

DEPARTMENT OF OCCUPATIONAL HEALTH AND SAFETY

GUIDELINES FOR AUTOCLAVES

Autoclaves provide an effective and efficient means of sterilizing and decomposing materials that may be biohazardous or been exposed to biohazardous or potentially biohazardous materials.

As autoclaves operate under high (15 pounds per square inch or higher) pressure and temperature, there is a significant risk of injury, such as burns from hot steam or surfaces and/or explosion, due to improper usage. Therefore appropriate controls and procedures must be in place to minimize any potential harm.

The legislation governing the installation and maintenance of autoclaves is Ontario Regulation 220/01 (Boilers and Pressure Vessels) under the Technical Standards and Safety Act.

I. RESPONSIBILITIES

It is the responsibility of the designate i.e., principal investigator or lab supervisor, who uses autoclaves, to ensure that training and testing is conducted for each autoclave that they use and that a record is available for inspection. The designate shall notify the Insurance and Risk Management Services and the Biosafety Officer of new or existing autoclaves which have not been previously declared (see Section VIII).

II. MONITORING

The designate must ensure that each autoclave is routinely monitored as follows:

Temperature – The designate must check to ensure that:

- (a) the indicating thermometer on the autoclave is calibrated annually, and
- (b) a minimum temperature of 250degF (or 121degC) is attained and the processing time of each cycle is adequate to achieve sterilization of the entire load. Note: Longer time and/or higher temperature may be necessary depending on the quality, quantity and compaction of the load.

Biological Indicators – In accordance with Health Canada and the Canadian Food Inspection Agency, biological indicators (e.g., *Bacillus Stearothermophilis* spores) are to be used at least monthly to ensure that autoclaves achieve appropriate steam penetration and temperature to achieve effective decontamination. The designate should ensure that the specific autoclave(s) they use are routinely monitored using biological indicators and records are available for inspection by the Biosafety Officer or government authorities.

EXAMPLE of Biological Indicators: *Geobacillus Stearothermophilis*- EZ Test (SGM Biotech) available from Fisher Scientific, cat.no.29801 074 or 3M Attest Rapid Readout Biological Indicators or Steris Verify Integrator Laminated and EO Integrators.

Chemical Indicators - Chemical indicators (i.e., autoclave tape) are meant to be used in conjunction with biological indicator and physical monitors (i.e., pressure and temperature readings). They provide instant results for day-to-day monitoring indicating that the load has been processed; however, they must not be used as the sole indicators of sterility.

III. TRAINING

Training is required prior to using the autoclave. Training should include the hazards, autoclave function, safety precautions and operating procedure for the particular autoclave one is using. Not only will this minimize the risk of physical injury to the end user, but it is essential to ensure a successful decontamination or sterilization of your material. Training will also help minimize the risk of damage to the equipment. This guideline is one tool for training.

The designate should document the training provided to their staff (e.g., students and support staff), using the autoclave. The record should include name of trainee, date of training and signature.

The designate should provide a written Standard Operating Procedure (SOP) to the end user which at a minimum should include the following information:

Material Preparation

- A. Glassware should be inspected for cracks prior to autoclaving. Prepare and package material suitably.
- B. Loose dry materials should be wrapped or bagged in steam-penetrable paper or loosely covered with aluminum foil.
- C. All containers should be covered by a loosened lid or steam-penetrable bung. Containers of liquid should be a maximum of 2/3rds filled, with lids loosened. Glassware should be heat-resistant borosilicate.
- D. Plastics should be heat-resistant eg: polycarbonate (PC), PTFE ("Teflon") and most polypropylene (PP) items. Items or baskets should be tagged with autoclave tape to verify sterilization. Loosen all lids to prevent pressure buildup. Add water to containers as appropriate.
- E. Items should be placed in a stainless steel or autoclavable plastic container for their stability and ease of handling. The pan must be large enough to contain a total spill of the contents. Bags must not be tightly sealed as steam cannot penetrate.

Loading Autoclave

- A. Wear heat-insulating gloves, safety glasses/shield and closed toed shoes.
- B. Place material in autoclave. Do not mix incompatible materials (e.g., rubber or materials that will melt). Use loading cart if available.
- C. 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.
- D. Close door firmly.
- E. Enter your name and lab with details on cycle used in Autoclave Log Book.

Operating Autoclave

- A. Check to be sure any ventilating hoods are operating.
- B. Choose appropriate cycle (e.g. liquid, dry etc) for the material.
- C. Set appropriate time and temperature for the cycle.
- D. Do not attempt to open the door while autoclave is operating.

Unloading Autoclave

- A. Wear heat-insulating gloves, safety glasses/face shield and closed toed shoes.
- B. Ensure that the pressure of the chamber is '0' before opening the door.
- C. Wear gloves and stand back from the door as a precaution, carefully crack door open no more than 1 inch (2.5 cm) to release residual steam and allow pressure within liquids and containers to normalize.
- D. Allow sterilized material to stand for 10 minutes. This will allow steam to clear and trapped air to escape from hot liquids, reducing risk to operator. (Note: This is built into the operating cycle on some of the autoclaves).
- E. Do not agitate containers of super-heated liquids or remove caps before unloading.
- F. After removal from the autoclave, mark hot items with warning sign (e.g., "Caution: Hot. Do not touch.") until the items cool to room temperature.
- G. Push door or close the door for autoclaves with an automatic closure.

IV. INCIDENT/ACCIDENT

- A. If any injury occurs seek first aid by contacting local designated first aider and/or Security Services at ext. 33333.
- B. All incidents/accidents are to be reported to the designate responsible for the autoclave, the supervisor/manager and the Biosafety Officer and Insurance and Risk Management Services.

V. WORKING ALONE

If a staff member is working alone using the autoclaves during off-hours ensure appropriate contact with colleague and/or Security Services at ext. 33333

VI. SPILL/CLEAN-UP

- A. Spills may occur from a boil over or breakage of containers.
- B. No operation of the autoclave is allowed until the spill is cleaned up.
- C. Cracked glassware must be disposed of properly in the "Broken Glass" disposal pail.
- D. Record the spill and cleanup procedure in the autoclave log book.
- E. Seek further assistance from designate or additional staff if required.

VII. MAINTENANCE, REPAIR and INSPECTION

The designate is responsible to report non-functioning autoclaves for repair or maintenance.

If an autoclave is not working properly, discontinue use immediately. Users are not to make repairs. A sign should be posted alerting others not to use the autoclave by the designate.

Autoclaves are considered unfired pressure vessels. They must be inspected at the time of installation by the Technical Safety and Standards Authority of Ontario (TSSA) and at least once in every 12 months thereafter depending on the type of autoclave. No person shall operate an autoclave unless it has been inspected by a Boiler Inspector holding a valid Certificate of Competency and a certificate of inspection has been issued. In

Ontario, inspection services are provided by the Insurer that provides Boiler and Machinery Insurance coverage. York University has arranged this service through its insurance broker.

Insurance and Risk Management Services receives copies of all inspection certificates and will distribute these to the appropriate designate with a copy sent to the Biosafety Officer.

A current certificate must be posted near the autoclave at all times. If there is no valid certificate of inspection posted, the autoclave should not be used. Copies of service records should be accessible to the designate for audit purposes.

If an autoclave is not working properly, discontinue use immediately. Users are not to make repairs. A sign should be posted alerting others not to use the autoclave, by the designate.

VIII. AUTOCLAVES PURCHASE

The designate must notify Insurance and Risk Management Services and the Biosafety Officer of new or existing autoclaves which have not been previously declared. The Biosafety Officer should update the autoclaves inventory and provide a copy of this guideline to the designate.

IX. AUDIT CHECKLIST

Autoclaves should be audited yearly by the designate. The following checklist should be completed to verify ongoing compliance at the same time as maintenance and inspection check with York University's current insurer.

Autoclave Audit Checklist

Building/Room # of autoclave: _____
 Name of responsible contact(s): _____ Phone number: _____
 Department: _____ Email: _____
 Make: _____
 Model: _____

	Yes	No	Comments
Annual inspection certificate is posted by the autoclave.			
Cycle Log or Pressure and Temperature indicator on the autoclave is operational			
Emergency contact / phone number posted.			
Housing keeping: area is clean and not overcrowded			
Standard Operating Procedure is posted.			
Operational manual is available.			
Chamber trap strainer present and clean			
Waste Disposal:			
- waste container available e.g., autoclavable bags, sharps container not overflowing (proper capacity)			
- waste is not overflowing and is container is lidded			
Room ventilation (supply and exhaust) is present			
Other comments:			

Audited by: _____

Date of audit: _____

A copy of the completed checklist should be kept by the designate and available for inspection.