

# ALUMINUM

## Polishing & Buffing

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I understand that most NOMMA projects in architectural aluminum use a grained rather than a mirror finish. Buffed aluminum can have a mirror finish just as brilliant as any brass or stainless steel part as shown in the before and after photos. However, let me remind you that aluminum, like brass, will oxidize if installed outside and left unprotected. One way to protect aluminum is to have it anodized. Clear anodizing will not change the appearance you have achieved through polishing or buffing.

This article is too short to cover every aspect of polishing and buffing. Instead, the focus will be placed on the shapes and types of parts that are the most important to the membership. I will explain your choices for finishing round tubing, square tubing, extruded cap rail, and castings. Using either stationary machines or portable tools, the methods for linear graining of square and round pieces will be explained. The terms used in metal finishing will be defined so that you and I are talking the same language. A specific example of why the original manufacturing method of your part is so critical to both your success and your pocketbook will be profiled. The stationary abrasive belt machines referred to in this article can produce either the grained (#3 or #4) or mirror (#7 or #8) finish by simply changing to a different attachment, speed, and/or the appropriate abrasive.



### Polishing & Buffing 101

Following is the definition of the words *polishing* and *buffing* as they relate to the metal finishing industry. **Polishing** is the imparting of a grain line into the material being worked. **Buffing** is removing the grain line and leaving a mirror finish. There can be many degrees of a particular finish. For a **precision type** part, the highs and lows of a particular grain line can be measured by a special machine and this known finish duplicated as often as needed. For a **particular look or finish** on a piece of architectural aluminum this close tolerance and precise measurement is not needed and would be too costly to implement. The original manufacturers of the aluminum each use different machinery and processes to produce the finish requirement; therefore, the results will be different. You will get what each factory perceives as the proper finish for that designation. Will all of the possible differences from the original manufacturers and the uncertainty of exactly what your customer may be referring to, you must establish a control part prior to giving any quotation. When a NOMMA member is asked to produce a mirror finish (or any finish) on a part, I recommend that two samples of the chosen finish be produced.

One part remains with the customer and the other is kept by the fabricator. As a job progresses, the customer will always become more critical of the finish being produced because his ability to see small imperfections improves with time and practice. With a control sample of the work to be performed, there can be no disagreement as to the degree of finish originally requested.

**Buffing** can further be broken down into the two distinct terms of cut and color. *Cut buffing* refers to the first buffing step after your last sanding step. In other words, you are cutting out the sanding lines or imperfections with a hard buff and aggressive compound and preparing the part for the final buffing step. *Color buffing* refers to this final step of bringing up the luster on a part or adding the final color to your piece, usually using a softer buff and finer compound. The #3, #4, #7, and #8 architectural finish designations which you may see on a blueprint actually refer to stainless steel, but the metalworking industry uses these numbers when making references to each particular look for all metals.

Because stainless steel is harder than aluminum, you will need to make allowances from the known methods for stainless steel when working with aluminum. The stainless designations are as follows: A #3 finish is generally produced using a 120 – 150 grit sanding belt. A #4 finish is produced using a 180 – 220 grit sanding belt. A #7 finish is a beautiful mirror but with pronounced grain lines, while a #8 finish is generally regarded as a mirror with no grain lines. In the United States, a #8 mirror may still have very light buff lines. A #8 finish from Asia will be 100 percent free of all lines. This Asian #8 is extremely difficult to duplicate or blend to because the final process is different from conventional buffing, thereby leaving no evidence of having been buffed.

### Lab 101

In this segment I will attempt through words and photographs to explain how each of the types of aluminum parts were taken from their initial raw state to one of the four finishes described above. I began the project working on the extruded cap rail, followed by the sand castings, and ended with the 2 inch round tubing.

**CAP RAIL:** If you want a mirror finish, do not sand first! If you are planning to produce a mirror finish on extruded aluminum cap rail, you should purchase the finest quality, defect free, aluminum you can find and have each piece wrapped and boxed so as to arrive to you in pristine condition. If you can make such a purchase, then you can produce your mirror finish in as little as one or two steps. Otherwise, any dings or handling marks must be hand sanded prior to beginning the buffing operation. The aluminum is too soft to mechanical sand without putting in marks that are very difficult to remove. I would hand sand with the structured abrasive A30 (US 400 grit) and follow it with the A16 (US 700 grit). Following any necessary hand sanding, you should use a 6 inch orange mill treat buff [Figure 1]



*Figure 1: A 6 inch orange mill treat buff is used with X67 Tripoli (brown) cut compound.*

or a 5 inch inflatable wheel with a CLEO<sup>®</sup> 3 ½ x 15 ½ BUFF-BELT<sup>®</sup> [Figure #2].



*Figure 2: Shown is a 5 inch inflatable wheel with a CLEO Buff-Belt with X67 Tripoli (brown) cut compound.*

The X67 Tripoli brown compound is recommended and equipment should be run at 3,800 r. p. m. or less with enough horsepower so as not to lose any r. p. m. when heavy pressure is applied. The choice of whether to the orange buff or the buffing belt depends on whether you had to hand sand first or if your extrusion is narrow. By overloading the buffing belt with the X67 compound, you can remove the sanding marks twice as fast as you can using the orange buffs. Also, if your extrusion is narrow, the buffing belt does not slip off the part as easily as a buff – which could damage the extrusion beyond repair. The second and final step uses a 5 inch inflatable wheel and a CLEO wool BUFF-BELT using Y86 mint green color compound. The speed of this second step is crucial to the ultimate finish. The tool selected should be able to run at only 1,000 r. p. m. with a bare minimum of one horsepower. At this slow speed the color buffing of the extrusion will occur with very little, if any, compound transfer. There are many other diameters and widths of inflatable wheels that could be chosen depending on the shape of your extrusion. If you want to produce a linear grain on any cap rail, round tube, square tube, or angle stock with a portable tool, then you would use the same 5 inch inflatable wheel with either a structured abrasive belt or a non-woven nylon belt at 4,000 r. p. m. or less. In most cases , this would be only a one or two step operation. A stroke sander or through-feed wide belt machine could be used for linear graining of flat bar, square tubing, angle, or aluminum sheet goods. These machines will produce a more consistent grain line on wide parts and provide higher production rates than any portable tool.

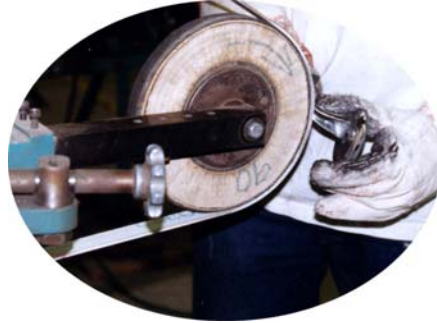
### **Sand Castings v. Investment Castings**

As I stated in the opening paragraph of this article, the original manufacturing method of a part can have a major effect on your ultimate success. No greater a statement could I have made when comparing the standard sand casting to an investment casting, which is much better suited for polishing. I worked at least 10 hours to perfect a method for first polishing and then buffing the sand castings used in this article. I can finish an investment casting of this size to a mirror in one step in less than five minutes, while a sand casting would take an hour or more. There is no doubt in my mind that the up-front cost of an investment casting would be less than the labor and supplies required to finish a sand casting.

Now, I will tell you two methods to achieve the mirror finish on the sand castings if you need to do so. You could use either a stationary belt machine [Figure#3, and #4]



*Figure 3: A pedestal mounted BM2 abrasive belt machine.*



*Figure 4: The BM2 Abrasive Machine is used to finish a handrail bracket with the help of a Buff-Belt.*

or a portable tool [Figure #5, #6, and #7)



*Figure 5: A portable tool with structured abrasive belt.*



*Figure 6: Hard-to-reach areas can be accessed with a portable die grinder using an alligator mandrel.*



*Figure 7: Final touches are applied with a portable die grinder and mechanical locking CLEO® buffing discs.*

depending on whether the casting was already installed or could be hand held. Both processes include the use of structured abrasives (A30 or coarser) followed by CLEO buffing material in either belt, disc, flap wheel, or sheet form with X67 brown Tripoli cut compound. The final color was obtained using the CLEO wool material in both mechanical locking disc form and material mounted in an alligator mandrel using Y86 coloring compound.

**Round Tubing:** The 2 inch round tubing shown both as raw and a #3 finish [Figure #8]



*Figure 8: The left side of this 2 inch tubing is raw, while the right features a #3 finish.*

was processed on the stationary abrasive belt centerless. The 7 ½ h. p. full float centerless is capable of processing parts from ¼ inch to 12 inches in diameter and up to 25 feet. The tube must be supported and can not exceed a weight of 300 pounds. Some tapered, irregular, out-of-round, and thin walled parts can be processed on this same machine. Reasonably good aluminum material can be finished to a #3 specification in only one pass using a brown non-woven belt in ACRS grade at a rate of 5 to 7 feet a minute. A poorer grade of material might require using an 80-120 grit belt as a first step. The same material could be taken to a #4 finish using a maroon

non-woven nylon A-MED belt in place of the brown ACRS belt. In order to produce a good #7 and approaching a #8 [Figure#9],



*Figure 9: An abrasive centerless machine brings this aluminum tubing to a #7 - #8 mirror finish.*

the raw material must be in the best possible condition, the same as the extruded cap rail. If your material is in pristine condition, you can achieve a near mirror finish on the centerless using only the CLEO buffing belt with X67 brown cut compound for the first few passes and a small amount of Y86 mint green color compound applied to the same CLEO belt for one or two more passes. The more passes you make the better the finish becomes. The centerless machine uses a 3 x 132 abrasive belt and can be reconfigured as a space saver [Figure #10]



*Figure 10: A 2 h.p. "space saver" abrasive belt machine.*

or other variations in only a matter of minutes.

Even though this article is concerned only with aluminum, the stationary abrasive belt equipment shown is currently being used worldwide on all materials, including but not limited to brass, stainless steel, titanium, cold roll steel, silver, pewter, acrylic, solid surfaces, wood, epoxy coatings, and exotic substances. This versatility adds to the equipment's cost effectiveness. The Stephen Bader Co., Inc. of Valley Falls, N.Y., is the manufacturer of this stationary equipment and is sponsoring the Grinding, Polishing & Buffing demonstration at METALfab '98. At this time I would like to thank Steve Parks, Marie Demas, and Todd E. Van Poucke of the J. G. Braun Co. for providing the majority of the raw materials used in this article. □

*Joe's technique demo takes place Friday, March 6, from 2:15 to 5:30 p. m..*

*For questions related to this article, call Buff Polish & Grind Industrial Supply Co., Inc. at (940) 455-2269. Fax: (940) 455-7385.*