



Standard Guide for Examination of Typewritten Items¹

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1. Scope

1.1 This guide covers procedures that should be used by forensic document examiners (Guide E 444) for examinations and comparisons involving typewritten items and related procedures.

1.2 These procedures are applicable whether the examination and comparison is of questioned and known items or of exclusively questioned items.

1.3 These procedures include evaluation of the sufficiency of the material (questioned, or known, or both) available for examination.

1.4 Procedures are also given for taking exemplars from typewriters and the proper handling of typewriters or parts of typewriters that might be relevant.

1.5 These methods can also be applicable (in whole or in part) to examinations of documents prepared on other impact and nonimpact printing devices.

1.6 The particular methods employed in a given case will depend upon the nature of the material available for examination.

1.7 This guide might not cover all aspects of unusual or uncommon examinations of typewritten items.

1.8 This guide cannot replace training (Guide E 2388) or experience and should be used in conjunction with professional judgment.

1.9 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.10 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

E 444 Guide for Scope of Work of Forensic Document Examiners

E 1658 Terminology for Expressing Conclusions of Forensic Document Examiners

E 1732 Terminology Relating to Forensic Science

E 2195 Terminology Relating to the Examination of Questioned Documents

E 2287 Guide for Examination of Fracture Patterns and Paper Fiber Impressions on Single-Strike Film Ribbons and Typed Text

E 2331 Guide for Examination of Altered Documents

E 2388 Guide for Minimum Training Requirements for Forensic Document Examiners

F 221 Terminology Relating to Carbon Paper and Inked Ribbon Products and Images Made Therefrom

F 909 Terminology Relating to Printers

F 1457 Terminology Relating to Laser Printers

3. Terminology

3.1 For definitions of terms in this Guide, refer to Terminology E 1732 and Terminology E 2195. Some useful definitions of terms can also be found in the other Terminology standards in 2.1.

3.2 Definitions:

3.2.1 *ball element, n*—an element used in a single element typewriter in which the fully formed characters are located on the outer surface of a sphere-like device. Frequently called *golf-ball element*.

3.2.2 *baseline, n*—the ruled or imaginary line upon which typewriting appears to rest.

3.2.3 *carbon paper, n*—a sheet composed of a supporting substrate on one or both sides of which is a coating containing a transferable (usually colored) material. The coating is of such nature that it will transfer in part or entirely to a copy sheet at the point of pressure contact. **F 221**

3.2.4 *character, n*—any language symbol (for example, letter, numeral, punctuation mark, or other sign), other symbol,

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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.

or ornament.

3.2.5 *character pitch*, *n*—the number of characters that can be printed in a horizontal 1 in. (25.4 mm). **F 1457**

3.2.6 *character spacing*, *n*—the width allotted to each character in a fixed pitch (monospacing) typewriter or to the basic unit in a proportional spacing typewriter; usually expressed in millimeters or as a fraction of an inch. Synonym for **horizontal escapement**.

3.2.7 *correctable ribbon*, *n*—a ribbon that produces an image that is designed to be completely removed from the substrate by means of lift-off.

3.2.8 *correction media*, *n*—ribbons, tapes, and sheets designed to be struck by the typeface to cover-up or lift-off typed text.

3.2.9 *cover-up*, *n*—the obliteration of one or more images by means of an opaque material similar in color to the substrate. **F 221**

3.2.10 *daisy wheel element (print wheel)*, *n*—an element used in a typewriter in which the fully formed characters are contained on the ends of finger-like projections radiating out from the center of a disk.

3.2.11 *electric typewriter*, *n*—a typewriter in which an electromechanical device causes the type element to be activated when the keys are struck. **F 909**

3.2.12 *electronic typewriter*, *n*—an electric typewriter in which the keyboard input is received by an electronic processor built into the typewriter. This unit then controls the print head and other features to produce the typing action. **F 909**

3.2.13 *element*, *n*—the interchangeable typeface carrier of a single element typewriter. See **ball element**, **daisy wheel element**, **thimble element**.

3.2.14 *fabric ribbon*, *n*—an inked ribbon wherein the substrate is a woven cloth material, such as nylon, cotton, silk, etc. **F 221**

3.2.15 *fixed pitch*, *adj*—describes a character set in which all character cells are of equal width. (See **proportional spacing**.) **F 1457**

3.2.16 *impact printer*, *n*—a printer in which printing is the result of mechanical impacts.

3.2.17 *individualizing characteristics*, *n*—marks or properties that serve to uniquely characterize.

3.2.17.1 *Discussion*—Both *class characteristics* (marks or properties that associate individuals as members of a group) and *individual characteristics* (marks or properties that differentiate the individual members in a group) are individualizing characteristics.

3.2.18 *inked ribbon*, *n*—a ribbon composed of a supporting substrate of film, fabric, or paper and a coating or impregnation of a coloring material. The coloring material is of such nature that it will transfer in part or entirely to a copy sheet at the point of pressure contact. **F 221**

3.2.19 *lift-off*, *n*—the removal of one or more images of copy from the substrate by transferring to an intermediate member. **F 221**

3.2.20 *line spacing*, *n*—the distance between successive lines of text, usually measured from baseline to baseline, and usually expressed in millimeters or as lines per inch for typewritten text. Synonym for **vertical escapement**.

3.2.21 *manual typewriter*, *n*—a typewriter whose operation depends solely upon the mechanical action powered by the operator.

3.2.22 *monospacing*, *n*—see **fixed pitch**.

3.2.23 *multi-strike film ribbon*, *n*—a ribbon wherein the substrate film such as polyester is coated or impregnated with an ink which allows several different imprints to be made from multiple overstrikes on the same location on the ribbon, and still result in full characters being printed. **F 221**

3.2.24 *nonimpact printer*, *n*—a printer in which image formation is not the result of mechanical impacts. **F 909**

3.2.25 *original typed text*, *n*—typed text imprinted onto the surface of a substrate as the result of the impact of a typeface.

3.2.26 *printer*, *n*—an output unit that produces durable hard-copy record of data in the form of a sequence of discrete graphic characters belonging to a predetermined character set. **F 909**

3.2.27 *proportional spacing*, *n*—a system of printing where the character spacing is set in accordance with the character width. See **fixed pitch**.

3.2.28 *single element typewriter*, *n*—a typewriter that generates text via interchangeable “elements” that each contain a full set of characters.

3.2.29 *single-strike film ribbon*, *n*—an inked ribbon wherein the substrate is a plastic film material such as polyethylene, where each area of the ribbon is capable of producing only one image. **F 221**

3.2.30 *single-strike paper ribbon*, *n*—an inked ribbon wherein the substrate is paper, where each area of the ribbon is capable of producing only one image. **F 221**

3.2.31 *thimble element*, *n*—an element used in a typewriter in which the fully formed characters are located on the ends of finger-like devices that are similar to a daisy wheel except that the device is formed to produce a cup-like or thimble structure.

3.2.32 *thread count*, *n*—the total number of warp and filling threads in one square inch of fabric. **F 221**

3.2.33 *typebar*, *n*—a bar, mounted on a typewriter, that holds a type slug(s).

3.2.34 *type element*, *n*—see **element**.

3.2.35 *typeface*, *n*—the portion of the element or type slug that projects from the body and contacts the surface of the substrate to form the character.

3.2.36 *type slug*, *n*—the block (usually metal) attached to the end of the typebar that bears the typeface.

3.2.37 *typestyle*, *n*—a particular variant of a type design.

3.2.38 *typestyle classification scheme*, *n*—a hierarchical taxonomic schematic, key, or computer database that can be used to determine the source of a particular typestyle.

3.2.38.1 *Discussion*—These schemes are only an aid for searching a typestyle library and are not a substitute for actual reference materials in the typestyle library.

3.2.39 *typestyle library*, *n*—an organized collection of reference samples of typestyles and related materials.

3.2.39.1 *Discussion*—Reference materials can also include information such as typestyle catalogs, treatises relative to typography and the design of typestyles used on typewriters and other printing systems, typewriters, type slugs, type

elements, actual strike-ups, and instruction and repair manuals. Available relevant data on each typestyle should be collected and maintained.

3.2.40 *typewriter*, *n*—a self-contained machine for character-by-character direct writing by means of keyboard-operated typefaces.

3.3 Definitions of Terms Specific to This Standard:

3.3.1 *alignment*, *n*—the adjustment of various mechanisms of a typewriter to ensure the even printing of the characters and their proper positioning relative to the baseline and to the other characters.

3.3.2 *alignment defect*, *n*—a deviation from the intended appearance or position of a character relative to another character. see **impression defect**, **motion defect**.

3.3.2.1 *Discussion*—Alignment defects are usually categorized as vertical misalignment (character too high or low relative to the baseline established by the other characters), horizontal misalignment (character too far to the left or right relative to other characters), and twisted or leaning (character leans to the left or to the right); because they are corrected in the alignment process, impression defects are considered as alignment defects.

3.3.3 *bead defect*, *n*—inked or uninked impression or hole in the paper caused by a contaminant particle encased in plating material located on or adjacent to the printing area of the typeface on a metal coated element.

3.3.4 *family (of type)*, *n*—a class of type designs sharing basic qualities of style and artistic expression that differentiate it from other similar designs.

3.3.5 *flashing*, *n*—excess material from the molding process.

3.3.6 *impression defect*, *n*—a deviation from the intended evenness in appearance of a character over the entire impression of the character or relative to the impression of another character. See **off-foot**.

3.3.7 *motion (as related to typebar typewriters)*, *n*—the distance traveled by the mechanism for case shifting (usually by the typebar segment or the carriage) and the corresponding separation of the characters on the type slug.

3.3.8 *motion defect (as related to typebar typewriters)*, *n*—a deviation from the intended evenness in appearance of the baseline alignment of unshifted characters relative to shifted characters.

3.3.9 *off-foot*, *n*—the lack of desired and optimum uniformity of contact between the typeface and the substrate.

3.3.9.1 *Discussion*—While the on-feet adjustment of the typewriter evens the impression of the upper and lower portions of all the characters, this term is also applied to uneven impressions that are heavier or lighter on the sides or corners (usually due to misalignment or distortion of individual typebars).

3.3.10 *on-feet*, *n*—the desired and optimum uniformity of contact between the typeface and the substrate

3.3.11 *on-feet adjustment*, *n*—the positioning and setting of various mechanisms of a typewriter to ensure the even printing of the upper and lower portions of the characters.

3.3.12 *rebound*, *n*—a double impression of a typed character, the second lighter than and overlapping the first.

3.3.13 *typeface defect*, *n*—deviation from the intended appearance of a character due to physical damage to the typeface or its malformation in manufacture.

4. Significance and Use

4.1 The procedures outlined here are grounded in the generally accepted body of knowledge and experience in the field of forensic document examination. By following these procedures, a forensic document examiner can reliably reach an opinion concerning the source of the item(s) examined.

4.2 The examinations described in this guide pertain to those documents prepared on typewriters and can consist of a wide range of forensic examinations. Some or all of these procedures can also be applicable to examinations of documents prepared on other impact and nonimpact printing devices.

4.2.1 Examinations can be conducted to classify a typestyle and to determine the possible make and model of typewriter(s) by comparison with a typestyle library.

4.2.2 Examinations and comparisons of typewritten documents can be conducted for the purpose of determining whether or not they are from a common source.

4.2.3 Examinations and comparisons of typewritten documents can be conducted for the purpose of determining whether or not they were produced using a particular typewriter or type element.

4.2.4 Examinations and comparisons of a typewritten document(s) with a typewriter (or particular part(s) of a typewriter) or type element can be conducted for the purpose of determining whether or not a document was prepared with that equipment.

4.2.5 Examinations and comparisons of a typewritten document(s) with typewritten documents of known date can be conducted for the purpose of determining whether or not a document was prepared on or about the date indicated.

4.2.6 Examinations of typewritten documents can be conducted for the purpose of determining whether or not a document was typed in a single, continuous operation.

4.2.7 Examinations of typewriter ribbons or correction media (see lift-off and cover-up), or both, can be conducted to determine the content or source of the material typed on them or corrected with them, respectively.

5. Interferences

5.1 Items submitted for examination can have inherent limitations that can interfere with the procedures in this guide. Limitations should be noted and recorded.

5.2 Limitations can be due to submission of nonoriginal documents or condition of the items submitted for examination. Other limitations can come from the quantity or comparability of the material submitted, or from limited individualizing characteristics. Such features are taken into account in this guide.

5.3 The results of prior storage, handling, testing, or chemical processing (for example, for latent prints) can interfere with the ability of the examiner to see certain characteristics.

Whenever possible, document examinations should be conducted prior to any chemical processing. Items should be handled appropriately to avoid compromising subsequent examinations.

5.4 Consideration should be given to the possibility that various forms of simulations, imitations, and duplications of typewriting can be generated by computer and other means.

6. Equipment and Requirements

6.1 Appropriate light source(s) of sufficient intensity to allow fine detail to be distinguished.

NOTE 1—Natural light, incandescent or fluorescent sources, or fiber optic lighting systems are generally utilized. Transmitted lighting, side lighting, and vertical incident lighting have been found useful.

6.2 Magnification sufficient to allow fine detail to be distinguished.

NOTE 2—The use of a comparison microscope or optical comparator (or the equivalent electronic imaging equipment) can facilitate certain of these examinations.

6.3 Measuring devices:

6.3.1 Rulers and measuring grids in SI (millimetre) and I-P (inch) units.

NOTE 3—Precision of ruling and width of ruled line are both important in typewriter alignment grids. A range of alignment grids with appropriate ruling increments is required. Some of the functions of these grids may be performed through the use of electronic imaging equipment.

6.4 Typestyle library and relevant reference material.

6.4.1 Typestyle classification scheme(s) can aid in searching for a particular typestyle.

6.5 Imaging or other equipment for recording observations as required.

6.6 Other apparatus as appropriate.

6.7 Sufficient time and facilities to complete all applicable procedures.

7. Procedure

7.1 Perform all procedures when applicable, and note each when appropriate. These procedures do not have to be performed in the order given.

7.2 Document the examinations performed, the relevant observations, and the results.

7.3 At various points in these procedures, a determination that a particular feature is not present or that an item is lacking in quality or comparability can indicate that the examiner should discontinue or limit the procedure(s). It is at the discretion of the examiner to discontinue the procedure at that point and report accordingly, or to continue with the applicable procedures to the extent possible. Document the reasons for such a decision.

7.4 Conduct an initial examination of each item for the presence of original typed text, nonoriginal text, or both.

NOTE 4—Examination of the original is preferable.

7.4.1 If the original is not submitted, evaluate the quality of the best available reproduction to determine whether the significant details have been reproduced with sufficient clarity for examination purposes and proceed to the extent possible.

7.4.1.1 If the nonoriginal text has not been reproduced with sufficient clarity for examination purposes, discontinue these procedures and report accordingly.

7.4.2 When examining nonoriginal text, determine whether the typestyle and other characteristics are consistent with a reproduction of original typed text or consistent with having been produced by another source (for example, computer generated typestyles that are based on or copied from typewriter typestyles).

7.4.2.1 If the text is not a reproduction of original typed text, report accordingly and continue to the extent possible with any applicable procedures in this guide.

7.5 Determine the suitability of each typewritten item for examination.

7.5.1 If a questioned item is unsuitable for examination, discontinue these procedures and report accordingly.

7.5.2 If a questioned item is suitable for a limited examination, proceed to the extent possible.

7.5.3 If the known typewritten item(s) submitted for examination is unsuitable for examination, request appropriate knowns. If a typewriter is submitted, it might be possible to obtain exemplars from this machine as described in 7.19.

NOTE 5—It can be useful for the examiner to obtain, if possible, any available information about the typewriter's usage (for example, office/legal correspondence; home/casual; school/reports) and date of purchase, as well as service and repair history. It can also be helpful if the submitter can locate other elements, ribbons, correction media, and other accessories that might have been used with the typewriter.

7.5.4 If the known typewritten item(s) available for examination is not suitable and no others are obtained, discontinue these procedures at the appropriate point and report accordingly.

7.5.5 If the known typewritten item(s) available for examination is suitable for a limited examination, proceed to the extent possible.

7.6 Examine typed text for the following characteristics:

7.6.1 The kind of typewriting mechanism (for example, typebar, single element using a ball element, a thimble element, or a daisy wheel element; manual, electric, or electronic).

7.6.2 Horizontal character spacing(s) (character pitch) and vertical line spacing(s), fixed pitch or proportional spacing, dual pitch or multiple spacing.

NOTE 6—Specially ruled grids have been found useful for these measurements, although rulers or other measuring devices may be used.

7.6.3 The length of the longest typewritten line and the maximum width of the paper in the typing direction which can be indicative of the typing line length (line-of-write length) and paper width capacity required for the typewriter(s) used to produce the typed text being examined.

7.6.4 Family(s) of type (for example, monotone, pica and elite, courier, prestige).

7.6.5 Size of characters (for example, pica, elite, micro).

7.6.6 The presence of operator-controllable features (for example, bold type, centered text, justified right margin).

7.6.7 Type of ribbon (for example, fabric, single-strike paper or film, permanent or lift-off correctable film, multi-strike film).

7.6.8 The presence and the method of any correction(s) (for example, abrasive erasure, strike-over, cover-up, lift-off).

7.7 Evaluate the consistency of typewriting throughout the document for any possible interlineations according to the procedures in 7.23. When multiple pages are involved, each page should be examined to determine consistency with the other pages.

7.8 Classify the typestyle(s).

7.8.1 Search typestyle library to determine, if possible, the typestyle, the manufacturer of the typestyle, and the possible make and model of typewriter(s) using that typestyle and having the characteristics noted in 7.6.

7.8.1.1 When available, a typestyle classification scheme(s) should be used to facilitate the search.

NOTE 7—Conclusions as to the classification of a typestyle are dependent on the completeness of the typestyle library used. Thus, it is possible that there are one or more typestyles not in the typestyle library that would be indistinguishable from the item being examined. Even with access to a comprehensive typestyle library, association of an unknown typestyle with a single known typestyle is not always possible. This is because differentiation of some typestyles depends on particular characters that might not be present in the typed text being examined or the quality of the typed text being examined can obscure significant differentiating design features.

7.8.2 If it is suspected that the document was prepared on a single element typewriter, consider the interchangeability of elements between compatible machines (including different makes and models).

7.8.3 Different typestyles can be used on the same single element typewriter. Consider the make(s) and model(s) of typewriter(s) that can use that class of element and the other typestyles available on compatible elements.

7.9 Conduct examinations of the typed text for those characteristics that, if present, can enable the examiner to determine the actual machine, element, or machine/element system used to prepare the document. Comparison with appropriate typestyle reference samples, strike-ups, or other reference material can aid in this phase of the examination. Examine the typed text for the following characteristics:

7.9.1 Character alignment or misalignment. Alignment defects can be horizontal (left/right), vertical (high/low), rotational (clockwise/counterclockwise), or a combination of these. Misalignment can also affect the uniformity of the impression ('off-foot'). Motion defects on typebar typewriters can affect the baseline alignment of shifted characters (for example, upper case) relative to unshifted characters (for example, lower case). Tilt and rotate defects on single element ball machines can affect horizontal and vertical alignment of specific groups of characters to each other.

7.9.2 Defects, or abnormalities, or both in individual typed characters can take the form of damage to the typeface, extraneous marks from unremoved flashing or bead defects, rebounding, improper ribbon operation affecting the printed impression, irregularities or variation in the spacing between letters or lines, paper slippage, or defective operation of margin. Dirty typefaces and worn fabric ribbons can also introduce transitory defects. (See references for other examples.)

NOTE 8—Some features in typewriting examinations can be both class and individual depending upon the particular make/model of typewriter and the nature of the misalignment, defect, or abnormality. Defects found in typewritten documents can be fixed, transient, or progressive and can also exhibit variation in successive impressions.

7.10 Conduct a side-by-side comparison of the questioned typed text(s) with the known typed text(s), the typewriter(s), or element(s), or both; or of the questioned typed texts to each other.

7.11 Analyze, compare, and evaluate the individualizing characteristics and other potentially significant features present in the comparable portions of the typed texts.

7.12 Evaluate similarities, differences, and limitations. Determine their significance individually and in combination.

7.13 Reach a conclusion according to the criteria set forth in Section 8.

WHEN A TYPEWRITER(S) HAS BEEN SUBMITTED FOR EXAMINATION

7.14 Determine whether the typewriter is electronic. If it is electronic, it can be important for the examiner to become familiar with its operation so that any data stored in the machine will not be lost.

7.15 The examiner should, if possible, document the physical condition of the typewriter and associated items, including:

7.15.1 Manufacturer, make, model, and serial number of the typewriter.

7.15.2 Any damage to mechanical components.

7.15.3 Settings on typewriter (for example, margins, tabulator stops, vertical spacing setting, pressure settings, ribbon switch (bichrome) setting; on a multi-spacing machine note the horizontal spacing setting and other possible settings).

7.15.4 Whether the typewriter is in new, used, or abused condition.

7.15.5 Any information, installation records, or service records that are with the typewriter.

7.16 Remove and examine ribbon and correction media, if present. Note any significant impressions prior to removal. (See also 7.19 and 7.22.)

7.17 Examine the typewriter typefaces for defects, if any, with magnification and appropriate illumination.

7.17.1 For single element typewriters, the element should be removed for examination. Note any unusual features about the seating of the element prior to removal. On metal coated elements, examine for plating defects (for example, beads, loss of plating).

7.18 Examine the typewriter platen for typewritten impressions or defects (for example, scratches, pitting, or extraneous matter). (This can require examination with various light sources.)

7.19 These steps should be followed when taking typewriter exemplars:

7.19.1 If possible, do not use the ribbon that was in the typewriter when it was submitted. Use a ribbon of the same kind (for example, fabric, single strike) appropriate for the machine. A sheet of carbon paper may be substituted when the appropriate ribbon cannot be used.

7.19.1.1 If it is necessary to use the ribbon in the typewriter when submitted, mark the exposed portion of the ribbon to

serve as a “start line” that separates the samples from the pre-existing typing on the ribbon.

7.19.2 On each exemplar, note the manufacturer, make, model, and serial number of the typewriter, the name of the person taking the exemplars, the date, and the location.

7.19.3 Initial samples should be taken using the settings on the typewriter when received.

7.19.4 Take multiple strike-ups of the entire keyboard, upper case and lower case (that is, with the shift key engaged and with the shift key not engaged).

7.19.5 Take multiple strike-ups with different settings as appropriate to the features of the machine (for example, pitch, line spacing, impact, margins). On manual typewriters, use varying amounts of force in striking the keys, obtaining strike-ups with heavy, medium, and light pressure.

7.19.6 To the extent possible, take multiple strike-ups that duplicate the questioned text using the same machine settings (for example, if a single element machine, pitch, line spacing, typestyle).

7.19.7 On fabric ribbon machines, it is helpful to take exemplars with the ribbon set to “stencil” (ribbon disengaged). Exemplars can be taken both with and without a sheet of carbon paper in contact with a clean sheet of paper.

7.19.8 For typebar machines, type the whole keyboard (upper and lower case) using the lower case n or h to space the letters (for example, nanbncnd...hahbhchd...). Type the keyboard again using the upper case N or H (for example, NANBNCND...HAHBHCHD...). For keyboard arrangements where these letters are not at or near the center of the type basket, substitute a suitably located character with a vertical element.

7.19.9 It can be useful to take strike-ups using different paper stock, including paper similar to the questioned document.

7.19.10 If the typewriter is inoperable or has a malfunction that interferes with taking appropriate exemplars, the examiner may have the malfunction(s) corrected, if possible, noting their causes and the steps (repairs) necessary to correct them.

7.20 Whenever possible, also obtain original normal course-of-business correspondence or other materials produced on the machine at the same approximate time as the date on the questioned material (as well as the time it might have been prepared, if appropriate). Where the typewriter is not available, these can be the only exemplars.

ADDITIONAL EXAMINATIONS

7.21 Dating Typewritten Text:

7.21.1 The date of introduction of a typestyle or typestyle variant, typewriter mechanism, feature (for example, type of ribbons, dual/multiple escapements, bold type, and margin justification), or date of production of a particular typewriter (based on the serial number) can establish the earliest possible date for the production of the document.

7.21.2 The gradual development of typewriting individuality plus ribbon condition and typeface cleanliness can be used to establish a date or period of time when a document was prepared by comparing questioned typed text to appropriate known documents.

7.22 Typewriter Ribbon Examinations:

7.22.1 The ribbon should be handled with appropriate care to avoid damaging the ink coating and compromising the potential for reading the text or for matching fracture patterns or paper fiber impressions.

7.22.2 Single-strike film ribbons, single-strike paper ribbons, and correction media can be read and potentially matched to typed text in accordance with Guide E 2287.

7.22.3 Text on fabric ribbons can sometimes be deciphered on new ribbons or those with limited usage. Dual color ribbons can sometimes be associated with typewritten text.

7.22.4 The thread count of a woven fabric ribbon can be matched at the level of class characteristics, but is generally more useful for differentiation of ribbons.

7.23 Alteration and Interlineation of Typewriting:

7.23.1 Examine typewritten text for continuity and note any irregularities. Examination should include:

7.23.1.1 Consistency of alignment and spacing (measured with typewriter grids or equivalent). Typebar typewriters should maintain a constant escapement. Margins, tabulator stops, and line spacing settings can be changed by the operator. Single element typewriters usually have greater latitude in changing escapement and other spacings.

7.23.1.2 Consistency of typestyle. Typebar typewriters maintain a constant typestyle throughout a page. Single element typewriters utilizing interchangeable elements allow for the changing of typestyles on documents without having to remove paper from the typewriter.

7.23.1.3 Consistency of ribbon type, thread count, and ink density.

7.23.1.4 Formatting features should also be considered (for example, margins, paragraph indentation).

7.23.1.5 Examine both sides of the document for chemical or physical/mechanical erasures. Use various light sources (including side and transmitted illumination) as well as ultraviolet illumination. (Guide E 2331.)

8. Report

8.1 The conclusion(s) resulting from the procedures in this guide may be reached once sufficient examinations have been conducted. The number and nature of the necessary examinations is dependent on the question at hand.

8.2 The bases and reasons for the conclusion(s) should be included in the examiner's documentation and may also appear in the report.

8.3 *Identification*—When the examination reveals no inexplicable differences and there is significant agreement of individualizing characteristics, an identification is appropriate.

8.4 *Elimination*—If significant differences are found at any level of the analyses, an elimination is appropriate.

8.5 *Qualified Opinions*—When there are limiting factors and the examination reveals similarities or differences of significance, the use of qualified opinions can be appropriate. Qualified opinions require explanation of the limiting factors.

8.6 *No Conclusion*—When there are significant limiting factors, a report that no conclusion can be reached can be appropriate.

NOTE 9—The Discussions in Terminology E 1658 may be of use in stating the conclusion(s).

8.7 Conclusions based on other examinations (for example, typestyle classification, dating typewritten text, alterations and interlineations of typewriting) can be reported in these or other terms, as appropriate.

9. Keywords

9.1 forensic sciences; questioned documents; typewriter; typewritten text

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