

Chemical Hygiene Plan – Appendix H

Common Laboratory Task Risk Analysis

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Contents

1	HANDLING AND WASHING KJELDAHL TUBES	2
2	TRANSFER OF HAZARDOUS WASTE LIQUIDS INTO DRUMS OR TEMPORARY CONTAINERS	3
3	OPERATING BICO ROCK GRINDING MILL (PULVERIZER)	4
4	COMPRESSED GAS CYLINDERS	6
5	HANDLING CUBITAINERS	8
6	USE OF BOTTLE-TOP DISPENSERS	9
7	GLASSWARE USAGE	11
8	SAMPLE DIGESTION AND HOTPLATE SAFETY	13
9	PIPETTING	14
10	CHITTICK GASOMETRIC APPARATUS FOR CO ₂ ANALYSIS.....	15
11	WORKING WITH SULFURIC ACID.....	17
12	PHOSPHORIC ACID SAMPLE HANDLING	19
13	OVEN AND MUFFLE FURNACE SAFETY	20
14	ICP ROUTINE OPERATION AND MAINTENANCE	21
15	HANDLING GOOCH CRUCIBLES	23
16	METHANOL HANDLING.....	24
17	OPERATING AND HANDLING COMBUSTION BOATS IN THE LECO S-832DR WITH AUTOSAMPLER	25



1 Handling and Washing Kjeldahl Tubes

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 01		Reviewed by: Angel Hernandez	Date: 12/21/2022
Task: Handling and Washing Kjeldahl Tubes		Approved by: Alan Shobert	Date: 12/21/2022
Step	Task Steps	Potential Hazards	Controls
1	Loading and unloading tubes in and out of the Vapodest unit	Exposure to reagents or to waste chemicals Thermal burns	Standard PPE for the lab is: eye protection, lab coat and disposable gloves. Allow the tubes to cool for about 5 minutes before removing the tubes from the carousel for cleanup.
2	Cleaning the tubes in either the glassware wash station or by hand	Cuts	Place tubes in a tube carrier to transport to the wash station area. Place the tubes over the spindles of the wash rack and wash as you would any other type of glassware. If washing by hand, wear cut resistant gloves and do not bump the tubes against the sides of the sink or each other.



2 Transfer of Hazardous Waste Liquids into Drums or Temporary Containers

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 02		Reviewed by: Angel Hernandez	Date: 12/21/2022
Task: Transfer of Hazardous Waste Liquids into Drums or Temporary Containers		Approved by: Alan Shobert	Date: 12/21/2022
Step	Task Steps	Potential Hazards	Controls
1	Pour the liquid into the receiving drum or container This includes Methanol waste and solution containing Barium Chloride or Barium Sulfate.	Exposure to the chemical waste and fumes Strains	Standard PPE for the lab is: eye protection, lab coat and disposable gloves. Small size container transfers (less than 5 gallons) require just the standard PPE for the lab. When the transfer is 5 gallons or more, a face shield and an apron are additionally required. Avoid breathing fumes by keeping the face away from the flow into the receiving container. Get help lifting any container you feel is too heavy or puts you in an awkward position.
2	Disposing or moving waste chemical to the bunker	N/A	Contact Mosaic's environmental specialist for this task.



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3 Operating BICO Rock Grinding Mill (Pulverizer)

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 03		Reviewed by: Angel Hernandez	Date: 3/29/2021
Task: Operating BICO Rock Grinding Mill (Pulverizer)		Approved by: Trace Yates	Date: 3/29/2021
Step	Task Steps	Potential Hazards	Controls
1	Opening and closing the grinder	Pinch points, cuts and abrasions	Allow grinder to come to a COMPLETE STOP before opening. Use caution when opening and closing the lid due to the heavy weight and potential for pinch points. Inspect the face plate, latch, leaf spring and other small parts for damage. Report any damaged parts immediately.
2	Grinding samples	Dust inhalation, noise and eye injury	Turn on the exhaust fan. Hearing protection is mandatory. Primary and secondary eye protection: either face shield and goggles or face shield and safety glasses is mandatory. These 3 controls remain in effect until all grinding activities are done, and the grinder is cleaned and turned off (steps 2 and 3). Dust masks are optional but recommended. If the exhaust fan stops working, dust masks become mandatory. Ensure the catch pan (bottom drawer) is closed tightly and stays closed. Long hair must be tied back when grinding. Do not wear loose fitting clothing or a lanyard while grinding. Feed rock to grinder at a moderate rate, do not overload it.



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			Be mindful of body position. Do not stand over the sample shoot to avoid being hit by flying debris.
3	Cleaning the grinder	Dust inhalation, pinch points, noise, eye injury and compressed air hazards	Turn on the exhaust fan. Hearing protection is mandatory. Primary and secondary eye protection: either face shield and goggles or face shield and safety glasses is mandatory. Allow grinder to come to a COMPLETE STOP before opening. Compressed air used for cleaning shall be a maximum of 30 psig and only approved nozzles shall be used. Compressed air shall not be used for cleaning body, or clothes.



4 Compressed Gas Cylinders

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 04		Reviewed by: Angel Hernandez	Date: 3/29/2021
Task: Compressed Gas Cylinders		Approved by: Trace Yates	Date: 3/29/2021
Step	Task Steps	Potential Hazards	Controls
1	Removing the regulator from an empty gas cylinder; and/or, attaching the regulator to a new cylinder	Pinch points, sparks, fire and accidental release	Except when moving cylinders, all cylinders must remain secured to the wall with a cylinder bracket and a strap that is in good condition. Make sure you are working on the correct gas cylinder. Close the cylinder valve and do not over tighten. Vent the cylinder, to release stored pressure, by turning the adjusting knob clockwise and noting the pressure drop on the gauge. With oxygen cylinders, use a brass wrench to prevent the production of sparks. With all cylinders, use the correct size of wrench to prevent slippage and personal injury or damage to the cylinder. Do not apply excessive force to the wrench and watch for potential pinch points. Visually inspect the regulator for damages. To prevent accidental releases, all empty cylinders must be tagged “Empty” and all full cylinders must be tagged “Full”. Valve caps must be kept on when the cylinder is not in use, even if the cylinder is empty.



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			Remember, oxygen supports combustion; No smoking or open flames when working in the cylinders' area.
2	Removing the valve cap from a full cylinder and replacing the cylinder valve cap on an empty cylinder	Pinch points and back or muscle strain	Watch for pinch points, check body positioning and do not use excessive force. When removing the valve cap, use only the 'Strap Wrench' and do not use excessive force. Never improvise a "cheater bar". If over-tightened, or cross threaded, label it for the supplier. When replacing the valve cap, make sure it is not cross threaded and only hand tighten the cap.
3	Open the cylinder valve and adjust the correct output pressure on the second stage valve (low-pressure gauge)	Fire, accidental release or injury from damaged regulator	For all cylinders, except oxygen cylinders: open the valve slowly until the pressure stops rising on the high-pressure gauge. For oxygen cylinders only: open valve slowly until the valve is fully open. Turn the adjusting knob, on the second stage side until the correct output pressure shows on the secondary gauge. Wait a few minutes and adjust it again, if needed. Before leaving the cylinders' area, ensure all cylinders are still secured from falling.



5 Handling Cubitainers

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 05		Reviewed by: Angel Hernandez	Date: 3/29/2021
Task: Handling Cubitainers		Approved by: Trace Yates	Date: 3/29/2021
Step	Task Steps	Potential Hazards	Controls
1	Receiving, transporting and storing the cubitainers	Spill or splash, skin and/or eye contact and muscle strains	When receiving, visually inspect the structural integrity of the boxes and check the containers for leaks, loose caps or damage. When transporting, visually inspect the structural integrity of the boxes before moving the Cubitainers and use a lab cart or a hand truck, when appropriate. When storing, visually inspect the structural integrity of the boxes and check the containers for leaks, loose caps or damage before lifting. Use proper lifting techniques when lifting the cubitainers. Store the boxes on a shelf or in a plastic tray off the floor.
2	Dispensing reagents from cubitainers	Spill or splash, skin and/or eye contact	Inspect the container and dispensing system for leaks, loose caps or damage. When possible, dispense away from you or to the side.
3	Disposing of empty cubitainers	Skin or eye contact with chemical and chemical spill	Use fresh water to triple-rinse the cubitainers before discarding to the dumpster.



6 Use of Bottle-Top Dispensers

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 06		Reviewed by: Angel Hernandez	Date: 3/29/2021
Task: Use of Bottle-Top Dispensers		Approved by: Trace Yates	Date: 3/29/2021
Step	Task Steps	Potential Hazards	Controls
1	Dispensing acids, bases, reagents and other solutions	Chemical burns, damage to the eye and/ skin and inhalation of fumes Cuts	Wear primary and secondary eye protection: face shield and goggles or face shield and safety glasses. An alternate secondary eye protection is to lower the fume hood sash to shoulder level to protect the eyes and the face. Only dispense acids under a fume hood with the exhaust running. Before using, inspect the receiving container, the dispenser and the dispenser's tip to ensure they are in good working conditions and the tip is securely attached to the dispenser. Point the tip away from your body and make sure the tip is inside the receiving container before dispensing. Use only moderate pressure to dispense the liquid. Clean or replace dispensers that leak or require heavy pressure to use. (Note: Do not clean or replace auto dispenser until you have received proper training on both tasks). Wear cut resistant gloves when handling broken glass or sharp pieces of plastic.
2	Removing, cleaning or replacing bottle top dispensers	Spill or splash, chemical burn to the eyes or skin and inhalation of fumes	Note: Use caution when removing. The dispenser's drawing tube will drip when it is removed from its container. Only perform this task under a fume hood with the exhaust fans running.



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			Slowly remove the dispenser from the container and allow the drawing tube to drain back into the container. Use a pan or container to rest the bottle top dispenser and to catch any extra drippings.
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7 Glassware Usage

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 07		Reviewed by: Angel Hernandez	Date: 3/29/2021
Task: Glassware Usage		Approved by: Trace Yates	Date: 3/29/2021
Step	Task Steps	Potential Hazards	Controls
1	Prior, during and after using glassware, inspect it for chips, cracks and other defects	Sharp edges or broken glass Spill/splash and chemical exposure	Replace glassware every 6 months. Dispose of any chipped, cracked or broken glassware in the broken glass containers deployed within the lab. Wear cut resistant gloves when handling cracked or broken glassware. Wear proper PPE. Aprons and sleeve guards are optional but recommended.
2	Inserting a stopper in a volumetric glass flask	Sharp edges or broken glass Spill/splash and chemical exposure	Wear cut resistant gloves when inserting stopper. Use the correct stopper size. Wet the stopper, before using it, to reduce the friction and apply moderate downward force to insert the stopper. Wear proper PPE. Aprons and sleeve guards are optional but recommended.
3	Inserting a stir bar in a volumetric glass flask	Broken glass Chemical exposure	Do not drop the stir bar in the flask; tilt the flask and allow the stir bar to slide in. Wear proper PPE. Aprons and sleeve guards are optional but recommended.
4	Mixing a solution in a flask	Spill/ splash and chemical exposure	Before starting the magnetic stirrer, make sure it is set at the correct RPMs. If mixing manually, make sure the stopper is secured before starting. Grasp the flask by the neck (at the stopper) and under the bulb simultaneously, invert repeatedly.



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5	Flask washing	Broken glass	Handle carefully and keep them from knocking into each other or hard surfaces.
		Chemical exposure	Wear proper PPE. Aprons and sleeve guards are optional but recommended.



8 Sample Digestion and Hotplate Safety

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 08		Reviewed by: Angel Hernandez	Date: 3/29/2021
Task: Sample Digestion and Hotplate Safety		Approved by: Trace Yates	Date: 3/29/2021
Step	Task Steps	Potential Hazards	Controls
1	Placing, digesting and removing flasks from hot plate	Spill/splash and exposure to chemical and fumes Thermal burns Chemical burns Broken glass	Ensure that Fume Hood is on and operating properly. Before using, check the tongs are working properly. Use care not to touch the hot plate and consider your hand and arm positioning to avoid a steam burn. Allow glassware to cool before removing from the fume hood. Do not reach over a digesting sample; and do not extend your upper body into the fume hood. Inspect the glassware prior to use; and only use tongs to remove hot glassware from the hotplate.

9 Pipetting

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 09		Reviewed by: Angel Hernandez	Date: 3/29/2021
Task: Pipetting		Approved by: Trace Yates	Date: 3/29/2021
Step	Task Steps	Potential Hazards	Controls
1	Placing bulb on a pipette, siphoning the aliquot, dispensing the aliquot and cleaning the pipettes	Spill/splash, chemical exposure and broken glass	Note 1: Pipetting by mouth is strictly prohibited. Note 2: Wearing gloves when pipetting is optional. Note 3: Using an electronic pipetting device or dispenser, eliminates all the hazards; except for the chemical exposure, which is mitigated by wearing PPE. Prior to use, inspect the pipet for damages. Grasp the pipet near the top (within 2-3 inches) and gently place the bulb on the pipet. Never hold the pipet near the middle when placing a bulb on the end. Never force a bulb onto a pipet by using undue pressure; use a different size bulb if the one you are trying to use will not go on easily. A tight-fitting bulb usually can be put on by first wetting the bulb at the insertion point. When washing, wash 1 pipette at a time.

10 Chittick Gasometric Apparatus for CO₂ Analysis

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 10		Reviewed by: Angel Hernandez	Date: 3/29/2021
Task: Chittick Gasometric Apparatus for CO ₂ Analysis		Approved by: Trace Yates	Date: 3/29/2021
Step	Task Steps	Potential Hazards	Controls
1	Adding 30% Hydrogen Peroxide to reaction vessel	Chemical burn to the skin Chemical burn to eyes and inhalation of fumes Broken glass	Wear proper PPE and perform this task inside an operating fume hood. Aprons and sleeve guards are optional but recommended. Primary and secondary eye protection is required. This includes either face shield and goggles or face shield and safety glasses. An alternate secondary eye protection is to lower the fume hood sash to shoulder level to protect the eyes and the face. Inspect the Apparatus and reaction vessel prior to use. See Common TRA for Glassware.
2	Adding Potassium Iodide to heated Hydrogen Peroxide	Chemical and thermal burns to the skin Chemical burn to eyes and inhalation of fumes Broken glass	Wear proper PPE and perform this task inside an operating fume hood. Aprons and sleeve guards are optional but recommended. Note: There is a potential for a violent exothermic reduction-oxidation reaction; add potassium iodide slowly to keep the reaction under control. Primary and secondary eye protection is required. This includes either face shield and goggles or face shield and safety glasses. An alternate secondary eye protection is to lower the fume hood sash to shoulder level to protect the eyes and the face.



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			Inspect the Apparatus and reaction vessel prior to use. See Common TRA for Glassware.
3	Connecting and removing the reaction vessel to the Chittick apparatus	Broken glass Chemical exposure	Proper PPE and cut resistant gloves are required for this task. Grasp the reaction vessel close to the top to reduce the chance of breakage. Wear proper PPE. Aprons and sleeve guards are optional but recommended.
4	Filling and using the 1:2 Hydrochloric acid dispensing burette	Broken glass Chemical exposure	Proper PPE and cut resistant gloves are required for this task. Grasp the reaction vessel close to the top to reduce the chance of breakage. Wear proper PPE. Aprons and sleeve guards are optional but recommended. Dispense the HCl slowly to prevent boil overs.



11 Working with Sulfuric Acid

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 11		Reviewed by: Angel Hernandez	Date: 3/29/2021
Task: Working with Sulfuric Acid		Approved by: Trace Yates	Date: 3/29/2021
Step	Task Steps	Potential Hazards	Controls
1	Handling sulfuric acid bulk bottles	Spills, splashes and chemical burns to the skin and (or) the eyes	In addition to the standard lab PPE, acid apron with sleeves and face shield are required. Incoming bulk sulfuric acid must be in shipping containers and bottles approved by the vendor. Transport individual bottles in “bottles totes” safety carriers. Triple rinse the empty bottles before disposing in the dumpster.
2	Handling sulfuric acid samples. This includes picking up, weighing, titrating and disposing of the samples	Spills, splashes and chemical burns to the skin and (or) the eyes	Samples must be contained in Teflon (FFP) bottles or other bottles made of approved materials. Do not pick up sulfuric samples that are not in the specified bottles. Test the caps to be sure they are on tight. Use only approved cradles and carriers for transporting samples; do not remove the acid bottles from the carriers. Use only clean and dry disposable pipets. Do not pass pipet with sulfuric acid in it across any part of your body. Use caution to not have the pipet “fling” any acid from the tip. Rinse used pipet with water when done and discard. Always add acid to water (NEVER add water to acid) Rinse the outside of the sample bottle if you suspect there is acid on the bottle.



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			If diluting the acid remember to add acid to water and not the opposite.
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12 Phosphoric Acid Sample Handling

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 12		Reviewed by: Angel Hernandez	Date: 3/29/2021
Task: Phosphoric Acid Sample Handling		Approved by: Trace Yates	Date: 3/29/2021
Step	Task Steps	Potential Hazards	Controls
1	Carrying, shaking, opening and closing phos acid sample bottles and cups	Spills/splashes, contact with the skin or the eyes	Wearing disposable gloves is required; inspect-the gloves often and change as needed. Wash your hands often. Ensure the lids are tight and in good conditions. Wash exterior of sample bottles or cups if there is phosphoric acid on them. When shaking the sample cups, hold a paper towel over it to prevent flinging acid. Shake sample cups below chest level. Never shake them at eye level. Do not leave open bottles of phosphoric acid unattended. Close containers tight.
2	Cleaning phos acid bottles and cups	Spills/splashes, contact with the skin or the eyes	A face shield is not required, but is recommended, the water pressure from the faucet may increase the chances of splashing. After cleaning, examine bottles and cups and discard worn or damaged bottles.



13 Oven and Muffle Furnace Safety

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 13		Reviewed by: Angel Hernandez	Date: 3/29/2021
Task: Oven and Muffle Furnace Safety		Approved by: Trace Yates	Date: 3/29/2021
Step	Task Steps	Potential Hazards	Controls
1	Placing samples in and removing samples from the lab ovens and muffle furnaces	Thermal burns	With the lab ovens: use handle clamps or heat resistant gloves when removing sample pans from the ovens. Be sure oven door is positioned well out of the way of your elbows and hands. Use the “HOT Signs” to keep other lab personnel informed. With the muffle furnaces: use long tongs for loading and unloading the crucibles in and out of the furnace. Be sure the door is secured and away from your elbows and hands. Place hot crucibles on a cooling rack and place a “HOT” sign by the hot crucibles to warn other lab personnel.
2	Handling samples after their removal from the lab ovens and muffle furnaces	Thermal burns	The sample pans and crucibles remain hot for several minutes after removal from the ovens and furnaces. Allow to cool before touching them.



14 ICP Routine Operation and Maintenance

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 14		Reviewed by: Angel Hernandez	Date: 3/29/2021
Task: ICP Routine Operation and Maintenance		Approved by: Trace Yates	Date: 3/29/2021
Step	Task Steps	Potential Hazards	Controls
1	Set up and operation of the ICPs	Electric shock Radio Frequency Radiation Oxygen deficiency and toxic vapors Thermal burns	Only users that have been trained are authorized to use the instruments. Safety devices and interlocks shall not be bypassed or disconnected. Persons with medical implants sensitive to RF signal shall not enter the room and must remain at least 50 feet away from the instruments. Check oxygen monitor frequently, especially as you enter the room. It MUST be 20.9%. Make sure that the exhaust fan is on. Keep hands clear of exhaust area while instrument is operating.
2	ICP Maintenance	Electric shock Radio Frequency Radiation Oxygen deficiency and toxic vapors Thermal burns and Cuts	Only users that have been trained are authorized to perform maintenance on the instruments. Safety devices and interlocks shall not be bypassed or disconnected. Persons with medical implants sensitive to RF signal shall not enter the room and must remain at least 50 feet away from the instruments. Check oxygen monitor frequently, especially as you enter the room. It MUST be 20.9%. Make sure that the exhaust fan is on. Allow the instrument to cool before opening the torch compartment. Wear cut resistant gloves for disassembly and assembly of the torch, nebulizer and spray chamber.



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		Back or muscle strain	Keep your back straight, bend at the knees, and do not turn or twist the body while lifting the ICP rinse solutions jugs. Ask for help when necessary.
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15 Handling Gooch Crucibles

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 15		Reviewed by: Angel Hernandez	Date: 12/21/2022
Task: Handling Gooch Crucibles		Approved by: Alan Shobert	Date: 12/21/2022
Step	Task Steps	Potential Hazards	Controls
1	Handling crucibles This includes: loading, unloading crucibles to and from the manifold and cleaning and prepping the crucibles	Contact with chemicals Cuts	Standard PPE for the lab is: eye protection, lab coat and disposable gloves. Inspect all crucibles prior and after using. Discard immediately any that are cracked or chipped. Wearing cut resistant gloves, when working with the crucibles, is not mandatory, but recommended. When loading crucible in the manifold, use gentle (but firm) pressure. A slight twist can help achieve a secure fit. Before removing crucibles from the manifold, release the vacuum on the crucible. To do this: turn "OFF" the vacuum and release the vacuum.



16 Methanol Handling

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 16		Reviewed by: J. Chauvin	Date: 12/21/2022
Task: Methanol Handling		Approved by: Whitney Hines	Date: 12/21/2022
Step	Task Steps	Potential Hazards	Controls
1	Transferring methanol	Flammable Skin irritant	Perform transfers away from any flame or heat source, preferably in a hood. All containers must be labeled. Clean up spills promptly. Wear safety glasses, lab coats, and nitrile gloves.
2	Storage	Flammable	Store in the Flammable Storage Cabinet.



17 Operating and Handling Combustion Boats in the LECO S-832DR with Autosampler

Dept/Area: Concentrates, Minerals, and Metallurgical Laboratories			
TRA No: COM – 17		Reviewed by: Zane Hranac	Date: 12/19/2022
Task: Operating and Handling Combustion Boats in the LECO S-832DR with Autosampler		Approved by: Andres Jimeno	Date: 12/19/2022
Step	Task Steps	Potential Hazards	Controls
1	Inspect combustion boats before use	Abrasions	Inspect combustion boats for cracks and other defects. Use cut resistant gloves to dispose of any boats that show signs of compromised integrity.
2	Transferring boats to the autoloader	Pinch points	Be sure autosampler hotel is not in motion when placing samples in their appropriate autosampler location.
3	Analyze samples	Pinch Points	Allow autosampler hotel to come to a complete stop before touching it.
4	Removing combustion boats from bucket	Thermal Burns Abrasions	Allow boats to cool in the disposal bucket. Using the bucket handle pour the combustion boats in the boat holding area. Use cut resistant gloves to dispose of any broken boats in the glass waste disposal. Assume boats are hot until otherwise determined.