LESSON PLAN

Date_____ Trade:- WELDER

Name_____ Unit/Lesson:- Thirty Four

Subject:- Preheating and post heating weld treatments. Use of temperature indicating crayons.

Motivation :- In previous lesson we study about heat input and heat distribution during welding and also study their effects and controlling methods.

PREPARATION

1) (Materials, Tools, Models, Charts and other aids)

2) INTRODUCTION:- Today we discuss about a very important chapter for a welder. Preheating and post heating are played a doctor role for a job.

Topic	Information Point	Spot Hints
Pre-Heating	Preheating is a heat treatment of job. Before welding to remove internal structure defects , we apply pre heating .Matter have three status. 1. Solid 2. Liquid 3. Gas Preheating process done with solid matter only.	
Why preheating	During welding a large amount of heat generated on job . this unbalance heat change internal structure of metal and metal loss his actual properties. This is a serious defects , we control this fault by preheating.	
Process	Every metals have own structure so we apply different criteria for every metals.	

TOUGHNESS	BRITTLENESS	DUCTILITY	MALLEABILITY	CORROSION RESISTANCE
Copper	White Cast Iron	Gold	Gold	Gold
Nickel	Gray Cast Iron	Silver	Silver	Platinum
Iron	Hardened Steel	Platinum	Aluminum	Silver
Magnesium	Bismuth	Iron	Copper	Mercury
Zinc	Manganese	Nickel	Tin	Copper
Aluminum	Bronzes	Copper	Lead	Lead
Lead	Aluminum	Aluminum	Zinc	Tin
Tin	Brass	Tungsten	Iron	Nickel
Cobalt	Structural Steels	Zinc		Iron
Bismuth	Zinc	Tin		Zinc
	Monel	Lead		Magnesium
	Tin			Aluminum
	Copper			
	Iron			

* Metals/alloys are ranked in descending order of having the property named in the column heading

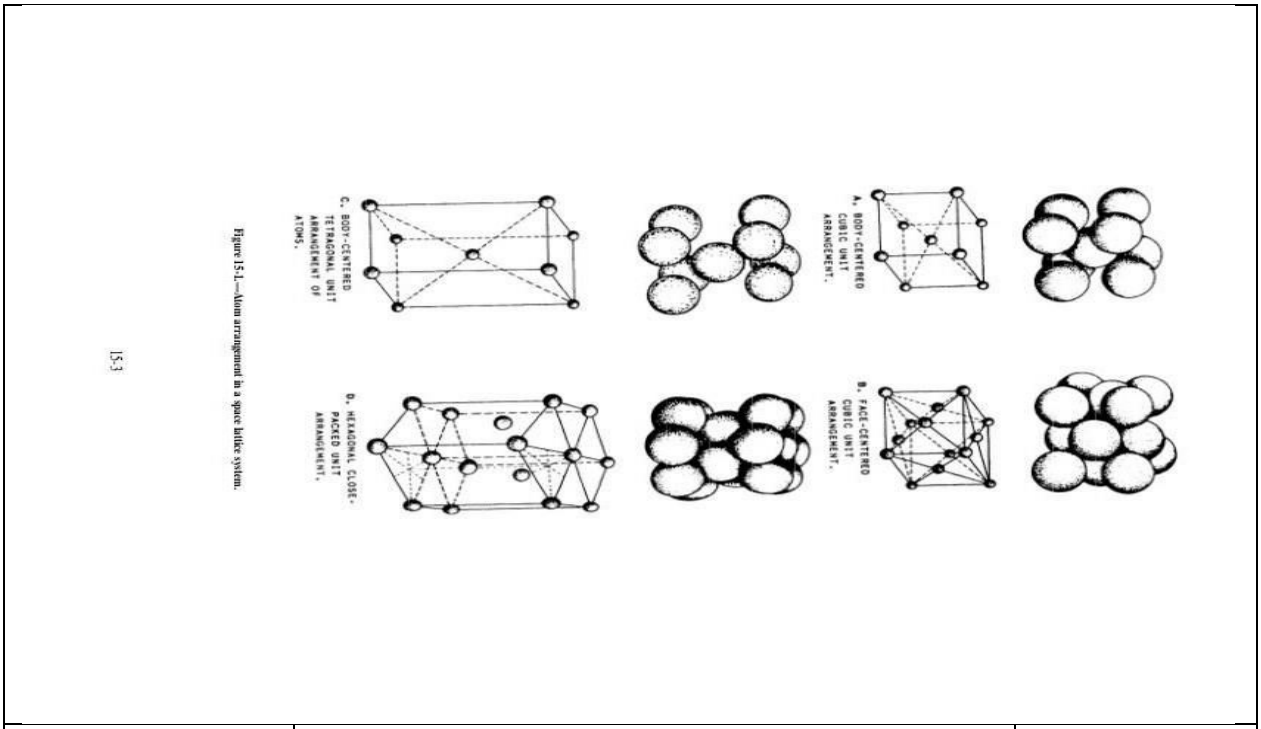


Figure 15-1.—Atom arrangement in a space lattice system.

15-3

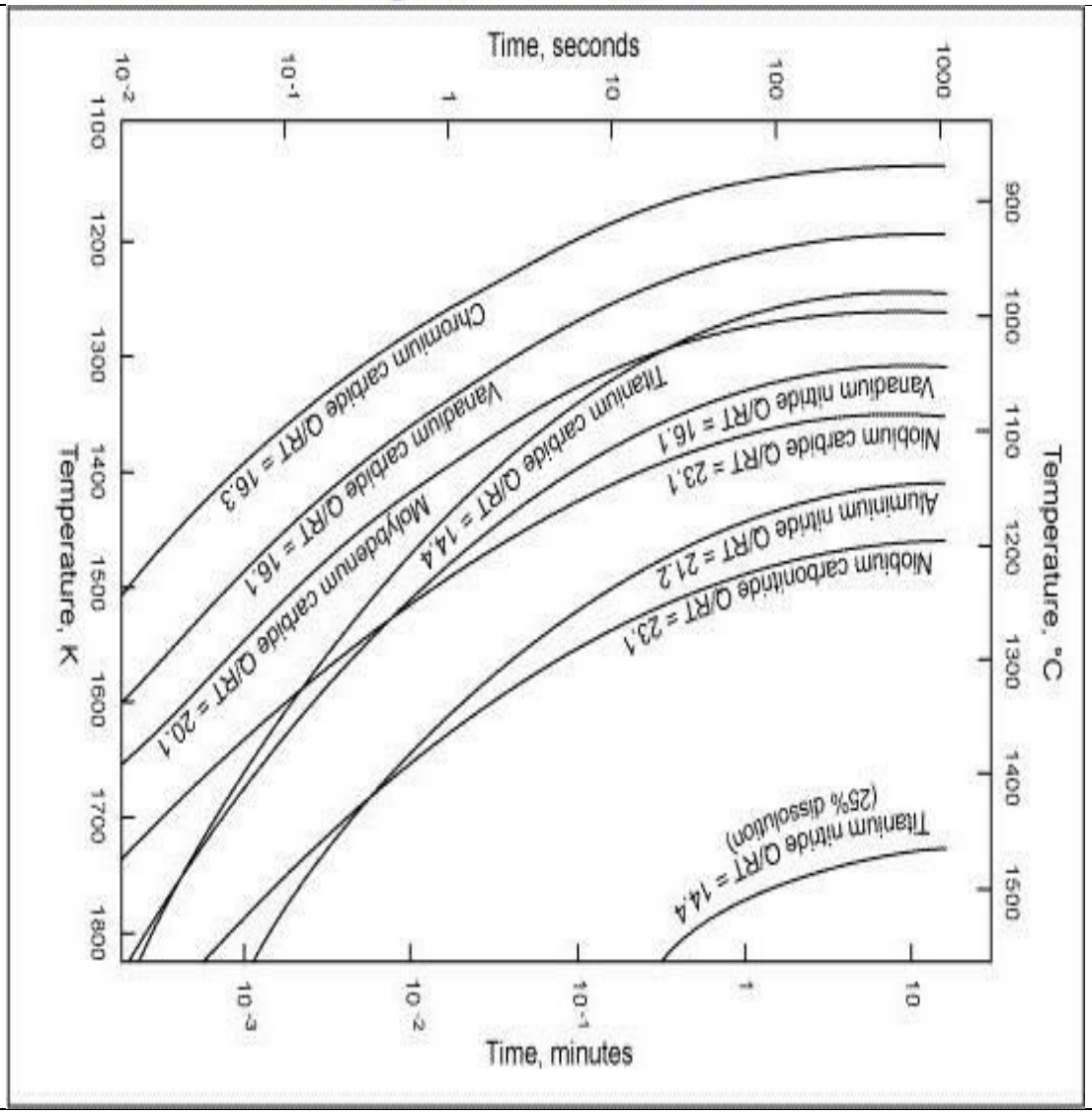
Types of Preheating	1. Full preheating 2. Local preheating 3. Indirect preheating	
Full preheating	Preheat the whole job equal	
Local preheating	Preheat only weld area	
Indirect preheating	Preheat only heat effected area	

INTRODUCTION:- Today we discuss about post heating treatment. After welding job loss internal structure due to unbalance heat ,post heating treatment use for remove /repair such type defects.

Topic	Information Point	Spot Hint
Post-Heating	Postheating is a heat treatment of job. After welding to remove internal structure defects , we apply post heating .Matter have three status. 1. Solid 2. Liquid 3. Gas Postheating process done with solid matter only.	
Why postheating	During welding a large amount of heat generated on job . this unbalance heat change internal structure of metal and metal loss his actual properties. This is a serious defects , we control this fault by postheating.	
Process	Every metals have own structure so we apply different criteria for every metals.	

Why Post Heating?

- Post heating eliminates possible delayed cracking of weld and HAZ
- Applicable to
  - -Thicker hardenable low alloy steels
  - -Restrained hardenable welds of all thickness
- Post heating temperature and duration depends on hardenability of material, thickness & joint restrain



Post heating treatment mostly done by Gas flame but in sime conditions electric furnance require. An expert welder compelete post heating by gas flame while in electric furnance anyone set temprature and post heat the job.

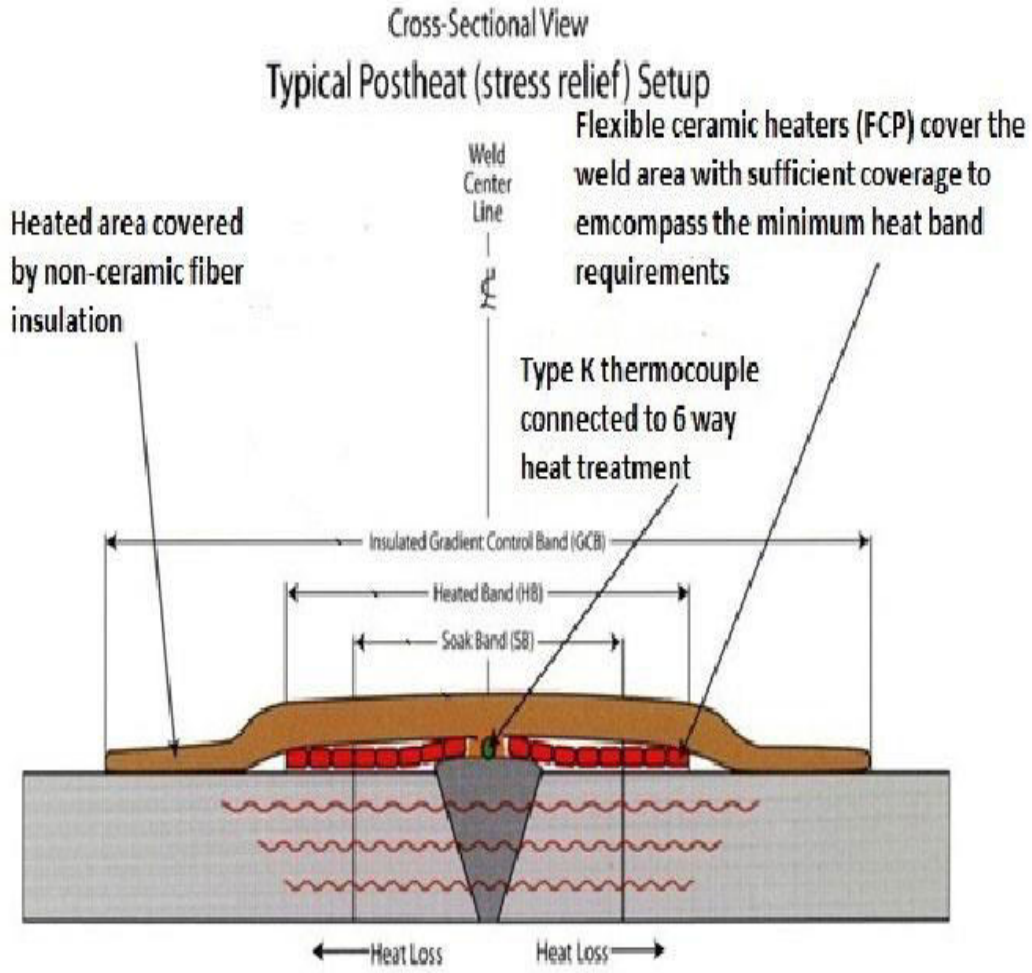
Stress Relief Heat Treatment of Weldments

1. Peening :

In Peening, outer fibres of the weld are elongated with the help of hammer blows. When properly applied Peening reduces residual stresses to a great extent. But Peening reduces internal stresses of a low intensity. Peening also reduces distortion. Peening should not be employed to the first and last layers of weld. Excessive Peening will result in cracking of weld.

2. Vibratory Stress Relief :

In this method, weld structures are subjected to vibrations to relive residual stresses. The weld structure is placed on a platform that vibrates. Up to 25%of residual stresses may be relived by Vibratory Stresses Relief Treatment.



Preheating and Post-Weld Heat Treatment

- With carbon and low-alloy steels, the rapid cooling rate from the welding temperature is similar to quenching in heat treatment operations
- The higher the carbon or alloy content, the more easily martensite is formed and the more brittle the martensite is
- This situation may easily cause cracking as the steel cools down.
- Steels that are susceptible to cracking must be preheated to "cushion" the effects of martensite formation.
- They are also post-weld heat treated to temper (improve the toughness) any martensite that is formed and additionally stress relieve the joint.
- Stress Relieving - Always done below the transformation temperature of the metal to minimize the welds residual stress. The temperature is held for roughly an hour until the residual stresses are minimized, then cooled very slowly to prevent new stresses from setting up in the metal.

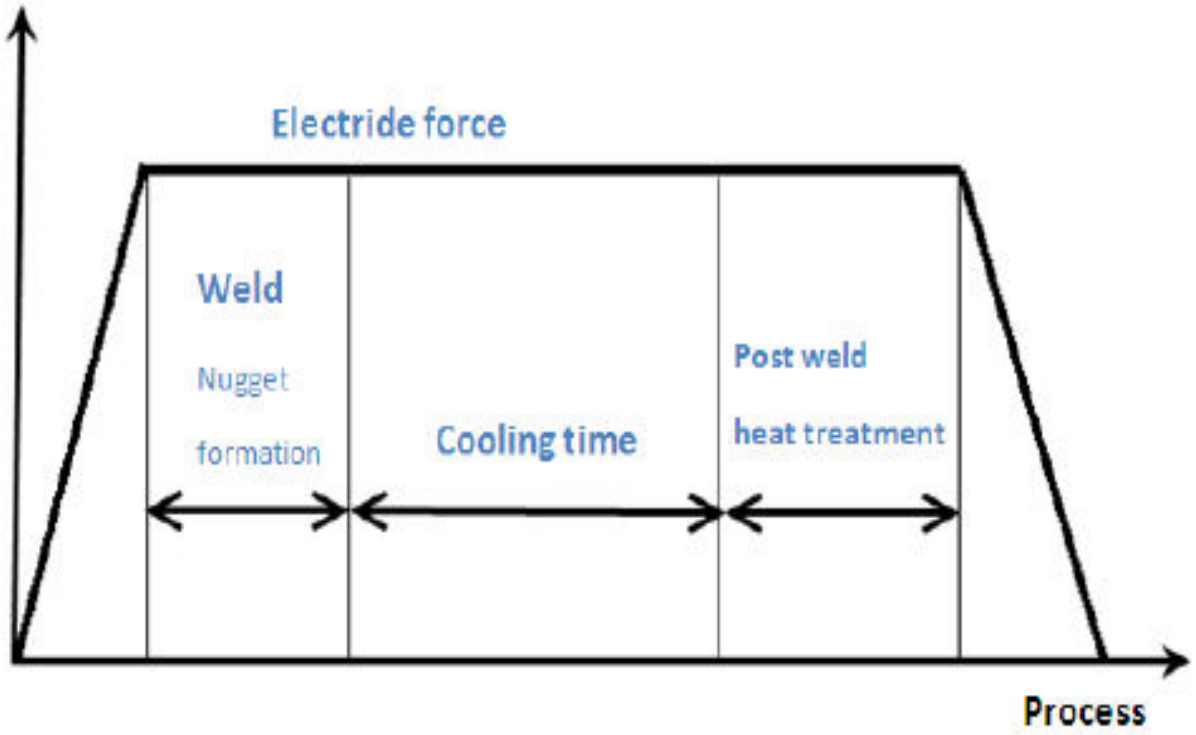
Post Weld Heat Treating (PWHT)

- Forming and joining (welding) can leave residual stresses in the metal
- Post-weld heat treatment is used to relax these stresses
- Guidelines for PWHT are given in the ASME BPV Code Sec. VIII D.1 Part UW-40
- PWHT requirements depend on material and thickness at weld:
  - Over 38mm for carbon steel
  - Over 16mm for low alloy

Heat Treating for Welding Applications continued

- Post weld heat treating:
  - Post weld heat treating reduces distortion and residual stress.
  - Allows for straightening of welded assemblies.
  - Reduces residual stress.
  - Allows for more uniform mechanical properties across the weld, heat affected zone and base metal.
  - Reduces distortion when machining after welding.
  - Reduces potential for post weld cracks.
- Specific information on pre-heat or post weld heating of specific metals and alloys can be found through the Welding Research Council or the American Welding Society.

element Heat Treating 35



Questions:- 1. What is post heating?
2 What is structural defects?
3 What is critical temperature?

Assignment:-

Next lesson:- Submerged arc welding, process, principal, equipments, advantages and limitations.

Checked By_____ Instructor_____