

# National Human Exposure Assessment Survey (NHEXAS)

## *Region 5 Study*

## Quality Systems and Implementation Plan for Human Exposure Assessment

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**Standard Operating Procedure**

**NHX/SOP-300-002**

**Title:** Personnel Safety in the ACS Inorganic Clean Lab Facility

**Source:** Research Triangle Institute

U.S. Environmental Protection Agency  
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**TITLE:** STANDARD OPERATING PROCEDURES FOR PERSONNEL SAFETY IN THE  
ACS INORGANIC CLEAN LAB FACILITY

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PERSONNEL SAFETY IN THE ACS INORGANIC CLEAN LAB FACILITY

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## 1.0 INTRODUCTION

Safety of the laboratory personnel is one of the most important issues in any chemical analysis laboratory. Chemicals and samples of toxic nature are often found in chemical analysis laboratories, thus laboratory personnel can be exposed to these chemicals on a regular basis. Proper laboratory construction and proper operating procedures are the key features for a safe laboratory. The purpose of this document is to provide guidelines to ensure the safety of the laboratory working staff and the clean room facility. This document does not intend to supersede general laboratory safety guidelines given in the "Safety and Occupational Health Manual", but to use as a supplement.

## 2.0 DESIGN OF THE CLEAN ROOM FACILITY

The clean room facility is designed to provide a particle-free clean room environment for trace and ultra-trace level metal analyses. As a result, the facility is somewhat different from a typical chemical analysis laboratory. The design and the floor plan of the clean room facility are described in detail in NHX/SOP-300-006, "Standard Operating Procedure for the ACS 100/10,000 Clean Lab Facility".

## 3.0 SAFETY CONSIDERATIONS IN NORMAL LABORATORY OPERATIONS

### 3.1 Sample/Standard Preparations

Sample/standard preparations usually involve the use of numerous chemicals and apparatus.

3.1.1 When handling chemicals, guidelines given in the material handling data sheets (MSDS) must be followed at all times. MSDS sheets are available through the manufacturer or can be requested from RTI Safety and Occupational Health.

3.1.2 All sample/standard preparations that generate fumes or volatile compounds must be carried out in a fume hood. The proper use of fume hoods is described later in this document (Section 3.4).

- 3.1.3 All prepared samples/standards should be properly labeled to reflect their contents (chemical name, matrix, solvent, etc.).
- 3.1.4 Wastes that are generated during sample/standard preparation must be stored in appropriate containers. Waste containers must be labelled to indicate their contents and approximate concentration whenever possible. (Section 4.1.8, Safety and Occupational Health Manual.)

### 3.2 The Use of Acid Baths

Acid baths are used in the class 100 room for leaching of labware. These acid baths may contain  $\text{HNO}_3$ ,  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{HF}$  or mixtures of these acids at concentrations up to 50% of acid. Acid baths have lids and are located in an exhaust cabinet. Proper use of acid baths are described in NHX/SOP-300-007, "Standard Operating Procedure for Cleaning Labware in the ACS Inorganics 100/10,000 Clean Lab Facility".

- 3.2.1 Care must be taken to avoid any acid spill when removing the acid leached labware from acid baths. In the event of accidental spill, the proper cleanup procedure should be followed (refer to Section 4.2).
- 3.2.2 Acid baths must be properly labelled to indicate the type of acid(s) and the concentration of the acid(s).

### 3.3 The Use of Hot Plates

The clean lab has two remotely operated hot plates (Corning Model PC-505) and they are placed inside the 8 foot fume hood in separate compartments.

- 3.3.1 Hot plates should never be operated outside the fume hood or when proper operation of the hood is in question.
- 3.3.2 Hot plates should be inspected regularly by laboratory personnel for their proper operation. Any defects in the hot plate or in the remote switch should be corrected by the laboratory staff or reported to the RTI Facilities and Maintenance as they may lead to electrical shocks or even fires.
- 3.3.3 Hot plates should never be operated above setting 5, which corresponds to a temperature of  $400^\circ\text{C}$ , as it may damage the hood material. Refer to the general information card for Corning remote hot plates for different control settings and corresponding temperatures.

### 3.4 The Use of Fume Hoods

The clean lab facility is furnished with 3 fume hoods, two in the clean lab and one in the instrument room. (Reference: NUAIRE Operation and Maintenance Manual).

- 3.4.1 No flames are allowed inside or near the fume hood.
- 3.4.2 Activities in the fume hood should be carefully planned to avoid the use of incompatible chemicals in the hood at the same time.
- 3.4.3 The sashes of the fume hood should never be lifted above 12" when carrying out operations inside the fume hood in order to minimize the personal exposure to chemicals and fumes. An 8" opening is the manufacturer recommended position of operation in order to prevent possible contamination.
- 3.4.4 All fume hoods should be inspected by the custodian for their proper operation regularly. The static pressure through the filter(s) in the fume hood should be monitored once a week and recorded in the log book. The replacement or cleaning of the filter(s) is requested through RTI Facilities and Maintenance.
- 3.4.5 The front area of the fume hood should be kept free of items that may prevent the closing of the sashes completely in the event of an emergency.

### 3.5 Handling of Chemicals

The clean lab is no different from a typical chemical analysis laboratory when it comes to the types of chemicals that are used. Chemicals that are routinely used in this laboratory include acids, bases, oxidants, reductants, solvents, etc. However any acidic or toxic fumes generated anywhere in the class 100 room (other than the fume hoods) will circulate throughout the room as a result of its air recirculation system. Therefore it is absolutely necessary to have all activities that generate fumes carried out in the fume hood.

- 3.5.1 All chemicals must have labels on them as well as any specific storage conditions.
- 3.5.2 All chemicals not in regular use should be kept in a designated chemical storage area.

#### 4.0 EMERGENCY SITUATIONS

Emergency situations include fires, explosions, toxic fumes, chemical gases, acid spills, accidents or any other event that imposes a threat to the people or to the facility. All types of emergencies should be reported to the laboratory manager and RTI safety personnel (extension 5911) as soon as possible.

##### 4.1 Fires

All exposed surfaces (wall, ceiling and floor) and furniture in the clean lab are constructed of plastic, PVC or polypropylene which are flammable materials. All laboratory personnel need to be adequately informed of the danger of fires in the clean lab. If the fire has just started and is small, laboratory personnel may choose to extinguish the fire. It is important to take necessary steps to avoid the spread of fire if possible. These steps may include closing of any opened containers of chemicals, shutting off any opened gas lines, etc. However the safety of the people must be considered first and if the fire has imposed a threat to the laboratory personnel, immediate evacuation of the facility is advised.

##### 4.2 Chemical Spills

Chemical spills are fairly common emergency situations in a chemical laboratory. Different chemicals have different effects on people and materials in the event they come into contact. The clean lab is equipped with floor drains, so that any spills can be washed down in to a containment tank and be neutralized or diluted later before release to the main sewer system. Spill kits are available in the instrument room for use in emergency situations.

#### 5.0 SAFETY ORIENTATION

The clean lab and the instrument room are equipped with a safety shower and a eye wash fountain. RTI safety personnel are responsible for regular inspection of these items to make sure they are in good operating condition.

All laboratory personnel will be given a safety orientation by the laboratory supervisor prior to their use of the clean room facility. They will be made aware of the locations of fire extinguishers, fire blankets, eye washes, safety showers, etc.