



Standard Terminology Relating to Print Problems¹

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1. Scope*

1.1 This terminology standard gives definitions for problems that develop with printed matter as a result of deficiencies in the ink, substrate, press, or combinations thereof.

1.2 These definitions cover the three major printing processes and are given in the following sequence: lithography, flexography, and gravure. For further information see Refs (1-4) at the end of this standard.

2. Referenced Documents

2.1 *ASTM Standards*:²

D4361 Test Method for Apparent Tack of Printing Inks and Vehicles by a Three-Roller Tackmeter

F425 Terminology Relating to Lithographic Copy Products (Withdrawn 2003)³

3. Significance and Use

3.1 A common set of definitions is essential to improve communication and avoid misunderstanding among ink makers, substrate makers, and printers.

3.2 The term “paper” in this standard also encompasses the term “paperboard.”

3.3 Definitions that are verbatim from one of the referenced sources are indicated by giving the acronym of the organization or the author of the book at the end of the definition.

4. Terminology

4.1 *Definitions*:

4.1.1 *Lithographic Printing*:

blistering, n—the formation of small air pockets under the printed paper surface.

¹ This terminology is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.56 on Printing Inks.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

DISCUSSION—It results from moisture being trapped under the dried ink film during heatset drying. This condition is more common with higher ink coverage and heavier basis weight papers.

blocking, n—an undesired adhesion between sheets of printed material that might occur under moderate pressure or increased temperature, or both, while in storage or in use.

DISCUSSION—Damage to one or both surfaces may be visible upon separation and may be due to improperly dried ink or coating.

bronzing, n—the metal-like reflectance which sometimes appears at the surface of nonmetallic colored materials.

DISCUSSION—Bronzing is perceived at the specular angle by observing the image of a white light source, for example, and is characterized by a distinct hue of different dominant wavelengths than the hue of the color itself. The origin of the selective specular reflectance observed is generally considered to be reflectance from very small particle size pigment partially separated from surrounding vehicle at or near the ink film surface.

catch up, n—a condition that occurs when the non-image area of the plate becomes ink receptive. See **scum**. [GATF]

DISCUSSION—This condition results from the insufficient feeding of dampening solution.

chalking, n—see **powdering**.

coating pick, n—the removal of coating particles from the sheet surface that occurs when the tack of the ink exceeds the surface strength of the substrate.

DISCUSSION—A loss in surface strength may occur during printing when the coating is resolubilized by the fountain solution.

crocking, n—smudging or rubbing off of ink.

dot distortion, n—an undesired change in shape of halftone dots during plate making or printing operations, or both.

dot doubling, n—the unintentional printing of two images slightly out of register from a single form.

DISCUSSION—Dot doublings can be the result of a mechanical problem due to undesired movement between the plate and the blanket.

dot gain, n—the increase in halftone dot size in relation to the dots on the lithographic film; it is the arithmetic difference between the dot area on the original film and dot area on the printed sheet.

DISCUSSION—Physical dot gain can be caused by a number of the processing steps in prepress or during actual printing. Factors that control dot gain on press are ink film thickness, amount of water feed, solid print density, ink holdout/absorbance characteristics of the paper,

*A Summary of Changes section appears at the end of this standard

screen ruling, blanket release, pressure between the blanket and plate, and pressure between the blanket and paper. Optical dot gain results from light scattering in the paper. The dot gain value can be determined using a dosimeter that calculates the apparent dot size on the print as compared with the original dot size based on the density of the solid.

dot loss, *n*—the total or partial loss of the smallest dots on the sheets, usually in the areas of 25 % screen or less.

DISCUSSION—Dot loss can be due to plate or blanket buildup caused by an undesired reaction between the paper and fountain solution. (Also referred to as disappearing dot or vanishing dot.)

dot slur, *n*—dot gain that occurs in a pronounced direction and is not symmetrical.

DISCUSSION—Slur is caused by mechanical problems with the drive and speed of the plate and blanket cylinders.

doubling, *n*—a printing defect in offset printing products (and other indirect printing processes) that manifests itself as a doubled or multiple (shadow-like) contour of the image elements. [KIPPHAN]

DISCUSSION—Mechanical vibration and register deviations during the printing process can cause doubling. Doubling can occur in single-color printing but is a special danger in multicolor printing. As is the case with slurring, doubling results in dot grain.

embossing, *n*—the tendency of a paper to take a permanent pattern, either depressed or raised, as a result of contact with the blanket during printing. [TAPPI]

fan-out effect, *n*—widening of the paper web in a web-fed press, normally caused by dampening but also by printing pressure, which can theoretically occur in sheet-fed printing as well. [KIPPHAN]

fiber pick, *n*—the delaminating, splitting, or tearing of paper surface fibers that occurs when the force between the paper and blanket exceeds the surface strength of the paper.

flying, *n*—the tendency of a printing ink or vehicle to be ejected as large globules from a roller distribution system. [D4361]

DISCUSSION—See also misting and spraying for comparison.

ghosting, *chemical, n*—the appearance of gloss or dull mirror images that are printed on the reverse side of the sheet.

DISCUSSION—This phenomenon is usually caused by chemical activity of the ink during the drying phase of oxidative inks.

ghosting, *mechanical, n*—the appearance of a phantom image on the printed side of the sheet.

DISCUSSION—These images can be caused by some mechanical factor in plate preparation, press settings or mechanical problems.

ghosting, *starvation, n*—mechanical ghosting that appears in solids and shadows as either a lighter image or a darker image than the background.

DISCUSSION—The basic cause is a layout that is too demanding for the inking capacity of the particular press.

(a) *light print ghosting*: a lighter image within the primary image. Light ghosts are defects in a print solid after other solids (for example, large letters) strip too much ink off the form rollers. This occurs when the other solids are next to the gripper edge, between it and the defective solid.

(b) *dark print ghosting*: a darker image within the primary image. Dark ghosts result, for example, from reverse block letters near the

grripper edge in a defective solid because the reverse leaves excess ink on the form rollers; the ghosts are further away from the gripper edge than the reverse.

hickey, *n*—an imperfection caused by dirt, hardened ink, paper debris or other unwanted particles that cling to the press or plate during printing.

DISCUSSION—Hickeys appear as either small solid printed areas surrounded by a white halo or as unprinted spots surrounded by printed ink.

hickey, *halo, n*—a doughnut shaped hickey with an inked center, often caused by foreign particles such as ink skin. [TAPPI]

hickey, *void, n*—a totally un-inked spot on the printed sheet, often caused by dust or pick-outs that adhere to the offset blanket or plate, thereby interfering with transfer of ink.

ink fading, *n*—term used in offset printing for the variation in the ink density (uneven ink film) in the direction of print (as a consequence of inking unit design and content of the printing sheet). [KIPPHAN]

ink over-emulsification, *n*—a condition that occurs when a lithographic ink picks up too much dampening solution resulting in a weak print or snowflake pattern.

ink misting, *n*—the ejection of fine particles of ink into the air and onto the press, occurring when the ink film splits in more than one place.

DISCUSSION—The centrifugal forces generated by high speed rollers can cause this problem. Long inks are more susceptible to misting than short inks.

ink refusal, *n*—the failure of a roller or plate to accept ink. Alternative term: *stripping*—see *Gravure Printing*.

DISCUSSION—The condition can be caused by gum buildup on the roller or plate in the image areas.

ink setoff, *n*—the undesirable transfer of an ink in any printing process from fresh prints to any other surface.

DISCUSSION—This printing defect is caused by slow setting inks or insufficient spray powder.

marking, *n*—the removal of printed ink from the web to idler rolls, turn bars, or nose cone on a printing press.

DISCUSSION—Printing ink may then be redeposited on subsequent printed sheets.

milking, *n*—a white colored buildup on the non-image areas of the offset blanket that usually occurs when the paper coating or paper filler (in the case of uncoated paper) softens due to inadequate water resistance.

misting, *n*—side effect of ink film splitting within an inking unit, in particular on rapidly-rotating inking rollers. [KIPPHAN]

DISCUSSION—Here, extremely small droplets (diameter of 10 to 50µm) of ink are released from the ink layers on the exiting nip. They form an aerosol with the ambient air, can lead to printing defects, and contribute to soiling of the press. Misting is very much dependent on the rheology of the ink, as well as on the velocity of the ink-carrying surface and the geometry of the rollers. See also spraying and flying for comparison.

moiré, *n*—an undesirable, unintended interference pattern caused by the out-of-register overlap of two or more regular patterns such as dots or lines.

DISCUSSION—In process color printing, screen angles are selected to minimize this pattern. If the angles are not correct, an objectionable effect may be produced.

mottle, *back trap*, *n*—a nonuniform density variation of a printed ink film due to nonuniform ink absorption into the paper.

DISCUSSION—This results in nonuniform transfer of the ink back onto the blankets of subsequent printing units of the press, which in turn is transferred onto the following sheets (or web) of paper.

mottle, *halftone*, *n*—a nonuniform transfer of halftone dots.

DISCUSSION—This condition can be caused by factors such as irregularities in paper surface, variations in ink transfer properties or emulsified ink.

mottle, *print*, *n*—an uneven appearance within the continuous ink film solid areas of a print, with respect to density, gloss or color.

DISCUSSION—Also referred to as “solid area mottle.” This effect may be caused by a varying ink film due to the uneven ink receptivity and absorbency of the paper or by poorly ground ink.

mottle, *trapping*, *n*—nonuniform print due to improper tack sequence of the inks.

DISCUSSION—If the first down ink is lower in tack on the substrate’s surface, subsequent ink film(s) will not trap uniformly. In this situation, it is not uncommon for the first down color to also be pulled off the printing substrate onto downline units causing poor density and ink color contamination.

mottle, *water interference*, *n*—nonuniform print caused by poor ink transfer due to the printing substrates’ inability to absorb fountain solution.

paper linting, *n*—the picking off of loosely bonded paper surface fibers, or dust, or both, that can accumulate on an offset plate or blanket interfering with print quality.

DISCUSSION—This condition is usually associated with uncoated paper.

pigment bleed, *n*—a condition in which some of the ink pigment is dispersed in the dampening solution and deposits on the non-image area of the plate and then prints as a light background tint. **[F425]**

DISCUSSION—Also referred to as tinting.

piling, *n*—a buildup of paper, ink or coating on the offset blanket, plate or rollers in such a quantity that it interferes with print quality. **[GATF]**

plate binding, *n*—the refusal of part of a lithographic plate to produce an image due to loss of ink receptivity.

DISCUSSION—This condition is caused by excess hydrophilic material such as gum.

plate wear blinding, *n*—the failure of the litho plate to print due to erosion in the image area.

plate scumming, *n*—the deposit of ink on the non-image area of the plate that can be in the form of minute particles or larger continuous solids.

plate tinting, *n*—the existence of a weak coloration from the fountain solution onto the non-image area of the plate.

DISCUSSION—The condition occurs when pigments, with or without ink ingredients, become solubilized or emulsified into the fountain solution.

plate wear, *n*—a physical abrading away of the non-image or image area, or both, of the plate.

DISCUSSION—This erosion can be caused by abrasive materials in the ink or on the substrate.

powdering, *n*—a condition where ink easily rubs off a print after the normal drying period.

DISCUSSION—Also referred to as “chalking.” Powdering could be due to the rapid absorption of the vehicle into the paper or the improper pigment to binder ratio in the ink.

print void, *n*—a defective spot of unprinted matter in a print solid or halftone that can be caused by a buildup of foreign matter on the plate or blanket.

railroad tracks, *n*—a pattern on the printed sheet extending in the machine direction that is comprised of one or more linear regions. **[TAPPI]**

DISCUSSION—This effect may be caused by excessive variations in drying across the width of the web.

scum, *n*—a condition that occurs when a lithographic plate has become sensitized in the non-image areas and these areas begin to take ink. **[GATF]**

set-off, *n*—the unintentional transfer of part of an image or ink from its intended location to another surface. **[F425]**

show-through, *n*—the printed image can be observed on the opposite side of the sheet under normal lighting conditions.

DISCUSSION—This condition can be caused by a heavy ink film, ink strike-through, or low substrate opacity.

slinging, *n*—see **spraying**.

slip roll ink buildup, *n*—an undesirable accumulation of ink on the dampening rolls of a continuous type dampening system.

slurring, *n*—slurring is a printing defect that occurs in offset printing, manifested as changes in the geometry of the halftone dots. **[KIPPHAN]**

DISCUSSION—Round elements may be deformed and become oval. Slurring in the direction of print is classed as circumferential slurring and slurring at right angles to this as lateral slurring. This effect is related to the rolling behavior between plate, blanket, and impression cylinders and to influences of the materials.

snow flaking, *n*—the appearance of tiny, white unprinted specks (voids) in type or solids, or both, in offset printing that can be caused by excessive emulsification.

spraying, *n*—when large ink particles (diameter roughly greater than 80 μm) are thrown off the rollers in the inking unit or the printing plate, particularly with presses that run at high speeds. **[KIPPHAN]**

DISCUSSION—Also referred to as slinging. See also misting and flying for comparison.

strike-through, *n*—the penetration of the vehicle of a printing ink through the sheet, so that the ink is apparent on the reverse side under normal lighting conditions.

DISCUSSION—This condition can be caused by heavy ink film, improper ink formulation, or poor ink holdout of the paper.

tinging, *n*—see **pigment bleed**.

tinting, *n*—a background wash of color seen uniformly across the non-image area of a print. See **plate tinting**.

DISCUSSION—Tinting can be caused by the pigment in the ink becoming partially dissolved in the fountain solution.

tracking, *n*—the undesired appearance of ink on the copy in a repeat pattern. **[F425]**

walking off, *n*—the disappearance or weakening of image parts on the printing plate during the press run.

DISCUSSION—Usually a blind image is slightly visible but ink repellent, whereas an image that has walked off is not there.

washed out solid, *n*—a decrease in the density of solids caused by ink taking on an excessive amount of water or by the insufficient transfer of ink.

whiskers at trailing edge of solid areas, *n*—ragged edges around the printed image caused by improper roller setting or by an impression roll that is too hard (improper durometer).

4.1.65 *Flexographic Printing:*

adhesion, *n*—the bonding of the ink to the substrate.

bleed, *n*—the spreading or running of a dye or pigment color by the action of a solvent.

blocking, *n*—(see 4.1.1)

blooming/blushing, *n*—a foggy appearance in a printed ink film commonly caused by incompatibility of the ingredients in the ink.

caking, *n*—a settling out of pigments in a fluid ink during storage (sedimentation).

crocking, *n*—(see 4.1.1)

delamination, *n*—the separation of layers of a laminate.

dry in, *n*—a situation where the cells in the anilox cylinder become partly or completely filled with dry ink.

DISCUSSION—This reduces print density and may cause loss of detail, particularly on fine type and highlight dots.

feathering, *n*—a ragged edge on printed type.

DISCUSSION—This effect may be caused by poor ink distribution, a bad impression, excessive ink, or an ink not suitable for the paper.

fill in, *n*—a condition where the halftone dots and fine type lose definition because the non-image areas of the plate between the dots or characters become plugged with dry ink or a mixture of dry ink and paper fibers.

haloing, *n*—the peripheral lines around print detail caused by excessive ink, excessive roller impression or faulty plate shoulders.

hickey, *n*—(see 4.1.1).

ink kick-out, *n*—the settling of pigment or resin in the bulk ink.

ink mottle, *n*—a condition in which large solid images show very localized variations in color strength or gloss, or both.

DISCUSSION—This condition is caused by an uneven transfer of the ink from the plate to the substrate, or by nonuniform absorption into the substrate.

ink sedimentation, *n*—the settling out of undissolved resin or improperly ground pigments.

ink setoff, *n*—the transfer of ink to the back side of the sheet or area of the web that is the result of slow drying.

moiré, *n*—(see 4.1.1).

pick off, *n*—the undesirable removal of a previously printed ink film in subsequent units of the press due to insufficient drying of the ink.

piling, *n*—a build up of paper or ink on the plate.

pinholing, *n*—the appearance of fine voids in the print area caused by nonuniform wetting of the substrate or some other mechanical problem.

plate swelling, *n*—an enlargement of rubber or polymer plates due to contact with an incompatible ink, coating, or wash up solvent.

reticulation, *n*—the cracking of a print (mud cracking) due to poorly plasticized ink, over-thinning of an ink or too little print pressure.

DISCUSSION—This condition can also be caused by the incompatibility of the ink and substrate.

screening, *n*—the appearance of a cross-hatch pattern on the print that can be caused by ink drying too rapidly.

show-through, *n*—(see 4.1.1).

streaking, *n*—undesirable lines in a print caused by damaged rollers, cylinder bounce or bottoming gears.

strike-through, *n*—(see 4.1.1).

4.1.92 *Gravure Printing:*

adhesion, *n*—(see 4.1.65).

bleed, *n*—the spreading of ink into an unwanted area on the printed sheet.

DISCUSSION—Also, the migration of ink through substrate or the spreading or running of a dye or pigment color by the action of a solvent.

blistering, *n*—an enclosed raised spot or air bubble on the paper surface that can be caused by moisture trapped during the drying process.

DISCUSSION—This is common with heavier ink coverage and higher basis weight paper.

blocking, *n*—(see 4.1.1).

cobwebbing, *n*—a filmy buildup of dried ink or coating on the doctor blade, ends of the impression roll, or printing cylinder.

comet, n—extraneous ink deposited in the shape of a round dot with a trailing tail.

DISCUSSION—This effect can be caused by a relatively hard foreign particle or dried ink that initially builds up under the doctor blade and is then released.

crawling, n—a nonuniform contraction of the printing ink on the substrate due to poor wetting.

DISCUSSION— Also referred to as *reticulation* or *pearling*. The condition is normally caused by low ink viscosity or incompatibility with the substrate.

crocking, n—(see 4.1.1)

darts, n— See **comet**.

delamination, n—(see 4.1.65).

doctor blade streaks, n—lines in the image or non-image areas of a gravure print caused by a defect of the doctor blade.

doughnuts, hickeys, n—round voids in a solid print with ink in the center.

DISCUSSION—The condition is caused by foreign matter in the ink.

drag out, n—excessive ink around shadow areas of the image usually associated with excessively deep etches on less absorbent substrate.

drying in, n—the accumulation of dried ink in the cells of the cylinder.

DISCUSSION—The condition is caused by inks that dry too quickly. The defect will normally first occur in the shadow areas.

feathering, n—a ragged or finely trailing pattern at the sharp edge of type or solid areas.

DISCUSSION—This effect can be caused by improper ink viscosity or an incorrectly set doctor blade.

ghosting, n—the presence of a faint mirror image of a design appearing in areas not intended to receive that portion of the image.

hazing, n—the fine deposit of ink on the non-image area of the gravure cylinder. It is also referred to as *scumming* or *dirty wipe*.

hickey, n—(see 4.1.1).

mealiness, n—an uneven or grainy solid or halftone dot caused by improperly ground ink or the presence of foreign matter.

missing dots, n—a noticeable area void of halftones or an area of the cylinder that has cells that have not transferred ink to the paper.

DISCUSSION—It can be caused by a worn cylinder or rough paper surface, or both. (Also referred to as *skipped dots*).

moiré, n—(see 4.1.1).

mottle, n—the nonuniform transfer or absorption of the ink into the substrate creating an uneven ink film.

orange peel, n—a pattern of roughness somewhat like that of the outer surface of an orange, appearing when the film split pattern is not uniform over the printed surface.

picking, n—the removal of material (fiber, filler or coating) from the paper surface or underlying ink film during printing.

DISCUSSION—The condition occurs when the pulling force of the ink is greater than the surface strength of the paper or underlying ink film. Unlike offset printing, it is not due to the tack force of the ink, but usually is associated with an ink drying deficiency.

piling, n—the build up of ink or other materials on the gravure cylinder or impression cylinder.

pinholes, n—small voids in the printed area caused by the failure of ink to form a continuous ink film.

railroading, n—the printing of thin parallel lines in the nonimage area as a result of a scratch(es) in the engraved cylinder or nick(s) in the doctor blade.

screening, n—a pattern of vertical and diagonal lines on the printed substrate where the ink flowout between cells in the cylinder is such that an uneven ink film is formed.

DISCUSSION—Usually associated with solid areas of the form. This effect can be caused by an ink too high in viscosity or ink drying too fast.

scumming, n—the deposit of ink in the non-imaging area.

show-through, n—(see 4.1.1).

snow flaking, n—small white spots in a printed area caused by the absence of ink.

streaking, n—linear deposits of ink that run across both image and non-image areas.

DISCUSSION—This condition can be caused by a defective doctor blade or improper pressure setting of the doctor blade.

strike-through, n—(see 4.1.1).

stripping, n—a printing imperfection observed when the print becomes alternatively more and less intense across the web.

toning, n—the deposit of ink in the non-image area caused by poor wiping of doctor blade.

volcanoes, n—printing imperfection resembling the crater of a volcano with a ring of heavy ink surrounding an area of no or very little ink.

DISCUSSION—Generally occurs in heavily inked areas and is caused by underlying solvent vapors leaving the already partially dried ink film.

whiskering, n—fine hair-like lines that are dragged from solid print areas to non-print areas.

DISCUSSION—The condition may be caused by static electricity, dry atmospheric conditions or paper characteristics.

5. Keywords

5.1 flexography; gravure; lithography; paper; print problems; printing inks; printing presses; printing substrates

REFERENCES

- (1) *NAPIM*, National Association of Printing Ink Manufacturers
Woodbridge, NJ.
- (2) *GATF*, Graphic Arts Technical Foundation, Pittsburgh, PA.
- (3) *TAPPI*, Technical Association of the Pulp and Paper Industry,
Norcross, GA.
- (4) *KIPPHAN*, *Handbook of Print Media Technologies and Production
Methods*, Helmut Kipphan, Springer 2001.

SUMMARY OF CHANGES

Committee D01.56 has identified the location of selected changes to this standard since the last issue (D6488 - 05) that may impact the use of this standard. (Approved July 1, 2008.)

(1) The definition of railroading (4.1.3) has been updated to more accurately reflect current usage.

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