I. PURPOSE

This procedure establishes the minimum requirements for operating an autoclave (steam sterilizer) at the University of Rochester.

Steam sterilization of materials is a dependable procedure for the destruction of microbial life. The hot, pressurized steam that autoclaves use to do the job makes them serious burn hazards as well. Therefore, staff must understand and respect this equipment and the hazards posed by their use. Before using an autoclave for the first time, all users should read and understand the owner’s manual. Many autoclaves have unique characteristics, which will impact their operation.

II. PERSONNEL AFFECTED

University of Rochester employees who operate autoclaves and their supervisors

III. DEFINITIONS

Autoclave: A strong, pressurized, steam-heated vessel, as for laboratory experiments, or sterilization.

IV. RESPONSIBILITIES

It is the responsibility of the Principal Investigator and laboratory supervisors to ensure that his/her staff and students adhere to the requirements set forth in this document as a minimum.

It is the responsibility of each person operating autoclaves to adhere to the requirements set forth in this document as a minimum.

V. PROCEDURES

A. Autoclave Cycles

The autoclave uses different patterns of high heat, vacuum, and pressure to sterilize its load. The type of materials you wish to sterilize will determine the “cycle”.

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<th>Policy No.: I005</th>
<th>Approved by: M. Cavanaugh</th>
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<tr>
<td>Title: Effective Use of Autoclaves</td>
<td>Date: 11/11/10</td>
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<td>Revision No.: 1</td>
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<td>Prepared by: Janet Ives</td>
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</table>
1. Liquids or “slow exhaust”: Used for water-based solutions and to prevent sterilized liquids from boiling over.

2. Dry goods without vacuum: Used for clean dry goods such as glassware. The autoclave chamber is pressurized with steam for the duration of the cycle and returns to normal.

3. Dry goods with vacuum: Used for porous material, or for large bags or bundles of materials. The vacuum is used to move the steam and heat into the center of the load.

4. Autoclaves usually have an additional “drying cycle” in which hot air is drawn into the chamber to dry materials before they are removed.

B. Packaging and Loading
Correct packaging ensures that steam penetrates the load. Containers packed to capacity will not be decontaminated effectively, even if the autoclave parameters are observed.

1. Ensure material is autoclavable. Not all plastics will remain intact while being autoclaved. For example materials made of polypropylene (PP) and polycarbonate (PC) will remain intact when autoclaved. Materials made of polyethylene (PE) and high-density polyethylene (HDPE) will not remain intact when autoclaved; they will melt.

2. Use polypropylene autoclave bags. Polyethylene bags will allow for greater steam permeability, but are not appropriate in many situations, as they will melt.

3. Prepare and load materials to ensure steam penetration

4. Do not overfill containers to prevent spills and boil-overs

5. Ensure all containers including bags are vented. **NEVER PLACE SEALED CONTAINERS IN AN AUTOCLAVE.** Large bottles with narrow necks can simulate sealed containers if filled with too much liquid. Using corks or stoppers could result in an explosion within the autoclave.

6. Ensure there is sufficient water in the load to allow steam penetration. One can open the bag prior to autoclaving and add water to the contents to
generate steam within the bag (NOT ALLOWED FOR BIOHAZARDOUS MATERIALS).

7. Use secondary containers such as polypropylene or stainless steel tubs to prevent damage to the autoclave.

8. Do not mix clean and contaminated materials in the same load.

9. Do not let bags touch the sides of the autoclave chamber; do not let containers touch each other.

10. When autoclaving liquids and to prevent bottle bottoms from breaking, place bottles in tubs containing 1-2 inches of water.

11. Never autoclave items containing solvents, volatile or corrosive chemicals (e.g. phenol, ether, chloroform, etc.), or any radioactive materials.

C. Autoclave Operation

1. Use autoclave tape or biological indicators to validate the process. If the indicator fails, you must contact Facilities at X34567 for autoclave maintenance.

2. Maintain a log to record autoclave operation.

3. Processing time starts after the autoclave reaches normal operating conditions of 121°C and 15 psi pressure.

D. Unloading the Autoclave

1. Once the cycle is complete, allow the chamber pressure to return to zero before trying to open the door. If the door does not open, most likely the pressure has not reached zero.

2. Open the autoclave door slowly to vent the steam into the canopy exhaust system. Keep your head, face, and hands away from the opening. Wait at least 30 seconds after cracking open the door. Opening the door too quickly
may very likely result in glassware breakage or burning your skin. **DO NOT LOOK INTO OR REACH INTO THE CHAMBER AT THIS POINT.**

3. Allow materials to cool for 10 minutes before removing them from the autoclave. Remember that all surfaces inside the autoclave and the materials are still extremely **HOT**!

4. Wear personal protective equipment (PPE) when removing materials from autoclave. Appropriate PPE includes long-sleeved, heat and fluid resistant gloves and a lab coat or gown. Face protection such as goggles or face shield is required when a splash hazards exists such as when autoclaving liquids. **DO NOT USE GLOVES THAT ARE WET OR WHICH HAVE HOLES!**

5. If there is a spill inside the autoclave chamber, allow the unit to cool completely before cleaning up the spill.

6. If glass breaks in the chamber, pick up the pieces using tongs and dispose of in glass waste box or sharps container depending on contamination status of the glass. Do not place broken glass in the regular trash.

7. Watch out for pressurized containers. Superheated liquid may spurt from the containers as they are removed from the autoclave.

**E. Emergency Burn Follow-up**

1. If you are burned, you can receive care through University Health Services Occupational Health Unit or the Strong Emergency Department. Burns to the face, third-degree burns, or burns over large parts of the body must be treated as emergencies. Contact Security at X13 for assistance.

2. You must report burns to your supervisor or Principal Investigator and complete the University’s Employee Incident Report Form [http://www.safety.rochester.edu/SMH115.html](http://www.safety.rochester.edu/SMH115.html)

**F. Questions**

If you have questions regarding this information, contact Environmental Health and Safety at X5-3241.
VI. REFERENCES
Not applicable

VII. APPENDICES/FORMS
University’s Employee Incident Report Form
http://www.safety.rochester.edu/SMH115.html

VII. REVISION HISTORY

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<td>5/13/2009</td>
<td>New</td>
<td>Establishes minimum requirements for operating an autoclave</td>
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<td>11/11/10</td>
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<td>Clarified ‘Responsibilities’ section</td>
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