (Freshly Mixed - Unhardened)
- Carbon Monoxide
- Diesel Fuel
- Gasoline (Leaded)
- Abrasive Wheels ("A" Resin Bonded)
- Abrasive Wheels ("C" Resin Bonded)
- Abrasive Wheels ("A" Rubber Bonded)
- Abrasive Wheels ("C" Rubber Bonded)
- Abrasive Wheels (Diamond Wheel)
- Oxygen (Industrial)
- Welding Rods (P5)
- Welding Rods (LH70)

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SAMPLE TRAINING

O.S.H.A. Hazard Communication Standard

Employee's Right to Know of Hazardous Materials in the Work Place

TRAINING GIVEN TO EACH EMPLOYEE:

The items mentioned below are used as a basis for a comprehensive training given to all present employees and to be given individually to new employees.

VISUAL AIDES:

- i. Safety Data Sheet (SDS)
- ii. Identification of fire hazards of materials.
- iii. Hazardous materials warning labels.

EMPLOYEES NEED TO KNOW:

- i. Reason for hazard communication.
 - ii. How to read SDS sheets, labels, etc.
 - iii. Hazards in the work place.
 - iv. Protective measures against hazards including safety.
 - v. Methods of detecting hazards in the work place.
 - vi. Where employer will keep SDS sheets, lists of hazardous chemicals.
1. Reasons for Hazard Communication.
 - a. Many workers in our industry work with chemicals that are hazardous.
 - b. The employee is not always aware of hazards, protective measures, handling, etc.
 - c. Suppliers and manufacturing concerns are not required to make this information available to employees.

*** *At the end of this lecture, each employee will be required to sign a form stating that he or she received the lecture and understands where information can be obtained.*

2. Safety Data Sheets (SDS)
 - a. Are required for materials that contain:
 - i 1% or more of a hazardous material or
 - ii 0.1% of a carcinogen.

*** *Hand out example of Safety Data Sheet.*

Section 1: Identification

This section identifies the chemical on the SDS as well as the recommended uses. It also provides the essential contact information of the supplier. The required information consists of:

- Product identifier used on the label and any other common names or synonyms by which the substance is known.
- Name, address, phone number of the manufacturer, importer, or other responsible party, and emergency phone number.
- Recommended use of the chemical (e.g., a brief description of what it actually does, such as flame retardant) and any restrictions on use (including recommendations given by the supplier).¹

Section 2: Hazard(s) Identification

This section identifies the hazards of the chemical presented on the SDS and the appropriate warning information associated with those hazards. The required information consists of:

- The hazard classification of the chemical (e.g., flammable liquid, category¹).
- Signal word.
- Hazard statement(s).

- Pictograms (the pictograms or hazard symbols may be presented as graphical reproductions of the symbols in black and white or be a description of the name of the symbol (e.g., skull and crossbones, flame).
- Precautionary statement(s).
- Description of any hazards not otherwise classified.
- For a mixture that contains an ingredient(s) with unknown toxicity, a statement describing how much (percentage) of the mixture consists of ingredient(s) with unknown acute toxicity. Please note that this is a total percentage of the mixture and not tied to the individual ingredient(s).

Section 3: Composition/Information on Ingredients

This section identifies the ingredient(s) contained in the product indicated on the SDS, including impurities and stabilizing additives. This section includes information on substances, mixtures, and all chemicals where a trade secret is claimed. The required information consists of:

Substances

- Chemical name.
- Common name and synonyms.
- Chemical Abstracts Service (CAS) number and other unique identifiers.
- Impurities and stabilizing additives, which are themselves classified and which contribute to the classification of the chemical.

Mixtures

- Same information required for substances.
- The chemical name and concentration (i.e., exact percentage) of all ingredients which are classified as health hazards and are:
 - Present above their cut-off/concentration limits or
 - Present a health risk below the cut-off/concentration limits.
- The concentration (exact percentages) of each ingredient must be specified except concentration ranges may be used in the following situations:
 - A trade secret claim is made,
 - There is batch-to-batch variation, or
 - The SDS is used for a group of substantially similar mixtures.

Chemicals where a trade secret is claimed

- A statement that the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret is required.

Section 4: First-Aid Measures

This section describes the initial care that should be given by untrained responders to an individual who has been exposed to the chemical. The required information consists of:

- Necessary first-aid instructions by relevant routes of exposure (inhalation, skin and eye contact, and ingestion).
- Description of the most important symptoms or effects, and any symptoms that are acute or delayed.
- Recommendations for immediate medical care and special treatment needed, when necessary.

Section 5: Fire-Fighting Measures

This section provides recommendations for fighting a fire caused by the chemical. The required information consists of:

- Recommendations of suitable extinguishing equipment, and information about extinguishing equipment that is not appropriate for a particular situation.
- Advice on specific hazards that develop from the chemical during the fire, such as any hazardous combustion products created when the chemical burns.
- Recommendations on special protective equipment or precautions for firefighters.

Section 6: Accidental Release Measures

This section provides recommendations on the appropriate response to spills, leaks, or releases, including containment and cleanup practices to prevent or minimize exposure to people, properties, or the environment. It may also include recommendations distinguishing between responses for large and small spills where the spill volume has a significant impact on the hazard. The required information may consist of recommendations for:

- Use of personal precautions (such as removal of ignition sources or providing sufficient ventilation) and protective equipment to prevent the contamination of skin, eyes, and clothing.



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- Emergency procedures, including instructions for evacuations, consulting experts when needed, and appropriate protective clothing.
- Methods and materials used for containment (e.g., covering the drains and capping procedures).
- Cleanup procedures (e.g., appropriate techniques for neutralization, decontamination, cleaning or vacuuming; adsorbent materials; and/or equipment required for containment/clean up)

Section 7: Handling and Storage

This section provides guidance on the safe handling practices and conditions for safe storage of chemicals. The required information consists of:

- Precautions for safe handling, including recommendations for handling incompatible chemicals, minimizing the release of the chemical into the environment, and providing advice on general hygiene practices (e.g., eating, drinking, and smoking in work areas is prohibited).
- Recommendations on the conditions for safe storage, including any incompatibilities. Provide advice on specific storage requirements (e.g., ventilation requirements)

Section 8: Exposure Controls/Personal Protection

This section indicates the exposure limits, engineering controls, and personal protective measures that can be used to minimize worker exposure. The required information consists of:

- OSHA Permissible Exposure Limits (PELs), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available.
- Appropriate engineering controls (e.g., use local exhaust ventilation, or use only in an enclosed system).
- Recommendations for personal protective measures to prevent illness or injury from exposure to chemicals, such as personal protective equipment (PPE) (e.g., appropriate types of eye, face, skin or respiratory protection needed based on hazards and potential exposure).
- Any special requirements for PPE, protective clothing or respirators (e.g., type of glove material, such as PVC or nitrile rubber gloves; and breakthrough time of the glove material).

Section 9: Physical and Chemical Properties

This section identifies physical and chemical properties associated with the substance or mixture. The minimum required information consists of:

- Appearance (physical state, color, etc.);
- Upper/lower flammability or explosive limits;
- Odor;
- Vapor pressure;
- Odor threshold;
- Vapor density;
- pH;
- Relative density;
- Melting point/freezing point;
- Solubility(ies);
- Initial boiling point and boiling range;
- Flash point;
- Evaporation rate;
- Flammability (solid, gas);
- Partition coefficient: n-octanol/water;
- Auto-ignition temperature;
- Decomposition temperature; and
- Viscosity.

The SDS may not contain every item on the above list because information may not be relevant or is not available. When this occurs, a notation to that effect must be made for that chemical property. Manufacturers may also add other relevant properties, such as the dust deflagration index (Kst) for combustible dust, used to evaluate a dust's explosive potential

Section 10: Stability and Reactivity

This section describes the reactivity hazards of the chemical and the chemical stability information. This section is broken into three parts: reactivity, chemical stability, and other. The required information consists of:

Reactivity

- Description of the specific test data for the chemical(s). This data can be for a class or family of the chemical if such data adequately represent the anticipated hazard of the chemical(s), where available.

Chemical stability

- Indication of whether the chemical is stable or unstable under normal ambient temperature and conditions while in storage and being handled.
- Description of any stabilizers that may be needed to maintain chemical stability.
- Indication of any safety issues that may arise should the product change in physical appearance.

Other

- Indication of the possibility of hazardous reactions, including a statement whether the chemical will react or polymerize, which could release excess pressure or heat, or create other hazardous conditions. Also, a description of the conditions under which hazardous reactions may occur.
- List of all conditions that should be avoided (e.g., static discharge, shock, vibrations, or environmental conditions that may lead to hazardous conditions).
- List of all classes of incompatible materials (e.g., classes of chemicals or specific substances) with which the chemical could react to produce a hazardous situation.
- List of any known or anticipated hazardous decomposition products that could be produced because of use, storage, or heating. (Hazardous combustion products should also be included in Section 5 (Fire-Fighting Measures) of the SDS.)

Section 11: Toxicological Information

This section identifies toxicological and health effects information or indicates that such data are not available. The required information consists of:

- Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact). The SDS should indicate if the information is unknown.
- Description of the delayed, immediate, or chronic effects from short- and long-term exposure.
- The numerical measures of toxicity (e.g., acute toxicity estimates such as the LD50 (median lethal dose)) - the estimated amount [of a substance] expected to kill 50% of test animals in a single dose.
- Description of the symptoms. This description includes the symptoms associated with exposure to the chemical including symptoms from the lowest to the most severe exposure.
- Indication of whether the chemical is listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest editions) or found to be a potential carcinogen by OSHA

Section 12: Ecological Information (non-mandatory)

This section provides information to evaluate the environmental impact of the chemical(s) if it were released to the environment. The information may include:

- Data from toxicity tests performed on aquatic and/or terrestrial organisms, where available (e.g., acute or chronic aquatic toxicity data for fish, algae, crustaceans, and other plants; toxicity data on birds, bees, plants).
- Whether there is a potential for the chemical to persist and degrade in the environment either through biodegradation or other processes, such as oxidation or hydrolysis.
- Results of tests of bioaccumulation potential, making reference to the octanol-water partition coefficient (Kow) and the bioconcentration factor (BCF), where available.
- The potential for a substance to move from the soil to the groundwater (indicate results from adsorption studies or leaching studies).
- Other adverse effects (e.g., environmental fate, ozone layer depletion potential, photochemical ozone creation potential, endocrine disrupting potential, and/or global warming potential).

Section 13: Disposal Considerations (non-mandatory)

This section provides guidance on proper disposal practices, recycling or reclamation of the chemical(s) or its container, and safe handling practices. To minimize exposure, this section should also refer the reader to Section 8 (Exposure Controls/Personal Protection) of the SDS. The information may include:

- Description of appropriate disposal containers to use.
- Recommendations of appropriate disposal methods to employ.
- Description of the physical and chemical properties that may affect disposal activities.
- Language discouraging sewage disposal.
- Any special precautions for landfills or incineration activities

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Section 14: Transport Information (non-mandatory)

This section provides guidance on classification information for shipping and transporting of hazardous chemical(s) by road, air, rail, or sea. The information may include:

- UN number (i.e., four-figure identification number of the substance)¹.
- UN proper shipping name¹.
- Transport hazard class(es)¹.
- Packing group number, if applicable, based on the degree of hazard².
- Environmental hazards (e.g., identify if it is a marine pollutant according to the International Maritime Dangerous Goods Code (IMDG Code)).
- Guidance on transport in bulk (according to Annex II of MARPOL 73/78³ and the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (International Bulk Chemical Code (IBC Code))).
- Any special precautions which an employee should be aware of or needs to comply with, in connection with transport or conveyance either within or outside their premises (indicate when information is not available).

Section 15: Regulatory Information (non-mandatory)

This section identifies the safety, health, and environmental regulations specific for the product that is not indicated anywhere else on the SDS. The information may include:

- Any national and/or regional regulatory information of the chemical or mixtures (including any OSHA, Department of Transportation, Environmental Protection Agency, or Consumer Product Safety Commission regulations)

Section 16: Other Information

This section indicates when the SDS was prepared or when the last known revision was made. The SDS may also state where the changes have been made to the previous version. You may wish to contact the supplier for an explanation of the changes. Other useful information also may be included here.

This material is available for inspection but may not be removed from the **Safety Manager's Office**.

The **Safety Manager** and Supervisors will be able to assist you if you have any questions.

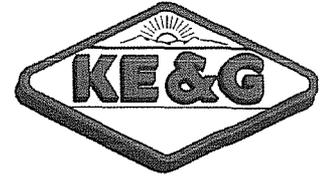
***Ask employee if he or she has any questions and whether he or she fully understands the information you have given him or her.*

***Employee must then sign Hazard Communication Training Completion Form. (See sample form on page 110)*

5.0 Excavation & Trenching



5.0 Excavation & Trenching



EXCAVATION & TRENCHING PROGRAM

INTRODUCTION

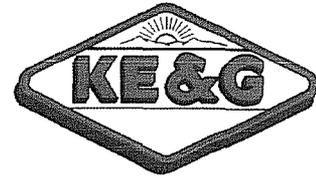
1. This program establishes the minimum requirements for all work in excavations and trenches which may expose employees to the hazards of moving ground.
2. This program incorporates the pertinent requirements of the applicable State and Federal safety regulations for excavations and trenching.
3. Deviations from the requirements of this program or the applicable regulations and all excavations and trenches deeper than 20 feet will be constructed and maintained in accordance with the design prepared by a **registered professional engineer**.

DEFINITIONS THAT APPLY TO THIS SUPPLEMENT

1. **ALUMINUM HYDRAULIC SHORING.** A pre-engineered shoring system comprised of aluminum hydraulic cylinders (cross braces) use in conjunction with vertical rails (uprights) or horizontal rails (wales). Such system is designed specifically to support the side walls of an excavation and prevent cave-ins.
2. **BENCHING.** A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal steps, usually with vertical or near vertical surfaces between levels.
3. **CAVE-IN.** The separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.
4. **CEMENTED SOIL.** A soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand size sample cannot be crushed into powder or individual particles by finger pressure.
5. **COHESIVE SOIL.** Clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical side slopes and is plastic when moist. Cohesive soil is hard to break up when dry and exhibits significant cohesion when submerged. Cohesive soils include clay silt, sandy clay, silt clay, clay and organic clay
6. **COMPETENT PERSON.** One who is capable of identifying existing or predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
7. **CROSS BRACES.** The horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.
8. **DRY SOIL.** Soil that does not exhibit visible signs of moisture content.
9. **EXCAVATION.** Any man made cut, cavity, trench or depression in the earth surface, formed by earth removal.
10. **FACES OR SIDES.** The vertical or inclined earth surfaces formed as a result of excavation work.
11. **FAILURE.** The breakage, displacement or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.
12. **FISSURED.** A soil material that has a tendency to break along definite planes of fracture with little resistance or material that exhibits open cracks, such as tension cracks, in as exposed surface.
13. **GRANULAR SOIL.** Gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.
14. **HAZARDOUS ATMOSPHERE.** An atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic or otherwise harmful, may cause death, illness or injury.
15. **LAYERED SYSTEM.** Two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.
16. **PLASTIC.** A property of a soil which allows the soil to be deformed or molded without cracking or appreciable volume change.

17. **PROTECTIVE SYSTEM.** A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems and other systems that provide the necessary protection.
18. **REGISTERED PROFESSIONAL ENGINEER.** A person who is registered as a professional engineer in the state where the work is being performed. However, a professional engineer, registered in any state is deemed to be a "registered" professional engineer within the meaning of this standard when approving designs for manufactured protective systems or tabulated data used in interstate commerce.
19. **SATURATED SOIL.** A soil in which the voids between the particles are filled with water. Saturation does not require flow. Saturation or near saturation is necessary for the proper use of instruments such as a pocket penetrometer or shear vane.
20. **SHIELD.** A structure that is able to withstand the forces imposed on it by a cave-in and thereby protects employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as the work progresses. Shields can be pre-manufactured or job built in accordance with Section C3. Of this program.
21. **SHORING.** A structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.
22. **SLOPING.** A method of protecting employees from cave-ins by excavating to form sides of an excavation that is inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure and application of surcharge loads.
23. **STABLE ROCK.** Natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving in or movement by rock bolts or by another protective system that has been designed by registered professional engineer.
24. **SUPPORT SYSTEM.** A structure such as underpinning, bracing or shoring which provides support to an adjacent structure, underground installation or the sides of an excavation.
25. **TABULATED DATA.** Tables and charts approved a registered professional engineer and used to design or construct a protective system.
26. **TRENCH.** A narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet. *If forms or other structures are installed so as to reduce the dimensions measured from the forms or structure to the side of the excavation to 15 feet or less, an excavation is considered a trench.*
27. **TYPE A SOIL.** Cohesive soils with an unconfined compressive strength of 1.5 tons per square foot (TSF) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam, and in some cases silty clay loam and sandy clay loam. Cemented soils such as caliche and hard pan are also considered Type A. However, no soil is Type A if:
 - a. The soil is fissured; or
 - b. The soil is subject to vibration from heavy traffic, pile driving or similar effects; or
 - c. The soil has been previously disturbed; or
 - d. The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
 - e. The material is subject to other factors that would require it to be classified as a less stable material.
28. **TYPE B SOIL.** Cohesive soil with an unconfined compressive strength greater than 0.5 TSF but less than 1.5 TSF; or, Granular cohesion less soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and in some cases, silty clay loam and sandy clay loam; or Previously disturbed soils except those which would otherwise be classed as Type C soil; or Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or, Dry rock that is not stable; or Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.
29. **TYPE C SOIL.** Cohesive soil with an unconfined compressive strength of 0.5 TSF or less; or, Granular soils including gravel, sand and loamy sand; or, Submerged soils including soil from which water is

5.0 Excavation & Trenching

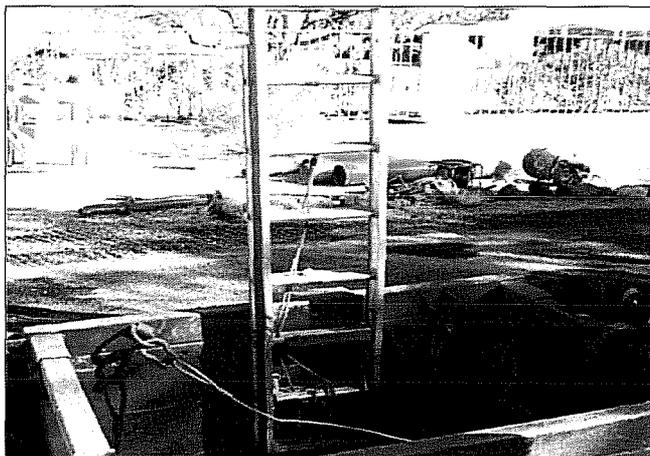


freely seeping; or, Submerged rock that is not stable; or, Material in a sloped, layered system where the layers dip into the excavation at a slope of four horizontal to one vertical (4H: 1V) or steeper.

30. **UNCONFINED COMPRESSIVE STRENGTH.** The load per unit area at which a soil will fail in compression. UCS can be determined by laboratory testing, or by using a pocket penetrometer, shearvane, or thumb penetration test.
31. **UPRIGHTS.** The vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced in contact with or interconnected to each other are often called "sheeting."
32. **WALES.** Horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or the earth.

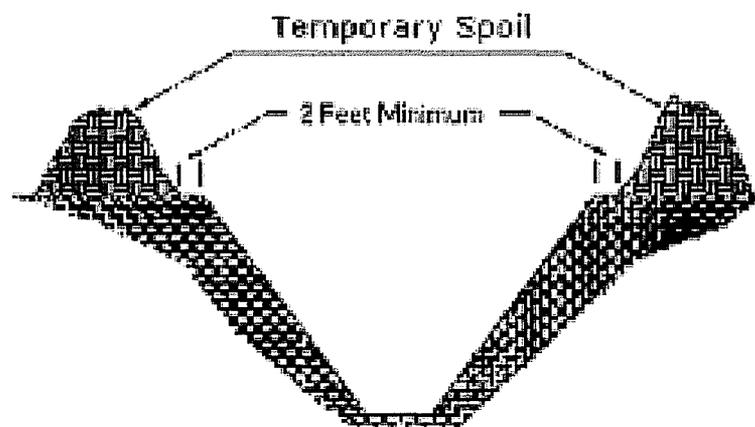
GENERAL REQUIREMENTS

1. All **SURFACE ENCUMBRANCES** (rocks, trees, telephone poles, fire hydrants, etc.) adjacent to an excavation that may create a hazard to employees will be removed, secured or supported, as necessary, to protect employees.
2. The estimated location of **UNDERGROUND INSTALLATIONS**, such as sewer, telephone, electric, water or other underground utilities will be identified prior to opening an excavation. The regional ONE CALL CENTER notification center in the area and the owners of underground facilities who may not participate in the regional ONE CALL CENTER program will be notified of proposed excavation at least 2 working days prior to the start of excavation operations. When excavations approach the estimated location of underground installations the exact location will be determined by probing or hand digging, as necessary, to prevent accidental contact with the underground installations. While the excavation is open, underground installations that create a hazard to employees will be supported, protected or removed, as necessary to protect employees.
3. Appropriate **ACCESS AND EGRESS** in the form of a stairway, ladder or ramp will be provided in all excavation deeper than 4 feet. In trenches the stairway, ladder or ramp must be within 25 feet of employees and extend above the trench a minimum of 3feet, access and egress shall not exceed 25ft of lateral travel.
4. Employees will wear Personal Protective Equipment (safety vests, hardhats, gloves or other authorized equivalent high visibility apparel) on all jobsites, protected from vehicular traffic at all times.
5. Employees will be protected from **EXPOSURE TO FALLING LOADS** that may be dropped by lifting or excavation equipment.



6. A **WARNING SYSTEM FOR MOBILE EQUIPMENT**, such as barricades, signals, stop logs and backup alarms will be provided when equipment is operated adjacent to an excavation and the operator does not have a clear and direct view of the edge of the excavation.

7. Excavations deeper than 4 feet will be tested, as necessary, to identify and prevent exposure to **HAZARDOUS ATMOSPHERES. EMERGENCY RESCUE EQUIPMENT** such as rescue breathing apparatus, a safety harness and line or a basket stretcher, will be available at the work site where a hazardous atmosphere exists or is reasonably expected to develop in an excavation.
8. Employees will not work in excavations where they will be exposed to the **HAZARDS ASSOCIATED WITH WATER ACCUMULATION**. If water accumulation in an excavation is controlled using pumps, the operation of the pumps will be continuously monitored by a competent person.
9. The **STABILITY OF ADJACENT STRUCTURES** such as buildings, walls, and sidewalks will be maintained using a support system, as necessary to protect employees.
10. Employees will be protected from **LOOSE ROCK OR SPOIL** that could fall or roll into the excavation by placing and keeping such material at least 2 feet from the edge of the excavation.



11. **DAILY INSPECTIONS** of trench and excavations fall under the responsibilities of the competent person, to identify and eliminate conditions that could result in possible cave-ins, failure of support systems, hazardous atmospheres or other unsafe conditions. Inspections will be conducted before the start of work each day and after every rain storm or other occurrence that may increase the hazard of moving ground. The results of the inspections will be recorded in the KE&G Daily Trench and Excavation Log (*see sample of log on page 88*). The original copy of the log will be forwarded to the Safety Manager for review and filing.
12. Where employees or equipment are allowed or required to cross over excavations appropriate **FALL PROTECTION** in the form of walkways or bridges with standard guardrails will be provided.

REQUIREMENTS FOR PROTECTIVE SYSTEMS

1. Sloping, shoring or shielding will be provided for **PROTECTION OF EMPLOYEES IN EXCAVATIONS** except where the excavation is made in stable rock or the excavation is less than 5 feet deep and an **examination by a competent person** does not indicate any potential for cave-in.
2. When sloping or benching is chosen as the method to protect employees in an excavation one of the following optional **DESIGNS OF SLOPING AND BENCHING SYSTEMS WILL BE USED**:
 - Option 1 - Sloping the excavation at an angle of one and one half horizontal to one vertical or flatter.
 - Option 2 - Performing a soil classification and determining the acceptable slopes using the tables located under SLOPING AND BENCHING section.
 - Option 3 - The project specific design prepared by a **registered professional engineer**. Engineered designs must be in writing and must include the name and registration number of the engineer, detailed plans and the calculations used in the design, the magnitude of slopes and the configurations determined to be safe. A copy of the design will be maintained at the jobsite during the use of the engineered system.

**see figures on pages 40-42*

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3. When a shoring or shielding system is chosen as the method to protect employees in an excavation one of the following optional **DESIGNS OF SUPPORT SYSTEMS, SHIELD SYSTEMS AND OTHER PROTECTIVE SYSTEMS** will be used: **Performed by a Competent Person**
 - Option 1 - Performing a soil classification and determining the appropriate aluminum hydraulic shoring configuration using the shoring manufacture's tabulated data or Section F of this program.
When using the manufacture's tabulated data the shoring system must be installed in accordance with all the specifications, recommendations, limitations or approvals to deviate issued by the manufacture. If used, the manufacture's tabulated data, specifications, recommendations, limitations and any written approval to deviate from any of them shall be in writing and maintained at the jobsite during the use of the shoring system.
 - Option 2 - The project specific design prepared by a **registered professional engineer**. Engineered designs must be in writing and must include the name and registration number of the engineer, detailed plans and the calculations used in the design and the sizes, types and configurations of materials to be used in the support system. A copy of the design will be maintained at the jobsite during the use of the engineered system.
4. The **MATERIALS AND EQUIPMENT** used for protective systems will be free of damage or defects that might impair their proper function. Manufactured materials and equipment will be maintained in accordance with the recommendations of the manufacturer. If material or equipment used in a protective system is damaged, altered or repaired it must be inspected by a competent person before being reused.
5. The **INSTALLATION AND REMOVAL OF SUPPORTS** will be performed in accordance with **all** of the following:
 - a. Members of support systems will be securely fastened together, as necessary, to prevent sliding, falling, kick outs or other predictable failures.
 - b. Support systems will be installed and removed in a manner that protects employees from cave-ins, structural collapses or being struck by members of the support system.
 - c. Individual members of support systems will not exceed their design capacity.
 - d. Before temporary removal of individual members begins, additional precautions will be taken to protect employees, including installing other structural members to support any additional load imposed on the support system.
 - e. Removal will begin at, and progress from, the bottom of the excavation. Members will be released slowly to reduce the likelihood of failure of the remaining members or a cave-in.
 - f. Backfilling will progress together with the removal of support systems.
 - g. Support systems will be closely coordinated with the excavation of trenches and will extend to within 2 feet of the bottom of the trench, but only if the system is designed to resist the forces calculated for the full depth of trench, and there is no indication that there is a loss of soil from behind or below the bottom of the support system.
6. **SHIELD SYSTEMS** will not be subjected to loads exceeding their design capacity. Shields will be installed in a manner that restricts lateral or hazardous movement in the event of the application of a sudden lateral load. Employees will remain in the shields at all times and must be protected when entering or exiting the areas protected by a shield. Employees will not be allowed in shields that are being installed, removed or moved vertically. When shield systems are used in trenches, excavation of material to a depth of not more than 2 feet below the bottom of the shield is permitted only if the shield is designed to resist the forces calculated for the full depth of trench, and there is no indication that there is a loss of soil from behind or below the bottom of the shield.

SOIL CLASSIFICATION

1. This section describes a method of classifying soil and rock deposits based on site and environmental conditions and on the structure and composition of the earth deposits. This section contains definitions, establishes requirements and describes acceptable visual and manual tests for use in classifying soils.
2. This section applies and must be used when designing a sloping or benching system in accordance with Option 2 or 3 of Section C 2 or a support or shield system in accordance with Option 1 or 2 of Section C 3 of this program. **A soil classification using this section is not necessary for excavations sloped at an angle of one and one half horizontal to one vertical or flatter.**

3. The classification of soil and rock deposits will be made based on the results of at least one visual and one manual analysis. These analyses will be conducted by a **competent person** using the tests described in this program or other approved methods of soil classification such as those adopted by the ASTM or the USDA.
4. The visual and manual analyses will be chosen and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors and conditions affecting the classification of the deposits.
5. When classifying a layered system the classification is based on the weakest layer. However, each layer may be classified individually when the more stable layer lies below a less stable layer.
6. If, after classifying a deposit, the properties, factors, or conditions change in any way, the changes will be evaluated by a **competent person**. The deposit will be reclassified, as necessary, to reflect the changed circumstances.
7. Visual analysis is conducted to collect qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the excavation and soil taken as samples from the excavated material. The visual analysis includes all of the following:
 - a. Observe samples of the soil that are excavated and soil in the sides of the excavation to estimate the range of particle sizes and the relative amounts of particle sizes. Fine grained material is cohesive.
 - b. Observe the soil as it is excavated to determine if it stays in clumps. Soil that breaks up easily and does not stay in clumps is granular.
 - c. Observe the side of the opened excavation and the surface area adjacent to the excavation to identify tension cracks or fissured material.
 - d. Observe the area adjacent to the excavation and the excavation itself to identify existing underground utilities, structures, or previously disturbed soils.
 - e. Observe the opened sides of the excavation to identify layered systems. Examine layered systems to determine if the layers slopes toward the excavation, if so, estimate the degree of slope in the layers.
 - f. Observe the area adjacent to the excavation and the area within the excavation to identify potential sources of vibration that may affect the stability of the excavation.
8. Manual analysis is conducted to collect quantitative as well as qualitative information regarding the properties of the soil and to provide more information in order to properly classify the soil. The manual analysis usually includes some or all of the following.
 - a. Evaluate the soils plasticity by molding a moist or wet sample of soil into a ball and attempting to roll it into threads as thin as 1/8 inch diameter. Cohesive material can be rolled into thread at least two inches long without crumbling or breaking.
 - b. If the soil is dry and it crumbles on its own or with moderate pressure into individual grains or fine powder it is granular. If the soil is dry and falls into clumps which break into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand, or silt. If the dry soil breaks into small clumps which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.
 - c. The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. Type A soils with an unconfined compressive strength of 1.5 TSF can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 TSF can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of soil, as soon as possible after excavation to keep to a minimum the effects of drying. If the excavation is later exposed to wetting influences (rain, flooding, watering), the classification of the soil must be changed accordingly.
 - d. Estimates of the unconfined compressive strength of soils can also be obtained by using a pocket penetrometer or a hand operated shearvane in accordance with the manufacturer's recommendations.
 - e. A drying test can be used to differentiate between cohesive material with fissures, unfissured cohesive material and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick and six inches in diameter until it is thoroughly dry:
 - i. If the sample develops cracks as it dries significant fissures are indicated.
 - ii. Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break the sample, the soil has significant cohesive material content. The soil can

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be classified as unfissured cohesive material and the unconfined compressive strength should be determined.

- iii. If the sample breaks easily by hand, it is either a fissures cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

SLOPING AND BENCHING

1. This section contains the specifications for sloping and benching when used as a method of protecting employees working in excavations. **THESE SLOPE AND BENCH SPECIFICATIONS ONLY APPLY IF A SOIL CLASSIFICATION HAS BEEN CONDUCTED.**
2. The maximum allowable slope based on the soil classification will be determined using the following table:

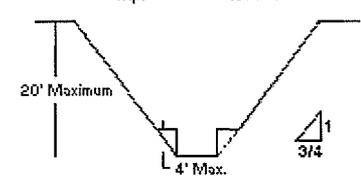
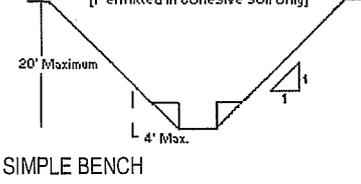
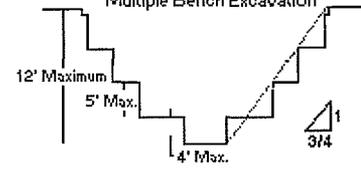
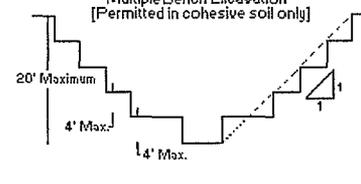
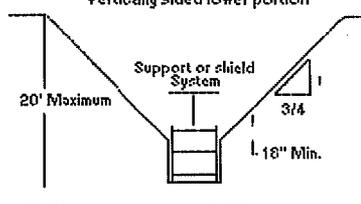
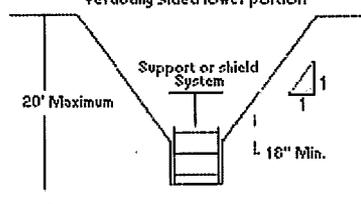
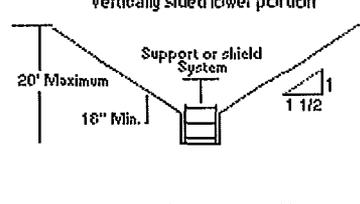
MAXIMUM ALLOWABLE SLOPES

SOIL OR ROCK TYPE	MAXIMUM ALLOWABLE SLOPES (H:V)[1] FOR EXCAVATIONS LESS THAN 20 FEET DEEP [3]
STABLE ROCK	VERTICAL (90 DEGREES)
TYPE A (2)	3/4:1 (53 DEGREES)
TYPE B	1:1 (45 DEGREES)
TYPE C	1-1/2:1 (34 DEGREES)

NOTES:

1. The numbers shown in parentheses next to the maximum allowable slopes are angles expressed in degrees from the horizontal. The angles have been rounded off
2. A short term-maximum allowable slope of 1/2:1 (63 degrees) is allowable in excavations in Type A soil less than 12 feet deep. Short-term maximum allowable slopes for excavation deeper than 12 feet will be 3/4:1 (53 degrees.)
3. Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.
4. Allowable slope or bench configuration based on the soil classification will be determined using the following figures:

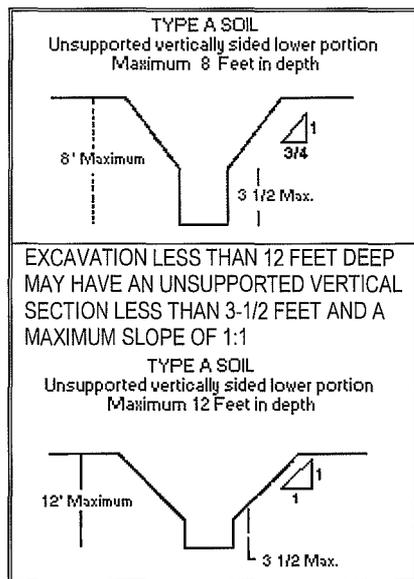
EXCAVATIONS IN TYPE A SOIL	EXCAVATIONS IN TYPE B SOIL	EXCAVATIONS IN TYPE C SOIL
<p>SIMPLE SLOPES LESS THAN 20 FEET DEEP WILL HAVE A MAXIMUM SLOPE OF 3/4:1</p> <p>TYPE A SOIL Simple Slope Excavation</p> <p>20' Maximum</p> <p>3/4:1</p> <p>SIMPLE SLOPE</p>	<p>SIMPLE SLOPES LESS THAN 20 FEET DEEP WILL HAVE A MAXIMUM SLOPE OF 1:1</p> <p>TYPE B SOIL Simple Slope Excavation</p> <p>20' Maximum</p> <p>1:1</p> <p>SIMPLE SLOPE</p>	<p>SIMPLE SLOPES LESS THAN 20 FEET DEEP WILL HAVE A MAXIMUM SLOPE OF 1-1/2:1</p> <p>TYPE C SOIL Simple Slope Excavation</p> <p>20' Maximum</p> <p>1-1/2:1</p> <p>SIMPLE SLOPE</p>
<p>EXCEPTION: SHORT-TERM SIMPLE SLOPES LESS THAN 12 FEET DEEP HAVE A MAXIMUM SLOPE OF 1/2:1</p> <p>TYPE A SOIL Simple Slope -- Short Term</p> <p>12' Maximum</p> <p>1/2:1</p> <p>SIMPLE SLOPE SHORT-TERM</p>	<p>EXCAVATIONS IN TYPE B SOIL</p>	<p>EXCAVATIONS IN TYPE C SOIL</p>
<p>BENCHED EXCAVATIONS LESS THAN 20 FEET DEEP WILL HAVE A MAXIMUM</p>	<p>BENCHED EXCAVATIONS LESS THAN 20 FEET DEEP WILL HAVE A MAXIMUM</p>	<p>BENCHED EXCAVATIONS ARE NOT ALLOWED</p>

<p>SLOPE OF 3/4:1</p> <p>TYPE A SOIL Simple Bench Excavation</p>  <p>20' Maximum</p> <p>4' Max.</p> <p>3/4</p> <p>1</p> <p>SIMPLE BENCH</p>	<p>SLOPE OF 1:1</p> <p>TYPE B SOIL Single Bench Excavation [Permitted in cohesive soil only]</p>  <p>20' Maximum</p> <p>4' Max.</p> <p>1</p> <p>1</p> <p>SIMPLE BENCH</p>	
<p>TYPE A SOIL Multiple Bench Excavation</p>  <p>12' Maximum</p> <p>5' Max.</p> <p>4' Max.</p> <p>3/4</p> <p>1</p> <p>MULTIPLE BENCH</p>	<p>TYPE B SOIL Multiple Bench Excavation [Permitted in cohesive soil only]</p>  <p>20' Maximum</p> <p>4' Max.</p> <p>4' Max.</p> <p>1</p> <p>1</p> <p>MULTIPLE BENCH</p>	<p>BENCHED EXCAVATIONS ARE NOT ALLOWED</p>
<p>SUPPORTED OR SHIELDED EXCAVATIONS LESS THAN 20 FEET DEEP WILL HAVE A MAXIMUM SLOPE OF 3/4:1</p> <p>TYPE A SOIL Supported or shielded Vertically sided lower portion</p>  <p>20' Maximum</p> <p>Support or shield System</p> <p>18" Min.</p> <p>3/4</p> <p>1</p> <p>SUPPORTED LOWER PORTION</p>	<p>SUPPORTED OR SHIELDED EXCAVATIONS LESS THAN 20 FEET DEEP WILL HAVE A MAXIMUM SLOPE OF 1:1</p> <p>TYPE B SOIL Supported or shielded Vertically sided lower portion</p>  <p>20' Maximum</p> <p>Support or shield System</p> <p>18" Min.</p> <p>1</p> <p>1</p> <p>SUPPORTED LOWER PORTION</p>	<p>SUPPORTED OR SHIELDED EXCAVATIONS LESS THAN 20 FEET DEEP WILL HAVE A MAXIMUM SLOPE OF 1-1/2:1</p> <p>TYPE C SOIL Supported or shielded Vertically sided lower portion</p>  <p>20' Maximum</p> <p>Support or shield System</p> <p>18" Min.</p> <p>1 1/2</p> <p>1</p> <p>SUPPORTED LOWER PORTION</p>
<p>THE SUPPORT OR SHIELD MUST EXTEND AT LEAST 18 INCHES ABOVE THE VERTICAL SIDE.</p>	<p>THE SUPPORT OR SHIELD MUST EXTEND AT LEAST 18 INCHES ABOVE THE VERTICAL SIDE.</p>	<p>THE SUPPORT OR SHIELD MUST EXTEND AT LEAST 18 INCHES ABOVE THE VERTICAL SIDE.</p>

THESE CONFIGURATIONS MAY ONLY BE USED IN TYPE A SOIL

EXCAVATIONS IN TYPE A SOIL
EXCAVATION LESS THAN 8 FEET DEEP
MAY HAVE AN UNSUPPORTED VERTICAL
SECTION LESS THAN 3-1/2 FEET AND A
MAXIMUM SLOPE OF 3/4:1

5.0 Excavation & Trenching



ALUMINUM HYDRAULIC SHORING

WALER SYSTEMS FOR TYPE B SOIL

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS		
	VERTICAL SPACING	SECTION MODULUS	WIDTH OF TRENCH (FEET)						HORIZONTAL SPACING		
			UP TO 8		8 TO 12		12 TO 15		SOLID SHEET	2 FEET	3 FEET
			HORIZ. SPACING	CYL. DIA.	HORIZ. SPACING	CYL. DIA.	HORIZ. SPACING	CYL. DIA.			
OVER 5 UP TO 10	4	3.5	8.0	2 IN	8.0	2 IN [2]	8.0	3 IN			
		7.0	9.0	2 IN	8.0	2 IN [2]	9.0	3 IN			
		14.0	12.0	3 IN	12.0	3 IN	12.0	3 IN			
OVER 10 UP TO 15	4	3.5	6.0	2 IN	6.0	2 IN [2]	6.0	3 IN	---	3X12	---
		7.0	8.0	3 IN	8.0	3 IN	8.0	3 IN			
		14.0	10.0	3 IN	10.0	3 IN	10.0	3 IN			
OVER 15 UP TO 20	4	3.5	5.5	2 IN	5.5	2 IN [2]	5.5	3 IN	3X12	---	---
		7.0	6.0	3 IN	6.0	3 IN	6.0	3 IN			
		14.0	9.0	3 IN	9.0	3 IN	9.0	3 IN			
OVER 20	NOTE [1]										

WALER SYSTEMS FOR TYPE C SOIL

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS		
	VERTICAL SPACING	SECTION MODULUS	WIDTH OF TRENCH (FEET)						HORIZONTAL SPACING		
			UP TO 8		8 TO 12		12 TO 15		SOLID SHEET	2 FEET	3 FEET
			HORIZ. SPACING	CYL. DIA.	HORIZ. SPACING	CYL. DIA.	HORIZ. SPACING	CYL. DIA.			
OVER 5 UP TO 10	4	6.0	8.0	2 IN	8.0	2 IN [2]	8.0	3 IN			
		6.5	9.0	2 IN	8.0	2 IN [2]	9.0	3 IN			
		10.0	12.0	3 IN	12.0	3 IN	12.0	3 IN			
OVER 10 UP TO 15	4	4.0	6.0	2 IN	6.0	2 IN [2]	6.0	3 IN	---	3X12	---
		5.5	8.0	3 IN	8.0	3 IN	8.0	3 IN			
		8.0	10.0	3 IN	10.0	3 IN	10.0	3 IN			
OVER 15 UP TO 20	4	3.5	5.5	2 IN	5.5	2 IN [2]	5.5	3 IN	3X12	---	---
		5.0	6.0	3 IN	6.0	3 IN	6.0	3 IN			
		6.0	9.0	3 IN	9.0	3 IN	9.0	3 IN			
OVER 20	NOTE [1]										

1. The following footnotes apply to all of the aluminum hydraulic shoring tables:
 - A. Trenches deeper than 20 feet will be constructed and maintained in accordance with the design prepared by a registered professional engineer.
 - B. 2 inch diameter cylinders, at this width, must have structural steel tube (3.5x3.5x0.1875) oversleeves, or structural oversleeves of manufacturer's specification, extending the full, collapsed length.
 - C. Hydraulic cylinders must have at least the following capacities:
 1. 2 inch cylinders will be a minimum 2 inch inside diameter with a safe working capacity of not less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.
 2. 3 inch cylinders will be a minimum 3 inch inside diameter with a safe working capacity of not less than 30,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.
 - D. All spacing indicated is measured center to center.

5.0 Excavation & Trenching

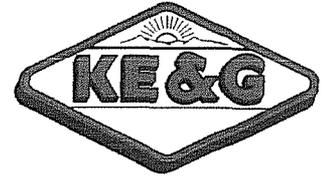


- E. Vertical shoring rails will have a minimum section modulus of 0.40 inch.
- F. When vertical shores are used, there must be a minimum of three shores spaced equally, horizontally, in a group.
- G. Plywood will be 1.125 inches thick of wood or 0.75 inches thick, 14 ply, arctic White Birch (Finland form). Plywood is not intended as a structural member, but only for prevention of local raveling (sloughing of the trench face) between the shores
- H. Timber specified in the tables is selected Douglas fir with a bending strength of not less than 1500psi. The dimensions given are actual not nominal.
- I. Wales are calculated for simple span conditions.
- J. The following are limits on the application of the shoring tables:
 - 1. It is not intended that these tables apply to every situation that may be experienced in the field. Shoring systems for use in situations not covered by these tables must be designed by a registered professional engineer.
 - 2. When any of the following conditions are present, the members specified in the tables are not adequate, and an alternate system must be designed by a registered professional engineer.
 - a. When loads imposed by structures or by stored material adjacent to the trench weigh more than the load imposed by a two foot soil surcharge. The term "adjacent" as used here means the area within a horizontal distance from the edge of the trench equal to the depth of the trench.
 - b. When vertical loads imposed on cross braces exceed a 240 pound gravity load distributed on a one foot section of the center of the cross brace.
 - c. When surcharge loads are present from equipment weighing more than 20,000 pounds.
 - d. When only the lower portion of the trench is shored and the remaining portion of the trench is sloped or benched unless: the sloped portion is sloped at an angle less steep than 3:1 or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

6.0 Fall Protection



6.0 Fall Protection



INTRODUCTION

Due to the seriousness of fall injuries employees must exercise extreme caution when working at heights. Use of fall protection systems and equipment is mandatory for all KE&G projects where any employee is required to work in excess of 6 ft. Any employee found in violation of fall protection requirements is subject to immediate termination. If for any reason you are uncomfortable with heights, notify your supervisor immediately.

A "Fall Protection System" is one in which some physical means or methods are provided to eliminate a fall exposure to employees. This may be accomplished by means of ladders, Scaffolds, Lift Units, Guardrails, Static Lines, Standard or Retractable Lanyards, or a Full Body Harness. Fall protection on KE&G projects shall be accomplished by a job hazard analysis and pre-planning before work begins.

All Fall Arrest Equipment shall be used and installed in accordance with the manufacturer's specifications and recommendations, meet the requirements of applicable ANSI, ASTM, or OSHA standards. In addition, all associated equipment shall be inspected on a minimum quarterly basis by the Safety Manager.

POSITIVE FALL PROTECTION

A full body harness and tie-off is required for all work in excess of six (6) feet. This includes leading edge work, and work from all aerial lifts. No more than six (6) feet of free fall distance into any fall protection system is permitted. If there is risk of a fall, then a fall arrest system must be utilized. Fall arrest systems require the use of a full body harness. If a static line system is utilized, documentation is required to demonstrate its effectiveness. In the event a fall arrest occurs, the fall arrest system shall be taken out of service and the incident documented and submitted to the Safety Manager. The following is a summary of OSHA's Fall Protection Standard:

1926.501 DUTY TO HAVE FALL PROTECTION

Employers must determine whether walking/working surfaces are structurally capable of supporting workers safely.

Workers on walking/working surfaces with unprotected sides or edges six (6) feet or higher above a lower level must be protected from fall by the use of guardrails, nets, or fall arrest systems.

Workers constructing or working near leading edges at six (6) feet or higher above a lower level must be protected from falls by guardrails or personal fall arrest systems.

Workers must be protected from falling more than six (6) feet through holes (including skylights) by covers, guardrails, or personal fall arrest systems.

Workers on the face of form work or reinforcing steel must be protected from falling six (6) feet or more by personal fall arrest systems, nets, or positioning devices.

Workers on the edge of excavations deeper than six (6) feet must be protected from falling by guardrails, fences, or barricades when the excavations are not easily visible.

Workers less than six (6) feet above dangerous equipment must be protected from falling into or onto the equipment by guardrails or equipment guards.

Workers six (6) feet or higher above dangerous equipment must be protected from falling hazards by guardrails, personal fall arrest systems, or nets.

Workers on walking/working surfaces six (6) feet or higher above lower levels which are not otherwise addressed must be protected from falling by guardrails, nets, or personal fall arrest systems. **Serious injury or death may occur without protection.**

Where workers are exposed to falling objects, the employer must have each worker wear a hard hat and must:

1. Erect toe boards, screens, or guardrails to prevent object from falling,
2. Erect a canopy structure and keep objects from the edge of the higher level, or
3. Barricade the area to which objects could fall and keep objects away from the edge of the higher level.

1926.502 FALL PROTECTION SYSTEMS CRITERIA AND PRACTICES

GUARDRAILS

The top edge of guardrails must be between thirty-nine (39) inches and forty-five (45) inches high.

Mid-rails, screen, mesh or intermediate vertical members must be installed between the top edge of the guardrail and the walking/working surface when there is no wall or parapet at least twenty-one (21) inches high.

Guardrails must be capable of withstanding a force of two hundred (200) pounds applied within two (2) inches of the top edge in any outward or downward direction.

With two hundred (200) pounds of downward force the top edge of the guardrail must not deflect to less than thirty-nine (39) inches.

Mid-rails, screens, mesh and intermediate vertical members must be capable of withstanding a force of at least one hundred-fifty (150) pounds applied in any downward or outward direction at any point along the mid-rail or other member.

Guardrail must be surfaced in a way that will prevent punctures, lacerations, and snags.

The ends of top rails and mid-rails must not overhang terminal posts unless an overhang would not create a projection hazard.

Steel and plastic banding shall not be used on top and mid-rails.

Top and mid-rails must be at least one-quarter (1/4) inch nominal diameter or thickness.

When guardrail is used in hoisting areas, a chain, gate or removable guardrail section must be placed across access opening when hoisting operations are not taking place.

When guardrails are used at holes they must be erected on all unprotected sides or edges.

When guardrails are used to protect openings which are used for the passage of materials, not more than two (2) sides can utilize a removable guardrail.

SAFETY NETS

Safety nets must be installed as close as possible, but not more than thirty (30) feet below the walking/working surface.

Safety nets must extend outward from the outermost projection of the work surface (refer to current OSHA regulation for distance).

Drop test must be performed on safety nets by dropping a four-hundred (400) pound, thirty to thirty-two (30-32) inch diameter bag of sand into the net from the highest walking/working surface (but not less than forty-two (42) inches).

When it is unreasonable to perform a drop test on a net, the employer or a designated competent person must certify that the net and installation are in compliance with this standard.

Nets must be inspected at the beginning of each shift and defective nets and parts must be removed from service.

Effective January 1, 1998 body belts are not acceptable as part of a fall arrest system.

PERSONAL FALL ARREST SYSTEMS REQUIREMENTS:

1. Limit maximum arresting force on an employee to (1,800) pounds when used with a body harness.
2. Rigged such that an employee can neither free fall more than six (6) feet, nor contact any lower level.
3. Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet and,
4. Have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of six (6) feet, or the free fall distance permitted by the system, whichever is less.

6.0 Fall Protection



The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level, or above the wearer's head.

Effective January 1, 1998 only locking type snap hooks shall be used.

Lanyards and vertical life lines must have a minimum breaking strength of five-thousand (5,000) pounds per person attached.

Personal fall arrest systems when stopping a fall must limit the maximum arrest force on the worker to eighteen-hundred (1,800) pounds when used with a body harness.

KE&G employees shall use a full body harness with a shock absorbing lanyards.

Personal fall arrest systems must be rigged so that the worker can neither fall more than six (6) feet nor contact any lower level.

Positioning devices must be rigged to prevent free fall of more than two (2) feet.

Controlled access zones must be defined by a control line or other means that restricts access.

When using safety monitoring systems a competent person must be used to monitor the safety of workers.

The employer must provide training for each worker that may be exposed to fall hazards.

The employer must keep a written certification record to verify compliance with training requirements.

The employer must provide retraining when workers do not have the understanding and skills required by initial training.

ACCIDENT/INCIDENT INVESTIGATION:

In the event of a fall related incident resulting in a serious accident to include "ALL NEAR-MISSES", an accident investigation will be conducted to determine root cause/s and preventive measures to ensure potential fall-related incidents are prevented. The Safety Manager and the General Superintendent will collaborate in gathering information for the investigation, and forward for review on facts and findings along with recommendations to eliminate future fall hazards.

RESCUE PROCEDURES:

In the unlikely event that a fall arrest occurs, all employees will be rescued by on-site personnel with the use of and of an articulating man lift or ladders where feasible. Alternate rescue would be through the local emergency services.

Communication Guidance:

In the event of a fall, the following people will be notified as soon as possible:

1. Rescue personnel (i.e., maintenance personnel).
2. Supervisor.
3. Fire Department or emergency medical services if necessary.
4. Safety manager and General Superintendent.

At the beginning of any work activity where fall protection is an issue, rescue plans must be identified and discussed with all employees in case of a fall. The supervisor will develop the rescue plan(s).

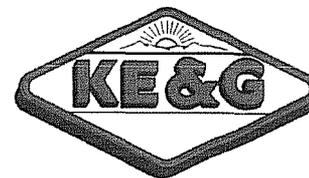
All employees involved in a fall arrest or fall will be sent for a medical evaluation to determine extent of injuries, if any.

This is not all inclusive. KE&G Construction and employees involved in operations will adhere to all standards as per OSHA 1926.501; site specific plans will not be utilized. For further detail or interpretation contact the KE&G Safety Manager or review the standard.

7.0 Lock-Out/Tag-Out Program



7.0 Lock-Out/Tag-Out Program



LOCK-OUT / TAG-OUT PROGRAM

INTRODUCTION

1. This program establishes procedures for compliance with OSHA's Mechanical and Electrical lockout and tagout program requirements, 29 CFR 1910.147 and 29 CFR 1910.333). These procedures are designed to protect our employees from the hazards and subsequent injuries that occur as the result of the unexpected release of a hazardous energy source during the performance of maintenance operations.

TRAINING

1. All employees likely to be assigned tasks involving maintenance or repairs of equipment, machinery, electrical circuits or any other operations that have a potential energy source will be trained using this lock-out procedure before their assignment.
2. All employees will be instructed that compliance with Danger, Warning and Lock-Out tags is mandatory.
3. The training for both the **mechanical and electrical lockout/tagout** is included in this program, and will include several employee classifications including **qualified, authorized, affected and other**. Those falling specifically under the mechanical LOTO program will include the following:
 1. Authorize
 2. Affected
 3. Other

For the electrical LOTO program we have only one classification:

1. Qualified

DEFINITIONS

An **authorized employee** is one who locks or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee can also become an authorized employee if his or her duties include servicing and maintenance along with the operation of the machine or equipment.

An **affected employee** is one whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under the lockout/tagout program or whose job requires him/her to work in an area in which such servicing or maintenance is being performed. An **other employee** is one who under normal conditions is not identified in the qualified, authorized, or affected categories.

A **qualified employee** is one who has been trained in 29 CFR 1910.331 through 335, to avoid the electrical hazards of working on or near exposed energized parts. It is possible for an employee to be considered qualified with regard to certain equipment in the workplace but unqualified as to other equipment. An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified employee is considered qualified for the performance of those duties.

Further, the relevant paragraphs of 1910.333 have been incorporated into the training curriculum outlined herein, for work that is performed on electrical circuitry and equipment.

TRAINING

Training for Authorized employees:

The training for authorized employees will include all aspects of the LOTO program and all specific procedures for each individual machine or equipment identified in the program.

Training for Affected Employees:

The training for affected employees will include the purpose of the program, and how to recognize a LOTO operation and how it will affect them.

Training for Other Employees:

The training for other employees will include notification that a LOTO program exists and to stay clear of a LOTO operation in progress.

Training for qualified employees:

Training for the qualified will include the same training as for the authorized employee in addition to the following:

1. The skills and techniques necessary to distinguish exposed parts from other parts of electrical equipment
2. The skills and techniques necessary to determine the nominal voltage of exposed live parts.
3. The capability of working safely on energized circuits.
4. Familiar with the proper use of precautionary techniques, personal protective equipment and;
5. How to use insulating and shielding materials, and insulated tools.
6. Proper use of test equipment.
7. How to test circuit elements and electrical parts of equipment to which employees may be exposed; and
8. How to verify that circuit elements and equipment are de-energized.
9. How to check if the test equipment is properly working before and after each operation.
10. How to determine if any energized condition exists and if it exists as a result of inadvertently induced voltage or unrelated voltage backfeed even though specific parts of the circuit have been de-energized.

TRAINING CERTIFICATION

OSHA requires that completed training be certified and kept up to date. And that the certification contains each employee’s name and the dates of training. Accordingly, the following format will be used to certify the training of employees:

EMPLOYEE NAME _____	DATE OF TRAINING _____
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
Signature of trainer _____	Date _____

METHOD TO ENFORCE COMPLIANCE

Supervisory personnel will enforce compliance with our LOTO program by disciplining employees who do not follow the policies and procedures set forth in this program. The chain of command will be followed when disciplinary action is required. Each supervisor will be held responsible for the violation actions of his or her employees. In addition to the employee being disciplined, his/her supervisor will also be disciplined when appropriate. The first action will be to verbally warn an employee of their noncompliance with the program. Immediately thereafter, verbal instruction will be provided as to how to perform the work properly.

For every subsequent violation the following actions will be taken:

- 1st offense - written warning
- 2nd offense - indefinite suspension
- 3rd offense - termination of employment



7.0 Lock-Out/Tag-Out Program

NOTE - THE PROGRAM INCORPORATES MANY SIGNIFICANT AND CRITICAL ELEMENTS FOR ITS SUCCESS, THEREFORE, A HEAVY RESPONSIBILITY IS PLACED ON EACH EMPLOYEE TO FOLLOW THESE PROCEDURES.

PERIODIC INSPECTIONS

To ensure that the LOTO program is being properly implemented, random audits (follow-up inspections) and planned visual observations will be conducted to determine the following:

- if the energy control procedures are followed;
- if employees know their responsibilities;
- if the procedure is adequate and what changes are needed.

An authorized and qualified employee, other than the one implementing the energy control procedure, if deviations are identified or if employees do not clearly understand the procedure, retraining will be conducted, will conduct the audits. Accordingly, the procedure will be re-evaluated and a more appropriate procedure will be implemented.

These inspections will be conducted at least annually, on a one to one basis, and when appropriate, through meetings with entire crews.

Inspection Certification

OSHA requires that completed inspections be certified and kept up to date. That the certification contains the name of the employee, date and time, whether retraining is necessary, the machine/equipment on which energy control procedures are being utilized, and the name, date and signature of the inspector. Therefore, the following format will be used to certify the inspection process:

NAME OF EMPLOYEE _____	DATE/TIME _____
MACHINE/EQUIPMENT _____	RETRAIN Y N _____
1. _____	
2. _____	
3. _____	
4. _____	
5. _____	
NAME & SIGNATURE OF INSPECTOR _____	DATE _____

GENERAL LOTO PROCESS

Preparation for shutdown - Before authorized, qualified, or affected employees turn off a machine or equipment that is to be maintained or serviced, they will have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the means to control that energy. An assessment will be made to determine all energy sources associated with the specific piece of equipment or machinery. A specific procedure will then be developed which will document the methods to be used for isolating the energy (see specific procedures), which will be followed by the authorized or qualified employee performing the servicing or maintenance operation.

Machine or equipment shutdown - The machine or equipment will be turned or shut down using the specific procedures. An orderly shutdown will be followed to avoid any additional or increased hazards to employees as the result of equipment being de-energized.

Machine or equipment isolation - All energy control devices that are needed to control the energy to the machine or equipment will be physically located and operated in such a manner as to isolate the machine or equipment from the energy source.

Lockout or tagout application - Lockout or tagout devices will be affixed to energy isolation devices by authorized or qualified employees. Lockout or tagout devices shall include the name of the individual placing the device. The lockout devices will be affixed in a manner that will hold the energy isolation device in a "safe" or "off" position. Where tagout devices are used they will be affixed in a manner that will clearly state that the operation or the movement of energy isolation devices from the "safe" or "off" position is prohibited. The tagout devices will be

attached to the same point a lock would be attached. If the tag cannot be affixed at that point the tag will be located as close as possible to the device in a position that will be immediately obvious to anyone attempting to operate the device.

Stored energy - Following the application of the lockout or tagout devices to the energy isolating devices, all residual energy will be relieved, disconnected, restrained, and otherwise rendered safe. Applicable sources of potential stored energy can be found in electrical, steam, hydraulic, along with components producing tension, gravity, etc. Where the re-accumulation of stored energy to a hazardous energy level is possible, verification of isolation will be continued until the maintenance or servicing is complete.

Verification of isolation - Prior to starting work on machines or equipment that have been locked or tagged out, the authorized or qualified employee will verify that isolation or de-energization of the machine or equipment has been accomplished.

Release from lockout or tagout - Before lockout or tagout devices are removed and the energy restored to the machine or equipment, the following actions will be taken:

-The work area will be thoroughly inspected to ensure that non-essential items have been removed and that machine or equipment components are operational.

-The work area is checked to ensure that all employees have been safely positioned or removed. Before lockout or tagout devices are removed the affected employees will be notified that the lockout or tagout devices are being removed.

-Each lockout or tagout device will be removed from each energy device by the employee who applied the device.

Group lockout or tagout - When servicing or maintenance is to be performed by a crew they will each be provided with a lock or a tag. An authorized or when appropriate, a qualified employee will assume responsibility of the entire crew so as to determine the exposure status of each group member and ensure continuity of protection.

Each employee will affix a personal lockout or tagout device to a group lockout device, group lockbox or comparable mechanism when he or she begins work, and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

Shift or personal changes - In order to maintain continuity of lockout/tagout protection the plant manager will assume responsibility and will assure that:

-Employees affected by the transfer of lockout-tagout devices between the off-going and oncoming employees are apprised of the transfer to coordinate the change.

-Certify that all aspects of the lockout/tagout program are followed to minimize exposure to hazards from the unexpected energization, start-up of machine or equipment or release of stored energy.

Outside Personnel (Multi-Employer Worksites)

With regards to our mechanical lockout/tagout program, all outside contractors will be informed by the manager of our lockout/tagout procedures, and they will be expected to follow them. No work will be performed by outside personnel until the manager has certified the awareness of our procedures. The electrical contractor will be required to follow our lockout/tagout program. The only exception will be that they (electrical contractor) will be required to develop their own specific procedures for the work they were contracted to perform. The manager will certify the procedure and grant permission for the work to proceed.

Failure to follow this process is a serious breach of our LOTO procedures and will result in disciplinary action up to and including termination of the contract.

7.0 Lock-Out/Tag-Out Program

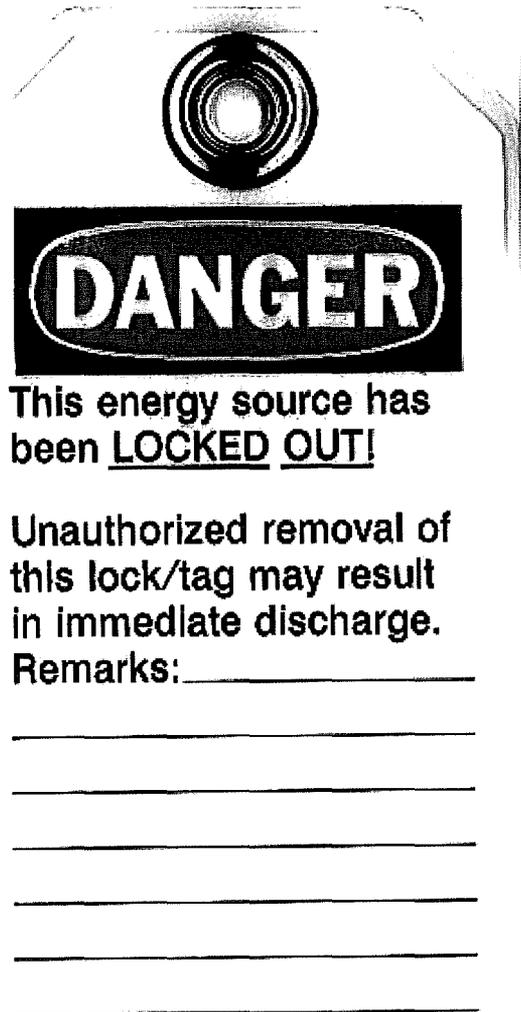


SAMPLE LOCK-OUT TAG



This lock/tag may
only be removed by:
Name _____
Date _____

BRADY, SIGNMARK® DIV. CAT. NO. 65520

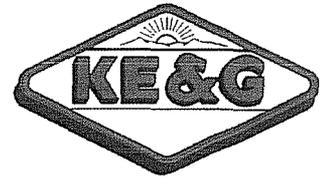




8.0 Confined Space Entry Program

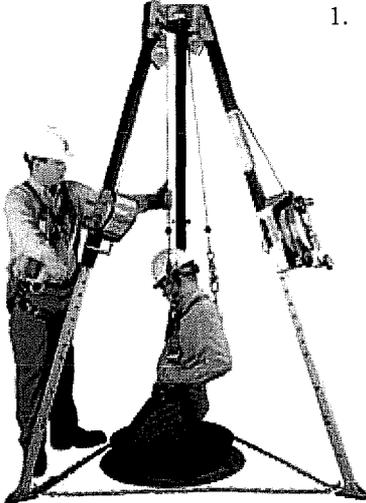


8.0 Confined Space Entry Program



CONFINED SPACE ENTRY PROGRAM

INTRODUCTION



1. These procedures prescribe the minimum standards for entry into confined spaces which are defined as follows:
 - **A SPACE LARGE ENOUGH FOR AN EMPLOYEE TO ENTER AND PERFORM ASSIGNED WORK.**
 - **HAS LIMITED OR RESTRICTED MEANS OF ENTRY OR EXIT.**
 - **IT IS NOT DESIGNED FOR CONTINUOUS OCCUPANCY BY THE EMPLOYEE.**

TRAINING

1. Prior to entry into or work in Enclosed or Confined Spaces all the affected employees will be trained and instructed as to the nature of the hazards involved, the necessary precautions to be taken and in the use of protective and emergency equipment. Additional training will be conducted prior to a changed in assigned duties, initial assignment, and when new hazards are encountered. They will be provided with a copy of these operating procedures. All training will be documented, maintained, and kept in the safety managers office for 5 years.
2. No work will be permitted in areas designated as IDLH. Rescue services will be provided for such services, and only personnel who have been properly trained and certified, will be authorized to conduct rescue services. Rescue services will be provided by the local city fire department, and certified rescuing services.
3. The Confined Space Entry Program will be reviewed annually by the safety manager, and when changes have been implemented to this program.

PRE-ENTRY REQUIREMENTS

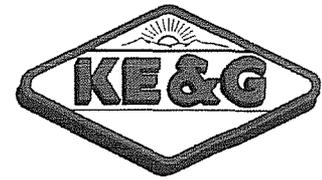
1. Only one employer will authorized to conduct confined space entries. If additional contractor/s is/are on site, rescheduling of task will be coordinated by the site supervisor.
2. All employees and pedestrians will be protected from vehicle traffic and additional potential hazards that may exist while involved in the confined space entry task. Proper traffic control will be in place, and all required personal protective equipment will be worn at all times.
3. All lines which may convey dangerous substances into the space will be disconnected, blocked, or effectively isolated to prevent dangerous air contamination or oxygen deficiency from developing. This will be done in such a manner that inadvertent reconnection is prevented.
4. This space will be emptied, flushed, or otherwise purged of dangerous substances to the extent feasible.
5. The air within the space will be tested for dangerous air contamination or oxygen deficiency by a qualified person and a written record (Confined Entry Space Permit) of such testing will be maintained at the jobsite for the duration of the work.
6. Additional testing and monitoring may be requested by any KE&G employee at their discretion. They will also be given the opportunity to observe calibration and data for air monitors.
7. When air testing/monitoring demonstrates that dangerous air contamination or oxygen deficiency does not exist, entry into and work within the space may proceed provided additional air testing/monitoring is conducted to ensure that dangerous air contamination or oxygen deficiency does not occur.
8. Adequate ventilation will be maintained while work is in progress.

9. A Confined Space Entry Permit shall be completed and signed by the Entry Supervisor prior to entry. Failure to complete the Permit and personnel entry is allowed will result in disciplinary action up to and including termination. (see sample of a properly completed Confined Space Permit on page 74-75)

CONFINED SPACE ENTRY

1. When an atmosphere free of dangerous air contamination or oxygen deficiency cannot be ensured or maintained through ventilation, the following procedures will be enforced:
 - A. Respiratory protective equipment will be provided and worn in accordance with the KE&G Respiratory Protection Program.
 - B. A full-body safety harness, which suspends a person in an upright position, with an attached lifeline will be used. The lifeline will have at least a 3,000 pound breaking strength. If an entry is made through a top opening, a hoisting device will be provided to lift employees out of the space.
 - C. At least one employee (attendant) will stand by outside of the confined space to give assistance in case of an emergency. At least one additional employee (the entry supervisor) will be within calling distance.
 - a. The standby employee (attendant) will have access to a self-contained breathing apparatus of 5 minutes or more.
 - b. Effective communication will be provided between standby employees and those inside a confined space. Hand signals shall be standard for all to use. Communication line will be kept open at all times in case in need of rescue services.
 - c. At least one employee trained in FA/CPR will be immediately available whenever respiratory protective equipment is required.
 - d. A standby employee may not enter a confined space unless another trained employee outside that confined space will be available to relieve the attendant.
 - e. Any confined space hot work that involved burning, welding, using fire- or spark- producing tools, or that produces a source of ignition requires a Hot Work Permit. (see sample Hot Work Permit on page 111)
 - f. Once any confined space entry has been reclassified with additional hazards, change of task, or personnel, the entry supervisor may terminate the task at his discretion.
 - g. Upon completion of a confined space entry, the entry supervisor must ensure the Confined Space Entry Permit has been cancelled, by signing the bottom portion on the back side of the permit.
 - h. Establish Communication:
 - o Inform all entrants that they are required to maintain communication with the attendant.
 - o Inform attendant that he/she must maintain constant contact with all entrants.
 - o Inform personnel of the type of communication they are to use.
 - o Protect from External HazardsInform personnel where signs and barriers will be placed to prevent unauthorized entry and protect entrants from external hazards.
 - i. Pre-Plan Rescue Procedures
 - j. The designated attendant(s) should be informed of the rescue procedures to be followed.
 - k. The attendant should be informed that he/she can have no other duty but to maintain contact with personnel inside the confined space.
 - l. Inform the attendant(s) that they must not enter the confined space under any circumstances.
 - m. Each individual confined space will be monitored by a single attendant during an emergency. At no time will an attendant monitor more than one confined space during an emergency.
 - D. The following are definitions of the individuals that are involved in Confined Space Entry.

8.0 Confined Space Entry Program



Entry Supervisor: The entry supervisor will be responsible for an receive training to ensure that the required atmospheric tests are performed at the confined space entry and the results recorded on the Confined Space Entry Permit Form prior to entry authorization. The ES will be responsible for maintaining all equipment ensuring all personnel involved are prepared to enter the Confined Space. They must insure that all conditions prior to and during the entry are maintained and constant with the Entry Permit. Additionally, the ES will be responsible for the authorization to enter the Confined Space and upon completion of the work to cancel the permit.

Authorized Entrant: The person(s) authorized to enter a confined space shall be responsible for and receive training that will include hazard recognition, methods of entry, signs and symptoms of exposure, proper use of atmosphere testing and monitoring equipment, ventilation units, communication equipment, lighting, barriers, shields, ladders and harnesses. They must understand and be able to communicate with the attendants in case of alerts and the need to evacuate. Additionally, they must be alert to warning signs or symptoms of exposure to enable them to exit quickly.

Attendants: Employees authorized to perform duties as attendants shall be responsible for and receive training that will include hazard recognition, the symptoms signs and consequences of exposure, behavioral effects of hazard exposure to the entrants and control of the entry area. They must remain outside of the confined space and must continuously record an accurate count of the authorized entrants. The attendant shall monitor the activities both inside the permit space and outside the entry. The attendant shall have access to summon rescue and other emergency services as soon as assistance is needed. If any unauthorized individual enters the designated safety zone, the attendant shall warn and advise them to leave immediately. The attendant must advise the entrants and entry supervisor of the violation and remain at their assigned position.

E. The following are the duties performed for individual involved in Confined Space Entry.

“ENTRY SUPERVISORS” shall be responsible for the following:

1. Ensuring that the required atmospheric tests are performed at the confined space and results recorded on the permit prior to entry authorization.
2. Obtaining and maintaining all equipment necessary to complete the confined-space entry project.
3. Authorizing entry by signing the Entry Authorization space on the entry permit after all conditions for a safe entry have been met.
4. Terminating the entry and canceling the permit when:
 - o Entry operations covered by the entry permit have been completed.
 - o A condition that is not allowed under the entry permit arises in or near the permit space.
5. Determining, whenever responsibility for a permit space entry operation is transferred, and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

“AUTHORIZED ENTRANTS” are responsible for and shall receive training in the Following:

1. The knowledge of hazards that may be faced during entry, including the mode, signs or symptoms, and consequences of the exposure.
2. Proper use of equipment, which includes:
 - o Atmospheric testing and monitoring equipment.

- Ventilating equipment needed to obtain acceptable entry conditions.
 - Communication equipment necessary to maintain contact with the attendant.
 - Personal protective equipment as needed.
 - Lighting equipment as needed.
 - Barriers and shields as needed.
 - Equipment, such as ladders, needed for safe ingress and egress.
 - Rescue and emergency equipment as needed.
 - Any other equipment necessary for safe entry into and rescue from permit spaces.
3. Communication with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space if required.
 4. Alert the attendant (standby person) whenever:
 - The entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or
 - The entrant detects a prohibited condition.
 5. Exiting the permit space as quickly as possible whenever:
 - An order to evacuate has been given by the attendant or the entry supervisor;
 - The entrant recognizes any warning sign or symptom of exposure to a dangerous situation;
 - The entrant detects a prohibited condition; or
 - An evacuation alarm is activated.

Persons authorized to perform duties as “ATTENDANT” shall be responsible for and receive training in the following:

1. Knowing the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of exposure.
2. Awareness of possible behavioral effects of hazard exposure in authorized entrants.
3. Continuously maintaining an accurate count of authorized entrants in the permit space and ensuring that the means used to identify authorized entrants accurately identifies who is in the permit space.
4. Remains outside the permit space during entry operations until relieved by another attendant.
5. Attempting non-entry rescue if proper equipment is in place and the rescue attempt will not present further hazards to the entrant or attendant.
6. Communicating with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space when conditions warrant.
7. Monitoring activities inside and outside the space to determine if it is safe for entrants to remain in the space and ordering the authorized entrants to evacuate the permit space immediately under any of the following conditions:
 - If the attendant detects a prohibited condition.
 - If the attendant detects the behavioral effects of hazard exposure in an authorized entrant.
 - If the attendant detects a situation outside the space that could endanger the authorized entrants.
 - If the attendant cannot effectively and safely perform all the duties required by this program.

8.0 Confined Space Entry Program



8. Summoning rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards.
9. Taking the following actions when unauthorized persons approach or enter a permit space while entry is underway:
 - Warning the unauthorized persons that they must stay away from the permit space.
 - Advising the unauthorized persons that they must exit immediately if they have entered the permit space.
 - Informing the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.
10. Performing no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

Rescue Procedures

In the event of an emergency, the attendant should:

1. Immediately summon the City Fire Department by radio or telephone. (Dial 911) A means of communication such as a radio, company cell phone will remain at the confined space entry site at all times.
2. Attempt to remove the victim by use of the retrieval line from outside the confined space if this can be accomplished without creating further hazard for the entrant or the attendant.
3. If the attendant is able to remove the victim with the retrieval line, he/she should administer aid within the limits of his/her training until emergency medical services (EMS) arrive.
4. If the attendant is unable to remove the victim by using the retrieval line, he or she must wait for help to arrive. The attendant(s) is not to enter the confined space for any reason.
5. Give EMS personnel any information they request.



PROJECT # 0090000

CITY TUCSON

DATE JANUARY 1, 2009

CONFINED SPACE ENTRY PERMIT

Is a permit required for the space to be entered? Yes No
 If no, complete only 1, 2, 3, 7, 9, 11 and cancel permit

1 Permit Space
 To Be Entered M.H.# 1461 SEC # 2 JOB# 090000

2 Purpose of Entry REPAIR AND REPLACE PIPE

3 Date of Entry JANUARY 1, 2009 Authorized Duration of Entry Permit 8 HOURS

4 Authorized Entrants JOHNNY JONES
HARRY SMITH
CLEM ROGERS

5 Attendant(s) BILL WESTON
GEORGE BEST

6 Name of Current Entry Supervisor(s) WILLIAM WALL Title 8:10
JESUS CASIAS Title 1:14
 Entry Supervisor who Originally Authorized Entry WILLIAM WALL

7 Record hazards of the permit space to be entered.				8 Check off List the measures used to isolate the permit space and to eliminate or control permit space hazards before entry
Hazard	Yes	No	N/A	
A Lack of Oxygen	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/> A Purge-Flush and Vent
B Combustible Gases	<input checked="" type="checkbox"/>			
C Combustible Vapors	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/> B Ventilation <u>FORCED AIR</u>
D Combustible Dusts	<input checked="" type="checkbox"/>			
E Toxic Gases	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/> C Lockout/Tag Out
F Toxic Vapors	<input checked="" type="checkbox"/>			
G Chemical Contact	<input checked="" type="checkbox"/>			<input type="checkbox"/> D Inerting
H Electrical Hazards		<input checked="" type="checkbox"/>		
I Mechanical Exposure		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/> E Blankin Blocking Bleeding
J Temperature		<input checked="" type="checkbox"/>		<u>PLUG</u>
K Engulfment	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/> F External Barricades
L Entrapment	<input checked="" type="checkbox"/>			<u>RESTRICT WORKSITE</u>
M Others				<input checked="" type="checkbox"/> G Confined Space Identification/Signs
				<u>PLACED AROUND WORKSITE AND ON TRIPPOD.</u>

DO NOT DESTROY THIS PERMIT
 AFTER CANCELLATION THIS ENTRY PERMIT MUST BE RETAINED
 BY EMPLOYER FOR AT LEAST ONE YEAR.

Side A of a properly filled out
 Confined Space Entry
 Permit

8.0 Confined Space Entry Program



Side B of a properly filled out
Confined Space Entry
Permit

CONFINED SPACE ENTRY PERMIT

9 Acceptable Entry Condition AIR + ENTRY LEVELS OK

10 Test(s) To Be Taken	Permissible Entry Levels	Test 1	Test 2	Test 3	Test 4
A Percent of Oxygen	19.5% to 23.5%	20.1	20.1	20.0	20.1
B Combustible Gas	<10% LEL	0	0	0	0
C H ₂ S	<10PPM	0	0	0	0
D CO	<25 PPM	0	0	0	0
E					
F					
G					
H					
I					

Name or Initials of Tester JT JW JW GL
Test Times 8:00AM 9:00AM/10:00 11:10

11 Rescue and Emergency Services Available
Name BILL DENTON TFD Name _____
Telephone 791-4441 Telephone _____

12 Communication procedures HAND + ROPE SIGNALS

13 Equipment supplied to the employee

Yes	No	N/A	Equipment	Description
<input checked="" type="checkbox"/>			(i) Gas Test and Monitoring	Name <u>GRAE</u> Model/Type <u>20</u> Serial/Unit No. <u>162784</u>
<input checked="" type="checkbox"/>			(ii) Ventilating	<u>FORCED AIR</u>
<input checked="" type="checkbox"/>			(iii) Communications	<u>MANUAL</u>
<input checked="" type="checkbox"/>			(iv) Personal Protective Equipment	<input checked="" type="checkbox"/> Safety Harness <input checked="" type="checkbox"/> Hard Hats <input checked="" type="checkbox"/> Hand With Life Lines <input checked="" type="checkbox"/> Eye <input checked="" type="checkbox"/> Foot <input type="checkbox"/> Respiratory <input type="checkbox"/> Ear <input checked="" type="checkbox"/> Clothing <input checked="" type="checkbox"/> Face
<input checked="" type="checkbox"/>			(v) Lighting	<u>PORTABLE / HAND LIGHT</u>
<input checked="" type="checkbox"/>			(vi) Barriers/Shields	<input checked="" type="checkbox"/> Pedestrian <input type="checkbox"/> Vehicle <input checked="" type="checkbox"/> Other
<input checked="" type="checkbox"/>			(vii) Safe Ingress/Egress	<input checked="" type="checkbox"/> Ladders
<input checked="" type="checkbox"/>			(viii) Rescue and Emergency	<input checked="" type="checkbox"/> Lifelines <input checked="" type="checkbox"/> Hoists <input type="checkbox"/> Resuscitators Inhalator
<input checked="" type="checkbox"/>			(ix) Other Safety Equipment	<u>WADDERS</u>

14 Other information for this particular confined space to ensure employee safety

15 Additional Permits Required Hot Work Other

THIS CONFINED SPACE ENTRY PERMIT HAS BEEN CANCELLED:

By Lellan Wall 12:30 PM 1/1/09
Entry Permit Supervisor Time Date

Side B of a properly filled out
Must be signed by
supervisor to be cancelled

