

UNT Rule on Open Flames in Biological Safety Cabinets

Overview

Biological safety cabinets (BSCs) are designed to protect workers, their products, and their environment. Most BSCs at the University of North Texas re-circulate 70% of their air within the cabinet. With only 30% of the air exhausting from the cabinet, natural gas or other flammable gases can quickly accumulate, potentially leading to an explosive atmosphere. The high efficiency particulate air (HEPA) filters – responsible for providing a sterile environment in the cabinet – can act as a dense mass of combustible material during an uncontrolled fire inside the cabinet. Also, the heat convection currents generated by the open flame compromise the carefully controlled airflow pattern responsible for protecting product and personnel. This rule outlines requirements for preventing flammable gas explosions within BSCs.

Applicability

This rule applies to those individuals involved in the following actions at UNC:

- Investigators using biological safety cabinets that meet the following requirements:
 - The BSC re-circulates air (see below of identification information) and
 - The BSC is connected to natural gas *or*
- The BSC is used with other flammable liquids or gases.
- Building or Project Managers who facilitate the installation of new BSCs.
- Facilities Services workers who respond to plumbing requests on BSCs.

Procedure

Certain types of BSCs are designed to contain, not exhaust, most of the air within a cabinet. These cabinets re-circulate 70% of their air within the enclosed work space. This makes them prone to the buildup of flammable materials within the cabinet. The following 4 types of cabinets are possible at UNT:

BSC Type	Former Name(s)	% Re-circulated Air
Class II Type A1	Class II Type A	70
Class II Type A2	Class II Type A/B3	70
Class II Type B1	N/A	30
Class II Type B2	N/A	0

To determine the type of cabinet, locate the unique serial number on the cabinet. This area should also contain the BSC type. If unable to locate this information, contact RMS/BSO for further assistance.

If a gas leak occurs (e.g. valve left on or tube leak) inside a Type A1 or Type A2 re-circulating biological safety cabinet, over time the gas becomes more concentrated, reaching explosive levels. Because this occurs within the confines of the BSC workspace, the user is unable to detect the gas leak. Therefore, researchers must refrain from the practice of using natural gas or other

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flammable gases within re-circulating biological safety cabinets. Additionally, open flames can affect the airflow pattern of a BSC. According to the National Institutes of Health and the Centers for Disease Control and Prevention, “Open flames are not required in the near microbe-free environment of a biological safety cabinet. On an open bench, flaming the neck of a culture vessel will create an upward air current which prevents microorganisms from falling into the tube or flask. An open flame in a BSC, however, creates turbulence which disrupts the pattern of HEPA-filtered air supplied to the work surface.”

RMS Rule – Flammable Gases in Biological Safety Cabinets

The use of open flame burners is not allowed in Biological Safety Cabinets of Type A1 and Type A2 at UNT. Biosafety Cabinets of Type A1 and Type A2 currently in use must have their gas lines removed or disconnected. New BSC installations of Type A1 and Type A2 should not be connected to gas lines.

RMS/BSO (biosafety@unt.edu) is available for consultation regarding alternatives to the use of gas burners.

Alternatives for researchers that need to disinfect instruments within the BSC include:

- The Electric Bunsen Burner combines the efficiency of a gas burner with the safety and control of an electric heater. It is ideal for sterilizing inoculating needles and loops, and for heating small flasks, test tubes, and beakers. Find [here](#) or [here](#).



- The Bead Sterilizer provides a safe, effective, and convenient method for sterilizing small instruments without using flames, gases, or chemicals ([not appropriate for surgical instruments](#)). Find [here](#), [here](#), or [here](#).



- Bacti-Cinerator to sterilize loops and needles safely and conveniently while preventing infectious spatter and cross-contamination. Find [here](#), [here](#), or [here](#).



- pre-sterilized inoculating loops and needles;
- pre-autoclaved forceps, scalpels, etc. in covered autoclavable plastic containers or the special sleeves supplied for this use by various companies. These can be taken into the BSC and

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used individually, then placed in an autoclavable discard tray located in the BSC for used/contaminated utensils; or

- a Bunsen burner outside the BSC (> 2 feet away from the BSC) for some applications. However, using a flame in this manner would cause the researcher to reach in and out of the BSC, disrupting the air curtain at the front of the cabinet. Flaming the necks of bottles is not necessary due to the protective airflow in the BSC.

Responsibilities

BSC Users

Refrain from requesting house natural gas be connected or using natural gas that is already connected within re-circulating BSCs. Other flammable gases such as oxygen, hydrogen, acetylene or propane should also not be used in the BSC.