

## Special Interest Articles:

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Prices are down (↓)  
and Nickel prices are  
on the rise (↑↑)

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## Heat Treatment & Solution Annealing

The following information is taken from an article written by J.G. Gillissie, for the *National Board Bulletin*.

**Stress Relieving ( post weld heat treating):** As a result of welding processes used to join metals together, the base materials near the weldment, the deposited weld metal and, in particular, the heat affected zones transform through various metallurgical phases. Depending upon the chemistry of the metals in these area, hardening occurs in various degrees, dependent mainly upon carbon content. Again, this is particularly true in the heat affected zone (HAZ) adjacent to the weld metal deposit where the highest stresses due to melting and solidification result. Stress relieving, as the name implies, is designed to relieve a proportion of these imposed Stresses by reducing the hardness and increasing ductility, thus reducing danger of cracking in the vessel weldment.

The Code sections contain requirements for stress relieving, specifying rate of heating and cooling above 800°F and requiring a holding temperature, usually one hour per inch of thickness of the materials. The holding temperatures vary with the P-number of the material which in turn are based on alloy content.

AS an example, P-1 through P-3 require 1100°F holding temperature, P-1 being carbon steels alloyed in relatively small percent with molybdenum, manga-

nese and vanadium. P-4 steels are the nickel steels, chrome-molys and nickel-chrome-molys. Holding temperature is 1200°F. P-5, P-6 and P-7 high alloy steels generally require a higher holding temperature ranging up to 1350°F. ( see Table UCS-56 for P numbers and holding temperatures.)

Following the holding (soaking) time, controlled cooling down to 800°F or lower is vitally important. Many high carbon steels are subject to surface cracking if cooled too rapidly.

PWHT is designed to return a metal as near as possible to its prefabrication state of yield, ultimate tensile and ductility.

### **Solution Heat Treatment ( Solution Annealing -**

While the Code sections state that heat treatment of austenitic stainless steel (P-8) is neither required nor prohibited, this refers to postweld stress relieving. There are certain processes to which this material may be subjected. These are performed almost exclusively by the manufacturers due to the fact that temperature ranges and holding time are critical and require careful controls, otherwise damage to the material can result from either too high or too low a furnace temperature.

Material manufacturers have the metallurgical staffs to determine requirements.

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In solution heat treatment, the material is subjected to a high heat, around 2000°F, and rapidly cooled in liquid in order to achieve an evenly distributed solution of carbon and austenite in the metallurgical structure of the material.

**The employees of Trumbo want to wish you and your family a Happy Thanksgiving Holiday.**



## NON FERROUS SURCHARGE CHART

Prices for Stainless are up (↓) for November deliveries. Nickel Prices are up (↑) in November, and really increase(↑↑) for December Deliveries. If you are considering any Nickel vessels, you might want to order them before the end of the year. Remember, this chart is for surcharge only, it does not include the base price for materials.

Alloy	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2205	0.7523	0.7574	0.7215	0.5632	0.5622	0.6308	0.7588	0.7249	
304 CLAD	0.3534	0.3347	0.3205	0.2666	0.2726	0.3	0.3594	0.3303	
304/304L	0.6016	0.5687	0.5403	0.4325	0.4446	0.4948	0.6136	0.5731	
304H	0.6016	0.5687	0.5403	0.4325	0.4446	0.4948	0.6136	0.5731	
304LN	0.6016	0.5687	0.5403	0.4325	0.4446	0.4948	0.6136	0.5731	
304N	0.6016	0.5687	0.5403	0.4325	0.4446	0.4948	0.6136	0.5731	
309/309S/309H	0.7841	0.7366	0.694	0.5587	0.5767	0.6502	0.8111	0.7581	
310/310S	1.0369	0.964	0.8965	0.7395	0.7681	0.8823	1.0993	1.0237	
316/316L	0.7608	0.739	0.6921	0.5689	0.5777	0.6627	0.7982	0.7485	
316LN	0.7608	0.739	0.6921	0.5689	0.5777	0.6627	0.7982	0.7982	
316Ti	0.7833	0.7597	0.7109	0.5844	0.594	0.6819	0.8226	0.7714	
317/317L	0.8799	0.8639	0.8075	0.661	0.6683	0.7703	0.9246	0.8707	
AL-6XN Plus	1.4162	1.3372	1.4477	1.449	1.3939	1.2735	1.0564	1.1345	1.4131
alloy 20	1.6467	1.4871	1.6107	1.5444	1.4468	1.3372	1.1699	1.2744	1.5584
AL-200 TM	3.1192	2.5648	2.907	2.6976	2.3947	2.1176	1.9971	2.294	3.0329
Al-400 TM	2.3123	1.9708	2.2196	2.0685	1.8568	1.6642	1.6041	1.8355	2.3819
Al-600 Tm	2.6038	2.2021	2.4507	2.2789	2.0593	1.8577	1.6881	1.904	2.4417
Altemp 625 In	4.344	4.0843	4.3166	4.2492	4.1002	3.8758	3.5821	3.7601	4.3039
Alloy 276	3.5832	3.3826	3.6396	3.6576	3.5368	3.261	2.9147	3.0924	3.7369



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