Six commonly used types of electrodes in welding

Six Commonly Used Types of Electrodes in Welding Thesis: In welding, the six commonly used types of electrodes are E6010, E6011, E6012, E6013, E7014 and E6015. Outline: 1. Introduction 2. 1. Background 2. 2. Thesis 2. Six Commonly Used Types of Electrodes 3. 3. Background of Welding 3. 4. Background of Electrode 3. 5. Six Types of Commonly Used Electrodes 3. 6. 1. E6010 3. 6. 2. E6011 3. 6. 3. E6012 3. 6. 4. E6013 3. 6. 5. E6015 3. 6. 6. E7014 3. Conclusion Background of Welding According to Cary (1998), the origin of welding can be traced to the Bronze Age more than 2000 years ago, wherein; tiny circular gold boxes were formed by pressure welding the lap joints together. Ancient sealed Egyptian tombs also reveal depictions of welders and tools. Much later, Sir Humphry Davy's production of an arc between the two carbon electrodes in early 1800s, along with Edmund Davy's discovery of acetylene in 1836, spearheaded the era of modern welding techniques. Till the 19th century, welding was mostly confined to the blacksmith's shop, where he would unite the metal pieces by a method called forge welding. It involved heating of the two metal pieces and then hammering away until the union took place. This time-consuming and tedious process was replaced by other quicker techniques, which were made possible due to the introduction of electricity into industrial processes. Nowadays, there are various methods that are followed after the advent of electricity. Now different sources of energy are used for welding purposes like gas flame, electric current, laser, electronic beam, friction and ultra sound. Some of them are Arc welding, Gas welding and Resistance welding. In addition, as defined by () Welding means the process of joining metals by causing melt due to heat. It happens by melting the workpiece with weld pool. The joint gets stronger when it cools down. It’s heats when the weld

pool is used with the workpiece & produces weld in that time. In all fabrication companies welding is very essential. Since welding has been used in steel fabrication its uses has expanded in other industrial sectors like construction, mechanical and car manufacturing etc. Figure 1: Welding Background of Electrode According to Cary (1998), an electrode comes from the Greek word elektron which means amber. The word electrode was composed by an English scientist Michael Faraday who contributed significantly to the study of electromagnetism and electrochemistry. In addition, Pierre (1974) says that an electrode is used to conduct current through a workpiece to combine two pieces together. Depending upon process, the electrode is either consumable which uses the gas metal arc welding and shielded metal arc welding, or non-consumable which the TIG welding is used. Faraday (1834) also stresses that an electrode is an electrochemical cell and it has two common types which are typically found in batteries. The anode, is an electrode through which electric current flows out of polarized electrical device and the cathode, is an electrode which electric current flows into a polarized electric device. Figure 2: The Electrodes E6010 Welding Electrode Sacks (1960) says that E6010 welding electrodes is one of the most commonly used electrode it is used for welding root passes in pipe and even for the fill passes on pipelines. It is one of the American Welding Society (AWM) classifications. The letter E on E6010 stands for electrode the next two numbers on it means 60000 pound per square inch (psi) tensile strength. And the number 1 means that E6010 can be weld in all position, vertical, horizontal, over hand and flat position. Weld penetration of an electrode defend on the type of current used. For instance as Bruce Bauerlein explained, E6010 electrode uses Direct Current Reverse

Polarity (DCRP) type of current and for this type of current the weld penetration is deep. E6010 has cellulose sodium coating and is used for more critical applications such as ship, barge, and storage tank fabrication. It should be kept in sealed containers at room temperature in a cool dry place as Horwitz (1979) stated. E6010 electrode has four operating characteristics as Sacks (1960) stated. First, E6010 it is a deep penetrating arc that reach the root of the fillet and other joints that a welder can used when welding a dirty metal, something with a lot of scale, rust, etc. Second, is a quick solidifying electrode that makes the melt metal to solid again fatly. Third, E6010 has friable slag that is easy to remove the waste metal that is left over while welding and which may not seem to completely cover the deposit. Lastly, it has an adequate gaseous atmosphere that developed around the arc that protects the molten metal while welding that is produced by its cellulose coating. Figure 3: The E6010 Electrodes E6011 Welding Electrode According to Horwitz (1979) E6011 welding electrode is almost the same as E6010 welding electrode. This electrode is also one of the AMW classifications. The letter E on E6011 is also stands for electrode, 60 for 60000 psi tensile strength. It can be also be used on any welding position, vertical, horizontal, over head and flat position. E6011 electrode and E6010 electrode differ on current they used. E6020 use DCRP while E6011 use Direct Current Straight Polarity (DCSP) this mean that E6011 electrodes can be used either DC or AC but it is advisable to use the AC for it eliminates the blow of an arc. And for this type of current, its weld penetration would be faster melt off and deposit rate. The same as E6010, E6011 electrode should also be placed in sealed containers in a cool dry place. Operating characteristics of an E6011 is just the same as E6010. E6010 has deeply

penetrating arc, quick solidified electrode, friable slag, an adequate gaseous atmosphere. Even though that this electrode is almost the same as E6010 electrode it’s still have not reached the high performance level of E6010. Figure 4: The E6011 Electrodes E6012 Welding Electrode Althouse (1970) says that the E6012 electrode is one of the most commonly use type of electrode in welding which is suitable for all sorts of joining, repairing and fabrication of structural works in mild steel. The letter E of E6012 stands for electrode; the initial two numbers signify the minimum tensile strength which is determined in pounds per square inch (psi). The number 60 in an E6012 electrode create a weld bead with minimum tensile strength of 60, 000 psi. The third number 1 indicates the electrode can be used in every position. The fourth number denotes the coating type and welding current. This electrode contains a Titania or rutile process covering (E-XXX2) which means use for flat and horizontal position. E6012 electrode a type of electrode that have a small amount of iron powder in the coating to become better characteristics which is establish in E6012 electrode as accomplish by Horwitz (1979). Figure 5: The E6012 Electrodes E6013 Welding Electrode Althouse (1970) believes that the E6013 electrode is also one of the most commonly used type of electrode in welding which can be used in all position with AC or DC current. The letter E of E6013 stands for arc welding electrode. The 60 is equals to 60, 000 lbs tensile strength, 1 equals all position, 13 states basic coating type and denotes AC plus DC useage. E6013 electrode is commonly used for automobile bodies and is used for sheet metal work. This electrode the arc well easily maintain through the process covering (E-XXX3) which is use for flat welding position. Figure 6: The E6013 Electrodes E6015 Welding Electrode As defined by Pollack (1987), an E6015 rod has a low

hydrogen coating and a minimum tensile strength of 60, 000 psi (pounds per Inch). It use a direct current reverse and can be applied in all rod position for flat, vertical, overhead, or horizontal positions. In addition, E6015 rod, as emphasized by Sacks (1960), is a type of low-hydrogen electrode that uses a direct current and reverses polarity only. It is because of its core wire which is a mild steel type or low alloy that requires a positive polarity or the reverse polarity. This rod matches in all rod position and is made up of 0. 08% carbon, 0. 56% manganese and 0. 25% silicon. Moreover, there are 4important characteristic of an E6015. First, it’s higher mechanical properties. Second, its ability to fit the heat-treating properties of alloy steels. Third, it’s coating ingredients that don’t contain minerals and hydrogen. And lastly, the absence of hydrogen that causes under-bead cracking in high carbon and alloy steels. Figure 7: The E6015 Electrodes E7014 Welding Electrode Based on Horwitz (1979), E7014 electrode has a thicker coating than E6012 and 6013 types. It is because of the moderate amount of iron powder it contains which is 30% of its coating weight. Its existing iron powder allows higher current that indicates higher deposition rates and welding speed. It is because iron powder needs high amount of current therefore welding speed and rate must be equal to the current to avoid melting of material. Although it’s welding capability maked this rod perfect in welding variable shaped products, it has its disadvantages like its thicker coating which is not qualified for thin-gage material. Moreovere, as added by the Welding Material Sales Inc. (2012), E7014 provides 4 good characteristic in welding. First, it’s smooth arc feature. Second, good arc stability. Third, has a low spatter and it creates medium to low penetration. And lastly, it’s superior assistance in removing slag and shows beautiful bead

appearance in working a material in welding which makes it an essential equipment in welding jobs that requires high deposition and speed of travel. Figure 8: The E7014 Electrodes Six Commonly Used Types of Electrodes in Welding Thesis: In welding, the six commonly used types of electrodes are E6010, E6011, E6012, E6013, E7014 and E6015. Outline: 1Introduction 1. 1. Background 1. 2. Thesis 2 Six Commonly Used Types of Electrodes 2. 1. Background of Welding Sarucam 2. 2. Background of Electrode 3. 3 . Six Types of Commonly Used Electrodes 2. 3. 1. E6010 Putis 2. 3. 2. E6011 2. 3. 3. E6012 Edpalina 2. 3. 4. E6013 2. 3. 5. E6015 Sontosidad 2. 3. 6. E7014 3. Conclusion Bibliography Althouse, A. D., Bowditch, W. A. & Turnquist, C. H. (1970). Modern Welding. USA: The Goodheart — Willcox Co., Inc. pp. 3-6. Horwitz, H. (1979). Welding: Principles and Practice. USA: Houghton Mifflin Company. pp. 54-57. Pierre, E. (1974). Welding Process and Power Sources. USA: Power Publications Company. pp. 39-40. Pollack, H. (1987). Manufacturing and Machine Tool Operations. New Jersey: Practice-Hall, Inc. pp. 68-69. Sacks, R. (1960). Theory and Practice of Arc Welding. NP: NPC. Pp. 56-58. William, D. P. The Welding Material Sales. http://www. weldingmaterialsales. com. NP. 28, January, 2013.