Albany Molecular Research, Inc.®
21 Corporate Circle • Albany, NY 12203 USA • Tel. 518-464-0279 • Fax 518-464-0289

Technical Reports
Volume 3, Number 20

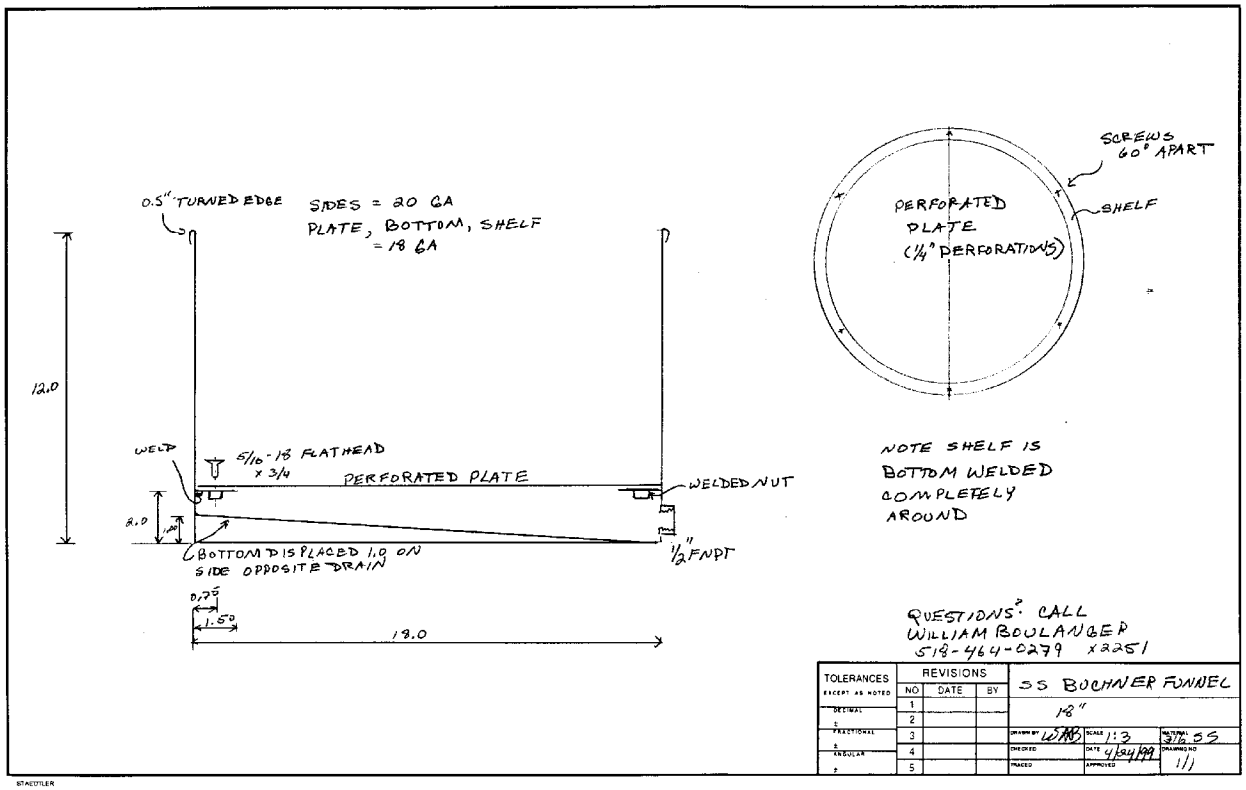
An Improved Large-Scale Büchner Design

William A. Boulanger, Ph.D.
Chemical Development Department
Albany Molecular Research, Inc.
21 Corporate Circle
Albany, NY 12203

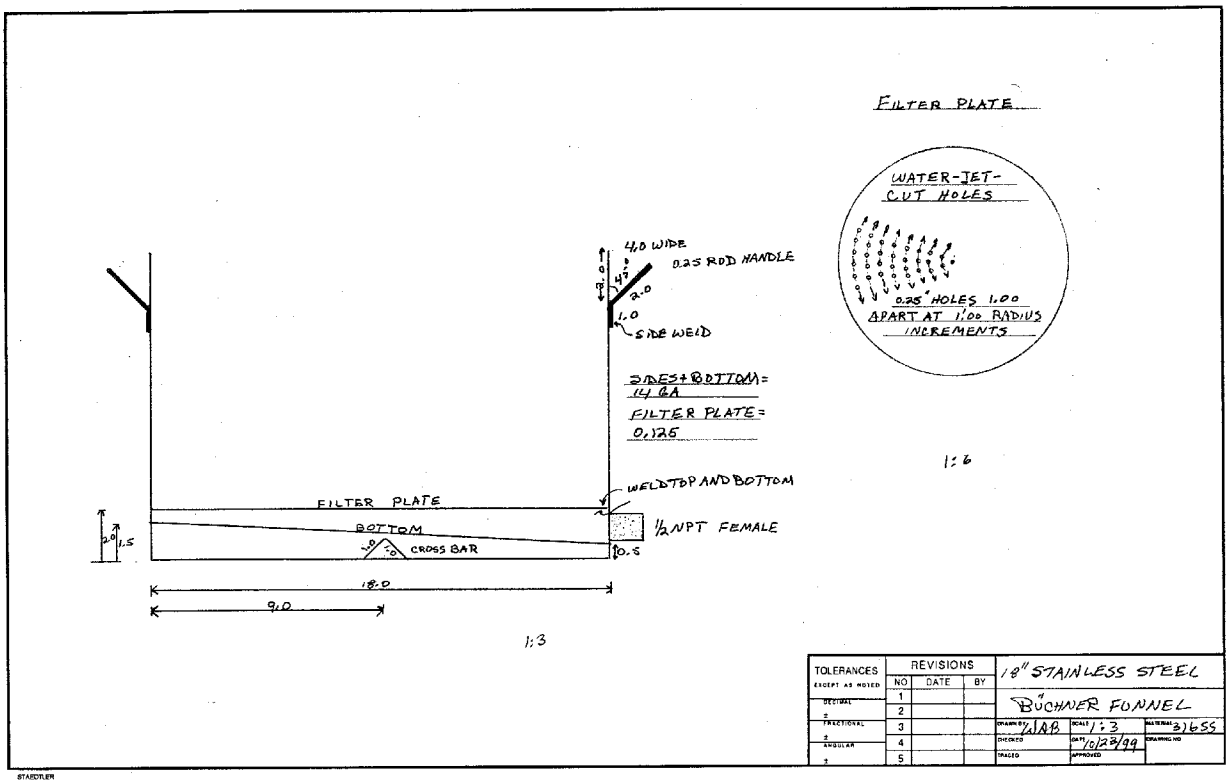
Abstract. *At AMRI, we frequently perform multi-kilo filtrations of slurries in organic solvent using commercially available 18" and 24" diameter polyethylene Büchner funnels lined with Sharkskin*Ò *filter paper. After encountering various difficulties with these* and *exploring other options such as polypropylene and stainless steel, we decided to explore making them ourselves. The following decribes the improved Large-Scale Büchner Design.*

At AMRI, we frequently perform multi-kilo filtrations of slurries in organic solvent. In the past, we employed the commercially available 18" and 24" diameter polyethylene Büchner funnels lined with Sharkskin® filter paper. We have found that these plastic funnels would crack after just a few uses, especially if exposed to such solvents as MTBE, toluene, or cyclohexane. This was apparently caused by differential swelling of the portions exposed or not exposed to solvent. Rewelding the cracks proved to be a temporary solution at best. At $350 per funnel, filtration was becoming an expensive proposition. Although polypropylene funnels would be more resistant, we were unable to identify a vendor for polypropylene funnels.

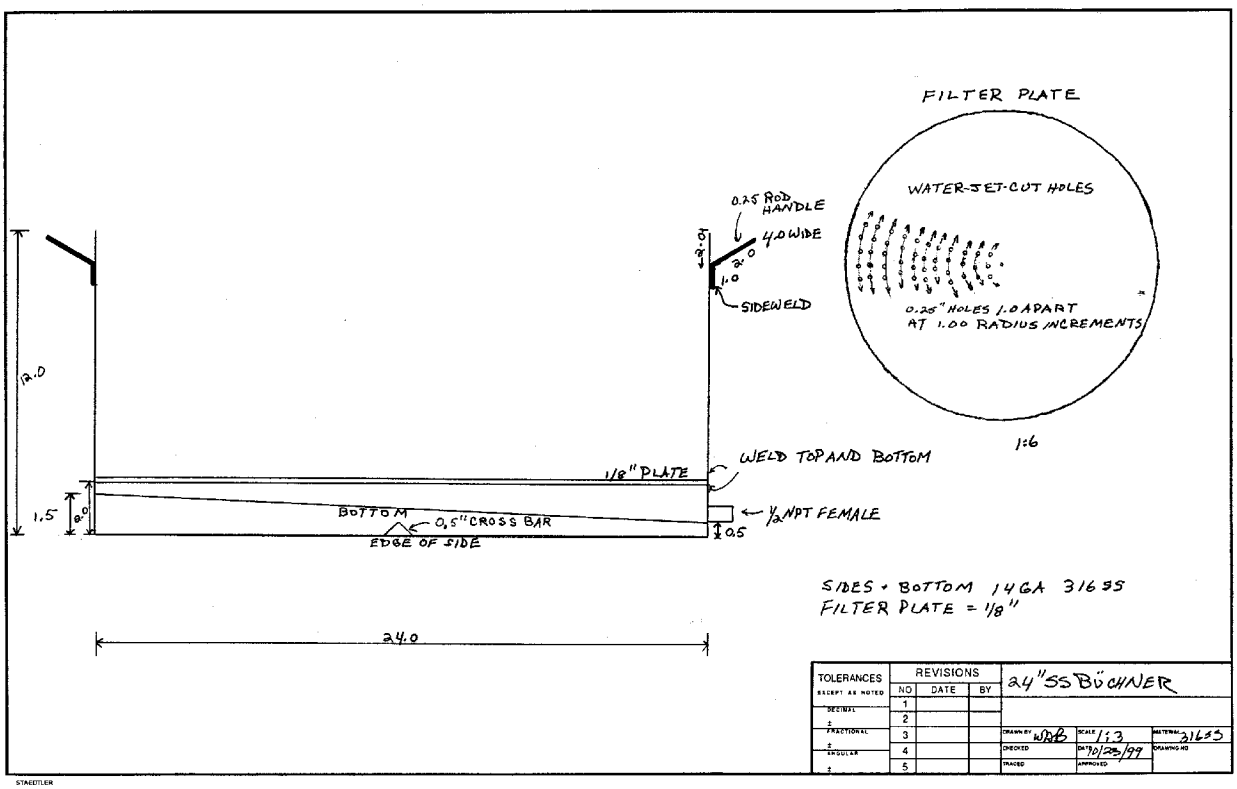
We decided to consider stainless steel funnels. Although stainless steel Büchner funnels are commercially available, they are exorbitantly expensive, and limited in size. Working with a local fabricator, we decided to explore making them ourselves. Our prototype is shown in Drawing 1. The initial design, when reduced to practice, revealed limitations on the materials and methods of construction, as well as functional and esthetic flaws. To save money, the material of the side was 18 gauge 316 stainless steel, while the bottom and filter plate were 14 gauge. The light gauge of the steel caused distortion and burn-through when welded. The filter-plate was intended to be screwed into a welded ring, allowing the plate to be removable. Unfortunately, it was difficult to place the ring for welding, and the ring consumed an additional section of plate, adding to the cost. Although the filter plate was composed of 14 gauge stainless steel, and had provision to be screwed down, drilling the multitude of holes relieved so much strain in the plate that it took on the exaggerated figure of a potatoe chip, and could not be seated well enough for a reliable seal. The welder was new at this kind of fabrication and had put on bail handles which were rather weakly and unaesthetically end-welded.



On the other hand, there were some redeeming features in the prototype. The space below the plate had been reduced to a mere inch, with a sloping bottom that drained toward an NPT outlet. This eliminated liquid hold-up. The 12" high sides were adequate for both an 18" and a 24" funnel. We learned that the stress resulting from drilling out the holes of the filter plate is very dependent on how the holes are made, and turned to an alternative method.



The new design (Drawing 2) uses 14 gauge SS for the sides and bottom. This made welding much easier, and gave a cleaner result. The handles (1/4" rod) were given a 1" parallel section, so that it could be side-welded to the funnel, much like on a tub. We did away with the support ring, and welded a 1/8" thick plate directly to the sides 1" off the bottom. We had about half the holes pre-cut by a local water-jet fabricator, then finished the rest of the holes with a large drill press after the plate was welded in place. The pre-cutting of the holes was so successful, that for future funnels, we will have all the holes pre-cut. The sealed edge on the funnel meant that we could use a flat sheet of filter paper, instead of a cup arrangement. (Removable plates invariably have leakage of material at the edge.) We kept the slanted bottom, but added a cross-bar. This was so that the funnel could be supported conveniently on boxes, etc, and still maintain a level position. The new design is heavy (about 40 lb), but is extremely durable. Due to the use we are currently putting these to, they have not been given a polished finish, but this is always an option. Contrary to dire predictions about difficulties in cleaning, we have not had any problems thus far.



Per funnel, our fabricator charged us $600, with materials cost being approximately $300. At a mere $900 per unit, this is a bargain, both against the commercial funnels, and the cost of the “throw away” plastic funnels.

