

**Health and Safety Plan – Addendum 1  
(Revised June 27, 2008)****Lecture Bottle Sized Cylinder Evaluation and Handling Procedures**

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**University of North Carolina – Chapel Hill  
Airport Road Waste Disposal Area Source Remedy**

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Lecture-bottle sized gas cylinders (cylinders) have been found in some areas of the site excavation at the UNC Airport Road Waste Disposal Area. The presence of these containers requires the implementation of additional safety procedures. This document has been prepared as an addendum to the Health and Safety Plan for the Airport Road Waste Disposal Area Source Remedy project (ARCADIS, 2008). The objective of this document is to provide general guidance with regards to the removal, handling, temporary storage, and disposal of cylinders. Health and Safety policies and procedures that are presented in this document were designed to provide for a safe and healthy work environment and to be protective of offsite parties.

The contents of the cylinders are not known. However, based on cylinder markings it is possible that some of the cylinders could contain Department of Transportation Hazard Zone A gases. Gases that carry a Hazard Zone A are considered to be toxic at low concentrations.

**1. Contractor Health and Safety**

The objective of this document and the HASP is to provide general health and safety information and procedures regarding conditions and activities at the site in order to promote a safe and healthy work environment. Each contractor will be required to continuously review their operations and their own safety plans to verify that the task(s) for which they are responsible are conducted in a safe manner, and that all policies and procedures provided in their site-specific HASP are enforced. The safety procedures and protective equipment presented in the HASP and this Addendum have been established based on an analysis of potential physical, chemical, and biological hazards. Hazard control methodologies have been evaluated and selected to minimize the potential of accident or injury to personnel at the site. Air monitoring and site control methods have also been developed to mitigate potential impacts to the surrounding community.

**2. General Information on Pressurized Gas Cylinders**

Cylinders containing pressurized gases pose unique hazards associated with the chemical composition of the gases, the stored energy of compression, and the possibility of release. The hazards associated with pressurized gas cylinders, which are buried and whose exact locations are unknown, must be carefully controlled. The likelihood that any of the cylinders at the site are labeled is low. It should be assumed that any cylinders will be unlabelled, and should be handled as if the contents are flammable, highly toxic, and reactive.

The removal of gas cylinders exposes them to conditions that are different than the conditions

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under which they have been stored for the past 25 to 30 years. Specialized techniques for the excavation of unknown cylinders are required.

Physical Hazards

Pressurized gas cylinders present a potential hazard even for inert gases. A typical cylinder pressurized to 500 psi contains energy equivalent to nearly a half pound of TNT. Failure of the cylinder or the valve can create dangerous projectiles at high velocity. Age, oxidation, and physical damage may have compromised the cylinders found at the site to the point that they are very delicate.

Chemical Hazards

The chemical hazards associated with cylinders containing pressurized gases differ greatly depending on the contents. Chemical hazards can be classified into groups: toxic, oxidizing, corrosive, flammable, pyrophoric, and reactive, or some combination thereof. Extremely toxic gases and liquids could be released from a lecture-bottle size gas cylinder containing compressed gases, reaching dangerous concentrations in surrounding areas. Oxidizing materials such as oxygen, nitrous oxide, and chlorine can cause other materials to ignite and cause explosions during uncontrolled releases. Corrosive gases such as anhydrous hydrogen fluoride will hydrolyze to form acid when exposed to moist air.

Flammable gases pose fire and explosion hazards. Pyrophoric liquids are often stored in gas cylinders; these materials will spontaneously ignite if exposed to air. Reactive gases such as hydrogen cyanide and ethylene oxide have the potential for exothermic polymerization. Gases such as hydrogen bromide can react with moisture in a way that causes the cylinder to become over-pressurized, leading to the potential for catastrophic cylinder failure.

Reactive mixtures of gases are not ordinarily stored in a single gas cylinder. However, extremely hazardous mixes are possible and have been encountered in research settings. In addition, many gases pose a combination of hazards. For example, nitrogen dioxide is oxidizing, corrosive, and toxic.

**3. Cylinder Response, Removal, and Handling Procedures**

The following sections discuss response, removal, and handling procedures for both non-leaking and leaking cylinders.

**3.1 Non-Leaking Cylinders Response, Removal and Handling Procedures**

The proposed response, removal, and handling procedures for non-leaking cylinders are discussed below.

- Upon discovery of a cylinder, the contractor will stop work in the vicinity of the cylinder and contact the following to provide information regarding the cylinder:
  - UNC, EHS Project Manager.

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- ARCADIS Associate Project Manager or Project Manager.
- An initial cylinder evaluation will be conducted to assess the condition of the cylinder upon discovery.
- ARCADIS Field Supervisor will notify the Orange County Animal Shelter manager on duty that a lecture bottle has been found via the non-emergency telephone numbers.
- ARCADIS Field Supervisor will also notify the Carolina North Land Management & Trail Information Office that a lecture bottle has been found.
- Adequate measures will be taken to reduce the potential for worker injury due to explosions and/or projectiles such as:
  1. Minimizing non-essential site personnel within an appropriate distance based on site conditions including temperature, wind speed, and wind direction,
  2. Installation of a blast shield on the excavator,
  3. Use of a designated “spotter” to assist in locating cylinders.
- Excavation of cylinders will occur in a manner that protects the integrity of containers and allows the spotter to detect the presence of cylinders.
- Cylinders will be handled with the valve end facing up.
- Once removed, the cylinder will be evaluated including:
  1. An in-field visual inspection of the valve assembly and overall condition of the cylinder.
  2. Photograph of the cylinder.
- The cylinder will be placed in a cylinder over pack container, purge with nitrogen gas, and labeled as an over pack cylinder with ID matching the ID in the photograph and any other appropriate information as required for disposal.
- The Orange County Animal Shelter and Carolina North Land Management & Trail Information Office will be notified that they can return to normal operating conditions.
- The over packed cylinders will be stored in a cool area away from sunlight, moisture, and ignition sources.
- The area surrounding the over packed cylinders will be ventilated continuously.

If the equipment (e.g. cylinder over pack) or trained personnel are not available to safely handle a cylinder, it will be left in place, covered with soil, and marked, and excavation in that area will be suspended until the cylinder is removed.

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#### **3.2 Leaking Cylinders Response, Removal, and Handling Procedures**

A leaking cylinder will be indicated by sound, sight (moving soil, moving cylinder, visible cloud), or instrument readings. The following response actions will be taken upon discovery of a leaking cylinder:

- Contractor will sound the emergency siren to indicate elevated safety procedures should be implemented.
- Non-essential site personal will evacuate an appropriate distance based on wind speed, direction, and air monitoring.
- Contractor track hoe operator will cover cylinder with soil.
- Contractor track hoe operator and spotter will retreat to safe location, dependent of wind speed and direction and air monitoring. Retreating further to rally point may be necessary dependent on air monitoring results. Contractor will communicate air monitoring results to team at rally point.
- ARCADIS Field Supervisor will call 911 to secure the intersection of Martin Luther King Jr. Boulevard and Municipal Drive, and contact ARCADIS Project Manager.
- Contractor Project Supervisor notifies UNC Project Manager.

When cylinder has apparently expended its contents (no elevated readings at 100 ft perimeter and no visible/ audible indications), contractor personnel will approach excavation area wearing Level B PPE, while conducting continuous air monitoring. Once contractor confirms the area is safe and the cylinder has completely vented, the cylinder will be over packed using the previously outlined steps. Additionally, the ARCADIS Field Supervisor will:

- Conduct a reconnaissance of the area surrounding the site.
- Contact emergency response personal to cancel security activities.
- Contact the Orange County Animal Shelter and the Carolina North office to notify them that normal operations can be continued.

#### **3.3 Engineering Controls**

Engineering controls will be implemented to mitigate impacts from a potential release from a compressed gas cylinder. These engineering controls will include the use of four pneumatic fans to extract vapors from the excavation pit area. Each fan will be capable of handling approximately 2,000 cubic feet per minute (cfm). The air extracted from the excavation pit area will be discharged through a manifold that will allow mixing of contaminant vapors with clean air. The overall dilution will equal or exceed 6,000 cfm. The manifold will be placed approximately

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30 yards north of the work area in the opposite direction of the Animal Shelter. This will position the manifold such that the diluted air discharge will occur in a location at least 130 yards away from the animal shelter. The use of this air extraction/air dilution system will mitigate the possible discharge of potentially toxic gases primarily through the process of dilution.

**3.4 Air Monitoring**

Real-time air monitoring for VOCs using a PID will be conducted during the entire process involving the removal and handling of each cylinder. A Photoionization detector (PID) with an 11.7 eV lamp will be used to screen the area and note any increase above background. The area of over packed cylinder storage will also be monitored.

The locations that will be monitored will include the area immediately around the excavation area that contains buried cylinders extending to an approximate 25-foot radius.

**3.5 Personal Protective Equipment (PPE)**

The following section describes the personnel protective equipment (PPE) that will be worn during the removal and handling of cylinders. The PPE will consist of a minimum of Level B as outlined below.

Level B Protection

Level B protection should, at a minimum, consist of the following:

- Full-face, positive pressure, air-supply respirator
- Outer coverall Pyloron® suit (or equivalent), with ankles and cuffs taped to boots and gloves
- Inner coverall Nomex, minimize non-cotton clothing underneath Nomex
- Nitrile gloves worn over nitrile surgical gloves
- Steel-toe work boots (meeting ANSI Z41)
- Chemical-resistant boots with steel-toes or Latex/PVC over boots over steel-toe boots
- Hardhat (meeting ANSI Z89)

If the contractor determines that there are any changes or modifications to the site conditions that present additional hazards not covered by the response procedures and notifications discussed in this document, then the ARCADIS and UNC Project Managers must be notified.

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**Emergency Call List**

Name/Title	Business/Organization	Office Phone Number	Cell Phone Number
Larry Daw, UNC EHS Project Manager	UNC EHS	(919) 962-6666	(919) 883-7019
Mary Beth Koza, UNC, Director EHS	UNC EHS	(919) 843-5913	(919) 210-5834
Alan Pinnix, ARCADIS, Associate Project Manager	ARCADIS	(919) 854-1282	(919) 539-4645
Jim Shilliday, ARCADIS, Project Manager	ARCADIS	(919) 854-1282	(919) 606-0797
Adam Tripp, ARCADIS, Field Supervisor	ARCADIS	(919) 854-1282	(919) 619-2084
Rodney Swiney, Site Manager	WRscompass	(919) 918-7912	(404) 328-5360
Alvy Sanders, Site Operations Manager	WRscompass	(919) 918-7912	(813) 918-4058
Staff on Duty	Orange County Animal Shelter	(919) 967-7383 (main line)	(919) 619-8443 (emergency mobile phone which is kept at the front desk at all times)
Jess Allison, Shelter Manager	Orange County Animal Shelter		(919) 210-6175
Drew Brinkley, Asst. Manager	Orange County Animal Shelter		(919) 805-1713
Greg Kopsch	Carolina North Land Management & Trail Information Office	(919) 883-8930	
Staff on Duty	Local Police, Ambulance, or Fire Department	911	911
Staff on Duty	Local Hospital (UNC)	Emergency: (919) 966-4721 Or Main Line (919) 966-4131	
Staff on Duty	UNC Public Safety	(919) 962-6565	
Staff on Duty	National Response Center (for all spills above Reportable Quantities	(800) 424-8802	