



## Glossary of Terms for New Inspectors

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### Glossary - Basic Terminology

#### A

AMS-Abbreviation for Aerospace Material Specification.

ANSI-Abbreviation for American National Standards Institute.

ASME-Abbreviation for American Society of Mechanical Engineers.

ASTM-Abbreviation for American Society for Testing and Materials.

AWS-Abbreviation for American Welding Society.

Abrasion-See "Mark, Traffic."

Age Hardening-An aging process which results in increased strength and hardness.

Age Softening-spontaneous decrease of strength and hardness that takes place at room temperature in certain strain hardened alloys containing magnesium.

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-An aluminum or aluminum-alloy coating that is metallurgically bonded to either one or both surfaces of an aluminum alloy product, and that is anodic to the alloy to which it is bonded, thus electrolytically protecting the core alloy against corrosion.

Alligatoring-See "Lamination."

Alloy-A substance having metallic properties and composed of two or more elements of which at least one is an elemental metal.

Angularity-Conformity to, or deviation from, specified angular dimensions in the cross section of a shape or bar.

Angulation-The deliberate departure from a horizontal passline on the entry side of a rolling mill used for one-side bright rolling.

Annealing-A thermal treatment to soften metal by removal of stress resulting from cold working or by coalescing precipitates from solid solution.



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Annealing, Partial-thermal treatment (H2X temper nomenclature) given cold worked metal to reduce strength and increase ductility to controlled levels other than annealed temper.

Anodizing-Forming a coating on a metal surface produced by electrochemical treatment through anodic oxidation.

Anodizing Sheet-See "Sheet, Anodizing." Arbor Break-See "Buckle, Arbor."

Arbor Mark-See "Mark, Arbor." Artificial Aging-See "Aging."

### **B**

Back End Condition-A condition occurring in the last metal to be extruded. It is a result of the oxidized surface of billet feed into the extrusion

Backup Rolls-Nongrooved rolls, which stiffen or strengthen work rolls.

Bar-A solid wrought product that is long in relation to its cross section which is square or rectangular (excluding plate and flattened wire) with sharp or rounded corners or edges, or is a regular hexagon or octagon, and in which at least one perpendicular distance between parallel faces is .375 inch or greater.

Bar, Cold Finished-Bar brought to final dimension by cold work to obtain improved surface finish and dimensional tolerances.

Bar, Cold Finished Extruded-Cold finished bar produced from extruded bar. BAR, Cold Finished Rolled-Cold Finished bar produced from rolled bar.

Bar, Extruded-Bar brought to final dimensions by hot extruding. Bar, Rolled- Bar brought to final dimensions by hot rolling.

Bar, Saw-Plate: -Bar brought to final thickness by hot or cold rolling and to final width by sawing.

Base Box-General-An agreed upon unit of area used primarily in packaging applications. One common base box of aluminum is 31,360 square inches; originally composed of 112 rectangular sheets each 14 by 20 inches.

Belled Edge-see Edge, Belled."

Belly- A loose center buckle extending to near the edges of a sheet.

Billet-A hot worked semifinished product suitable for subsequent working by such methods as rolling forging, extruding, etc.



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**Blank-** A piece of metal cut or formed to regular or irregular shape for subsequent processing such as by forming, bending or drawing. The piece of sheet stock cut out by blanking die. It will subsequently be

Drawn into a cup or end shell. **Bleed Out-**See "Two-Tone."

**Blister-** A raised area on the surface of an extruded product due to subsurface gas expansion. This can occur during extrusion or thermal treatment.

**Blister, Bond-**A raised spot on only one surface of the metal whose origin is between the cladding and core in clad products.

**Blister, Coating-**A blister in the coating of an alclad or a clad product. **Blister, Core-**A raised spot (one or both sides) on rolled metal.

**Block Mark-** See "Scratch, Tension."

**Bloom-** A semifinished hot rolled product, rectangular or square in cross sections, produced on a blooming mill.

**Blow Hole-** A blister that has ruptured and may produce a void. See also "Blister." **Boss-** a knoblike projection on the main body of a forging or casting.

**Bottom Draft-** Taper or slope in the bottom of a forged depression to assist the flow of metal toward the side of the depressed area.

**Bow-** Longitudinal curvature of rod, bar, profiles (shapes), and tube. Bow is measured after allowing the weight of the extrusion to minimize the deviation. Bow can be caused by a non-uniform extrusion rate across the cross section resulting in one portion of the extrusion being longer than the other or non-uniform contraction during quenching.

**Bow, Lateral-** Deviation from straight of a longitudinal edge.

**Bow, Longitudinal-** Curvature in the plane of sheet or plate in the rolling direction. **Bow, Transverse-** Curvature across the rolling direction of sheet or plate.

**Brazing-** Joining metals by fusion of nonferrous alloys that have melting points above 425c (800F) but lower than those of the metals being joined. This may be accomplished by means of a torch (torch brazing), in a furnace (furnace brazing), or by dipping in a molten flux bath (dip or flux brazing).

**Brazing Rod-** A rolled, extruded, or cast round filler metal for use in joining by brazing.

**Brazing Sheet-** Sheet of a brazing alloy or sheet clad with a brazing alloy on one or both sides.

**Brazing Wire-** Wire for use as a filler metal in joining by brazing.



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Bright Sheet- See " Sheet, (1SBMF), (S1SBF) and ( S2SBF)." Bristle Mark- See "Mark, Bristle."

Broken Die- A deviation from the desired cross section due to the absence of a certain portion of the die used to extrude the profile (shape).

Broken Edge- See "Edge, Broken."

Broken Matte Finish- Non uniform surface on the inside of packed rolled foil (Bright Spots).

Broken Surface- See "Crazing."

Bruise- See "Mark, Roll Bruise."

Buckle- A distortion of the surface of the metal.

Buckle, Arbor- Bend, crease, wrinkle, or departure from flat, occurring perpendicular to the slit edge of a coil and which are repetitive in nature, with severity decreasing as the distance increases in the coil from the original source. Normally, it is found on the ID of the coil but can appear on the coil OD as a result of a prior winding operation.

Buckle, Center- Undulation (wavy region) in the center of the metal.

Buckle, Edge- Undulation (wavy region) along the edge (s) of the metal.

Buckle, Oil Can-See "Buckle, Trapped".

Buckle, Quarter- Undulation (wavy region) which occur approximately at both quarter points across the width.

Buckle, Trapped- Undulation (wavy region) which is smaller sized and often circular in shape.

Buff Streak- See "Streak".

Buffing- A mechanical finishing operation in which fine abrasives are applied to a metal surface by rotating fabric wheels for the purpose of developing a lustrous finish.

Burnish Streak- See "Streak, Burnish." Burnishing- See "Two-Tone."

Burr- A thin ridge of roughness left by a cutting operation such as slitting, trimming, shearing, blanking or sawing.

Bursting Strength- The pressure required to rupture a foil specimen when it is tested in a Mullen instrument under specified conditions. See also "Mullen Test."



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Bus Bar- A rigid electric conductor in the form of a bar. Butt-Seam Tube- See " Tube, Open-Seam."

### C

Camber-See "Bow, Lateral." Carbon Mark- See "Mark, Carbon."

Center- The difference in thickness between the middle and edges (average) of a sheet.

Center Buckle- See "Buckle."

Chafing- See "Mark, Traffic."

Chatter Mark- See "Dent, Repeating."

Chop- Metal sheared from a vertical surface of a die forging, which is spread, by the die over an adjoining horizontal surface.

Chucking Lug-A lug or boss added to a forging so that "on center" machining and forming may be performed with one setup or checking. This lug is finally machined or cut away.

Cinching- See "Scratch, Tension."

Circle- A circular blank fabricated from plate, sheet or foil. Clad Sheet- See "Sheet, Clad."  
Coating- Continuous film on the surface of a product. Coating Blister- See " Blister, Coating."

Coating Build-Up- A coating thickness greater than nominal in localized area of sheet, usually along edges, due to uneven application techniques.

Coating Dip- A non-uniform extraneous deposit of coating on the coated sheet. Coating Oven Trash- See " Dirt."

Coating Streak- See " Streak, Coating."

Coating, Conversion- An inorganic pretreatment some time applied to metal surface to enhance coating adhesion and to retard corrosion.

Coating, High or Low- Failure of the coating to meet the agreed upon thickness limits measured in weight per unit area.

Cobble- (1) A jamming of the mill by aluminum (1) product while being rolled. (2) A piece of aluminum which for any reason has become so bent or twisted that it must be withdrawn from the rolling operation and scrapped.

Coil Curvature- See " Coil Set."



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**Coil Orientation- Clockwise Coil:** With the coil core vertical (" eye to the sky") and viewed from above, a trace of the metal edge from the ID to the OD involves clockwise movement. **Counter-Clockwise (Anti-Clockwise coil:** With the coil core vertical (" eye in the sky") and viewed from above, a trace of the metal edge from the ID to the OD involves counter-clockwise (anti-clockwise) movement.

**Coil Set- Longitudinal bow** in an unwound coil in the same direction as curvature of the wound coil.

**Coil Set Differential-** The difference in coil set from edge to edge of a coiled sheet sample. It is measured with the sample on a flat table, concave side up, and is the difference in elevation of the corners on one end.

**Coil Set Reversed-** Longitudinal bow in an unwound coil in the direction opposite to the curvature of the wound coil.

**Coiled Sheet-** See "Sheet, Coiled."

**Cold Shut-** (1) A linear discontinuity in a cast surface caused when meeting streams of metal fail to merge prior to solidification. (2) A forging defect developed by metal flowing into a section from two directions, resulting in a discontinuity at the junction.

**Cold Working-** Plastics (i.e., permanent) deformation of metal at such temperature and rate the strain hardening occurs.

**Collapse-** Out-of-round condition of coil often due to inappropriate tension during rewinding operations.

**Coloring-** A finishing process, or combination of processes, which alters the appearance of an aluminum surface via coating, chemical and/or mechanical operations.

**Concavity-** Curved like the inner surface of a sphere, See also "Convexity."

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

**Condensation Stain-**See " Corrosion, Water Stain."

**Condenser Tube-** The term "Heat- Exchanger Tube" is preferred, unless specific reference to a condenser application is intended.

**Conduit-** A tube used to protect electric wiring. See " Tubing, Electrical Metallic."



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**Conduit, Rigid-** Conduit having dimensions of ANSI Schedule 40 pipe in standardized length with threaded ends.

**Coned-Out Coil-** See " Telescoping."

**Contour-** That portion of the outline of a transverse cross section of an extruded shape that is represented by a curved line or curved lines.

**Conversion Coating- Can Ends-** See " Coating, Conversion."

**Convexity-** Curved like the outer surface of a sphere. See also "Concavity."

**Core-** A hollow cylinder on which a coiled product may be wound that forms the inside diameter of a coil.

**Core Blister-** See " Blister, Core." **Coring-** See " Back End Condition."

**Corner Turn-Up-** A distortion, buckle or twist condition that causes the corner (s) of the sheet to deviate from a perfectly flat plane on which it rests.

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

**Corrosion, Exfoliation-** Corrosion that progresses approximately parallel to the metal surface, causing layers of the metal to be elevated by the formation of corrosion product.

**Corrosion, Galvanic-** Corrosion associated with the current of galvanic cell consisting of two dissimilar conductors in an electrolyte or two similar conductors in dissimilar electrolyte. Aluminum will corrode if it is anodic to the dissimilar metal.

**Corrosion, Intergranular-** Corrosion occurring preferentially at grain boundaries (also termed intercrystalline corrosion).

**Corrosion, Pitting-** Localized corrosion resulting in small pits or craters in a metal surface.

**Corrosion, Stress 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 Electro-chemical effects of the surface environment. The term is often abbreviated SCC which correctly stands for stress corrosion cracking.

**Corrosion, Water Stain-** Superficial oxidation of the surface with a water film, in the absence of circulating air, held between closely adjacent metal surfaces.

**Corrugating-** Forming rolled metal into a series of straight parallel regular alternate grooves and ridges.



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Coupon- A piece of metal from which a test specimen may be prepared.

Covering Area- Yield expressed in terms of a given number of square inches in a pound. For metric units, use square metres per kilogram.

Crazing- A macroscopic effect of numerous surface tears, transverse to the rolling direction, which can occur when the entry angle into the cold mill work rolls is large

Crease- A sharp deviation from flat in the sheet which is transferred from processing equipment subsequent to the roll bite.

Cross Hatching- See "Crazing." Crown- See "Convexity."

Curl- An undesirable condition caused by uneven rates of absorption or evaporation of moisture, uneven rates of contraction or expansion, or internal stresses in the material. Curl is most prevalent in laminated structures where the components have differing physical properties.

### D

Deep Drawing- Forming a deeply recessed part by forcing sheet metal to undergo plastic flow between dies, usually without substantial thinning of the sheet.

Defect- A defect is anything that renders the aluminum unfit for the specific use for which it was ordered.

Dent- (1) For rolled products, a sharply defined surface impression on the metal, which may be caused by a blow from another object. (2) For extrusions, a synonym for handling mark. See "Mark, Handling."

Dent, Expansion- localized surface deviation from flat generated by expansion of vapor during thermal treatment of cold rolled coiled sheet.

Dent, Repeating- Repeating depression caused by a particle adhering to a rotating roll over which the metal has passed.

Die Line- A longitudinal depression or protrusion formed on the surface of drawn or extruded material. Die lines are present to some degree in all extrusions and are caused by a roughening of the die bearing.

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.

Diffusion Streak- See "Streak, Diffusion."

Dirt- Foreign debris from rolling or post-rolling operations imbedded in or under the coating.



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**Disc-** A circular blank fabricated from plate, sheet or foil, from which a central concentric area has been removed.

**Double Shear Notch-** See " Notch, Double Shear."

**Draft-** Taper on the sides of a die or mold impression to facilitate removal of forgings, castings or patterns from dies or molds.

**Drag Mark-** See " Rub, Tool."

**"Draw and Iron"- Can Bodies-** Term which refers to a method of fabricating a can body in which a cup is drawn from flat sheet, redrawn to the final diameter and then wall ironed to reduced the wall thickness and to achieve the required height.

**Drawing-** (1) In forging, an operation of working metal between flat dies to reduce the cross section and increase length. (2) The process of pulling material through a die to reduce the size, changes the cross section or shape, or hardens the material.

**Drawing Stock-** A hot worked intermediate solid product of uniform cross section along its whole length, supplied in coils and of quality suitable of drawing into wire.

**Drawn Product-** A product formed by pulling material through a die. **Drawn-In Scratch-** See " Scratch, Drawn-In."

**Dropped Edge-** See "Edge, Dropped." **Dry Sheet-** See " Lube, Low."

**Dry Surface-** A foil surface substantially free from oily film, and suitable for lacquering, printing, or coating with water- dispersed adhesives.

**Duct Sheet-** Coiled or flat sheet in specific tempers, widths and thicknesses, suitable for duct applications.

**Ductility-** The property that permits permanent deformation before fracture by stress in tension.

## E

**Earing-** Wavy symmetrical projections formed during cupping, deep drawing or spinning. Earing is caused by nonuniform directional properties in the aluminum and/or by improperly adjusted tooling.

**Ears-** Wavy symmetrical projections formed in the course of deep drawing or spinning as a result of directional properties or anisotropy in sheet. Ears occur in-groups of 4 or 8 with the peaks of the projections located at 45 degrees and/or at 0 and 90 degrees to the rolling direction. Degrees of earing is the difference between average height at the peaks and average height at the valleys, divided by average height at the valleys, multiplied by 100 and expressed in percent.



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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.

**Edge Band-** See "Two-Tone."

**Edge, Belled-** Excessive build-up of material on edge (s) during a rewinding operation. Typical caused includes excessive edge burr, turned edge, and "dog bone" shaped cross sectional profiles.

**Edge Broken (Cracked)-** Edge (s)-containing crack, split, and/or tear, which is caused by inability to deform without fracturing.

**Edge Build-up-** See "Edge, Belled."

**Edge, Damaged-** Edge of a coil that has been bent, torn or scraped by an object.  
**Edge, Dropped-** A continuous, downward edge deflection.

**Edge, Liquefied-** Surface condition remaining after portions of a side of an as-cast rolling ingot deforms enough during hot rolling to become top and/or bottom surface (s) of the rolled product at an edge.

**Edge, Rippled-** See "Buckle, Edge." **Edge, Wavy-** See "Buckle, Edge."

**Electrical Conductivity-** The capacity of a material to conduct electric current. For aluminum, this capacity is expressed as a percentage of the International Annealed Copper Standard (IACS), which has a resistivity of 1/58 ohm-mm<sup>2</sup>/meter at 68 degrees f and an arbitrarily designated conductivity of unity.

**Electrical Resistivity-** The electrical resistance of a body of unit length and unit cross-sectional area or unit weight. The value of 1/58 ohm-mm<sup>2</sup>/ meter at 68 degrees F is the resistivity equivalent to the International Annealed Copper Standard for 100 percent conductivity. This means that a wire of 100 percent conductivity, 1 meter in length and 1 square millimeter in cross-sectional area would have a resistance of 0.017241 ohms at 68 degrees F.

**Elongation-** The percentage increase in distance between two gauges marks that results from stressing the specimen in tension to fracture. The original gauge length is usually 2 inches for flat specimens and round specimens whose diameter is ½ inch, or four times the diameter for specimens where that dimension is under ½ 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.

**Embossing-** Raising a design in relief against a surface.

**Endurance Limit-** The limiting stress below which a material will withstand a specified large number of cycles of stress.



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Equivalent Round- The diameter if a circle having a circumference equal to the outside perimeter of other than round tube.

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

Extrusion Billet- The starting stock for the extrusion operation. Extrusion billet is a solid or hollow form, commonly cylindrical and is the length charged into the extrusion press cylinder. It is usually a cast product but may be wrought product or powder compact.

Extrusion Butt End Defect- A longitudinal discontinuity in the extreme rear portion of an extruded product, which is normally discarded.

Extrusion Ingot- A cast form that is solid or hollow, usually cylindrical suitable for extruding. See also " Fabrication Ingot."

Extrusion Log- The starting stock for extrusion billet. Extrusion log is usually produced in lengths from which shorter extrusion billets are cut.

Extrusion Seam- A region in extruded hollow profiles observed after creating two seams of metal and rejoining them around the mandrel of a porthole or bridge die.

Eyehole- See " Holiday."

## F

Fabricating Ingot- A cast form suitable for subsequent working by such methods as rolling, forging, extruding, etc. (" Rolling Ingot." "Forging Ingot." " Extrusion Ingot.")

Fatigue- The tendency for a metal to break under conditions of repeated cyclic stressing considerably below the ultimate tensile strength.

Feed In- See "Back End Condition." Feed Line- See " Streak, Grinding."

Fillet- A concave junction between two surfaces.

Fin- A thin projection on a forging resulting from trimming or from the metal under pressure being forced into hairline cracks in the die or around die inserts.

Fin Stock- Coiled sheet or foil in specific alloys, tempers, and thickness ranges suitable for manufacture of fins for heat- exchanger applications.

Finish- The characteristics of the surface of a product. Fish Mouthing- See " Lamination."

Flag- A marker inserted adjacent to the edge at a splice or lap in a roll or foil.



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**Flaking-** A condition in coated sheet where portions of the coating become loosened due to inadequate adhesion.

**Flange-** See " Rib."

**Flash-** A thin protrusion at the parting line of a forging, which forms when metal, in excess of that required to fill the impressions, is forced between the die interfaces.

**Flash Line-** A line left on a forging where flash has been removed.

**Flatness-** (1) For rolled products, a distortion of the surface of sheet such as a bulge or a wave, usually transverse to the direction of rolling. Often described by location across width, i.e., edge buckle, quarter, center buckle, etc. (2) For extrusions, flatness (off contour) pertains to the deviation of a cross-section surface intended to be flat. Flatness can be affected by conditions such as die performance, thermal effects and stretching.

**Flow Lines-** Lines on the surface of painted sheet, brought about by incomplete leveling of the paint. (2) The line pattern revealed by etching, which shows the direction of plastic flow on the surface or within a wrought structure.

**Flow Through-** A forging defect caused when metal flows past the base of a rib resulting in rupture of the grain structure.

**Foil-** A rolled product rectangular in cross section of thickness less than 0.006 inch. In Europe, foil is equal to and less than 0.20 mm.

**Foil Stock-** See " Reroll Stock."

**Foil, Annealed-** Foil completely softened by thermal treatment.

**Foil, Bright Two Sides-** Foil having a uniform bright specular finish on both sides.

**Foil, Chemically Cleaned-** Foil, chemically washed to remove lubricant and foreign material.

**Foil, Embossed-** Foil on which a pattern has been impressed by means of an engraved roll or plate.

**Foil, Etched-** foil roughened chemically or electrochemically to provide an increased surface area.

**Foil, Hard-** Foil fully work-hardened by rolling.

**Foil, Intermediate Temper-** Foil intermediate in temper between Annealed Foil and Hard foil.



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Foil, Matte One Side (MIS)- Foil with a diffuse reflection finish on one side and a bright specular finish on the other.

Foil, Mechanically Grained- Foil mechanically roughened for such applications as lithography.

Foil, Mill Finish (MF)- Foil having a non-uniform finish which may vary from coil to coil and within a coil.

Foil, Scratch Brushed- Foil abraded, usually with wire brushed, to produce a roughened surface.

Fold- A forging discontinuity caused by metal folding back on its own surface during flow in the die cavity.

Forgeability- The term used to describe the relative workability of forging material.

Forging- A metal part worked to a predetermined shape by one or more processes such as hammering, upsetting, pressing, rolling, etc.

Forging Billet- The term "Forging Stock" is preferred.

Forging Ingot- A cast form intended and suitable for subsequent working by the forging process.

Forging Plane- A reference plane or planes normal to the direction of applied force from which all draft angles are measured.

Forging, Blocker-Type- A forging made in a single set of impressions to the general contour of a finished part.

Forging, Cold-Coined- A forging that has been restruck cold in order to obtain closer dimensions, to sharpen corners or outlines and is non-heat-treatable alloys, to increase hardness.

Forging, Die- A forging formed to the required shape and size by working in impression dies.

Forging, Draftless- A forging with zero draft on vertical walls.

Forging, Flashless- A closed die forging made in dies constructed and operated to eliminate, in predetermined areas, the formation of flash.

Forging, Hammer- A forging produced by repeated blows in a forging hammer.

Forging, Hand- A forging worked between flat or simply shaped dies by repeated strokes or blows and manipulation of the piece.

Forging, No-Draft- See "Forging, Draftless."



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Forging, Precision- A forging produced to tolerances closer than standard.

Forging, Press- A die forging produced by pressure applied in a forging press.

Forging, Rolled Ring- A cylindrical product of relatively short height, circumferentially rolled from a hollow section.

Forging, Upset- A forging having part or all of its cross section greater than that of the stock.

Formability- The relative ease with which a metal can be shaped through plastic deformation.

Fracture Toughness- A generic term for measure of resistance to extension of a crack. The term is sometimes restricted to results of a fracture mechanics test, which is directly applicable in fracture control.

Fretting- See " Mark, Traffic."

Friction Scratch- See " Scratch, Friction." Full Center- See " Buckle, Center."

## G

Gauge: a term previously used in referring to the thickness of a wrought product. Thickness is preferred in dimension description.

Glaze- See "Pickup, Roll."

Gouge, Rolled In- A more localized gross rolled-in scratch. See also "Scratch, Rolled-In."

Grain Flow- The directional characteristics of the metal structure after working, revealed by etching a polished section.

Grease Streak- See "Streak, Grease."

## H

Hair, Slitter- Minute hair-like silver along edge (s) due to shearing or slitting operation. Handling

Mark- See " Mark, Handling."

Hardener- An alloy containing at least some aluminum and one or more added elements for use in making alloying additions to molten aluminum. Also referred to as "Master Alloy."

Hardness- Resistance to plastic deformation, usually by indentation. The term may also refer to stiffness or temper or to resistance to scratching, abrasion or cutting. Brinell Hardness:



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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 loading with a 500 kilogram-force for 15 seconds and dividing the applied load by the area of the impression.

Rockwell Hardness: An indentation hardness test based on the depth of penetration of a specified penetrator into the specimen under certain arbitrarily fixed conditions.

Heat Streak- See "Streak, Heat." Heat Treat Lot- See "Lot, Heat Treat."

Heat Treat Stain- A discoloration due to non-uniform oxidation of the metal surface during solution heat 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- see "Solution Heat Treating," "Aging."

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

Herringbone- See "Streak, Herringbone."

Hole- Void in rolled product. Typical cause is a nonmetallic inclusion during rolling.

Holiday- Region where film is absent due to non-wetting of the metal surface by the coating.

Homogenizing- Is a process whereby ingots are raised to temperatures near the solidus temperature and held at that temp for varying lengths of time. The purpose of this process are to (1) reduce microsegregation by promoting diffusion of solute atoms within the grains of aluminum and (2) improve workability.

Hook- An abrupt deviation from straightness. Hook can be caused by non-uniform metal flow during breakthrough. See also "Blow."

Hot Line Pickup- See " Pickup, Roll."

Hot Shortness- A condition of the metal at excessively high working temperatures characterized by low mechanical strength and a tendency for the metal to crack rather than deform.

Hot Tear- See " Tear, Speed."

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



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### I

**Impact-** A part formed in a confining die from a metal slug, usually cold, by rapid single stroke application of force through a punch, causing the metal to flow around the punch and/or through an opening in the punch or die.

**Inclusion-** Foreign material in the metal or impressed into the surface.

**Inclusion, stringer-** An impurity, metallic or non-metallic, which is trapped in the ingot and elongated subsequently in the direction of working. It may be revealed during working or finishing as a narrow streak parallel to the direction of working.

**Incomplete Seam-** See "Weld, Incomplete."

**Ingot-** A cast form suitable for remelting or fabricating. See "Remelt Ingot," "Fabricating Ingot," "Extrusion Ingot." "Forging Ingot." "Rolling Ingot."

**Inspection Lot-** See "Lot, Inspection."

**Interleaving-** The insertion of paper or application of suitable strippable coatings between layers of metal to protect from damage.

### K

**Kink-** (1) For rolled products, an abrupt bend or deviation from flat, which is caused by, localized

Bending during handling. (2) For extrusions, an abrupt deviation from straightness. A kink can be caused by handling.

**Knife Mark-** See "Mark, Knife."

**Knock-Out Mark-** See "Mark, Knock-Out."

### L

**Lacquer-** Occasionally used to describe oil stain. See "Stain, Oil."

**Lamination-** An internal crack or separation aligned parallel to the direction of major metal flow and, in the case of plate, sheet or foil, parallel to the rolled surfaces. In extrusions, it can be caused by contaminants that feed into the metal flow before it reaches the die opening or cracked billets. See also "Back End Condition".

**Lap-** See "Fold."



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Lateral Bow- See "Bow, Lateral."

Layout Sample- A prototype forging or a "cast" used to determine conformance to designed dimensions.

Leveling- The mechanical flattening of plate, sheet or foil. Leveling, Roller- Leveling carried out by bending.

Leveling, Stretcher- Leveling carried out by uniaxial tension.

Leveling, Tension- Leveling continuously carried out by uniaxial stretching usually with the assistance of bending.

Leveling, Thermal- Leveling carried out at an elevated temperature under an applied load normal to the surface to be flattened.

Leveller Chatter- See "Mark, Chatter (Roll or Leveller)."

Leveller Mark- See "Dent, Repeating."

Leveller Streak- See "Dent, Leveller."

Line, Flow- The line pattern which shows the direction of flow of the surface.

Line, Looper- Closely spaced symmetrical lines on the surface of metal, which has undergone non-uniform deformation, usually in a drawing operation.

Line, Luders- Elongated surface markings or depressions appearing in patterns caused by localized plastics deformation that results from non-uniform yielding.

Line, Weld- See "Seam, Extrusion."

Line- The slab of coating metal that is placed on the core alloy and is subsequently rolled down to clad sheet as composite.

Liquated Edge- See "Edge, Liquated."

Liquation- The bleeding of the low-melting constituents through the solidified ingot surface.

Lock- A condition in which the parting line of a forging is not all in one plane.

Log- See "Extrusion Log."

Long Transverse Direction- For plate, sheet and forging, the directions perpendicular to the longitudinal direction which is also at right angles to the thickness of the product. See "Longitudinal Direction."



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Longitudinal Bow- See "Bow, Longitudinal."

Longitudinal Direction- The direction of major metal flow in a working operation.

Looper Line- See "Line, Looper."

Loose Wrap- See "Wrap, Loose."

Lot, Heat Treat- Material of the same mill form, alloy, temper, section and size traceable to one heat-treat furnace load (or extrusion charge or billet in the case of press heat-treated extrusions) or, if heat treated in a continuous furnace, charged consecutively during an 8-hour period.

Lot, Inspection- (1) For non-heat treated tempers, an identifiable quantity for material of the same mill form, alloy, temper, section and size submitted for inspection at one time. (2) For heat treated tempers, an identifiable quantity of material of the same mill form, alloy, temper, section and size traceable to a heat treat lot or lots and submitted for inspection at one time. (For sheet and plate, all material of the same thickness is considered to be of the same size.)

Lube, High- Lubricant limit exceeds the maximum agreed upon limit measured in weight per unit area.

Lube, Low- Failure of the lubricant to meet the agreed upon minimum limit measured in weight per unit area.

Luders Line- See "Line, Luders."

## M

Mark- Damage in the surface of the product whose name is often described by source.

Mark, Arbor- Surface damage in the vicinity of a coil ID caused by contact with a roughened, damaged or noncircular arbor.

Mark, Bearing- A depression in the extruded surface caused by a change in bearing length in the extrusion die.

Mark, Bite- A line which is generally perpendicular to the rolling direction.

Mark, Bristle- Raised surface about one inch long, crimped wire shaped oriented in any direction.

Mark, Carbon- Gray or black surface marking caused by contact with carbon runout blocks.

Mark, Chatter (Roll or Leveller)- Numerous intermittent lines or grooves that are usually full width and perpendicular to the rolling or extrusions direction.



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Mark, Drag- See "Rub, Tool."

Mark, Edge Follower- Faint intermittent marks at the edge of a cold rolled products which are usually perpendicular to the rolling direction. This mark caused by action of devices designed to rewind coils without weave.

Mark, Handling- (1) For rolled products, an area of broken surface that is introduced after processing. The mark usually has no relationship to the rolling direction. (2) For extrusions, damage that can be imparted to the surface during handling operations.

Mark, Heat Treat Contact- Brownish, iridescent, irregularly, shaped stain with a slight abrasion located somewhere within the boundary of the stain. It is a result of metal-to-metal contact during the quenching of solution heat-treated flat sheet or plate.

Mark, Inclusion- Appearance of surface where actual inclusion or the void it left is observed. See also "Inclusion, Stringer."

Mark, Knife- A continuous scratch (which may also be creased) near a slit edge, caused by sheet contracting the slitter knife.

Mark, Knock-Out- A small solid protrusion of circular fin on a forging or a casting, resulting from the depression of a knock-out pin under pressure or inflow of metal between the knock- out pin and the die or mold.

Mark, Leveller Chatter- See "Mark, Chatter (Roll or Leveller)."

Mark, Metal-on-Roll- See "Dent, Repeating."

Mark, Mike- Narrow continuous line near the rolled edge caused by a contacting micrometer.

Mark, Pinch- See "Crease."

Mark, Roll- (1) For rolled products, a small repeating raised or depressed area caused by the opposite condition on a roll. The repeat distance is a function of the offending roll diameter. (2) For extrusion, a longitudinal groove or indentation caused by pressure from contour rolls as a profile (shape) passed through them for dimensional correction.

Mark, Roll Bruise- A greatly enlarged roll mark whose height or depth is very shallow. See "Mark, Roll."

Mark, Roll Skid- A full width line perpendicular to the rolling direction and repeating as a function of a work roll diameter.



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**Mark, Rub-** A large number of very fine scratches or abrasions. A rub mark can occur by metal-to-metal contact, movement in handling and movement in transit.

**Mark, Snap-** A band-like pattern around the full perimeter of an extruded section and perpendicular to its length. A snap mark can occur whenever there is an abrupt change in the extrusion process. See "Mark, Stop."

**Mark, Stop-** A band-like pattern around the full perimeter of an extruded section and perpendicular to its length. A stop mark occurs whenever the extrusion process is suspended. See "Mark, Snap."

**Mark, Stretcher Jaw-** A cross hatched appearance left by jaws at the end(s) of metal that has been stretched. These marks are seen if insufficient metal has been removed after the stretching operation.

**Mark, Tab-** See "Buckle, Arbor." **Mark, Tail-** See "Scratch, Tension."

**Mark, Take Up-** See "Scratch, Tension."

**Mark, Traffic-** Abrasion which results from relative movement between contracting metal surfaces during handling and transit. A dark color from the abrasively produced aluminum oxide is usually observed. A mirror image of a traffic mark is observed on the adjacent contracting surface.

**Mark, Whip-** A surface abrasion which is generally diagonal to the rolling direction. It is caused by a fluttering action of the metal as it enters the rolling mill.

**Master Alloy-** See "Hardener."

**Mean Diameter-** The average of two measurements of the diameter at right angles to 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 relationship between stress and strain; for example, modulus of elasticity, tensile strength, endurance limit. These properties are often incorrectly referred to as physical properties.

**Mike Mark-** Narrow continuous line near the rolled edge caused by a contracting micrometer.

**Minimum Residual Stress (MRS)-** The term applied to products, usually flat rolled, which have been processed to minimize internal stress of the kind that caused distortion when material is disproportionately removed from one of the two surfaces through mechanical or chemical means.

**Mismatch-** Error in register between two halves of a forging by opposing die halves not being in perfect alignment.



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**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 there are three kinds of moduli of elasticity for any material modulus in tension, in compression, and in shear.

**Mottling, Pressure-** Non-uniform surface appearance resulting from uneven pressure distribution between adjacent layers of the product.

**Mullen Test-** Measurement of bursting strength of foil in pounds per square inch. Testing machine applies increasing pressure to one square inch of the sample until it ruptures.

### N

**Natural Aging-** See "Aging."

**Nick-** Rolled product, see "Scratch." Extrusions, see "Mark, Handling."

**Non-Heat-Treatable Alloy-** An alloy which can be strengthened only by cold work. Nonfill-Failure of metal to fill a forging die impression.

**Notch, Double Shear-** An abrupt deviation from straight on a sheared edge. This offset may occur if the flat sheet or plate is longer than the blade for the final shearing operation.

### O

**Off Gauge-** Deviation of thickness or diameter of a solid product, or wall thickness of a tubular product, from the standard or specified dimensional tolerances.

**Offset-** Yield strength by the "offset method" is computed from a load-strain curve obtained by means of an extensometer. A straight line is drawn parallel to the initial straight line portion of the load-strain curve and at a distance to the right corresponding to 0.2 percent offset (0.002 in. per in. of gauge length) of the tension test specimen is the yield strength.

**Oil Stain-** See "Stain, Oil."

**Orange Peel-** Surface roughening on formed products which occurs when large grains in the metal are present.

**Oscillation-** Uneven wrap in coiling and lateral travel during winding. Improper alignment of rolls over which the metal passed before rewinding and insufficient rewind tension are typical caused. See also "Telescoping."

**Out-Of-Register-** An embossed pattern distortion due to misalignment of the male and female embossing rolls.

**Ovality-** Deviation from a circular periphery, usually expressed as the total difference found at



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any cross section between the individual maximum and minimum diameters, which usually occur at or about 90 degrees to each other. Since ovality is the difference between extreme diameters, it is not expressed as plus or minus.

Ovalness- See "Ovality"

Oxide Discoloration- See "Stain, Heat Treat."

### P

Pack Rolling- The simultaneous rolling of two or more thickness of foil.

Parent Coil- A coil that has been processed to final temper as a single unit. The parent coil may subsequently be cut into two or more smaller plates to provide the required width and length.

Partial Annealing- See "Annealing, Partial."

Parting Line- A condition unique to stepped extrusions where more than one cross section exists in the same extruded shape. A step shape uses a split die for the minor or small cross section and after its removal, another die behind it for the major configuration. Slightly raised fins can appear on that portion of the shape where the two dies meet. See also "Profile, Stepped Extruded."

Patterned Sheet- See " Embossing."

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

Pick Off- The transfer of portions of the coating from one surface of the sheet to an adjacent surface due to poor adhesion of the coating.

Pickup- Small particles of oxide adhering to the surface of a product at irregular intervals.

Pickup Repeating- See "Dent, Repeating."

Pickup, Roll- Small particles of aluminum and aluminum oxide generated in the roll bite which subsequently transfer to the rolled product. It may be distributed uniformly and/or in streaks. See also "Streak, Coating."

Pinch Mark- See "Crease."

Pinhole- (1) Minute hole in foil. (2) A small-sized void in the coating of sheet or foil product. A typical cause is solvent popping.



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Pipe- Tube is standardized combinations of outside diameter and wall thickness, commonly designed by "Normal Pipe Size" and "ANSI Schedule Numbers."

Pipe, Drawn- Pipe brought to the final dimensions by drawing through a die.

Pipe, Extruded- Pipe formed by extruding.

Pipe, Seamless- Extruded or drawn pipe, which does not contain any line junctures resulting from the method of manufacture.

Pipe, Structural- Pipe commonly used for structural purpose.

Piping- See "Back End Condition."

Pit- A depression in the rolled surface which is usually not visible from the opposite side.

Pitting- See "Corrosion."

Plate- A rolled product that is rectangular in cross section and with thickness not less than 0.250 inch with sheared or sawed edges.

Plate, Circle- Circle cut from plate.

Plate, Alclad- Composite plate comprised of an aluminum alloy core having on both surface (if on one side only Alclad One Side Plate) A metallurgically bonded aluminum or aluminum alloy coating that is anodic to the core, thus electrolytically protecting the core against corrosion

Pop, Solvent- Blister and/or void in the coating resulting from trapped solvents released during curing process.

Precipitation Hardening- See "Aging." Precipitation Heat Treating- See "Aging."

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

Pressure Mottling- See "Mottling, Pressure."

Profile- A wrought product that is long in relation to its cross-sectional dimensions, which is of a form other than that of sheet, plate, rod, tube, wire or foil.

Profile, Class 1 Hollow Extruded- A hollow extruded profile, the void of which is round and 1 inch or more in diameter and whose weight is equally distributed on opposite sides of two or more equally spaced axes.



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Profile, Class 2 Hollow Extruded- Any hollow extruded profile 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.

Profile, Class 3 Hollow Extruded- any hollow extruded profile other than class 1 or class 2.

Profile, Cold-Finished- a profile brought to final dimensions by cold-working to obtain improved surface finish and dimensional tolerances.

Profile, Cold-Finished Extruded- A profile produced by cold-finishing an extruded profile. Profile, Cold-Finished Rolled- A profile produced by cold-finishing a rolled profile.

Profile, Drawn- A profile brought to final dimensions by drawing through a die. Profile, Extruded- a profile produced by hot extruding.

Profile, Flute Hollow- A hollow profile having plain inside surfaces and whose outside surfaces comprise regular, longitudinal, concave corrugations with sharp cusps between corrugations.

Profile, Helical Extruded- An extruded profile twisted along its length.

Profile, Hollow- A profile any part of whose cross section completely encloses a void.

Profile, Lip Hollow- A hollow profile of generally circular cross section and nominally uniform wall thickness with one hollow or solid protuberance or lip parallel to the longitudinal axis; used principally for heat-exchange purposes.

Profile, Pinion Hollow- A hollow profile with regularly spaced, longitudinal serrations outside and round inside, used primarily for making small gears.

Profile, Rolled- A profile produced by hot rolling.

Profile, Semi-hollow- A profile 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. The ratio of the area of the void to the square of the gap is dependent on the class of semi-hollow profile, the alloy and the gap width.

Profile, Solid- A profile other than hollow or semi-hollow.

Profile, Stepped Extruded- An extruded profile whose cross section changes abruptly in area at intervals along its length.

Profile, Streamline Hollow- A hollow profile with a cross section of tear-drop shape.

Profile, Structural- A profile in certain standard alloys, tempers, sizes, and sections, such as angles, channels, H-sections, I-beams, tees, and zees commonly used for structural purpose. For channels and I-beams, there are two standards, namely Aluminum Association Standard and American Standard.



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Profile, Tapered Extruded- An extruded profile whose cross section changes continuously in area along its length or a specified portion thereof.

### Q

Quarter Buckle- See "buckle, Quarter."

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

### R

RCS- Abbreviation for Rigid Container Sheet. Razor Streak- See " Inclusion, Stringer."  
Rear End Condition- See " Back End Condition."

Redraw Rod- This term is not recommended. The term "Drawing Stock" is preferred.

Refined Aluminum- Aluminum of very high purity (99.950 percent or higher) obtained by special metallurgical treatment.

Reflector Sheet- Sheet suitable for the manufacture of reflectors.

Re Heating Heating metal again to hot-working temperature. In general no structural changes are intended.

Re-oil- Oil put on the sheet after cleaning and before coiling for shipment to prevent water stain.

Reroll Stock- A semi-finished rolled product of rectangular cross-section in coiled form suitable for further rolling. Example: "Foil Stock" and " Sheet Stock."

Rib- An elongated projection on a shape, forging or casting to provide stiffening. Rivet- See "Wire, Cold-Heating."

Rod- A solid wrought product that is long in relation to its circular cross section, which is not less than 0.375 inch diameter.

Rod, Alclad- Rod having on its surface a metallurgically bonded aluminum alloy coating that is anodic to the core alloy to which it is bonded, thus electrolytically protecting the core alloy against corrosion.

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

Rod, Cold-Finished Extruded- Rod produced by cold working



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Rod, Cold-finished Rolled- Rod produced by cold working rolled rod.

Rod, Cold-Heading- Rod of a quality suitable for use in the manufacture of cold-headed products such as rivets and bolts.

Rod, Extruded- Rod produced by hot extruding. Rod, Rivet- See " Rod, Cold heading."

Rod, Rolled- Rod produced by hot rolling.

Roll Chatter- See " Mark, Chatter (Roll or Leveller). Roll Coating- See "Streak, Coating."

Roll Grind- The uniform ground finish on the work rolls which is imparted to the sheet or plate during rolling.

Roll Mark- See "Mark, Roll." Roll Pickup- See "Pickup, Roll."

Rolled Ring- See "Forging, Rolled Ring." Rolled-In Scratch- See " Scratch, Rolled-In."

Rolled-in Metal- An extraneous chip or particle of metal rolled into the surface of the product.

Rolled-over Edge- See "Edge, liquated."

Rolling Ingot- A cast form suitable for rolling. See "Fabricating Ingot."

Rolling slab- A rectangular semi-finished product, produced by hot rolling fabricating ingot and suitable for further rolling.

Roofing Sheet- Coiled or flat sheet in specific tempers, widths, and thicknesses suitable for the manufacture of corrugated or V-crimp roofing.

Roping- A rope-like appearance in the rolling direction after the metal has undergone severe deformation.

Roundness- This term is not recommended. The term "Ovality" is preferred. Rub Mark- See " Mark, Rub."

Rub, Tool- A surface area showing a scratch or abrasion resulting from contact of the hot extrusion with the press equipment or tooling or, in the case of multi-hole dies, with others sections as they exit the press.

## S

Sample- A part, portion, or piece taken for purposes of inspection or test as representative of the whole.



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Saw-Plate Bar- See " Bar, Saw-Plate."

Scalping- Mechanical removal of the surface layer from a fabricating ingot or semi-finished wrought product so that surface imperfections will not be worked into the finished product.

Scratch- (1) For rolled products, a sharp indentation in the surface usually caused by a machine or during handling. (2) For extrusions, a synonym for handling mark. See "Mark, Handling."

Scratch, Drawn-In- A scratch occurring during the fabrication process and subsequently drawn over, making it relatively smooth to the touch.

Scratch, Friction- A scratch caused by relative motion between two contacting surfaces.

Scratch, Handling- A more severe form of rub mark. See "Mark, Rub."

Scratch, Machine- An indentation which is straight, is in the rolling direction and is caused by contact with a sharp projection in equipment.

Scratch, Oscillation- Minor indentation at an angle to the rolling direction that result from coil, oscillation during unwinding or rewinding.

Scratch, Oven- A scratch which is caused by moving contact of coating against a non-moving object in an oven.

Scratch, Rolled-In- A scratch which is subsequently rolled. It will then appear as a greyish white ladder (distinct transverse lines within the longitudinal indentation).

Scratch, Slippage- See "Scratch, Tension."

Scratch, Tension- A short longitudinal indentation parallel to the rolling direction.

Seam Defect- An unbonded fold or lap on the surface of the metal, which appears as a crack, usually the result of a defect in working that has not bonded shut.

Seam, Extrusions- The junction line of metal that has passed through a hollow die, separated and rejoined at the exit point. Seams are present in all extruded hollows produced from the direct extrusion process and in many cases are not visible. See "Weld, Incomplete."

Seamless- A hollow product which does not contain any line junctures resulting from method of manufacture.

Section Number- The number assigned to an extruded or drawn profile (shape) for identification and cataloging purpose, usually the same number assigned for the same purpose to the die which the profile (shape) is made.



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Serpentine Weave- See "Snaking."

Shear Strength- The maximum stress that a material is capable of sustaining in shear. In practice, shear strength is considered to be the maximum average stress computed by dividing the ultimate load in the plane of shear by the original area subject to shear. Shear 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 shear strength.

Sheet- A rolled product that is rectangular in cross section with thickness less than 0.250 inch but not less than 0.006 inch and with slit, sheared or sawed edges.

Sheet Stock- See "Reroll Stock."

Sheet, Alclad- 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.

Sheet, Anodizing- Sheet with metallurgical characteristics and surface quality suitable for the development of protective and decorative films by anodic oxidation processes.

Sheet, Clad- Composite sheet having on both surfaces (if on one side only, Clad One Side Sheet) a metallurgically bonded metal coating, the composition of which may or may not be the same as that of the core.

Sheet, Coiled- Sheet in coils with slit edges.

Sheet, Coiled Circles- Circles cut from coiled sheet.

Sheet, Coiled Cut to Length- Sheet cut to specified length from coils and which has a lesser degree of flatness than flat sheet.

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

Sheet, Flat Circles- Circles cut from flat sheet.

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

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

Sheet, Painted- Sheet, one or both sides of which has a factory-applied paint coating of controlled thickness.



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Sheet, Standard One Side Bright Finish (1SBF)- Sheet having a uniform bright finish on one side and a mill finish on the other.

Short Transverse Direction- For plate, Sheet, and forgings, the direction through the thickness perpendicular to both longitudinal and long transverse directions.

Shrinkage- Contraction that occurs when metal cools from the hot-working temperature. Side Crack- See "Edge, Broken (Cracked)."

Side Set- A difference in thickness between the two edges of plate, sheet or foil.

Skip- An area of uncoated sheet which is frequently caused by equipment malfunction. Slippage

Scratch- See " Scratch, Tension."

Slitter Hair- See " Hair, Slitter."

Sliver- Thin fragment of aluminum which is part of the material but only partially attached.

Surface damage or residual liquation which is subsequently rolled are typical causes.

Slug- A metal blank for forging or impacting.

Smudge- A dark film or debris, sometimes covering large areas, deposited on the sheet during rolling.

Smut- See " Smudge."

Snaking- A series of reversing lateral bows in coil products. This condition is caused by a weaving action during an unwinding or rewinding operation.

Solution Heat Treating- 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.

Specimen- That portion of a sample taken for evaluation of some specific characteristic or property.

Speed Crack- See " Tear, Speed." Splice- The end joint uniting two webs.

Spot, Lube- A non-uniform extraneous deposit of lube on the coated sheet.

Squareness- Characteristic of having adjacent sides or planes meeting at 90 degrees.

Stabilizing- A low temperature thermal treatment designed to prevent age softening in certain strain hardened alloys containing magnesium.

Stain, Heat Treat- A discoloration due to non-uniform oxidation of the metal surface during heat treatment.



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**Stain, Oil-** Surface discoloration, which may vary from dark brown to white and is produced during thermal treatment by incomplete evaporation and/or oxidation of lubricants on the surface.

**Stain, Saw Lubricant-** A yellow to brown area of surface discoloration at the ends of the extruded length. It is the residue of certain types of saw lubricants if they are not removed from the metal prior to the thermal treatment.

**Stain, Water-** See "Corrosion, Water Stain."

**Starvation-** Non-uniform coating application which results in absence of coating in certain areas.

**Sticking-** Adherence of foil surface sufficient to interfere with the normal ease of unwinding.

**Straightness-** the absence of divergence from a right (straight) line in the direction of measurement.

**Strain-** A measure of the change in size or shape of a body under stress, referred to its original size or shape. Tensile or compressive strain is the change, due to force, per unity of length in an original linear dimension in the direction of the force. It is usually measured as the change (in inches) per inch of length.

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

**Streak (Stripe)-** A superficial band or elongated mark which produces a non-uniform surface appearance. A streak is often described by source.

**Streak, Bearing-** A longitudinal discoloration that can occur where there are changes in wall thickness as a result of uneven cooling. These streaks usually appear lighter than the surrounding metal.

**Streak, Bright-** A bright superficial band or elongated mark which produces a non-uniform surface appearance.

**Streak, Buff-** A dull continuous streak caused by smudge buildup on a buff used at shearing or other operations.

**Streak, Burnish-** A bright region on the sheet caused by excessive roll surface wear.

**Streak, Coating-** A banded condition caused by non-uniform adherence of roll coating to a work roll. It can be created during hot and/or cold rolling. If generated in the hot rolling process, it is also called "Hot Mill Pickup."



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Streak, Cold- See "Streak, Heat."

Streak Diffusion- Surface discoloration which may vary from gray to brown and found only on alclad products.

Streak, Dirt- Surface discoloration which may vary from gray to black, is parallel to the direction of rolling, and contains rolled in foreign debris. It is usually extraneous material from an overhead location that drops onto the rolling surface and is shallow enough to be removed by etching or buffing.

Streak, Grease- A narrow discontinuous streak caused by rolling over an area containing grossly excessive lubricant drippage.

Streak, Grinding- A streak with a helical pattern appearance transferred to a rolled product from a work roll.

Streak, Heat- Milky colored band (s) parallel to the rolling directions, which vary in both width and exact location along the length.

Streak, Herringbone- Elongated alternately bright and dull chevron markings.

Streak, Leveller- A streak on the sheet surface in the rolling direction caused by transfer from the leveler rolls.

Streak, Mill Buff- See " Streak, Roll." Streak, Pick-up- See "Streak, Coating."

Streak, Roll- A non-uniform surface appearance parallel to the rolling direction.

Streak, Structural- A non-uniform appearance on an etched or anodized surface caused by heterogeneities (variabilities) remaining in the metal from the casting, thermal processes or hot working stages of fabrication.

Stress- Force per unit area. Stress is normally calculated on the basis of the original cross-sectional dimensions. The three kinds of stresses are tensile, compressive, and shear.

Stress Corrosion Cracking- See "Corrosion, Stress Cracking.'

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

Stretcher Strain- See "Line, Luders."

Striation- Longitudinal non-uniform coating thickness caused by uneven application of the liquid coating.



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Strip- This term is not recommended. The term "Sheet" is preferred. Structural Streak- See "Streak, Structural.'

Suck-In- A defect caused when one face of a forging is sucked in to fill a projection on the opposite side.

Surface Tear- Minute surface cracks on rolled products which can be caused by insufficient ingot scalping.

### T

Tail Mark- See " Mark, Roll Bruise."

Tear, Speed- A series of surface cracks perpendicular to the extruding direction. Speed tearing normally occurs in corner radii or extremities of a section and is caused by localized high temperature.

Telescoping- Lateral stacking, primarily in one direction, of wraps in a coil so that the edges of the coil are conical rather than flat. Improper alignment of rolls over which the metal passes before rewinding is a typical cause. See also "Oscillation."

Temper- The condition produced by either mechanical or thermal treatment, or both, and characterized by a certain structure and mechanical properties.

Tensile Strength- In tensile testing, the ratio of maximum load to original cross-sectional area. Also called "Ultimate Strength."

Tension Scratch- See " Scratch, Tension.'

Tolerance- Allowable deviation from a nominal or specified dimension.

Tool- A term usually referring to the dies, mandrels, etc., used in the production of extruded or drawn shapes or tube.

Tooling Pad- See " Chucking Lug."

Torn Surface- A deep Longitudinal rub mark resulting from abrasion by extrusion or drawing tools.

Traffic Mark- Abrasion which results from relative movement between contraction metal surfaces during handling and transit. A dark color from the abrasively produced aluminum oxide is usually observed. A mirror image of a traffic mark is observed on the adjacent contracting surface.



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Transverse Bow- See "Bow, Transverse."

Transverse Direction- A direction perpendicular to the direction of working.

Tread Plate- Sheet or plate having a raised figured pattern on one surface to provide improved traction.

Trim Inclusion- Edge trimming accidentally wound into a roll or foil.

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

Tube, Arc-Welded- Tube made from sheet or plate butt welded by either gas-tungsten or gas-metal arc-welding method, with or without the use of filler metal.

Tube Blossom- This term is not recommended. The term "Tube Stock" is preferred.

Tube Stock- A semifinished tube suitable for the production of drawn tube.

Tube, Alclad- 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.

Tube, Blazed- A tube produced by forming and seam-brazing sheet.

Tube, Butt-welded- A welded tube, the seam of which is formed by positioning one edge of the sheet against the other for welding.

Tube, Drawn- A tube brought to final dimensions by cold drawing through a die. (Note: This product may be produced from either seamless or non-seamless extruded stock or from welded stock.)

Tube, Embossed- A tube the outside surface of which has been roll-embossed with a design in relief regularly repeated in a longitudinal direction.

Tube, Extruded- A tube formed by hot extruding. (Note: This product may be either seamless or non-seamless.)

Tube, Finned- Tube which has integral fins or projections protruding from its outside surface.

Tube, Fluted- A tube of nominally uniform wall thickness having regular, longitudinal, concave corrugations with sharp cusps between corrugations.



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**Tube, Heat-Exchanger-** A tube for use in apparatus in which fluid inside the tube will be heated or cooled by fluid outside the tube. The term usually is not applied to coiled tube or to tubes for use in refrigerators or radiators.

**Tube, Helical-Welded-** A welded tube produced by winding she sheet to form a closed helix and joining the edges of the seam by welding.

**Tube, Lap-Welded-** A welded tube the seam of which is formed by longitudinally lapping the edges of the sheet for welding.

**Tube, Lock-Seam-** A tube produced by forming and mechanically lock-seaming sheet.

**Tube, Open-Seam-** A shape normally produced from sheet of nominally uniform wall thickness and approximately tubular form but having a longitudinal unjointed seam or gap of width not greater than 25 percent of the outside diameter or greatest over-all dimensions. Also referred to as "Butt-Seam Tube."

**Tube, Redraw-** This term is not recommended. The term "Tube Stock" is preferred.

**Tube, Seamless-** A tube that does not contain any line junctures (metallurgical welds) resulting from the method of manufacture. (Note: This product may be produced by die and mandrel or by hot piercer processes.)

**Tube, Sized-** A tube that, after extrusion, has been cold drawn a slight amount to minimize ovality.

**Tube, Stepped Drawn-** A drawn tube whose cross section changes abruptly in area at intervals along its length.

**Tube, Structural-** Tube commonly use for structural purposes.

**Tube, Welded-** A tube produced by forming and seamwelding sheet longitudinally.

**Tubing-Electrical Metallic-** A tube having certain standardized length and combinations of outside diameter and wall thickness thinner that that of "Rigid Conduit," commonly designated by nominal electrical trade sizes, for use with compression-type fittings as a protection for electric wiring.

**Tubular Conductor-** A tubular product suitable for use as an electric conductor.

**Twist-** (1) For rolled products, a winding departure from flatness. (2) For extrusions, a winding departure from straightness.

**Two-Tone-** A sharp color demarcation in the appearance of the metal due to a difference in the work roll coating.



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### U

Ultimate Tensile Strength- See "Tensile Strength."

### V

Vent Mark- A small protrusion on a forging resulting from the entrance of metal into a die vent hole.

### W

Water Stain- See "Corrosion, Water Stain."

Wavy Edge- See "Buckle, Edge." Weave- See "Oscillation."

Web- (1) A single thickness of foil as it leaves the rolling mill. (2) A connecting element between ribs, flanges, or bosses on shapes and forgings.

Weld Line- See "Seam, Extrusions."

Weld, Incomplete- The junction line of metal that has passed through a die forming a hollow profile (shape) separated and not completely rejoined. Flare testing is a method of evaluating weld integrity.

Welding- Joining two or more pieces of aluminum by applying heat or pressure, or both, with or without filler metal to produce a localized union through fusion or recrystallization across the interface. (In cold welding, it is a solid state welding process in which pressure is used at room temperature to produce coalescence of metals with substantial deformation at the weld.)

Welding Rod- A rolled extruded, or cast round filler metal for use in joining by welding. Welding

Wire- Wire for use as filler metal in joining by welding.

Wettability Test- The degree to which a metal surface may be wet to determine the absence of or the amount of residual rolling or added lubricants or deposits on the surface.

Whip Marks- See "Mark, Whip." Whisker- See "Hair, Slitter."

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 its round, hexagonal, or octagonal, and whose diameter or greatest perpendicular distance between parallel faces is less than 0.375 inch.



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Wire, Alclad- A composite wire product comprised of an aluminum-alloy wire having on its surface a metallurgically bonded aluminum or aluminum-alloy coating that is anodic to the alloy to which it is bonded, thus electrolytically protecting the core alloy against corrosion.

Wire, Cold-Heading- Wire of quality suitable for use in the manufacture of cold-headed products such as rivets and bolts.

Wire, Drawn- Wire brought to final dimensions by drawing through a die. Wire, Extruded- Wire produced by hot extruding.

Wire, Flattened- Wire having two parallel flat surfaces and rounded edges produced by roll-flattened round wire.

Wire, Flattened and Slit- Flattened wire that has been slit to obtain square edges.

Wire, Rivets- See "Wire, Cold-Heading."

Work Hardening- See "Strain Hardening."

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

Wrap, Loose- A condition in coil due to insufficient tension which creates a small void between adjacent wraps.

Wrinkle- See "Crease."

Wrought Product- A product that has been subjected to mechanical working by such processes as rolling, extruded, forging, etc.

## Y

Yield Strength- The stress at which a material exhibits a specified permanent set. The offset use for aluminum and its alloys is 0.2 percent of gauge length. For aluminum alloys the yield strengths in tension and compressions are approximately equal.