
EVERETT STEEL COMPANIES

DEFINITION OF TERMS

Age Hardening — Precipitation hardening; a process of aging that increases hardness and strength and ordinarily decreases ductility. Age hardening usually follows rapid cooling from solution heat treatment temperatures or cold working.

Age Softening — The loss of strength and hardness at room temperature which takes place in certain alloys due to spontaneous reduction of residual stresses in the strain-hardened structure.

Aging — Precipitation from solid solution resulting in a change in properties of an alloy, usually occurring slowly at room temperature (natural aging) and more rapidly at elevated temperatures (artificial aging).

Alclad — "Alclad" designates a product having on its surface a metallurgically bonded aluminum or aluminum alloy coating anodic to the core alloy, thus protecting it physically and electrolytically against corrosion. In sheet and plate, the term "Alclad" indicates cladding on both sides unless designated "Alclad One Side." The term "Clad" is used in a similar manner when cladding is applied to sheet or plate for reasons other than corrosion resistance, such as for surface appearance, brazing, etc. Both of these processes are used to retain the high strength properties of the selected core alloy while providing the surface characteristics of the cladding alloy.

Alloy — Material that has metallic properties and which is composed of two or more chemical elements, one always being a metal. The alloy's properties are usually different from those of the components.

Alodized Sheet — Sheet that has been treated by the Alodine process, a proprietary chemical conversion coating method, to produce a thin, colored film which serves as an excellent base for paint.

Annealing — Any treatment at elevated temperature which has for its principal purpose softening and removal of residual stresses. In wrought aluminum products, "annealing" generally connotes a treatment above the recrystallization temperature.

Anoclad Sheet — Sheet of suitable chemistry and surface quality developed for the application of architectural anodized finishes.

Anodizing — An electrochemical method of increasing the thickness of the natural oxide coating of aluminum producing a hard transparent oxide coating up to several mils in thickness which enhances the surface appearance and increases resistance to atmospheric corrosion and abrasion.

ANSI — Abbreviation of American National Standards Institute.

ASTM — Abbreviation for American Society for Testing and Materials.

Bar — A solid product that is long in relation to cross section, which is square or rectangular (excluding plate and flattened wire) with sharp or

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rounded corners or edges, or is a regular hexagon or octagon, and in which at least one perpendicular distance between parallel faces is 3/8 inch or greater.

Cold-Finished Bar: Bar brought to final dimensions by cold working to obtain improved surface finish and dimensional tolerances.

Extruded Bar: Bar brought to final dimensions by hot extruding.

Bend Radius — The radius corresponding to the curvature of a bent specimen or bent area of a formed part and measured on the inside of the bend.

Brinell Hardness — See Hardness.

Chemical Properties — The properties of a material that describe its reactions with other substances, e.g. corrosion resistance.

Coefficient of Thermal Expansion — The linear expansion (or contraction) per unit length per degree F between specified lower and upper Fahrenheit temperatures. As stated in connection with aluminum these values are multiplied by one million for easier reading.

Cold Working — Mechanical deformation of metal or alloy at temperatures below that at which recrystallization occurs. Cold working alloys result in increased hardness and improved strength. Cold worked metal may be brought back to the original state or workability by proper annealing.

Common Alloys — The non-heat-treatable alloys.

Concentricity — Conformance to a common center as, for example, the inner and outer walls of round tube.

Corrosion — The deterioration of a metal by chemical or electrochemical reaction with its environment.

Intergranular Corrosion: Corrosion occurring preferentially at grain boundaries (also termed intercrystalline corrosion).

Pitting Corrosion: Localized corrosion resulting in small pits or craters in a metal surface.

Stress Corrosion Cracking: Failure by cracking resulting from selective directional attack caused by the simultaneous interaction of sustained tensile stress at an exposed surface with the chemical or electrochemical effects of the service environment.

Die Line — A longitudinal depression or protrusion formed on the surface of drawn or extruded material due to imperfections on the die surface.

Die Number — The number assigned to a die for identification and cataloging purposes, and which usually is assigned for the same purpose to the product produced from that die.

Drawn Product — A product formed by pulling material through a die.

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Eccentricity — Deviation from a common center as, for example, the inner and outer walls of a round tube. The difference between the mean wall thickness and minimum or maximum wall thickness at any one cross section. The permissible degree of eccentricity can be expressed by a plus and minus wall thickness tolerance.

Elastic Limit — Stress value below which no permanent set or permanent deformation takes place; the highest stress which will permit return to original shape upon removal of force causing the stress. The greatest load per square inch of original cross sectional area which, when removed, has not caused a permanent elongation.

Elongation — The percentage increase in distance between two gauge marks that results from stressing the specimen in tension to fracture. The original gauge length is usually two inches for sheet specimens and round specimens whose diameter is 1/2 inch, or four times the diameter for specimens where that dimension is under 1/2 inch. Elongation values depend to some extent upon size and form of the test specimen. For example, the values obtained from sheet specimens will be lower for thin sheet than for thicker sheet.

Embossed Sheet — (Patterned Sheet) Sheet on which a raised or indented pattern has been impressed on either one or both surfaces by the use of rolls.

Endurance Limit — The limiting stress below which a material will withstand a specified large number of cycles of stress. (For aluminum alloys, endurance limits are based on 500,000,000 cycles of completely reversed stress, using the rotating beam type of machine and specimen.)

Extrusion — A product formed by pushing material through a die.

Extrusion Seam — A seam in tube, pipe, and hollow shape resulting from the pressure bonding of two or more edges in the course of extruding through a spider or porthole die.

Fillet — A concave junction between two surfaces.

Finish — The characteristics of the surface of a product.

Gauge — Dimension expressed in terms of a system or arbitrary reference numbers. Dimensions expressed in decimals are preferred.

Grain Size — All metals are crystalline in structure. The crystals are generally referred to as grains. Grain size is a measure of the individual crystal size and is usually reported in terms of grains per unit area (e.g. mm²) or unit volume (e.g., mm³).

Hardening — See Heat Treating.

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Hardness — Resistance to plastic deformation, usually by indentation.

Brinell Hardness: Brinell hardness of aluminum alloys is obtained by measuring the permanent impression in the material made by a ball indenter 10 millimeters in diameter after applying a load of 500 kilograms for 30 seconds and dividing the applied load by the area of the impression.

Heat-Treatable Alloy — An alloy which may be strengthened by a suitable thermal treatment.

Heat Treating — Heating and cooling a solid metal or alloy in such a way as to obtain desired conditions or properties. Commonly used as a shop term to denote a thermal treatment to increase strength. Heating for the sole purpose of hot working is excluded from the meaning of this definition.

Heat-Treat Stain — A discoloration due to oxidation of the metal surface during thermal treatment.

Homogenizing — A high temperature soaking treatment to eliminate or reduce segregation by diffusion.

Hot Working — Plastic deformation of metal at such temperature and rate that strain hardening does not occur.

Ingot — A cast form suitable for remelting or fabricating.

Intergranular Corrosion — See Corrosion.

Interleaving — The insertion of paper between layers of metal to protect from damage.

Lateral Bow — Deviation of a longitudinal edge from straight (sometimes called camber).

Longitudinal Bow — A longitudinal curvature in the plane of a sheet.

Luder Lines — Surface markings resulting from localized flow which appear on some alloys after light straining. They lie approximately parallel to the direction of maximum shear stress (about 45 degrees to the direction of the applied stress), and appear as depressions when forming is in tension and as elevations when in compression.

Machinability — The ease and speed with which a metal may be efficiently cut, with free chip removal and producing a reasonably smooth surface.

Mean Diameter — The average of two measurements of the diameter at right angles to each other.

Mean Wall Thickness — The average of two measurements of the wall thickness of a tubular product, taken opposite each other.

Mechanical Properties — Those properties of a material that are associated with elastic and inelastic reaction when force is applied, or that involve the

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relationship between stress and strain; for example, modulus of elasticity, tensile strength, endurance limit. These properties are often referred to as "physical" properties.

Modulus of Elasticity — The ratio of stress to corresponding strain throughout the range where they are proportional. As there are three kinds of stresses, so are there three kinds of moduli of elasticity for any material — modulus in tension, in compression, and in shear.

Non-Ferrous — Metals or alloys that contain no appreciable quantity of iron; applied to such metals as aluminum, copper, magnesium and their alloys.

Non-Heat-Treatable Alloy — An alloy which can be strengthened only by cold work.

Oil-Can — A buckle that can be snapped from one position to another. Also referred to as snap buckle.

Oil-Stain — Discoloration produced during thermal treatment due to incomplete oxidation of lubricants on the surface. The color may vary from dark brown to white.

Orange Peel — Surface roughening on formed products resulting from the use of coarse grained material.

Oxidation — A reaction in which an element reacts with oxygen, or oxygen-containing compound.

Oxide Discoloration — Discoloration of the metal surface due to oxidation during thermal treatment.

Partial Annealing — Thermal treatment given cold worked metal to reduce the strength to a controlled level.

Pattern Sheet — See Embossed Sheet.

Physical Properties — The properties, other than mechanical properties, that pertain to the physics of a metal; for example, density, electrical conductivity, heat conductivity, thermal expansion.

Pickup — Small particles of oxide adhering to the surface of a product.

Pipe — Tube in standardized combinations of outside diameter and wall thickness, commonly designated by "Nominal Pipe Sizes" and "ANSI Schedule Numbers."

Seamless Pipe: Pipe produced from hollow extrusion ingot.

Structural Pipe: Extruded pipe, which may contain an extrusion seam, suitable for applications not involving internal pressure.

Pit — A sharp depression in the surface.

Plate — A rolled product rectangular in cross section and form of thickness 0.250 inch or more, with either sheared or sawed edges.

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Preheating — A high temperature soaking treatment to provide a desired metallurgical structure. Homogenizing is a form of preheating.

Quenching — Controlled rapid cooling of a metal from an elevated temperature by contact with a liquid, a gas, or a solid.

Rod — A solid product that is long in relation to cross section, which is 3/8 inch or greater in diameter.

Cold-Finished Rod: Rod brought to final dimensions by cold working to obtain improved surface finish and dimensional tolerances.

Extruded Rod: Rod produced by hot extruding.

Residual Stresses — Stresses that are set up within a metal as a result of a non-uniform plastic deformation which may be caused by cold working or drastic temperature gradients in quenching or welding.

Rub Mark — A minor form of scratching.

Scratch — A sharp linear surface indentation.

Screw Machine Stock — Bar, rod, and wire in certain standard alloys, tempers, sizes, and shapes suitable for automatic screw-machine applications.

Section Number — The number assigned to an extruded or drawn shape for identification and cataloging purposes, usually the same number assigned for the same purpose to the die from which the shape is made.

Shape — A wrought product that is long in relation to its cross-sectional dimensions and has a cross section other than that of sheet, plate, rod, bar, tube, or wire.

Extruded Shape: A shape produced by hot extruding.

Hollow Extruded Shape: A hollow shape formed by hot extruding.

Class 1 Hollow Extruded Shape: A hollow extruded shape the void of which is round and one inch or more in diameter and whose weight is equally distributed on opposite sides of two or more equally spaced axes.

Class 2 Hollow Extruded Shape: Any hollow extruded shape other than Class 1, which does not exceed a 5 inch diameter circumscribing circle and has a single void of not less than 0.375 inch diameter or 0.110 square inch area.

Class 3 Hollow Extruded Shape: Any hollow extruded shape other than Class 1 or Class 2.

Semihollow Shape: A shape any part of whose cross section is a partially enclosed void the area of which is substantially greater than the square of the width of the gap.

Shear Strength — The maximum shearing stress which a material is capable of developing. In practice, it is considered to be the maximum average stress computed by dividing the ultimate load in the plane of shear by the original

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area subject to shear. Shearing strength is usually determined by inserting a cylindrical specimen through round holes in three hardened steel blocks, the center of which is pulled (or pushed) between the other two so as to shear the specimen on two planes. The maximum load divided by the combined cross-sectional area of the two planes is the shearing strength.

Sheet — A rolled product rectangular in cross section and form of thickness 0.006 through 0.249 inch with sheared, slit, or sawed edges.

Alclad Sheet: Composite sheet comprised of an aluminum alloy core having on both surfaces (if one side only, Alclad One Side Sheet) a metallurgically bonded aluminum or aluminum alloy coating that is anodic to the core, thus electrolytically protecting the core against corrosion.

Coiled Sheet: Sheet in coils with slit edges.

Flat Sheet: Sheet with sheared, slit, or sawed edges, which has been flattened or leveled.

Mill Finish Sheet (MF): Sheet having a non-uniform finish which may vary from sheet to sheet and within a sheet, and may not be entirely free from stains or oil.

One Side Bright Mill Finish Sheet (1SBMF): Sheet having a moderate degree of brightness on one side and a mill finish on the other.

Panel Flat Sheet: Sheet which has a higher degree of flatness than Flat Sheet.

Solution Heat Treatment — Heating an alloy at a suitable temperature for sufficient time to allow soluble constituents to enter into solid solution where they are retained in a supersaturated state after quenching.

Specific Gravity — The weight of a material divided by the weight of an equal volume of water.

Stabilizing — A thermal treatment to reduce internal stresses in order to promote dimensional and mechanical property stability.

Stiffness — Resistance to deflection under load within the elastic limit. See also Modulus of Elasticity.

Strain Hardening — Modification of a metal structure by cold working resulting in an increase strength and hardness with loss of ductility.

Stress Relieving — The reduction of the effects of internal residual stresses by thermal or mechanical means.

Structural Streaks — Streaks on etched or anodized surfaces resulting from heterogeneities in the metal structure.

Tensile Strength — (Ultimate Tensile Strength) The maximum tensile load which a material is capable of withstanding under gradually and uniformly applied loading, divided by the original cross-sectional area in the minimum plane perpendicular to the direction of loading.

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Tolerance — Allowable deviation from a nominal or specified dimension; the permissible deviation from the exact dimensions given on the drawing or model, or from a specification for any characteristic.

Traffic Marks — Abrasions resulting from relative movement between contacting metal surfaces during transit. These abrasions are usually dark in appearance due to the presence of aluminum and aluminum oxide fines produced by the abrasive action.

Tread Plate — A sheet or plate product having a raised, figured pattern on one surface, to provide improved traction.

Tube — A hollow wrought product that is long in relation to its cross section, which is round, a regular hexagon, a regular octagon, elliptical, or square or rectangular with sharp or rounded corners, and that has uniform wall thickness except as affected by corner radii.

Alclad Tube: Composite tube composed of an aluminum alloy core having on either the inside or outside surface a metallurgically bonded aluminum or aluminum alloy coating that is anodic to the core, thus electrolytically protecting the core against corrosion.

Drawn Tube: A tube which does not contain any line junctures resulting from the method of manufacture.

Structural Tube: Extruded tube, which may contain an extrusion seam, suitable for applications not involving internal pressure.

Water Stain — Superficial surface oxidation due to the reaction of water films held between closely adjacent metal surfaces such as between wraps of a coil or sheets in a stack. The appearance varies from iridescent in mild cases to white, gray, or black in more severe instances.

Wire — A solid wrought product that is long in relation to its cross section, which is square or rectangular with sharp or rounded corners or edges, or is round, a regular hexagon or a regular octagon, and whose diameter or greatest perpendicular distance between parallel faces (except for flattened wire) is less than 3/8 inch.

Workability — The relative ease with which various alloys may be formed by rolling, extruding, forging, etc.

Wrought Product — A product which has been subjected to mechanical working by such processes as rolling, extruding, forging, etc.

Yield Point — The stress at which a marked increase in deformation occurs without increase in load. This phenomenon is not common in aluminum alloys.

Yield Strength — The stress at which a material exhibits a specified permanent set. The value of set used for aluminum and its alloys is 0.002 inch per inch, 0.2 percent. For the aluminum alloys the yield strength in tension and compression are approximately equal.