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TECHNICAL DATA

B/Ox™ 311 B/Ox™ 312
B/Ox™ 313 B/Ox™ 314

Room Temperature Oxidizing/Antiquing Solutions for Brass, Bronze, Copper, Silver and Nickel

The 300 series of **B/Ox** products give the metal finisher a wide range of choices for color development in the oxidizing of copper and its alloys. The liquid concentrates are diluted with water and by varying the concentration and length of immersion, a range of colors can be developed. These products meet the standard of the Living Building Challenge Red List: An international sustainable building certification program.

B/Ox 311:
15% to 20% by volume solutions produce black to blackish-brown US 10B finishes on copper and brass with immersions of 1 to 3 minutes. Diluted 5% to 10% by volume solutions produce lighter Flemish and statuary bronzes with 1 to 3 minutes of immersion. Desirable underlying red tones revealed upon highlighting the brown tones.

B/Ox 312:
20% by volume solutions produce more pronounced brown to chocolate brown colors on copper and brass than **311**, with a richer reddish tone when highlighted. 1-to-3-minute immersions. Diluted 5% to 10% by volume solutions produce very light brown tones.

B/Ox 313:
Used at the same dilution as **311** and **312** with copper and brass, but the highlighted finishes do not exhibit any underlying red tones. Also used to blacken Silver and Nickel.

B/Ox 314:
Similar in action to **312** but slower acting while producing warmer and richer brown tones of varying intensity to include deep walnut browns on brass and bronze.

Some experimentation should be done with properly prepared sample parts using various dilution and immersion times prior to charging a production tank. Once the optimum conditions are determined they can be consistently reproduced in production.

The natural color of the alloy and the mechanical finish on the surface will affect the final color of highlighted or burnished finishes. The ultimate color will also be enhanced when top coated with a lacquer or wax, and therefore, the topcoat should be applied prior to judging the color or before comparing with antiqued finishes.

The easy to relieve **B/Ox** finishes increase productivity by reducing the time required for buffing or burnishing and the consumption of buffing wheels, compounds and burnishing media is reduced.

EQUIPMENT REQUIRED

Acid resistant tanks, tumbling barrels, baskets, hooks, and racks must be used with the **B/Ox** and **E-Pik** solutions. Plastic, plastic lined, rubber lined, glass or stainless steel are suitable. Mild steel may be used for the cleaning, rinsing and sealant tanks. A mild steel immersion heater is required for the **E-Kleen** tanks. A filtration system may be required with the **B/Ox** solution. In some infrequent installations an ion exchange system may be required for the rinse water after the **B/Ox** solution to remove heavy metals.

FINISHING PROCEDURE

1. Surfaces must be free of oxides and residual plating solutions.
   a.) Plated surfaces should be thoroughly rinsed with cold water followed by another short rinse in a room temperature 5% Sulfuric Acid solution or **EPi's E-Pik 215** acid salts (1/4 oz. to 2 oz./gallon water) to neutralize residual alkaline plating solutions.
   b.) Wrought alloys and sheet stock can be mechanically cleaned and deoxidized by burnishing, belt sanding, glass bead, or sand blasting. Chemical cleaning and deoxidizing can be accomplished with **EPi's E-Kleen 153** soak/electro cleaner, followed by **E-Pik 215**. A cold-water rinse is used following cleaning and deoxidizing to remove residual solutions or blasting dust.
2. **Oxidizing Brass, Bronze, and Copper**
   Immerse pieces, while still wet from the preceding rinse in the **B/Ox** solution for the length of time necessary to produce the desired color. Rotating perforated plastic barrels are recommended for processing small parts. When using dip baskets, the parts should be agitated when immersed in the solution to break air bubbles and to assure solution contact with all surfaces.
3. Rinse thoroughly in bottom fed overflowing cold-water rinse. A stagnant hot water rinse can be used to speed drying, but it should be preceded by a short cold-water rinse to minimize staining. Hot rinses should be maintained at 160º to 180ºF and dumped periodically or overflowed very slowly. A rinse aid may be helpful in eliminating water spots.
4. Force drying in heated spin dryers, ovens or cob meal will minimize streaking and staining. Large architectural panels should be wiped dry or blown dry. Small parts do not require drying if they will be barrel or vibratory burnished immediately after rinsing.
5. "Highlighted" or relieved antique finishes are produced by buffing, scratch brushing, barrel or vibratory burnishing.
6. Sealing the finish with a protective topcoat will enhance the color and impart corrosion and abrasion resistance. A clear acrylic lacquer topcoat such as **E-Tec 520** produces a hard, dry US 10L finish. **E-Tec 501** produces an oily US 10B finish.
7. For a hand applied wax topcoat, we use **RENWAX**.

Blackening Silver Surfaces With B/Ox 313

1. Clean, if necessary with **EPi's E-Kleen 153** or **E-Kleen SR 148-E**. Mechanically engraved surfaces do not have to be cleaned if they are blackened immediately after engraving.
2. Rinse thoroughly with cold water to remove residual cleaning or chemical etching solutions.
3. Dilute one (1) part **B/Ox 313** concentrate with 1 to 3 parts waters to determine by test the shortest immersion time required to produce the desired depth of black. The immersion time is controlled by the amount of water.

4. Rinse with hot or cold water and force dry.
5. A variety of antiqued finishes are produced by buffing, scratch brushing, barrel or vibratory burnishing.
6. Seal and enhance the depth of black with a topcoat of **EPi's E-Tec 520** or **E-Tec 521**.
7. For a hand applied wax topcoat, we use **RENWAX**.

Blackening Nickel Plating With B/Ox 313

1. Freshly plated nickel surfaces should be kept wet with rinse water to prevent the surface from becoming too passive to react with the **B/Ox 313** solution. The reactivity will depend upon the level and type of brighteners used in the nickel plating and it may be necessary to activate the surface with a 2–5-minute immersion in a 25% Hydrochloric Acid solution or an acidic or reverse current nickel activator.
2. Rinse thoroughly with cold water to remove residual activator solution.
3. Dilute one part **B/Ox 313** concentrate with 3-9 parts water and determine by test the shortest immersion time required to produce the desired depth of black. Varying the amount of water will shorten or lengthen the immersion time. Interference colors of varying intensity and color from gold to purple will be developed on the surface prior to the desired black. Immersing parts longer than necessary will cause the black finish to fade.
4. Rinse with hot or cold water and force dry.
5. Apply a topcoat of **E-Tec 520** or **E-Tec 521**.
6. For a hand applied wax topcoat, we use **RENWAX**.

NOTE: EPi's Ultra-Blak 465 may also be used to blacken nickel. The **Ultra-Blak 465** process is operated at temperatures of 160º to 180ºF.

SOLUTION MAINTENANCE

The **B/Ox** solutions are gradually depleted through use, but may be replenished indefinitely with periodic additions of **B/Ox** concentrate. The strength of the solution and the amount of concentrate to be added can be determined by titrating the solution per burette titration control procedure **CP-1** available from **EPi**, or by using a simple dropping bottle method outlined below. The strength of the solution can also be fairly accurately maintained by the immersion time required to produce the desired color. As the time increases, add sufficient concentrate to reduce the time to your established standard. A sample of a freshly prepared bath should always be retained as a control.

The frequency of additions will depend upon the volume of work processed through the solution and the color developed. Producing the darker black and brown colors will consume more than the lighter colors. Coverage will be on the order of 400 sq/ft. per gallon of concentrate added to the bath for blacks, and 800 sq/ft. per gallon for the light browns.

For optimum results, the strength of the solutions should be maintained at 85% of its original strength or greater at all times and frequent small additions are recommended. With automatic lines a bath history should be established while running the first several (15 to 25) racks or barrels, and by titrating the strength after each 5 loads to determine the point at which the solution is depleted approximately 10-15% and replenishment is necessary. Timed metering pumps, triggered by the load, are recommended for replenishing the solution and maintaining a consistent strength.

If the ambient temperature in the plant varies considerably, then electric heaters may be used to maintain a consistent solution temperature of 68º to 80ºF.

The life of the solution and coverage will be increased by continuous circulation and filtration through a 50-micron filter. An alternative with smaller baths is to allow the solid by-products of the reaction to settle to the bottom of the tank and transfer the solution to a plastic holding drum to be retained for recharging the tank after the solids have been removed.

NOTE: For optimum results with brass plated surfaces **EPi's E-Brite B-150** brass plating process is recommended. These plating brightener systems produce uniformly alloyed and colored finishes which will result in more uniformly oxidized and highlighted finishes that greatly reduce reject rates. **EPi's E-Brite 5.0 Cu** alkaline non-cyanide copper plating process is recommended for superior copper finishes.

DROPPING BOTTLE CONTROL PROCEDURE

A sample of a freshly prepared production bath should always be taken as a control solution prior to running any parts through the bath. If a sample was not taken, a laboratory prepared solution at the same concentration may be used as the control solution. Titration of this "new" solution will provide the figure for **D_1**.

1. Transfer a 5 ml sample of the production bath into a 125 ml Erlenmeyer flask.
2. Dilute with water to the 50 ml mark.
3. Add 2 ml 6N (1:1) Hydrochloric Acid to the flask.
4. Add 4 ml of the 15% by weight Potassium Iodide solution.
5. Add 2 ml of Starch solution. The solution will become a dark blue to almost black color.
6. Add the 0.5N Sodium Thiosulfate solution, from the dropping bottle - drop by drop - counting the drops while swirling the flask.
7. The end point is marked by a sudden change in color from dark black to light brown.

Note: Upon standing, the light brown color will turn dark again, but additional Sodium Thiosulfate solution should not be added. The first end point is correct.

8. Calculate the amount of concentrate to be added as follows:

$$\mathbf{C_2} = \frac{D_1 - D_2}{D_1} \quad \mathbf{(C_1)}$$

C_2 = Concentration in gallons to be added to the bath.
D_1 = Number of drops of Sodium Thiosulfate used to titrate the new production bath.
D_2 = Number of drops of Sodium Thiosulfate used to titrate the used production bath.
C_1 = Volume of concentrate in gallons used to make up the original "new" bath.

A test kit for the above procedure is available from **EPi**.

CAUTION

The **B/Ox** solutions are mildly acidic. Avoid contact with eyes, skin, and clothing. Wear eye shields, protective gloves and aprons when preparing solutions and while working with the solutions. Do not mix the **B/Ox** solutions with alkaline materials, cyanide containing materials, or any other chemical substances. The **B/Ox** solutions are toxic if taken internally. Do not work with the **B/Ox** solutions without first reading and understanding the **SAFETY DATA SHEETS** furnished by **EPi**.

PACKAGING

One (1), five (5), and 55-gallon non-returnable containers.

IMPORTANT NOTICE! For Industrial Use Only

The following is made in lieu of all warranties, expressed or implied, including the implied warranties of merchantability and fitness for purpose: seller's and manufacturer's only obligation shall be to replace such quantity of the product as proved to be defective. Before using, user shall determine the suitability of the product for its intended use, and user assumes all risk and liability whatsoever in connection therewith. **Neither seller nor manufacturer shall be liable either in tort or in contract for any loss or damage, direct, incidental or consequential, arising out of the use or the inability to use the product.**

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