THE BAKER COMPANY

OPERATOR'S MANUAL

INCLUDING INSTALLATION, MAINTENANCE AND SPARE PARTS

MODEL NO. VBM-600

N.S.F. CLASSIFICATION CLASS II, TYPE A
(CLASS II, TYPE B3 WHEN VENTED TO THE OUTSIDE)

SERIAL NO: SP - _____ _V

NOTE: The open front containment unit described in this manual is for use with low to moderate risk agents only. As with all open front units, it does not provide absolute protection for the user. The adequacy of this containment cabinet for the user's personal safety, as with any containment cabinet, should be determined by an industrial hygienist, safety officer or other qualified individual.

It is recommended that this manual be kept at the site of the containment cabinet for referral by the operator.

P.O. Drawer E, Sanford, Maine 04073 · (207) 324-8773 · 1-800-992-2537 · FAX (207) 324-3869
"Creating immaculate atmospheres."

THE BAKER COMPANY

Dear Customer:

We would like to take this opportunity to thank you for purchasing a Baker Class II Unit.

We know that part of your decision to purchase this unit was based upon the fact that The Baker Company, Inc., as a part of it's Quality Control Program, biologically challenges one unit from each production run of units we manufacture. We want to make sure that our production models meet the same stringent performance criteria of our prototypes.

A certified copy of the Biological tests for Personnel Protection and Product Protection performed on one (1) unit from the production run from which your cabinet was purchased is on file at The Baker Company, Inc.

Should you desire a copy of these tests, please write or call and we will be happy to send them to you. (Note: Include the Model and Serial Number of the unit).

Should you require any additional information, do not hesitate to call on our representative or our Customer Service Department.

Once again, thank you for choosing Baker.

Sincerely,

Dennis Eagleson
President

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"Creating immaculate atmospheres."

CONTENTS

CONTENTS CONTINUED

Appendix:

FOREWORD

IMPORTANT

READ THIS MANUAL CAREFULLY, FOLLOW THE INSTRUCTIONS AND PAY CAREFUL ATTENTION TO THE WARNINGS. YOUR HEALTH IS AT STAKE.

If this cabinet is used for radiological, biological, toxicological or other hazardous activities, it must be monitored by a biological safety officer or health physicist.

Before user starts any work, he should fully acquaint himself with this manual and the proper operation and maintenance of the machine. Additionally, it is recommended that prior to use all users take the training course on testing, care and operation offered by The Baker Company. For details, contact The Baker Company direct.

Responsibility for safe proper functioning, testing, care and proper operation of this cabinet is with the owner and user of this cabinet. He should use this manual as a guide rather than as a "gospel". There is no substitute for common sense and good laboratory technique and the user should determine for himself the best and safest methods and techniques associated with the equipment only after study of other references as well as this manual.

YOU, THE OWNER AND/OR USER, ARE ULTIMATELY RESPONSIBLE AND YOU USE THIS CABINET AT YOUR OWN RISK.

IF THIS UNIT IS NEWLY SHIPPED AND INSTALLED, IT SHOULD BE THOROUGHLY TESTED AND CHECKED BEFORE USE.

Much of the information in this manual applied only to certain equipment manufactured by The Baker Company, Inc. and may not apply to units of other manufacturers.

If biological hazardous work is to be performed in this cabinet, apply the appropriate biohazard decal, which is enclosed, in accord with OSHA regulations, Volume 39, No. 125, Part II, para. 1910.145, page 23680.

UNPACKING PROCEDURE

1. Upon receipt of this equipment, inspect the exterior of the crate and skid for damage. Broken glass or other visual damage should be noted on the receiving slip and report to the delivering carrier.

2. Remove the crate and inspect the unit for other damage. All damage should be reported to the delivering carrier and a claim for restitution made. this claim should be filed within 15 days from receipt of our equipment. The carrier will want to make a physical inspection of the equipment.

3. Extensive damage to equipment en route to destination, caused by mishandling by trucking occurs, has necessitated that certain parts be removed from the cabinets and packed separately.

   These separately packed items are listed on the packing slips accompanying the units and should be checked to assure that all items have been received.

OF SPECIAL NOTE TO THE USER OF THIS CABINET

The use of many hazardous materials in the cabinet requires that it be monitored by and industrial hygienist, safety officer or other qualified individual.

Do not use explosive or flammable substances in this cabinet.

If hazardous biological work is to be performed in this cabinet, apply the appropriate biohazard decal which is enclosed in accord with O.S.H.A. regulations.

Before starting any work in the cabinet, one should be come fully acquainted with its operation and maintenance procedures found the Operator's Manual.

PURPOSE:

To provide a workspace for biological testing and experimentation which offers protection of the experiment from the ambient environment and at the same time affords with ambient environment a measure of protection from the experiment. The cabinet is used in biological research or production as and aid to control airborne contaminants which may be harmful to the scientific personnel and/or deleterious to the experiment. The laminar flow biological safety cabinet is designed for use in work with Class 1, Class 2 and Class 3 (low to moderate risk) agents as listed in the Centers for Disease Control's Classification of Etiologic Agents on the Basis of Hazard", U.S. Public Health Service, C.D.C., Atlanta, Georgia 30333). Class 4 or extreme high risk should never be used in this cabinet.

Proper cabinet usage by scientific personnel is essential to achieve the above purpose.

LOCATION WITHIN THE LABORATORY:

The ideal location for any laminar flow biological safety cabinet (LFBSC) is in a dead end corner of the laboratory, away from personnel traffic, vents, doors, windows and any other source of disruptive air currents. Unpublished tests performed at the National Cancer Institute and tests performed at The Baker Company show that if the draft or other disruptive current exceeds the intake velocity of the cabinet, (see Cabinet Function), then room contamination will enter the cabinet work zone and vice versa. Thus, the proper placement of cabinets in the laboratory is essential.

INSTALLATION AND PREPARATION FOR OPERATION - STERILGARD

NOTE: Installation of this cabinet should be performed in accord with appropriate O.S.H.A. regulations and other regulatory agencies.

1. Move the equipment from the unloading area to its intended location on dollies.

2. The overall dimensions in the shipping position are:

   33 1/2" deep X 76 1/2" wide X 74 3/8" high

   To extend the telescoping legs, see attached procedure (page 11) and sketch (page 12).

3. Level the work surface by adjusting the glides on each of the four corners of the leg risers. Be sure that all four are firmly on the flow so that the cabinet will not teeter.

4. Check to see that the liquid drain valve is in the closed position (parallel to the floor). If something is spilled in the work area, it will thus remain in the drain system and not be transported to the laboratory floor.

5. Check to see that service petcocks, if present are in the closed position, (perpendicular to the rear wall of the unit if installed in the sidewalls).

6. Remove cardboard shipping cover from top of exhaust filter.

7. Remove angle clips from unit front above light pan which holds window from opening. Replace screws.

   Carefully check the window for smooth vertical operation. If the window binds, adjust the track by loosening the screws, arranging the track in the proper position, and retightening screws in the new position on the track. In order for the wiper gasket to be effective, it puts a certain amount of "drag" on the glass. If the window is loosened, make sure the wiper still makes contact.

8. Plug light electrical cord into socket in top of unit.

9. Exhaust: This unit may be operated in two modes
a) filtered exhaust dumping directly into a room or
b) filtered exhaust dumping into an exhaust system.
If these units are to be connected to a duct, see below and refer to N.S.F. (National Sanitation Foundation) Standard No. 49 and other applicable information on ventilation.

A. Filtered exhaust dumping directly into the room:

In this case, the top of the unit may be no closer than 4" to the ceiling to allow free escape of air. The cardboard cover on the exhaust HEPA filter must be removed. NEVER use the top of the unit or the cabinet workspace as a storage area. No hazardous volatile chemicals (flammable, explosive or toxic) should be used in the cabinet, as the filter removes only particulates and not gases (see HEPA Filters). Attach exhaust filter guard, supplied with the unit, with the long legs to the rear.

B. Filtered exhaust air dumping into an exhaust system:

It is recommended that whenever possible, an individual cabinet should be connected to its own separate exhaust system, but if it must be connect to a multihouse system, that system must not be recirculating. Whichever the case, make certain that the system can adequately handle the air volume passing through the unit and that the system has sufficient static pressure for proper cabinet function.

Exhaust requirements are 390 CFM at .02" - .04" of water column suction directly above the exhaust filter, before any dampers, elbows or other restrictions.

The system should have an interlocking safety device to indicate if the exhaust system fails. Some safeguard against exhaust failure should be taken. A properly designed duct system includes a tight fitting adjustable damper in order to properly balance the air as well as to completely shut off the duct for decontamination procedures.

10. Plumbing:

    A. A drain valve is provided at the right bottom of the work area. Since the effluent from this drain may be biologically hazardous, necessary precautions must be taken for safe disposal.

    B. When present, petcocks are piped within the cabinet. External connection is 3/8" FPT nipples in the sidewalls. Connection to plant utilities should be made with proper materials and technique for the individual service. No flammable gas should be used in this unit. If the decision is made to install a flammable gas petcock, an emergency shut-off valve must be located in an accessible area external to the unit.

11. There are two power cords - one providing power to the motors and lights, and the other providing power to the duplex utility outlet. It is recommended that these be plugged to the duplex utility outlet. It is recommended that these be plugged into separate circuits so an overloading of duplex outlets will not cause the unit to be shut off. Plug each into a grounded 115V - 60 cycle 20 amp utility outlet.

    Starting current is approximately 20 amps
    Running current is approximately 14 amps

12. Snap light switch to fluorescent ON position, check to see that fluorescent bulb is lighted. These tubes are locked in place with the usual stop lock on fluorescent lights. Turn switch to germicidal ON position and check to see that the germicidal light is lighted. See caution below.

    NOTE: This switch is a three position switch with center OFF, ultraviolet light ON and fluorescent light ON.

    CAUTION: Rays from ultraviolet lamps are injurious to human eyes. It is suggested the ultraviolet lamps be operated after working hours, and not while personnel are in the room.

13. Start the unit by turning the "blower" switch to the ON position. Allow the unit to operate for about 1/2 hour. This ensures that the dirty air in the workspace is totally removed and that the work area is clean enough in which to work.

14. Unit wipe down: The unit should be switched on and left running. Before initial use, the entire cabinet surface, inside the work area and out, should be washed with a detergent/disinfectant to remove "surface dust". We recommend that all units be left running continuously.

15. All units are completely tested at the factory prior to shipment. However, it is advisable that certain checks be made on-site after installation. These include checking supply and exhaust filter for leaks and the air balance of the unit (especially if connected to an exhaust system). A list of these checks and a brief description of each follow and should be completed prior to beginning work in the unit. (See Recommended On-site Checks and Maintenance Procedures). More detailed information on test procedures are available by contacting The Baker Company, Inc.

16. It is suggested that the personnel who will be using the equipment study this Operator's Manual for proper effective use of this unit.

PROCEDURE FOR POSITIONING LEG ASSEMBLY FOR VBM MODELS

Optional Heights:

1. Worksurface 30" from floor
2. Worksurface 36" from floor

A. This unit will be shipped with the legs extended 6" below the cabinet.

B. If lifting equipment is available, lift cabinet vertically to a height of approximately 40". All four legs may be extended to the desired height by removing the four bolts, setting the height of the legs and then securing the legs in position with the four 3/8-16 x 3 -1/2" long bolts supplied with the unit (see Figure 1). Cabinet must be held safely at the 40" height during this entire operation and set back on the floor only after all four legs have been secured. Final leveling may be accomplished with the adjusting leveling pads.

C. If lifting equipment is not available, legs may be extended to the desired height in the following manner. It is recommended that at least four people be used for this operation.

1. Lift either right or left end of the cabinet approximately 8" to 9" (see Figure 2)/ Remove shipping screws and lower the free legs to the next hole position in the leg.

   Replace the shipping screws to lock in position.

2. Repeat Step 1 lifting from opposite end. this will bring the cabinet to a level position. Extreme care should be taken in this step to make sure the cabinet does not slip on the floor.

3. Repeat steps 1 and 2 once to obtain sitting position height and twice to obtain standing position height.

D. After unit has been adjusted to the desired position, insert solid dot plugs (shipped in a small bag), in the unused holes in the legs to prevent dust and dirt entering through the open holes.

CABINET FUNCTION AND DESCRIPTION

The SterilGARD is a unique Class II Type A (N.S.F. definition, Class II, Type B3 if vented to the outside) containment cabinet fabricated of stainless steel and other materials and designed by The Baker Company, Inc. Figure 1 illustrates the air pattern of this unit and should be reviewed by potential operators. Clean (HEPA filtered) air descends through the work zone and at the approximate center of the work area splits, exiting either through the front air intake or rear exhaust grille. It is then pulled up the SURROUNDING NEGATIVE PRESSURE PLENUM, through the fan, which pushes it into the small positive pressure plenum at the top of the unit (Figure 1). Here, approximately 30% is exhausted through the top exhaust filter and approximately 70% is recirculated through the supply filter in to the work zone. A metal diffuser just below the supply filter, creates a faster air flow at the front (100 to 120 LFPM) and rear (70 to 90 LFPM) of the work zone with a slower air flow (50 to 70 LFPM) over the center of the work surface. This, Baker feels will better protect the operator and experiment by creating a more impenetrable barrier at the unit front.

Since the cabinet must get make up air to replace that air eliminated through the exhaust filter, the same volume of room air enters the system through the 8" front access opening at 90-110 FPM. This air, which never enters the work zone, completes the air barrier at the face of the unit and is partially responsible for the containment properties of this cabinet. Because room air enters through the intake grille at the unit front, work in the unit must be performed beyond it and into the clean atmosphere of the inner cabinet. Any blockage of any of the perforated areas of the cabinets disrupts airflows, causes increased turbulence, promotes cross-contamination within the work zone, and generally compromises cabinet function. It must therefore be avoided.

What makes the SterilGARD unique is that the contaminated positive pressure areas are surrounded by a NEGATIVE PRESSURE PLENUM. Any particle in this zone will necessarily be drawn through the blower and trapped on a filter. This affords an extra measure of protection, as do the EdgeGARD suction slots at the corners of the front access opening. These slots eliminate any "skin effects" which may cause particulate entry into or egress from the cabinet at this critical point.

For easy entry of research apparatus, the SterilGARD is equipped with a vertical sliding view screen. It is essential that the view screen be held at the 8" level during operations within the unit. If the view screen is opened farther, the intake velocity of room "barrier" air is lowered because the blower is moving the same amount of air into the cabinet but

through a greater area. The air barrier at the front is thus "weakened" and particles may pass through the barrier more easily. Inflow of room contamination into the unit may also become a problem is the view screen is elevated above 8" for the same reason.

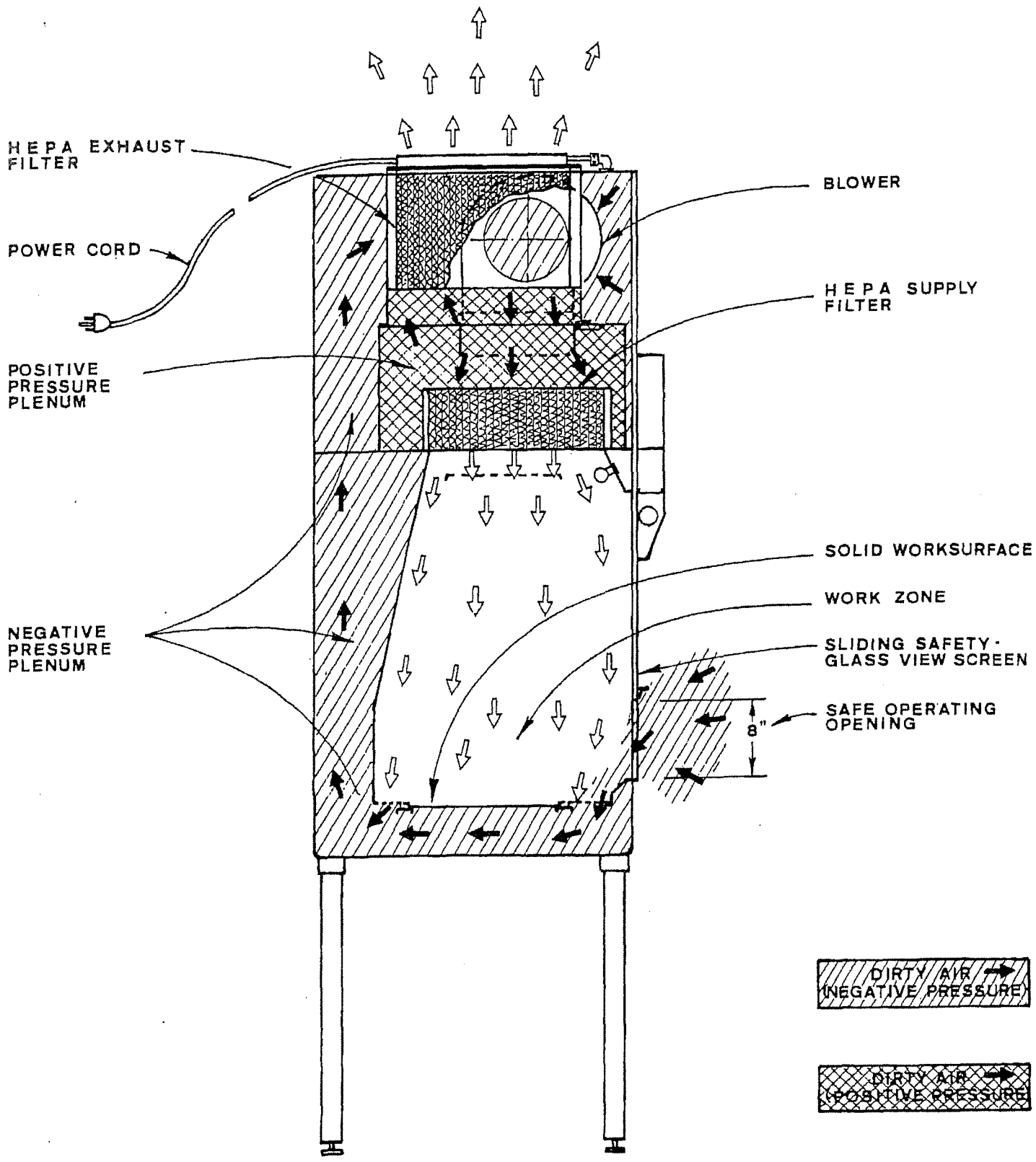
This unit is equipped with a buzzer alarm (with an adjustable volume level) which warns the operator when the view screen is at an unsafe level for proper unit function (higher that 8"). THIS ALARM BOX SHOULD NOT BE REMOVED FROM THE UNIT AT THE UNIT SHOULD NOT BE WORKED IN WHILE IT IS SOUNDING. This restricted access opening is essential for proper unit function. Refer to "Working in the Cabinet" for how to deal with this restricted opening into the work zone.

As with other Baker units, the electrical outlets within the work zone are protected with circuit breakers so that an overload by research equipment will not affect air handling or unit function. This does not imply,. however, that the work zone should be overloaded with electrical equipment (see Ancillary Equipment). The more equipment the work zone houses, the higher the air turbulence which may diminish the effectiveness of the cabinet.

Most SterilGARD units come with an ultraviolet germicidal light as standard equipment. These lamps lose their effectiveness over a period of time and should be replaced when intensity drops below the optimum level. Eyes or s kin should not be exposed to ultraviolet light - recommended usage is only when the cabinet is not in use. It should be remembered that ultraviolet lights should not be relied upon as the sole decontaminating agent within the cabinet. Rather, surface disinfection with the proper decontaminating agent should be performed before and after each cabinet use. Biological safety cabinetry acts as a supplement to, not a replacement for, good aseptic techniques.

This cabinet is subjected to a variety of tests among which are: Air velocity through the work area and through the exhaust filter, and leak tests for particulates at all gasket seals including the seal of the HEPA filters (see Recommended On-site Checks and Maintenance Procedures).

The important function of this unit is to prevent migration of air and airborne particulates either into or out of the cabinet by the precise control of air volumes and velocities within the work area and at the suction points.



SterilGARD HOOD

FIGURE 1

the BAKER COMPANY, Inc.
SANFORD, MAINE 04073

RECOMMENDED ON-SITE CHECKS AND MAINTENANCE PROCEDURES

It is recommended that the following procedures be performed on each biological safety cabinet before initial use, at regular intervals, as determined by an industrial hygienist, safety officer, or other qualified individual, after relocation and after each filter change. This should be done only by qualified individuals with the proper instrumentation. Consult The Baker Company, Inc. for recommended minimum requirements and other tests that may be desirable.

One of the advantages of buying a Baker containment cabinet is that each individual cabinet is subjected to a variety of physical testing procedures, those listed below plus several other testing and quality control criteria. The test report at the end of this manual lists the results of these tests for the model whose serial number is listed on the front page. Use it as your guide to how the unit was originally set up and how it should be set up in the future. This represents the optimal operating mode for your particular unit and should be an invaluable reference to maintenance personnel performing routine checks, filter changes, etc. Make sure that the personnel performing these maintenance functions on the cabinet consult the test report and come as close as possible to duplicating the recorded results. If this is done, your unit should provide you with many years of satisfactory service.

1. The Air Flow Balance:

   A. The airflow balance as set at the factory provides air volume and velocity control to prevent ingress or egress of airborne contamination from the work zone. All current SterilGARD models exhaust through a HEPA filter 30% of total cabinet airflow, while approximately 70% is being recirculated. Both the supply and exhaust is HEPA filtered. (See Cabinet Function).

   B. The airflow characteristics indicated on the original test report, located at the end of the manual, should be duplicated as closely as possible.

      1. Using a thermoanemometer, measure the exhaust air velocity. Calculate the total volume of air being exhausted, divide by the area of the work access opening to determine the calculated intake velocity of the access opening. This should agree with the test report results.

2. Using the same instrument mounted on a ring stand, take readings at the level of the bottom of the view screen. Readings should agree in location and velocity with those on the test report.

3. Check the figures obtained against those originally taken at the factory and adjust as necessary.

C. As HEPA filters load up with particulates, airflow will be maintained automatically, at least until the filter resistance increases 50% or more. When airflow diminishes, it will be necessary to increase the blower speed to maintain the initial volume of recirculating air. This is done by turning the speed control located in the electrical box clockwise until the desired airflow is met. If the airflow cannot be maintained, the HEPA filters must be replaced. (See Procedures for HEPA Filter Replacement).

2. Filter media and seal leak tests - Verify that the filters and cabinet have maintained their integrity in shipment by probe testing the filter faces and seals using one of two methods.

EQUIPMENT

a. If a single particle counter is used, set to count 0.5 micron size particles. Challenge the filter (with cigarette smoke) so the minimum particle concentration upstream of the filter is 30,000 per 0.1 cubic foot of air (300,000 particles per cubic foot).

Scan entire HEPA filter surface area (downstream side) and perimeter area (filter gasket-frame area) with particle monitor probe held one to two inches from surface of areas being tested.

When leakage is indicated, reduce probe distance from surface and scan immediate area to pinpoint leak.

Repair of the significant leaks found in the filter media or the band area between the media and filter case, by the use of silicone RTV sealant is permitted. Such repair shall not block more than 3% of the total filter area. Any significant leaks found in the seal area between the filter housing and the device (filter mounting frame) shall be repaired only by corrective fabrication methods.

Repeat scanning and repairing steps (above) over all perimeter and surface area of filter until the following criteria is obtained.

Acceptance: The filter is acceptable when no leaks greater than 0.01% of upstream count can be detected by this method.

b. If a photometer is used, set upstream concentration by using a cold D.O.P. generator with laskin nozzle(s) at 25 psi air pressure. Adjust the instrument to give a concentration of 1 x 10 4 above the concentration required to give a reading of one scale division. Follow the same procedures as (a) above.

Acceptance: The filter is acceptable when no leaks greater than one scale division are present.

3. Air Flow Smoke Pattern

a. Containment

Using a lighted cigarette or other smoke generator, trace along the inside of the cabinet along the front access opening. Observe that no smoke is escaping from the work area.

b. Cleanliness

Trace along the outside of the front access opening. Observe that no smoke penetrates further into the cabinet than the front 4" of perforated metal.

4. Monitoring Use of Cabinet

   All activities that are to be performed in the unit should first be approved by an industrial hygienist, safety officer or other qualified individual to ensure that the cabinet is appropriate for that function. This person should monitor the cabinet and its operating personnel periodically to assure proper cabinet usage.

5. Work Area Cleaning

   Any spillage which may fall through the perforated worksurface may be drained off through the liquid drain valve after proper decontamination.

   To wash the drain pan under the worksurface, simply lift up the solid worksurface and/or perforated surface (worksurface is secured with hold down clips for shipping purposes).

6. Lamps

   Germicidal lamps lose their effectiveness over a period of time and should be replaced when intensity drops below 40 microwatts per square centimeter at worksurface.

   If your cabinet contains a germicidal lamp, measure intensity at the worksurface with an ultraviolet light meter.

7. Magnehelic Gauge

   The magnehelic gauge should be zeroed after leveling the unit, before it is turned on. It indicates suction in the blower plenum (not pressure drop across the filters). It should not be used to determine that the cabinet airflow are safe and/or properly balanced. The suction indicated is the suction required to pull the total volume of air into the front and rear window at 8" and the perforated unrestricted. If the window is closed or the perforated is restricted, the suction will increase.

TROUBLE SHOOTING

Caution: Any time the "dirty" areas of the cabinet (See Figure 1) must be entered to affect repair, the unit must first be decontaminated with an appropriate gas (see the section on unit decontamination for details).

1. Outflow of smoke from unit interior into ambient room

   a. Make sure shipping cover is removed from exhaust filter and no other objects are blocking air flow.

   b. If connected to in-house exhaust, may indicate inadequate exhaust suction or back pressure. Make sure dampers are open. Rebalance exhaust system to handle adequate volume of air. Consult with building maintenance people.

   c. Exhaust filter may be loaded with dirt if unit is old. Decontaminate unit and replace all HEPA filters.

   d. High cross drafts in the room can cause outflow of smoke.

   e. Check air flow balance (see Recommended On-site Checks and Maintenance Procedures).

2. Low air flow within the work area and through the exhaust filter.

   a. Check incoming voltage. Low voltage can cause the blower to operate at a slower than designed speed. This should be corrected in the building electrical system, however, some compensation for it is possible by adjusting the triac speed control clockwise until the proper velocity is reached.

   b. Filters may be loaded with particulates if unit is old, decontaminate and replace.

3. No air flow within the work area.

   a. If lights also fail to operate, make sure unit is plugged into a grounded 20 amp, 115V, 60 cycle utility outlet. Check blower switch on left side of control box is in the ON position.

b. If lights are operational, turn the blower switch off and let the unit rest for 10 minutes, then turn the blower switch on. If the blower starts, this indicates that there is overheating of the blower motor. Overheating may be due to lower incoming voltage and high amperage. If so, adjustment of the speed control is required if stepping up the voltage is impossible. If this does not correct the problem, or if the blower never started after the rest period, then either the speed control or the blower motor or capacitor is defective. A qualified electrician can determine if the speed control is defective by bypassing it, using the wiring diagram at the back of this manual as a guide. He should next check the motor bearings, after first decontaminating the unit. The circuit should be checked for continuity. Any defective equipment, if found, should be replaced. Overheating may also be due to excessive heat load from hot plates, Bunsen burners or room temperatures, in which case the source of heat load must be determined.

4. Fluorescent light malfunction

Remove the fluorescent light fixture from the unit. Check the plug and socket at the ends to be sure they are securely engaged. Check to see that the lamp pins are contacting both sockets. If lamp flickers and can be corrected by vigorous rubbing of the bulb, this indicates an improper ground. Have a qualified electrician check the electrical circuit for any break in the ground. If necessary, the electrician should trace the wiring to the source of bad ground and correct. Replace the fluorescent tube if required.

5. Pulsive fan operation or noise from fan or motor

After unit decontamination, check for paper, cleaning cloths or other objects in the fan cage and remove, or it may be an indication of a speed control which has overheated or is defective. (See 3b).

6. Germicidal light malfunction

Check to see that the lamp pins are connecting both sockets. Retrip light switch to make proper contact. Replacement of lamp tube or starter may be required.

7. Viewscreen sticks or will not slide freely. Tension between two angles forming the window track glides may be too great. Loosen screws holding angles and retighten at proper spacing between them.

HEPA FILTER

Definition:

One of the most critical components of any biological safety cabinet is the high efficiency particulate arrestance (HEPA) filter which in effect stands between your environment and your experimental agent. HEPA filters were developed in the 1940's and 1950's by the U.S. Army Chemical Corps, Naval Research Laboratories, and the Atomic Energy Commission and are often referred to as absolute filters. They consist of continuous sheets of glass fiber paper pleated over rigid corrugated separators and mounted in a wood frame. They are extremely delicate and the filter media should never be touched.

By definition, the HEPA filter has an efficiency of 99.97% for particulates 0.3 micron in diameter. This size particle is used as the basis for filter definition because theoretical studies have shown that filtration efficiency should be at a minimum for particles of this diameter with efficiency increasing for particles either larger or smaller. Experimental challenge of HEPA filters with various microbial agents including viruses have proven their effectiveness.

Chemical Effects:

HEPA filters are not effective, however, against chemicals in the gaseous state. The substances readily pass through these particulate barriers. Since most of Baker's units are partially recirculating, gaseous build up to a point of equilibrium may occur. The NCB, a Class II, Type B Cabinet, exhausts 70% of the work zone air, will build up gaseous contaminants at a slower rate than the Class II, Type A units (BioGARD and SterilGARD) which exhaust only 30% of the work zone air. This is one reason that the National Cancer Institute recommends a Class II, Type B Cabinet, i.e., NCB for work with microgram quantities of chemical carcinogens. The BiochemGARD, which is a 100% exhaust unit, will not build up gaseous contaminants when operating properly at design airflows.

Before any chemicals are used in the cabinet, careful consideration should be given to all factors including the following:

1. Chemicals which singularly or in combination attack filter components, or even stainless steel. This must be ascertained for each chemical used in the cabinet.

2. Chemicals which may become toxic to the operator, or any combination of two or more chemicals which may react and the resultant product become toxic to the operator. If the cabinet is being correctly used, i.e., operator's arms only inside the unit with the viewscreen in a safe position and the blowers functioning; toxicity or irritation should only occur through skin penetration, either directly or through wounds. A proper evaluation of the chemical's toxicity should include not only information single exposure effects at a concentration, but the effect of many small exposures over time as well.

3. Chemicals which singularly or in combination are explosive or flammable. With recirculating build up an explosion may be caused by ignition of the gas by a motor spark, or a burner in the work zone. Such an explosion has occurred in the past. It is thus an extremely hazardous situation which should be carefully avoided.

   Careful risk assessment must be made in selecting a cabinet if chemical carcinogens, mutagens, or teratogens, in small amounts, are to be used in the cabinet. If it is determined that the exhaust effluent from a cabinet contains a contaminant, then it must be treated appropriately.

Filter Life:

The lifetime of the filter is governed by how and where you use your cabinet. Generally, under normal laboratory conditions, a filter will last as long as five years, but misuse of the cabinet and/or heavy dust load within the laboratory will act to shorten any filter's lifetime. Use of Bunsen burners may damage filter media, especially if the blowers are not operating. Any destruction due to misuse of chemical within the hood will also cut filter life.

Filter life expectancy is roughly inversely proportional to the particulate load of the atmosphere within the laboratory. The higher the load, the shorter the lifetime. If your laboratory building is next to a construction site, or near any area which creates large amounts of dust, the filter life will be shortened significantly. Even if the cabinet is located near a storage area where frequent opening of boxes and ruffling of packaging materials occurs, the resultant air burden will effect filter life.

Frequent Operation Checks:

From the information above, you can see that your safety cabinet and filter are in a dynamic state, not a static one. Therefore, to ensure filter integrity and cabinet performance, periodic exhaust and supply airflow measurements and filter leak checks should be taken. This will make sure your filter continues offering you protection from your experimental agents.

PROCEDURE FOR HEPA FILTER REPLACEMENT

A periodic check of air flow on all biological safety cabinets should be made to ascertain that the units are operating efficiently. The National Institutes of Health recommends that this be done at least annually. A drop of 10% in the total airflow from the original settings (see test report) may indicate the HEPA filters have picked up some dirt. If indicated by measurement as described in Recommended On-site Checks and Maintenance Procedures, unlock the speed control on the top right front the of cabinet inside the control box, and turn it clockwise until the original settings have been reached once again. When the blower can no longer be turned up to compensate for filter loading, then the filters need to be replaced. Filters should also be replaced when damaged beyond repair.

Before any panels are removed, the unit must first be decontaminated with an appropriate sterilizing agent (see Decontamination). The filters will have collected microorganisms throughout their lifetime, and service or maintenance personnel should not be exposed to them. It must be remembered that gaseous decontamination only eliminates the risk from viable agents (microorganism) and not chemical ones. In situations involving a chemical hazard, a safety officer or other qualified individual should be consulted for recommendations.

HEPA filters are extremely easily damaged. Great care must be exercised in their manipulation to be sure that the filter media or gasket surfaces are not damaged. It is good practice to tape a piece of cardboard over the filter media to guard against dropped wrenches or misplaced fingers while installing new filters. Carefully inspect filters before and after installation for signs of damage. A broken or otherwise damaged filter is worthless in biological safety cabinets.

Note: When changing filters, the resistances of both the supply and exhaust filters should be matched as closely as possible in order to maintain proper airflow balance within the unit.

1. Exhaust Filter:

   Lower the viewscreen to its lowest position. Unplug the light panel service cord from the top of the unit. Loosen and remove the wing nuts on top of the l light panel and lift the panel off the face of the unit. Remove nuts and washers holding the top half of the window tracks and insert a spacer between the tacks and the cabinet to clear the front panel. Remove the front access panel on the top section of the unit, as well as the smaller inner exhaust and supply access panels. Loosen the lock nuts on the four square-head screws under the exhaust filter, and back the screws down until the clamp bars under the filter bottom out. Remove the filter through the front opening into a heat sealable polyethylene bag for disposal.

Put a light coat of silicone grease on the face of the gasket of the new replacement filter. Clean the filter sealing flange thoroughly. Slide the new f filter into place carefully and be sure that it is properly seated on the flange. Tighten the four square-head screws uniformly against the clamping bars until the filter gasket has been compressed about 20%, (do not over-tighten). Tighten the lock nuts to hold the screws securely in place. Replace the exhaust filter access panel securely. Leak test (see Recommended On-site checks and Maintenance Procedures).

2. Supply Filter:

After removing panels as outlined in 1 above, loosen and remove the supply filter clamps and lift the dirty filter into a heat sealable polyethylene bag for disposal.

If ordered from The Baker Company, Inc., the replacement filter will be accompanied by a new set of stainless steel angles. Attach them carefully to the new supply filter in the same location as the fold angles were on the old filter. If the supply filter is ordered from another source, remove the angles from the old filter (which has been decontaminated) and attach them carefully to the new filter in the same place. They are important because they keep the clamp assemblies in place.

Put a light coat of silicone grease on the face of the gasket of the new replacement filter. Clean the filter sealing flange thoroughly. Slide the new filter into place carefully and be sure that it is properly seated on the flange. Replace the filter clamp assemblies and screw the stainless steel stud finger tight. Tighten the studs uniformly, and moderately, a few threads at a time until the filter gasket has been compressed about 20%, do not over-tighten. Replace both access panels securely. Replace window track hardware and adjust, if necessary, so glass slides easily into them.

After filter replacements are made, the airflow must be balanced and a thorough leak test made on the filters and filter seals by qualified personnel.

PROPER CABINET USE

General: Any laminar flow biological safety cabinet (LFBSC) is only a supplement to good microbiological technique, not a replacement for it. If the cabinet is not properly understood and operated, it will not maintain an adequate protective barrier between the operator and the experiment.

All of Baker Company's laminar flow biological safety cabinets are designed for continuous operation for the workspace interior to remain clean and particulate free. If the blowers are shut off, the air barrier ceases and the unit becomes contaminated as the rest of the laboratory. We thus recommend that the blowers be left operating continuously.

Working in the Cabinet:

1. If the unit is not left running continuously, turn the blower switch to the ON position and insure that you have cabinet airflow, either by listening for blower noise or feeling the airflow across your fingers. An alternate method in cabinets which have one, is to make certain that the magnehelic gauge (which measures suction pressure) is reading something other than zero.

   Turn the fluorescent light on, turning off the ultra violet light. Never work in the unit with the ultra violet light operating. Make certain the drain valve is in the "closed" position.

2. As with any other laboratory workspace, the work surface should be wiped down with an appropriate disinfectant. Let the unit run for 5 to 10 minutes to clean itself and let the blower achieve its proper operating temperature.

3. Preplan your work operation. Everything needed for the complete procedure should be placed in the cabinet before starting so nothing passes in or out through the air barrier until the procedure is completed. The implements should be arranged in a logical manner such that clean and dirty materials are segregated, preferably on opposite sides of the operator. Only equipment which is necessary for the particular procedure should in the cabinet.

Any blockage of air intake grilles must be avoided (see Cabinet Function). If toweling is used, be sure it is confined to the solid worksurface section, not the perforated.

4. Once all equipment is inside the cabinet in the proper place, close the vertical sliding view screen making certain it is at the 8" opening level. NEVER operate the unit in any other mode. THE RESTRICTED OPENING IS ESSENTIAL FOR PROPER UNIT OPERATION.

5. Air purge. Let the unit operate at least three minutes before beginning any work to allow sufficient time for the cabinet air to purge airborne contamination from the work area.

6. Hands and arms should be washed well with germicidal soap before and after work in the cabinet. Operators are encouraged to wear long sleeved gowns or lab coats with tight fitting cuffs and sterile plastic or rubber gloves. This minimizes the shedding of skin flora into the work area and protects the hand and arms from contamination.

7. Begin work as far into the cabinet as comfortable on the depressed area of the solid work surface. Work with a limited number of arm movements. Since all equipment necessary for the experimental operation has already been placed in the cabinet, removal and re-entry of the arms is neither necessary not advisable. Since opening and closing of doors and other personnel affecting cabinet operations, they should be cut to a minimum. Always avoid any airflow blockage. Do not use floor-type discard pipette canisters. Discard used pipettes into a surgical instrument tray inside the cabinet.

8. Use good aseptic technique.

   Most procedures, when combined with good aseptic technique and proper cabinet use, should not require use of a flame.

   If a safety officer approves the use the flame, a burner with a pilot light such as the "Touch-O-Matic" type should be used. It should be placed to the rear of the workspace where resulting air turbulences has a minimal effect.

The flame not only disrupts the unidirectional airstream, but also contributes significantly to the heat load. If the cabinet air is inadvertently turned off, the flame could damage the filter.

Tubing for a burner should be resistant to cracking or puncture. Material such as tygon tubing is not acceptable for this use.

Because of the restricted access space, pipetting within the cabinet will require the use of pipetting aids, which with a minimal amount of practice, the operator may easily become proficient.

9. NEVER OPERATE A LAMINAR FLOW BIOLOGICAL SAFETY CABINET WHILE A WARNING LIGHT OR AN ALARM IS SIGNALING.

   These safety devices were put there for a reason - to warn of a compromise in cabinet integrity. Correct the problem, whether it is an insufficient amount of suction in the house exhaust system or improper elevation of the cabinet viewscreen, before beginning or continuing wok in the unit. This cannot be over-emphasized.

10. After the procedure is completed, all equipment in direct contact with the research agent should be enclosed and/or surface decontaminated with the appropriate disinfectant. Trays of discarded pipettes and glassware should be covered. The cabinet should then be allowed to run for a least three minutes with no activity. This should allow sufficient time for cabinet airflow to purge airborne contaminants from the work area.

    Remove all equipment from the cabinet.

11. Decontamination of the interior surfaces should be repeated after removal of all materials, cultures, apparatus, etc. Check the work areas carefully for spilled or splashed nutrients. If left behind, they may support microbial growth which may contaminate the protected work environment. Keep in mind that while the laminar flow biological safety cabinet will keep the work zone air clean, it is up to the operator of the cabinet to keep the work zone surfaces clean.

    DO NOT USE THE CABINET TO STORE EXCESS LABORATORY EQUIPMENT.

12. If during cabinet operation, an accident occurs which spills or spatters the research agent around the work area, all surfaces and items in the cabinet must be surface decontaminated before being removed. If the spill is large enough to result in puddles on the work surface and/or liquid in the cabinet drain, then the unit should be flooded with disinfectant. The drain capacity of the SterilGARD Model VBM-600 is 109.0 liters.

    After sufficient contact time for complete kill has occurred, remove/drain the material. If the drain system is involved, flush it again with disinfectant and finally with water and dry. If the disinfectant and/or spilled material is at all harmful to stainless steel (for example: Hypochlorite solutions), be certain that no residue is left to corrode cabinet surfaces.

    If the spill involves a CDC Class 2 or 3* agent of sufficient hazard (Class 4 agents should NEVER be used in this type of cabinet) and/or the spill is large enough, leave the unit running and where possible (in the SterilGARD) close the viewscreen. If the spill/accident contains any volatile liquids or gasses which might present a fire or explosion hazard, turn the unit off and close the viewscreen if possible. In either or both cases, evacuate and seal the room. Seek immediate assistance from a health physicist or biological safety officer. Such spills may require unit or room decontamination by an agent such as formaldehyde gas.

    It is recommended that the operator, as part of proper cabinet usage, familiarize himself with the capabilities and limitations of the cabinet by reading some of the available literature, a portion of which is listed in the Bibliography.

    The U.S. Department of Health, Education and Welfare offers an excellent slide cassette program entitled "Effective Use of the Laminar Flow Biological Safety Cabinet". This is an invaluable aid in teaching technical personnel proper cabinet use and is available from the following address:

    Sales Branch
    National Audiovisual Center (G.S.A.)
    Washington, DC 20409

* From Centers for Disease Control: "Classification of Etiologic Agents on the Basis of Biohazard".

ANCILLARY EQUIPMENT

When using ancillary equipment, keep in mind that the more equipment and materials within the cabinet, the greater the turbulence in the work zone, which diminishes the effectiveness of the cabinet. Units which disrupt airflow either through the rotating and vibrating parts or heating elements, should be used with caution. Always place this type of unit at the rear of the work zone where disturbances least affect the air barriers. Follow the same procedures detailed in "Working in the Cabinet" especially those concerning surface decontamination and air purges before and after use of this type of equipment.

Never use equipment which singularly or in combination exceeds the amperage limit of the work area duplex. Amperage limit of the Model VBM-600 workarea duplex is 5 amps. As an additional safety feature, the cabinets are designed such that the electrical outlets in the work area are protected by a circuit breaker. Thus an overload on outlets will not affect the airflow.

Blender: Homogenization of cultures with a blender can crate an enormous aerosol load, and thus special care must be taken with its use. Surface decontamination and air purge procedures are essential before and especially after blender use. DO NOT perform other research activities or leave your arms in the cabinet while the blender is in operation. Wait AT LEAST five minutes after the blender has come to a complete stop before opening the cover. If the blender is opened during or just following operation, contaminated particles could be in sufficient concentration and of high enough velocity to easily penetrate the cabinet air barrier and contaminate the surrounding laboratory.

Centrifuge: Small clinical centrifuges and other rotating laboratory equipment create severe air turbulence which disrupts airflow both within the cabinet and at the work opening. This is sufficient for contaminated air to escape into the laboratory environment. DO NOT perform other research activities or leave your arms in the cabinet while the centrifuge is operating. Surface decontamination and air purge procedures are essential before and especially after centrifuge use. Wait at least five minutes after the centrifuge has come to a complete stop before opening the

cover to give contents within the centrifuge a chance to settle. This is extremely important.

If you use the centrifuge frequently and/or work with a fairly hazardous CDC Class 2 or 3* agent, the purchase of an LFBSC modified to hold various small clinical centrifuges is recommended. In these units, the centrifuge is placed in a well recessed in the work surface which holds air turbulence to a minimum. For work involving larger scale centrifugation or ultracentrifugation, Baker makes a Class III Centrifuge cabinet which houses units of a few manufacturers. This unit, with the use of glove ports, offers a complete barrier between the operator and biological agent. It thus may be used with Class 4 agents when properly installed.

When working with any piece of auxiliary equipment, it is essential to use good aseptic technique and closely carry out correct procedures for working in an LFBSC. This includes making sure the cabinet is operating in the proper mode, view screen at the proper place, access doors latched, no warning devices signaling, etc. Since use of these auxiliary items, blenders, centrifuges, sonication devices, etc., create the greatest amount the aerosol and thus hazard, using them properly is a MUST.

For an idea of the amount of aerosol the use of these and other common laboratory implements creates, refer to:

A. R. L. Dimmick, W. F. Vogl, and M. Chatigny 1973. Potential for Accidental Microbial Aerosol Transmission in the Biological Laboratory, p. 246-267, In Biohazards in Biological Research, A. Hellman, M.N. Oxman, R. Pollack, Eds. Cold Spring Harbor Laboratory.

* From CDC "Classification of Etiologic Agents on the Basis of Risk"

LIST OF DON'TS

From many years of observing our equipment being misused in laboratories, the following is a list of the most common problems we discovered. Never be guilty of these habits as they compromise the effectiveness of the unit and may create unsafe conditions.

1. NEVER store equipment in the cabinet.
2. NEVER fail to turn on the blowers.
3. NEVER fail to keep the viewscreen at the proper level.
4. NEVER fail to use pipetting aids.
5. NEVER use an open flame in the cabinet.
6. NEVER block any of the air intake grilles.
7. NEVER effect changes to the cabinet or the blower speed, unless indicated by air velocity decrease.
8. NEVER overload the work area.
9. NEVER use toxic, explosive or flammable substances in these units, unless the cabinet is specifically designed for this use.
10. NEVER work with a CDC Class 4 agent, or equally hazardous material in this cabinet.
11. NEVER forget to close the drain valve.
12. NEVER operate a unit while a warning signal is indicating.
13. NEVER work in the unit while the ultra violet light is operating.
14. NEVER fail to use good aseptic technique.
15. NEVER fail to use surface disinfecting procedures before and after work.

16. NEVER fail to ensure that the cabinet undergoes periodic maintenance checks.

If the operator exercises common sense and is adequately trained to use the laminar flow biological safety cabinet, no problems should arise. However, if either or both are ignored, problems will persist.

DECONTAMINATION

Before maintenance, service or repair work is performed in a contaminated area on a biological safety cabinet, the unit must first be decontaminated by a gaseous agent. This is to minimize the chances of the service employee from being exposed to any viable harmful agent that is present in the filters, on the inner cabinet surface, etc. The National Institutes of Health, National Cancer Institute and Centers for Disease Control recommend the use of formaldehyde gas and their procedures are referenced below. An ethylene oxide gas mixture is an alternative, but it involves a more complicated procedure and should only be used by persons knowledgeable and experienced in its use. Whatever gas you select, have the proper safety equipment within easy access (gas masks, protective clothing, etc.) and make certain that the gas employed is effective against all biological agents used in the cabinet. It is also important to know the antidote to the gas and post it in a readily accessible area before beginning. The volume of the VBM-600 is 84.1 cubic feet. You will need this information to calculate the proper amount of the appropriate decontaminating gas.

Carcinogens present a unique chemical deactivation need and standard biological decontamination will not be effective on chemicals and non-biologic materials. An industrial hygienist, safety officer or other qualified individual should be consulted in these instances.

Procedure references:

Formaldehyde Decontamination of Laminar Flow Biological Safety Cabinets - a slide cassette program. U.S. Department of Health, Education and Welfare, National Institutes of Health, National Cancer Institute. Available through Ralph Collett, Chief, Sales Branch, National Audiovisual Center, Washington, DC 20409.

Decontamination of Biological Safety Cabinets, U.S. Department of Health, Education and Welfare, Public Health Service, Health Services and Mental Health Administration, Centers for Disease Control, Atlanta, GA 30333. (Pamphlet on two methods).

Antidote to formaldehyde gas included in:

Working With Formaldehyde
U.S. Department of Health, Education and Welfare
Public Health Service
National Institute for Occupational Safety & Health 1973

Sale by: Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

A good general reference: G. Briggs Phillips and William S. Miller, eds, 1973 Industrial Sterilization Duke University Press, Durham, NC pp.426

NOTE: When using polyethylene film to seal cabinets for gaseous decontamination, the plastic film must be at least 8 mil thick to prevent formaldehyde gas penetration.

Due to the sliding sash, the suction slots, and the thick gasketed seams between the steel panels on the SterilGARD, it is difficult to get a true gas tight seal by just closing up the front with plastic film and tape. For gaseous decontamination, therefore, all SterilGARD units must be sealed appropriately in plastic film of sufficient thickness. After the appropriate contact period, the gas must be vented where it can be safety eliminated from the laboratory. It is good practice to ascertain whether anything "downwind" of the building exit point will be harmed by concentration of gas released.

GLOSSARY *

Absolute containment - Capacity for completely retaining any specified substance. Class III Safety Cabinet, for example.

Aerosol - A colloid of liquid or solid particles suspended in gas, usually air.

Air balance - To adjust the proper exhaust and supply air volume to provide optimum operating conditions of cleanliness and containment.

Biological hazard - Those biological entities presenting a risk or potential risk to the well being of man, either directly or indirectly through disruption of his environment. The term is often contracted to "biohazard".

Containment - Prevention of agent transmission from one point to another. (Absolute containment can only be accomplished with an absolute physical barrier).

Contamination - Any foreign substance which makes an unwanted incursion.

Decontamination - The destruction or removal of hazardous entities to safe levels.

Disinfectant - A chemical agent that kills or inactivates microorganisms.

D.O.P. - Dioctylphthalate: Oil used to generate an aerosol of particles to challenge HEPA filters. Other substances which may be less toxic (DOS) can be used as an acceptable substitute.

HEPA filter - A high efficiency particulate arrestance filter technically capable of retaining 99.97% of all particles 0.3 micron diameter.

Health Physicist - A professional whose duties are to protect the individual and environment from unwarranted radiation or biological exposure.

Laminar air flow - Air flow within a Reynolds number below 2000. In this context, for Class II cabinets, it is air flow in which the entire body of air within a designated space moves within single direction along parallel flow lines.

Laminar flow biological safety cabinets (LFBSC) - Class II cabinet providing simultaneous personnel protection and a contamination-free work environment.

Micron - Micrometer - A unit of length equivalent to 10 -6 meters.

Negative pressure - Pressure in a space, less than ambient, which causes and inflow of air.

Partial containment - An enclosure which is so constructed that contamination between its interior and the surroundings is minimized by the controlled movement of air. Class I and Class II safety cabinets are examples.

Plenum - An enclosed space in which the pressure if the air is greater, or less than that of the outside atmosphere. In Class II cabinet, it is also a chamber for conveying or containing air.

Positive pressure - Pressure in a space, greater than ambient, which causes an outflow of air.

* Taken principally from a workshop for Certification of Biological Safety Cabinets by Dow Chemical under contract to N.C.I.

CLASSIFICATION OF BIOLOGICAL SAFETY CABINETS *

Class I Safety Cabinet

This is a ventilated enclosure which is basically a variation of the chemical fume hood. Personnel protection is provided by the inflow of room air through a fixed size cabinet work opening; contaminants are captured in the airstream and removed from the work space by HEPA filters which are incorporated in the cabinet or in the exhaust air system. No product protection is afforded as the work is exposed to a wide variety of contaminants swept in from the room environment. It is designed for work with CDC Class 1, 2, and 3 agents.

Class II Safety Cabinet

This is a ventilated enclosure simultaneously providing personnel protection and a contamination free work environment. Personnel protection is provided by an inflow of room air at the work opening where it is quickly entrained in a recirculating air stream and removed through an exhaust grille at the leading edge of the work area. A contamination-free work zone (product protection) is provided by supplying recirculated air through HEPA filters downward towards the work surface at a uniform velocity. Also called a laminar flow biological safety cabinet (LFBSC).

Class II Safety Cabinet

These are gas tight enclosures maintained under a negative pressure in which work is performed through rubber gloves. The cabinet is ventilated by drawing room air through HEPA filters and exhausting it separately at the atmosphere through additional HEPA filters. It is designed for work with CDC Class 4 agents (extremely high risk).

* Taken from a Workshop for Certification of Biological Safety Cabinets by Dow Chemical under contract to N.C.I.

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REPLACEMENT PARTS LIST

STERILGARD HOOD VERTICAL LAMINAR FLOW CABINET

MODEL VBM-600

PART NAME	
Supply Motor	1/3 hp - 115V 1625 rpm 2 required
Supply Blower	DD9-7AT 2 required
Supply HEPA Filter	18" x 72" x 6"
Exhaust HEPA Filter	18" x 18" 12"
Lamps	F72T12/CW/HO
Ultra Violet Lamp	G64T6 60" long
Motor/Blower Controller	Triac 2 required
View Screen	1/4" Safety Glass 32" x 76 1/8"
Sash Balances	#60 2 required
Window Wiper	Silicone Rubber

NOTE: When ordering replacement parts, please furnish the serial number of the unit, as well as model number.

REPLACEMENT PARTS LIST

STERILGARD HOOD VERTICAL LAMINAR FLOW CABINET

MODEL VBM-400

PART NAME	
Supply Motor	1/3 HP - 115V
Supply Blower	DD9-7AT
Final HEPA Filter	18" x 48" x 6"
Exhaust HEPA Filter	12" x 18" x 12"
Lamps	F48T12/CW/HO
Ultra Violet Lamp	36" Long G30T8
Motor/Blower Controller	Triac Rplmt. # 343261
View Screen	1/4" Safety Glass 32" x 52-1/8"
Sash Balances	#37
Window Wiper	Silicone Rubber

NOTE: When ordering replacement parts, please furnish serial number of unit, as well as model number.

7/18/83

WARRANTY

The Baker Company, Inc. expressly represents and warrants all goods (a) to be as specified (and described) in The Baker Company catalogs and literature, and (b) to be free under normal use, service and testing (all as described in The Baker Company catalogs and literature) from defects in material and workmanship for a period of twelve months from the invoice date.

The exclusive remedy for any breach or violation of this warranty is as follows: The Baker Company, Inc. Will F.O.B. Sanford, Maine furnish without charge repairs to or replacement of the parts or equipment which proved defective in material or workmanship. No claim may be made for any incidental or consequential damages. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE UNLESS OTHERWISE AGREED IN WRITING SIGNED BY THE BAKER COMPANY. (THE BAKER COMPANY SHALL NOT BE RESPONSIBLE FOR ANY IMPROPER USE, INSTALLATION SERVICE OR TESTING OF THE GOODS).

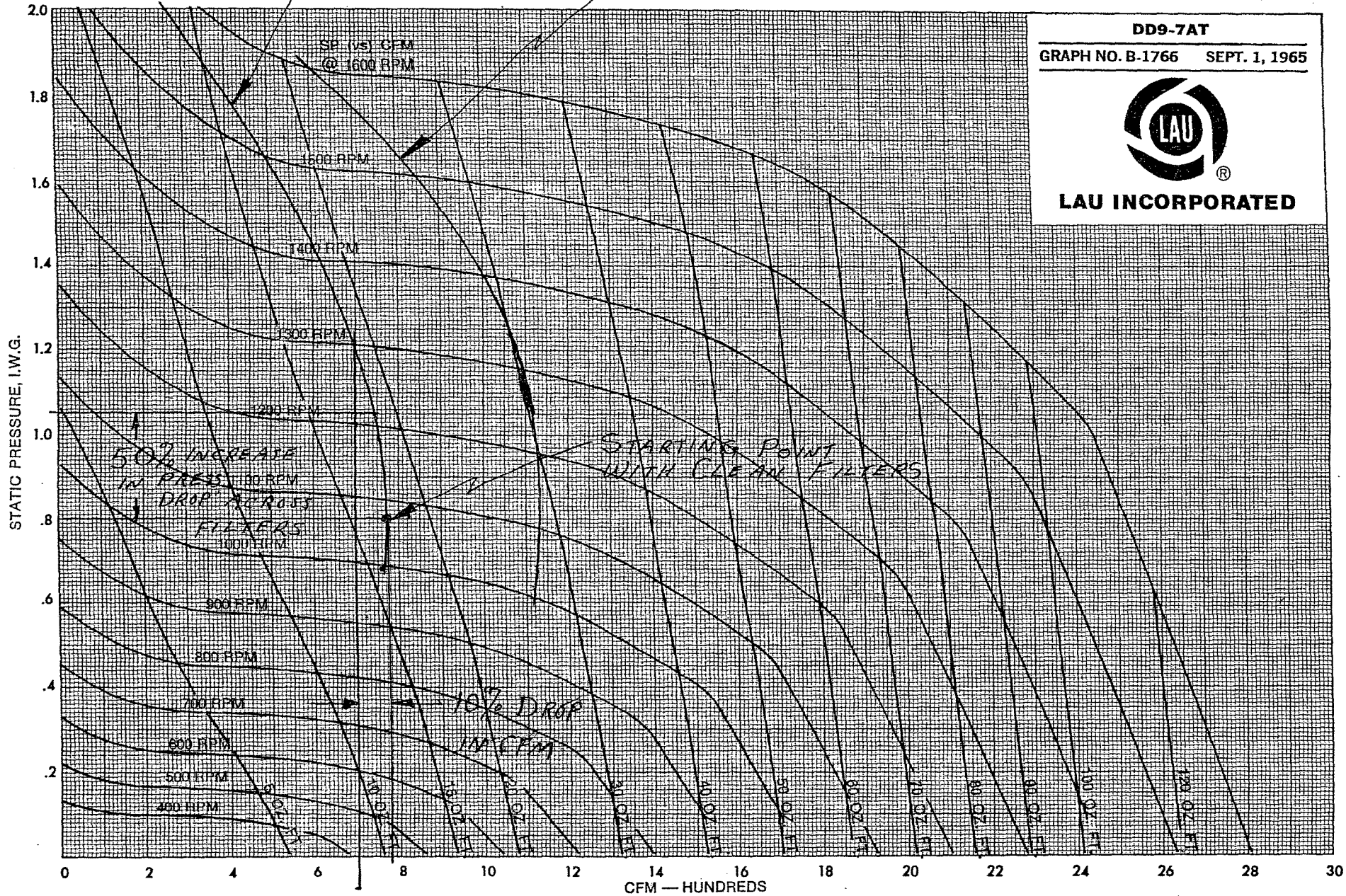
VB-1 400

BLOWER/MOTOR CURVE

MOTOR CURVE WITH SPEED CONTROL TURNED DOWN TO OPERATIONAL RANGE LINE VOLTAGE: 115V

MOTOR CURVE WITH SPEED CONTROL FULL IN - LINE VOLTAGE: 115V

the BAKER COMPANY, inc.
SANFORD, MAINE 04073



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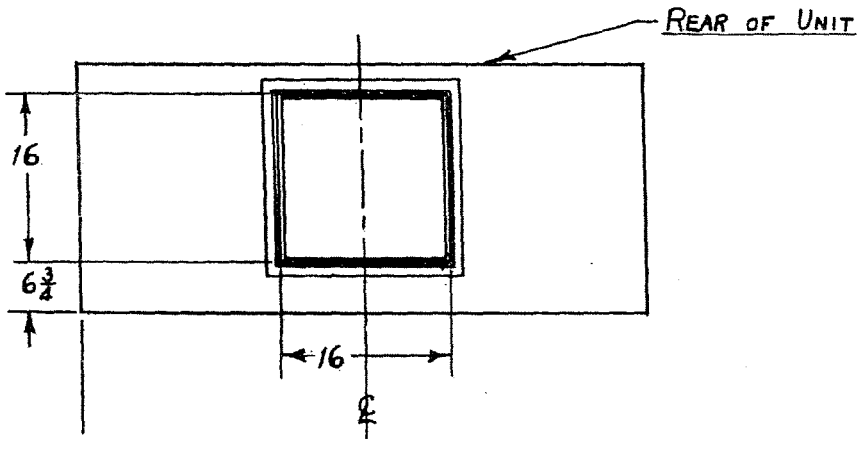
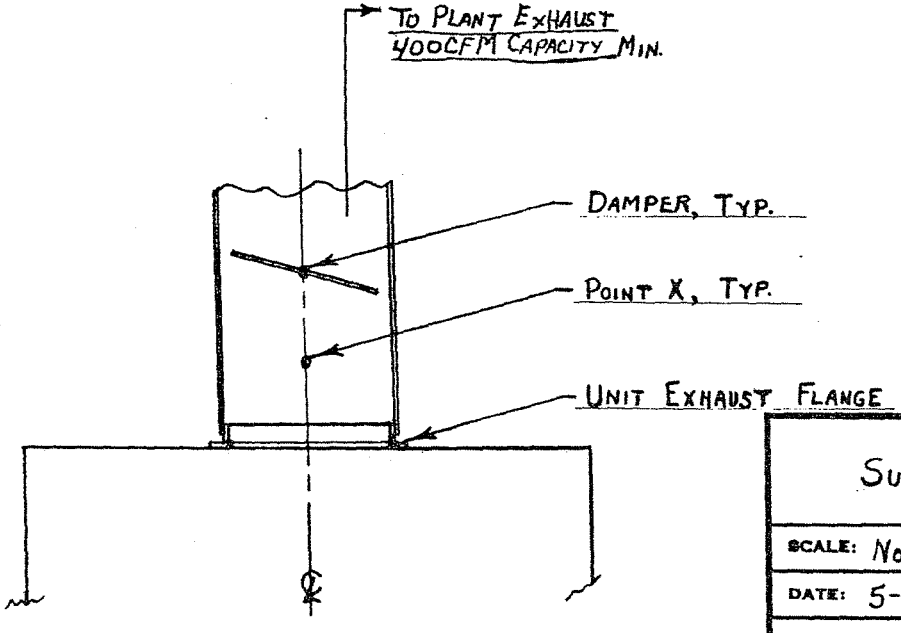




DAMPER ADJUSTMENT

1. OPEN DAMPER TO FULL PLANT EXHAUST.
2. INSTALL DRAFT GAGE AT POINT X.
3. WITH UNIT BLOWER OPERATING, ADJUST DAMPER FOR A READING OF .02 TO .04 INCHES WATER COLUMN (SUCTION) ON DRAFT GAGE.

NOTE:

ALL EXHAUST CONNECTION & ADJUSTMENT TO ANY EXTERNAL EXHAUST SYSTEM TO BE MADE BY CUSTOMER.

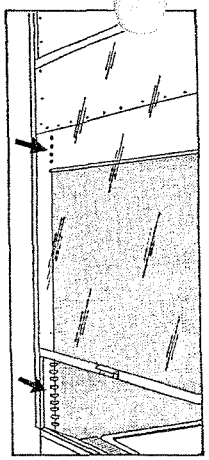
SUGGESTED EXTERNAL EXHAUST ASSEMBLY

SCALE: NONE	APPROVED BY:	DRAWN BY GEA
DATE: 5-21-73		REVISED

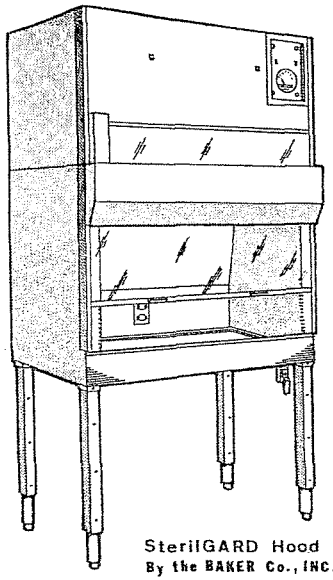
MODEL VBM 600

THE BAKER COMPANY, P.O. DRAWER E
SANFORD AIRPORT, SANFORD, MAINE 04073

DRAWING NUMBER VBM 600 A



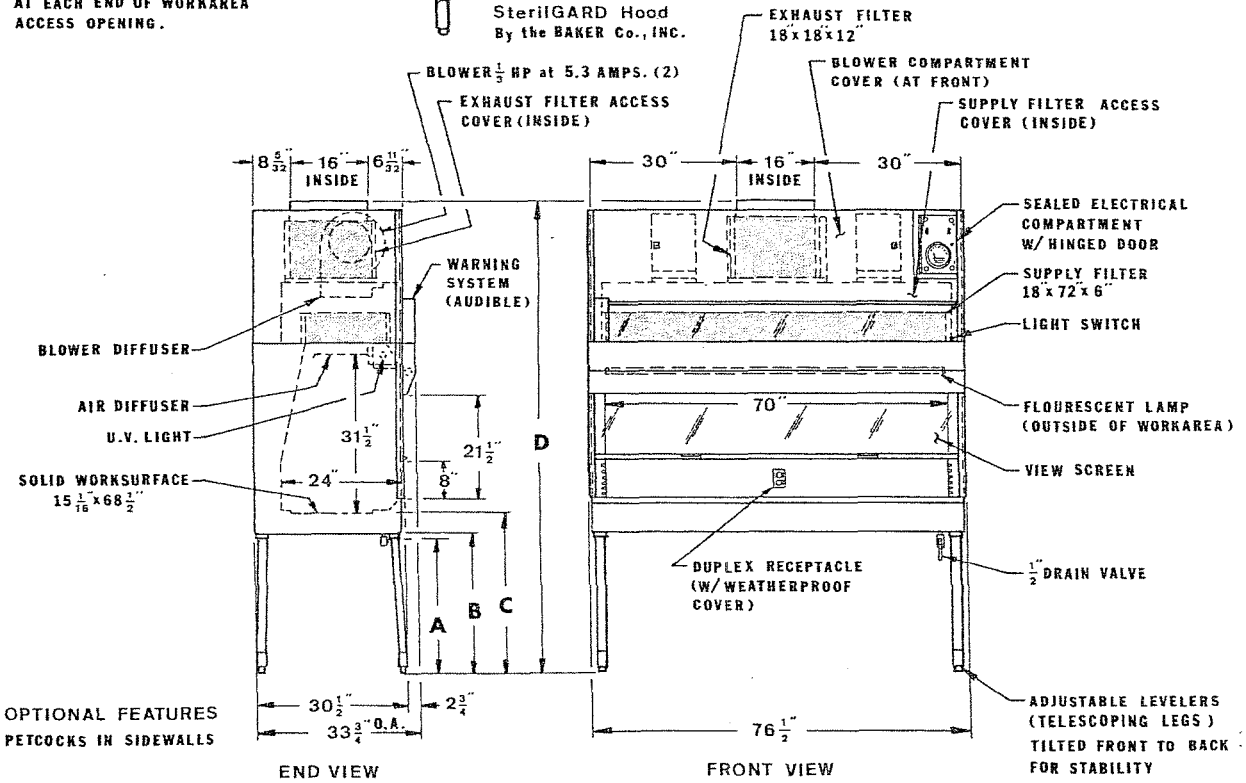
EdgeGARD® TYPE-AIR RETURN SLOTS LOCATED BEHIND VIEW SCREEN AT THE TOP AND AT EACH END OF WORKAREA ACCESS OPENING.



SterilGARD Hood
By the BAKER Co., INC.

EXHAUST REQUIREMENT

When connecting to an external exhaust system, the exhaust requirement is 390 CFM at .02 to .04 inches water column suction directly above the exhaust filter before any reductions, elbows or restrictions.



OPTIONAL FEATURES
PETCOCKS IN SIDEWALLS

PURPOSE OF VARIOUS CABINET HEIGHTS	A LEG EXTENSION	B KNEE SPACE	C WORKSURFACE HEIGHT	D OVERALL HEIGHT
SHIPPING & INSTALLATION	$7\frac{3}{4}$"	—	—	$74\frac{3}{8}$"
SITTING OPERATION	25"	26"	30"	$91\frac{5}{8}$"
STANDING OPERATION	31"	32"	36"	$97\frac{5}{8}$"

U.S. Pat. No. 3,895,570

NOTE:

ELECTRICAL: 115V-1 PHASE-60 HZ-STANDARD UNIT IS PROVIDED W/ONE DUPLEX RECEPTACLE W/5.5 AMP. CAPACITY - CONTROLLED BY A CIRCUIT BREAKER SWITCH. UNIT IS FURNISHED W/ONE 14FT POWER CORD.

A. Blower Mtr. (2) at 6.6 =	13.2 AMPS.
B. U.V. Light (Ballast)	0.50 AMPS.
C. Fluor. Light (Ballast)	1.20 AMPS.
D. Duplex	5.5 AMPS.
TOTAL	20.0 AMPS.

This Unit is listed by the "CANADIAN STANDARDS ASSOCIATION" as CERTIFIED.

SPECIFICATIONS

CONSTRUCTION — Cabinet exterior, heavy gauge reinforced steel, polyurethane painted, standard color-white. Worksurface, Sidewalls & front face, at Workarea, is 304 stainless steel w/Sidewalls slotted for high velocity air return. Each cabinet component is welded, gasketed or assembled with hermetically sealed joints to provide a bubbletight seal when completely assembled.

ILLUMINATION — 100+foot candles at worksurface level.

FILTERS — Exhaust & Supply Filters - Zero Probed HEPA-99.99% efficient on all particles 0.3 micron by D.O.P. test.

WARNING SYSTEM — This audible alarm, mounted at the top left of the light fixture, automatically sounds when the sliding view screen is raised beyond its proper 8" operating position.

HIGH INTAKE VELOCITY — Calculated air velocity intake through the 8" workarea access opening is 100 f.p.m.

TESTS — Complete testing for leaks, dust count, vibration and noise levels is performed as described in the Baker Company, Inc. Standards for Laminar Flow Devices.

NSF TESTING LABORATORY NSF ANN ARBOR, MICH.

MODEL VBM 600

SterilGARD Hood

"CREATING IMMACULATE ATMOSPHERES"

the BAKER Co., INC.
SANFORD AIRPORT, SANFORD, ME. 04073
TEL. (207) 324-8773