



---

## **Rolled Alloys - Chemical Process**

**ASME SB-463, UNS NO8020**

---

### **Carpenter 20Cb-3<sup>®</sup> Stainless Phosphate Coating Equipment**

One of this country's major automotive manufacturing companies selected Carpenter 20Cb-3 stainless steel as the material of construction for 25 phosphate coating line processing drums. Each, 34" diameter by 35" deep, drum was fabricated from   " thick Carpenter 20Cb-3 stainless steel plate. Carpenter 20Cb-3 stainless steel was specified because it is still serving well in another phosphate coating line installed six years earlier.

The complete bill-of-materials for these drums, including the vastly improved welding wire for Carpenter 20Cb-3, RA320LR alloy, was supplied by Rolled Alloys of Temperance, Michigan.

These drums will become part of the phosphate coating line equipment. They will contain the solutions of phosphoric acid (and other chemicals) which react chemically with the surface of the metal being treated. The treated metal surface is actually converted to a somewhat protective, integral layer of insoluble crystalline phosphate.

All phosphate coating baths are acid in nature (pH 5.0 to as low as 1.4) and most also contain oxidizers. Such solutions, operating in the 90 to 210 degrees Fahrenheit range, are corrosive to most metals including stainless steel. In addition, chromic acid, often used as a post treatment passivating rinse, is also corrosive to stainless steels including type 316.

The original drums, constructed of Carpenter 20Cb-3, have proved their usefulness in such service. A less suitable alloy would have likely failed due to pitting and/or

accelerated general corrosion in far less time than the 6 years service life observed to date.

During fabrication, welding was accomplished by the gas-metal-arc welding process (GMAW) using RA320LR MIG wire which was supplied as 0.045" wire on 30 lb. spools. In certain "precision" welds, cuts of the RA320LR wire were used for gas-tungsten-arc welding (GTAW). The relatively new, and vastly improved, RA320LR welding alloy is a matching wire with low residual elements i.e., columbium, phosphorus and silicon. This welding wire allows for trouble free welds, which are far less sensitive to cooling cracks.

RA320LR weld fillers are produced from Carpenter 20Cb-3LR stainless steel and offer significantly improved weldability when welding Carpenter 20Cb-3 stainless steel. It has been said that this high purity (low interstitial element) alloy permits Carpenter 20Cb-3 stainless steel to be welded with the ease of 316L.

The finished drums, along with various fabricated components i.e., shafting, locating pins, nuts, bolts and washers were shipped to the end user with everything being fabricated of the "Real McCoy" Carpenter 20Cb-3 stainless steel.

Carpenter 20Cb-3 stainless steel is uniquely blended with approximately 33% nickel, 20% chromium, 3.3% copper and 2.2% molybdenum. The chromium, in concert with the molybdenum, enhances this alloy's pitting resistance. The copper (unique to Carpenter 20Cb-3 stainless steel as compared to almost all other stainless steels) greatly enhances this alloy's resistance to many acids i.e., chromic, phosphoric, hydrochloric, sulfuric, etc. The combination of higher nickel and molybdenum also imparts useful resistance to chloride stress corrosion cracking or SCC.

Rolled Alloys carries a full inventory of warehouse stock, in the popular forms, of Carpenter 20Cb-3 stainless steel. For the phosphate coating drums application mentioned here, Rolled Alloys supplied all of the required forms in Carpenter 20Cb-3 stainless steel and RA320LR welding wire.

Another example of RA's slogan:

***"Where and When You Need Them."***

This RA320LR welding product is specified as follows:

|                    |            |                 |            |
|--------------------|------------|-----------------|------------|
| Bare Welding Wire: | RA320LR    | <u>AWS A5.9</u> | <u>UNS</u> |
| Covered Electrode: | RA320LR-15 | ER320LR         | NO8022     |
|                    |            | E320LR          | W88022     |

20Cb-3 and 20Cb-3LR are Registered Trademarks of Carpenter Technology Corporation.