STAINLESS STEEL MINI ENCYCLOPEDIA

AUSTENITIC: - Refers to 300 series stainless, the most popular of stainless alloys accounting for 85-90% of stainless fasteners sold. Named for Sir Robert Williams Austen, an English metallurgist, austenitic steel is a crystal structure formed by heating steel, chromium, and nickel to a high temperature where it forms the characteristics of 300 series stainless steel. An AUSTENITE is a molecular structure where 8 atoms of iron surround one atom of carbon, thus limiting the corrosive effects of the carbon. Austenitic fasteners give high level of corrosion resistance in the stainless family, cannot be hardened by heat treatment, and are almost always non magnetic. Sometimes heat and friction in cold forming can cause austenitic stainless to take slight magnetism, but the corrosion resistant properties remains the same. Most commonly used grade is termed as 304. Typical industries using these fasteners include: food, dairy, wine, chemical, pulp and paper, pharmaceutical, boating, swimming pool, pollution control, electronic, medical and hospital equipment, computer, textiles.

Type 316 stainless has added nickel and added molybdenum. The molybdenum (called molly) increases corrosion resistance to chlorides and sulfates, including sulfurous acids in pulp industry. It has superior tensile strength at high temperatures compared to 304. Besides pulp and paper, typical industries using 316 are: photographic and other chemicals, ink, textile, bleach, rubber.

CARBIDE RECIPITATION: - Carbon that breaks loose from its bond within the stainless solution when material is heated between 800-1400 degrees. Under severe corrosive conditions, it can result **in extra oxidation and surface corrosion.**

CARBON: - Adds strength to stainless steel, but also lowers corrosion resistance. The more carbon there is, the more chromium be added, because carbon offsets 17 times its own weight in chromium to form carbides, thus reducing chromium available for resisting corrosion.

CHROMIUM: - A blue white metal, chromium is the most important element providing corrosion resistance in stainless steel. By adding 12% chromium to ordinary steel, stainless steel is formed. Chromium offsets the corrosive effects of carbon found in steel and is the primary factor in the ability of stainless to form a passive film on its surface providing corrosion resistance.

FORMING OR COLD HEADING OR COLD WORKING:- When fasteners are produced without heating or small heat below recrystallization temperature (so the raw material bond of stainless remains unchanged) by processing metal wire against various dies at high speed to form a fastener's head or basic shape. Cold working causes an increase in tensile strength and hardness (known as work hardening) and a decrease in ductility.

COPPER: - A reddish metal that is an excellent conductor of heat and electricity. It is malleable, ductile and non magnetic with low to average strength and good corrosion resistance.

CREEP STRENGTH: - A measure of the resistance of fasteners to stress under elevated temperatures. At higher temperatures, fasteners can change in dimension under the same load, and is called creep. Creep can cause the loosening of fasteners as temperature increases.

DISCONTINUTIES:- A variety of small or large disfigurations in a fastener such as pits, tool marks, voids, laps, folds, and seams and inclusions. Minor discontinuities are permissible in both commercial fasteners and those made to various specs.

DRAWING: - Where raw material shaped like wire is pulled through a die to reduce its diameter to that needed for particular fastener being manufactured.

DUCTILITY: - the ability of a fastener to deform before breaking (for example an elastic would be more ductile than a diamond). Ductility is a measurement similar to elongation

ELONGATION: - Stretching a fastener to the point that it breaks. The percentage of elongation at rupture (same as measure of ductility) is determined by dividing the total length after stretching to the original length. Elongation decreases as strength and
hardness increases.

MAGNETISM: - As related to stainless steel fasteners, 300 series stainless is non magnetic in its raw material condition. Cold working can sometimes induce traces of magnetism in 300 series, depending on the severity of cold working and chemical composition of the stainless. A rise in magnetism is related to increase in tensile strength and work hardening caused by the heat
and friction of cold forming and does not reduce corrosion resistance or cause any molecular change in austenitic raw material. A higher portion of nickel can increase stability in stainless, thus decreasing work hardening and any possibilities of magnetism. Many stainless specs allow 2.0 magnetic permeability which translates to low/medium magnetism.

MANGANESE: - A non magnetic metal which improves strength and hardness.

MOLYBDENUM: - Nicknamed moly, molybdenum is a metal added to 316 stainless steel, sharply increasing its corrosion resistance to chlorides and sulfates, especially various sulfurous acids in the pulp industry. Molybdenum helps reducehardness and increase tensile strength at higher temperatures.

NICKEL: - A metal added to 300 series stainless to provide corrosion resistance, increased strength in both high and low temperatures, and increased toughness in low temperatures. Nickel lowers the effects of work hardening, thus reducing traces of magnetism caused by cold forming and making material flow more freely in manufacturing.

PASSIVATING: - Technically, passivating is a process of dipping fasteners into a nitric acid solution to rapidly form a chromium oxide on the surface of the material, creating a passive film that protects stainless from further oxidation. The purpose of passivating is to remove both grease left from manufacturing and traces of steel particles which may have rubbed off manufacturing tools onto the fastener.

PASSIVE FILM: - The major characteristic of stainless is its ability to form a thin layer of protection called a passive film on its outside surface. This film results from a continual process of low level oxidation, so oxygen from the atmosphere is neededfor the passive film to exist. Once formed it prevents further oxidation or corrosion from occurring. Even if chipped or scratched, a new passive film on stainless will form.

PROOF LOAD: - A test load that a fastener must undergo without showing significant deformation. It is usually 90% of yield strength.

STAINLESS STEEL: - With the addition of 12 % chromium to iron, stainless steel is formed. The chromium protects the iron against most corrosion or red coloured rust; thus the term stainless steel. The ability of stainless to form a thin layer of protection on its outside surface, called a "passive film" is its most important characteristic in preventing corrosion. The overriding purpose of stainless steel is to provide corrosion resistance against : (a) atmospheric conditions such as carbon dioxide, moisture, electrical fields, sulphur, salt and chloride compounds (b) natural and artificially produced
chemicals (c) extremes weather where cold temperatures cause brittleness and hot temperatures reduce strength and increase corrosion.

TENSILE STRENGHT: - A common measure to compare the strength of a fastener. It is the load needed to pull the fastener apart.

TORQUE OR TORSION STRENGTH: - Torque is the force used in twisting, such as tightening a fastener. Torsion strength is the amount of force needed to twist a fastener apart. Both measures consider the amount of pressure applied to the fastener and the length of the wrench used in the application.

YIELD STRENGHTH: - The amount of pressure required to cause permanent deformity.
Chemical composition of S.S. Fasteners (% values in max unless otherwise stated).

Steel Group	C	Si	Mn	P	S	Cr	Mo	Ni	Cu
A2(304)	0.08	1.0	2.0	.05	.03	15-20	-	8-11	3.5
A4(316)	0.08	1.0	2.0	.045	.03	16-18.5	2-3	10-15	1

All Dimensional, Mechanical and Chemical properties are as per specified standards. The designation system comply with ISO 3506 standard. A270 donates A= Austenitic chromium-nickel steel, 2 = Cold heading steel alloyed with chromium and nickel normally called as 304 grade. 4 = cold heading steel alloyed with chromium, nickel and molybdenum. 70 = property class, i.e.: Tensile Strength which is 10 times of the denoted figure in N/mm^2 min.