

I. STANDARD OPERATING PROCEDURE

Use this form to document the Health & Safety information associated with the procedure.

Procedure Title: Autoclave Operation

Dept: EEOB **Bldg/Rm:** 431 Bessey **Supervisor:** J. F. Wendel

Procedure Overview: (brief description of the project)

The purpose of this document is to provide standard operating procedures for the use of autoclaves. Autoclaving is a process used to destroy micro-organisms and decontaminate biohazardous waste and microbiological equipment.

Potential Risks:

Autoclaves use high pressure and high temperature steam for sterilization. The potential safety risks for the operators include:

- Heat burns from hot materials and autoclave chamber walls and door.
- Steam burns from residual steam coming out from autoclave and materials on completion of cycle.
- Hot fluid scalds from boiling liquids and spillage in autoclave and during transport of superheated materials.
- Hand and arm injuries when closing the door.
- Body injury if there is an explosion.

Health and Safety:

To insure the health and safety of personnel using the autoclave, it is important for each department to maintain autoclaves and to train personnel in their proper use.

- The name of the person responsible for the autoclave shall be posted near the autoclave. This SOP should be posted near the autoclave.
- It is the supervisor's responsibility to ensure employees are trained before operating any autoclave unit.
- Procedural and instructional documents provided by the manufacturer must be followed.
- Personal protective clothing and equipment must be worn when loading and unloading the autoclave.

Hazard Control Measures:

(Lab coat, eye and hand protection, and closed toe/heel shoes must be selected as required by Section D of the ISU Laboratory Safety Manual.)

<input type="checkbox"/> Latex gloves	<input checked="" type="checkbox"/> Insulated gloves	<input type="checkbox"/> Face Shield	<input type="checkbox"/> Respirator
<input type="checkbox"/> Nitrile gloves	<input checked="" type="checkbox"/> Safety glasses	<input checked="" type="checkbox"/> Lab Coat	<input type="checkbox"/> Fume hood
<input type="checkbox"/> Neoprene gloves	<input type="checkbox"/> Vented goggles	<input type="checkbox"/> Apron	<input type="checkbox"/> Biosafety cabinet
<input type="checkbox"/> Vinyl gloves	<input type="checkbox"/> Splash goggles	<input type="checkbox"/> Dust mask	<input type="checkbox"/> Glove box
<input checked="" type="checkbox"/> Closed Toe/Closed Heel Shoes		<input type="checkbox"/> Flame Resistant Lab coat	

Procedure:

A. Training

All personnel who use autoclaves must have successfully completed a training session from their supervisor on the safe operating procedures. This requirement applies to both new and experienced personnel.

B. Material Preparation

Ensure that the material is safe for autoclaving:

- Samples containing solvents or substances that may emit toxic fumes should not be autoclaved.
- Do not autoclave bleach!
- Glassware must be inspected for cracks prior to autoclaving.
- Prepare and package material suitably:
 - Loose dry materials must be wrapped or bagged in steam-penetrating paper or loosely covered with aluminum foil. Wrapping too tightly will impede steam penetration, decreasing effectiveness of the process.
 - Loosen all lids to prevent pressure buildup. All containers must be covered by a loosened lid or steam-penetrating bung.
 - Place non-borosilicate glass bottles in a tray of water to help prevent heat shock.
 - Plastics must be heat-resistant, i.e., polycarbonate (PC), PTFE ("Teflon") and most polypropylene (PP) items.
 - Discarded sharps must be in a designated 'Sharps' container.
 - All items must be tagged with autoclave tape.

Place items in secondary containers to secure and contain spills:

- Items should be placed in a stainless steel pan or other autoclavable container for their stability and ease of handling.
 - Place containers of liquid, bags of agar plates, or other materials that may boil over or leak, into a secondary pan in the autoclave.
 - The pan must be large enough to contain a total spill of the contents.

- Bags must not be tightly sealed as steam cannot penetrate.

C. Loading Autoclave

- Wear lab coat, eye protection, heat-insulating gloves, and closed-toe shoes.
- Place material in autoclave. Do not mix incompatible materials.
- Do not overload; leave sufficient room for steam circulation. If necessary, place the container on its side to maximize steam penetration and avoid entrapment of air.
- Close and latch door firmly.

D. Operating Autoclave

- Close and lock door.
- Choose appropriate cycle (i.e., gravity, liquid, or dry cycle) for the material. Consult the autoclave manual for assistance in choosing a cycle. The manuals for operation of the autoclave should be located near the autoclave.
- Set appropriate time and temperature if you are using a customized cycle.
- Start your cycle and fill out the autoclave user log with your contact information. A completed cycle usually takes between 1-1.5 hours, depending on type of cycle.
- Do not attempt to open the door while autoclave is operating.
- If problems with your autoclave are perceived, abort cycle and report it to your PI immediately.

E. Unloading Autoclave

- Wear heat-insulating gloves, eye protection, lab coat, and closed-toe shoes.
- Ensure that the cycle has completed and both temperature and pressure have returned to a safe range.
- Wearing PPE, stand back from the door as a precaution and carefully open door no more than 1 inch. This will release residual steam and allow pressure within liquids and containers to normalize.
- Allow the autoclaved load to stand for 10 minutes in the chamber. This will allow steam to clear and trapped air to escape from hot liquids, reducing risk to operator.
- Do not agitate containers of super-heated liquids or remove caps before unloading.
- Wearing heat-insulated gloves remove items from the autoclave and place them in an area which clearly indicates the items are 'hot' until the items cool to room temperature.
- Shut autoclave door.

Note: Allow autoclaved materials to cool for at least 10 minutes before transporting. Never transport superheated materials.

F. Autoclave Use Log

- Entries must be placed in the log book each time the autoclave is used. These records are used for maintenance/service schedules and reporting of incidents, accidents and/or faults.
- Entries should include: operator's name, phone number, date, time and duration.
- The log book must be kept adjacent to the autoclave.

G. Maintenance and Repair

- No person shall operate the autoclave unless the autoclave is in good repair.
 - Only qualified professionals are permitted to make repairs.
 - For more information about the ISU autoclave bioindicator program, contact EH&S at (515) 294-5359.
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First Aid Procedures:

Minor burns are typically small, red, have swelling, and can blister. Cool burns with cold water and continue until the pain lessens. After cooling, cover with a dry, sterile bandage or clean dressing. Consult a physician as needed. Report all injuries to a supervisor.

All accidents and injuries occurring at work or in the course of employment must be reported to the employee's supervisor as soon as possible (even if no medical attention is required).
<http://www.ehs.iastate.edu/occupational/accidents-injuries>

Spill/Release Containment, Decontamination, and Clean Up Procedures:

Spills may occur from a boil-over or breakage of containers.

- No operation of the autoclave is allowed until the spill is cleaned up.
- The operator is responsible for clean-up of spills. Contain the spilled material using paper towels. Use your laboratory's spill kit if necessary. Wait until the autoclave and materials have cooled to room temperature before attempting clean-up.
- Review the SDS, if appropriate, to determine appropriate PPE, spill cleanup and disposal protocols that are necessary.
- Dispose of the waste following the protocol appropriate for the material (i.e., red biohazard bag). If materials have been intermingled, follow the clean-up and disposal protocol for the most hazardous component of the mixture.
- Cracked glassware must be disposed of properly.
- Record the spill and clean-up procedure in the autoclave log book.

References:

Using Substances Requiring Special Procedures? No ☒ Yes ☐

(If Yes; identify authorized personnel, designate a use area and specify specialized safety precautions here. Refer to Section B in the ISU Laboratory Safety Manual for details.)

Written By: Downloaded from ISU EH&S SOP library **Date:** 11/28/17

Approved By: _____ **Date:** _____
(PI or Lab Supervisor)

II. HAZARD ASSESSMENT

Use the hierarchy of controls to document the hazards and the corresponding control measure(s) involved in each step of the procedure.

Consider *elimination or substitution* of hazards, if possible.

Engineering Control(s): items used to isolate the hazard from the user (i.e. fume hood, biosafety cabinet).

Administrative Control(s): policies/programs to limit the exposure to the hazard (i.e. authorizations, designated areas, time restrictions, training).

Required PPE: indicate PPE including specific material requirements if applicable (i.e. flame resistant lab coat, type of respirator or cartridge).

Hazard	Engineering Control(s)	Administrative Control(s)	Required PPE
<i>Heat transfer causing burn</i>		<i>Site specific training</i>	<i>Insulated gloves</i>

III. Training Record

Use the following table to record the training associated with this Standard Operating Procedure.

Print Name	Signature	Date

Note: Attach to or file with written materials and methods