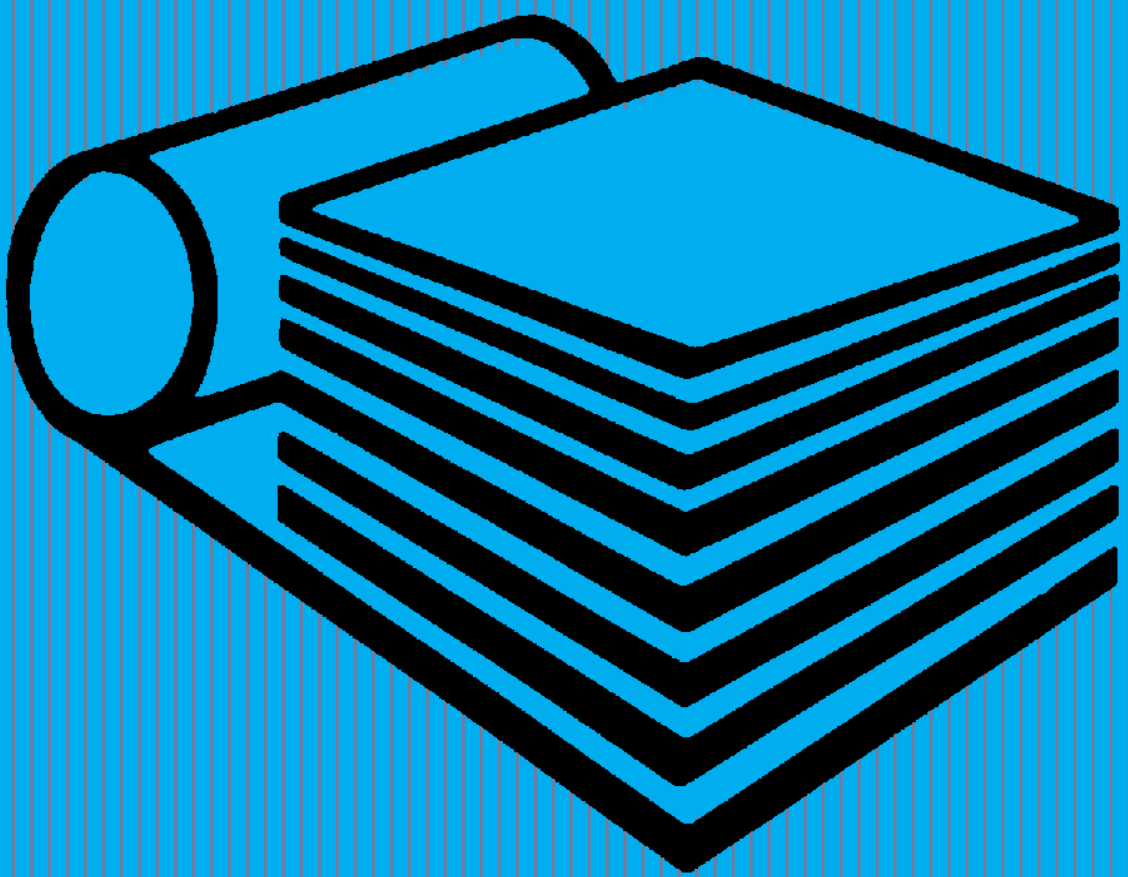


Visual Quality Characteristics of Aluminum Sheet and Plate

The Aluminum Association

Incorporated



Visual Quality Characteristics of Aluminum Sheet and Plate

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Fourth Edition
February 2002

The Aluminum Association
900 19th Street, N.W.
Washington, D.C. 20006

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ABOUT THE ALUMINUM ASSOCIATION

The Aluminum Association, based in Washington, DC, with offices in Detroit, MI, represents U.S. and foreign-based primary producers of aluminum, as well as recyclers, and producers of semi-fabricated products. Member companies operate almost 200 plants in the United States and many conduct business worldwide.

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Visual Quality Characteristics of Aluminum Sheet and Plate has been compiled by the Technology Committee of the Sheet and Plate Division as a reference for those who have an interest in these rolled products and who may have a need to know the terminology commonly used in this largest segment of the aluminum industry.

The terms are arranged alphabetically in the index based on the term noun followed by the appropriate adjective. There is a second index which categorizes the terms by the characteristics of flatness, metallurgical, surface, other and coating. The preferred terms, obtained by consensus, are defined; other terms for the same condition are cross-referenced in the alphabetical index.

The reader should be mindful that terminology is the subject of this document. **The visual quality characteristics defined, together with any visual representation, do not constitute quality standards.** In many instances, the definitions are enhanced by providing visual extremes.

Wherever possible, typical causes are given for the visual characteristics. These causes may differ from the experience of the reader because of alternate equipment, processes or technology. This edition retains the use of inch as the unit of distance referenced on figures whenever it was available from original sources.

Though a number of Association member companies provided pictures and sketches, Kaiser Aluminum and Chemical Corporation and the Japan Light Metal Association also gave The Aluminum Association use of illustrations from their published documents as information sources.

The 2002 Fourth Edition has been updated based upon suggestions made by Arvid N. Anderson, consultant. Mr. Anderson is the former chairman of The Aluminum Association's Task Group on Visual Quality Attributes of Aluminum Sheet and Plate.

ALUMINUM ASSOCIATION SHEET AND PLATE DIVISION COMPANIES

Alcan Inc.	Logan Aluminum, Inc.
Alcoa, Inc.	McCook Metals L.L.C.
ARCO Aluminum Inc.	Nichols Aluminum
Coastal Aluminum Rolling Mills, Inc.	Ormet Corporation
Corus Aluminium Rolled Products	Pechiney Rolled Products
Jupiter Aluminum Corporation	Precision Coil, Inc.
Kaiser Aluminum & Chemical Corporation	United Aluminum Corporation
Spectrulite Consortium, Inc.	

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FLATNESS—

Typical flatness characteristics are described in this section. Measurement of flatness, especially for thin sheet, is often made in terms of "I" units. The "I" unit is the measure of differential length between longitudinal elements of a rolled product. It offers more descriptive flexibility than do standard tolerance tables. The formula is:

$$I = \left(\frac{\pi}{2} \cdot \frac{H}{L} \right)^2 \left(10 \right)^5$$

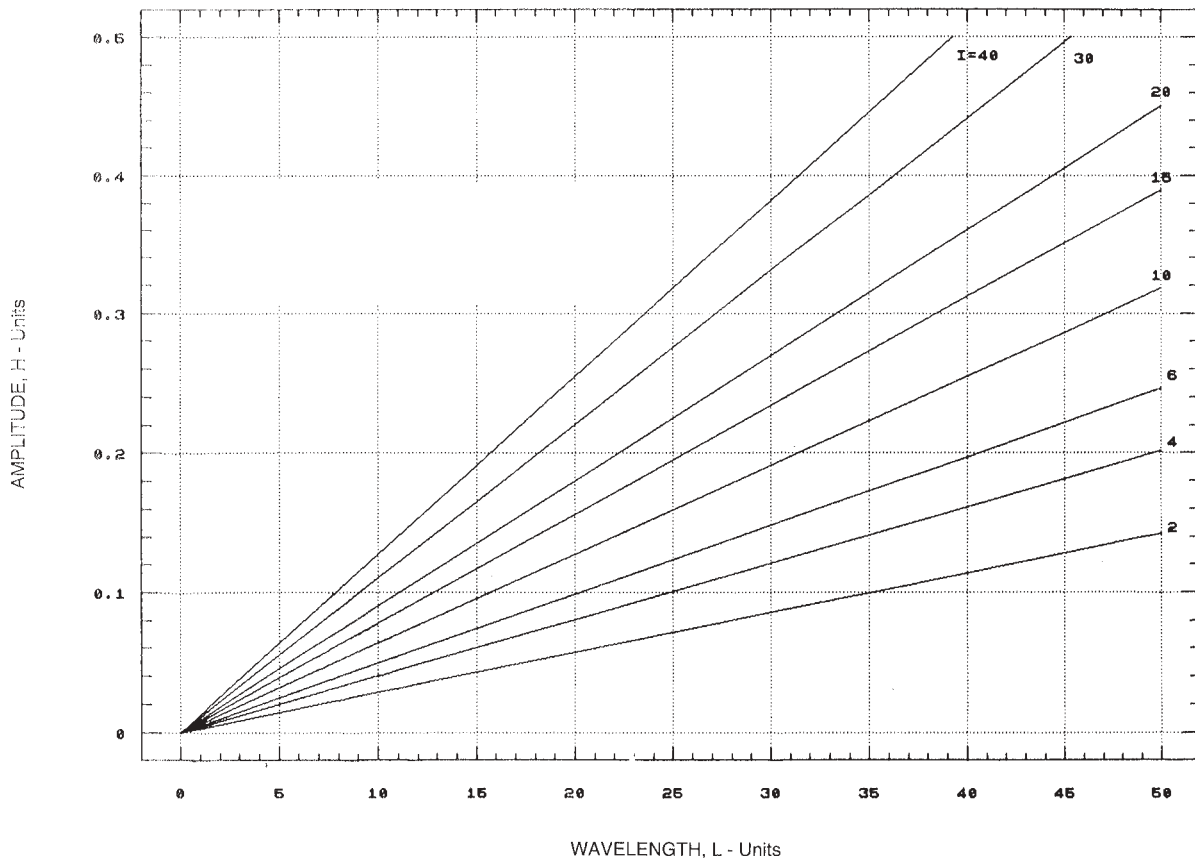
Where:

H = Average height (amplitude) of an out-of-flat section, valley to peak, in inches.

L = Average straightline wavelength of an out-of-flat section, peak to peak, in inches.

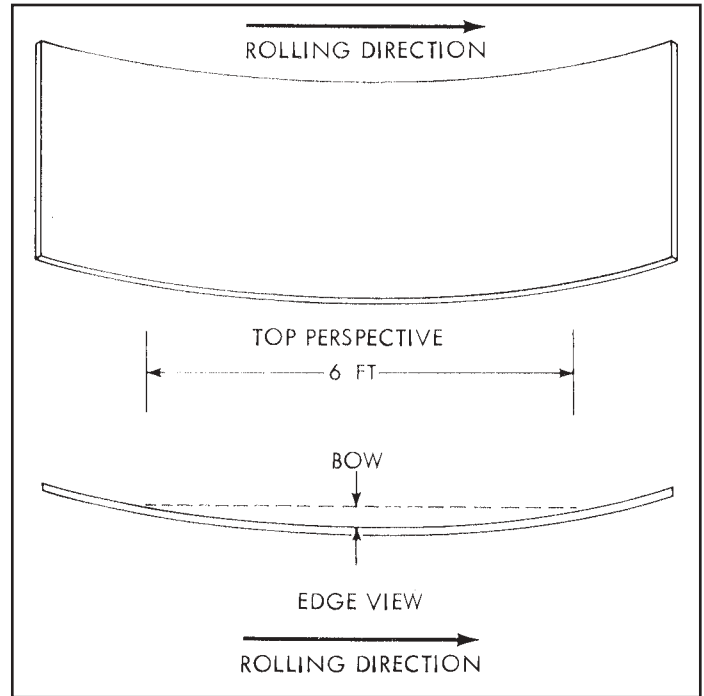
The graphical representation of this formula is shown:

FLATNESS MEASUREMENT CHART



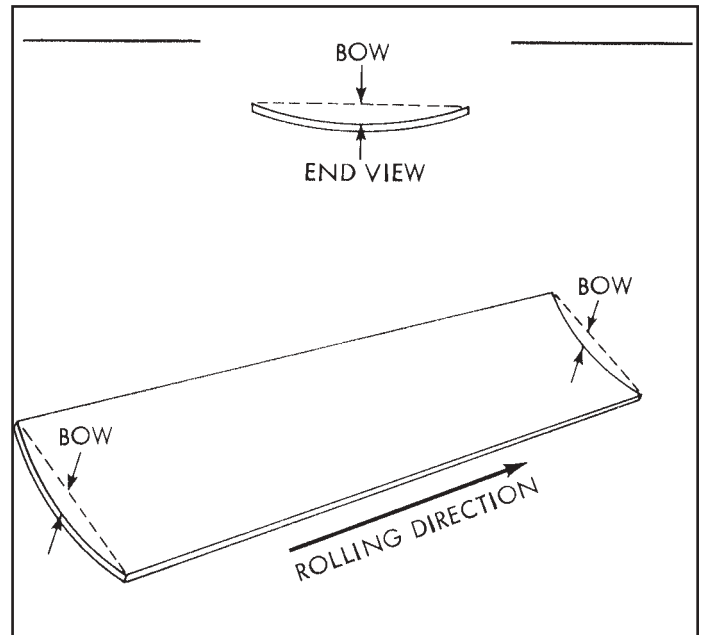
BOW, LONGITUDINAL—

Curvature in the plane of sheet or plate in the rolling direction. Usually caused by unbalanced stresses between the top and bottom surfaces of the rolled product. One type is coil set (coil curvature).



BOW, TRANSVERSE—

Curvature across the rolling direction of sheet or plate. Usually caused by a slight difference between the extension of the center of the sheet or plate and the edge. A more severe case can result in a center buckle. (Should not be confused with anti-clastic curvature. An example of anti-clastic curvature is the transverse off-flatness generated when a sheet with longitudinal bow conforms to a flat surface.)



BUCKLE—

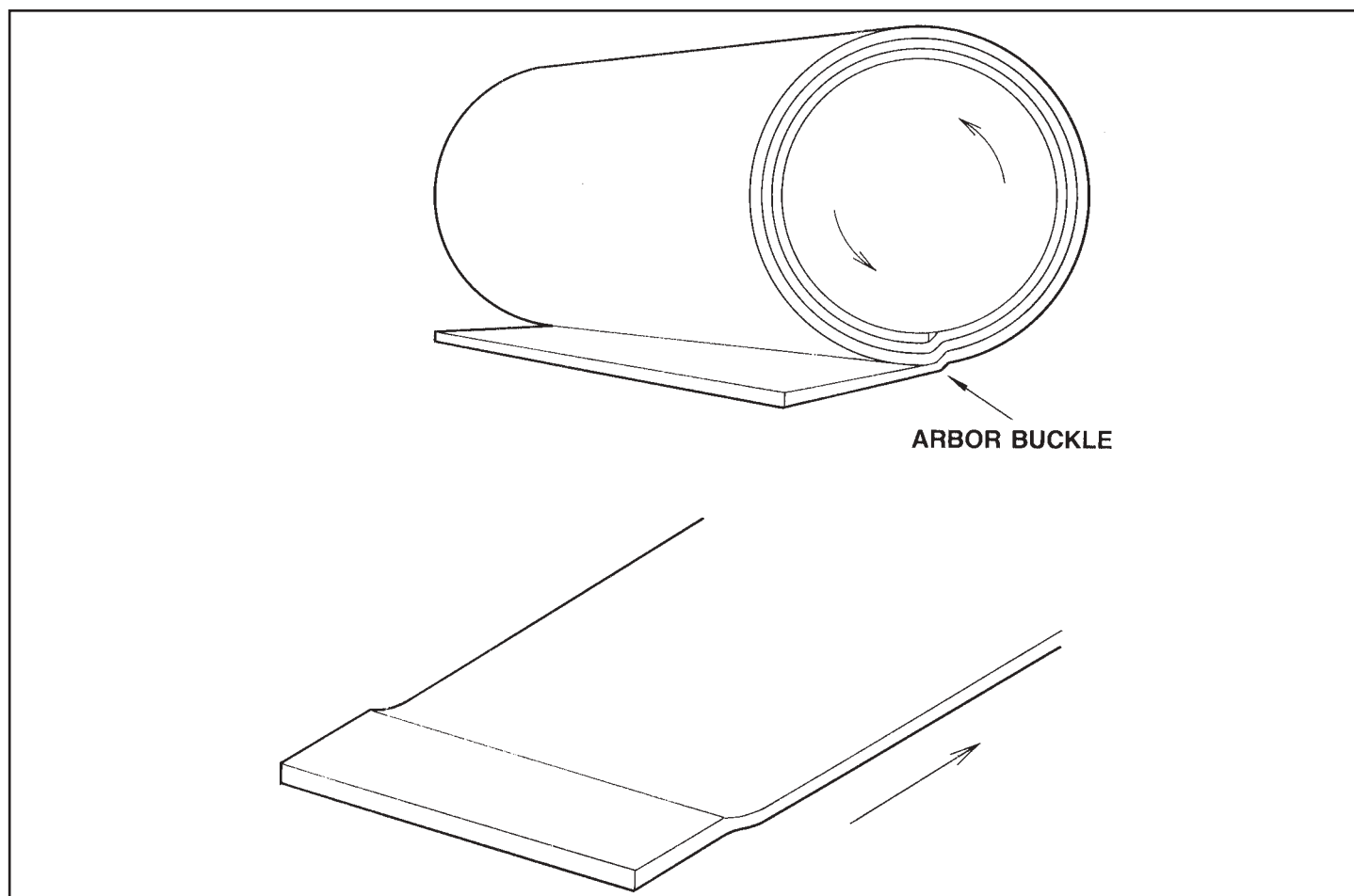
A distortion of the surface of the metal. Often described by (1) location across the product width of the metal or (2) cause. See following examples.

Buckles generated in the roll bite are caused by mismatch between entering metal cross sectional profile and the gap created by work rolls. Buckles are usually repetitive. Buckles can also be created by factors other than rolling reduction. **(No picture)**

BUCKLE, ARBOR—

(Arbor Break, Tab Mark)

Bends, creases, wrinkles, or departures 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, they are found on the ID of a coil but they can appear on the coil OD as a result of a prior winding operation. Arbor buckles are caused by plastic bending over a coil and in contact with the mandrel.



BUCKLE, CENTER—

(Full Center)

Undulations (wavy regions) in the center of the sheet width.

BUCKLE, EDGE—

(Edge Ripple, Edge Wave, Wavy Edge)

Undulations (wavy regions) along the edge(s) of the sheet width.

BUCKLE, QUARTER—

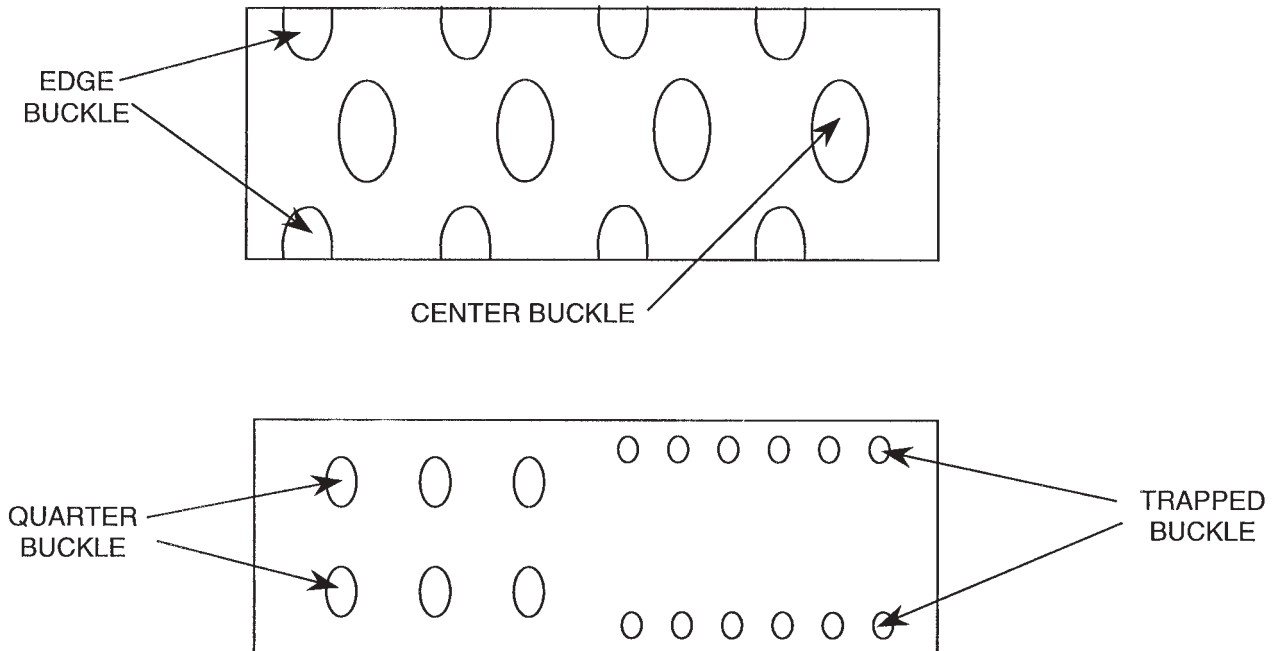
Undulations (wavy regions) which occur approximately at both quarter points across the sheet width.

BUCKLE, TRAPPED—

(Oil Can)

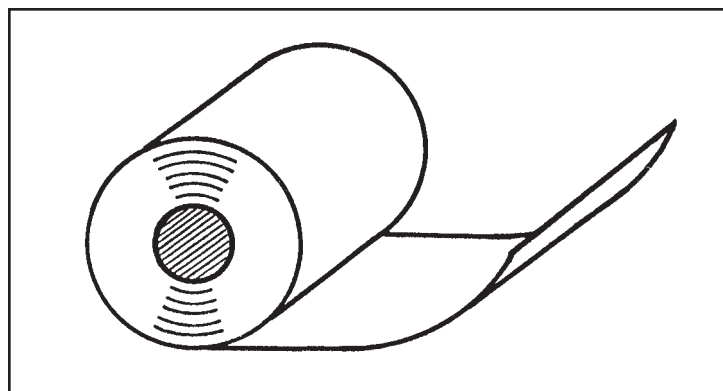
Undulations (wavy regions) which are smaller sized and often circular in shape.

BUCKLE
TOP VIEW

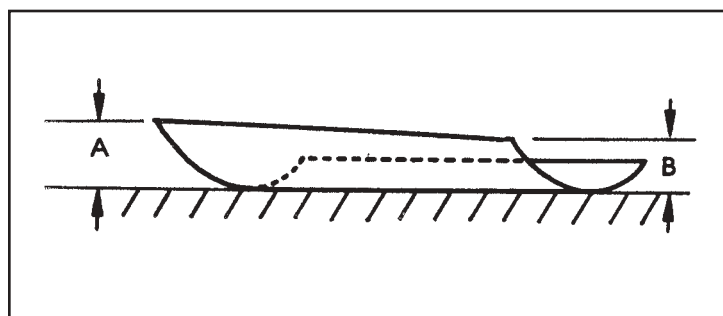


COIL SET—**(Coil Curvature)**

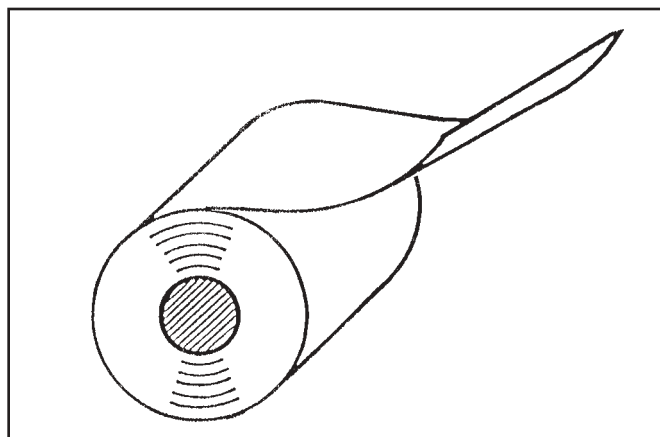
Longitudinal bow in an unwound coil in the same direction as curvature of the wound coil. This condition is caused by plastic bending during coil processing operation or by residual coil set from a prior operation.

**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. Typically a 3-foot long sample is used.

**COIL SET, REVERSED—**

Longitudinal bow in an unwound coil in the direction opposite to the curvature of the wound coil. Same causes as for **coil set**.



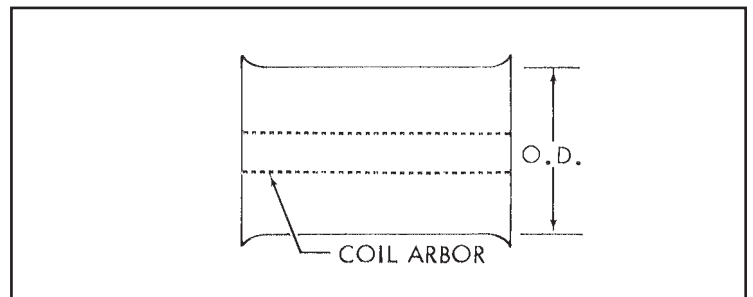
CREASE—

(Pinch Mark, Wrinkle)

A sharp deviation from flat in the sheet which is transferred from processing equipment subsequent to the roll bite. If longitudinal, typical sources include idler rolls, leveler rolls, segmented rolls and slitter spacers. If transverse, typical sources include mandrels, coil ends and racks.

**EDGE, BELLED—**

Excessive buildup of material on edge(s) during a rewinding operation. Typical causes include excessive edge burr, turned edge, and “dog bone” shaped cross sectional profiles.

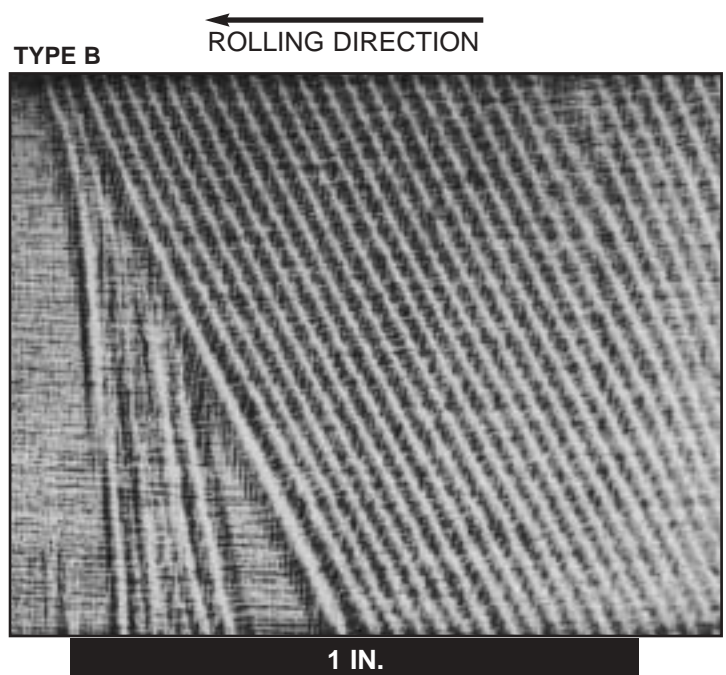
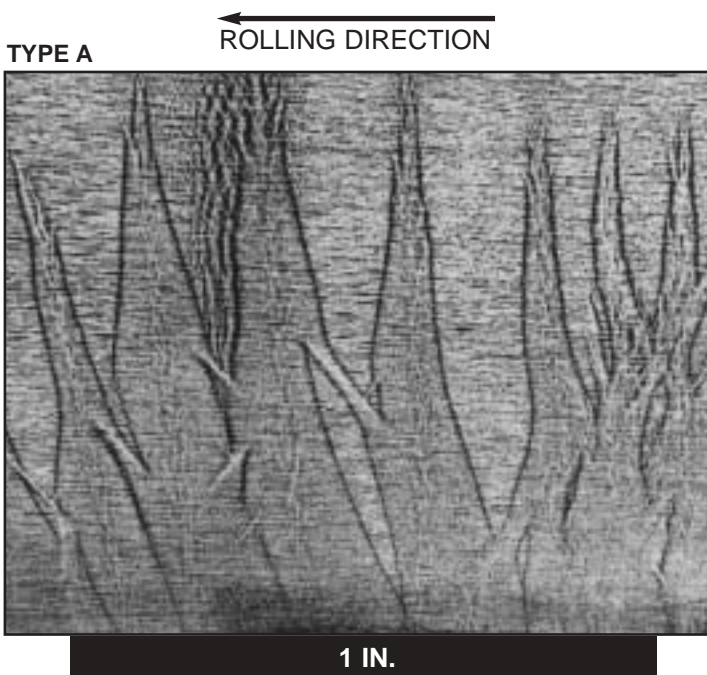
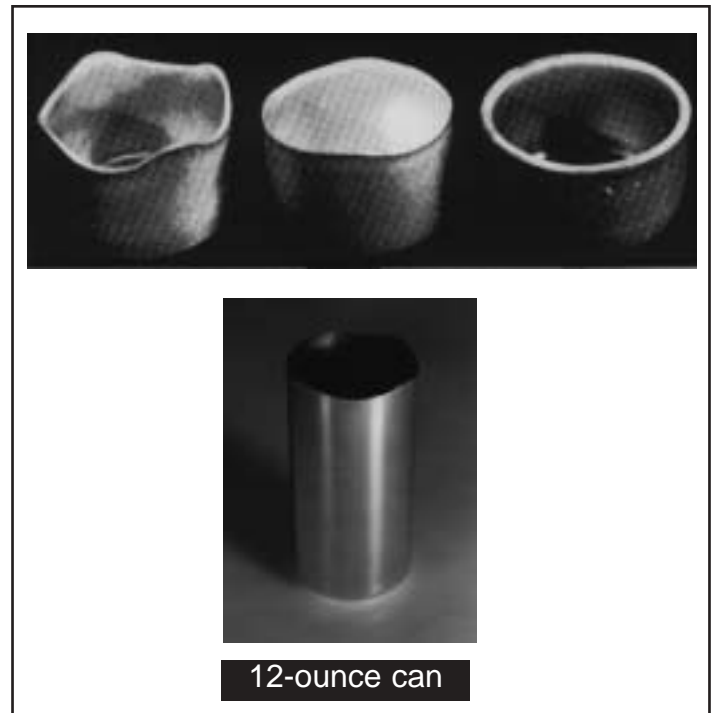


EARING—

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

LINE, LÜDERS—

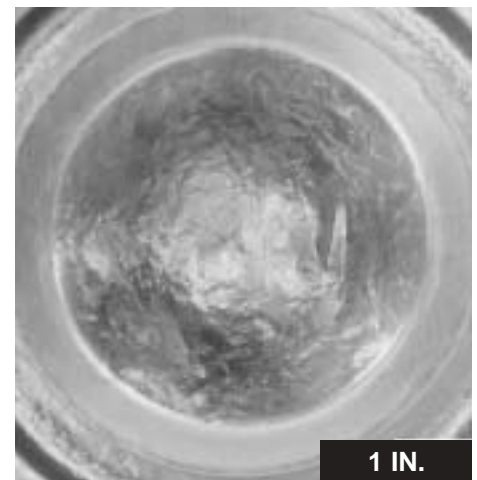
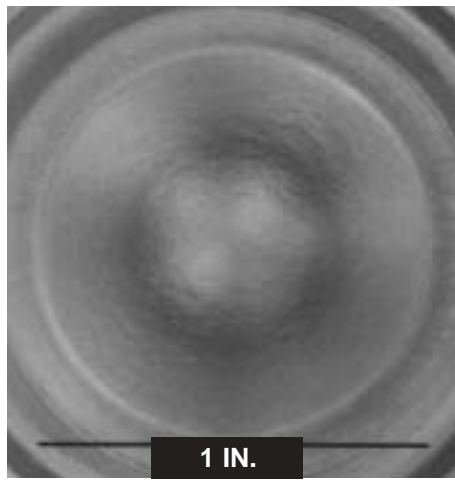
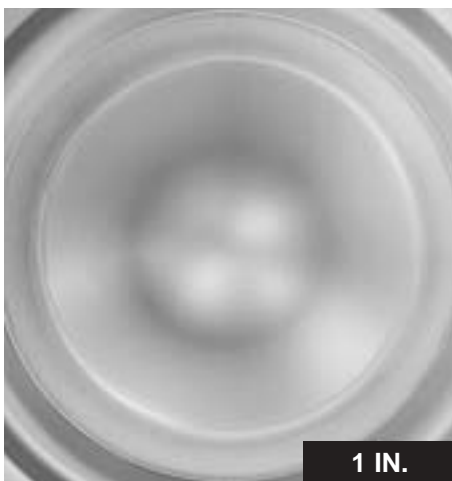
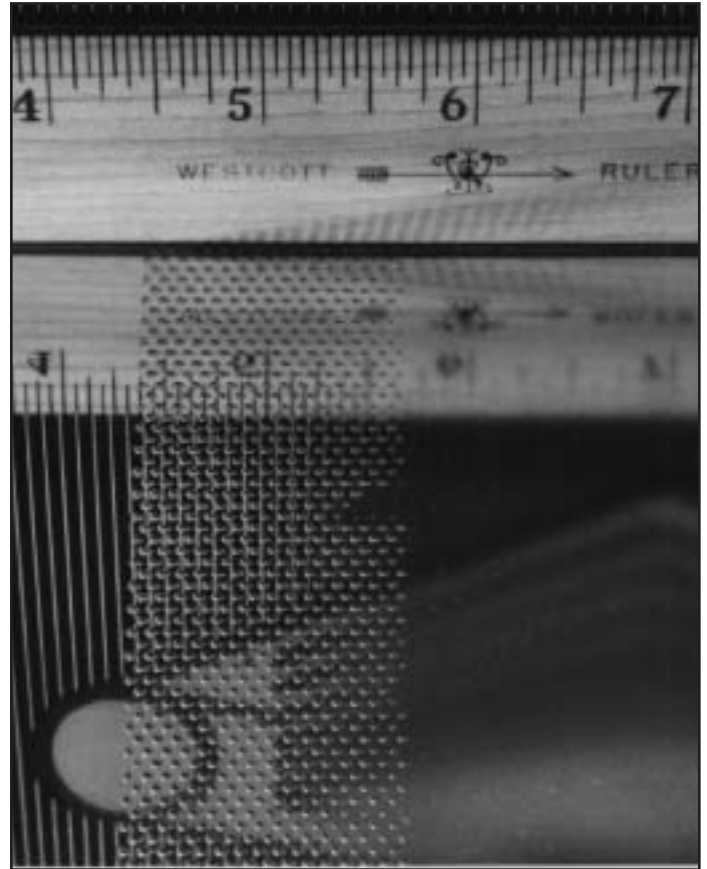
Elongated surface markings or depressions appearing in patterns caused by localized plastic deformation that results from non-uniform yielding. **Type A** lines are a yield-point elongation phenomena usually observed in annealed 5XXX series aluminum-magnesium alloys which have been drawn or stretch-formed in which some areas receive little deformation. **Type B** lines occur in most alloys when the metal has been stretched considerably beyond the yield point. **Type B** lines appear as diagonal bands oriented about 60 degrees to the tension axis, are rarely observed in commercial forming operations but may occur during stretching to produce good flatness.



ORANGE PEEL—

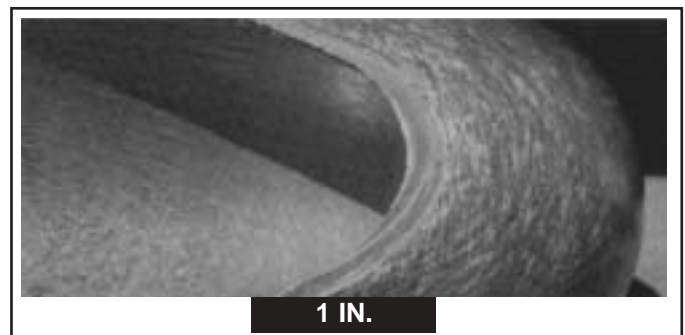
(Large Grain)

Surface roughening on products formed by bending, bulging and/or stretching which occurs when large grains in the metal are present. The photograph shows the effect of stretching a very smooth surfaced sheet product having large grains. Where unstretched, the **reflected** images of ruler and this document cover to the left of the stretcher mark are not distorted. To the right of the stretcher mark where stretched, the large grains greatly distort the **reflected** image. The remaining 3 photographs reveal after a bulge test differing sizes of large grains.



ROPING—

A rope-like appearance in the rolling direction after the metal has undergone severe deformation. This condition is caused by the presence of elongated grains in the rolled product before being deformed.



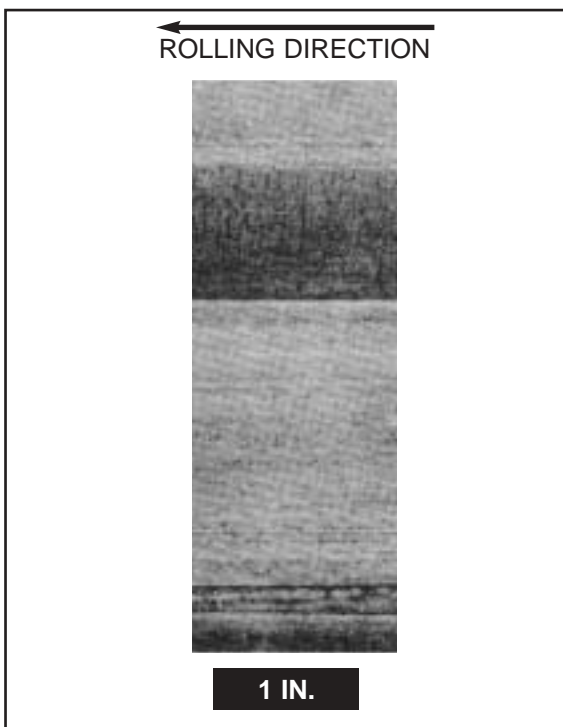
STREAK, DIFFUSION—

Surface discoloration which may vary from gray to brown and found only on Alclad products. This condition is caused by excessive amounts of alloying elements diffusing nonuniformly from the core through to the surface of the cladding during thermal treatment.



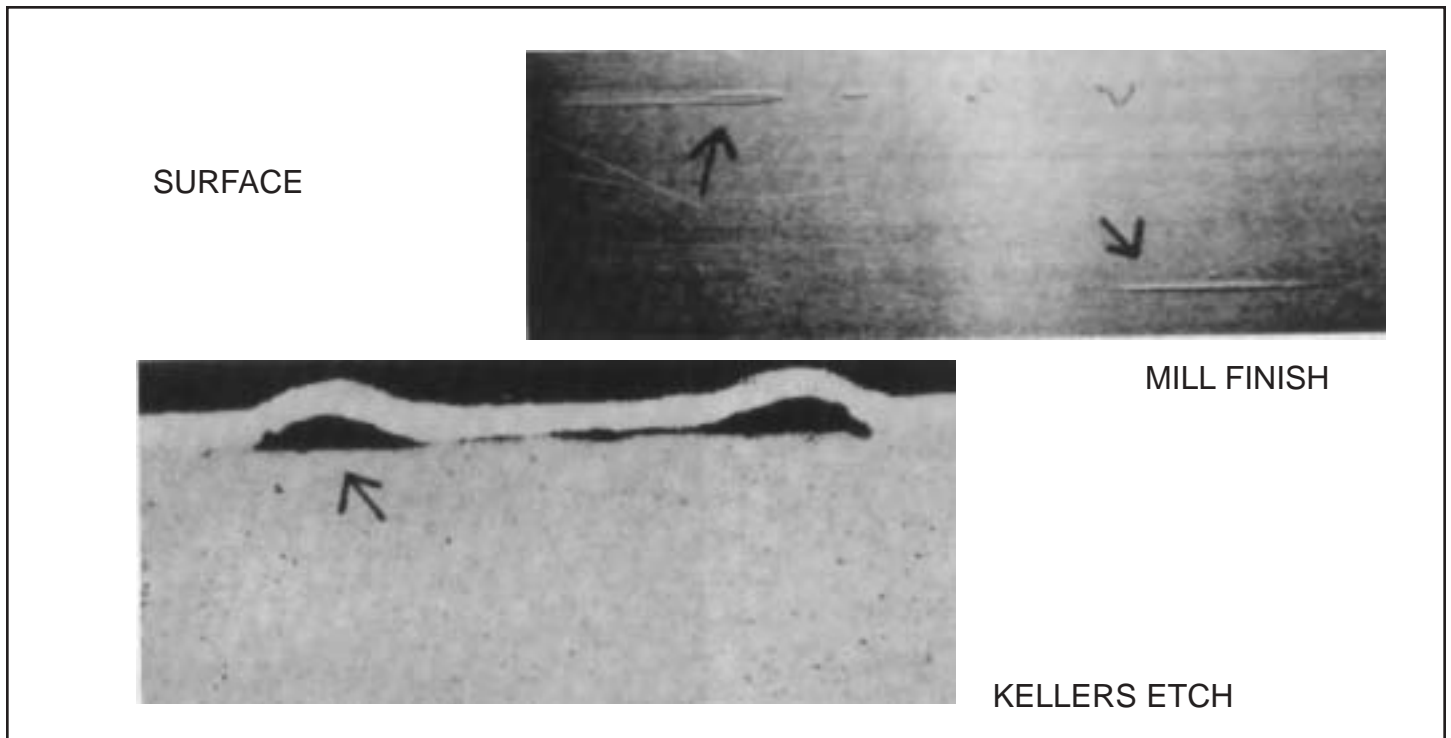
STREAK, STRUCTURAL—

A non-uniform appearance on an etched or anodized surface caused by heterogeneities in the metal remaining from the casting, thermal and/or hot rolling stages of fabrication.



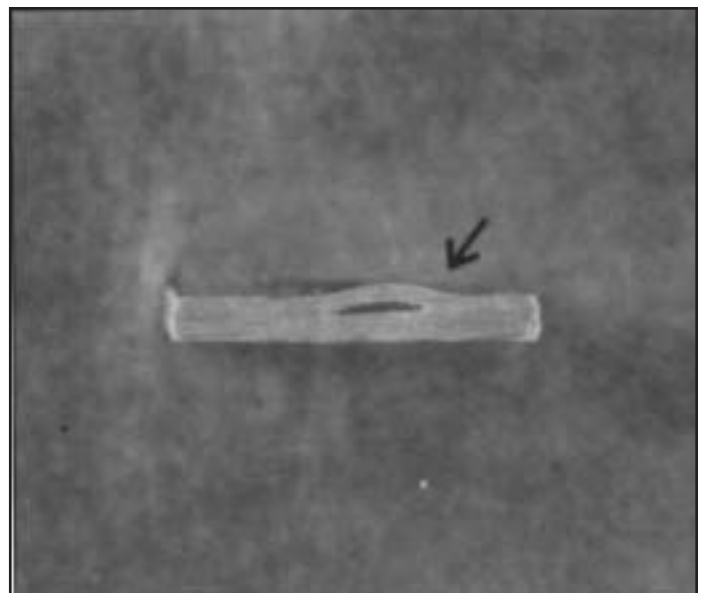
BLISTER, BOND—

A raised spot on only one surface of the metal whose origin is between the cladding and core in clad products. Bond blisters are caused by expansion of gas from a localized incomplete bond.



BLISTER, CORE—

A raised spot on the surface (one or both sides) of rolled metal. Core blisters, caused by expansion of gas contained in the core of the product, have a detrimental effect on mechanical and physical properties.



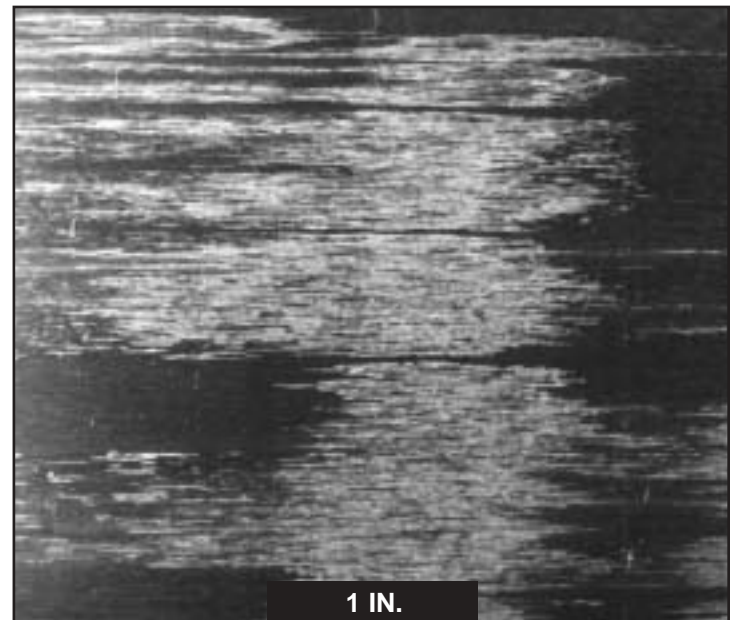
BURR—

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

**CORROSION, WATER STAIN—**

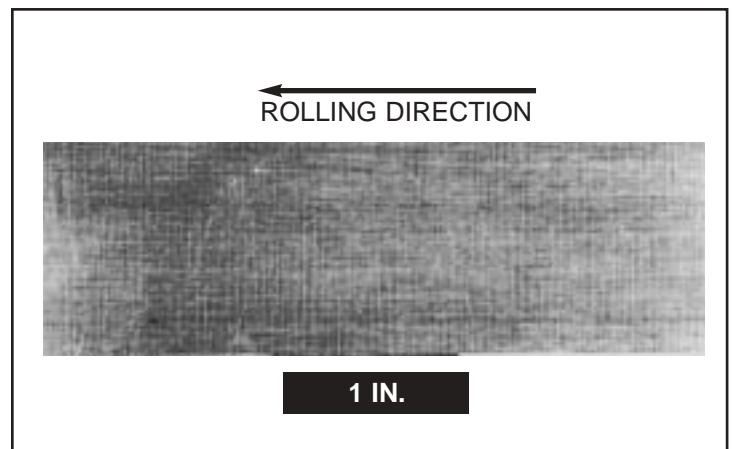
(Condensation Stain, Water Stain)

Superficial oxidation of the surface with a water film in the absence of circulating air, held between closely adjacent metal surfaces such as between wraps of a coil or sheets of a stack. The appearance varies from iridescent in mild cases to white, gray, or black in more severe instances.

**CRAZING—**

(Broken Surface, Cross Hatching, Reticulation, Transverse Cracks)

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.



DENT—

A sharply defined surface impression on the metal which may be caused by a blow from another object. Repeating impressions may be caused by a particle adhering to a rotating roll across which the metal has passed. These may be referred to as repeating dent, chip mark, metal-on-roll mark or repeating pickup.

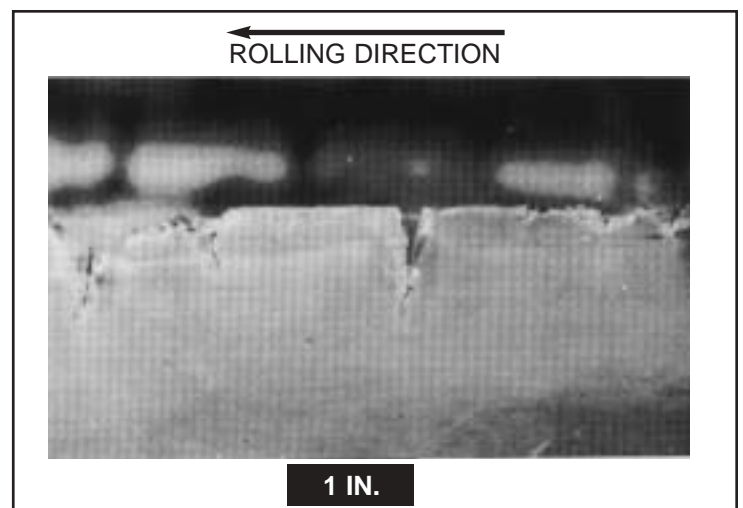
**DENT, EXPANSION—**

Localized surface deviation from flat generated by expansion of vapors during thermal treatment of cold rolled coiled sheet.

**EDGE, BROKEN (CRACKED)—**

(Cracked Edge, Side Crack)

Edge containing crack, split, and/or tear which is caused by inability to deform without fracturing.



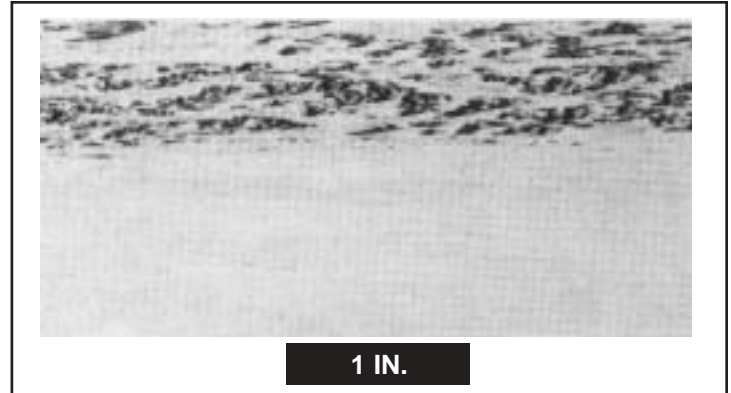
EDGE, DAMAGED—

Edge of a coil that has been bent, torn or scraped by an object. **(No picture)**

EDGE, LIQUATED —

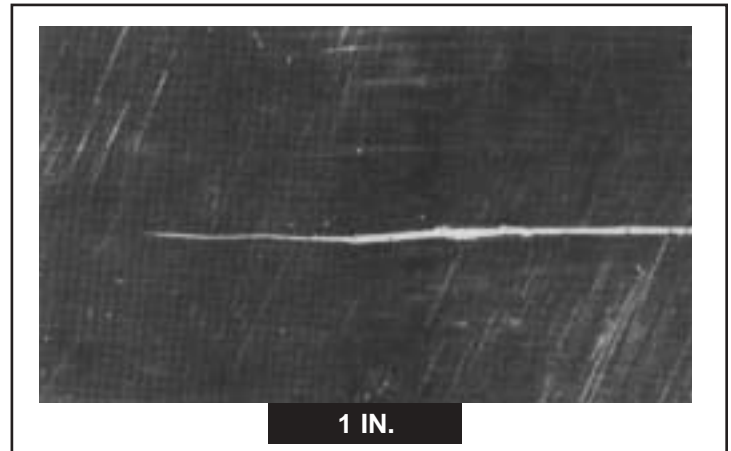
(Rolled over Edge)

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.

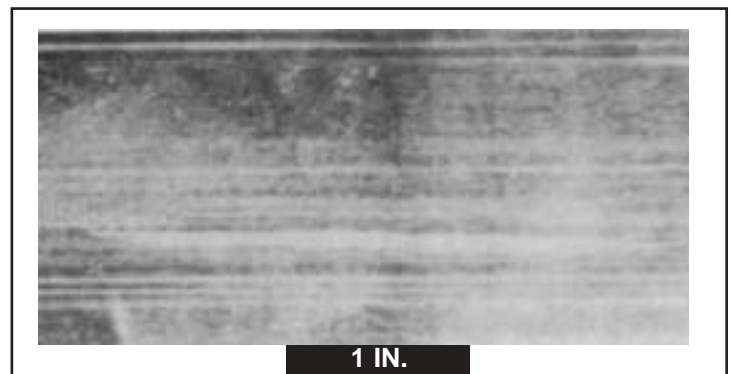
**GOUGE—**

(Nick)

A gross scratch. See "Scratch".

**GOUGE, ROLLED-IN—**

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

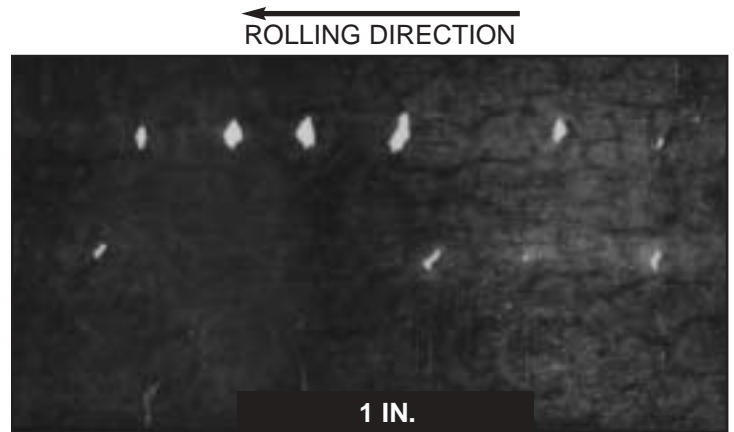
**HAIR, SLITTER—**

(Whisker)

Minute hair-like slivers along edge(s) due to shearing or slitting operation. **(No picture)**

HOLE—

Void in rolled product. Typical cause is a non-metallic inclusion during rolling.



INCLUSION, STRINGER—

(Razor Streak)

An inclusion, either metallic or non-metallic, is an impurity trapped in the ingot during solidification. It may be revealed during rolling in which case it appears as a short narrow streak parallel to the direction of rolling (see photograph A). It may be revealed during subsequent forming such as a small hole ("pinhole") (see photograph B as viewed from inside of drawn can).

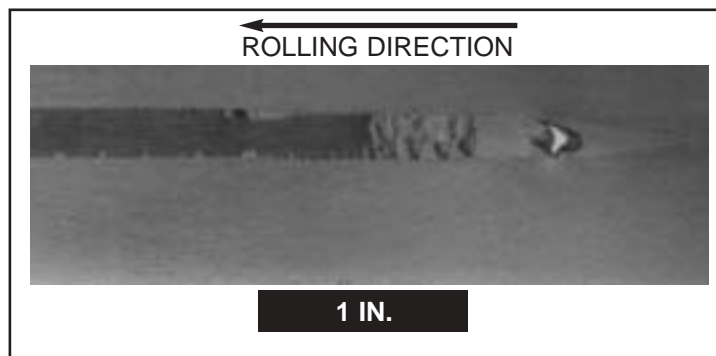


Photo A

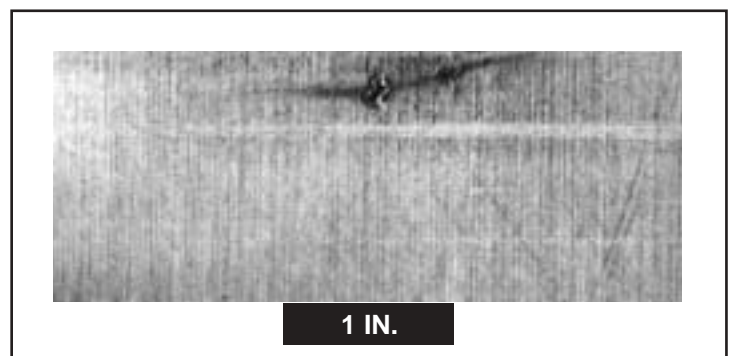
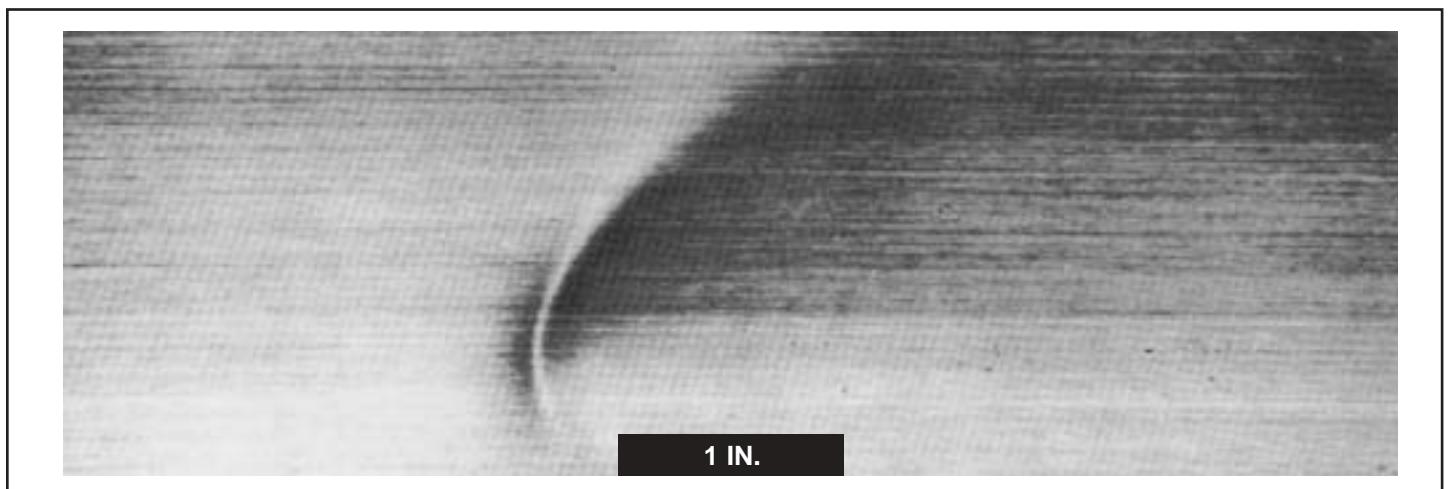


Photo B

KINK—

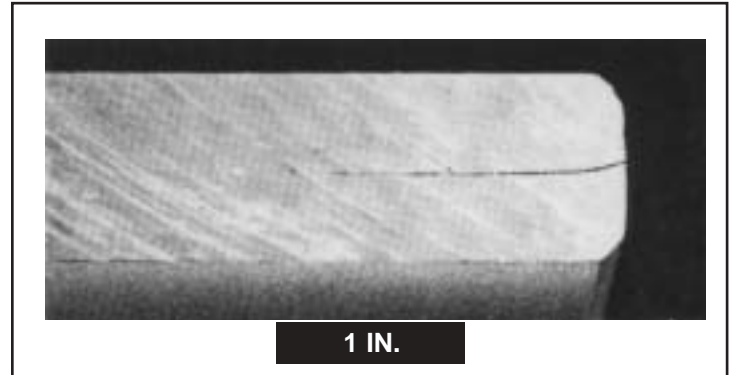
An abrupt bend or deviation from flat which is caused by localized bending during handling.



LAMINATION—

(Alligatoring, Crocodiling, Fish Mouthing)

An internal or external crack aligned parallel to the rolled surfaces which extends to side(s) and/or end(s) of the product. This can occur during hot rolling; if at the head or tail end, it is called “alligatoring” or other synonym. In addition, a crack caused during ingot casting may appear as a lamination. A lamination need not extend to an exterior surface.



LINE, LOOPER—

Closely spaced symmetrical lines on the surface of metal which has undergone non-uniform deformation, usually in a drawing operation. If the deformed object is cylindrically shaped, the lines form a loop shaped like the letter “U”.

MARK—

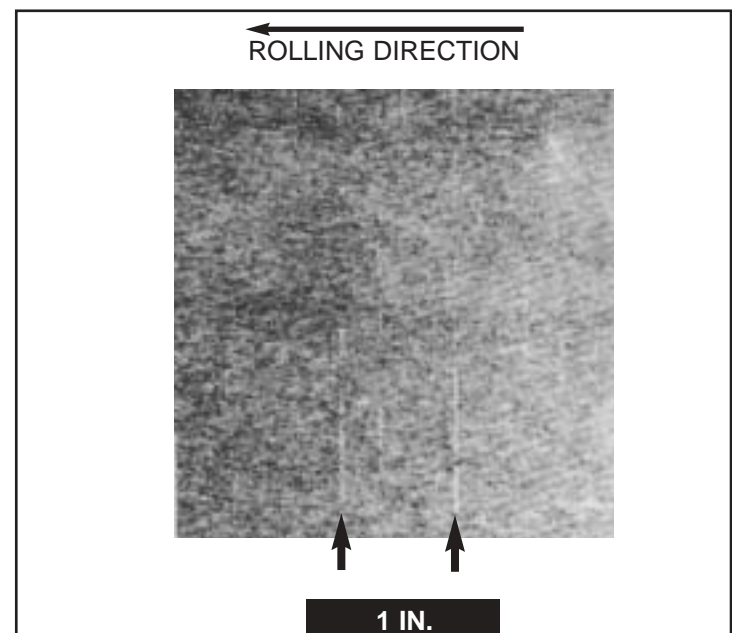
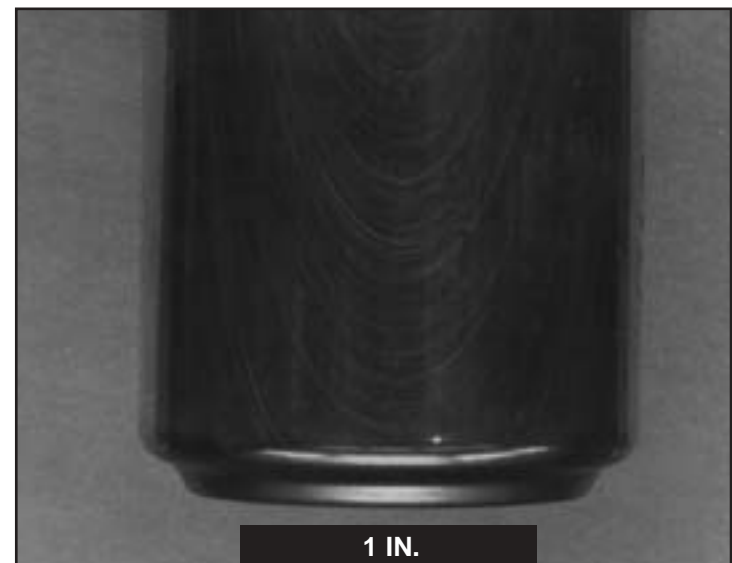
Damage in the surface of the product whose name is often described by source. See the following:

MARK, ARBOR—

Surface damage in the vicinity of a coil ID caused by contact with a roughened, damaged or non-circular arbor. (No picture)

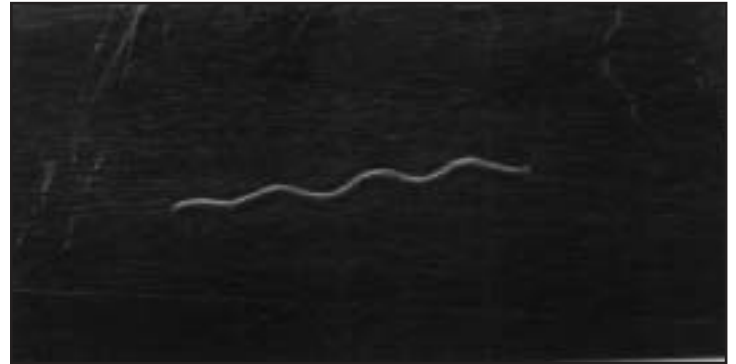
MARK, BITE—

A line which is generally perpendicular to the rolling direction. It is caused by the leading end of the metal entering the rolling mill resulting in a minor surface disruption. This disruption then transfers to the surface of the rolled metal in subsequent rotations.

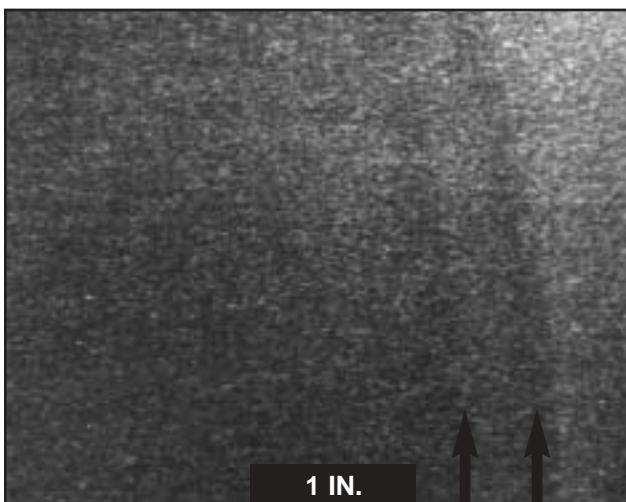
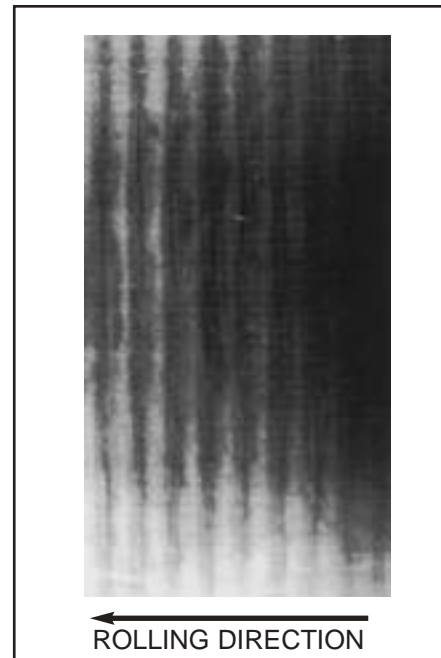


MARK, BRISTLE—

Raised surface about one inch long, crimped wire shaped and oriented in any direction. This mark is caused by a wire bristle dropping out of a brush (used in hot rolling) and going between work and backup rolls, thus marking the work roll.

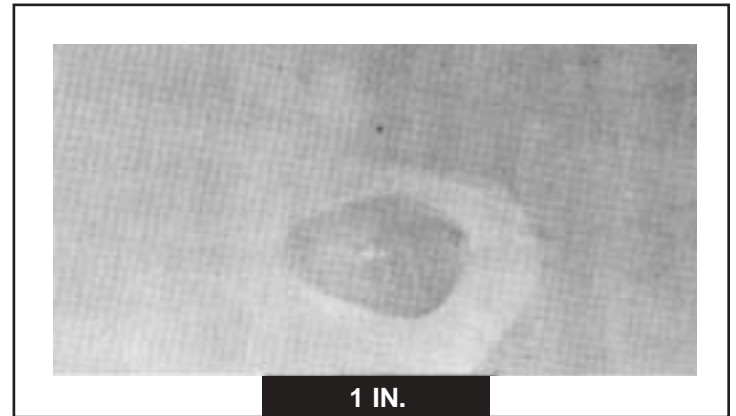
**MARK, CHATTER
(ROLL OR LEVELER)—**

Numerous intermittent lines or grooves that are usually full width and perpendicular to the rolling direction. Conditions which create cyclic vertical vibration in or near the roll bite of the leveler or the rolling mill cause this surface appearance. The adjacent photo is a severe example; the lower photo is a mild example.

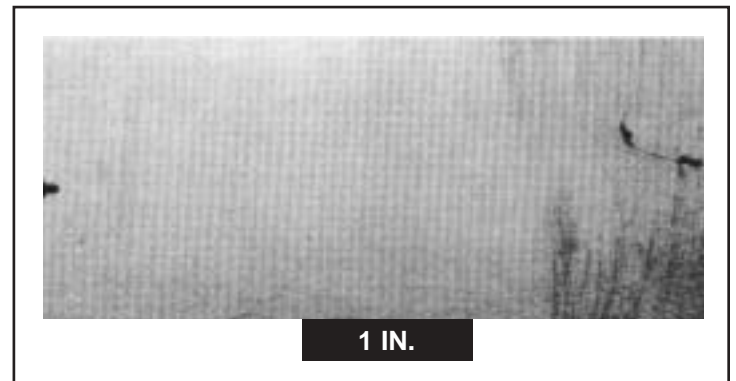


MARK, HEAT TREAT CONTACT—

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 contacting the slitter knife.

**MARK, MIKE—**

Narrow continuous line on both rolled surfaces of the sheet occurring near the rolled edge caused by a contacting micrometer.



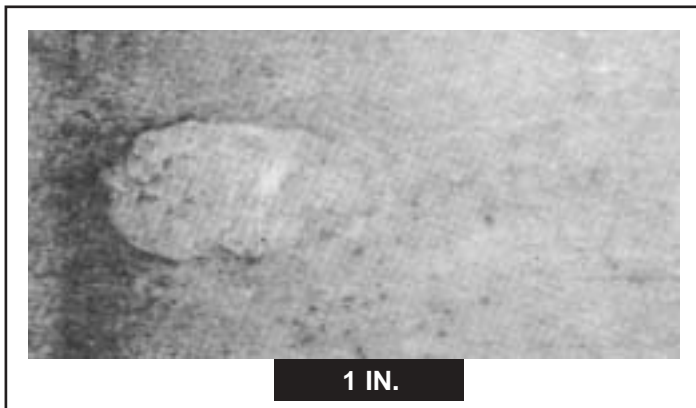
MARK, ROLL—

A small repeating raised or depressed area on rolled products caused by the opposite condition on a roll. The repeat distance is a function of the offending roll diameter. A typical cause is an unwanted particle which enters the work roll bite. The particle is crushed which simultaneously damages the work roll(s) to the pattern of the crushed particle.

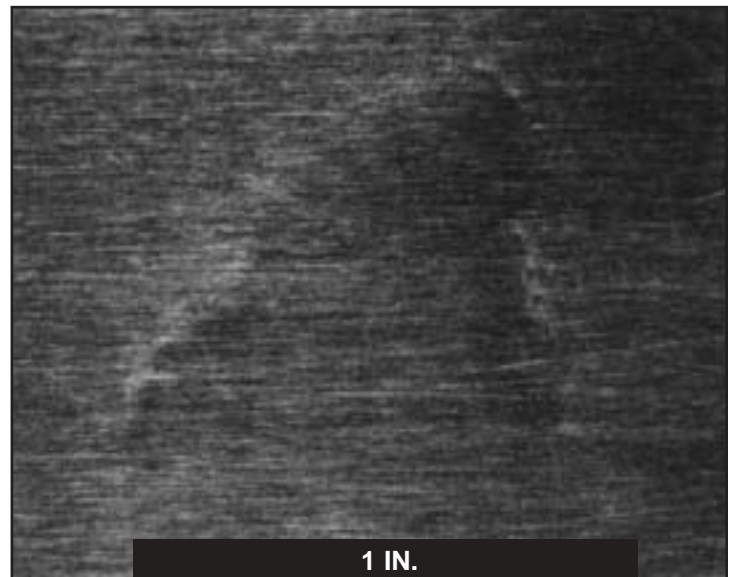
**MARK, ROLL BRUISE—**

(Tail Mark)

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



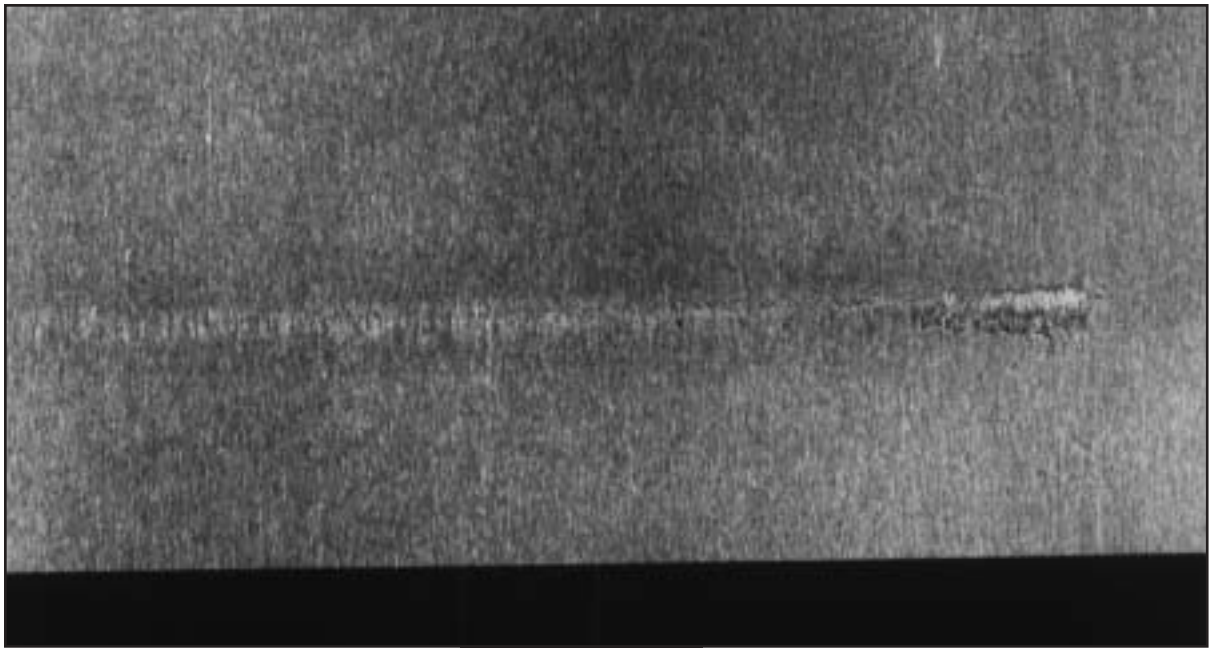
←
ROLLING DIRECTION



MARK, ROLL SKID—

(Roll Stop Mark)

A full width line perpendicular to the rolling direction and repeating as a function of a work roll diameter. This line is often associated with scratch-like roll marks in the rolling direction. A roll skid mark is caused by a large relative velocity difference between adjacent work and backing rolls, such as may occur during sudden machine stops.



1 IN.

MARK, RUB—

A large number of very fine scratches. A rub mark can occur by metal-to-metal contact, movement in handling and movement in transit. Photo shows rub mark in addition to oil stain. See "Stain, Oil" for remainder of photo.

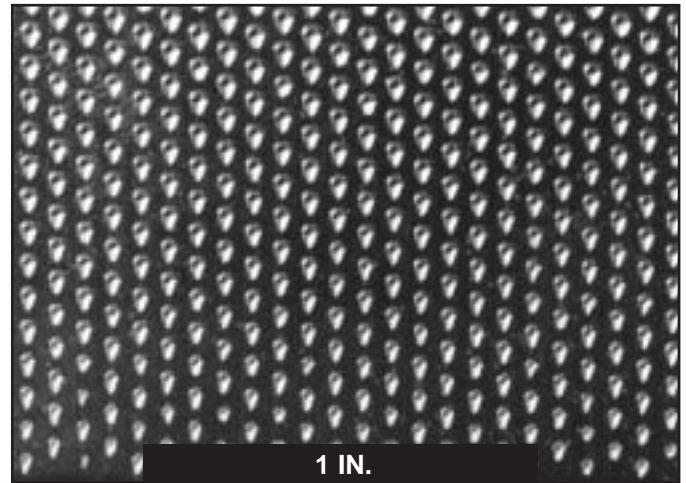
←
ROLLING DIRECTION



1 IN.

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, TRAFFIC—**

(Abrasion, Fretting)

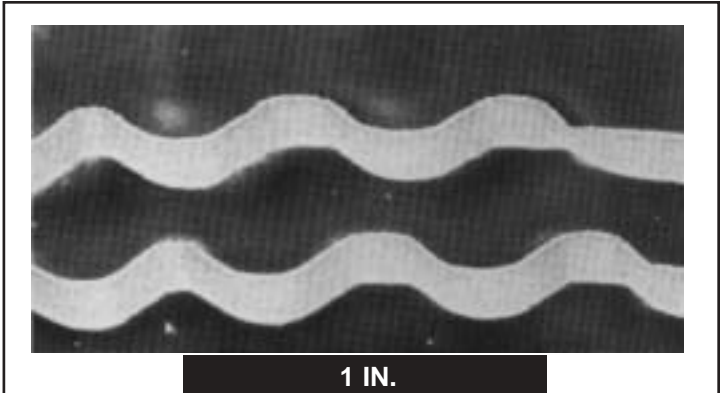
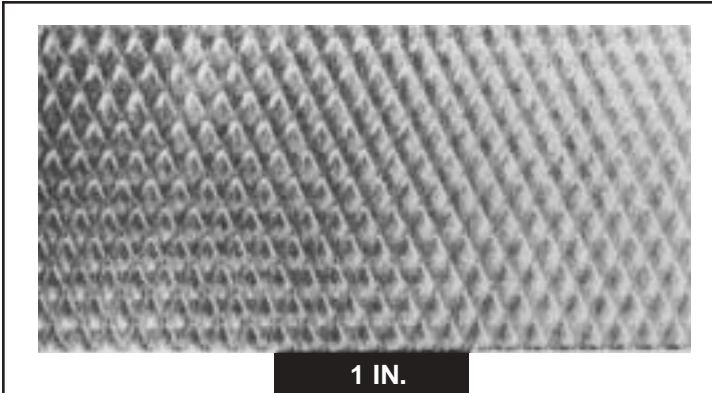
Abrasion which results from relative movement between contacting metal surfaces during handling and transit. A dark color from the abrasively produced aluminum oxide is usually observed. A mirror image of traffic mark is observed on the adjacent contacting surface.

**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. **(No picture)**

OUT-OF-REGISTER—

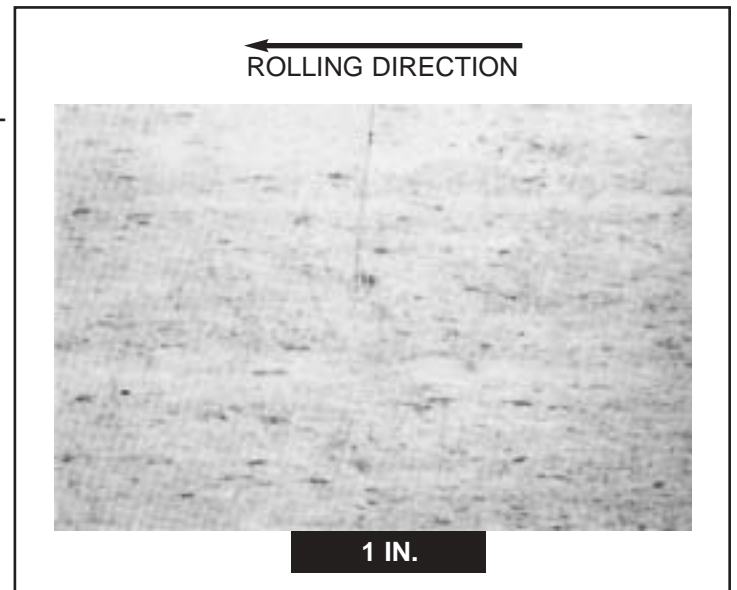
An embossed pattern distortion due to misalignment of the male and female embossing rolls.



PICKUP, ROLL—

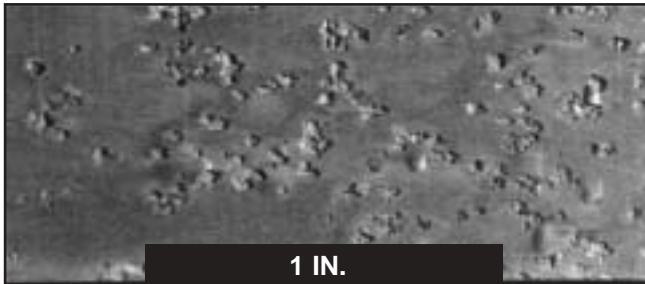
(Glaze, Hot Line Pickup, Oxide Streak)

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

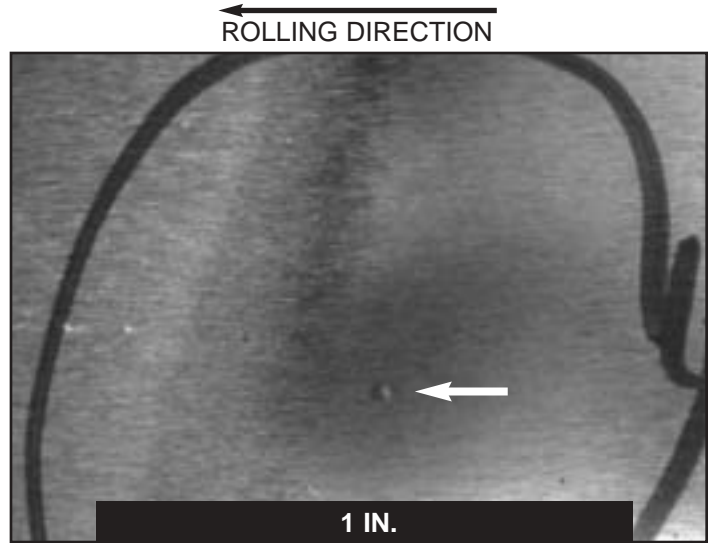


PIT—

A depression in the rolled surface which is usually not visible from opposite side. This is usually created in post-rolling circumstances such as etching (etch pits) or passing over debris on sheet finishing equipment.



ETCH PITS

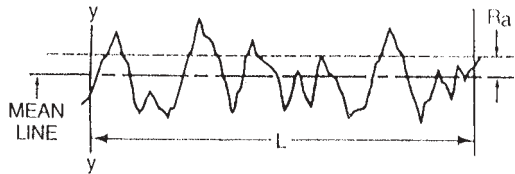


PIT CAUSED BY DEBRIS

ROLL GRIND—

The uniform ground finish on the work rolls which is imparted to the sheet or plate during rolling. Work rolls are ground to a measured roughness range to satisfy the intended application of the rolled product.

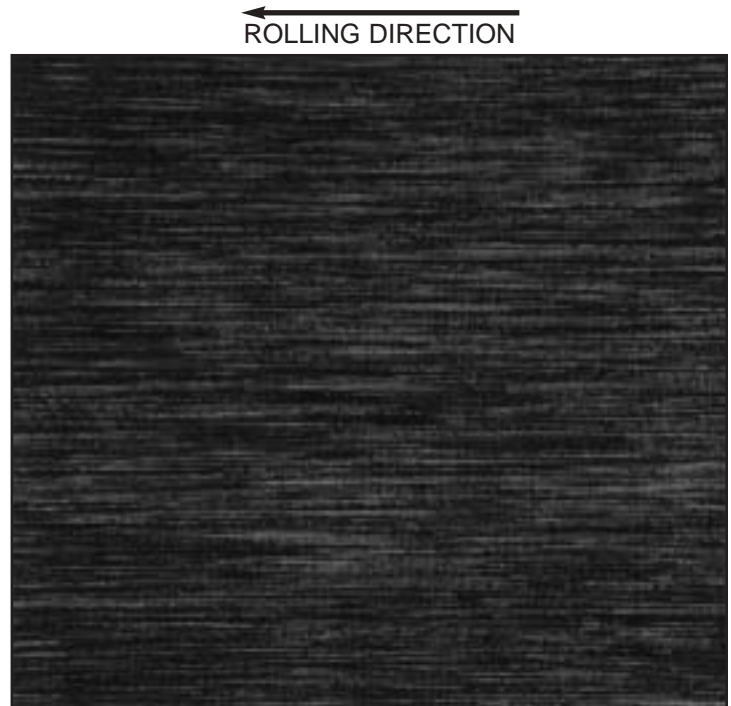
One common measurement calculation is called “Roughness Average” whose symbol is R_a . It is the average height of roughness irregularities measured from a mean line within the evaluation length (L). In diagram form,



In formula form,

$$R_a = \frac{1}{L} \int_0^L |y| dx$$

$$R_a \text{ (approx.)} = \frac{y_1 + y_2 + y_3 + \dots + y_n}{n}$$

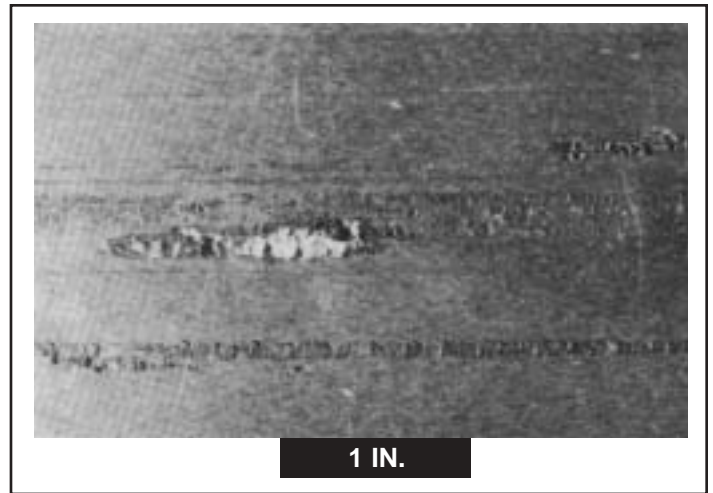


16X

.03125 inch

ROLLED-IN METAL—

An extraneous chip or particle of metal rolled into the surface of the product.

**SCRATCH—**

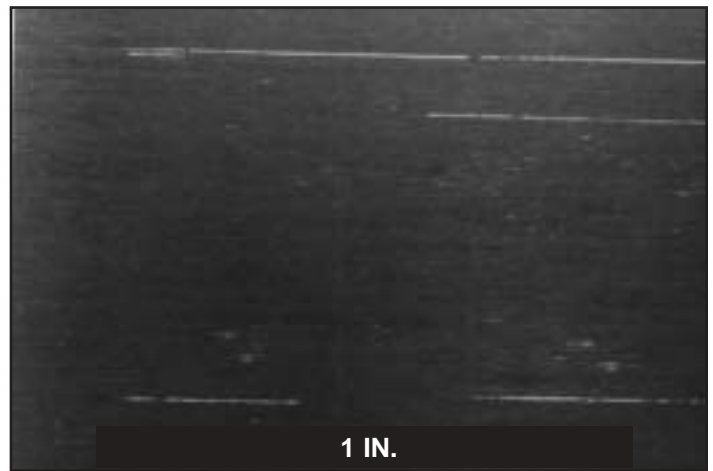
(Nick)

Sharp indentation in the surface of the product usually caused by a machine or during handling. A scratch is often described by source. See the following examples:

SCRATCH, DRAG—

(Machine Scratch)

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

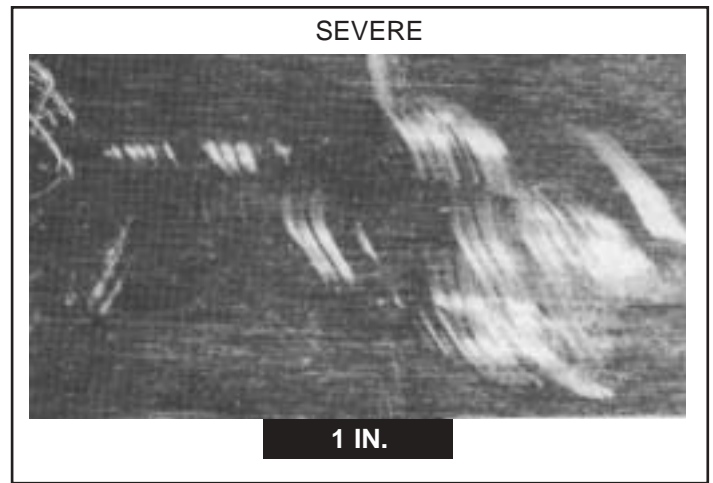
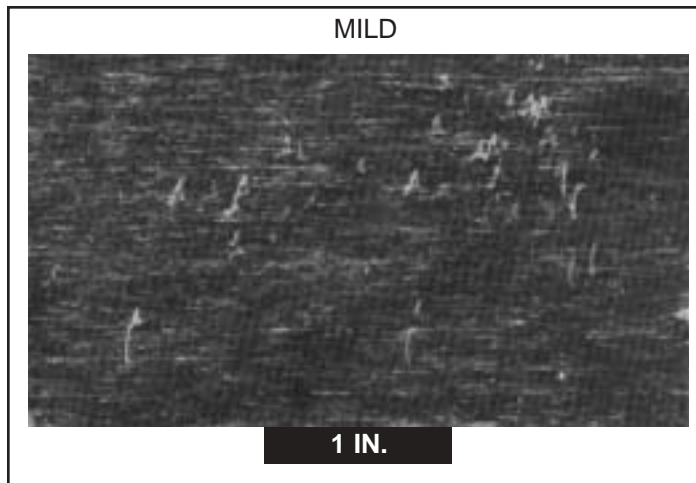
**SCRATCH, FRICTION—**

A scratch caused by relative motion between two contacting surfaces.

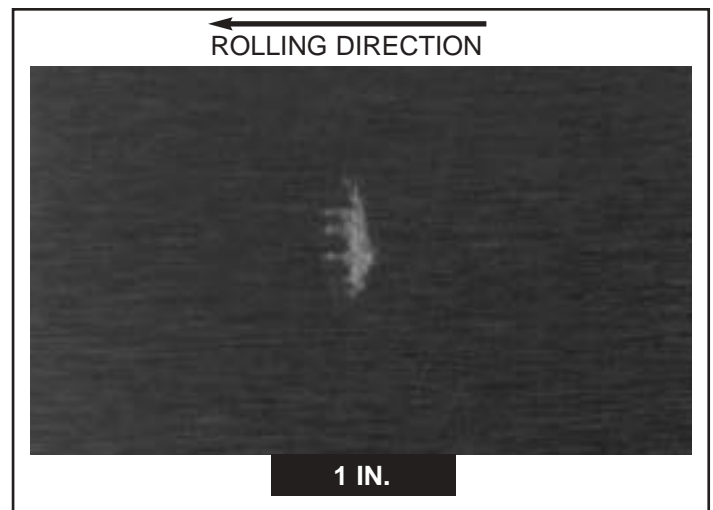


SCRATCH, HANDLING—

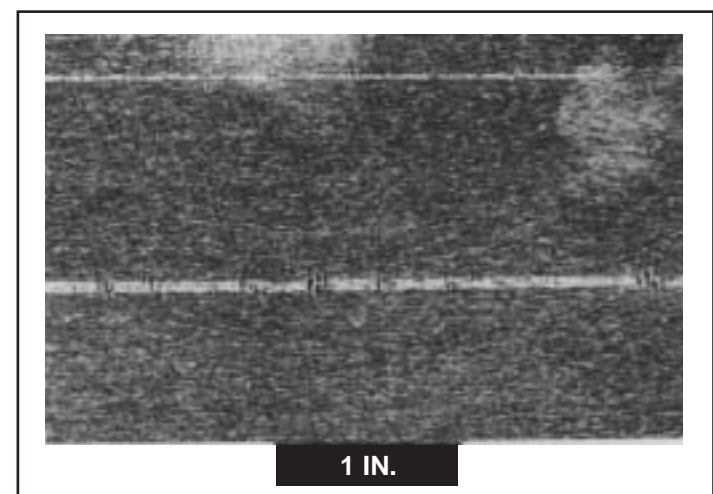
A more severe form of rub mark. See “Mark, Rub”.

**SCRATCH, OSCILLATION—**

Minor indentation at an angle to the rolling direction that results from coil oscillation during unwinding or rewinding.

**SCRATCH, ROLLED-IN—**

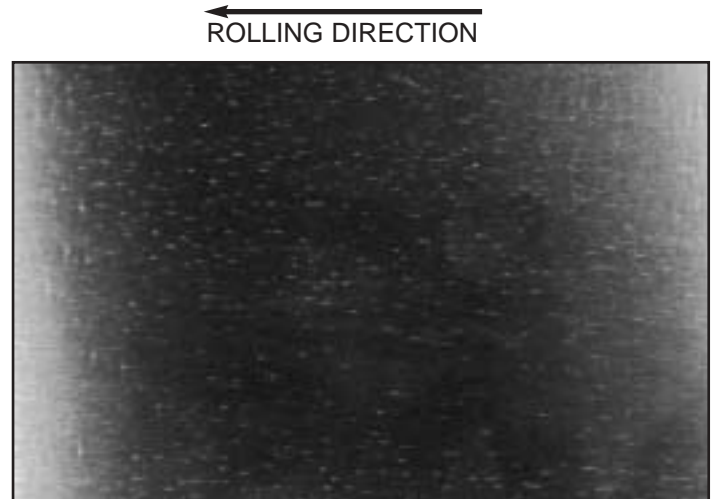
A scratch which is subsequently rolled. It will then appear as a greyish white ladder (distinct transverse lines within the longitudinal indentation).



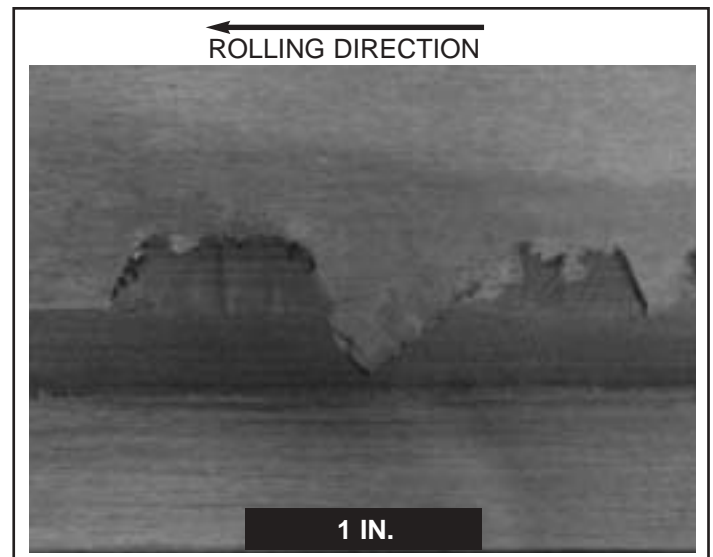
SCRATCH, TENSION—

(Cinching, Slippage Scratch, Takeup Mark)

A short longitudinal indentation parallel to the rolling direction. This condition is caused by relative movement between adjacent wraps of a coil during unwinding or rewinding operations.

**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.

**SMUDGE—**

(Smut)

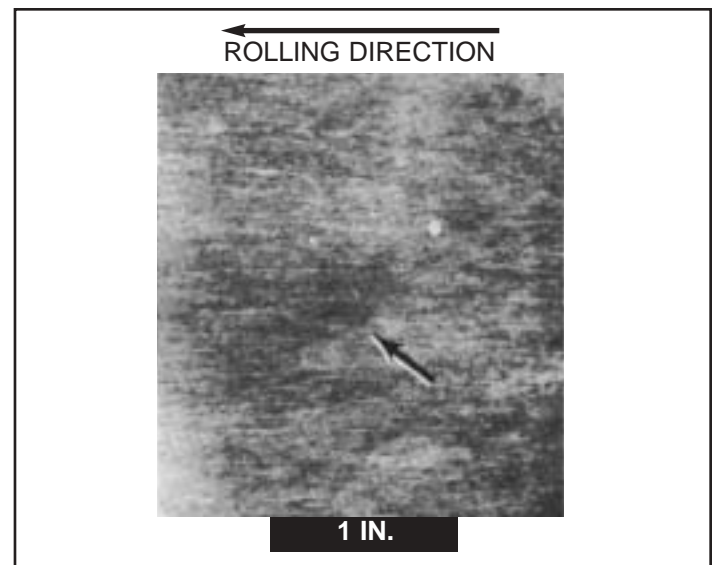
A dark film of debris, sometimes covering large areas, deposited on the sheet during rolling.

(No picture)

STAIN, HEAT TREAT—

(Oxide Discoloration)

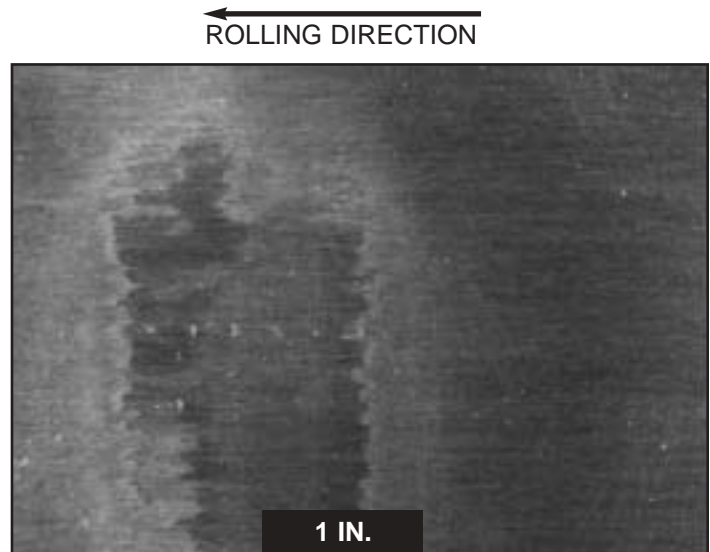
A discoloration due to non-uniform oxidation of the metal surface during thermal treatment.



STAIN, OIL—

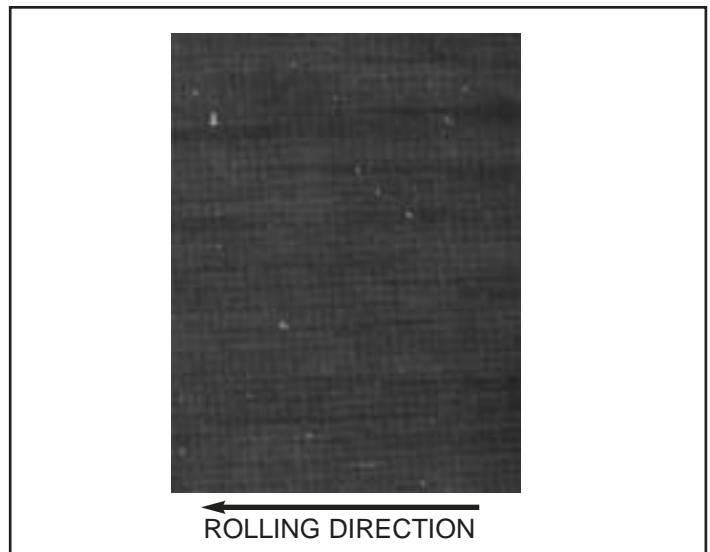
(Bloom, Brown Stain, Lacquer)

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.

**STREAK (STRIPE)—**

(Bright Streak)

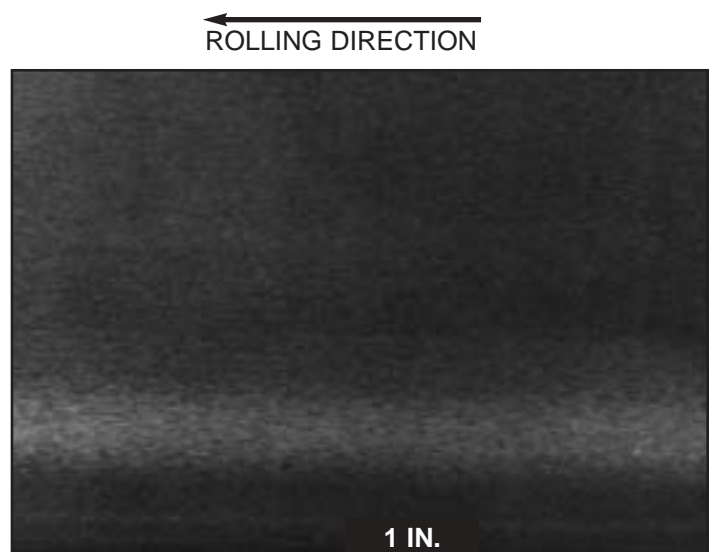
A superficial band or elongated mark which produces a non-uniform surface appearance (accentuated in this photo by anodizing). A streak is often described by source. See the following:

**STREAK, BUFF—**

A dull continuous streak caused by smudge buildup on a buff used at shearing or other operations.

(No picture)**STREAK, BURNISH—**

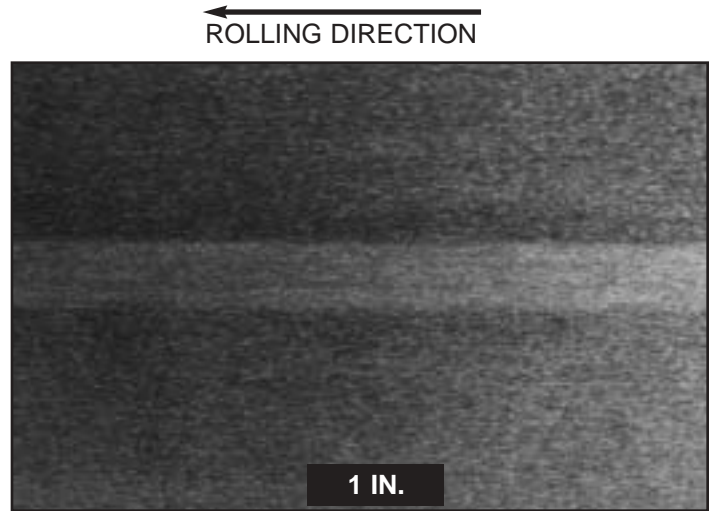
A bright region on the sheet caused by excessive roll surface wear.



STREAK, COATING—

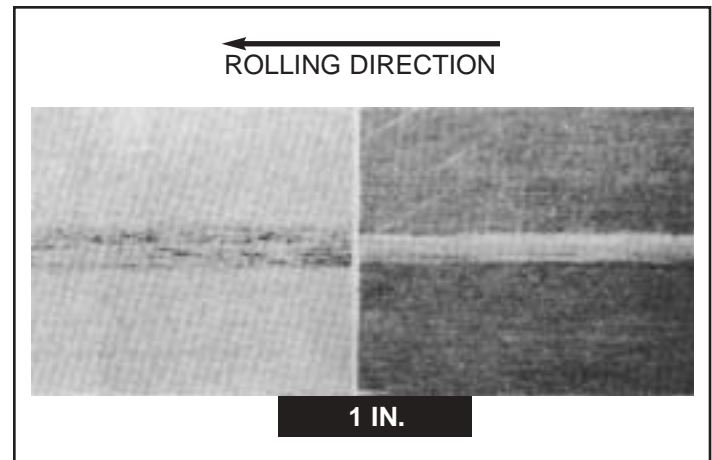
(Pickup Streak, Roll Coating)

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”.



STREAK, DIRT—

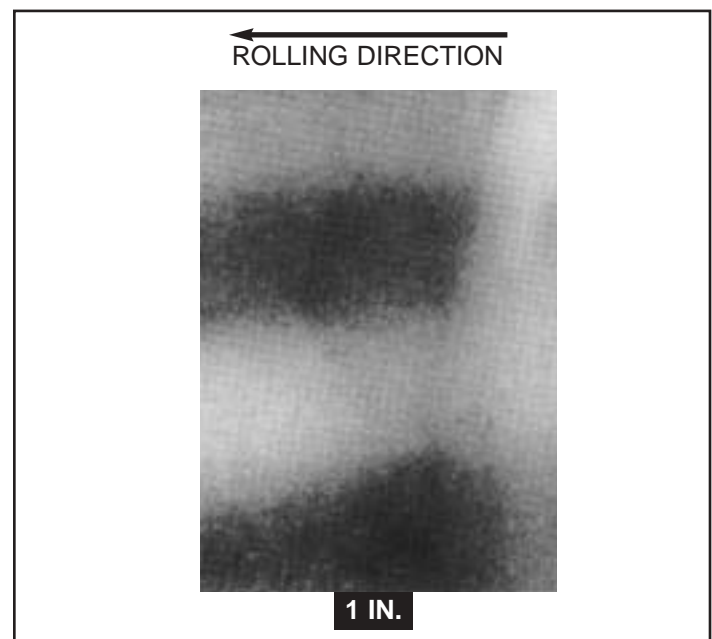
Surface discoloration which may vary from grey to black, is parallel to the direction of rolling, and contains rolled in foreign debris. It is usually extraneous material from an overhead location that drops onto the rolling surface and is shallow enough to be removed by etching or buffing.



STREAK, HEAT—

(Cold Streak)

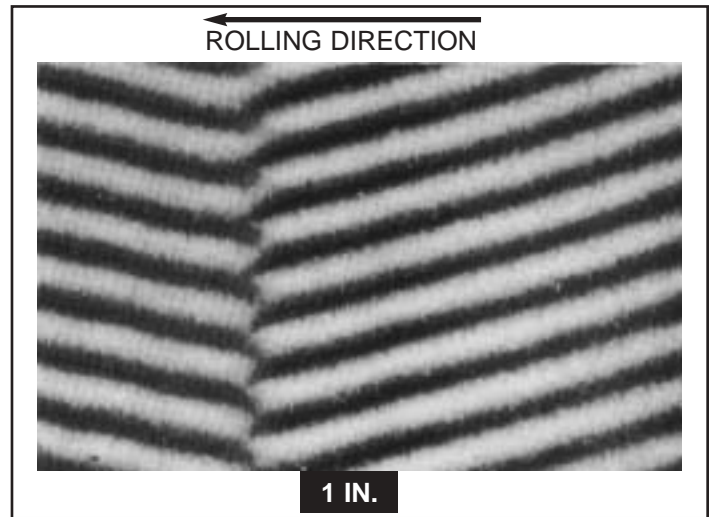
Milky colored band(s) parallel to the rolling direction which vary in both width and exact location along the length. This condition is caused by localized oil film thickness variations resulting from heat variations or by angulation into the roll nip.



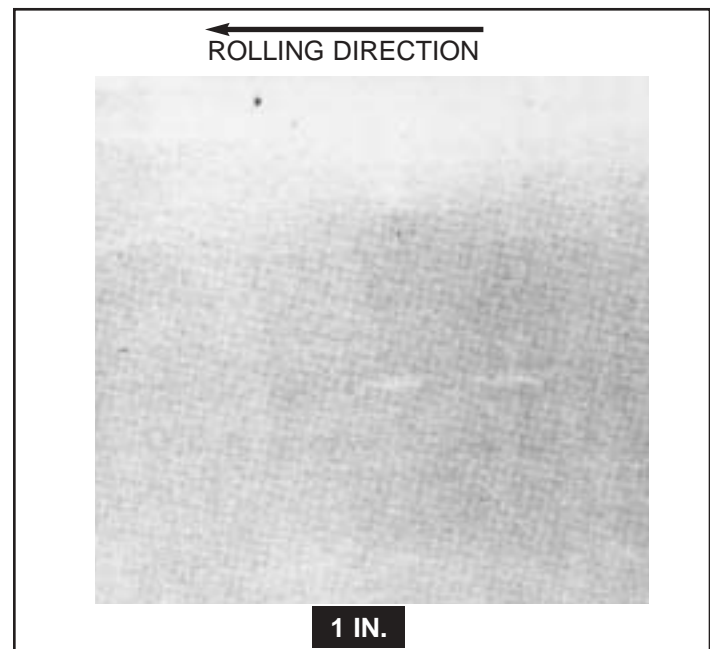
STREAK, HERRINGBONE—

(Herringbone, Reduction Marks)

Elongated alternately bright and dull chevron markings. It is caused by incipient failure of the oil film between roll and aluminum surface.

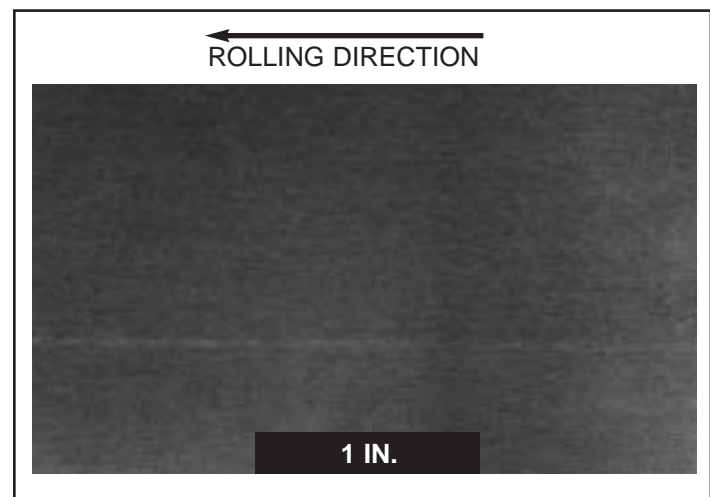
**STREAK, LEVELER—**

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

**STREAK, ROLL—**

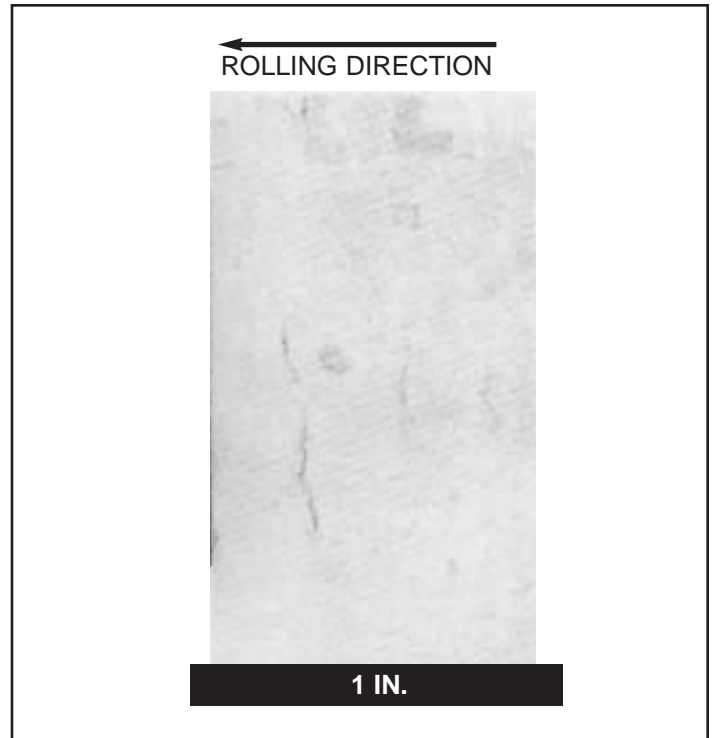
(Mill Buff Streak)

A non-uniform surface appearance parallel to the rolling direction. It is caused by an uneven wiping action on the upper backup roll(s) of a mill which transfers first to the work roll and then to the rolled product.



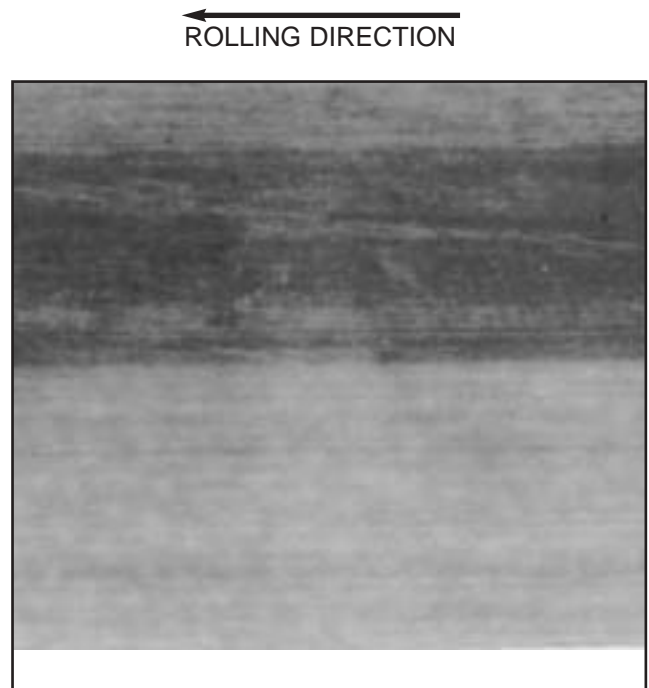
SURFACE TEAR—

Minute surface crack on rolled products which can be caused by insufficient ingot scalping.

**TWO-TONE—**

(Bleed Out, Burnishing, Edge Band, Pass Line)

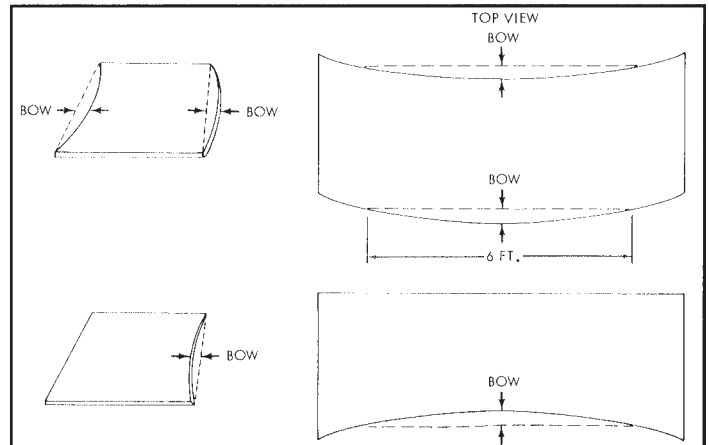
A sharp color demarcation in the appearance of the metal due to a difference in the work roll coating. This is typically caused by rolling wide metal after narrower metal on the same work rolls.



BOW, LATERAL—

(Camber)

Deviation from straight of a longitudinal edge. Usually caused by greater reduction of one edge than the other.

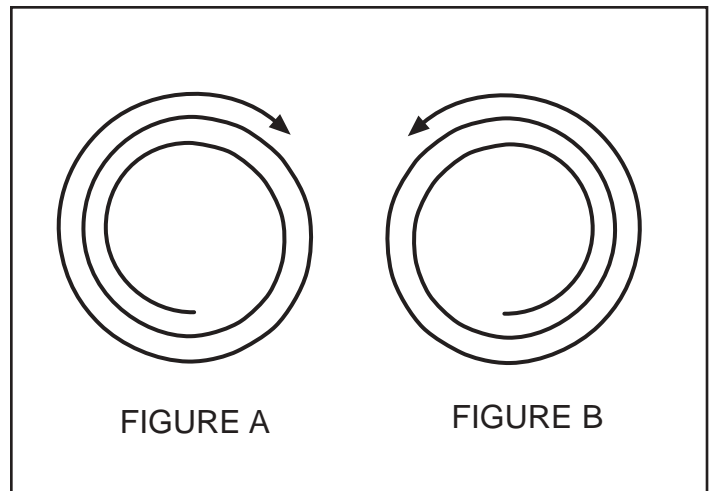
**COIL ORIENTATION—**

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.

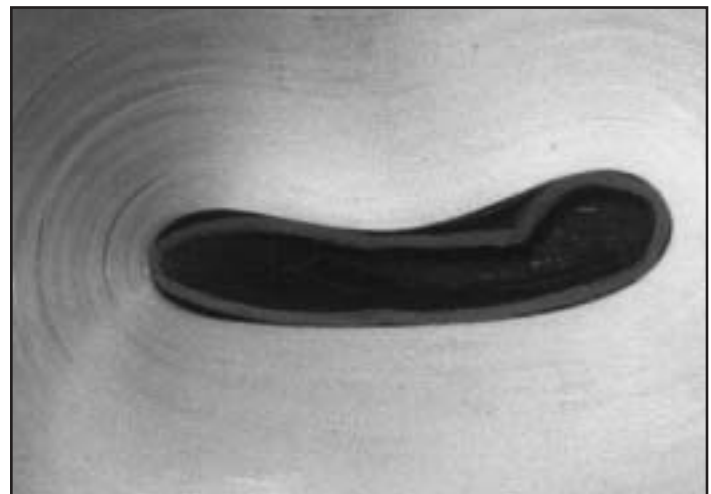
See figure A.

Counter-clockwise (Anti-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 counter-clockwise (anti-clockwise) movement. See figure B.

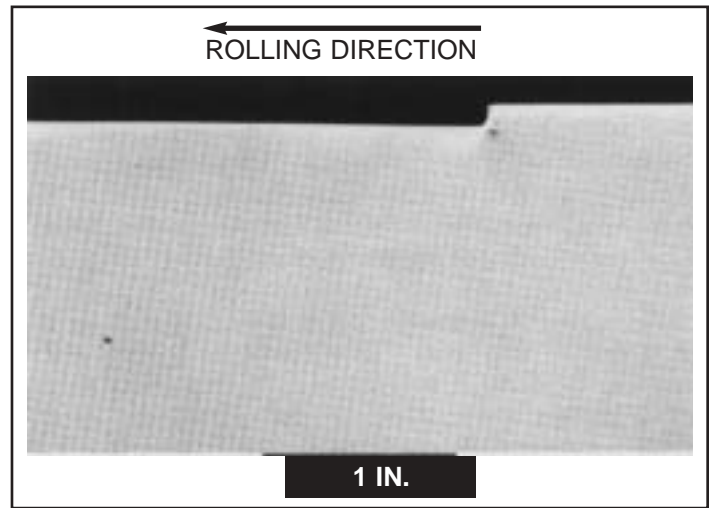
**COLLAPSE—**

Out-of-round condition of coil often due to inappropriate tension during rewinding operations and/or improper coil handling techniques.



NOTCH, DOUBLE SHEAR—

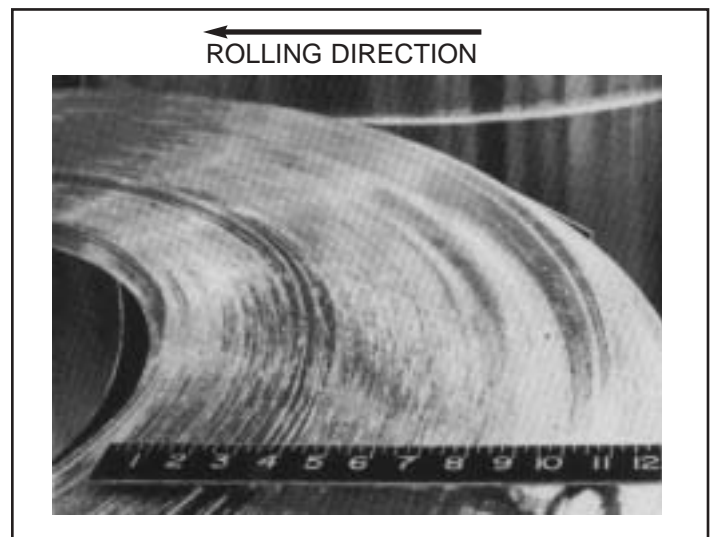
An abrupt deviation from straight on a sheared edge. This offset may occur if the flat sheet or plate product is longer than the blade used for the final shearing operation.



OSCILLATION—

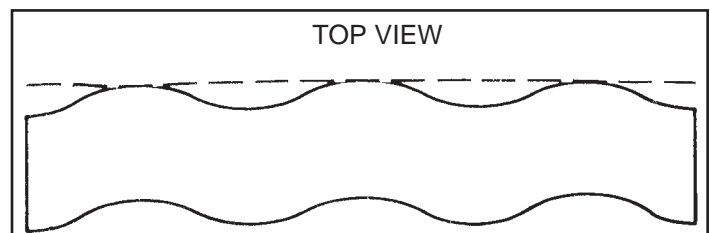
(Weave)

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



SNAKING—

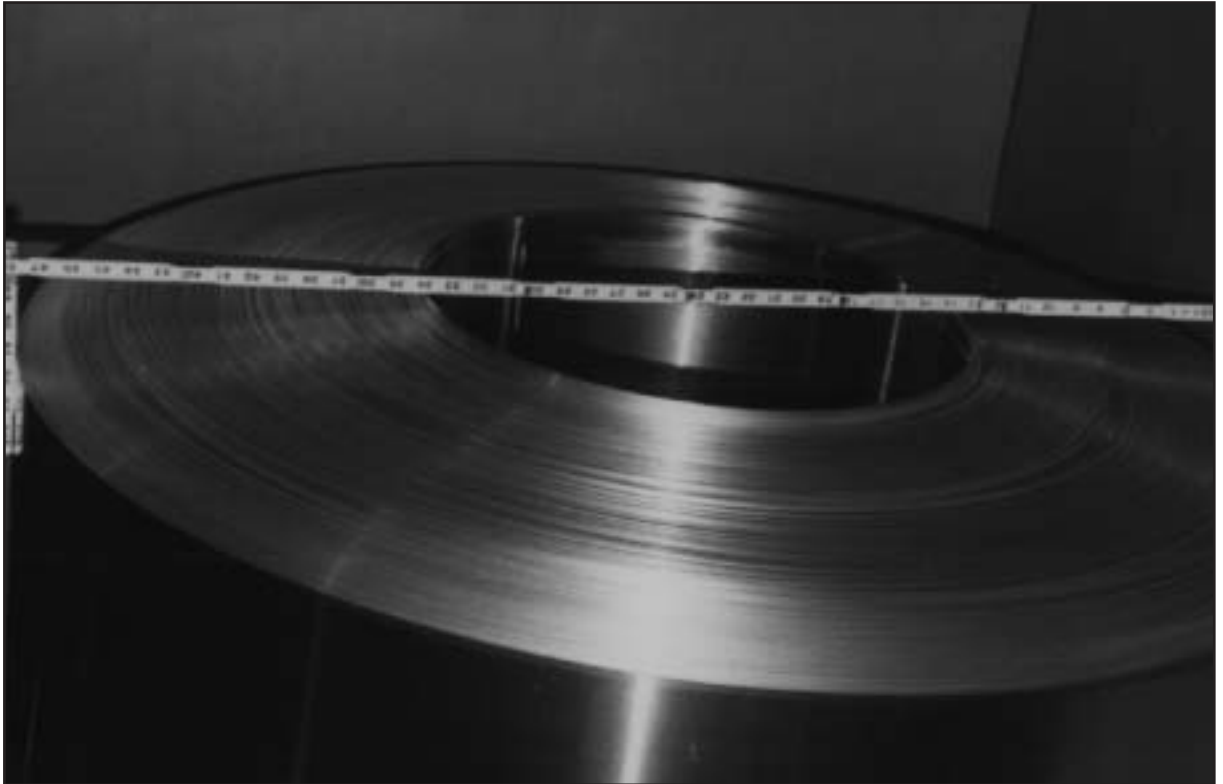
A series of reversing lateral bows in coil products. This condition is caused by a waving action during an unwinding or rewinding operation.



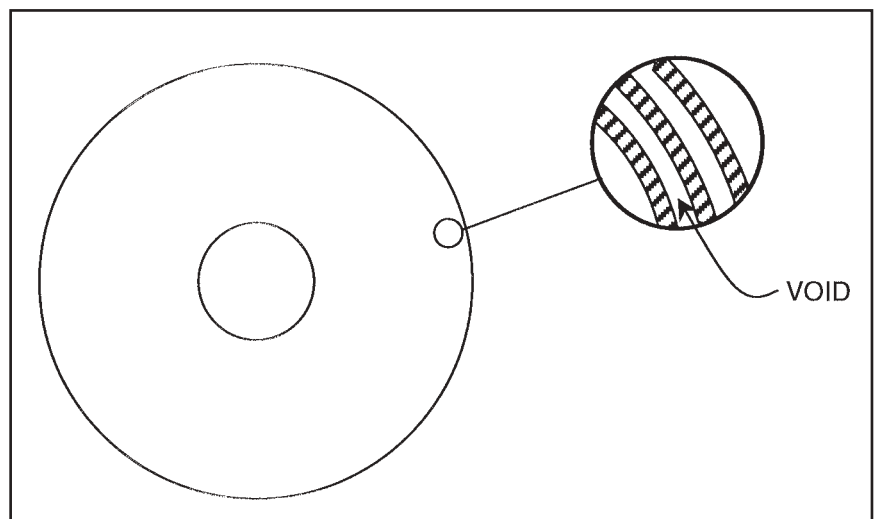
TELESCOPING—

(Coned-out coil)

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".

**WRAP, LOOSE—**

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



COATED SHEET—

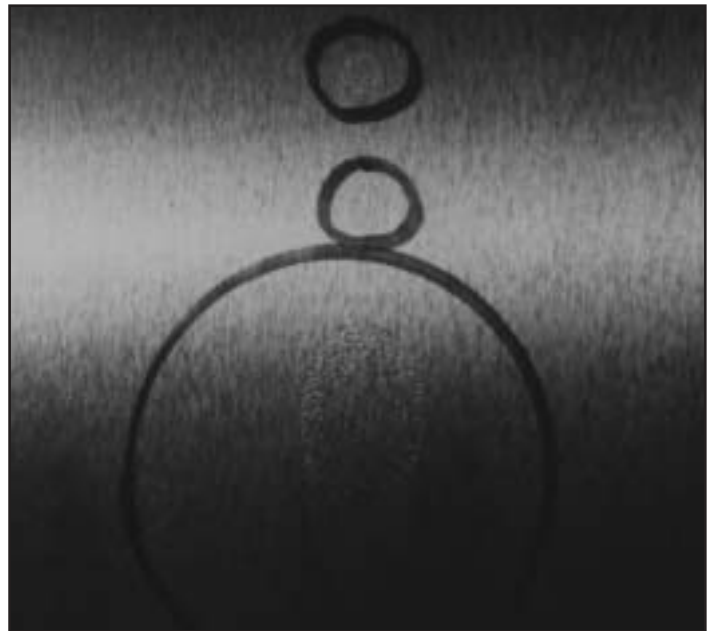
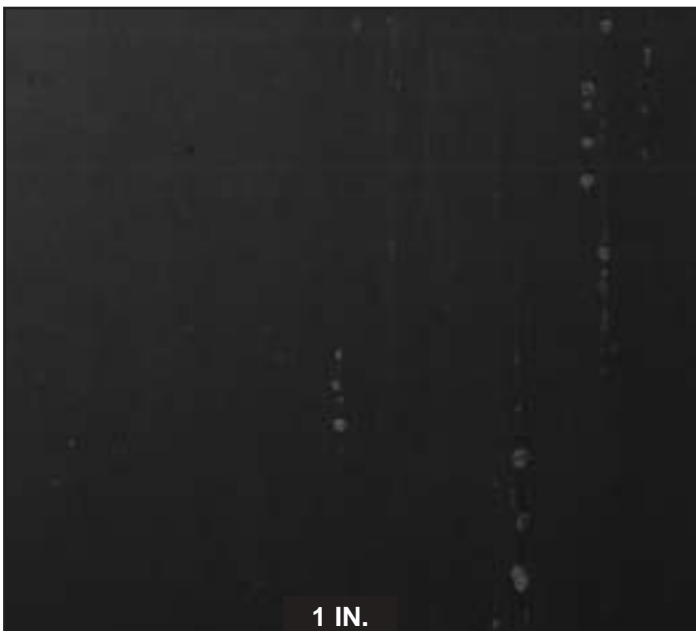
Coated sheet quality characteristics described in this section are associated with rolled products which are cleaned, pre-treated, coated and, if desired, lubricated.

COATING BUILD-UP—

A coating thickness greater than nominal in localized area of sheet, usually along, edges, due to uneven application techniques. **(No picture)**

COATING DRIP—

A non-uniform extraneous deposit of coating on the coated sheet. The pictures show a severe condition over a rather large area (on the left) and a close up of 3 drips which are circled (on the right).



COATING SKIP—

(Holiday, Skip)

Region where film is absent due to non-wetting of the metal surface by the coating. An area of uncoated sheet which is frequently caused by equipment malfunction.



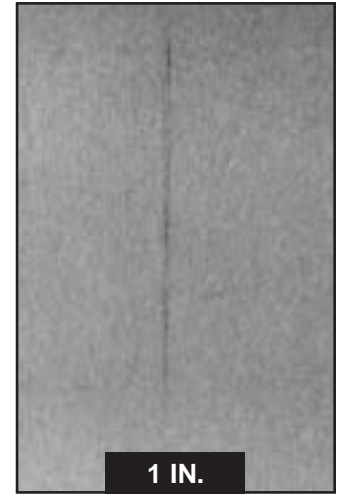
DIRT—

(Coating Oven Trash, Smudge)

Foreign debris from rolling or post-rolling operations imbedded in or under the coating. Two examples are shown, one revealing dirt from a coating oven and one revealing an elongated dirt streak originating from a leveller.



DIRT (Coated) — Oven

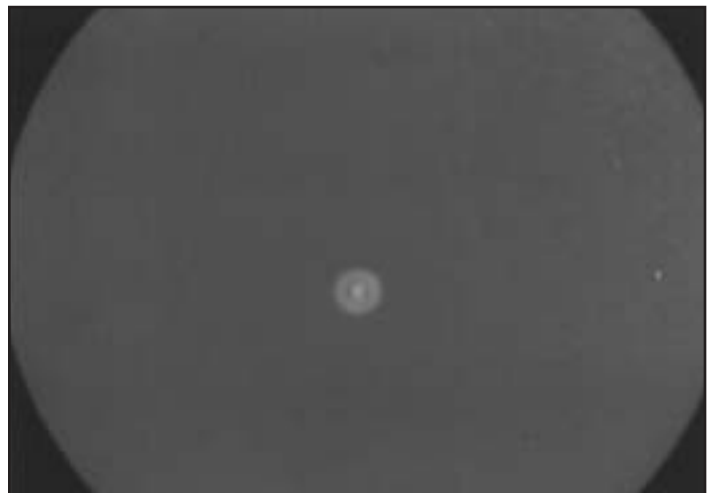


DIRT — Leveller

FISH EYE—

(Cratering, Solvent Pop)

Small crater-like openings that appear during or shortly after coating application due to surface contaminated with oil, wax, silicone, grease, etc.

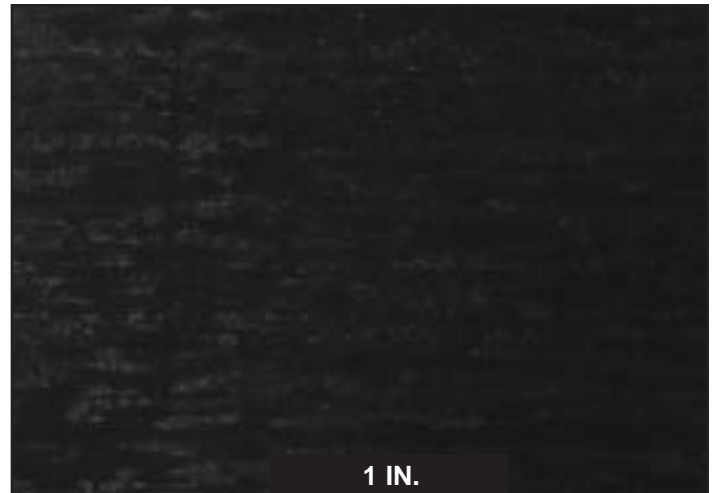


FLAKING—

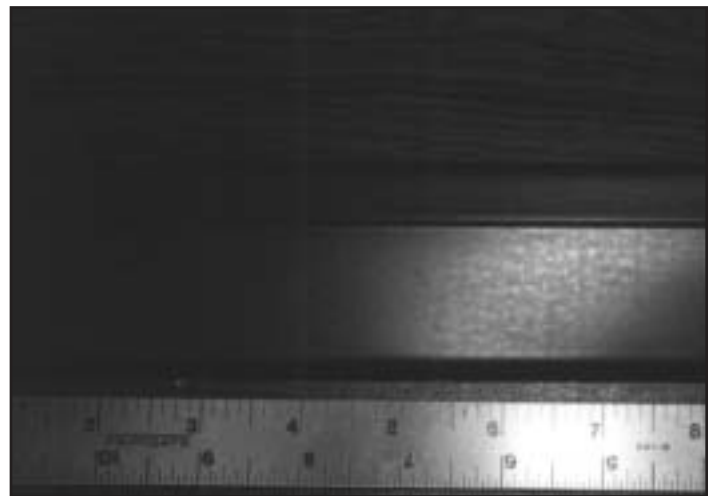
A condition in coated sheet where portions of the coating become loosened due to inadequate adhesion. **(No picture)**

LUBE, HIGH OR LOW—

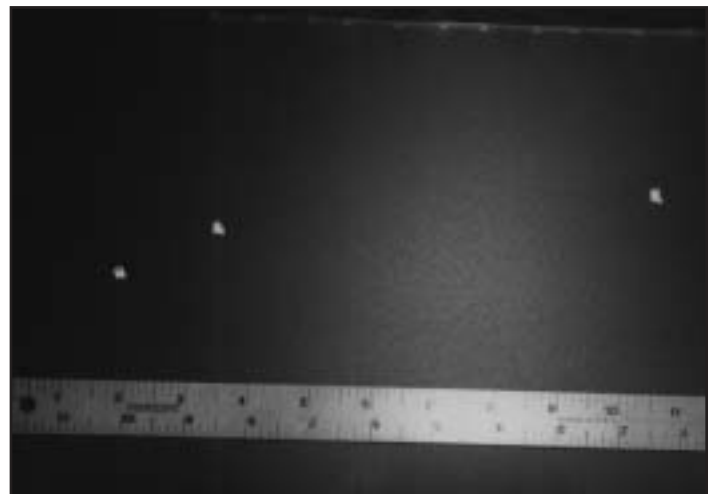
Failure of the lubricant to meet the agreed upon thickness limits measured in weight per unit area. Picture shows high lube.

**MOTTLING, PRESSURE—**

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

**PICK-OFF—**

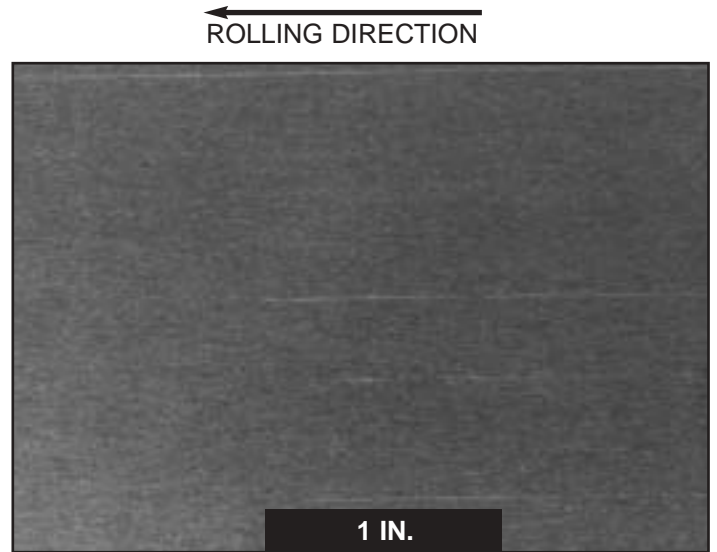
The transfer of a portion of the coating from one surface of the sheet to an adjacent surface due to poor adhesion of the coating.

**PINHOLE—**

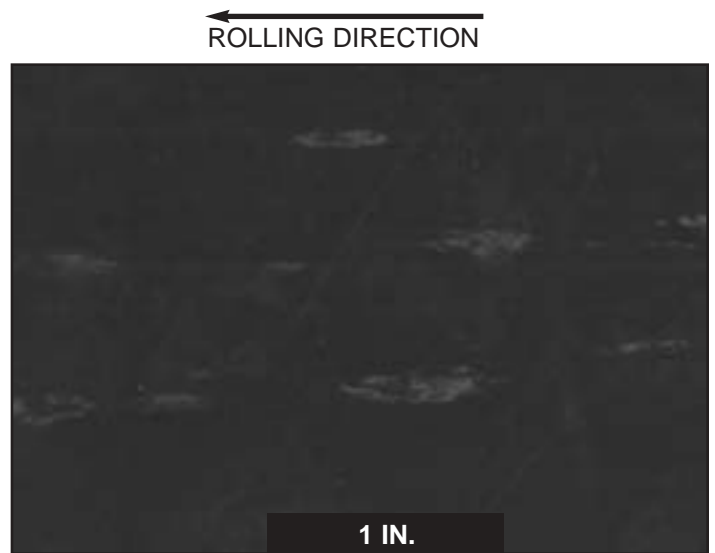
A small-sized void in the coating of a sheet product. A typical cause is solvent popping. **(No picture)**

SCRATCH, OVEN—

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

**SPOT, LUBE—**

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

**STARVATION—**

Non-uniform coating application which results in absence of coating in certain areas. This condition can be caused by mismatch of applicator roll and sheet surface velocities. **(No picture)**

STRIATION—

Longitudinal non-uniform coating thickness caused by uneven application of the liquid coating. **(No picture)**

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