

## A Versatile Fume Hood Support To Secure Large Reaction Flasks

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### Abstract:

We describe a simple support that can be used with 12 or 22 L reaction flasks. Common fume hoods readily accommodate reaction vessels up to 5 L by attachment to a lattice in the rear. Anchoring larger glassware using this relatively frail lattice arrangement results in problems with bottom drop valves, access to apical openings, and support for large masses. The apparatus described herein permits the safe and inherently stable support of jacketed 12 or 22 L reactor vessels.

### Introduction

Once the decision is made to employ large-scale (>5 L) glassware in a fume hood, typically the next step is to modify the fume hood. The benchtop must be removed and replaced with a tripod ring stand. The ring stand is usually too tall and must be modified before placement in the hood is possible. Once in place, the legs of the ring stand often hinder access to the drop valve of the reactor vessel, so further adjustments must be made. Returning the hood to normal small flask uses after the project is completed requires that the modified ring stand be removed and stored for further use.

The support system described herein safely secures 12 and 22 L reactor vessels while avoiding all of the aforementioned problems. Although there is a moderate initial investment, the economic benefit will be obvious to those who choose to employ this support system (Figure 1).

Most of the fume hoods in our laboratories have a robust frame. This frame (which supports the soap stone work platform) is connected to the hood side walls. The essence of our idea is to secure a hoop inside of a horizontal cradle (Figure 2) that is level with or slightly below (*very important!*) the horizontal framework support (Figure 2, item C).

### Construction Details: Primary Cradle

Most of the 22 L reactors in our laboratories have a  $\frac{1}{2}$  jacket that allows the use of coolant.<sup>1</sup> Each of these reactors can be envisioned approximately as a sphere (Figure 2, item A) by imagining that the coolant jacket extends around the reactor vessel. The circular support band diameter is



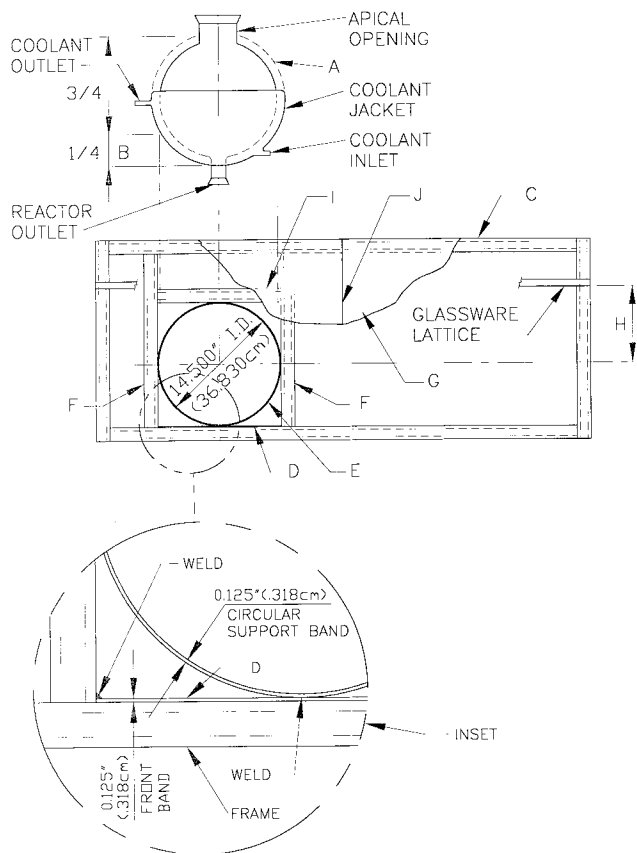
**Figure 1.** Photograph of a 22 L reactor vessel using the primary fume hood support (item A) and the primary fume hood support plus the adapter ring (item B shown without cushions). Note the easy access to the space under the reactor.

determined by measuring the diameter of the reactor 25% of the way up from the bottom of the hypothetical sphere (Figure 2, item B). In our case, this measurement was ~36.83 cm (14.5 in.). It is important to make certain that there is no interference from the coolant inlet or the coolant outlet (Figure 2).

Once the hoop is made (from 0.635 cm (0.25 in.)  $\times$  1.905 cm (0.75 in.) band steel), determining where to attach it to the horizontal perimeter framework (Figure 2, item C) is necessary. The center of the hoop *must* be within reach of the glassware clamps (Figure 2, item H). In our case, this distance was 21.59 cm (8.5 in.) from the glassware lattice. This arrangement allows glassware clamps to secure addition funnels, stirrer bearings, and other attachments that are usually at, or near, the top and in line with the central axis of the reactor.

The hoop was placed inside of a removable interior framework (Figure 2, items D–I). The three components

(1) Flasks are custom-made by LAB GLASS of Vineland, NJ (1-800-522-7123). The catalogue number for the 22 L  $\frac{1}{2}$ -jacketed flask is LG-8026-22L-191860. The catalog number for the 12 L  $\frac{1}{2}$ -jacketed flask is LG-8026-12L-191860.



**Figure 2. Primary cradle.**

of the interior framework are: (1) Two lateral pieces of Unistrut<sup>2</sup> (Figure 2, item F) that span the length between front and rear of the horizontal framework; (2) the perpendicular piece of Unistrut in the rear of the hoop (Figure 2, item I); (3) the metal band in the front (Figure 2, item D, and inset, Front Band, item D). All of these pieces (Figure 2, items F, D, and I) of the interior framework are “TIG” welded together with the circular support band (Figure 2, item E). The cradle per se was attached within the horizontal framework (Figure 2, item C) via flat plate fittings, nuts, and screws to simplify removal.

The entire ring support apparatus is positioned in the hood approximately one-half of the way from the left-hand side of the hood (Figure 2). This arrangement allows more efficient use of the fume hood. The right-hand portion of the soapstone work platform (Figure 2, item G) can remain on the right-hand side of the framework. This arrangement allows small-scale and large-scale work to occur concurrently.

### Construction Details: Adapter Ring

An adapter was also developed that allows the support system to be used with smaller reactor vessels. It is placed concentrically in the primary cradle (Figure 3). In our case,

we wished to support a 12 L flask equipped with a cooling jacket.<sup>1</sup> The diameter of this secondary support ring can be determined by the same method as described above. These flask dimensions were identical to those of a 22 L *un*jacketed flask. One important aspect of the adapter ring is the design feature to prevent horizontal movement of smaller reactor vessels. This is accomplished with three support hooks spaced at 120° around the adapter, so the adapter ring always rests firmly in the primary circular support. The diameter of the primary support band (Figure 2) determines the distance between the hooks (Figure 3, item A). In our case, this was 36.83 cm (14.5 in.). The gap in the hooks (Figure 3, item B) of the adapter ring is only slightly larger than the primary circular support band’s thickness. This hook design prevents horizontal movement of the smaller reactor vessel.

Three tabs were appended to our adapter ring (Figure 3) to add stability and prevent breakage. Without these tabs, the adapter ring can pivot and destroy the coolant jacket and the coolant inlet during the placement of the reactor flask. Each of these tabs (Figure 3, item C) must protrude slightly further than the hook (Figure 3, item D), so contact can be made with the primary support ring during pivoting. These tabs must be slightly bent away from the primary support ring (Figure 2, item E) so the weight of the reactor rests on the three hooks to maintain stability. Our adapter ring, hooks, and tabs were fabricated with lengths of 0.635 cm (0.25 in.) × 1.905 cm (0.75 in.) band steel and 1 in. (2.54 cm) × 0.125 in. (0.318 cm) band steel and welded together.

### Construction Details: Miscellaneous

To avoid glass breakage, a cushion over the support ring is necessary. A thick vacuum hose slit lengthwise and secured on the support ring with duct tape serves as a cushion (Figure 1, item A).

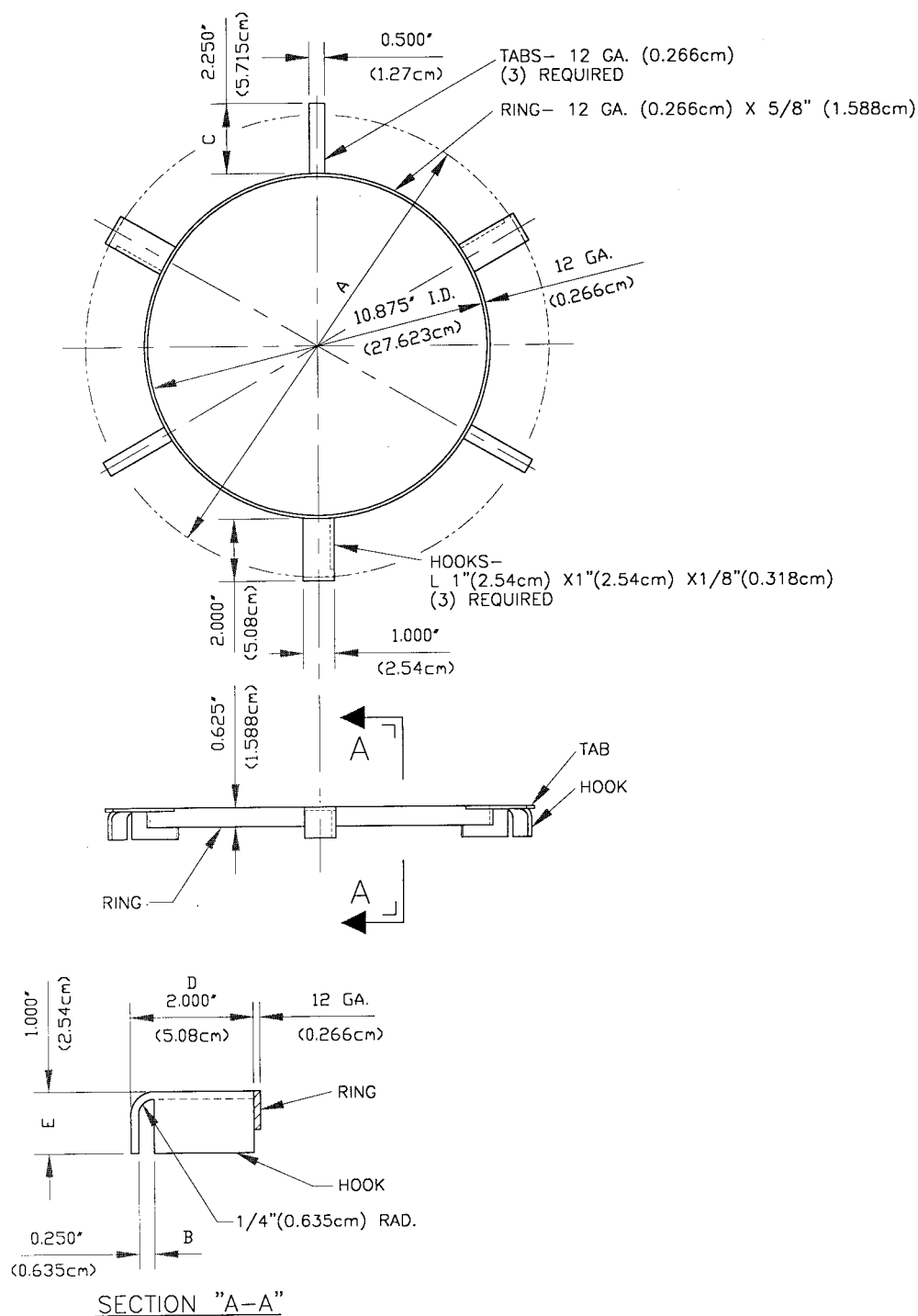
### Fume Hood Restoration

The support system described herein is readily reversible for restoring the fume hood to full-time small-scale use. The steps are (1) remove the 22 L reactor (or the smaller reactor vessel and the adapter ring), (2) remove the cushioning, and (3) slide the left-hand side of the soap stone work platform in place. An additional ~1 cm (0.40 in.) should be removed from the end of the work platform (Figure 2, item J) to facilitate the movement in and out of the fume hood when both halves are present. When the soapstone is replaced, the cradle is minimally noticeable.

### Safety Considerations

Our fume hoods are routinely monitored for proper air flow. Use of a 22 L reactor flask with our fume hood cradle does not appear to pose a safety hazard in regard to the air handling system. The fume hood framework where you wish to place the cradle must be able to support the weight of a full reactor vessel, the coolant, and the cradle (~35 Kg).

(2) Unistrut is a commercially available framework that permits attachments via flat plate fittings, nuts, and screws. Unistrut may also be referred to as Vari-Strut and is available from McMaster-Carr Supply Company, Elmhurst, IL, (630)-834-9600. Unistrut is a registered trademark of Unistrut International Corporation.



**Figure 3.** Adapter ring.

As long as the fume hood and the support are made from sturdy materials such as the recommended Unistrut, the support is assembled with qualified welders, and common sense maintenance is practiced, we feel that the described cradle is as safe as or safer than the traditional tripod ring stand.

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