



Welding

Flexible Instruction Day

Assignment #2

Chapter 1: AWS Electrode Classification System

Learning Standard	Standard CC.3.5.9-10.A. Cite specific textual evidence, etc....
Task # & Description	Review the information and complete the activity Follow written instructions to complete work assignments and rules.

CONTACT INFORMATION/ASSISTANCE

Instructor Name: George Petronelis, Jacob Hughes

We will be available by email 7:40-12, and 12:30-3:10 to answer your questions. Please reach out if you are having difficulty completing your assignments.

Mr. Petronelis: petronelisg@butlertec.us 724-282-0735 Ext. 233

Mr. Hughes: hughesj@butlertec.us 724-282-0735 Ext. 224

INSTRUCTIONS

- All work is due on the day we return to school. This is counted towards your attendance **and** as a classroom assignment.
- Read the information
- Complete the attached assignment

Name: _____

Session: _____

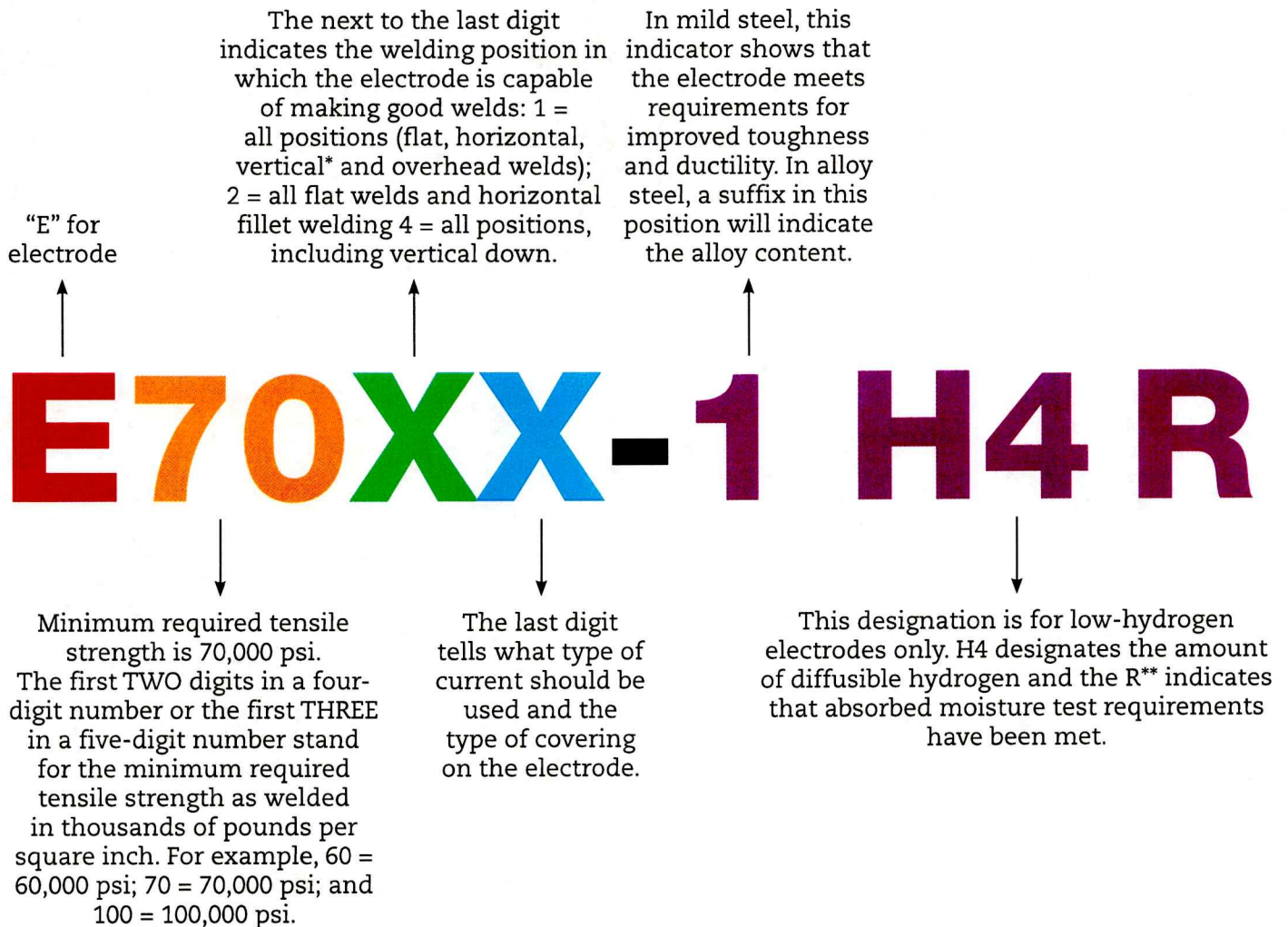
_____/____ points

AWS Electrode Classification System



Name: _____ Date: _____

Directions: Review this information as directed by your instructor. Keep this handout for future reference.



More designators can be added to the numbering system to show any extra testing the electrode manufacturer has done.

*The AWS specifies that "V" denotes a vertical-up weld, while "V-down" denotes a vertical down weld.

**The presence of "R" means the electrodes may safely remain open for up to nine hours; no "R", for four hours.

Electrode Classification System Review Exercise



Name: _____ Date: _____

Directions: Explain what the indicated section of the electrode classification signifies in the space beneath each.

E7018-1 H4 R

E7018-1 H4 R

E7018-1 H4 R

E7018-1 H4 R

E7018-1 H4 R

E7018-1 **H4** R

E7018-1 **H4** R

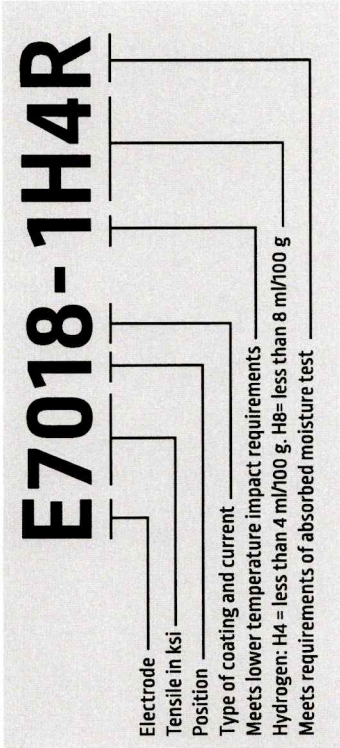
Electrode Classifications



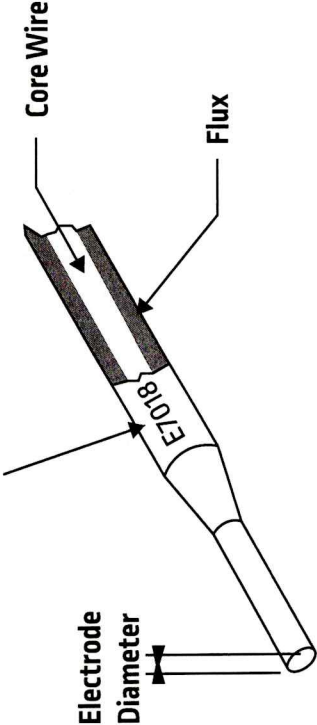
Name: _____ Date: _____

Directions: Review this information as directed by your instructor. Keep this handout for future reference.

How AWS Classifies Electrodes



AWS Classification Number



Electrode Characteristics						
ELECTRODE	COATING	POSITION	POLARITY	PENETRATION	TENSILE STRENGTH	
E-6010	High Cellulose Sodium	All Positions	DC+	Deep	60,000 PSI	
E-6011	High Cellulose Potassium	All Positions	DC+ AC	Deep	60,000 PSI	
E-6013	High Titania Potassium	All Positions	DC+ DC- AC	Shallow	60,000 PSI	
E-7018	Iron Powder Low Hydrogen	All Positions	DC+ AC	Shallow to Medium	70,000 PSI	
E-7024	Iron Powder Low Hydrogen	Flat Horizontal Fillets	DC- AC	Shallow to Medium	70,000 PSI	

SMAW Electrode Characteristics



Name: _____ Date: _____

Directions: Read the information below. Keep this handout for future reference.

A stick electrode is a coated metal rod that completes the circuit between the welding machine and the base metal in the SMAW process. Lincoln Electric's stick electrodes are classified as fast freeze, fast fill or fill freeze. Some are classified as mild steel, low hydrogen electrodes.

Fast-Freeze Electrodes

Description: Considered the "all purpose" electrode. The weld puddle solidifies quickly, allowing the welder to use a whipping technique. Deep penetration and maximum admixture can be achieved with these electrodes.

AWS* Class	Lincoln Electric Brand Name	Electrode Polarity	Sizes and Current Ranges (Amps)			Typical Use
			3/32 in. Size	1/8 in. Size	5/32 in. Size	
E6010	Fleetweld® 5P+	DC(+)	50-85	75-135	100-175	General purpose DC welding, critical out-of-position welding and pipe welding.
E6011	Fleetweld® 35	AC	50-85	75-120	90-160	General purpose AC welding, vertical down welding and tack welding; not generally used for X-ray quality welding.
		DC(+)	40-75	70-110	80-145	

Fast-Fill Electrodes

Description: Capable of high deposition rates due to the flux containing 50% iron powder. Weld metal solidifies slowly, not allowing for out-of-position welding. Shallow penetration with minimum admixture can be expected.

AWS Class	Lincoln Electric Brand Name	Electrode Polarity	Sizes and Current Ranges (Amps)		Typical Use
			1/8 in. Size	5/32 in. Size	
E7024	Jetweld® 1	AC	115-175	180-240	General purpose fast-fill electrode used in the flat and horizontal position.
		DC(±)	100-160	160-215	

Fill-Freeze Electrodes

Description: Capable of medium penetration and deposition rates. These electrodes are well suited for sheet metal applications and can weld in all positions.

AWS Class	Lincoln Electric Brand Name	Electrode Polarity	Sizes and Current Ranges (Amps)			Typical Use
			3/32 in. Size	1/8 in. Size	5/32 in. Size	
E6013	Fleetweld® 37	AC	75-115	110-140	160-200	Sheet metal electrode with excellent bead appearance. Typically used with small AC welders.
		DC(±)	70-105	100-135	145-180	

Mild Steel, Low Hydrogen Electrodes

Description: These electrodes produce X-ray quality welds and are suitable for steels that have a tendency to crack. Due to their ability to draw moisture, these electrodes should be stored in a 250° F oven.

AWS Class	Lincoln Electric Brand Name	Electrode Polarity*	Sizes and Current Ranges (Amps)			Typical Use
			3/32 in. Size	1/8 in. Size	5/32 in. Size	
E7018-H4R	Excalibur® 7018	DC(+)	70-110	90-160	130-210	Suitable for all position welding except vertical down. DCEP for most applications.
		AC	80-120	100-160	140-210	

*Preferred polarity listed first.

SMAW Electrodes Assessment



Name: _____ Date: _____

Directions: Choose the letter of the best answer.

1. SMAW electrodes can be used on any polarity the welder selects.
A. True B. False
2. The AWS electrode classification system does not identify which welding positions the electrode can be used in.
A. True B. False
3. Fast-freeze electrodes provide a deep penetration.
A. True B. False
4. When selecting an electrode for welding, the tensile strength of the electrode should be equal to or exceed the base metal tensile strength.
A. True B. False
5. Once low-hydrogen electrode containers are opened, the electrodes must be stored in a rod oven at 650°F.
A. True B. False
6. If the flux on a low-hydrogen electrode has absorbed excessive moisture, the electrode can be re-dried in a rod oven.
A. True B. False
7. Fill-freeze electrodes provide some characteristics of both fast-freeze and fast-fill electrodes.
A. True B. False
8. Rutile based fluxes on electrodes provide a deep penetrating arc.
A. True B. False
9. In addition to being used with critical welds on mild carbon steels, low-hydrogen electrodes can be used on low-alloy steels.
A. True B. False

Multiple Choice

Directions: Choose the letter of the best answer.

10. The organization that regulates the industrial standards for welding in the United States is the _____.
A. Society of American Welding B. American Welding Society
C. Welding American Society D. Arc Weld Society

11. What amount of penetration will a fill-freeze electrode have compared to a fast-freeze electrode?
- A. Low
 - B. Medium
 - C. Complete
 - D. Deep
12. When welding in the vertical or overhead position using a fast-freeze electrode, the electrode will provide which of the following advantages?
- A. Weld pool control
 - B. Solidifies rapidly
 - C. Deep penetration
 - D. All of these
13. An electrode that is considered best for a "fast-follow" joint design is also referred to as a ____ electrode.
- A. Fast-freeze
 - B. Fast-fill
 - C. Fill-freeze
 - D. Low-hydrogen
14. When X-ray quality welds are required for overhead welding of plate, which of the following electrodes is the best choice?
- A. E6010
 - B. E6013
 - C. E7024
 - D. All of these
15. A vertical groove weld cannot be welded with which of the following electrodes?
- A. E6011
 - B. E6013
 - C. E7018
 - D. E7024
16. Of the following groups of electrodes, which group is best suited for welding unclean surfaces?
- A. Low-hydrogen
 - B. Fast-freeze
 - C. Fast-fill
 - D. Fill-freeze
17. Which welding position(s) can fill-freeze electrodes be used in?
- A. Flat only
 - B. Flat welds and horizontal fillet welds only
 - C. Flat and vertical down only
 - D. All welding positions
18. Cellulose coverings on SMAW electrodes provide which of the following characteristics?
- A. Deep penetrating effect
 - B. Increased arc temperature
 - C. Higher hydrogen content
 - D. All of these
19. The purpose(s) of flux on an electrode is/are ____.
- A. Provide cleansing and deoxidizing
 - B. Produce carbon dioxide to keep the atmosphere out of the weld pool
 - C. Stabilize the arc and reduce spatter
 - D. All of these

E10018-D2 H4 R

20. The E in the electrode classification shown identifies ____.
- A. Tensile strength
 - B. Electrode
 - C. Weld position
 - D. Polarity
21. The 100 in the electrode classification shown designates ____.
- A. Tensile strength
 - B. Electrode
 - C. Weld position
 - D. Flux covering and polarity
22. The fourth digit in the E10018 electrode classification shown designates ____.
- A. Tensile strength
 - B. Electrode
 - C. Weld position
 - D. Flux covering and polarity
23. The 8 in the E10018 electrode classification shown designates ____.
- A. Tensile strength
 - B. Electrode
 - C. Weld position
 - D. Flux covering and polarity

E XXX X X - XX H4 R

24. The H4 in the electrode classification shown designates the electrode ____.
- A. Meets absorbed moisture requirements
 - B. Diffusible hydrogen per 100 grams
 - C. Flux covering and polarity
 - D. Undiluted weld metal composition
25. The R in the electrode classification shown designates the electrode ____.
- A. Meets absorbed moisture requirements
 - B. Diffusible hydrogen per 100 grams
 - C. Flux covering and polarity
 - D. Undiluted weld metal composition