



HAZARDOUS MATERIALS & WASTES IN CONSTRUCTION, PLANNING AND RISKS

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Items to be covered in this discussion:

1. Employee protection via planning & client/owner collaboration
2. Preliminary project investigation: Phase I (identification of recognized conditions)
3. If recognized concerns are identified, a Phase II (Site investigation) starts
4. Greenfields / Brownfields
5. Hazardous Materials used in construction
6. Hazardous Wastes generated in construction
7. Worker Protection methods (PPE)



Protection of Your Employees

Plan



Execute

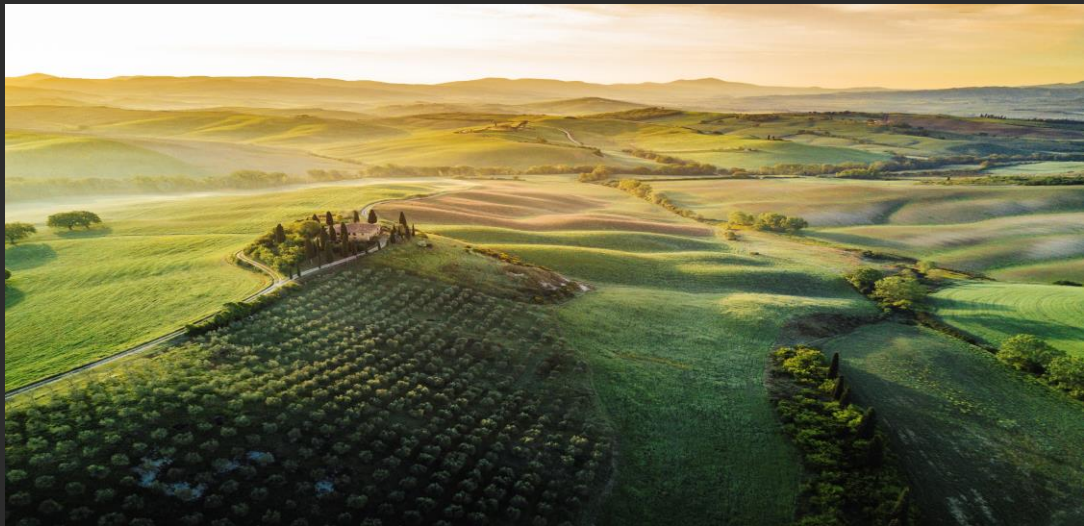
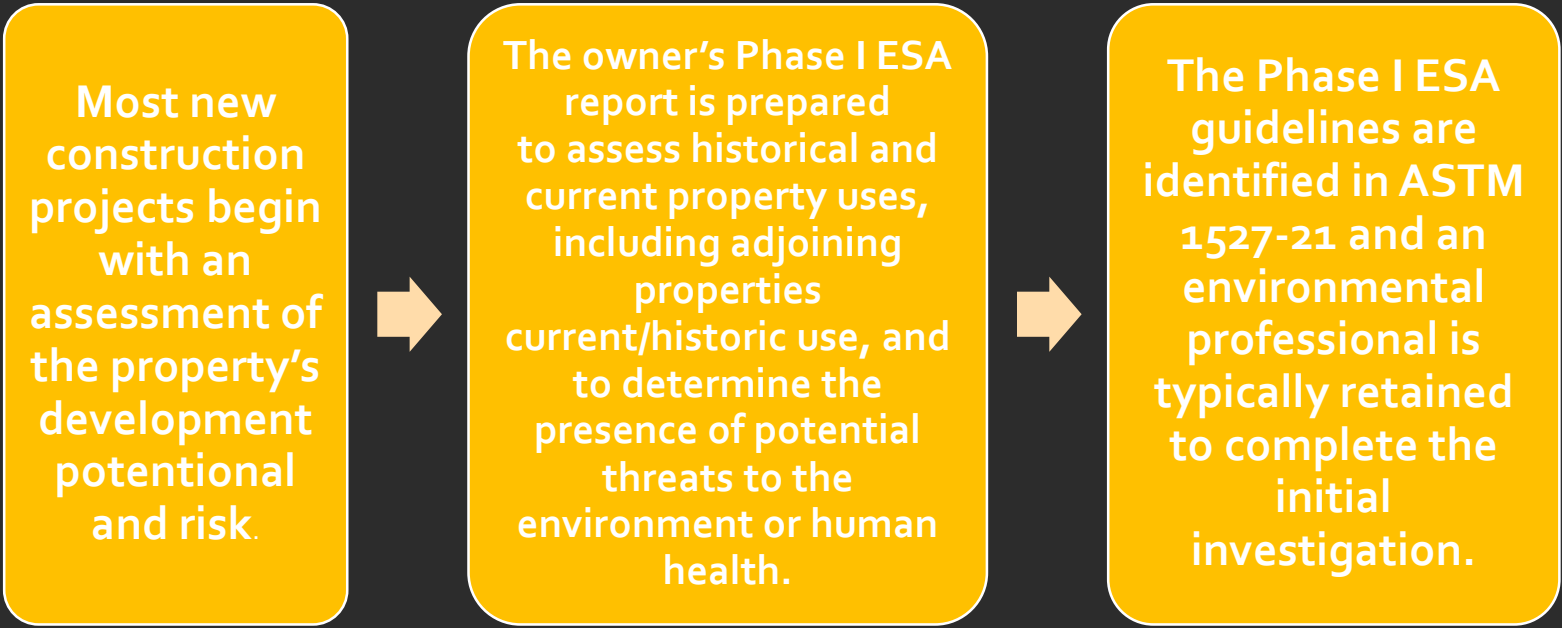
Know what is on your work site!

Discussion-Coordination between owner-client and Contractor

As a contractor, we should ask
questions before a surveyor sets
up or a shovel hits the dirt.



The Answer is: A Phase I ESA*



greenfield



brownfield



Greenfields

A greenfield site is defined as undeveloped land that typically is used for commercial or residential development.

Former farmland or even woodlands may be undeveloped in the traditional sense but may still contain materials that can be dangerous to your employees and the public's health.

Brownfields

The U.S. Environmental Protection Agency (EPA) defines a brownfield not simply as a possible improvement site which has been previously improved, but one that may also have impediments, such as "the presence or potential presence of a hazardous substance, pollutant, or contaminant".



PHASE II

If the Phase I ESA determines that there may be site impacts to soil, groundwater or surface water from historic or adjacent land use then a Phase II may be warranted. These “impacts” are classified as recognized environmental conditions (RECs).



GHS Pictogram



Oxidizers



Flammables, Self Reactives,
Pyrophorics, Self-Heating,
Emits Flammable Gas,
Organic Peroxides



Explosives, Self
Reactives, Organic
Peroxides



Acutely Toxic
(severe)



Burns Skin, Damages
Eyes, Corrosive to Metals



Gases Under Pressure



Carcinogen, Respiratory
Sensitizer, Reproductive
Toxicity, Target Organ
Toxicity, Mutagenicity
Aspiration Toxicity



Toxic to aquatic
environment



Acutely toxic(harmful),
Irritant to skin, eyes or
respiratory tract, Skin
sensitizer, Hazardous to

HAZARDOUS MATERIALS IN CONSTRUCTION

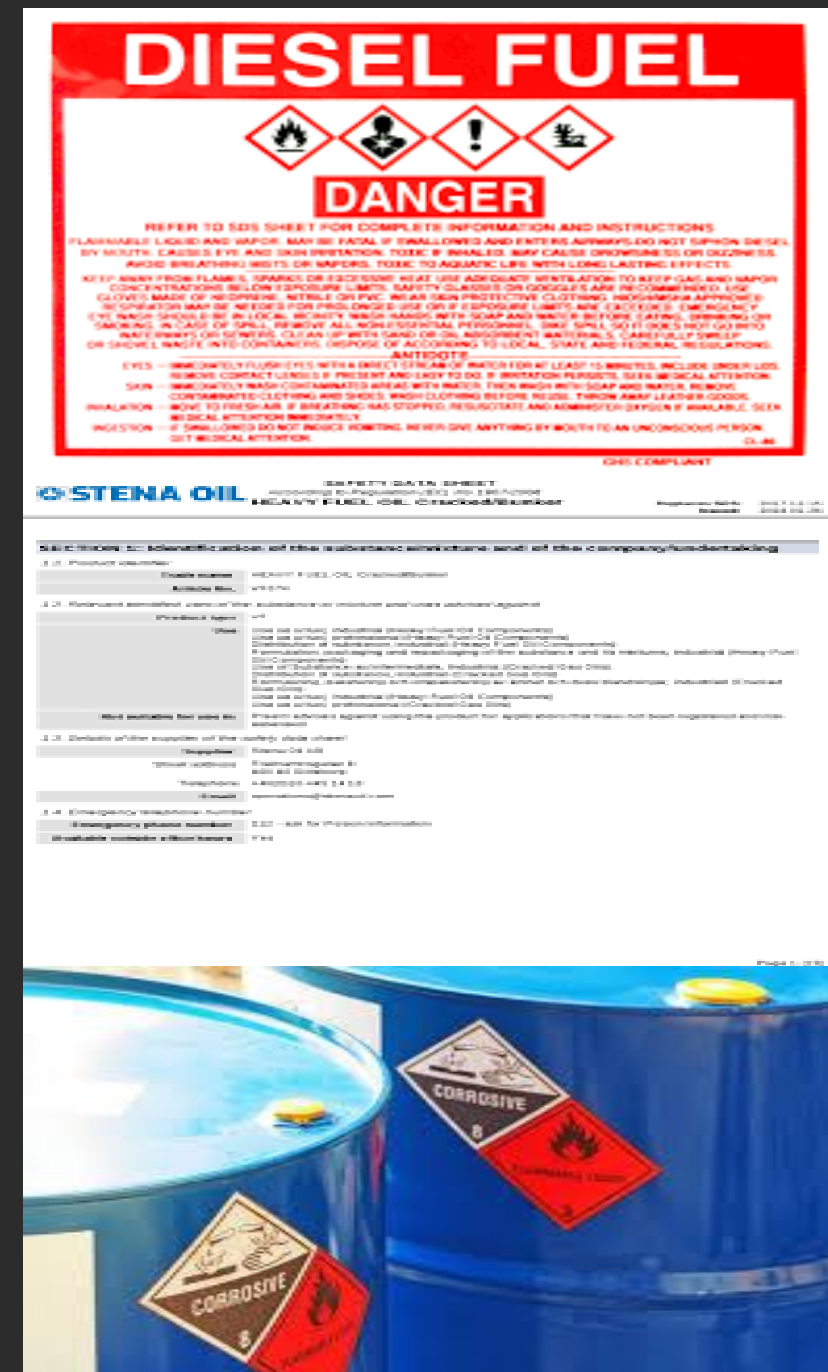
Labels and Safety Data Sheets

First Line of Defense

Labels- Under the Globalized Harmonization System (GHS) or OSHA Communication Standard, labels outline the 5 important components of the hazardous chemical.

Always read the label!!!

Safety Data Sheets- The SDS is the replacement for MSDS and consists of 16 sections.



Hazardous Materials in Construction *

There are several common use materials in construction which are deemed hazardous. Listed below are several commonly found on jobsites:

- 1.) Fuels, oils and greases (diesel, gasoline or kerosene, motor fluids)
- 2.) Paints and stains
- 3.) Solvents (turpentine, acetone, alcohol, ketones or mineral spirits)
- 4.) Adhesives/glue
- 5.) Cleaners (ammonia, sodium hypochlorite [bleach])
- 6.) Dusts (wood, silica, etc.)
- 7.) Man-made fibers (fiberglass, rock wool, and slagwool)
- 8.) Anti-freeze (glycol products)

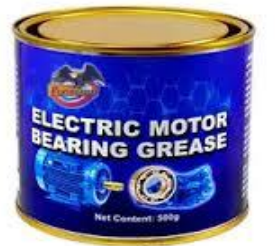
We'll briefly look at each of these construction material categories

* [Hazardous Building Materials in Construction: Most Common Dangers \(procore.com\)](https://www.procore.com/resources/articles/hazardous-building-materials-in-construction)

Hazardous Materials in Construction (Cont.)

Fuels, Oils and Greases

- These materials are petroleum-based products that are flammable (or combustible) and toxic. Gasoline and kerosene is highly flammable while diesel fuel is combustible.



Paints and Stains

- Paints and stains, especially oil-based, contain petroleum products and volatile organic compounds (VOCs).



Hazardous Materials in Construction (Cont.)

Solvents (turpentine, acetone, alcohol, ketones, or mineral spirits)

- Solvents are found in adhesives, paints, and cleaning fluids. They are used for dissolving grease, oils, and paints. They are highly flammable and contain volatile organic compounds (VOCs) which present a health concern.
- They are inherently dangerous your health due to inhalation, absorption, and ingestion dangers. The danger lies in that they attack the nervous system and cognitive brain function.



Hazardous Materials in Construction (Cont.)

Adhesives /Glues

- Glues and adhesives can be hazardous, toxic, and flammable. Typically, these materials contain volatile organic compounds (VOCs) whose impacts we've discussed previously. Examples of VOCs found in adhesives/glues include benzene, toluene, and xylene. Formaldehyde is also a common compound found in adhesives.



Hazardous Materials in Construction (Cont.)

Cleaners (ammonia, sodium hypochlorite)

- Industrial and many household cleaners commonly used in construction have harmful effects on the human body. Many of the cleaners contain chemicals that are corrosive or in some cases, flammable. These chemicals cause chemical burns if splashed on the skin or in the eyes.



Hazardous Materials in Construction (Cont.)

Dusts (silica, wood, etc.)

- Dust from construction activities affects more than just the workers. In large enough quantities it affects nearby homes, businesses, and sometimes entire communities. Some dusts are dangerous when even a small amount is inhaled (acute) and others can cause lung diseases when inhaled over long periods of time (chronic).
- Silica dust comes from working with materials that contain silica like concrete, mortar, and sandstone. Activities like grinding, sawing, polishing, and cutting, create a very fine type of silica dust that gets deeply lodged in the lungs when inhaled.
- Whenever you are cutting or sanding wood products such as softwood, hardwood, plywood, OSB, and medium density fiberboard, you are exposed to wood dust. When wood products are worked on, dust and formaldehyde are released into the air.
- Lower toxicity dusts come from working with materials like drywall, limestone, and marble.



Hazardous Materials in Construction (Cont.)

Man-made fibers (fiberglass, rock wool, and slagwool)

- **Fiberglass** is considered a safer alternative to other types of insulation. However, Eyes may become red and irritated after exposure to fiberglass.
- **Rockwool** is not natural. Rockwool dust is generally very tiny short fibers of impure glass. It is not a chemical hazard per se, but it can easily cause mechanical damage to lung tissue, as well as cause irritation to eye and skin.
- **Slagwool** is a mineral wool made usually from molten blast-furnace slag by the action of jets of steam under high pressure. The material is used as a thermal insulation material and acoustical limiting media.



Hazardous Materials in Construction (Cont.)

Ethylene glycol (Antifreeze)

- Ethylene glycol is a central nervous system (CNS) depressant that produces acute effects like those of ethanol. These CNS effects dominate during the first hours after exposure.
- Is toxic to both humans and animals (pets). Dogs especially are poisoned as they perceive the ethylene glycol mixture as "sweet". Symptoms initially include a narcotic or intoxicated effect, slurred speech, disoriented, and irritation.



Hazardous Materials in Construction (Cont.)

Compressed gases

Compressed gases are not hazardous materials per se but typically contain flammable or oxidizing gases that require fire watches. There are gases that may also displace oxygen and create an asphyxiation hazard (ex. Carbon dioxide, nitrogen).



The image displays two safety signs. The top sign is titled "Safe cylinder handling and storage" and features a red gas cylinder icon with a yellow warning triangle. It lists six safety instructions: 1. SECURE cylinders properly at all times. 2. STORE cylinders in a cool, well ventilated fire-resistant areas in accordance with regulations. 3. LOCATE cylinders where they will not be knocked over or damaged by falling objects. 4. CLOSE valves and SECURE caps when not in use. 5. INSPECT cylinders for leaks and damage and report immediately. 6. TRANSPORT cylinders in an open well ventilated vehicle with the cylinder valves closed and secured properly. Below the list is a section for "EMERGENCY EQUIPMENT LOCATED AT:" with two blank lines. The bottom sign is a yellow "CAUTION" sign with the text "GAS CYLINDER STORAGE AREA" and an illustration of a metal cylinder rack containing five black gas cylinders.

Safe cylinder handling and storage

1. SECURE cylinders properly at all times.
2. STORE cylinders in a cool, well ventilated fire-resistant areas in accordance with regulations.
3. LOCATE cylinders where they will not be knocked over or damaged by falling objects.
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EMERGENCY EQUIPMENT LOCATED AT:

CAUTION
GAS
CYLINDER
STORAGE
AREA

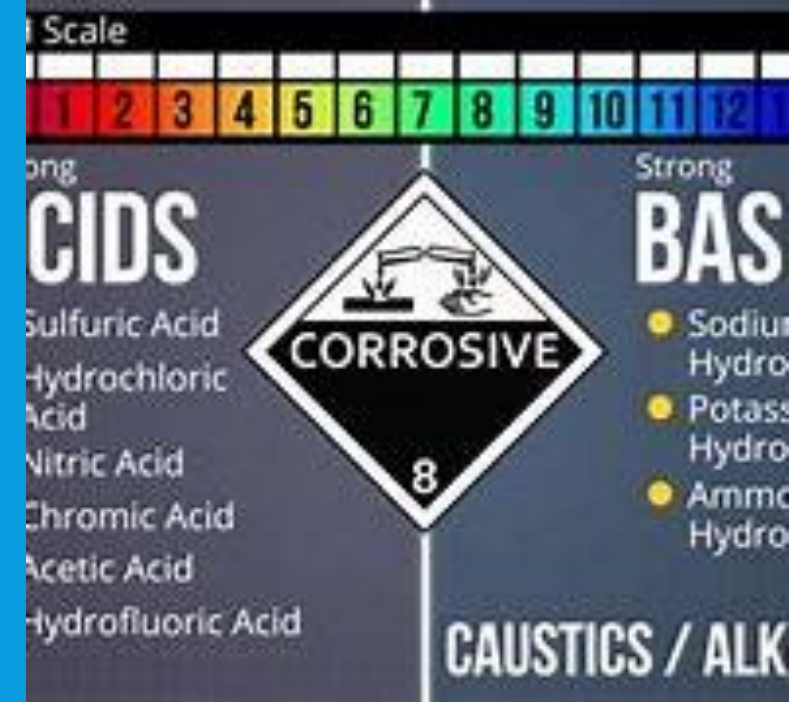
Hazardous Wastes

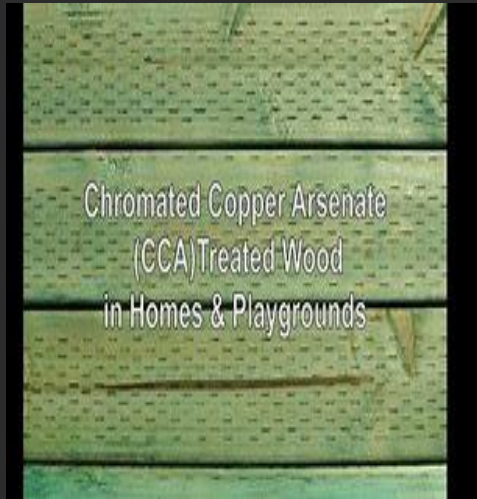
Corrosive substances are materials that can attack the integrity of materials, often by dissolving them.

Corrosives are typically caustic or acidic (low or high pH) - these chemicals can be damaging to human skin, many times causing severe damage to human tissue

Corrosive chemical examples:

Heavy equipment and automotive lead-acid batteries, oven cleaners, bleach, drain cleaners, laundry stain removers, oxidizers, and strong acids and bases.



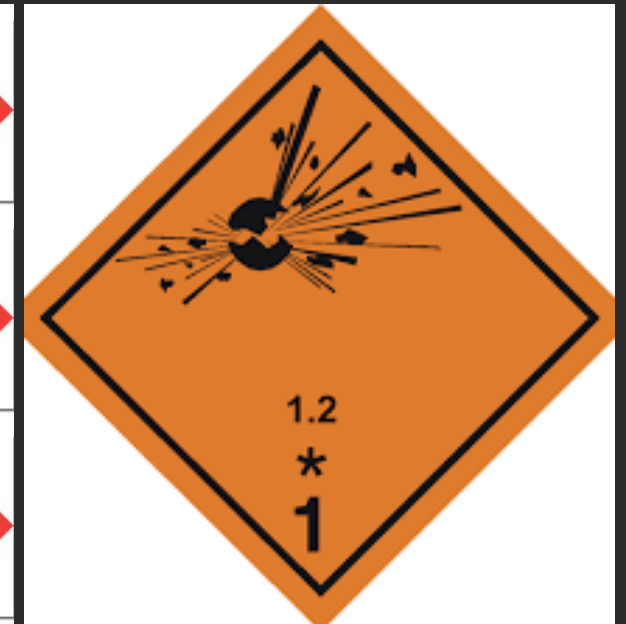


Toxics

- Toxics: containing or being poisonous material especially when capable of causing death or serious debilitation.
- Examples include rat/mouse poison, pesticides, cleaners, pharmaceuticals, and chemically treated wood products

Reactive

- Chemical reactivity hazard is a situation where an uncontrolled reaction could result directly or indirectly in serious harm to people, property, or equipment. **Fire and explosion** are common reactivity hazards.
- Reactive materials are commonly regarded as those materials that can be hazardous by themselves when caused to react by heat, pressure, shock, friction, a catalyst, or by contact with air or water. Reactive interactions require the combining of two or more materials to pose a hazardous situation by chemical reaction (ex.- ammonia and bleach mixture).





Flammable

A combustible material is a material that can burn in air under certain conditions. A material is flammable if it ignites easily at ambient temperatures.

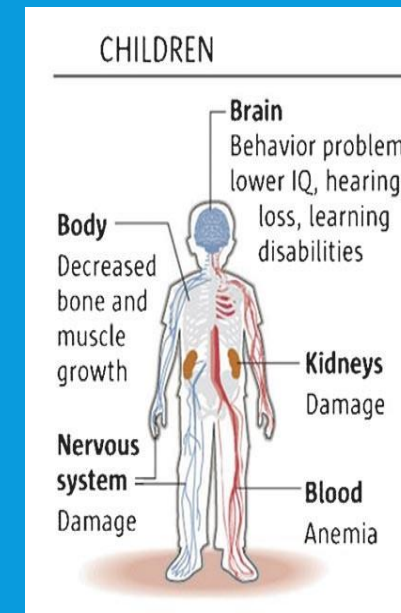


Demolition: Asbestos, Lead, and Radioactivity

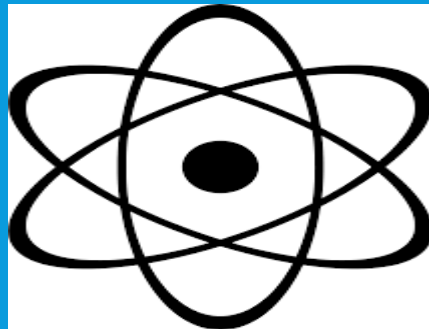
1.) Asbestos is a naturally occurring fibrous silicate mineral. There are six types, all of which are composed of long and thin fibrous crystals, each fiber (particulate with length substantially greater than width) being composed of many microscopic "fibrils" that can be released into the atmosphere by abrasion and other processes. Insulation, wallboard, roofing and siding, spackling, mastic, vehicular brakes/clutch pads



2.) Lead is a naturally occurring poisonous metal found in small amounts in the earth's crust. It's a toxic element that can cause serious health effects in humans and animals. Lead is especially dangerous to babies and young children, causing its use to be banned in 1978. It is commonly found in residential / commercial paints, foreign toys painted with lead paint, and in lead pipes.






Asbestos, Lead, and Radioactivity (Cont.)



Radiation

Definition of Radiation:

Radiation can be defined as energy released in the form of particles or electromagnetic waves.

Name	Symbol(s)	Representation	Description
Alpha particle	${}^4_2\text{He}$ or ${}^4_2\alpha$		(High-energy) helium nuclei consisting of two protons and two neutrons
Beta particle	${}^0_{-1}\text{e}$ or ${}^0_{-1}\beta$		(High-energy) electrons
Gamma ray	γ		Very high-energy electromagnetic radiation



Personal Protection Equipment

Know the best level of Personal Protection equipment for you staff. Ensure you know potential hazardous exposures for you site...plan for safety and execute your plan. Be sure your Safety Manager is informed.



There are 4 levels of personal protection equipment: A, B, C and D

OSHA LEVELS	LEVEL A	LEVEL B	LEVEL C	LEVEL D
Items Worn	NIOSH approved positive pressure, full face-piece self-contained breathing apparatus (SCBA); Totally-encapsulating chemical-protective suit; Inner and outer chemical-resistant gloves; Chemical-resistant, steel toe and shank boots (Optional: Hard Hat/Helmet, Coveralls, Long Underwear, Outer Disposable Suit/Gloves/Boots or Flash Suit; PAPR/SCBA Hybrid System).	NIOSH approved positive pressure, full face-piece self-contained breathing apparatus (SCBA); Hooded chemical-resistant suit (one or two piece); Inner and outer chemical-resistant gloves; Chemical-resistant, steel toe and shank boots or chemical resistant boot covers (Optional: Hard Hat/Helmet, Coveralls, Face Shield; PAPR/SCBA Hybrid System).	NIOSH approved full face or half mask air purifying respirator; Hooded chemical-resistant suit (one or two piece); Inner and outer chemical resistant gloves; Chemical-resistant, steel toe and shank boots or chemical resistant boot covers (Optional: Hard Hat/Helmet, Coveralls, Face Shield).	Coveralls or other work clothing; chemically resistant steel toe and shank boots/shoes or chemically resistant boot covers (Optional: Gloves; Safety glasses or chemical splash goggles; Hard Hat/Helmet; Escape Mask; Face Shield).
Used For	Unknown environments; Confined spaces; Environments requiring the greatest level of skin, respiratory, and eye protection	The highest level of respiratory protection is required, but a lesser level of skin protection	The concentration(s) and type(s) of airborne substance(s) are known and the criteria for APR are met according to NIOSH or equivalent guidelines	Atmosphere contains no known hazard and where work conditions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of chemicals

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Questions

???

References/Resources

- 1.) [E1527-21 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process \(astm.org\)](#)
- 2.) [Brownfields: Fact Sheet USEPA assessing_brownfield_sites.pdf \(epa.gov\)](#)
- 3.) [Hazardous Building Materials - Traditional Building Materials](#)
- 4.) [Chemical Hazards and Toxic Substances - Overview | Occupational Safety and Health Administration \(osha.gov\)](#)
- 5.) [Compressed Gas Safety: Oregon OSHA Fact Sheet fsog.pdf \(oregon.gov\)](#)
- 6.) [Asbestos Regulation 29 CFR 1910.1001: Fact Sheet: OSHA3507.pdf](#)
- 7.) [Lead-29 CFR 1926.62 Fact Sheet: LeadHazards.pdf \(osha.gov\)](#)
- 8.) [Silica Standard-29 CFR 1926.1153 \(Construction\): OSHA3681.pdf](#)
- 9.) [OSHA Standard-Radiation \(29 CFR 1910.1096\): 1910.1096 - Ionizing radiation. | Occupational Safety and Health Administration \(osha.gov\)](#)