

# 6 ft General Solvent Hood

## Operations

Roger Robbins

8/24/2005

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**THE UNIVERSITY OF TEXAS AT DALLAS**  
**ERIK JONSSON SCHOOL OF ENGINEERING**

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### ***Introduction***

This document describes the Clean Room's new 6 foot General Solvent Hood from Leatherwood Plastics, Inc., Lewisville, Texas. This hood is intended to be used with solvents only, and not base solutions which tend to discolor the stainless steel. Because of the small size of this hood it is desired that only one operation at a time be conducted in the hood.

### ***Description***

#### **Work Surface**

The Solvent hood is constructed of Type 304 stainless steel. The working surface components include three 10" x 10" x 10" stainless steel drainless sinks located at the front of the work deck. They are built flush with the deck, and include stainless steel lids to increase the flat work surface area when the sinks are not in use. Since they have no drains, the aspirator is to be used to drain them into the waste solvent canister located in the chase behind the hood. On the right side of the working surface, there is one 10" x 24" x 10" type 316 stainless steel recessed sink with a perforated stainless steel lid and a 1.5" drain to the Industrial Waste Water system. At the back of the work surface is a recessed 10" x 10" x 10" ultrasonic tank, also covered with a lid flush with the work surface. Also, there is a 9" x 9" explosion proof hot plate, and a 6" diameter by 6" deep type 316 stainless steel cup sink with a 0.5 inch diameter drain to the solvent collection canister. Each of the features has been labeled for identification and proper use.



Figure 1. Photo of 6' General solvent hood showing the layout of components on the work surface.

**Fire and Health Safety**

The fire protection system consists of a major fire pull station that will set off the building alarm, and a local fire suppression system that will automatically detect and suppress a hood fire in the working area, below deck, and at the solvent waste canister with a CO<sub>2</sub> extinguishing system. The photohelic exhaust pressure gauge has a sensor and relay that will shut off the hood if the exhaust fails. There is a standard red EMO button on the control panel that shuts down the hood in case of a local non-spreading emergency. The hood facilities are turned on and off with an “on” and “off” button on the control panel.

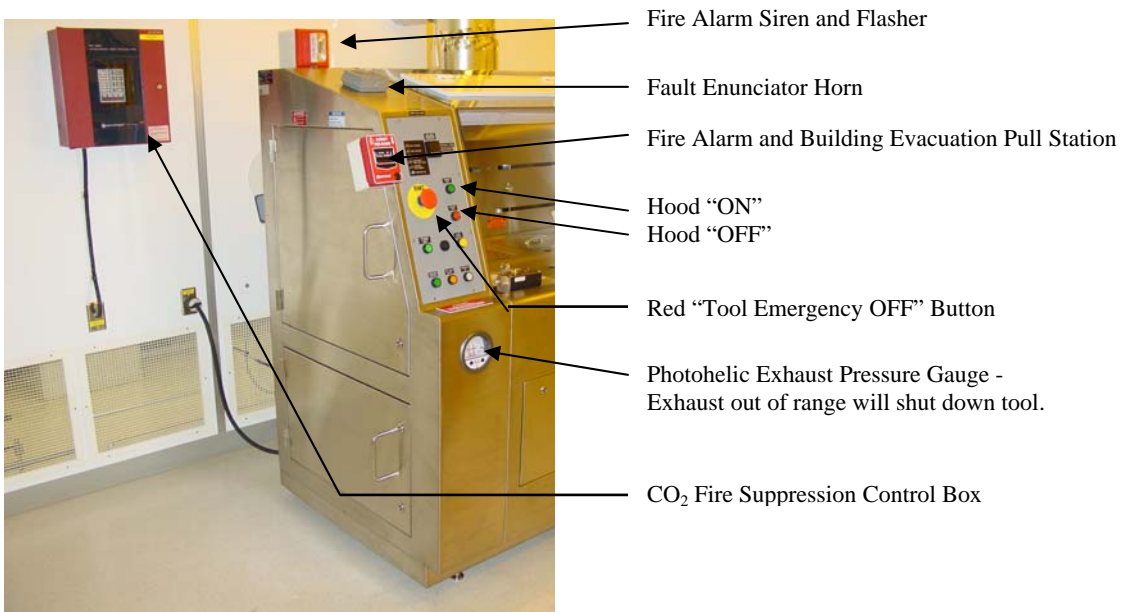


Figure 2. Safety alarm and shutoff switches

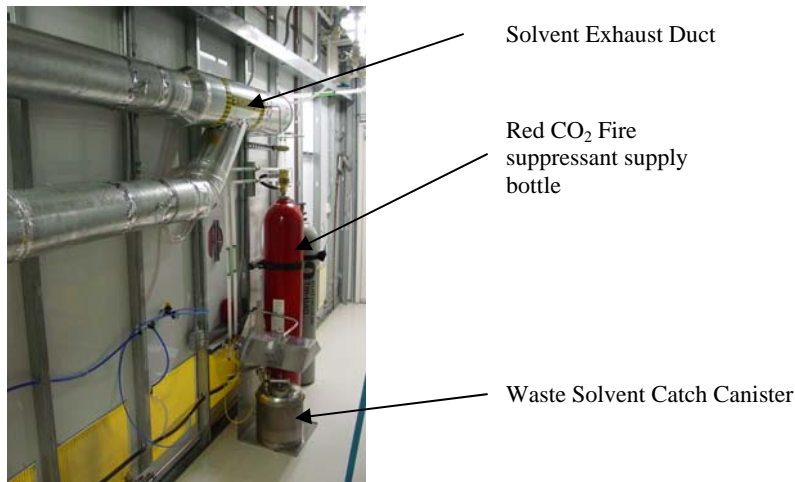


Figure 3. Red CO<sub>2</sub> bottle for fire suppression is located in the service chase behind the hood.

The “hooded” canister seen in Figure 3 and more closely in Figure 4 is the hood’s waste solvent collection canister. It is located in the service chase behind the hood and is situated in a semi-enclosed “doghouse” with fire sensing and suppression equipment protecting it. It attaches with “quick connect” connectors to the drain and exhaust lines. It also has a liquid level sensor that notifies the hood operator that the canister is full and shuts off the hood drains if the liquid actually reaches the full level.

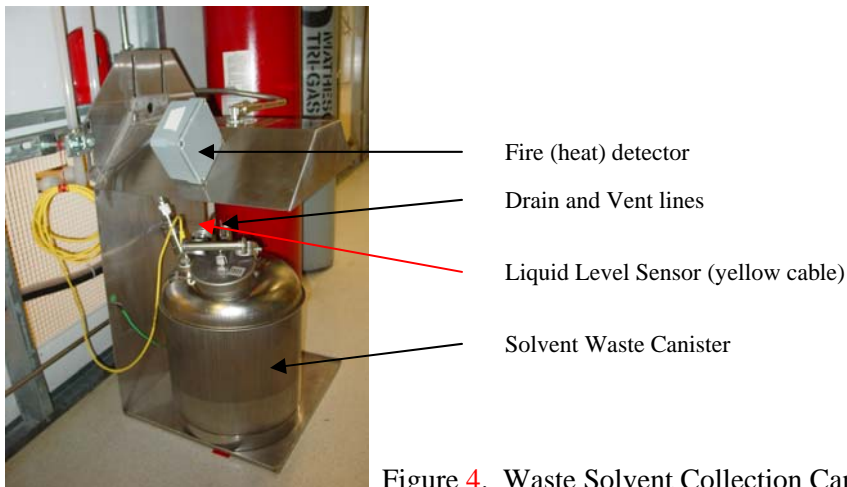


Figure 4. Waste Solvent Collection Canister

The yellow fluorescent lamp is housed in a N<sub>2</sub> purged box above the work surface and illuminates the work surface with a filtered light that will not expose optical resists. The bulb is changed by lifting the handle and replacing the bulb.



Figure 5. Changing hood lamp. Note the yellow filter to prevent unintended exposure of optical photoresist.

### **Hood Facilities**

The hood control facilities are located below the work surface and in a service panel on the left side of the hood behind the control panel. Figure 6 shows the insides of the control panel on the left side of the hood and the plumbing facilities under the work surface from the front of the hood. There are no user controls located in these locked areas, so if a problem arises, please call a Clean Room Staff member for help.



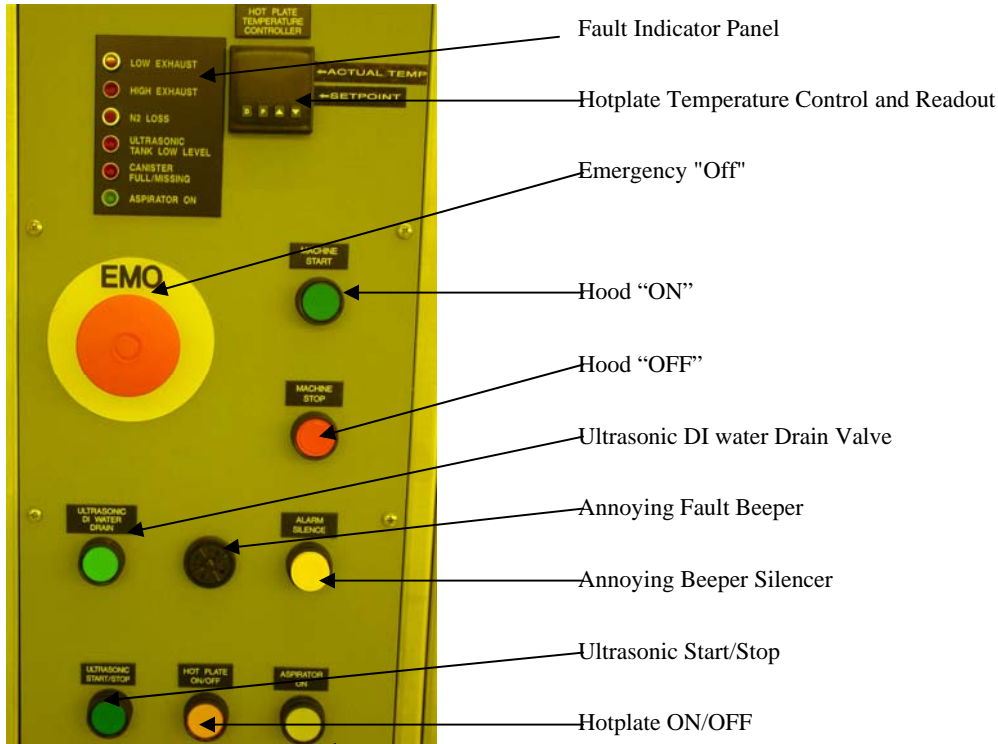
Figure 5. Hood Control (left) and plumbing facilities (right two photos). The large dark box in the middle of the left photo is the ultrasonic tank power supply.

### ***Hood Features***

The following discussion outlines the work area features, tools and intended use.

## Control Panel

The hood control panel is located on a sloping face at the left end of the hood. It consists of control buttons, indicator lamps and emergency buttons. Figure 6 points out the features of interest.



Aspirator "On" – (Must remain depressed during aspiration startup).

## Solvent Cup Sink

The solvent cup sink is designed as a convenient receptacle to dump used solvents from beakers, Petri dishes and so forth. This sink is located in the left rear corner of the working deck and drains into the waste solvent can in the chase behind the hood. There is however a valve in this drain line that closes when the waste solvent canister is detected to be full. There will be a little red light shining brightly on the hood control fault indicator panel when the canister is full. Please notify a clean room staff member when this occurs. Figure 7 shows the solvent cup sink.

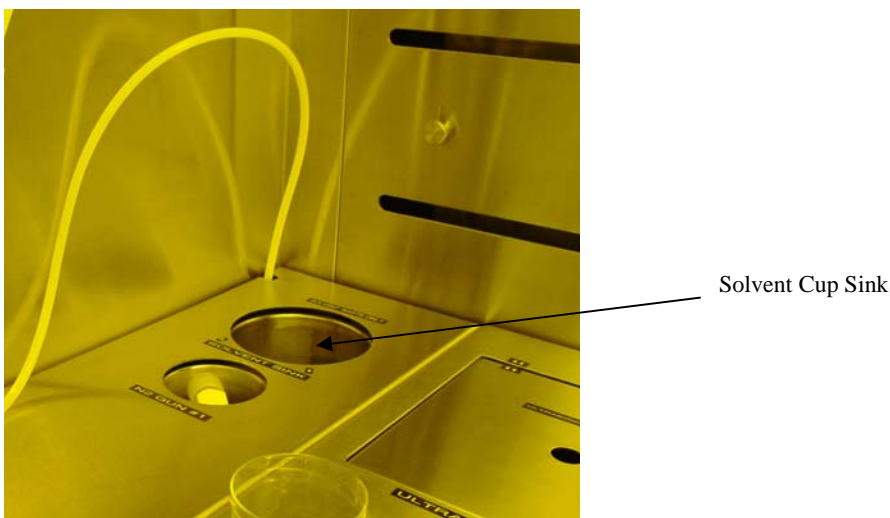


Figure 7. Waste Solvent Cup Sink located in the left rear corner of the working deck.

### **Ultrasonic Tank**

The ultrasonic tank is located next to the waste solvent cup sink. It is recessed under the surface and covered with a lid that sits flush with the deck surface. There is a handle in its center to lift it away from the tank. Don't poke your finger through the hole and touch the hot hotplate! The tank should be filled with water as an energy transmission medium and the substrates requiring agitation should be floated on the water inside a Petri dish filled with appropriate solvents to satisfy the purpose of the agitation. The water level in the tank is monitored by a pressure sensitive bubbler so that if the water level drops below the end of the bubbler tube, the system will shut off the ultrasonic tank power to protect the ultrasonic transponders and set off the annoying alarm. You can silence the alarm by pressing the yellow "Silence Alarm" button on the hood control panel at the left end. This alarm condition is also noted on the hood control panel with a brightly shining red light next to the appropriate sign. Also, because of the presence of the bubbler tube, the lid to the tank is slotted on opposite corners to avoid collision with the tube. There is a handy arrow marker on the lid and the working deck denoting the proper orientation of the lid.

The power level of the ultrasonic transponders is set at about 2/3 of maximum. If you need a different power setting, please contact a staff member for adjustment and notify him when you have finished so the power level can be returned to its normal setting.



Figure 8. Ultrasonic tank showing the lid orientation and the bubbler level monitor. Bubbles should be emitted from the tube at a rate of about 3 sec. when the water level is at the proper height.

### Hotplate

There is a conveniently located explosion proof hot plate with stirrer action recessed into the deck just to the right of the ultrasonic tank in the rear center of the working area. It is covered with a lid so that there will be a serviceable area to put things on when the hot plate is not in use. NOTE: This hotplate can get **very hot**, so for personnel safety we recommend to never put the lid on a hot hotplate – wait until it has cooled to room temperature to return the lid. The temperature control for the hotplate is located on the hood control panel at the left end of the hood, (Fig 9). The temperature is set by pressing the up or down arrows at the right end of the row of buttons under the temperature readout. The red upper number reflects the current temperature of the hotplate, and the green lower number represents the set-point temperature. At the conclusion of your hotplate use, please return the set-point to room temperature (25C), and then **turn off** the hotplate.



Figure 9. Recessed Explosion-Proof Hotplate, (Right), and temperature control and readout, (Left). See the knobs on the right side of the hotplate – Don't touch them!

Unfortunately the stirrer speed control knob is mounted on the side of the recessed hot plate. Do not try to turn this knob with the hot plate hot! Please ask a clean room staff member to diddle this knob to set up your stirring speed, (*Before* heating the hotplate!).

Since this is a new hood, please help us take care of it and keep it clean. If there is a spill, please clean up the hotplate surface safely. Contact a staff member if you need assistance.

### Hood Tools

#### Nitrogen Blow off Guns

There are two Nitrogen blow off guns on the working deck. Both have filtered soft-blow N2 streams. As it turns out, the gun on the left side has a little stronger flow than the one on the right. Take care in handling them because the spiral hose is quite stiff and may cause spills if it gets loose or springs back or rakes across the deck.



Figure 10. Two N<sub>2</sub> blow-off guns.

### DI Water Spray Gun

The De-Ionized water spray gun is situated on the left side of the hood next to the large water sink and is used to rinse substrates as required. The spray gun has a stiff spiral recirculating coaxial feeder tube supplying water. The recirculating feature keeps the DI water from stagnating and allowing bacteria to grow, thus causing particles to appear. Beware, this tube is very stiff and springy and can cause spills if it slips from your gloved hand. Grip the handle firmly and aid the tubing when pulling and returning the sprayer to its cubby hole.



Figure 11. DI recirculating water spray gun

### Solvent Aspirator

The solvent aspirator is basically a Venturi vacuum assisted-start siphon. The aspirator is located and stored on the left hand wall of the working area as shown in Fig 12. This is a waste solvent drain tool to siphon solvent from a container or sink that has no drain. It operates by sending high pressure N<sub>2</sub> through a Venturi suction device that pulls fluid into the aspirator tube with a very slight vacuum created by the Venturi. When the fluid fills the suction tube to a level below the fluid level in the container that requires draining, the N<sub>2</sub> is cut off and the solvent then is siphoned into the solvent drain canister. **BEWARE:** When the N<sub>2</sub> is first started, it puffs out the end of the aspirator tube and if you have it submerged in your waste solvent, then it will cause the solvent to violently erupt and splash all over everything in the hood. Also, when you first turn on the N<sub>2</sub> to start the aspiration, there may be some previously aspirated fluid that flies out the end of the tube. Therefore, **to start the aspiration**, point the end of the aspirator tube into a sink,

push and hold the “Aspirator” button and then after about 3 to 5 seconds, place the end of the tube into the waste solvent and allow the suction to fill the tube all the way to a point below the surface of the waste solvent container, and then you can let go of the “Aspirator” button and the siphoning action should drain your container. If you allow air to get into the tube during this stage, the siphoning action may stop and you will have to start all over.

The aspirator will usually not be needed for Petri dish and small beaker use because the (solvent) contents of small containers can be easily poured into the solvent cup sink at the left rear of the hood. This drains directly into the waste solvent canister.

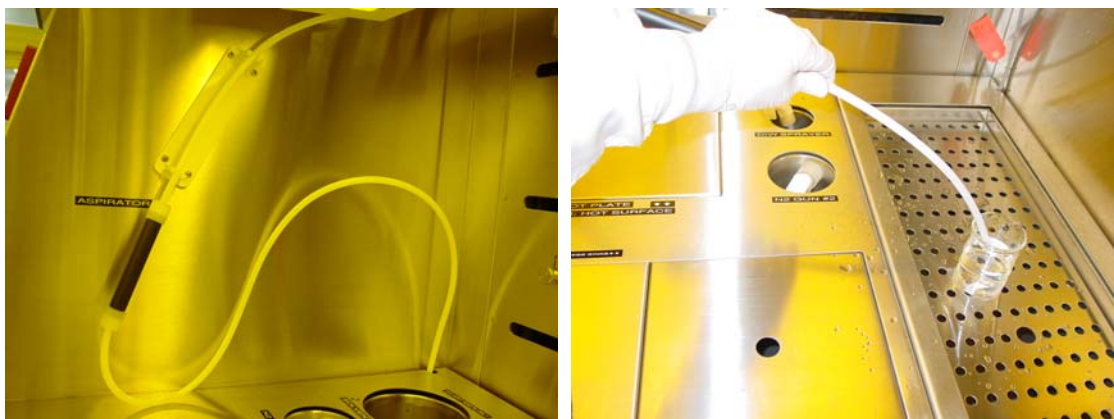


Figure 12. Solvent Aspirator storage (Left), and in operation (Right).

## Summary

This document has briefly outlined the description and features of the new General Purpose Solvent Hood. Things to note are: 1) Use this hood for Solvent operations ONLY, 2) Beware of the Hotplate – do not put the lid on when it is hot and do not try to adjust stirrer RPM knob when the hotplate is hot (preferably call Clean Room Staff for any hood parameter change), 3) Note that the solvent aspirator is a siphon and puffs  $N_2$  out the end when it starts, (start aspirator before putting into solvent); fill the tube to a level below the surface of the waste solvent to start the siphoning action.

## Rules of Operation

Now that the hood facilities and capabilities have been described in writing, here are a few rules of operation to keep the hood in top shape as well as keeping it in a safe condition:

### Rules

- Please read all labels and instructions prior to using the solvent hood
- Before starting any operation, fill out the standard chemical form with the chemical in use, your name, date and time, and contact information.
- Take your time, be careful and focus on your operation in the hood – minimize distractions.
- Remember the difficulties inherent in the aspirator and use it carefully.
- The hotplate can be HOT!! Try your best not to touch it when it is in that condition!

- When you are finished, clean up your work area and return all the tools you have been using to their proper place. – especially papers and rags.
- Dispose of SOLVENT waste in the solvent cup sink.
- **Do not** pour solvent waste into the **water** sink.
- Please do not place items on top of the ultrasonic and hotplate covers.
- Always turn off the hotplate when your job is complete - wait until it is cool before replacing the lid. This will help prevent burns when unsuspecting users try to lift the lid when you have left.
- Never pull the fire handle unless you actually see fire in the hood area.

## Appendix A

### Air Flow Measurements

Airflow measurements in linear ft/min were taken at numerous points as shown in Figure A1. The main exhaust duct damper valves were both set at about 45 degrees. The measuring points are labeled in the figure and refer to entries in the following table listing the values.

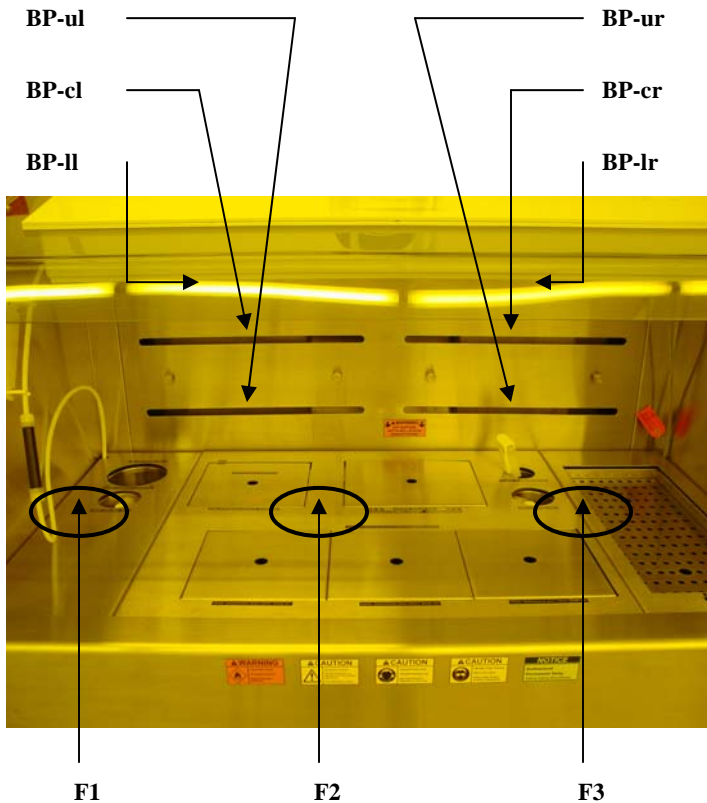


Figure A1. Location of air velocity measurements

Table A1  
Air Velocity Measurements

Location	Velocity (ft/min)
F1	175
F2	165
F3	110
BP-ul	1460
BP-cl	1360
BP-ll	1315
BP-ur	1260
BP-cr	1040
BP-lr	1075